STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Southwest Region Office
PO Box 47775 • Olympia, WA 98504-7775 • 360-407-6300

January 10, 2024

Jonathon Wolf
Port of Olympia
606 Columbia Street NW, Suite 300
Olympia, WA 98501

Re: DRAFT Sub-Area 1 Project Area Pre-Remedial Design Sediment Chemistry Investigation Work Plan, Port of Olympia Budd Inlet Sediment Site, Olympia, Washington, December 1, 2023

- **Site Name: Budd Inlet Sediment Site, Olympia, Thurston County, Washington**
- **Facility/Site No. 3097108**
- **Cleanup Site ID No. 2245**

Dear Jonathon Wolf:

Thank you for the Port submittal of the document titled *DRAFT Sub-Area 1 Project Area Pre-Remedial Design Sediment Chemistry Investigation Work Plan, Port of Olympia Budd Inlet Sediment Site, Olympia, Washington* (work plan), dated December 1, 2023. The work plan includes a Sampling and Analysis Plan/ Quality Assurance Project Plan (Attachment A), Health and Safety Plan (Attachment B), and Inadvertent Discovery Plan (Attachment C). The Department of Ecology (Ecology) approves the Port mobilizing to the field to implement the sediment chemistry pre-remedial design investigation on the condition that our comments on the work plan provided in this letter and attachments are resolved to Ecology's satisfaction and implemented during the investigation. Revised work plan documents incorporating our specific comments and edits consistent with this letter and attachments, as well as the outcome of work plan discussions between Ecology and the Port team on January 2 and 4, 2024, shall be resubmitted to Ecology for review and approval by January 31, 2024.

Ecology has the following comments on the work plan submittals.

General. The 2023 Revised Draft Identification and Evaluation of Interim Action Alternatives Memorandum referred to in the work plan has not been approved by Ecology. Approval of this work plan does not include Ecology approval of the screening level hierarchy provided in

SAP/QAPP Table 3, preliminary sediment cleanup standards and chemicals of concern provided in work plan Table 3, SWAC and RAL calculation methodology in the work plan, nor imply Ecology approval of any portion of the 2023 Revised Draft Identification and Evaluation of lnterim Action Alternatives Memorandum.

Comments on the Draft Work Plan, December 1, 2023

Chemicals of concern. The preliminary chemicals of concern (COCs) list presented in Work Plan Table 3, which was developed as part of the Draft Identification and Evaluation of lnterim Action Alternatives Memorandum, is outdated. Changes to the geographic area of the project from the study area to a larger area of Budd Inlet, and changes to anticipated remedial actions, including substantial dredging, likely will result in changes to the preliminary chemicals of concern. Ecology expects the Port to re-assess COCs following data collection.

Pentachlorophenol. As presented in Ecology's comment letter "Ecology Comments on the Draft Identification and Evaluation of lnterim Action Alternatives Memorandum Budd Inlet Sediment Site," dated March 29, 2018, pentachlorophenol is considered a potential site contaminant of concern and will require a human health-based screening level be developed for the work plan. Include pentachlorophenol in the work plan primary COC list.

Arsenic and mercury. In addition, please include arsenic and mercury, potential bioaccumulative metals with organic forms, as potential site COCs. Natural background concentrations of mercury (0.2 mg/kg) and arsenic (11 mg/kg) (SCUM Table 10-1) may be used as screening levels for the work plan. Include arsenic and mercury in the primary COC list.

Work plan specific comments and edits. Please also review and incorporate into the revised work plan the additional comments provided in the attached redline draft work plan.

Comments on the Draft Sampling and Analysis Plan/ Quality Assurance Project Plan (Work Plan Attachment A), December 1, 2023

Table 3. Ecology does not accept use of 360 ug/kg as a screening level for pentachlorophenol. Pentachlorophenol will require a human health-based screening level be developed.

SAP/QAPP specific comments and edits. Please also review and incorporate additional comments provided in the attached redline SAP/QAPP and annotated Table 3 (provided as separate documents).

Comments on the Health and Safety Plan (Work Plan Attachment B), December 1, 2023

Section 1.0. Introduction, page 1-1, second paragraph. Please update the sentence "The HASP is specifically limited to field activities associated with the Port of Olympia Fall 2023 Sampling

Event Memorandum (DOF 2023a) and the project-specific draft Sediment Sampling and Analysis Plan and Quality Assurance Project Plan (DOF 2023b)." to refer to the most recent planning documents. In addition, please include the scope of the HASP written out in the text of the document.

Section 2.0. Project and Site Description, general. Please update this section to incorporate Ecology comments and to be consistent with project and site descriptions provided in the Work Plan and SAP/QAPP. Ecology comments were provided on both the September 15 and December 1, 2023, versions of the plans.

Comments on the Inadvertent Discovery Plan (Work Plan Attachment C), Revised December 4, 2023.

Regulatory Context, page 4. Please revise this section to clarify the project is partially funded by grants from both the Washington State Department of Commerce (DOC) and Department of Ecology (Ecology).

Delete the following sentences "The Washington State Department of Ecology (Ecology) is the state agency responsible for GEO 21-02 compliance." and "The USACE and Ecology will consult with the Washington Department of Archaeology and Historic Preservation (DAHP)." Please add a statement in the IDP summarizing the U.S. Army Corps of Engineer's *No Potential to Cause Effects* determination for the sampling activities to document how cultural resource requirements were addressed.

Based on information provided to Ecology during the week of January 1, 2024, Ecology's consultation requirements under Governor's Executive Order EO 21-02 were addressed by the USACE's *No Potential to Cause Effects* determination under Section 106 of the National Historic Preservation Act. The determination was made as part of USACE issuance of a Nationwide Permit 6 to the Port of Olympia for the subject sampling activities in Budd Inlet.

Tribal Consultation, page 5. Update the sentence "Ecology's consultation requirements under Governor's Executive Order EO 21-02 were addressed by the USACE's *No Potential to Cause Effects* determination under Section 106 of the National Historic Preservation Act. Ecology will keep the Nisqually Indian Tribe, the Squaxin Island Tribe, the Cowlitz Indian Tribe, and the Confederated Tribes of the Chehalis Reservation informed of site progress."

If you have any questions, please contact me at (360) 999-9588 or sandy.smith@ecy.wa.gov.

Sincerely,

Sandy Smith

Sandy Smith
Cleanup Project Manager
Toxics Cleanup Program
Southwest Regional Office

Attachments

cc by email: Rebecca S. Lawson, P.E., LHG, Ecology rebecca.lawson@ecy.wa.gov
Connie Groven, P.E., Ecology connie.groven@ecy.wa.gov
Rob Webb, Dalton Olmsted Fuglevand rwebb@dofnw.com
Sandy Smith, P.E., Ecology sandy.smith@ecy.wa.gov
Ecology Site File

DRAFT
Sediment Sampling and Analysis Plan and Quality Assurance Project Plan Port of Olympia Budd Inlet Cleanup Site Olympia, Washington

~~September 15~~December 1, 2023

Prepared for

Port of Olympia
915 Washington Street NE
Olympia, Washington 98501

Prepared by

Dalton, Olmsted & Fuglevand
1001 SW Klickitat Way
Suite 200B
Seattle, Washington, 98134

The Budd Inlet Team

DRAFT

Sediment Sampling and Analysis Plan
and Quality Assurance Project Plan
Port of Olympia Budd Inlet ~~Sediments~~ Sediments Cleanup Site
Olympia, Washington

~~September 15~~December 1, 2023

Commented [A1]: This is a general comment that carries through from our comments on the PRD data gaps memo into this SAP/QAPP. Refer to project Visio.

Address plan organization issues. Restructure SAP/QAPP to accommodate addenda for future phases of work.

Please provide additional information about what sampling efforts this SAP/QAPP is intended to cover.

- Areas
- Sample types
- Data use

Include site-specific COCs and preliminary SCLs.

Commented [DF2R1]: Addressed per team discussion

Commented [TCP-SBS3R1]: See comments later in plan re: plan coverage.

Commented [A4]: Please clarify how disposal is used in this plan. Is this for landfill disposal characterization only?

Will you be evaluating/mapping wood waste? If so, please describe.

Commented [DF5R4]: Addressed per team discussion:

Disposal/material management will be addressed separately.

Sediment samples will be visually inspected for the presence of wood waste; text added accordingly.

Commented [TCP-SBS6R4]: See comments later in plan re: wood waste.

DALTON OLMSTED FUGLEVAND

The Budd Inlet Team

Sediment Sampling and Analysis Plan and Quality Assurance Project Plan

Port of Olympia Budd Inlet Cleanup Site

Agreed Order Number DE 6083

by Dalton, Olmsted, and Fuglevand Team

Published September 2023

Commented [A7]: Ecology's plan approval will be provided in a formal letter. Ecology will not sign this or other signature pages in the planning documents.

Commented [DF8R7]: addressed

Commented [TCP-SBS9R7]: Okay

Commented [TCP-SBS10]: September 2023 is the date of the previous submittal. Use current document date here and in the footers.

TABLE OF CONTENTS

FIGURES

Commented [TCP-SBS11]: Please remove Cascade Pole Cleanup Site boundary line from Figure 2-1. It has been replaced with the multiple benefits line. Please revise 'Marina Terminal' label to 'Marine Terminal.'

TABLES

ATTACHMENTS

Commented [A12]: TVS samples must not be frozen
Sulfides samples must not be frozen

Commented [DF13R12]: addressed

Commented [TCP-SBS14R12]: Please review and incorporate the following comments into Table 2 of the SAP/QAPP:
- Dioxins and furans holding time and preservative are not consistent with SCUM Table 4-7 which includes cool for 14 days before extraction, freeze for 1 year before extraction, and cool for 40 days after extraction.
- Fix vertical spacing on 6020B row.
- Freezing samples for TVS analysis is acceptable, per SCUM Table 4-7. Please disregard previous comment.
- Freezing samples for ammonia analysis is not consistent with SCUM Table 4-7.
- Freezing samples for total sulfides analysis is not consistent with SCUM Table 4-7.

Commented [A15]: This table requires substantial rework. Please see comments in a separate Word document.

Note: SCUM allows substitution for PCB Aroclors with PCB congeners, which may allow the Port to reduce the overall PCB analyses. See Appendix O of SCUM 2021 for details.

Commented [DF16R15]: Addressed per team discussion

Commented [TCP-SBS17R15]: See additional comments on Table 3 that are provided in a separate document.

Commented [TCP-SBS18]: The lab shall analyze a Spectral Interference Check (SIC) sample to verify the effectiveness of the UCT-KED technology. Refer to EPA Method 6020B. Include the SIC sample requirement in this SAP-QAPP.

Commented [TCP-SBS19]: Remove all logs and forms for activities not covered in this SAP/QAPP. Examples of items to be removed include:
- 6. Stormwater sample collection form
- 7. Stormwater sample collection form
- 8. Soil sample collection form
- 9. Groundwater elevation record
- 10. Groundwater low-flow sample collection form
- 11. As-Built well completion form
- 12. Well development record

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LIST OF ABBREVIATIONS AND ACRONYMS

%R	percent recovery
°C	degrees Celsius
AO	Agreed Order
ASTM	ASTM International
Cascade Pole	Cascade Pole Inc McFarland ~~C~~cleanup ~~S~~site
CCV	continuing calibration verification
CLP	Contract Laboratory Program
cm	centimeter
COC	chain of custody
cPAH	carcinogenic polycyclic aromatic hydrocarbon
D/F	dioxin and furan
DGPS	differential global positioning system
DL	detection limit
DMMO	Dredged Material Management Office
DMMP	Dredged Material Management Program
DNR	Department of Natural Resources
DOF	Dalton Olmsted & Fuglevand
DQO	data quality objective
DUP	duplicate
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EIM	Environmental Information Management System
EPA	US Environmental Protection Agency
ft	feet/foot
GC	geochronological core
GC/MS	gas chromatograph/mass spectrometer
HASP	Health and Safety Plan
HARN	High Accuracy Reference Network
HDPE	high-density polyethylene
l_A	incremental length of sediment acquired in the core tube
l_P	incremental penetration of the core tube below mudline
IAP	Interim Action Plan
ICP	inductively coupled plasma
ID	identification
Initiative	Puget Sound Initiative
Landau	Landau Associates, Inc.

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

LCS	laboratory control sample
LOTT	LOTT Cleanup Water Alliance
m/s	meters per second
MDL	method detection limit
MLLW	mean lower low water
MQO	measurement quality objective
MRL	method report limit
MS	matrix spike
MSD	matrix spike duplicate
MTCA	Model Toxics Control Act
NAD83	North American Datum of 1983
NAPL	light non-aqueous phase liquid
NOAA	National Oceanic Atmospheric Administration
PCB	polychlorinated biphenyl
PM	project manager
PMA	Port Management Agreement
POBI	Port of Olympia Budd Inlet
Port	Port of Olympia
PQL	practical quantitation limits
Project	Budd Inlet Cleanup Site Project
PSEP	Puget Sound Estuary Program
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RL	reporting limit
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SB	sediment bulk
SC	sediment core
SCUM	Sediment Cleanup User's Manual
SG	surface grab sediment
Site	Budd Inlet Cleanup Site
SMS	Sediment Management Standards
SOP	standard of practice
SRM	standard reference material
ST	station
TCLP	toxicity characteristic leaching procedure

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Commented [A20]: Clarify what this refers to. Is it project area?

Commented [DF21R20]: Addressed in text

Commented [A22]: Please clarify how Site differs from Project.

Commented [DF23R22]: Addressed in text

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

TOC .... total organic carbon
USACE .... US Army Corps of Engineers
V-SAM .... vibracore sediment acquisition monitoring
WAC .... Washington Administrative Code

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1.0 INTRODUCTION

This Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) has been prepared to support work being performed under Agreed Order (AO) No. DE 6083 (Ecology 2008), and its subsequent two amendments (Ecology 2012; Ecology 2023), between the Port of Olympia (Port) and the Washington State Department of Ecology (Ecology), to support the Budd Inlet Sediments ~~C~~cleanup ~~S~~site ~~P~~project (Project).

This SAP/QAPP presents the data quality objectives, laboratory activities, core processing procedures, field sampling procedures, and field quality assurance/quality control (QA/QC) procedures to be implemented during field sampling activities and laboratory analyses in support of ~~additional~~ sediment chemistry data gathering efforts for Sub-Area~~s~~ 1 ~~through 3~~ in the Budd Inlet Sediments ~~C~~cleanup ~~S~~site (Site). This SAP/QAPP was developed in accordance with Ecology's *Sediment Cleanup User's Manual (SCUM)* ~~III~~ (Ecology 2021) and Ecology's *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Ecology 2016a)~~, where appropriate~~. This SAP/QAPP meets the requirements of Washington Administrative Code (WAC) 173-340-820, in the Model Toxics Control Act (MTCA); and WAC 173-204-600, in the Sediment Management Standards (SMS). Updates to this SAP/QAPP will be communicated to Ecology and addressed as addenda~~, when appropriate, as additional guidance requirements arise~~ throughout the course of sediment chemistry data gathering efforts for Sub-Area 1~~the Project~~.

Commented [A24]: Communications with Rob Webb on September 18, 2023, confirm that this version is the Ecology review draft, not the internal team draft as noted in the header. Please revise the header for future submittals.

Commented [DF25R24]: Landau PC will revise during prep of revised draft

Commented [A26]: Please clarify use of the word 'additional' here and throughout the SAP/QAPP. Distinguish between activities intended to be covered by this SAP/QAPP and those activities anticipated to be covered by addenda.

Commented [DF27R26]: Addressed per team discussion

Commented [TCP-SBS28]: Remove Subareas 2 and 3 from the text. Ecology's future approval of this SAP/QAPP will be limited to sediment chemistry data acquisition for Sub-Area 1 (see text edit below).

Commented [A29]: Same comment as previous. Is this SAP/QAPP intended to cover all areas and tasks? Or is it specific to the East Bay project area? Revise text to clarify.

Commented [DF30R29]: Addressed per team discussion

Commented [A31]: Please identify where accordance with guidance documents is not appropriate. In these instances, provide full description of the proposed procedures, rationale, and supporting documentation.

Commented [DF32R31]: Addressed

A Health and Safety Plan (HASP) for support of field sampling activities will be provided with future work plan documentation~~, as appropriate~~. HASP addenda will also be developed, if appropriate, depending on future field investigation requirements.

Other additional addenda, such as sampling protocols and standards of practice (SOPs), will be provided with future work plan documentation~~, as appropriate~~.

Commented [TCP-SBS33]: Revise this paragraph to remove the statement about the HASP being provided with future work plan documentation. A HASP is required when performing field activities. A draft HASP was submitted with work plan documentation.

Include specific information in the plan text about when HASP addenda may be appropriate, such as when field activities and conditions change from those included in the plan.

Commented [TCP-SBS34]: Please delete this sentence from the text or clarify the intent in the text. I think this sentence may no longer be applicable because you've submitted the work plan.

2.0 PROJECT AND SITE DESCRIPTION

The following sections include a description of the Project as defined by the AO and for the Budd Inlet Cleanup Site.

2.1 Project Description

Under the Puget Sound Initiative (Initiative), Ecology identified Budd Inlet as a high priority cleanup area that required focused sediment cleanup and source control primarily due to elevated dioxin and furan (D/F) concentrations in sediment (Ecology 2008). As part of the Initiative, Ecology issued AOs to property owners to investigate and clean up contaminated sites within Budd Inlet. Ecology and the Port entered into AO No. DE 6083 in 2008 to complete a pilot remedial dredging action in a portion of the Port's berthing area (completed in 2009). In 2012, the AO was amended to require the Port to evaluate a larger area, identified as the Study Area, and address contaminated sediment in the vicinity of the Port Peninsula (Ecology 2012). The AO was recently amended a second time (effective June 9, 2023) requiring the Port to prepare public review draft and final versions of the Interim Action Plan (IAP), prepare a pre-remedial design data gaps memorandum and investigation work plan, perform the pre-remedial design investigation and reporting, and develop engineering design and permitting documents for the interim action (Ecology 2023).

The Port is and Ecology are currently working with Ecology oversightin a collaborative process to develop, design, and permit, fund, and construct Budd Inlet sediment remediation., such that remedial work is complete prior to the potential upcoming removal of the Capitol Lake dam. Removal of the dam is expected to significantly increase the sediment load into Budd Inlet. If the new sediment from Capitol Lake enters Budd Inlet prior to remediation, the total volume of sediment to remediate in Budd Inlet would likely increase because the new sediment could not be differentiated from the impacted sediment in a cost-effective manner.

2.2 Site Description

The Port's Marine Terminal facility is located in the northern portion of the City of Olympia on a peninsula within Budd Inlet, which is a small embayment in southern Puget Sound (Figure 2-1). Budd Inlet is divided into West Bay and East Bay at the southernmost portionint. The filling of tidelands in the late 1800s and early 1900s created the Port Peninsula, the West Bay and East Bay of Budd Inlet, and part of the downtown area of Olympia. Summaries of West Bay and East Bay are provided below.

The Marine Terminal is approximately 66 acres and provides approximately 2,500 linear feet (ft) of wharf (Berths 1, 2, and 3) and 76,000 square ft of warehousing. Current upland use immediately adjacent to the berths and turning basin include log storage yards, cargo storage yards, and loading docks. A former log pond/marina area is present in the northwestern corner of the peninsula, defined

Commented [TCP-SBS35]: Added 'and' to clarify that both project description (Section 2.1) and site description (Section 2.2) are included in this section.

Commented [TCP-SBS36]: Please delete source control from text here. The 2008 agreed order (Ecology 2008) did not include source control.

Commented [A37]: Delete all references to funding. It is not relevant to the SAP/QAPP.

Please delete construction. Constructing the remedial action is not included in the AO.

Commented [DF38R37]: Addressed

Commented [A39]: Delete early. East Bay marina construction was in the 1980s.

Commented [DF40R39]: addressed

Commented [A41]: Consider separating the overall Marine Terminal facility description into an upland area section, instead of including as part of West Bay description.

Commented [DF42R41]: Addressed.

by a dilapidated external pier running north parallel to the peninsula, outlining a shallower submerged area.

Summaries of West Bay and East Bay are provided below.

2.2.1 West Bay

The Olympia Harbor federal navigation channel extends into Budd Inlet's West Bay and widens into a turning basin near its southern end, adjacent to the Port's Marine Terminal berthing area. This portion of the navigation channel is a deep draft channel (federally authorized depth -30 mean lower low water [MLLW]), primarily providing access to the Marine Terminal for oceangoing vessels. The Port manages the harbor area under a Port Management Agreement (PMA) with the Washington Department of Natural Resources (DNR). Along the Marine Terminal, the harbor area is mostly defined as a 54-feet-wide swath that extends from the south end of the Marine Terminal to beyond the north end. This narrow swath extends from the face of the Port's Marine Terminal landward and includes the underpier area of the Marine Terminal. Waterward of the Marine Terminal, the berthing area coincides withabuts the federal turning basin.

The Marine Terminal is approximately 66 acres and provides approximately 2,500 linear feet (ft) of wharf (Berths 1, 2, and 3) and 76,000 square ft of warehousing. Current upland use immediately adjacent to the berths and turning basin include log storage yards, cargo storage yards, and loading docks. A former log pond/marina area is present in the northwestern corner of the peninsula, defined by a dilapidated external pier running north parallel to the peninsula, outlining a shallower submerged area.

Commented [A43]: Consider separating the overall Marine Terminal facility description into an upland area section, instead of including as part of West Bay description.

Commented [DF44R43]: Addressed, moved above

Additional features within the West Bay include separate Ecology cleanup sites, a boat basin, marinas, and waterfront shops and restaurants. Within West Bay, five contaminated sites previously or currently under separate AOs with Ecology are located along the shoreline: West bBay Marina; Hardel Mutual Plywood; BMT Northwest aka Reliable Steel; Solid Wood, Inc.; and Industrial Petroleum Distributors. The area south of the Marine Terminal includes a boat basin, waterfront shops and restaurants, and marinas. Three marinas are currently present: Fiddlehead, Martin, and the Olympia Yacht Club.

Commented [TCP-SBS45]: Please see edit. Not all these sites are currently under order.

At the southern endSouth of West Bay, the Deschutes River drains into Capitol Lake, in an area that was once an estuary where freshwater from the Deschutes River intermingled with salt water from Budd Inlet. The lake was created in 1951, as a reflection pond for the State Capitol, by installing an earthen dam and an approximately 82-ft-wide tide gate with spillways across the mouth of the Deschutes River under the 5th Avenue Bridge in Olympia (USGS 2006). The flow of freshwater into West Bay is controlled by gated discharges from Capitol Lake. The Washington State Department of Enterprise Services is planningconsidering future removal of the Capitol Lake dam and returning the lake to an estuary. If implemented, this change is expected to ~~would~~ increase future sediment transport and deposition into Budd Inlet, and West Bay in particular, likely increasing future dredging needs.

Commented [TCP-SBS46]: Please consider revised language. We understand sedimentation is based on modeling.

2.2.2 East Bay

The eastern portion of the federally authorized navigation channel runs from the north of the Port Peninsula and extends into the East Bay of Budd Inlet. This is a shallow draft channel (federally authorized depth -12 and -13 MLLW) generally for recreational vessels accessing Swantown Marina and Boatworks. The primary commercial facilities in East Bay are operated by the Port and include Swantown Marina and Swantown Boatworks, located on the eastern side of the peninsula. The federal navigation channel also extends to the boat launch ramp located just north of Swantown Marina. Swantown Marina (referred to as East Bay Marina prior to 1995) has been in operation since 1983, is owned and operated by the Port, and maintains slips for approximately 700 vessels. Swantown Boatworks provides vessel service, ~~haulout~~haul out, and a vessel storage facility. Prior to construction of the Marina, East Bay was historically used for log storage.

