UPDATED FINAL

Surface Sediment Field Sampling Plan

Portland Harbor Pre-Remedial Design Investigation and Baseline Sampling

Portland Harbor Superfund Site

AECOM
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CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

September 19, 2018

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Date

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
AECOM	AECOM Technical Services
ALS	ALS Environmental in Kelso, Washington
ASAOC	Administrative Settlement Agreement and Order on Consent
ASTM	American Society for Testing and Materials
BL	baseline/stratified random samples
cm	centimeter
COCs	contaminants of concern
CRD	Columbia River Datum
CSM	Conceptual Site Model
D/U Reach	the Downtown Reach and the Upriver Reach
DDx	dichlorodiphenyltrichloroethane and its derivatives
D/F	dioxins/furans
DGPS	differential global positioning system
DQOs	data quality objectives
EPA	United States Environmental Protection Agency
FC	Field Coordinator
FS	feasibility study
FSP	Field Sampling Plan
Geosyntec	Geosyntec Consultants, Inc.
GIS	geographic information systems
Gravity	Gravity Marine Services
GSI	GSI Water Solutions, Inc.
ID	identification number
IDW	Investigation-Derived Waste
Integral	Integral Consulting
LWG	Lower Willamette Group
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
ODEQ	Oregon Department of Environmental Quality
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PDI	Pre-Remedial Design Investigation
PHSS	Portland Harbor Superfund Site

Pre-RD AOC Group	Pre-Remedial Design AOC Investigation Group
Pre-RD	Pre-Remedial Design
PSEP	Puget Sound Estuary Program
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RI	remedial investigation
RM	river mile
ROD	Record of Decision
SG	surface sediment grabs
Site	Portland Harbor Superfund Site
SMA	sediment management area
SOP	Standard Operating Procedure
SOW	Statement of Work
SWAC	surface weighted average concentration
TestAmerica	TestAmerica Laboratories
TOC	total organic carbon

1. INTRODUCTION

The Record of Decision (ROD) described a post-ROD sampling effort for the Portland Harbor Superfund Site (Site or PHSS; Figure 1) located in Portland, Oregon, to delineate and better refine the sediment management area (SMA) footprints, refine the Conceptual Site Model (CSM), determine baseline conditions, and support remedial design (United States Environmental Protection Agency [EPA] 2017a). Geosyntec Consultants, Inc. (Geosyntec), and AECOM Technical Services (AECOM) submitted a detailed Work Plan for Pre-Remedial Design Investigation and Baseline Sampling (PDI) on behalf of a group of industrial parties called the Pre-Remedial Design Agreement and Order on Consent Investigation Group (Pre-RD AOC Group). On December 19, 2017, EPA entered into an Administrative Settlement Agreement and Order on Consent (ASAOC) with the Pre-RD AOC Group to conduct the PDI studies at the Site (EPA 2017b). The ASAOC includes a Statement of Work (SOW) and the PDI Work Plan (as an attachment to the SOW), which generally describe the agreed upon field investigation activities, data analyses, schedule, and deliverables for the PDI.

These PDI studies are a foundational step in what will be a multi-phase effort to update current conditions from the collection of data during the remedial investigation (RI)/feasibility study (FS). The RI/FS was initiated by a group of potentially responsible parties known as the Lower Willamette Group (LWG) and completed by EPA in 2016 (EPA 2016a, 2016b). The RI consisted of three rounds of data collection, including surface and subsurface sediment, bank soils, surface water, sediment traps, porewater, fish tissue, and other media from 2001 through 2007.

This Field Sampling Plan (FSP) was prepared to support the surface sediment sampling efforts outlined in the PDI Work Plan (Geosyntec 2017) and the project Quality Assurance Project Plan (QAPP) (AECOM and Geosyntec 2018a). To the extent practicable, previously approved FSPs from the RI will be referenced.

1.1 Project Setting

The PHSS is located in Portland, Oregon, on the lower Willamette River immediately downstream of the urban downtown area from river mile (RM) 1.9 upstream to 11.8 and covers 2,190 acres. There are two reaches located immediately upstream of the Site. The Downtown Reach, which includes the urbanized area of downtown Portland, is defined by EPA as extending from RM 11.8 to RM 16.6. EPA defines the Upriver Reach as extending from RM 16.6 to RM 28.4. Collectively, RM 11.8 to RM 28.4 is referred to as the D/U Reach.

1.2 Project Overview

Two kinds of surface sediment data will be collected within the Site: 1) random stratified samples within a grid system (for establishing a new baseline dataset); and 2) targeted (non-random) samples located in SMA areas to support further refinement of the SMA footprints. Additional surface sediment samples may be collected to reoccupy 2004 RI surface sediment

locations. If this reoccupation of 2004 RI sampling activity was to occur, the same protocols would be followed outlined in this FSP and the description of the sampling activities would be developed as an addendum to this FSP and provided to EPA for consideration prior to sampling.

Surface sediment will be collected from a target depth of 0- to 30-centimeter depths, consistent with the RI (Integral 2004).[1] Additionally, surface sediment samples will be collected from the D/U Reach. The D/U Reach stations will be located in sediment areas targeting fine-grained sediment and higher total organic carbon (TOC), generally similar to surface sediment within the Site; target ranges are discussed in Section 2.1.4. The sampling scheme and RAOs are also discussed in the PDI Work Plan (Geosyntec 2017).

Baseline surface sediment samples will be analyzed for the ROD contaminants of concern (COCs). Surface sediment samples from targeted (non-random) stations will be analyzed for the focused COCs, which include dichlorodiphenyltrichloroethane and its derivatives (DDx), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and dioxin/furans (D/F). All stations will be analyzed for grain size and TOC, and a portion of the fine-grained samples may be selected for Atterberg Limits geotechnical testing.

1.3 Data Quality Objectives

The stratified random surface sediment sampling effort, in conjunction with surface water and fish tissue data, will be used to update the current conditions for the full ROD suite of COCs (see ROD Table 17, relisted in Table 3 of the PDI Work Plan) and will provide a baseline for long-term monitoring and remedy effectiveness evaluations. As described in the PDI Work Plan (Geosyntec 2017), the SMA surface sediment sampling effort, along with baseline sampling, will help refine the CSM for the Site. Data quality objectives (DQOs) for surface sediment sampling are detailed in Table 3 of the project QAPP (AECOM and Geosyntec 2018a).

[1] See notable exceptions in Section 4.4.

2. SAMPLING DESIGN AND APPROACH

This FSP has been prepared to ensure DQOs are met. Methods for surface sediment sampling are consistent with EPA-approved sampling plans from the RI (Integral Consulting [Integral] 2002, 2004, 2006), EPA guidance on collecting sediment data (EPA 2014), and Puget Sound Estuary Program (PSEP) protocols (PSEP 1996).

For clarification, terminology used in this FSP includes:

- Surface Sediment Sample = is a grab sample targeting the upper 30 centimeters of the sediment bed.
- Sample Location = is the sampling point shown on maps from which a chemistry sample was collected.
- Sample Station = is the place in space where the vessel is located to collect a sample or sub-station composite sample (a, b, and c stations).
- Upriver or Upstream Area = the spatial area located immediately upstream of the Site and includes the Downtown Reach and Upriver Reach.

2.1 Surface Sediment

Two kinds of surface sediment data will be collected within the Site: stratified random samples within a grid system to establish a baseline dataset and targeted (non-random) samples located in SMA areas to support further refinement of the SMA footprints. All surface sediment sampling stations within the Site are presented in Figure 2. In addition, upriver surface sediment data will be collected to evaluate current conditions and incoming contaminant loads. All surface sediment samples will consist of a three-point composite. At each proposed station, three “grabs” will be collected within a relatively small footprint and composited into one sample for analysis.

2.1.1 Stratified Random Sampling

A total of 428 sediment samples will be collected for this DQO. The gridded random stations will be applied throughout the Site, including areas where other parties are collecting post-RI data. All surface sediment sample types, numbers, and analyses are summarized in Table 1. Section 3.2.2 of the PDI Work Plan details the rationale and statistical justification for the stratified random sampling design. In summary, the total sample count reflects the number of samples required to improve upon the level of variability in the 2004 surface weighted average concentrations (SWAC) and to enable the design to statistically detect differences ($\alpha = 0.05$) between 2004 SWACs and current SWAC estimates with an approximate 80 percent level of statistical power. The dataset will be used to establish a baseline for future long-term monitoring. All stratified random surface stations will be analyzed for the full ROD Table 17 suite of COCs, plus grain size and TOC (see Section 5 for details).

Combined with the SMA samples (see below), this sample design represents the estimated 666 surface sediment sampling stations needed to yield a statistically robust new dataset for determining SWACs at varying scales.

2.1.2 Targeted SMA Delineation

A total of 178 targeted surface sediment sample stations will be collected to support further refinement of the SMA footprints. In addition, 60 surface grab samples will be co-located with the 60 deep in-water core stations in SMA areas. A total of 233 surface sediment grab samples will be collected for targeted SMA delineation. Details regarding the sediment core sampling are provided in the Subsurface Sediment Coring FSP (AECOM and Geosyntec 2018b).

The criteria considered for the placement of SMA surface sediment samples include:

- **Pairing with Core Collection in Deep Water Areas**: collect a co-located grab sample at each of the 60 proposed sediment core locations (rationale for core locations provided in the Subsurface Sediment Coring FSP)
- **Spatial Resolution**: Place adequate number of grab samples such that a sediment sample would be present approximately every 300 feet within the SMAs
- **Reduced Uncertainty for Future Planning**: The density of SMA sampling achieves the level of precision needed to delineate SMAs within an approximate 30 percent level of uncertainty, sufficient for the needs of the Pre-RD AOC Group to support SMA delineation need during remedial design.

2.1.3 Downtown/Upriver Reaches

A total of 30 surface sediment samples will be collected from the Downtown Reach located immediately upstream of the Site, and 30 surface sediment samples will be collected from the Upriver Reach, for a total of 60 D/U Reach samples. All D/U locations will target fine-grained sediments similar to Site sediments to facilitate matching the D/U sediments with the Site sediments.

A review of previous sediment studies' available grain size data and bathymetry data was conducted to select initial target areas in the D/U Reach (RI/FS database; GSI Water Solutions, Inc. [GSI] and Hart Crowser 2010; GSI 2014; Kleinfelder 2015; Hart Crowser 2002). Samples were randomly placed in areas with more than 35 percent fines (sum of clay and silt fractions) from the FS dataset. Percent fines is defined as material passing through a #200 sieve for American Society for Testing and Materials (ASTM) grain size. The random placement process is comparable to the stratified random sampling design used within the Site as both used the same industry standard geospatial randomization algorithm for spatial coverage in GIS. However, where the stratified random samples within the Site were placed using a weighted grid (smaller cells near the banks, wider in the navigation channel), no grid was used for the D/U Reach samples as these are being randomized across areas with more than 35 percent fines

(Note: a grid was used for the revised locations to provide more spatial coverage: see FSP Addendum). The randomization of each sampling location within a grid cell is comparable to the randomization of a sample location within the targeted area of more than 35 percent fines. Figure 3 presents the available percent fines data in the D/U Reach, and Figure 4 presents randomly placed proposed locations based on the results of the visual reconnaissance and data evaluation as discussed in Appendix C. However, the actual collection locations will be selected based on confirmation of sufficient fine-grained sediment (see below).

2.1.4 Pre-Screening D/U Sediments for Grain Size

It is critical that D/U Reach samples have grain size and TOC fractions similar to Site conditions, so they can be representative comparisons to the Site. In addition, cleanup levels for organic sediment COCs in the ROD are dry weight-based values (i.e., not normalized for organic carbon content); therefore, TOC should be within the range of Site conditions for concentrations of organic chemicals in D/U sediments to be evaluated within the context of cleanup levels for the Site. For reference, the average site-wide TOC is 1.8 percent (median of 1.7 percent) with a distribution range of 0.04 to 27 percent. The mean grain size distribution of site surface sediments is classified as a sandy silt. The average upriver TOC concentration is 1.1 percent with a range of 0.033 to 13 percent depending on the river reach. The TOC distribution in the Downtown Reach appears to be different from the upper reaches, especially from RM 22.7 to RM 28.4 where the sediment facies may be different. The historical data generally show good correlation between percent fines and TOC ($r2 = 0.9$, $p < 0.001$), however neither percent fines alone or TOC alone are always well correlated with concentrations of organics. Based on an evaluation of paired upstream data, the correlation between percent fines and concentrations of total PCBs is low ($r2 = 0.18$), however the correlation between TOC and concentrations of total PCBs in sediment is significant ($r2 = 0.42$, $p = 0.015$). Therefore, both parameters will be considered to ensure that the D/U Reach samples are appropriate for comparison to Site data. While grain size data will be considered prior to sample collection, TOC will be evaluated as a post-processing statistical evaluation of the data.

The process for determining D/U Reach sample locations based on grain size considerations is provided in Figure 5, and described below. In brief, the following steps will be performed:

1. Soft sediment probing and visual reconnaissance to map areas of fine grain sediments (>35 percent fines)
2. Placement of randomized sample locations within mapped areas targeting >35 percent fines
3. Collection of surface sediment samples for full volume of sediment needed for analyses
4. Visual assessment of grain size at the target sampling location
5. Expedited analysis of grain size

As shown in Figure 5, geotechnical analyses may be performed based on grain size results; however, these do not impact the decision criteria. This process has been designed to result in a total of 60 D/U Reach surface sediment samples as presented in the PDI Work Plan with the highest likelihood of grain size that are appropriate for comparison to Site data. Each step is described in detail below.

Visual and Soft Sediment Probing Reconnaissance. A field reconnaissance survey will be conducted prior to sampling to confirm a target area containing fine sediments. First, the sediment bottom will be probed using a steel-tipped rod and BioSonar to confirm the presence of fine-grained sediments in expected areas based on the desktop review of available grain size data. Best professional judgment can easily distinguish between predominantly coarse-grained material (sand and gravel) versus predominantly fine-grained material (silt and clay, and up to some sand). BioSonar[2] will be utilized as an additional field tool in order to acquire sediment hardness over a large spatial area (RM 11.8 to 28.4), and specifically in areas not reachable during hand-probing. Second, an aliquot of mud will be collected (using the hydraulic power grab) and the sediment grain size fractions will be visually classified according to ASTM visual-manual soil classification methods for particle size (e.g., cobbles, gravel, silt, sand). The field staff will refer to the ASTM Unified Soil Classification System Log Key 2 (Appendix A-1). Visual inspections will include recording of the presence/absence of organic matter, organic silt, leaf litter, roots, rootlets, and other organic matter that may indicate the presence of TOC. Lastly, field wet sieving will be conducted in areas where fine-grained sediment is identified based on visual classification (Appendix B-4 Standard Operating Procedure [SOP]). Additional details on the visual reconnaissance are provided in Appendix C.

Mapping of Grain Size and Placement of Sample Locations. Areas containing an estimated >35 percent fines and presence of organic matter based on the visual reconnaissance will be mapped in GIS. Following the field survey, the BioSonar data will be processed through the BioSonics® software and classified as soft, medium, and hard bottom. The soundings will then be compared and correlated to the probe sampling, visual grabs, and the historic 2004 RI/FS data. Details of this process and results are provided in Appendix C. Figure 4 presents 60 re-randomized locations based on the visual probing survey.

Sample Collection. Following the mapping of grain size and re-randomization of sample locations, it is anticipated that surface sediment sampling within the Site will still be on-going. At this point, the sampling vessel will return to the D/U Reach and all 60 D/U Reach sample locations will be sampled. Surface sediment samples will be collected, processed, and packaged (as described below) from all 60 D/U Reach sample locations.

Expedited Grain Size Analysis. The full sets of samples and jars collected will be submitted to the designated analytical lab. All analyses will be held, pending the result of a quick turnaround analysis of grain size by ASTM D7928 / D6913. Grain size analysis will include both the coarse-

[2] Use of the Biosonar tool was approved by EPA in May 2018 in a Change Request Form #4.

and fine- fraction estimation of the sample (sieves and hydrometer), including determination of silts and clays.

- The target recovery depth is an average recovery depth of 10 centimeters or greater among the three deepest grab attempts (up to six attempts). If fewer than three grabs are accepted, then a one or two-point composite will be collected (following the same decision criteria described in Section 4.3).
- The target criteria for grain size is > 35 % fines with some clay present. No samples will be analyzed if < 25 % fines (based on recent Oregon Department of Environmental Quality [ODEQ] 2018 sampling results [ODEQ 2018]).[3]

Review of Decision Criteria - Analysis of ROD Table 17 COCs or Resample. Following expedited analysis of grain size, all samples meeting the criteria described above will be analyzed for the complete list of ROD Table 17 sediment COCs and TOC by EPA Method 9060. Samples that do not meet the criteria for grain size will be archived pending discussion with the PDI Project Manager and EPA.

In the event that data indicate areas with target ranges of grain size in the D/U Reach are spatially limited, then multiple samples may be grouped in smaller areas. However, no samples below the minimum requirements for grain size (< 25 percent fines) will be analyzed unless field conditions warrant additional discussion with EPA.

Once laboratory grain size fractions are confirmed to be within the targeted range, a subset of up to 10 samples with > 50 percent fines will be analyzed for Atterberg Limits testing to further classify fine-grained sediments. Methods for Atterberg Limits are noted in FSP Table 7 and in the project QAPP (AECOM and Geosyntec, 2018a).

2.2 Sample Identification

2.2.1 Sample Types, Locations, Depths

Consistent with the previous RI/FS protocol, surface sediment samples will target collection of sediment from 0 to 30 centimeters (See Section 4.3.2 for details on Substrate Types). Proposed surface sediment sample stations within the Site are provided in Figure 2 and in the D/U Reach in Figure 4. Sample location coordinates and sample identification numbers (IDs) are provided in Table 2. All surface grab samples will be collected as three-point composites with a hydraulic power grab sampler (see Section 4.3 below for more details).

[3] TOC and percent fines are correlated such that samples with > 25% fines should also have TOC > 0.5%, so we recommend relaxing the minimum percent fines criteria from 35% to 25% to account for (i) recent ODEQ 2018 upriver data, which all had less than 30% fines based on lab results; 5 of 9 samples were between 25 and 30% fines; and (ii) differences between lab/field wet sieve measurements.

Additionally, two alternative stations for the stratified random samples are provided in Figure 6 and Figure 7. Stations were re-randomized within each grid, using the same approach as the parent sample (see Section 4.4 below for more details on the rationale for selection of the two alternative stations).

2.2.2 Sample Nomenclature

Sample nomenclature will be developed in a manner similar to the RI Round 1 FSP (Integral 2002, Section 4.2). In brief, all samples will have a unique identifying sample ID that includes the following:

- Project phase (PDI).
- Sample matrix (SG [sediment grab]).
- Sample Area (B for baseline/stratified random samples and D/U Reach). All baseline sample stations will be numbered B001 through B428 and D/U Reach stations will be numbered B429 through B489 (N=60). All SMA or in-water core location stations will be numbered sequentially S001 through S238 (N=178 targeted SMA grab samples, N=60 in-water SMA core location samples). All surface sediment sample locations are numbered sequentially from downstream to upstream.
- Unique, sequential station number (001 to ### per sample area).
- Sampling round (BL1 [baseline monitoring round 1]).

For example, a surface grab sample from the 428th stratified random sampling location would have the sample ID PDI-SG-B428-BL1. See Section 4.2.1 of the QAPP for nomenclature associated with field duplicates and other quality assurance (QA)/quality control (QC) samples. Additional data fields that describe each unique sample features, location, and composite type will be recorded in the field forms and will be included in the project database, as described in the project Data Quality Management Plan (DQMP).

2.3 Sampling Schedule

The overall project schedule is outlined in the PDI Work Plan (Geosyntec 2017). Surface sediment grab sampling is targeted to begin First Quarter of 2018. EPA will be notified 1 to 2 weeks prior to sampling. Surface sediment sampling is expected to last 2 months using two sampling vessels. About 1 month into the program, progress will be assessed and, if it appears that the sampling effort is behind schedule, a third boat and crew will be mobilized to complete the sampling in the targeted 2-month period.

3. PROJECT ORGANIZATION/FIELD TEAM

3.1 Team Organization and Responsibilities

Team organization is detailed in the PDI Work Plan and in Section 2 of the QAPP (AECOM and Geosyntec 2018a). As it relates to this FSP, AECOM and Geosyntec are coordinating activities including management of all subcontractors, field sampling, analysis, and reporting scoping tasks. The PDI Project Coordinator, Mr. Ken Tyrrell, and PDI Project Manager, Dr. Jennifer Pretare, PhD (AECOM), will be responsible for overall project coordination and providing oversight on all project deliverables. Ms. Anne Fitzpatrick (Geosyntec) is the project's senior technical lead for this task. Ms. Nicky Moody (AECOM) and Mr. Keith Kroeger (Geosyntec) will be the Project Field Coordinators (FCs) and will be generally responsible for general field QA/QC oversight. The project chemists, Ms. Julia Klens-Caprio (Geosyntec), Ms. Amy Dahl (AECOM), and Ms. Karen Mixon (AECOM), will be responsible for coordination with labs regarding sample volumes, logistics, schedule, detection limits and matrix interferences, and ensuring overall data quality.

Gravity Marine (Gravity), of Fall City, Washington, will perform vessel support, with Shawn Hinz acting as a point of contact. Analytical laboratories include ALS Environmental (ALS) in Kelso, Washington, and TestAmerica Laboratories (TestAmerica) in Fife, Washington, Sacramento, California, and Knoxville, Tennessee.

3.2 Communication/Information Flow

The communication strategy is outlined in Section 2 of the QAPP (AECOM and Geosyntec 2018a). In brief, the Field Coordinators, Ms. Nicky Moody (AECOM) and Mr. Keith Kroeger (Geosyntec), will be the points of contact for field staff during the implementation of this FSP. Anne Fitzpatrick (Geosyntec) will be the senior technical lead for this task. Deviations from this FSP or the project-specific QAPP will be reported to Dr. Pretare, the PDI Project Manager, for consultation. Significant deviations from the FSP/QAPP will be further reported to representatives of the Pre-RD AOC Group and EPA by the PDI Project Coordinator.

3.3 Coordination with EPA

The PDI Project Coordinator will notify the EPA Project Manager 1 to 2 weeks prior to beginning any field activities so that EPA can schedule any oversight activities required. The PDI Project Coordinator will also notify the EPA Project Manager once field activities have been completed.

Split samples for chemical analyses can be provided to EPA upon its request. EPA's Project Manager should contact the PDI Project Coordinator to coordinate this activity and determine appropriate logistics. If EPA elects to collect split samples, collection at stations where field

duplicates are taken is recommended so that EPA's comparison samples can be evaluated relative to the field and analytical variability measured by the project team.

4. SAMPLE COLLECTION PROCEDURES

The following sections describe the procedures and methods that will be used during surface sediment sampling, including sampling procedures; recordkeeping; sample handling, storage and shipping; and field quality control procedures. All field sampling activities will follow procedures outlined in the project Health and Safety Plan (AECOM and Geosyntec 2018c).

4.1 Sampling Vessels and Equipment

Gravity will perform the surface sediment sampling activities. Gravity will utilize two sampling vessels, RV *Cayuse* and RV *Tieton*, equipped with hydraulic power grab samplers to complete the work. Both vessels have a virtual anchoring system that incorporates an autopilot and two small motors to keep the vessel on station without needing to set fixed anchors. The RV *Cayuse* is a 26-foot research vessel with landing craft design, crew cabin, and forward working area. The vessel has an A-frame with a custom research winch and dynamic positioning system. The RV *Tieton* is a 34-foot research vessel with landing craft design and crew cabin, pilot house, and forward working area. The vessel has an A-frame with custom research winch and dynamic positioning system. Supplemental vessels are available if additional or backup support for in-water sampling is needed. All vessels will be mobilized from Swan Island Launch.

Equipment and supplies will include all equipment for positioning, sampling, processing, recording, and shipping samples. Sample containers and preservatives, as well as coolers and packing material, will be supplied by the analytical laboratory. An equipment checklist is provided in Appendix A-2.

4.2 Station Positioning and Vertical Control

Station positioning and vertical control will be performed as detailed in the attached SOP (Appendix B-1). A differential global positioning system (DGPS) unit will be used to confirm the horizontal sampling locations to an accuracy of 1 to 2 meters. The DGPS accuracy will be confirmed each morning and evening at the PH-1 benchmark installed at the Swan Island boat launch for the project (see GPS station log in Appendix B-1). Confirmed station locations will be recorded to the nearest whole foot in North American Datum of 1983 National Adjustment of 2011, NAD83 (2011), State Plan Coordinate System (SPCS) Oregon North Zone, International Feet.

Vertical control will be established using an on-board fathometer or lead line to measure depth to mudline at sampling locations. The fathometer accuracy will be checked regularly by Gravity and calibrated when necessary following ASTM D6318 Standard Practice for Calibrating a Fathometer Using a Bar Check Method or other similar practice. Water depths will be converted to elevations in feet North American Vertical Datum of 1988 (NAVD88) based on synchronizing timestamped gauge data downloaded from the Northwest River Forecast Center for gauge PRT03, located near RM 12.8. As described in Appendix B-1, this river stage gauge data are

reported in the Columbia River Datum (CRD), so a correction will be needed to convert to NAVD88. Water levels will be recorded to the nearest one tenth of a foot in the datum specified in the DQMP (AECOM and Geosyntec 2018d).

4.3 Sample Collection and Processing

In general, sample collection will be performed as described in the RI Round 1 FSP (Integral 2002), RI Round 2 FSP for Sediment Sampling and Benthic Toxicity Testing (Integral 2004), and the RI Round 3 FSP for Upstream and Downstream Sediment Sampling (Integral 2006) with modifications described herein.

- Key changes from the RI Round 1 FSP include the following:
- Samples will be collected as three-point composite samples.
- Sediment will be collected from 0 to 30 centimeters, depending on sediment substrate conditions. Section 4.3.2 provides details on encountering different substrate types.
- Samples will be processed on the sampling vessel. Samples will be transported in coolers on ice to the field lab for sample packaging and shipment. The AECOM Sample Processing Facility at 1115 SE Caruthers Street, Portland, Oregon, is approximately 20 blocks from the Site and will be used as a base for staging work, core sample processing, sample storage, sample packaging and shipping, daily field team meetings, gear storage, decontamination, and other field support needs.
- The pneumatic/hydraulic power grab was designed and manufactured by Gravity Marine. The power grab is 26 inches long by 16 inches wide with a 14-inch grab depth, with a closing force of 1,000 pounds per square foot. The approximate sampling volume is 0.3 cubic meters.

Standard Operating Procedures (SOPs) from the RI will be followed. The Surface Sediment Sampling SOP from Appendix F of the LWG FSP for RI Round 2 (Integral 2004), is provided in Appendix B-2, and consistent with Appendix D of the LWG FSP for RI Round 3 (Integral 2006), which was previously approved by EPA. These SOPs include lists of needed supplies and equipment, equipment decontamination, sediment sample collection, and sediment sample processing procedures. Procedures regarding the chain-of-custody, packaging, and shipping samples are presented in Section 4.3 of the project QAPP (AECOM and Geosyntec 2018a), and are consistent with those in the Surface Sediment Sampling SOP (Integral 2004).

4.3.1 Sample Compositing

The power grab samplers (similar to a van Veen grab sampler but with power-assist) will target collection of sediment from the upper 0 to 30 centimeters of sediment at three sampling points at each sample location; the three grab samples will be composited into a single sample for analysis. The three-point composite sample will be collected within a relatively small footprint

around the sampling vessel (i.e., less than 25 feet) where possible. For example, grab #1 will be deployed, accepted, and processed on the deck of the vessel. The sampling vessel will then shift approximately 5 to 10 feet from the original sample location either using the vessels engines or by pulling in 5 feet on one anchor while releasing 5 feet on the other anchor. This process will be repeated until there is an equal volume of sediment from the three grabs. Approximately 20 ounces (oz) (equal volume) of sediment will be collected from each of the three surface grabs. The sediment will be sampled using a stainless-steel spoon, then placed in a 20-oz jar or similar container, scoop or device (to estimate the equal volume), then transferred to a stainless-steel bowl for compositing. The spoon and container will be rinsed free of solids between subsample composite stations, but not decontaminated. Decontamination of the power grab and field equipment will take place between sample stations (as detailed in Section 4.7).

In general, the volume of sediment from the three-point surface grabs will be homogenized until uniform in color and texture. Color and texture will be described following the ASTM visual-soil classification method (Appendix A-1). Sediments will be collected from the hydraulic power grab using a stainless-steel spoon, avoiding sediments in contact with the sides of the power grab. Large organisms and pieces of debris will be removed and noted in the sample log sheet (Appendix A-3). Acceptance criteria include the following (PSEP 1996; Integral 2004):

1. No or minimal excess water leaking from the jaws of the sampler.
2. No excessive turbidity in the overlaying water of the sampler.
3. Sampler did not over-penetrate.
4. Sediment surface appears to be intact with minimal disturbance.
5. Program-specific penetration depth has been achieved (target of 20 centimeter or more, but less can be accepted after several attempts).

After sample acceptance, the sediment will be placed in a large, stainless-steel bowl for homogenization. Once the volume of sediment from each grab has been homogenized to a uniform consistency and color, composited sediments will be visually described following ASTM visual-soil classification procedure in the field log book (Appendix A-1). Sediments will be placed in the appropriate laboratory-provided sampling containers and stored in a cooler at 0 to 6 degrees Celsius (°C) until transport to the laboratory.

4.3.2 Substrate Types

Field conditions will not consistently achieve target penetration depths because of varying substrate conditions. These conditions may range from woody debris, gravel/rock in sampler jaws, sand and gravel bottom conditions, stiff silts, steep slopes, and areas of no recoverable sediment (e.g., bedrock, riprap). To help quantify these substrate conditions, a documentation protocol has been added to the sediment grab collection activities. Field crews will classify the sample location into one of four substrate types:

- Substrate Bin #1 - Soft Sediment; over-penetration may be expected and sampling weights adjusted
- Substrate Bin #2 - Soft Sediment With Debris; silt, sandy silt, and silty sand with good recovery expected; however, the presence of debris makes it difficult to consistently achieve a target recovery depth of >20 cm (especially when debris is caught in the jaws and some material is lost during retrieval because the jaws did not make a tight seal). Debris is specifically classified as wood, trash, scrap metal, concrete, or subsurface obstructions such as steep slopes that prevent collection of soft sediment under Bin #1 conditions.
- Substrate Bin #3 – Natural Hard Sediment Bottom; this type of dense sand and gravel, stiff silt, or uncemented cobble substrate is expected to produce consistently low penetration depths (less than the target recovery depth of 20 cm) in each grab.
- Substrate Bin #4 - No Recoverable Sediment: this type of substrate is expected to be impenetrable bedrock, riprap, or very dense/cemented cobbles.

4.4 Contingency Plan for Field Condition Impediments to Collecting Samples

During the sediment grab sampling efforts, the field crew may encounter substrate and other field conditions that preclude collection of grab samples at the planned stations (e.g., limited access, poor recovery, safety concerns, debris/rock/bedrock causing refusal). To account for difficult substrate conditions, contingency protocols will be adapted for each of the four substrate types listed above. The sampling protocol will be slightly different for random and SMA sample locations. The inset table below summarizes the revised protocol discussed with EPA on May 18, 2018, to address anomalous field conditions; these protocols are detailed in the following subsections.

Substrate Type	Substrate Description	Acceptance Criteria for Recovery Depths [a, b]
1	Soft Sediment: full penetration depth expected	Minimum of 20 cm recovery depth in each accepted grab (adjust weights if overpenetration encountered).
2	Soft Sediment with Debris: wood, trash, scrap metal, concrete, slopes; difficult to consistently achieve good recovery depth (e.g., 20 cm depth)	Up to 6 attempts at primary location; retain 3 deepest recovery bucket attempts within 50 ft radius of primary location. If composite avg >10 cm depth then analyze; if avg <10 cm then archive pending discussion; if less than 3 recoveries are obtained for 3-point composite then archive pending discussion; only go to Alt 1 if no recovery or access issues. [c]
3	Natural Hard Sediment Bottom: dense sand and gravel, stiff silt, uncemented cobbles; lower recovery depth expected	Up to 6 attempts at primary location. Using all weights, retain 3 deepest bucket attempts within 50 ft radius of primary location. If composite avg >10 cm depth then analyze; if avg <10 cm then archive pending discussion and probe the area to determine if Bin 4 conditions; if less than 3 recoveries are obtained for 3-point composite then archive pending discussion; only go to Alt 1 if access issues. [c, d]
4	No Recoverable Sediment: bedrock, riprap, very dense/cemented cobbles	After three grab attempts, if no acceptable sample (NR), use probe to confirm bottom substrate is not recoverable and document; only go to Alt 1 if access issues. Discussions with EPA will determine if resample or sampling at Alt 1/Alt 2 locations is necessary under these conditions.

Notes:

a) All grabs attempts should be documented in the field notes.

b) Target three attempts in 25-ft radius and three attempts at 50-ft radius = total of 6 attempts.

c) For Bins 2 and 3, a maximum of 6 field attempts will be made unless field crews recommend additional attempts based on professional judgement. The best /deepest 3 of 6 attempts will be retained.

d) In natural hard sediment bottom area (Bin 3), stay on primary location and collect best possible sample.

4.4.1 Substrate #1 - Soft Sediment

A minimum of 20 cm recovery depth is expected in each acceptable grab in this type of substrate. Sampler weights will be adjusted to minimize over-penetration. It is expected that a three-point composite can be obtained within the 25-foot radius of the Primary location.

4.4.2 Substrate #2 – Soft Sediment with Debris

In this type of substrate, the goal for minimum average composite recovery depth is 10 cm for each subsample. This substrate type may range from soft silt, to soft sandy silt, to loose silty sand and sand. Contingency plan and acceptance criteria for recovery depths at areas encountering Substrate #2 include the following steps:

- At the Primary target location, conduct up to six bucket attempts within a 50-foot radius to collect acceptable grabs (target three attempts within 25-foot radius and three attempts in 50-foot radius). All attempts will be logged and documented in the field form. Retain the three best/deepest penetrating samples and calculate the average sample recovery depth.
- If less than 3 acceptable recoveries are obtained after 6 bucket attempts then archive pending discussions with EPA.
- If the average composite sample depth is >10 cm, then submit sample for analytical testing. If the average composite sample depth is <10 cm or if only one or two grabs has recoverable sediment, then archive pending further discussions with EPA.
- (For Stratified Random Samples) The Alternate 1 location (Figure 6) will only be visited in the event that the Primary location is inaccessible or no recovery/very low recovery is achieved after several attempts. Repeat steps above at Alternate 1 location.
- (For Stratified Random Samples) The Alternate 2 location (Figure 7) will only be visited in the event that both the Primary and Alternate 1 locations are inaccessible.

4.4.3 Substrate #3 – Natural Hard Sediment Bottom

Acceptance criteria and contingency planning at areas encountering low sample recoveries in Substrate #3 include the following steps:

- At the Primary target location, conduct up to six bucket attempts within a 50-foot radius using all weights and retain the three best/deepest bucket attempts. All attempts will be logged and documented in the field form. Calculate the average sample depth of the three best samples.
- If less than 3 acceptable recoveries are obtained after 6 bucket attempts then archive pending discussions with EPA.
- If the average composite sample depth >10 cm, then submit sample for analytical testing. If the average composite depth is <10 cm at the Primary location or if only one or two grabs has recoverable sediment (one-point or two-point composite), then archive pending further discussions with EPA and probe the general target area to confirm substrate type.
- (For Stratified Random Samples) The Alternate 1 location will only be visited in the event that the Primary location is inaccessible. Repeat steps above. Sampling an Alternate 1 location for reasons other than access issues will be discussed and determined with EPA input.
- (For Stratified Random Samples) The Alternate 2 location will only be visited in the event that both the Primary and Alternate 1 locations are inaccessible. Repeat steps above.

4.4.4 Substrate #4 - No Recoverable Sediment

Acceptance criteria and contingency planning for areas encountering Substrate #4 include the following steps:

- At the Primary target location, three attempts will be made to collect an acceptable sample within a 50-foot radius. If no acceptable sample is obtained after three attempts (e.g., no recoverable amount of sediment), a hand probe will be used in the general target area to confirm the bottom substrate. All attempts will be logged and documented in the field form.
- If no recoverable sediment is obtained following the protocol above, then the location will be abandoned and no sample collected. A description of bottom substrate and probing efforts will be recorded in the field log form.
- (For Stratified Random Samples) The Alternate 1 location (Figure 6) will only be visited in the event that the Primary location is inaccessible.
- (For Stratified Random Samples) If field crews judge that the Alternate 1 or 2 locations represent the general area, then initiate further discussions with EPA and consider collecting a sample at these alternate locations.

All attempts will be logged and recorded in the field notebooks. Sample location coordinates for Alternate 1 and Alternate 2 are provided in Tables 3 and 4, respectively. Alternate sampling locations were re-randomized using a GIS randomization program to maintain the geostatistical methods used during development of the PDI Work Plan (Geosyntec 2017). The rationale for moving to Alternate Location 1 or, if needed, Alternate Location 2, will be documented in the field log.

For SMA target locations, the radius protocol described above will be used. The re-randomization geostatistical methods are not necessary as a contingency plan for the SMA locations as these locations were not randomly generated. Field crews will conduct three grab attempts within a 25-foot radius of the target location. In the event that field conditions preclude the field crews from collecting proposed target samples within SMAs, up to three additional attempts within a 50-foot or larger radius (depending on access or other issues) will be continued (maximum of six attempts). As described in Section 2.1.2, the criteria considered for SMA sample placement is to maintain a 300-foot spatial resolution between SMA samples within SMAs; therefore, larger radius locations will be considered on an SMA by SMA basis with a goal of sampling within the SMA footprint. If no recoverable amount of sediment is obtained within (and up to) a 300-foot radius of the target location (and within the SMA footprint), then abandon the station, document substrate conditions in the field logbook, and notify the PDI Project Manager and EPA.

After six attempts, the three best/deepest recovery of six samples will be retained and composited. If three subsamples are not recovered, the available samples will be processed for analysis (composite if two grab samples if available or collect a single grab sample if necessary). If the average composite sample depth is >10 cm, submit the sample for analytical testing. If the average composite depth is <10 cm, then archive pending further discussions with EPA. If no recoverable amount of sediment (e.g., less than ~4 cm) is obtained, then abandon the station and notify the PDI Project Manager and EPA.

4.5 Contingency Plan for Downtown/Upriver Reach Sampling in Areas with Soft Sediment

Collection of surface sediment samples for Downtown and Upriver sampling in areas with soft sediment will follow the revised protocol outlined in Section 4.4, with some notable changes as described below and in Appendix C: [4]

- Go to primary target area and begin attempting to collect a three-point composite sample within a 50-foot radius of primary target.
- Following the first grab sample at the primary target, classify the substrate as described in Section 4.3.2 of the Surface Sediment FSP, including a visual estimate of percent fines. If the substrate is classified as:
    - Substrate #1 – Soft Sediment: Collect the surface sediment samples per the FSP protocol. At the field team's discretion, wet sieving may be performed on the first sediment grab sample to evaluate percent fines by volume.
        - Selecting Alternate 1 Location: If wet sieving results indicate insufficient fine material at the primary target location, probe the surface sediment moving toward the shoreline (beginning at ½ the distance to shore) or laterally along the shoreline until soft sediment is encountered. The field crew will use best professional judgement to determine where to probe based on the grid cell size, shape, and physical features present. Once an area of soft sediment has been identified, this will be designated Alternate 1. A three-point composite sample will be attempted within a 50-foot radius of the selected Alternate 1 location.
    - Substrates #2 (Soft Sediment with Debris) or #3 (Natural Hard Sediment Bottom): Field staff will collect up to six attempts and will retain the three grabs with the deepest/best recovery depths. If significant debris is encountered, the field staff may decide to attempt an Alternate 1 location, determined in the field, before completing the six grab sample attempts.

[4] These guidelines are for optimal sample recovery. See sentence following the bullets for minimum acceptable criteria in the case of challenging field conditions.

        - Selecting Alternate 1 Location: If significant debris is encountered at the primary target location, field staff may move towards the shoreline or laterally along the shoreline remaining within the grid cell.
        - The default distance will be ½ the distance towards shore, and then laterally at 25-foot increments towards the known probe point explored during the D/U reconnaissance. Each incremental step will include a probing assessment with substrate conditions noted at each incremental move.
        - Movement will continue, as practicable, until soft sediment is encountered. This station becomes the Alternate 1 Location. A three-point composite sample (up to six grab attempts) will be attempted within a 50-foot radius of the selected Alternate 1 location.
    - Substrate #4 – No Recoverable Sediment: If Substrate 4 is encountered, attempt three grab samples. If any of the three grab samples do not have sufficient recovery, the field crew may move to an Alternate 1 location determined in the field.
        - Selecting Alternate 1 Location: the field team will probe the surface sediment moving toward the shoreline (beginning ½ distance to shore) or laterally along the shoreline until soft sediment is encountered. The field crew will use best professional judgement to determine where to probe based on the grid cell size, shape and physical features present. Once an area of soft sediment has been identified, this station becomes the Alternate 1. A three-point composite sample (up to six attempts) will be attempted within a 50-foot radius of the selected Alternate 1 location.
- If the bottom is soft, then conduct wet sieving on the first successful grab sample prior to sample collection to confirm > 35 percent fines by volume in the field; and
- Field crews will document field conditions, weights used, probing/wet sieving results, each grab sample attempt, and will note boundaries between hard and soft sediments during probing. Where attempted sampling locations are not yielding fine sediment, field crews have the flexibility to move off station to sample in areas of soft sediments as described in the selection of Alternate 1 locations above.

The minimum acceptable field criteria for a sample will include a one-point composite of at least 4-centimeter recovery, with visual characterization indicating > 35% fines (by volume). If the field crew is unable to collect an acceptable soft sediment sample with > 35% fines within a grid cell, then alternate options for that grid cell will be discussed with the Project Manager and EPA. The field crew may move to another grid cell while alternate options are being decided.

4.6 Sample Custody and Transport

Chain-of-custody procedures will be followed as detailed in Section 4.3 of the project QAPP (AECOM and Geosyntec 2018a). These methods are consistent with the RI Round 1 FSP (Integral 2002) and similarly described in the RI Round 2 FSP and RI Round 3 FSP (Integral 2004 and 2006). Samples will be stored on ice at a temperature of 0 to 6°C in a field cooler and shipped to appropriate laboratories (See Section 4.3.4 Sample Packing and Shipping in project QAPP).

4.7 Field Logbook and Forms

All field activities will be recorded in a field logbook as outlined in Section 4.10.1 in the project QAPP (AECOM & Geosyntec, 2018d), consistent with Section 5.3 of the RI Round 1 FSP (Integral 2002). Field forms (Appendix A-3 of this FSP) will be completed as outlined in the project QAPP (AECOM & Geosyntec, 2018d), consistent with the RI Round 1 FSP (Integral 2002).

