

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION 10

IN THE MATTER OF:

Portland Harbor Superfund Site

Arkema Inc., Evraz Inc. NA,
Schnitzer Steel Industries, Inc. and
The Marine Group LLC

Respondents

Proceeding Under Sections 104, 107
and 122 of the Comprehensive
Environmental Response, Compensation,
and Liability Act, 42 U.S.C. §§ 9604,
9607 and 9622

CERCLA Docket No. 10-2018-0236

**ADMINISTRATIVE SETTLEMENT
AGREEMENT AND ORDER ON
CONSENT FOR PRE-REMEDIAL
DESIGN INVESTIGATION AND
BASELINE SAMPLING**

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I. JURISDICTION AND GENERAL PROVISIONS

1.1. This Administrative Settlement Agreement and Order on Consent (“Settlement”) is entered into voluntarily by the United States Environmental Protection Agency (“EPA”) and Arkema Inc., Evraz Inc. NA, Schnitzer Steel Industries, Inc. and The Marine Group LLC (“Respondents”). This Settlement provides for the Respondents’ performance of a Pre-Remedial Design investigation and baseline sampling program and the payment of certain response costs incurred by the EPA and the Oregon Department of Environmental Quality (“ODEQ”) at or in connection with the Work conducted under this Settlement related to the in-river portion of the Portland Harbor Superfund Site (the “Site”) as defined in Section IV below. It is anticipated that the Work will be completed by mid-2019.

1.2. This Settlement is issued under the authority vested in the President of the United States by Sections 104, 107, and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. §§ 9604, 9607, and 9622 (“CERCLA”). This authority was delegated to the EPA Administrator on January 23, 1987 by Executive Order 12580, 52 Fed. Reg. 2923 (Jan. 29, 1987), and further delegated to the EPA Regional Administrators by EPA Delegation Nos. 14-14-C (Administrative Actions Through Consent Orders, January 18, 2017) and 14-14-D (Cost Recovery Non-Judicial Agreements and Administrative Consent Orders, January 18, 2017). This authority has been re-delegated by the Region 10, Regional Administrator (“Regional Administrator”) to the Region 10, Director, Environmental Cleanup Office, and Program Managers thereunder by EPA Delegation R10 14-14C.

1.3. EPA represents that, in accordance with Section 122(j)(1) of CERCLA, 42 U.S.C. § 9622(j)(1), it notified the natural resource trustees for the Portland Harbor Site of negotiations with Respondents regarding the release of hazardous substances that may have resulted in injury to the natural resources under federal trusteeship and encouraged the trustee(s) to participate in the negotiation of this Settlement consistent with the process agreed to in the 2001 Memorandum of Understanding related to the Site.

1.4. EPA and Respondents recognize that this Settlement has been negotiated in good faith and that the actions undertaken by Respondents in accordance with this Settlement do not constitute an admission of any liability. Respondents do not admit, and retain the right to controvert in any subsequent proceedings other than proceedings to implement or enforce this Settlement, the validity of the findings of facts, conclusions of law, and determinations in Sections V (Findings of Fact) and VI (Conclusions of Law and Determinations) of this Settlement. Respondents agree to comply with and be bound by the terms of this Settlement and further agree that they will not contest the basis or validity of this Settlement or its terms.

II. PARTIES BOUND

2.1. This Settlement is binding upon EPA and upon Respondents and their successors, and assigns. Any change in ownership or corporate status of a Respondent including, but not limited to, any transfer of assets or real or personal property shall not alter such Respondent’s responsibilities under this Settlement.

2.2. EPA contends that Respondents are jointly and severally liable for response action at the Site. Respondents agree to carry out all activities agreed to in this Settlement. In the event of the insolvency or other failure of any Respondent to implement the requirements of this Settlement, the remaining Respondents agree they shall complete all such requirements.

2.3. Each undersigned representative of Respondents certifies that he or she is fully authorized to enter into the terms and conditions of this Settlement and to execute and legally bind Respondents to this Settlement.

2.4. Respondents shall provide a copy of this Settlement to each contractor hired to perform the Work required by this Settlement and to each person representing any Respondents with respect to the Site or the Work, and shall condition all contracts entered into hereunder upon performance of the Work in conformity with the terms of this Settlement. Respondents or their contractors shall provide written notice of the Settlement to all subcontractors hired to perform any portion of the Work required by this Settlement. Respondents shall nonetheless be responsible for ensuring that their contractors and subcontractors perform the Work in accordance with the terms of this Settlement.

III. STATEMENT OF PURPOSE

3.1. In entering into this Settlement, the objectives of the Parties are to: (a) implement investigation baseline sampling to update existing site-wide data; (b) gather data to be used as part of a baseline dataset for future long-term monitoring; (c) inform certain analysis regarding scope and extent of remedial actions; (d) collect data to facilitate completion of the third-party allocation by potentially responsible parties (“PRPs”) (this allocation process is independent of EPA oversight); (e) assist in refining the scope and extent of the remedial actions that will be performed at the Site, including refining Sediment Management Areas, informing technology assignments consistent with the decision tree in the ROD (Figure 28) throughout the Site, and refining the horizontal and vertical extent of the dredging and capping areas; (f) collect additional data regarding upstream conditions and contaminant loading into the Site; (g) update and evaluate site conditions to refine the conceptual site model for all pathways consistent with the ROD, page 106 (Post-ROD Data Gathering) and (h) provide for recovery of response and oversight costs incurred by EPA and ODEQ with respect to this Settlement.

IV. DEFINITIONS

4.1. Unless otherwise expressly provided in this Settlement, terms used in this Settlement that are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Settlement or its attached appendices, the following definitions shall apply:

“Affected Property” shall mean all real property at the Site and any other real property where access is needed to perform the Work under this Settlement Agreement.

“CERCLA” shall mean the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §§ 9601-9675.

“Day” or “day” shall mean a calendar day. In computing any period of time under this Settlement, where the last day would fall on a Saturday, Sunday, or federal or State holiday, the period shall run until the close of business of the next working day.

“Effective Date” shall mean the effective date of this Settlement as provided in Section XXVII.

“EPA” shall mean the United States Environmental Protection Agency and its successor departments, agencies, or instrumentalities.

“EPA Hazardous Substance Superfund” shall mean the Hazardous Substance Superfund established by the Internal Revenue Code, 26 U.S.C. § 9507.

“EPA Future Response Costs” shall mean all costs EPA incurs from the Effective Date of this Settlement through the date of the Notice of Work Completion pursuant to Section XXVIII (Notice of Work Completion) (which Notice of Work Completion has been issued in writing by EPA or provided through dispute resolution under Paragraph 14.3) related solely to this Settlement, the Statement of Work, and Work Plan, including, but not limited to, direct and indirect costs, that the EPA incurs in reviewing or developing deliverables submitted pursuant to this Settlement, in overseeing implementation of the Work, or otherwise implementing, overseeing, or enforcing this Settlement, including but not limited to, payroll costs, contractor costs, travel costs, laboratory costs, cooperative assistance grant costs related to oversight of the Work under this Settlement; the costs incurred pursuant to Section IX (Property Requirements) (including, but not limited to, cost of attorney time and any monies paid to secure or enforce access, ¶ 8.3 (Emergencies and Releases), ¶ 24.6 (Access to Financial Assurance), ¶ 8.4 (Community Involvement Plan related solely to this Settlement (including the costs of any technical assistance grant under Section 117(e) of CERCLA, 42 U.S.C. § 9617(e)), and the costs incurred by the EPA in enforcing the terms of this Settlement, including all costs incurred in connection with Dispute Resolution pursuant to Section XIV (Dispute Resolution) and all litigation costs in enforcing the terms of this Settlement.

“EPA Past Response Costs” shall mean all costs, including, but not limited to, direct and indirect costs, paid or incurred by EPA prior to the Effective Date in connection with negotiating this Settlement or in connection with developing the Statement of Work and Sampling and Analysis Plan dated June 2017 for the Site and charged to account 10PX beginning January 10, 2017.

“Interest” shall mean interest at the rate specified for interest on investments of the EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a). The applicable rate of interest shall be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year. Rates are available online at <https://www.epa.gov/superfund/superfund-interest-rates>.

“National Contingency Plan” or “NCP” shall mean the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300, and any amendments thereto.

“Non-Settling Owner” shall mean any person, other than a Respondent, that owns or controls any Affected Property, including but not limited to, the Oregon Department of State Lands. The clause “Non-Settling Owner’s Affected Property” means Affected Property owned or controlled by Non-Settling Owner.

“ODEQ” shall mean the Oregon Department of Environmental Quality and any successor departments or agencies of the State.

“ODEQ Oversight Costs” shall mean only those direct and indirect costs that ODEQ incurs in coordinating and consulting with EPA in conjunction with EPA’s planning and implementation of this Settlement, from July 6, 2017 through the date of completion of all Work agreed to by the Respondents under Section VIII of this Settlement. ODEQ Oversight Costs are only those costs incurred to fulfill the coordination and consultation role with EPA regarding implementation of this Settlement, including review of plans, reports and assessments prepared pursuant to this Settlement, but excluding any costs related to natural resource damages assessments, liability or restoration or uplands investigation, or source control. ODEQ Oversight Costs that are not inconsistent with the NCP, 40 C.F.R. Part 300, are recoverable response costs pursuant to Sections 104 and 107 of CERCLA, 42 U.S.C. §§ 9604 and 9607. ODEQ Oversight Costs shall not include the costs of oversight or data collected by ODEQ concerning any other response action or Settlement Agreement associated with the Site.

“Owner Respondent” shall mean any Respondent that owns or controls any Affected Property. The clause “Owner Respondent’s Affected Property” means Affected Property owned or controlled by Owner Respondent.

“Paragraph” or “¶” shall mean a portion of this Settlement identified by an Arabic numeral or an upper or lower case letter.

“Parties” shall mean EPA and Respondents.

“Portland Harbor Special Account” shall mean the special account within the EPA Hazardous Substance Superfund, established for the Site by EPA pursuant to Section 122(b)(3) of CERCLA, 42 U.S.C. § 9622(b)(3) through prior settlements related to the Site.

“Portland Harbor Superfund Site” or “Site” for purposes of this Settlement shall mean the in-river portion of the site in Portland, Multnomah County, Oregon listed on the National Priorities List (“NPL”) on December 1, 2000. 65 Fed. Reg. 75179-01 and for which a final remedy was selected in the January 2017 Record of Decision. As described in the Record of Decision, the Site extends in-river from approximately river mile (“RM”) 1.9 to 11.8 and is depicted generally on the map attached as Appendix B.

“RCRA” shall mean the Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6992 (also known as the Resource Conservation and Recovery Act).

“Record of Decision” or “ROD” shall mean the EPA Record of Decision relating to the Site, signed on January 3, 2017, by the Administrator of EPA, and all attachments thereto. A copy of the ROD can be found at <https://www3.epa.gov/region10/pdf/ph/sitewide/record-of-decision-jan2017.pdf>.

“Respondents” shall mean Arkema Inc., Evraz Inc. NA, Schnitzer Steel Industries, Inc. and The Marine Group LLC.

“Section” shall mean a portion of this Settlement identified by a Roman numeral.

“Settlement” shall mean this Administrative Settlement Agreement and Order on Consent and all appendices attached hereto (listed in Section XXV (Integration/Appendices)). In the event of conflict between this Settlement and any appendix, this Settlement shall control.

“State” shall mean the State of Oregon.

“Statement of Work” or “SOW” shall mean the document describing the activities that EPA and Respondents have agreed will be performed to implement the sampling and other Work, which is attached as Appendix A to this Settlement.

“Supervising Contractor” shall mean the principal contractor retained by Respondents to supervise and direct the implementation of the Work under this Settlement.

“Transfer” shall mean to sell, assign, convey, lease, mortgage, or grant a security interest in, or where used as a noun, a sale, assignment, conveyance, or other disposition of any interest by operation of law or otherwise.

“Tribal Governments” shall mean the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of the Grand Ronde Community of Oregon, the Confederated Tribes of Siletz Indians, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Nez Perce Tribe. References to “Tribal Governments” in this Settlement Agreement may be a reference to an individual tribe, the tribes collectively, or some combination thereof.

“United States” shall mean the United States of America and each department, agency, and instrumentality of the United States, including EPA and any federal natural resource trustee for the Site.

“Waste Material” shall mean (1) any “hazardous substance” under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); (2) any “pollutant or contaminant” under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); (3) any “solid waste” under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27); and (4) any “hazardous substance” under ORS 465.200 et seq.

“Work” shall mean all activities and obligations that EPA and Respondents have agreed will be performed pursuant to the SOW and the Work Plan under this Settlement, except those required by Section XI (Record Retention).

“Work Plan” shall mean the document describing all of the specific tasks that constitute the Work that EPA and Respondents have agreed will be performed under this Settlement, which is an appendix to the SOW attached as Appendix A to this Settlement.

V. FINDINGS OF FACT

5.1. EPA finds the following facts, which Respondents neither admit nor deny:

5.1.1. Historical industrial, commercial, agricultural, and municipal practices and releases of contaminants dating back to the early 1900s contributed to the observed chemical distribution of sediments within the Site. Historical sources responsible for the existing contamination include, but are not limited to: ship building, repair and dismantling; wood treatment and lumber milling; storage of bulk fuels and manufactured gas plant (“MGP”) waste; chemical manufacturing and storage; metal recycling, production and fabrication; steel mills, smelters and foundries; electrical production and distribution; municipal combined sewer overflows; and stormwater from industrial, commercial, transportation, residential and agricultural land uses. Operations that continue to exist today include: bulk fuel storage; barge building; ship repair; automobile scrapping; recycling; steel manufacturing; cement manufacturing; operation and repair of electrical transformers; and many smaller industrial operations, as well as other commercial, agricultural, and municipal practices.

5.1.2. On December 1, 2000, the Portland Harbor Superfund Site was listed on the National Priorities List due mainly to concerns about contamination in the sediments and the potential risks to human health and the environment from consuming fish. The most widespread contaminants found at the Site include, but are not limited to, polychlorinated biphenyls (“PCBs”), polycyclic aromatic hydrocarbons (“PAHs”), and dioxins/furans.

5.1.3. In 2001, EPA entered into a Memorandum of Understanding for the Portland Harbor Site (the “MOU”) with the Oregon Department of Environmental Quality (“ODEQ”), National Oceanic and Atmospheric Administration within the Department of Commerce, the United States Fish and Wildlife Service within the Department of the Interior, the Oregon Department of Fish and Wildlife and the Tribal Governments. The MOU, among other things, established the roles and responsibilities between EPA and ODEQ on managing the upland and in-river portions of the Site and set up a framework for technical and legal coordination among EPA and the Natural Resource Trustees; and relative to the Tribal Governments it sought to acknowledge the federal government’s consultation requirements concerning the Portland Harbor Superfund Site, and to ensure the Tribal Governments’ participation in the response actions at the Portland Harbor Superfund Site.

5.1.4. The Tribal Governments have treaty-reserved rights and resources and other rights, interests, or resources in the Site. The National Oceanic and Atmospheric Administration, the United States Department of the Interior, the Oregon Department of Fish & Wildlife, and the Tribal Governments are designated Natural Resource Trustees

overseeing the assessment of natural resource damages at the Site. To the extent practicable, and if consistent with the objectives of the site-wide baseline sampling described herein, EPA intends that the work under this Settlement will be conducted so as to be coordinated with any natural resource damage assessment and restoration of the Portland Harbor Superfund Site. EPA intends to provide the Tribal Governments and the federal and state Natural Resource Trustees an opportunity to review and comment on plans, reports, and other deliverables submitted by Respondents to EPA under this Settlement.

5.1.5. A remedial investigation and feasibility study (“RI/FS”) was initiated in 2001 and completed in 2017. As part of the RI/FS, baseline human health and ecological risk assessments were conducted to estimate the current and future effects of contaminants in sediments, surface water, groundwater seeps, and fish tissue on human health and the environment. The risk assessments provided the basis for taking action and identified the contaminants of potential concern (“COPCs”) and exposure pathways that the remedial action should address.

5.1.6. The baseline human health risk assessment (“BHHRA”) estimated cancer risks and noncancer health hazards from exposures to a set of chemicals in sediments (both beach and in-river), surface water, groundwater seeps, and fish tissue from samples collected at the Site.

5.1.7. The baseline ecological risk assessment (“BERA”) estimated risks to aquatic and aquatic-dependent species exposed to hazardous substances associated with the in-river Willamette River portion of the Site.

5.1.8. The BHHRA and BERA concluded that contamination within the Site poses unacceptable risks to human health and the environment from numerous contaminants of potential concern in surface water, groundwater, sediment, and fish tissue. The selected remedy reduced the COPCs to 64 contaminants of concern (“COCs”) that contribute the most significant amount of risk to the human and ecological receptors. See ROD, Appendix II, Tables 1–5.

5.1.9. A subset of the COCs, called focused COCs, was developed in order to simplify analysis and develop and evaluate remedial alternatives for the Site. The focused COCs include PCBs, PAHs, dioxins and furans, and DDX; and they contribute the most significant amount of site-wide risk to human and ecological receptors.

5.1.10. PCBs are classified as probable human carcinogens. Children exposed to PCBs may develop learning and behavioral problems later in life. PCBs are known to impact the human immune system and skin, especially in child receptors, and may cause cancer in people. Nursing infants can be exposed to PCBs in breast milk. PCBs can also bioaccumulate in fish, shellfish, and mammals. In birds and mammals, PCBs can cause adverse effects such as anemia and injuries to the liver, stomach, and thyroid gland. PCBs also can cause problems with the immune system, behavioral problems, and impaired reproduction.

5.1.11. PAHs are human health and ecological COCs. PAHs are suspected human carcinogens with potential to cause lung, skin, and bladder cancers with occupational exposure.

Animal studies show that certain PAHs affect the hematopoietic, immune, reproductive and neurologic systems and cause developmental effects. They can cause inhibited reproduction, delayed emergence, sediment avoidance, and mortality. In fish, PAHs cause liver abnormalities and impairment of the immune system.

5.1.12. Dioxins and furans are human health and ecological COCs. Toxic effects in humans include reproductive problems, problems in fetal development or early childhood, immune system damage, and cancer. Nursing infants can be exposed to dioxins and furans in breast milk. Dioxins and furans can bioaccumulate in fish, shellfish, and mammals. Animal effects include developmental and reproductive problems, hemorrhaging, and immune system problems.

5.1.13. DDx, which represents collectively DDT and its primary breakdown products dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethene (DDE), are human health and ecological COCs. DDT is considered a possible human carcinogen. DDT and DDE are stored in the body's fatty tissues. In pregnant women, DDT and DDE can be passed to the fetus. Nursing infants can be exposed to DDx in breast milk. Laboratory animal studies showed effects on the liver and reproduction. These compounds can accumulate in fish, shellfish and mammals, and can cause adverse reproductive effects such as eggshell thinning in birds.

5.1.14. The Record of Decision requires active remediation (dredging, capping and enhanced natural recovery) at areas exceeding the remedial action levels ("RALs") for the focused COCs and contaminated riverbanks adjacent to some of those areas. The Record of Decision allows approximately 1,774 acres of sediment to recover naturally. The ROD estimated the remedy would take 13 years to construct.

5.1.15. One of the first steps in implementing the ROD is to implement site-wide investigation baseline sampling to update existing data, gather data as part of long-term trend analysis, and further refine and delineate Sediment Management Areas in order to inform the remedial design process and the PRPs' allocation process.

5.1.16. The Work to be performed under this Settlement is required to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment and pollutants or contaminants which may present an imminent and substantial endangerment to the public health or welfare.

5.1.17. Respondents currently own or operate or have owned or operated facilities that released hazardous substances at the Portland Harbor Superfund Site and, pursuant to the terms of this Agreement, have agreed to step forward to conduct the Work.

VI. CONCLUSIONS OF LAW AND DETERMINATIONS

6.1. Based on the Findings of Fact set forth above and the administrative record, EPA has determined that:

6.1.1. The Portland Harbor Superfund Site is a "facility" as defined by Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

6.1.2. The contamination found at the Site, as identified in the Findings of Fact above, includes “hazardous substance(s)” as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

6.1.3. Each Respondent is a “person” as defined by Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

6.1.4. Each Respondent is a potentially responsible party under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a), and has agreed to enter into this Settlement and perform the Work agreed upon in this Settlement to advance the purposes enumerated in Section 3.1 above.

6.1.5. The conditions described in Section V, Findings of Fact above constitute an actual or threatened “release” of a hazardous substance from the facility as defined by Section 101(22) of CERCLA, 42 U.S.C. § 9601(22).

6.1.6. The Work agreed upon in this Settlement is necessary to protect the public health, welfare, or the environment and, if carried out in compliance with the terms of this Settlement, will be consistent with the NCP, as provided in Section 300.700(c)(3)(ii) of the NCP.

VII. SETTLEMENT AGREEMENT AND ORDER

7.1. Based upon the Findings of Fact, Conclusions of Law, and Determinations set forth above, and the administrative record for the Site, it is hereby Ordered and Agreed that Respondents will comply with this Settlement, including, but not limited to, the SOW and all appendices to this Settlement hereby incorporated by reference herein.

VIII. PERFORMANCE OF THE WORK

8.1. Coordination and Supervision

8.1.1 Project Coordinators.

a. Respondents’ Project Coordinator must have sufficient technical expertise to coordinate the Work. Respondents’ Project Coordinator may not be an attorney representing any Respondent in this matter and may not act as the Supervising Contractor. Respondents’ Project Coordinator may assign other representatives, including other contractors, to assist in coordinating the Work.

b. EPA shall designate and notify Respondents of EPA’s Project Coordinator. Except as otherwise provided in this Settlement Agreement, Respondents shall direct all submissions required by this Settlement Agreement to the EPA Project Coordinator as designated by EPA. Upon request by EPA, Respondents will also provide submissions on a compact disc. All requested electronic submissions must be formatted as directed by the EPA’s Project Coordinator in order to be official file copies. Unless otherwise requested, EPA will not require hardcopy submissions of documents.

c. Respondents’ Project Coordinator shall provide monthly progress reports to EPA and meet with EPA’s Project Coordinator at least monthly to update EPA on the

progress of the Work and resolve any technical questions not impacting the scope or structure of the Work in this Settlement.

8.1.2. Supervising Contractor. Respondents' Supervising Contractor must have sufficient technical expertise to supervise the Work and a quality assurance system that complies with ASQ/ANSI E4:2014, "Quality management systems for environmental information and technology programs - Requirements with guidance for use" (American Society for Quality, February 2014).

8.1.3. Procedures for Disapproval/Notice to Proceed.

a. Respondents shall designate, and notify EPA, within 10 days after the Effective Date, of the name[s], title[s], contact information, and qualifications of Respondents' proposed Project Coordinator and Supervising Contractor, whose qualifications shall be subject to EPA's review for verification based on objective assessment criteria (*e.g.*, experience, capacity, technical expertise) and do not have a conflict of interest with EPA with respect to the project.

b. EPA shall issue notices of disapproval and/or authorizations to proceed regarding the proposed Project Coordinator and Supervising Contractor, as applicable. If EPA issues a notice of disapproval, Respondents shall, within 10 days, submit to EPA a list of supplemental proposed Project Coordinators and/or Supervising Contractors, as applicable, including a description of the qualifications of each. EPA shall issue a notice of disapproval or authorization to proceed regarding each supplemental proposed coordinator and/or contractor. Respondents may select any coordinator/contractor covered by an authorization to proceed and shall, within 21 days, notify EPA of Respondents' selection.

c. Respondents may change their Project Coordinator and/or Supervising Contractor, as applicable, by following the procedures of ¶¶ 8.1.3(a) and 8.1.3(b).

8.2. Performance of Work in Accordance with the SOW and Work Plan. EPA and Respondents agree that Respondents shall perform the Work specified in the SOW and Work Plan. All deliverables required to be submitted for approval under the SOW or Work Plan shall be subject to approval by EPA in accordance with ¶ 5 (Approval of Deliverables) of the SOW.

8.3. Emergencies and Releases. Respondents shall comply with the emergency and release response and reporting requirements under ¶ 3.5 (Emergency Response and Reporting) of the SOW. Subject to Section XVII (Covenants by EPA), nothing in this Settlement, including ¶ 3.5 of the SOW, limits any authority of EPA: (a) to take all appropriate action to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site associated with the Work, or (b) to direct or order such action to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site. If, due to Respondents' failure to take appropriate response action under ¶ 3.5 of the SOW, EPA takes such action instead, Respondents shall reimburse EPA under Section XIII (Payment of Response Costs) for all costs of the response action.

8.4. Community Involvement. If requested by EPA, Respondents shall conduct community involvement activities under EPA's oversight as provided for in, and in accordance with, Section 2 (Community Involvement) of the SOW. Costs incurred by EPA under this Section constitute EPA Future Response Costs to be reimbursed under Section XIII (Payments for Response Costs).

8.5. Modification of SOW or Related Deliverables.

8.5.1. A basic tenet of Respondents' willingness to undertake the Work under this Settlement was EPA's willingness to agree in advance on the scope of all of the Work to be performed under this Settlement and the incorporation into the binding terms of this Settlement. The sampling and reporting to be performed under this Settlement is therefore limited to the specific tasks described in the Work Plan. EPA may not require the Respondents under the terms of this Settlement to perform any work not expressly identified in the SOW or Work Plan.

8.5.2. The SOW and Work Plan can only be modified by the mutual written consent of all Parties to this Settlement, each at its sole discretion, at which point the agreed to modification shall be incorporated into and enforceable under this Settlement. Respondents agree to incorporate any agreed to modification into the deliverable required under the SOW, as appropriate.

8.5.3. Nothing in this Paragraph shall be construed to limit EPA's authority through a separate order or consent decree or otherwise pursuant to CERCLA or any other applicable law to require performance of response actions. In addition, nothing in this Settlement shall be construed to limit EPA's authority to perform or to authorize any other parties to perform additional work beyond the Work provided under this Settlement. However, nothing in this Settlement shall be construed as requiring Respondents under this Settlement to perform any work other than the Work provided under this Settlement or to reimburse any costs that do not constitute EPA Past Response Costs, EPA Future Response Costs or ODEQ Oversight Costs. Nothing in this Settlement limits EPA's authority through other means to collect any and all response costs that are excluded from or capped by this Settlement in the future.

IX. PROPERTY REQUIREMENTS

9.1. **Agreements Regarding Access and Non-Interference.** Respondents shall, with respect to any Non-Settling Owner's Affected Property, use best efforts to secure from such Non-Settling Owner an agreement, enforceable by Respondents and the EPA, providing that such Non-Settling Owner, and Owner Respondent shall, with respect to any Owner Settling Respondent's Affected Property: (i) provide EPA, Respondents, and their representatives, contractors, and subcontractors with access at all reasonable times to such Affected Property to conduct any activity regarding the Settlement, including those activities listed in ¶ 9.2 (Access Requirements); and (ii) refrain from using such Affected Property in any manner that interferes with or adversely affects the implementation or integrity of the Work.

9.2. **Access Requirements.** The following is a list of activities for which access is required regarding the Affected Property:

- 9.2.1. Monitoring the Work;
- 9.2.2. Verifying any data or information submitted to the EPA;
- 9.2.3. Conducting investigations regarding contamination at or near the Site;
- 9.2.4. Obtaining samples;
- 9.2.5. Assessing the need for, planning, implementing, or monitoring response actions;
- 9.2.6. Assessing implementation of quality assurance and quality control practices as defined in the approved quality assurance quality control plan as provided in the SOW;
- 9.2.7. Implementing the Work pursuant to the conditions set forth in ¶ 18.3 (Work Takeover);
- 9.2.8. Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Respondents or their agents, consistent with Section X (Access to Information);
- 9.2.9. Assessing Respondents' compliance with the Settlement;
- 9.2.10. Determining whether the Affected Property is being used in a manner that is prohibited or restricted, or that may need to be prohibited or restricted under the Settlement; and
- 9.2.11. Taking all appropriate action to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material associated with the Work as provided in ¶8.3. (Emergencies and Releases).

9.3. **Best Efforts.** As used in this Section, “best efforts” means the efforts that a reasonable person in the position of Respondents would use so as to achieve the goal in a timely manner, including the cost of employing professional assistance and the payment of reasonable sums of money to secure access and/or use restriction agreements, as required by this Section. If Respondents are unable to accomplish what is required through “best efforts” in a timely manner, they shall notify EPA, and include a description of the steps taken to comply with the requirements. If EPA deems it appropriate, it may assist Respondents, or take independent action, in obtaining such access. All costs incurred by the EPA in providing such assistance or taking such action, including the cost of attorney time and the amount of monetary consideration or just compensation paid, constitute EPA Future Response Costs to be reimbursed under Section XIII (Payment of Response Costs).

9.4. If EPA determines in a decision document prepared in accordance with the NCP that institutional controls in the form of state or local laws, regulations, ordinances, zoning

restrictions, or other governmental controls or notices are needed, Respondents shall cooperate with EPA's efforts to secure and ensure compliance with such institutional controls.

9.5. In the event of any Transfer of the Affected Property, unless EPA otherwise consents in writing, Respondents shall continue to comply with their obligations under the Settlement, including their obligation[s] to secure access from the new owner of the Affected Property.

9.6. **Notice to Successors-in-Title.** Owner Respondent shall, prior to entering into a contract to Transfer its Affected Property, or 60 days prior to Transferring its Affected Property, whichever is earlier: (a) notify the proposed transferee that EPA has determined that site-wide investigative baseline sampling must be performed at the Site, that potentially responsible parties have entered into an Administrative Settlement Agreement and Order on Consent requiring implementation of such baseline sampling, (identifying the name, docket number, and the effective date of this Settlement); and (b) notify EPA of the name and address of the proposed transferee and provide EPA with a copy of the above notice that it provided to the proposed transferee.

9.7. Notwithstanding any provision of the Settlement, EPA retains all of its access authorities and rights, as well as all of its rights to require land, water, or other resource use restrictions, including enforcement authorities related thereto under CERCLA, RCRA, and any other applicable statute or regulations.

X. ACCESS TO INFORMATION

10.1. Respondents shall provide to EPA, upon request, copies of all records, reports, documents and other information (including records, reports, documents and other information in electronic form) (hereinafter referred to as "Records") within their possession or control or that of their contractors or agents relating to Work under this Settlement, including, but not limited to sampling results, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information related to the Work. Respondents shall also make available to EPA, for purposes of investigation, information gathering, or testimony, their employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work.

10.2. Privileged and Protected Claims.

10.2.1. Respondents may assert all or part of a Record requested by EPA is privileged or protected as provided under federal law, in lieu of providing the Record, provided Respondents comply with ¶ 10.2.2, and except as provided in ¶ 10.2.3.

10.2.2. If Respondents assert such a privilege or protection, they shall provide EPA with the following information regarding such Record: its title; its date; the name, title, affiliation (e.g., company or firm), and address of the author, of each addressee, and of each recipient; a description of the Record's contents; and the privilege or protection asserted. If a claim of privilege or protection applies only to a portion of a Record, Respondents shall provide the Record to EPA in redacted form to mask the privileged or protected portion only. Respondents shall retain all Records that they claim to be privileged or protected until EPA has

had a reasonable opportunity to dispute the privilege or protection claim and any such dispute has been resolved in Respondents' favor.

10.2.3. Respondents may make no claim of privilege or protection regarding: (1) any data that is collected in performing the Work under this Settlement, including, but not limited to, all such sampling, analytical, monitoring, hydrogeologic, scientific, chemical, radiological, or engineering data; (2) the portion of any Record that Respondents are required to create or generate pursuant to this Settlement; or (3) any information for which a claim of confidentiality or privilege is expressly prohibited under applicable law including Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7).

10.3. **Business Confidential Claims.** Subject to subparagraph 10.2.3, above, Respondents may assert that all or part of a Record provided to EPA under this Section or Section XI (Record Retention) is business confidential to the extent permitted by and in accordance with ¶ 10.2.3, Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. § 2.203(b). Respondents shall segregate and clearly identify all Records or parts thereof submitted under this Settlement for which Respondents assert business confidentiality claims. Records claimed as confidential business information will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality accompanies Records when they are submitted to EPA, or if EPA has notified Respondents that the Records are not confidential under the standards of Section 104(e)(7) of CERCLA or 40 C.F.R. Part 2, Subpart B, the public may be given access to such Records without further notice to Respondents.

10.4. Notwithstanding any provision of this Settlement, EPA retains all of its information gathering and inspection authorities and rights, including enforcement actions related thereto, under CERCLA, RCRA, and any other applicable statutes or regulations.

XI. RECORD RETENTION

11.1. Until 10 years after completion of the Remedial Action, Respondents shall preserve and retain all non-identical copies of Records (including Records in electronic form) now in their possession or control or that come into their possession or control that relate in any manner to their liability under CERCLA with respect to the Site, provided, however, that Respondents who are potentially liable as owners or operators of the Site must retain, in addition, all Records that relate to the liability of any other person under CERCLA with respect to the Site. Each Respondent must also retain, and instruct its contractors and agents to preserve, for the same period of time specified above, all non-identical copies of the last draft or final version of any Records (including Records in electronic form) now in their possession or control or that come into their possession or control that relate in any manner to the performance of the Work, provided, however, that each Respondent (and its contractors and agents) must retain, in addition, copies of all data generated during the performance of the Work and not contained in the aforementioned Records required to be retained. Each of the above record retention requirements shall apply regardless of any corporate retention policy to the contrary.

11.2. At the conclusion of the document retention period, Respondents shall notify EPA at least 90 days prior to the destruction of any such Records and, upon request by EPA, and

except as provided for in ¶ 10.2 (Privileged and Protected Claims), Respondents shall deliver any such Records to EPA.

11.3. Each Respondent certifies individually that to the best of its knowledge and belief, after thorough inquiry, it has not altered, mutilated, discarded, destroyed, or otherwise disposed of any Records (other than identical copies) relating to its potential liability regarding the Site since notification of potential liability by EPA and that it has fully complied with any and all EPA requests for information regarding the Site pursuant to Sections 104(e) and 122(e) of CERCLA, 42 U.S.C. §§ 9604(e) and 9622(e), and Section 3007 of RCRA, 42 U.S.C. § 6927, and state law.

XII. COMPLIANCE WITH OTHER LAWS

12.1. Nothing in this Settlement limits Respondents' obligations to comply with the requirements of all applicable federal and state laws and regulations. Respondents must also comply with all applicable or relevant and appropriate requirements of all federal and state environmental laws as set forth in the ROD and the SOW. The activities conducted pursuant to this Settlement, if approved by EPA, shall be considered consistent with the NCP.

12.2. **Permits.** As provided in Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), and Section 300.400(c)(3) of the NCP, no permit shall be required for any portion of the Work conducted entirely on-site (i.e. within the areal extent of contamination or in very close proximity to the contamination and necessary for implementation of the Work). Where any portion of the Work that is not on-site requires a federal, state, or local permit or approval, Respondents shall submit timely and complete applications and take all other actions necessary to obtain and to comply with all such permits or approvals.

12.3. Respondents may seek relief under the provisions of Section XV (Force Majeure) for any delay in performance of the Work resulting from a failure to obtain, or a delay in obtaining, any permit or approval referenced in ¶ 12.2 (Permits) and required for the Work, provided that they have submitted timely and complete applications and taken all other actions necessary to obtain all such permits or approvals. This Settlement is not, and shall not be construed to be, a permit issued pursuant to any federal or state statute or regulation.

XIII. PAYMENT OF RESPONSE COSTS

13.1. Payment for EPA Past Response Costs

13.1.1. Within 180 days after the Effective Date, EPA will send Respondents a bill for Past Response Costs that includes a SCORPIOS Report or similar EPA-prepared cost summary report. Respondents shall pay within 60 days Respondent's receipt of a bill for Past Response Costs. Payment shall be made to EPA by Electronic Funds Transfer ("EFT") in accordance with current EFT procedures to be provided to Respondents by EPA, Region 10, and shall be accompanied by a statement identifying the name and address of the party making payment, the Site name, the EPA Region, the account number 10PX, and the EPA docket number for this action.

13.1.2. At the time of payment, Respondents shall send notice that such payment has been made by email to acctsreceivable.cinwd@epa.gov, and to:

EPA Cincinnati Finance Office
26 Martin Luther King Drive
Cincinnati, Ohio 45268

13.1.3. The total amount to be paid by Respondents pursuant to Paragraph 13.1.1 shall be deposited by EPA in the Portland Harbor Special Account within the EPA Hazardous Substance Superfund to be retained in the Portland Harbor Special Account and used to conduct or finance response actions at or in connection with the Site or to be transferred by EPA to the EPA Hazardous Substance Superfund.

13.2. Payment for EPA Future Response Costs

13.2.1. Respondents shall reimburse EPA for all EPA Future Response Costs incurred pursuant to this Settlement and not inconsistent with the NCP, provided that the aggregate amount of EPA Future Response Costs required to be reimbursed under this Paragraph 13.2 plus EPA Past Response Costs reimbursed under Paragraph 13.1 shall not exceed \$2,000,000. Emergency response costs incurred by EPA pursuant to Paragraph 8.3 shall not be subject to the \$2,000,000 limit. On a periodic basis, EPA will send Respondents a bill requiring payment that includes a SCORPIOS Report or similar EPA-prepared cost summary report. Respondents shall make all payments within 60 days of any Respondent's receipt of each bill requiring payment, except as otherwise provided in Paragraph 13.5 (Contesting Future Response Costs).