Two Sites under AOs with Ecology are located on the Port Peninsula adjacent to East Bay: The Cascade Pole Inc McFarland ~~C~~cleanup ~~S~~site (Cascade Pole; located on the north end of the peninsula) and the East Bay Redevelopment ~~S~~site (located on the southern portion of the peninsula). The Port has been addressing contamination at Cascade Pole since 1990. The previous cleanup activities at Cascade Pole include several interim actions to remove and contain contamination, both on the uplands (groundwater and soil) and in the sediments. The Port continues to operate, maintain, and monitor a groundwater pump-and-treat system ~~where contamination is confined~~ as an interim action under a separate AO with Ecology. Long-term monitoring as part of the ~~final~~ Cascade Pole sediment cleanup is ongoing under an Agreed Order ~~Consent Decree~~ with Ecology. ~~.~~The historical activities at East Bay Redevelopment site caused soil ~~and groundwater~~ contamination. At the East Bay Redevelopment site the Port has been conducting upland soil investigations and cleanup actions under separate MTCA AOs with Ecology since 2007. The Port, along with the City of Olympia and LOTT Cleanup Water Alliance (LOTT), worked with Ecology to implement the Cleanup Action Plan for the site. Remediation included removal of some soil contamination hot spots. Remaining impacted soil were covered with a cap of clean soil, pavement, or buildings. ~~At the East Bay Redevelopment Ssite, the Port has been conducting upland soil investigations and cleanup actions under separate MTCA AOs with Ecology since 2007.~~

Commented [TCP-SBS47]: Please see text revision. Groundwater is not a media of concern at EBRD.

Commented [A48]: Also include a description of East Bay Redevelopment site.

Commented [DP49R48]: Paragraph revised to include brief description about the E Bay Redevelopment Site.

Moxlie Creek originates from an artesian spring approximately 1.5 miles south of Budd Inlet. It flows into East Bay through a mile-long culvert that receives stormwater flows from urban areas, including road runoff from city streets and state and federal highways, before discharging at the southern end of East Bay (Anchor QEA 2012a). East Bay was placed on the 303(d) impaired water body list for polychlorinated biphenyls (PCBs), based on the results of mussel shellfish tissue samples collected in 1995 from the culvert at the mouth of Moxlie Creek. D/F and carcinogenic polycyclic aromatic hydrocarbons (cPAHs) were added to the East Bay 303(d) listing due to bent-nosed clam tissue concentrations measured in 2007 (Ecology 2016b).

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The specific roles, activities, and responsibilities of Project participants are described in Table 1. Before field work commences, Project participants listed in Table 1 will receive a copy of the final approved SAP/QAPP. The Port has the primary responsibility for managing the work completed at the Site. Ecology will be notified in writing of changes to Table 1.

Table 1. Project Team Roles and Responsibilities

Title/Role	Name	Organization	Responsibilities
Port Project Manager	~~To be determined~~Jon Wolf	Port	Manages the Project for Port of Olympia.
Ecology Project Manager	Sandy Smith	Ecology	Oversees the Project on behalf of the Washington State Department of Ecology.
~~**US Army Corps of Engineers (USACE) Project Manager**~~	~~To be determined~~	~~USACE~~	~~Oversees the Project on behalf of the US Army Corps of Engineers.~~
Consultant Project Managers	Rob Webb; Natasya Gray	Dalton Olmsted & Fuglevand, Inc. (DOF)	Supervises and coordinates all work for the Project. These responsibilities include Project planning and execution, scheduling, staffing, data evaluation, sample archive management, submitting data to EIM, report preparation, subcontracts, and managing deliverables.
Quality Assurance Manager	Danille Jorgensen	Landau Associates, Inc. (Landau)	Oversees and directs quality assurance reviews for the Project, including laboratory procedures and actions. Coordinates and reviews data validation. Has oversight responsibility for management and integrity of the data.
Data Validator	Kristi Schultz	Landau	Reviews laboratory analytical data and provides data validation. ~~Submits data to EIM.~~
Field Lead	To be determined based on scope of work—see ~~relevant~~ work plan	Landau	Leads and coordinates field activities, including documentation, sampling, and sample handling. Reports directly to the Consultant Project Managers (PM).
Health and Safety Manager	Christine Kimmel	Landau	Responsible for review and implementation of the Project HASP.
Field Equipment Manager	Ken Reid	Landau	Ensures equipment is properly maintained and in good condition for Project use.
Environmental, ~~Geotechnical~~ Laboratory Project Manager(s)	To be determined based on scope of work—see ~~relevant~~ work plan	Analytical Resources, LLC (Tukwila, WA) Enthalpy Analytical (El Dorado Hills, CA)	Manages laboratory analysis and reporting, including supervising in-house chain of custody and scheduling sample analyses within required holding times; oversees data review and preparation of laboratory reports and electronic data deliverables (EDDs). Holds archived samples.

Commented [A50]: What portions of the project will be overseen by USACE? Will involvement extend beyond permitting? We would like to discuss USACE's roles in the project.

Commented [DJ51R50]: Per 11/10 team call, remove all references to USACE however do following USACE DMMP requirements

Commented [A52]: Does this include field activities?

Commented [DF53R52]: Correct; HASP will be implemented during field activities

Commented [A57]: Will the labs also manage the sample archive?

Commented [DF58R57]: Archived samples will be held by labs under the direction of DOF; added text above to clarify

Commented [TCP-SBS59R57]: See edit in laboratory row. Added 'holds archived samples.'

Commented [A54]: Please identify the specific Enthalpy Analytical laboratory.

Commented [DF55R54]: Addressed

Commented [TCP-SBS56R54]: Checked El Dorado Hills lab accreditations.

4.0 SEDIMENT SAMPLE COLLECTION, PROCESSING, AND HANDLING PROCEDURES

This section describes activities, methods, and procedures that will be used to complete the sediment chemistry sampling investigation in Sub-Area 1. Sample collection and related management discussed herein include procedures relating to sediment sampling (i.e., surface grabs, cores, bulk sediment).

Commented [A60]: Define the scope of this SAP-QAPP—areas, data types, and data uses.
- Bioassays?
- Porewater?
- Evaluating upland disposal?
- Mapping and characterizing wood waste (if present)?

Explain how data types not covered here will be addressed (addenda?).

Commented [DF61R60]: Addressed; this SAP/QAPP is for Sediment Chemistry work only.

Commented [TCP-SBS62R60]: Please see edit in text to clarify SAP/QAPP coverage.

Porewater sampling is not addressed in this SAP/QAPP; however, it is still included in the work plan. This discrepancy needs to be resolved by either removing porewater sampling from the work plan or including porewater procedures in this SAP.

Wood waste evaluation is limited to a visual assessment, which may not be adequate to identify wood waste. Please flesh out the assessment and/or explanation of the visual assessment. See Ecology's 2013 Wood Waste guidance for more information. https://apps.ecology.wa.gov/publications/documents/0909044.pdf

Commented [TCP-SBS63]: Delete bulk sediment. It has been removed from this plan.

The rationale for the sampling design and the design assumptions for locating and selecting environmental samples will be detailed in work plan documentation that will reference this SAP/QAPP, when appropriate. Sediment sampling procedures will comply with Ecology protocols, or other Ecology-approved sample collection standards established and documented for the Site.

Commented [TCP-SBS64]: Please revise this statement. It is unclear. The work plan has already been submitted. Shouldn't this sentence be present tense?

Commented [A65]: Sampling procedures also should conform to PSEP protocols. See SCUM Section 4.5.

Commented [DP66R65]: Sampling procedures conform to PSEP protocols.

Commented [A67]: If sampling procedures not in compliance with Ecology and PSEP protocols are necessary, they need to be provided to Ecology for review and approval before the sampling activity.

Commented [DF68R67]: Addressed

4.1 Sediment (Surface Grabs and Subsurface Core Sampling)

Sampling methods for surface sediment (grabs) and subsurface sediment (cores) are outlined in the section that follows.

4.1.1 Station and Sample Identification and Nomenclature

Each sample will be assigned a unique alphanumeric identifier according to the following method:

- Each sample identification (ID) will be identified by *Project Name-Sample Method-Location Number-Sample Collection Date-Sample Type Depth.*
  - The Project name will be identified by four letters: *POBI* for *Port of Olympia Budd Inlet*.
  - Sample method will be identified by two lettersas: *SG* for *surface grab sediment, SVC* for *subtidal vibrasediment core, and SVCI for intertidal sediment vibracore, and SB for sediment bulk*.
  - Sample location number will be in order by sample method beginning with -001 (e.g., SG-001).
  - Sample collection date will be identified by year, month, and day as YYMMDD (e.g., 240116 for 01/16/2024)
  - Sample depth will be identified by the upper and lower sample collection depths. Surface grab depths are measured in centimeters (cm), and sediment core intervals are measured in feet. For example, a sample ID for the first surface sediment grab location will be POBI-SG-001-(0-10), and from the 0- to 2-foot interval of a sediment core will be POBI-SVC-001-(0-2).
- A field duplicate collected from a sample will be identified by the addition of *DUP* to the sample number. A duplicate sample of the above sediment grab example would be POBI-SG-001-0-10-DUP.

Commented [A69]: Consider adding 2 to 4 characters to indicate year and/or month of study to avoid confusion with other sampling efforts using POBI. EIM recommends this for naming conventions.

Commented [DP70R69]: Sample date added to be consistent with previous sample IDs. Three digit revised from 2 to 3 digits so naming convention can be used for future samples in all sub-areas.

Each sample station location will be assigned a unique alphanumeric identifier according to the following method:

- Each station location ID will be identified by *Project Name-Location Type-Location Number.*
  - The Project name will be identified by four letters: *POBI* for *Port of Olympia Budd Inlet*.

- Location type will be identified by two to four letters: ST SG for surface grabs, SVC for sediment vibracores in subtidal areas, and SVCI- for sediment vibracores in intertidal areas. for station.
- Station Location ID numbers location number will be in order are preassigned as shown on Figures 2-7, 2-8, and 2-9, beginning with -001. (e.g., ST-001). For example, a station location ID in the intertidal area would for the first location would be POBI-STSVCI-001.

4.1.2 Station Positioning – Sediment

Horizontal positioning will be determined by the sampling vessel's onboard differential global positioning system (DGPS) based on target coordinates for each sample location. Measured station positions will be converted to latitudinal and longitudinal coordinates to the nearest 0.01 second. The accuracy of measured and recorded horizontal coordinates is typically less than 1 meter and will be within 2 meters according to Puget Sound Estuary Program (PSEP) guidance. Northing and easting coordinates of the vessel will be updated every second and displayed directly on a computer onboard the vessel. The coordinates will then be processed in real time and stored at the time of sampling using DGPS software the navigation system. Washington State Plane South Coordinates, North, North American Datum of 1983 (NAD83) High Accuracy Reference Network (HARN) will be used for the horizontal datum.

The vertical elevation distance from the water line to the mudline of each station will be measured using a fathometer or lead line.

Commented [A71]: Please provide the make/model of the DGPS unit, differential signal, and station that will be used.

Commented [DP72R71]: There are various makes and models DGPS systems that can achieve the accuracy required per PSEP guidance and will vary from contractor to contractor. Actual unit used will be included in report.

Commented [A73]: Why is converting to lat-long necessary? The SAP indicates final location will be provided in northing-easting. Please include a short explanation of how lat-long will be used.

Commented [DP74R73]: The Washington State Department Of Ecology
Puget Sound Sediment Monitoring Program/Noaa Bioeffects Monitoring form asks for coordinates to be in LAT/LONG.

Commented [TCP-SBS75R73]: Thank you. Suggest moving this sentence to the end of this paragraph. Include in Section 4.1.2 text the reason for the lat-long conversion provided in the comment bubble above.

Please clarify within the text that horizontal sample location will be documented in both Northing-Easting and lat-long formats.

Commented [A76]: Do you mean depth?

Commented [DP77R76]: Yes, the depth of water from surface to mudline.

Tidal elevation during sampling will be determined using a tide gauge and tide board to be installed onsite for the duration of the sampling event.

Commented [TCP-SBS78]: This paragraph still needs some work. First, suggest moving the paragraph to the end of Section 4.1.2. Right now, the paragraph divides 2 paragraphs that discuss horizontal positioning. Second, include in the text the information provided in the comment bubbles below that describes how a surveyor will establish a benchmark and the tide board elevation will be measured using a Trimble.

Commented [A79]: Where is/will the tide gauge be located? What is the status of the NOAA Budd Inlet station and benchmark? https://tidesandcurrents.noaa.gov/stationhome.html?id=9446969

Commented [DP80R79]: The location of the onsite tide gauge will be determined prior to the start of sampling.

A bench mark will be set by Professional Land Surveyor prior to the start of the sampling event. This bench mark will then be used for install of tide gauge and tide board.

Commented [A81]: Where is the installed tide gauge? Or is it to be installed?

Commented [DP82R81]: The tide gauge has not been installed. It is a temporary unit that will be installed prior to the start of sampling and will removed after this sampling event is complete. Tide board will be installed and will not be removed at end of sampling event to be used during future events.

Commented [A83]: How does one verify with a predicted tide? Is this possible considering that the station is historical?
What is the estimated vertical accuracy of proposed measuring techniques? Will these estimates be compared to bathymetry?
The next sentence says you'll be evaluating the accuracy of the NOAA predictions—is that correct?

Commented [DP84R83]: Predicted tide will not be used to verify tide gauge accuracy. Tide gauge will be installed and height of gauge will be determined using a Trimble DA2 GPS unit with 1-inch vertical accuracy.

NOAA predictions will not be used to determine the accuracy of the tide gauge installation. Sentence removed.

A visual tide board will be installed. This depth will be corrected for tidal influence to obtain the depth Waterline elevation and distance to the mudline will be used to calculate the elevation of the mudline relative to MLLW. Tidal elevation will be determined using a tide gauge and tide board to be installed onsite for the duration of the sampling eventand verified with National Oceanic Atmospheric Administration (NOAA) predicted tides in Budd Inlet (Station ID 9446969).

Commented [A85]: Do you mean elevation?

Commented [DP86R85]: Sentence revised for clarity.

Commented [A87]: Where is/will the tide gauge be located? What is the status of the NOAA Budd Inlet station and benchmark? https://tidesandcurrents.noaa.gov/stationhome.html?id=9446969

Commented [DP88R87]: The location of the onsite tide gauge will be determined prior to the start of sampling.

A bench mark will be set by Professional Land Surveyor prior to the start of the sampling event. This bench mark will then be used for install of tide gauge and tide board.

Commented [A89]: Where is the installed tide gauge? Or is it to be installed?

Commented [DP90R89]: The tide gauge has not been installed. It is a temporary unit that will be installed prior to the start of sampling and will removed after this sampling event is complete. Tide board will be installed and will not be removed at end of sampling event to be used during future events.

Commented [A91]: How does one verify with a predicted tide? Is this possible considering that the station is historical? What is the estimated vertical accuracy of proposed measuring techniques? Will these estimates be compared to bathymetry? The next sentence says you'll be evaluating the accuracy of the NOAA predictions—is that correct?

Commented [DP92R91]: Predicted tide will not be used to verify tide gauge accuracy. Tide gauge will be installed and height of gauge will be determined using a Trimble DA2 GPS unit with 1-inch vertical accuracy.

NOAA predictions will not be used to determine the accuracy of the tide gauge installation. Sentence removed.

Periodic waterline measurements to an appropriate survey point will be conducted to evaluate the accuracy of the NOAA predicted data.

A checkpoint will be used to ensure the horizontal accuracy of the sampling vessel's navigation system. This checkpoint will be located at a known fixed point accessible by the sampling vessel (such as a pier face, dock, piling, or similar structure). At the beginning and end of each day, the vessel will be stationed at the checkpoint, a DGPS reading will be taken, and the two readings will be compared. The two position readings should agree, within the limits of survey vessel operational mobility, to within 1 to 2 meters, per PSEP guidance.

Commented [A93]: Please describe what an appropriate survey point would be. A fixed survey point tied to a benchmark?

Commented [DJ94R93]: Landau: DOF to address

Commented [DP95R93]: The location of the onsite tide gauge will be determined prior to the start of sampling.

A bench mark will be set by Professional Land Surveyor prior to the start of the sampling event. This bench mark will then be used for install of tide gauge and tide board.

Commented [A96]: What does this mean? Will this caveat allow to you conform to the PSEP guidance of within 2 meters?

Please provide a brief explanation.

Commented [DP97R96]: The 1st paragraph of the sentence states that the vessels DGPS system is typically less than 1 meter and will be within 2 meters according to PSEP guidance.

4.1.3 Sampling Platforms

Surface and subsurface sediment will be collected from a platform appropriate for the sample collection method and sampling location. Appropriate sampling platforms may include sampling on foot (shallow locations at low tide), from existing infrastructure (docks, wharfs, etc.), small vessels operated by a qualified operator, or larger vessels specifically designed to support environmental sampling activities by a qualified operator.

4.1.4 Surface Sediment Sample Collection Method

Surface sediment samples for laboratory analyses from the 0- to 10-cm biologically active zone will be collected for grain size testing ~~physical~~ and chemical analysis~~testing~~. Surface samples may be collected using essentially a power grab sampler or by hand in near shore areas inaccessible by sampling vessel in accordance with PSEP (1997a) and Ecology's SCUM ~~II~~ (Ecology 2021) protocols, ~~or by hand~~ using a stainless-steel bowl and spoon at intertidal locations (e.g., along the shorelines of East and West Bay or mudflat area around the peninsula) during a low tide, when the sediment surface is exposed.

The grab sampler is used to collect large-volume, surface sediment samples. The sampler uses a hinged jaw assembly for sample collection. Upon contact with sediments, the jaws are drawn shut to collect the sample. In general, the grab sampler will be used to collect samples in the following manner:

- Maneuver the vessel to the sampling location using a DGPS to within 1 to 2 meters of the target sampling location.
- Using a lead line, measure and record water depth at target sampling location.
- Open the decontaminated grab sampler jaws to the deployment position.
- Draw the winch cable to the grab sampler taut and vertical.
- Lower the sampler through the water column to the bottom at a speed of approximately 0.3 meters per second (m/s).
- Close the jaws of the sampler when the sampler reaches the bottom and record the time and DGPS coordinates.
- Retrieve the sampler, raising it at approximately 0.3 m/s.
- Evaluate the retrieved sediment sample aboard the vessel against the following PSEP acceptability criteria:
  - Grab sampler is not overfilled (i.e., sediment surface is not against the top of sampler).
  - Sediment surface is relatively flat, indicating minimal disturbance or winnowing (for samples collected to characterize wood debris [if required], acceptable grab samples will allow for minor surface disturbance).
  - Overlying water is present, indicating minimal leakage.
  - Overlying water has low turbidity, indicating minimal sample disturbance.

Commented [A98]: Please identify physical tests to be performed. SAP/QAPP includes grain size and logging sediment (Table 3).

Commented [DF99R98]: Per table 3, grain size analysis is included in the testing to be performed.

Commented [TCP-SBS100R98]: Please revise the text throughout the plan to clarify that physical testing is grain size. See suggested edit.

Commented [A101]: Please replace this reference with the field methods reference: Recommended Guidelines for Sampling Marine Sediment, Water Column, and Tissue in Puget Sound, April 1997. Include this reference in Section 8. The PSEP guidance lists many grab samplers—will you be using a specific type?

Note: PSEP 1997a is listed in Section 8 as the reference for organics laboratory analyses. PSEP 1997a reference in SCUM refers to metals laboratory analyses.

PSEP 1997a is recommended for metals in SCUM 5.1.1.2. PSEP 1997b is recommended for organic chemicals in 5.1.1.3.

Commented [DP102R101]: It is essentially a power grab sampler as described on Table 4-5 of SCUM.

Commented [TCP-SBS103R101]: This comment was not fully addressed. Please correct the PSEP citation in the text here and add the reference to Section 8.

Commented [A104]: Edited text. Hand-collected samples also must conform to SCUM sampling protocols.

Health and safety and decontamination should be addressed in this SAP and the HASP. They will be different than sampling from a vessel.

Commented [DP105R104]: Paragraph revised. Decon of hand sampling equipment is detailed later in this document Section 4.3

Commented [A106]: Include taking measurements to determine water depth and elevation.

Commented [DP107R106]: Edited to include measurement from waterline to mudline.

– Desired penetration depth is achieved.

- Siphon off overlying water and use a stainless-steel spoon to collect a 0- to 10-cm sediment layer from inside the sampler, taking care not to collect sediment in contact with the sides of the sampler. A photograph of the undisturbed intact sample in grab sampler will be taken prior to collecting sediment.
- Place the collected sediment in a stainless-steel mixing bowl and, when sufficient sample volume has been collected, samples for volatile analysis will be placed in collection jars and the remaining sediment in the stainless-steel bowl will, homogenized the sediment using a stainless-steel spoon.
- Place homogenized sediment immediately into appropriate pre-labeled sample containers (see Table 2) and place immediately on ice and maintain at < 6 degrees Celsius (°C) until delivered to the appropriate analytical laboratory.

Sample Collection Forms and Daily Log notes (see examples in Attachment A) of grab samples will be maintained as samples are collected and correlated to the sampling location map. At a minimum, the following information will be included on the Sample Collection Form or Daily Log:

- Water depth to mudline surface
- Horizontal and vertical Llocation information of each grab sample as described in Section 4.1.2termined by DGPS
- Date and time of collection of each sediment grab sample
- Names of field supervisor and person(s) collecting and logging the sample
- Observations made during sample collection, including weather conditions, complications, ship traffic, and other details associated with the sampling effort
- Station location ID and sample ID
- Physical description in accordance with ASTM International (ASTM) procedures (ASTM D2488 and ASTM D2487—Unified Soil Classification System), including type, density, consistency, and color
- Odor (e.g., hydrogen sulfide, petroleum)
- Vegetation and debris (e.g., wood chips or fibers, paint chips, concrete, sandblast grit, and metal debris)
- Biological activity (e.g., detritus, shells, tubes, bioturbation, and live or dead organisms)
- Presence of oil sheen (Ecology 2016c)
- Any other distinguishing characteristics or features
- Any deviation from the approved sampling plan.

Sediment surface samples will also be visually inspected for the presence of wood waste as part of visual logging. If observed, wood waste volume will be visually determined in the field by an

Commented [A108]: Please include photographing the accepted, intact sample

Include collecting samples for volatile analyses including total sulfides and total volatile solids as soon as possible and before homogenizing sample.

Commented [DP109R108]: Revised as suggested.

Commented [TCP-SBS110]: Please include reference.

Commented [TCP-SBS111]: Do you mean percentage by volume? Please provide the volume estimation method or otherwise clarify this statement in the text.

The proposed process/description for visually inspecting sediment samples for wood waste needs to be expanded. Please refer to Ecology's 2013 wood waste guidance for more information. https://apps.ecology.wa.gov/publications/documents/0909044.pdf

State in the text whether wood waste, if encountered, will be sampled and analyzed.

environmental scientist or geologist. This information, along with chemistry data, will be used to identify areas, if any, with wood waste accumulation for consideration during cleanup design.

4.1.5 Subsurface Sediment Sample Collection Method (Cores)

Subsurface sediment will be collected by obtaining sediment cores at each location using a vibracore. If vibracore is unable to achieve target depth below mudline due to obstruction (e.g. debris, wood waste, compact sand lens) and data at that location is critical to evaluation and design needs, ~~A~~an auger rig or other drilling technology may be used as appropriate based on conditions.

Commented [A112]: Please generally describe when using a rig would be appropriate. What are your general criteria for using a rig instead of a vibracore?

Commented [DP113R112]: It is not anticipated that alternate collection method will be necessary based on historical data and knowledge of the site. Paragraph revised to describe when a drill rig would be needed and vibracore would not work.

4.1.5.1 Vibracore Sampling

A vibracore collects a continuous profile of subsurface sediment by using a high-frequency vibrating coring device that penetrates the underlying sediments with minimal distortion. When the core tube has been advanced to full penetration or has met refusal and will not advance further, the tube is withdrawn from the sediment.