4.8 Decontamination Procedures

Equipment decontamination procedures will be performed as outlined in the RI Round 2 FSP Appendix F Sediment Sampling SOP (Integral 2004) provided in this FSP as Appendix B-2. This SOP is consistent with the RI Round 3 FSP Appendix D Sediment Sampling SOP (Integral 2006). Decontamination of field sampling equipment will occur between stations. For the 3-point composite sub-stations from which a composite sample will be generated, the grab sampler will be rinsed/sprayed with river water until all solid material is removed. Stainless steel sampling spoons will be rinsed with river water to remove residual solids between sub-stations and re-used among sub-sampling composite stations. Re-usable sampling equipment will be decontaminated between stations. In summary, the decontamination steps will include an initial rinse with vessel river water to dislodge particles, a scrub with brush and Alconox™ or other phosphate-free detergent, and then a rinse with deionized water. Additional rinses with nitric acid or methanol are not anticipated but may be considered based on sample conditions (e.g., excessive oily/tar residue). Sampling spoons and bowls will be covered with aluminum foil until use (dull side down).

4.9 Investigation-Derived Waste Disposal

Investigation-derived waste (IDW) disposal will occur as described in the Management of IDW SOP (Appendix B-3). In general, any excess water or sediment remaining after processing will be returned to the vicinity of the collection site. Any water or sediment spilled on the deck of the sampling vessel will be washed into the surface waters at the collection site before proceeding to the next station. Phosphate-free detergent-bearing liquid wastes from decontamination of the sampling equipment will be washed overboard or disposed into the sanitary sewer system.

Tyvek, gloves, paper towels, plastic sheeting, and other waste material generated during sampling will be placed in heavyweight garbage bags or other appropriate containers and placed in normal refuse containers for disposal at a solid waste landfill.

4.10 Field Quality Control

All QA/QC procedures are detailed in the QAPP (AECOM and Geosyntec 2018a). Requirements for QA/QC samples are provided in Table 5, and a summary of all field QA/QC sample numbers is provided in Table 6. In brief, homogenized field duplicates will be collected from the same composited bowl of homogenized sample on 5 percent of the samples to assess variability within samples. Other field QC samples, such as trip blanks, temperature blanks, and rinsate blanks, will be collected per sampling vessel (as needed) as outlined in Section 4.6.1 of the QAPP.

5. LABORATORY ANALYSIS

With the large numbers of samples and multiple analytes, it is best to separate the sample analyses among laboratories that specialize in certain analytical methods and have the capacity to complete the work on schedule. As such, the Pre-RD AOC Group has selected the following laboratories to perform the physical and chemical analyses:

- ALS in Kelso, Washington, will analyze for chlorinated pesticides, PAHs, bis-(2-ethylhexyl) phthalate, tributyltin, and total solids.
- TestAmerica in:
    - Fife, Washington, will analyze for total petroleum hydrocarbons diesel range, metals, TOC, grain size, and total solids.
    - Sacramento, California, will analyze for dioxins/furans.
    - Knoxville, Tennessee, will analyze for PCB congeners.

The analytes and analytical methods are provided in Table 7 for each sample type. Additional details on the analytical methods, QA/QC requirements and procedures, and laboratory-specific QA/QC requirements are detailed in Section 4.6 of the QAPP (AECOM and Geosyntec 2018a). All samples will be placed in laboratory-supplied sample containers and preserved according to analytical protocols. Sample containers, preservation requirements, holding times, and sample sizes are provided for all analyses in Table 8.

6. DATA MANAGEMENT AND REPORTING

6.1 Field Data Management

The procedures and activities outlined in this FSP are designed to ensure DQOs outlined in the PDI Work Plan are met. Specifically, and as detailed in Sections 4.2, 4.3, 4.6, and 4.10 in the QAPP (AECOM and Geosyntec 2018a), the following data management procedures will be performed in the field:

- All samples will be given a unique identifier (Section 2.2 of this FSP).
- All samples will be collected and transported under chain-of-custody control (Section 4.6 of this FSP).
- Field logbooks and data sheets will be maintained (Section 4.7 of this FSP).
- Field QA/QC samples will be collected according to the QAPP (Section 4.10 of this FSP).

6.2 Post-Analysis Data Management and Reporting

Analytical laboratories will be required to adhere to all QA/QC procedures outlined in the QAPP. Laboratories will provide all data for field investigations in electronic format and QA/QC reports, including a narrative of the standard QA/QC protocols. Data validation and data management will be performed according to the QAPP and DQMP (AECOM and Geosyntec 2018d). Following data validation, all data, supplementary information, and validator qualifiers will be compiled into an SQL Server database for the project. Data summary files will be provided to EPA as they become available after data validation and database management.

Results from the implementation of this FSP will be used to support the data use objectives described in Section 1.3 of the PDI Work Plan (Geosyntec 2017: Table 5). Data summaries and evaluations will be included in the PDI Evaluation Report.

7. REFERENCES

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TABLES

Table 1. Summary of Surface Sediment Sample Types, Numbers, and Analytes
Portland Harbor PDI Surface Sediment FSP
Portland, OR

Surface Sediment Sample Type	Number of Samples	Analyses
Stratified Random Site Samples	428	All ROD Table 17 Analytes
SMA Site Samples	178	Focused COCs
Co-located Grabs at In-water Core Stations	60	Focused COCs
Downtown Reach	30	All ROD Table 17 Analytes
Upriver Reach	30	All ROD Table 17 Analytes
Total Count	**726**	

General Notes:
1. All samples will be 0 to 30 cm depth.
2. All samples will be 3-point composites over a small footpring (< 25 ft).
3. Site = Portland Harbor Superfund Site RM 1.9 to 11.8
4. Downtown Reach = RM 11.8 to 16.6
5. Upriver Reach = RM 16.6 to 28.4

Table 2. Station Location Coordinates, Target Depth, and Identification Scheme
Portland Harbor PDI Surface Sediment FSP, rev 2
Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B001-BL1	NA	7616223	726382	001
	PDI-SG-B002-BL1	-38.3	7616865	725994	002
	PDI-SG-B003-BL1	-41.6	7617552	725384	003
	PDI-SG-B004-BL1	-45.2	7617360	725438	004
	PDI-SG-B005-BL1	-49.0	7616987	725480	005
	PDI-SG-B006-BL1	-14.5	7616168	725962	006
	PDI-SG-B007-BL1	-45.1	7617274	725225	007
	PDI-SG-B008-BL1	-9.0	7616026	725856	008
	PDI-SG-B009-BL1	-45.6	7617115	724852	009
	PDI-SG-B010-BL1	-12.1	7615787	725287	010
	PDI-SG-B011-BL1	-30.3	7617513	724549	011
	PDI-SG-B012-BL1	-18.4	7615838	725048	012
	PDI-SG-B013-BL1	-49.0	7616429	724771	013
	PDI-SG-B014-BL1	-36.5	7617117	724302	014
	PDI-SG-B015-BL1	-43.9	7616457	724443	015
	PDI-SG-B016-BL1	NA	7615435	724765	016
	PDI-SG-B017-BL1	-36.9	7617158	724020	017
	PDI-SG-B018-BL1	-13.9	7615557	724533	018
	PDI-SG-B019-BL1	-33.2	7615583	723961	019
	PDI-SG-B020-BL1	-35.7	7616505	723723	020
	PDI-SG-B021-BL1	-34.2	7616599	723675	021
	PDI-SG-B022-BL1	-42.6	7615714	723434	022
	PDI-SG-B023-BL1	-34.4	7615581	723415	023
	PDI-SG-B024-BL1	-33.0	7616931	723304	024
	PDI-SG-B025-BL1	-46.2	7616151	723279	025
	PDI-SG-B026-BL1	-42.9	7615836	723147	026
	PDI-SG-B027-BL1	NA	7615152	723123	027
	PDI-SG-B028-BL1	-22.0	7616982	722941	028
	PDI-SG-B029-BL1	-3.9	7615256	722977	029
	PDI-SG-B030-BL1	-34.2	7616857	722699	030
	PDI-SG-B031-BL1	-32.1	7616836	722509	031
	PDI-SG-B032-BL1	-9.3	7615254	722326	032
	PDI-SG-B033-BL1	NA	7615163	721939	033
	PDI-SG-B034-BL1	-40.8	7616472	721953	034
	PDI-SG-B035-BL1	-54.7	7615532	721775	035
	PDI-SG-B036-BL1	-44.9	7616323	721720	036
	PDI-SG-B037-BL1	-43.6	7616122	721593	037
	PDI-SG-B038-BL1	-41.3	7616506	721652	038
	PDI-SG-B039-BL1	-45.0	7615969	721331	039
	PDI-SG-B040-BL1	-8.5	7615132	721046	040
	PDI-SG-B041-BL1	NA	7614939	720797	041
	PDI-SG-B042-BL1	NA	7616859	721056	042
	PDI-SG-B043-BL1	NA	7615002	720453	043
	PDI-SG-B044-BL1	-38.0	7616561	720789	044
	PDI-SG-B045-BL1	-44.0	7616117	720585	045
	PDI-SG-B046-BL1	-43.1	7616200	720559	046
	PDI-SG-B047-BL1	-41.9	7616580	720489	047
	PDI-SG-B048-BL1	-32.6	7613979	720275	048
	PDI-SG-B049-BL1	-7.8	7612801	720887	049
	PDI-SG-B050-BL1	-16.6	7615017	719963	050
	PDI-SG-B051-BL1	-41.3	7616668	720238	051
	PDI-SG-B052-BL1	-7.9	7614776	719726	052
	PDI-SG-B053-BL1	-11.1	7615032	719597	053
	PDI-SG-B054-BL1	NA	7616932	719955	054
	PDI-SG-B055-BL1	-16.9	7615493	719528	055
	PDI-SG-B056-BL1	-47.2	7616388	719570	056

Table 2. Station Location Coordinates, Target Depth, and Identification Scheme
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Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B057-BL1	NA	7615139	719197	057
	PDI-SG-B058-BL1	-45.5	7616134	719341	058
	PDI-SG-B059-BL1	-32.9	7616937	719319	059
	PDI-SG-B060-BL1	-25.6	7615665	718978	060
	PDI-SG-B061-BL1	-43.4	7616694	718944	061
	PDI-SG-B062-BL1	-6.1	7617080	719063	062
	PDI-SG-B063-BL1	-40.0	7616930	718861	063
	PDI-SG-B064-BL1	-34.6	7615895	718389	064
	PDI-SG-B065-BL1	-30.9	7615779	718210	065
	PDI-SG-B066-BL1	-43.7	7616398	718313	066
	PDI-SG-B067-BL1	-22.5	7617278	718377	067
	PDI-SG-B068-BL1	-42.1	7617183	718225	068
	PDI-SG-B069-BL1	-46.1	7616565	718055	069
	PDI-SG-B070-BL1	-36.6	7616117	717965	070
	PDI-SG-B071-BL1	-36.4	7616265	717583	071
	PDI-SG-B072-BL1	-44.4	7617290	717850	072
	PDI-SG-B073-BL1	-51.9	7617416	717666	073
	PDI-SG-B074-BL1	-33.4	7616310	717241	074
	PDI-SG-B075-BL1	-45.7	7617627	717363	075
	PDI-SG-B076-BL1	-49.7	7617698	717197	076
	PDI-SG-B077-BL1	-38.0	7618030	717200	077
	PDI-SG-B078-BL1	-10.9	7619956	717203	078
	PDI-SG-B079-BL1	-45.1	7616746	716853	079
	PDI-SG-B080-BL1	-35.1	7616547	716760	080
	PDI-SG-B081-BL1	-30.7	7616513	716599	081
	PDI-SG-B082-BL1	-31.6	7617869	716776	082
	PDI-SG-B083-BL1	-26.6	7616599	716189	083
	PDI-SG-B084-BL1	NA	7618120	716555	084
	PDI-SG-B085-BL1	-44.4	7617364	716252	085
	PDI-SG-B086-BL1	-51.8	7617651	716168	086
	PDI-SG-B087-BL1	-26.6	7618103	716297	087
	PDI-SG-B088-BL1	-17.7	7616828	715518	088
	PDI-SG-B089-BL1	-34.8	7618148	716034	089
	PDI-SG-B090-BL1	NA	7616826	715201	090
	PDI-SG-B091-BL1	-21.5	7616981	715113	091
	PDI-SG-B092-BL1	-40.9	7617312	715070	092
	PDI-SG-B093-BL1	-43.4	7617600	715093	093
	PDI-SG-B094-BL1	-16.6	7618474	715577	094
	PDI-SG-B095-BL1	-59.1	7618290	715307	095
	PDI-SG-B096-BL1	NA	7617115	714676	096
	PDI-SG-B097-BL1	NA	7618610	715242	097
	PDI-SG-B098-BL1	NA	7617185	714478	098
	PDI-SG-B099-BL1	-26.6	7618646	715118	099
	PDI-SG-B100-BL1	-34.8	7618892	714586	100
	PDI-SG-B101-BL1	-22.0	7619525	714384	101
	PDI-SG-B102-BL1	-34.8	7620153	714455	102
	PDI-SG-B103-BL1	NA	7617357	713841	103
	PDI-SG-B104-BL1	NA	7617560	713699	104
	PDI-SG-B105-BL1	-18.0	7619021	714287	105
	PDI-SG-B106-BL1	-24.2	7617800	713484	106
	PDI-SG-B107-BL1	-24.4	7619107	714002	107
	PDI-SG-B108-BL1	-70.9	7618632	713521	108
	PDI-SG-B109-BL1	-13.1	7619349	713804	109
	PDI-SG-B110-BL1	NA	7617843	713024	110
	PDI-SG-B111-BL1	-51.4	7618289	713159	111
	PDI-SG-B112-BL1	-8.6	7618138	712695	112
	PDI-SG-B113-BL1	-59.7	7618634	712845	113

Table 2. Station Location Coordinates, Target Depth, and Identification Scheme
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Sample Type	Sample ID	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B114-BL1	-46.7	7619531	713352	114
	PDI-SG-B115-BL1	NA	7618159	712484	115
	PDI-SG-B116-BL1	-38.2	7619707	713147	116
	PDI-SG-B117-BL1	-40.1	7619969	713212	117
	PDI-SG-B118-BL1	-66.7	7619241	712696	118
	PDI-SG-B119-BL1	-6.8	7618367	712152	119
	PDI-SG-B120-BL1	-14.0	7619712	712826	120
	PDI-SG-B121-BL1	-30.6	7619809	712521	121
	PDI-SG-B122-BL1	NA	7618475	711792	122
	PDI-SG-B123-BL1	-47.0	7618979	711926	123
	PDI-SG-B124-BL1	-65.8	7619575	712072	124
	PDI-SG-B125-BL1	-39.8	7619944	712113	125
	PDI-SG-B126-BL1	-31.9	7618818	711480	126
	PDI-SG-B127-BL1	-40.3	7620085	711863	127
	PDI-SG-B128-BL1	-13.8	7618964	711098	128
	PDI-SG-B129-BL1	-19.5	7619124	710850	129
	PDI-SG-B130-BL1	-22.6	7620378	711474	130
	PDI-SG-B131-BL1	-27.5	7620401	711377	131
	PDI-SG-B132-BL1	-77.4	7619946	711038	132
	PDI-SG-B133-BL1	-35.5	7619335	710638	133
	PDI-SG-B134-BL1	-31.6	7620573	710980	134
	PDI-SG-B135-BL1	NA	7619508	710115	135
	PDI-SG-B136-BL1	-40.5	7619758	710194	136
	PDI-SG-B137-BL1	NA	7619635	709986	137
	PDI-SG-B138-BL1	NA	7620817	710617	138
	PDI-SG-B139-BL1	-19.6	7619912	709809	139
	PDI-SG-B140-BL1	-45.2	7620050	709917	140
	PDI-SG-B141-BL1	-11.1	7621028	710377	141
	PDI-SG-B142-BL1	-31.1	7621075	710135	142
	PDI-SG-B143-BL1	-53.1	7620965	709796	143
	PDI-SG-B144-BL1	-8.4	7620205	709319	144
	PDI-SG-B145-BL1	-22.5	7621328	709783	145
	PDI-SG-B146-BL1	-46.2	7620660	709266	146
	PDI-SG-B147-BL1	-31.9	7620494	709050	147
	PDI-SG-B148-BL1	NA	7621459	709649	148
	PDI-SG-B149-BL1	-32.9	7620583	708939	149
	PDI-SG-B150-BL1	-54.6	7621237	709164	150
	PDI-SG-B151-BL1	-16.8	7621572	709342	151
	PDI-SG-B152-BL1	-21.9	7620874	708595	152
	PDI-SG-B153-BL1	-17.4	7621085	708293	153
	PDI-SG-B154-BL1	-32.5	7621846	708885	154
	PDI-SG-B155-BL1	-16.0	7622091	708750	155
	PDI-SG-B156-BL1	-45.7	7621918	708530	156
	PDI-SG-B157-BL1	NA	7621324	707900	157
	PDI-SG-B158-BL1	-34.3	7621554	707828	158
	PDI-SG-B159-BL1	NA	7622233	708556	159
	PDI-SG-B160-BL1	-25.9	7621686	707653	160
	PDI-SG-B161-BL1	NA	7621756	707507	161
	PDI-SG-B162-BL1	-43.7	7622420	708161	162
	PDI-SG-B163-BL1	-37.8	7622493	708153	163
	PDI-SG-B164-BL1	-52.8	7622683	707805	164
	PDI-SG-B165-BL1	NA	7622000	707091	165
	PDI-SG-B166-BL1	-13.0	7622217	706965	166
	PDI-SG-B167-BL1	-10.5	7623016	707770	167
	PDI-SG-B168-BL1	-45.8	7622578	707128	168
	PDI-SG-B169-BL1	-46.9	7623053	707443	169
	PDI-SG-B170-BL1	-16.9	7622551	706680	170

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Sample Type	Sample ID	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B171-BL1	-47.3	7623258	707067	171
	PDI-SG-B172-BL1	-5.0	7622702	706401	172
	PDI-SG-B173-BL1	-53.0	7623400	706796	173
	PDI-SG-B174-BL1	-10.1	7622912	706126	174
	PDI-SG-B175-BL1	-47.6	7623548	706865	175
	PDI-SG-B176-BL1	-57.1	7623277	706482	176
	PDI-SG-B177-BL1	-51.5	7623623	706712	177
	PDI-SG-B178-BL1	-38.3	7623543	706020	178
	PDI-SG-B179-BL1	NA	7623610	705858	179
	PDI-SG-B180-BL1	-42.8	7624151	706660	180
	PDI-SG-B181-BL1	-44.7	7623768	705961	181
	PDI-SG-B182-BL1	NA	7623843	705709	182
	PDI-SG-B183-BL1	-48.8	7624178	706187	183
	PDI-SG-B184-BL1	-25.3	7624403	706537	184
	PDI-SG-B185-BL1	-19.2	7624738	706488	185
	PDI-SG-B186-BL1	NA	7624283	705458	186
	PDI-SG-B187-BL1	-38.0	7624407	705530	187
	PDI-SG-B188-BL1	-51.4	7624609	705861	188
	PDI-SG-B189-BL1	NA	7624492	705341	189
	PDI-SG-B190-BL1	-43.1	7624954	706047	190
	PDI-SG-B191-BL1	-43.7	7625178	705894	191
	PDI-SG-B192-BL1	NA	7625008	704995	192
	PDI-SG-B193-BL1	NA	7625099	704992	193
	PDI-SG-B194-BL1	-42.6	7625455	705395	194
	PDI-SG-B195-BL1	-49.6	7625602	705583	195
	PDI-SG-B196-BL1	-41.4	7625369	704990	196
	PDI-SG-B197-BL1	-50.4	7626034	705608	197
	PDI-SG-B198-BL1	-33.0	7625624	704770	198
	PDI-SG-B199-BL1	-16.4	7625705	704679	199
	PDI-SG-B200-BL1	-25.3	7626544	705786	200
	PDI-SG-B201-BL1	-28.9	7626061	704510	201
	PDI-SG-B202-BL1	-44.7	7626480	704945	202
	PDI-SG-B203-BL1	-28.0	7626718	705358	203
	PDI-SG-B204-BL1	-22.1	7626955	705370	204
	PDI-SG-B205-BL1	-34.6	7626347	704356	205
	PDI-SG-B206-BL1	-45.2	7626570	704436	206
	PDI-SG-B207-BL1	NA	7626403	703870	207
	PDI-SG-B208-BL1	-20.7	7627365	704792	208
	PDI-SG-B209-BL1	NA	7626510	703675	209
	PDI-SG-B210-BL1	-43.8	7627321	704274	210
	PDI-SG-B211-BL1	-47.4	7627454	704204	211
	PDI-SG-B212-BL1	-39.7	7627079	703734	212
	PDI-SG-B213-BL1	NA	7626878	703454	213
	PDI-SG-B214-BL1	NA	7628162	704529	214
	PDI-SG-B215-BL1	-25.7	7628014	704229	215
	PDI-SG-B216-BL1	NA	7627106	703159	216
	PDI-SG-B217-BL1	NA	7628505	704240	217
	PDI-SG-B218-BL1	-16.6	7627563	702927	218
	PDI-SG-B219-BL1	NA	7627584	702769	219
	PDI-SG-B220-BL1	-46.4	7628122	703075	220
	PDI-SG-B221-BL1	-60.2	7628432	703284	221
	PDI-SG-B222-BL1	-35.8	7628152	702596	222
	PDI-SG-B223-BL1	NA	7628032	702321	223
	PDI-SG-B224-BL1	-57.1	7628824	703173	224
	PDI-SG-B225-BL1	-13.4	7628174	702214	225
	PDI-SG-B226-BL1	-9.2	7629476	703298	226
	PDI-SG-B227-BL1	-42.5	7628726	702265	227
	PDI-SG-B228-BL1	-49.3	7628994	702411	228

Table 2. Station Location Coordinates, Target Depth, and Identification Scheme
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Sample Type	Sample ID	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B229-BL1	-54.5	7629186	702585	229
	PDI-SG-B230-BL1	-25.5	7628536	701853	230
	PDI-SG-B231-BL1	-51.6	7629323	702392	231
	PDI-SG-B232-BL1	NA	7628614	701604	232
	PDI-SG-B233-BL1	-18.0	7630137	702514	233
	PDI-SG-B234-BL1	-44.0	7629711	702151	234
	PDI-SG-B235-BL1	-41.1	7629189	701648	235
	PDI-SG-B236-BL1	-19.7	7628694	701204	236
	PDI-SG-B237-BL1	-26.9	7628589	700934	237
	PDI-SG-B238-BL1	-16.3	7630464	702247	238
	PDI-SG-B239-BL1	-35.8	7628723	700679	239
	PDI-SG-B240-BL1	-10.4	7630610	702121	240
	PDI-SG-B241-BL1	-20.3	7629090	700309	241
	PDI-SG-B242-BL1	-52.8	7630100	701206	242
	PDI-SG-B243-BL1	-20.0	7631008	701861	243
	PDI-SG-B244-BL1	NA	7631240	701810	244
	PDI-SG-B245-BL1	-9.2	7629632	700257	245
	PDI-SG-B246-BL1	-10.9	7629848	700119	246
	PDI-SG-B247-BL1	-36.2	7631400	701516	247
	PDI-SG-B248-BL1	-20.3	7631597	701592	248
	PDI-SG-B249-BL1	NA	7631939	701629	249
	PDI-SG-B250-BL1	-40.4	7630574	700344	250
	PDI-SG-B251-BL1	NA	7630148	699860	251
	PDI-SG-B252-BL1	-29.6	7632256	701598	252
	PDI-SG-B253-BL1	NA	7630330	699532	253
	PDI-SG-B254-BL1	-23.5	7632677	701777	254
	PDI-SG-B255-BL1	-32.6	7632109	701132	255
	PDI-SG-B256-BL1	-44.0	7631135	699980	256
	PDI-SG-B257-BL1	-13.7	7630632	699464	257
	PDI-SG-B258-BL1	-42.8	7631704	700269	258
	PDI-SG-B259-BL1	-32.8	7632116	700590	259
	PDI-SG-B260-BL1	-49.6	7632675	701227	260
	PDI-SG-B261-BL1	NA	7631938	700224	261
	PDI-SG-B262-BL1	-16.1	7630768	699211	262
	PDI-SG-B263-BL1	-27.9	7633388	701785	263
	PDI-SG-B264-BL1	-58.5	7632140	700244	264
	PDI-SG-B265-BL1	-29.6	7633513	701483	265
	PDI-SG-B266-BL1	-33.5	7632235	699964	266
	PDI-SG-B267-BL1	-31.5	7631463	699206	267
	PDI-SG-B268-BL1	-9.5	7631196	698783	268
	PDI-SG-B269-BL1	-11.1	7631292	698677	269
	PDI-SG-B270-BL1	-48.7	7632207	699406	270
	PDI-SG-B271-BL1	-34.0	7633484	701223	271
	PDI-SG-B272-BL1	-37.5	7632535	699645	272
	PDI-SG-B273-BL1	-33.1	7633887	701103	273
	PDI-SG-B274-BL1	-36.1	7632665	699558	274
	PDI-SG-B275-BL1	-12.2	7631501	698100	275
	PDI-SG-B276-BL1	-45.4	7632542	698917	276
	PDI-SG-B277-BL1	-13.5	7631722	697935	277
	PDI-SG-B278-BL1	-40.4	7632981	699260	278
	PDI-SG-B279-BL1	-23.7	7634346	700967	279
	PDI-SG-B280-BL1	-32.2	7634458	700657	280
	PDI-SG-B281-BL1	-38.0	7633219	699056	281
	PDI-SG-B282-BL1	-25.0	7632337	698186	282
	PDI-SG-B283-BL1	NA	7631774	697610	283
	PDI-SG-B284-BL1	NA	7634868	700603	284
	PDI-SG-B285-BL1	-41.9	7633352	698900	285
	PDI-SG-B286-BL1	-6.6	7632185	697491	286

Table 2. Station Location Coordinates, Target Depth, and Identification Scheme
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Sample Type	Sample ID	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B287-BL1	-38.7	7633089	698217	287
	PDI-SG-B288-BL1	-29.9	7634887	700392	288
	PDI-SG-B289-BL1	-38.0	7633722	698591	289
	PDI-SG-B290-BL1	NA	7632621	697143	290
	PDI-SG-B291-BL1	-14.7	7632907	697095	291
	PDI-SG-B292-BL1	-34.0	7633442	697663	292
	PDI-SG-B293-BL1	NA	7634072	698575	293
	PDI-SG-B294-BL1	-23.5	7635412	700151	294
	PDI-SG-B295-BL1	-37.5	7633711	697721	295
	PDI-SG-B296-BL1	-25.9	7635402	699676	296
	PDI-SG-B297-BL1	-13.1	7634411	698221	297
	PDI-SG-B298-BL1	NA	7633314	696787	298
	PDI-SG-B299-BL1	-28.0	7633527	696813	299
	PDI-SG-B300-BL1	-29.4	7633846	697210	300
	PDI-SG-B301-BL1	NA	7634572	698170	301
	PDI-SG-B302-BL1	-20.3	7635524	699491	302
	PDI-SG-B303-BL1	-23.2	7635971	699580	303
	PDI-SG-B304-BL1	-33.1	7634678	697884	304
	PDI-SG-B305-BL1	NA	7633798	696564	305
	PDI-SG-B306-BL1	-32.3	7634433	696984	306
	PDI-SG-B307-BL1	NA	7635056	697778	307
	PDI-SG-B308-BL1	-21.1	7636178	699081	308
	PDI-SG-B309-BL1	-10.6	7634355	696256	309
	PDI-SG-B310-BL1	-14.9	7634402	696241	310
	PDI-SG-B311-BL1	-45.1	7634995	697138	311
	PDI-SG-B312-BL1	-33.6	7635199	697487	312
	PDI-SG-B313-BL1	-14.3	7636417	698725	313
	PDI-SG-B314-BL1	-3.9	7635609	697319	314
	PDI-SG-B315-BL1	-6.9	7636897	698745	315
	PDI-SG-B316-BL1	-25.1	7634928	695974	316
	PDI-SG-B317-BL1	-21.9	7635041	695874	317
	PDI-SG-B318-BL1	-45.3	7635739	696577	318
	PDI-SG-B319-BL1	-25.1	7635989	696999	319
	PDI-SG-B320-BL1	-22.5	7636122	696932	320
	PDI-SG-B321-BL1	-16.0	7635543	695787	321
	PDI-SG-B322-BL1	-16.8	7635680	695666	322
	PDI-SG-B323-BL1	-42.0	7636084	696134	323
	PDI-SG-B324-BL1	-25.4	7636625	696614	324
	PDI-SG-B325-BL1	-20.1	7635992	695430	325
	PDI-SG-B326-BL1	-14.1	7636724	696564	326
	PDI-SG-B327-BL1	-21.8	7636483	695369	327
	PDI-SG-B328-BL1	-32.3	7637014	696259	328
	PDI-SG-B329-BL1	-36.4	7636814	695564	329
	PDI-SG-B330-BL1	-74.0	7637158	695822	330
	PDI-SG-B331-BL1	-24.1	7637380	696139	331
	PDI-SG-B332-BL1	NA	7636670	694831	332
	PDI-SG-B333-BL1	NA	7636891	694755	333
	PDI-SG-B334-BL1	-41.2	7637422	695253	334
	PDI-SG-B335-BL1	-13.7	7637827	695913	335
	PDI-SG-B336-BL1	-34.3	7637847	695786	336
	PDI-SG-B337-BL1	-3.6	7637295	694326	337
	PDI-SG-B338-BL1	-13.8	7637443	694285	338
	PDI-SG-B339-BL1	NA	7638211	695705	339
	PDI-SG-B340-BL1	-39.9	7638287	695470	340
	PDI-SG-B341-BL1	NA	7638545	695546	341
	PDI-SG-B342-BL1	-32.5	7638030	694371	342
	PDI-SG-B343-BL1	-51.2	7638527	695195	343
	PDI-SG-B344-BL1	-30.4	7638152	694220	344

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Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B345-BL1	-30.2	7638665	695328	345
	PDI-SG-B346-BL1	-37.8	7638388	694508	346
	PDI-SG-B347-BL1	-4.2	7639021	695279	347
	PDI-SG-B348-BL1	-36.3	7638526	693899	348
	PDI-SG-B349-BL1	-37.2	7638615	693813	349
	PDI-SG-B350-BL1	-35.6	7639298	694908	350
	PDI-SG-B351-BL1	-18.3	7639611	694986	351
	PDI-SG-B352-BL1	-40.5	7639033	693807	352
	PDI-SG-B353-BL1	-36.5	7639871	694437	353
	PDI-SG-B354-BL1	-37.9	7639013	693466	354
	PDI-SG-B355-BL1	-21.5	7640151	694091	355
	PDI-SG-B356-BL1	-38.7	7639217	693269	356
	PDI-SG-B357-BL1	-41.3	7639356	693362	357
	PDI-SG-B358-BL1	-38.9	7639255	693228	358
	PDI-SG-B359-BL1	-37.9	7640160	693929	359
	PDI-SG-B360-BL1	-40.6	7640157	693685	360
	PDI-SG-B361-BL1	-34.6	7640370	693631	361
	PDI-SG-B362-BL1	-24.6	7639602	692854	362
	PDI-SG-B363-BL1	-22.1	7639731	692681	363
	PDI-SG-B364-BL1	-31.9	7640564	693260	364
	PDI-SG-B365-BL1	-34.3	7640672	693077	365
	PDI-SG-B366-BL1	-49.7	7640270	692769	366
	PDI-SG-B367-BL1	-27.5	7640048	692298	367
	PDI-SG-B368-BL1	-29.3	7640165	692146	368
	PDI-SG-B369-BL1	-34.5	7640977	692683	369
	PDI-SG-B370-BL1	-50.2	7640836	692188	370
	PDI-SG-B371-BL1	-22.1	7640433	691791	371
	PDI-SG-B372-BL1	-9.9	7641258	692381	372
	PDI-SG-B373-BL1	-9.6	7641436	692177	373
	PDI-SG-B374-BL1	-25.3	7640657	691549	374
	PDI-SG-B375-BL1	-37.8	7641487	691912	375
	PDI-SG-B376-BL1	-29.2	7641571	691924	376
	PDI-SG-B377-BL1	-27.9	7640953	691149	377
	PDI-SG-B378-BL1	-52.0	7641333	691382	378
	PDI-SG-B379-BL1	-25.2	7641874	691569	379
	PDI-SG-B380-BL1	NA	7640838	690487	380
	PDI-SG-B381-BL1	NA	7642057	691442	381
	PDI-SG-B382-BL1	NA	7641283	690634	382
	PDI-SG-B383-BL1	-11.5	7641555	690395	383
	PDI-SG-B384-BL1	-55.8	7641949	690485	384
	PDI-SG-B385-BL1	-6.0	7642430	690949	385
	PDI-SG-B386-BL1	-14.0	7642539	690766	386
	PDI-SG-B387-BL1	NA	7641767	690106	387

Table 2. Station Location Coordinates, Target Depth, and Identification Scheme
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Sample Type	Sample ID	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B388-BL1	-43.4	7642465	690598	388
	PDI-SG-B389-BL1	-21.3	7642739	690508	389
	PDI-SG-B390-BL1	-9.8	7642022	689886	390
	PDI-SG-B391-BL1	-49.8	7642656	690280	391
	PDI-SG-B392-BL1	NA	7642895	690405	392
	PDI-SG-B393-BL1	-17.6	7642418	689508	393
	PDI-SG-B394-BL1	-34.0	7642543	689635	394
	PDI-SG-B395-BL1	-16.2	7642652	689308	395
	PDI-SG-B396-BL1	-15.1	7643325	689968	396
	PDI-SG-B397-BL1	-9.2	7642904	689061	397
	PDI-SG-B398-BL1	-24.2	7643596	689772	398
	PDI-SG-B399-BL1	-45.2	7643535	689456	399
	PDI-SG-B400-BL1	-31.3	7643852	689582	400
	PDI-SG-B401-BL1	-29.8	7643266	688913	401
	PDI-SG-B402-BL1	NA	7643133	688763	402
	PDI-SG-B403-BL1	NA	7643183	688734	403
	PDI-SG-B404-BL1	-41.8	7643915	689458	404
	PDI-SG-B405-BL1	-10.6	7644261	689277	405
	PDI-SG-B406-BL1	NA	7643497	688411	406
	PDI-SG-B407-BL1	-11.2	7643740	688216	407
	PDI-SG-B408-BL1	-49.2	7644499	688962	408
	PDI-SG-B409-BL1	-48.4	7644402	688802	409
	PDI-SG-B410-BL1	-44.7	7644669	688722	410
	PDI-SG-B411-BL1	NA	7644006	687988	411
	PDI-SG-B412-BL1	-32.6	7644268	687874	412
	PDI-SG-B413-BL1	NA	7644285	687670	413
	PDI-SG-B414-BL1	-24.1	7644917	688372	414
	PDI-SG-B415-BL1	-32.7	7645019	688145	415
	PDI-SG-B416-BL1	-37.0	7644534	687614	416
	PDI-SG-B417-BL1	-38.1	7644567	687621	417
	PDI-SG-B418-BL1	-39.1	7645168	687847	418
	PDI-SG-B419-BL1	-41.2	7644909	687601	419
	PDI-SG-B420-BL1	-40.1	7644993	687639	420
	PDI-SG-B421-BL1	-49.2	7644975	687415	421
	PDI-SG-B422-BL1	-41.7	7645169	687531	422
	PDI-SG-B423-BL1	-45.2	7645386	687495	423
	PDI-SG-B424-BL1	-50.4	7645151	687009	424
	PDI-SG-B425-BL1	-26.8	7645237	686724	425
	PDI-SG-B426-BL1	-36.8	7645725	687007	426
	PDI-SG-B427-BL1	-67.0	7645741	686809	427
	PDI-SG-B428-BL1	-68.1	7645737	686591	428

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Sample Type	Sample ID	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Downtown/ Upriver Reach [c]	PDI-SG-B429	NA	7645273	686589	429
	PDI-SG-B430	NA	7645832	685810	430
	PDI-SG-B431	-38.2	7646115	685471	431
	PDI-SG-B432	-42.4	7647015	684804	432
	PDI-SG-B433	-12.2	7646781	683140	433
	PDI-SG-B434	-9.8	7646391	681722	434
	PDI-SG-B435	-19.7	7646274	681262	435
	PDI-SG-B436	NA	7645076	680645	436
	PDI-SG-B437	-23.2	7645220	680211	437
	PDI-SG-B438	-10.1	7645469	679267	438
	PDI-SG-B439	-13.9	7645702	678870	439
	PDI-SG-B440	-16.4	7646346	677122	440
	PDI-SG-B441	NA	7647802	675636	441
	PDI-SG-B442	NA	7648009	675443	442
	PDI-SG-B443	NA	7647600	674216	443
	PDI-SG-B444	NA	7648368	673605	444
	PDI-SG-B445	-6.9	7646779	673680	445
	PDI-SG-B446	-5.0	7646527	672880	446
	PDI-SG-B447	NA	7645540	672436	447
	PDI-SG-B448	NA	7649571	671647	448
	PDI-SG-B449	NA	7645174	671361	449
	PDI-SG-B450	-6.0	7646163	671113	450
	PDI-SG-B451	NA	7649897	671431	451
	PDI-SG-B452	NA	7646913	669176	452
	PDI-SG-B453	-8.8	7646045	667770	453
	PDI-SG-B454	NA	7645988	667628	454
	PDI-SG-B455	NA	7648051	667208	455
	PDI-SG-B456	-8.9	7647054	666157	456
	PDI-SG-B457	-5.7	7646780	665287	457
	PDI-SG-B458	NA	7646777	664307	458
	PDI-SG-B459	NA	7647413	662314	459
	PDI-SG-B460	NA	7647231	660249	460
	PDI-SG-B461	NA	7648042	660483	461
	PDI-SG-B462	NA	7648912	658355	462
	PDI-SG-B463	NA	7649429	657071	463
	PDI-SG-B464	NA	7649833	656401	464
	PDI-SG-B465	NA	7650446	655132	465
	PDI-SG-B466	NA	7651174	654197	466
	PDI-SG-B467	NA	7651565	653136	467
	PDI-SG-B468	NA	7651328	652982	468
	PDI-SG-B469	NA	7650105	651095	469
	PDI-SG-B470	NA	7650287	650584	470
	PDI-SG-B471	NA	7649452	649839	471
	PDI-SG-B472	NA	7648406	647388	472
	PDI-SG-B473	NA	7648576	646244	473
	PDI-SG-B474	NA	7655566	636887	474
	PDI-SG-B475	NA	7655850	634738	475
	PDI-SG-B476	NA	7655744	634467	476
	PDI-SG-B477	NA	7657537	629980	477
	PDI-SG-B478	NA	7658488	629128	478
	PDI-SG-B479	NA	7661008	625975	479
	PDI-SG-B480	NA	7661146	624885	480
	PDI-SG-B481	NA	7656722	620219	481
	PDI-SG-B482	NA	7656008	619968	482
	PDI-SG-B483	NA	7654430	619948	483
	PDI-SG-B484	NA	7653105	618181	484
	PDI-SG-B485	NA	7652475	618854	485
	PDI-SG-B486	NA	7650723	617481	486
	PDI-SG-B487	NA	7649518	616808	487
	PDI-SG-B488	NA	7649778	616099	488

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Sample Type	Sample ID	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
SMA Targeted Samples and Co-Located Grab at Core Location	PDI-SG-S001	NA	7617962	725157	001
	PDI-SG-S003	-8.8	7617774	724959	003
	PDI-SG-S004	-3.2	7617674	724707	004
	PDI-SG-S005	-33.3	7617585	724727	005
	PDI-SG-S006	-17.4	7617459	724368	006
	PDI-SG-S007	NA	7617494	724203	007
	PDI-SG-S008	-30.9	7617311	724217	008
	PDI-SG-S009	-36.1	7617132	723877	009
	PDI-SG-S010	-23.9	7617252	723774	010
	PDI-SG-S011	NA	7617185	723518	011
	PDI-SG-S012	-25.3	7617100	723514	012
	PDI-SG-S013	-3.7	7617105	723217	013
	PDI-SG-S015	-33	7616871	722876	015
	PDI-SG-S016	NA	7616992	722624	016
	PDI-SG-S017	NA	7617004	722340	017
	PDI-SG-S018	-34.7	7616718	721796	018
	PDI-SG-S019	-26.8	7616724	721582	019
	PDI-SG-S020	-30.7	7616779	721391	020
	PDI-SG-S021	-8.2	7615798	717953	021
	PDI-SG-S023	-48.7	7617276	717742	023
	PDI-SG-S024	-38.7	7618163	717154	024
	PDI-SG-S025	-38.9	7618228	717186	025
	PDI-SG-S026	-37.7	7618422	717115	026
	PDI-SG-S027	-38.5	7618724	717136	027
	PDI-SG-S028	-24.5	7619022	717183	028
	PDI-SG-S029	-30.8	7619197	717135	029
	PDI-SG-S030	-13.6	7619376	717044	030
	PDI-SG-S031	-22.4	7619579	717143	031
	PDI-SG-S032	-9.2	7619801	717236	032
	PDI-SG-S035	NA	7617909	717009	035
	PDI-SG-S037	NA	7616630	715972	037
	PDI-SG-S038	NA	7616671	715749	038
	PDI-SG-S039	NA	7616637	715829	039
	PDI-SG-S040	NA	7618253	716287	040
	PDI-SG-S041	NA	7618335	715997	041
	PDI-SG-S043	NA	7618408	715789	043
	PDI-SG-S044	NA	7618567	715423	044
	PDI-SG-S046	-12.7	7617310	714319	046
	PDI-SG-S047	-13.1	7617451	714126	047
	PDI-SG-S048	-32.6	7619270	714452	048
	PDI-SG-S049	-33.1	7619381	714641	049
	PDI-SG-S050	-26.2	7619590	714678	050
	PDI-SG-S051	-35.1	7619847	714517	051
	PDI-SG-S052	-32.5	7620324	714503	052
	PDI-SG-S053	NA	7617469	713720	053
	PDI-SG-S054	NA	7619578	713890	054
	PDI-SG-S055	-9.3	7619660	713672	055
	PDI-SG-S056	-43	7619277	713511	056
	PDI-SG-S057	-45.8	7619774	713421	057
	PDI-SG-S058	-48.1	7620077	713408	058
	PDI-SG-S059	-45.9	7620409	713319	059
	PDI-SG-S060	-37.3	7620262	713165	060
	PDI-SG-S062	-12.4	7618175	712583	062
	PDI-SG-S063	NA	7618239	712310	063
	PDI-SG-S065	NA	7618588	711680	065
	PDI-SG-S067	-55.1	7619937	710436	067
	PDI-SG-S068	-50.2	7620270	710342	068
	PDI-SG-S069	-47.6	7620058	710152	069
	PDI-SG-S070	-9.7	7619684	710015	070
	PDI-SG-S071	-47.2	7620330	710026	071
	PDI-SG-S072	NA	7620015	709541	072