13.2.2. Payments made pursuant to this Paragraph 13.2 shall be made by EFT in accordance with EFT instructions provided by EPA, or by submitting a certified or cashier's check or checks made payment to "EPA Hazardous Substance Superfund," referencing the name and address of the party making the payment, the Site name, the EPA Region, the account number 10PX, and the EPA docket number for this action. Respondents shall send the check to:

U.S. Environmental Protection Agency
Superfund Payments
Cincinnati Finance Center
P.O. Box 979076
St. Louis, MO 63197-9000

Respondents shall use the following address for payments made by overnight mail:

U.S. Bank
1005 Convention Plaza
Mail Station SL-MO-C2GL
St. Louis, MO 63101-1229

13.2.3. At the time of payment, Respondents shall send notice that payment has been made to EPA to the Region 10 Project Coordinator and to the Servicing Finance Office, EPA Finance Center, MS-NWD, Cincinnati, OH 45268.

13.3. The total amount paid by Respondents for EPA Future Response Costs will be deposited by EPA in the Portland Harbor Special Account to be retained in the Portland Harbor Special Account and used by EPA to conduct or finance response actions at or in connection with the Site or to be transferred by EPA to the EPA Hazardous Substance Superfund.

13.4. **Interest.** In the event that any payment for EPA Past Response Costs or EPA Future Response Costs is not made by the date required, Respondents shall pay Interest on the unpaid balance. The Interest on EPA Past Response costs and EPA Future Response costs shall begin to accrue on the date of each bill. The Interest shall accrue through the date of Respondents' payment. Payments of Interest made under this Paragraph shall be in addition to such other remedies or sanctions available to the EPA by virtue of Respondents' failure to make timely payments under this Section, including but not limited to, payment of stipulated penalties pursuant to Section XVI (Stipulated Penalties).

13.5. **Contesting EPA Future Response Costs.** Respondents may initiate the procedures of Section XIV (Dispute Resolution) regarding payment of any EPA Future Response Costs billed under ¶ 13.2 (Payments for EPA Future Response Costs) if they determine that EPA has made a mathematical error or included a cost item that is not within the definition of EPA Future Response Costs or the not-to-exceed amount at ¶ 13.2.1, or if they believe EPA incurred excess costs as a direct result of an EPA action that was inconsistent with a specific provision or provisions of the NCP. To initiate such dispute, Respondents shall submit a Notice of Dispute in writing to the EPA Project Coordinator within 30 days after receipt of the bill. Any such Notice of Dispute shall specifically identify the contested Future Response Costs and the basis for objection. If Respondents submit a Notice of Dispute, Respondents shall within the 60-day payment period, also as a requirement for maintaining the dispute, (a) pay all uncontested EPA Future Response Costs to EPA in the manner described in ¶ 13.2, and (b) establish, in a duly chartered bank or trust company, an interest-bearing escrow account that is insured by the Federal Deposit Insurance Corporation (FDIC) and remit to that escrow account funds equivalent to the amount of the contested EPA Future Response Costs. Respondents shall send to the EPA Project Coordinator a copy of the transmittal letter and check paying the uncontested EPA Future Response Costs, and a copy of the correspondence that establishes and funds the escrow account, including, but not limited to, information containing the identity of the bank and bank account under which the escrow account is established as well as a bank statement showing the initial balance of the escrow account. If EPA prevails in the dispute, within 5 days after the resolution of the dispute, Respondents shall pay the sums due (with accrued interest) to EPA in the manner described in ¶ 13.2. If Respondents prevail concerning any aspect of the contested costs, Respondents shall pay that portion of the costs (plus associated accrued interest) for which they did not prevail to EPA in the manner described in ¶ 13.2. Respondents shall be disbursed any balance of the escrow account. The dispute resolution procedures set forth in this Paragraph in conjunction with the procedures set forth in Section XIV (Dispute Resolution) shall be the exclusive mechanisms for resolving disputes regarding Respondents' obligation to reimburse EPA for its Future Response Costs.

13.6. Payment of ODEQ Oversight Costs

13.6.1. Respondents shall be responsible under this Settlement for reimbursing ODEQ for ODEQ Oversight Costs incurred pursuant to this Settlement that are not inconsistent with the NCP under the terms of a separate agreement to be executed by Respondents and ODEQ (“ODEQ Agreement”). Subject to the terms of the ODEQ Agreement, ODEQ will submit a detailed accounting to Respondents’ Project Coordinator on a monthly basis of all ODEQ Oversight Costs sought for reimbursement under the ODEQ Agreement.

13.6.2. Except for any ODEQ Oversight Costs that they dispute under the ODEQ Agreement, Respondents shall, following receipt of each ODEQ invoice, remit payment to ODEQ in a manner agreed to by ODEQ and Respondents in the ODEQ Agreement.

13.6.3. Subject to the terms of the ODEQ Agreement, ODEQ invoices will include a summary of costs billed to date and all underlying documentation including but not limited to: ODEQ personnel time sheets; travel authorizations and vouchers; ODEQ contractor monthly invoices; and all applicable laboratory invoices.

13.6.4. Disputes regarding ODEQ Oversight Cost bills shall be resolved in accordance with a process agreed to between ODEQ and Respondents under the ODEQ Agreement, and neither ruled by nor conducted under Section XIV of this Settlement.

13.6.5. Nothing in this Paragraph shall be construed to limit ODEQ’s authority under any source other than this Settlement to seek reimbursement from Respondents or any other party of any costs that ODEQ may incur or may have incurred.

XIV. DISPUTE RESOLUTION

14.1. Unless otherwise expressly provided for in this Settlement, the dispute resolution procedures of this Section shall be the exclusive mechanism for resolving disputes arising under this Settlement. The Parties shall attempt to resolve any disagreements concerning this Settlement expeditiously and informally.

14.2. **Informal Dispute Resolution.** Except as provided in this Paragraph 14.2, if Respondents object to any EPA decision or action taken pursuant to this Settlement, including billings for EPA Future Response Costs, they shall send EPA’s Project Coordinator a written Notice of Dispute describing the objection(s) within thirty (30) days after such action, unless the objection(s) has/have been resolved informally. The Respondents, when submitting a matter for resolution under this subparagraph, shall be limited collectively to one dispute per EPA decision or action. EPA and Respondents shall have thirty (30) days from EPA’s receipt of Respondents’ Notice of Dispute to resolve the dispute through informal negotiations (the “Negotiation Period”). The Negotiation Period may be extended only upon the mutual agreement of all Parties to this Settlement. Any agreement reached by the Parties pursuant to this Paragraph 14.2 shall be in writing and shall, upon signature by the Parties, be incorporated into and become an enforceable part of this Settlement. Notwithstanding the foregoing, any disputes regarding the following matters may proceed to formal dispute resolution under Paragraph 14.3 without need for informal dispute resolution: (i) EPA’s approval of any Deliverable as described in the SOW;

(ii) EPA's failure to issue a Notice of Work Completion under Section XXVIII; and (iii) any Work Takeover under Paragraph 18.3.

14.3. Formal Dispute Resolution. For any matters subject to informal dispute resolution under Paragraph 14.2, if the Parties are unable to reach an agreement on such matter in dispute within the Negotiation Period, within fourteen (14) days after the end of the Negotiation Period, the Respondents may submit the matter for formal dispute resolution in accordance with this Paragraph 14.3. If Respondents object to any EPA decision or action taken pursuant to this Settlement that relate to matters not subject to informal dispute resolution under Paragraph 14.2, they may, within thirty (30) days after such action, submit the matter for formal dispute resolution in accordance with this Paragraph 14.3.

14.3.1. Any requests for formal dispute resolution shall be submitted for a written determination by the Regional Administrator or any EPA Region 10 official that the Regional Administrator may designate to resolve disputes under this Settlement ("Regional Administrator's Designee"). The Respondents, when submitting a matter for resolution under this subparagraph, shall be limited collectively to one dispute per EPA decision or action. The Respondents shall provide to the Regional Administrator or the Regional Administrator's Designee, with a concurrent copy to all other Parties, a written request for resolution that includes, at a minimum, a statement of the matter in dispute, a summary of efforts to resolve the dispute informally, a succinct summary of the resolution sought and the basis for that determination, and any other materials that the Party deems necessary for resolution of the issue ("Request for Resolution"). The Request for Resolution may also include a report that Respondents may choose to commission from a panel of experts with expertise in fields relevant to the Work who may be selected and retained by Respondents for the purpose of providing an expert technical evaluation regarding the Work. Such report shall be included with and submitted at the same time as the Request for Resolution. At any time within fourteen (14) days after receipt of the Request for Resolution, the EPA may provide to the Regional Administrator or the Regional Administrator's Designee, with a concurrent copy to Respondents, a written response to the Request for Resolution ("Response to Request for Resolution"). The Respondents, in submitting a Request for Resolution, may request a review of any technical issue in dispute by the sitting Chairperson of the Contaminated Sediment Technical Advisory Group within the Office of Superfund Remediation and Technology Innovation ("CSTAG Chairperson"). Upon any such request, EPA shall promptly provide to the CSTAG Chairperson the Request for Resolution and Response to Request for Resolution. The CSTAG Chairperson shall evaluate the technical issues in dispute and, within thirty (30) days after the Response to Request for Resolution, issue a written evaluation assessing each such issue and the merits of the dispute. The Respondents, in submitting a Request for Resolution, may request the opportunity for a teleconference with the Regional Administrator or the Regional Administrator's Designee in advance of the determination. If such a teleconference is requested, it shall be scheduled by the Regional Administrator or the Regional Administrator's Designee for a mutually acceptable date and time within fourteen (14) days of any Response to Request for Resolution, or as soon as practicable thereafter, if no review by the CSTAG Chairperson is requested. If a review by the CSTAG Chairperson is requested, any such teleconference shall be scheduled by the Regional Administrator or the Regional Administrator's Designee for a mutually acceptable date and time within fourteen (14) days of the issuance of the CSTAG Chairperson's evaluation, or as soon as practicable thereafter. The Regional Administrator or the Regional Administrator's Designee

shall issue a written determination on the dispute (“Regional Determination”) to all parties within ten (10) days after the last of the three potential events occur: (i) if a teleconference is requested, the date of the teleconference; (ii) if no teleconference is requested but an evaluation by the CSTAG Chairperson is requested, the date on which the CSTAG Chairperson issues an evaluation; or (iii) if no teleconference is requested and no evaluation by the CSTAG Chairperson is requested, the date on which the Response to Request for Resolution is submitted. In issuing the Regional Determination, the Regional Administrator or the Regional Administrator’s Designee shall consider, at a minimum, the Request for Resolution, the Response to Request for Resolution, and any evaluation from the CSTAG Chairperson. The Regional Determination shall constitute EPA’s final decision on the matter, and EPA and Respondents shall thereafter comply with the Final Determination unless Respondents initiate an appeal of the Regional Determination under Paragraph 14.3.2.

14.3.2. Within ten days of issuance of the Regional Determination, Respondents may appeal the Regional Determination or any portion thereof to the EPA Administrator for a review by the EPA Administrator or any EPA official that the EPA Administrator may designate to resolve disputes under this Settlement (“Administrator’s Designee”). The appeal shall include a written request for review of the Regional Determination along with a brief statement of the basis of the appeal and shall attach any underlying Requests for Resolution, Response to Request for Resolution and any evaluation from the CSTAG Chairperson. The Respondents shall submit a concurrent copy of the appeal and supporting documentation to the EPA Project Coordinator. At any time within fourteen (14) days after receipt of the appeal, the EPA may provide to the EPA Administrator, with a concurrent copy to Respondents, a written response to the appeal. Within fourteen days of a timely response to appeal, the EPA Administrator or the Administrator’s Designee shall issue a final decision on the matter (“Final Determination”). EPA and Respondents shall thereafter comply with the Final Determination.

14.4. The invocation of formal dispute resolution procedures under this Section does not extend, postpone, or affect in any way any obligation of Respondents under this Settlement, except as provided by ¶ 13.5 (Contesting EPA Future Response Costs), as agreed by EPA.

14.5. Except as provided in ¶ 16.4, stipulated penalties with respect to the disputed matter shall continue to accrue, but payment shall be stayed pending resolution of the dispute. Notwithstanding the stay of payment, stipulated penalties shall accrue from the first day of noncompliance with any applicable provision of this Settlement. In the event that Respondents do not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XVI (Stipulated Penalties).

XV. FORCE MAJEURE

15.1. “Force Majeure” for purposes of this Settlement is defined as any event arising from causes beyond the control of Respondents, of any entity controlled by Respondents, or of Respondents’ contractors that delays or prevents the performance of any obligation under this Settlement despite Respondents’ best efforts to fulfill the obligation. The requirement that Respondents exercise “best efforts to fulfill the obligation” includes using best efforts to anticipate any potential force majeure and best efforts to address the effects of any potential force majeure (a) as it is occurring and (b) following the potential force majeure such that the

delay and any adverse effects of the delay are minimized to the greatest extent possible. “Force majeure” does not include financial inability to complete the Work or increased cost of performance.

15.2. If any event occurs or has occurred that may delay the performance of any obligation under this Settlement for which Respondents intend or may intend to assert a claim of force majeure, Respondents shall notify the EPA Project Coordinator orally or, in his or her absence, EPA’s Alternate Project Coordinator or, in the event both of EPA’s designated representatives are unavailable, the Director of the Environmental Cleanup Office, EPA Region 10, within 24 hours of when Respondents first knew that the event might cause a delay. Within 10 days thereafter, Respondents shall provide in writing to EPA an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; Respondents’ rationale for attributing such delay to a force majeure; and a statement as to whether, in the opinion of Respondents, such event may cause or contribute to an endangerment to public health or welfare, or the environment. Respondents shall include with any notice all available documentation supporting their claim that the delay was attributable to a force majeure. Respondents shall be deemed to know of any circumstance of which Respondents, any entity controlled by Respondents, or Respondents’ contractors knew or should have known. Failure to comply with the above requirements regarding an event shall preclude Respondents from asserting any claim of force majeure regarding that event, provided, however, that if EPA, despite the late or incomplete notice, is able to assess to its satisfaction whether the event is a force majeure under ¶ 15.1 and whether Respondents have exercised their best efforts under ¶ 15.1, EPA may, in its unreviewable discretion, excuse in writing Respondents’ failure to submit timely or complete notices under this Paragraph.

15.3. If EPA agrees that the delay or anticipated delay is attributable to a force majeure, the time for performance of the obligations under this Settlement that are affected by the force majeure will be extended by EPA for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the force majeure shall not, of itself, extend the time for performance of any other obligation. If EPA does not agree that the delay or anticipated delay has been or will be caused by a force majeure, EPA will notify Respondents in writing of its decision. If EPA agrees that the delay is attributable to a force majeure, EPA will notify Respondents in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure.

15.4. If Respondents elect to invoke the dispute resolution procedures set forth in Section XIV (Dispute Resolution), they shall do so no later than 15 days after receipt of EPA’s notice. In any such proceeding, Respondents shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Respondents complied with the requirements of ¶¶ 15.1 and 15.2. If Respondents carry this burden, the delay at issue shall be deemed not to be a violation by Respondents of the affected obligation of this Settlement identified to EPA.

15.5. The failure by EPA to timely complete any obligation under the Settlement is not a violation of the Settlement, provided, however, that if such failure prevents Respondents from meeting one or more deadlines under the Settlement, Respondents may seek relief under this Section.

XVI. STIPULATED PENALTIES

16.1. Respondents agree to be liable to EPA for stipulated penalties in the amounts set forth in ¶ 16.2 for any noncompliance with the requirements of this Settlement unless excused under Section XV (Force Majeure). “Comply” as used in the previous sentence includes compliance by Respondents with all applicable requirements of this Settlement, within the deadlines established under this Settlement. If: (i) an initially submitted deliverable that has been disapproved due to material defects and the deficiencies in the initial submission under consideration indicate a bad faith lack of effort to submit an acceptable deliverable; or (ii) a resubmitted deliverable contains a material defect; then such action constitutes a lack of compliance for purposes of this Paragraph.

16.2. The following stipulated penalties shall accrue per violation per day for any non-compliance with the requirements of this Settlement Agreement, including late payments of EPA Future Response Costs.

Penalty Per Violation Per Day	Period of Noncompliance
\$ 250	1st through 7th day
\$ 500	8 th through 14 th day
\$ 1,500	15th through 30th day
\$ 2,500	31st day and beyond

16.3. All penalties shall begin to accrue on the day after the complete performance is due or the day a violation occurs and shall continue to accrue through the final day of the correction of the noncompliance or completion of the activity. Penalties shall continue to accrue during any dispute resolution period, and shall be paid within 15 days after the agreement or the receipt of EPA’s decision. However, stipulated penalties shall not accrue: (a) with respect to a deficient submission under ¶ 5.6 (Approval of Deliverables) of the SOW, during the period, if any, beginning on the 31st day after EPA’s receipt of such submission until the date that EPA notifies Respondents of any deficiency; (b) with respect to a decision on a dispute under Section XIV (Dispute Resolution), during the period, if any, beginning on the date on which the Notice of Dispute is submitted or, for any dispute not subject to informal dispute resolution under Paragraph 14.2, the date on which a Request for Resolution is submitted until the date that the relevant EPA dispute official issues a final decision regarding such dispute; and (c) for any matter subject to a Work Takeover under Paragraph 18.3, from the date of the Work Takeover Notice. Nothing in this Settlement shall prevent the simultaneous accrual of separate penalties for separate violations of this Settlement.

16.4. Following EPA's determination that Respondents have failed to comply with a requirement of this Settlement, EPA may give Respondents written notification of the failure and describe the noncompliance. EPA may send Respondents a written demand for payment of the penalties. However, penalties shall accrue as provided in the preceding Paragraph regardless of whether EPA has notified Respondents of a violation.

16.5. All penalties accruing under this Section shall be due and payable to EPA within 30 days after Respondents' receipt from EPA of a demand for payment of the penalties, unless Respondents invoke the Dispute Resolution procedures under Section XIV (Dispute Resolution) within the 30-day period. All payments to EPA under this Section shall indicate that the payment is for stipulated penalties and shall be made in accordance with ¶ 13.2 (Payments for EPA Future Response Costs).

16.6. If Respondents fail to pay stipulated penalties when due, Respondents shall pay Interest on the unpaid stipulated penalties as follows: (a) if Respondents have timely invoked dispute resolution such that the obligation to pay stipulated penalties has been stayed pending the outcome of dispute resolution, Interest shall accrue from the date stipulated penalties are due pursuant to ¶ 16.4 until the date of payment; and (b) if Respondents fail to timely invoke dispute resolution, Interest shall accrue from the date of demand under ¶ 16.6 until the date of payment. If Respondents fail to pay stipulated penalties and Interest when due, the United States may institute proceedings to collect the penalties and Interest.

16.7. The payment of penalties and Interest, if any, shall not alter in any way Respondents' obligation to complete performance of the Work required under this Settlement.

16.8. Nothing in this Settlement shall be construed as prohibiting, altering, or in any way limiting the ability of EPA to seek any other remedies or sanctions available by virtue of Respondents' violation of this Settlement or of the statutes and regulations upon which it is based, including, but not limited to, penalties pursuant to Section 122(l) of CERCLA, 42 U.S.C. § 9622(l), and punitive damages pursuant to Section 107(c)(3) of CERCLA, 42 U.S.C. § 9607(c)(3), provided, however, that EPA shall not seek civil penalties pursuant to Section 122(l) of CERCLA or punitive damages pursuant to Section 107(c)(3) of CERCLA for any violation for which a stipulated penalty is provided in this Settlement, except in the case of a willful violation of this Settlement.

16.9. Notwithstanding any other provision of this Section, EPA may, in its unreviewable discretion, waive any portion of stipulated penalties that have accrued pursuant to this Settlement.

XVII. COVENANTS BY EPA

17.1. Except as provided in Section XVIII (Reservation of Rights by EPA), EPA covenants not to sue or to take administrative action against Respondents pursuant to Sections 106 and 107(a) of CERCLA, 42 U.S.C. §§ 9606 and 9607(a), for the Work performed, or for EPA Past Response Costs paid and EPA Future Response Costs paid up to the aggregate amount of \$2 million under Paragraph 13.2.1. These covenants shall take effect upon the Effective Date. These covenants are conditioned upon the complete and satisfactory performance by

Respondents of their obligations under this Settlement. These covenants extend only to Respondents and do not extend to any other person.

XVIII. RESERVATIONS OF RIGHTS BY EPA

18.1. Except as specifically provided in this Settlement, nothing in this Settlement shall limit the power and authority of EPA or the United States to take, direct, or order all actions necessary to protect public health, welfare, or the environment or to prevent, abate, or minimize an actual or threatened release of hazardous substances, pollutants, or contaminants, or hazardous or solid waste on, at, or from the Site. Further, except as specifically provided in this Settlement, nothing in this Settlement shall prevent EPA from seeking legal or equitable relief to enforce the terms of this Settlement, from taking other legal or equitable action as it deems appropriate and necessary, or from requiring Respondents in the future to perform additional activities pursuant to CERCLA or any other applicable law under a separate order or consent decree.

18.2. The covenants set forth in Section XVII (Covenants by EPA) above do not pertain to any matters other than those expressly identified therein. EPA reserves, and this Settlement is without prejudice to, all rights against Respondents with respect to all other matters, including, but not limited to:

- 18.2.1. liability for failure by Respondents to meet a requirement of this Settlement;
- 18.2.2. liability for costs not included within the definitions of EPA Past Response Costs or EPA Future Response Costs;
- 18.2.3. liability for costs included within the definitions of EPA Past Response Costs or EPA Future Response Costs that are not reimbursed under this Settlement;
- 18.2.4. liability for performance of response action other than the Work;
- 18.2.5. criminal liability;
- 18.2.6. liability for violations of federal or state law that occur during or after implementation of the Work;
- 18.2.7. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;
- 18.2.8. liability arising from the past, present, or future disposal, release or threat of release of Waste Materials outside of the Site; and
- 18.2.9. liability for costs incurred or to be incurred by the Agency for Toxic Substances and Disease Registry related to the Site not paid as EPA Future Response Costs under this Settlement.

18.3. Work Takeover

18.3.1. In the event EPA determines that Respondents: (1) have ceased implementation of the Work or any portion of the Work; or (2) are seriously or repeatedly deficient or late in their performance of the Work or any portion of the Work, EPA may issue a written notice (“Work Takeover Notice”) to Respondents. Any Work Takeover Notices issued by EPA (which writing may be electronic) will state whether it applies to all of the Work or a portion of the Work. If it applies to only a portion of the Work, the notice shall specifically identify the portion of the Work to be taken over. All Work Takeover Notices shall specify the grounds upon which such notice was issued, and will provide Respondents a period of 10 days within which to remedy the circumstances giving rise to EPA’s issuance of such notice.

18.3.2. If, after expiration of the 10-day notice period specified in ¶ 18.3.1. Respondents have not remedied to EPA’s satisfaction the circumstances giving rise to EPA’s issuance of the relevant Work Takeover Notice, EPA may at any time thereafter assume the performance of all of the Work or portion of the Work identified in the notice as EPA deems necessary (“Work Takeover”). EPA will notify Respondents in writing (which writing may be electronic) if EPA determines that implementation of a Work Takeover is warranted under this ¶ 18.3.2.

18.3.3. Respondents may invoke the procedures set forth in ¶ 14.3 (Formal Dispute Resolution) to dispute EPA’s implementation of a Work Takeover under ¶ 18.3.2. However, notwithstanding Respondents’ invocation of such dispute resolution procedures, and during the pendency of any such dispute, EPA may in its sole discretion commence and continue a Work Takeover under ¶ 18.3.2 until the earlier of: (1) the date that Respondents remedy, to EPA’s satisfaction, the circumstances giving rise to EPA’s issuance of the relevant Work Takeover Notice; or (2) the date that a written decision terminating such Work Takeover is rendered in accordance with ¶ 14.3 (Formal Dispute Resolution).

18.3.4. If EPA implements a Work Takeover of all Work remaining, Respondents shall have no further obligation under this Settlement to perform or fund any of the Work, nor shall Respondents have any obligation under this Settlement to fund or reimburse EPA for any costs it may incur in performing any Work under the Work Takeover. Respondents shall have a continuing obligation under Paragraph 13.2 to reimburse EPA for EPA Future Response Costs incurred pursuant to this Settlement for cost incurred up to the date of Work Takeover, but shall have no obligation under this Settlement for reimbursing EPA for any EPA Future Response Costs that it may incur beginning on the date of the Work Takeover Notice. Respondents shall also have a continuing obligation under Paragraph 13.6 to reimburse ODEQ for ODEQ Oversight Costs incurred pursuant to this Settlement for cost incurred up to the date of Work Takeover, but shall have no obligation under this Settlement for reimbursing ODEQ for any ODEQ Oversight Costs that ODEQ may incur beginning on the date of the Work Takeover Notice.

18.3.5. If EPA implements a Work Takeover for only a portion of the Work (“Partial Work Takeover”), Respondents shall have no further obligation under this Settlement to perform or fund the portion of the Work subject to the Partial Work Takeover, nor shall Respondents have any obligation under this Settlement Agreement to fund or reimburse EPA for

any costs it may incur in performing that portion of the Work. However, Respondents shall have a continuing obligation to perform those portions of the Work not subject to the Partial Work Takeover. Respondents shall have a continuing obligation under Paragraph 13.2 to reimburse EPA for EPA Future Response Costs incurred pursuant to this Settlement for cost incurred up to the date of Partial Work Takeover, and shall also have a continuing obligation for reimbursing EPA for any EPA Future Response Costs incurred after the date of the Partial Work Takeover related to the portion of the Work not subject to the Partial Work Takeover, but shall have no obligation under this Settlement to reimburse EPA for any EPA Future Response Costs incurred after the Partial Work Takeover that relate to Work subject to the Partial Work Takeover. Respondents shall also have a continuing obligation under Paragraph 13.6 to reimburse ODEQ for ODEQ Oversight Costs incurred pursuant to this Settlement for cost incurred up to the date of Partial Work Takeover, and shall also have a continuing obligation for reimbursing ODEQ for any ODEQ Oversight Costs incurred after the date of the Partial Work Takeover related to the portion of the Work not subject to the Partial Work Takeover, but shall have no obligation under this Settlement to reimburse ODEQ for any ODEQ Oversight Costs incurred after the Partial Work Takeover that relate to Work subject to the Partial Work Takeover.

18.3.6. Respondents' obligation to address emergency situations as described in the Paragraph 8.3 and in the SOW, and EPA's authority to abate an endangerment resulting from Respondents' activities are not included in this Work Takeover notice and process provided for in this Section.

18.3.7. Notwithstanding any other provision in this Settlement, EPA retains all authority and reserves all rights to take any and all response actions authorized by law.

XIX. COVENANTS BY RESPONDENTS

19.1. Except as provided in 19.2 below, Respondents covenant not to sue and agree not to assert any claims or causes of action against the United States, or its contractors or employees, with respect to the Work, EPA Past Response Costs, EPA Future Response Costs, and this Settlement, including, but not limited to:

- 19.1.1. any direct or indirect claim for reimbursement from the EPA Hazardous Substance Superfund through Sections 106(b)(2), 107, 111, 112, or 113 of CERCLA, 42 U.S.C. §§ 9606(b)(2), 9607, 9611, 9612, or 9613, or any other provision of law;
- 19.1.2. any claim arising out of response actions at or in connection with the Site, including any claim under the United States Constitution, the Oregon Constitution, the Tucker Act, 28 U.S.C. § 1491, the Equal Access to Justice Act, 28 U.S.C. § 2412, or at common law; or
- 19.1.3. any claim under Sections 107 and 113 of CERCLA, Section 7002(a) of RCRA, 42 U.S.C. § 6972(a), or state law.

19.2. This Settlement Agreement shall not have any effect on claims or causes of action that any Respondent has or may have pursuant to Sections 107(a) or 113(f) of CERCLA, 42 U.S.C. §§ 9607(a) or 9613(f), against the United States on behalf of various federal agencies,

based upon a claim that the United States is a potentially responsible party pursuant to Section 107(a) of CERCLA, 42 U.S.C. § 9607(a), relating to the Work, EPA Past Response Costs, and EPA Future Response Costs paid under Section XIII of this Settlement Agreement. However, the United States acknowledges the reservation of Section 107 claims without any concession that, even if such a claim exists, it is cognizable under Section 107.

19.3. These covenants not to sue shall not apply in the event the EPA brings a cause of action or issues an order pursuant to any of the reservations set forth in Section XVIII (Reservations of Rights by EPA), other than in ¶ 18.2.1 (liability for failure to meet a requirement of the Settlement), 18.2.2 (criminal liability), or 18.2.3 (violations of federal/state law during or after implementation of the Work), but only to the extent that Respondents' claims arise from the same response action, response costs, or damages that the EPA is seeking pursuant to the applicable reservation.

19.4. Nothing in this Settlement shall be deemed to constitute approval or preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S. C. § 9611, or 40 C.F.R. § 300.700(d).

19.5. Respondents reserve, and this Settlement is without prejudice to, claims against the EPA, subject to the provisions of Chapter 171 of Title 28 of the United States Code, and brought pursuant to any statute other than CERCLA or RCRA and for which the waiver of sovereign immunity is found in a statute other than CERCLA or RCRA, for money damages for injury or loss of property or personal injury or death caused by the negligent or wrongful act or omission of any employee of the EPA, as that term is defined in 28 U.S.C. § 2671, while acting within the scope of his or her office or employment under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred. However, the foregoing shall not include any claim based on EPA's selection of response actions, or the oversight or approval of Respondents' deliverables or activities.

XX. OTHER CLAIMS

20.1. By issuance of this Settlement, the EPA assumes no liability for injuries or damages to persons or property resulting from any acts or omissions of Respondents. The EPA shall not be deemed a party to any contract entered into by Respondents or their directors, officers, employees, agents, successors, representatives, assigns, contractors, or consultants in carrying out actions pursuant to this Settlement.

20.2. Except as expressly provided in Section XVII (Covenants by EPA), nothing in this Settlement constitutes a satisfaction of or release from any claim or cause of action against Respondents or any person not a party to this Settlement for any liability such person may have under CERCLA, other statutes, or common law, including but not limited to any claims of the EPA for costs, damages, and interest under Sections 106 and 107 of CERCLA, 42 U.S.C. §§ 9606 and 9607.

20.3. No action or decision by EPA pursuant to this Settlement shall give rise to any right to judicial review, except as set forth in Section 113(h) of CERCLA, 42 U.S.C. § 9613(h).

XXI. EFFECT OF SETTLEMENT/CONTRIBUTION

21.1. Nothing in this Settlement shall be construed to create any rights in, or grant any cause of action to, any person not a Party to this Settlement. Except as provided in Section XIX (Covenants by Respondents), each of the Parties expressly reserves any and all rights (including, but not limited to, pursuant to Section 113 of CERCLA, 42 U.S.C. § 9613), defenses, claims, demands, and causes of action that each Party may have with respect to any matter, transaction, or occurrence relating in any way to the Site against any person not a Party hereto. Nothing in this Settlement diminishes the right of the United States, pursuant to Section 113(f)(2) and (3) of CERCLA, 42 U.S.C. § 9613(f)(2)-(3), to pursue any such persons to obtain additional response costs or response action and to enter into settlements that give rise to contribution protection pursuant to Section 113(f)(2).

21.2. The Parties agree that this Settlement constitutes an administrative settlement pursuant to which each Respondent has, as of the Effective Date, resolved liability to the EPA within the meaning of Sections 113(f)(2) and 122(h)(4) of CERCLA, 42 U.S.C. §§ 9613(f)(2) and 9622(h)(4), and is entitled, as of the Effective Date, to protection from contribution actions or claims as provided by Sections 113(f)(2) and 122(h)(4) of CERCLA, or as may be otherwise provided by law, for the “matters addressed” in this Settlement. The “matters addressed” in this Settlement are solely the Work and EPA Past Response Costs and EPA Future Response Costs up to the maximum of \$2 Million, but no more than actually billed and reimbursed by the Respondents.

21.3. The Parties further agree that this Settlement constitutes an administrative settlement pursuant to which each Respondent has, as of the Effective Date, resolved liability to the EPA within the meaning of Section 113(f)(3)(B) of CERCLA, 42 U.S.C. § 9613(f)(3)(B).

21.4. Each Respondent shall, with respect to any suit or claim brought by it for the matters addressed in this Settlement, notify EPA in writing no later than 60 days prior to the initiation of such suit or claim. Each Respondent also shall, with respect to any suit or claim brought against it for the matters addressed in this Settlement, notify EPA in writing within 10 days after service of the complaint or claim upon it. In addition, each Respondent shall notify EPA within 10 days after service or receipt of any Motion for Summary Judgment and within 10 days after receipt of any order from a court setting a case for trial, for matters addressed in this Settlement.

21.5. In any subsequent administrative or judicial proceeding initiated by EPA, or by the United States on behalf of EPA, for injunctive relief, recovery of response costs, or other relief relating to the Site, Respondents shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim-splitting, or other defenses based upon any contention that the claims raised in the subsequent proceeding were or should have been brought in the instant case; provided, however, that nothing in this Paragraph affects the enforceability of the covenant by EPA set forth in Section XVII (Covenants by EPA).

21.6. Effective upon signature of this Settlement by a Respondent, such Respondent agrees that the time period commencing on the date of its signature and ending on the date EPA

receives from such Respondent the payment(s), if any, required by Paragraph 13.1 (Payment for EPA Past Response Costs) and, if any, Section XVI (Stipulated Penalties) shall not be included in computing the running of any statute of limitations potentially applicable to any action brought by the United States related to the “matters addressed” as defined in ¶ 21.2 and that, in any action brought by the United States related to the “matters addressed,” such Respondent will not assert, and may not maintain, any defense or claim based upon principles of statute of limitations, waiver, laches, estoppel, or other defense based on the passage of time during such period. If EPA gives notice to Respondents that it will not make this Settlement effective, the statute of limitations shall begin to run again commencing ninety days after the date such notice is sent by EPA.

XXII. INDEMNIFICATION

22.1. The EPA does not assume any liability by entering into this Settlement or by virtue of any designation of Respondents by the United States as EPA’s authorized representatives under Section 104(e) of CERCLA, 42 U.S.C. § 9604(e), and 40 C.F.R. 300.400(d)(3). Respondents shall indemnify, save, and hold harmless the EPA, its officials, agents, employees, contractors, subcontractors, employees, and representatives for or from any and all claims or causes of action arising from, or on account of, negligent or other wrongful acts or omissions of Respondents, their officers, directors, employees, agents, contractors, or subcontractors, and any persons acting on Respondents’ behalf or under their control, in carrying out activities pursuant to this Settlement. Further, Respondents agree to pay the EPA all costs it incurs, including, but not limited to attorneys’ fees and other expenses of litigation and settlement arising from, or on account of, claims made against the United States based on negligent or other wrongful acts or omissions of Respondents, their officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf or under their control, in carrying out activities pursuant to this Settlement. The EPA shall not be held out as a party to any contract entered into, by, or on behalf of Respondents in carrying out activities pursuant to this Settlement. Neither Respondents nor any such contractor shall be considered an agent of the EPA.

22.2. The EPA shall give Respondents notice of any claim for which the EPA plans to seek indemnification pursuant to this Section and shall consult with Respondents prior to settling such claim.

22.3. Respondents covenant not to sue and agree not to assert any claims or causes of action against the EPA for damages or reimbursement or for set-off of any payments made, or to be made, to the EPA, arising from or on account of any contract, agreement, or arrangement between any one or more of Respondents and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays. In addition, Respondents shall indemnify and hold harmless the EPA with respect to any and all claims for damages or reimbursement arising from or on account of, any contract, agreement, or arrangement between any one or more of Respondents and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays.

XXIII. INSURANCE

23.1. No later than 15 days before commencing any on-site Work, Respondents shall secure, and shall maintain until so notified by EPA, commercial general liability insurance with limits of liability of \$1 million per occurrence, and automobile insurance with limits of liability of \$1 million per accident, and umbrella liability insurance with limits of liability of \$5 million in excess of the required commercial general liability and automobile liability limits, naming EPA as an additional insured with respect to all liability arising out of the activities performed by or on behalf of Respondents pursuant to this Settlement. In addition, for the duration of the Settlement, Respondents shall provide EPA with certificates of such insurance and a copy of each insurance policy. Respondents shall resubmit such certificates and copies of policies each year on the anniversary of the Effective Date. In addition, for the duration of the Settlement, Respondents shall satisfy, or shall ensure that their contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of worker's compensation insurance for all persons performing the Work on behalf of Respondents in furtherance of this Settlement. If Respondents demonstrate by evidence satisfactory to EPA that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering some or all of the same risks but in a lesser amount, Respondents need provide only that portion of the insurance described above that is not maintained by the contractor or subcontractor. Respondents shall ensure that all submittals to EPA under this Paragraph identify the Site name, City, State and the EPA docket number for this action.