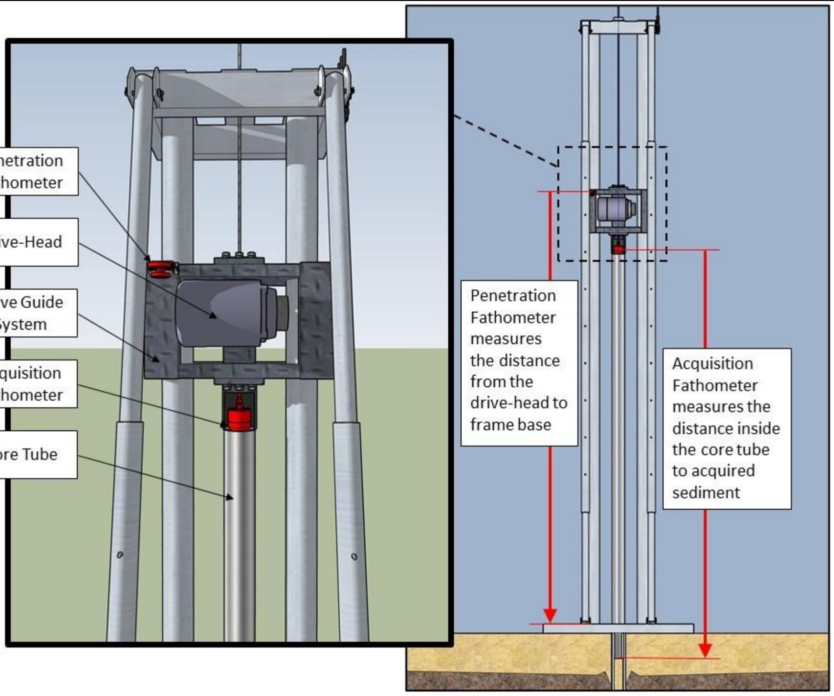
4.1.5.2 Vibracore Sediment Acquisition Monitoring

The vibracore sediment acquisition monitoring (V-SAM) coring methodology employs aluminum core tubes ~~-~~driven into the substrate by a high-frequency vibrating drivehead attached to the top of the core tube, the same as conventional vibracoring. The V-SAM system directly measures the length of sediment acquired in the core tube as well as the corresponding incremental distance that the core tube is advanced into the sediment. The difference between the driven distance and the core acquisition length informs the sampler of ~~is~~ the percentage of sediment recovered (within the driven interval)~~recovery %~~. -Foer example, if driven ~~1'one~~1 foot and ~~1'one~~1 foot of sediment is measured inside the tube, that~~'s~~ is a 100~~%~~ percent recovery.- If driven ~~1one~~1 foot into sediment and only 0.5~~'~~ feet ~~is~~are measured in the core~~ that's~~, that is a 50~~%~~ percent recovery. V-SAM is typically implemented using shorter drive intervals (~~one~~1- to ~~twothree~~3--foot intervals until full core drive is achieved or refusal occurs) ~~than~~unlike traditional sediment coring methods that may drive ~~five to ten feet~~the full length of the core or until~~l~~ refusal in one ~~core~~ interval ~~collected~~ for subsampling sediment.

Commented [TCP-SBS114]: Please see suggested edit.

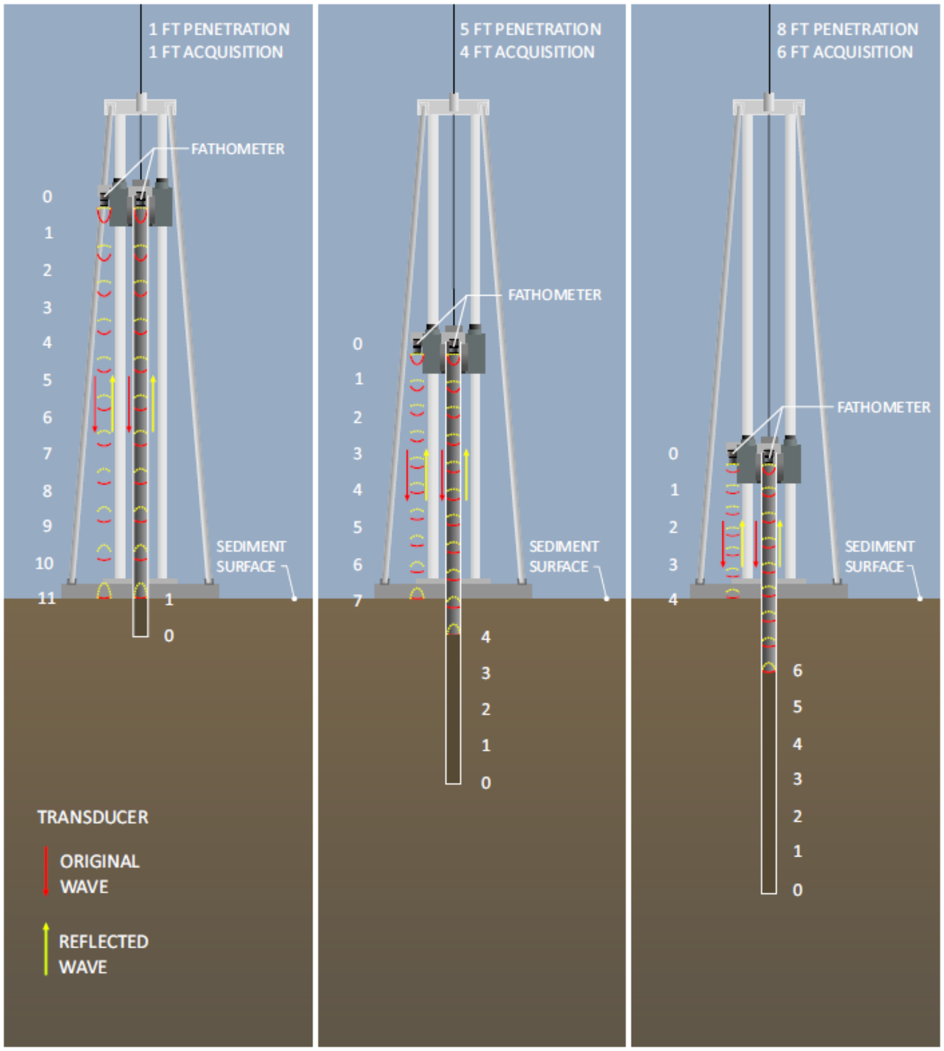
The equipment consists of a bottom-sitting vibracore A-frame configured with two specialized fathometers.

- The Penetration Fathometer, mounted on the A-frame drivehead, measures the incremental penetration of the core tube below mudline (I_P) by recording the changing distance as the drivehead advances the core and moves closer to the sediment bed. This is the distance the core has been driven below the mudline.
- The Acquisition Fathometer, located at the top of and inside the core tube, measures the incremental length of sediment acquired in the core tube (I_A) by recording the distance to the top of the sediment as the core is advanced into the sediment bed during driving. This is the length of sediment core inside the tube.



Marine Sampling System's V-SAM Vibracoring System

Recording and comparing the measures of l_P and l_A during vibracoring is referred to as *V-SAM*.



Vibracoring with V-SAM

After extraction from the bed of the waterway, the core tube will be kept in an upward-oriented position, measured for penetration depth and headspace (the ~~length~~ distance from the top of the core tube to contact with retrieved sediment), total ex-situ recovery, and sectioned into manageable lengths for transport to the core processing location. Samples will be submitted to the laboratory for chemical analysis.

Commented [TCP-SBS115]: Please revise text to total ex-situ core recovery acceptance criteria. It is important to us to determine the total length of sediment recovery before core acceptance. The field crew should check the bottom of the retrieved vibracore sample for possible loss of sediment before core acceptance.

Commented [TCP-SBS116]: Please revise this text to clarify that samples will be collected from the sediment core using the procedure in 4.1.6 and then submitted to the laboratory. As written, it could be interpreted that the sediment core lengths will be submitted to the lab.

4.1.5.3 Sample Collection Procedures

Sediment cores will be collected using the V-SAM system and decontaminated aluminum core tube barrels. The core tube caps will be removed from the decontaminated core tubes just prior to placement into the vibracore frame. Care will be taken during sampling to avoid contact of the sample tube with potentially contaminated surfaces. Extra sample tubes will be available during sampling operations in the event of core tube breakage or contamination. ~~Core tubes suspected to have been contaminated may be decontaminated as follows:~~

- ~~Rinse and pre-clean with potable water.~~
- ~~Wash and scrub the tubes in a solution of laboratory grade, non-phosphate-based soap (e.g., Alconox) and potable water.~~
- ~~Rinse with potable water.~~
- ~~Rinse three times with distilled water.~~
- ~~Seal both ends of each core tube with aluminum foil.~~

Vibracore sediment samples will be collected in the following manner:

- Maneuver the vessel to the proposed sample location.
- Secure a decontaminated core tube the length of the desired penetration depth to the vibracore assembly and deploy it from the vessel.
- Deploy the corer by winch to the mudline, where the vibracore will then be energized and advanced to the target coring depth.
- Continuously monitor and record the incremental penetration and acquisition measurements from the transducers attached to the fathometer equipment during the coring operation.
- Collect a continuous core sample to the designated coring depth or until refusal, whichever is reached first. Cores are typically advanced in ~~one~~1 to ~~twothree~~3~~-~~foot intervals.
- Measure and record the location of the core~~,~~ and measure the depth to sediment using a lead line or a survey tape attached to the vibracore head assembly.
- Measure and record the mechanical depth of core penetration.
- Extract the core from the sediment using the winch.
- Spray off the assembly and core barrel, while they are suspended from the A-frame, and then place them on the vessel deck.
- Remove the core tube from the vibracore assembly once on board the vessel~~,~~ and measure the headspace (distance from the sediment surface to the top of the core tube) to verify acquisition readings.

Conformance with ~~T~~the performance standard for subsurface cores collected by V-SAM will be based on the acquisition data (measures of I_P and I_A during vibracoring) and total sediment core recovery. Acceptance criteria for sediment core samples are as follows:

Commented [TCP-SBS117]: Add total ex-situ sediment core recovery to the text here.

Commented [A118]: I don't understand this—please see edit. The standard should be set beforehand and seems to be in the third and fourth bullets below. Field acquisition data should be evaluated against the standard.

Commented [DP119R118]: Acceptance criteria for core revised and moved to top bullet.

- The incremental recovery percentage shall be 50% percent or greater within an increment and an average of 70% percent or greater for all intervals collected in the core. The *in situ* depth certainty will be estimated based on the length of the segment and the unaccounted portion based on acquisition data. Incremental sample recovery measurement supersedes measurement of bulk recovery percentage to determine core acceptance.
- Overlying water is present and the surface is intact.
- The core tube appears intact without obstruction or blocking.
- The incremental recovery percentage shall be such that the sample depth within an increment is known to within 1.5 feet of the actual *in situ* sample interval. The *in situ* depth certainty will be estimated based on the length of the segment and the unaccounted portion based on acquisition data. Incremental sample recovery measurement supersedes measurement of bulk recovery percentage to determine core acceptance.
- Target penetration depth is achieved unless refusal occurs after three attempts, in which case the deepest penetrating core will be sampled.

If sample acceptance criteria are not achieved, the core will be rejected, the vessel will shift no more than 20-feetft from the target location and attempt to collect an acceptable core. At least three attempts to collect an acceptable core will be made for each sample location. If a core is not collected that meets acceptance criteria after three attempts, the field lead will determine if additional attempts are likely to result in a core that will meet acceptance criteria or if a core already collected will contain enough sediment for the analysis suite appropriate for the sample location. If sample acceptance criteria are not achieved, the core will be rejected, and at least two additional attempts to collect an acceptable core will be made, if possible. The Field Lead can accept a core if sediment characteristics do not allow for the collection of an acceptable sample. The sampling location can also be relocated a short distance from the planned location if an acceptable core cannot be collected at that location. After three attempts are made, the Field Lead can accept a core if sediment characteristics do not allow for the collection of an acceptable sample. Rationale for accepting a core that does not meet acceptance criteria will be documented in the field notes.

Acceptable cores will have the extra tube cut off near the sediment surface and be capped and stored upright in an insulated box on the vessel. Cores longer than 6 ft in length will be cut into smaller sections (up to 4 ft long) so that they can be transported to the processing facility in a vertical position, if possible, and so they will fit in the insulated storage box on the vessel and at the processing facility.

The core tube will be labeled with the location ID and an arrow pointing to the top of core in permanent black marker. At the end of each day, or incrementally during the day, the cores will be taken to the processing facility, where they will be processed the following day.

Logs and field notes of core samples will be maintained as samples are collected and correlated to the sampling location map. The following information will be included in this log:

Commented [TCP-SBS120]: If the average is 70% or greater for each interval then this should correspond to a total recovery percentage of at least 70%?

The recovery percentage should be based on an ex-situ measurement, however, ideally made on the vessel before core acceptance.

Commented [A121]: Please clarify. I don't understand this as written.
Does this mean the documented depth could vary from actual +/- 1.5 feet and be acceptable?

I don't understand how the term in situ is used relative to v-SAM.

Commented [DP122R121]: This bullet has been revised and moved up.

Commented [A123]: This paragraph was difficult to understand. Please see suggested edits. The number of attempts was added to be consistent with the bullet above.

Commented [DP124R123]: Paragraph revised.

Commented [A125]: Should ASTM D4220 be referenced here? Is this the same box that is discussed below in Section 4.1.6?

Commented [DP126R125]: Sentence revised to remove the box. Cores will be stored on the vessel upright until they are offloaded and taken upland for processing. The box in ASTM D4220 is used for shipping. These core will not be shipped.

Commented [TCP-SBS127]: There are discrepancies between the information to be documented as presented here and on the field forms in Attachment A. Please resolve these discrepancies in the text here and on the forms.

Specifically, the Mudline Elevation Check Sheet is unclear. What does '(add 2 ft to minimum core length)' mean? What is decompaction factor? Neither are addressed in Section 4.1.5.

- Mudline elevation of each core station sampled relative to MLLW
- Location of each core station as determined by DGPS
- Date and time of collection of each sediment core sample
- Names of field supervisor and person(s) collecting and logging the sample
- Observations made during sample collection, including weather conditions, complications, ship traffic, and other details associated with the sampling effort
- The sample station ID
- Core tube penetration depth
- Sediment core length (measured ex-situ)
- Acquisition data and acquisition curve including the *in situ* drive interval measurements vs. interval acquisition measurements.
- Any deviation from the approved sampling plan.

4.1.6 Core Processing

Core processing will be conducted one core at a time at the processing facility.. Transported cores will be handled consistent with ASTM procedures (ASTM D4220) and stored upright. The cores will be stored cool or on ice until they can be processed in the order in which they were collected. Cores may be held for a maximum of 72 hours before processing. Core processing will be conducted by an appropriately trained environmental professional.

Cores will be cut for logging and sampling by removing the core caps and cutting the core tube longitudinally with a circular saw. The core will be split into two vertical halves with decontaminated stainless-steel spatulas. If the core was divided into sections for easier transport, this step will be repeated for each section until the entire core is extracted. The entire length of each core will be logged, even if deeper than the target sample depth. Prior to sampling, color photographs will be taken, and a sediment description of each core will be recorded on the core log. At a minimum, the following parameters will be noted:

- *In situ* sample intervals/elevations based on V-SAM measurements from the core log.
- Physical description in accordance with ASTM procedures (ASTM D2488 and ASTM D2487 – Unified Soil Classification System) including type, density, consistency, and color
- Odor (e.g., hydrogen sulfide, petroleum)
- Visual stratification, structure, and texture
- Vegetation and debris (e.g., wood chips or fibers, paint chips, concrete, sandblast grit, and metal debris)
- Biological activity (e.g., detritus, shells, tubes, bioturbation, and live or dead organisms)
- Presence of oil sheen (Ecology 2016c)

Commented [TCP-SBS128]: See suggested edit.

Commented [A129]: Is this the same box that is used on the vessel?

Commented [DP130R129]: ASTM procedures (ASTM D4220) reference to a box is for shipping. The cores will not be shipped. They will be processed on site. Reference deleted.

Commented [A131]: For sheen testing, add reference: Ecology Guidance for Remediation of Petroleum Contaminated Sites, Publication No. 10-09-057, Revised June 2016.

Commented [DP132R131]: Reference added as suggested.

- Any other distinguishing characteristics or features.

Subsurface samples will also be visually inspected for the presence of ~~woodwaste~~wood waste as part of visual logging. If observed, wood waste volume will be visually determined by the environmental scientist or geologist. This information, along with chemistry data, will be used to identify areas, if any, with wood waste accumulation for consideration during cleanup design.

Starting at the mudline, the core will be sectioned into sample intervals based on the requirements of the sample design for each location. The sample design intervals may vary slightly based on sediment lithology and observations. *In situ* sample intervals will be established based on the details provided in the V-SAM core log. This method will provide the best estimate of elevations related to the vertical extent of contamination for remedial alternative evaluation and related to the post-dredge surface in the proposed maintenance dredge areas (e.g., z-samples collected for Dredged Material Management Program (DMMP) evaluation, if required). Field observations collected during core penetration and core logging may be used to supplement V-SAM core log data (or replace if V-SAM core log data is~~f~~ not available or due to malfunction) to identify *in situ* sample intervals.

The sampled intervals from each core will be placed in a clean stainless-steel bowl and homogenized by thoroughly mixing with stainless-steel utensils until the sediment appears uniform in color and texture. The homogenized sediment sample will be placed in the appropriate sample jars using a stainless-steel ~~spoon, and~~spoon and stored on ice until submitted to the identified analytical laboratory. Each jar will be firmly sealed and clearly labeled. Samples for volatile analyses will be collected directly from the sample interval before the interval is homogenized.

Commented [TCP-SBS133]: Do you mean percentage by volume? As noted in the surface sample section above, please provide the volume estimation method or otherwise clarify this statement in the text.

The proposed process/description for visually inspecting sediment samples for wood waste needs to be expanded. Please refer to Ecology's 2013 wood waste guidance for more information. https://apps.ecology.wa.gov/publications/documents/0909044.pdf

State in the text whether wood waste, if encountered, will be sampled and analyzed.

Commented [TCP-SBS134]: For the benefit of the field staff, recommend moving this to the first part of the paragraph as it will be performed first. Recommend also being specific about which volatile analyses samples will be collected before homogenization.

4.2 Bulk Sediment Sampling

Bulk sediment samples will be collected for disposal characterization and for stabilization testing, as needed for transportation. Details of theseis analyses and evaluation are presented in the work plan. This section of the SAP covers sample collection only. Site water, as needed for analysis, will be collected in future as needed and be detailed in the Work Plan. Specific objectives of the bulk sediment sampling include:

- **Disposal Characterization.** Bulk sediment samples will be tested by the toxicity characteristic leaching procedure (TCLP) for site-specific metals (chromium and lead) as specified by the Resource Conservation and Recovery Act (RCRA) to characterize dredged sediments for disposal characteristics. Sediment will also be analyzed for total organic carbon (TOC) and grain size.
- **Dewatering and Stabilization.** Samples of bulk sediments will be mixed with different amendments (e.g., Portland cement and ZapZorb) to identify effective amendments and dose rates to dewater and/or stabilize dredge material as needed for transportation and/or disposal of dredged material.

Commented [A135]: We understand from previous meeting that these samples will not be collected during the upcoming sampling event. We left comments on this section here for your information.

Include procedures for determining and documenting horizontal and vertical sample location.

Commented [DF136R135]: Addressed; bulk sediment sampling will not be included

Commented [A137]: Does disposal include placement in onsite CDFs or beneficial reuse?

This section does not appear to include sampling to evaluate sediment for potential upland and in-water CDFs. Please either explicitly include sampling requirements for potential site placement or note in this document that sediment sampling for potential site placement will be performed later.

Commented [DJ138R137]: DYLAN: Priority 1 – this falls into scope category, please discuss with Rob.

Commented [A139]: What is the basis for performing TCLP?

If TCLP is required for metals, it should be performed for all RCRA metals. Anchor 2016 reported benthic criteria were exceeded for cadmium, mercury, silver, and zinc in Budd Inlet sediment samples. Chromium and lead exceedances were not identified. Could testing by TCLP be avoided using the 20x rule?

For upland placement, the SPLP also may need to be considered WAC 173-340-747.

Commented [DJ140R139]: DYLAN: Priority 1 – this falls into scope category, please discuss with Rob.

Commented [A141]: Include required tests for dredge material reuse by placement on Port property if necessary.

Commented [DJ142R141]: DYLAN: Priority 1 – this falls into scope category, please discuss with Rob.

Bulk Sediment Sampling Approach

The Project Area will be divided into several bulk sampling areas as described in the work plan. The bulk sediment samples will be composite samples, from one bulk sampling area that includes the full sediment profile from the mudline to the estimated depth of contamination, and will consist of multiple sediment cores collected at the same time as, and collocated with, the subsurface sediment cores. The sampling approach includes compositing sediment from individual cores within a bulk sampling area to create a sediment sample representative of the material that may require handling during remedial action. The sample depth will be based on results from prior sampling conducted at the Site. The bulk sample areas, target core locations, and sample depths will be detailed in the work plan.

Bulk Sediment Sample Collection Methods

Sediment for bulk samples will be collected at multiple stations per bulk sample area. Borings will be advanced and logged using the methods detailed in Section 4.1.5 for subsurface sampling. At each station designated for bulk sediment sample collection, cores will be advanced to the target depth. Replicate borings may be advanced next to the first core to ensure adequate sample volume is collected. Recovered material representative of the entire sample depth will be composited into a single sample.

For each bulk sample area, after an acceptable volume of material has been collected at each station, the sediment will be mixed. The necessary sediment sample volumes and storage requirements are shown in Table 2. Once mixed, the material will be divided in the following manner:

Disposal Characterization. Material from the composited sediments for each bulk sampling area will be placed in laboratory-supplied sample containers and appropriately preserved. Gravel, large rocks, debris, and/or other detritus will not be placed in the sample container. Samples will be shipped to the laboratory for TCLP, TOC, and grain size analysis.

Sediment Handling Properties. The remaining composited bulk sediment will be placed in a 5-gallon bucket with a lid and labeled appropriately, to be used for handling and stabilization bench testing, details are provided in the work plan.

4.34.2 Field Quality-Control Samples

Field QC samples will be collected along with the sediment samples to evaluate reproducibility of field and laboratory procedures and matrix effectsidentify possible issues resulting from sample collection or sample processing in the field. TField QC sample frequency is presented in Table 4 and described belowhe collection of field QC samples includes field duplicates and matrix spike/matrix spike duplicates (MS/MSDs), as described below. Equipment blanks may be collected, as appropriate for the media and sample collection process.

Commented [A143]: Please clarify whether composite samples will be made from a single core or from multiple cores within an area.

Commented [DP144R143]: Bulk sediment sampling will not be done a part of this event. This section is deleted.

Commented [A145]: Please clarify whether this includes the contaminated interval, or only includes the sediment above the contamination as written.

Include approach to sampling the contaminated sediment interval.

Commented [DP146R145]: Bulk sediment sampling will not be done a part of this event. This section is deleted.

Commented [A147]: Revise this section. This is incorrect for MS/MSD, and only partially correct for duplicates. MS/MSD samples are analyzed to evaluate matrix effects. Duplicates help to evaluate reproducibility of both lab and field procedures. Please also describe how the SRM will be used.

QC samples to evaluate field-related issues would include things like trip or equipment-rinsate blanks.

Commented [KG148R147]: Addressed. SRM addressed in Section 7 and Table 4 (it is not a field QA sample).

- Field duplicates will be collected at a frequency of 1 per 20 samples collected, from areas known or suspected to be contaminated. A field duplicate is an additional sample collected from the same sample material as the parent sample. ~~MS/MSD samples will be collected at a frequency of 1 per sampling event or 1 in 20 samples processed, whichever is more frequent.~~ Field duplicate samples for solid matrices will be prepared by homogenizing sufficient sample volume from each sample location. The field duplicate will be labeled as described in the appropriate sample-naming section above and analyzed for the same constituent list as the parent sample.
- Matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a frequency of 1 per sampling event per method or 1 in 20 samples processed, whichever is more frequent. For every 20 samples, additional aliquots will be collected to ensure that the laboratory has sufficient sample volume to run the ~~program-required~~ MS/MSD analysis. MS/MSD samples will be identified on sample labels and the chain of custody (COC) and will retain the same sample identifier as the original sample. Field duplicates, equipment blanks, ~~QC~~ and MS/MSD samples will be documented in the field logbook and verified by the QA manager or designee.
- Equipment blanks will not be collected when dedicated sampling equipment is used. Equipment blanks may be collected, as appropriate, if non-dedicated sampling equipment is used.

~~4.4 Sample Handling Procedures~~

~~Samples will be collected in the appropriate sample containers and preserved as specified in Table 2. Samples will be stored in coolers containing ice to maintain the samples at <6°C, as needed, until delivery to the appropriate analytical laboratory.~~

~~Working surfaces and instruments will be thoroughly cleaned, decontaminated, and as appropriate, covered with aluminum foil to minimize outside contamination between sampling events. Disposable gloves will be discarded after processing each core sample and replaced prior to handling decontaminated instruments or work surfaces.~~

~~4.5~~4.3 Equipment Decontamination Procedures

The decontamination procedures described below are to be used by field personnel to clean drilling, sampling, and related field equipment. Deviation from these procedures must be documented in the field records.