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			Easting	Northing	
SMA Targeted Samples and Co-Located Grab at Core Location	PDI-SG-S073	-47.3	7620604	709561	073
	PDI-SG-S074	NA	7620318	709147	074
	PDI-SG-S075	-51.7	7620889	709461	075
	PDI-SG-S076	-51.5	7620959	709255	076
	PDI-SG-S077	-46.9	7620850	709046	077
	PDI-SG-S078	-12.4	7620681	708690	078
	PDI-SG-S079	-29.8	7621671	709095	079
	PDI-SG-S080	NA	7620966	708437	080
	PDI-SG-S081	-47	7621546	708370	081
	PDI-SG-S083	-50.6	7621575	708068	083
	PDI-SG-S084	-46.2	7621841	708208	084
	PDI-SG-S085	NA	7622302	708577	085
	PDI-SG-S086	-50.8	7621839	707823	086
	PDI-SG-S087	-47.4	7622061	708071	087
	PDI-SG-S088	-36.9	7622381	708288	088
	PDI-SG-S089	NA	7622526	708389	089
	PDI-SG-S090	-50.9	7622191	707840	090
	PDI-SG-S091	-50.7	7622058	707626	091
	PDI-SG-S092	NA	7622708	708150	092
	PDI-SG-S093	-4.5	7622856	708004	093
	PDI-SG-S094	-44.3	7622108	707245	094
	PDI-SG-S096	-44.5	7622449	706903	096
	PDI-SG-S097	NA	7623213	707638	097
	PDI-SG-S098	-45.6	7622652	706761	098
	PDI-SG-S099	NA	7623366	707450	099
	PDI-SG-S100	-36.4	7623469	707231	100
	PDI-SG-S101	-33.7	7622807	706534	101
	PDI-SG-S102	-13.3	7622987	706298	102
	PDI-SG-S103	-39.8	7623053	706372	103
	PDI-SG-S104	-17.8	7623732	707137	104
	PDI-SG-S106	-28.4	7623244	706171	106
	PDI-SG-S107	-48.9	7623633	706523	107
	PDI-SG-S108	-11.3	7623957	706996	108
	PDI-SG-S109	-44.6	7623821	706068	109
	PDI-SG-S110	-45	7623993	706160	110
	PDI-SG-S111	-7.8	7624552	706646	111
	PDI-SG-S113	-40.5	7624300	705633	113
	PDI-SG-S114	-6.4	7624971	706403	114
	PDI-SG-S115	NA	7625201	706313	115
	PDI-SG-S116	-44	7624706	705476	116
	PDI-SG-S118	-36.1	7624857	705236	118
	PDI-SG-S119	NA	7625423	706206	119
	PDI-SG-S120	NA	7625707	706104	120
	PDI-SG-S122	NA	7625993	706004	122
	PDI-SG-S123	-46.2	7625575	705190	123
	PDI-SG-S124	NA	7626287	705943	124
	PDI-SG-S125	-47.2	7625815	704973	125
	PDI-SG-S126	-37.3	7626498	705490	126
	PDI-SG-S128	-44.5	7626449	705210	128
	PDI-SG-S130	-19.7	7626998	705809	130
	PDI-SG-S131	-31.6	7626896	705602	131
	PDI-SG-S132	-44.5	7626776	704896	132

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			Easting	Northing	
SMA Targeted Samples and Co-Located Grab at Core Location	PDI-SG-S133	-12.5	7627283	705707	133
	PDI-SG-S134	-10.6	7627197	705454	134
	PDI-SG-S135	-11.1	7626327	704104	135
	PDI-SG-S136	NA	7626540	703725	136
	PDI-SG-S137	-30.7	7626783	703799	137
	PDI-SG-S138	NA	7626673	703543	138
	PDI-SG-S139	-7.4	7627058	703340	139
	PDI-SG-S141	-31.1	7627417	703217	141
	PDI-SG-S142	NA	7627256	702997	142
	PDI-SG-S143	NA	7628385	704100	143
	PDI-SG-S144	NA	7628759	704113	144
	PDI-SG-S145	-4.4	7628619	703925	145
	PDI-SG-S146	-16.4	7627591	702895	146
	PDI-SG-S147	NA	7628828	703729	147
	PDI-SG-S148	-32.4	7627852	702736	148
	PDI-SG-S149	NA	7629051	703558	149
	PDI-SG-S150	-21.9	7628009	702448	150
	PDI-SG-S151	-28.8	7628124	702358	151
	PDI-SG-S152	-5.5	7629314	703467	152
	PDI-SG-S153	-19.5	7628346	702019	153
	PDI-SG-S155	NA	7628616	701528	155
	PDI-SG-S156	NA	7628438	701361	156
	PDI-SG-S157	-37.9	7628992	700979	157
	PDI-SG-S158	-37.5	7629029	701024	158
	PDI-SG-S159	-35.7	7629045	700755	159
	PDI-SG-S160	-34.7	7628840	700428	160
	PDI-SG-S161	-43.8	7629277	700786	161
	PDI-SG-S162	-30	7629439	700574	162
	PDI-SG-S163	-25.8	7629268	700351	163
	PDI-SG-S164	NA	7630027	699987	164
	PDI-SG-S165	-22.3	7630320	699720	165
	PDI-SG-S166	NA	7630506	699311	166
	PDI-SG-S167	NA	7631607	700516	167
	PDI-SG-S168	-57.2	7631788	700712	168
	PDI-SG-S169	-35.7	7632329	701316	169
	PDI-SG-S170	-32.8	7632550	701508	170
	PDI-SG-S171	-38.2	7632034	700860	171
	PDI-SG-S172	-13.1	7633011	701894	172
	PDI-SG-S173	-35.8	7632837	701597	173
	PDI-SG-S174	-33.7	7632356	701007	174
	PDI-SG-S175	NA	7631874	700471	175
	PDI-SG-S176	-43.3	7632595	701150	176
	PDI-SG-S177	-27.1	7633185	701784	177
	PDI-SG-S178	-34.4	7632913	701344	178
	PDI-SG-S179	-41.5	7632407	700714	179
	PDI-SG-S180	-34.8	7633170	701487	180
	PDI-SG-S181	-43.9	7632004	699996	181
	PDI-SG-S182	-6.6	7632396	700483	182
	PDI-SG-S183	NA	7632704	700805	183
	PDI-SG-S184	-41.3	7632961	700962	184
	PDI-SG-S186	-24.4	7633614	701703	186
	PDI-SG-S187	NA	7633179	701189	187
	PDI-SG-S190	NA	7630934	698949	190
	PDI-SG-S191	-47.5	7632893	700639	191
	PDI-SG-S193	-26.3	7633802	701391	193
	PDI-SG-S194	-33.4	7633678	701116	194
	PDI-SG-S195	-19.1	7631432	698399	195
	PDI-SG-S196	NA	7631252	698149	196
	PDI-SG-S197	-25.3	7631721	698305	197
	PDI-SG-S198	-33.3	7633962	701062	198

Table 2. Station Location Coordinates, Target Depth, and Identification Scheme
Portland Harbor PDI Surface Sediment FSP, rev 2
Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
SMA Targeted Samples and Co-Located Grab at Core Location	PDI-SG-S199	-13.8	7634144	701259	199
	PDI-SG-S200	-30.6	7634163	700983	200
	PDI-SG-S201	-32.3	7633972	700775	201
	PDI-SG-S202	-25	7631941	698098	202
	PDI-SG-S203	-34.6	7634189	700562	203
	PDI-SG-S204	-17.6	7634615	700796	204
	PDI-SG-S205	-11.9	7632159	697892	205
	PDI-SG-S206	NA	7631956	697409	206
	PDI-SG-S207	-15.8	7632379	697684	207
	PDI-SG-S208	-31.8	7634586	700378	208
	PDI-SG-S209	-16.2	7632574	697493	209
	PDI-SG-S210	NA	7632397	697248	210
	PDI-SG-S211	-33	7634779	700167	211
	PDI-SG-S212	-18.4	7632756	697314	212
	PDI-SG-S213	-31.8	7634983	700092	213
	PDI-SG-S214	-4.1	7635223	700364	214
	PDI-SG-S215	-32.6	7635087	699825	215
	PDI-SG-S216	-27.1	7635297	699937	216
	PDI-SG-S217	-27.8	7633143	697043	217
	PDI-SG-S218	NA	7633085	696850	218
	PDI-SG-S220	-25.5	7635617	699935	220
	PDI-SG-S221	-28.8	7633359	696915	221
	PDI-SG-S222	-13.4	7633418	696809	222
	PDI-SG-S223	-23.8	7635704	699685	223
	PDI-SG-S224	-11.8	7635931	699879	224
	PDI-SG-S225	-22.4	7635739	699425	225
	PDI-SG-S226	NA	7633678	696608	226
	PDI-SG-S227	-16.2	7634098	696454	227
	PDI-SG-S228	-17.1	7635600	697286	228
	PDI-SG-S229	NA	7635857	699176	229
	PDI-SG-S230	-22.9	7636127	699519	230
	PDI-SG-S231	-22.2	7636042	699322	231
	PDI-SG-S233	-20.1	7636405	699406	233
	PDI-SG-S234	-18.8	7636304	698915	234
	PDI-SG-S235	-17.3	7636477	699071	235
	PDI-SG-S236	-15.4	7636643	699218	236
	PDI-SG-S237	-22.7	7634664	696105	237
	PDI-SG-S238	-14.1	7636449	698735	238
	PDI-SG-S239	-13.7	7636758	698960	239
	PDI-SG-S240	NA	7636937	699124	240
	PDI-SG-S241	-11	7636654	698746	241
	PDI-SG-S242	NA	7636706	698453	242
	PDI-SG-S243	-19.7	7635786	697155	243
	PDI-SG-S244	-17.3	7635278	695745	244
	PDI-SG-S246	-16.7	7635733	695498	246
	PDI-SG-S247	-19.5	7636119	695232	247
	PDI-SG-S248	-20.4	7636288	695193	248
	PDI-SG-S249	-18.3	7636390	695093	249
	PDI-SG-S250	-19.8	7636627	695075	250
	PDI-SG-S252	-19.4	7637602	696023	252
	PDI-SG-S253	-14.8	7637107	694683	253
	PDI-SG-S254	-23.4	7637333	694599	254
	PDI-SG-S255	NA	7637134	694050	255
	PDI-SG-S256	NA	7637282	694037	256
	PDI-SG-S257	-16.8	7637494	694351	257
	PDI-SG-S258	-28.7	7639814	694669	258

Table 2. Station Location Coordinates, Target Depth, and Identification Scheme
Portland Harbor PDI Surface Sediment FSP, rev 2
Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
SMA Targeted Samples and Co-Located Grab at Core Location	PDI-SG-S259	-35.7	7640001	694254	259
	PDI-SG-S261	-20.3	7639895	692464	261
	PDI-SG-S262	-2.6	7641772	691789	262
	PDI-SG-S263	NA	7642066	691478	263
	-- [d]				
	-- [d]				
	-- [d]				
	-- [d]				
	-- [d]				

General Notes:
1. All surface sediment samples have a target depth of 30 cm.
2. Conversion From CRD to NAVD88: Elevation (CRD) +5.38=NAVD88 (Geoid 12b)
3. NA = not available

Footnotes:
a) Vertical Datum: CRD (Columbia River Datum; Feet); based on 2009 NOAA bathymetry
b) Horizontal Projection: NAD 1983 (2011) State Plane Coordinate System (SPCC) Oregon North Zone (Intl Feet)
c) Upriver surface sediment samples target fine grain materials and locations were adjusted in June 2018 after completion of the soft sediment probing survey/field reconnaissance. Location may be further adjusted in field to reflect field conditions.
d) Five SMA Locations samples pulled from River Mile 11E area.

Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 1 Locations
Portland Harbor PDI Surface Sediment FSP
Portland, OR

Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B001-BL1	-10.3	7616297	726267	001
	PDI-SG-B002-BL1	-46.4	7616849	725515	002
	PDI-SG-B003-BL1	-28.5	7617854	725354	003
	PDI-SG-B004-BL1	-43.6	7617500	725361	004
	PDI-SG-B005-BL1	-48.0	7616855	725268	005
	PDI-SG-B006-BL1	-40.3	7616564	725690	006
	PDI-SG-B007-BL1	-42.3	7617410	725033	007
	PDI-SG-B008-BL1	-6.3	7616042	725915	008
	PDI-SG-B009-BL1	-45.9	7617206	724940	009
	PDI-SG-B010-BL1	NA	7615768	725446	010
	PDI-SG-B011-BL1	-34.7	7616917	724557	011
	PDI-SG-B012-BL1	-10.9	7615769	725274	012
	PDI-SG-B013-BL1	-47.6	7616339	724499	013
	PDI-SG-B014-BL1	-36.2	7617096	724240	014
	PDI-SG-B015-BL1	-39.9	7616844	724826	015
	PDI-SG-B016-BL1	NA	7615513	724995	016
	PDI-SG-B017-BL1	-36.5	7617158	723920	017
	PDI-SG-B018-BL1	-40.5	7615801	724387	018
	PDI-SG-B019-BL1	-20.9	7615574	724183	019
	PDI-SG-B020-BL1	-35.9	7616628	724203	020
	PDI-SG-B021-BL1	NA	7617203	723607	021
	PDI-SG-B022-BL1	-45.7	7615908	723609	022
	PDI-SG-B023-BL1	NA	7615083	723488	023
	PDI-SG-B024-BL1	-35.4	7616641	723278	024
	PDI-SG-B025-BL1	-49.1	7615991	722711	025
	PDI-SG-B026-BL1	-40.1	7615653	722899	026
	PDI-SG-B027-BL1	NA	7615223	723118	027
	PDI-SG-B028-BL1	-20.2	7616991	723001	028
	PDI-SG-B029-BL1	-31.3	7615565	722963	029
	PDI-SG-B030-BL1	-26.7	7616896	722558	030
	PDI-SG-B031-BL1	-44.4	7616369	722248	031
	PDI-SG-B032-BL1	NA	7615149	722412	032
	PDI-SG-B033-BL1	-54.6	7615519	721926	033
	PDI-SG-B034-BL1	-22.0	7616786	722026	034
	PDI-SG-B035-BL1	-54.3	7615498	721914	035
	PDI-SG-B036-BL1	-45.1	7616426	721790	036
	PDI-SG-B037-BL1	-44.5	7616164	721899	037
	PDI-SG-B038-BL1	-38.9	7616389	721311	038
	PDI-SG-B039-BL1	-50.0	7615778	721836	039
	PDI-SG-B040-BL1	-12.9	7615334	721260	040
	PDI-SG-B041-BL1	-31.3	7615605	720898	041
	PDI-SG-B042-BL1	-33.9	7616749	721094	042
	PDI-SG-B043-BL1	-32.9	7615729	720572	043
	PDI-SG-B044-BL1	-28.2	7616782	720950	044
	PDI-SG-B045-BL1	-44.6	7616049	720423	045
	PDI-SG-B046-BL1	-42.3	7616308	720803	046
	PDI-SG-B047-BL1	-40.1	7616643	720540	047
	PDI-SG-B048-BL1	-35.0	7613984	720179	048
	PDI-SG-B049-BL1	NA	7612944	720100	049
	PDI-SG-B050-BL1	-29.9	7615695	720391	050
	PDI-SG-B051-BL1	-36.4	7616805	720117	051
	PDI-SG-B052-BL1	-50.5	7614482	720154	052
	PDI-SG-B053-BL1	-26.8	7615757	719873	053
	PDI-SG-B054-BL1	-33.5	7616869	719765	054
	PDI-SG-B055-BL1	-36.6	7615895	719504	055
	PDI-SG-B056-BL1	-44.6	7616611	719210	056

Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 1 Locations
Portland Harbor PDI Surface Sediment FSP
Portland, OR

Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B057-BL1	-27.5	7615773	719033	057
	PDI-SG-B058-BL1	-43.4	7616149	719108	058
	PDI-SG-B059-BL1	NA	7616905	719613	059
	PDI-SG-B060-BL1	-37.7	7616009	719057	060
	PDI-SG-B061-BL1	-45.0	7616693	719148	061
	PDI-SG-B062-BL1	-44.8	7616823	719131	062
	PDI-SG-B063-BL1	NA	7617180	718876	063
	PDI-SG-B064-BL1	-36.9	7616141	718527	064
	PDI-SG-B065-BL1	-38.6	7616210	718363	065
	PDI-SG-B066-BL1	-45.4	7616248	719101	066
	PDI-SG-B067-BL1	-19.9	7617258	718458	067
	PDI-SG-B068-BL1	-25.5	7617352	718103	068
	PDI-SG-B069-BL1	-47.7	7616804	717715	069
	PDI-SG-B070-BL1	-14.6	7615880	717800	070
	PDI-SG-B071-BL1	-20.7	7616003	717525	071
	PDI-SG-B072-BL1	-49.0	7617228	717247	072
	PDI-SG-B073-BL1	-34.5	7617517	717639	073
	PDI-SG-B074-BL1	-34.7	7616374	717119	074
	PDI-SG-B075-BL1	-23.9	7617601	717531	075
	PDI-SG-B076-BL1	NA	7617992	717010	076
	PDI-SG-B077-BL1	-38.2	7618188	717198	077
	PDI-SG-B078-BL1	-17.9	7619632	717194	078
	PDI-SG-B079-BL1	-44.7	7616946	716482	079
	PDI-SG-B080-BL1	-21.2	7616325	716794	080
	PDI-SG-B081-BL1	NA	7616382	716517	081
	PDI-SG-B082-BL1	-30.1	7617812	716949	082
	PDI-SG-B083-BL1	NA	7616475	716231	083
	PDI-SG-B084-BL1	-30.8	7617942	716565	084
	PDI-SG-B085-BL1	-38.2	7617757	716683	085
	PDI-SG-B086-BL1	-47.4	7617775	716333	086
	PDI-SG-B087-BL1	-7.8	7618182	716263	087
	PDI-SG-B088-BL1	NA	7616579	715707	088
	PDI-SG-B089-BL1	NA	7618361	715905	089
	PDI-SG-B090-BL1	-26.2	7616944	715260	090
	PDI-SG-B091-BL1	NA	7616900	715151	091
	PDI-SG-B092-BL1	-50.8	7617662	715361	092
	PDI-SG-B093-BL1	-43.2	7617632	714649	093
	PDI-SG-B094-BL1	NA	7618392	715792	094
	PDI-SG-B095-BL1	-61.1	7618207	715285	095
	PDI-SG-B096-BL1	NA	7617072	714713	096
	PDI-SG-B097-BL1	-50.0	7618459	715355	097
	PDI-SG-B098-BL1	-22.5	7617239	714485	098
	PDI-SG-B099-BL1	-37.4	7618614	715082	099
	PDI-SG-B100-BL1	-36.5	7618823	714624	100
	PDI-SG-B101-BL1	-5.9	7619258	714741	101
	PDI-SG-B102-BL1	-27.7	7620345	714536	102
	PDI-SG-B103-BL1	-23.2	7617430	714230	103
	PDI-SG-B104-BL1	NA	7617413	713849	104
	PDI-SG-B105-BL1	-35.4	7618989	714477	105
	PDI-SG-B106-BL1	NA	7617598	713405	106
	PDI-SG-B107-BL1	-5.5	7619241	713959	107
	PDI-SG-B108-BL1	-29.9	7618952	714213	108
	PDI-SG-B109-BL1	-12.9	7619345	713819	109
	PDI-SG-B110-BL1	-7.7	7617870	713160	110
	PDI-SG-B111-BL1	-58.9	7618306	713544	111
	PDI-SG-B112-BL1	NA	7617964	712923	112
	PDI-SG-B113-BL1	-49.1	7618331	712890	113

Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 1 Locations
Portland Harbor PDI Surface Sediment FSP
Portland, OR

Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B114-BL1	-17.5	7619484	713612	114
	PDI-SG-B115-BL1	NA	7618239	712351	115
	PDI-SG-B116-BL1	-18.2	7619621	713082	116
	PDI-SG-B117-BL1	NA	7619729	713067	117
	PDI-SG-B118-BL1	-73.1	7619108	712428	118
	PDI-SG-B119-BL1	NA	7618352	711986	119
	PDI-SG-B120-BL1	-23.9	7619662	712854	120
	PDI-SG-B121-BL1	-35.3	7619780	712470	121
	PDI-SG-B122-BL1	NA	7618596	711645	122
	PDI-SG-B123-BL1	-48.1	7619057	711845	123
	PDI-SG-B124-BL1	-68.7	7619610	711692	124
	PDI-SG-B125-BL1	-41.0	7619834	712319	125
	PDI-SG-B126-BL1	NA	7618590	711555	126
	PDI-SG-B127-BL1	-40.5	7620027	711904	127
	PDI-SG-B128-BL1	-34.7	7618988	711177	128
	PDI-SG-B129-BL1	-20.0	7619094	710898	129
	PDI-SG-B130-BL1	-14.4	7620397	711471	130
	PDI-SG-B131-BL1	NA	7620581	711191	131
	PDI-SG-B132-BL1	-76.8	7619912	710893	132
	PDI-SG-B133-BL1	-28.7	7619339	710563	133
	PDI-SG-B134-BL1	NA	7620638	711113	134
	PDI-SG-B135-BL1	NA	7619455	710193	135
	PDI-SG-B136-BL1	-51.2	7619662	710795	136
	PDI-SG-B137-BL1	-7.7	7619640	710054	137
	PDI-SG-B138-BL1	NA	7620693	710782	138
	PDI-SG-B139-BL1	NA	7619884	709724	139
	PDI-SG-B140-BL1	-47.8	7620072	710169	140
	PDI-SG-B141-BL1	-24.5	7620915	710479	141
	PDI-SG-B142-BL1	-24.4	7621116	710132	142
	PDI-SG-B143-BL1	-49.0	7620341	710250	143
	PDI-SG-B144-BL1	-4.2	7620065	709524	144
	PDI-SG-B145-BL1	-23.6	7621355	709674	145
	PDI-SG-B146-BL1	-47.4	7620841	708955	146
	PDI-SG-B147-BL1	-35.7	7620436	709164	147
	PDI-SG-B148-BL1	-4.5	7621552	709475	148
	PDI-SG-B149-BL1	-31.5	7620543	708978	149
	PDI-SG-B150-BL1	-47.5	7621459	709214	150
	PDI-SG-B151-BL1	-28.4	7621699	709070	151
	PDI-SG-B152-BL1	-12.2	7620749	708600	152
	PDI-SG-B153-BL1	-24.8	7621047	708379	153
	PDI-SG-B154-BL1	-29.2	7621778	708985	154
	PDI-SG-B155-BL1	NA	7622181	708862	155
	PDI-SG-B156-BL1	-45.4	7621857	708529	156
	PDI-SG-B157-BL1	-4.6	7621364	707873	157
	PDI-SG-B158-BL1	-38.4	7621546	707903	158
	PDI-SG-B159-BL1	-40.3	7622261	708387	159
	PDI-SG-B160-BL1	NA	7621588	707642	160
	PDI-SG-B161-BL1	-16.9	7621810	707492	161
	PDI-SG-B162-BL1	-41.7	7622443	708192	162
	PDI-SG-B163-BL1	-37.3	7622415	708247	163
	PDI-SG-B164-BL1	-41.0	7622702	707915	164
	PDI-SG-B165-BL1	NA	7621907	707222	165
	PDI-SG-B166-BL1	-46.1	7622416	706944	166
	PDI-SG-B167-BL1	-23.4	7622900	707843	167
	PDI-SG-B168-BL1	-51.1	7622108	707771	168
	PDI-SG-B169-BL1	-46.1	7623217	707262	169
	PDI-SG-B170-BL1	-39.6	7622580	706752	170

Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 1 Locations
Portland Harbor PDI Surface Sediment FSP
Portland, OR

Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B171-BL1	-10.6	7623606	707241	171
	PDI-SG-B172-BL1	-13.5	7622825	706383	172
	PDI-SG-B173-BL1	-45.6	7623002	707130	173
	PDI-SG-B174-BL1	-5.3	7623077	706156	174
	PDI-SG-B175-BL1	-49.8	7623630	706892	175
	PDI-SG-B176-BL1	-44.0	7622839	706948	176
	PDI-SG-B177-BL1	-55.5	7623732	706793	177
	PDI-SG-B178-BL1	-34.7	7623572	705975	178
	PDI-SG-B179-BL1	-4.9	7623691	705841	179
	PDI-SG-B180-BL1	NA	7624389	706839	180
	PDI-SG-B181-BL1	-43.1	7623982	706093	181
	PDI-SG-B182-BL1	-27.2	7624168	705606	182
	PDI-SG-B183-BL1	-45.6	7624072	706158	183
	PDI-SG-B184-BL1	-43.9	7624353	706532	184
	PDI-SG-B185-BL1	-4.0	7625025	706396	185
	PDI-SG-B186-BL1	NA	7624314	705468	186
	PDI-SG-B187-BL1	-46.3	7624640	705682	187
	PDI-SG-B188-BL1	-43.5	7625117	705548	188
	PDI-SG-B189-BL1	-5.8	7624686	705247	189
	PDI-SG-B190-BL1	-44.2	7625131	705881	190
	PDI-SG-B191-BL1	-43.1	7625377	705715	191
	PDI-SG-B192-BL1	-24.5	7624990	705117	192
	PDI-SG-B193-BL1	-30.8	7625333	704949	193
	PDI-SG-B194-BL1	-44.8	7625760	705235	194
	PDI-SG-B195-BL1	-44.8	7625710	705668	195
	PDI-SG-B196-BL1	-46.3	7625417	705068	196
	PDI-SG-B197-BL1	-14.0	7626325	705804	197
	PDI-SG-B198-BL1	-5.3	7625635	704682	198
	PDI-SG-B199-BL1	-9.5	7625896	704516	199
	PDI-SG-B200-BL1	-43.0	7626435	705410	200
	PDI-SG-B201-BL1	-30.2	7626226	704387	201
	PDI-SG-B202-BL1	-46.2	7626994	704306	202
	PDI-SG-B203-BL1	-29.1	7626977	705695	203
	PDI-SG-B204-BL1	-17.3	7626976	705342	204
	PDI-SG-B205-BL1	-23.4	7626327	704208	205
	PDI-SG-B206-BL1	-41.6	7626733	704114	206
	PDI-SG-B207-BL1	-18.6	7626468	703985	207
	PDI-SG-B208-BL1	-43.1	7627000	704700	208
	PDI-SG-B209-BL1	NA	7626606	703549	209
	PDI-SG-B210-BL1	-52.2	7627753	703694	210
	PDI-SG-B211-BL1	-47.0	7627475	704409	211
	PDI-SG-B212-BL1	-39.4	7626959	703821	212
	PDI-SG-B213-BL1	NA	7626792	703404	213
	PDI-SG-B214-BL1	NA	7628078	704707	214
	PDI-SG-B215-BL1	NA	7628407	704300	215
	PDI-SG-B216-BL1	NA	7627226	703070	216
	PDI-SG-B217-BL1	-51.5	7628326	703631	217
	PDI-SG-B218-BL1	-10.3	7627383	703060	218
	PDI-SG-B219-BL1	-6.2	7627587	702830	219
	PDI-SG-B220-BL1	-44.6	7627773	703424	220
	PDI-SG-B221-BL1	-29.7	7628763	703619	221
	PDI-SG-B222-BL1	-39.0	7628152	702712	222
	PDI-SG-B223-BL1	-25.3	7628035	702442	223
	PDI-SG-B224-BL1	-61.1	7628776	703100	224
	PDI-SG-B225-BL1	-27.8	7628279	702194	225
	PDI-SG-B226-BL1	-7.2	7629520	703375	226
	PDI-SG-B227-BL1	-37.0	7628284	702469	227

Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 1 Locations
Portland Harbor PDI Surface Sediment FSP
Portland, OR

Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B228-BL1	-57.3	7629000	702637	228
	PDI-SG-B229-BL1	-33.1	7629531	702755	229
	PDI-SG-B230-BL1	NA	7628304	701974	230
	PDI-SG-B231-BL1	-34.4	7629661	702720	231
	PDI-SG-B232-BL1	NA	7628429	701346	232
	PDI-SG-B233-BL1	-25.3	7629954	702547	233
	PDI-SG-B234-BL1	-49.1	7629457	701751	234
	PDI-SG-B235-BL1	-47.4	7629516	701505	235
	PDI-SG-B236-BL1	-23.5	7628541	700944	236
	PDI-SG-B237-BL1	-24.6	7628738	700917	237
	PDI-SG-B238-BL1	-15.9	7630359	702347	238
	PDI-SG-B239-BL1	-35.7	7628900	700699	239
	PDI-SG-B240-BL1	-17.4	7630541	702134	240
	PDI-SG-B241-BL1	-34.3	7629336	700607	241
	PDI-SG-B242-BL1	-38.0	7630159	700525	242
	PDI-SG-B243-BL1	-26.2	7630908	701873	243
	PDI-SG-B244-BL1	-9.0	7631206	701808	244
	PDI-SG-B245-BL1	-21.1	7629543	700307	245
	PDI-SG-B246-BL1	-12.7	7629834	700147	246
	PDI-SG-B247-BL1	-48.4	7630880	701414	247
	PDI-SG-B248-BL1	NA	7631610	701664	248
	PDI-SG-B249-BL1	-29.3	7631876	701548	249
	PDI-SG-B250-BL1	-25.7	7630763	699446	250
	PDI-SG-B251-BL1	NA	7629940	699941	251
	PDI-SG-B252-BL1	-37.3	7632150	701358	252
	PDI-SG-B253-BL1	NA	7630290	699608	253
	PDI-SG-B254-BL1	-32.4	7632951	701295	254
	PDI-SG-B255-BL1	-44.8	7632388	700928	255
	PDI-SG-B256-BL1	-38.0	7631768	701156	256
	PDI-SG-B257-BL1	-8.0	7630585	699330	257
	PDI-SG-B258-BL1	-45.9	7631731	700332	258
	PDI-SG-B259-BL1	-37.6	7631959	700949	259
	PDI-SG-B260-BL1	-35.0	7632393	701502	260
	PDI-SG-B261-BL1	-44.1	7632015	700028	261
	PDI-SG-B262-BL1	-21.3	7630945	699100	262
	PDI-SG-B263-BL1	-17.2	7633045	701877	263
	PDI-SG-B264-BL1	-58.6	7632205	700345	264
	PDI-SG-B265-BL1	NA	7633557	701820	265
	PDI-SG-B266-BL1	-41.1	7632090	699990	266
	PDI-SG-B267-BL1	-26.4	7631047	699283	267
	PDI-SG-B268-BL1	-6.7	7630958	699011	268
	PDI-SG-B269-BL1	-21.2	7631350	698694	269
	PDI-SG-B270-BL1	-45.5	7631586	699514	270
	PDI-SG-B271-BL1	-33.0	7633621	701157	271
	PDI-SG-B272-BL1	-39.9	7632271	699844	272
	PDI-SG-B273-BL1	-31.2	7633878	701184	273
	PDI-SG-B274-BL1	-43.3	7632672	699435	274
	PDI-SG-B275-BL1	-9.8	7631463	698121	275
	PDI-SG-B276-BL1	-46.0	7632734	699318	276
	PDI-SG-B277-BL1	NA	7631596	697685	277
	PDI-SG-B278-BL1	-46.0	7632938	699177	278
	PDI-SG-B279-BL1	NA	7634314	701174	279
	PDI-SG-B280-BL1	-32.6	7634403	700661	280
	PDI-SG-B281-BL1	-46.1	7633118	699047	281
	PDI-SG-B282-BL1	-24.1	7632036	698080	282
	PDI-SG-B283-BL1	-11.0	7632022	697636	283
	PDI-SG-B284-BL1	NA	7634982	700544	284

Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 1 Locations
Portland Harbor PDI Surface Sediment FSP
Portland, OR

Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B285-BL1	-44.6	7633382	698841	285
	PDI-SG-B286-BL1	-11.0	7632508	697411	286
	PDI-SG-B287-BL1	-36.2	7633437	697821	287
	PDI-SG-B288-BL1	-28.7	7635021	700393	288
	PDI-SG-B289-BL1	-37.1	7633703	698653	289
	PDI-SG-B290-BL1	-17.0	7632670	697417	290
	PDI-SG-B291-BL1	NA	7632925	696983	291
	PDI-SG-B292-BL1	-33.6	7633135	697398	292
	PDI-SG-B293-BL1	-34.2	7633945	698507	293
	PDI-SG-B294-BL1	-28.6	7635134	700095	294
	PDI-SG-B295-BL1	-41.2	7633858	697734	295
	PDI-SG-B296-BL1	-25.1	7635598	699716	296
	PDI-SG-B297-BL1	-13.9	7634164	698435	297
	PDI-SG-B298-BL1	NA	7633207	696721	298
	PDI-SG-B299-BL1	NA	7633542	696706	299
	PDI-SG-B300-BL1	-27.8	7633726	696955	300
	PDI-SG-B301-BL1	-35.7	7634416	698095	301
	PDI-SG-B302-BL1	-22.7	7635743	699438	302
	PDI-SG-B303-BL1	-22.0	7636058	699290	303
	PDI-SG-B304-BL1	-5.0	7634762	697981	304
	PDI-SG-B305-BL1	-5.4	7633851	696555	305
	PDI-SG-B306-BL1	-35.7	7634777	696880	306
	PDI-SG-B307-BL1	-8.5	7634976	697807	307
	PDI-SG-B308-BL1	-20.8	7636221	699076	308
	PDI-SG-B309-BL1	-15.6	7634299	696336	309
	PDI-SG-B310-BL1	NA	7634510	696095	310
	PDI-SG-B311-BL1	-38.9	7635111	696739	311
	PDI-SG-B312-BL1	-23.2	7635472	697356	312
	PDI-SG-B313-BL1	-17.6	7636540	699215	313
	PDI-SG-B314-BL1	-21.9	7635730	697181	314
	PDI-SG-B315-BL1	NA	7636601	698507	315
	PDI-SG-B316-BL1	-22.6	7634997	695902	316
	PDI-SG-B317-BL1	-14.0	7635241	695748	317
	PDI-SG-B318-BL1	-70.3	7636337	696318	318
	PDI-SG-B319-BL1	-22.6	7635871	697086	319
	PDI-SG-B320-BL1	-37.7	7636109	696825	320
	PDI-SG-B321-BL1	-15.1	7635585	695777	321
	PDI-SG-B322-BL1	-13.2	7635804	695680	322
	PDI-SG-B323-BL1	-12.4	7635602	695878	323
	PDI-SG-B324-BL1	-15.1	7636514	696737	324
	PDI-SG-B325-BL1	-17.0	7636089	695415	325
	PDI-SG-B326-BL1	-11.4	7636802	696510	326
	PDI-SG-B327-BL1	-13.2	7636423	695328	327
	PDI-SG-B328-BL1	-26.5	7637025	696303	328
	PDI-SG-B329-BL1	-26.1	7636525	695511	329
	PDI-SG-B330-BL1	-59.4	7636655	695903	330
	PDI-SG-B331-BL1	-6.3	7637493	696154	331
	PDI-SG-B332-BL1	-14.9	7636709	695129	332
	PDI-SG-B333-BL1	-16.2	7637109	694796	333
	PDI-SG-B334-BL1	-41.5	7637917	694962	334
	PDI-SG-B335-BL1	-22.0	7637560	696045	335
	PDI-SG-B336-BL1	-5.9	7638008	695794	336
	PDI-SG-B337-BL1	NA	7637308	694265	337
	PDI-SG-B338-BL1	NA	7637218	694036	338
	PDI-SG-B339-BL1	-21.2	7638292	695567	339
	PDI-SG-B340-BL1	-73.0	7637468	695561	340
	PDI-SG-B341-BL1	NA	7638752	695596	341

Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 1 Locations
Portland Harbor PDI Surface Sediment FSP
Portland, OR

Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B342-BL1	-32.6	7638052	694352	342
	PDI-SG-B343-BL1	-42.0	7638870	695039	343
	PDI-SG-B344-BL1	-31.4	7638100	694279	344
	PDI-SG-B345-BL1	NA	7638943	695432	345
	PDI-SG-B346-BL1	-44.2	7638921	694425	346
	PDI-SG-B347-BL1	-30.4	7639287	695013	347
	PDI-SG-B348-BL1	-36.2	7638526	693890	348
	PDI-SG-B349-BL1	-37.7	7638628	693823	349
	PDI-SG-B350-BL1	-57.0	7639115	694609	350
	PDI-SG-B351-BL1	-33.5	7639680	694816	351
	PDI-SG-B352-BL1	-40.9	7639002	694041	352
	PDI-SG-B353-BL1	-34.7	7639893	694463	353
	PDI-SG-B354-BL1	-37.0	7638959	693511	354
	PDI-SG-B355-BL1	-36.4	7639967	694273	355
	PDI-SG-B356-BL1	-38.8	7639166	693320	356
	PDI-SG-B357-BL1	-34.8	7639616	692934	357
	PDI-SG-B358-BL1	-38.0	7639347	693110	358
	PDI-SG-B359-BL1	-7.9	7640381	693730	359
	PDI-SG-B360-BL1	-46.4	7640298	692876	360
	PDI-SG-B361-BL1	-34.9	7640344	693661	361
	PDI-SG-B362-BL1	-39.6	7639499	692970	362
	PDI-SG-B363-BL1	-22.9	7639728	692697	363
	PDI-SG-B364-BL1	-19.0	7640580	693294	364
	PDI-SG-B365-BL1	-27.6	7640746	692986	365
	PDI-SG-B366-BL1	-47.7	7640467	692523	366
	PDI-SG-B367-BL1	-26.8	7640030	692318	367
	PDI-SG-B368-BL1	-30.6	7640300	691987	368
	PDI-SG-B369-BL1	-21.9	7640908	692807	369
	PDI-SG-B370-BL1	-46.9	7640387	692795	370
	PDI-SG-B371-BL1	-27.0	7640543	691695	371
	PDI-SG-B372-BL1	-15.7	7641138	692546	372
	PDI-SG-B373-BL1	-10.8	7641473	692143	373
	PDI-SG-B374-BL1	-21.6	7640545	691657	374
	PDI-SG-B375-BL1	-38.4	7641472	691917	375
	PDI-SG-B376-BL1	-29.1	7641615	691868	376
	PDI-SG-B377-BL1	-24.8	7640912	691177	377
	PDI-SG-B378-BL1	-49.9	7641355	691109	378
	PDI-SG-B379-BL1	-16.2	7641936	691546	379
	PDI-SG-B380-BL1	-23.4	7640960	690922	380
	PDI-SG-B381-BL1	-24.9	7642148	691227	381
	PDI-SG-B382-BL1	-21.7	7641386	690629	382
	PDI-SG-B383-BL1	-14.5	7641450	690513	383
	PDI-SG-B384-BL1	-56.4	7641737	690887	384
	PDI-SG-B385-BL1	-6.6	7642296	691122	385
	PDI-SG-B386-BL1	-20.4	7642481	690816	386
	PDI-SG-B387-BL1	-19.3	7641763	690228	387
	PDI-SG-B388-BL1	-38.5	7642076	691180	388
	PDI-SG-B389-BL1	-26.8	7642749	690473	389
	PDI-SG-B390-BL1	-29.6	7641963	690046	390
	PDI-SG-B391-BL1	-50.2	7642934	689975	391
	PDI-SG-B392-BL1	-38.4	7642997	690188	392
	PDI-SG-B393-BL1	-10.6	7642177	689706	393
	PDI-SG-B394-BL1	-42.4	7642887	689481	394
	PDI-SG-B395-BL1	-13.8	7642676	689276	395
	PDI-SG-B396-BL1	-21.2	7643226	690031	396
	PDI-SG-B397-BL1	-6.6	7642709	689208	397
	PDI-SG-B398-BL1	-26.6	7643598	689760	398

Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 1 Locations
Portland Harbor PDI Surface Sediment FSP
Portland, OR

Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B399-BL1	-45.9	7643700	689216	399
	PDI-SG-B400-BL1	-15.7	7643673	689754	400
	PDI-SG-B401-BL1	-36.3	7642871	689372	401
	PDI-SG-B402-BL1	NA	7643154	688757	402
	PDI-SG-B403-BL1	NA	7643347	688553	403
	PDI-SG-B404-BL1	-43.6	7643898	689427	404
	PDI-SG-B405-BL1	-32.4	7644273	689174	405
	PDI-SG-B406-BL1	NA	7643524	688419	406
	PDI-SG-B407-BL1	-9.7	7643961	688075	407
	PDI-SG-B408-BL1	-33.4	7644503	689106	408
	PDI-SG-B409-BL1	-43.5	7643868	688917	409
	PDI-SG-B410-BL1	-39.5	7644733	688742	410
	PDI-SG-B411-BL1	NA	7643958	687997	411
	PDI-SG-B412-BL1	-34.1	7644261	687971	412
	PDI-SG-B413-BL1	-21.3	7644266	687765	413
	PDI-SG-B414-BL1	-26.4	7644908	688391	414
	PDI-SG-B415-BL1	-46.5	7644666	688185	415
	PDI-SG-B416-BL1	-38.4	7644654	687490	416
	PDI-SG-B417-BL1	-36.7	7644446	687771	417
	PDI-SG-B418-BL1	-29.1	7645044	688139	418
	PDI-SG-B419-BL1	-41.9	7644913	687516	419
	PDI-SG-B420-BL1	-42.0	7644990	687592	420
	PDI-SG-B421-BL1	-30.2	7644753	687247	421
	PDI-SG-B422-BL1	-41.1	7645212	687531	422
	PDI-SG-B423-BL1	-53.0	7645302	687205	423
	PDI-SG-B424-BL1	-47.2	7644960	687135	424
	PDI-SG-B425-BL1	NA	7645158	686736	425
	PDI-SG-B426-BL1	-57.1	7645413	687129	426
	PDI-SG-B427-BL1	-66.3	7645825	686742	427
	PDI-SG-B428-BL1	-36.6	7645498	686477	428

General Notes:
1. All surface sediment samples have a target depth of 30 cm.
2. Conversion From CRD to NAVD88: Elevation(CRD)+5.38=NAVD88
3. NA = not available

Footnotes:
a) Vertical Datum: CRD (Columbia River Datum; Feet); based on 2009 NOAA bathymetry
b) Horizontal Projection: NAD 1983 (2011) Oregon State Plane North (Intl Feet)

Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 2 Locations
Portland Harbor PDI Surface Sediment FSP, rev 2
Portland, OR

Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B001-BL1	-20.0	7616393	726093	001
	PDI-SG-B002-BL1	-42.7	7616958	725972	002
	PDI-SG-B003-BL1	-20.0	7617849	725169	003
	PDI-SG-B004-BL1	-40.3	7617494	725280	004
	PDI-SG-B005-BL1	-47.4	7617149	725468	005
	PDI-SG-B006-BL1	-17.7	7616286	726052	006
	PDI-SG-B007-BL1	-41.7	7617641	724936	007
	PDI-SG-B008-BL1	-32.6	7616236	725649	008
	PDI-SG-B009-BL1	-49.5	7617531	724840	009
	PDI-SG-B010-BL1	NA	7615752	725651	010
	PDI-SG-B011-BL1	NA	7617627	724562	011
	PDI-SG-B012-BL1	-19.5	7615855	724958	012
	PDI-SG-B013-BL1	-52.2	7616093	724420	013
	PDI-SG-B014-BL1	-26.8	7617362	724178	014
	PDI-SG-B015-BL1	-45.7	7616635	724843	015
	PDI-SG-B016-BL1	-14.8	7615593	724654	016
	PDI-SG-B017-BL1	-34.2	7616816	724054	017
	PDI-SG-B018-BL1	NA	7615414	724419	018
	PDI-SG-B019-BL1	-5.4	7615398	724055	019
	PDI-SG-B020-BL1	-39.1	7616393	723698	020
	PDI-SG-B021-BL1	NA	7617238	723614	021
	PDI-SG-B022-BL1	-47.9	7616264	724342	022
	PDI-SG-B023-BL1	NA	7615236	723825	023
	PDI-SG-B024-BL1	-34.1	7616734	723279	024
	PDI-SG-B025-BL1	-42.8	7616279	723294	025
	PDI-SG-B026-BL1	-41.3	7615716	723294	026
	PDI-SG-B027-BL1	-37.5	7615639	723260	027
	PDI-SG-B028-BL1	-37.5	7616743	722966	028
	PDI-SG-B029-BL1	-26.9	7615461	722964	029
	PDI-SG-B030-BL1	-41.5	7616495	722719	030
	PDI-SG-B031-BL1	-11.4	7616925	722289	031
	PDI-SG-B032-BL1	-30.5	7615378	722564	032
	PDI-SG-B033-BL1	-53.4	7615490	721935	033
	PDI-SG-B034-BL1	-40.6	7616472	721925	034
	PDI-SG-B035-BL1	-55.8	7615519	721836	035
	PDI-SG-B036-BL1	-45.0	7616329	721765	036
	PDI-SG-B037-BL1	-47.8	7615931	721816	037
	PDI-SG-B038-BL1	-40.2	7616463	721572	038
	PDI-SG-B039-BL1	-48.8	7615872	721825	039
	PDI-SG-B040-BL1	NA	7615075	721350	040
	PDI-SG-B041-BL1	-13.0	7615401	721065	041
	PDI-SG-B042-BL1	-37.4	7616435	721094	042
	PDI-SG-B043-BL1	-5.5	7615106	720667	043
	PDI-SG-B044-BL1	-38.9	7616692	720947	044
	PDI-SG-B045-BL1	-44.3	7616000	721224	045
	PDI-SG-B046-BL1	-43.2	7616169	720601	046
	PDI-SG-B047-BL1	NA	7616896	720498	047
	PDI-SG-B048-BL1	-29.5	7613540	720414	048
	PDI-SG-B049-BL1	-35.8	7612791	720638	049
	PDI-SG-B050-BL1	-19.0	7615216	720119	050
	PDI-SG-B051-BL1	NA	7616852	720077	051
	PDI-SG-B052-BL1	-56.0	7614386	720299	052
	PDI-SG-B053-BL1	-21.1	7615584	719958	053
	PDI-SG-B054-BL1	-39.1	7616807	719821	054

Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 2 Locations
Portland Harbor PDI Surface Sediment FSP, rev 2
Portland, OR

Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B055-BL1	-19.0	7615679	719410	055
	PDI-SG-B056-BL1	-46.9	7616656	719705	056
	PDI-SG-B057-BL1	-19.4	7615760	719334	057
	PDI-SG-B058-BL1	-45.6	7616310	719144	058
	PDI-SG-B059-BL1	-39.2	7616846	719593	059
	PDI-SG-B060-BL1	-27.4	7615752	718985	060
	PDI-SG-B061-BL1	-46.1	7616813	718410	061
	PDI-SG-B062-BL1	-30.5	7616940	719236	062
	PDI-SG-B063-BL1	-26.6	7617157	718606	063
	PDI-SG-B064-BL1	-24.9	7615713	718371	064
	PDI-SG-B065-BL1	-29.3	7615775	718202	065
	PDI-SG-B066-BL1	-46.5	7616427	718544	066
	PDI-SG-B067-BL1	-4.3	7617299	718491	067
	PDI-SG-B068-BL1	-25.2	7617377	718051	068
	PDI-SG-B069-BL1	-47.1	7616783	717645	069
	PDI-SG-B070-BL1	-35.1	7616039	717835	070
	PDI-SG-B071-BL1	-31.3	7616111	717452	071
	PDI-SG-B072-BL1	-50.8	7617139	717235	072
	PDI-SG-B073-BL1	-43.9	7617314	717860	073
	PDI-SG-B074-BL1	-35.6	7616408	717156	074
	PDI-SG-B075-BL1	NA	7617726	717638	075
	PDI-SG-B076-BL1	-36.7	7617753	716995	076
	PDI-SG-B077-BL1	-17.4	7618784	717244	077
	PDI-SG-B078-BL1	-1.7	7619077	717293	078
	PDI-SG-B079-BL1	-52.7	7617010	716724	079
	PDI-SG-B080-BL1	-22.6	7616276	716928	080
	PDI-SG-B081-BL1	-30.5	7616499	716614	081
	PDI-SG-B082-BL1	-30.7	7617854	716866	082
	PDI-SG-B083-BL1	-28.9	7616636	716174	083
	PDI-SG-B084-BL1	-30.4	7617938	716575	084
	PDI-SG-B085-BL1	-39.8	7617830	716440	085
	PDI-SG-B086-BL1	-40.1	7617962	716031	086
	PDI-SG-B087-BL1	-25.0	7618121	716310	087
	PDI-SG-B088-BL1	NA	7616664	715760	088
	PDI-SG-B089-BL1	NA	7618331	716114	089
	PDI-SG-B090-BL1	NA	7616799	715124	090
	PDI-SG-B091-BL1	-32.7	7617114	714941	091
	PDI-SG-B092-BL1	-43.0	7617113	715814	092
	PDI-SG-B093-BL1	-42.5	7617590	714729	093
	PDI-SG-B094-BL1	-18.4	7618474	715560	094
	PDI-SG-B095-BL1	-64.6	7618358	714912	095
	PDI-SG-B096-BL1	NA	7617127	714517	096
	PDI-SG-B097-BL1	-16.7	7618506	715500	097
	PDI-SG-B098-BL1	-25.9	7617286	714447	098
	PDI-SG-B099-BL1	NA	7618704	714974	099
	PDI-SG-B100-BL1	-28.5	7618823	714734	100
	PDI-SG-B101-BL1	-32.6	7619063	714612	101
	PDI-SG-B102-BL1	-13.1	7619718	714722	102
	PDI-SG-B103-BL1	NA	7617360	713935	103
	PDI-SG-B104-BL1	NA	7617556	713646	104
	PDI-SG-B105-BL1	-35.5	7618991	714491	105
	PDI-SG-B106-BL1	NA	7617585	713432	106
	PDI-SG-B107-BL1	-27.7	7619039	714070	107
	PDI-SG-B108-BL1	-49.1	7618833	714065	108
	PDI-SG-B109-BL1	-12.1	7619379	713783	109

Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 2 Locations
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Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B110-BL1	NA	7617770	713229	110
	PDI-SG-B111-BL1	-24.7	7617618	713893	111
	PDI-SG-B112-BL1	NA	7617953	712906	112
	PDI-SG-B113-BL1	-52.4	7618328	712996	113
	PDI-SG-B114-BL1	-38.8	7619382	713579	114
	PDI-SG-B115-BL1	NA	7618134	712558	115
	PDI-SG-B116-BL1	-39.0	7619534	712939	116
	PDI-SG-B117-BL1	-30.6	7620315	713074	117
	PDI-SG-B118-BL1	-73.1	7619083	712733	118
	PDI-SG-B119-BL1	-10.0	7618414	712141	119
	PDI-SG-B120-BL1	-11.3	7619700	712891	120
	PDI-SG-B121-BL1	-40.5	7619822	712335	121
	PDI-SG-B122-BL1	NA	7618439	711814	122
	PDI-SG-B123-BL1	-42.3	7618925	711697	123
	PDI-SG-B124-BL1	-68.0	7619461	712181	124
	PDI-SG-B125-BL1	-38.5	7619970	712082	125
	PDI-SG-B126-BL1	NA	7618713	711321	126
	PDI-SG-B127-BL1	-39.3	7620050	711943	127
	PDI-SG-B128-BL1	-29.0	7619022	711082	128
	PDI-SG-B129-BL1	-21.8	7619179	710756	129
	PDI-SG-B130-BL1	-42.1	7620166	711620	130
	PDI-SG-B131-BL1	-33.8	7620358	711376	131
	PDI-SG-B132-BL1	-67.8	7620117	710516	132
	PDI-SG-B133-BL1	-32.2	7619400	710531	133
	PDI-SG-B134-BL1	-32.0	7620614	710910	134
	PDI-SG-B135-BL1	-32.5	7619549	710301	135
	PDI-SG-B136-BL1	-61.8	7619750	710764	136
	PDI-SG-B137-BL1	-28.6	7619739	710071	137
	PDI-SG-B138-BL1	-7.2	7620906	710636	138
	PDI-SG-B139-BL1	-24.2	7619907	709839	139
	PDI-SG-B140-BL1	-39.6	7619942	709917	140
	PDI-SG-B141-BL1	-14.5	7620963	710442	141
	PDI-SG-B142-BL1	-3.7	7621180	710159	142
	PDI-SG-B143-BL1	-53.6	7620258	710458	143
	PDI-SG-B144-BL1	-6.8	7620058	709541	144
	PDI-SG-B145-BL1	NA	7621290	709918	145
	PDI-SG-B146-BL1	-46.4	7620568	709380	146
	PDI-SG-B147-BL1	-4.9	7620294	709211	147
	PDI-SG-B148-BL1	-27.5	7621434	709479	148
	PDI-SG-B149-BL1	-34.8	7620579	708988	149
	PDI-SG-B150-BL1	-52.3	7620946	709606	150
	PDI-SG-B151-BL1	-27.5	7621597	709199	151
	PDI-SG-B152-BL1	-16.8	7620858	708502	152
	PDI-SG-B153-BL1	NA	7620950	708390	153
	PDI-SG-B154-BL1	NA	7622111	708967	154
	PDI-SG-B155-BL1	NA	7622168	708844	155
	PDI-SG-B156-BL1	-46.4	7622021	708149	156
	PDI-SG-B157-BL1	-12.3	7621352	707960	157
	PDI-SG-B158-BL1	-47.5	7621932	707876	158
	PDI-SG-B159-BL1	-34.5	7622285	708387	159
	PDI-SG-B160-BL1	-16.9	7621625	707637	160
	PDI-SG-B161-BL1	-11.0	7621868	707378	161
	PDI-SG-B162-BL1	-46.3	7622434	708017	162
	PDI-SG-B163-BL1	NA	7622564	708338	163
	PDI-SG-B164-BL1	-7.9	7622715	708041	164

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Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B165-BL1	NA	7622020	707083	165
	PDI-SG-B166-BL1	-20.9	7622157	707085	166
	PDI-SG-B167-BL1	-44.7	7622952	707487	167
	PDI-SG-B168-BL1	-51.9	7621949	707605	168
	PDI-SG-B169-BL1	-46.7	7623201	707263	169
	PDI-SG-B170-BL1	NA	7622398	706382	170
	PDI-SG-B171-BL1	-7.2	7623662	707208	171
	PDI-SG-B172-BL1	-9.5	7622757	706368	172
	PDI-SG-B173-BL1	-48.4	7623280	706950	173
	PDI-SG-B174-BL1	-41.3	7623071	706372	174
	PDI-SG-B175-BL1	-25.8	7623735	707089	175
	PDI-SG-B176-BL1	-46.4	7622621	706920	176
	PDI-SG-B177-BL1	-55.3	7623871	706586	177
	PDI-SG-B178-BL1	NA	7623248	706010	178
	PDI-SG-B179-BL1	-15.4	7623645	705878	179
	PDI-SG-B180-BL1	-37.1	7624278	706599	180
	PDI-SG-B181-BL1	-43.5	7623899	706134	181
	PDI-SG-B182-BL1	NA	7623946	705617	182
	PDI-SG-B183-BL1	-46.5	7623993	706273	183
	PDI-SG-B184-BL1	-44.3	7624445	706442	184
	PDI-SG-B185-BL1	-29.5	7624957	706236	185
	PDI-SG-B186-BL1	NA	7624285	705420	186
	PDI-SG-B187-BL1	-44.4	7625150	705334	187
	PDI-SG-B188-BL1	-49.3	7624808	705693	188
	PDI-SG-B189-BL1	NA	7624660	705215	189
	PDI-SG-B190-BL1	-43.9	7625199	705963	190
	PDI-SG-B191-BL1	-43.5	7625238	705826	191
	PDI-SG-B192-BL1	-15.9	7625056	705064	192
	PDI-SG-B193-BL1	NA	7625257	704874	193
	PDI-SG-B194-BL1	-44.3	7625844	705181	194
	PDI-SG-B195-BL1	-14.8	7625796	705956	195
	PDI-SG-B196-BL1	-42.5	7625627	704832	196
	PDI-SG-B197-BL1	-9.2	7626131	705902	197
	PDI-SG-B198-BL1	-19.8	7625484	704821	198
	PDI-SG-B199-BL1	-9.3	7625714	704653	199
	PDI-SG-B200-BL1	-43.4	7626254	705152	200
	PDI-SG-B201-BL1	NA	7626168	704204	201
	PDI-SG-B202-BL1	-44.1	7626873	704404	202
	PDI-SG-B203-BL1	-44.4	7626680	705118	203
	PDI-SG-B204-BL1	-18.0	7626924	705163	204
	PDI-SG-B205-BL1	-31.3	7626415	704223	205
	PDI-SG-B206-BL1	-45.5	7626205	704677	206
	PDI-SG-B207-BL1	NA	7626513	703795	207
	PDI-SG-B208-BL1	-48.0	7627055	704571	208
	PDI-SG-B209-BL1	-32.9	7626909	703713	209
	PDI-SG-B210-BL1	-43.1	7627253	704260	210
	PDI-SG-B211-BL1	NA	7627734	704557	211
	PDI-SG-B212-BL1	-43.6	7627208	703746	212
	PDI-SG-B213-BL1	NA	7626777	703469	213
	PDI-SG-B214-BL1	NA	7628016	704317	214
	PDI-SG-B215-BL1	NA	7628132	704268	215
	PDI-SG-B216-BL1	NA	7627213	703041	216
	PDI-SG-B217-BL1	-26.9	7628340	704015	217
	PDI-SG-B218-BL1	-11.3	7627473	702990	218
	PDI-SG-B219-BL1	-8.6	7627787	702611	219

Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 2 Locations
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Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B220-BL1	-45.1	7627775	703450	220
	PDI-SG-B221-BL1	-22.1	7628718	703698	221
	PDI-SG-B222-BL1	-38.6	7627623	703223	222
	PDI-SG-B223-BL1	-17.7	7627854	702602	223
	PDI-SG-B224-BL1	-43.9	7628869	703324	224
	PDI-SG-B225-BL1	-21.0	7628162	702268	225
	PDI-SG-B226-BL1	-35.6	7629249	703009	226
	PDI-SG-B227-BL1	-36.3	7628500	702175	227
	PDI-SG-B228-BL1	-52.3	7628664	702736	228
	PDI-SG-B229-BL1	-10.6	7629589	703244	229
	PDI-SG-B230-BL1	-3.7	7628356	701920	230
	PDI-SG-B231-BL1	-45.2	7629473	702532	231
	PDI-SG-B232-BL1	NA	7628523	701514	232
	PDI-SG-B233-BL1	-27.0	7630149	702350	233
	PDI-SG-B234-BL1	-32.3	7630378	701973	234
	PDI-SG-B235-BL1	-36.3	7629165	701428	235
	PDI-SG-B236-BL1	-12.1	7628476	701097	236
	PDI-SG-B237-BL1	-28.1	7629035	701159	237
	PDI-SG-B238-BL1	-26.9	7630298	702219	238
	PDI-SG-B239-BL1	-18.7	7628652	700564	239
	PDI-SG-B240-BL1	-3.5	7630536	702213	240
	PDI-SG-B241-BL1	-16.2	7629003	700194	241
	PDI-SG-B242-BL1	-41.1	7629789	701025	242
	PDI-SG-B243-BL1	-28.0	7630913	701860	243
	PDI-SG-B244-BL1	-22.2	7631239	701768	244
	PDI-SG-B245-BL1	-5.5	7629550	700191	245
	PDI-SG-B246-BL1	-20.2	7629782	700260	246
	PDI-SG-B247-BL1	-53.3	7630449	701067	247
	PDI-SG-B248-BL1	-9.5	7631655	701632	248
	PDI-SG-B249-BL1	-33.9	7631710	701524	249
	PDI-SG-B250-BL1	-27.6	7630686	699564	250
	PDI-SG-B251-BL1	-35.3	7630198	699947	251
	PDI-SG-B252-BL1	-36.0	7632260	701502	252
	PDI-SG-B253-BL1	-8.3	7630244	699718	253
	PDI-SG-B254-BL1	NA	7632949	701252	254
	PDI-SG-B255-BL1	-40.1	7632044	701166	255
	PDI-SG-B256-BL1	-45.1	7631392	700490	256
	PDI-SG-B257-BL1	-22.9	7630728	699335	257
	PDI-SG-B258-BL1	NA	7631640	700458	258
	PDI-SG-B259-BL1	-33.5	7632352	700387	259
	PDI-SG-B260-BL1	-32.3	7632474	701523	260
	PDI-SG-B261-BL1	-44.8	7631860	700240	261
	PDI-SG-B262-BL1	NA	7630675	699094	262
	PDI-SG-B263-BL1	-24.3	7632706	701778	263
	PDI-SG-B264-BL1	-55.5	7631733	700786	264
	PDI-SG-B265-BL1	-33.3	7633428	701364	265
	PDI-SG-B266-BL1	-43.2	7632200	699801	266
	PDI-SG-B267-BL1	-39.1	7631690	699230	267
	PDI-SG-B268-BL1	-22.4	7631014	699063	268
	PDI-SG-B269-BL1	-15.6	7631412	698501	269
	PDI-SG-B270-BL1	-48.5	7632026	699461	270
	PDI-SG-B271-BL1	-32.6	7633524	701343	271
	PDI-SG-B272-BL1	-40.1	7632441	699682	272
	PDI-SG-B273-BL1	NA	7634074	701263	273
	PDI-SG-B274-BL1	-35.0	7632816	699447	274

Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 2 Locations
Portland Harbor PDI Surface Sediment FSP, rev 2
Portland, OR

Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B275-BL1	NA	7631311	698076	275
	PDI-SG-B276-BL1	-49.1	7632351	699366	276
	PDI-SG-B277-BL1	-13.3	7631738	697899	277
	PDI-SG-B278-BL1	-40.8	7633039	699194	278
	PDI-SG-B279-BL1	-6.1	7634481	701069	279
	PDI-SG-B280-BL1	-33.1	7634384	700410	280
	PDI-SG-B281-BL1	-38.3	7633208	699060	281
	PDI-SG-B282-BL1	-30.4	7631807	698301	282
	PDI-SG-B283-BL1	-7.6	7632200	697783	283
	PDI-SG-B284-BL1	-30.9	7634658	700451	284
	PDI-SG-B285-BL1	-40.8	7633453	698815	285
	PDI-SG-B286-BL1	-9.2	7632326	697580	286
	PDI-SG-B287-BL1	-47.8	7633532	698270	287
	PDI-SG-B288-BL1	-32.6	7634842	700114	288
	PDI-SG-B289-BL1	-38.8	7633659	698628	289
	PDI-SG-B290-BL1	NA	7632717	697030	290
	PDI-SG-B291-BL1	NA	7632932	696925	291
	PDI-SG-B292-BL1	-31.1	7633244	697119	292
	PDI-SG-B293-BL1	NA	7634015	698638	293
	PDI-SG-B294-BL1	NA	7635288	700313	294
	PDI-SG-B295-BL1	-49.2	7634507	697452	295
	PDI-SG-B296-BL1	-25.1	7635591	699723	296
	PDI-SG-B297-BL1	-34.0	7634291	698205	297
	PDI-SG-B298-BL1	-21.2	7633251	696939	298
	PDI-SG-B299-BL1	-22.6	7633608	696750	299
	PDI-SG-B300-BL1	-31.1	7633405	697204	300
	PDI-SG-B301-BL1	-32.8	7634417	698114	301
	PDI-SG-B302-BL1	-24.2	7635782	699821	302
	PDI-SG-B303-BL1	NA	7635688	699249	303
	PDI-SG-B304-BL1	-6.0	7634752	697982	304
	PDI-SG-B305-BL1	NA	7633942	696493	305
	PDI-SG-B306-BL1	-23.7	7634239	696537	306
	PDI-SG-B307-BL1	-35.0	7634936	697664	307
	PDI-SG-B308-BL1	-19.6	7636454	699266	308
	PDI-SG-B309-BL1	NA	7634329	696257	309
	PDI-SG-B310-BL1	-15.1	7634623	696086	310
	PDI-SG-B311-BL1	-40.9	7635302	696652	311
	PDI-SG-B312-BL1	-30.0	7635253	697475	312
	PDI-SG-B313-BL1	-17.7	7636531	699207	313
	PDI-SG-B314-BL1	-16.2	7635601	697288	314
	PDI-SG-B315-BL1	-10.2	7636760	698790	315
	PDI-SG-B316-BL1	-15.5	7634732	696025	316
	PDI-SG-B317-BL1	-17.9	7635258	695794	317
	PDI-SG-B318-BL1	-43.1	7635636	696818	318
	PDI-SG-B319-BL1	-13.0	7636029	697019	319
	PDI-SG-B320-BL1	-29.6	7636093	696907	320
	PDI-SG-B321-BL1	-19.9	7635559	695682	321
	PDI-SG-B322-BL1	-18.3	7635654	695549	322
	PDI-SG-B323-BL1	-39.6	7636001	696158	323
	PDI-SG-B324-BL1	-22.1	7636501	696714	324
	PDI-SG-B325-BL1	-11.9	7636124	695544	325
	PDI-SG-B326-BL1	-18.0	7636772	696505	326
	PDI-SG-B327-BL1	-20.5	7636310	695196	327
	PDI-SG-B328-BL1	-18.3	7637089	696319	328
	PDI-SG-B329-BL1	-50.0	7636742	695749	329

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Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B330-BL1	-70.5	7636696	696088	330
	PDI-SG-B331-BL1	NA	7637486	696210	331
	PDI-SG-B332-BL1	-19.2	7636541	694991	332
	PDI-SG-B333-BL1	NA	7636812	694819	333
	PDI-SG-B334-BL1	-28.3	7637070	695182	334
	PDI-SG-B335-BL1	-13.2	7637584	696070	335
	PDI-SG-B336-BL1	-15.5	7638090	695717	336
	PDI-SG-B337-BL1	-31.5	7637319	694867	337
	PDI-SG-B338-BL1	NA	7637215	694056	338
	PDI-SG-B339-BL1	-29.2	7638096	695644	339
	PDI-SG-B340-BL1	-53.2	7637729	695216	340
	PDI-SG-B341-BL1	-15.9	7638400	695530	341
	PDI-SG-B342-BL1	-31.5	7637995	694376	342
	PDI-SG-B343-BL1	-51.1	7638558	695108	343
	PDI-SG-B344-BL1	-31.8	7638307	694119	344
	PDI-SG-B345-BL1	NA	7639012	695324	345
	PDI-SG-B346-BL1	-43.2	7638599	694587	346
	PDI-SG-B347-BL1	NA	7639076	695349	347
	PDI-SG-B348-BL1	-31.4	7638422	693998	348
	PDI-SG-B349-BL1	-36.9	7638769	693686	349
	PDI-SG-B350-BL1	-43.8	7639594	694250	350
	PDI-SG-B351-BL1	-15.5	7639483	694989	351
	PDI-SG-B352-BL1	-41.8	7639119	694121	352
	PDI-SG-B353-BL1	-34.9	7639909	694442	353
	PDI-SG-B354-BL1	-36.2	7638932	693532	354
	PDI-SG-B355-BL1	-36.3	7639968	694274	355
	PDI-SG-B356-BL1	-36.7	7639059	693395	356
	PDI-SG-B357-BL1	-46.3	7639935	693048	357
	PDI-SG-B358-BL1	-39.0	7639279	693206	358
	PDI-SG-B359-BL1	-39.8	7640305	693667	359
	PDI-SG-B360-BL1	-37.7	7640212	693485	360
	PDI-SG-B361-BL1	-37.9	7640320	693662	361
	PDI-SG-B362-BL1	-12.2	7639526	692895	362
	PDI-SG-B363-BL1	-19.7	7639865	692510	363
	PDI-SG-B364-BL1	-10.4	7640699	693133	364
	PDI-SG-B365-BL1	-18.8	7640815	692942	365
	PDI-SG-B366-BL1	-51.5	7640457	692042	366
	PDI-SG-B367-BL1	-31.2	7639968	692419	367
	PDI-SG-B368-BL1	-32.6	7640274	692031	368
	PDI-SG-B369-BL1	-14.1	7641083	692641	369
	PDI-SG-B370-BL1	-45.1	7640950	692177	370
	PDI-SG-B371-BL1	-24.7	7640398	691857	371
	PDI-SG-B372-BL1	-26.7	7641108	692537	372
	PDI-SG-B373-BL1	-12.9	7641456	692104	373
	PDI-SG-B374-BL1	-23.9	7640666	691525	374
	PDI-SG-B375-BL1	-43.6	7641339	691940	375
	PDI-SG-B376-BL1	-26.7	7641724	691751	376
	PDI-SG-B377-BL1	-27.5	7640955	691134	377
	PDI-SG-B378-BL1	-31.2	7641021	691122	378
	PDI-SG-B379-BL1	NA	7641985	691534	379
	PDI-SG-B380-BL1	-21.6	7640924	690930	380
	PDI-SG-B381-BL1	-28.7	7642136	691219	381
	PDI-SG-B382-BL1	-24.7	7641411	690661	382
	PDI-SG-B383-BL1	-10.5	7641541	690409	383
	PDI-SG-B384-BL1	-51.7	7641806	690583	384

Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternate 2 Locations
Portland Harbor PDI Surface Sediment FSP, rev 2
Portland, OR

Sample Type	Sample ID (within the Site)	Mudline Elevation (CRD - Feet) [a]	Proposed Location Coordinates (NAD 1983; Intl Feet) [b]		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B385-BL1	-33.2	7642280	691012	385
	PDI-SG-B386-BL1	-14.3	7642604	690698	386
	PDI-SG-B387-BL1	-23.0	7641736	690296	387
	PDI-SG-B388-BL1	-62.2	7642294	690636	388
	PDI-SG-B389-BL1	-11.2	7642698	690605	389
	PDI-SG-B390-BL1	-23.2	7642036	689922	390
	PDI-SG-B391-BL1	-51.6	7642876	690014	391
	PDI-SG-B392-BL1	-27.0	7642874	690354	392
	PDI-SG-B393-BL1	-38.6	7642224	689753	393
	PDI-SG-B394-BL1	-49.1	7642188	689930	394
	PDI-SG-B395-BL1	NA	7642522	689338	395
	PDI-SG-B396-BL1	NA	7643208	690167	396
	PDI-SG-B397-BL1	-5.0	7642833	689090	397
	PDI-SG-B398-BL1	-28.3	7643415	689860	398
	PDI-SG-B399-BL1	-43.7	7643692	689024	399
	PDI-SG-B400-BL1	-31.1	7643786	689620	400
	PDI-SG-B401-BL1	-15.1	7643433	688614	401
	PDI-SG-B402-BL1	-9.9	7643096	688895	402
	PDI-SG-B403-BL1	-7.4	7643236	688749	403
	PDI-SG-B404-BL1	NA	7644092	689412	404
	PDI-SG-B405-BL1	-38.0	7644363	689086	405
	PDI-SG-B406-BL1	NA	7643493	688423	406
	PDI-SG-B407-BL1	-9.7	7643753	688202	407
	PDI-SG-B408-BL1	-46.9	7644462	688993	408
	PDI-SG-B409-BL1	-55.0	7644503	688431	409
	PDI-SG-B410-BL1	NA	7644760	688764	410
	PDI-SG-B411-BL1	-20.3	7644203	687837	411
	PDI-SG-B412-BL1	-34.9	7643775	688482	412
	PDI-SG-B413-BL1	-28.5	7644387	687655	413
	PDI-SG-B414-BL1	-14.2	7644953	688359	414
	PDI-SG-B415-BL1	-34.8	7645056	687778	415
	PDI-SG-B416-BL1	-40.5	7644719	687538	416
	PDI-SG-B417-BL1	-38.3	7644556	687830	417
	PDI-SG-B418-BL1	-27.7	7645213	687928	418
	PDI-SG-B419-BL1	-44.6	7644991	687480	419
	PDI-SG-B420-BL1	-38.1	7645085	687612	420
	PDI-SG-B421-BL1	-38.9	7644871	687438	421
	PDI-SG-B422-BL1	-14.2	7645402	687636	422
	PDI-SG-B423-BL1	-26.9	7645416	687559	423
	PDI-SG-B424-BL1	-48.5	7645027	687198	424
	PDI-SG-B425-BL1	-59.9	7645406	686934	425
	PDI-SG-B426-BL1	-63.8	7645553	687001	426
	PDI-SG-B427-BL1	-43.8	7645931	686773	427
	PDI-SG-B428-BL1	-63.1	7645602	686606	428

General Notes:
1. All surface sediment samples have a target depth of 30 cm.
2. Conversion From CRD to NAVD88: Elevation(CRD)+5.38=NAVD88
3. NA = not available

Footnotes:
a) Vertical Datum: CRD (Columbia River Datum; Feet); based on 2009 NOAA bathymetry
b) Horizontal Projection: NAD 1983 (2011) Oregon State Plane North (Intl Feet)

Table 5. Field Quality Control Sample Requirements
Portland Harbor PDI Surface Sediment FSP
Portland, OR

QA/QC Sample Type	Frequency
Temperature Blanks	1 per cooler
Field Duplicates	5 percent
Field Equipment Rinsate Blanks	5 percent or 1 per week per equipment

Acronyms:
QA/QC = quality assurance/quality control

Table 6. Summary of Estimated Field Quality Control Samples
Portland Harbor PDI Surface Sediment FSP
Portland, OR

Surface Sediment Sample Type	Number of Project Samples	Estimated # of Field Weeks	Field Duplicates	Field Equipment Rinsate Blanks
Stratified Random Site Samples	428	8.6	22	86
SMA Targeted Site Samples	178	3.6	9	36
Co-located Grabs at In-water Core Stations	60	1.2	3	12
Downtown/Upriver Reaches	60	2.2	3	20
Total Count	**726**	**15.5**	**37**	**153**

General Notes:
1. Estimated # of field weeks assumes 2 vessels in the field.

Table 7. Analyte List
Portland Harbor PDI Surface Sediment FSP
Portland, OR

Media	Location Count	Analyte List	
		Parameter	Method
Surface Sediment Stratified Random	428 - within Site; 60 - D/U Reach	Aldrin	8081B
		Arsenic	6020B
		Atterberg Limits	ASTM D4318
		BEHP	8270C
		Cadmium	6020B
		Chlordanes	8081B
		Copper	6020B
		DDx	8081B
		DDD	8081B
		DDE	8081B
		DDT	8081B
		Dieldrin	8081B
		Lindane	8081B
		Lead	6020B
		Mercury	7471A
		PCB congeners	1668
		PAHs	8270D SIM
		cPAHs (BaP eq)	8270D SIM
		1,2,3,4,7,8-HxCDF	1613B
		1,2,3,7,8-PeCDD	1613B
		2,3,4,7,8-PeCDF	1613B
		2,3,7,8-TCDF	1613B
		2,3,7,8-TCDD	1613B
		PCDD/Fs	1613B
		TPH-Diesel	NWTPH-Dx
		Tributyltin	OrganoTin
		Zinc	6020B
		TOC	Plumb 1981/ EPA 9060
		Grain Size	ASTM D7928 / D6913
Additional Surface Sediment - SMA	178 - within Site	DDx	8081B
		PCB congeners	1668
		PAHs	8270D SIM
		PCDD/Fs	1613B
		TOC	Plumb 1981/ EPA 9060
		Grain Size	ASTM D7928 / D6913
Additional Surface Sediment - In-water Core Location Grab	60 - within Site	DDx	8081B
		PCB congeners	1668
		PAHs	8270D SIM
		PCDD/Fs	1613B
		TOC	Plumb 1981/ EPA 9060
		Grain Size	ASTM D7928 / D6913

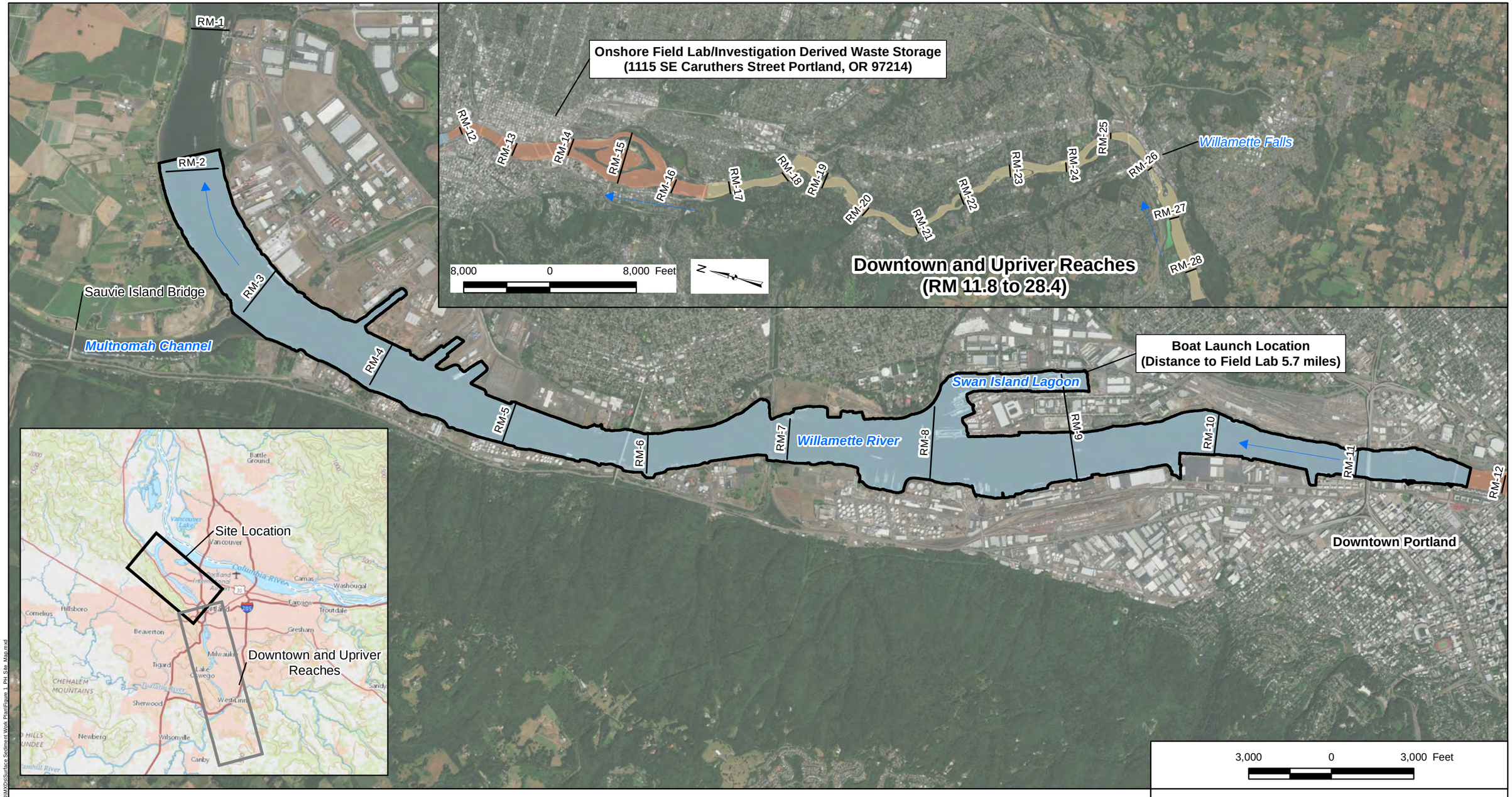
Abbreviations:
BL - baseline; DDx - sum of dichlorodiphenyltrichloroethane and its derivatives; PAHs - polycyclic aromatic hydrocarbon; PCBs - polychlorinated biphenyls; PCDD/Fs - polychlorinated dibenzo-p-dioxins and furans; PDI - Pre-remedial Design Investigation. PSEP - Puget Sound Estuary Protocol; TOC - total organic carbon; D/U – Downtown/Upriver Reach; SS - surface grab

Table 8. Sample Containers, Preservation, Holding Times, and Sample Volume
Portland Harbor PDI Surface Sediment FSP
Portland, OR

Sediment Analysis	Container		Preservation	Holding Time	Minimum Sample Size (wet weight grams)
	Type	Size			
PCBs	WMG	8 oz	Refrigerate, 0 to 6ºC Deep Frozen (-20ºC)	1 year, 1 year	100
PCDD/PCDFs	WMG	8 oz	Refrigerate, 0 to 6ºC Deep Frozen (-20ºC)	1 year, 1 year [a]	100
Pesticides	WMG	8 oz	Refrigerate, 0 to 6ºC Deep Frozen (-20ºC)	14 days, 1 year	100
SVOCs	WMG	8 oz	Refrigerate, 0 to 6ºC Deep Frozen (-20ºC)	14 days, 1 year	100
VOCs	G (no headspace)	8 oz	Refrigerate, 4 ± 2ºC	14 days	50
Herbicides	WMG	8 oz	Refrigerate, 0 to 6ºC Deep Frozen (-20ºC)	14 days, 1 year	100
Metals	G or P	8 oz	Refrigerate, 0 to 6ºC Deep Frozen (-20ºC)	6 months, 2 years	50
Mercury	WMG	8 oz	Refrigerate, 0 to 6ºC Deep Frozen (-20ºC)	28 days, 28 days	50
Tributyltin	WMG	8 oz	Refrigerate, 0 to 6ºC Deep Frozen (-20ºC)	14 days, 1 year	100
Grain size	G or P	16 oz	Refrigerate, 4 ± 2ºC	6 months	100 to 150
Total organic carbon	WMG	8 oz	Refrigerate, 0 to 6ºC Deep Frozen (-20ºC)	14 days, 1 year	25
Total solids	G or P	8 oz	Refrigerate, 0 to 6ºC Deep Frozen (-20ºC)	14 days, 6 months	50

General Notes:
1. Refrigerate preservation times consistent with PSEP protocols for Washington State.
2. Frozen preservation times provided from PSEP 1996.
3. Method detection limits presented in the project QAPP.
Footnotes:
a) stored in darkness
G - glass; P - plastic; WMG - wide mouth glass

FIGURES



Legend

- Flow Direction
- River Mile Marker
- Superfund Site Boundary (RM 1.9 to 11.8)

Study Area

- Site Area (RM 1.9 to 11.8)
- Downtown Reach (RM 11.8 to 16.6)
- Upriver Reach (RM 16.6 to 28.4)

Note:
1. Aerial Imagery provided by ESRI Basemaps 2016

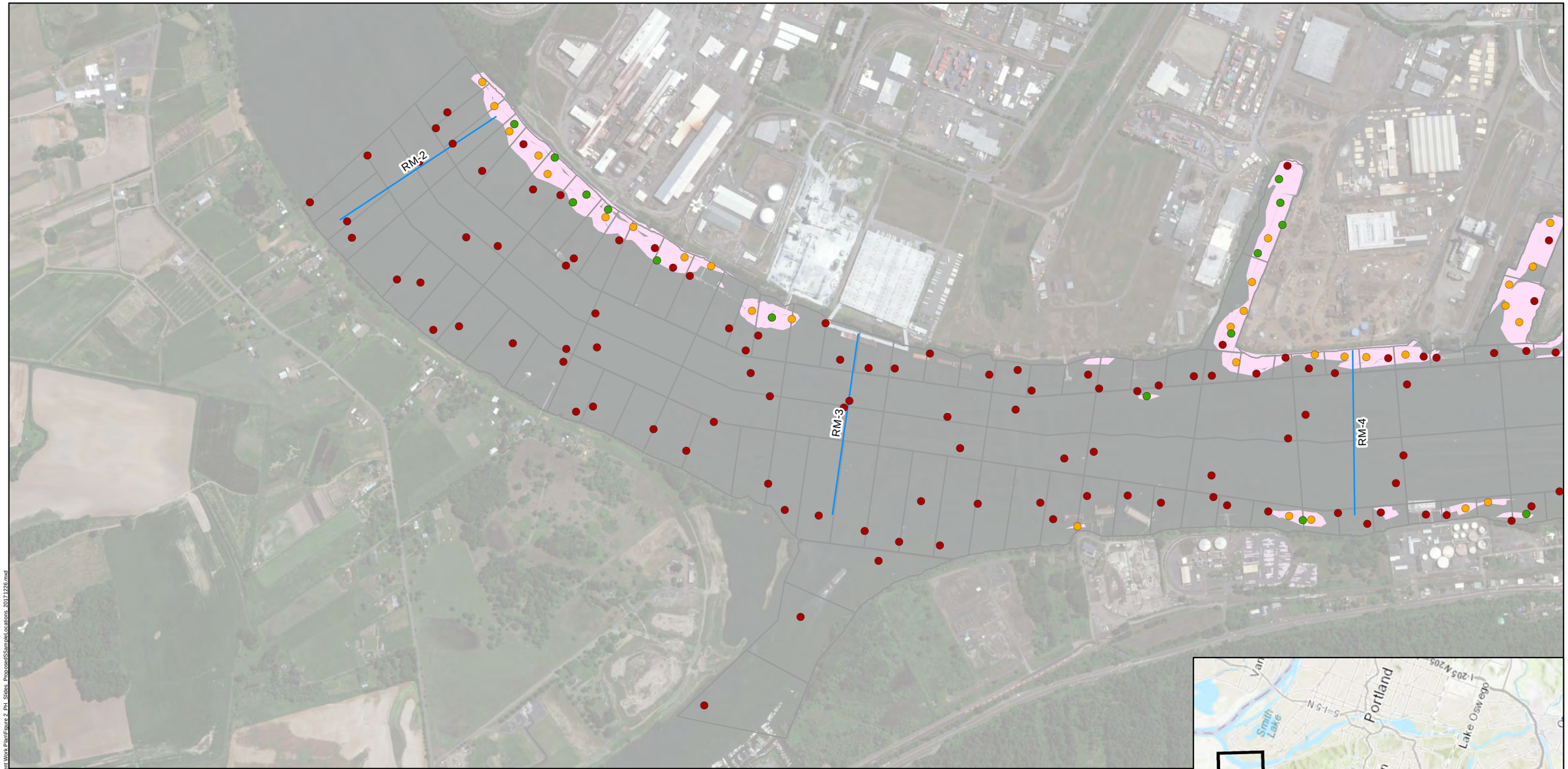
Portland Harbor Site Map

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

MI/SEA	March 23, 2018	Figure 1

Path: P:\Projects\Portland Pre-Design PN\G07\67A\900\GIS and CAD\MXDs\Surface Sediment Work Plan\Figure 1_PH_Site_Map.mxd



Legend

- Stratified Random Samples (n = 428)
- Additional SMA Samples (n = 178)
- Surface Grab at Co-located Core Location (n = 60)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

1,000 500 0 1,000 2,000 Feet

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. 5 grabs were removed from the RM 11E
vicinity and will be redistributed in the site (TBD).
4. n - sample count, RM - river mile. SMA - Sediment Management Area.
5. SMA surface sediment grab samples may need to be revisited based on redistribution of cores to optimize coverage in the SMAs.