XXIV. FINANCIAL ASSURANCE

24.1. In order to ensure the completion of the Work, Respondents shall secure financial assurance, initially in the amount of \$12,000,000 (twelve million dollars) ("Estimated Cost of the Work"), for the benefit of EPA. Portions of this financial assurance may be provided by different Respondents using different mechanisms as long as the total amount of financial assurance provided by Respondents equals the Estimated Cost of Work. Notwithstanding the potential separate financial assurance mechanisms, Respondents are jointly and severally responsible for securing financial assurance equal to the total Estimated Cost of Work. All financial assurance under this Settlement must be provided through one or more of the mechanisms listed below, in a form substantially identical to the relevant sample documents available from EPA or under the "Financial Assurance - Settlements" category on the Cleanup Enforcement Model Language and Sample Documents Database at <https://cfpub.epa.gov/compliance/models/>, and satisfactory to EPA. Respondents may use multiple mechanisms, including but not limited to surety bonds guaranteeing payment, letters of credit, trust funds, and/or insurance policies:

- 24.1.1. A surety bond guaranteeing payment and/or performance of the Work that is issued by a surety company among those listed as acceptable sureties on federal bonds as set forth in Circular 570 of the U.S. Department of the Treasury;
- 24.1.2. An irrevocable letter of credit, payable to or at the direction of EPA, that is issued by an entity that has the authority to issue letters of credit and whose letter-of-credit operations are regulated and examined by a federal or state agency;

24.1.3. A trust fund established for the benefit of EPA that is administered by a trustee that has the authority to act as a trustee and whose trust operations are regulated and examined by a federal or state agency;

24.1.4. A policy of insurance that provides EPA with acceptable rights as a beneficiary thereof and that is issued by an insurance carrier that has the authority to issue insurance policies in the applicable jurisdiction(s) and whose insurance operations are regulated and examined by a federal or state agency;

24.1.5. A demonstration by a Respondent that it meets the financial test criteria of ¶ 24.3; or

24.1.6. A guarantee to fund or perform the Work executed in favor of EPA by a company: (1) that is a direct or indirect parent company of a Respondent or has a “substantial business relationship” (as defined in 40 C.F.R. § 264.141(h)) with a Respondent; and (2) can demonstrate to EPA’s satisfaction that it meets the financial test criteria of ¶ 24.3.

24.2. Respondents shall within thirty (30) days of the Effective Date, obtain EPA’s approval of the form of Respondents’ financial assurance. Within 30 days of such approval, Respondents shall secure all executed and/or otherwise finalized mechanisms or other documents consistent with the EPA-approved form of financial assurance and shall submit such mechanisms and documents to the EPA Region 10, Office of Regional Counsel, 1200 Sixth Avenue, ORC 113, Seattle, WA 98101.

24.3. Respondents seeking to provide financial assurance by means of a demonstration or guarantee under ¶ 24.1.5 or 24.1.6, must, within 30 days of the Effective Date:

24.3.1. Demonstrate that:

a. The affected Respondent or guarantor has:

- i. Two of the following three ratios: a ratio of total liabilities to net worth less than 2.0; a ratio of the sum of net income plus depreciation, depletion, and amortization to total liabilities greater than 0.1; and a ratio of current assets to current liabilities greater than 1.5; and
- ii. Net working capital and tangible net worth each at least six times the sum of the Estimated Cost of the Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; and
- iii. Tangible net worth of at least \$10 million; and

- iv. Assets located in the United States amounting to at least 90 percent of total assets or at least six times the sum of the Estimated Cost of the Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; or

b. The affected Respondent or guarantor has:

- i. A current rating for its senior unsecured debt of AAA, AA, A, or BBB as issued by Standard and Poor's or Aaa, Aa, A or Baa as issued by Moody's; and
- ii. Tangible net worth at least six times the sum of the Estimated Cost of the Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; and
- iii. Tangible net worth of at least \$10 million; and
- iv. Assets located in the United States amounting to at least 90 percent of total assets or at least six times the sum of the Estimated Cost of the Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; and

24.3.2. Submit to EPA for the affected Respondent or guarantor: (1) a copy of an independent certified public accountant's report of the entity's financial statements for the latest completed fiscal year, which must not express an adverse opinion or disclaimer of opinion; and (2) a letter from its chief financial officer and a report from an independent certified public accountant substantially identical to the sample letter and reports available from EPA or under the "Financial Assurance - Settlements" subject list category on the Cleanup Enforcement Model Language and Sample Documents Database at <https://cfpub.epa.gov/compliance/models/>.

24.4. Respondents providing financial assurance by means of a demonstration or guarantee under ¶ 24.1.5 or 24.1.6 must also:

24.4.1. Annually resubmit the documents described in ¶ 24.3.2 within 90 days after the close of the affected Respondent's or guarantor's fiscal year;

24.4.2. Notify EPA within 30 days after the affected Respondent or guarantor determines that it no longer satisfies the relevant financial test criteria and requirements set forth in this Section; and

24.4.3. Provide to EPA, within 30 days of EPA's request, reports of the financial condition of the affected Respondent or guarantor in addition to those

specified in ¶ 24.3.2; EPA may make such a request at any time based on a belief that the affected Respondent or guarantor may no longer meet the financial test requirements of this Section.

24.5. Respondents shall diligently monitor the adequacy of the financial assurance. If Respondents becomes aware of any information indicating that the financial assurance provided under this Section is inadequate or otherwise no longer satisfies the requirements of this Section, Respondents shall notify EPA of such information within seven days. If EPA determines that the financial assurance provided under this Section is inadequate or otherwise no longer satisfies the requirements of this Section, EPA will notify the Respondents of such determination. Respondents shall, within 30 days after notifying EPA or receiving notice from EPA under this Paragraph, secure and submit to EPA for approval a proposal for a revised or alternative financial assurance mechanism that satisfies the requirements of this Section. EPA may extend this deadline for such time as is reasonably necessary for the Respondents, in the exercise of due diligence, to secure and submit to EPA a proposal for a revised or alternative financial assurance mechanism, not to exceed 60 days. Respondents shall follow the procedures of ¶ 24.7 (Modification of Amount, Form, or Terms of Financial Assurance) in seeking approval of, and submitting documentation for, the revised or alternative financial assurance mechanism. Respondents' inability to secure financial assurance in accordance with this Section does not excuse performance of any other obligation under this Settlement.

24.6. Access to Financial Assurance

- 24.6.1. If EPA is notified by the issuer of a financial assurance mechanism that it intends to cancel such mechanism, and the Respondents fail to provide an alternative financial assurance mechanism in accordance with this Section at least 30 days prior to the cancellation date, the funds guaranteed under such mechanism must be paid prior to cancellation in accordance with ¶ 24.6.4.
- 24.6.2. If, upon issuance of a notice of implementation of a Work Takeover under ¶ 18.3, either: (1) EPA is unable for any reason to promptly secure the resources guaranteed under any applicable financial assurance mechanism and/or related standby funding commitment, whether in cash or in kind, to continue and complete the Work; or (2) the financial assurance is a demonstration or guarantee under ¶ 24.1.5 or 24.1.6, then EPA is entitled to demand an amount, as determined by EPA, sufficient to cover the cost of the remaining Work to be performed. Respondents shall, within 30 days of such demand, pay the amount demanded as directed by EPA.
- 24.6.3. Any amounts required to be paid under this ¶ 24.6 shall be, as directed by EPA: (i) paid to EPA in order to facilitate the completion of the Work by EPA or by another person; or (ii) deposited into an interest-bearing account, established at a duly chartered bank or trust company that is insured by the FDIC, in order to facilitate the completion of the Work by another person. If payment is made to EPA, EPA may deposit the payment into the EPA Hazardous Substance Superfund or into the Portland Harbor

Special Account within the EPA Hazardous Substance Superfund to be retained and used to conduct or finance response actions at or in connection with the Site, or to be transferred by EPA to the EPA Hazardous Substance Superfund.

24.7. Modification of Amount, Form, or Terms of Financial Assurance.

Respondents may submit, on any anniversary of the Effective Date or at any other time agreed to by the Parties, a request to reduce the amount, or change the form or terms, of the financial assurance mechanism. Any such request must be submitted to EPA in accordance with ¶ 24.2 and must include an estimate of the cost of the remaining Work, an explanation of the bases for the cost calculation, and a description of the proposed changes, if any, to the form or terms of the financial assurance. EPA will notify Respondents of its decision to approve or disapprove a requested reduction or change pursuant to this Paragraph. Respondents may reduce the amount of the financial assurance mechanism only in accordance with: (a) EPA's approval; or (b) if there is a dispute, the agreement or written decision resolving such dispute under Section XIV (Dispute Resolution). Respondents may change the form or terms of the financial assurance mechanism only in accordance with EPA's approval. Any decision made by EPA on a request submitted under this Paragraph to change the form or terms of a financial assurance mechanism shall not be subject to challenge by Respondents pursuant to the dispute resolution provisions of this Settlement or in any other forum. Within 30 days after receipt of EPA's approval of, or the agreement or decision resolving a dispute relating to, the requested modifications pursuant to this Paragraph, Respondents shall submit to EPA documentation of the reduced, revised, or alternative financial assurance mechanism in accordance with ¶ 24.2.

24.8. Release, Cancellation, or Discontinuation of Financial Assurance.

Respondents may release, cancel, or discontinue any financial assurance provided under this Section only: (a) in accordance with EPA's approval of such release, cancellation, or discontinuation; or (b) if there is a dispute regarding the release, cancellation, or discontinuance of any financial assurance, in accordance with the agreement or final decision resolving such dispute under Section XIV (Dispute Resolution), or (c) upon completion of the Work and termination of the work requirements of the Order.

XXV. INTEGRATION/APPENDICES

25.1. This Settlement and its appendices constitute the final, complete, and exclusive agreement and understanding among the Parties with respect to the settlement embodied in this Settlement. The parties acknowledge that there are no representations, agreements, or understandings relating to the settlement other than those expressly contained in this Settlement. The following appendices are attached to and incorporated into this Settlement:

25.1.1. Appendix A is the Statement of Work.

25.1.2. Appendix B is a map of the Site.

XXVI. MODIFICATION

26.1. The EPA Project Coordinator and Respondents' Project Coordinator may modify any schedule under the SOW or Work Plan by mutual agreement in writing. Any other

requirements of this Settlement may only be modified in writing by mutual agreement of all Parties, each at its sole discretion.

26.2. If Respondents seek permission to deviate from the SOW, Work Plan, or schedule, Respondents' Project Coordinator shall submit a written request to EPA for approval outlining the proposed modification and its basis. Respondents may not proceed with the requested deviation until receiving oral or written approval from the EPA Project Coordinator pursuant to ¶ 8.1.1.

26.3. No informal advice, guidance, suggestion, or comment by the EPA Project Coordinator or other EPA representatives regarding any deliverable submitted by Respondents shall relieve Respondents of their obligation to obtain any formal approval required by this Settlement, or to comply with all requirements of this Settlement, unless it is formally modified.

XXVII. EFFECTIVE DATE

27.1. This Settlement shall be effective upon signature by the Environmental Cleanup Office, EPA Region 10.

XXVIII. NOTICE OF WORK COMPLETION

28.1. When EPA determines, after EPA's review of the PDI Evaluation Report described in the SOW, that all Work has been fully performed in accordance with this Settlement, with the exception of any continuing obligations as provided in Paragraph 28.3, EPA will provide written notice of that determination to Respondents ("Notice of Work Completion"). If EPA determines that any such Work has not been completed in accordance with this Settlement, EPA will notify Respondents, provide a list of the deficiencies, and require that Respondents modify the Work if appropriate in order to correct such deficiencies. If EPA does not make such determination within ninety (90) days of submittal of the PDI Evaluation Report, Respondents may dispute that inaction pursuant to Section XIV (Dispute Resolution).

28.2. Respondents shall modify the Work to correct the deficiencies in accordance with EPA's direction and shall submit the modified deliverable. If approved, EPA will issue the Notice of Work Completion. If EPA does not make a determination on the modified deliverable within ninety (90) days of submittal, Respondents may dispute that inaction pursuant to Section XIV (Dispute Resolution).

28.3. Issuance of the Notice of Work Completion does not affect the ongoing requirements of this Settlement under Section X (Access to Information), Section XI (Record Retention), Section XIII (Payment of Response Costs), Section (XVI) Stipulated Penalties, Section XVII (Covenants by EPA), Section XVIII (Reservation of Rights by EPA), Section XIX (Covenants by Respondents), Section XX (Other Claims) and Section XXI (Effect of Settlement/Contribution), that shall remain in effect.

IT IS SO AGREED AND ORDERED;

U.S. ENVIRONMENTAL PROTECTION AGENCY:

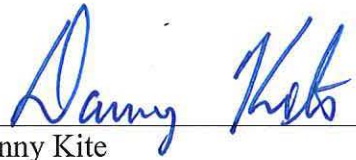
12/19/17
Dated

Sheryl Bilbrey
Sheryl Bilbrey
Director, Environmental Cleanup Office
EPA Region 10

Signature Page for Settlement regarding the Portland Harbor Superfund Site

FOR Arkema Inc. :

12/18/2017
Dated



Danny Kite
President
Legacy Site Services LLC, agent for Arkema Inc.
486 Thomas Jones Way, Suite 110
Exton, PA 19341-2528

Signature Page for Settlement regarding the Portland Harbor Superfund Site

FOR  :
Evraz Inc. NA

Dated
12/19/2017

[Name] Conrad Winkler
[Title] President & CEO
[Company] Evraz Inc. NA
[Address] 200 E. Randolph Dr. Ste 7800
Chicago, IL 60601

Signature Page for Settlement regarding the Portland Harbor Superfund Site

FOR _____:

Schnitzer Steel Industries, Inc.

December 18, 2017

Dated



Peter B. Saba

Senior Vice President & General Counsel

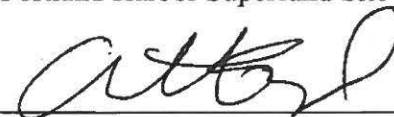
Schnitzer Steel Industries, Inc.

299 SW Clay Street, Suite 350

Portland, OR 97201

Signature Page for Settlement regarding the Portland Harbor Superfund Site

FOR



:

The Marine Group LLC

12/15/17
Dated

ARTHUR ENGEL

[Name]

[Title]

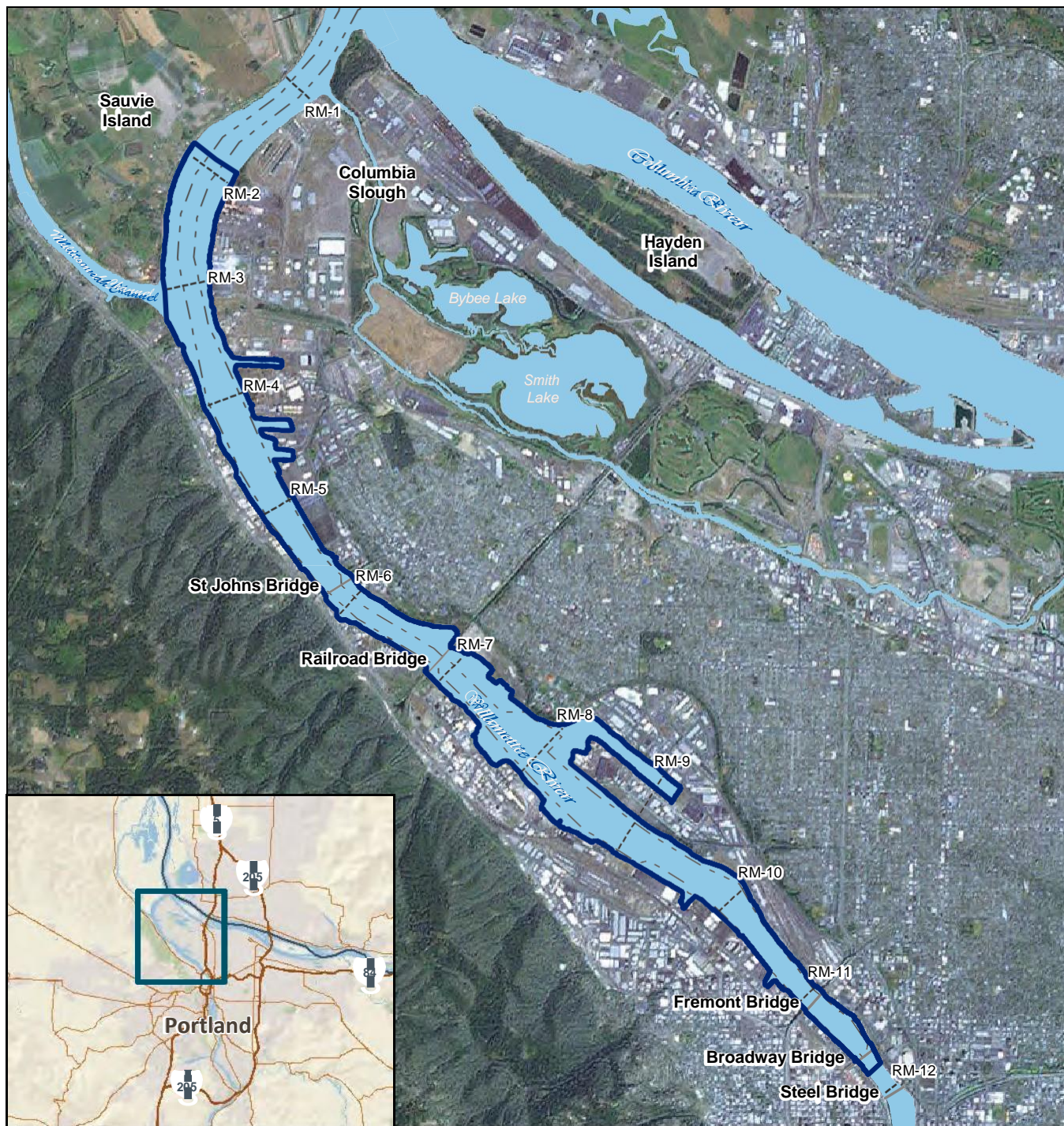
MANAGING MEMBER

[Company]

MARINE GROUP

[Address]

1311 FIRST ST
CORONADO, CA
92118



LEGEND

- Portland Harbor Study Area
- River miles
- Navigation Channel

K

Miles
0 0.3 0.6 0.9 1.2




Figure 1. Site Area

Portland Harbor Superfund Site

PRE-REMEDIAL DESIGN INVESTIGATION AND BASELINE SAMPLING

STATEMENT OF WORK

PORTLAND HARBOR SUPERFUND SITE

Portland, Multnomah County, Oregon

EPA Region 10

December 2017

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1. INTRODUCTION

- 1.1 Purpose of the SOW.** This Statement of Work (SOW) sets forth the procedures and requirements for implementing the pre-remedial design investigation and baseline sampling (Work) at the Portland Harbor Superfund Site (Site) in accordance with the Administrative Settlement Agreement and Order on Consent for Pre-Remedial Design Investigation and Baseline Sampling (ASAOC). EPA and the Respondents to the ASAOC (Respondents) recognize that the data gathered in this Work is not the complete dataset for final remedy design/implementation and that EPA's review of the data reports or data analysis may include an assessment as to whether the data relied on is sufficient to support final evaluations, refinements, recalculations and updates. EPA reserves the right to review all submittals prepared under the attached Work Plan (Attachment A). The purpose of this SOW is described in more detail in Section 3.1 of the ASAOC.
- 1.2 Structure of the SOW.** Section 2 (Community Involvement) sets forth EPA's and Respondents' responsibilities for community involvement. Section 3 (Pre-Remedial Design Investigation and Work Plan) sets forth the process for developing the pre-remedial design investigation (PDI), which includes the submission of specified primary deliverables. Section 4 (Reporting) sets forth Respondents' reporting obligations. Section 5 (Deliverables) describes the content of the supporting deliverables and the general requirements regarding Respondents' submission of, and EPA's review of, approval of, comment on, and disapproval of, the deliverables. Section 6 (Schedules) sets forth the schedule for submitting the primary deliverables, the supporting deliverables that must accompany each primary deliverable, and the schedule of milestones regarding the completion of the PDI. Section 7 (State, Tribal and Agency Partner Participation) addresses EPA's responsibility to coordinate with certain other federal agencies, State agencies and tribes. Section 8 (References) provides a list of references, including web addresses.
- 1.3 Remedy.** The remedy selected by EPA for the Site is described in detail in Section 14 of the Record of Decision (ROD) issued by EPA in January 2017.
- 1.4 Scope of Work.** This SOW covers only the sampling and reporting work described in the attached Work Plan (Attachment A).
- 1.5 Definitions.** Terms used in this SOW that are defined in CERCLA, in regulations promulgated under CERCLA, or in the ASAOC, have the meanings assigned to them in CERCLA, in such regulations, or in the ASAOC, except that the term "Paragraph" or "¶" means a paragraph of the SOW, unless otherwise stated.
- 1.6 Dispute Resolution.** Any dispute concerning the SOW shall be initiated under and subject to Section XIV of the ASAOC.

2. COMMUNITY INVOLVEMENT

2.1 Community Involvement Responsibilities

- (a) EPA has the lead responsibility for developing and implementing community involvement activities at the Site. During the remedial investigation/feasibility study (RI/FS) phase, EPA developed a Community Involvement Plan (CIP) for the Site. Pursuant to 40 C.F.R. § 300.435(c), EPA shall review the existing CIP and determine whether it should be revised to describe further public involvement activities that are not already addressed or provided for in the existing CIP.
- (b) If requested by EPA, Respondents shall support EPA's community involvement activities. This may include providing online access to initial submissions and updates of deliverables to: (1) Community Advisory Groups; (2) Technical Assistance Grant recipients and their advisors; and (3) other entities identified by EPA. All community involvement activities conducted by Respondents at EPA's request are subject to EPA's oversight.
- (c) If requested by EPA, Respondents shall explore the possibility of participating in EPA's Superfund Job Training Initiative program (SuperJTI). This program provides job training to communities affected by Superfund Sites. Respondents will have input into the selection of SuperJTI candidates proposed to be involved in the Work.
- (d) **Respondents' CI Coordinator.** If requested by EPA, Respondents shall, within 15 days, designate and notify EPA of their Community Involvement Coordinator (Respondents' CI Coordinator). Respondents may hire a contractor for this purpose. Respondents' notice must include the name, title, and qualifications of the Respondents' CI Coordinator. Respondents' CI Coordinator is responsible for providing support regarding EPA's community involvement activities, including coordinating with EPA's Community Involvement Coordinator regarding responses to the public's inquiries about the Site.

3. PRE-REMEDIAL DESIGN INVESTIGATION AND WORK PLAN

- 3.1 Scope of Pre-Remedial Design Investigation (PDI).** The purpose of the PDI is described in the ASAO in Section 3.1 and the scope of the Work is set forth in this SOW and Work Plan (Attachment A). The Work Plan includes tasks as further described in Attachment A of this SOW:

- Site-wide bathymetry
- Surface sediment sampling
- Fish tissue sampling
- Surface water sampling

- Sediment coring
- Fish tracking study
- Downtown Reach and Upriver Reach sampling
- Porewater background sampling for metals
- Reporting

3.2 Contents of Work Plan. The Work Plan (Attachment A) includes the items enumerated in paragraphs 3.2 (a) through (e):

- (a) A brief description of the media to be sampled, contaminants or parameters for which sampling will be conducted, location (areal extent and depths), and number of samples;
- (b) A description of the overall management strategy for performing the PDI;
- (c) A description of the responsibility and authority of all organizations and key personnel involved with the development of the PDI;
- (d) A description of the requirements for preparation of the Health and Safety Plan (HASP), Quality Assurance Project Plan (QAPP), and Data Quality Management Plan (DQMP), which will be submitted as specified in the schedule set forth in ¶ 6.2 (PDI Schedule); and
- (e) A schedule for performance of the Work and submission of the PDI Evaluation Report discussed in paragraph 3.3. below.

3.3 PDI Data Summary and Evaluation Report. Following the sampling events outlined in the Work Plan, Respondents shall submit a PDI Data Summary and Evaluation Report described more fully in Section 3.3 of the Work Plan. This report must include:

- (a) Summary of the investigations performed;
- (b) Summary of investigation results and identification of existing conditions;
- (c) Summary of validated data (i.e., tables and graphics);
- (d) Data validation reports (Tier II) and laboratory data reports;
- (e) Photographs documenting the work; and
- (f) An evaluation of and technical data supporting the activities identified in Work Plan Section 3.3 to be provided in the form of Excel spreadsheets after data validation, with citation of appropriate data validation reports (see 3.3(d)) and with the evaluations described in Work Plan Section 3.3.

3.4 Meetings and Inspections. Respondents shall meet with EPA to discuss PDI issues as necessary and, as directed or determined by EPA. Meetings and inspections will include:

- (a) **PDI Conference.** Respondents shall hold one PDI conference with EPA and others as directed or approved by EPA. Respondents shall prepare minutes of the conference and shall distribute the minutes to all Parties.
- (b) **Periodic Meetings.** During the conduct of the Work, Respondents shall meet regularly with EPA, as directed or determined by EPA (at least one meeting every month), to discuss status, access, and other issues. Respondents shall distribute an agenda and list of attendees to all Parties prior to each meeting. Respondents shall prepare minutes of the meetings and shall distribute the minutes to all Parties.
- (c) **Inspections**
 - (1) EPA shall conduct periodic inspections of or have an on-site presence during the PDI field work. At EPA's request, the Supervising Contractor or other designee shall accompany EPA during inspections.
 - (2) Respondents shall provide personal protective equipment needed for EPA personnel and any oversight officials to perform their oversight duties, including personal flotation devices when overseeing over-water portions of the PDI field work.
 - (3) Upon notification by EPA of any deficiencies in the Work, Respondents shall take all necessary steps to correct the deficiencies. Respondents and EPA shall both comply with any schedule provided by EPA in its notice of deficiency, unless a dispute resolution process is initiated under Section XIV of the ASAOC.

3.5 Emergency Response and Reporting

- (a) **Emergency Response and Reporting.** If any event occurs in the performance of the PDI field work that causes or threatens to cause a release of Waste Material on, at, or from the Site and that either constitutes an emergency situation or that may present an immediate threat to public health or welfare or the environment, Respondents shall: (1) immediately take all appropriate action to prevent, abate, or minimize such release or threat of release; (2) immediately notify the authorized EPA officer (as specified in ¶ 3.5(c)) orally; and (3) take such actions in consultation with the authorized EPA officer and in accordance with all applicable provisions of the Health and Safety Plan, the Emergency Response Plan, and any other deliverable approved by EPA under the SOW.
- (b) **Release Reporting.** Upon the occurrence of any event in the performance of the PDI field work that Respondents are required to report pursuant to Section 103 of

CERCLA, 42 U.S.C. § 9603, or Section 304 of the Emergency Planning and Community Right-to-know Act (EPCRA), 42 U.S.C. § 11004, Respondents shall immediately notify the authorized EPA officer orally.

- (c) The “authorized EPA officer” for purposes of immediate oral notifications and consultations under ¶ 3.5(a) and ¶ 3.5(b) is the EPA Project Coordinator, the EPA Alternate Project Coordinator (if the EPA Project Coordinator is unavailable), or the EPA Emergency Response Unit, Region 10 (if neither EPA Project Coordinator is available).
- (d) In the event of any action or occurrence associated with the Work which causes or threatens to cause a release of Waste Material from the Portland Harbor Site that constitutes an emergency situation or may present an immediate threat to public health or welfare or the environment, Respondents shall immediately take all appropriate action. Respondents shall take these actions in accordance with all applicable provisions of this Settlement, in order to prevent, abate or minimize such release or endangerment caused or threatened by the release. Respondents shall also immediately notify the EPA Project Coordinator or, in the event of his/her unavailability, the Regional Duty Officer, Environmental Cleanup Office, Emergency Response Unit, EPA Region 10, (206) 553-1263, of the incident or conditions. In the event that Respondents fail to take appropriate response action as required by this Paragraph, and EPA takes such action instead, Respondents shall reimburse EPA for all costs of the response action not inconsistent with the NCP pursuant to Section XIII (Payment of Response Costs) of the ASAOC.
- (e) In addition, in the event of any release of a hazardous substance to the Portland Harbor Site while the Work is being performed that is caused by or results from the Work, Respondents shall immediately notify the EPA Project Coordinator and the National Response Center at (800) 424-8802. Respondents shall submit a written report to EPA within 7 days after each release, setting forth the events that occurred and the measures taken or to be taken to mitigate any release or endangerment caused or threatened by the release and to prevent the reoccurrence of such a release. This reporting requirement is in addition to, and not in lieu of, reporting under Section 103(c) of CERCLA, 42 U.S.C. § 9603(c), and Section 304 of the Emergency Planning and Community Right-To-Know Act of 1986, 42 U.S.C. § 11001, et seq.
- (f) The reporting requirements under ¶ 3.5 are in addition to the reporting required by CERCLA § 103 or EPCRA § 304.

4. REPORTING

- 4.1 Progress Reports.** Commencing with the month following the Effective Date of the ASAOC and until issuance of the Notice of Work Completion under Section XXVIII of the ASAOC, Respondents shall submit progress reports to EPA monthly, or as otherwise

requested by EPA (Progress Reports). The Progress Reports must cover all activities that took place during the prior reporting period, including:

- (a) The actions that have been taken toward achieving compliance with the ASAO;C;
- (b) Results of all sampling, validated test results, and all other data received or generated in the performance of the Work;
- (c) A description of all deliverables that Respondents submitted to EPA;
- (d) A description of all activities relating to the Work that are scheduled for the next six weeks;
- (e) An updated PDI Schedule, together with information regarding percentage of completion, delays encountered or anticipated that may affect the future schedule for implementation of the Work, and a description of efforts made to mitigate those delays or anticipated delays;
- (f) A description of any modifications to the work plans or other schedules that Respondents have proposed or that have been approved by EPA; and
- (g) A description of all activities undertaken in support of the CIP during the reporting period and those to be undertaken in the next six weeks.

4.2 Notice of Progress Report Schedule Changes. If the schedule for any activity described in the Progress Reports, including activities required to be described under ¶ 4.1(d), changes, Respondents shall notify EPA of such change at least 7 days before the scheduled date for performance of the activity.

5. DELIVERABLES

5.1 Applicability. Respondents shall submit deliverables for EPA approval or for EPA comment as specified in Work Plan Section 5.2. Paragraphs 5.2 (In Writing) through 5.4 (Technical Specifications) apply to all deliverables. Paragraph 5.5 (Certification) applies to any certification of deliverables. Paragraph 5.6 (Approval of Deliverables) applies to any deliverable that is required to be submitted for EPA approval.

5.2 In Writing. All deliverables under this SOW must be in writing unless otherwise specified.

5.3 General Requirements for Deliverables. All deliverables must be submitted by the deadlines in the Schedule of the Work Plan, as applicable and as it may be amended from time to time with EPA's approval. Respondents shall submit all deliverables to EPA in electronic form. Deliverables should follow EPA's electronic submittal requirements, and consist of a single compiled pdf file with bookmarks, 508 tagging completed, and metadata included.

5.4 Technical Specifications

- (a) Sampling and monitoring data should be submitted in standard regional Electronic Data Deliverable (EDD) format (Attachment B). Other delivery methods may be allowed if electronic direct submission presents a significant burden or as technology changes. All data must be formatted such that they can be easily uploaded to the Site database.
- (b) Spatial data, including spatially-referenced data and geospatial data, should be submitted: (1) in the ESRI File Geodatabase format; and (2) as unprojected geographic coordinates in decimal degree format using North American Datum 1983 (NAD83) or World Geodetic System 1984 (WGS84) as the datum, consistent with the format used for such submissions in the RI/FS for the Site. If applicable, submissions should include the collection method(s). Projected coordinates may optionally be included but must be documented (four aspects include projection, zone, datum, and units). Spatial data should be accompanied by metadata, and such metadata should be compliant with the Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata and its EPA profile, the EPA Geospatial Metadata Technical Specification. An add-on metadata editor for ESRI software, the EPA Metadata Editor (EME), complies with these FGDC and EPA metadata requirements and is available at <https://edg.epa.gov/EME/>. Respondents are required to upload data collected to EPA's Water Quality Exchange (WQX) in a manner approved in advance by EPA.
- (c) Each file must include an attribute name for each site unit or sub-unit submitted. Consult <http://www.epa.gov/geospatial/policies.html> for any further available guidance on attribute identification and naming.

5.5 Certification. All deliverables require compliance with this ¶ 5.5 and must be signed by the Respondents' Project Coordinator, or other responsible official of Respondents, and must contain the following statement:

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.

5.6 Approval of Deliverables

- (a) **Initial Submissions.** After review of any deliverable that is required to be submitted for EPA approval under the SOW, EPA shall: (i) approve, in whole or in part, the submission; (ii) approve the submission upon specified conditions; (iii) provide comments and require resubmissions; (iv) disapprove, in whole or in part, the submission; (v) disapprove and decline further review of the submission, in whole or in part, where EPA determines that its review will require additional data or analysis, the performance of which will exceed funds available or hinder or delay cleanup; or (vi) any combination of the foregoing.
- (b) **Resubmissions.** Upon receipt of a notice of disapproval or comments that require resubmission under ¶ 5.6(a) (Initial Submissions), or if required by a notice of approval upon specified conditions under ¶ 5.6(a), Respondents shall, within 30 days or such longer time as specified by EPA in such notice, correct the deficiencies and resubmit the deliverable for approval unless a dispute resolution process is initiated under Section XIV of the ASAOC. After review of the resubmitted deliverable, EPA shall: (1) approve, in whole or in part, the resubmission; (2) approve the resubmission upon specified conditions; (3) provide comments and require resubmission; (4) disapprove, in whole or in part, the resubmission, requiring Respondents to correct the deficiencies; (5) disapprove and decline further review of the submission, in whole or in part, where EPA determines that its review will require additional data or analysis, the performance of which will exceed funds available or hinder or delay cleanup; or (6) any combination of the foregoing.
- (c) **Implementation.** Upon approval or approval upon conditions by EPA under ¶ 5.6(a) (Initial Submissions) or ¶ 5.6(b) (Resubmissions), of any deliverable, or any portion thereof: (1) such deliverable, or portion thereof, will be incorporated into and enforceable under the ASAOC; and (2) Respondents shall take any action required by such deliverable, or portion thereof unless any condition to approval is disputed and a dispute resolution is initiated under Section XIV of the ASAOC. The implementation of any non-deficient portion of a deliverable submitted or resubmitted under ¶ 5.6(a) or ¶ 5.6(b) does not relieve Respondents of any liability for stipulated penalties under Section XVI (Stipulated Penalties) of the ASAOC.

- 5.7 Supporting Deliverables to PDI Work Plan.** Respondents shall submit each of the following supporting deliverables for EPA approval, except as specifically provided. The deliverables must be submitted, for the first time, by the deadlines in the EPA-approved schedule, as applicable. Respondents shall develop the deliverables in accordance with all applicable regulations, guidance, and policies (see Section 8 (References)). Respondents shall update each of these supporting deliverables as necessary or appropriate during the Work, and/or as requested by EPA.

- (a) **Health and Safety Plan.** The HASP describes all activities to be performed to protect on site personnel and area residents from physical, chemical, and all other hazards posed by the Work. Respondents shall develop the HASP in accordance with EPA's Emergency Responder Health and Safety and Occupational Safety and Health Administration (OSHA) requirements under 29 C.F.R. §§ 1910 and 1926. EPA does not approve the HASP, but will review it to ensure that all necessary elements are included and that the plan provides for the protection of human health and the environment. The plan will include appropriate elements of an Emergency Response Plan to cover field activities in the event of an accident or emergency at the Site (e.g. power outages, slope failure, spill releases, etc.) and notification requirements. Work may not commence until EPA comments on the HASP have been resolved.
- (b) **Quality Assurance Project Plan.** The QAPP addresses all sample collection activities as well as sample analysis and data handling regarding the Work. It must be written so that a field sampling team unfamiliar with the project would be able to gather the samples and field information required. A separate Field Sampling Plan (FSP) is not required. Instead, this information is incorporated into the Quality Assurance Project Plan. The QAPP developed by the Lower Willamette Group for the RI/FS will be used where methods are consistent, and Respondents' QAPP will include amendments where the methods are different.

The QAPP must include a detailed explanation of Respondents' quality assurance, quality control, and chain of custody procedures for all treatability, design, compliance, and monitoring samples. Respondents shall develop the QAPP in accordance with *EPA Requirements for Quality Assurance Project Plans*, QA/R-5, EPA/240/B-01/003 (Mar. 2001, reissued May 2006); *Guidance for Quality Assurance Project Plans*, QA/G-5, EPA/240/R 02/009 (Dec. 2002); and *Uniform Federal Policy for Quality Assurance Project Plans*, Parts 1-3, EPA/505/B-04/900A through 900C (Mar. 2005). The QAPP also must include procedures:

- (1) To ensure that EPA and its authorized representative have reasonable access to laboratories used by Respondents in implementing the ASAO (Respondents' Labs);
- (2) To ensure that Respondents' Labs analyze all samples pursuant to the QAPP for quality assurance monitoring;
- (3) To ensure that Respondents' Labs perform all analyses using EPA-accepted methods (i.e., the methods documented in *USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis*, ILM05.4 (Dec. 2006); *USEPA Contract Laboratory Program Statement of Work for Organic Analysis*, SOM01.2 (amended Apr. 2007); and *USEPA Contract Laboratory Program Statement of Work for Inorganic Superfund Methods*

(*Multi-Media, Multi-Concentration*), ISM01.2 (Jan. 2010)) or other methods acceptable to EPA;

- (4) To ensure that Respondents' Labs participate in an EPA-accepted QA/QC program or other program QA/QC acceptable to EPA;
- (5) For Respondents to provide EPA with notice at least 7 days prior to any sample collection activity;
- (6) For Respondents to provide split samples for any purposes and duplicate samples for quality assurance/quality control purposes, to the extent feasible, to EPA upon request;
- (7) For EPA to provide to Respondents, upon request, split samples and/or duplicate samples in connection with EPA's oversight sampling; and
- (8) For Respondents to submit to EPA all sampling and tests results and other data received or generated in the performance of the Work.