~~4.5.1~~4.3.1 Sediment Sampling Equipment

All non-dedicated sampling equipment used (e.g., stainless-steel bowls, stainless-steel spoons, hand augers, core samplers, etc.) will be cleaned using a three-step procedure~~s~~, as follows:

1. Scrub surfaces of equipment that would be in contact with the sample with brushes using an Alconox solution. If light non-aqueous phase liquid (NAPL) is encountered, methanol will be used to clean ~~equipment~~ and then decontaminate~~d~~ equipment as described in steps 1 ~~thru~~through 3.
2. Rinse and scrub equipment with clean tap water.

Commented [A149]: Table 4 specifies 1 per 10 samples. Please resolve discrepancy.

Commented [KG150R149]: Table updated to 1 in 20 to match text.

Commented [A151]: What does program-required refer to here?

Commented [KG152R151]: Addressed.

Commented [TCP-SBS153]: Collecting equipment blanks for re-usable sampling equipment is used is generally standard procedure. We are surprised equipment blanks may not be collected during field activities. We recommend collecting equipment blanks to evaluate the effectiveness of field decontamination procedures and possible impacts to sediment samples.

We also note trip and temperature blanks have not been proposed.

Commented [A154]: Consider deleting this section. Sample handling procedures are described in more detail in Section 4.1 above. Any unique information presented here could be move to Section 4.1. The second paragraph seems more appropriate for a decontamination report section.

Commented [DJ155R154]: Landau: Agree, will delete.

Commented [A156]: Consider deleting this section. It isn't clear how the subject and content differ from Section 4.5.2.

Commented [DF157R156]: DOF/Landau- evaluate after other revisions in this section to determine if deleting this text is appropriate

Commented [DP158R156]: This is specific to sediment collection equipment. The next section is for sediment processing/jarring.

3. Rinse equipment a final time with deionized water to remove tap-water impurities.

Decontamination of the reusable sampling devices will occur between the collection of each sample.

4.5.24.3.2 Sediment Sampling Processing

Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with suspected contaminated sediment must meet high standards of cleanliness. All equipment and instruments used that are in direct contact with the sediment collected for analysis will be made of glass, stainless steel, or high-density polyethylene (HDPE), and will be decontaminated at the beginning of each day as well as between sampling locations. Decontamination of all items will follow PSEP protocols.

The decontamination procedure is as follows if NAPL is not encountered:

1. Perform pre-wash rinse with site water.
2. Wash with solution of laboratory-grade, non-phosphate-based soap (e.g., Alconox).
2.
3. Rinse with site water.
4. Rinse three times with laboratory-grade distilled water.
5. Cover all decontaminated items with aluminum foil.
6. Store in clean area or closed container for next use.

The decontamination procedure is as follows if NAPL is encountered:

1. Rinse with Ccitrus-based solvent (CitriSolv).
2. Rinse with Mmethanol.
3. Wash in Alconox solution.
4. Rinse with site water
5. Rinse three times with laboratory-grade distilled water.
6. Cover all decontaminated items with aluminum foil.
6.7. Store in clean area or closed container for next use.

4.5.34.3.3 Heavy Equipment

Heavy equipment if used and in contact with contaminated sediment (e.g., the drilling rigs and the drilling equipment used downhole or that contacts material and equipment going downhole) will be cleaned using the procedures identified above or using a high-pressure steam cleaner.

Commented [A159]: Consider providing sampling and decontamination procedures if NAPL is encountered.

Commented [DP160R159]: Section revised to include procedure if NAPL is encountered.

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4.64.4 Containers, Preservation, and Holding Times

The analytical lab will provide certified, pre-cleaned, US Environmental Protection Agency (EPA)-approved containers for all samples (see Table 2), with appropriate preservation in accordance with PSEP (PSEP 1997a and b), SCUM II (Ecology 2021), and EPA's SW-846 Compendium (EPA 2023).

4.74.5 Sample Identification and Labels

Each sample will have an adhesive plastic or waterproof paper label affixed to the container and will be labeled at the time of collection. The following information will be recorded on the container label at the time of collection:

- Project name
- Sample identification
- Date and time of sample collection
- Preservative type (if requiredapplicable)
- Initials of the person preparing the sample.

Samples will be uniquely identified with a sample identification as described in the above sections.

4.84.6 Waste Management

Sediment remaining after sampling will be placed in water-tight 55-gallon drums that will be classified prior to disposal. and sMinimal spilled sediment on the deck of the sampling vessel that does not exhibit visible evidence of contamination (such as oily droplets, sheen, paint chips, sandblast grit, etc) will be washed overboard at the collection site prior to moving to the next sampling station. Sediment spilled on the deck of the sampling vessel will be washed into the surface waters at the collection site. Excess sediment remaining after processing of the Shelby core tubes at the analytical or geotechnical laboratory will be disposed of in an appropriate manner using the procedures outlined in the specific laboratory's waste-handling plan. Remaining sediment after core processing and decontamination water generated from decontamination of non-dedicated tools will be segregated and stored in 55-gallon drums at the processing facility. Filled drums with sediment will be disposed of by the Port using a waste-management contractor. Sediment waste will be managed in accordance with the USACE *Dredged Material Evaluation and Disposal Procedures User Manual* (USACE 2021)WAC 173-303-070.

Disposable sampling materials and personnel protective equipment used in sample processing, such as disposable coveralls, gloves, and paper towels, that are not visibly contaminated will be placed in heavy-duty garbage bags for disposal as municipal waste.

Commented [A161]: Include procedures for managing and disposing of decontamination water.

Commented [DF162R161]: Addressed

Commented [DP163R161]: The deck of vessel has to be sprayed down to maintain safe working conditions.

Commented [TCP-SBS164R161]: Retain. Discharging an unpermitted oil sheen to a WOTUS may not be allowed under the CWA.

Commented [A165]: Should this be vibracore tube? Shelby tube sampling is not addressed in this SAP.

Commented [KG166R165]: Updated to match wording in section 4.1.

Commented [A167]: I could not locate waste management procedures in USACE 2021. Please provide section and page number.

Commented [DJ168R167]: Landau: will review reference and update text

Commented [TCP-SBS169R167]: WAC 173-303-070 is for designation of dangerous waste. It does not address managing waste. Please include in the text of this SAP/QAPP procedures for managing investigation derived waste. IDW needs to be disposed of at a facility permitted to accept the material.

5.0 SAMPLE TRANSPORT AND CHAIN-OF-CUSTODY PROCEDURES

This section addresses the sampling program requirements for maintaining custody of the samples throughout the sample collection and delivery process.

5.1 Sample Custody Procedures

Samples are considered to be in one's custody if they are in the custodian's possession or view, in a secured location (under lock) with restricted access, or in a container that is secured with an official seal, such that the sample cannot be accessed without breaking the seal.

COC procedures will be followed for all samples throughout the collection, handling, and analysis process. The principal document used to track possession and transfer of samples is the COC form (see example in Attachment A). Each sample will be represented on a COC form the day it is collected. All data entries will be made using an indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, and then dating and initialing the change. Blank lines or spaces on the COC form will be lined-out and dated and initialed by the individual maintaining custody.

A COC form will accompany each cooler of samples to the analytical laboratory. Each person who has or relinquishes custody of the samples will sign the COC form and ensure that the samples are not left unattended unless properly secured. Copies of all COC forms will be retained in the Project files.

5.2 Sample Delivery and Receipt Requirements

Samples submitted to the laboratory will be collected in the appropriate sample containers and preserved as specified in Table 2. The storage temperatures and maximum holding times for grain size tests physical and /chemical analyses are also provided in Table 2. The persons transferring custody of the sample container will sign the COC form upon transfer of sample possession to the laboratory, unless the samples are shipped via commercial carriers, in which case the custody signature will be that of the individual taking possession of the samples from the carrier at its final destination.

When the samples are delivered to the laboratory, the receiver will record the condition of the samples on a sample receipt form. COC forms will be used internally in the laboratory to track sample handling and final disposition. If containers arrive with broken custody seals, the laboratory will note this on the COC record and will immediately notify the PM or Field Lead, as appropriate. Samples scheduled for chemical analysis will be preserved by the laboratory according to Table 2. Core samples representing 1-ft intervals scheduled for archive will be preserved by the laboratory according to Table 2. Samples that require freezing will be frozen by the laboratory upon receipt. Sediment samples may be archived for later analysis by freezing and storing at -18 °C. Samples to be analyzed for grain size, ammonia, total sulfides, and volatile organic compounds willshould not be frozen. Allowance for expansion of the sample should be made to prevent breakage of the sample bottles

Commented [A170]: What physical tests will be performed?

Commented [KG171R170]: Per table 3, grain size analysis is included in the testing to be performed.

Commented [TCP-SBS172R170]: For the benefit of the reader, please replace the words physical analyses with grain size tests in the text throughout this plan.

Commented [TCP-SBS173]: Revise this text to clarify that samples will be placed on ice following collection and transported to the analytical lab on ice.

As written, this suggests that samples will not be placed on ice at the time of collection nor kept on ice during transport to the lab. Enthalpy lab is in California so samples to be analyzed by Enthalpy will probably be shipped.

This is not consistent with the first paragraph of 5.2 that states samples will be collected in appropriate containers and preserved.

upon freezing. The archived samples may be thawed within the maximum holding times listed in Table- 2 and analyzed for the appropriate analytes. Once the laboratory work has been completed and the data report submitted by the laboratory, samples and extracts will be transferred from cold storage to a sample archiving area (as appropriate for the type of media to be handled), where they will be stored for 3 months, unless the PM provides other written instructions. Custody will be maintained in the long-term storage area and upon ultimate disposition, samples will be logged out, and the disposition recorded. Disposal will be in accordance with local, state, and federal landfill and wastewater regulations.

Commented [A174]: Please include procedures for sample freezing/archiving. Table 2 and the work plan include archiving frozen samples.

Commented [KG175R174]: Addressed. Archived cores will be sequentially analyzed as needed. Details are included in the work plan.

6.0 CHEMICAL AND PHYSICAL ANALYTICAL TESTING

The rationale for the requirements and need for chemical analytical and grain sizephysical analytical testing will be detailed in the sample plans.Work Plan for each Site Sub-Area 1. This section includes information on target analytes, proposedappropriate analytical testing methods, and laboratory-testing information, as the information relates to the media being evaluated.

6.1 Sediment Analytical Testing

SCUM II (Ecology 2021) specifies sampling and testing protocols for the chemical and physical characterization of sediment. The DMMP User's Manual describes the sampling and testing protocols for dredge sediment characterization (DMMO 2021). To achieve the required reporting limits (RLs), some modifications to the analytical methods may be necessary and will be discussed further in the sample designs, if appropriate. These modifications to the specified analytical methods will be provided by the laboratory at the time of establishing the laboratory contract.

Chemical analysis and grain sizephysical testing will be conducted by an Ecology or NELAP accredited laboratory, as appropriate for the required analyses. Target analyte lists will be specified in the associated work plan. Environmental analytical laboratories performing work under this SAP/QAPP shall maintain current accreditation through Ecology's lab accreditation program orand the National Environmental Laboratories Accreditation Program. Chemical and grain sizephysical testing will adhere to the most recent Ecology, PSEP, and Dredged Material Management Office (DMMO) analysis protocols and QA/QC procedures (PSEP 1986, 1997a, 1997b) and to EPA's SW-846 Compendium. Additional information on sediment analytical testing is provided in Table 3.

6.2 Laboratory Requirements and Reporting

In completing chemical and/or physical analyses for this Project, the laboratories are expected to meet the following minimum requirements:

- Adhere to the methods outlined in this SAP/QAPP, including methods referenced for each analytical procedure (Table 3).
- Deliver hard copy and electronic data as specified.
- Meet reporting requirements for deliverables.
- Meet turnaround times for deliverables.
- Implement QA/QC procedures, including measurement quality objectives (MQOs), laboratory quality control requirements, and performance evaluation testing requirements (Tables 4 and 5).
- Notify the Project QA Manager and/or PM of any QA/QC problems when they are identified, to allow for quick resolution.
- Allow laboratory and data audits to be performed, if deemed necessary.

Commented [A176]: Please describe physical testing to be performed.

Commented [DF177R176]: Analytical testing will be conducted per Table 3; conventionals testing includes grain size. Removed Chemical and Physical to avoid confusion.

Commented [TCP-SBS178R176]: Revise the text to grain size testing throughout the plan.

Commented [A179]: Maybe the work plan? This is the sampling plan.

Commented [DF180R179]: addressed

Commented [TCP-SBS181]: See revision to Sub-Area 1.

Commented [A182]: This is the sample design document. Please discuss the modifications in this document.

Commented [DF183R182]: addressed

Commented [A184]: These modifications need to be provided to and approved by Ecology before use.

Commented [DF185R184]: addressed

Commented [TCP-SBS186]: Ecology's comments on Table 3 are provided in a separate document.

- Maintain applicable accreditation for the analytical methods and sample media as specified in this QAPP.

Laboratory QC procedures, where applicable, include initial and continuing instrument calibrations, standard reference materials, laboratory control samples, matrix replicates, matrix spikes, surrogate spikes (for organic analyses), and method blanks. Table 4 lists the frequency of analysis for laboratory QC samples, and Table 5 summarizes the MQOs.

Results of the QC samples from each sample group will be reviewed by the laboratory analyst immediately after a sample group has been analyzed. All samples will beare diluted and reanalyzed if target compounds are detected at concentrationslevels that exceed their respective established calibration ranges. Any cleanups will be conducted prior to the dilutions. The QC sample results will be evaluated to determine if control limits have been exceeded. If control limits are exceeded in the sample group, the Project QA Manager will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

Commented [A187]: These two sentences are not included in the Section 7.5 cut-and-paste.

Commented [DJ188R187]: This sentence does not belong in Section 7.5, which is about data validation.

Commented [TCP-SBS189R187]: okay

7.0 QUALITY ASSURANCE PROJECT PLAN

This section establishes QA objectives and functional activities associated with ~~additional~~ sediment chemistry ~~environmental and geotechnical~~ data gathering a~~ts~~ the Site. The methods and QA procedures described in this QAPP will be followed during throughout the course of data collection activities.

The goal of this QAPP is to ensure that data of sufficiently high quality are generated to support the data quality objectives (DQOs). This section describes project management responsibilities; sampling and analytical QA/QC procedures; assessment and oversight; and data reduction, verification, validation, and reporting. This QAPP was prepared following Ecology's SCUM ~~II~~ and QAPP guidance documents (Ecology 2021 and 2016a). Analytical QA/QC procedures were also developed based on the protocols and quality assurance guidance of the PSEP and DMMP (PSEP 1986, 1997a, 1997b, 1997c; DMMO 2021).

Field and laboratory activities must be conducted in such a manner that the results meet specified data quality objectives and are fully defensible. Guidance for QA/QC is derived from the protocols developed for the PSEP and DMMP (PSEP 1986, 1997a, 1997b; DMMO 2021), EPA SW-846, EPA Contract Laboratory Program (EPA ~~2017~~2020, 2020a, 2020b), ~~and~~ EPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use (EPA 2009), and the Sediment Cleanup User's Manual (SCUM) (Ecology~~,~~ 2021~~19~~)~~.~~.

7.1 Data Quality Objectives and Criteria

DQOs reflect the overall degree of data quality or uncertainty that the decision-maker is willing to accept during the process. DQOs are used to ensure that generated data are scientifically valid, defensible, and of an appropriate level of quality given the intended use for the data (EPA 2000). The quality of the data is assessed by MQOs, which consist of precision, accuracy, representativeness, comparability, completeness, sensitivity, and bias.

Additional ~~planned~~ data gathering efforts at the Site will be~~are~~ focused on gathering the necessary level of data to inform the engineering requirements of the remedial design. Environmental and geotechnical data collection strategies will be further detailed in supporting ~~sample design plans~~Work Plans that will be submitted to Ecology for review and approval. Task-specific DQOs will be included in the corresponding work plan.

Commented [A190]: Please clarify use of the word 'additional' here and throughout the SAP/QAPP. Distinguish between activities intended to be covered by this SAP/QAPP and those activities anticipated to be covered by addenda.

Commented [DF191R190]: addressed

Commented [A192]: Please describe geotechnical data to be collected.

Commented [DJ193R192]: DYLAN: as above

Commented [A194]: SCUM 2021.

Commented [DF195R194]: addressed

Commented [A196]: Please clarify what these additional planned data gather efforts will be. Does this refer to future work and future sampling plans?

Commented [DF197R196]: Correct; clarified

Commented [TCP-SBS198R196]: The tense of the first sentence still needs to be fixed (see suggested edits). Include statement about requirement for Ecology review and approval of plans.

Data quality objectives are presented below.

Process	Response
Step 1: State the problem	Additional information is needed in the East Bay Project Area (as defined in the Work Plan) to address pre-remedial design data gaps. Data will be collected to confirm nature and extent, inform clean up design through vertical delineation, and to inform source control assessment.
Step 2: Identify the decision	Data will be collected to: • Support calculation of ~~sitewide~~ surface weighted average concentrations (SWAC) including~~for~~ cadmium, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), and dioxins and furans (D/Fs)+dioxin-like PCB congeners via collection of surface sediment (0-10 centimeter [cm]) data. • Support calculation of intertidal SWACs including ~~for~~ cadmium, cPAHs, and D/Fs+dioxin-like PCB congeners via collection of surface sediment data (0-45 cm) data in intertidal areas. • Support determination of the depth of contamination within areas proposed for remedial dredging within the Draft Alternatives Memorandum • Support initial source control assessment. • Support initial dredge material management assessment.
Step 3: Identify the inputs to the decision	Surface and subsurface sediment samples will be collected from both intertidal and subtidal areas. Sediment samples will be analyzed as follows: • ~~Sitewide~~ Cadmium, cPAHs, D/Fs, polychlorinated biphenyls (PCBs). (12 cPAH toxicity equivalency quotient [TEQ] congeners to be reported by lab for use in TEQ calculations.) • Areas with dredging as a proposed remedy in the Draft Alternatives Analysis - Dredged Material Management Office (DMMO) suite of chemicals in sediments anticipated to be exposed by dredging, the Z-layer. The full list of analytes is presented in Table 3 as the "Z-Layer" analytical suite. • Near outfalls and other potential source areas: Washington sediment management standards (SMS) marine list of chemicals. The full list of analytes is presented in Table 3 as the "SMS Marine List" analytical suite.
Step 4: Define the study boundaries	Geographic: Budd Inlet Sediments Cleanup Site Sub-Area 1, Sub-Area 2, and Sub-Area 3 Time frame: Jan 2024 through completion of design Sample type: Surface and subsurface sediment
Step 5: Develop a decision rule	Details for this focused investigational suite are described by location and depth interval in Tables 2 and 3 of the PRDI Work Plan. Existing sediment data

Commented [TCP-SBS199]: Delete sidewide. It does not apply.

Commented [TCP-SBS200]: Ecology has not approved the alternatives memorandum

Commented [TCP-SBS201]: This is incorrect—please correct this statement in the table. PAHs are a heterogeneous group of molecules. They are not congeners. And there are 7 (not 12) cPAHs.

Commented [TCP-SBS202]: This terminology is no longer consistent with Table 3 terminology. Please revise terminology to remove inconsistency.

Commented [TCP-SBS203]: Same comment as above.

Process	Response
	have been used as guidance in developing the planned analytical suite and analysis program. Archived core samples representing 1-ft intervals will be sequentially analyzed, as needed, to delineate the depth of contamination at each coring location. Not all 1-ft core intervals will be analyzed. Additional details and rationale for the planned sampling are as follows: • Sitewide cChemicals identified for testing are based on those identified as chemicals of concern (COCs) in the Investigation Report (Anchor 2016b). • •Surface sediment samples collected throughout the East Bay Project Area will be used to update the East Bay Project Area–specific SWACs. Samples will be analyzed for cadmium, D/Fs, PCBs, and cPAHs. • •Intertidal surface sediment samples collected throughout the intertidal portions of the East Bay Project Area will be used to update the East Bay Project Area–specific intertidal SWACs. Samples towill be analyzed will includefor cadmium, D/Fs, PCBs, and cPAHs. • •Within areas where the identified preferred remedial action is dredging, based on the Draft Alternatives Memorandum (DOF et al. 2023), samples will be collected with a focus on identifying the depth of contamination, and the sediment quality, of the sediment surface anticipated to be exposed by dredging (i.e., the Z-layer). Samples will be used to design the remedial action in these areas. Samples used to identify the depth of contamination will be analyzed for cadmium, D/Fs, PCBs, and cPAHs. Z-layer samples will be analyzed for the required Dredged Material Management Program (DMMP) suite of chemicals. • •In areas near outfalls, surface and subsurface sediment samples will be collected to evaluate potential previous and ongoing sources of contamination and the effectiveness of source control. Additionally, these data will support development of potential remedial alternatives for these areas, as needed. Samples will be analyzed for the SMS marine suite of chemicals. • •In areas immediately adjacent to the federal navigation channel in East Bay, samples will be collected to evaluate potential contamination and the depth of contamination, if present. These data will be used in design of the remedial action and dredging within the federally authorized channel to reduce potential for recontamination and redistribution following dredging. These samples will be analyzed for cadmium, D/Fs, PCBs, and cPAHs.
Step 6: Specify performance or acceptance criteria	Regulatory limits for metals and PAHs are presented in Table 3. Chemical analysis shall be performed by an Ecology accredited laboratory. Performance and acceptance criteria are presented in Tables 4, 5, and 6 including the following quality control considerations: Data quality indicators for laboratory analyses (precision, accuracy, representativeness, completeness, and comparability) Laboratory quality control Field quality control samples.

Commented [TCP-SBS204]: This is an outdated list which must be updated to reflect the changed scope of the project since the 2016 report was written.

Commented [TCP-SBS205]: Subarea 1

Commented [TCP-SBS206]: Not Ecology approved.

Commented [TCP-SBS207]: Please update terminology in the table.

Process	Response
Step 7: Develop the detailed plan for obtaining data	The sample design is presented in Section 5 of this SAP/QAPP.

7.2 Measurement Quality Objectives

MQOs are described in the following sections and are summarized in Table 5.

Commented [A208]: Please include criteria for all MQOs on Table 5 or elsewhere in this section.

Commented [DF209R208]: addressed

7.2.1 Precision

Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling, and laboratory analysis that includes the following:

- Repeatability: The random error associated with measurements made by a single test operator on identical aliquots of test material in a given laboratory, with the same apparatus, under constant operating conditions
- Reproducibility**:** The random error associated with measurements made by different test operators, in different laboratories, using the same method but different equipment to analyze identical samples of test material.

In the laboratory, *within-batch* precision is measured using replicate sample or QC analyses and is expressed as the relative percent difference (RPD) between the measurements. The batch-to-batch precision is determined from the variance observed in the analysis of standard solutions or laboratory control samples from multiple analytical batches. Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit (MDL), where the percent error (expressed as RPD) increases.

Field precision will be evaluated by the collection of field duplicates for chemistry samples at a frequency of 1 in 20 samples. Field chemistry duplicate precision will be screened against an RPD of 50 percent for solid samples. and 20 percent for aqueous samples.

Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit (MDL), where the percent error (expressed as RPD) increases.

The equation used to express precision is as follows:follows:

Relative Percent Difference = [(ABS (R1 – R2)) / ((R1 + R2) / 2)] x 100

Where:

ABS = Absolute difference between values (meaning no negative values)

MS = Matrix Spike

MSD = Matrix Spike Duplicate

R1 = Measured concentration for MS or duplicate #1

R2 = Measured concentration for MSD or duplicate #2

Where:
RPD = relative percent difference
C1 = larger of the two observed values
C2 = smaller of the two observed values

7.2.2 Accuracy and Bias

Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the mean value of results from ongoing analyses of laboratory-fortified blanks, standard reference materials, and standard solutions. Laboratory-fortified (i.e., matrix-spiked) samples are also measured; this indicates the accuracy or bias in the actual sample matrix.

Accuracy is expressed as percent recovery (%R) of the measured value, relative to the true or expected value. If a measurement process produces results whose mean is not the true or expected value, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination). Analytical laboratories use several QC measures to infereliminate analytical bias, including systematic analysis of method blanks, and laboratory control samples, and independent calibration verification standards.. Because bias can be positive or negative, and because several types of bias can occur simultaneously, either the net, or total, bias can be evaluated in a measurement.

Commented [A210]: What do you mean by independent calibration verification standards? Please describe what these standards are and how they are used to address analytical bias.

Commented [DJ211R210]: For simplicity, removed ICV as an example of accuracy.