Proposed Surface Sediment Sampling Locations - RM 1.9 to 4

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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Figure **2a**

MI/SEA | March 23, 2018

Path: P:\Projects\Portland Pre-Design PN\60707A\900\GIS and CAD\MXD\s\Surface Sediment Work Plan\Figure 2_PH_Slides_Proposed\SSampleLocations_20171226.mxd

RM-4

RM-5

RM-6

Legend

- Stratified Random Samples (n = 428)
- Additional SMA Samples (n = 178)
- Surface Grab at Co-located Core Location (n = 60)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

N

1,000 500 0 1,000 2,000 Feet

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. 5 grabs were removed from the RM 11E vicinity and will be redistributed in the site (TBD).
4. n - sample count, RM - river mile. SMA - Sediment Management Area.
5. SMA surface sediment grab samples may need to be revisited based on redistribution of cores to optimize coverage in the SMAs.

Proposed Surface Sediment Sampling Locations - RM 4 to 6

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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MI/SEA	March 23, 2018	Figure 2b

Path: P:\Projects\Portland Pre-Design PN\GI\76TA\900\GIS and CAD\MXD\Surface Sediment Work Plan\Figure 2_PH_Slides_ProposedSSSampleLocations_20171226.mxd

RM-6

RM-7

RM-8

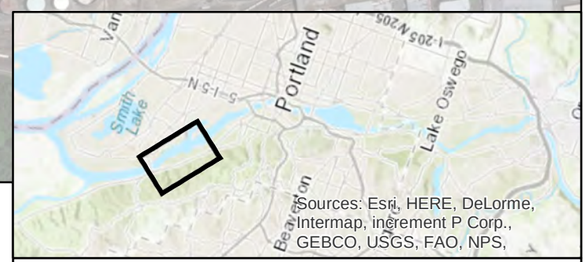
Legend

- Stratified Random Samples (n = 428)
- Additional SMA Samples (n = 178)
- Surface Grab at Co-located Core Location (n = 60)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

N

1,000 500 0 1,000 2,000 Feet

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. 5 grabs were removed from the RM 11E
vicinity and will be redistributed in the site (TBD).
4. n - sample count, RM - river mile. SMA - Sediment Management Area.
5. SMA surface sediment grab samples may need to be revisited based on redistribution of cores to optimize coverage in the SMAs.



Proposed Surface Sediment Sampling Locations - RM 6 to 8

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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Figure **2c**

MI/SEA | March 23, 2018

Path: P:\Projects\Portland Pre-Design\PN\60707A\900\GIS and CAD\MXDs\Surface Sediment Work Plan\Figure 2_PH_Slides_ProposedSSampleLocations_20171226.mxd

RM-8

RM-9

RM-10

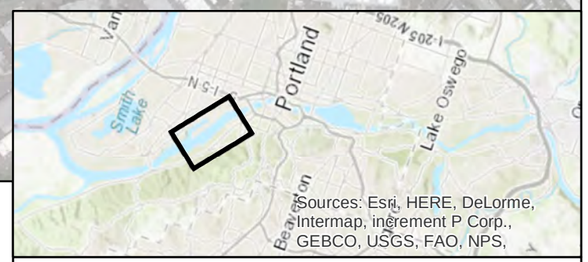
Legend

- Stratified Random Samples (n = 428)
- Additional SMA Samples (n = 178)
- Surface Grab at Co-located Core Location (n = 60)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

N

1,000 500 0 1,000 2,000 Feet

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. 5 grabs were removed from the RM 11E
vicinity and will be redistributed in the site (TBD).
4. n - sample count, RM - river mile. SMA - Sediment Management Area.
5. SMA surface sediment grab samples may need to be revisited based on redistribution of cores to optimize coverage in the SMAs.



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS,

Proposed Surface Sediment Sampling Locations - RM 8 to 10

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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MI/SEA	March 23, 2018	Figure 2d

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RM-10

RM-11

RM-12

Legend

- Stratified Random Samples (n = 428)
- Additional SMA Samples (n = 178)
- Surface Grab at Co-located Core Location (n = 60)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

1,000 500 0 1,000 2,000 Feet

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. 5 grabs were removed from the RM 11E vicinity and will be redistributed in the site (TBD).
4. n - sample count, RM - river mile. SMA - Sediment Management Area.
5. SMA surface sediment grab samples may need to be revisited based on redistribution of cores to optimize coverage in the SMAs.

Proposed Surface Sediment Sampling Locations - RM 10 to 11.8

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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MI/SEA	March 23, 2018	Figure 2e

Path: P:\Projects\Portland Pre-Design PN\G07\FA\90\GIS and CAD\MXDs\Surface Sediment Work Plan\Figure 2 PH Slides ProposedSSSampleLocations 20171226.mxd

RM-12
RM-13
RM-14
RM-15
RM-16
RM-17
RM-18
RM-19
RM-20
RM-21
RM-22
RM-23
RM-24
RM-25
RM-26
RM-27
RM-28
Willamette Falls

Legend

Percent Fines - Surface Sediment

- < 15%
- 15% - 30%
- > 30%

River Mile Marker

Capped Area (Existing)

Notes:

1. Percent Fines defined as the percentage (mass) of material that passed through a 0.06 mm sieve.
2. Aerial Imagery provided by ESRI Basemaps 2017
3. RM = River Mile
4. RI samples obtained from *EPA, 2016. Portland Harbor RI/FS, Final Remedial Investigation Report, Portland Oregon. United States Environmental Protection Agency Region 10, Seattle, Washington. 8 February.*
5. Post RI samples obtained from *GSI Water Solutions, Inc. (GSI), and Hart Crowser, Inc., 2010. Field and Data Report, Downtown Portland Sediment Characterization Phase II, Willamette River, Portland, Oregon* and *Kleinfelder, 2015. Sediment Sampling Data Report, Portland Harbor, Portland, Oregon. Prepared for de maximis Inc. 1 June. Prepared for Oregon Department of Environmental Quality.*
6. Zidell Cap is approximate only; Figure 5-4 Sediment Alternative 4 (ZRZ Realty Company), Dated 2004-11-01, Revised 2004-11-29.

N

2,000 0 2,000 Feet

Upriver Percent Fines Distribution
RM 11.8 to 26.4

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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MI/SEA	June 14, 2018	Figure 3

Path: P:\Projects\Portland Pre-Design PN\G07\07A9100 GIS and CAD\MXDs\Surface Sediment Work Plan\Figure 3_PH_Proposed Upriver Fines.mxd

RM-12
RM-13
RM-14
RM-15
RM-16
RM-17
RM-18
RM-19
RM-20
RM-21
RM-22
RM-20
RM-21
RM-22
RM-23
RM-24
RM-25
RM-26
Willamette Falls
RM-27
RM-28

Legend

- Proposed Sediment Grab Sample Location (n = 60)
- Historical Sediment Grab Sample
- River Mile Marker
- Downtown Reach
- Upriver Reach
- Capped Area (Existing)

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. RM = River Mile.
3. Upriver sampling area consists of the Downtown Reach (RM 11.8 to 16.6) and Upstream Reach (RM 16.6 to 28.4) (EPA, 2017).
4. RI samples obtained from *EPA, 2016. Portland Harbor RI/FS, Final Remedial Investigation Report, Portland Oregon. United States Environmental Protection Agency Region 10, Seattle, Washington. 8 February.*
5.Post RI samples obtained from *GSI Water Solutions, Inc. (GSI), and Hart Crowser, Inc., 2010. Field and Data Report, Downtown Portland Sediment Characterization Phase II, Willamette River, Portland, Oregon* and *Kleinfelder, 2015. Sediment Sampling Data Report, Portland Harbor Portland, Oregon. Prepared for de maximis Inc. 1 June. Prepared for Oregon Department of Environmental Quality.*
6. Zidell Cap is approximate only; Figure 5-4 Sediment Alternative 4 (ZRZ Realty Company), Dated 2004-11-01, Revised 2004-11-29
7. Sediment grab locations to be confirmed in the field and placed in areas of fine-grained material
8. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver reaches.

N

2,000 0 2,000 Feet

Proposed Upriver Surface Sediment Sampling Locations RM 11.8 to 28.4

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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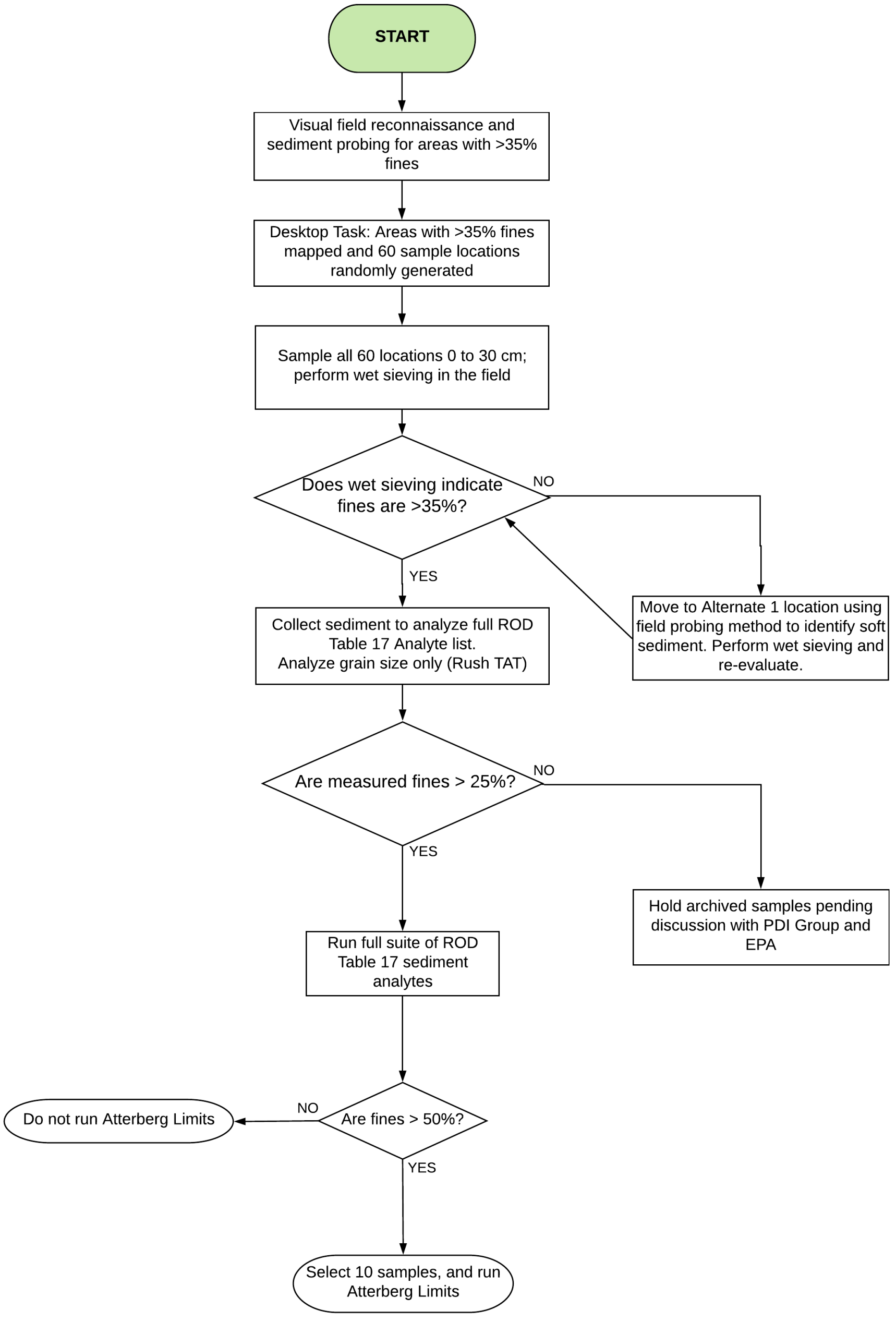
MI/SEA	June 14, 2018	Figure 4

Path: P:\Projects\Portland Pre-Design PNG\07617A\900 GIS and CAD\MXDs\Surface Sediment Work Plan\Figure 4_PH_Proposed Upriver Surface Sediment.mxd



Path: P:\Projects\Portland Pre-Design PNG07767A\800 GIS and CADMXDs\Surface Sediment Work Plan\Figure 5_PH_Decision Flow Chart.mxd

Downtown/Upstream Reaches Sediment Sampling Decision Flow Chart

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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Figure **5**

MI/SEA | March 23, 2018

RM-2

RM-3

RM-4

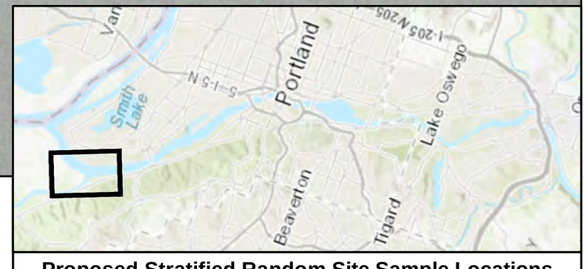
Legend

- Stratified Random Samples (n = 428)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.

N

1,000 500 0 1,000 2,000 Feet



Proposed Stratified Random Site Sample Locations (Alternate 1) RM 1.9 to 4

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

MI/SEA	March 23, 2018	Figure 6a

Path: P:\Projects\Portland Pre-Design\PN\G076\TA\900\GIS and CAD\MXDs\Surface Sediment Work Plan\PH_mxds_20171220\Figure 6_PH_Slides_ProposedLocations_A81_20171220.mxd

RM-4

RM-5

RM-6

Legend

- Stratified Random Samples (n = 428)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.

N

1,000 500 0 1,000 2,000 Feet

Proposed Stratified Random Site Sample Locations (Alternate 1)
RM 4 to 6

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure **6b**

MI/SEA | March 23, 2018

Path: P:\Projects\Portland Pre-Design\PN\G07\67A\900\GIS and CAD\MXDs\Surface Sediment Work Plan\PH .mxds 20171220\Figure 6. PH. Slides. ProposedLocations Alt1. 20171220.mxd

RM-6

RM-7

RM-8

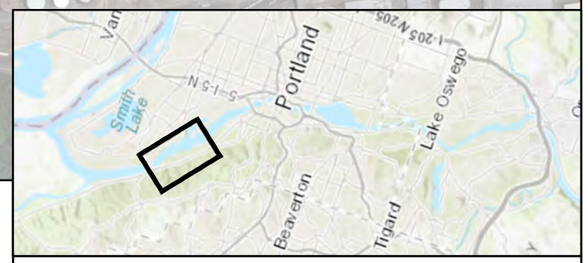
Legend

- Stratified Random Samples (n = 428)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.

N

1,000 500 0 1,000 2,000 Feet



Proposed Stratified Random Site Sample Locations (Alternate 1)
RM 6 to 8

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

MI/SEA	March 23, 2018	Figure 6c

Path: P:\Projects\Portland Pre-Design PN\GI076\TA\900\GIS and CAD\MXDs\Surface Sediment Work Plan\PH_mxds_20171220\Figure 6_PH_Slides_ProposedLocations_A1E_20171220.mxd

RM-8

RM-9

RM-10

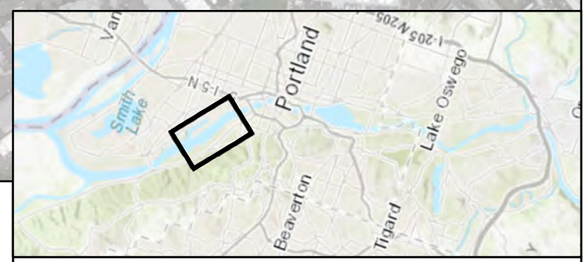
Legend

- Stratified Random Samples (n = 428)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.

N

1,000 500 0 1,000 2,000 Feet



Proposed Stratified Random Site Sample Locations (Alternate 1)
RM 8 to 10

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

MI/SEA	March 23, 2018	Figure 6d

Path: P:\Projects\Portland Pre-Design\PNG07\07A\900\GIS and CAD\MXDs\Surface Sediment Work Plan\PH .mxds 20171220\Figure 6 PH_Slides ProposedLocations A1I1 20171220.mxd

RM-10

RM-11

RM-12

Legend

- Stratified Random Samples (n = 428)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.

N

1,000 500 0 1,000 2,000 Feet

Proposed Stratified Random Site Sample Locations (Alternate 1)
RM 10 to 11.8

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

MI/SEA	March 23, 2018	Figure 6e

Path: P:\Projects\Portland Pre-Design\PN\G0765A\900\GIS and CAD\MXDs\Surface Sediment Work Plan\PH .mxds 20171220\Figure 6 PH_Slides_ProposedLocations Alt1 20171220.mxd

RM-2

RM-3

RM-4

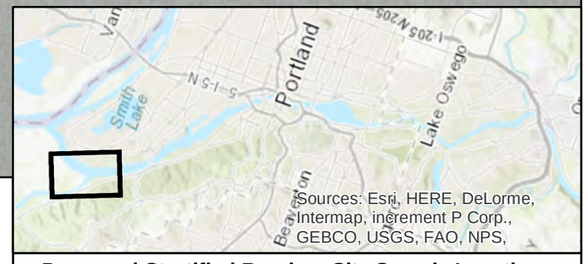
Legend

- Stratified Random Samples (n = 428)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.

N

1,000 500 0 1,000 2,000 Feet



Proposed Stratified Random Site Sample Locations (Alternate 2) RM 1.9 to 4

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure 7a

MI/SEA | March 23, 2018

Path: P:\Projects\Portland Pre-Design\PN\G07\67A\900\GIS and CAD\MXDs\Surface Sediment Work Plan\PH_mxds_20171220\figure 7_PH_SMAs_ProposedLocations_AR2_20171220.mxd

RM-4

RM-5

RM-6

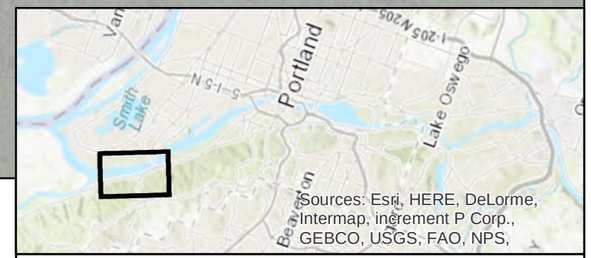
Legend

- Stratified Random Samples (n = 428)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.

N

1,000 500 0 1,000 2,000 Feet



Proposed Stratified Random Site Sample Locations (Alternate 2) RM 4 to 6

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure 7b

MI/SEA | March 23, 2018

Path: P:\Projects\Portland Pre-Design PNG07674\0\00 GIS and CAD\MXDs\Surface Sediment Work Plan\PH_mxds_20171220\figure 7_PH_SSIdes_ProposedLocations_AR2_20171220.mxd

Legend

- Stratified Random Samples (n = 428)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.

N

1,000 500 0 1,000 2,000 Feet

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS,

Proposed Stratified Random Site Sample Locations (Alternate 2)
RM 6 to 8

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

MI/SEA	March 23, 2018	Figure 7c

Path: P:\Projects\Portland Pre-Design\PN\G07\67A\900\GIS and CAD\MXDs\Surface Sediment Work Plan\PH_mxds_20171220\figure_7_PH_Slides_ProposedLocations_ARZ_20171220.mxd

RM-8

RM-9

RM-10

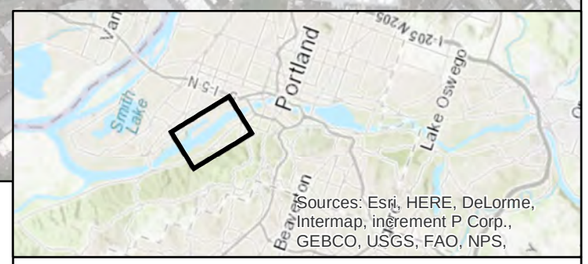
Legend

- Stratified Random Samples (n = 428)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.

N

1,000 500 0 1,000 2,000 Feet



Proposed Stratified Random Site Sample Locations (Alternate 2) RM 8 to 10

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure 7d

MI/SEA | March 23, 2018

Path: P:\Projects\Portland Pre-Design\PNG07\07A0900\GIS and CADMX\Dx\Surface Sediment Work Plan\PH_mxds_20171220\pm_7_PH_SMAs_ProposedLocations_A82_20171220.mxd

RM-10

RM-11

RM-12

Legend

- Stratified Random Samples (n = 428)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.

N

1,000 500 0 1,000 2,000 Feet

Proposed Stratified Random Site Sample Locations (Alternate 2)
RM 10 to 11.8

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure **7e**

MI/SEA | March 23, 2018

Path: P:\Projects\Portland Pre-Design PN\60767A\900 GIS and CAD\MXDs\Surface Sediment Work Plan\PH_mxds_20171220\figure 7_PH Skides ProposedLocations_A#2_20171220.mxd

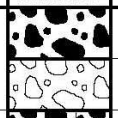
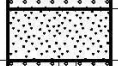
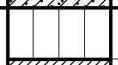
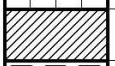
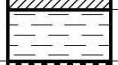
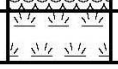
APPENDIX A – Sediment Logging Keys, Equipment Checklist, and Field Forms

A-1. Summary of the ASTM Visual-Soil Classification Method and Sediment Sample Logging Key

A-2. Equipment Checklist

A-3. Field Forms

Appendix A-1 Summary of the ASTM Visual-Soil Classification Method and Sediment Sampling Logging Key

MAJOR DIVISION			GROUP SYMBOL	LETTER SYMBOL	GROUP NAME
COARSE GRAINED SOILS CONTAINS MORE THAN 50% FINES	**GRAVEL AND GRAVELLY SOILS** MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVEL WITH 5% FINES		GW	Well-graded GRAVEL
				GP	Poorly graded GRAVEL
		GRAVEL WITH BETWEEN 5% AND 15% FINES		GW-GM	Well-graded GRAVEL with silt
				GW-GC	Well-graded GRAVEL with clay
				GP-GM	Poorly graded GRAVEL with silt
				GP-GC	Poorly graded GRAVEL with clay
		GRAVEL WITH ≥ 15% FINES		GM	Silty GRAVEL
				GC	Clayey GRAVEL
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SAND WITH 5% FINES		SW	Well-graded SAND
				SP	Poorly graded SAND
		SAND WITH BETWEEN 5% AND 15% FINES		SW-SM	Well-graded SAND with silt
				SW-SC	Well-graded SAND with clay
				SP-SM	Poorly graded SAND with silt
				SP-SC	Poorly graded SAND with clay
		SAND WITH ≥ 15% FINES		SM	Silty SAND
				SC	Clayey SAND
FINE GRAINED SOILS CONTAINS MORE THAN 50% FINES	SILT AND CLAY	LIQUID LIMIT LESS THAN 50		ML	Inorganic SILT with low plasticity
				CL	Lean inorganic CLAY with low plasticity
				OL	Organic SILT with low plasticity
		LIQUID LIMIT GREATER THAN 50		MH	Elastic inorganic SILT with moderate to high plasticity
				CH	Fat inorganic CLAY with moderate to high plasticity
				OH	Organic SILT or CLAY with moderate to high plasticity
HIGHLY ORGANIC SOILS				PT	PEAT soils with high organic contents

Notes

1. Sample descriptions are based on visual field and laboratory observations using classification methods of ASTM D2488. Where laboratory data are available, classifications are in accordance with ASTM D2487.
2. Same percentage distribution and group name method applies to fine-grained soils and % of sand and gravel it contains.
3. Fines are material passing the U.S. Std. #200 Sieve.

AECOM Geosyntec consultants	**PDI Portland Harbor Superfund Site Pre-Remedial Design and Baseline Sampling Portland, OR**	Appendix A-1: Summary of the ASTM Visual-Soil Classification Method

Appendix A-1
Portland Harbor PDI Sediment
Sample Logging Key

Visual Sediment Descriptions consist of the following:

- Moisture content
- Density/consistency (estimated based on visual observation)
- Color (Munsell Number)
- Major/Minor Contituents
- Amount and shape of minor constituents and major constituent structure
- Sheen and odor
- Redox potential discontinuity

Example: wet, soft, olive green (GLEY 1, 5/10Y) clayey SILT, little sand, moderate shell fragments, and trace twigs and rootlets. Silt texture is uniform, slightly compressible, massive, blocky, and of low plasticity. Slight odor and trace sheen. RPD 1 cm.

Sediment Description Terminology: Estimated based on visual observations

Moisture Content

Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content, no visible water
Wet	Visible free water, probably above optimum

Color descriptions in Munsell Charts

Density: Visual Core Drive Penetration

SAND or GRAVEL		SILT or CLAY
Density	**Visual**	**Consistency**
Very loose	freefall	Very soft
Loose	easy penentration	Soft
Medium dense	moderate penentration	Medium stiff
Dense	hard penentration	Stiff
Very dense	refusal	Very Stiff/Hard

MAJOR and Minor Constituent % (by weight)

Core Logs	Percent	Field Logs
Trace (clay, silt, etc.)	0–5	not identified
Few (clay, silt, etc.)	5-15	Slightly (clayey, silty, etc.)
Little (clay, silt, etc.)	15-30	Clayey, silty, sandy, gravelly
Clayey, silty, sandy, gravelly	30-50	Very (clayey, silty, sandy, etc.)
GROUP NAME	> 50	GROUP NAME

Other Minor Constituents: % (by volume)

(i.e., shells, wood, organics, plastic, non-native debris)

Trace	0-5
Scattered	5-10
Moderate	10-30
Substantial	30-50
GROUP NAME	> 50

Structure

Stratified	Alternating layers of varied material/color at least 1/4" thick
Laminated	Alternating layers of varied material/color at least 1/4 mm thick
Blocky	Cohesive soil that can be broken down into smaller lumps
Spongy	Organic and compressible nature
Lensed	Inclusion of thin discontinuous layers of different sediment
Homogenous/Massive	Same color and appearance throughout
Fibrous	Stringy or rope like structure
Seam	1/16 to 1/2" thick
Layer	greater than 1/2" thick
Interbedded	Multiple beds within a unit
Rolls Easily	Play-dough like (plasticity observation)
Angular	Sharp edges
Subangular	Rounded edges
Subrounded	Well-rounded edges
Rounded	Smoothed, no edges

Odor Descriptions

none
trace
slight
moderate
strong

Sheen Test- % coverage

S.T. = Sheen test visual analysis	
none, trace	<2
slight sheen	2-15
moderate sheen	15-40
moderate to heavy	40-70
heavy	>70

Sheen Test- Visual Description

rainbow	multicolored
metallic	metallic gray-colored
florets	semi-circular and multicolored
streaks	long and flowing shape

Other Sediment Descriptions Used

Agglomerate	Fused-appearance, often vesicular
Clast/inclusion	Non-fused appearance
Xenoclasts	Clasts that have been moved
Fresh	No visible sign of decomposition or discoloration
Winnowed	Loss of fines
Slumped	Settled but intact
Pockets/balls	Semicircular to circular inclusion/deposit
Chunky	Mass of unidentified material

Sediment Core Log Guidelines

----------	color or minor change
————	major sediment change
▬▬▬▬	depositional change

Core Acceptance Guidelines

1. Desired drive/penetration depth is reached.
2. Core recovery is greater than 70%.
3. Core tube appears intact (no signs of blocking, bending).
4. Minimal sediment loss out the top or bottom (minimal winnowing).

Grab Acceptance Guidelines

1. No or minimal excess water leaking from the jaws of the sampler.
2. No excessive turbidity in the overlaying water of the sampler.
3. Sampler did not over-penetrate.
4. Sediment surface appears to be intact with minimal disturbance.
5. Program-specific penetration (30 centimeters) has been achieved.

NOTES:

*Classification of sediment on core logs is based on visual field observations.
Classification notes should not be construed to imply laboratory testing unless presented herein. Unified Soil Classification System ASTM D-2487 and Visual-manual classification method ASTM D-2488 for the description and identification of soils were used as an identification guide.

Appendix A-2 Portland Harbor PDI
Sediment Sampling Equipment List

Safety Equipment
GPS
Cell phones (fully charged) or Satellite phone (if no cell coverage)
VHF radios
Rescue rope in throw bag
Air horns and/or whistles
Waterproof flashlight
Secondary "kicker" motor or alternative propulsion
Bailer or bilge pump/emergency pump
Length of rope for securing boat
US Coast Guard approved Type III or V PFD or life jacket
Type 4 throwable ring or cushion
Type BC fire extinguisher (10 pound) if extra fuel is carried in portable containers.
Anchor with appropriate length of line
First-Aid Kit and AED
Oil booms
PID
Bottled water
Snacks
Float plan

PPE
Boots, waterproof, steel-toed
Gloves, nitrile, heavy outer
Gloves, nitrile, thin inner
Hard hats
Hearing protection
Rain slicks
Safety glasses/goggles
Butcher apron or Tyvek for decon
Warm/dry clothes

Sample Handling
Vibracore sampler, core and tubes [1]
Hydraulic power grab sampler [2]
Bowls, large, stainless
Spoons, small, stainless
Spoons, large, stainless
Bottleware, sample analyses specific
Sample labels
core caps [1]
core catchers [1]

Plans
Field Sampling Plan [3]
Maps
Health and Safety Plan
Quality Assurance Program Plan

Tools
Hacksaw and Circular saw [1]
Extension cord and power strip [1]
Drywall blade, 6"
Ruler (12 inch/30 cm)
Measuring tape (with 1/10 inch increments) [1]
Rubber mallet [1]
Screwdrivers (Phillips, flat)
Siphon tubes [2]
Utility knife
Lead line (if not on vessel)

Supplies
Handheld GPS, fully charged
Camera
Gas for boat, if applicable
Keys for boat, if applicable
White board, white board markers
Bags, plastic zip, gallon-size
Bags, plastic zip, quart-size
Duct tape, electrical tape, and packing tape
Plastic sheeting
Ice
Logs, field [3]
Field books
Paper towels
Pens, ballpoint, permanent [3]
Sharpies, small and large
Trash bags
Zip ties
4" pipe clamps
Core carrying box

Decon Equipment
Brushes, long-handled
Brushes, short-handled
Detergent, laboratory (e.g., Alconox)
Methanol/hexane in dispensing bottle (optional)
Nitric acid, 10% in dispensing bottle (optional)
5 gallon buckets, or similar
Aluminum foil
Water, distilled in dispensing bottle

Notes:
1: Subsurface Coring specific equipment
2: Surface grab sampling specific
3: Write-in-Rain waterproof paper/pens are recommended

Portland Harbor PDI Surface Sediment Sampling Log

Location ID: _____

Sample Date: ____ / ____ / _____

Page: 1 of ____

Vessel (circle one):	Tieton Cayuse
Weather Conditions:	
Depth Sounding Method:	*AirMar Echo Sounder (Bow Mounted)*
Gauge Source (circle one):	NOAA PRT03 USGS 14211720
Gauge Height and Datum:	ft PRD, Measurement Time:
Horizontal Coordinate Datum	*NAD 1983 Oregon State Plane North (Intl ft)*
Proposed Coordinates:	Easting: Northing:

Sampling Personnel:	Notes: Sampler:
Subcontractor Personnel:	Captain: Deckhand:
Sampling Equipment	*Powergrab, Stainless Steel Bowls & Spoons*
General River Location:	

Sample Type (circle one):	Baseline/BL	SMA / Co-Located with Core	Downtown/Upriver
Analytical Suite (circle one):	Full ROD Table 17	Four Focused COCs	

EPA Oversight During Sample Collection? No Yes If Yes, name of person: _____

(Definitions: Rec. = recovery; JC = jaws closed; OLW = overlying water; In 3-PT? = sediment used in 3-Point composite)

Attempt Summary

Attempt #	Radius (ft)	Time	Coordinates Easting:	Coordinates Northing:	Water Depth (ft)	Rec. Depth (cm)	JC? ✓	OLW? ✓	Accepted ✓	Photo? ✓	Additional Comments	Sample Interval (cm)	In 3-PT? ✓
1													
2													
3													
4													
5													
6													
7													

Homogenized 3-Point Composite Sample Description

3 x Attempt #s:	Color, Minor/Major Constituent %, Density:

Sample Information

Sample ID	Sample Time	Sample Type (Primary, Duplicate, MS/MSD, EPA Split)	# of Containers
		Primary	

Additional Comments (weight adjustments/per attempt; substrate bin type; access issues; probing results)

Portland Harbor PDI Surface Sediment Sampling Log

Location ID: ________________

Sample Date: ____ / ____ / ______

Page: ____ of ____

Sediment Description	
Attempt #:	Redox Potential Discontinuity (RPD): cm
Structure:	
Density, Color, Minor/Major Constituent %:	
Odor/Sheen:	
Organics, Biota, or Other:	

Sediment Description	
Attempt #:	Redox Potential Discontinuity (RPD): cm
Structure:	
Density, Color, Minor/Major Constituent %:	
Odor/Sheen:	
Organics, Biota, or Other:	

Sediment Description	
Attempt #:	Redox Potential Discontinuity (RPD): cm
Structure:	
Density, Color, Minor/Major Constituent %:	
Odor/Sheen:	
Organics, Biota, or Other:	

APPENDIX B – Standard Operating Procedures

B-1. Horizontal and Vertical Station Control

B-2. Surface Sediment Sampling (Integral 2004)

B-3. Management of IDW

B-4. Field Wet Sieving for Grain Size

STANDARD OPERATING PROCEDURE
HORIZONTAL AND VERTICAL SURVEY CONTROL

Introduction

This Standard Operating Procedure (SOP) has been developed for the Pre-Remedial Design Sampling and Baseline Investigations (PDI) at the Portland Harbor Superfund Site located in Portland, Oregon to confirm accurate positioning of vessels and samples during sample collection activities. The survey control requirements described in this SOP are specifically for environmental sample collection and will generally comply with map-grade precision and accuracy in contrast to the geodetic-grade precision and accuracy performed for the Bathymetric Survey conducted by David Evans and Associates (DEA). However, the same survey control points and geodetic parameters will be used in both surveys for consistency, and a portion of the quality assurance/quality control (QA/QC) process will involve consultation with DEA Oregon Professional Land Surveyor (PLS) staff to review the map-grade data collected for the environmental sample collection.

The organization of this SOP is as follows:

- Methodology Overview
- Project Geodetic Parameters
- Survey Accuracy, Precision, and Control
- Primary Equipment
- Hand-Held GPS Operation
- Vessel Navigation and Equipment Operation
- Data Processing and QA/QC Procedures

Tables, figures, and attachments are presented at the end of the SOP.

Methodology Overview

Horizontal (Map) Data Collection

A combination of vessel-mounted and hand-held GPS receivers will be used to navigate to sampling locations and to collect map location coordinates (Northings, Eastings) for those sampling locations. The vessel-mounted GPS receivers will be the primary tool used for navigation to the pre-planned sampling locations in a GIS file, which will be pre-loaded into the vessel navigational system. The hand-held GPS devices will be used as a backup and confirmation of vessel position only if there are problems with the vessel GPS navigation system or if there is no specific vessel navigation system (i.e., smaller boats). Since the inception of field work, the vessel GPS coordinates have been consistently verified and deemed to be sufficient to meet position and accuracy requirements for the project. The hand-held GPS devices will primarily be used for studies involving small vessels. These devices will also have the pre-loaded basemap content depicting planned sampling locations.

The vessel GPS will operate in two modes, collecting both a separate continuous data stream of positional information (line file) and recording GPS soundings (target file) when a sample is specifically

collected. The sample location target file will be recorded when the sampling device is in position for the grab (e.g., when sampler is on the river bottom). The specific Location ID associated with the sample will also be recorded in the GPS device log. Field personnel will be required to write that same Location ID on their field data collection forms at the same time. Both the continuous and episodic dataset will be timestamped to allow comparison of the two types of data. This data will be recorded and maintained on the vessel, and will also be exported from the vessel navigation system and archived to project servers on a daily basis.

The hand-held GPS devices will be operated independently of the vessel's systems and will be used to record a location sounding wherever a sample is collected only for studies unable to use the vessel GPS navigation system. The sample location sounding will be recorded approximately at the same time as when the vessel GPS measurement is collected (e.g., when sampler is in position). The specific Location ID associated with the sample will also be recorded on the GPS device. Field personnel will write this Location ID on the field forms only if the vessel measurement described earlier cannot be collected for some reason (e.g., equipment failure). These measurements will also be timestamped. The data from the hand-held GPS devices will be wirelessly synchronized to a "cloud" web service in near real-time; the data from the "cloud" will also downloaded and saved to project servers daily.

Vertical Data Collection

Vertical (elevation) data is also required for water levels, sample collection depth below surface water, and bottom (mudline) depth location for some types of sample locations. For increased precision and accuracy, it is proposed that bottom (mudline) depth locations (e.g., for sediment cores) be calculated from the bathymetric surface to be developed by the hydrographic survey performed by DEA (since the data will be collected within a few months of each other). The NAVD88 elevation will be calculated from the intersection of the surface map location coordinates collected as described earlier, projected vertically down to the bathymetric surface (United States Army Corps of Engineers [USACE], 2004). The elevation from the intersection of the bathymetric surface will be used as the final or "best" elevation for the sample.

In contrast, for depth measurements that require less precision (e.g., water levels, depth to samples below water surface), the onboard vessel sonar will be used to record depth and then subsequently calculate elevation. All depths will be recorded relative to the water surface and time tagged to correct with time tagged gauge data for obtaining riverbed elevations. The elevation will be calculated to NAVD88 datum. To correct elevations, gauge data from the Northwest River Forecast Center will be downloaded for gauge PRT03, which is representative of the former Morrison gauge which has been moved. This gauge does not report NAVD88 elevations but rather reports a value that is 0.3 feet above Columbia River Datum (CRD). Corrections from CRD to NAVD88 differ moving down the river from the gauge due to the fact that NAVD88 is a reference normal to gravity (water does not flow if the elevation is unchanging), and CRD is a gradient datum that follows the lower water surface. In Portland Harbor, the difference between CRD and NAVD88 (Geoid12b) ranges from 0.00 feet CRD = -5.16 feet NAVD88 (Geoid12b) at Willamette River river mile (RM) 2.0, to 0.00 feet CRD = -5.41 feet NAVD88 (Geoid12b) at Willamette River RM 12.8 (approximate location of PRT03 Gauge). Accordingly, a correction to the Willamette Gauge in Portland would be -5.41+0.3 or -5.11 feet at RM 12.8. An approximation would be to subtract 5 feet from the gauge reading for the full length of the

study area, but precision will vary depending on tides and river gradient.

For sample locations requiring vertical information, depth will be recorded by field staff on their data collection forms relative to the water surface, and these values will be loaded to the project database as described in the Data Quality Management Plan (DQMP). Final calculated NAVD88 elevation data (feet) will also be entered into a separate data field in the project database after completion of spatial analysis, calculations, and QA/QC. DEA will provide support during the QA/QC process to verify proper calculation of NAVD88 elevation data.

Location Position Recording in Project Database

Discrete Samples

When discrete samples are collected, the Location ID and the location coordinates (Northing/Easting) will be recorded on the GPS device(s) and the field data collection form(s). The location coordinates will be based on the vessel GPS instantaneous target measurement. This target measurement will be the location coordinate pair loaded initially to the project database. After the field event is completed, the target measurement will be compared to the line file (vessel continuous GPS measurement) to confirm that the coordinate pair loaded to the project database is appropriate. If analysis reveals precision or accuracy issues, the loaded location coordinate pair in the project database may be updated and edited with a better value derived from the line file. In general, the hand-held GPS devices will be used as a backup and confirmation of vessel position only if there are problems with the vessel GPS navigation system or an independent navigation system is not available on the vessel. These coordinates will be loaded to the project database only if there is a significant problem with the vessel GPS (e.g., equipment failure) or if there is no vessel GPS.

Composite Samples

When composite samples are collected, location coordinates will also be recorded as both target measurements and continuous measurements using the vessel GPS. The continuous GPS measurements will be recorded during the entire compositing event, and instantaneous target measurements will be collected when the sampler is in position for each individual composite grab. At each compositing location, a target measurement will be recorded in the vessel GPS along with the Location ID with an "a," "b," or "c" suffix. These measurements will be recorded on the field forms in the same manner (e.g., there will be three sets of location coordinates, lithologic descriptions, etc.).

When the location data is loaded to the project database, a single set of location coordinates will be recorded in the project database with a Location ID that excludes the "a," "b," or "c" suffix. As a presumed middle time point, the "b" set of coordinates will be loaded with the primary Location ID to the project database. After the field event is completed, the target measurement associated with the "b" location composite will be compared to the line file (vessel continuous GPS measurement) to assess vessel position and the timeframe of the entire sampling event to confirm if the coordinate pair loaded to the project database is appropriate. The goal will be to finalize the location coordinate information in the project database based on the most representative position based on this analysis. Similar to discrete sample collection, a hand-held GPS device and related data will only be loaded to the project database if there is a significant problem with operation of the vessel GPS or if the vessel does not have a GPS.

Finally, after field data are collected and surveys are completed, as defined in the DQMP, the location coordinate data will be joined with the tabular data collected by the field teams and loaded to the project database.

Project Geodetic Parameters

The geodetic parameters to be used for the PDI field studies will be as follows:

Horizontal Datum: North American Datum of 1983 (2011)
Projection: State Plane Coordinate System (SPCS) Oregon North Zone
Vertical Datum: North American Vertical Datum of 1988 (NAVD88) Geoid12b
Units: International Feet

Survey Accuracy, Precision, and Control

The anticipated horizontal accuracy of environmental sampling associated with vessel and hand-held GPS devices is a range of 1 to 5 meters (target 1 to 2 meters for the DGPS unit itself). This should be consistent with RI target accuracy (Integral 2002) and best practices (Puget Sound Estuary Protocols [PSEP] 1998 and US Environmental Protection Agency [EPA] 2008).