(c) **Field Sampling Plan for Pre-Remedial Investigation Studies.** The field sampling plan (FSP), incorporated as a subsection of the QAPP, provides objectives and minimum sampling requirements. It includes guidelines for sediment, surface water, and small mouth bass. Preliminary RD characterization will focus on delineating horizontal and vertical extent of contamination associated with SMAs, small mouth bass fish tissue, and other tasks listed in Section 3.1. The sampling will provide up-to-date information on the extent of contamination in affected media, identify existing conditions, and include a statistically valid data set that could be used to evaluate ROD remedial action objectives (RAOs). The FSP must include:

- (1) Description of environmental media to be sampled;
- (2) Description of data collection parameters, including existing and proposed monitoring devices and locations, analytical parameters to be assessed, analytical methods employed, supporting rationale for the sample components and their relationship to ROD RAOs, metrics, and targets (fish tissue);
- (3) Description of how data will be analyzed, interpreted, and reported, and/or other Site-related requirements; and
- (4) Description of verification sampling procedures.

- (d) **Data Quality Management Plan.** A DQMP that presents how the data will be managed, reported, and consistently formatted for uploading to EPA data repositories shall be included in the Work Plan.

6. SCHEDULES

- 6.1 Applicability and Revisions.** All deliverables and tasks required under this SOW must be submitted or completed by Respondents and/or EPA (as applicable) by the deadlines or within the time durations listed in the schedule set forth below and/or approved as part of the PDI Work Plan unless a dispute resolution process is initiated under Section XIV of the ASAOC. Respondents and EPA may submit to each other a proposed revised schedule for approval. Upon approval by all Parties, the revised schedule supersedes the schedule set forth below, and any previously-approved schedule. Any denial of a request for revisions to the schedule may be subject to resolution under Section XIV of the ASAOC.

EPA shall use its best efforts to meet the time deadlines in the ASAOC, and repeated or prolonged failure to meet such deadlines shall be a matter subject to dispute resolution under Section XIV of the ASAOC.

6.2 PDI Schedule. (Days in this schedule are calendar days.)

	Description of Deliverable, Task	¶ Ref.	Deadline
1	HASP, QAPP, DQMP	¶¶ 3.1, 5.7	<p>Respondents will submit within 30 days after Effective Date of ASAOC.</p> <p>EPA will review the documents as described in Section 7.1 of this SOW and submit comments and any requested changes to Respondents within 30 days after receipt.</p> <p>Respondents will revise the documents within 15 days.</p>
2	Pre-RD Remedial Footprint Report	Work Plan	<p>Respondents will submit by January 7, 2019.</p> <p>EPA will review the report and submit comments and any requested changes to Respondents within 45 days after receipt.</p> <p>Respondents will revise the document within 45 days after receiving comments.</p>
3	PDI Evaluation Report	3.3	<p>Respondents will submit by May 9, 2019.</p> <p>EPA will review the report and submit comments and any requested changes to Respondents within 90 days after receipt.</p> <p>Respondents will revise the document within 45 days after receiving comments.</p>
4	Monthly progress reports	4.1	<p>Due by the 15th day of the month following the reporting month.</p>

7. STATE, TRIBAL AND AGENCY PARTNER PARTICIPATION

- 7.1** EPA will coordinate with the Oregon Department of Environmental Quality (ODEQ), the Tribal Governments (as defined in the ASAOC), the Oregon Department of Fish and Wildlife, National Oceanic and Atmospheric Administration, and U.S. Department of the Interior (collectively “MOU partners”) including providing a reasonable opportunity for

their review and comment on any deliverables that are required to be submitted for EPA approval or disapproval under ¶ 5.6 (Approval of Deliverables) as part of EPA's review and to the extent practicable during the time specified for EPA review in ¶ 6.2 (PDI Schedule). EPA shall, at any time it sends a notice, authorization, approval, disapproval, or certification to Respondents, send a copy of such document to the MOU partners. All distribution copies will be electronic.

8. REFERENCES

8.1 The following regulations and guidance documents, among others, apply to the Work. Any item for which a specific web address is not provided below is available on one of the two EPA web pages listed in ¶ 8.2:

- (a) A Compendium of Superfund Field Operations Methods, OSWER 9355.0-14, EPA/540/P-87/001a (Aug. 1987).
- (b) CERCLA Compliance with Other Laws Manual, Part I: Interim Final, OSWER 9234.1-01, EPA/540/G-89/006 (Aug. 1988).
- (c) CERCLA Compliance with Other Laws Manual, Part II, OSWER 9234.1-02, EPA/540/G-89/009 (Aug. 1989).
- (d) Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties, OSWER 9355.5-01, EPA/540/G-90/001 (Apr. 1990).
- (e) Guidance on Expediting Remedial Design and Remedial Actions, OSWER 9355.5-02, EPA/540/G-90/006 (Aug. 1990).
- (f) Guide to Management of Investigation-Derived Wastes, OSWER 9345.3-03FS (Jan. 1992).
- (g) Permits and Permit Equivalency Processes for CERCLA On-Site Response Actions, OSWER 9355.7-03 (Feb. 1992).
- (h) National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule, 40 C.F.R. Part 300 (Oct. 1994).
- (i) EPA Guidance for Data Quality Assessment, Practical Methods for Data Analysis, QA/G-9, EPA/600/R-96/084 (July 2000).
- (j) Guidance for Quality Assurance Project Plans, QA/G-5, EPA/240/R-02/009 (Dec. 2002).
- (k) Quality Systems for Environmental Data and Technology Programs -- Requirements with Guidance for Use, ANSI/ASQ E4-2004 (2004).

- (l) Uniform Federal Policy for Quality Assurance Project Plans, Parts 1-3, EPA/505/B-04/900A through 900C (Mar. 2005).
- (m) Superfund Community Involvement Handbook, EPA/540/K-05/003 (Apr. 2005).
- (n) EPA Guidance on Systematic Planning Using the Data Quality Objectives Process, QA/G-4, EPA/240/B-06/001 (Feb. 2006).
- (o) EPA Requirements for Quality Assurance Project Plans, QA/R-5, EPA/240/B-01/003 (Mar. 2001, reissued May 2006).
- (p) EPA Requirements for Quality Management Plans, QA/R-2, EPA/240/B-01/002 (Mar. 2001, reissued May 2006).
- (q) USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, ILM05.4 (Dec. 2006).
- (r) USEPA Contract Laboratory Program Statement of Work for Organic Analysis, SOM01.2 (amended Apr. 2007).
- (s) EPA National Geospatial Data Policy, CIO Policy Transmittal 05-002 (Aug. 2008), available at <http://www.epa.gov/geospatial/policies.html> and http://www.epa.gov/geospatial/docs/National_Geospatial_Data_Policy.pdf
- (t) USEPA Contract Laboratory Program Statement of Work for Inorganic Superfund Methods (Multi-Media, Multi-Concentration), ISM01.2 (Jan. 2010).
- (u) EPA's Emergency Responder Health and Safety Manual, OSWER 9285.3-12 (July 2005 and updates), http://www.epaossc.org/_HealthSafetyManual/manual-index.htm

8.2 A more complete list may be found on the following EPA Web pages:

Laws, Policy, and Guidance <https://www.epa.gov/superfund/superfund-policy-guidance-and-laws>

Test Methods Collections <http://www.epa.gov/fem/methcollectns.htm>

8.3 For any regulation or guidance referenced in the ASAOC or SOW, the reference will be read to include any subsequent modification, amendment, or replacement of such regulation or guidance. Such modifications, amendments, or replacements apply to the Work only after Respondents receive notification from EPA of the modification, amendment, or replacement.

Attachment A

Work Plan for Pre-Remedial Design Investigation and Baseline Sampling

Attachment B

Electronic Data Deliverable Format

Statement of Work Attachment A

Work Plan for Pre-Remedial Design Investigation and Baseline Sampling

Prepared for:

United States Environmental Protection Agency, Region 10

1200 Sixth Avenue, Suite 900

Seattle, Washington 98101

and

Portland Harbor Pre-RD Group

Portland Oregon

WORK PLAN

PORTLAND HARBOR PRE-REMEDIAL DESIGN INVESTIGATION STUDIES PORTLAND HARBOR SUPERFUND SITE

Prepared by:

Geosyntec 
consultants

engineers | scientists | innovators

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LIST OF ACRONYMS AND ABBREVIATIONS

µm	micrometer
95UCL	95% upper confidence limit
AECOM	AECOM Technical Services
Alt F Mod	Alternative F Modified
ARARs	applicable or relevant and appropriate requirements
ASAO	Administrative Settlement and Agreement Order on Consent
ASTM	American Society of Testing Materials
BAZ	biologically active zone
BERA	baseline ecological risk assessment
BHHRA	baseline human health risk assessment
bml	below mudline
BMPs	best management practices
CDM Smith	CDM Smith, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
COCs	contaminants of concern
COPCs	contaminants of potential concern
CRD	Columbia River Datum
CSM	Conceptual Site Model
cy	cubic yards
D/F	dioxins/furans
D/U Reach	the Downtown Reach and the Upriver Reach
DDx	dichlorodiphenyltrichloroethane and its derivatives
DQMP	Data Quality Monitoring Plan
DQOs	data quality objectives
DUOs	data use objectives
EIM	Environmental Information Management
ENR	enhanced natural recovery
EPA	United States Environmental Protection Agency

ERDC	Engineer Research and Development Center
ESD	Explanation of Significant Differences
FC	Field Coordinator
FSP	Field Sampling Plan
FWM	food web model
Geosyntec	Geosyntec Consultants, Inc.
Germano	Germano and Associates
GSI	GSI Water Solutions, Inc.
Hart Crowser	Hart Crowser, Inc.
HSP	health and safety plan
ICs	Institutional Controls
L	liter
LSS	Legacy Site Services
LWG	Lower Willamette Group
MDL	method detection limit
MNR	monitored natural recovery
NELAP	National Environmental Laboratory Accreditation Program
NPL	National Priorities List
NWIS	National Weather Information System
ODEQ	Oregon Department of Environmental Quality
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PCI	Participation and Common Interest
PDI	pre-remedial design investigation
PES	polyethersulfone
PHSS	Portland Harbor Superfund Site
PII	Personal Identification Information
Pre-RD	Pre-Remedial Design

PRP	potentially responsible party
PTW	Principal Threat Waste
PVC	polyvinyl chloride
QA	quality assurance
QAPPs	quality assurance project plans
QC	quality control
RALEs	Remedial Action Levels
RAOs	remedial action objectives
RI	remedial investigation
RI/FS	Remedial Investigation/Feasibility Study
RM	river mile
ROD	Record of Decision
SDU	Sediment Decision Unit
Site	Portland Harbor Superfund Site
SMA	sediment management area
SMB	smallmouth bass
SOW	Statement of Work
SWACs	surface weighted average sediment concentrations
TOC	total organic carbon
TSS	total suspended solids
TZW	transition zone water
USACE	United States Army Corps of Engineers
US DOD	United States Department of Defense
USGS	United States Geological Survey

1. INTRODUCTION

The Record of Decision (ROD) described a post-ROD sampling effort for the Portland Harbor Superfund Site (Site or PHSS) to delineate and better refine the sediment management area (SMA) footprints, refine the Conceptual Site Model (CSM),¹ determine baseline conditions, and support remedial design (United States Environmental Protection Agency [EPA] 2017).

The ROD provides that “This updated information will inform the implementation of the Selected Remedy decision tree. When applying the decision tree logic with newly gathered information, the design and constructed remedy will reflect the newer information.” (ROD at p. 106) and “Additional data will be collected during remedial design to assist in refining the remedy beyond the feasibility study level of analysis.” (ROD Responsiveness Summary at p. 2-77). The pre-remedial design investigation (PDI) study is intended to assist in meeting ROD objectives and the resulting data may be used in the allocation process being conducted by potentially responsible parties (PRPs) (the allocation process is independent of EPA oversight). Table 1 lists the data that will be collected to satisfy these data use objectives (see Section 1.3). This PDI scope of work focuses on site-wide studies that will assist in refining the scope and extent of the remedial actions to support the 30% design, including refining the SMAs, informing technology assignments consistent with the decision tree in the ROD (Figure 28), and refining the horizontal and vertical extent of the dredging and capping areas. It also achieves many of the baseline sampling objectives outlined in the ROD for purposes of long-term monitoring. The Work Plan does not include SMA-specific design-level sampling, nor source control evaluations, which could be conducted during future remedial design. The data collected as part of this scope of work are not intended to provide final conclusions for the Site. Additional data collection as a part of separate scopes of work will be needed to support future remedial design efforts.

This Work Plan, prepared by Geosyntec Consultants, Inc. (Geosyntec) and AECOM Technical Services (AECOM), is a focused and foundational step in what will likely be a multi-phase effort to bring current the collection of data over the past 15 years. It provides an overview of studies that will be prepared for pre-remedial design investigation at the PHSS located in Portland, Oregon. The work described in this Work Plan will be

¹ New data will be used to refine the CSM for remedial design purposes.

conducted by a group of industrial parties called the Pre-Remedial Design Investigation (Pre-RD) Group. This Work Plan was prepared in general accordance with the Superfund Remedial Design and Remedial Action Guidance document (EPA 1985).

EPA and the Pre-RD Group recognize that the data gathered in the PDI is not the complete dataset for final remedy design/implementation and that EPA's review of the data reports or data analysis may include an assessment as to whether the evaluations, refinements, recalculations and updates are sufficient to support conclusions and fulfill the objectives of the Record of Decision. EPA reserves the right to review all submittals prepared under the Work Plan.

The approach to consider and incorporate the data generated during the PDI into the overall remedial process is consistent with EPA guidance and policy (EPA 2002, EPA 2005) and the ROD for Portland Harbor.

1.1 Site Description

The Site extends from river mile (RM) 1.9 near the mouth of the Willamette River to RM 11.8 (Figure 1). The Willamette River is a dynamic waterbody that originates within Oregon in the Cascade Mountain Range and flows approximately 187 miles north to its confluence with the Columbia River. Its average flow rate is 33,000 cubic feet per second (cfs), with high season rates of 200,000 cfs or higher (EPA 2016a).

The Site includes a water-dependent, highly industrialized area, which contains a multitude of facilities and both private and municipal outfalls. Land use along the Lower Willamette River in the Portland Harbor includes marine terminals, manufacturing and other commercial and municipal operations, and public facilities, parks, and open spaces (EPA 2016a). 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 extending from RM 16.6 to RM 28.4. For purposes of the PDI and for consistency with the remedial investigation (RI) dataset, the Work Plan is focusing on RM 11.8 to RM 28.4 for data collection to assess incoming contaminant loads to the Site.

The shorelines along most of the Portland Harbor area have been developed for industrial, marine, commercial, defense, and municipal operations over a 100 year period; the Portland Harbor area serves as a major shipping route for containerized and bulk cargo. In addition, the Portland Harbor area has historically received, and currently receives, discharges from industrial and municipal sources including point and non-point sources that discharge to the Lower Willamette River. Common shoreline features within the

harbor include constructed bulkheads, piers, wharves, buildings extending over the water, and steeply-sloped banks armored with riprap or other fill materials. Site background and other site characteristics are described in detail in the Final Remedial Investigation Report (EPA 2016a).

On 1 December 2000, the Site was listed on the National Priorities List (NPL) by EPA mainly due to concerns about contamination in the sediments and the potential risks to human health and the environment from consuming fish. The most widespread contaminants found at the Site include, but are not limited to, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), dichlorodiphenyltrichloroethane and its derivatives (DDx), and dioxins/furans (D/F). A remedial investigation and feasibility study (RI/FS) was initiated in 2001 by a small subset of potentially responsible parties (PRPs) known as the Lower Willamette Group (LWG), and completed by EPA in 2016 (EPA 2016a, EPA 2016b).

In June 2017, the Pre-RD Group developed and offered a pre-remedial design scope of work focused on defining current conditions for specific media and refining delineation of active remedial areas to EPA. Over the last four months, EPA and the Pre-RD Group held several scoping meetings to negotiate study objectives, data collection activities, and data interpretation tasks; the scope was expanded to address several baseline study elements as required by the ROD. In fall 2017, the EPA entered into an Administrative Settlement and Agreement Order on Consent (ASAOC) with the Pre-RD Group to conduct the agreed-upon work at the Site. This Work Plan supports the Statement of Work (SOW) which is an attachment to the ASAOC, and describes the specific field investigation activities, data analyses, schedule, and deliverables for the PDI. The Work Plan is included as an attachment to the SOW.

1.2 Remedy of Record

The remedy selected in the ROD (EPA 2017), called Alternative F Modified (Alt F Mod), identified 394 acres of engineered remediation with a combination of remedial technologies (Figure 2). The remedy includes 365.4 acres of capping and dredging contaminated sediment above Remedial Action Levels (RALs) and 28.2 acres of enhanced natural recovery (ENR) within the Site. The RALs are listed in ROD Table 21 (reproduced as Table 2 in this Work Plan). Alt F Mod addresses all areas where contaminant concentrations exceed the cleanup levels (see ROD Table 17, reproduced as Table 3 in this Work Plan) through a combination of dredging, capping, ENR, monitored natural recovery (MNR), and Institutional Controls (ICs). The ROD indicates that EPA

expects 215.2 acres of sediment will be dredged to varying depths and 140.1 acres will be capped, or partially dredged and capped. Additionally, 23,305 lineal feet of riverbank are assumed to be excavated and covered with either an augmented reactive cap or an engineered cap using beach mix or vegetation after excavating. Under Alt F Mod, approximately 3,017,000 cubic yards (cy) of contaminated sediment and 123,000 cy of soil were estimated by EPA to be removed and transported to off-site disposal facilities. About 1,774 acres are designated for MNR (EPA 2017).

The SMAs represent areas which EPA considered to have contaminant concentrations in surface sediment where natural recovery is not occurring or is not likely to be effective in reducing concentrations of contaminants of concern (COCs) within a reasonable time frame (EPA 2017). Additionally, EPA used the presence of Principal Threat Waste (PTW) as defined in its FS (EPA 2017), and used in-situ treatment areas for PTW to delineate SMAs.

The ROD states that the in-river construction duration for Alt F Mod will be approximately 13 years at a pre-engineering estimated cost of \$1.7 billion (non-discounted). The remedy will likely change somewhat during the remedial design and be adapted during the multi-year construction process. Changes to the remedy will be documented using a technical memorandum in the Administrative Record, an Explanation of Significant Differences (ESD), or ROD amendment (EPA 2017).

The remedial actions identified in the ROD address nine narrative remedial action objectives (RAOs) that EPA developed for the Site for environmental media of interest and exposure pathways, including exposure routes and receptors. The ROD defined numeric, concentration-based cleanup levels to achieve these RAOs for each exposure route (and tissue targets for seafood consumption RAOs). The cleanup levels considered conservative risk assessments, applicable or relevant and appropriate requirements (ARARs-based), and background concentrations (background-based). Achieving the RAOs relies on the remedy's ability to meet cleanup levels or tissue targets. Fish tissue targets will be used to update fish advisories, assess whether the remedy will achieve RAOs, make adjustments to best management practices (BMPs); their uses will be further defined in the monitoring plans. ROD Table 17 presents the COCs for the Site and respective cleanup levels by media (reproduced as Table 3 in this Work Plan). Site-specific cleanup levels were developed for each RAO for the following media: sediment (including beaches) and riverbank soil, surface water, and groundwater (EPA 2017).

1.3 Pre-Remedial Design Data Use Objectives

The Pre-RD Group proposes to conduct a comprehensive 2017/2018 synoptic sampling program of surface sediment, select sediment cores, fish tissue, surface water, background porewater, and bathymetry/fish tracking studies. These investigation activities are focused on achieving the following goals:

1. Implement investigation baseline sampling to update existing site-wide data;
2. Gather data to be used as part of baseline dataset for future long-term monitoring;
3. Assist in refining the scope and extent of the remedial actions that will be performed at the Site, including refining SMAs, informing technology assignments consistent with the decision tree in the ROD (Figure 28) throughout the Site, and refining the horizontal and vertical extent of the dredging and capping areas;
4. Collect data to facilitate completion of the third-party allocation by PRPs, this allocation process is independent of EPA oversight;
5. Collect additional data regarding upstream conditions and contaminant loading into the Site; and
6. Update and evaluate site conditions to refine the CSM for all pathways consistent with the ROD, page 106 (Post-ROD Data Gathering).

Sediment contaminant data from the SMA delineation effort will be used to delineate SMAs, and updated bathymetric data from this effort will be used to support remedial design using the ROD's decision trees. The stratified random sediment sampling effort, in conjunction with water, sediment trap, and fish data will be used to update the current conditions and provide a baseline for long-term monitoring and remedy effectiveness evaluations.

The Parties to the ASAO agree that, notwithstanding the stated objectives under this agreement/work plan, nothing precludes the Pre-RD Group from using the data collected pursuant to this agreement/work plan as it sees fit to support interpretations of site conditions. The Pre-RD Group may, at its election, present such data and interpretations to EPA for consideration, and EPA will consider such data and interpretations. EPA makes no advance representation as to EPA's acceptance of such interpretations.

This Work Plan acknowledges that the pre-design data are a first step, and that additional sampling will be necessary for certain areas during the remedial design phase. However,

the proposed PDI sampling program is extensive and the data will be used to update the CSM to inform future remedial design activities and future long-term monitoring, in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidance. In addition, the RI/FS dataset forms the conditions for the Site that was used to evaluate risks, develop RALs, and the remedial footprint established in the ROD. The collection and use of new “baseline” data to revisit and refine understanding of site conditions and, as appropriate, the remedial design, remedial action and operations and maintenance are consistent with EPA regulations, policies and guidance including EPA’s guidance documents related to Superfund contaminated sediment sites.²

Table 1 lists the data that will be collected to achieve these goals. The 2017/2018 data will be used to determine current surface weighted average sediment concentrations (SWACs), refine the CSM for remedial design purposes and collect additional data regarding upstream conditions and contaminant loading into the Site. This sampling program is intended to provide a scientifically and statistically sound and robust balance of: (i) near-term initiation of field work; (ii) prioritizing field data collection for studies that provide informative updates to the Site baseline; and (iii) provide data that may be used by the Participation and Common Interest (PCI) Allocation Team to reduce remedy uncertainty.

This work is further supported by the ROD and the goal of considering new data. As stated in Section 2.7.3 of the ROD Responsiveness Summary (EPA 2017), “*EPA agrees with the importance of considering new data during decision making and that decisions should have built in flexibility to accommodate an updated understanding of site conditions. However, it is important to have a representative data set that establishes ‘baseline conditions’ prior to initiating a response action.*” And “*EPA expects remedial footprints to be refined based on data collected during remedial design.*” Also, “*Pre-design sampling will be used to ensure that the [sic?] natural recovery is factored into the design and implementation of the sediment remedy and post construction monitoring will be used to evaluate natural recovery following remedy implementation.*”

² See, e.g., Principles 4, 5, 6, and 11 of EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9285.6-08 (EPA 2002).

2. SITE BACKGROUND

This section provides a summary of site physical conditions, risks above protective levels, COCs, and site investigations completed after the data cut-off for completion of the RI/FS.

2.1 Physical Conditions

The lower reach of the Willamette River extending from RM 0 to approximately RM 26.5 is a shallow segment that is tidally influenced with river flow reversals occurring during low-flow periods as far upstream as RM 15. The portion of the river where the federal navigation channel is maintained at -40 feet Columbia River Datum (CRD) defines Portland Harbor and extends upstream from the Columbia River (RM 0) to the Broadway Bridge (RM 11.7) (EPA 2017). The Willamette River channel, from the Broadway Bridge (RM 11.6) to the mouth (RM 0), varies in width from 600 to 1,900 feet.

The high tide can influence Willamette River levels by up to 3 feet in Portland Harbor when the river is at a low stage. Tidal fluctuations during low river stage can result in short-term flow reversals (i.e., upstream flow) in late summer to early fall. Low water typically occurs during the regional dry season from August to November. The winter (November to March) river stage is relatively high, but variable, due to short-term changes in precipitation levels in the Willamette basin. Finally, a distinct and persistent period of relative high water occurs from late May through June when the Willamette River flow into the Columbia River are slowed during the spring freshet by the high-water stage in the Columbia River (EPA 2016a).

Factors controlling river flow dynamics, sediment deposition and erosion, and riverbed character appear to be the river cross-sectional area, thalweg location, and navigation channel width. The upstream boundary of the Site to Willamette Falls is narrower, more confined by bedrock outcrops, and faster flowing than the Portland Harbor Reach. The river widens as it enters the Site and becomes increasingly depositional, most notably in the western portion of the river, until RM 7. From approximately RM 5 to RM 7, the river and navigation channel narrow; this Reach is dominated by higher energy environments with little deposition. From RM 5 to approximately RM 2, the river widens again and becomes depositional, particularly in the eastern portion.

Long-term net sedimentation rates based on time-series bathymetric surveys show patterns of general shoaling in wider reaches. Wide areas of deposition occur in the channel and along channel margins in the broader sections of the river (RM 1.5 to 3

[eastern margin], RM 4 to 5, and RM 7 to 10). These areas are known to be long-term sediment accumulation areas based on historical dredging records. Shoaling is the dominant change observed, with 26% of the riverbed surveyed showing net accretion (January 2002 to January 2009) exceeding 1 foot (30 centimeters), whereas net erosion exceeding 1 foot is noted in only 5% of the riverbed overall.

Downstream of the Site, the river narrows as it turns and converges with the Columbia River. The Multnomah Channel exits at RM 3, reducing direct discharge to the Columbia River. From 1973 through 2007, average annual mean flow in the Willamette River was approximately 33,800 cfs at the Morrison Bridge (near RM 12.8) (EPA 2016a).

2.2 Summary of Site Contaminants and Risks

The baseline human health risk assessment (BHHA, Kennedy/Jenks 2013a) and the baseline ecological risk assessment (BERA, Windward 2013) concluded that contamination within the Site poses potential unacceptable risks to human health and the environment from numerous contaminants of potential concern (COPCs) in surface water, groundwater, sediment, and fish tissue. The RI/FS reduced the list of COPCs to media-specific COCs, as presented in Table 17 of the ROD.

As stated in Section 10.1 of the ROD, *“The COCs used to define the SMA boundaries encompassed most of the spatial extent of contaminants posing the majority of the risks as identified in the baseline risk assessments. However, since it is difficult to design a range of alternatives for multiple COCs that have different distributions in various media throughout the Site, the FS alternatives were developed using COCs that were the most widespread and posed the greatest risk, called “focused COCs.” “These focused COCs, were developed by evaluating colocation of all COCs, their toxicity, and significance in the risk assessments, as well as other factors outlined in the RI.”*

The focused COCs are:

- PCBs;
- DDx;
- Total PAHs; and
- Dioxins/Furans.

The remedial footprint of the focused COCs encompasses the majority of the COCs at the Site (EPA 2017). To establish 2017/2018 baseline conditions at the Site, this work will develop a representative dataset by including the full list of media-specific COCs presented in ROD Table 17 for surface sediment, surface water, and fish tissue for the initial round of sampling. The data will also be evaluated for the purpose of potentially focusing the list of COCs for future monitoring events.

The environmental media contaminated by site-related contaminants include surface sediment (0 to 30 centimeters depth below mudline [bml]), subsurface sediment (>30 centimeters bml), suspended sediment, surface water, groundwater, biota, and riverbanks. The surface sediment sample interval (0 to 30 centimeters) is the point of compliance for the RAOs and cleanup levels, as it represents the biologically active zone (BAZ) and the active mixing zone depth, which is the portion of the sediment column that has the potential to be disturbed or transported under typical conditions (EPA 2017).

Several locations within the Site have relatively high surface sediment concentrations of more than one contaminant. Overall, the patterns of contaminant distribution are as follows:

- Nearshore areas have greater sediment contaminant concentrations than sediments offshore and in the navigation channel;
- Subsurface sediments have greater organic contaminant concentrations than surface sediments;
- Some contaminants, such as DDx and PAHs, have higher concentrations and are more commonly found in the downstream portion of the Site;
- Sediment grain size and concentrations of certain metals are correlated; and
- Multiple contaminants are co-occurring; they are co-located with other COCs with respect to horizontal and vertical distribution in the river/sediments (EPA 2016a).

2.3 Summary of Data Collected Since the RI/FS

From 2008 to 2016, eight environmental studies relevant to this Work Plan have been conducted since the RI/FS data were collected. Environmental media sampled included surface sediment grabs, subsurface sediment cores, and smallmouth bass (SMB) fish tissue samples for various COCs. Several studies focused on mainly PCBs. The eight studies, are summarized in Appendix A and include the following:

- Downtown Portland Sediment Characterization Phase I and II (GSI Water Solutions, Inc. [GSI] and Hart Crowser, Inc. [Hart Crowser] 2010);
- SMB Tissue Sampling (GSI 2011);
- SMB Tissue Study (Kennedy/Jenks 2013b);
- Sediment Profile Imaging (Germano and Associates [Germano] 2014);
- Final Supplemental RI/FS Study, River Mile 11 East (GSI 2014);
- Sediment Sampling Data Report (Kleinfelder 2015);
- Concentrations and Character of PAH in Sediments in Area of RMs 5 to 6, (NewFields 2016); and
- Sediment Sampling Data Report, Swan Island Lagoon (Geosyntec 2016).

The Pre-RD Group believes that such studies support the following conclusions:

- Recent surface sediment sampling studies conducted by PRP groups indicate that newly deposited sediments are covering and/or mixing with the older surface sediments and that natural recovery is occurring in many areas of the Site (Geosyntec 2016; Germano 2014; Henderson 2015).
- The Oregon Department of Environmental Quality (ODEQ) Downtown Reach investigation found that COCs were much lower than those found in the Site and ODEQ believes the Downtown Reach is not a significant ongoing upstream source (ODEQ 2011).
- Analysis of SMB tissue sampling results conducted by LWG with EPA oversight found that the mean 2012 tissue concentrations were lower than the mean concentrations of the combined 2002 and 2007 SMB data that were used in the RI/FS and by statistical comparisons of the two datasets on a Study Area-wide scale. Total PCB congener concentrations in whole body SMB tissue show a statistically significant decrease from the 2002 and 2007 data (Kennedy/Jenks 2013b, Legacy Site Services [LSS] 2015). The 2012 SMB data support that natural recovery is occurring on a system-wide scale.

Data collected since the RI/FS that have been validated will be reviewed by EPA and compiled and uploaded, as appropriate, into the project database.

3. SCOPE OF WORK TASKS

Each task and field study included in the work is briefly summarized below and in Table 1. Project goals for each component of the work are provided in Table 4. Many of the field data will serve multiple data use objectives (DUOs), as shown in Table 5. Table 6 lists the work studies, including media, sample counts, and analyses. Figures 4a-e, 5, and 6 show the approximate sampling locations for sediment cores, tissue, and surface water, respectively. The final sample design for surface sediment will be depicted in the quality assurance project plan (QAPP) and Field Sampling Plan (FSP) for sediment sampling and follow the approach described in Appendix B.

3.1 Task 1: Quality Assurance Project Plans

Details regarding these sampling efforts will be further refined in QAPPs to be prepared following this Work Plan. These documents will include a QAPP, FSP, and Data Quality Monitoring Plan (DQMP), and will be prepared in accordance with EPA standards and previously-approved RI documents for the Site. A health and safety plan (HSP) will also be prepared. These PDI project plans will be focused and targeted plans, or addendums; they will appropriately reference the RI plans as source documents and then describe and document any changes relevant to the PDI scope of work.

- The QAPP will address all sample collection activities as well as sample analysis and data handling regarding the work. The QAPP will be developed in accordance with EPA Requirements for Quality Assurance Project Plans, QA/R-5, EPA/240/B-01/003 (March 2001, reissued May 2006); Guidance for Quality Assurance Project Plans., QA/G-5, EPA/240/R 02/009 (December 2002); and Uniform Federal Policy for Quality Assurance Project Plans, Parts 1 3, EPA/505/B-04/900A through 900C (March 2005).
- An FSP, incorporated as a subsection of the QAPP, will provide objectives and minimum sampling requirements. The FSP will include guidelines for sediment, surface water, porewater, and SMB tissue sampling.
- A Data Quality Management Plan (DQMP) will present how the data will be managed, reported, and consistently formatted for uploading to EPA data repositories.
- The HSP will describe all activities to be performed to protect on-site personnel and area residents from physical, chemical, and all other hazards posed by the

work. The HSP will be developed in accordance with EPA's Emergency Responder Health and Safety and Occupational Safety and Health Administration (OSHA) requirements under 29 Code of Federal Regulations (CFR) §§ 1910 and 1926.

The QAPP will include analytical laboratory Quality Assurance Plans and internal data validation procedures, along with standard quality assurance/quality control (QA/QC) procedures. All chemical analysis will be performed by a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory. Analytical laboratories will conduct QA/QC as detailed by their respective laboratory QC procedures and manuals. Standard method and operating procedures, calibration, internal QC, and preventative maintenance are examples of QA/QC processes to improve accuracy and precision. All laboratory QC analysis results will be reported with the final data report. Failure of any QC samples to meet QC criteria will be noted and the data that corresponds to these samples will be adequately qualified in the final report. Records of QA/QC will be maintained for review as needed. Field QA/QC procedure will include the collection of field duplicate samples which will be analyzed for the same set of physical and chemical analyses, along with equipment blank and field blank samples as appropriate. It will be the responsibility of the analytical laboratories to provide accurate results in electronic and hard copy formats, along with Level III Data Validation packages consistent with laboratory Quality Assurance Plans. Data provided by the laboratory will undergo data validation by a third party. Data validation is analyte- and sample-specific, and extends the evaluation of data beyond method, procedural, or contractual compliance to determine the analytical quality of a dataset. Data will be validated and qualified as outlined in project specific QAPPs.

A few notable details relevant to these Project Plans include:

- Surface sediment will be collected from the 0- to 30-centimeter interval, which is the point of compliance throughout the Site and incorporates the BAZ and the active mixing zone depth;
- Chemical analyses for surface sediment, surface water, and fish tissue will include the full list of COCs for each media (excluding PAHs in tissue) as presented in Table 6;
- Chemical analyses for subsurface sediment will include the focused COCs (PCBs, PAHs, D/F, and DDx) which have corresponding RALs, and the additional contaminants in ROD Table 21 that have PTW thresholds;

- A DUO for surface sediment is to establish baseline site-wide and segment-wide 95% upper confidence limit on the mean (95UCL) concentrations or SWACs for the focused COCs; in addition, rolling river mile (one-side) and Sediment Decision Unit (SDU)-scale estimates of SWACs will be calculated for focused COCs;
- The sampling program of synoptically-collected surface sediment, SMB tissue, and surface water data collected from the Site is a substantial baseline study effort (further described in Section 3);
- Sediment and SMB tissue data collected from the upstream areas will be evenly distributed between the Downtown Reach and the Upriver Reach; and sampling locations will target areas of the sediment bed likely to influence downstream contaminant concentrations (i.e., fine-grained sediment and similar total organic carbon [TOC] concentrations); the PDI objective is to evaluate concentrations of COCs coming into the Site; and to establish upstream sediment bed concentrations and SMB tissue concentrations in the upstream areas for comparison to site concentrations using an equivalency analysis;
- The home range of SMB will be evaluated over a year-long study in collaboration with the United States Army Corps of Engineers (USACE);
- The site-wide bathymetry survey is intended to refresh and update the surface bed elevations to current conditions and fill-in no coverage areas (especially nearshore) to support the 30% design; and
- Background concentrations of naturally-occurring metals in porewater will be evaluated for arsenic and manganese; sampling locations will be developed in collaboration with EPA.

3.2 Task 2: Sampling and Analysis

The DUOs, sampling design, and analytical methods for the PDI are discussed below. The PDI includes the following tasks involving several multi-media sampling and analytical testing activities:

- Site-wide bathymetry survey;
- Surface sediment sampling;
- Fish tissue sampling;

- Surface water sampling;
- Sediment coring;
- Fish tracking study;
- D/U Reach study;
- Background porewater study; and
- Reporting.

3.2.1 Bathymetry Survey

A bank-to-bank bathymetry survey throughout the Site will document current bed elevations relative to the remedial technology assignment requirements (per the ROD decision tree) and assess changes in elevation/sedimentation over the past 15 years and to evaluate mudline elevations. Multibeam sonar will be used to collect high-resolution data with up to 100% coverage of the riverbed. The site-wide multibeam bathymetry survey will be supplemented with lead-line measurements along the shoreline banks and difficult-to-access areas for better coverage than provided by multi-beam alone.

This survey will produce an up-to-date bathymetric dataset with a high level of detail and accuracy. The multibeam bathymetric data will be used to create a digital terrain model of the riverbed morphology from which hill-shade images will be generated. As in the FS and ROD, bathymetry results may also serve as a line of evidence relevant for the evaluation of riverbed slope conditions, natural recovery, and bed stability (e.g., erosional versus depositional areas).

The most recent bathymetry survey was performed in 2002. The new bathymetry data will also be used to help identify target areas for surface sediment sampling, refine the elevation clearances for dredging and capping, and adjust the estimated dredge volumes (to reduce uncertainty for allocation associated with the extent of the active remedial footprint and remedial technologies assigned to them³). The anticipated schedule for the bathymetry survey is the end of 2017 (December 2017).

³ As stated in earlier sections, including stated goal #4 in Section 1.3, this allocation process is independent of EPA oversight.

3.2.2 Surface Sediment Sampling

Many of the surface sediment data for the Site are over 10 years old. The new surface sediment data will be used to: baseline the river bed to establish current conditions and SWACs, refine the active remedial SMA footprints consistent with the ROD decision tree, evaluate changes to sediment concentrations over time including since the RI dataset, and collect a unique, random stratified dataset to enable comparison to future random stratified sediment sampling data collected under long-term monitoring to evaluate remedy effectiveness. Because Portland Harbor is part of a dynamic river system, current concentrations for all COCs are expected to be different than the dataset used in the RI. The synoptic surface sediment sampling, fish tissue, and surface water samples (discussed below) data will provide an empirical and statistically valid dataset for baselining the river and refining the CSM for remedial design purposes. Two kinds of surface sediment data will be collected – random stratified samples within a grid system (for long-term monitoring) (N=428 samples) and discrete targeted samples located in SMA areas to support further refinement of the SMA footprints (N=178 samples).