Laboratory accuracy will be evaluated against quantitative matrix spike and surrogate spike recovery performance criteria provided by the laboratory. Accuracy can be expressed as a percentage of the true or reference value, or as a %R in those analyses where reference materials are not available and spiked samples are analyzed. The equation used to express accuracy is as follows:

Percent Recovery = [(SSR – SR) / SA] x 100

Where:

SSR = Spiked sample result

SR = Sample result

~~7.2.3~~ SA = Spike added~~%R = 100% x (S-U) / Csa~~

~~Where:~~
~~%R = percent recovery~~
~~S = measured concentration in the spiked aliquot~~
~~U = measured concentration in the unspiked aliquot~~
~~Csa = actual concentration of spike added~~

~~7.2.41.1.1 Field accuracy will be controlled by adherence to sample collection procedures outlined in Section 4.0 of this SAP/QAPP.~~

~~7.2.5~~7.2.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an environmental condition~~. Assuming those objectives are met, the samples collected should be considered adequately representative of the environmental conditions they are intended to characterize~~. Field ~~accuracy~~representativeness will be controlled by adherence to sample collection procedures outlined in Section 4.0 of this SAP/QAPP.

Commented [A212]: This equation is incorrect. See correct equation below (SCUM Section 5.4.2)

Percent Recovery = [(SSR – SR) / SA] x 100

Where:
SSR = Spiked sample result
SR = Sample result
SA = Spike added

Commented [DJ213R212]: Updated to match SCUM

Commented [A214]: Following field procedures will improve sample representativeness. Suggest moving this statement to Section 7.2.2.1 Representativeness

Commented [DF215R214]: addressed

Commented [A216]: Representativeness, comparability, and completeness should not be a subset of accuracy and bias. Please use a 3rd level heading.

Commented [DF217R216]: addressed

Commented [A218]: Delete or expand this statement. As written, its intent is unclear. See SCUM Section 5.4.2 for a discussion of representativeness.

Commented [DJ219R218]: deleted

Commented [A220]: Following field procedures will improve sample representativeness. Suggest moving this statement to Section 7.2.2.1 Representativeness.

Commented [DJ221R220]: Text moved

7.2.5.1 7.2.4 Comparability

Comparability expresses the confidence with which one dataset can be evaluated in relation to another dataset. For this program, comparability of data will be established through the use of standard analytical methodologies and reporting formats, and of common traceable calibration and reference materials.

7.2.5.2 7.2.5 Completeness

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows:

C = (Number of acceptable data resultspoints) x 100
(Total number of data resultspoints)

The DQO for completeness for all components of this Project is 95 percent. Data that have been qualified as estimated because the QC criteria were not met will be considered valid for the purpose of assessing completeness. Data that have been qualified as rejected will not be considered valid for the purpose of assessing completeness.

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Commented [A222]: This equation is incorrect. See correct equation below (SCUM Section 5.4.2)

Percent Completeness = [(Number of valid results) / (Number of samples taken)] x 100

Commented [DF223R222]: addressed

Commented [TCP-SBS224R222]: This equation is still incorrect. Please correct the equation in the text.

7.2.5.3 7.2.6 Sensitivity

Analytical sensitivities must be consistent with or lower than the regulated criteria values in order to demonstrate compliance with this SAP/QAPP. If reporting limits lower than criteria are not achievable during analysis, the QA Manager will work with the laboratory to ensure that, if at all possible, re-analyses are performed and reporting limits lower than criteria are achieved.

The MDL is defined as the minimum concentration at which a given target analyte can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero0. Laboratory MDLs will behave been used to evaluate the method sensitivity or applicability prior to the acceptance of a method for this program. Laboratory RLs are defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions for that particular method.

Formatted: Heading 3

Commented [A225]: Table 5 does not include sensitivity criteria. Please provide sensitivity criteria, such as a table that includes COCs, preliminary SCLs, laboratory MDLs, RLs, and PQLs.

What do you mean by regulated criteria values? Are they preliminary sediment cleanup levels (SCL)?

Ecology's QAPP guidance uses 'reference levels' or 'lowest concentration of interest.' Goal is an MDL at 10% of the reference level. See Ecology's 2016 QAPP guidance Appendix H.

Commented [DJ226R225]: Criteria provided by DOF in revised table. PQL and RL are used interchangeably, as acknowledge by Ecology in SCUM and verified by laboratories for this project. Laboratories QSMs with procedures for determination of RLs and MDLs will be provided upon request by Ecology.

Commented [A227]: MDLs should have been evaluated before being proposed in this SAP/QAPP. Please complete the evaluation.

Commented [DF228R227]: addressed

Commented [TCP-SBS229]: Please add a statement in the text that analytical results that fall between the RL and MDL/PQL shall be reported. The resulting value shall be flagged as estimated.

The sample practical quantitation limits (PQLs) will be reported by the laboratory and will take into account any factors relating to the sample analysis that might decrease or increase the reporting limit (e.g., dilution factor, percent moisture, sample volume, sparge volume). In the event that the RL and PQL are elevated for a sample due to matrix interferences and subsequent dilution or reduction in the sample aliquot, causing criteria to be exceeded, the data will be evaluated by the Project PM and/or data validator (as appropriate) and the laboratory to determine if an alternative course of action is required or possible. If this situation cannot be resolved readily, (i.e., detection limits less than criteria achieved), Ecology or the appropriate regulatory authority will be contacted to discuss an acceptable resolution.

7.3 Laboratory Quality Control

Laboratory QC procedures will include procedures necessary to meeting EPA Stage 2B or 4 level of validation. , where applicable, They may include initial and continuing instrument calibrations, standard reference materials, laboratory control samples, matrix replicates, MS, surrogate spikes (for organic analyses), and method blanks. Results of the QC samples from each sample group will be reviewed by the analyst immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine if control limits have been exceeded. If control limits are exceeded in the sample group, the QA Manager will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples. Laboratory QC sample are discussed below; frequency and MQOs are presented in Tables 4 and 5.

7.3.1 Laboratory Instrument Calibration and Frequency

An initial calibration will be performed on each laboratory instrument to be used prior to the start of the project, after each major interruption to the analytical instrument, and when any ongoing calibration does not meet method control criteria. Calibration verification will be analyzed following each initial calibration and will meet method criteria prior to analysis of samples. Continuing calibration verifications (CCV) will be performed daily prior to any sample analysis to track instrument performance. The frequency of CCVs varies with method. For gas chromatograph/mass spectrometer (GC/MS) methods, one CCV will be analyzed every 12 hours. For GC/MS, metals, and inorganic methods, one CCV will be analyzed for every 10 field samples, or daily, whichever is specified in the method. If the ongoing continuing calibration is out of control, the analysis must come to a halt until the source of the control failure is eliminated or reduced to meet control specifications. All Project samples analyzed while instrument calibration was out of control will be reanalyzed.

Instrument blanks or continuing calibration blanks provide information on the stability of the baseline established. Continuing calibration blanks will be analyzed immediately prior to, or immediately following, CCV at the instrument for each type of applicable analysis.

Commented [A230]: Provide laboratory specific PQLs. Report detections between MDL and RL as estimated (J), rather than not detected.

FYI, SCUM includes programmatic PQLs in Appendix D.

Commented [DJ231R230]: Landau: As acknowledged in SCUM Appendix D, RL, PQL, and LLOQ are used interchangeably. Laboratry PQLs are listed in the QAPP tables. Results detected between MDL and RL/LLOQ/PQL will be reported as estimated (J) by the laboratory.

Commented [TCP-SBS232R230]: Please update the text to state results detected between the MDL and RL will be reported as estimated (J).

Commented [A233]: What are 'criteria achieved'? It seems like you would want detection limits (MDLs?) to be less than criteria. Please revise this statement to clarify.

Commented [DJ234R233]: This was meant to be an example of if the method detection limit still can't meet the criteria due to dilution…but I agree, it's confusing and I have removed.

Commented [A235]: If not Ecology, who would the appropriate regulatory authority be?

Commented [DJ236R235]: DYLAN: Priority 1 – need Rob's input on USACE involvement in this project

Commented [DJ237]: This insertion is rejected. Laboratory procedures are not tailored to fit 2B or 4. Laboratory protocol and procedures are based on the lab's QSM. Data validation is a process separate from the laboratory. Required elements for laboratory data packages are listed in the the DV section.

Commented [TCP-SBS238R237]: Thank you for clarifying. What we want is to be sure the lab data packages are adequate for the specified data validation stage.

7.3.2 Laboratory Duplicates and Replicates

Analytical duplicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity. ~~and matrix effects.~~ Analytical duplicates and replicates are subsamples of the original sample that are prepared and analyzed as a separate sample.

Commented [A239]: I don't think a duplicate will allow assessment of matrix effects. Spiked samples typically are used to evaluate matrix effects. Please revise.

Commented [DF240R239]: addressed

7.3.3 Matrix Spikes/Matrix Spike Duplicates

Analysis of MS samples provides information on the extraction efficiency of the method on the sample matrix. By performing duplicate MS analyses, information on the precision of the method is also provided for organic analyses.

7.3.4 Method Blanks

Method blanks are analyzed to assess possible laboratory contamination at all stages of sample preparation and analysis. The method blank for all analyses must be less than the method report limit (MRL) of any single target analyte or compound. If a laboratory method blank exceeds this criterion for any analyte or compound, then the laboratory shall follow corrective action procedures in accordance with the analytical method and laboratory Quality Systems Manual SOPs.

7.3.5 Laboratory Control Samples

Laboratory control samples (LCS) are analyzed to assess possible laboratory bias at all stages of sample preparation and analysis. The LCS is a matrix-dependent spiked sample prepared at the time of sample extraction along with the preparation of sample and the MSs. The LCS will provide information on the precision of the analytical process, and when analyzed in duplicate, will provide accuracy information as well.

7.3.6 Standard Reference Materials

Standard reference materials (SRMs) are analyzed to assess possible matrix affects at all stages of sample preparation and analysis. The SRM is a matrix-matched sample that is carried through all aspects of preparation and analysis as a field sample and has a known concentration of target analytes. Puget Sound SRM ~~will be~~are used for D/F and PCB analyses. ~~(DMMO 2012), when appropriate to the requirements of the sampling and the rationale outlined in the sample design plan. Performance will be evaluated using the MQOs listed in Table 5 and as outlined in in DMMO (2021) and Ecology (2008).~~

Commented [A241]: Please include SRM requirements and rationale. They are not presented in the Work Plan or this SAP/QAPP.

Commented [DF242R241]: addressed

Commented [A243]: This reference is to the original AO and is not correct as used here.

Commented [DF244R243]: addressed

7.4 Data Management

Commented [DJ245]: SCUM has QA1 = 1,2a AND QA2 = 3,4. WE are proposing 2b which inbetween an includes instrument QC on all project samples. While this is not explicitly called in SCUM, this level is ahigher level…

2B, data packages will be in Level IV format. Samples may undergo Stage IV if .

Commented [TCP-SBS246R245]: 2B is acceptable for most sediment investigations conducted for cleanup. See SCUM 2021, Section 5.5.

7.4.1 Data Recording and Reporting

Field data and observations will be recorded on waterproof paper kept in field notebooks. Qualified staff will transfer information contained in field notebooks to Excel spreadsheets (or alternate software) after they return from the field. Data entries will be independently verified for accuracy by another member of the Project team. Relevant fField and laboratory data for the Project will be uploaded to Ecology's Environmental Information Management (EIM) System per the schedule in the AO, which is within 90 calendar days following receipt of all pre-validated laboratory data.

Commented [A247]: Add timeframe from AO.
Commented [DF248R247]: addressed

Laboratory results, including QC data, will be submitted electronically. The electronic formats will include a PDF file of the laboratory report and an EDD in Project-specified format. The laboratory PM shall ensure that the EDD matches the laboratory hard copy data report. This data review must be completed before deliverables are reported by the laboratory. Raw and final data will be stored electronically, with regularly scheduled backups performed and maintained at the laboratory. The laboratories will prepare a detailed laboratory data package documenting all activities associated with the sample analyses.

7.4.2 Laboratory Data Package RequirementsDeliverables

Environmental analytical laboratories performing work under this SAP/QAPP will provide Laboratory data will be provided in a minimum EPA Stage 2B data report, with Contract Laboratory Program (CLP)-equivalent forms. Data packages with methods undergoing Stage 2Bb or Stage 4 data validation will be provided as a Stage 4 data report with CLP-equivalent forms.full (Stage 4) analytical reports, with CLP equivalent forms. Required analytical report elements are presented in Table 6. Laboratories will also provide Electronic Data Deliverables (EDDs) in both EIM and the project EDD format. Required data report elements are presented in Table 6.

Commented [A249]: For sediment cleanup data, Stage 3 is preferred.
Commented [DJ250R249]: Addressed however, changed to receive all Stage 4 packages

Table 6. Data Package Elements

Data Package Element	Stage 4
Field collection and handling	
Completeness	
Data presentation	
Reporting limits	
Chain of custody documentation, sample receipt, and condition documentation	X
Sample summary or equivalent, method summary or equivalent	X
Sample results (with date, units, RLs, and/or DLs)	X
Laboratory data qualifier definitions	X
Method/laboratory blank results	X
Sample surrogate results	X
Field QC results	X
Laboratory control sample results, matrix spike results, duplicate and/or matrix spike duplicate results, post-digestion spike sample results	X
ICP serial dilution results	X
Standard reference material	X

Commented [DJ251]: These are data package elements, not element of review per section 5.5
Commented [DJ252]: Will be rejecting all of these insertions because they are not data package elements are are already listed.
Commented [TCP-SBS253R252]: Okay
Formatted Table
Commented [DJ254]: This is not a laboratory data package lement
Commented [DJ255]: This is not a data package element, and "CLP" equivalent forms are already addressed in the introduction paragraph to this table.
Commented [DJ256]: This is not a data package element
Commented [DJ257]: Already listed
Formatted Table

Data Package Element	Stage 4
Tuning results summary	X
Initial calibration results, continuing calibration results	X
Internal standard results	X
QC surrogate results	X
Secondary column results	X
Endrin/DDT breakdown results	X
Instrument blanks	X
Analytical sequences	X
Initial and continuing calibration verification results	X
Calibration blank results	X
Instrument detection limits	X
ICP interference check sample results	X
ICP/mass spectrometry internal standard areas	X
ICP interelement correction factors, ICP linear ranges, ICP serial dilution results	X
Analysis run logs, extraction logs, preparation logs	X
Raw data	X
System performance checks (e.g., chromatography, instrument sensitivity drift, baseline shifts, negative absorbances)	X
Mass spectral identifications, target compound identifications	X
Retention time windows	X
Tentatively identified compounds (if applicable)	X

DDT = dichlorodiphenyltrichloroethane
DL = detection limit
ICP = inductively coupled plasma
RL = reporting limits
QC = quality control
SRM = standard reference material

7.5 Data Validation and Verification

Sample collection forms and field notes will be reviewed by the PM or designee and placed in the electronic Project files. ~~Relevant f~~Field data will be entered into an Excel spreadsheet (or alternate software) and verified to determine that entered data are correct and without omissions and errors.

Environmental analytical data generated under this SAP/QAPP will undergo ~~a~~EPA ~~minimum~~ Stage 2~~B~~A data validation. ~~(SCUM QA1 equivalent), 2B, or~~If serious deficiencies are noted during data validation, or if the intended use of the data changes from what is presented in this QAPP, then the Port may choose to have a Stage 4 data validation performed on specific datasets. ~~4 level data quality review~~

Commented [DJ252]: Will be rejecting all of these insertions because they are not data package elements are are already listed.
Commented [TCP-SBS253R252]: Okay
Formatted Table
Commented [DF258]: Ecology is proposing a change in data validation approach. Landau do not agree with Stage 3 being appropriate – it is not called out in SCUM or DMMP. Decided to go with 2B for everything under this QAPP, with option to perform Level IV on select samples.
Commented [TCP-SBS259R258]: Okay with 2B and 4.
Commented [DJ260]: Reject this insertion. Not all information from our field forms is input into Excel.
Commented [TCP-SBS261R260]: Okay with edit.
Commented [DJ262]: Reject this insertion – there is no need to state minimum. The data will either undergo 2B or 4.
Commented [DJ263]: Reject this insertion. Since SCUM is the guidance document for this QAPP, it is important to have a crosswalk between the defined EPA industry standard levels of validation (Stage 1, 2a, 2b, 3, and 4), and what SCUM lists (QA1 and QA2).
Commented [TCP-SBS264R263]: We are okay with EPA validation stages. 2B and 4 are okay.

(SCUM QA2 equivalent). Stage 2BA is a data quality review; raw data are not reviewed during this process. The data validation level will be determined based on the intended use of the data, and the validation level will be specified in the Work Plan.

Commented [A265]: This is not included in the work plan.

Commented [DJ266R265]: Addressed in text.

Stage 2A vData validation will be performed in accordance with National Functional Guidelines (EPA 2020, 2020a, 2020b), SCUM, *Dredged Material Evaluation and Disposal Procedures User Manual* (DMMO 2021), and Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use (EPA 2009).Validation and verification will follow EPA's Functional Guidelines for Organic/Inorganic/High Resolution Data Review (EPA 2020), Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use (EPA 2009),

During EPA and include the followingStage 2B (SCUM QA1) data validation, the results of all sample-related and instrument QC forms are evaluated and used to assess and qualify sample results. StageLevel 2B data validation is performed primarily from information contained on sample result forms and sample related QC summary forms, including calibration information, and sample receipt information. Information contained on the forms is used to verify that QC samples were analyzed with the correct analytes at the proper frequency and concentration and that the QC was met. Raw data is not reviewed during the StageLevel 2B data validation process.:

EPA Stage 2A includes:

Verification that the laboratory data package contains all necessary documentation (including COC records; identification of samples received by the laboratory; date and time of receipt of the samples at the laboratory; sample conditions upon receipt at the laboratory; date and time of sample analysis; and, if applicable, date of extraction, definition of laboratory data qualifiers, all sample-related QC data, and QC acceptance criteria).

Verification that all samples were received by the laboratory; and requested analyses, special cleanups, and special handling methods were conducted.

Verification that QC samples were analyzed as specified in the appropriate work plan.

Evaluation of sample holding times.

Evaluation of QC data compared to acceptance criteria, including method blanks, surrogate recoveries, laboratory duplicate and/or replicate results, and LCS results.

Evaluation of RLs compared to target RLs specified in this SAP/QAPP.

Stage 2B includes Stage 2A the above as well as:

Stage 3 (add info).

Verification and validation checks for the compliance of instrument-related QC.

Stage 4 (SCUM QA2) includes Stages 2A, 2B, and 3,the above as well as:includes the Stage 2B validation elements, with the addition of an examination of sample and QC raw data and instrument printouts to check for technical, calculation, analyte identification, analyte quantitation, and transcription or reduction errors. At a minimum 10% of reported results on summary forms should be confirmed by recalculation.

Recalculation of instrument and sample results.

Evaluation of raw data.

Data validation will be performed in accordance with National Functional Guidelines (EPA 202017, 2020a, 2020b), SCUM II, *Dredged Material Evaluation and Disposal Procedures User Manual* (DMMO 2021), and Guidance for Labeling Externally Validated Laboratory AnalyticalLabeled Data for Superfund Use (EPA 2009).

The results of the data quality reviewData validation findings, including text assigningqualification of data in qualifiers in accordance with the EPA National Functional Guidelines and a tabular summary of qualifiers and qualified data will be overseen by the QA Manager, who will conduct final review and confirmation of the validity of the data. A copy of the data validation report will be submitted by the QA Manager and will be presented as an appendix to the appropriate report. Data will be labeled according to EPA 2009. Data labels will be included with all reported data.

Laboratory data, which will be electronically provided and loaded into the database, will undergo a 10 percent check against the laboratory hard copy data. If errors are discovered, a 100 percent QC check will be performed and the findings will be communicated to the laboratory for resolution. . D Data will be validated or reviewed manually, and qualifiers, if assigned, will be entered manually. The accuracy of all manually entered data will be verified by a second party. Data tables will be exported from an EQuIS database to Microsoft Excel tables based on the requirements for reporting and data management and use.

Commented [DJ267]: Reject this insertion. EPA qualifiers (U, UJ, J, J+, J-, and R) will be reported as final qualifiers in data tables. Data labels (for example S2AVEM) as explained in EPA 2009 document will not be used for this project (although other portions of that guidance will be followed, for example the data validation elements).

Commented [A268]: Why wouldn't the data be returned to the lab for correction?

Commented [DF269R268]: addressed

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Commented [TCP-SBS270]: Ecology has removed the numbering. It's just SCUM now.

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PSEP. 1997a. *Puget Sound Estuary Program: Recommended Guidelines for Measuring MetalsOrganic Compounds in Puget Sound Sediment and Tissue Samples*. Prepared for the US Environmental Protection Agency Region 10, and the Puget Sound Water Quality Authority. Puget Sound Water Quality Authority, Olympia, Washington.

PSEP. 1997b. *Puget Sound Estuary Program: Recommended Protocols for Measuring OrganicsMetals in Puget Sound Sediment and Tissue Samples*. Prepared for the US Environmental Protection Agency Region 10, and the Puget Sound Water Quality Authority. Puget Sound Water Quality Authority, Olympia, Washington.

USACE. 2021. *Dredged Material Evaluation and Disposal Procedures User Manual.* US Army Corps of Engineers. July.

USGS. 2006. *Deschutes Estuary Feasibility Study – Hydrodynamics and Sediment Transport Modeling. Final Report.* Available at: http://www.ga.wa.gov/CLAMP/HSTA.pdf. US Geological Survey.

Washington State Legislature. Washington Administrative Code Title 173. Ecology, Department of, Chapter 173-160. Minimum Standards for Construction and Maintenance of Wells. Last updated March 3, 2023.

Commented [A271]: EPA also updated the organics NFGs in 2020. Please update. If there is a reason to refer to 2017, let's discuss this.

Commented [DJ272R271]: Landau: agree, will update

TABLE OF CONTENTS

FIGURES

Commented [TCP-SBS1]: I recall Boatworks area dredging was performed (rather than proposed) in 2013/2014. Please research and, if necessary, revise this and other applicable figures.

Commented [TCP-SBS2]: For ease of use by the reader, please include intertidal area hatching on this figure.

TABLESF

ATTACHMENTS

Commented [TCP-SBS3]: This table is a duplication of a table in the SAP/QAPP. Please remove or review for consistency with other versions of the table.

Commented [TCP-SBS4]: Please substantially revise or remove Table 2. As presented the table is incomplete because it does not list all parameters of concern in the parameter group.

Note a). This note is regarding laboratory limits; however, no laboratory limits are provided on the table. Please resolve.
Note b). Change two instances of method to mode (ie scan or SIM).
Note c). Please include porewater sampling, analytical, and QAPP information in the SAP/QAPP.

Commented [TCP-SBS5]: Please revise the column header for Natural Background to cover only the SCO value. The CSL value under Natural Background is covered under Protection of Benthic Community.

Ecology is not assessing a regional background concentration for cadmium. In Table 3, revise 'pending' to the none (or n/a) under the regional background and CSL columns, and preliminary SCL: 0.8 mg/kg dw.

Update SCOs, CSLs, and preliminary SCL for mercury to reflect protection of human health criteria.

First note and Note d. Please clarify Attachment A is an attachment to the Alternatives Evaluation, and provide the complete reference for the attachment.

Commented [TCP-SBS6]: Please change to intertidal. Subtidal sample locations are included in Table 6.

Commented [TCP-SBS7]: Please change title to Subtidal. Intertidal sample locations are included in Table 5.

Please explain why several subtidal sediment cores do not include collecting or archiving samples below 3 feet; however, the typical coring depth at these locations is about 8 feet. Noted for POBI-SVC-827, 829, 831, 832, 835, 837, 838, 841, 842, 843, 854, 855, 856, 857, 858, and 859. Ecology may require a modification to the approach in these locations.