The anticipated vertical accuracy of final elevation calculations derived from vessel sonar systems is anticipated to be 1.0 meter.

Table 1 summarizes the survey control locations used in the DEA Bathymetric Survey, which will be used for the environment sample collection work described in this SOP. Figure 1 shows the PH2 piling at Fred Devine boat dock, and Figure 2 shows the approximate locations of the survey control references. Attachment 1 contains detailed survey sheets of the control points: Raindeer, PH1 and PH2, and 2100.

Primary Equipment

- Trimble® SPS 461 GPS with dual antennas (vessel GPS)
- A-frame assembly, sampling winch (vessel boom)
- Trimble® R1 (hand held GPS), tethered to Bluetooth® capable smartphone or tablet, ESRI Collector software with Trimble® GNSS Status middleware
- GPS owner's manual
- Writing tools (pencils, Sharpie®)
- Field logbook
- Spare batteries and/or battery charger
- Compass
- Tape measure

Hand-Held GPS Operations

For ease of use, the project team will utilize smartphones tethered to the Trimble® R1 GNSS Receiver via a Bluetooth® connection. The smartphone will be configured with Trimble's middleware software called GNSS Status to convert and stream NMEA satellite data to the smartphone for real-time

correction and display to a simple electronic data collection form developed on the ESRI Collector platform. The form will contain a limited number of data fields, including location, study name and operator, date, and notes or comments. This form is not intended to duplicate the content and scope of the field data collection forms, but rather clearly link the GPS data to those forms via the unique Location ID. There are metadata fields available as well from these GPS records, such as estimated horizontal accuracy.

Collected data recorded onto the phone will be transmitted wirelessly via a synchronization process invoked when data is "saved" to the device. The data will be pushed to AECOM Online's Portal and ArcGIS Server for storage of "corrected" location coordinates, Location ID, and other information captured when the GPS sounding is recorded. The sampling event will be trackable in near-real-time as samples are collected on the ArcGIS Portal Interface. Either dedicated, experienced GPS-operators will be collecting the measurements on the smartphones, or, due to the very simple nature of the interface, field personnel will be trained to use the devices. Initial training sessions were already successfully conducted March 19-20, 2018 on use of the smartphone GPS interface. These handheld devices were successfully used for the first 2 weeks of field work. For some studies, such as the smallmouth bass tracking study, these handhelds may be used as the primary GPS due to smaller vessel configuration.

Vessel Navigation and Equipment Operation

Vessel positioning will be conducted through the marine navigation and hydrographic software package HYPACK. This software package allows the visualization of the vessel over navigable charts, the processing of satellite corrections, stored hardware, and vessel parameters, as well as the storing of physical target locations during sampling activities. HYPACK version 2017 will be used for this project.

Vessel position is measured using a Trimble SPS 461 GPS dual antenna receiver. The dual antennas provide precise vessel positioning via both satellite and differential radio corrections along with heading correction to 0.09 degree. GPS data is output through a serial connection into computer running the HYPACK software, for vessel positioning and target collection.

At each sampling location, depth to mudline will be measured using an onboard fathometer (with lead line as confirmation as needed) immediately prior to or during the sampling. Water depths are measured at each station using an Airmar ss510 survey sonar at the sampling point and confirmed daily with a lead line with reference to water surface. Vertical measurements will be recorded to the nearest 0.1 foot. Water depths will be converted to elevations in NAVD88 based on the river stage at the time of sampling as recorded at the closest available tide gage.

Data Processing and QA/QC Procedures

All GPS devices will be subject to a position check to confirm the accuracy of the on-vessel GPS and hand-held GPS devices and to validate the positions derived from each GPS receiver. Correctors being applied as needed, resulting in a position that is within specified positioning accuracy of the DEA published position for control monument PH1 and PH2. At the start and end of each field day, the PH2 benchmark location will be visited by boat to perform a position check. At the piling serving as the control monument, the on-vessel GPS calibrated to the top of A-frame assembly will be maneuvered as close to the benchmark piling as possible to record a point. The GPS-derived position

of the sampling vessel is compared with the known horizontal location; results will be recorded in HYPACK to confirm that accuracy is within +/- 2 meters. For handheld GPS, field staff will occupy the PH1 at the Swan Island boat launch parking lot. Using the R1 and phone/tablet combination GPS setup, the field staff will hold the R1 above PH1 and wait for a satellite "fix," and when ready, the staff will record the GPS location in Collector. This GPS location will be compared to the known coordinates to confirm the accuracy is within +/- 2 meters. The survey control monuments act as a known location to allow for corrected station location coordinates during post-processing of data as needed. If a need arises to locate another benchmark, there are several USGS control points near the project area and near the AECOM project warehouse. Experienced GPS operators on the project team will be involved in all aspects of field data collection events to troubleshoot devices and assist in daily review of extracted geospatial datasets. Additional details on QA/QC procedures can be found on the DQMP.

References

AECOM (AECOM Technical Services) and Geosyntec (Geosyntec Consultants, Inc.). 2018. Data Quality Management Plan Portland Harbor Pre-Remedial Design Investigation and Baseline Sampling. Portland Harbor Superfund Site. 22 February.

Integral (Integral Consulting). 2002. Round 1 Field Sampling Plan. Prepared for the Lower Willamette Group (LWG) for submittal and approval by EPA Region 10. June 14.

EPA (United States Environmental Protection Agency). 2008. National Geospatial Data Policy. August 24.

PSEP. 1998. Recommended Guidelines for Station Positioning in Puget Sound. Prepared for United States EPA Region 10 and the Puget Sound Water Quality Action Team. September.

USACE (United States Army Corps of Engineers). 2004. Engineering and Design Hydrographic Surveying Manual, EM 1110-2-1003, U.S. Army Corps of Engineers, April 2004

Attachments

PH Control Points of 2100, Portland Harbor (PH1 and PH2), and Raindeer survey monuments, as well as figures presenting PH2.

Table 1. Benchmark Monument Coordinates and Description

Designation	Approx. Location	Description	NAD83 (2011), Oregon SPCS North (ft)		NAVD88 Elevation (ft)
			Northing	Easting	
DEMSI-BASE	Columbia River	Fixed antenna with height at antenna reference point	718172.70	7654431.05	73.58
DEMSI- CHECK	Columbia River	Fixed antenna with height at antenna reference point	718170.73	7654419.84	71.67
RAINDEER	RM 2	USACE Brass Cap	722443.24	7614886.64	35.44
Portland Harbor (PH1)	Swan Island Boat Ramp	1/2" Iron Rod with red plastic cap stamped "DEA Control" Point is 0.3 feet south of the back of curb at the Swan Island Boat Ramp, 10.5 feet north of a cyclone fence, and 60 feet east of a light post	698702.46	7637426.37	33.38
Portland Harbor 2 (PH2)	Fred Devine Boat Dock	Reference point is 0.2 feet SE of the SE side of a 1-1/2 foot steel pile. This is the furthest SE pile at the end of the Fred Devine Diving and Salvage Company dock in the Swan Island Lagoon. This pile is to be used for daily position checks for sediment sampling operations. Pile is for position only and not elevation.	700967.87	7634507.67	NA
2100	RM 13	5/8" bolt on SW corner of screen wall at DEA office 2100 SW River Parkway, Portland, OR	678400.01	7645190.81	159.51

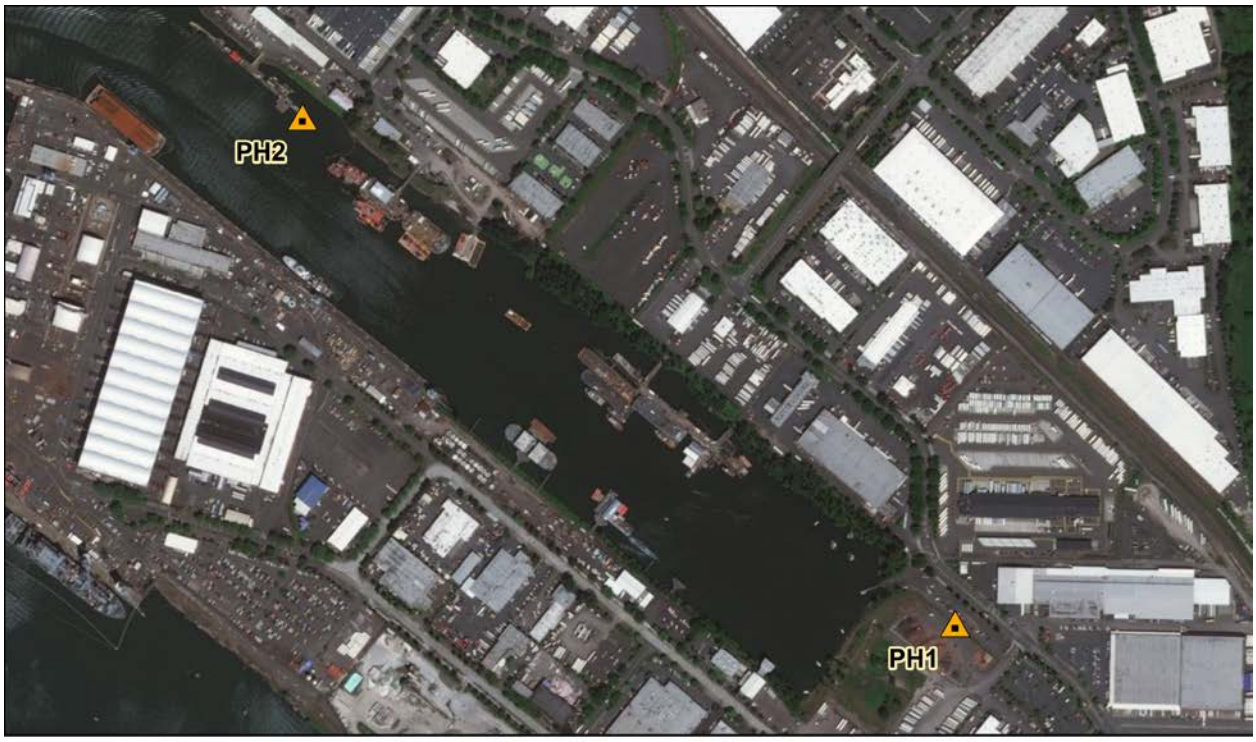
General Notes:

1. The two DEMSI and the 2100 stations are transceiver beacon stations in upland areas (Green Shade).
2. PH1 is located at the Swan Island boat ramp parking lot and accessible by foot.
3. PH2 is located at a piling at the boat dock where project-related vessels will be docked and is accessible by boat.
4. Raindeer station is located adjacent to the river and accessible by foot (for the hand-held GPS).

Acronyms:

DEA = David Evans and Associates; ft = feet; NAD83 = North American Datum of 1983; NAVD88 = North American Vertical Datum of 1988; PH = Portland Harbor; RM = river mile; USACE = US Army Corps of Engineers; SPCS = State Plane Coordinate System

Figure 1. Photograph of Piling PH2, at the end of the Fred Devine Boat Dock. Piling was captured in DEA bathymetric survey. Photo is facing northwest.



PH2 is located on the SE corner of the Fred Devine Boat Dock, where Gravity's boats berth every night.

PH1 is located on the SW side of the Swan Island Boat Launch parking lot, where field crews park to meet the boats at the launch dock.

Figure 2. Locations of control monuments PH1 and PH2 at Swan Island Boat Launch and Fred Devine Boat Dock, respectively.

NOTE: This form intended for field use. Unsolicited data submitted to NGS must be converted to bluebook format.

GPS STATION OBSERVATION LOG
April 16, 2003

Station Designation: (check applicable:__ FBN__ CBN__ PAC__ SAC __BM) 2100		Station PID, if any:	Date (UTC): 06-Mar-18
General Location: DEA Office 2100 SW River Parkway, Portland	Airport ID, if any:	Station 4-Character ID:	Day of Year: 065
Project Name: Portland Harbor - AETR00000034	Project Number: GPS-	Station Serial # (SSN):	Session ID:(A,B,C etc)

NAD83 Latitude o ‘ “	NAD83 Longitude o ‘ “	NAD83 Ellipsoidal Height meters NAVD88 Orthometric Ht. meters GEOID99 Geoid Height meters	Agency Full Name: David Evans and Associates, Inc. Operator Full Name: David T. Moehl Phone #: ( ) (360) 314-3200 e-mail address: dtm@deainc.com
Observation Session Times (UTC): Sched. Start _____ Stop _____ Actual Start 18:55 Stop 23:00	Epoch Interval= 1 Seconds Elevation Mask = 10 Degrees		

Receiver Brand & Model: Trimble SPS855
P/N: 69855-60
S/N: 5506R0075
Firmware Version: 5.30
❒ CamCorder Battery, ❒ 12V DC, ✓ 110V AC, ❒ Other

Antenna Code*, Brand & Model: Trimble Zephyr 3 Base
P/N: 115000-10
S/N: 3121179869
Cable Length, meters: 10
Vehicle is Parked n/a meters ____(direction) from antenna.

Antenna plumb before session?	(Y / N)	Circle
Antenna plumb after session?	(Y / N)	Yes or No
Antenna oriented to true North?	(Y / N) ✓	-If no,
Weather observed at antenna ht.	(Y / N) ✓	explain
Antenna ground plane used?	(Y / N) ✓	“
Antenna radome used?	(Y / N) ✓	If yes,
Eccentric occupation (>0.5 mm)?	(Y / N) ✓	describe.
Any obstructions above 10°?	(Y / N) ✓	Use
Radio interference source nearby	(Y / N) ✓	Vis. form

Tripod or Antenna Mount: Check one:
❒ Fixed-Leg Tripod, ❒ Collapsible-leg tripod ✓ Fixed Mount
Brand & Model: Bolt
P/N:
S/N:
Last Adjustment date:

Psychrometer (if used) Brand & Model:
P/N:
S/N:
Last Calibration or check Date:

**** ANTENNA HEIGHT ****

	Before Session Begins: Meters	Feet	After Session Ends: Meters	Feet
A= Datum point to Top of Tripod (Tripod Height)	0.000		0.000	
B= Additional offset to ARP if any (Tribrach/Spacer)	0.000		0.000	
H= Antenna Height **= A + B** = Datum Point to Antenna Reference Point (ARP)	0.000	0.00	0.000	0.00

Meters = Feet x (0.3048)
Height Entered Into Receiver = 0.000 meters.
Note &/or sketch **ANY** unusual conditions. Be **Very Explicit** as to where and how Measured!

Barometer (if used) Brand & Model:
S/N:

Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp Fahrenheit	Dry-Bulb Temp Celsius	WetBulb Temp Fahrenheit	WetBulb Temp Celsius	Rel. % Humidity	Atm. Pressure inches Hg	Atm. Pressure millibar
Before	00000	18:55							
Middle									
After	00000	23:00							

Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

5/8" bolt found on the southeast corner of the VAC screen wall on DEA office roof at 2100 SW River Parkway, Portland, OR. The geodetic antenna was screwed tight to the top of the double nut on the 5/8" bolt. The antenna height = zero to the antenna reference point (bottom of antenna mount).

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.

Data File Name(s): 00750650.T02
(Standard NGS Format = aaaaddds.xxx)
where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension

Updated Station Description:	❒ Attached	❒ Submitted earlier
Visibility Obstruction Form:	❒ Attached	❒ Submitted earlier
Photographs of Station:	✓ Attached	❒ Submitted earlier
Pencil Rubbing of Mark:	❒ Attached	

LOG CHECKED BY: Jon Dasler

Table of Weather Codes	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND
	0	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)
	1	did occur	Fair, 7-15 miles	Hot, over 80°F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph
	2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over15 mph (24km/h)
Examples:	00000 = No problem, good visibility, normal temp, clear, calm wind			12121 = Problems, poor visibility, hot, overcast, moderate wind		

Photo of Monument 2100

Photo of Monument 2100

GNSS Setup on 2100

NOTE: This form intended for field use. Unsolicited data submitted to NGS must be converted to bluebook format.

GPS STATION OBSERVATION LOG
April 16, 2003

Station Designation: (check applicable:__ FBN__ CBN__ PAC__ SAC __BM) Portland Harbor 1 (PH1)		Station PID, if any:	Date (UTC): 06-Mar-18
General Location: Swan Island Boat Launch	Airport ID, if any:	Station 4-Character ID:	Day of Year: 065
Project Name: Portland Harbor - AETR00000034	Project Number: GPS-	Station Serial # (SSN):	Session ID:(A,B,C etc)

NAD83 Latitude o ‘ “	NAD83 Longitude o ‘ “	NAD83 Ellipsoidal Height meters NAVD88 Orthometric Ht. meters GEOID99 Geoid Height meters	Agency Full Name: David Evans and Associate, Inc. Operator Full Name: David T. Moehl Phone #: ( ) (360) 314-3200 e-mail address: dtm@deainc.com
Observation Session Times (UTC): Sched. Start _____ Stop _____ Actual Start 19:30 Stop 21:32	Epoch Interval= 1 Seconds Elevation Mask = 10 Degrees		

Receiver Brand & Model: Trimble SPS985
82500-60
P/N:
S/N: 5616F59510
Firmware Version: 5.30
❒ CamCorder Battery, ❒ 12V DC, ❒ 110V AC, ✓ Other

Antenna Code*, Brand & Model: Trimble SPS985 Internal
P/N:
S/N:
Cable Length, meters: n/a
Vehicle is Parked 10 meters N (direction) from antenna.

Antenna plumb before session?	(Y / N)	Circle
Antenna plumb after session?	(Y / N)	Yes or No
Antenna oriented to true North?	(Y / N) ✓	-If no,
Weather observed at antenna ht.	(Y / N) ✓	explain
Antenna ground plane used?	(Y / N) ✓	“
Antenna radome used?	(Y / N) ✓	If yes,
Eccentric occupation (>0.5 mm)?	(Y / N) ✓	describe.
Any obstructions above 10°?	(Y / N) ✓	Use
Radio interference source nearby	(Y / N) ✓	Vis. form

Tripod or Antenna Mount: Check one:
✓ Fixed-Leg Tripod, ❒ Collapsible-leg tripod ❒ Fixed Mount
Brand & Model: Seco fixed height
P/N:
S/N: 5115-00-FLY
Last Adjustment date: 2018-03-05

Psychrometer (if used) Brand & Model:
P/N:
S/N:
Last Calibration or check Date:

**** ANTENNA HEIGHT ****

	Before Session Begins: Meters	Feet	After Session Ends: Meters	Feet
A= Datum point to Top of Tripod (Tripod Height)	2.000		2.000	
B= Additional offset to ARP if any (Tribrach/Spacer)	0.000		0.000	
H= Antenna Height **= A + B** = Datum Point to Antenna Reference Point (ARP)	2.000	6.56	2.000	6.56

Meters = Feet x (0.3048)
Height Entered Into Receiver = 2.000 meters.
Note &/or sketch **ANY** unusual conditions. Be **Very Explicit** as to where and how Measured!

Barometer (if used) Brand & Model:
S/N:

Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp Fahrenheit	Dry-Bulb Temp Celsius	WetBulb Temp Fahrenheit	WetBulb Temp Celsius	Rel. % Humidity	Atm. Pressure inches Hg	Atm. Pressure millibar
Before	00000	19:30							
Middle									
After	00000	21:32							

Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

Control point is a 1/2" iron rod with red plastic cap stamped "DEA CONTROL" set 0.1' below natural grade. Control point is 0.3' south of the back of curb, 10.5' north of a cyclone fence and 60' easterly of the 2nd light post east of the boat ramp. See detached sketch and photos.

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.

Data File Name(s): 95100650.T02
(Standard NGS Format = aaaaddds.xxx)
where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension

Updated Station Description:	❒ Attached	❒ Submitted earlier
Visibility Obstruction Form:	❒ Attached	❒ Submitted earlier
Photographs of Station:	✓ Attached	❒ Submitted earlier
Pencil Rubbing of Mark:	❒ Attached	

LOG CHECKED BY: Jon Dasler

Table of Weather Codes	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND
	0	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)
	1	did occur	Fair, 7-15 miles	Hot, over 80°F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph
	2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over15 mph (24km/h)
Examples:	00000 = No problem, good visibility, normal temp, clear, calm wind			12121 = Problems, poor visibility, hot, overcast, moderate wind		

Sketch of Monument PH1

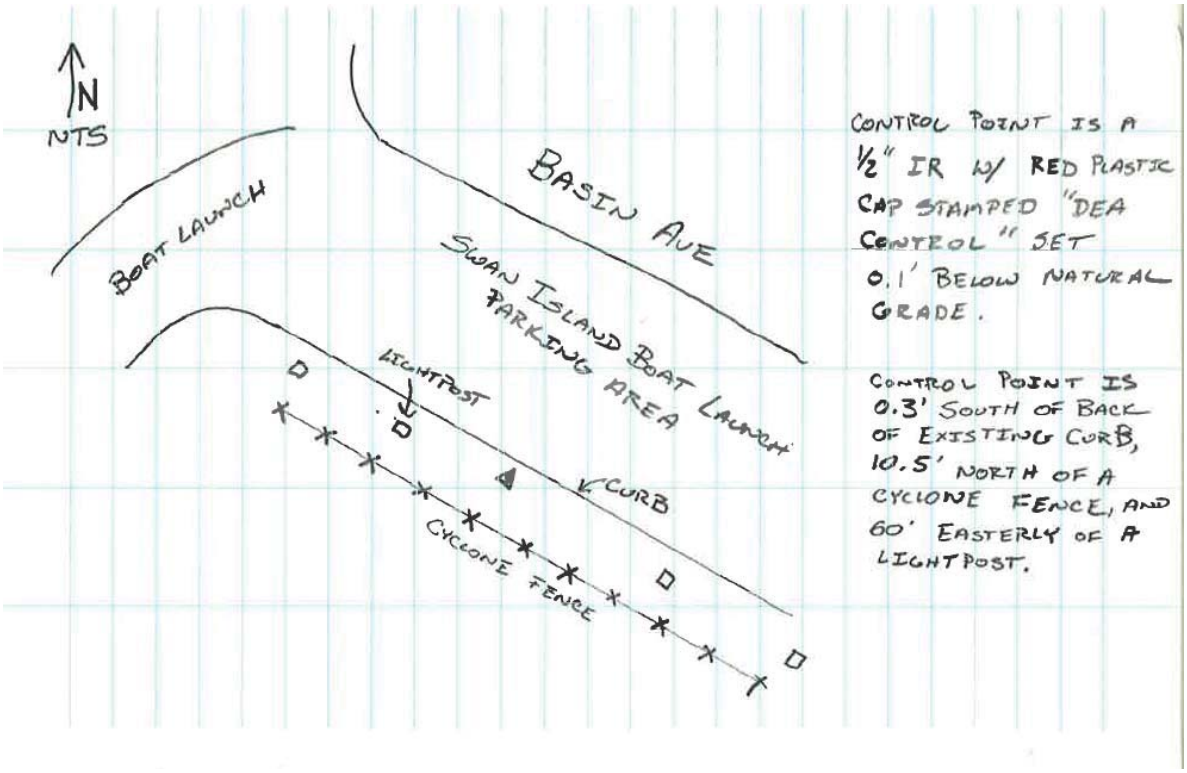


Photo of Monument PH1

GNSS Setup on PH1

NOTE: This form intended for field use. Unsolicited data submitted to NGS must be converted to bluebook format.

GPS STATION OBSERVATION LOG
April 16, 2003

Station Designation: (check applicable:__ FBN__ CBN__ PAC__ SAC __BM) Portland Harbor 2 (PH2)		Station PID, if any:	Date (UTC): 20-Apr-18
General Location: Fred Devine Boat Dock	Airport ID, if any:	Station 4-Character ID:	Day of Year: 111
Project Name: Portland Harbor - AETR00000034	Project Number: GPS-	Station Serial # (SSN):	Session ID:(A,B,C etc)

NAD83 Latitude o ‘ “	NAD83 Longitude o ‘ “	NAD83 Ellipsoidal Height meters NAVD88 Orthometric Ht. meters GEOID99 Geoid Height meters	Agency Full Name: David Evans and Associate, Inc. Operator Full Name: David T. Moehl Phone #: ( ) (360) 314-3200 e-mail address: dtm@deainc.com
Observation Session Times (UTC): Sched. Start _____ Stop _____ Actual Start 19:45 Stop 19:49	Epoch Interval= 1 Seconds Elevation Mask = 10 Degrees		

Receiver Brand & Model: Trimble SPS985
82500-60
P/N:
S/N: 5616F59510
Firmware Version: 5.30
❒ CamCorder Battery, ❒ 12V DC, ❒ 110V AC, ✓ Other

Antenna Code*, Brand & Model: Trimble SPS985 Internal
P/N:
S/N:
Cable Length, meters: n/a
Vehicle is Parked n/a meters ____(direction) from antenna.

Antenna plumb before session?	(Y / N) ✓	Circle
Antenna plumb after session?	(Y / N) ✓	Yes or No
Antenna oriented to true North?	(Y / N) ✓	-If no,
Weather observed at antenna ht.	(Y / N) ✓	explain
Antenna ground plane used?	(Y / N) ✓	“
Antenna radome used?	(Y / N) ✓	If yes,
Eccentric occupation (>0.5 mm)?	(Y / N) ✓	describe.
Any obstructions above 10°?	(Y / N) ✓	Use
Radio interference source nearby	(Y / N) ✓	Vis. form

Tripod or Antenna Mount: Check one:
✓ Fixed-Leg Tripod, ❒ Collapsible-leg tripod ❒ Fixed Mount
Brand & Model: Seco fixed height
P/N:
S/N: 5115-00-FLY
Last Adjustment date: 2018-03-05

Psychrometer (if used) Brand & Model:
P/N:
S/N:
Last Calibration or check Date:

**** ANTENNA HEIGHT ****

	Before Session Begins: Meters	Feet	After Session Ends: Meters	Feet
A= Datum point to Top of Tripod (Tripod Height)	2.000		2.000	
B= Additional offset to ARP if any (Tribrach/Spacer)	0.000		0.000	
H= Antenna Height **= A + B** = Datum Point to Antenna Reference Point (ARP)	2.000	6.56	2.000	6.56

Meters = Feet x (0.3048)
Height Entered Into Receiver = 2.000 meters.
Note &/or sketch **ANY** unusual conditions. Be **Very Explicit** as to where and how Measured!

Barometer (if used) Brand & Model:
S/N:

Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp Fahrenheit	Dry-Bulb Temp Celsius	WetBulb Temp Fahrenheit	WetBulb Temp Celsius	Rel. % Humidity	Atm. Pressure inches Hg	Atm. Pressure millibar
Before	00010	19:45							
Middle									
After	00010	19:49							

Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

Reference point is 0.2 feet SE of the SE side of a 1-1/2 foot steel pile. This is the furthest SE pile at the end of the Fred Devine Diving and Salvage Company dock in the Swan Island Lagoon. This pile is to be used for daily position checks for sediment sampling operations. Pile is for position only and not elevation.
NAD83(2011) Oregon North Zone International Feet Coordinates
North 700967.9 East 7634507.7

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.

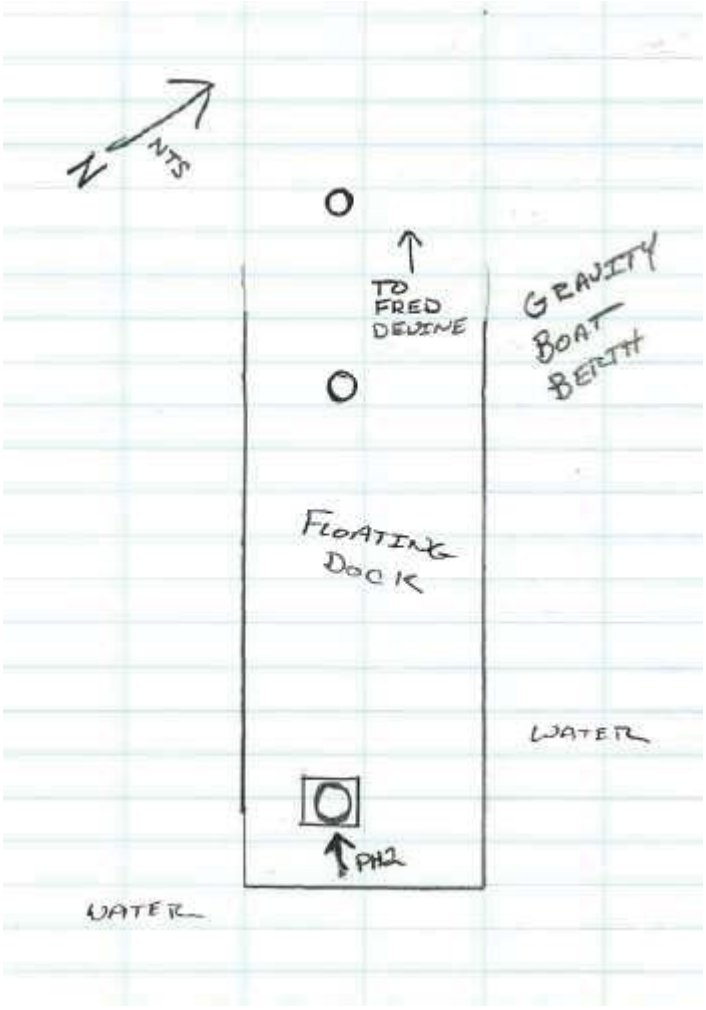
Data File Name(s):
(Standard NGS Format = aaaaddds.xxx)
where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension

Updated Station Description:	❒ Attached	❒ Submitted earlier
Visibility Obstruction Form:	❒ Attached	❒ Submitted earlier
Photographs of Station:	✓ Attached	❒ Submitted earlier
Pencil Rubbing of Mark:	❒ Attached	

LOG CHECKED BY: Jon Dasler

Table of Weather Codes	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND
	0	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)
	1	did occur	Fair, 7-15 miles	Hot, over 80°F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph
	2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over15 mph (24km/h)
Examples:	00000 = No problem, good visibility, normal temp, clear, calm wind			12121 = Problems, poor visibility, hot, overcast, moderate wind		

Sketch and Fieldnotes



200 CHK PH1

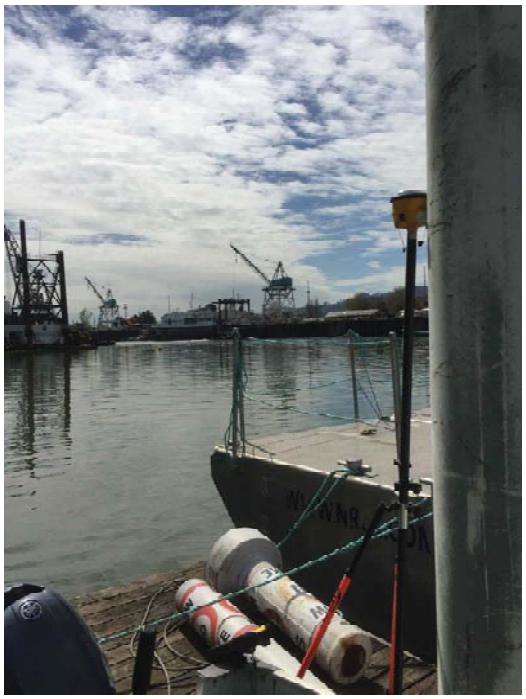
	KNOWN COORDS	OBS	Δ (FT)
N	698702.46	698702.45	0.01
E	7637426.37	7637426.39	0.02
Z	33.38	33.37	0.01

201 SE FACE OF PILE
3-MIN OBS
N = 700967.87
E = 7634507.64
Z = N/A

202 SW FACE TOPO
203 NW FACE TOPO
204 NE FACE TOPO

Overview of PH2 Pile

GNSS Setup on PH2 Pile



View facing south

View facing northwest

NOTE: This form intended for field use. Unsolicited data submitted to NGS must be converted to bluebook format.

GPS STATION OBSERVATION LOG
April 16, 2003

Station Designation: (check applicable:__ FBN__ CBN__ PAC__ SAC __BM)	Station PID, if any:	Date (UTC):
Raindeer		06-Mar-18
General Location: Sauvie Island, Willamette River	**Airport ID, if any:**	**Station 4-Character ID:** / **Day of Year:** 065
Project Name: Portland Harbor - AETR00000034	**Project Number:** GPS-	**Station Serial # (SSN):** / **Session ID:(A,B,C etc)**

NAD83 Latitude	NAD83 Longitude	NAD83 Ellipsoidal Height
o ‘ “	o ‘ “	meters
		NAVD88 Orthometric Ht. meters
		GEOID99 Geoid Height meters

Observation Session Times (UTC):
Sched. Start _____ Stop _____
Actual Start 17:38 Stop 23:45
Epoch Interval= 1 Seconds
Elevation Mask = 10 Degrees

Agency Full Name: David Evans and Associates, Inc.
Operator Full Name: David T. Moehl
Phone #: ( ) (360) 314-3200
e-mail address: dtm@deainc.com

Receiver Brand & Model: Trimble SPS855
P/N: 69855-60
S/N: 5506R0074
Firmware Version: 5.30
❒ CamCorder Battery, ✓ 12V DC, ❒ 110V AC, ❒ Other

Antenna Code*, Brand & Model: Trimble Zephyr 3 Base
P/N: 115000-00
S/N: 1551129193
Cable Length, meters: 10
Vehicle is Parked n/a meters ____(direction) from antenna.

Antenna plumb before session?	(Y / N)	Circle
Antenna plumb after session?	(Y / N)	Yes or No
Antenna oriented to true North?	(Y / N)	-If no,
Weather observed at antenna ht.	(Y / N)	explain
Antenna ground plane used?	(Y / N)	“
Antenna radome used?	(Y / N)	If yes,
Eccentric occupation (>0.5 mm)?	(Y / N)	describe.
Any obstructions above 10°?	(Y / N)	Use
Radio interference source nearby	(Y / N)	Vis. form

Tripod or Antenna Mount: Check one:
✓ Fixed-Leg Tripod, ❒ Collapsible-leg tripod ❒ Fixed Mount
Brand & Model: Seco fixed height
P/N:
S/N: 5115-00-FLY
Last Adjustment date: 2018-03-05

Psychrometer (if used) Brand & Model:
P/N:
S/N:
Last Calibration or check Date:

**** ANTENNA HEIGHT ****

	Before Session Begins: Meters	Feet	After Session Ends: Meters	Feet
A= Datum point to Top of Tripod (Tripod Height)	2.000		2.000	
B= Additional offset to ARP if any (Tribrach/Spacer)	-0.003		-0.003	
H= Antenna Height **= A + B** = Datum Point to Antenna Reference Point (ARP)	1.997	6.55	1.997	6.55

Meters = Feet x (0.3048)
Height Entered Into Receiver = 2.000 meters.
Note &/or sketch **ANY** unusual conditions. Be **Very Explicit** as to where and how Measured!

Barometer (if used) Brand & Model:
S/N:

Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp Fahrenheit	Dry-Bulb Temp Celsius	WetBulb Temp Fahrenheit	WetBulb Temp Celsius	Rel. % Humidity	Atm. Pressure inches Hg	Atm. Pressure millibar
Before	00000	17:38							
Middle									
After	00000	23:45							

Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.

Data File Name(s): 00740650.T02
(Standard NGS Format = aaaaddds.xxx)
where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension

Updated Station Description:	❒ Attached	❒ Submitted earlier
Visibility Obstruction Form:	❒ Attached	❒ Submitted earlier
Photographs of Station:	✓ Attached	❒ Submitted earlier
Pencil Rubbing of Mark:	❒ Attached	

LOG CHECKED BY: Jon Dasler

Table of Weather Codes	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND
	0	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)
	1	did occur	Fair, 7-15 miles	Hot, over 80°F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph
	2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over15 mph (24km/h)
Examples:	00000 = No problem, good visibility, normal temp, clear, calm wind			12121 = Problems, poor visibility, hot, overcast, moderate wind		

Photo of Monument RAINDEER

Photo of Monument RAINDEER

GNSS Setup on RAINDEER

SURFACE SEDIMENT SAMPLING AND PROCESSING

The purpose of this standard operating procedure (SOP) is to define and standardize the methods for collecting surface sediment samples from freshwater or marine environments. For the purpose of this SOP, surface sediments are defined as those from 0 to at most 30 cm below the sediment-water interface. The actual definition of surface sediments is typically program-specific and is dependent on the purpose of the study and the regulatory criteria (if any) to which the data will be compared.

This SOP utilizes and augments the procedures outlined in Puget Sound Estuary Program (PSEP 1996) guidelines. A goal of this SOP is to ensure that the highest quality, most representative data be collected, and that these data are comparable to data collected by different programs that follow PSEP guidelines.

SUMMARY OF METHOD

Sediment samples for chemical and toxicity analysis are collected using a surface sediment sampling device (e.g., grab sampler). If a sample meets acceptability guidelines, overlying water is siphoned off the surface and the sediment is described in the field log. Sediment samples for chemical analysis may be collected directly from the sampler (e.g., volatile organic compounds and sulfides) or sediment from the sampler may be homogenized using decontaminated, stainless-steel containers and utensils prior to being placed in sample jars. Sediment from several sampler casts may also be composited.

SUPPLIES AND EQUIPMENT

A generalized supply and equipment list is provided below. Additional equipment may be required depending on project requirements.

- Sampling device:
  Grab sampler or box corer

- Field equipment:
  Siphoning hose
  Stainless-steel bowls or containers
  Stainless-steel spoons, spatulas, and/or mixer
  Decontamination supplies
  (Alconox™ detergent, 0.1 N nitric acid, methanol dionized water)
  Personal protective equipment for field team
  (rain gear, safety goggles, hard hats, nitrile gloves)
  First Aid kit
  Cell phone

Sample containers
Bubble wrap
Sample jar labels
Clear tape
Permanent markers
Pencils
Coolers
Ice

- Documentation

  Waterproof field logbook
  Field sampling plan
  Health and safety plan
  Correction forms
  Request for change forms
  Waterproof sample description forms

PROCEDURES

EQUIPMENT DECONTAMINATION

The basic procedure used most commonly in Integral field projects to decontaminate field sampling equipment is as follows:

1. Rinse with tap or vessel water.
2. Wash with brush and Alconox™ detergent.
3. Rinse with tap or vessel water.
4. Rinse with distilled water.
5. Rinse with 0.1 N Nitric acid (optional - if metals analysis is to be performed).
6. Rinse with methanol or hexane (optional - if organics analysis is to be performed or adhering petroleum residue present).
7. Rinse with distilled water.
8. Cover with aluminum foil (dull side down).

This procedure may be modified depending on site-specific requirements, as described in PSEP (1986). For example, if sampling is in areas known to be uncontaminated or only slightly contaminated, the solvent and/or acid rinses may be eliminated. Conversely, if creosote or other petroleum-based residue is encountered, a hexane rinse may be added.

Decontamination with acid or solvents should always be performed outdoors using appropriate protective equipment, including, at a minimum, chemical-resistant gloves (e.g., nitrile) and goggles. All decontamination liquids that include solvents or acids should be contained in tightly sealed buckets or other containers for disposal in an approved onshore facility. Alternatively, low-vapor pressure solvents may be evaporated in a well-ventilated open area away from the work zone.

SEDIMENT SAMPLE COLLECTION

To collect sediment for chemical and biological analyses, a sampler that obtains a quantifiable volume of sediment with minimal disturbance of the sediments must be employed. Additionally, the sampler should be composed of a material such as stainless steel or aluminum, or have a non-contaminating coating such as Teflon™. Samplers capable of providing high-quality sediment samples include grab-type samplers (van Veen, Smith-McIntyres, Young grab, power-grab and ponar grab) and box cores (Soutar, mini-Soutar, Gray-O'Hara, spade core). Some programs require a sampler that collects from a specific area (e.g., 0.1 m^2). Most sampling devices are typically a standard size; however, some non-standard sizes are available to meet the requirements of specific programs. Grab samplers, especially the van Veen grab, are the most commonly used samplers to collect surface sediment. Power grab samplers are often used for programs requiring collection of sediment deeper than 10 cm or in areas with debris.

A hydraulic winch system should be used to deploy the sampler at a rate not exceeding 1 m/sec to minimize the bow wake associated with sampler descent. Once the sampler hits the bottom, the jaws are slowly closed and the sampler is brought to the deck of the vessel at a rate not exceeding 1 m/sec to minimize any washing and disturbance of the sediment within the sampler. At the moment the sampler hits the bottom, the time, depth, and location of sample acquisition are recorded in the field logbook.

Once onboard, the sampler is secured, any overlying water is carefully siphoned off, and the sample is inspected to determine acceptability. Criteria used to determine acceptability are those detailed in PSEP (1986), except when noted in the project-specific field sampling plan (FSP). These criteria include but are not limited to:

- There is minimal or no excessive water leakage from the jaws of the sampler.
- There is no excessive turbidity in the water overlying the sample.
- The sampler is not over-penetrated.

- The sediment surface appears to be intact with minimal disturbance.
- The program-specified penetration depths are attained.

If the sample meets acceptability criteria, the sample is recorded and observations entered into a sample description form or log. Once the sample has been characterized, the sediment is then sub-sampled for chemical and biological analyses.

SAMPLE PROCESSING

Sediment for chemical and/or toxicity analyses is removed from the sampler using a stainless-steel spoon. Depending on programmatic goals, the upper 2 to 30 cm of sediment are removed. To prevent possible cross contamination, sediments touching the margins of the sampler are not used.

Samples for volatile compounds (either organics or sulfides) are collected using a decontaminated stainless-steel spoon while sediment is still in the sampler. These sediments are not homogenized. The volatile organics sample jar should be tightly packed with sediment (to eliminate obvious air pockets) and filled so that there is no headspace remaining in the jar. Alternatively, if there is adequate water in the sediment, the container may be filled to overflowing so that a convex meniscus forms at the top, and the cap carefully placed on the jar. Once sealed, there should be no air bubbles. The sulfides sample is preserved with 0.2 N zinc acetate.

The remaining sediment is then placed into a pre-cleaned, stainless-steel bowl. Typically, sediment from a minimum of three separate casts of the sampler is composited at each station. Once a sufficient amount of sediment has been collected, the sediment is homogenized until it is of uniform color and has obtained a smooth consistency. It is then dispensed into pre-cleaned sample jars for the various chemical or biological analyses. Sample jars for biological analyses should be filled to the top with sediment to minimize available headspace. This procedure will minimize any oxidation reactions within the sediment. Sample jars for chemical analysis may be frozen for storage, leaving enough headspace left in the container to allow for expansion of the sediment upon freezing. After dispensing the sediment, the containers are then placed into coolers with ice and are either shipped directly to the analytical laboratories or transported to a storage facility.