To the extent that these samples fall in close proximity to sample locations evaluated in 2004 (or other time periods), the Pre-RD Group proposes to use these samples to evaluate changes in concentrations using a paired difference method. Additional samples may be added to the sample program to assist in this comparative effort (United States Department of Defense [US DOD] 2009). The 2004 dataset (and the broader RI/FS dataset) was considered acceptable for unqualified use in the FS. These data were part of the data set used in the development of remedial alternatives in the EPA FS (see p. 1-24 of EPA 2016b) and the ROD; the ROD states “*the large data set [from the RI/FS] is considered adequate to represent current conditions and for evaluating remedial alternatives in the FS report*” (see page 2-76 to 2-77 of the ROD Responsiveness Summary).

Data will be evaluated at several spatial scales: rolling RM one-side, 21 segments (with 10 RM segments with east and west side, plus Swan Island Lagoon), 1-mile river segments (both sides), 2- to 3-mile river segments (nine segments), SDU-scale basis, and site-wide. Both the RM and site-wide spatial scales are consistent with and support the decision framework in the ROD. Rationale for the nine river segments is presented below. The Pre-RD Group may, at its election, present such data and interpretations to EPA for consideration, and EPA will consider such data and interpretations. EPA makes no advance representation as to EPA’s acceptance of such interpretations.

Nine River Segments

Previous analyses conducted by PRPs independent of EPA oversight (Wolf 2015a, Wolf 2015b, and Toll et al. 2015) found that the river is spatially and chemically unique and can be properly stratified into five river segments including the Swan Island Lagoon, each about 2 to 3 miles long. The Pre-RD Group will divide the Site into five segments spanning the length of the Site for evaluation of surface concentrations and SWACs, based on physical features, river flow dynamics, contaminant distributions, and fish home ranges (Figure 3). Four of the five segments will be further divided down the center of the navigation channel into two segments each, east and west, thereby forming eight segments. A ninth segment is between RM 8 and RM 9 at Swan Island Lagoon. The nine segments from upstream to downstream (as shown in Figure 3) are: Segment 1 E&W (RM 11.8 to 9), Segment 2 E&W (RM 9 to 7.5), Segment 3 E&W (RM 7.5 to 5), Segment 4 E&W (RM 5 to 1.9), and Segment 5 (Swan Island Lagoon).

One additional use of the new data (along with the fish tracking results and determination of SMB home ranges) will be to confirm the representativeness of these segment delineations, then estimate SWACs site-wide and at other spatial scales.

Geostatistics

Several stratified/random/equal allocation methods of statistical analysis were used to estimate the appropriate sample size within the Site needed to satisfy the DUOs described above. A summary of the geostatistical analysis, approach, and findings is summarized in Appendix B. As detailed in Appendix B, the sample count was determined by considering the number of surface sediment samples needed in each segment to maintain or improve upon the level of variability in the SWACs generated using the 2004 data, and, in most areas and assessment segments, enable the design to statistically detect differences ($\alpha = 0.05$) between 2004 SWACs and current SWAC estimates with an approximate 80% level of statistical power. Based on this analysis, an estimated 640 discrete surface sediment samples are needed to yield a statistically-robust new dataset for calculating SWACs, with 428 stratified random locations within the Site and 178 additional samples specifically located for accurate SMA delineation. This new dataset will be used for the purposes of refining the SMA footprints and technology selections described in the ROD. The 428 stratified random sample dataset will be used to help establish a baseline dataset for future long-term monitoring.

Sampling Methods

Surface grab samples will be collected with a hydraulic power grab sampler from 640 locations (Figures 4a-e). The final sample design for surface sediment sampling will be depicted in the QAPP/FSP and follow the approach detailed in Appendix B. The final sampling effort may include additional stations co-located with previously analyzed stations in the RI/FS from 2004 (depending on the randomization outcome and final placement of the samples). The 428 stratified random sample locations will not be moved to re-occupy stations sampled in 2004.⁴ The hydraulic power grab sampler will collect sediment from the upper 0 to 30 centimeters of sediment at three sampling points at each sample location (without adjusting vessel location), and homogenized into a three-point composite sample for chemical analysis of the full list of sediment COCs, TOC, and grain size. The three-point composite sample will be collected within a relatively small footprint around the anchored sampling vessel. For example, grab #1 will be deployed, accepted, and processed on the deck of the vessel. The sampling vessel's overhead winch may pivot 5 to 10 feet from the original sample location, and the process will be repeated until there is an equal volume of sediment from the three grabs. The volume will be homogenized until uniform in color and texture, then processed (described in QAPP/FSP).

For consistency purposes, surface sediment grab samples will be collected using the RI data collection protocols. The anticipated schedule for the surface sediment sampling is the first quarter of 2018.

3.2.3 Fish Tissue Sampling

The primary objectives of the fish tissue sampling study include collecting the data needed to:

- Characterize current levels of fish tissue COCs in resident fish tissue (SMB) on a site-wide basis and smaller spatial scale (pending results of the fish tracking study);

⁴ All stratified random sample locations that require modification due to obstructions will be moved to an alternate location as defined under Appendix B, Section B-1, Part 4 and reviewed and approved by EPA.

- Characterize upriver concentrations in resident fish tissue (SMB);
- Update statistically-based evaluations of PCB differences and changes in fish tissue; and
- Update and evaluate site conditions to refine Conceptual Site Model for all pathways consistent with the ROD.

The study includes collection of synoptic SMB data to baseline resident fish tissue concentrations in the river, evaluate MNR changes, and inform institutional controls. The characterization of COC concentrations in fish from the upstream area is consistent with the ROD (ROD Section 11, page 87) which states, “During design and construction, fish tissue data will be gathered which may enable background fish tissue concentrations to be developed.” The scope includes collection of 95 whole body discrete (non-composited) samples from the Site, plus 20 from the Downtown Reach and 20 from the Upriver Reach (D/U Reach). While 95 SMB samples within the Site and 40 SMB samples from the D/U Reach will be targeted, the number collected will be to the extent sufficient numbers of fish are present. The overall sample design is consistent with the approved 2012 SMB sample design.⁵ The sample design targets 20 to 30 samples in each of the four segments (described previously), including 5 samples in Swan Island Lagoon (Figure 5). A statistical analysis, as described in section 2.3, of the 2012 SMB data indicates that replicating the 2012 program sample size will allow detections of statistically significant ($p < 0.05$) concentration differences for PCBs in SMB. A summary of the statistical power analysis performed for fish tissue sample size is provided in Appendix C (Kennedy/Jenks 2013b, Legacy Site Services [LSS] 2015). Within the D/U Reach, the 40 samples will be collected from locations throughout the Reach. Consistent with the 2012 sampling, SMB that are 225 to 355 millimeters in total length (approximately 9 to 14 inches) will be targeted.

All fish tissue samples will be analyzed for lipids and the COCs presented in Table 6 (with the exception of PAHs). Samples will be analyzed as individual whole-body specimens, and fillet concentrations will be estimated using the SMB whole body to fillet

⁵ The design is also consistent with the 2011 SMB study performed by EPA, the State of Oregon, and the City of Portland (GSI 2011). The analytical laboratory contracted by EPA incorrectly prepared 75% of the samples as skin-off fillets, discarding the remainder of the carcass instead of processing the whole fish. Thus, tissue chemistry results from the 2011 sampling effort are limited.

ratios presented in the final Feasibility Study (EPA 2016b), as supported by analysis of the Round 3B SMB tissue data (see Appendix D). Collection methods will include hook and line with electroshock back-up if needed. The anticipated schedule for the fish tissue sampling is late summer 2018, consistent with previous tissue sampling events.

3.2.4 Surface Water Sampling

The objective of surface water sampling is to baseline river conditions with synoptic data (sediment, fish tissue, surface water), evaluate surface water current conditions and changes, and provide 2017/2018 data to refine the CSM for remedial design purposes. Surface water will be collected from seven transect locations over three sampling rounds. Figure 6 presents the locations of the transects, located at approximately:

- RM 1.8 at the downstream boundary (within the Site, Segment 4);
- Downstream boundary in Multnomah Channel; entrance to channel is near RM 3;
- RM 4;
- RM 7;
- RM 8.8;
- RM 11.8, just upstream of the Site, near the Downtown Reach boundary; and
- RM 16.2, further upstream, near the Downtown Reach/Upriver boundary.
- These locations will effectively characterize the four segments of the Site RM 1.9 to 5 (Segment 4); RM 5 to 7.5 (Segment 3); RM 7.5 to 9 (Segment 2); and RM 9 to 11.8 (Segment 1).

The purpose of sampling is to characterize the flow and quality of surface water passing through the river's cross section at each location. These locations were targeted to provide spatial coverage and analyze physical changes in the river dynamics.

One composited sample will be collected per transect (similar to the RI/FS data use approach). The sample will be vertically-composited and horizontally-composited along the transect. Composite samples will be collected by sampling equal volumes from three locations (east shore, navigation channel, and west shore) and at three depths per location – upper (three feet below water surface), near bottom (three feet above sediment surface) and middle (equal distance between upper and bottom). The objective of the composite sample design is equal volume across the cross-sectional area of the segment. The target volume will be collected from nine discrete subsample locations across the transect.

However, if the nearshore areas have shallow water depths (i.e., less than 10 feet), fewer subsamples may be collected. Volumes will be adjusted such that equal volume of surface water is collected from the east shore, navigation channel, and west shore.

Surface water sampling will be conducted over three events targeting different months and flow conditions to capture seasonal variability of surface water conditions. For PDI investigations, sampling will target three seasonal events: (i) August, during summer low flow conditions; (ii) January/February, during winter high flow conditions; and (iii) November/December, targeted for storm flood-influenced conditions and consistency with previous sampling events. For the PDI effort, the time of year for sampling will be the primary factor (coverage throughout the year) and the water level/river flow will be a secondary consideration factor for selecting when to sample.

During the RI, two sets of sampling events occurred: one during Round 2A and one during Round 3A (EPA 2016a). Each set of sampling events targeted a low-flow, high-flow, and stormwater-influenced condition. Low-flow events occurred throughout the year in November 2004, March 2005, July 2005, and September 2006. For all low-flow events, the average flow was less than 19,400 cfs. High flow events occurred in January 2006 and January 2007, during which average flow was greater than 59,800 cfs. One stormwater influenced event occurred in November 2006, during which average flow was 23,000 cfs.

Flood conditions will be checked relative to the United States Geological Survey (USGS) Real Time National Weather Information System (NWIS) Database for the Morrison Bridge station 14211720. Consistent with the RI, high river flow events will be characterized as >50,000 to 100,000 cfs and low flow events will be characterized as within or less than historic average flows (15,400-24,700 cfs from 1998 to 2003). Surface water average monthly discharge, velocity, height, and rainfall are shown in Figure 7 for 2010 through the most recent data available in 2016.

Surface water data will be collected using a high-volume pumping system connected to a XAD-2 resin filter and column (hydrophobic polyaromatic resin) to collect hydrophobic organic compounds for analysis by ultra-low detection limit analytical methods (consistent with RI/FS approaches and methods). Surface water will be pumped through a Teflon lined polypropylene tubing, 140-micrometer (μm) stainless-steel pre-filter, 0.5- μm glass fiber filter cartridges, and XAD-2 resin beads packed inside stainless-steel canisters. A target volume of 300 liters (L) of water will be pumped through the system from three discrete vertically composited locations per transect for a single composite sample per transect as described above. XAD sampling is expected to result in method

detection limits (MDLs) for DDx, Chlordanes, PCBs, and PAH that are at or below ARARs, and MDLs for Aldrin and D/F that are equivalent to those achieved in the RI.

Surface water samples will also be collected using a peristaltic pump for the analysis of semi-volatile organic compounds (SVOCs), metals, and non-chemical parameters (e.g. total suspended solids [TSS]). Surface water samples collected via peristaltic pump will be collected in accordance with RI procedures. In brief, surface water will be drawn through pre-cleaned acid washed Teflon tubing, following purging of at least 5 times the required sample volume. Surface water from each vertically-integrated location will be combined in a laboratory provided container. Once all locations on a single transect have been sampled, surface water will be homogenized, filtered as needed and allocated to individual laboratory sample containers for analysis. Peristaltic pump samples are expected to reach MDLs at or below ARARs for all metals with the exception to arsenic. Select organics measured via peristaltic pump are expected to achieve MDLs similar to those in the RI; however, some remain above ARARs. SVOCs will not be analyzed via XAD sampling due to analytical interferences and to remain consistent with RI methods. However, lower MDLs than those listed in Table 6 may be achievable in coordination with the selected lab.

Each sample will be analyzed for suspended solids in the water column (TSS), particle size distribution, and chemical testing for the COCs presented in Table 6. XAD analytes (PCB congeners, DDx, PAHs,⁶ and D/F) will be reported as dissolved and particulate phase results. Filtered peristaltic pump samples will be analyzed for dissolved metals and dissolved organic carbon; unfiltered samples will be analyzed for total metals, select organics (see Table 6), tributyltin, and conventionals. Field parameters will include temperature, pH, dissolved oxygen, oxidation-reduction potential (ORP), flow rate velocity, and conductivity. Field parameters will be measured real-time in-situ at each location using a YSI Multiprobe Water Quality Meter or equivalent. Water quality meters will be calibrated per manufacturer's specifications each day prior to sampling.

The anticipated schedule for the surface water sampling is winter 2017 through summer 2018. A total of 15 water samples (7 total, 7 dissolved, and 1 QA/QC) will be analyzed per event, for a total of 45 samples.

⁶ Surface water PAH samples may be collected by peristaltic pump method pending additional review of previous data.

3.2.5 Subsurface Sediment Sampling

Subsurface sediment (core) sampling will be conducted in targeted areas within or along the boundaries of SMAs that have limited data coverage to refine the active footprint boundaries of the Alt F Mod SMA footprints. The goal of this study is to refine the horizontal and vertical extent of contamination at concentrations greater than the RALs at depth for the purpose of supporting the 30% design, to refine the CSM for remedial design purposes, and to refine the dredge volumes for 30% design cost estimation.

A total of 90 core locations are planned based on visual distribution of subsurface contamination, using 250- to 300-foot distance as a general guide to the next nearest coring location. In some cases, stations will be reoccupied to determine the vertical extent of contamination where previous cores did not “tag bottom”, and in other cases, a new core will be collected in an active footprint area where none previously existed.

Core locations, rationale, target depths, and analytes are provided in Table 7a. Table 7b presents the rationale for the core placement location and target depth. Target depths were based on the vertical extent of contamination observed in surrounding cores, anticipated depth of native material, or an additional 2- to 4-foot sample depth if previous cores did not reach the bottom of contamination (“tag bottom”). Cores will be advanced using a vibracore, impact core, diver push core, or similar device from a floating platform with an experienced subcontractor and field collection team. The QAPP/FSP will provide more details.

Cores will be visually logged using American Society of Testing Materials (ASTM) and RI procedures (e.g., correcting for compaction), then subsampled into 2-foot increments unless stratigraphy indicates otherwise. Planned coring locations (Figures 4a-e) may be adjusted after the 2018 surface sediment sampling results are reviewed. Subsurface sediment samples will be analyzed for focused COCs, TOC, and grain size as outlined in Table 7a. Deeper intervals will be archived pending the chemical results (> RALs) of selected intervals, and will include to the extent feasible one-foot intervals based on stratigraphy, estimated bottom of contamination, or other field observations.

Geotechnical characterization of subsurface sediment will include index testing (e.g., moisture content, grain size, and TOC) and relevant field parameters (field torvane test as a measure of shear strength).

3.2.6 Fish Acoustic Tracking Study

An acoustic fish tracking study is planned to capture fine-scale temporal and spatial movement of SMB at the Site, pending pilot study results. A pilot study conducted in June 2017 involved deployment of an array of acoustic receivers from two vendors in two different types of environments within the river system (quiescent and active). Willamette Cove was selected as the more quiescent location, and RM 11.5 East as the more active location (Figures 8 and 9). The acoustic receivers were mounted on the bottom of the river and deployed for one week (13 through 19 June 2017). The pilot test included mobile and stationary testing of acoustic tags to evaluate the range of reception and position accuracy of both vendor's systems.

Preliminary analysis of pilot study results supports the technical feasibility of a site-wide study that is intended to provide data on SMB movement in the Lower Willamette River. A properly designed array of acoustic receivers can provide fine-scale and presence/absence data that can be used to understand SMB movement in the Study Area. The full-scale study will be conducted over a one-year period to capture seasonal home range patterns. Using a more refined acoustic telemetry approach than the historical (2000-2003) radiotracking study (Friesen 2005), the results are intended to inform the exposure areas assumed for SMB at the Site.

The results will be used in Pre-RD Group's analyses to: (i) inform the fish tissue sampling plan scheduled for late summer 2018; (ii) refine the SWAC segments used to evaluate changes in surface sediment concentrations; (iii) refine understanding of the CSM for remedial design purposes and reduce uncertainty about remedy effectiveness for fish tissue recovery; and (iv) help inform future IC plan. The anticipated schedule for the full-scale fish tracking study is early spring 2018 through winter 2019. An additional data use objective of the fish tracking study is to establish the home range of the SMB used in long-term biological monitoring to inform the degree to which that species can be associated with remedial outcomes.

The work will be performed in collaboration with Dr. Karl Gustavson, EPA Office of Superfund Remediation and Technology Innovation (formerly USACE) and experienced staff from USACE Engineer Research and Development Center (ERDC).

3.2.7 Downtown/Upriver Reach Study

The Downtown Reach is immediately south (upstream) of the Site between RM 11.8 and RM 16.6 (as defined by EPA) and located in the heart of the downtown Portland urban

center. It has historically had a higher level of contamination than the Upriver Reach and is in immediate proximity to the Site (EPA 2017); remedial actions have been completed in this area during the last decade. The Upriver Reach (RM 16.6 to 28.4) was selected as the reference area for evaluating background sediment concentrations in the RI. This area extends from the upstream end of Ross Island Lagoon to approximately 2.5 miles above the Willamette Falls, which was considered generally representative of upstream sediment loading to Portland Harbor. Early (2006) memoranda describe the background Reach from RM 15.5 (upper end of Ross Island) to RM 26 (Willamette Falls), although this was revised to RM 15.3 to RM 28.4 in the Draft RI (in 2009). The upstream extension was to capture the EPA West Linn and Blue Heron Sediment Investigation data from 2007, located upstream of Willamette Falls. The lower boundary changed from RM 15.5 to RM 15.3 due to additional samples collected downstream of RM 15.5.

This component of the work focuses on the Downtown Reach (RM 11.8 to RM 16.6) and Upriver Reach (RM 16.6 to RM 28.4) (D/U Reach) to characterize incoming contaminant loading to the Site. Figure 10a presents the distribution of fine-grained sediment based on historic samples. Sampling of this area includes surface water, surface sediment, sediment traps, and fish tissue sampling in the D/U Reach (Figures 10b and 10c), and samples will be collected assuming sufficient fine-grained sediment and fish availability. Half of the targeted surface sediment samples will be collected from the Downtown Reach and the other half will be collected within the Upriver Reach. Data collected during the work will be used to: (i) refine the concentration of COCs immediately upstream of the Site; (ii) refine the concentrations of COCs entering the Site in surface water and suspended sediments to assess potential recontamination post-remedy; and (iii) refine understanding of upstream conditions and contaminant loading into the Site; and (iv) further inform remedial action objectives, if appropriate.

Surface Sediment

An additional 60 surface sediment samples will be collected from the D/U Reach, with locations targeting fine grain sediments to characterize the mobile sediments likely to be deposited throughout the Site. While a total of 60 surface sediment samples from the D/U Reach will be targeted, the number collected will be to the extent reasonably or technically practicable, based on sufficient fine-grained sediment presence. A desktop study and reconnaissance survey will be conducted in the D/U Reach to identify areas with fine grain sediments prior to sampling. The desktop study will research previous sediment study available grain size data and bathymetry data to select target areas. A reconnaissance survey will be performed to further identify target areas and ground truth

results from the desktop study. Figures 10a-c show 30 random locations in the Downtown Reach and 30 locations in the Upriver Reach (locations to be confirmed pending grain size evaluation). Surface sediment samples will be collected as described in Section 3.2.2 and analyzed for the full list of COCs. All validated and acceptable data will be considered in data evaluation to fully characterize potential upstream sources. Grain size and organic carbon content will be considered when comparing samples from the upstream area to site concentrations.

Fish Tissue

An additional 40 SMB samples will be collected from the D/U Reach. Fish tissue samples will be collected as described in Section 3.2.3 and will include whole-body analysis of the COCs presented in Table 6 (with the exception of PAHs). Fish tissue sample locations are presented in Figures 10b and 10c (locations to be confirmed pending on-site reconnaissance).

Surface Water

As noted in Section 3.2.4, two upstream transects for surface water sampling will be included – one in the Downtown Reach at RM 11.8 and one in the Upriver Reach at RM 16.2. Surface water samples will be collected as described in Section 3.2.4 and analyzed for the surface water COCs presented in Table 6. Analysis of total and dissolved analytes via XAD and filtered/unfiltered peristaltic pump samples will match site surface water sampling as described Section 3.2.4.

Sediment Traps

Sediment traps will be deployed to provide a line of evidence on incoming sediment load to the Site that targets fine-grained, more mobile suspended sediment, and higher-TOC material that is more likely to move downstream and be deposited at the Site. Consistent with methods in the RI, sediment traps will consist of four glass tubes approximately 10 centimeters in diameter and 55 centimeters long.⁷ Tubes will be placed inside protective polyvinyl chloride (PVC) sleeves, which will be attached together and secured to a rebar post driven into the sediment floor by divers. The diver will affix the sediment trap assembly to the rebar so that the open tops of the cylinders are 3 feet above the mudline

⁷ Note: the top of the trap is oriented parallel to mudline and perpendicular to the direction of the flow.

elevation. Two sediment traps will be deployed along each transect (total of four traps). Settling particulate material will be collected in the glass tubes of the sediment trap. For recovery, a diver will cover the tops of each glass tube with foil, detach the trap assembly from the rebar, and the trap will be raised to the surface with the vessel's winch. The glass tubes will be removed from the assembly, kept upright, and allowed to resettle, if needed. The thickness of accumulated sediment will be measured at multiple points around each tube to account for sloping of sediment within the tube. Overlaying water will then be siphoned or pumped off, sediments collected in a stainless-steel mixing container, homogenized until uniform color and consistency is achieved, and placed in the appropriate laboratory provided sample jars. Sediments will be analyzed for the full list of sediment COCs, TOC, and grain size (Table 6). Sediment traps will be sampled in coordination with the surface water sampling program (three events over one year, coordinated with the surface water sampling program).

3.2.8 Background Porewater Sampling

Background metals concentrations in porewater were not defined during the RI, and the focus of a background porewater characterization would be naturally-occurring metals. Data collected during the work will be used to assist in the development of background metals porewater concentrations and to further inform remedial action objectives, if appropriate. Metals, especially arsenic and manganese, are present in relatively high concentrations in volcanic rocks, which are the primary source of Willamette River sediment. Porewater concentrations above ROD cleanup levels may occur in the transitional zone water (TZW) near the mudline, as a result of the geochemistry which favors dissolution of these metals from the mineral components of the sediment.

This component of the work is intended to place dialysis equilibrium passive porewater samplers (referred to as peepers) in the sediment bed in areas that are representative of background metals in porewater (during periods of low redox, target July/August). Peepers include a glass or polyethylene vial covered with a 0.45- μ m polyethersulfone (PES) membrane (see photograph in Figure 11). The interior of a peeper vial consists of rows of chambers that are filled with distilled deionized water prior to deployment. During deployment, the deionized water approaches diffusive equilibrium with the porewater, over a 2- to 4-week period; the peepers are then retrieved. A chemical tracer will be placed in each probe to evaluate achievement of equilibrium.

Porewater peepers will be deployed in triplicate (for three-point composite samples) at eight locations in upstream areas, or other relevant areas from within the Site. Ideally, these stations would be co-located with surface sediment stations. Locations for

porewater sampling will be selected to be representative of redox conditions and variation in source. In general, these areas will include thicker sediment zones, areas downgradient of wetlands or buried lakes, and will consider Columbia and Willamette River provenance. Sample locations will be pre-screened to ensure sediment concentrations are similar to background and redox potential is low. Two potential locations have been identified – adjacent to Port of Portland Terminal 5 at approximately RM 1.8 and adjacent to Miller Creek at the mouth of the Multnomah Channel.

Porewater peeper samples will be deployed from a vessel using a push pole deployment device, and will be deployed with a marker and weighted retrieval line. Porewater samples will be retrieved following two to four weeks of deployment, and porewater will be analyzed for freely-dissolved arsenic and manganese. Porewater results from passive samplers could be compared to laboratory-derived porewater samples from the upstream bulk sediment surface grab locations. A total of 8 samples (3 subsamples will be composited into 1 sample per location) will be collected from a one-time event during low flow conditions (8 stations, 2 duplicates).

3.3 Task 3: Data Evaluation

Data collected as part of the work will be summarized and analyzed to meet several DUOs (see Table 5). Table 8 outlines the data evaluation and interpretation plan.

EPA and the Pre-RD Group recognize that the data gathered in the Pre-Design Investigation (PDI) is not the complete dataset for final remedy design/implementation and that EPA’s review of the data reports or data analysis may include an assessment as to whether the data relied on is sufficient to support final evaluations, refinements, recalculations and updates. EPA reserves the right to review all submittals prepared under the Work Plan, including any data evaluation prepared by the Pre-RD Group in addition to those addressing the data use objectives 1 through 6 as specified in Section 1.3. Prior to any active remediation, the sediment bed will be resampled to update the active remedial footprint, and incorporate any natural recovery that has occurred. The updated active remedial footprint may be supplemented with contemporary surface and subsurface sediment data to apply the decision tree.

Following completion of field work and chemical analyses, data analyses will be completed and a PDI Evaluation Report will be submitted to EPA. The PDI Evaluation Report will include the following elements that support ROD objectives including collecting additional data to “inform the implementation of the Selected Remedy decision

tree” (ROD at p. 106) and “to assist in refining the remedy beyond the feasibility study level of analysis.” (ROD Responsiveness Summary at p. 2-77):

- Summary of the investigations performed;
- Summary of investigation results and identification of existing conditions;
- Summary of data received or generated in the performance of the work (i.e., tables and graphics);
- Data validation reports (Tier II) and laboratory data reports;
- Photographs documenting the work;
- Evaluation of current sediment/fish tissue/surface water conditions along with background loading to refine the CSM for remedial design purposes and to assist in refining the remedy as per the ROD; and may include SWAC comparisons based on current conditions, consistent with EPA guidance (EPA 2008) to further refine the active remedial footprints⁸;
- Use of bathymetry data to refine the elevation requirements of the active remedy footprint, especially in the intermediate and shallow areas;
- Refinement of MNR potential based on empirical data changes;
- Re-calculation of surface sediment SWACs for focused COCs using new data at several spatial scales as identified in Section 3.2.2;
- Evaluation of fish tracking results to inform the use of SMB for long-term biological monitoring of remedial outcomes;
- Update the surface sediment, fish tissue, and surface water data based on the validated 2017/2018 information obtained during this investigation;
- Assessment of new bathymetry for bed stability and recovery potential;
- Assessment of new fish/sediment data for monitored natural recovery potential based on concentrations changes from 2004 (sediment) and 2002, 2007, 2011, and 2012 (fish tissue);

⁸ EPA (2008) guidance regarding remedy effectiveness monitoring states “It is important to try and understand the relationship between contaminant levels in the surface sediment and the resulting levels in the fish.”

- Evaluation of current upstream conditions and contaminant loading into the Site
- Evaluate the active remedial footprint by running the new data through the ROD decision tree to inform the application of remedial technologies (note: footprints may be further refined during remedial design with additional data);
- Evaluation of the new ROD COC data (tabular summary statistics) for purpose of potentially focusing the list of COCs for future monitoring rounds;
- Evaluate new data to inform fish advisories and reduce uncertainty about remedy effectiveness for fish tissue recovery and to further inform fish advisory updates consistent with EPA guidance (2008) and the ROD (see ROD p. 68 and p.99 and p. 108 which states that “the advisory is expected to be periodically updated until RAOs and cleanup levels are reached”); and
- Provide data that may be used in the PCI allocation conducted by PRPs independent of EPA oversight.

Technology assignments will be identified based on sampling data in all areas of the river, as indicated by the decision tree described in the ROD (2017 ROD Figure 28, Appendix I). It is recognized that these assignments may refine initial assignments specified in the ROD, but may not necessarily be final assignments pending the potential additional data collection and review with EPA in a manner consistent with agency guidance (EPA, 2002). The ROD decision tree provides detail regarding how design data will influence design and construction and future maintenance dredging. The decision tree allows caps to be used in dredge areas if RALs are not achieved or if PTW remains. This is based on area-specific analysis (EPA 2017). The ROD decision tree describes four compliance regions (ROD Figure 28):

- Navigation Channel and Future Maintenance Dredge area;
- Intermediate Region (outside the navigation channel to -2 feet CRD);
- Shallow Region (-2 feet CRD to shore); and
- Riverbank Region (top of bank down to the river).

The riverbank areas are currently being evaluated under ODEQ-led investigations.

One important component of baselining the Site and delineating SMAs using updated contaminant data is to evaluate the extent of natural recovery processes as measured by changes in concentrations since the RI. As stated in the ROD (ROD Responsiveness

Summary at pp. 2-76 to 2-77), “EPA concurs that natural recovery is occurring within Portland Harbor and that it should be utilized in the sediment remedies, as evidenced by the fact that MNR represents the response action assigned to between 64 and 90 percent of the total area of the Site for all alternatives carried through the detailed analysis in the June 2016 feasibility study report. However, the rate of natural recovery is expected to vary by location. . . . Pre-design sampling will be used to ensure that the natural recovery is factored into the design and implementation of the sediment remedy and post construction monitoring will be used to evaluate natural recovery following remedy implementation.” Prior to any active remediation, the sediment bed will be resampled to update the active remedial footprint, and incorporate any natural recovery that has occurred. The updated active remedial footprint may be supplemented with contemporary surface and subsurface sediment data to apply the decision tree.

The work sampling program is intended to be statistically robust to support calculation of site-wide SWACs and assess spatial patterns without reliance on older data. Figure 12 presents a summary of the PDI field sampling tasks.

3.4 Task 4: Data Compilation

The purpose of this task is to identify, review, compile, and summarize site and upstream data collected since the RI/FS that are relevant to the work. This task includes compilation of data collected after 2008, including data collected as part of this Work Plan. A summary of investigations from 2008 to 2017 are included as Appendix A.

The data collected since the RI/FS that have been validated will be reviewed by EPA and will be compiled and uploaded as appropriate into the project database and may include the following:

- Site data – sediment, porewater, fish (SMB) tissue, and bank soil data collected from 2008 to 2015;
- Downtown/Upriver data – sediment and tissue data collected from 2008 to 2015; and
- PDI data – sediment, fish tissue, surface water, and porewater data collected as part of this study.

EPA and the Pre-RD Group recognize that the data gathered in the PDI is not the complete dataset for final remedy design/implementation and that EPA’s review of the data reports or data analysis may include an assessment as to whether the data relied on is sufficient

to support final evaluations, refinements, recalculations and updates. EPA reserves the right to review all submittals prepared under the Work Plan.

Available data will be acquired from LWG, ODEQ's Environmental Information Management (EIM) database, and participating parties. Site data (i.e., sediment, tissue, surface water, and porewater data) will undergo a data quality review to determine if they meet data quality objectives (DQOs) consistent with those developed for the RI/FS using Superfund guidance. If so, the data will be summarized, compiled in the project database, and determined acceptable for appropriate uses consistent with the DQOs. If data do not meet DQOs, they will be summarized, compiled in the Site database (or separate database for transparency), and flagged for conditional use. For example, data from the EIM database did not meet DQOs because QC backup was not available. Data (including surface and subsurface sediment and porewater data) collected at locations that were subsequently dredged or remediated will also be excluded from the compilation as these no longer represent current conditions.

3.5 Task 5: Reporting

Reporting and deliverables are discussed in Section 5.

4. WORK MANAGEMENT STRATEGY

The following information generally describes the duties, responsibilities of personnel and firms involved in the work; project organization; reporting relationships; lines of communication; and management authorities.

4.1 Roles and Responsibilities

4.1.1 EPA

EPA is the lead agency overseeing the work. EPA has the authority to review, approve, and disapprove the supporting FSP and QAPP documents and reporting deliverables pursuant to Section 5.6 of the SOW. EPA will be assisted in the review of technical documents by an oversight contractor. In addition, Karl Gustavson, from the EPA Office of Superfund Remediation and Technology Innovation, and Contaminated Sediments Technical Advisory Group, will continue to provide regulatory and technical support throughout the project. A peer review process will be followed per the ASAOC.

4.1.2 Participating Parties

Those participating in the PDI studies being performed by Pre-RD Group and its contractors will be determined at a later date. Once the participating parties are determined, they collectively will be responsible for implementing the studies.

4.1.3 Selected Contractor

AECOM and Geosyntec (TBC) are coordinating activities including management of all subcontractors, field sampling, analysis, and reporting scoping tasks in preparation of this Work Plan. The contractor to lead the field sampling will be determined at a later date.

The Project Manager will be responsible for overall project coordination and providing oversight on planning and coordination, work plans, all project deliverables, and performance of the administrative tasks needed to ensure timely and successful completion of the project. AECOM and Geosyntec (TBC) will also be responsible for coordinating with Pre-RD Group and EPA on schedule, deliverables, and other administrative details.

The Field Coordinator (FC) will be responsible for managing field activities and general field QA/QC oversight. The selected FC will ensure that appropriate protocols for sample

collection, preservation, and holding times are observed and oversee delivery of environmental samples to the designated laboratory for chemical analyses. Deviations from this QAPP/FSP will be reported to the Project Manager for consultation. Significant deviations from the QAPP/FSP will be further reported to representatives of the Pre-RD Group and EPA.

The lead subcontractor will oversee data management to ensure that analytical data are incorporated into the PDI database with appropriate qualifiers following acceptance of the data validation. QA/QC of the database entries will ensure accuracy for use in the PDI study. The testing laboratories (TBD) and field contractors (TBD) all play supporting roles.

4.2 Communication Strategy

This information will be developed in the project QAPP.

5. SCHEDULE AND DELIVERABLES

5.1 Schedule

The goal is to complete the work by June 2019. Figure 13 presents an example project schedule through 2019 (to be updated). The field schedule for the work includes time for development of QAPP and other project plans in 2017 and completion of field investigation activities by the end of 2018. The Pre-RD Remedial Footprint Report is scheduled to be submitted in January 2019. The PDI scope of work is planned for completion by June 2019 and the draft PDI Evaluation Report is targeted for delivery to EPA by June 2019. An updated project schedule will be provided to EPA when revisions are made, and EPA will be given a minimum of two weeks' notice prior to the start of each field activity.

5.2 Deliverables

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 of laboratory results will be performed by the lead contractor. 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. Deliverables include:

- FSP, QAPP, and DQMP describing how the work will be conducted;
- HSP describing worker safety for hazards posed by the work;
- Monthly Progress Reports;
- Pre-RD Remedial Footprint; and
- PDI Evaluation Report.

Contents of the PDI Evaluation Report will include data summary tables, data graphics such as box-and-whisker plots, maps depicting the spatial distribution of sediment chemistry for selected analytical parameters, a comparison of site conditions to the active Alt F Mod remedial footprint, analysis of differences and changes, and revised SMA boundary maps.

This document comprises the total work scope agreed upon by the Pre-RD Group and EPA.