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LIST OF ABBREVIATIONS AND ACRONYMS

Draft Alternatives Memorandum	Draft Identification and Evaluation of Interim Action Alternatives Memorandum
AET	apparent effects threshold
AO	Agreed Order
Cascade Pole	Cascade Pole site
CDF	confined disposal facility
City	City of Olympia
cm	centimeter
COC	chemical of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSL	cleanup screening level
D/F	dioxin and furan
DMMO	Dredged Material Management Office
DMMP	Dredged Material Management Program
DNR	Washington State Department of Natural Resources
DOF	Dalton Olmsted & Fuglevand
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EDR	engineering design report
EIM	Environmental Information Management System
ENR	enhanced natural recovery
EPA	US Environmental Protection Agency
ESA	Endangered Species Act
ft	feet/foot
GPS	global positioning system
HASP	Health and Safety Plan
HpCDD	heptachlorodibenzo-*p*-dioxin
IAP	interim action plan
IDP	Inadvertent Discovery Plan
Landau	Landau Associates, Inc.
LOTT	LOTT Clean Water Alliance
MHHW	mean higher high water
MLLW	mean lower low water
MTCA	Model Toxics Control Act
OC	organic carbon normalized
OD	ordnance datum
OSV	Ocean Survey Vessel
PCB	polychlorinated biphenyl

Port .... Port of Olympia
PQL .... practical quantitation limit
PSEP .... Puget Sound Estuary Program
QAPP .... Quality Assurance Project Plan
RAL .... remedial action level
RBC .... risk-based concentration
RCW .... Revised Code of Washington
SCL .... sediment cleanup level
SCUM .... Sediment Cleanup User's Manual
SEPA .... State Environmental Policy Act
SIM .... selected ion monitoring
SMA .... Sediment Management Area
SMS .... sediment management standards
SWAC .... surface weighted average concentration
TCLP .... toxicity characteristic leaching procedure
TEQ .... toxicity equivalency quotient
UCT-KED .... Universal Cell Technology-Kinetic Energy Discrimination
USACE .... US Army Corps of Engineers
UTL .... upper tolerance limit
WAC .... Washington Administrative Code
Work Plan .... Pre-Remedial Design Investigation Work Plan

1.0 INTRODUCTION

This Pre-Remedial Design Investigation Work Plan (Work Plan) has been prepared as required by Amendment No. 2 to Agreed Order (AO) No. DE 6083. AO No. DE 6083 was entered into by the Washington State Department of Ecology (Ecology) and the Port of Olympia (Port) on December 5, 2008. This Work Plan has been prepared consistent with the requirements of "Task 8: Pre-Remedial Design Investigation Work Plan" of AO Amendment No. 2, effective June 9, 2023.

This Work Plan is focused on a geographical and technical subset of investigations and related work plans for the overall Budd Inlet Sediment site, as shown on Figure 1-1. This Work Plan is focused on the collection of sediment chemistry data in:

- Subtidal and intertidal areas east and north of the Port Peninsula to the confluence of the shallow and deep draft federal navigation channels.
- The former log pond.
- Potential mitigation area: On the west shoreline in West Bay in the vicinity of West Bay Park.

These areas collectively are defined as the "Sub-Area 1 Project Area" within this Work Plan (see Figure 1-2). The Sub-Area 1 Project Area comprises the East Bay, Log Pond, and West Bay Park Segments, as shown on Figure 1-2, that have been identified as feasible to address in an initial phase of sampling.

This Work Plan is consistent with AO Task 8: Pre-Remedial Design Investigation Work Plan. Additional sediment sampling will be completed in subsequent stages of work at the Budd Inlet Sediment site, as illustrated on Figure 1-3 below, to work toward satisfying the requirements of Task 8.

This Work Plan describes planned intertidal and subtidal sediment sampling for chemical analysis. Both surface and subsurface sediment samples will be collected and analyzed for chemical contamination.

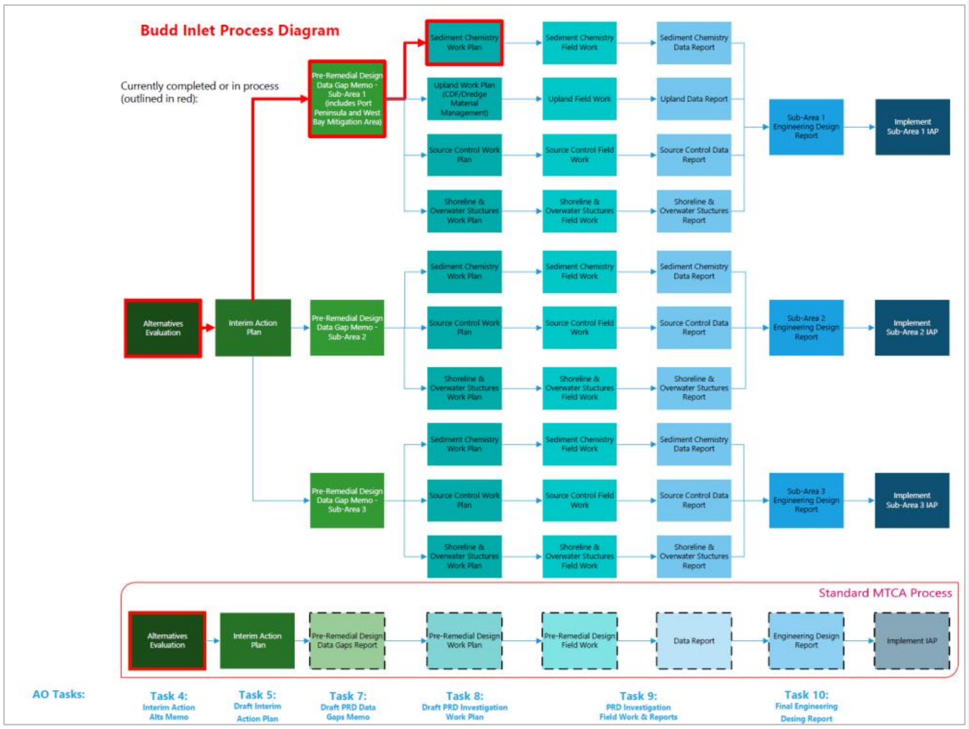

Figure 1-~~2~~3: Budd Inlet Process vs. Standard Model Toxics Control Act (MTCA) Process Diagram (Ecology, September 2023)

Commented [TCP-SBS8]: Please revise figure number to be consistent with text.

Additional work plans will be prepared for the Sub-Area 1 Project Area in response to additional data needs, including geotechnical and upland site data collection, and source control studies. The current sediment chemistry data collection will be used to inform and guide these future studies. This workflow process, as previously discussed with Ecology, is depicted on Figure 1-3, with the tasks associated with AO Amendment No. 2 shown below the process diagram.

For each study within the Sub-Area 1 Project Area, a data report will be prepared and submitted to Ecology. At the completion of data collection within the Sub-Area 1 Project Area, a Sub-Area 1 Project Area Engineering Design Report (EDR) will be prepared and submitted to Ecology. Following review and approval of the final Sub-Area 1 Project Area EDR by Ecology, the Sub-Area 1 Project Area portion of the interim action plan (IAP) will be implemented for the Sub-Area 1 Project Area.

Additionally, similar work plans for sediment chemistry, geotechnical data, and source control evaluations will be prepared for the Sub-Area 2 Project Area and then for the remainder of the Budd Inlet Site ~~as a whole~~ (Sub-Area 3), extending to the north as required, based upon contamination identified by previous and future sediment investigations. These work plans may be prepared in parallel or in series, to be coordinated with Ecology.

As required by Task 8 of AO Amendment No. 2, this Work Plan for sediment chemistry sampling in the Sub-Area 1 Project Area describes:

- Field sediment chemistry investigations to be performed
- Data use
- Data collection methodologies
- Reporting requirements, and
- Schedule.

As further required by Task 8 of AO Amendment No. 2, this Work Plan includes the following supporting plans as attachments:

- Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP; Attachment A)
- Health and Safety Plan (HASP; Attachment B)
- Inadvertent Discovery Plan (IDP; Attachment C)

1.1 Objectives of the Pre-Design Sediment Sampling

Within the Sub-Area 1 Project Area, multiple surface and subsurface sediment samples will be collected to fill existing sediment chemistry data gaps, consistent with the requirements of Task 8 of AO Amendment No. 2, which states, "the Work Plan will be focused on collection of data to fill data gaps identified in the PRD Memo." Existing sediment chemistry sample density for dioxin/furans (D/Fs) and carcinogenic polycyclic aromatic hydrocarbons (cPAHs) are shown on Figures 2-1 thru 2-3 and Figures 2-4 thru 2-6 respectively.

Objectives of the pre-remedial design sediment sampling detailed in this Work Plan include:

- Collection of sediment chemistry data to support remedial design within the Sub-Area 1 Project Area where a specific remedial approach was proposed in the Draft Identification and Evaluation of Interim Action Alternatives Memorandum (DOF et al. 2023).
- Collection of sediment chemistry data to refine the extent of contamination in surface and subsurface sediments within the Sub-Area 1 Project Area.
- Collection of sediment chemistry data to support detailed design-level evaluation of the Sub-Area 1 Project Area.

Specifically, data will be collected to:

- Support calculation of surface weighted average concentrations (SWAC) for cadmium, cPAHs, dioxin-like polychlorinated biphenyls (PCBs), and D/Fs via collection of surface sediment (0-10 centimeter [cm]) data.

- Support calculation of intertidal SWACs for cadmium, cPAHs, dioxin-like PCBs, and D/Fs via collection of surface sediment data (0-45 cm) data in intertidal areas.
- Support determination of the depth of contamination within areas proposed for remedial dredging within the Draft Alternatives Memorandum (DOF et al. 2023). This includes hot spots, navigational areas, and around the Moxlie Creek Outfall at the southern end of Sub-Area 1 Project Area.
- Support initial source control assessment.
- Support initial dredge material management assessment.

1.2 Regulatory Framework

Under the Puget Sound Initiative (Initiative), Ecology identified Budd Inlet as a high-priority cleanup area that requires focused sediment cleanup ~~and source control~~ primarily due to elevated concentrations in sediment (Ecology 2008). As part of the Initiative, Ecology issued AOs to property owners to investigate and clean up contaminated sites within Budd Inlet.

Commented [TCP-SBS9]: Delete this phrase—source control was not included in the Agreed Order (Ecology 2008).

Ecology and the Port entered into AO No. DE 6083 in 2008 to complete a pilot remedial dredging action in a portion of the Port's berthing area (completed in 2009). In 2012, the AO was amended to require the Port to evaluate a larger area, referred to as the Study Area, and address contaminated sediment in the vicinity of the Port Peninsula (Ecology 2012a). In 2023 the AO was amended a second time to include additional tasks, including the preparation of a Pre-Remedial Design Investigation Work Plan (Ecology 2023a). This Work Plan for sediment chemistry investigation within the defined Sub-Area 1 Project Area is one component of the overall Work Plan required by AO Amendment No. 2. Future work plans will be prepared for additional studies within the Sub-Area 1 Project Area and the remainder of the Budd Inlet Sediments site.

The Port (performing party for the remediation) and Ecology (lead regulatory agency) are currently working in a collaborative process to develop, design, and permit Budd Inlet sediment remediation such that remedial work will be complete prior to the potential upcoming removal of the Capitol Lake dam. Removal of the dam is expected to significantly increase the sediment load into Budd Inlet. If new sediment from Capitol Lake enters Budd Inlet prior to remediation, the total volume of sediment to remediate in Budd Inlet would likely increase, because the new sediment likely could not be separately managed from the impacted sediment in a cost-effective manner.

This work is being performed as required by Amendment No. 2 to 2008 AO No. DE 6083, entered by Ecology and the Port on June 8, 2023. Ecology is the lead regulatory authority for this work.

1.2.1 Permitting and Other Approvals

In-water sampling will require a US Army Corps of Engineers (USACE) permit. The Nationwide Permit 6 covers sampling activities, and the USACE will likely use this permit to authorize this cleanup action. Endangered Species Act (ESA) consultation will be conducted concurrent with the USACE permit process. Whether or not ESA consultation is necessary, and what level of consultation (formal or informal) is necessary, would be determined by the USACE.

State and local permits generally are not required under a state-led cleanup project. Revised Code of Washington (RCW) 70A.305.090 exempts state-led cleanup projects from the procedural requirements of obtaining permits under programs including the hydraulic code (RCW 77.55) and the Shoreline Management Act (RCW 90.58). However, RCW 70A.305.090 requires that Ecology ensure the project complies with the substantive provisions of these programs.

In-water sampling is exempt from review under the State Environmental Policy Act (SEPA), per Washington Administrative Code (WAC) 197-11-800 (17), which exempts data collection. The SEPA lead agency (likely the Port in this case) would be responsible for determining whether the project meets this exemption.

1.3 General Site Information

The Port's Marine Terminal facility is located in the northern portion of the City of Olympia (City) on a peninsula within Budd Inlet, which is a small embayment in southern Puget Sound (Figure 1-2). Southern Budd Inlet is divided into West Bay and East Bay by the Port Peninsula. The filling of tidelands in the late 1800s and 1900s created the Port Peninsula and the downtown area of Olympia. The upland Port Peninsula consists of approximately 150 acres. Detailed background information related to property features, regulatory background, and historical operational uses are presented in the Existing Information Summary and Data Gaps Memorandum (Anchor QEA 2012a).

1.3.1 East Bay

A federally authorized navigation channel runs from the area north of the Port Peninsula and extends into the East Bay of Budd Inlet. This channel was originally dredged by the USACE and the marina basin was dredged by the Port, to support development of the East Bay Marina, now Swantown Marina, and the dredge material was used as fill to expand the Port Peninsula (Figure 1-2). The federal navigation channel also extends to the boat launch ramp located just north of Swantown Marina. Prior to the USACE channel dredging and subsequent construction of the Marina, the Sub-Area 1 Project Area was historically used for log storage.

Two sites under AOs with Ecology are located on the Port Peninsula adjacent to the Sub-Area 1 Project Area (Figure 1-4): The Cascade Pole site (Cascade Pole; located on the north end of the peninsula) and the East Bay Redevelopment site (located on the southern portion of the peninsula). The Port has been addressing contamination at Cascade Pole since 1990. The previous cleanup activities at Cascade Pole include several interim actions to remove and contain contamination both on the uplands (groundwater and soil) and in sediments, out to the "Multiple Benefits Line" (Figure 1-2). The historical activities at East Bay Redevelopment site caused soil ~~and groundwater~~ contamination. The Port, along with the City and LOTT Clean Water Alliance (LOTT), worked with

Commented [TCP-SBS10]: Groundwater is not a media of concern for EBRD.

Ecology to implement the Cleanup Action Plan for the site. Remediation included removal of some soil contamination hot spots. Remaining impacted soil was covered with a cap of clean soil, pavement, or buildings.

Moxlie Creek originates from an artesian spring approximately 1.5 miles south of Budd Inlet. It flows into the Sub-Area 1 Project Area through a mile-long culvert that receives stormwater flows from urban areas, including road runoff from city streets and state and federal highways, before discharging at the southern end of the Sub-Area 1 Project Area (Anchor QEA 2012a).

1.3.2 US Army Corps of Engineers and Authorized Federal Navigation Channels

The two federally authorized navigation channels within Budd Inlet are described below. The shallow draft channel is part of the Sub-Area 1 Project Area and is included in this Work Plan. The deep draft channel will be included in the future Sub-Area 2 and Sub-Area 3 Work Plans as appropriate.

- The deep draft (-30 feet [ft] mean lower low water [MLLW] authorized depth) navigation channel starts in the northern section of Budd Inlet and extends into West Bay, including the Turning Basin. The Port's berthing areas at the Marine Terminal are outside the federal channel.
- The shallow draft (-13 MLLW and -12 MLLW authorized depths) extends from the deep draft navigation channel north of the Port Peninsula into the Sub-Area 1 Project Area and south to the Boatworks area.

The USACE is responsible for dredging federally authorized channels (with direction and funding from Congress) but will not dredge channels within an Ecology-listed contaminated site. In discussions, USACE has indicated that remediation in the federally authorized navigation channels must consider future maintenance dredging requirements. As such, any restrictions on future dredge, such as a cap over contaminated sediments, must be greater than 2 ft below the typical overdredge allowance of 2 ft below authorized depth; 4 ft below the overdredge (OD) elevation is preferred by the USACE (Hicks, J., 2023, personal communication).

In the shallow draft channel in East Bay, where the authorized depth is -13 ft MLLW, a 2-ft overdredge allowance is -15 ft MLLW, the minimum additional 2-ft clearance required by USACE is -17 ft MLLW, and the preferred 4-ft allowance below OD is -19 ft MLLW.

These guidelines from the USACE have been considered and incorporated into the planned sediment sampling within the federally authorized navigation channels.

The Swantown Marina boat basin is maintained by the Port and is not part of the federally authorized navigation channel.

1.4 Work Plan Organization

The remainder of this Work Plan is divided into the following sections and attachments, consistent with AO Amendment No. 2, Task 8:

Field Investigations to Be Performed and Data Collection Methodologies (Work Plan Section 2)
This section generally describes the methods to be used to collect the various types of sediment samples for chemical analysis to inform remedial design requirements. Additional details are provided in the SAP/QAPP (Attachment A).

Data Use (Work Plan Section 3)
This section expands on the objectives defined in Section 1.1 and describes the intended data use for each type of sediment sample, specifically each sample planned to be collected at both surface and subsurface locations. Surface sediment samplings include samples in the Sub-Area 1 Project Area within both intertidal areas (0-45 cm sample depth) and subtidal areas (0-10 cm sample depth). Subsurface samples are at depths deeper than 10 cm below the surface in subtidal areas and deeper than 45 cm below the surface in the intertidal areas.

Reporting Requirements (Work Plan Section 4)
This section describes how the various types of data will be reported and details associated reporting requirements. Specifics on laboratory processes and reporting are presented in the SAP/QAPP (Attachment A).

Schedule (Work Plan Section 5)
This section describes the planned schedule for implementation of the Work Plan, laboratory analyses, and data report preparation.

Attachments to This Work Plan

- SAP/QAPP: The SAP/QAPP provides details on sediment-related field procedures, laboratory methodologies, and quality assurance requirements.
- HASP: The HASP addresses project and task-specific health and safety procedures and requirements for sediment sampling.
- IDP: The IDP provides guidance and procedures to be followed in the case of an inadvertent discovery of potentially historically significant artifacts.

2.0 FIELD INVESTIGATIONS TO BE PERFORMED

The sediment chemistry field investigations proposed in this Work Plan have been developed to fill sediment chemistry data gaps in the Budd Inlet Sub-Area 1 Project Area as identified in the Draft Final Pre-Remedial Design Data Gaps Memorandum (DOF 2023).

Existing surface sediment data are limited in geographical coverage throughout most of Budd Inlet and the Sub-Area 1 Project Area. Proposed surface sediment samples will be collected on an approximately 500-foot-grid spacing throughout most of the Sub-Area 1 Project Area, with increased density of samples near existing outfalls and in the vicinity of Moxlie Creek. Surface sediment samples will be collected using a grab sampler (power grab or similar) or by using hand tools in intertidal areas during low tide.

Commented [TCP-SBS11]: Please include in the text when or where samples would be collected by hand. Possibly in areas inaccessible by the sampling vessel.

Existing subsurface sediment data are limited in geographical coverage throughout most of Budd Inlet and the Sub-Area 1 Project Area. Proposed subsurface sediment samples will be collected on an approximately 500-foot-grid spacing throughout the Sub-Area 1 Project Area, with greater density of samples in the navigation channel, near outfalls, and within the vicinity of Moxlie Creek. Samples of subsurface sediment will be collected using a vibracorer.

Sediment samples will be sent to a laboratory for chemical analysis as detailed in Sections 2.1, 2.2, and 2.3 of this Work Plan. Detailed procedures for sample collection, identification, handling, and laboratory analysis are presented in the attached SAP/QAPP. The rationale for different sampling approaches is discussed below and in Section 3.0.

2.1 Surface Sediment Sampling (0-10 cm below mudline) in Subtidal and Intertidal Areas

Surface sediment samples (0-10 cm below mudline) will be collected throughout the Sub-Area 1 Project Area as shown on Figure 2-7. This includes samples within intertidal and subtidal areas. These samples will be collected using a power grab or similar surface sediment sampling device and will be analyzed for the Primary Chemical of Concern (COC) suite. Alternatively, within intertidal areas samples may be collected using hand tools as necessary as described in the SAP/QAPP. Samples near outfalls will also be analyzed for the Source Control suite. The Primary COC suite includes D/Fs (dioxin toxicity equivalency quotient [TEQ]), cPAHs, PCBs as congeners (PCB TEQ), and cadmium. The Source Control suite consists of the Sediment Management Standards Marine suite (Sediment Cleanup User's Manual [SCUM]~~II~~, Table 8-1) developed for protection of the benthic community and the Primary COC suite, as detailed in the attached SAP/QAPP.

2.2 Surface Sediment Sampling (0-45 cm below mudline) in Intertidal Areas

The intertidal areas are located between elevations -4' MLLW and +16' MLLW based on typical lowest and highest tides annually. Within the mapped intertidal areas of the Sub-Area 1 Project Area, surface sediment samples (0-45 cm below mudline) will be collected as shown on Figure 2-8. These samples will be collected using a vibracorer and will be analyzed for the Primary COC suite. Samples near outfalls will also be analyzed for the Source Control suite, as detailed in the attached SAP/QAPP.

2.3 Subsurface Sediment Sampling (below 10 cm [~0.3 ft] within subtidal areas, below 45 cm [~1.5 ft] within intertidal areas)

Subsurface sediment samples (deeper than 10 cm [~0.3 ft] in subtidal areas, deeper than 45 cm [~1.5 ft] in intertidal areas) will be collected throughout the Sub-Area 1 Project Area as shown on Figure 2-9. These samples will be collected using a vibracorer and will be analyzed for the Primary COC suite at all sample locations and for the Z-layer suite at locations where dredging is anticipated to occur, as detailed in the attached SAP/QAPP. The Z-layer suite consisted of the USACE Dredged Material Management Program Standard List of Chemicals of Concern (Dredged Material Management Program [DMMP] User Manual, Table 8-3). The cores will be sampled based on a 1' *in situ* sample interval (take samples from the core to represent 1' *in situ* intervals).

2.4 Field Data Collection Preparation

Prior to implementing the field sediment sampling program, the following supporting activities will be completed:

- Permitting as described in Section 1.2.1
- Coordination and Right of Entry from the Washington State Department of Natural Resources (DNR) for sampling on DNR property
- Field utility locate to identify any underground utilities within the Sub-Area 1 Project Area
- Identification of project support areas, including:
  - Sampling vessel moorage
  - Core sample processing area
  - Property access, as needed
- Contracting and coordination with sampling vessel
- Contracting and coordination with analytical laboratory.

3.0 DATA USE

Sediment samples will be collected throughout the Sub-Area 1 Project Area to support multiple project objectives, as presented in Section 1.1, including refining the extent of contamination in surface and subsurface sediments and providing data to inform remedial design requirements, as practicable, for development of remedial alternatives within areas of insufficient existing data and to identify areas where additional investigation is needed to determine additional sources of contamination entering the Sub-Area 1 Project Area. Data will also be used to:

- Define the nature and extent of chemical contamination throughout the Sub-Area 1 Project Area, including identification of areas of significantly elevated chemical concentrations or "hot spots."
- Determine surface sediment chemistry for recalculation of surface~~sitewide~~ and intertidal SWACs as appropriate.
- Map chemical concentrations in sediment, both horizontally and vertically, to support design, confirm potential COCs in the Z-layer (the surface exposed by dredging, if dredging is performed), and evaluate potential capping of contaminated sediments within areas where capping is a selected remedy and below the Z-layer if necessary, based on a proposed dredging remedy within that Sediment Management Area (SMA).
    - Sufficient data density is required to define an accurate dredge prism, horizontally and vertically, to remove the impacted sediments.
- Determine sediment chemistry in the vicinity of existing and former outfalls for identification of potential current or historical sources of contamination.
- Determine sediment chemistry for the development and evaluation of potential dredged material management options, including onsite confined disposal facilities (CDFs) either upland or in water. Additional sediment and upland investigations will be performed in the future as part of a focused work plan, as appropriate.
- Determine sediment physical parameters, such as grain size and density, to evaluate dredgeability, dredged material management, and sediment management approaches other than dredging, including capping or enhanced natural recovery (ENR).

Planned sampling locations, the number of sediment samples of each type, and intended data use are presented in Table 1 below. Tables 3, 4, and 5 provide additional details and describe locations to be sampled, previous contamination in the vicinity, depth intervals to be initially analyzed, and chemicals of concern to be analyzed. Additional core intervals may be analyzed, as needed, to determine the depth of contamination based on initial analyses. Cores will be driven to the depth indicated in Tables 4 and 5 or to refusal, whichever is encountered first. If sample acceptance criteria are not achieved, the core will be rejected, and the vessel will shift no more than 20 feet from the target location and attempt to collect an acceptable core. At least three attempts to collect an acceptable core will be made for each sample location. If a core is not collected that meets acceptance criteria after three attempts, the field lead will determine if additional attempts are likely to result in a core that will meet acceptance criteria or if a core already collected will contain enough sediment for the

Commented [TCP-SBS12]: Depths are not included in Table 4.

analysis suite appropriate for the sample location. The acceptance criteria for core samples are as follows and are detailed in the SAP/QAPP.