CHAIN-OF-CUSTODY

Field

The cruise leader or other designated field sample custodian is responsible for all sample tracking and chain-of-custody procedures until sample custody is transferred to the laboratory. Custody procedures in the field are as follows:

1. Record all field and sample collection activities (including sample identification number, collection time and date) in the field logbook. While being used in the field, the logbook remains with the field team at all times. Upon completion of the sampling effort, the logbook should be reproduced and then kept in a secure area.
2. Complete a chain-of-custody form whenever samples are being transferred or removed from the custody of field sampling personnel. A sample form is provided in Appendix B. Record each individual sample on the form. Include additional information to assist in sample tracking such as collection date and time, number of containers, and sample matrix. The chain-of-custody may also serve as the sample analysis request form, with the required analysis indicated for each individual sample.
3. Sign the form and ensure that the samples are not left unattended unless secured.
4. Store, pack, or ship samples as described in the following section. Place the original completed chain-of-custody form in a sealed plastic bag inside the shipping container. A copy is retained by the shipping party.
5. Complete a separate custody form for each individual shipping container or a single form for all samples in multiple shipping containers in a single shipment, with the number of containers noted on the custody form.
6. Attach completed custody seals to any shipping container that will be sent to the laboratory by delivery service or courier. Delivery personnel are not required to sign the custody form if custody seals are used. Custody seals are used to detect unauthorized tampering with the samples. Gummed paper or tape should be used so that the seal must be broken when the container is opened. The laboratory sample custodian (or other sample recipient) will establish the integrity of the seals.

7. The laboratory custodian (or other sample recipient) acknowledges receipt of the samples by signing, dating, and noting the time of transfer on the chain-of-custody form. The condition of the samples and any problems or irregularities (e.g., cracked or broken jars, loose lids, evidence of tampering) should also be recorded. Return a copy of the completed custody form to the project manger or designated sample coordinator.

Laboratory

The laboratory will designate a sample custodian who is responsible for receiving samples and documenting their progress through the laboratory analytical process. Each custodian will ensure that the chain-of-custody and sample tracking forms are properly completed, signed, and initialed on transfer of the samples. Specific laboratory chain-of-custody procedures should be in writing, included in the laboratory QA plan, and approved prior to beginning sampling and analysis. Laboratory custody procedures should include the following:

- A designated laboratory person initiates and maintains a sample tracking log that will follow each sample through all stages of laboratory processing and analysis.
- The laboratory tracking log includes, at a minimum, the sample number, location and type of storage, date and time of each removal, and signature of the person removing or returning the sample.
- The final disposition of the sample is recorded.

CHAIN-OF-CUSTODY QUALITY CONTROL PROCEDURES

Complete and correct chain-of-custody is essential to ensure and demonstrate sample integrity. Errors in entering information or transferring custody can result in analytical or data reporting errors. Inaccuracies or errors in sample tracking and custody records can compromise data usability, particularly as legal evidence.

Quality control procedures include the following:

- Allow adequate time to take accurate and complete field records and to carefully complete chain-of-custody forms.
- When possible, work in pairs or more to complete the chain-of-custody form and check for accurate information entry.

- Complete all custody records in ink; errors should be neatly crossed out and corrected and initialed by the person making the change.
- Immediately notify the project manager of any deviation from required custody procedures.

PACKING AND SHIPPING SAMPLES

Environmental samples are packed in a manner to reduce the chance of sample breakage, ensure sample integrity, and prevent material leakage and potential exposure to hazardous materials in the event of breakage. Samples are placed in sealed plastic bags and packed in a sturdy container with adequate packing material to prevent breakage. Ice or dry ice may be included to maintain sample storage conditions. Samples are transported by field personnel or shipped via courier or common carrier. Shipping procedures are in accordance with U.S. Department of Transportation regulations (49 CFR 173.6 and 49 CFR 173.24).

All preserved samples should be shipped as soon as possible after completion of sampling. This minimizes the number of people handling samples and protects sample quality and security.

Sample Packing

Upon completion of final sample inventory by the field sample custodian and completion of chain-of-custody, samples are packed as follows:

1. If not already done after sample collection, wipe the outside of each sample container and lid with a disposable cloth to remove any soil or sediment adhering to the outside of the jar and place each container in a sealed plastic bag (e.g., ziplock).
2. Wrap each glass sample container in bubble wrap or place it in a bubble wrap plastic bag. [Note: When samples are being transported by field personnel directly from the field site to the laboratory (thereby ensuring careful handling), this step is recommended but may be omitted. However, this step is required when a courier or delivery service is transporting the samples.]
3. Line the shipping container with heavy-duty plastic bags (e.g., garbage bags) and bubble wrap. Use a leak-proof, sturdy container that can withstand rough treatment during shipping. If ice chests or coolers are used, the drain should be securely plugged and sealed with duct tape.

4. Place the samples tightly in the shipping container:
   - Use dividers or bubble wrap to separate all glass containers
   - Fill any empty space in the shipping cooler or box with packing material so that the jars are held securely.

5. Place the original completed chain-of-custody form in a sealed plastic bag and place it inside the shipping container. If using a cooler or ice chest, the form should be securely taped to the inside of lid.
6. For liquid samples, absorbent material (e.g., vermiculite) should be placed in the container in sufficient quantity such that all liquid could be absorbed.
7. Tie or seal the bag lining the shipping container.
8. If required to meet sample storage requirements, fill the ice chest with crushed or block ice, blue ice (refrigerated samples, 4°C) or dry ice (frozen samples). A temperature blank (provided by the laboratory) should be packed in each cooler.
9. If samples for volatile organics analysis (VOA) are included in the shipping container, two VOA trip blanks (provided by the analytical laboratory) should also be packed in the cooler.
10. Seal shipping container securely with packing or duct tape.
11. If the shipping container will be transported by anyone other than the person who completed and signed the chain-of-custody form, attach completed custody seals so that the shipping container cannot be opened without breaking the seal.
12. Attach a *This End Up* label to each side of the shipping container to ensure that jars are transported in an upright position. A *Fragile* label may also be attached to reduce rough handling of the samples.
13. Label the shipping container with all appropriate information (name of project, time and date, responsible person and company name, address and phone) to enable positive identification.

Sample Shipping

Packed containers may be delivered to the laboratory or storage facility by field personnel, courier, or common carrier (FedEx, UPS). However, any outside carrier or courier service must provide a delivery receipt. The carrier or courier must also ensure delivery time if holding time and storage conditions are critical.

Unless arranged in advance, shipping charges should be prepaid by sender to avoid confusion and possible rejection of the package by the laboratory.

The adequacy of handling and shipping procedures is reflected in the condition of the samples upon receipt by the laboratory:

- No jars are cracked or broken.
- There is no evidence of sample leakage.
- Measuring the temperature of the temperature black indicates that correct storage conditions have been maintained.

The sample custodian or other designated person is responsible for confirming that copies of all shipping documents, completed in full and correctly, are on file at Integral.

QUALITY CONTROL PROCEDURES

Field quality control (QC) samples that may be collected during surface sediment sampling are the same as for any field sampling program. The types and frequency of field QC sample collection are project-specific and will be described in the project field sampling plan. The most commonly collected field QC sample are described below (PSEP 1996):

- **Field Blank**. A field blank is a sample of analyte-free water that is supplied by the laboratory. The field blank is generated by transferring the analyte-free water to another laboratory-supplied sample container while at the field sampling location. Field blank results are used to measure and document any possible onsite contamination.

- **Field Split Sample**. A field split sample consists of aliquots of the same homogenized sediment sample that are equally distributed in two sets of sample containers. These samples may be analyzed identically or analyzed by different laboratories to evaluate repeatability of sample handling and analytical procedures, sample heterogeneity, and analytical procedures.

- **Field Replicate**. A field replicate consists of a second sample that is collected using the same sampling methodology used to obtain the first sample. It is collected at the same sampling location and as soon after the original sample as possible. Analysis of the field replicate allows evaluation of the repeatability of field sampling methodologies, as well as the heterogeneity of the sample matrix. Statistical analysis of multiple replicates may also be used to calculate the likely range of an analyte concentration at a given sampling location.

REFERENCES

PSEP. 1996. Puget Sound Estuary Program: Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound. Final Report. TC-3991-04. Prepared for U.S. Environmental Protection Agency, Region 10 and Puget Sound Estuary Program, Seattle, WA. Tetra Tech and HRA, Inc., Bellevue, WA.

STANDARD OPERATING PROCEDURE SOP-02

MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Introduction

Investigation derived wastes (IDW) generated during the Pre-Remedial Design Investigations at the Portland Harbor Superfund Site may include:

- Soils/sediments
- Surface water
- Other materials:
    - Personal protective equipment
    - Disposable sampling equipment
    - Spent decontamination liquids
    - Plastic sheeting, containers, etc.

The management of these wastes will be conducted to limit exposure of Site personnel to hazardous materials, and to prevent introduction of contaminated materials to uncontaminated environmental media at the Site (soils, sediment). The following Standard Operating Procedures (SOPs) establish protocols for testing, storage, and disposal of these materials.

Disposal of laboratory test equipment and supplies will be handled in accordance with the laboratory Quality Assurance Project Plan (QAPP).

General

IDW management will follow guidance described in the Office of Solid Waste and Emergency Response (OSWER) document, Guide to Management of Investigation-Derived Wastes (United States Environmental Protection Agency [EPA] 1992). This guidance discusses factors to consider as part of an IDW management program. These factors include protectiveness of human health and the environment, compliance with applicable and relevant or appropriate requirement (ARAR)-based cleanup levels, land disposal restrictions, storage requirements, recordkeeping and manifesting, and handling of non- Resource Conservation and Recovery Act (RCRA) hazardous wastes. The IDW management program described in this section incorporates these factors in the program.

All IDW identified as potentially contaminated with hazardous materials will be stored in a designated and clearly marked IDW management area located at the AECOM Technical Services (AECOM) Field Laboratory. All vessels will also be clearly labeled to indicate the source of the IDW. The IDW storage area will be inspected daily to ensure that storage procedures (as outlined below) are being followed. Any violations of these procedures will be

documented and remedied as quickly as possible. Potentially contaminated IDW will be identified based on its origin, olfactory evidence, and visual evidence. Laboratory testing will be required to determine the proper disposition of these IDW.

Media Specific IDW Management

Sediment/Soils

Waste soils and sediments will be generated as excess sample material. The required testing and handling of this IDW will depend on its origin and characteristics. Olfactory and visual observations will be used to determine if the soils contain potentially elevated levels of hazardous materials. The amount of sediment generated will be minimized to the volume necessary for sampling and analysis, if possible. During field operations, leftover sediment material will be returned to the location it was generated from unless a significant sheen or non-aqueous phase liquid (NAPL) is observed. If significant sheen or NAPL is observed, sediment on the vessel or laboratory processing area will be temporally stored in 5-gallon buckets with lids, then transferred to 55-gallon drums. Each drum will be labeled using a grease pencil or paint pen to indicate the date sealed, location, and contents. Each of the sealed drums will then be staged at a designated solid waste management unit location for later disposal characterization.

Surface Water

Sampling activities may result in the creation of surface water sheens. Sorbent booms will be deployed if significant sheen is encountered on the water surface during coring/grab sampling. A small support boat may be used to manage the boom so the sampling vessel can operate without interruption. AECOM will coordinate with the Office of Spill Prevention Section on additional mitigation measures and agency notifications for releases. Surface water generated during sediment collection will be returned to the lake unless a significant sheen is observed. If a sheen is observed, water will be contained in 55-gallon drums or plastic containers and managed accordingly.

Personal Protective Equipment (PPE)

Investigation-derived PPE consists of gloves, chemically protective clothing, respirator canisters, and other one-time use equipment used during the field investigation. All used PPE will be containerized in plastic garbage bags and disposed of on-site for subsequent transport to the municipal landfill.

Decontamination Fluids

Decontamination fluids will be drummed up in either 55-gallon drums or disposed of in sanitary sewers if no significant sheen is observed. Alconox used on the boat will be discarded overboard if no significant sheen is observed. The decontamination containers will be kept on-site until the water has been analyzed for hazardous materials, at which time the water will be discarded appropriately.

Chemical Liquid Wastes

Chemical liquid wastes will include the spent solvents and acids and other residual chemicals generated during the decontamination process.

Waste acids and solvents will be collected in (dedicated) satellite containers as follows:

- Waste acids (e.g., hydrogen chloride, nitric acid) will be collected in a plastic storage carboy (20-L) SEPARATE FROM WASTE SOLVENTS, labeled with a Class 8 Corrosive Liquid label and containing a tag that indicates acid name, concentration, and volume along with users' initials and date/time.
- Waste solvents (e.g., acetone, methanol, and hexane) will be collected in Type I or II UL-approved galvanized steel disposal can, SEPARATE FROM WASTE ACIDS, labeled with a Class 3 Flammable Liquid label and containing a tag that indicates solvent name, concentration, and volume along with users' initials and date/time.

Solvent Waste (Acetone, Methanol, Hexane)

- Assign a unique identification number to the Type I or II UL-approved steel disposal can (clearly marked on the top and sides).
- Prepare a log for the drum, listing the volume and concentration of each solvent transferred to the drum along with date/time.
- Place a label indicating that the drum contains IDW pending characterization and a Class 3 Flammable Liquid label on the drum.
- Close the drum after each transfer.
- Store the drum in a secure area at the field facility until pickup by an authorized waste handler at the end of the field phase. Drums containing hazardous waste will be removed from the facility within the time mandated for the governing hazardous waste generator status (large quantity generator, small quantity generator, or conditionally except generator).

Other Materials

All plastic sheeting, sampling containers, and other disposable equipment that is free from hazardous materials will be containerized in plastic garbage bags and disposed of on-site for subsequent transport to the municipal landfill. Materials that have visible NAPL will also be drummed and shipped off-site for disposal at an approved facility. Non-disposable or bulky materials may be decontaminated and re-used or disposed as solid waste (see SOP for decontamination). Other disposable materials used on-site (tarps covering non-contaminated soils, caution tape, potable water containers) that have not contacted contaminated media will be disposed as solid waste.

Testing and Disposal

All drummed materials will be tested to determine the proper disposal method. Composite samples will be collected from each drum for analysis. Composite samples will be collected such that reasonable likelihood exists that the entire volume of material in a drum is represented in the sample.

Composite samples will be tested for the parameters identified in the QAPP. Modifications of this analyte list may be made based on specific knowledge of the origin and likely contaminants in the materials.

Soils contaminated above hazardous waste criteria will be shipped to a licensed disposal facility following any further required waste characterization or stabilization.

References

United States Environmental Protection Agency (EPA). 1992. Guide to Management of Investigation-Derived Wastes. Office of Solid Waste and Emergency Response. 9345-03FS.

STANDARD OPERATING PROCEDURE
FIELD WET SIEVING FOR GRAIN SIZE

INTRODUCTION

This Standard Operating Procedure (SOP) has been developed for the Pre-Remedial Design Sampling and Baseline Investigations (PDI) at the Portland Harbor Superfund Site located in Portland, Oregon. The objective of this SOP is to establish standard procedures for conducting wet sieving of sediment samples in the field for grain size screening. Conducting a wet sieve analysis is a useful field application to understand the percentage of fine grained sediments, by volume. Fine-grained sediments are classified as material that passes through a No. 200 sieve (nominal sieve opening size 0.074 millimeters).

This SOP provides basic steps to guide the process of conducting wet sieving in the field. The intended audience of this document includes all personnel involved in planning, field sampling, and conducting wet sieve analysis.

Equipment will include:

- No. 200 sieve (stainless-steel is preferred)
- 200 milliliter (ml) graduated cylinder with leveling edge at the top (or 100 ml depending on size if sieve screen)
- Disposable gloves
- Mixing bowl and utensil
- Squirt bottle
- Rinse water for helping the material pass through sieve
- Writing tools (pencils, Sharpie®)
- Field log book

FIELD WET SIEVE METHODS

The following sections outline the basic steps involved in conducting wet sieving techniques by the field team.

1. Put on a pair of disposable gloves.
2. Homogenize a representative aliquot of sediment using appropriate nonreactive processing equipment:

a. Collect an appropriate aliquot of sediment of at least 200 ml and place in a stainless-steel bowl.

b. Homogenize the sediment by mixing with stainless-steel utensil until uniform consistency and color is reached.

c. Decant excessive water from homogenized mix.

d. Visually inspect homogenized composite and record color and texture information in field notes.

3. Measure out 200 ml of sediment and place on No. 200 sieve (100 ml of sediment could also be used depending on the size of the sieve screen):

    a. Remove any large objects that would not be sampled (gravel or larger, clams, large sticks, etc.).

    b. Completely fill a 200 ml graduated cylinder with the homogenized sediment and scrape off any excess sediment so that the sediment is flush with the top of the graduated cylinder.

    c. Empty contents from 200 ml graduated cylinder onto surface of No. 200 sieve. Make sure all sediment from cylinder is in sieve; use a squirt bottle and spray water, if needed, to help ensure all sediment gets onto the sieve.

4. Wet sieving:

    a. Carefully use river water to help push fine-grained sediment through No. 200 sieve, making sure not to splash out any sediment from the sides of the sieve. Wash all sediment in sieve, as fine grain sediment can adhere to coarse sediment, leaves, or other small debris.

    b. Shaking of the sieve from side-to-side to allow passage of material smaller than the sieve openings is appropriate; however, care must be taken not to spill any sediment out the sides of the sieve.

    c. Slow mixing of sediment within the sieve, using a gloved hand or appropriate nonreactive utensil, may be conducted to help work the finer particle-size fractions through the sieve. Care must be taken not to press on the sieve screen or scrape materials, as to prevent compromising sieve openings.

5. Measuring sieved material:

    a. Once all wash water has passed through the sieve, begin collecting material retained on the sieve using a nonreactive spoon, taking care not to damage the screen. Water can again be used to help gather sediment that did not pass through the screen to a single area on the sieve, making it easier to collect sediment with a spoon. Sediment that did not pass through the sieve will be placed back into the 200 ml graduated

cylinder for a final volume check. Make sure that all sediment is collected from the sieve and placed in the 200 ml graduated cylinder.

b. Allow sediment within graduated cylinder to settle, as best as possible, and then record new volume of sediment.

6. Determine percentage of fines in sediment sample:

   a. Record the initial volume of sediment before sieving.

   b. Record the new (residual) sediment volume in the 200 ml graduated cylinder after sieving.

   c. Divide the volume of the sediment remaining in the graduated cylinder by 200 ml (initial volume).

   d. Take the new number and subtract from 1. (For example, if 150 ml remains, then divide 150 by 200 = 0.75. Then, 1 – 0.75 = 0.25, or 25% fines.)

   e. Record the percent fines by volume in the field notebook.

APPENDIX C – Rerandomization of Upriver Sediment Locations Based on 2018 Soft Sediment Probing Survey, FSP Addendum

FINAL

Appendix C – Rerandomization of Upriver Sediment Grab Locations Based on 2018 Soft Sediment Probing Survey, Addendum

Portland Harbor Pre-Remedial Design Investigation and Baseline Sampling

Portland Harbor Superfund Site

AECOM
Geosyntec Project Number: PNG0767

June 22, 2018

Prepared for:

United States Environmental Protection Agency, Region 10
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CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

June 22, 2018

Kenneth M. Tyrrell
PDI Project Coordinator
AECOM Technical Services

Date

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1. INTRODUCTION

This Field Sampling Plan (FSP) Addendum presents proposed rerandomized upriver surface sediment sampling locations based on recent soft sediment probing results. Soft sediment probing data were collected in April 2018 by Geosyntec Consultants, Inc. (Geosyntec) and AECOM Technical Services (AECOM) to identify areas of high proportions of fine-grained soft sediment. This FSP addendum (1) documents the field methods used for upriver probing; (2) describes the mapping of soft sediment areas; and (3) selects randomized gridded target locations for collection of surface sediment samples in areas identified as predominantly soft sediments. The potential need for rerandomization is outlined in *Section 2.1.4 Pre-Screening D/U Sediments for Grain Size* of the Pre-Remedial Design Investigation (PDI) Surface Sediment Sampling FSP (AECOM and Geosyntec 2018) approved by the United States Environmental Protection Agency (EPA) on March 29, 2018.

As described in Section 2.1.4 of the FSP (AECOM and Geosyntec 2018), surface sediment sampling in the Downtown and Upriver Reaches (D/U Reach) will target sample locations representative of fine material (including organic carbon and colloids and silt and clay particles) that is likely to be transported downstream. Surface sediment sampling locations are developed to target samples with >35% fines (sum of silt and clay fractions).

2. FIELD METHODS

Between April 2 and 6, 2018, AECOM and Geosyntec field staff along with EPA oversight conducted a field reconnaissance survey to confirm the bottom conditions of the D/U Reaches using three tools (presented in sequential order of use):

1. BioSonar® acoustic sonar
2. Mechanical hand-probing using 18-foot-long sediment probe
3. Grab sample collection and visual classification of sediment texture (along with field wet sieving)

The survey area extended from river mile (RM) 11.8 up to RM 26.4 (northeast and upstream of Willamette Falls). During this one-week field survey, 15,446 BioSonar® data points were collected, 275 locations were hand-probed, and 57 visual confirmation samples were collected. The field methods and approach are described in more detail below. Figure 1 series (1a–1h) presents the sonar and probing locations.

2.1 BioSonar Acoustic Sonar

BioSonar® was conducted on the first day (April 2, 2018) to help provide spatial coverage and help identify hard-bottom areas that would be excluded from sampling. BioSonar® acoustic sonar was identified by the field team as a tool that would provide better spatial coverage of the

deeper, middle-channel river areas that were beyond the reach of the hand-probe; its use was approved by EPA in May 2018 in Change Request 4.

BioSonar® uses a single-beam Echosounder that generates five acoustic sonar pings per second. The BioSonar® data contain information about bottom sediment substrate type (density and texture) embedded in the echo signal. Visual Habitat® software uses statistical signal processing techniques (Principal Component Analysis) to decode the signal and identify the composition of the bed material (e.g., rock, sand, and mud substrates). The BioSonar® tool also provides water depth soundings. Differential global position system (DGPS) is incorporated into the Echosounder to provide accuracy of less than 3 meters with DGPS updated every second. The sounder was located at the bow of the research vessel, and the vessel moved in sweeping transects across the river approximately every one tenth mile.

2.2 Mechanical Hand-Probing

Mechanical hand-probing was conducted from April 3 to 5, 2018, using an 18-foot-long metal probe. Probing of the sediments was performed at transects approximately every 0.1 RM but limited to areas where the water depth was less than 18 feet (primarily the eastern and western shores of the river). Along each transect, the metal probe was inserted manually through the water column into the surface sediment to classify the substrate as either soft, medium, or hard based on the probe operator's assessment of bottom substrate resistance to the probe (and confirmed with a visual ponar grab). Beyond a depth of 18 feet, sediment could not be assessed using the probing technique; therefore, the BioSonar® tool was used, as described above.

2.3 Visual Classification and Wet Sieving of Grab Samples

On April 6, 2018, a subset of areas was revisited where the mechanical hand-probing identified the bottom substrate as soft sediment, and grab samples were collected to verify the BioSonar® and mechanical hand-probing results. Sediment was obtained using a Ponar grab sampler deployed from the research vessel and visually classified according to the American Society for Testing and Materials (ASTM) visual-soil classification method described in Appendix A-1 of the FSP.

In addition to visual classification of the sediment, field wet sieving techniques were conducted on the grab samples by the field team on the vessel deck to quantify the percent fines by volume. A 200-milliliter sample of sediment was sieved through a No. 200 sieve (74-micrometer mesh), and the volume of sediment retained on the sieve was recorded in the field notebook along with the calculated percentage of fines (Table 1).

3. DATA ANALYSIS

The evaluation of the field reconnaissance survey data included three data analysis steps to select 60 proposed D/U Reach surface sediment sampling locations (30 in the Downtown Reach, 30 in the Upriver Reach). Step 1 included a review of the BioSonar® data to exclude large areas of hard bottom substrate from further data analysis, primarily from the middle of the channel. Step 2 included the interpolation of the remaining areas and classification of soft, medium, and hard bottom substrates based on the hand-probing, visual classification, and wet-sieving results. Step 3 included randomized placement of 60 locations in the areas identified as soft bottom with >35% fines. These steps are described in more detail below.

3.1 Step 1 – Review of BioSonar® Data and Determination of Mid-Channel Hard Bottom

The BioSonar® soundings point-data (categorized as 1, 2, 3, 4, 5, and 6 return ratings) were processed and decoded into groupings of soft, medium, and hard bottom substrates.[1] A statistical comparison was conducted between a "hard" BioSonar® return and what was classified as "hard" during the mechanical probing/visual classification to determine if the sonar data could be used to support the mapping of areas determined to be hard bottom. Figure 2 presents the correlation between BioSonar® data indicating hard bottom substrates and the average percentage of fine sediments based on results of visual grab sample confirmation and 2004 Remedial Investigation/Feasibility Study (RI/FS) data points.[2]

The BioSonar® data suggest that the middle of the channel almost exclusively features hard-bottom substrates. Multiple ponar grabs in the middle of the channel confirmed sediment generally contained < 35% fines based on visual classification. The multiple data types evaluated (including the 2004 RI/FS data) show that the middle channel of the river generally does not contain soft sediment substrate with greater than 35% fines. Based on this conclusion, the middle channel area was excluded from further analysis in Steps 2 and 3. The hard bottom mid-channel area was delineated manually by "connecting the green dots" among the sonar "soft bottom" returns near the middle of the channel. The middle channel areas are unlikely to feature soft sediment with > 35% fines. Figure 1 series (1a–1h) presents the BioSonar® results and the mid-channel exclusion area that was generated based on the hard bottom designation. The area encompasses 51% of the D/U Reach.

3.2 Step 2 – Interpolation of Spatial Extents

Following exclusion of the middle of the river that is hard-bottom under Step 1, the remaining areas were interpolated using Thiessen polygons for spatial extents. Each polygon was assigned a

[1] The data is classified into the six sediment hardness classifications using a Fuzzy Centroid Mean (FCM) Algorithm.
[2] The correlations included sonar data within a 100-foot radius of a known, discrete probe or data point.

classification value of *soft, medium, or hard* based on the hand-probing data and visual confirmation of the probe data:

- Soft Bottom – areas identified as predominantly soft silt size fractions with easy penetration by the hand probe (then visually confirmed as containing >35% fines with a grab sample).
- Medium Bottom – areas identified as medium hard substrates from the hand-probing data were generally classified as predominantly sand.
- Hard Bottom – areas where hand-probing data hit "hard" substrate, and penetration was zero or minimal, were generally classified as containing dense sand, gravel, or cemented cobble.

Figure 3 series (3a–3h) presents the Thiessen polygons, hand-probe results, and percent fines from historical surface sediment samples collected during the 2004 RI/FS for comparison. As shown in Figure 3, Thiessen polygons are located on the river margins, nearshore, and back eddy areas of the river and "clipped" to exclude the mid-channel area. The mid-channel hard-bottom area that was determined in Step 1 was used during the generation of the Thiessen polygons to prevent shoreline probe data from giving a false characterization of sediment conditions (false positive) in the middle of the river. Table 2 presents the area (in acres) of probing area, exclusion area, and remaining hard, medium, and soft sediment > 35% fines area.

3.3 Step 3- Grid Derivation and Sample Randomization

The total soft-bottom area to be sampled within the D/U Reach, as delineated by the survey efforts, consists of non-contiguous polygons spread among the length of the two reaches. Soft sediment bottom areas with > 35% fines comprise 315 acres (16%) of the D/U Reach based on the Thiessen polygons. As designated in the Work Plan (Geosyntec 2017), both the Downtown Reach (RM 11.8 to 16.6) and the Upstream Reach (RM 16.6 to 28.4) are to each include 30 randomly determined sample locations for subsequent surface sediment sample collection.

3.3.1 Grid Derivation

To distribute these sample locations in a randomized manner such that the samples would be evenly distributed along the length of the reaches where soft sediment areas are present, a grid was generated within the soft sediment areas such that 30 cells were present in the Upriver Reach and 30 cells were present in the Downtown Reach. While this step was not specifically mentioned in the Surface Sediment FSP, this step is proposed because it is consistent with the grid cell approach used to randomly place surface sediment samples within the site and to provide spatial coverage across all soft sediment areas. A grid pattern avoids potential randomization in which some portions of soft sediment in the D/U Reach areas are not sampled or are sampled at extremely high density compared to other areas of soft sediment.

To generate the grid cells, once the Thiessen polygons had been generated in Step 2, the total length of soft sediment areas was measured, and then 60 evenly spaced grids were plotted within the soft sediment areas to allow for an even distribution of randomized sample grid cells laterally along the river. The total lateral length of soft sediment areas was approximately 1,625 feet (ft), of which 675 ft is in the Downtown Reach and 950 ft is in the Upriver Reach. Grid sizes were similar between the D/U Reaches, with the slight difference resulting from the higher lateral length of soft sediments in the Upriver Reach.

3.3.2 Revision of Soft Sediment Polygons

Following review of the randomized sample locations and discussion with EPA, EPA requested that the results of the BioSonar survey be used to refine the areas of soft sediments that considered multiple lines of evidence including sonar results (green/soft areas), probe results, historic data, best professional judgement, and river and sediment flow dynamics. The goal was to develop smaller areas for targeted sampling of areas with higher confidence of soft sediment being present. Following EPA approval of the refined footprints, samples were rerandomized as described below.

3.3.3 Sample Randomization

Surface sediment sample locations were randomly generated within each of the 60 soft sediment grid cells (one location per cell) using the Create Random Points tool in ArcGIS 10. The same randomization approach and tool were used for the randomly generated stratified random surface sediment sample locations within the Site described in the Work Plan (Geosyntec 2017). Figure 4 series (4a–4h) presents the grid cells, soft sediment areas as Thiessen polygons, and proposed sediment locations (x/y coordinates will be provided to the field crews and EPA after the target locations have been approved by EPA). Based on this approach, the samples are randomly distributed within areas that are likely to yield samples of soft sediments.

4. RESULTS AND RECOMMENDATIONS

The stratified random grid approach for soft sediment areas provides spatial coverage across the D/U Reaches and is consistent with the work plan methodology used to select the locations for the stratified random samples within the site. Consistent with the Surface Sediment FSP, the goal is to collect the surface sediment samples as three-point composite grab samples.

The average distance between a known probe point (from the D/U reconnaissance) indicating soft sediment and a random sample location is approximately 150 feet, with a maximum distance of approximately 300 feet. Therefore, uncertainty exists regarding changes in surface sediment composition between the probed and randomly proposed location within a grid cell. For this reason and as described below, field staff will have flexibility in employing their best professional judgment to select an Alternate 1 location as necessary. Collection of surface

sediment samples will follow the revised protocol outlined in Section 4.4 of the FSP, with some notable changes[3]:

- Go to primary target area and begin attempting to collect a three-point composite sample within a 50-foot radius of primary target.
- After collection of the first grab sample at the primary target, classify the substrate as described in Section 4.3.2 of the Surface Sediment FSP, including a visual estimate of percent fines. If the substrate is classified as:
    - Substrate 1 – Soft Sediment: Collect the surface sediment samples per the FSP protocol. At the field team's discretion, wet sieving may be performed on the first sediment grab sample to evaluate percent fines by volume.
        - Selecting Alternate 1 Location: If wet sieving results indicate insufficient fine material at the primary target location, probe the surface sediment moving toward the shoreline (beginning at ½ the distance to shore) or laterally along the shoreline until soft sediment is encountered. The field crew will use best professional judgement to determine where to probe based on the grid cell size, shape and physical features present. Once an area of soft sediment has been identified, this will be designated Alternate 1. A three-point composite sample will be attempted within a 50-foot radius of the selected Alternate 1 location.
    - Substrates 2 (Soft Sediment with Debris) or 3 (Natural Hard Sediment Bottom): Field staff will collect up to six attempts and will retain the three grabs with the deepest/best recovery depths. If significant debris is encountered, the field staff may decide to attempt an Alternate 1 location, determined in the field, before completing the six grab sample attempts.
        - Selecting Alternate 1 Location: If significant debris is encountered at the primary target location, field staff may move towards the shoreline or laterally along the shoreline staying within the grid cell.
        - The default distance will be ½ the distance towards shore, and then laterally at 25-foot increments towards the known probe point explored during the D/U Reconnaissance. Each incremental step will include a probing assessment, with substrate conditions noted at each incremental move.
        - Movement will continue, as practicable, until soft sediment is encountered. This station becomes the Alternate 1 Location. A three-point composite sample (up to six grab attempts) will be attempted within a 50-foot radius of the selected Alternate 1 location.

[3] These guidelines are for optimal sample recovery. See sentence following the bullets for minimum acceptable criteria in the case of challenging field conditions.

- Substrate 4 – No Recoverable Sediment: If Substrate 4 is encountered, attempt 3 grab samples. If any of the three grab samples do not have sufficient recovery, the field crew may move to an Alternate 1 location determined in the field.
    - Selecting Alternate 1 Location: the field team will probe the surface sediment moving toward the shoreline (beginning at ½ the distance to shore) or laterally along the shoreline until soft sediment is encountered. The field crew will use best professional judgement to determine where to probe based on the grid cell size, shape, and physical features present. Once an area of soft sediment has been identified, this station becomes the Alternate 1 Location. A three-point composite sample (up to six grab attempts) will be attempted within a 50-foot radius of the selected Alternate 1 location.

- If the bottom is soft, then conduct wet sieving on the first successful grab sample prior to sample collection to confirm > 35 percent fines by volume in the field;
- Field crews will document field conditions, weights used, probing/wet sieving results, each grab sample attempt, and will note the boundaries between hard and soft sediments during probing. Where attempted sampling locations are not yielding fine sediment, field crews have the flexibility to move off station to sample in areas of soft sediments as described in the selection of Alternate 1 locations above.

The minimum acceptable field criteria for a sample will include a one-point composite of at least 4-centimeter recovery, with visual characterization indicating > 35% fines (by volume). If the field crew is unable to collect an acceptable soft sediment sample with > 35% fines within a grid cell, then alternate options for that grid cell will be discussed with the Project Manager and EPA. The field crew may move to another grid cell while alternate options are being decided.

The D/U Reach surface sediment samples will be analyzed as described in Section 2.1.4 of the Surface Sediment FSP. All samples will first be analyzed on an expedited basis for grain size to confirm grain size is within the criteria included in the FSP. If the grain size results are within the stated criteria in the FSP, the held sediment will be analyzed for all Record of Decision (ROD) Table 17 sediment contaminants of concern (COCs) and TOC.

The historical dataset and the final decision criteria listed in Surface Sediment FSP (for deciding whether or not to analyze for full-suite ROD COCs) are based on laboratory measurement results of grain size. Laboratory ASTM grain size method uses the #200 sieve, but results are calculated by dry weight and not volume (which is used for field wet sieving). Since sand-size fractions weigh more than silt/clay-size fractions, the laboratory results will likely be lower. Hence, it is recommended to relax the final criteria described in the PDI Surface Sediment FSP from 35 to 25 percent fines to account for (i) this field/lab measurement difference; and (ii) recent laboratory results of the Oregon Department of Environmental Quality (ODEQ) Upriver Reach Sediment Characterization investigation (2018) where all samples had < 30% fines (dry weight).

5. REFERENCES

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ODEQ (Oregon Department of Environmental Quality). 2018. Final Field and Data Report, Upriver Reach Sediment Characterization, Lower Willamette River, Portland, Oregon. Prepared by GSI Water Solutions Inc. and Hart Crowser and prepared for State of Oregon Department of Environmental Quality. 8 May.

TABLES

Table 1. Field Wet Sieving Results and Visual Estimates of Percent Fines

PDI Upriver Survey Date	River Mile	Probe No.	Water Depth	Field Wet Sieve Volumes (200 mL)			Pre-Sieve Visual Description
				Fines Passing (< No. 200 sieve)	Fines Remaining (>No. 200 Sieve)	Percent Fines	
4/3/2018	17.6 E	58*	5.2	130	50	72%	silt with fine grain sand
	18.9 E	72*	7.5	80	150	35%	poorly graded fine sand with silt
4/4/2018	26.0 W	115	11.8	70	130	35%	poorly graded fine sand, trace woody debris
	25.6 E	113	5.1	75	125	38%	poorly graded fine sand with silt
	24.5 W	126	3.3	120	80	60%	silt with fine grain sand
	24.2 W	130	7.1	20	180	10%	well graded sand trace gravel and some silt
	23.3 W	137	13.1	130	70	65%	silt with some fine sand
	22.8 E	98	4.5	110	90	55%	silt with fine sands and trace organic debris
	20.2 W	153	3.6	130	70	65%	silt with fine sands and trace organic debris
	19.5 W	159	6.3	100	100	50%	silt with fine sand
4/5/2018	19.3 E	77	7.2	100	100	50%	silt with fine sand
	19.2 W	163	6.6	80	120	40%	sand with silt
	18.9 E	72	8.6	100	100	50%	silt with fine sand
	18.7 E	70	9.1	90	110	45%	silt with fine sand
	18.5 W	170	4.8	140	60	70%	silt with trace fine sand
	18.5 E	67	5.9	110	90	55%	silt with some fine sand
	18.2 W	173	6.1	80	120	40%	silt with organic material
	18.0 W	175	6.3	140	60	70%	silt with fine sand and trace organic material
	17.8 E	60	5.5	120	80	60%	silt with some fine sand
	17.4 E	57	5.5	130	70	65%	silt with fine sand
	17.6 W	178	6.2	150	50	75%	silt with trace fine sand
	17.1 W	184	5.8	160	40	80%	silt with trace fine sand
	17.0 E	52	6.3	150	50	75%	silt with trace fine sand
	16.8 E	49	14.2	130	70	65%	silt with trace fine sand
	16.8 W	187	5.9	100	100	50%	silt with fine sand
	16.3 E	45	5.4	90	110	45%	silty sand with trace gravel
	16.0 E	42	4.4	130	70	65%	silt with fine sand and trace organics
	15.7 E	39	13.4	140	60	70%	silt with trace fine sand and trace organic material
	14.9 E	220	11.3	75	125	38%	silty sand with trace organics
	14.5 E	223	9.5	50	150	25%	fine sand some silt and some organic material
4/5/2018	14.2 E	226	15.9	120	80	60%	silt with fine sand and trace

PDI Upriver Survey Date	River Mile	Probe No.	Water Depth	Field Wet Sieve Volumes (200 mL)			Pre-Sieve Visual Description
				Fines Passing (< No. 200 sieve)	Fines Remaining (>No. 200 Sieve)	Percent Fines	
							oxidized nodes
	15.6 W	197	8.8	90	110	45%	silt with fine sand
	15.4 E	35	5.6	110	90	55%	silt with fine sand
	14.9 E	30	6.8	80	120	40%	sand with silt
	14.9 W	204	12.0	110	90	55%	silt with fine sand
	14.6 E	26	5.4	155	45	78%	silt with trace fine sands
	13.8 W	229	10.3	150	50	75%	silt with trace fine sand and trace organic material
	13.3 W	234	15.3	90	110	45%	silt with trace fine sand and trace organic material
	12.8 E	10	12.9	100	100	50%	silt with fine sand
	12.2 E	5	12.5	140	60	70%	silt with trace fine sand and trace organic material
	12.0 W	236	4.5	150	50	75%	silt with trace fine sand
	11.8 W	238	8.2	150	50	75%	silt with fine sand and trace organic material
4/6/2018	28.3 W	240	10.3	120	80	60%	silt with fine sand, moderate weeds and trace clams
	28.3 W	241	4.3	120	80	60%	silt with fine sand and trace organics
	27.8 W	245	11.3	80	120	40%	fine to medium sand with silt and trace organics
	27.3 W	250	9.8	110	90	55%	silt with fine sand and trace organics
	27.0 W	253	12.5	130	70	65%	silt with some fine sand and trace clams
	26.7 W	257	9.6	160	40	80%	silt with trace fine sand and trace organic material
	26.9 E	260	12.8	120	80	60%	silt with some fine sand and trace organics
	27.4 E	265	10	130	70	65%	silt with some fine sand
	27.9 E	270	10.7	100	100	50%	silt with some fine sand and some organics
	28.3 E	274	10.3	150	50	75%	silt with trace sand and trace organic material

Notes:

* The starting volume for the first two sieves was not 200 milliliters.

Table 2. Percent Distribution of Soft, Medium, and Hard Bottom Areas in the D/U Reach

Upriver Area		Area (acres)	Percentage of Entire Area (% of 1,939 acres)
Total D/U Reach		1,939	100%
Mid-Channel Hard Bottom Excluded Footprint (Excluded from Interpolation		990	51%
Remaining Area (Included for Interpolation)		949	49%
Remaining Areas	Remaining Area Classified as Soft Only	315	16%
	Remaining Area Classified as Medium Only	208	11%
	Remaining Area Classified as Hard Only	406	21%
	Remaining Area not Included, Result of Thiessen Polygon Anomalies	20	2%

FIGURES

RM-12

RM-13

RM-14

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Sonar Probe Bottom Condition

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Capped Area (Existing)
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe.
5. Survey data in NAD 83 OSPN Intl.feet.
6. Exclusion area based on 2018 Biosonar ® data, 2018 probe results, and historic fines data.
7. June 2018 exclusion area based on change from connect-the -hard -orange-dots to connect-the-soft-green-dots.