6. REFERENCES

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TABLES

Table 1. Overview of Pre-Remedial Design Investigation Studies

Portland Harbor Pre-Remedial Design Investigation Work Plan

Portland, OR

PDI Study Element	General Approach and Rationale
Bathymetric Survey	Current bed elevations to support the CSM, evaluating changes in sediment bed elevation, and run through ROD decision tree.
Surface Sediment Sampling for Baseline and SMA Delineation	For Baseline and SMA delineation in the Site Total sample count of 606 within Site: 428 stratified random; Full ROD Table 17 Sediment COC list 178 SMA samples; Focused COCs only ⁽¹⁾ 3-point composite (over small area) Additional sample locations may be considered for reoccupation
SMB Fish Tissue Sampling for Baseline	Smallmouth bass fish tissue sampling at 95 stations in the Site Individual whole body samples, derive fillet values through relationship Full ROD Table 17 Tissue COCs
Surface Water Sampling for Baseline	Seven transects, 3 seasonal events, 3 subsamples per transect Vertical and horizontal compositing along transect Sample with high volume XAD samplers for low MDLs and peristaltic pump for select analytes Full ROD Table 17 Surface Water COCs, total and dissolved
Subsurface Sediment Coring to Refine Remedial Footprint Boundaries	90 sediment cores typically 10 to 15-ft deep and 6-ft in nearshore areas 2-ft sample increments Archive deeper intervals in 1 ft increments, as practical Focused COCs only ⁽¹⁾ , plus TOC and grain size
Fish Acoustic Tracking Study	Year long study of acoustic tracking of SMB fish movements
Downtown/Upriver Reach: Sediment, Surface Water, Tissue, and Trap Sampling to assess incoming loads	60 sediment samples collected between RM 11.8 to RM 28.4 targeting fine-grained sediment (30 samples Downtown Reach, 30 samples Upriver Reach) 40 SMB samples (20 in Downtown Reach; 20 in Upriver Reach) Surface water transects at RM 11.8 and RM 16.2 3 seasonal sampling events for surface water Two sediment traps per transect at RM 11.81 and 16.5 (match SW program) Full ROD Table 17 COCs for each media; all data will be considered; assumes sufficient sediment and fish present
Background Porewater Sampling	8 locations with 3 composites per location (2 duplicates) Target placement in representative background areas, locations TBD Naturally-occurring COC metals - arsenic and manganese

Notes:

(1): Focused COCs include PCBs, DDx, PAHs, and Dioxins/Furans

Abbreviations:

COCs - contaminants of concern; CSM - Conceptual Site Model; DDx - sum of dichlorodiphenyltrichloroethane and its derivatives; MDL - method detection limits; PAHs - polycyclic aromatic hydrocarbons; PCB - polychlorinated biphenyls; ROD - record of decision; SW - surface water; SMA - Sediment Management Area; SMB - smallmouth bass; TOC - Total Organic Carbon

Table 21. Sediment RALs and PTW Thresholds for Selected Remedy

Contaminants	Site Wide RALs ⁽¹⁾	PTW Thresholds ⁽²⁾	Navigation Channel RALs
Focused COCs			
PCBs	75	200	1,000
Total PAHs ⁽⁴⁾	13,000	NA	170,000
2,3,7,8-TCDD	0.0006	0.01	0.002
1,2,3,7,8-PeCDD	0.0008	0.01	0.003
2,3,4,7,8-PeCDF	0.2	0.2	1
DDx	160	7,050	650
Additional Contaminants			
2,3,7,8-TCDF	NA	0.6	NA
1,2,3,4,6,7,8-HxCDF	NA	0.04	NA
cPAHs (BaP Eq)	NA	106,000	NA
Chlorobenzene	NA	>320	NA
Naphthalene	NA	>140,000	NA

Notes:

1 – Site wide includes all areas of the Site except the navigation channel. FMD areas are subject to these RALs.

2 – PTW thresholds are based on highly toxic PTW values (10^{-3} risk) except chlorobenzene and naphthalene, which are threshold values for not reliably contained PTW.

Abbreviations:

BaP Eq – benzo(a)pyrene equivalent

cPAH –carcinogenic polycyclic aromatic hydrocarbon

COC – Contaminant of concern

DDx – dichlorodiphenyldichloroethane + dichlorodiphenyldichloroethene +
 dichlorodiphenyltrichloroethane

FMD – future maintenance dredge

HxCDF - hexachlorodibenzofuran

NA – not applicable

PAH – polycyclic aromatic hydrocarbon

PCB – polychlorinated biphenyl

PeCDD – pentachlorodibenzo-p-dioxin

PeCDF – pentachlorodibenzofuran

PTW – principal threat waste

RAL – remedial action level

TCDD – tetrachlorodibenzo-p-dioxin

TCDF – tetrachlorodibenzofuran

µg/kg – microgram per kilogram

> – greater than

Table 3. Summary of Cleanup Levels or Targets by Media
Portland Harbor Pre-Remedial Design Investigation Work Plan
Portland, OR

Table 17. Summary of Cleanup Levels or Targets by Media

Contaminant	Surface Water (1)			Groundwater (2)			River Bank Soil/Sediment (3)			Fish Tissue (4)		
	Unit	Conc.	Basis	Unit	Conc.	Basis	Unit	Conc.	Basis	Unit	Conc.	Basis
Aldrin	µg/L	0.00000077	A				µg/kg	2	R	µg/kg	0.06	R
Arsenic	µg/L	0.018	A	µg/L	0.018	A	mg/kg	3	B	mg/kg	0.001	R
Benzene				µg/L	0.44	A						
BEHP	µg/L	0.2	A				µg/kg	135	R	µg/kg	72	R
Cadmium				µg/L	0.091	A/R(5)	mg/kg	0.51	R			
Chlordanes	µg/L	0.000081	A				µg/kg	1.4	R	µg/kg	3	R
Chlorobenzene				µg/L	64	R						
Chromium	µg/L	100	A	µg/L	11	A						
Copper	µg/L	2.74	A	µg/L	2.74	A/R	mg/kg	359	R			
Cyanide				µg/L	4	A						
DDx	µg/L	0.01	R	µg/L	0.001	A	µg/kg	6.1	R	µg/kg	3	R
DDD	µg/L	0.000031	A	µg/L	0.000031	A	µg/kg	114	R			
DDE	µg/L	0.000018	A	µg/L	0.000018	A	µg/kg	226	R			
DDT	µg/L	0.000022	A	µg/L	0.000022	A	µg/kg	246	R			
1,1-Dichloroethene				µg/L	7	A						
cis-1,2-Dichloroethene				µg/L	9.9	A						
Dieldrin							µg/kg	0.07	R	µg/kg	0.06	R
2,4-Dichlorophenoxyacetic acid				µg/L	70	A						
Ethylbenzene	µg/L	7.3	R	µg/L	7.3	R						
Hexachlorobenzene	µg/L	0.000029	A				µg/kg			µg/kg	0.6	R
Lindane							µg/kg	5	R			
Lead				µg/L	0.54	A/R	mg/kg	196	R			
Manganese				µg/L	430	R						
MCPP	µg/L	16	R									
Mercury							mg/kg	0.085	R	mg/kg	0.031	A
Pentachlorophenol	µg/L	0.03	A	µg/L	0.03	A				µg/kg	2.5	R
Perchlorate				µg/L	15	A						
PBDEs										µg/kg	26	R
PCBs	µg/L	0.0000064	A	µg/L	0.014	A/R	µg/kg	9	B	µg/kg	0.25 (6)	R
PAHs							µg/kg	23000				
cPAHs (BaP eq)	µg/L	0.00012	A	µg/L	0.00012	A	µg/kg	12 (7)	B	µg/kg	7.1	R
Acenaphthene				µg/L	23	R						
Acenaphthylene												
Anthracene				µg/L	0.73	R						
Benzo(a)anthracene	µg/L	0.0012	A	µg/L	0.0012	A						
Benzo(a)pyrene	µg/L	0.00012	A	µg/L	0.00012	A						
Benzo(b)fluoranthene	µg/L	0.0012	A	µg/L	0.0012	A						
Benzo(g,h,i)perylene												
Benzo(k)fluoranthene	µg/L	0.0013	A	µg/L	0.0013	A						
Chrysene	µg/L	0.0013	A	µg/L	0.0013	A						
Dibenz(a,h)anthracene	µg/L	0.00012	A	µg/L	0.00012	A						
Fluoranthene												
Fluorene												
Indeno(1,2,3-c,d)pyrene	µg/L	0.0012	A	µg/L	0.0012	A						
2-Methylnaphthalene												
Naphthalene	µg/L	12	R									
Phenanthrene												
Pyrene												
Dioxins/Furans (2,3,7,8-TCDD eq)	µg/L	0.0000000005	A									
1,2,3,4,7,8-HxCDF							µg/kg	0.0004	B	µg/kg	0.00008	R
1,2,3,7,8-PeCDD							µg/kg	0.0002	B	µg/kg	0.000008	R
2,3,4,7,8-PeCDF							µg/kg	0.0003	B	µg/kg	0.00003	R
2,3,7,8-TCDF							µg/kg	0.00040658	R	µg/kg	0.00008	R
2,3,7,8-TCDD							µg/kg	0.0002	B	µg/kg	0.000008	R
Tetrachloroethene				µg/L	0.24	A						
Toluene				µg/L	9.8	R						
TPH-Diesel							mg/kg	91	R			
TPH-Diesel (C10-C12 Aliphatic)				µg/L	2.6	R						
Tributyltin	µg/L	0.063	A				µg/kg	3080	R			
Trichloroethene				µg/L	0.6	A						
2,4,5-Trichlorophenol				µg/L	50	A						
Vanadium				µg/L	20	R						
Vinyl Chloride				µg/L	0.022	A						
Xylenes				µg/L	13	R						
Zinc	µg/L	36.5	R	µg/L	36.5	R	mg/kg	459	R			

Notes:
(1) Surface Water Cleanup Levels - RAOs 3 and 7
(2) Groundwater Cleanup Levels - RAOs 4 and 8
(3) Sediment Cleanup Levels - RAOs 1 and 5
(4) Fish Tissue Targets - RAOs 2 and 6
(5) A/R indicates that the ARARs-based number and the risk-based number are the same.
(6) The tissue target is a risk-based number and does not represent background levels. Additional data will be collected to determine background fish tissue concentrations for PCBs during design and construction of the Selected Remedy.
(7) The cleanup level for cPAHs of 12 µg/kg is based on direct contact with sediment and is applicable to nearshore sediment. The cleanup level applicable to sediments in the navigation channel is 3,950 µg/kg and is based on human consumption of clams.

Abbreviations:
A- ARAR-based number
ARAR - applicable or relevant and appropriate requirement
B - Background-based number
BEHP - bis(2-ethylhexyl)phthalate
BaP eq - benzo(a)pyrene equivalent
C - carbon
Conc - concentration
cPAH - carcinogenic polycyclic aromatic hydrocarbon
DDD - dichlorodiphenyldichloroethane
ԴԴԸ - ճին ճին ճին ճին ճին ճին ճին ճին
DDT - dichlorodiphenyltrichloroethane
DDx - DDD + DDE + DDT
HxCDF - 1,2,3,7,8,9-hexachlorodibenzofuran
MCPP - 2-(4-chloro-2-methylphenoxy)propanoic acid
mg/kg - milligram per kilogram
PAH - polycyclic aromatic hydrocarbon
PBDE - polybrominated diphenyl ether
PCB - polychlorinated biphenyl
PeCDD - pentachlorodibenzo-p-dioxin
PeCDF - pentachlorodibenzofuran
R - risk-based number
RAO - remedial action objective
TCDD - 2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF - tetrachlorodibenzofurans
TPH - total petroleum hydrocarbons
µg/kg - microgram per kilogram
µg/L - microgram per liter

Table 4. Project Goals for Pre-Remedial Design Investigation Scope of Work

Portland Harbor Pre-Remedial Design Investigation Work Plan

Portland, OR

#	Project Goals	Spatial Scale	Media	Questions to Answer
1	Obtain SMA baseline characterization data adequate to refine the remedial footprint for allocation purposes	SMA specific	Discrete sediment grabs (0 to 30 cm), bathymetry, sediment cores	<ul style="list-style-type: none"> Have the active remedial footprints changed since the FS? Can we refine the footprints and reduce uncertainty? Have the elevations changed since the FS, hence the footprint changes through the ROD technology decision tree? What are the extent of footprints above RALs?
2	Establish current baseline conditions (SWACs, CSM) to evaluate future remedy performance and progress towards RAOs	Site-wide, segments, rolling RM	Surface sediment, fish tissue (SMB), surface water	<ul style="list-style-type: none"> What are concentrations of COCs prior to remedial activities? Do results support refinement of the remedial footprint? What are current baseline risks?
3	Evaluate recovery changes within the Site	Site-wide, segments	Surface sediment, fish tissue (SMB), surface water	<ul style="list-style-type: none"> Are Site conditions improving since the RI/FS datasets? Do improvements support the narrative of MNR?
4	Update Downtown Reach and Upriver Reach datasets	RM 11.8 to 28.4	Surface sediment, fish tissue (SMB), surface water; porewater	<ul style="list-style-type: none"> What are upstream concentrations of select COCs in sediment and fish tissue, and have they changed since the RI/FS datasets? What are background concentrations of naturally-occurring metals COCs in porewater? How could new data inform future evaluation of remedy performance and what is achievable?

Notes:

(1) Data collected for each project goal may serve multiple data use objectives (DUOs).

Abbreviations:

COCs - chemicals of concern; FS - feasibility study; RM - river mile; ROD - Record of Decision; SWAC - surface weighted average concentrations; SMB - small mouth bass

Table 5. Data Use Objectives for Pre-Remedial Design Investigation Studies

Portland Harbor Pre-Remedial Design Investigation Work Plan

Portland, OR

Proposed Scope Item			Data Use Objective (DUO)										
#	Task		Purpose	Refine CSM	Update SWAC (various spatial scales)	Update Baseline Conditions	Recovery Changes Since RI/FS	Active Footprint/ RAL exceedences	Remedial Technology	Recontamination Potential	Support Allocation	Institutional Controls	Future Compliance
Pre-Design Field Investigation Studies													
	Site-wide bathymetry survey	footprint	X			X	X	X		X			
	Surface sediment sampling	recovery/CSM	X	X	X	X	X	X		X			X
	Fish tissue sampling	recovery/CSM	X		X	X						X	X
	Surface water sampling	recovery/CSM	X		X	X							
	Sediment cores	footprint	X			X	X	X		X			X
	Fish acoustic tracking study	fish home range	X										X
	Porewater sampling	bkgd	X				X	X		X			X
Technical Analyses / Reporting													
	Evaluate current conditions	footprint	X	X	X	X	X	X		X			X
	Evaluate recovery changes	recovery	X		X								
	Evaluate upstream levels	recovery	X			X			X				
	Refine active footprint	footprint	X	X			X	X		X			X
	Evaluate fish home ranges and scale of SWAC estimate	fish home range	X	X									X
	Refine CSM based on current conditions	recovery/footprint	X	X		X	X			X	X	X	X
	Data Interpretation Report	all	X	X	X	X	X	X	X	X	X	X	X

Abbreviations:

IC - institutional controls; bkgrd - background; CSM - conceptual site model; SWAC - surface weighted average concentration; RM - river mile; RAL - remedial action level

Table 6. Summary of Pre-Remedial Design Investigation Media, Sample Counts, and Analyses for Sediment, Tissue, and Surface Water
Portland Harbor Pre-Remedial Design Investigation Work Plan
Portland, OR

Media	Location Count	Proposed Sample IDs	Analyte List			
			Parameter	Method	MDL ^(1,2,3,4,5)	Units
Surface Sediment - Unbiased	428 - within Site; 60 - D/U Reach	PDI-SS-BL-01 to PDI-SS-BL-428	Aldrin	8081B	0.175	µg/kg
			Arsenic	6020B	0.0102	mg/kg
			BEHP	8270C	136	µg/kg
			Cadmium	6020B	0.0053	mg/kg
			Chlordanes	8081B	0.0097	µg/kg
			Copper	6020B	0.0608	mg/kg
			DDx	8081B	0.529	µg/kg
			DDD	8081B	0.17	µg/kg
			DDE	8081B	0.529	µg/kg
			DDT	8081B	0.171	µg/kg
			Dieldrin	8081B	0.158	µg/kg
			Lindane	8081B	0.344	µg/kg
			Lead	6020B	0.024	mg/kg
			Mercury	7471A	0.0037	mg/kg
			PCB congeners ⁽⁷⁾	1668	10	ng/kg
			PAHs	8270D SIM	3.3	µg/kg
			cPAHs (BaP eq)	8270D SIM	3.3	µg/kg
			1,2,3,4,7,8-HxCDF	1613B	5	pg/g
			1,2,3,7,8-PeCDD	1613B	5	pg/g
			2,3,4,7,8-PeCDF	1613B	5	pg/g
			2,3,7,8-TCDF	1613B	1	pg/g
			2,3,7,8-TCDD	1613B	1	pg/g
			PCDD/Fs	1613B	5	pg/g
			TPH-Diesel	8015B-DRO	9.9	mg/kg
			Tributyltin	OrganoTin	1.53	µg/kg
			Zinc	6020B	0.144	mg/kg
			TOC	Plumb 1981/ EPA 9060	0.00715	%
			Grain Size	PSEP	0.1	%
Additional Surface Sediment - SMA	178 - within Site	PDI-SS-SMA-01 to PDI-SS-SMA-212	DDx	8081B	0.529	µg/kg
			PCB congeners ⁽⁷⁾	1668	10	ng/kg
			PAHs	8270D SIM	3.3	µg/kg
			PCDD/Fs	1613B	5	pg/g
			TOC	Plumb 1981/ EPA 9060	0.00715	%
Subsurface Sediment	90 Cores - within Site	PDI-SC-01 to PDI-SC-90	Grain Size	PSEP	0.1	%
			PCB Aroclors	8082A	0.00138	µg/kg
			PCDD/Fs	1613	2.48	pg/g
			DDx	8081	0.051	µg/kg
			PAHs	8270D SIM	3.3	µg/kg
Suspended Sediment (Sediment Traps)	4 locations (12 samples over 3 rounds)	PDI-ST-R#-01 to PDI-ST-R#-04	TOC	Plumb 1981/ EPA 9060	0.00715	%
			Grain Size	PSEP	0.1	%
			Aldrin	8081B	0.175	µg/kg
			Arsenic	6020B	0.0102	mg/kg
			BEHP	8270C	136	µg/kg
			Cadmium	6020B	0.0053	mg/kg
			Chlordanes	8081B	0.0097	µg/kg
			Copper	6020B	0.0608	mg/kg
			DDx	8081B	0.529	µg/kg
			DDD	8081B	0.17	µg/kg
			DDE	8081B	0.529	µg/kg
			DDT	8081B	0.171	µg/kg
			Dieldrin	8081B	0.158	µg/kg
			Lindane	8081B	0.344	µg/kg
			Lead	6020B	0.024	mg/kg
			Mercury	7471A	0.0037	mg/kg
			PCB congeners ⁽⁷⁾	1668	10	ng/kg
			PAHs	8270D SIM	3.3	µg/kg
			cPAHs (BaP eq)	8270D SIM	3.3	µg/kg
			1,2,3,4,7,8-HxCDF	1613B	5	pg/g
			1,2,3,7,8-PeCDD	1613B	5	pg/g
			2,3,4,7,8-PeCDF	1613B	5	pg/g
			2,3,7,8-TCDF	1613B	1	pg/g
			2,3,7,8-TCDD	1613B	1	pg/g
			PCDD/Fs	1613B	5	pg/g
			TPH-Diesel	8015B-DRO	9.9	mg/kg
			Tributyltin	OrganoTin	1.53	µg/kg
			Zinc	6020B	0.144	mg/kg
			TOC	Plumb 1981/ EPA 9060	0.00715	%
			Grain Size	PSEP	0.1	%
			Aldrin	8081B	0.5	µg/kg-wet
			Arsenic	6020B	0.0203	mg/kg-wet
			BEHP	8270D	11.2	µg/kg-wet
			Chlordanes	8081B	0.0194	µg/kg-wet
			DDx	8081B	0.5	µg/kg-wet
			Dieldrin	8081B	0.5	µg/kg-wet

Table 6. Summary of Pre-Remedial Design Investigation Media, Sample Counts, and Analyses for Sediment, Tissue, and Surface Water

Portland Harbor Pre-Remedial Design Investigation Work Plan
Portland, OR

Media	Location Count	Proposed Sample IDs	Analyte List			
			Parameter	Method	MDL ^(1,2,3,4,5)	Units
Fish Tissue (SMB, whole body)	95 - within Site; 40 - D/U Reach	PDI-SMB-BL-01 to PDI-SMB-BL-135	Hexachlorobenzene	8270D	5	µg/kg-wet
			Mercury	7471A	0.00739	mg/kg
			Pentachlorophenol	8270D	63.1	µg/kg-wet
			PBDEs	1614	50	pg/g-wet
			PCB congeners ⁽⁷⁾	1668	2	ng/kg-wet
			1,2,3,4,7,8-HxCDF	1613B	5	pg/g-wet
			1,2,3,7,8-PeCDD	1613B	5	pg/g-wet
			2,3,4,7,8-PeCDF	1613B	5	pg/g-wet
			2,3,7,8-TCDF	1613B	1	pg/g-wet
			2,3,7,8-TCDD	1613B	1	pg/g-wet
			PCDD/Fs	1613B	5	pg/g-wet
			Lipids	DCM extraction gravimetric (NOAA, 1993)	1.5	%
Surface Water ⁽⁶⁾	7 transects (21 samples over 3 rounds; 42 samples with dissolved and total)	PDI-SW-R#-01 to PDI-SW-R#-07	Aldrin	AXYS Method	0.0048	ng/L
			Arsenic	6020A	0.22	µg/L
			BEHP	8270C	1.6	µg/L
			Chlordanes	AXYS Method	0.0048	ng/L
			Chromium	6020A	0.378	µg/L
			Copper	6020A	1.04	µg/L
			DDx	AXYS Method	0.003	ng/L
			DDD	AXYS Method	0.003	ng/L
			DDE	AXYS Method	0.0024	ng/L
			DDT	AXYS Method	0.0026	ng/L
			Ethylbenzene	8260C	0.252	µg/L
			Hexachlorobenzene	8270D	0.104	µg/L
			MCP	8151A	290	µg/L
			Pentachlorophenol	8270D	0.271	µg/L
			PCBs	AXYS Method	0.0048-0.0608	pg/L
			cPAHs (BaP eq) ⁽⁷⁾	AXYS Method or 8270-SIM	0.2818	ng/L
			Benzo(a)anthracene	AXYS Method or 8270-SIM	0.1234	ng/L
			Benzo(a)pyrene	AXYS Method or 8270-SIM	0.0588	ng/L
			Benzo(b)fluoranthene	AXYS Method or 8270-SIM	0.2818	ng/L
			Benzo(k)fluoranthene	AXYS Method or 8270-SIM	0.2818	ng/L
			Chrysene	AXYS Method or 8270-SIM	0.1334	ng/L
			Dibenz(a,h)anthracene	AXYS Method or 8270-SIM	0.1324	ng/L
			Indeno(1,2,3-c,d)pyrene	AXYS Method or 8270-SIM	0.1264	ng/L
			Naphthalene	AXYS Method or 8270-SIM	0.1622	ng/L
			Dioxins/Furans (2,3,7,8-TCDD eq)	AXYS Method	0.00228	pg/L
			Tributyltin	OrganoTin	0.045	µg/L
			Zinc	6020A	2.65	µg/L
			TSS	2540D	NA	NA
			Turbidity, pH, flow rate velocity, eH, DO	field parameter	NA	NA
Porewater	8	PDI-PW-01 to PDI-PW-08	Arsenic	200.7	0.05	µg/L
			Manganese	200.7	0.264	µg/L
			redox	field parameter	---	---

Notes:

(1) Surface sediment MDLs from EPA RI (2016) Table 5-2.1; PCB 1668 MDL from Vista Analytical.

(2) Subsurface sediment MDLs from EPA RI (2016) Table 5-2.2

(3) Fish tissue MDLs from EPA RI (2016) Table 5-6.1; PCB 1668 MDL from Vista Analytical.

(4) Surface water MDLs from Portland Harbor RI/FS Round 3A Field Sampling Plan Surface Water Sampling (2006) Table 2-4

(5) Porewater MDL for Mn provided by analytical laboratory (TestAmerica), MDLs for As is MRL reported in RI/FS Round 3A Field Sampling Plan Surface Water Sampling (2006) Table 2-4.

(6) Total and dissolved

(7) Where MDLs for totals were not available, the highest MDL for individual analyte was used.

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; PW - porewater; TOC - total organic carbon; D/U - Downtown/Upriver Reach; SC - subsurface core; SMB - small mouth bass; SS - surface grab; SW - surface water

Table 7a. Sediment Cores for Pre-Design Studies
Portland Harbor Pre-Remedial Design Investigation Work Plan
Portland, OR

Alternative F Mod Footprint Area / Description		Core #	New Core Station	Re- Occupy Old Station	Old Station	Core Depth (feet bgs)	# of Samples	Estimated Vertical Extent of Contamination (ft blm)	Focus COCs Above RALs at Any Depth
Proposed Deep Subsurface Core Locations									
RM 2E	Evraz	1	X			12	6	>8.9	PCBs, DDx
		2	X			12	6		
		3		X	C011-2	12	2		
		4		X	C019-1	12	2		
		5	X			12	6		
RM 2.75E	Blob	6	X			12	6	>8.3	PCBs
RM 3.5E	Blob	7	X			15	8	>11.2	PCBs, DDx, Dioxin/Furans
RM 3.8E	Slip	8	X			15	8	>12.6	PCBs
		9	X			15	8		
		10		X	LWMC3	15	2		
		11	X			15	8		
		12	X			15	8		
RM 4.4W	Blob	13		X	C626	15	2	>14.0	PAHs
		14	X			15	8		
RM 4.5E	Slip	-	No cores needed, plenty of data and all shallow exceedances, Alt F Mod dredge						PCBs
RM 4.51E	Slip	15		X	HC-S-42	15	2	>12.9	PAH
RM 4.52E	Slip	-	No cores needed, plenty of data and all shallow exceedances, Alt F Mod dredge						PCBs, PAHs, DDx
RM 5 to 6	Blobs	16	X			15	8	>11.5	PAHs
		17	X			15	8		
RM 5 to 6W	Shallow Blobs	18		X	C136	20	2	>16.5	PAHs, PCBs, DDx, Dioxin/Furans
		19		X	C142	20	2		
		20		X	C147	20	2		
		21		X	C179	20	2		
RM 5.5E	Sliver	22	X			15	8	>10.9	PCBs, PAHs, Dioxin/Furans, DDx
		23	X			15	8		
		24	X			15	8		
RM 6W	Shallow Long Band / Inlet	25	X			15	8	>12.8	PAHs, DDx
		26	X			15	8		
		27	X			15	8		
		28		X	LWMC11	15	2		
RM 6.5E	Blob	29		X	C244	15	2	>10.0	PCBs, PAHs, DDx
		30	X			15	8		
		31	X			15	8		
RM7W	Blob	32	X			15	8	>14.5	PCBs, DDx, Dioxin/Furans
		33	X			15	8		
		34	X			15	8		
		35	X			15	8		
		36	X			15	8		
RM 7.5W		37	X			15	8	>15.8	PCBs, DDx, Dioxin/Furans
		38		X	C690	20	2		
		39	X			15	8		
Swan Island		40	X			10	8	>7.9	PCBs
		41		X	C421	10	2		
		42	X			10	8		
		43	X			10	8		
		44	X			10	8		
		45	X			10	8		
		46	X			10	8		
		47	X			10	8		
48	X			10	8				

Table 7a. Sediment Cores for Pre-Design Studies
Portland Harbor Pre-Remedial Design Investigation Work Plan
Portland, OR

Alternative F Mod Footprint Area / Description		Core #	New Core Station	Re- Occupy Old Station	Old Station	Core Depth (feet bgs)	# of Samples	Estimated Vertical Extent of Contamination (ft blm)	Focus COCs Above RALs at Any Depth
RM 8 to 8.75W	long band	49		X	C450	10	2	>8.0	PCBs, DDx, Dioxin/Furans
		50	X			20	8	>16.2	
		51	X			20	8		
		52	X			20	8		
RM 9.8W		53	X			15	8	>12.1	PCBs, DDx, Dioxin/Furans
		54	X			15	8		
		55	X			15	8		
		56		X	LWMC24	15	2		
Locations will be Redistributed		57	X			15	8	>10	PCBs, DDx
		58		X		15	2		
		59		X		15	2		
		60	X			15	8		
Proposed Nearshore/ Shallow Area Core Locations									
RM 2E	Evraz	B-1	X			6	3		PCBs, DDx
		B-2	X			6	3		
RM 3.5E	Blob	B-3	X			6	3		PCBs, DDx, Dioxin/Furans
RM 3.8E	Slip	B-4	X			6	3		PCBs
		B-5	X			6	3		
RM 3.9E	Blob	B-6	X			6	3		PCBs, DDx, Dioxin/Furans
		B-7	X			6	3		
RM 4W	Blob	B-8	X			6	3		PAHs
RM 4.52E	Slip	B-9	X			6	3		PCBs, PAHs
RM 4.8W	Blob	B-10	X			6	3		PAHs, PCBs, DDx, Dioxin/Furans
RM 5.5E	Sliver	B-11	X			6	3		PAHs, PCBs, DDx, Dioxin/Furans
RM 5.7W	Sliver	B-12	X			6	3		PAHs, PCBs, DDx, Dioxin/Furans
RM 6.2W	Blob	B-13	X			6	3		PAHs, DDx
RM 6.3E	Blob	B-14	X			6	3		PCBs, PAHs, DDx
RM 6.4W	Blob	B-15	X			6	3		PAHs, DDx
RM 6.5E	Blob	B-16	X			6	3		PCBs, PAHs, DDx
RM 6.7W	Blob	B-17	X			6	3		PCBs, DDx, Dioxin/Furans
RM 6.8E	Blob	B-18	X			6	3		PCBs, PAHs, DDx
RM 7W	Blob	B-19	X			6	3		PCBs, DDx, Dioxin/Furans
		B-20	X			6	3		
RM 8.1W	Blob	B-21	X			6	3		PCBs, DDx, Dioxin/Furans
Swan Island		B-22	X			6	3		PCBs
		B-23	X			6	3		
		B-24	X			6	3		
		B-25	X			6	3		
		B-26	X			6	3		
RM 9E	Sliver	B-27	X			6	3		PCBs
RM 9W	Long band	B-28	X			6	3		PCBs, DDx, Dioxin/Furans
		B-29	X			6	3		
RM 10.2W	Sliver	B-30	X			6	3		PCBs
Total # Deep Cores		43		17		460			
Total # of Nearshore Cores		30							
# of QA/QC Samples						46			
Total # of Cores/Samples		90				506			

Notes:

(1) Archive deeper intervals in nearshore areas; archive at 1-ft intervals near expected bottom of contamination if practical.

(2) Remedial Action Level Cleanup Concentration:

PCBs = 9.0 µg/kg, total PAHs = 23 mg/kg, DDx = 6.1 µg/kg, 2,3,7,8-TCDD = 0.0002 µg/kg

Abbreviations:

BML - below mudline; COC - contaminant of concern; D/F - dioxins/furans; PAH - polycyclic aromatic hydrocarbons

Table 7b. Rationale for Sediment Core Locations for Pre-Design Studies

Portland Harbor Pre-Remedial Design Investigation Work Plan
Portland, OR

Alternative F Mod Active Footprint Area / Description		Core #	New Core Station	Re- Occupy Old Station	Summary Rationale	Additional Rationale
RM 2E	Evraz	1	X		Define horizontal extent - north end	Better define horizontal gradient extent towards the north end (cores to the north do not tag bottom)
		2	X			Better define horizontal towards the navigational channel. C600 does not tag bottom.
		3		X	Define vertical extent, unbounded to 10 ft bgs	Define vertical extent, reoccupy C011-2 which remains unbounded to 10 feet bgs with a concentration of 8,200 µg/kg PCB. Samples in proximity (C011-1, RB13, and C602) are all unbounded.
		4		X	Define vertical extent, unbounded to 10 ft bgs	Define vertical extent, reoccupy C019-1 which remains unbounded in vertical direction with a concentration of 1,100 µg/kg PCB; samples in proximity (C019-2, LWMC1, and C604) are all unbounded.
		5	X		Define horizontal extent - southeast end	Better define the horizontal and vertical extent, previously no cores that tag bottom within 250 feet
RM 2.75E	Blob	6	X		No existing core in the dredge footprint	No existing core in the dredge footprint. Nearby core C061, C613, and C614 are vertically unbounded.
RM 3.5E	Blob	7	X		No existing core in the dredge footprint	No existing core in the dredge footprint. Nearby core C061, C613, and C614 are vertically unbounded.
RM 3.8E	Slip	8	X		Define horizontal extent	Define horizontal extent/improve concentration gradient. Spacing between cores +400 feet
		9	X			Define Shallow extent.
		10		X	Define vertical extent in Alt I dredge footprint	Define vertical extent, LWMC3 unconfined vertically with a concentration of TPCB at 5,000µg/kg for the entire core depth of 10 feet bgs.
		11	X		Define horizontal extent	Define horizontal extent/improve concentration gradient. Spacing between cores +300 feet
		12	X		n	Closest sample SED14, is unconfined vertically. Sample approximately 3 ft bgs with a concentration of 1,100 µg/kg. Define horizontal extent between cap and dredge
RM 4.4W	Blob	13		X	Define vertical extent.	Reoccupy C622 which is vertically unbounded, core went down ~15' bgs with a PAH Concentration of ~150,000 µg/kg.
		14	X		Define horizontal extent in shallow area	Define Horizontal extent in shallow area. Closest core is unbounded C626. Could move sample slightly north into proposed F Mod dredge area that contains no core samples
RM 4.5E	Slip	-			No cores needed, plenty of data and all shallow exceedances, Alt I dredge	
RM 4.51E	Slip	15		X	Define vertical extent	Reoccupy HC-S-42 which is vertically unbounded, core went to ~5 feet bgs with a PAH concentration of 220,000 µg/kg. Will also help define horizontal extent in shallow area
RM 4.52E	Slip	-			No cores needed, plenty of data and all shallow exceedances, Alt I dredge	
RM 5 to 6	Blobs	16	X		Define vertical/horizontal extent	Define vertical/horizontal extent with new cores; some new cores collected in 2014 with good coverage at depth
		17	X			
RM 5 to 6W	Shallow Blobs	18		X	Define vertical extent	Reoccupy C136 which is vertically unbounded, core went down ~15 feet bgs with a PAH concentration of 80,000 µg/kg. No other core in existing dredge footprint.
		19		X	Define vertical extent	Reoccupy C142 which is vertically unbounded, core went down ~10 feet bgs with a PAH concentration of 240,000 µg/kg.
		20		X	Define vertical extent	Reoccupy C147 which is vertically unbounded, core went down ~15 feet bgs with a PAH concentration of 250,000 µg/kg.
		21		X	Define vertical extent	Reoccupy C179 which is vertically unbounded, core went down ~10 feet bgs with a PAH concentration of 90,000 µg/kg. Next to C182, also unbounded vertically with a concentration of ~25,000 µg/kg.
RM 5.5E	Sliver	22	X		No existing cores in dredge footprint	No existing cores in dredge footprint, 1 core nearby vertically bounded at 10 feet below ground surface; Alt I dredge/cap
		23	X			No existing cores in dredge footprint, 1 core nearby vertically bounded at 10 feet below ground surface; Alt I dredge/cap
		24	X			No existing cores in dredge footprint, 1 core nearby vertically bounded at 10 feet below ground surface; Alt I dredge/cap
		25	X		Define vertical extent	Horizontally define navigational channel. CS003 depth was only 3 foot bgs, with a concentration of 68,000 µg/kg tPAHs
		26	X			Horizontally define navigational channel extent. No core currently within proposed dredge footprint.

Table 7b. Rationale for Sediment Core Locations for Pre-Design Studies

Portland Harbor Pre-Remedial Design Investigation Work Plan
Portland, OR

Alternative F Mod Active Footprint Area / Description		Core #	New Core Station	Re- Occupy Old Station	Summary Rationale	Additional Rationale
RM 6W	Shallow Long Band / Inlet	27	X		Horizontal extent along nav channel, define vertical extent for proximal cores	Better define concentration gradient. Closest cores ~250 feet away is DGS-08C (in navigational channel, concentration of 1,800,000 µg/kg). Downriver of LWMC11, unbounded sample with a concentration of 8,400,000 µg/kg, and DGS-19SC with a concentration of 4,500,000 µg/kg.
		28		X	Define vertical extent	Reoccupy LMWC11 which is vertically unbounded, core went down ~10 feet bgs with 8,400,000 µg/kg. Next to GS-B5 also unbounded vertically with concentrations of 1,100,000 µg/kg.
RM 6.5E	Blob	29		X	Define vertical extent	Reoccupy C244 which is vertically unbounded, core went down ~10 feet bgs 250 µg/kg PCB. Southern edge of proposed dredge footprint.
		30	X		Define horizontal extent	No historical cores collected within Alternative F Mod footprint.
		31	X		Define vertical/horizontal extent in the low spot near C291	Better define horizontal gradient. Distance between cores is greater than 300 feet. Two of the four closest cores are unbounded vertically with concentrations of 250 µg/kg and 750 µg/kg PCB.
RM7W	Blob	32	X		Define vertical extent	Define vertical extent in proposed dredge area around C311, DGS-37SC, SD072, and C316; these cores are all unbounded vertically and have PAH concentrations >50,000 µg/kg and as high as 570,000 µg/kg.
		33	X		Define vertical and horizontal extent	Define horizontal extent of proposed dredge area around WB-66, which is unbounded vertically and horizontally and has a 2,3,7,8-TCDD concentrations as high as 0.0015 µg/kg.
		34	X		Define vertical extent	Define vertical extent in proposed dredge area around C679, which is unbounded vertically and has a 2,3,7,8-TCDD concentration 0.003 µg/kg.
		35	X		Define vertical extent	Define vertical extent in proposed dredge area around LWMC14, which is unbounded vertically and has a 2,3,7,8-TCDD concentration 0.002 µg/kg; surrounding unbounded samples are WB-37, WB-41, and SD092 with concentrations as high as 0.007 µg/kg.
		36	X		Define vertical/horizontal extent	Define vertical and horizontal extent of proposed dredge area south of WB-34. WB-34 is unbounded vertically and has a 2,3,7,8-TCDD concentration 0.001 µg/kg.
RM 7.5W		37	X		Define vertical/ horizontal extent	Define vertical and horizontal extent near C688. C688 is unbounded vertically and has a 1,2,3,7,8-PeCDD concentration >0.001 µg/kg.
		38		X	Define vertical extent	Reoccupy C690. C690 had concentrations greater than 0.001 of 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD is 0.007 µg/kg, and vertical extent was unbounded to 15 ft below mudline surface
		39	X		No existing core in active footprint	Inside proposed dredge area has no core samples.
Swan Island		40	X		Define vertical extent	Sample near SD133 to define vertical extent in proposed dredge area. SD133 was unbounded vertically and had a PCB concentration of 2,400 µg/kg.
		41		X	Define vertical extent	
		42	X		Define vertical extent	Help determine vertical extent and better cover horizontal area which is over 250 feet from next sample location.
		43	X		Define vertical extent / horizontal gradient	Define vertical extent between C702 and C703 (cores are over 400 feet apart) and C702 is unbounded with a max concentrations of 250 µg/kg of PCB.
		44	X		Define horizontal extent	Define horizontal and vertical extent between C364 and PSY20C (cores are over 600 feet apart) and have max PCB concentration of >250 µg/kg and 2,300 µg/kg respectively.
		45	X		Define vertical extent	Define vertical extent between C372 and PSY18C (cores are over 400 feet apart) and have PCB concentrations of ~200 µg/kg and >500 µg/kg respectively. C372 is also unbounded vertically.
		46	X		Define vertical extent	Better define vertical gradient between C379 and PSY11C (cores are over 600 feet apart) and have max PCB concentration of >750 µg/kg and >7.5 µg/kg respectively.
		47	X		Define vertical/horizontal extent	Better define vertical gradient near C397. C397 is vertically unbounded and had a max PCB concentration of >500 µg/kg.