- Overlying water is present and the surface is intact.
- The core tube appears intact without obstruction or blocking.
- The incremental recovery percentage shall be 50 percent or greater within an increment and 70 percent or greater for the core overall. The *in situ* depth certainty will be estimated based on the length of the segment and the unaccounted portion based on acquisition data. Incremental sample recovery measurement will supersede measurement of bulk recovery percentage to determine core acceptance.
- Target penetration depth is achieved unless refusal occurs after three attempts, in which case the deepest penetrating core will be sampled.

Commented [TCP-SBS13]: A slightly different version of acceptance criteria is presented in the SAP/QAPP. Please consider deleting this acceptance criteria or reconciling the differences between this description and the description in the SAP/QAPP.

An ex-situ measurement should be made to determine the length of the sediment core following retrieval.

Table 1. Sample Type, Number of Samples, and Locality

Sample Type	Locations	Planned Analyses	Data Use
Surface sediment samples (0-10 cm)	Sub-Area 1 Project Area–Wide 96 sampling locations (Figure 2-1)	Primary COC suite (all locations)	Update SWAC and determine sediment physical parameters, such as grain size and density, to evaluate dredgeability, dredged material management, and sediment management approaches other than dredging, including capping or ENR.
	Near stormwater outfalls within Sub-Area 1 Project Area 15 sampling locations (included in the 96 locations above)	Source Control suite	Evaluate, and identify potential current or historical sources,
Intertidal surface sediment samples (0-45 cm)	Intertidal areas within Sub-Area 1 Project Area 48 sampling locations	Primary COC suite (all locations)	Update SWAC and determine sediment physical parameters, such as grain size and density, to evaluate dredgeability, dredged material management, and sediment management approaches other than dredging, including capping or ENR.
	Near stormwater outfalls within Sub Area 1 Project Area 19 sampling locations (included in the 48 locations listed above)	Source Control suite	Evaluate, and identify potential current or historical sources,
Subsurface sediment samples (below 10 cm [~0.3 ft] subtidal, below 45 cm [~1.5 ft] intertidal)	Sub-Area 1 Project Area–Wide 108 sampling locations	Primary COC suite (all locations)	Evaluate depth of contamination and for the development and evaluation of potential dredged material management options,
	Near stormwater outfalls within Sub-Area 1 Project Area 19 sampling locations (included in the 108 locations listed above)	Source Control suite	Evaluate, and identify potential current or historical sources,
	Anticipated Remedial Dredging Areas 40 sampling locations (included in the 108 locations listed above)	Z-layer suite based on depth of contamination and potential dredge depth	Evaluate sediments anticipated to be exposed by dredging (Z-layer) and to define an accurate dredge prism, horizontally and vertically, to remove the impacted sediments.

Note:

All outfalls, current and historical, are shown on Figure 2-7.

Commented [TCP-SBS14]: This table is repeated in the SAP/QAPP. Please consider removing one instance of the table or resolving any discrepancies between the versions.

Commented [TCP-SBS15]: It would be very helpful to distinguish these locations on the figure. Is it correct that based on Table 4, the 15 locations where the source control suite will be added are POBI-SG-001 through -015?

Wouldn't outfalls that discharge from the Port peninsula including outfall on the west shore of East Bay south of Boatworks, and outfalls near Swantown Marina and Cascade Pole also be locations where source control suite would be analyzed?

Commented [TCP-SBS16]: Please distinguish these locations on the figure. Is it correct that based on Table 4, the 15 locations where the source control suite will be added are POBI-SVCI-400, 403, 404, 408, 410, and 414 through 427?

Please see comment above regarding source control samples.

Commented [TCP-SBS17]: Please identify these locations. They are not shown on Figure 2-9 or identified on Table 4.

Commented [TCP-SBS18]: Table 4 identifies 42 sampling locations (listed below) where Z-layer samples will be collected. Please resolve this discrepancy.

POBI-SVC-800-804, 806-809, 811-818, 820-826, 828-830, 833-836, 838-840, 844-847, 850-853

Table 2. Sediment Analytical Testing Suites (Full list of individual analytes included on Table 3 of SAP)

Commented [TCP-SBS19]: Remove or substantially revise this table based on Ecology's previous comments. The information here is incomplete and repeated in SAP/QAPP Table 3.

See additional comments on this table in the Table of Contents section above.

Parameter Group	Analytical Method	Parameter		Analytical Suite		
				Primary	Z-layer	Source Control
SVOCs	EPA 8270E	1,2,4-Trichlorobenzene	(b)		X	
SVOCs	EPA 8270E SIM	1,2,4-Trichlorobenzene	(b)		X	
SVOCs - Butyltins	EPA 8270E SIM	Tributyltin Ion	(c)		X	
SVOCs - cPAHs	EPA 8270E	Benzo(a)anthracene	(b)		X	
SVOCs - cPAHs	EPA 8270E - calc	cPAH TEQ	(d)	X	X	X
SVOCs - cPAHs	EPA 8270E SIM	Benzo(a)anthracene	(b)		X	
SVOCs - cPAHs	EPA 8270E SIM - calc	cPAH TEQ	(d)	X	X	X
Organochlorine Pesticides	EPA 8081B	4,4-DDD			X	
PCBs - Congeners	EPA 1668	2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)		X	X	X
PCBs - Congeners	EPA 1668 - Calc	PCB Congener TEQ		X		X
PCBs - Congeners	EPA 1668 - Calc	PCB Congener Total (209 Congeners)			X	X
Dioxin/Furans	EPA 1613B	1,2,3,4,6,7,8-HpCDD		X	X	X
Metals	EPA 6020B	Antimony			X	
Metals	EPA 6020B UCT-KED	Arsenic			X	
Metals	EPA 7471B	Mercury		X	X	X
Conventionals	EPA 9060A	Total Organic Carbon		X	X	X
Conventionals	PSEP 1986	Total Volatile Solids		X	X	X
Conventionals	PSEP-PS	Grain Size		X	X	X
Conventionals	SM 2540 G-97	Total Solids		X	X	X
Conventionals	SM 4500-NH3 H-97	Ammonia		X	X	X
Conventionals	SM 4500-S2 D-00	Total Sulfides		X	X	X

Notes:

a) Laboratory limits are from Analytical Resources, Inc. except for PCB - Congeners by EPA 1668C, which are from Enthalpy Analytical. Limits may be updated annually based on laboratory studies.
b) Parameter is offered by more the one method, as presented in this table (e.g., EPA 8270E scan and SIM), and method selection may be driven by achievable reporting limits as well as the analytical suite for the sample.
c) Porewater may also be analyzed for tributyltin.
d) cPAH analytes as listed in SCUM Table 6-1.
e) Select samples scheduled for metals analysis may be prepared using TCLP.

Abbreviations:

cPAH = carcinogenic polycyclic aromatic hydrocarbon

EPA = US Environmental Protection Agency

HpCDD = heptachlorodibenzo-*p*-dioxin

PCB = polychlorinated biphenyl

PSEP = Puget Sound Estuary Program

SIM = selected ion monitoring

TCLP = toxicity characteristic leaching procedure

TEQ = toxicity equivalency quotient

UCT-KED = Universal Cell Technology-Kinetic Energy Discrimination

Based on previous studies and existing data, this Work Plan is focused on analytes as follows:

- Sitewide: Cadmium, 7 cPAHs, D/Fs, and 12 dioxin-like PCBs.
- In areas with dredging as a proposed remedy in the Draft Alternatives Memorandum (DOF et al. 2023): Dredged Material Management Office (DMMO) suite of chemicals in sediments anticipated to be exposed by dredging, the Z-layer. The full list of analytes is presented in Table 3 of the SAP/QAPP (Attachment A) as the “Z-layer” analytical suite.
- Near outfalls and other potential source areas: Washington sediment management standards (SMS) marine list of chemicals. The full list of analytes is presented in Table 3 of the SAP/QAPP (Attachment A) as the “Source Control” Marine List analytical suite.

Details for this focused investigational suite are described by location and depth interval in Tables 2 and 3. Existing sediment data have been used as guidance in developing the planned analytical suite and analysis program. Archived core samples representing 1-ft intervals will be sequentially analyzed, as needed, to delineate the depth of contamination at each coring location. Not all 1-ft core intervals will be analyzed. Additional details and rationale for the planned sampling are as follows:

- Sitewide chemicals identified for testing are based on those identified as primary COCs in the Investigation Report. The COC list and primary sediment cleanup levels (SCLs) are included in Table 3 below.
- Surface sediment samples (grab samples 0-10 cm below mudline) collected throughout the Sub-Area 1 Project Area will be used to update the Sub-Area 1 Project Area–specific SWACs. Samples will be analyzed for cadmium, D/Fs, 12 dioxin-like PCBs, and 7 cPAHs.
- Intertidal surface sediment samples (vibracore samples 0-45 cm below mudline) collected throughout the intertidal portions of the Sub-Area 1 Project Area will be used to update the Sub-Area 1 Project Area–specific intertidal SWACs. Samples will be analyzed for cadmium, D/Fs, dioxin-like PCBs, and cPAHs.
- Within areas where the identified proposed remedial action is dredging, based on the Draft Alternatives Memorandum (DOF et al. 2023), samples will be collected with a focus on identifying the depth of contamination, and the sediment quality of the sediment surface anticipated to be exposed by dredging (i.e., the Z-layer). Sample results will be used to design the remedial action in these areas. Samples used to identify the depth of contamination will be analyzed for cadmium, D/Fs, PCBs, and cPAHs. Z-layer samples will be analyzed for the required DMMP suite of chemicals.
- In areas near outfalls, surface and subsurface sediment samples will be collected to evaluate potential previous and ongoing sources of contamination. Additionally, these data will support development of potential remedial alternatives for these areas, as needed. Samples will be analyzed for the Source Control suite of chemicals.
- In areas immediately adjacent to the federal navigation channel in the Sub-Area 1 Project Area, samples will be collected to evaluate potential contamination and the depth of contamination, if present. These data will be used in design of the remedial action and dredging within the federally authorized channel to reduce potential for recontamination and redistribution following dredging. These samples will be analyzed for cadmium, D/Fs, PCBs, and cPAHs.

3.1 Data Management and Analysis

Field investigation personnel will be responsible for maintaining a daily record of significant events, observations, and measurements during field investigations. Field records may consist of a bound logbook or of paper or electronic field data sheets. A separate entry will be made for each sample collected. Field logbooks and forms will be included in the project files at the end of field activities to provide a record of sampling.

The laboratory shall record the results of each analysis in a Laboratory Information Management System in accordance with the contracted laboratory's quality assurance plan. Data will be provided as electronic data deliverables (EDDs), which will be imported directly into an EQuIS database used for data storage. Validated laboratory results will be exported and provided as part of the final report. Data will be managed in such a way that they can be provided to Ecology in its Environmental Management Information database.

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

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

Data analyses, validation, and quality assurance methods are provided in the SAP, which is an attachment to this work plan. A description of the types of analyses that will be performed, and the products of each analysis, should be presented to indicate what data gaps the analysis would fulfill and is provided in Section 1.1 of this work plan.

In addition to the data management software listed above, SWACs may be calculated for the primary risk drivers (cadmium, total D/F and PCB TEQ, and cPAHs) with the incorporation of new data proposed in this work plan. SWACs will be calculated using the following steps:

1) The data density visualization tool in ArcGIS Pro will be used to determine the areas where data are sufficient for interpolation. Interpolations will be developed using the inverse distance-weighted method in ArcGIS Pro 3.1.0.
2) Following interpolation, the SWAC area will be divided into a raster grid, with 50-ft by 50-ft cells or a smaller grid size (e.g., 10-ft by 10-ft cells). Each grid cell will be assigned the interpolated value at the centroid of the grid cell.
3) Grid cells with interpolated values below SCLs will be removed from the SWAC area prior to calculation of SWACs.

4) SWACs will be calculated using the equation SWACc = Σ ((SAi / TSA) * SCi). SAi is the surface area of the ith cell, TSA is the sum of all cell surface areas, and SCi is the interpolated surface concentration (SC) of the ith cell.

If SWAC evaluations are conducted with the new data, remedial action levels (RALs) may be updated as determined necessary using the following procedure:

- Interpolated surfaces may be developed for the surface (0-10 cm) and near surface (0-45 cm) and SWAC areas determined based on data density (i.e., East Bay). The SWAC area will then be divided into a raster grid, and each grid cell assigned the interpolated value at the centroid of the grid cell.
- A hill-topping procedure may be used where raster grid cells are replaced with estimated post-remediation concentrations for various RALs identified.
- The SWAC may be recalculated with each grid cell replacement for various RALs to identify which RAL achieves a preliminary sediment cleanup level. RAL curves showing SWAC reduction (remediation benefit) and approximate associated remediation acres (as a proxy for remediation cost) may be developed.

Table 3. Preliminary Sediment Cleanup Standards for Chemicals of Concern

			Protection of Benthic Community	Natural Background[a]		Regional Background[b]	PQL[c]	Preliminary Sediment Cleanup Standards			
COC Basis	Analyte	Units	SCO	CSL	SCO	CSL	SCO and CSL	SCO	CSL	Preliminary SCL	Point of Compliance
Protection of human health[d]	Total Dioxin/Furan and PCB TEQ	ng TEQ/kg dw	n/a	n/a	4.2	19	5	5	19	19	Area-wide, upper 10 cm; Intertidal, upper 45 cm
	Total cPAHs	µg TEQ/kg dw	n/a	n/a	21	78	9	21	78	78	Area-wide, upper 10 cm; Intertidal, upper 45 cm
	Cadmium	mg/kg dw	5.1	6.7	0.8	Pending[e]	0.07	0.8	Pending[e]	Pending[e]	Area-wide, upper 10 cm; Intertidal, upper 45 cm
Protection of the benthic community	Acenaphthene	Dependent on sample OC content[f]	16 mg/kg OC; 500 µg/kg dw	57 mg/kg OC; 500 µg/kg dw	n/a	n/a	n/a	16 mg/kg OC; 500 µg/kg dw	57 mg/kg OC; 500 µg/kg dw	16 mg/kg OC; 500 µg/kg dw	Point, upper 10 cm
	Benzyl alcohol	µg/kg dw	57	73	n/a	n/a	n/a	57	73	57	Point, upper 10 cm
	Butylbenzyl phthalate	Dependent on sample OC content[f]	4.9 mg/kg OC; 63 µg/kg dw	64 mg/kg OC; 900 µg/kg dw	n/a	n/a	n/a	4.9 mg/kg OC; 63 µg/kg dw	64 mg/kg OC; 900 µg/kg dw	4.9 mg/kg OC; 63 µg/kg dw	Point, upper 10 cm
	Mercury	mg/kg dw	0.41	0.59	n/a	n/a	n/a	0.41	0.59	0.41	Point, upper 10 cm

Commented [TCP-SBS20]: This is outdated. Ecology is no longer assessing for cadmium.

Notes:

Exposure pathways, RBCs, and other concentrations applicable to preliminary SCL determination for Study Area COCs are shown in this table. All evaluated chemicals, exposure pathways, RBCs, background concentrations, and PQLs are presented in Attachment A.

a) Ecology calculated natural background based on the 90 percent upper tolerance limit on the 90th percentile (90/90 UTL) using the Ocean Survey Vessel (OSV) Bold Plus dataset, as described in Table 10-1 of SCUM ~~II~~ (Ecology 2021b).

b) Ecology calculated regional background concentrations based on the 90/90 UTL of the selected data in the South Puget Sound as reported in Table 10-2 of SCUM ~~II~~ (Ecology 2021b).

c) PQLs are based on SCUM ~~II~~, Table 11-1 (Ecology 2021b).

d) As discussed in Attachment A, risk-based concentrations (RBCs) for seafood consumption were not calculated for human health. Instead, the SCOs and CSLs were developed from PQLs and background concentrations only, consistent with option 1 outlined in SCUM II (Ecology 2021b). RBCs for protection of human health for direct contact (clam digging, net fishing, and beach play scenarios) are presented in Attachment A; however, they are not carried forward in this table because SCOs and CSLs default to background values or PQLs under option 1.

e) Ecology is currently assessing Budd Inlet regional background concentration for cadmium.

f) If the total organic carbon content of a sediment sample is outside the recommended range for OC normalization (less than 0.5 percent or greater than 3.5 percent), then dry-weight concentrations are compared with the marine apparent effects threshold (AET) criteria presented.

Abbreviations:

µg/kg = micrograms per kilogram
AET = apparent effects threshold
cm = centimeter
cPAH = carcinogenic polycyclic aromatic hydrocarbon
COC = chemicals of concern
CSL = cleanup screening level
dw = dry weight
mg/kg = milligrams/kilogram
n/a = not applicable or not developed
ng/kg = nanograms per kilogram
OC = organic carbon normalized
OSV = Ocean Survey Vessel
PCB = polychlorinated biphenyl
PQL = practical quantitation limit
RBC = risk-based concentration
SCL = sediment cleanup level
SCO = sediment cleanup objective
SCUM II = Sediment Cleanup User's Manual II
TEQ = toxicity equivalency quotient
UTL = upper tolerance limit

4.0 REPORTING REQUIREMENTS

As required by AO Amendment No. 2, Task 9, "following field investigation and data analysis, the Port shall prepare a Pre-Remedial Design Investigation Report and submit it to Ecology for review and comment. The investigation report will present the data collected during the Pre-Remedial Design Field Investigation and identify if there are additional data gaps that need to be addressed by another phase of pre-remedial design sampling. Potential data evaluation methods are described in Section 3.1 of this report. If further data gaps are identified ~~by Ecology~~, Tasks 7 through 9 will be repeated until there is sufficient data. If future data gaps are identified ~~by Ecology~~, they will be addressed through a schedule change." The investigation report will include the following:

- Summary of field procedures and any deviations from the Work Plan and SAP/QAPP
- Figures showing sample locations and results
- Tabulated data
- Statistical methods used to evaluate the data
- Validated data and a data validation memo
- Data submittal to the Environmental Information Management System (EIM).

As previously discussed, this Work Plan is focused on a geographical and technical subset of future investigations and related work plans to be prepared for the overall Budd Inlet Site. This Work Plan is focused on the collection of sediment chemistry data within the Sub-Area 1 Project Area and north of the Port Peninsula to the confluence of the shallow and deep draft federal navigation channels, the former log pond, the north end of the Port Peninsula, and a small area of the west shoreline in West Bay. These areas collectively are defined as the "Sub-Area 1 Project Area" within this Work Plan.

Commented [TCP-SBS21]: Delete this phrase. The north end of the Port Peninsula is upland area and is not included in the area covered under this work plan.

Following completion of this Sub-Area 1 Project Area sediment chemistry investigation, data will be validated as described within the SAP/QAPP, and a Sub-Area 1 Project Area sediment chemistry data report, including a data validation memorandum, will be prepared and submitted to Ecology. Data validation will be performed as detailed in the SAP/QAPP. It is anticipated that at least one more, and possibly two, sediment investigation events will be required within the Sub-Area 1 Project Area to fully evaluate, define the nature and extent of contamination, and inform the design of the sediment remedial action within the Sub-Area 1 Project Area.

At the completion of data collection, which includes additional studies and additional sediment, upland, overwater structure and shoreline, and source control investigations as needed within the Sub-Area 1 Project Area, a Sub-Area 1 Project Area EDR consistent with the IAP will be prepared and submitted to Ecology.

5.0 SCHEDULE

The Port is targeting January 2024 for implementation of the proposed field investigation. The exact schedule is dependent on multiple factors, as listed below:

- Ecology approvals of the Work Plan and attachments
- Weather
- Subcontractor availability
- In-water work window
- Permitting and other approvals.

The Port is actively working to address and manage these various issues, as practicable.

The Port's preferred schedule is to start the surface sediment sampling in early January 2024, followed by subsurface sediment sampling.

Depending upon field conditions, weather, and other factors, it is anticipated to take approximately 2 to 4 weeks to collect the surface samples and approximately 3 to 4 weeks to collect the planned sediment cores.

Consistent with AO Amendment No. 2, the Port will submit a "Draft Pre-Remedial Design Investigation Report" to Ecology and submit data to the EIM within 90 calendar days following receipt of all pre-validated laboratory data.

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Table 3
Analyte List, Analytical Methods, and Reporting Limits
Port of Olympia Budd Inlet Sediment Site SAP/QAPP
Olympia, Washington

Parameter Group	Parameter Type	Method	Parameter	MDL (a)	RL/PQL (a)	Units	Screening level (d)	Analytical Suite		
								Primary COCs (e)	Z Layer	Source Control (f)
Conventionals	Conventionals	SM 4500-NH3 H-97	Ammonia	--	0.400	mg/kg	--	X	X	X
Conventionals	Conventionals	PSEP-PS	Grain Size	--	--	--	--	X	X	X
Conventionals	Conventionals	EPA 9060A	Total Organic Carbon	--	0.0200	%	--	X	X	X
Conventionals	Conventionals	SM 2540 G-97	Total Solids	--	0.04000	%	--	X	X	X
Conventionals	Conventionals	SM 4500-S2 D-00	Total Sulfides	--	1.00	mg/kg	--	X	X	X
Conventionals	Conventionals	PSEP 1986	Total Volatile Solids	0.01000	0.01000	%	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	1,2,3,4,6,7,8-HpCDD	0.56	2.50	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	1,2,3,4,6,7,8-HpCDF	0.21	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	1,2,3,4,7,8,9-HpCDF	0.24	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	1,2,3,4,7,8-HxCDD	0.17	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	1,2,3,4,7,8-HxCDF	0.28	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	1,2,3,6,7,8-HxCDD	0.18	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	1,2,3,6,7,8-HxCDF	0.2	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	1,2,3,7,8,9-HxCDD	0.22	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	1,2,3,7,8,9-HxCDF	0.19	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	1,2,3,7,8-PeCDD	0.17	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	1,2,3,7,8-PeCDF	0.24	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	2,3,4,6,7,8-HxCDF	0.17	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	2,3,4,7,8-PeCDF	0.22	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	2,3,7,8-TCDD	0.15	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	2,3,7,8-TCDF	0.058	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	OCDD	4.6	10.0	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	OCDF	1.1	2.50	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B - calc	Dioxin Furan TEQ	--	--	ng/kg	5 (g)	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	Total HpCDD	--	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	Total HpCDF	--	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	Total HxCDD	--	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	Total HxCDF	--	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	Total PeCDD	--	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	Total PeCDF	--	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	Total TCDD	--	1.00	ng/kg	--	X	X	X
Dioxin Furan	Dioxins Furans	EPA 1613B	Total TCDF	--	1.00	ng/kg	--	X	X	X
Metals	Metals	EPA 6020B	Antimony	0.102	0.200	mg/kg	150		X	
Metals	Metals	EPA 6020B UCT-KED	Arsenic	0.038	0.200	mg/kg	57		X	X
Metals	Metals	EPA 6020B UCT-KED	Cadmium	0.03	0.100	mg/kg	0.8	X	X	X
Metals	Metals	EPA 6020B	Chromium	0.26	0.500	mg/kg	260		X	X
Metals	Metals	EPA 6020B UCT-KED	Copper	0.174	0.500	mg/kg	390		X	X
Metals	Metals	EPA 6020B	Lead	0.052	0.100	mg/kg	450		X	X
Metals	Metals	EPA 7471B	Mercury	0.00525	0.0250	mg/kg	0.41		X	X
Metals	Metals	EPA 6020B UCT-KED	Selenium	0.18	0.500	mg/kg	3		X	
Metals	Metals	EPA 6020B UCT-KED	Silver	0.022	0.200	mg/kg	6.1		X	X
Metals	Metals	EPA 6020B UCT-KED	Zinc	2.92	6.00	mg/kg	410		X	X
Organochlorine Pesticides	Organochlorine Pesticides	EPA 8081B	4,4-DDD	0.32	1.00	µg/kg	16		X	
Organochlorine Pesticides	Organochlorine Pesticides	EPA 8081B	4,4-DDE	0.135	1.00	µg/kg	9		X	
Organochlorine Pesticides	Organochlorine Pesticides	EPA 8081B	4,4-DDT	0.325	1.00	µg/kg	12		X	
Organochlorine Pesticides	Organochlorine Pesticides	EPA 8081B - calc	Total DDD, DDE, DDT	--	--	µg/kg	50		X	
Organochlorine Pesticides	Organochlorine Pesticides	EPA 8081B	Aldrin	0.369	0.500	µg/kg	9.5		X	
Organochlorine Pesticides	Organochlorine Pesticides	EPA 8081B	cis-Chlordane (alpha-chlordane)	0.111	0.500	µg/kg	2.8		X	
Organochlorine Pesticides	Organochlorine Pesticides	EPA 8081B	Dieldrin	0.115	1.00	µg/kg	1.9		X	
Organochlorine Pesticides	Organochlorine Pesticides	EPA 8081B	Heptachlor	0.0464	0.500	µg/kg	1.5		X	