N

1,000 500 0 1,000 2,000 Feet

Upriver 2018 Soft Sediment Probing Data
RM 11.8 to 14

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure 1a

MI/SEA | June 15, 2018

Path: P:\Projects\Portland Pre-Design\PN\2070\A9\90\GIS and CAD\2018 Soft Sediment Probing Study\Figure 2a_PH Sonar Data Analysis.mxd

RM-14

RM-15

RM-16

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

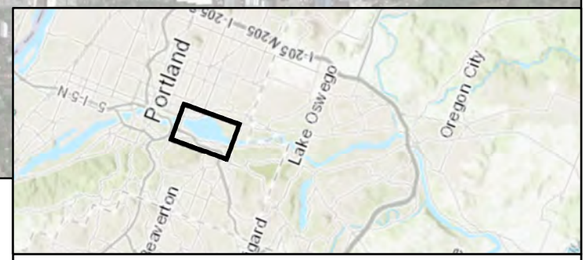
Sonar Probe Bottom Condition

- Soft
- Medium
- Hard

- River Mile Marker
- Approximate River Centerline
- Capped Area (Existing)
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

1,000 500 0 1,000 2,000 Feet



Upriver 2018 Soft Sediment Probing Data
RM 14 to 16

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure **1b**

MI/SEA | June 15, 2018

Path: P:\Projects\Portland Pre-Design PH\G07\67A\900 GIS and CAD\2018 Soft Sediment Probing Study\Figure 2b PH Sonar Data Analysis.mxd

RM-16

RM-17

RM-18

RM-16

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Sonar Probe Bottom Condition

- Soft
- Medium
- Hard

Historic Fines Percentage

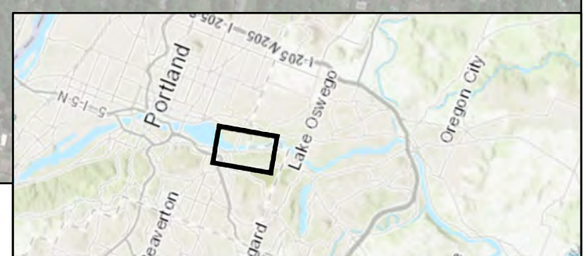
- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Buffer Based On Hard Bottom Designation
- Sample Placement Analysis Extent

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

N

1,000 500 0 1,000 2,000 Feet



Upriver 2018 Soft Sediment Probing Data
RM 16 to 18

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

MI/SEA	June 15, 2018	Figure 1c

Path: P:\Projects\Portland Pre-Design\PN\G07\67A\900\GIS and CAD\2018 Soft Sediment Probing Study\Figure 2c_PH Sonar Data Analysis.mxd

RM-18

RM-19

RM-20

RM-18

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

Sonar Probe Bottom Condition

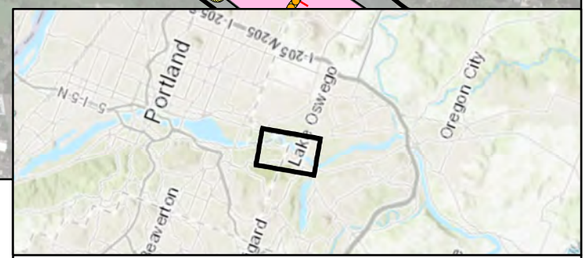
- Soft
- Medium
- Hard

- River Mile Marker
- Approximate River Centerline
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

N

1,000 500 0 1,000 2,000 Feet



Upriver 2018 Soft Sediment Probing Data
RM 18 to 20

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure 1d

MI/SEA | June 15, 2018

Path: P:\Projects\Portland Pre-Design PN\07\67\A9\00 GIS and CAD\2018 Soft Sediment Probing Study\Figure 2d PH Sonar Data Analysis.mxd

RM-20

RM-21

RM-22

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

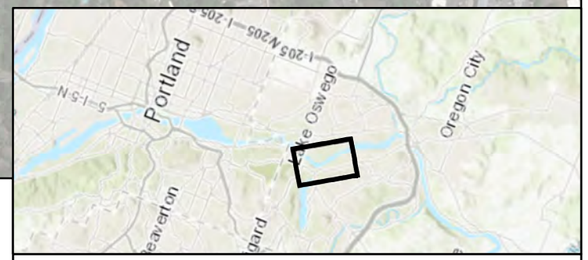
Sonar Probe Bottom Condition

- Soft
- Medium
- Hard

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

N

1,000 500 0 1,000 2,000 Feet



Upriver 2018 Soft Sediment Probing Data
RM 20 to 22

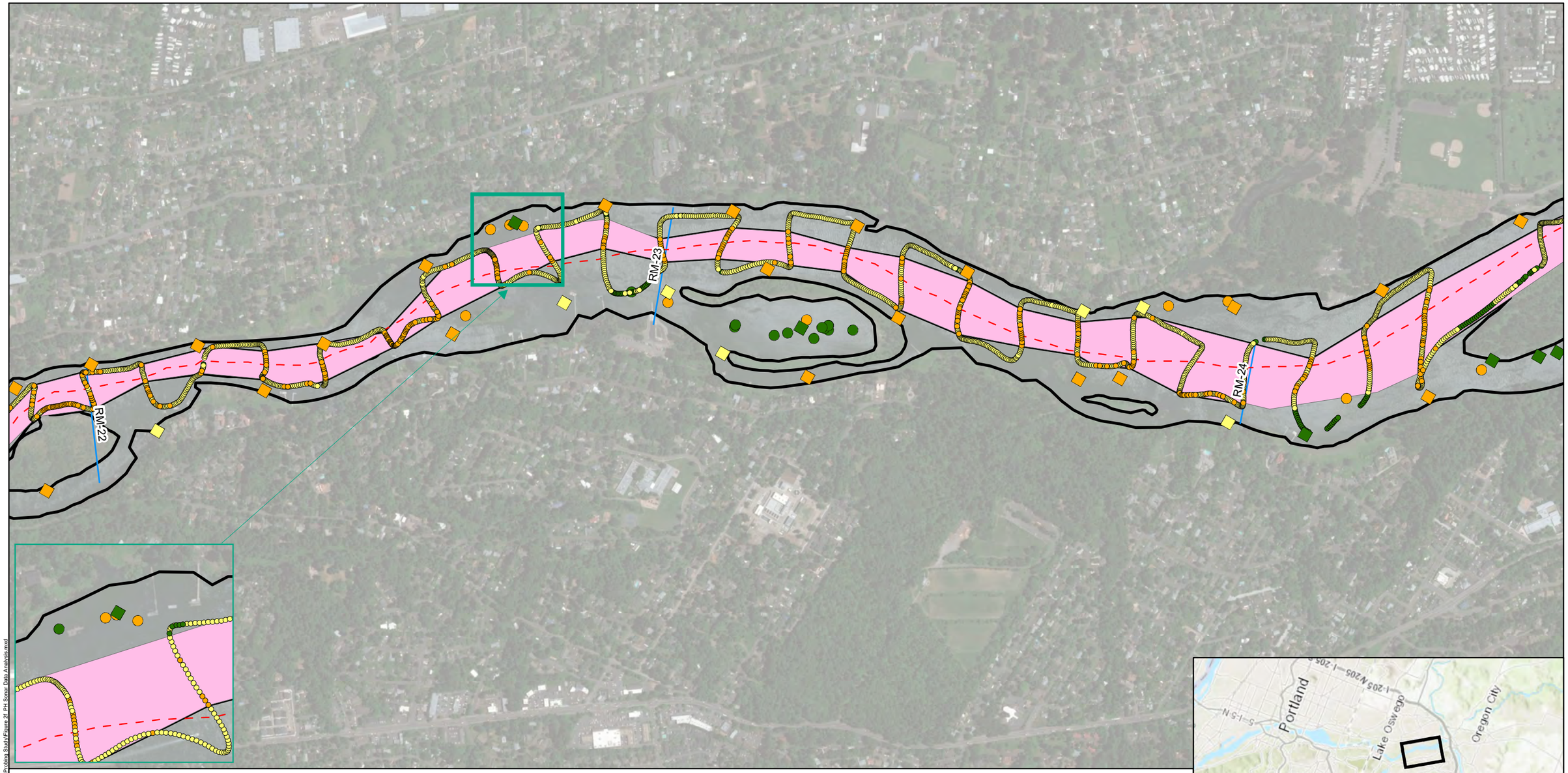
Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure 1e

MI/SEA | June 15, 2018

Path: P:\Projects\Portland Pre-Design PN\G07\67\A9\00 GIS and CAD\2018 Soft Sediment Probing Study\Figure 2e_PH Sonar Data Analysis.mxd



Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Sonar Probe Bottom Condition

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

N

1,000 500 0 1,000 2,000 Feet

Upriver 2018 Soft Sediment Probing Data
RM 22 to 24

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure **1f**

MI/SEA | June 15, 2018

Path: P:\Projects\Portland Pre-Design PN\60797A\900\GIS and CAD\2018 Soft Sediment Probing Stud\Figure 2f_PH Sonar Data Analysis.mxd

RM-24

RM-25

RM-26

Portland

Lake Oswego

Oregon City

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Sonar Probe Bottom Condition

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

N

1,000 500 0 1,000 2,000 Feet

Upriver 2018 Soft Sediment Probing Data
RM 24 to 26

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure 1g

MI/SEA | June 15, 2018

Path: P:\Projects\Portland Pre-Design PN\G07\67A\600 GIS and CAD\2018 Soft Sediment Probing Stud\F\Figure 2g_PH Sonar Data Analysis.mxd

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Sonar Probe Bottom Condition

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

1,000 500 0 1,000 2,000 Feet

Upriver 2018 Soft Sediment Probing Data
RM 27 to 28.6

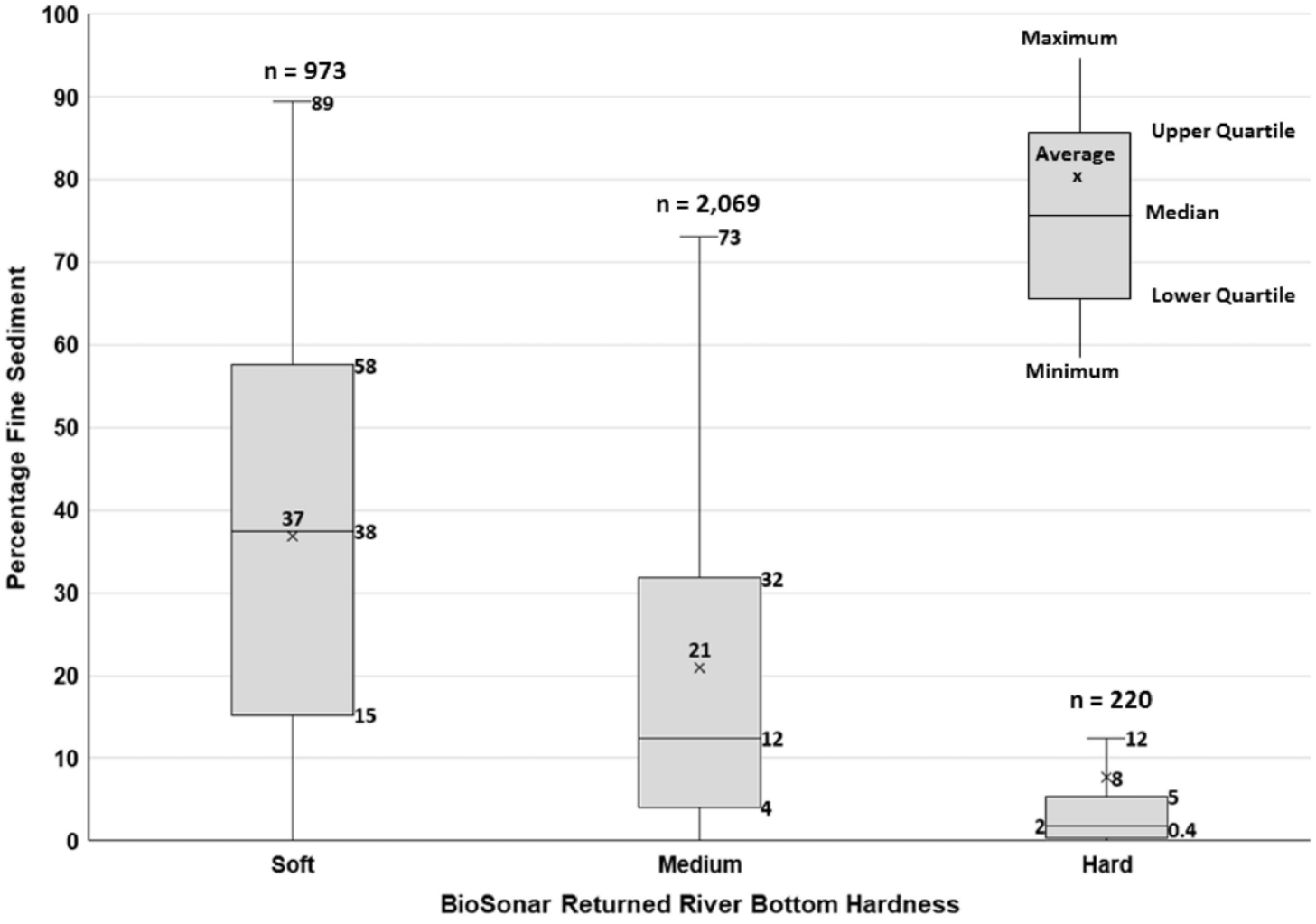
Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

MI/SEA | June 15, 2018

Figure 1h

Path: P:\Projects\Portland Pre-Design PN\GI\767A\900 GIS and CAD\2018 Soft Sediment Probing Study\Figure 2h_PH Sonar Data Analysis.mxd



Note:
Data provided in Figure 2 was collected on 2 April, 2018 with the use of a single beam sonar and analyzed through BioSonar®. Over 15,000 sonar points were recorded and then compared against sediment grab data points. The BioSonar® data located within 100 feet of a sediment Grab Data point was compared against the percent fines of that grab. The comparison was used to determine the statistical accuracy of the BioSonar® data with a total of 3,262 data points analyzed. Figure 2 shows that statistically hard BioSonar® data is not likely to contain soft sediment based on sediment grab data comparison.

Biosonar® Data Located within 100ft Radius of a Sediment Grab Data Point Compared to Percent Fines of that Data Point

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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Figure **2**

MI/SEA | May 23, 2018

Path: P:\Projects\Portland Pre-Design PN\G07\67\A9\00 GIS and CAD\2018 Soft Sediment Probing Study\Figure 1

RM-12

RM-13

RM-14

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Capped Area (Existing)
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4, Biosonar ® trasducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

N

1,000 500 0 1,000 2,000 Feet

2018 Interpolated Upriver Areas of Soft Sediment RM 11.8 to 14

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure 3a

MI/SEA | June 15, 2018

Path: P:\Projects\Portland Pre-Design PN\C0707A09\00\GIS and CAD\2018 Soft Sediment Probing Stud\FFigure 3_Interpolated_SoftSediment.mxd

RM-14

RM-15

RM-16

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

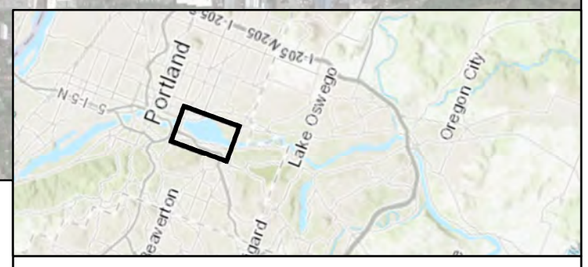
- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Capped Area (Existing)
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4, Biosonar ® trasducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

N

1,000 500 0 1,000 2,000 Feet



2018 Interpolated Upriver Areas of Soft Sediment RM 14 to 16

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

MI/SEA	June 15, 2018	Figure 3b

Path: P:\Projects\Portland Pre-Design PN\GI\767A\900 GIS and CAD\2018 Soft Sediment Probing Study\Figure 3_Interpolated_SoftSediment.mxd

RM-16

RM-17

RM-18

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

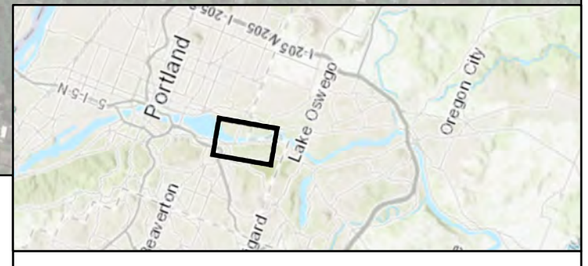
- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4, Biosonar ® trasducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

N

1,000 500 0 1,000 2,000 Feet



2018 Interpolated Upriver Areas of Soft Sediment RM 16 to 18

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

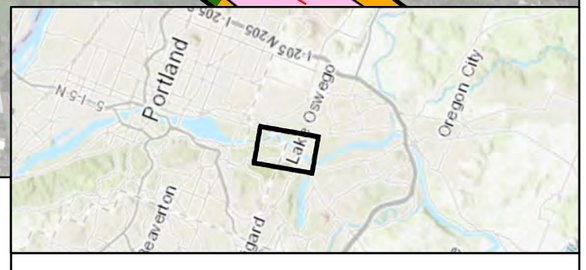
MI/SEA	June 15, 2018	Figure 3c

Path: P:\Projects\Portland Pre-Design PN 60797A\900 GIS and CAD\2018 Soft Sediment Probing Study\Figure 3_Interpolated_SoftSediment.mxd

RM-18

RM-19

RM-20



Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4, Biosonar ® trasducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

N

1,000 500 0 1,000 2,000 Feet

2018 Interpolated Upriver Areas of Soft Sediment RM 18 to 20

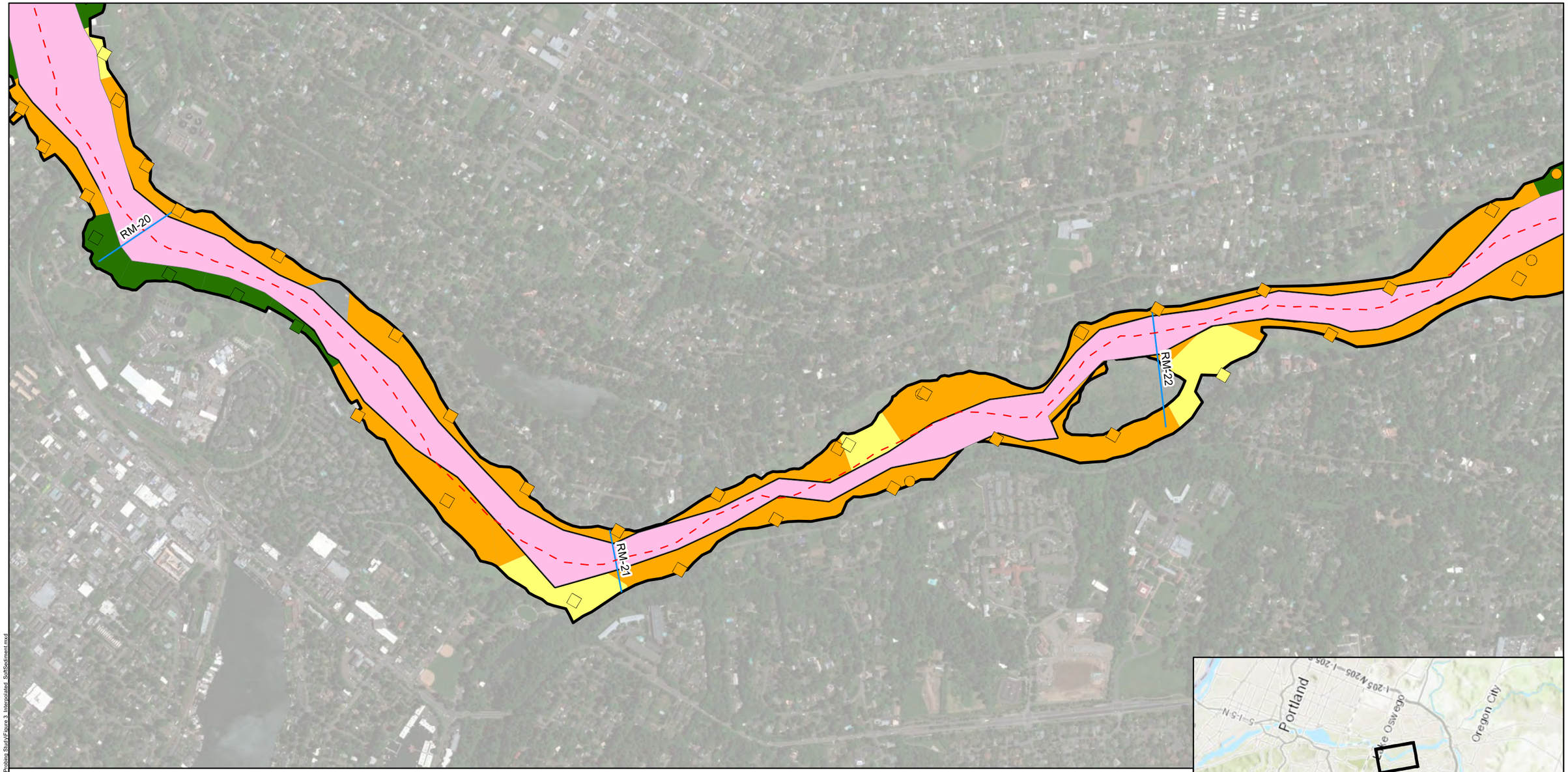
Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

MI/SEA	June 15, 2018

Figure **3d**

Path: P:\Projects\Portland Pre-Design PN 60707A\900 GIS and CAD\2018 Soft Sediment Probing Stud\Figure 3_Interpolated_SoftSediment.mxd



Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4, Biosonar ® trasducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

1,000 500 0 1,000 2,000 Feet

2018 Interpolated Upriver Areas of Soft Sediment RM 20 to 22

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure 3e

MI/SEA | June 15, 2018

Path: P:\Projects\Portland Pre-Design PN\G0787A\800 GIS and CAD\2018 Soft Sediment Probing Stud\F\Figure 3_Interpolated_SoftSediment.mxd

RM-22

RM-23

RM-24

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

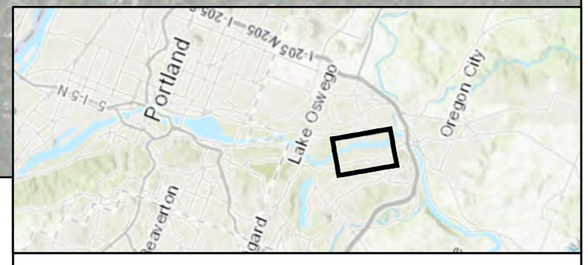
- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4, Biosonar ® trasducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

N

1,000 500 0 1,000 2,000 Feet



2018 Interpolated Upriver Areas of Soft Sediment RM 22 to 24

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure 3f

MI/SEA | June 15, 2018

Path: P:\Projects\Portland Pre-Design PN\60707A\900\GIS and CAD\2018 Soft Sediment Probing Stud\Figure 3_Interpolated_SoftSediment.mxd

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4, Biosonar ® trasducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

N

1,000 500 0 1,000 2,000 Feet

2018 Interpolated Upriver Areas of Soft Sediment RM 24 to 26

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure 3g

MI/SEA | June 15, 2018

Path: P:\Projects\Portland Pre-Design PN\GI\767A\600 GIS and CAD\2018 Soft Sediment Probing Stud\F\Figure 3_Interpolated_SoftSediment.mxd

RM-27

RM-28

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

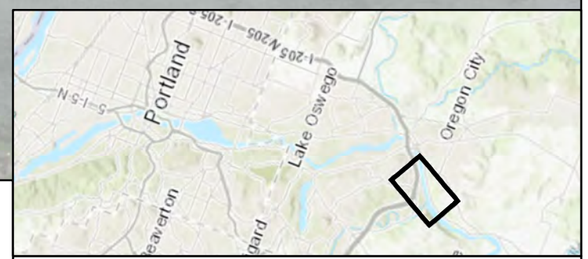
- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Excluded Mid-channel Bottom Area
- Sample Placement Analysis Extent

Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4, Biosonar ® trasducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.

N

1,000 500 0 1,000 2,000 Feet



2018 Interpolated Upriver Areas of Soft Sediment RM 27 to 28.6

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure 3h

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Path: P:\Projects\Portland Pre-Design PN 60787A\900 GIS and CAD\2018 Soft Sediment Probing Study\Figure 3_Interpolated_SoftSediment.mxd

Legend

Proposed Sediment FSP Grab Sample Location (n = 60)

Hand Probe Bottom Condition

Soft (> 35% fines)

Percent Fines - Historic RI and 2018 Surface Sediment

< 30 %

30 - 60 %

> 60 %

Percent TOC - Historic RI Surface Sediment

< 0.5 %

0.5- 2.5 %

> 2.5 %

Areas of Soft Sediment Based on 2018 Hand Probing Data

Excluded Mid-channel Hard Bottom Area

Analysis Grid

River Mile Marker

Capped Area (Existing)

N

1,000 500 0 1,000 2,000 Feet

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Downtown Reach defined as (RM 11.8 -16.6) and the Upriver Reach (RM 16.6 - 28.4).
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.
6. The approximate lateral distance along the shore used to define the Analysis Grids was approximately 675 ft in the Downtown reach and 950 ft in the Upriver reach.
7. Points were generated randomly inside the Hand Probe Thiessen Polygons within each of the Analysis Grids using the Create Random Points tool in ArcGIS 10. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver Reaches.
8. 2018 data includes ODEQ 2018 Upriver reach sampling locations and 2018 Geosyntec ponar grabs.

Proposed Downtown/Upriver Reach Surface Grab Locations (revised) RM 11.8 to 14

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

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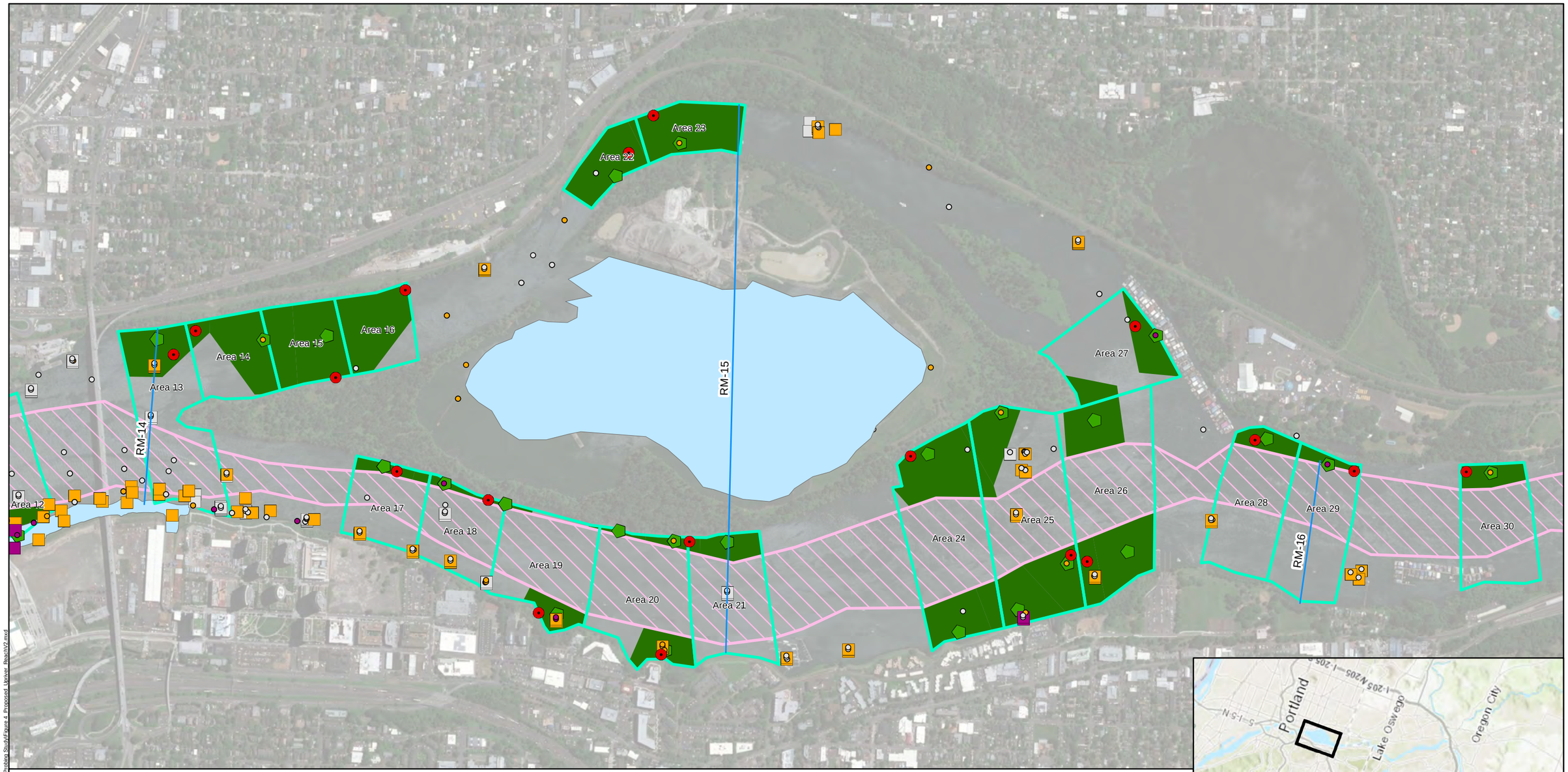
Figure **4a**

Path: P:\Projects\Portland Pre-Design PN\60707A\900\GIS and CAD\2018 Soft Sediment Probing Study\Figure 4 Proposed Upriver Reach\V2.mxd



Legend

- Proposed Sediment FSP Grab Sample Location (n = 60)

Hand Probe Bottom Condition

- Soft (> 35% fines)

Percent Fines - Historic RI and 2018 Surface Sediment

- < 30 %
- 30 - 60 %
- > 60 %

Percent TOC - Historic RI Surface Sediment

- < 0.5 %
- 0.5- 2.5 %
- > 2.5 %
- Areas of Soft Sediment Based on 2018 Hand Probing Data
- Excluded Mid-channel Hard Bottom Area
- Analysis Grid
- River Mile Marker
- Capped Area (Existing)

N

1,000 500 0 1,000 2,000 Feet

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Downtown Reach defined as (RM 11.8 -16.6) and the Upriver Reach (RM 16.6 - 28.4).
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.
6. The approximate lateral distance along the shore used to define the Analysis Grids was approximately 675 ft in the Downtown reach and 950 ft in the Upriver reach.
7. Points were generated randomly inside the Hand Probe Thiessen Polygons within each of the Analysis Grids using the Create Random Points tool in ArcGIS 10. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver Reaches.
8. 2018 data includes ODEQ 2018 Upriver reach sampling locations and 2018 Geosyntec ponar grabs.

Proposed Downtown/Upriver Reach Surface Grab Locations (revised) RM 14 to 16

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

MI/SEA	June 15, 2018	Figure 4b

Path: P:\Projects\Portland Pre-Design PNG\276\A\900\GIS and CAD\2018 Soft Sediment Probing Study\Figure 4 Proposed Upriver Reach\v2.mxd

Area 27
Area 26
Area 28
Area 29
RM-16
Area 30
Area 31
Area 32
RM-17
Area 33
Area 34
Area 35
Area 36
RM-18
Area 37
Area 38

Legend

Proposed Sediment FSP Grab Sample Location (n = 60)

Hand Probe Bottom Condition

Soft (> 35% fines)

Percent Fines - Historic RI and 2018 Surface Sediment

< 30 %

30 - 60 %

> 60 %

Percent TOC - Historic RI Surface Sediment

< 0.5 %

0.5- 2.5 %

> 2.5 %

Areas of Soft Sediment Based on 2018 Hand Probing Data

Excluded Mid-channel Hard Bottom Area

Analysis Grid

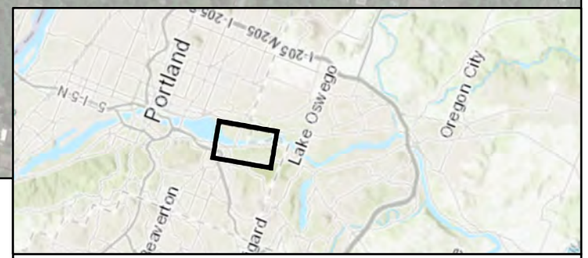
River Mile Marker

N

1,000 500 0 1,000 2,000 Feet

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Downtown Reach defined as (RM 11.8 -16.6) and the Upriver Reach (RM 16.6 - 28.4).
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.
6. The approximate lateral distance along the shore used to define the Analysis Grids was approximately 675 ft in the Downtown reach and 950 ft in the Upriver reach.
7. Points were generated randomly inside the Hand Probe Thiessen Polygons within each of the Analysis Grids using the Create Random Points tool in ArcGIS 10. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver Reaches.
8. 2018 data includes ODEQ 2018 Upriver reach sampling locations and 2018 Geosyntec ponar grabs.



Proposed Downtown/Upriver Reach Surface Grab Locations (revised) RM 16 to 18

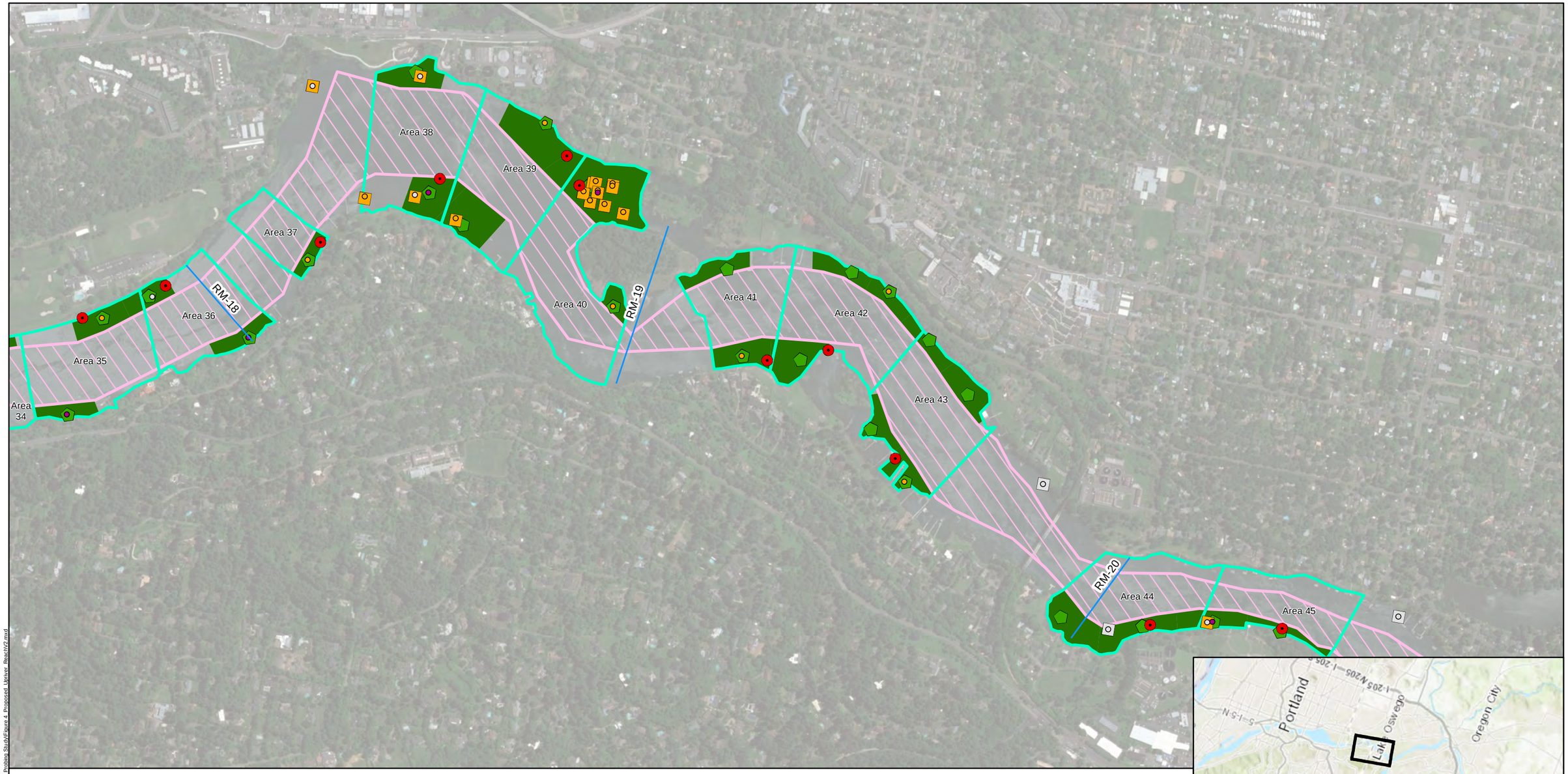
Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

MI/SEA	June 15, 2018

Figure **4c**

Path: P:\Projects\Portland Pre-Design PN\GI\767A\900 GIS and CAD\2018 Soft Sediment Probing Study\Figure 4. Proposed Upriver Reach\V2.mxd



Legend

- Proposed Sediment FSP Grab Sample Location (n = 60)

Hand Probe Bottom Condition

- Soft (> 35% fines)

Percent Fines - Historic RI and 2018 Surface Sediment

- < 30 %
- 30 - 60 %
- > 60 %

Percent TOC - Historic RI Surface Sediment

- < 0.5 %
- 0.5- 2.5 %
- > 2.5 %

River Mile Marker

Areas of Soft Sediment Based on 2018 Hand Probing Data

Excluded Mid-channel Hard Bottom Area

Analysis Grid

N

1,000 500 0 1,000 2,000 Feet

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Downtown Reach defined as (RM 11.8 -16.6) and the Upriver Reach (RM 16.6 - 28.4).
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.
6. The approximate lateral distance along the shore used to define the Analysis Grids was approximately 675 ft in the Downtown reach and 950 ft in the Upriver reach.
7. Points were generated randomly inside the Hand Probe Thiessen Polygons within each of the Analysis Grids using the Create Random Points tool in ArcGIS 10. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver Reaches.
8. 2018 data includes ODEQ 2018 Upriver reach sampling locations and 2018 Geosyntec ponar grabs.

Proposed Downtown/Upriver Reach Surface Grab Locations (revised) RM 18 to 20

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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Figure	
4d	
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Path: P:\Projects\Portland Pre-Design\PN\60707A\900\GIS and CAD\2018 Soft Sediment Probing Study\Figure 4. Proposed Upriver Reach\V2.mxd

Area 43

RM-20

Area 44

Area 45

RM-21

RM-22

Area 46

Legend

Proposed Sediment FSP Grab Sample Location (n = 60)

Hand Probe Bottom Condition

Soft (> 35% fines)

Percent Fines - Historic RI and 2018 Surface Sediment

< 30 %

30 - 60 %

> 60 %

Percent TOC - Historic RI Surface Sediment

< 0.5 %

0.5- 2.5 %

> 2.5 %

Areas of Soft Sediment Based on 2018 Hand Probing Data

Excluded Mid-channel Hard Bottom Area

Analysis Grid

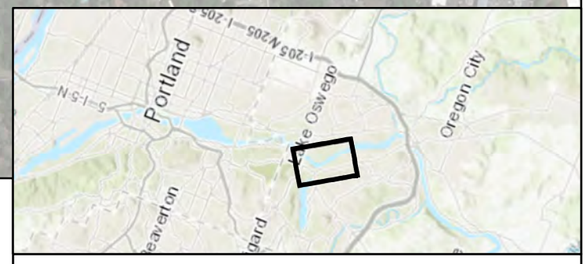
River Mile Marker

N

1,000 500 0 1,000 2,000 Feet

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Downtown Reach defined as (RM 11.8 -16.6) and the Upriver Reach (RM 16.6 - 28.4).
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.
6. The approximate lateral distance along the shore used to define the Analysis Grids was approximately 675 ft in the Downtown reach and 950 ft in the Upriver reach.
7. Points were generated randomly inside the Hand Probe Thiessen Polygons within each of the Analysis Grids using the Create Random Points tool in ArcGIS 10. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver Reaches.
8. 2018 data includes ODEQ 2018 Upriver reach sampling locations and 2018 Geosyntec ponar grabs.



Proposed Downtown/Upriver Reach Surface Grab Locations (revised) RM 20 to 22

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

Figure **4e**

MI/SEA | June 15, 2018

Path: P:\Projects\Portland Pre-Design\PN\GO7\67A\900\GIS and CAD\2018 Soft Sediment Probing Study\Figure 4 Proposed Upriver ReachV2.mxd

Legend

Proposed Sediment FSP Grab Sample Location (n = 60)

Hand Probe Bottom Condition

Soft (> 35% fines)

Percent Fines - Historic RI and 2018 Surface Sediment

< 30 %

30 - 60 %

> 60 %

Percent TOC - Historic RI Surface Sediment

< 0.5 %

0.5- 2.5 %

> 2.5 %

Areas of Soft Sediment Based on 2018 Hand Probing Data

Excluded Mid-channel Hard Bottom Area

Analysis Grid

River Mile Marker

1,000 500 0 1,000 2,000 Feet

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Downtown Reach defined as (RM 11.8 -16.6) and the Upriver Reach (RM 16.6 - 28.4).
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.
6. The approximate lateral distance along the shore used to define the Analysis Grids was approximately 675 ft in the Downtown reach and 950 ft in the Upriver reach.
7. Points were generated randomly inside the Hand Probe Thiessen Polygons within each of the Analysis Grids using the Create Random Points tool in ArcGIS 10. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver Reaches.
8. 2018 data includes ODEQ 2018 Upriver reach sampling locations and 2018 Geosyntec ponar grabs.

Proposed Downtown/Upriver Reach Surface Grab Locations (revised) RM 22 to 24

Portland Harbor Superfund Site
PDI Surface Sediment FSP

AECOM Geosyntec consultants

MI/SEA	June 15, 2018	Figure 4f

Path: P:\Projects\Portland Pre-Design PN\60767A\900\GIS and CAD\2018 Soft Sediment Probing Study\Figure 4 Proposed Upriver ReachV2.mxd

Legend

- Proposed Sediment FSP Grab Sample Location (n = 60)

Hand Probe Bottom Condition

- Soft (> 35% fines)

Percent Fines - Historic RI and 2018 Surface Sediment

- < 30 %
- 30 - 60 %
- > 60 %

Percent TOC - Historic RI Surface Sediment

- < 0.5 %
- 0.5- 2.5 %
- > 2.5 %
- Areas of Soft Sediment Based on 2018 Hand Probing Data
- Excluded Mid-channel Hard Bottom Area
- Analysis Grid
- River Mile Marker

1,000 500 0 1,000 2,000 Feet

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Downtown Reach defined as (RM 11.8 -16.6) and the Upriver Reach (RM 16.6 - 28.4).
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.
6. The approximate lateral distance along the shore used to define the Analysis Grids was approximately 675 ft in the Downtown reach and 950 ft in the Upriver reach.
7. Points were generated randomly inside the Hand Probe Thiessen Polygons within each of the Analysis Grids using the Create Random Points tool in ArcGIS 10. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver Reaches.
8. 2018 data includes ODEQ 2018 Upriver reach sampling locations and 2018 Geosyntec ponar grabs.

Proposed Downtown/Upriver Reach Surface Grab Locations (revised) RM 24 to 26

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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MI/SEA	June 15, 2018	Figure 4g

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Legend

- Proposed Sediment FSP Grab Sample Location (n = 60)

Hand Probe Bottom Condition

- Soft (> 35% fines)

Percent Fines - Historic RI and 2018 Surface Sediment

- < 30 %
- 30 - 60 %
- > 60 %

Percent TOC - Historic RI Surface Sediment

- < 0.5 %
- 0.5- 2.5 %
- > 2.5 %
- Areas of Soft Sediment Based on 2018 Hand Probing Data
- Excluded Mid-channel Hard Bottom Area
- Analysis Grid
- River Mile Marker

1,000 500 0 1,000 2,000 Feet

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Downtown Reach defined as (RM 11.8 -16.6) and the Upriver Reach (RM 16.6 - 28.4).
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visial confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.
6. The approximate lateral distance along the shore used to define the Analysis Grids was approximately 675 ft in the Downtown reach and 950 ft in the Upriver reach.
7. Points were generated randomly inside the Hand Probe Thiessen Polygons within each of the Analysis Grids using the Create Random Points tool in ArcGIS 10. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver Reaches.
8. 2018 data includes ODEQ 2018 Upriver reach sampling locations and 2018 Geosyntec ponar grabs.

Proposed Downtown/Upriver Reach Surface Grab Locations (revised) RM 27 to 28.6

Portland Harbor Superfund Site
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Figure 4h

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