Table 7b. Rationale for Sediment Core Locations for Pre-Design Studies

Portland Harbor Pre-Remedial Design Investigation Work Plan
Portland, OR

Alternative F Mod Active Footprint Area / Description		Core #	New Core Station	Re- Occupy Old Station	Summary Rationale	Additional Rationale
		48	X		Refine horizontal gradient	Better define vertical gradient between C405 and SD141 (cores are over 300 feet apart) and both are vertically unbounded. The max concentration between the two cores was >500 µg/kg of PCB.
RM 8 to 8.75W	long band	49		X	Unbounded to 10 ft below ground surface	Define vertical extent in proposed dredge area around C450, which is unbounded vertically and has a PCB concentration 2,200 µg/kg.
		50	X		collect bank sample near C431	Define vertical and horizontal extent of proposed dredge area north east of C431, edge of dredge area over 300 feet from C431 core.
		51	X		Define vertical extent	Define shallow horizontal extent west of C455. C455 has a max PCB concentration of 6,000 µg/kg.
		52	X		Define vertical extent	Define vertical extent in proposed dredge area around LWMC19, which is unbounded vertically and has a PCB concentration 2,200µg/kg. No proposed cores in this area or vertically bounded cores in this dredge area.
RM 9.8W		53	X		Cores are vertically unbounded, but there is 10 ft of clean overburden; horizontal extent	Define vertical and horizontal extents in proposed dredge area north east of C738 and C739; both cores are vertically and horizontally unbounded with max concentrations >500 µg/kg of PCB.
		54	X			Better define vertical gradient between C739 and LWMC24. Both cores are unbounded, with max concentrations greater than 500 µg/kg of PCB.
		55	X		Define extent	Define vertical and horizontal extents in proposed dredge area west of LMWC24. LWMC24 is vertically unbounded with max concentration >750 µg/kg of PCB.
		56		X	Define vertical/ horizontal extent	Define horizontal extent south of LMWC24 which is approximately 400 feet from the shoreline and is unbounded vertically with a max concentration >750 µg/kg of PCB.
Stations will be Redistributed within Site		57	X		Define horizontal extent	TBD
		58		X	Define vertical extent	TBD
		59		X	Define vertical extent	TBD
		60	X		Define horizontal/vertical extent	TBD
Shallow Area Cores		61 to 90	X		Define areas	No existing cores in these areas

Abbreviations:

bgs - below ground surface; bml - below mudline; COC - contaminant of concern; PAH - polycyclic aromatic hydrocarbon

Table 8. Data Interpretation and Analysis Plan

Portland Harbor Pre-Remedial Design Investigation Work Plan

Portland, OR

Data Utilization	Description
Current Conditions and Sediment SWACs for baseline dataset	Generate summary tables and maps with the new 2018 data and baseline the river for sediment, SMB fish tissue, and surface water for media-specific COCs and selected other COCs. Generate sediment SWACs for the Site on a site-wide and other spatial scales using Theissen Polygons for the 606-sample plan, and the statistical mean for both the stratified random 428 sample plan and 606 sample plan.
Concentration Changes Over Time (focused COCs)	Provide plot of the tissue data over time. Provide surface water data with simple data plots of baseline and previous applicable surface water data. Compare the new 2018 data to the RI/FS dataset for sediment (2004 in particular), tissue (2002, 2007 and 2012), and surface water media, and evaluate changes since the RI: (1) The new sediment SWAC and arithmetic mean of unbiased dataset (stratified random) will be compared to the 2004 data at site-wide, segment-wide scales, and river mile-scales to look for differences in the last 14 years. (2) Datasets will also be compared to the Downtown/Upriver Reaches (are the three populations different, how different, and is site recontamination expected?). (3) Additional surface sediment locations may be re-occupied from 2004, and these two populations will be compared for changes. <i>Note: The data permits statistical comparisons at the site-wide and other spatial scales such as rolling river mile one-side, 21 segments (10 segments with east and west side plus Swan Island Lagoon), and 9 segments (8 segments each 2 to 3 miles one-side plus Swan Island Lagoon).</i>
Alt F Mod Active SMA Footprint (1)	Refine the SMA footprints using new data collected during the PDI. SMA delineation activity to evaluate these data, bathymetry, and applicable historical data will be run through the ROD decision tree to support allocation. Run the new 2018 surface sediment data and bathymetry data through the ROD decision tree to refine the active remedy footprint. The 2018 core data will be combined with RI/FS subsurface coring data to update the conceptual site model understanding of subsurface contamination, collectively these data will also run through the ROD decision tree to refine the active remedy footprint and dredge volume estimate. Changes in sediment elevation will be a modifying factor for volume estimates to inform the 30% design estimates.
Downtown/Upriver Baseline	Report data separately to EPA by reach (Downtown / Upriver Reach). Evaluate current upriver conditions by SWAC and summary distribution statistics for other media, for future long-term comparative analysis with Site. Generate tables, maps, and summary statistics for all new 2018 data (sediment, SMB tissue, surface water, and sediment traps) as 2018 baseline conditions. These data may be compared to new site data, and qualitatively compared to older downtown/upriver data to evaluate changes and provide a first look at what may be achievable at the site for focused COCs.
Background Porewater	Provide porewater data to EPA, provide sufficient data to derive porewater background for metals using the passive porewater samples from the upriver reach or other appropriate background areas (see EPA March 13, 2017 framework).
Fish Tracking Results	Provide fish tracking data to be presented as a tabular spreadsheet deliverable that includes location, tag IDs, and time stamps for each of the tagged fish. Data processing for data report limited to tabular and graphical outputs showing locations/tag IDs of fish movement (e.g. heat maps). Evaluate the fish tracking results to evaluate the home range of SMB. Maps, home range estimates, and summary tables will be generated. <i>Note: results may inform the fish tissue sampling program and the appropriate scale for calculating baseline conditions with respect to fish; refine the CSM and reduce uncertainty about remedy effectiveness for fish tissue recovery and inform fish consumption advisory updates.</i>
Data Design for Long-term Monitoring	The PDI Evaluation Report will include an evaluation of the 2018 data for purpose of potentially focusing the list of COCs for future monitoring rounds.

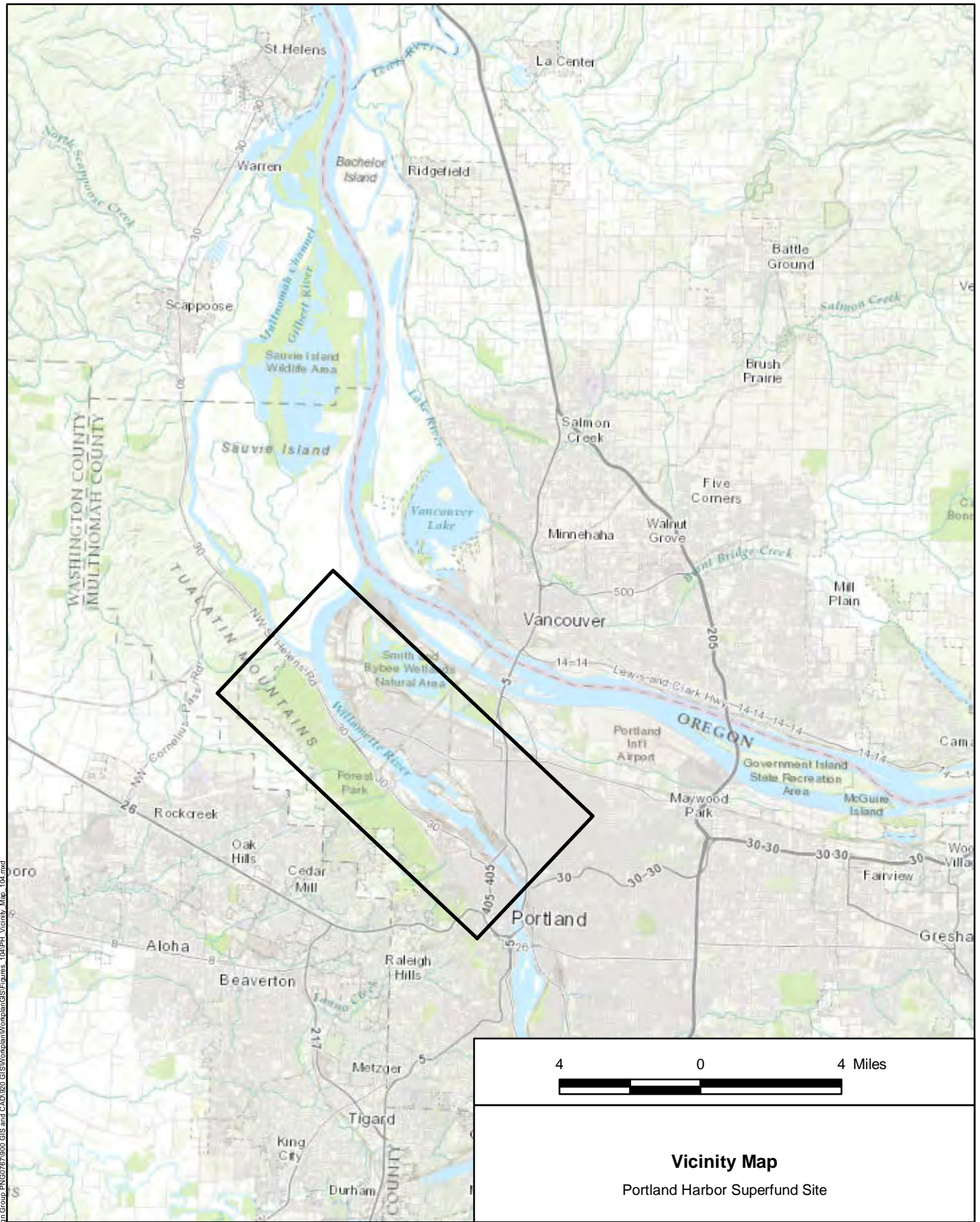
Notes:

(1) Pre-Design Core data collection may have limitations for characterizing final SMA footprint delineation. Accordingly, any final decision on the SMA footprint will be pending full remedial design and confirmation sampling results obtained during remedy implementation.

Abbreviations:

COCs - chemicals of concern; CSM - conceptual site model; PDI - pre-remedial design investigation; RI/FS - remedial investigation/feasibility study; RAO - remedial action objective; RM - river mile; ROD - Record of Decision; SMA - sediment management area; SMB - small mouth bass; SWAC - surface weighted average concentrations

FIGURES



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Legend

Site Location

Notes:

1. Topographical map provided by ESRI Basemaps 2016



4 0 4 Miles



Vicinity Map

Portland Harbor Superfund Site

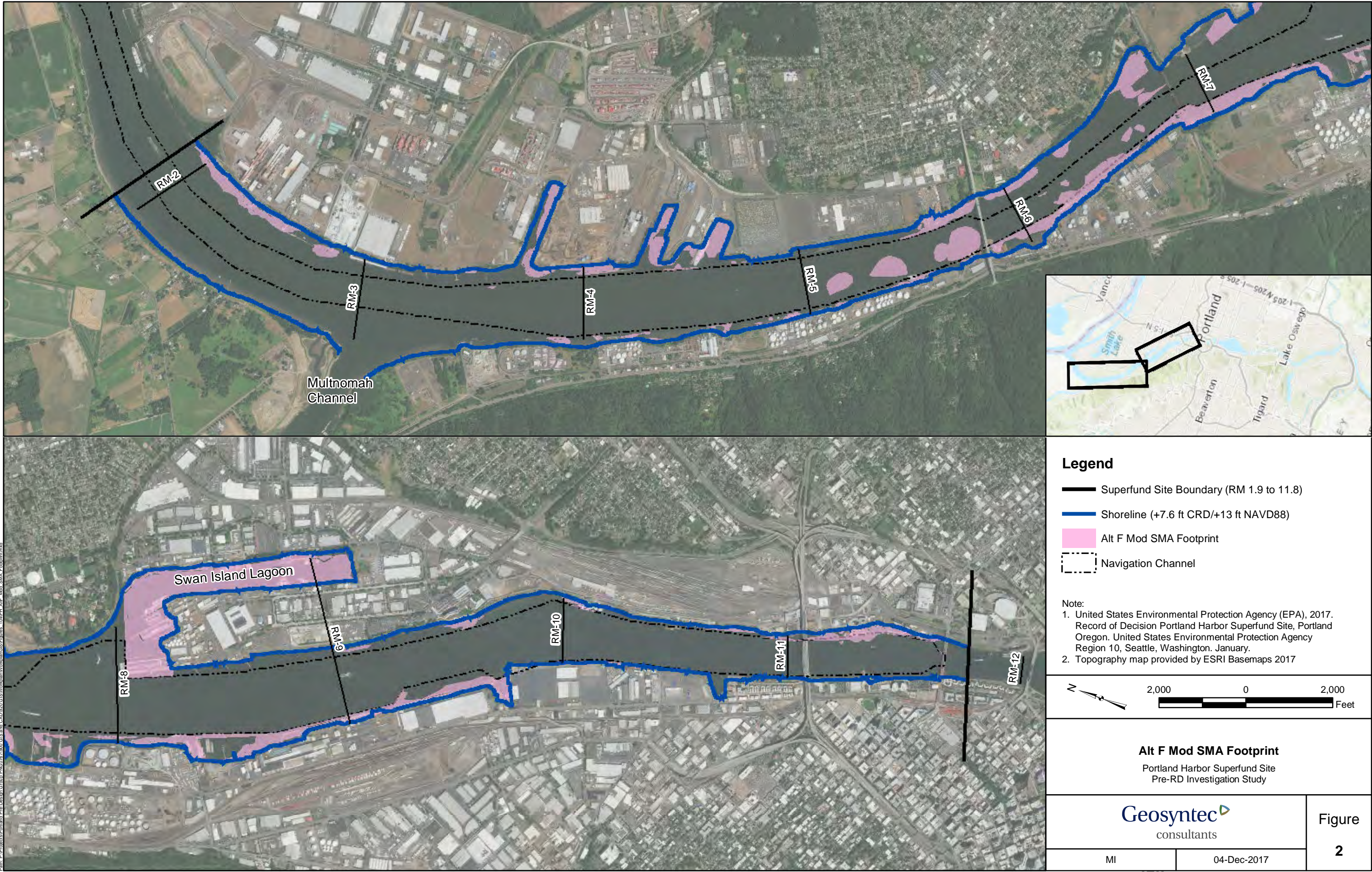
Geosyntec
consultants

Figure

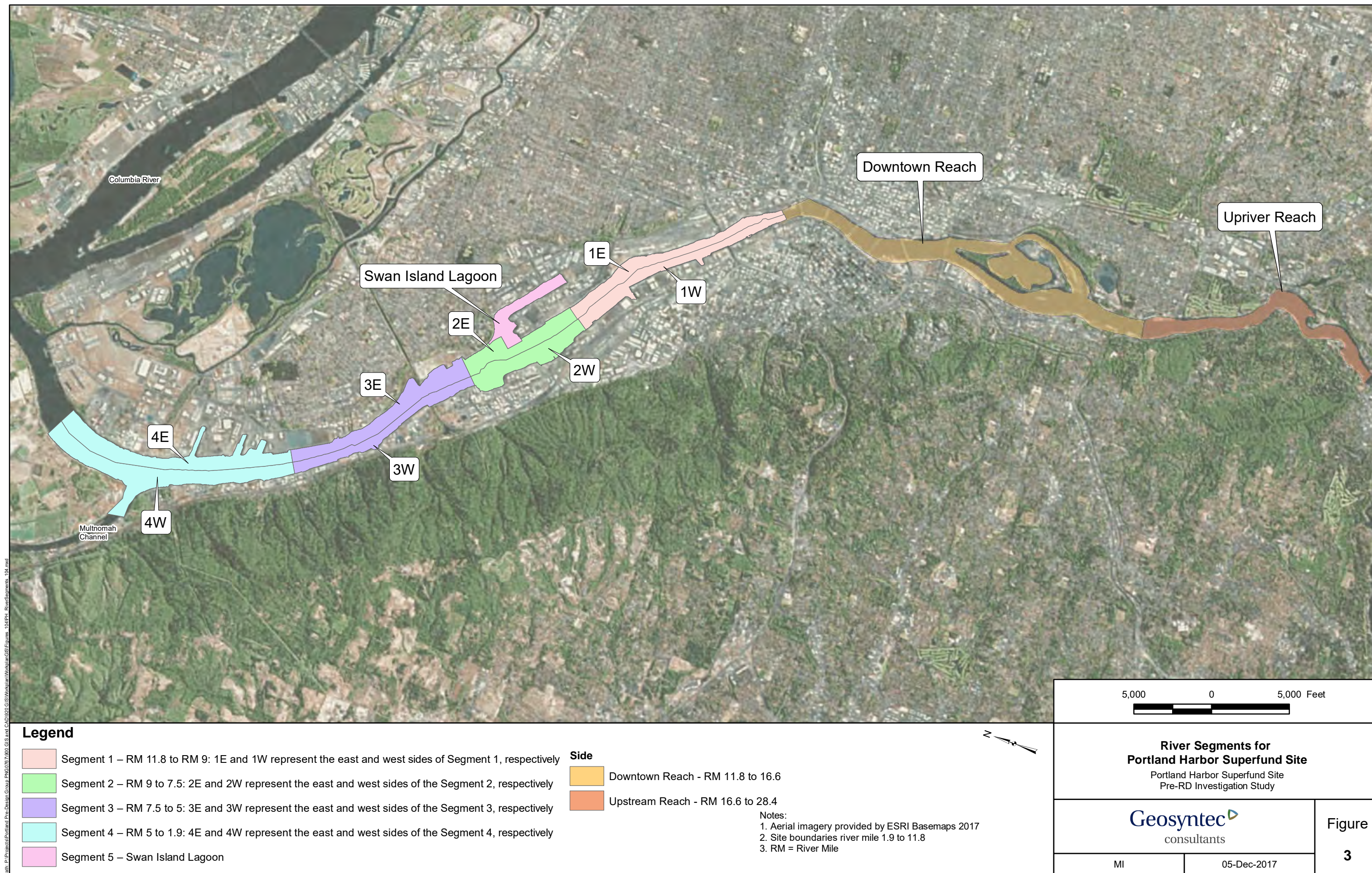
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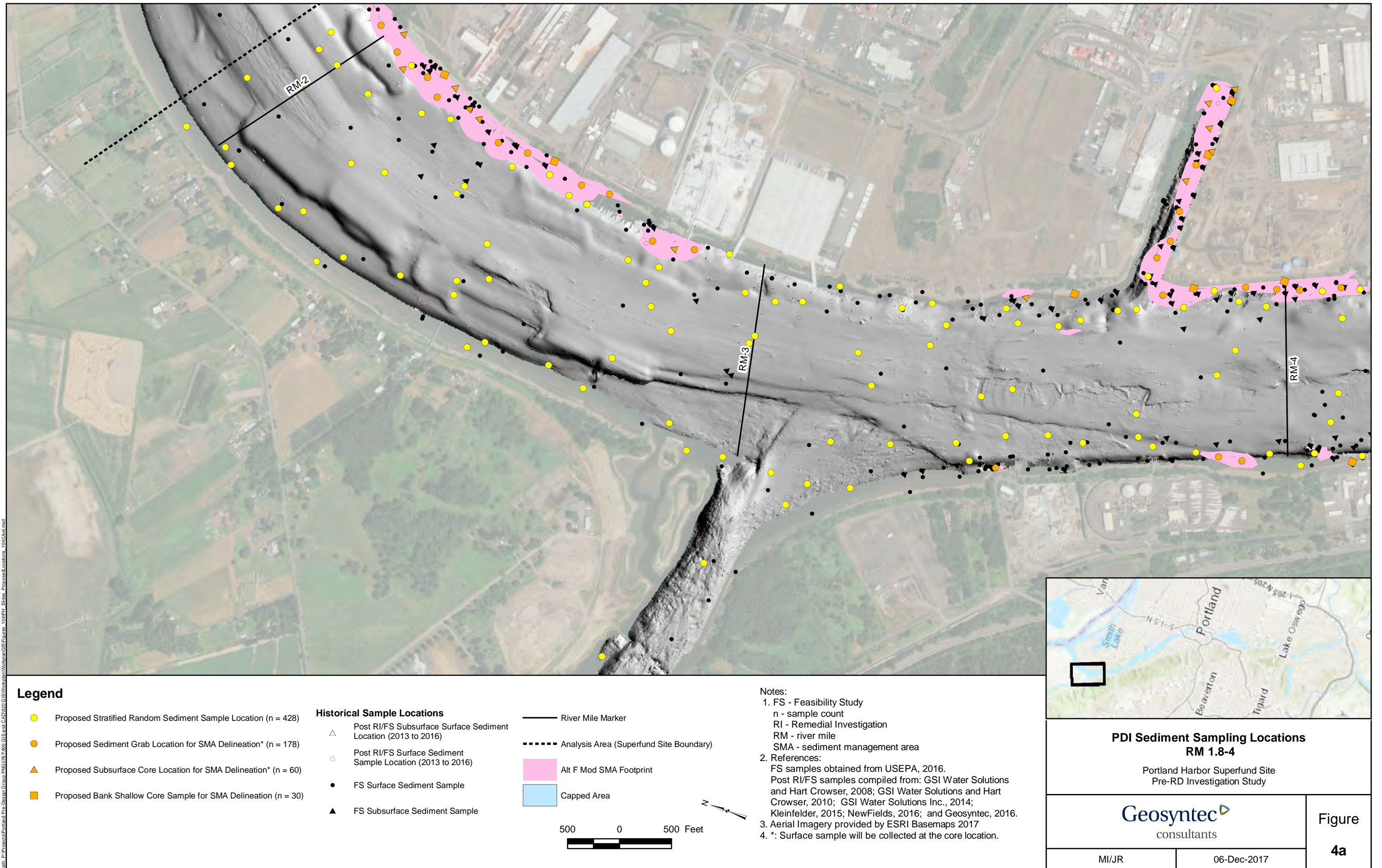
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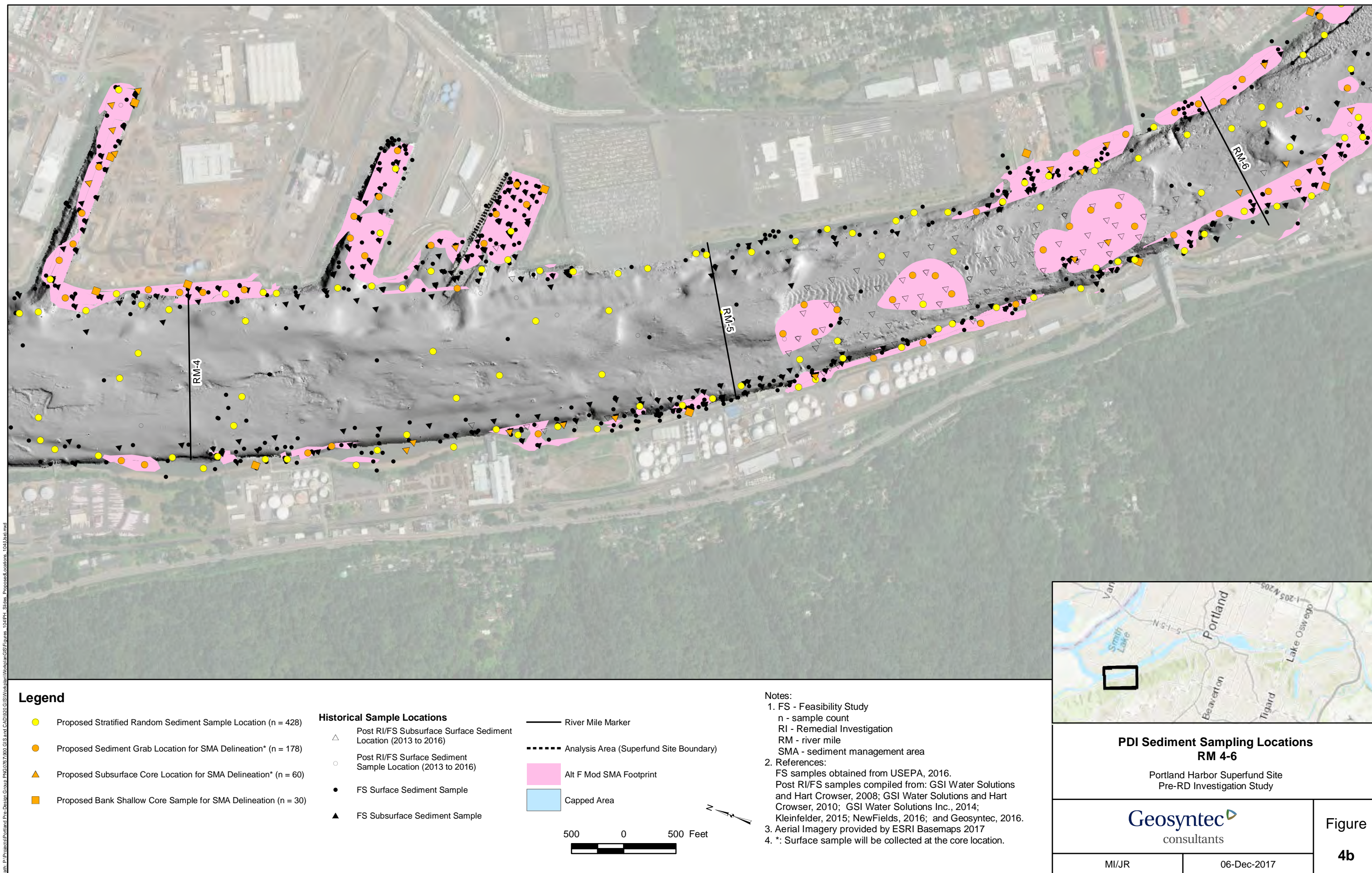
06-Dec-2017

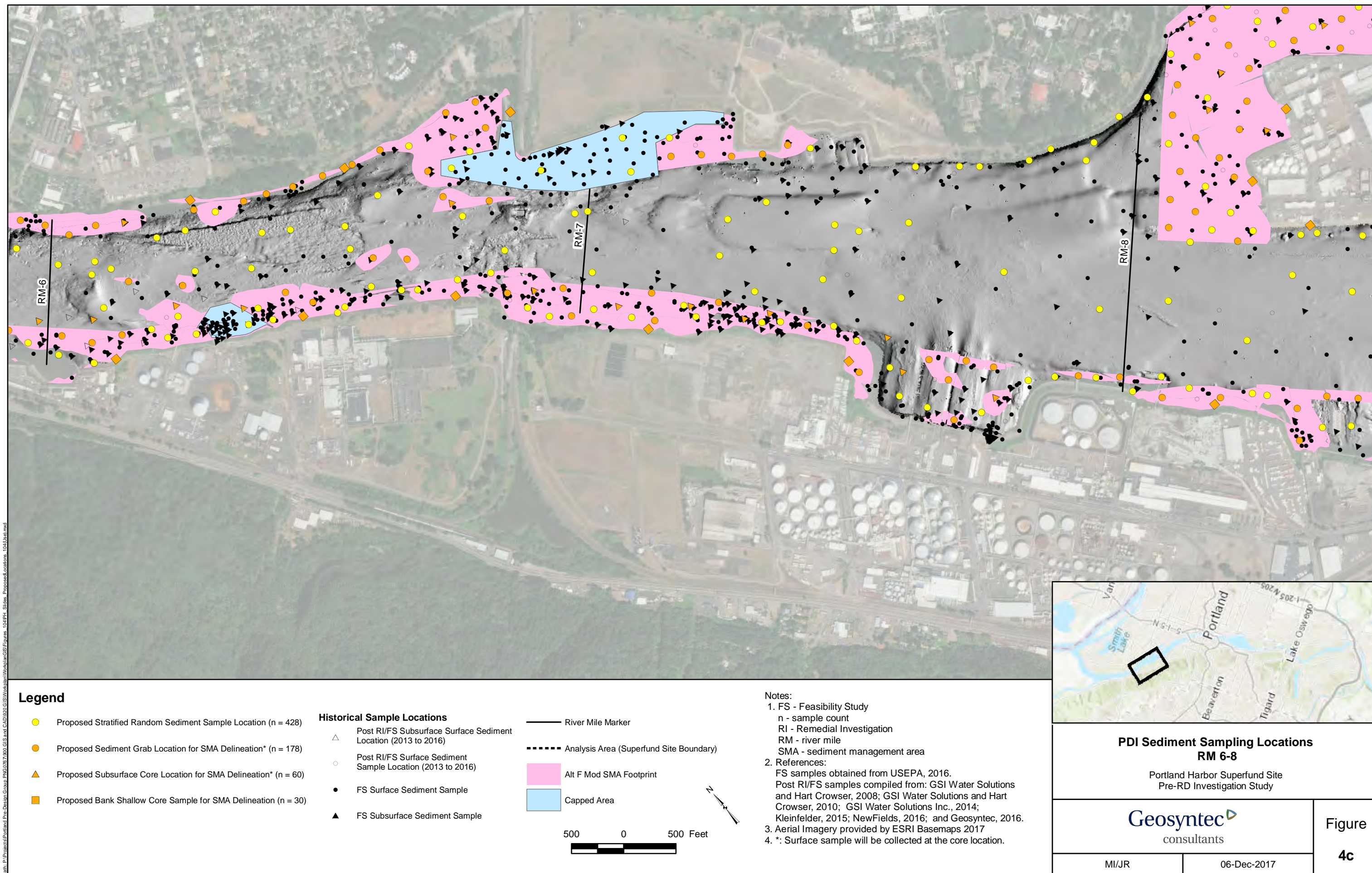


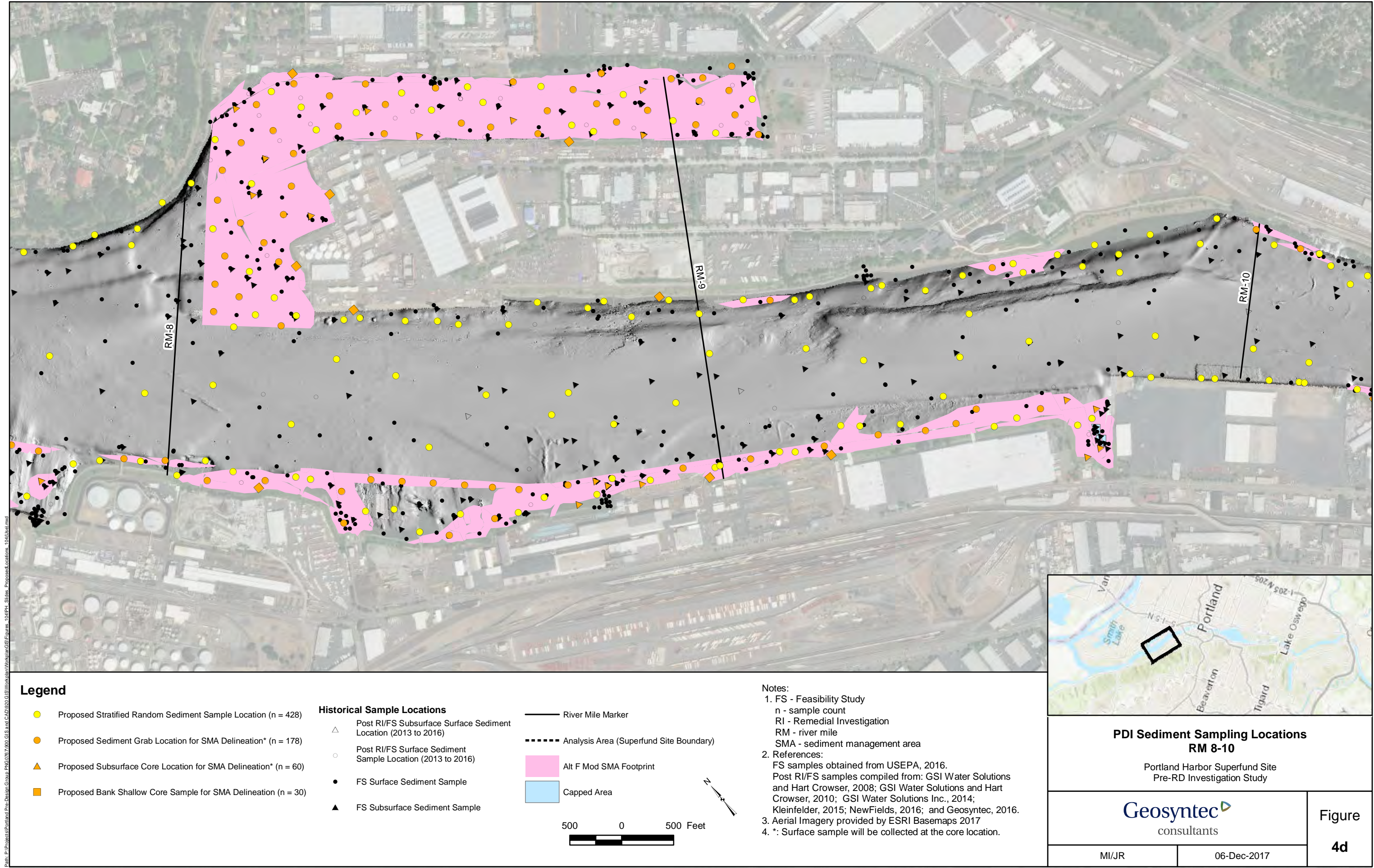
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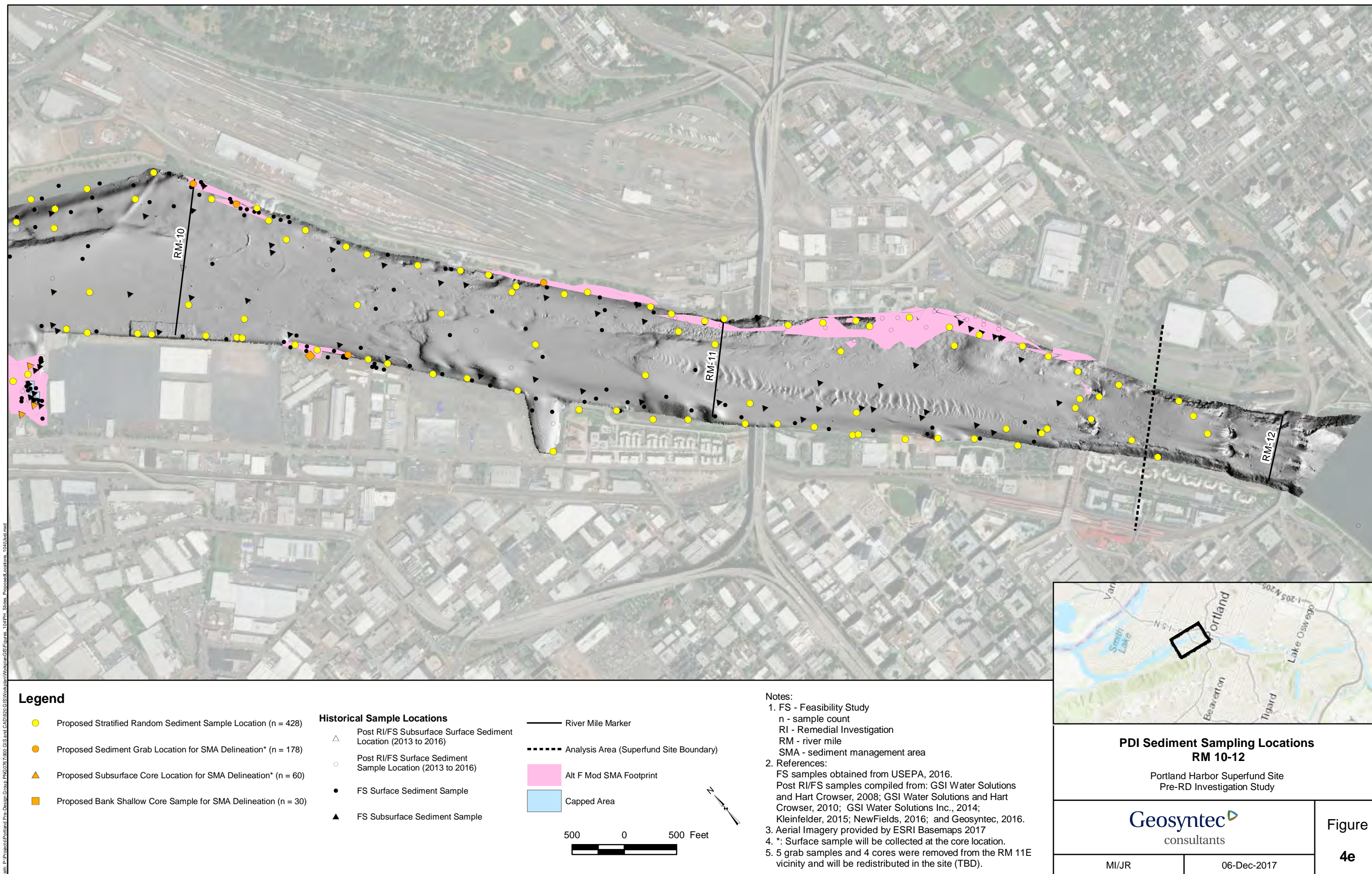


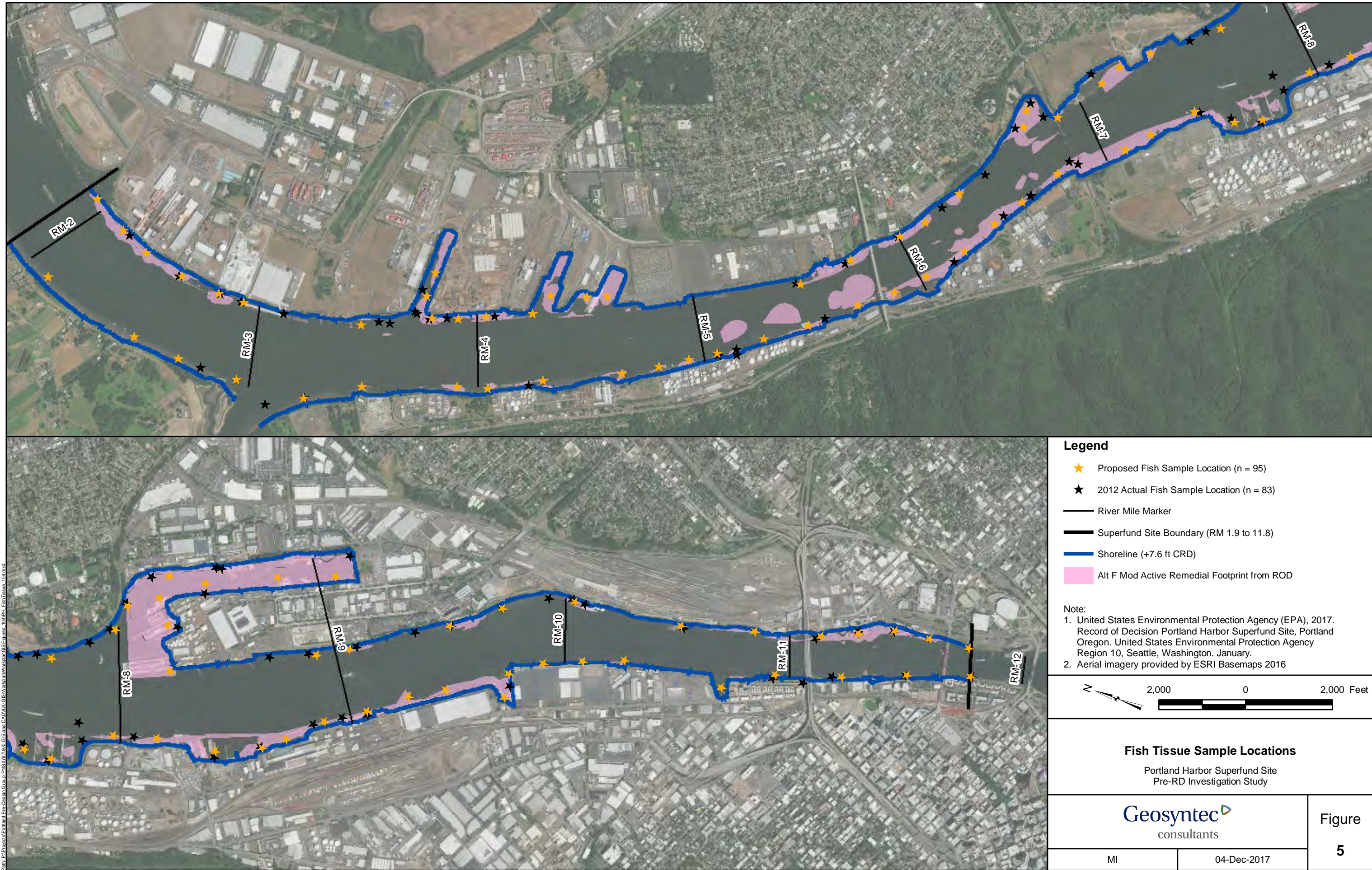












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Legend

- Proposed Surface Water Sample Location (n = 21)
- Proposed Sediment Trap Sample Location (n = 4)
- Proposed Surface Water Transect

Note:
1. Aerial Imagery provided by ESRI Basemaps 2016
2. One composited sample will be collected per transect. The sample will be vertically-composited and horizontally-composited along the transect.