Table 3
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Parameter Group	Parameter Type	Method	Parameter		MDL (a)	RL/PQL (a)	Units	Screening level (d)	Analytical Suite		
									Primary COCs (e)	Z Layer	Source Control (f)
Organochlorine Pesticides	Organochlorine Pesticides	EPA 8081B	trans-Chlordane (beta-Chlordane)		0.327	0.500	µg/kg	2.8		X	
SVOCs	Chlorinated Hydrocarbons	EPA 8270E SIM	1,2,4-Trichlorobenzene	(b)	2.68	5.00	µg/kg	31		X	X
SVOCs	Chlorinated Hydrocarbons	EPA 8270E SIM	1,2-Dichlorobenzene	(b)	0.740	5.00	µg/kg	35		X	X
SVOCs	Chlorinated Hydrocarbons	EPA 8270E SIM	1,4-Dichlorobenzene	(b)	0.600	5.00	µg/kg	110		X	X
SVOCs	Chlorinated Hydrocarbons	EPA 8270E SIM	Hexachlorobenzene	(b)	0.700	5.00	µg/kg	22		X	X
SVOCs	Miscellaneous Extractables	EPA 8270E SIM	Benzoic acid	(b)	13.4	100	µg/kg	650		X	X
SVOCs	Miscellaneous Extractables	EPA 8270E SIM	Benzyl Alcohol	(b)	2.48	20.0	µg/kg	57		X	X
SVOCs	Miscellaneous Extractables	EPA 8270E SIM	Dibenzofuran	(b)	1.38	5.00	µg/kg	540		X	X
SVOCs	Miscellaneous Extractables	EPA 8270E SIM	Hexachlorobutadiene	(b)	0.72	5.00	µg/kg	11		X	X
SVOCs	Miscellaneous Extractables	EPA 8270E SIM	N-Nitrosodiphenylamine	(b)	3.05	25	µg/kg	28		X	X
SVOCs	PAHs	EPA 8270E SIM	2-Methylnaphthalene	(b)	1.10	5.00	µg/kg	670		X	X
SVOCs	PAHs	EPA 8270E SIM	Acenaphthene	(b)	0.571	5.00	µg/kg	500		X	X
SVOCs	PAHs	EPA 8270E SIM	Acenaphthylene	(b)	1.08	5.00	µg/kg	1300		X	X
SVOCs	PAHs	EPA 8270E SIM	Anthracene	(b)	0.871	5.00	µg/kg	960		X	X
SVOCs	cPAHs	EPA 8270E SIM	Benzo(a)anthracene	(b)	0.824	5.00	µg/kg	1300	X	X	X
SVOCs	cPAHs	EPA 8270E SIM	Benzo(a)pyrene	(b)	0.614	5.00	µg/kg	1600	X	X	X
SVOCs	cPAHs	EPA 8270E SIM	Benzo(b)fluoranthene		1.37	5.00	µg/kg	3200	X	X	X
SVOCs	PAHs	EPA 8270E SIM	Benzo(g,h,i)perylene	(b)	1.06	5.00	µg/kg	670		X	X
SVOCs	PAHs	EPA 8270E SIM	Benzo(j)fluoranthene		0.68	5.00	µg/kg	3200		X	X
SVOCs	cPAHs	EPA 8270E SIM	Benzo(k)fluoranthene		0.76	5.00	µg/kg	3200	X	X	X
SVOCs	cPAHs	EPA 8270E SIM	Chrysene	(b)	1.05	5.00	µg/kg	1400	X	X	X
SVOCs	cPAHs	EPA 8270E SIM	Dibenzo(a,h)anthracene	(b)	0.891	5.00	µg/kg	230	X	X	X
SVOCs	PAHs	EPA 8270E SIM	Fluoranthene	(b)	0.470	5.00	µg/kg	1700		X	X
SVOCs	PAHs	EPA 8270E SIM	Fluorene	(b)	0.631	5.00	µg/kg	540		X	X
SVOCs	cPAHs	EPA 8270E SIM	Indeno(1,2,3-cd)pyrene	(b)	1.05	5.00	µg/kg	600	X	X	X
SVOCs	PAHs	EPA 8270E SIM	Naphthalene	(b)	1.28	5.00	µg/kg	2100		X	X
SVOCs	PAHs	EPA 8270E SIM	Phenanthrene	(b)	0.718	5.00	µg/kg	1500		X	X
SVOCs	PAHs	EPA 8270E SIM	Pyrene	(b)	0.626	5.00	µg/kg	2600		X	X
SVOCs	cPAHs	EPA 8270 - calc	cPAH TEQ		--	--	µg/kg	21	X		
SVOCs	PAHs	EPA 8270 - calc	HPAHs, Total		--	--	µg/kg	12000		X	X
SVOCs	PAHs	EPA 8270 - calc	LPAHs, Total		--	--	µg/kg	5200		X	X
SVOCs	Phenols	EPA 8270E SIM	2,4-Dimethylphenol	(b)	2.17	20.0	µg/kg	29		X	X
SVOCs	Phenols	EPA 8270E SIM	2-Methylphenol	(b)	1.10	5.00	µg/kg	63		X	X
SVOCs	Phenols	EPA 8270E SIM	4-Methylphenol	(b)	0.88	5.00	µg/kg	670		X	X
SVOCs	Phenols	EPA 8270E SIM	Pentachlorophenol	(b)	2.13	20	µg/kg	360		X	X
SVOCs	Phenols	EPA 8270E SIM	Phenol	(b)	2.23	5.00	µg/kg	420		X	X
SVOCs	Phthalates	EPA 8270E	bis(2-Ethylhexyl)phthalate		5.46	50.0	µg/kg	1300		X	X
SVOCs	Phthalates	EPA 8270E SIM	Butylbenzylphthalate	(b)	0.68	5.00	µg/kg	63		X	X
SVOCs	Phthalates	EPA 8270E SIM	Diethyl phthalate	(b)	4.81	20.0	µg/kg	200		X	X
SVOCs	Phthalates	EPA 8270E SIM	Dimethylphthalate	(b)	1.00	5.00	µg/kg	71		X	X
SVOCs	Phthalates	EPA 8270E	Di-n-Butylphthalate		5.61	20.0	µg/kg	1400		X	X
SVOCs	Phthalates	EPA 8270E	Di-n-Octylphthalate		4.39	20.0	µg/kg	6200		X	X
SVOCs - Butyltins	Butyltins	EPA 8270E SIM	Tributyltin Ion		0.45	3.86	µg/kg	73		X	
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)	(h)	0.585	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	(h)	0.874	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	(h)	0.811	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	(h)	0.656	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	(h)	0.788	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',4,4',5-Pentachlorobiphenyl (PCB 106/118)	(h)	0.731	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,4,4',5-Pentachlorobiphenyl (PCB 114)	(h)	0.321	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2',3,4,4',5-Pentachlorobiphenyl (PCB 123)	(h)	1.04	2.50	pg/g	--	X	X	X

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									Primary COCs (e)	Z Layer	Source Control (f)
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	(h)	0.659	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	(h)	0.681	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,3',4,4'-Tetrachlorobiphenyl (PCB 77)	(h)	0.875	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,4,4',5- Tetrachlorobiphenyl (PCB 81)	(h)	0.703	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2-Chlorobiphenyl (PCB-1)		0.937	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3-Chlorobiphenyl (PCB-2)		0.842	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3-Chlorobiphenyl (PCB-3)		0.839	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2'-Dichlorobiphenyl / 2,6-Dichlorobiphenyl (PCB-4/10)		1.86	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3-Dichlorobiphenyl / 2,4'-Dichlorobiphenyl (PCB-5/8)		1.89	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3'-Dichlorobiphenyl (PCB-6)		1.13	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,4-Dichlorobiphenyl / 2,5-Dichlorobiphenyl (PCB-7/9)		1.52	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,3'-Dichlorobiphenyl (PCB-11)		2.97	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,4-Dichlorobiphenyl / 3,4'-Dichlorobiphenyl (PCB-12/13)		1.71	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,5-Dichlorobiphenyl (PCB-14)		0.907	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	4,4'-Dichlorobiphenyl (PCB-15)		0.759	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3-Trichlorobiphenyl / 2,4',6-Trichlorobiphenyl (PCB-16/32)		1.14	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',4-Trichlorobiphenyl (PCB-17)		0.606	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',5-Trichlorobiphenyl (PCB-18)		0.598	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',6-Trichlorobiphenyl (PCB-19)		0.444	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3'-Trichlorobiphenyl / 2,3,4-Trichlorobiphenyl / 2,3',4'-Trichlorobiphenyl (PCB-20/21/33)		2.03	7.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,4'-Trichlorobiphenyl (PCB-22)		1.25	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,5-Trichlorobiphenyl (PCB-23)		1.04	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,6-Trichlorobiphenyl / 2,3',6-Trichlorobiphenyl (PCB-24/27)		0.957	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',4-Trichlorobiphenyl (PCB-25)		0.922	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',5-Trichlorobiphenyl (PCB-26)		0.81	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,4,4'-Trichlorobiphenyl (PCB-28)		0.984	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,4,5-Trichlorobiphenyl (PCB-29)		0.734	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,4,6-Trichlorobiphenyl (PCB-30)		0.499	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,4',5-Trichlorobiphenyl (PCB-31)		0.855	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',5'-Trichlorobiphenyl (PCB-34)		0.726	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,3',4-Trichlorobiphenyl (PCB-35)		0.68	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,3',5-Trichlorobiphenyl (PCB-36)		0.732	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,4,4'-Trichlorobiphenyl (PCB-37)		0.804	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,4,5-Trichlorobiphenyl (PCB-38)		0.746	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,4',5-Trichlorobiphenyl (PCB-39)		0.678	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3'-Tetrachlorobiphenyl (PCB-40)		0.979	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4-Tetrachlorobiphenyl / 2,3,4',6-Tetrachlorobiphenyl / 2,3',4',6-Tetrachlorobiphenyl / 2,3',5,5'-Tetrachlorobiphenyl (PCB-41/64/71/72)		1.88	10.0	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4'-Tetrachlorobiphenyl / 2,3,3',6-Tetrachlorobiphenyl (PCB-42/59)		1.43	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,5-Tetrachlorobiphenyl / 2,2',4,5'-Tetrachlorobiphenyl (PCB-43/49)		1.29	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,5'-Tetrachlorobiphenyl (PCB-44)		0.972	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,6-Tetrachlorobiphenyl (PCB-45)		0.754	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,6'-Tetrachlorobiphenyl (PCB-46)		0.656	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',4,4'-Tetrachlorobiphenyl (PCB-47)		0.829	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',4,5-Tetrachlorobiphenyl / 2,4,4',6-Tetrachlorobiphenyl (PCB-48/75)		1.12	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',4,6-Tetrachlorobiphenyl (PCB-50)		0.701	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',4,6'-Tetrachlorobiphenyl (PCB-51)		0.756	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',5,5'-Tetrachlorobiphenyl / 2,3',4,6-Tetrachlorobiphenyl (PCB-52/69)		1.23	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',5,6'-Tetrachlorobiphenyl (PCB-53)		0.852	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',6,6'-Tetrachlorobiphenyl (PCB-54)		0.735	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4-Tetrachlorobiphenyl (PCB-55)		0.574	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4'-Tetrachlorobiphenyl / 2,3,4,4'-Tetrachlorobiphenyl (PCB-56/60)		1.09	5.00	pg/g	--	X	X	X

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								Primary COCs (e)	Z Layer	Source Control (f)
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',5-Tetrachlorobiphenyl (PCB-57)	0.746	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',5'-Tetrachlorobiphenyl (PCB-58)	0.546	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,4,5-Tetrachlorobiphenyl / 2,3',4',5-Tetrachlorobiphenyl (PCB-61/70)	1.02	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,4,6-Tetrachlorobiphenyl (PCB-62)	0.686	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,4',5-Tetrachlorobiphenyl (PCB-63)	0.676	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,5,6-Tetrachlorobiphenyl (PCB-65)	0.546	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',4,5-Tetrachlorobiphenyl (PCB-67)	0.792	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',4,5'-Tetrachlorobiphenyl (PCB-68)	0.783	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',5',6-Tetrachlorobiphenyl (PCB-73)	0.791	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,4,4',5-Tetrachlorobiphenyl (PCB-74)	0.675	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',4,4'-Tetrachlorobiphenyl / 2,3',4',5'-Tetrachlorobiphenyl (PCB-76/66)	1.12	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,3',4,5-Tetrachlorobiphenyl (PCB-78)	0.653	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,3',4,5'-Tetrachlorobiphenyl (PCB-79)	0.656	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,3',5,5'-Tetrachlorobiphenyl (PCB-80)	0.488	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4-Pentachlorobiphenyl (PCB-82)	0.776	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',5-Pentachlorobiphenyl (PCB-83)	0.689	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',6-Pentachlorobiphenyl / 2,2',3,5,5'-Pentachlorobiphenyl (PCB-84/92)	1.04	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,4'-Pentachlorobiphenyl / 2,3,4,5,6-Pentachlorobiphenyl (PCB-85/116)	1.12	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,5-Pentachlorobiphenyl (PCB-86)	1.11	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,5'-Pentachlorobiphenyl / 2,3,4',5,6-Pentachlorobiphenyl / 2,3',4',5',6-Pentachlorobiphenyl (PCB-87/117/125)	1.16	7.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,6-Pentachlorobiphenyl / 2,2',3,4',6-Pentachlorobiphenyl (PCB-88/91)	1.40	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,6'-Pentachlorobiphenyl (PCB-89)	0.512	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4',5-Pentachlorobiphenyl / 2,2',4,5,5'-Pentachlorobiphenyl (PCB-90/101)	0.740	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,5,6-Pentachlorobiphenyl (PCB-93)	1.30	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,5,6'-Pentachlorobiphenyl (PCB-94)	0.889	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,5',6-Pentachlorobiphenyl / 2,2',3,4',6'-Pentachlorobiphenyl / 2,2',4,5,6'-Pentachlorobiphenyl (PCB-95/98/102)	1.56	7.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,6,6'-Pentachlorobiphenyl (PCB-96)	0.700	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4',5'-Pentachlorobiphenyl (PCB-97)	0.597	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',4,4',5-Pentachlorobiphenyl (PCB-99)	0.808	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',4,4',6-Pentachlorobiphenyl (PCB-100)	0.631	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',4,5',6-Pentachlorobiphenyl (PCB-103)	0.846	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',4,6,6'-Pentachlorobiphenyl (PCB-104)	0.700	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4',5-Pentachlorobiphenyl / 2,3,3',4,6-Pentachlorobiphenyl (PCB-107/109)	0.820	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4,5'-Pentachlorobiphenyl / 2,3,3',5,6-Pentachlorobiphenyl (PCB-108/112)	0.952	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4',6-Pentachlorobiphenyl (PCB-110)	0.845	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',5,5'-Pentachlorobiphenyl / 2,3,4,4',6-Pentachlorobiphenyl (PCB-111/115)	0.980	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',5',6-Pentachlorobiphenyl (PCB-113)	0.565	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',4,4',6-Pentachlorobiphenyl (PCB-119)	0.595	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',4,5,5'-Pentachlorobiphenyl (PCB-120)	0.562	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',4,5',6-Pentachlorobiphenyl (PCB-121)	0.598	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4',5'-Pentachlorobiphenyl (PCB-122)	0.772	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',4',5,5'-Pentachlorobiphenyl (PCB-124)	0.527	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	3,3',4,5,5'-Pentachlorobiphenyl (PCB-127)	0.805	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,4'-Hexachlorobiphenyl / 2,3,3',4',5,5'-Hexachlorobiphenyl (PCB-128/162)	1.06	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,5-Hexachlorobiphenyl (PCB-129)	0.835	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,5'-Hexachlorobiphenyl (PCB-130)	0.755	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,6-Hexachlorobiphenyl / 2,2',3,3',5,5'-Hexachlorobiphenyl (PCB-131/133)	1.15	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,6'-Hexachlorobiphenyl / 2,3,3',4',5,5'-Hexachlorobiphenyl (PCB-132/161)	1.24	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',5,6-Hexachlorobiphenyl / 2,2',3,4,5,6'-Hexachlorobiphenyl (PCB-134/143)	1.23	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',5,6'-Hexachlorobiphenyl (PCB-135)	0.967	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',6,6'-Hexachlorobiphenyl (PCB-136)	0.626	2.50	pg/g	--	X	X	X

Table 3
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Port of Olympia Budd Inlet Sediment Site SAP/QAPP
Olympia, Washington

Parameter Group	Parameter Type	Method	Parameter	MDL (a)	RL/PQL (a)	Units	Screening level (d)	Analytical Suite		
								Primary COCs (e)	Z Layer	Source Control (f)
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,4',5-Hexachlorobiphenyl (PCB-137)	0.862	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,4',5'-Hexachlorobiphenyl / 2,3,3',4',5,6-Hexachlorobiphenyl / 2,3,3',4',5',6-Hexachlorobiphenyl (PCB-138/163/164)	1.51	7.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,4',6-Hexachlorobiphenyl / 2,2',3,4',5',6-Hexachlorobiphenyl (PCB-139/149)	1.54	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,4',6'-Hexachlorobiphenyl (PCB-140)	1.20	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,5,5'-Hexachlorobiphenyl (PCB-141)	0.474	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,5,6-Hexachlorobiphenyl (PCB-142)	0.750	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,5',6-Hexachlorobiphenyl (PCB-144)	0.860	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,6,6'-Hexachlorobiphenyl (PCB-145)	0.847	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4',5,5'-Hexachlorobiphenyl / 2,3,3',5,5',6-Hexachlorobiphenyl (PCB-146/165)	1.09	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4',5,6-Hexachlorobiphenyl (PCB-147)	0.906	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4',5,6'-Hexachlorobiphenyl (PCB-148)	0.748	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4',6,6'-Hexachlorobiphenyl (PCB-150)	0.493	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,5,5',6-Hexachlorobiphenyl (PCB-151)	0.783	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,5,6,6'-Hexachlorobiphenyl (PCB-152)	0.774	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',4,4',5,5'-Hexachlorobiphenyl (PCB-153)	0.599	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',4,4',5,6'-Hexachlorobiphenyl (PCB-154)	0.838	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',4,4',6,6'-Hexachlorobiphenyl (PCB-155)	0.639	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4,4',6-Hexachlorobiphenyl / 2,3,3',4,5,6-Hexachlorobiphenyl (PCB-158/160)	1.04	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4,5,5'-Hexachlorobiphenyl (PCB-159)	0.497	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,4,4',5,6-Hexachlorobiphenyl (PCB-166)	0.601	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3',4,4',5',6-Hexachlorobiphenyl (PCB-168)	0.657	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,4',5-Heptachlorobiphenyl (PCB-170)	0.802	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,4',6-Heptachlorobiphenyl (PCB-171)	0.741	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,5,5'-Heptachlorobiphenyl (PCB-172)	0.698	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,5,6-Heptachlorobiphenyl (PCB-173)	0.736	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,5,6'-Heptachlorobiphenyl (PCB-174)	0.768	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,5',6-Heptachlorobiphenyl (PCB-175)	0.717	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,6,6'-Heptachlorobiphenyl (PCB-176)	0.857	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,5',6'-Heptachlorobiphenyl (PCB-177)	0.714	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',5,5',6-Heptachlorobiphenyl (PCB-178)	0.580	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',5,6,6'-Heptachlorobiphenyl (PCB-179)	0.753	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB-180)	0.495	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,4',5,6-Heptachlorobiphenyl (PCB-181)	0.652	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,4',5,6'-Heptachlorobiphenyl / 2,2',3,4',5,5',6-Heptachlorobiphenyl (PCB-182/187)	1.38	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,4',5',6-Heptachlorobiphenyl (PCB-183)	0.723	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,4',6,6'-Heptachlorobiphenyl (PCB-184)	0.746	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,5,5',6-Heptachlorobiphenyl (PCB-185)	0.799	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,5,6,6'-Heptachlorobiphenyl (PCB-186)	0.625	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4',5,6,6'-Heptachlorobiphenyl (PCB-188)	0.636	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4,4',5,6-Heptachlorobiphenyl (PCB-190)	0.712	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4,4',5',6-Heptachlorobiphenyl (PCB-191)	0.513	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4,5,5',6-Heptachlorobiphenyl (PCB-192)	0.553	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4',5,5',6-Heptachlorobiphenyl (PCB-193)	0.598	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,4',5,5'-Octachlorobiphenyl (PCB-194)	0.707	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,4',5,6-Octachlorobiphenyl (PCB-195)	0.735	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,4',5,6'-Octachlorobiphenyl (PCB-196/203)	1.29	5.00	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,4',6,6'-Octachlorobiphenyl (PCB-197)	0.514	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,5,5',6-Octachlorobiphenyl (PCB-198)	1.05	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,5,5',6'-Octachlorobiphenyl (PCB-199)	0.999	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,5,6,6'-Octachlorobiphenyl (PCB-200)	0.649	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,5',6,6'-Octachlorobiphenyl (PCB-201)	0.786	2.50	pg/g	--	X	X	X

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Port of Olympia Budd Inlet Sediment Site SAP/QAPP
Olympia, Washington

Parameter Group	Parameter Type	Method	Parameter	MDL (a)	RL/PQL (a)	Units	Screening level (d)	Analytical Suite		
								Primary COCs (e)	Z Layer	Source Control (f)
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',5,5',6,6'-Octachlorobiphenyl (PCB-202)	0.523	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,4,4',5,6,6'-Octachlorobiphenyl (PCB-204)	0.486	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,3,3',4,4',5,5',6-Octachlorobiphenyl (PCB-205)	1.03	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (PCB-206)	0.806	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (PCB-207)	0.717	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (PCB-208)	0.610	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668	Decachlorobiphenyl (PCB-209)	0.610	2.50	pg/g	--	X	X	X
PCBs - Congeners	PCBs - Congeners	EPA 1668 - Calc	PCB Congener TEQ	--	--	pg/g	5 (g)	X		
PCBs - Congeners	PCBs - Congeners	EPA 1668 - Calc	PCB Congener Total (209 congeners)	--	--	µg/kg	130		X	X

Notes:

a) Laboratory limits are from Analytical Resources, Inc except for PCB - Congeners by EPA 1668C which are from Enthalpy Analytical. Limits may be updated annually based on laboratory studies.

b) Parameter is offered by more the one method (e.g. EPA 8270E scan and SIM), and final method selection may be driven by achievable reporting limits as well as the analytical suite for the sample. The method with the lowest available reporting limits is shown.

c) Porewater analysis for tributyltin is optional under the DMMP and may be conducted opportunistically where hold time is not exceeded.

d) Screening levels based on the following hierarchy: site-specific SCO cleanup levels presented in the 2023 Alternatives Analysis report, SCUM ~~II~~ Table 8-1 marine criteria, and DMMP Table 8-3 marine criteria.

e) Primary COC suite includes dioxins/furans (dioxin TEQ), cPAHs, PCBs as congeners (PCB TEQ), and cadmium.

f) Source control suite consists of 1) the Sediment Management Standards marine suite (SCUM ~~II~~ Table 8-1) developed for protection of the benthic community and 2) primary COCs.

g) Screening level based on the sum of dioxin furan TEQ and PCB TEQ.

h) Dioxin like PCB congener.

Acronyms/Abbreviations:

-- = not applicable
µg/kg = micrograms per kilogram
cPAH = carcinogenic polycyclic aromatic hydrocarbon
DMMP = Dredged Material Management Program
EPA = US Environmental Protection Agency
MDL = method detection limit
mg/kg = milligrams per kilogram
N/A = not applicable
ng/kg = nanograms per kilogram
pg/g = picograms per gram
PCBs = polychlorinated biphenyls
RL = reporting limit
SIM = selected ion monitoring
SVOCs = semivolatile organic compounds
UCT-KED = collision cell