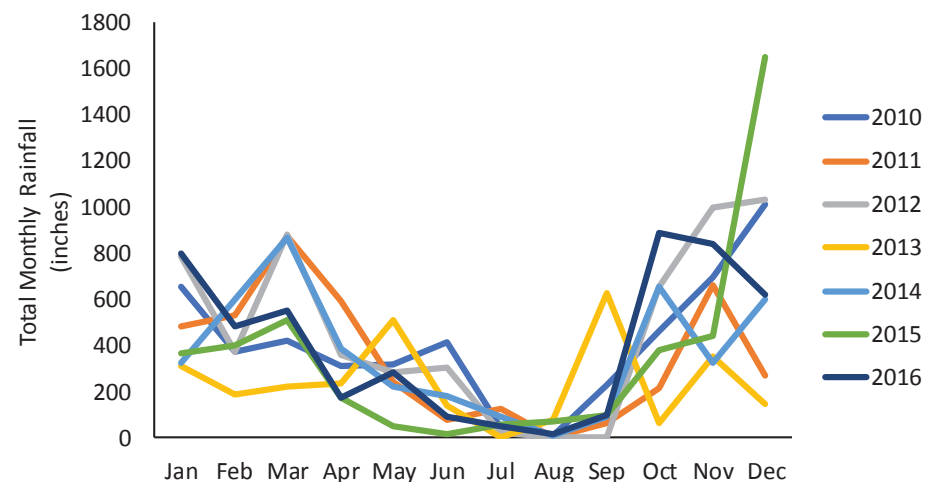
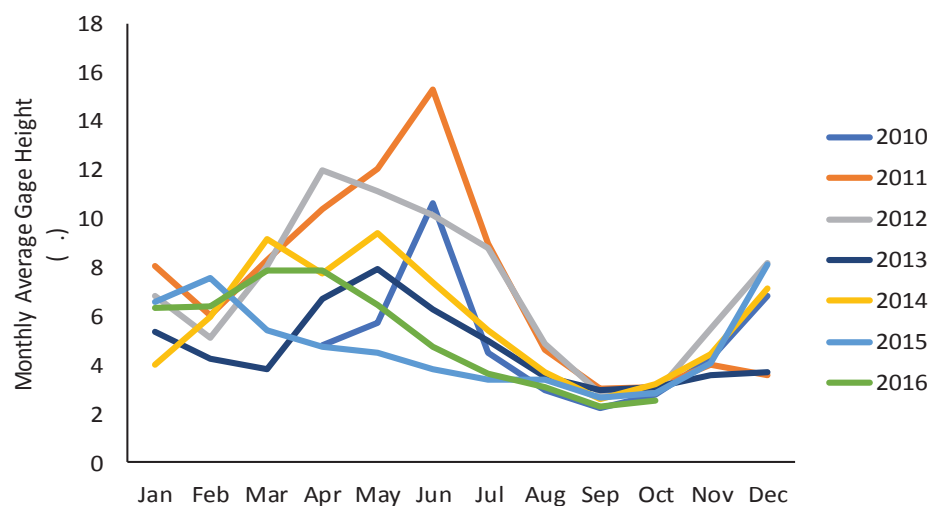
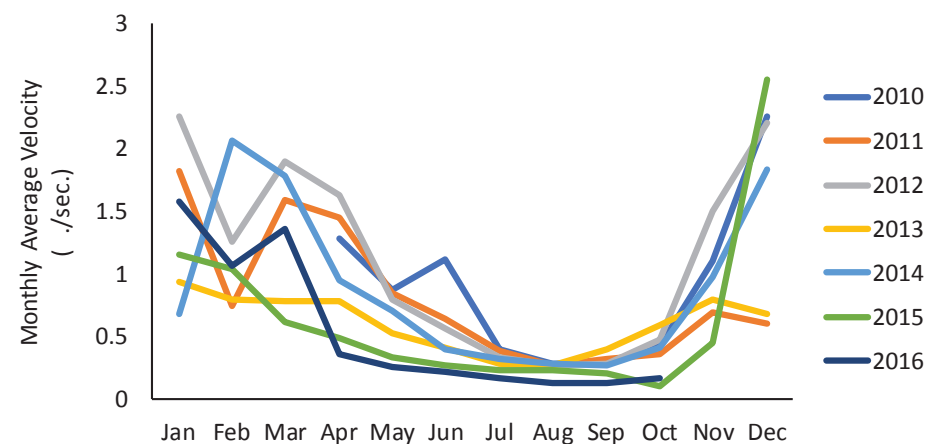
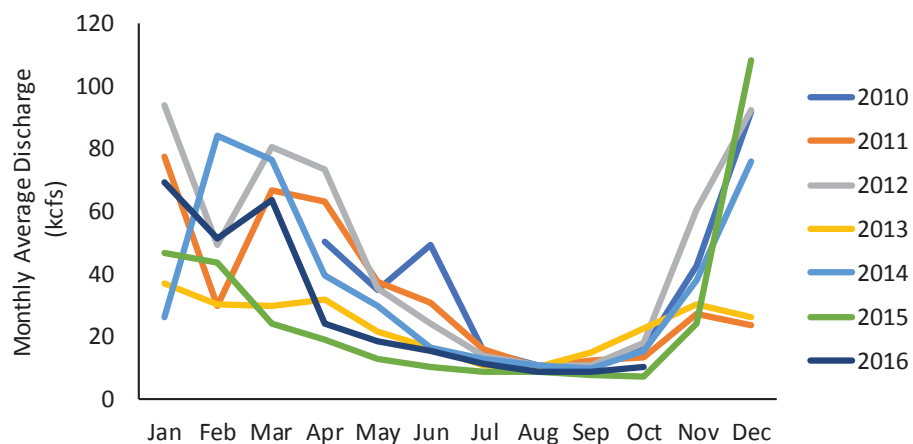


**PDI Surface Water
and Sediment Trap Sampling Locations**
Portland Harbor Superfund Site
Pre-RD Investigation Study

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MI 04-Dec-2017

Figure
6



Notes:

kcfs – Thousand cubic feet per second

ft./sec. – feet per second

ft. – feet

1. Data were obtained from USGS Oregon Water Science Center for Station ID 14211720 Willamette River at Portland, OR near the Morrison Bridge (<https://or.water.usgs.gov/>); and provisional, uncorrected raw data from the Swan Island Pump Station Rain Gauge for the City of Portland Hydra Network (https://or.water.usgs.gov/precip/swan_island_pump.rain).

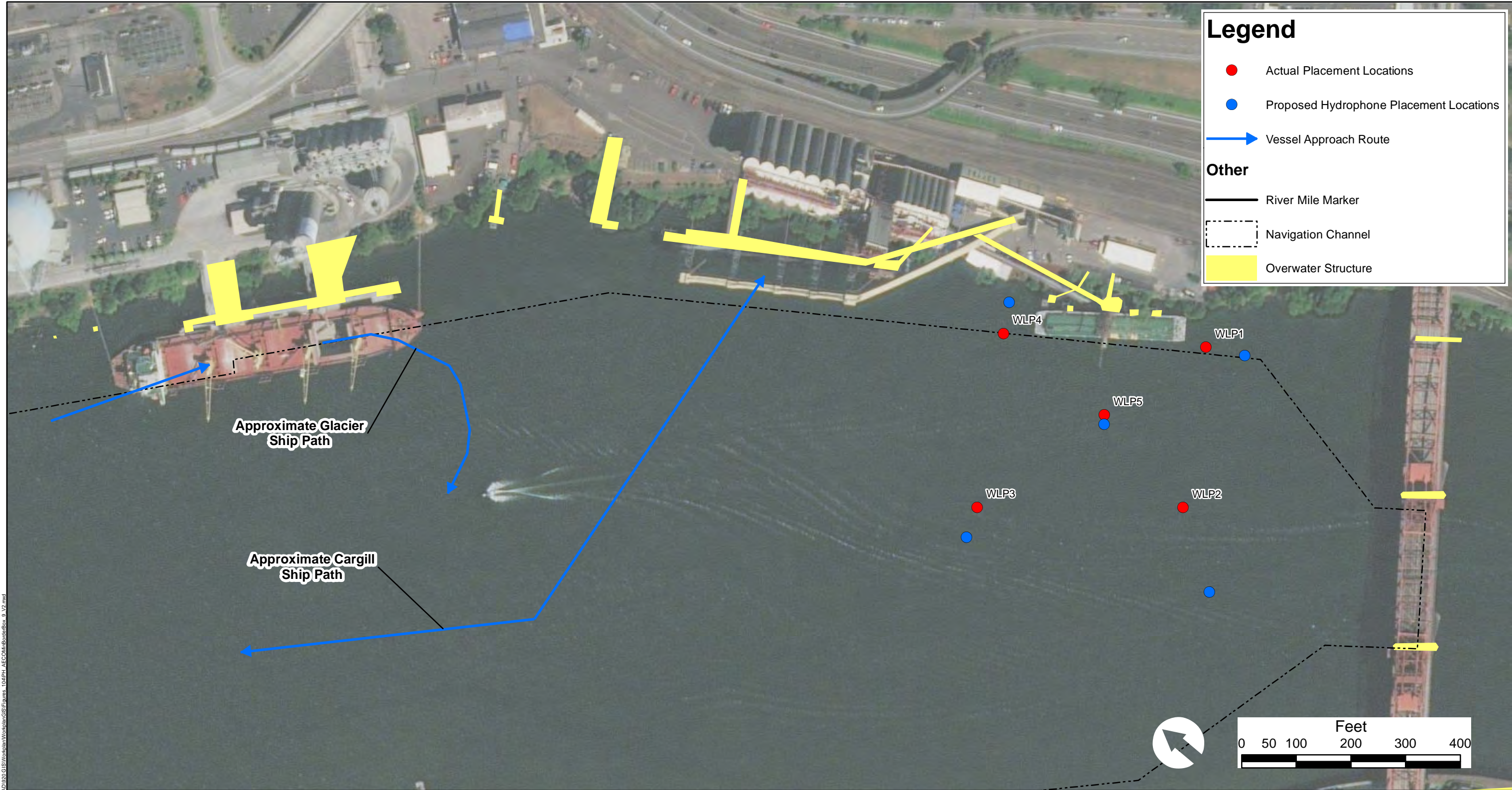
Monthly Average Discharge, Velocity, Gauge Height, and Rainfall Portland Harbor Superfund Site

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Figure
7



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Note:
1. AECOM, 2017

Fish Tracking Pilot Study (June 2017)
Vessel Routes and Hydrophone and Camera Locations
at RM11.5E Study Area
Portland Harbor Superfund Site
Pre-RD Investigation Study

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Figure
8



Legend

Actual Placement Locations

Proposed Hydrophone Placement Locations

Other

River Mile Marker

Navigation Channel

Note:
1. AECOM, 2017

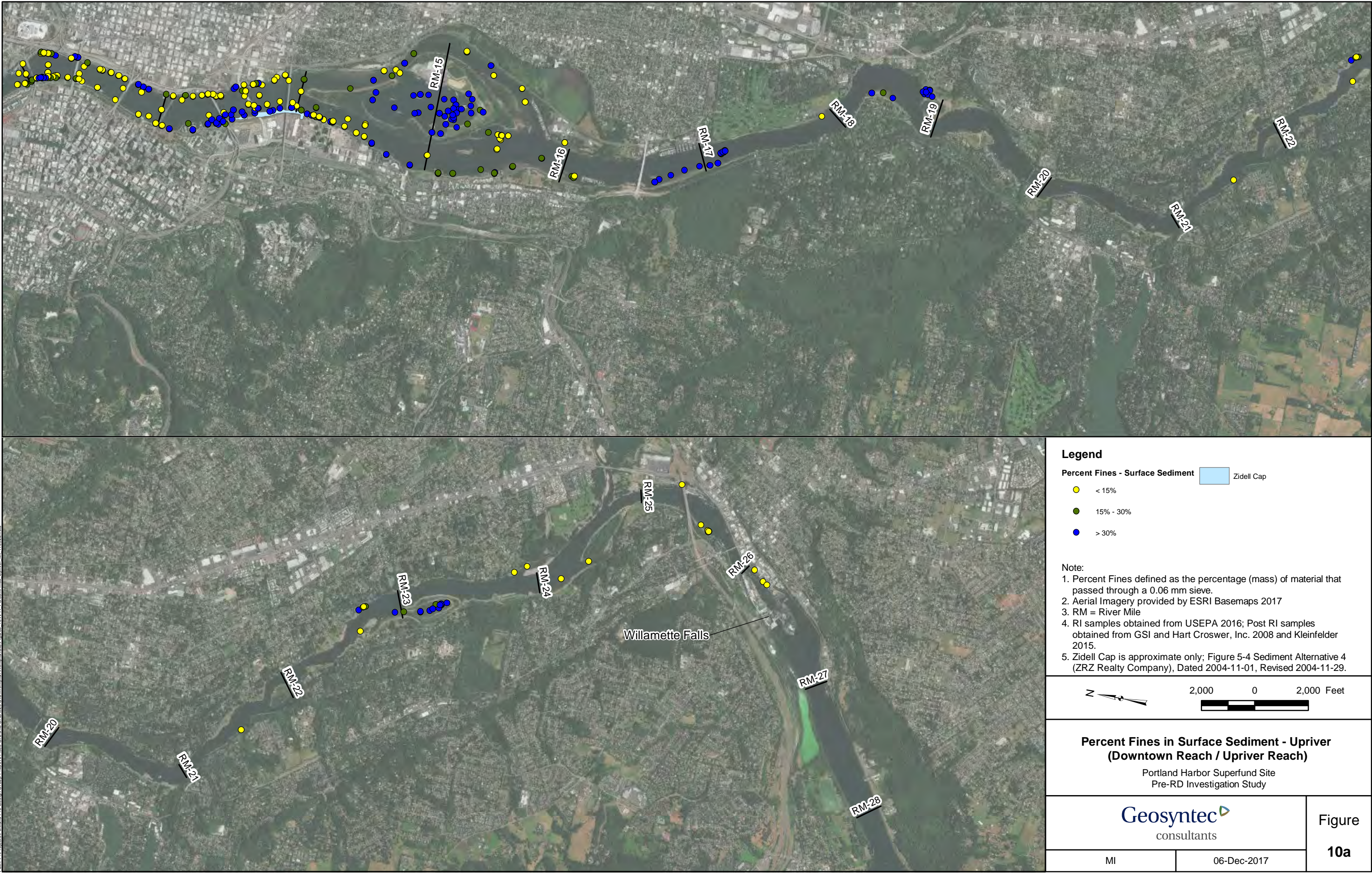
**Fish Tracking Pilot Study (June 2017)
Hydrophone and Camera Locations
at Willamette Cove Study Area**
Portland Harbor Superfund Site
Pre-RD Investigation Study

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04-Dec-2017

Figure
9



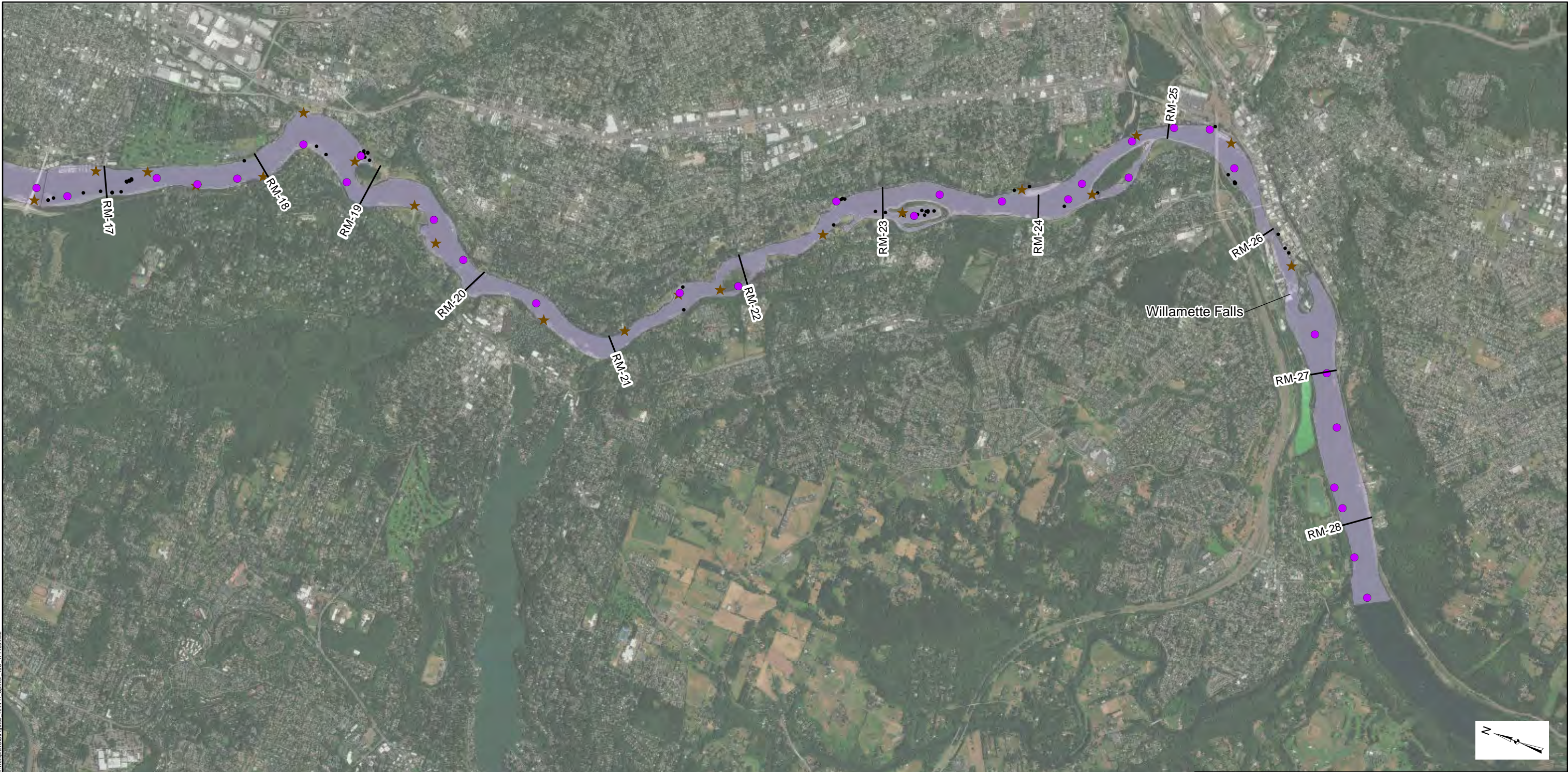
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Note (12/01/17) - Surface sediment and fish tissue sample locations shown in this figure are example placements only and will not reflect the final positioning based on field conditions.

Legend		Note: 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 USEPA 2016; Post RI samples obtained from GSI and Hart Crowser, Inc. 2008 and Kleinfelder 2015 5. Zidell Cap is approximate only; Figure 5-4 Sediment Alternative 4 (ZRZ Realty Company), Dated 2004-11-01, Revised 2004-11-29 6. Sediment grab locations to be confirmed in the field and placed in areas of fine-grained material	
● Proposed Sediment Grab Sample Location (n = 30)	■ Proposed Surface Water Transect		
★ Proposed Fish Tissue Sample Location (n = 20)	■ Zidell Cap		
◆ Proposed Surface Water Sample Location (n = 6)			
◇ Proposed Sediment Trap Sample Location (n = 4)			
• Historical Sediment Grab Sample			

Upriver (Downtown Reach) Sampling Area (RM 11.8 to 16.6) Portland Harbor Superfund Site Pre-RD Investigation Study	
Geosyntec consultants	
MI/JR	06-Dec-2017
Figure 10b	



Note (12/01/17) - Surface sediment and fish tissue sample locations shown in this figure are example placements only and will not reflect the final positioning based on field conditions.

Legend		Note:	
Proposed Sediment Grab Sample Location (n = 30)	Proposed Surface Water Transect	1. Aerial Imagery provided by ESRI Basemaps 2017	
Proposed Fish Tissue Sample Location (n = 20)	Zidell Cap	2. RM = River Mile	
Proposed Surface Water Sample Location (n = 6)		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)	
Proposed Sediment Trap Sample Location (n = 4)		4. RI samples obtained from USEPA 2016; Post RI samples obtained from GSI and Hart Croswer, Inc. 2008 and Kleinfelder 2015	
Historical Sediment Grab Sample		5. Zidell Cap is approximate only; Figure 5-4 Sediment Alternative 4 (ZRZ Realty Company), Dated 2004-11-01, Revised 2004-11-29	
		6. Sediment grab locations to be confirmed in the field and placed in areas of fine-grained material	
		Upriver (Upriver Reach) Sampling Area (RM 16.6 to 28.4)	
		Portland Harbor Superfund Site Pre-RD Investigation Study	
		Figure 10c	
		MI/JR	06-Dec-2017



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Photographs of Porewater Peepers

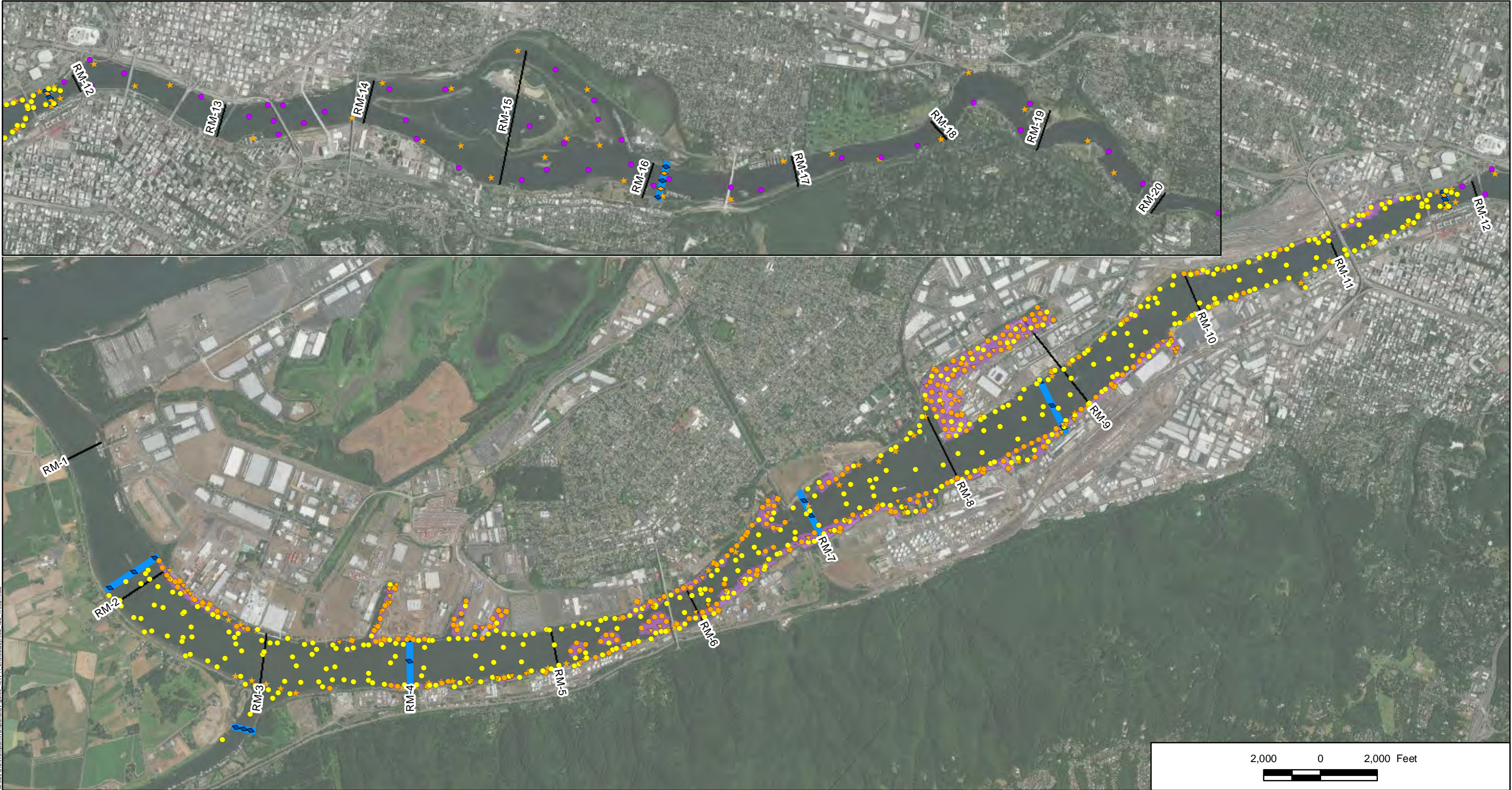
Portland Harbor Superfund Site
Pre-RD Investigation Study

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Figure
11

MI

04-Dec-2017



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Legend

- Proposed Stratified Random Sediment Sample Location (n = 428)
- Proposed Sediment Grab Location for SMA Delineation* (n = 178)
- Proposed Subsurface Core Location for SMA Delineation* (n = 60)
- Proposed Bank Shallow Core Sample for SMA Delineation (n = 30)
- Proposed Upriver Sediment Grab Sample Location (n = 60)
- Proposed Fish Tissue Sample Location (n = 135)
- Proposed Surface Water Sample Location (n = 21)
- Proposed Sediment Trap Sample Location (n = 4)
- Surface Water Transect
- Alt F Mod SMA Footprint

Note:

- Aerial Imagery provided by ESRI Basemaps 2017
- RM = River Mile
- Site defined as RM 1.9 to 11.8
- Upriver defined as RM 11.8 to 28.4
- Upriver sediment grab locations to be confirmed in the field and placed in areas of fine-grained material
- *: Surface sample will be collected at the core location.
- 5 grab samples and 4 cores were removed from the RM 11E vicinity and will be redistributed in the site (TBD).

**Summary of PDI Sampling Locations
(RM 1.9 to 20)**

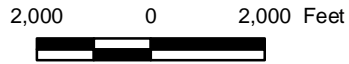
Portland Harbor Superfund Site
Pre-RD Investigation Study

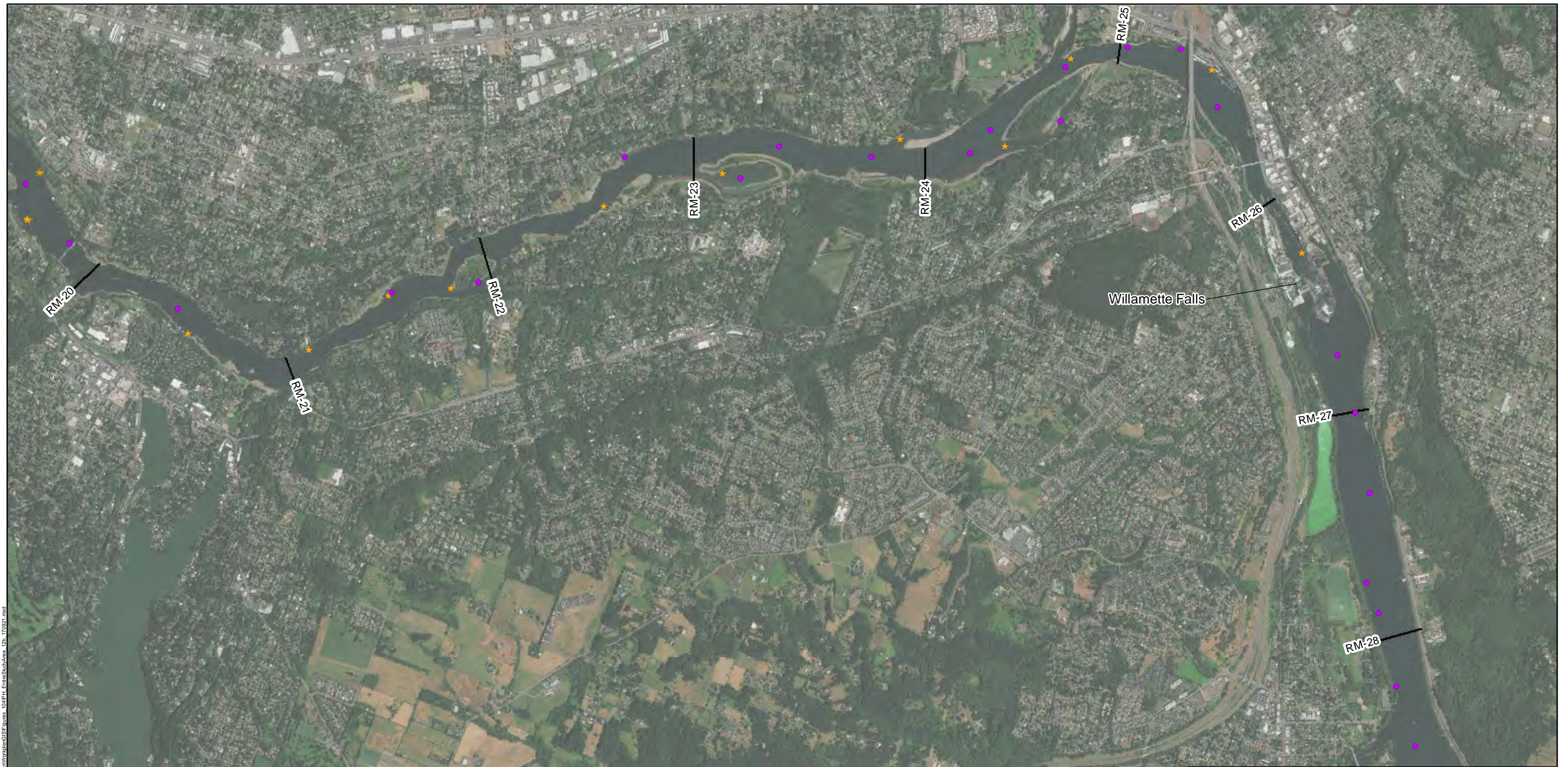
Geosyntec
consultants

**Figure
12a**

MI/JR

06-Dec-2017





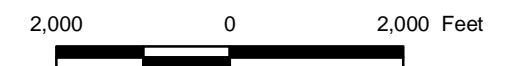
Note (12/01/17) - Surface sediment and fish tissue sample locations shown in this figure are example placements only and will not reflect the final positioning based on field conditions.

Legend

- | | | | |
|---|---|---|---|
| ● | Proposed Stratified Random Sediment Sample Location (n = 428) | ◆ | Proposed Surface Water Sample Location (n = 21) |
| ● | Proposed Sediment Grab Location for SMA Delineation* (n = 178) | ◆ | Proposed Sediment Trap Sample Location (n = 4) |
| ▲ | Proposed Subsurface Core Location for SMA Delineation* (n = 60) | ■ | Surface Water Transect |
| ■ | Additional Bank Shallow Core Sample for SMA Delineation (n=30) | ■ | Alt F Mod SMA Footprint |
| ● | Proposed Upriver Sediment Grab Sample Location (n = 60) | | |
| ★ | Proposed Fish Tissue Sample Location (n = 135) | | |

Note:

1. Aerial Imagery provided by ESRI Basemaps 2017
2. RM = River Mile
3. Site defined as RM 1.9 to 11.8
4. Upriver defined as RM 11.8 to 28.4
5. Upriver sediment grab locations to be confirmed in the field and placed in areas of fine-grained material
6. *: Surface sample will be collected at the core location.



Summary of PDI Sampling Locations (RM 20 to 28.4)

Portland Harbor Superfund Site
Pre-RD Investigation Study

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consultants

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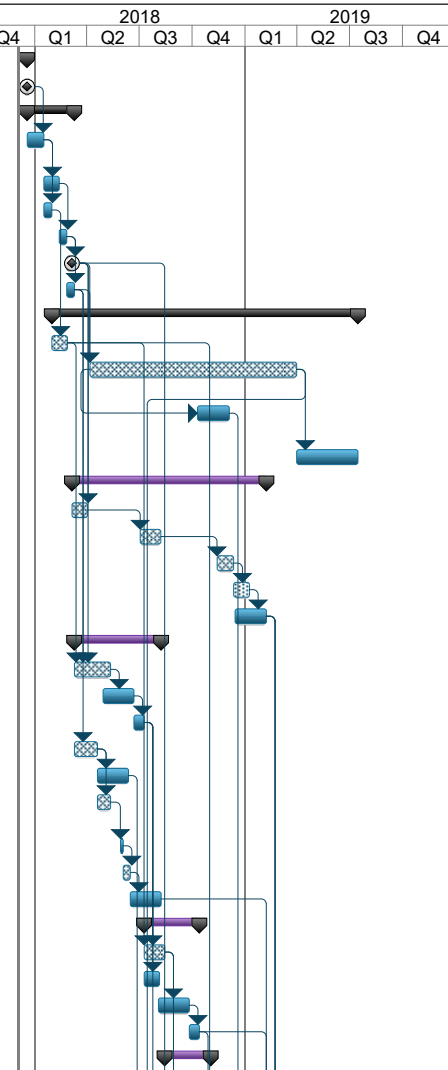
04-Dec-2017

Figure
12b

Project Start Date: Sun 1/1/17
Project Finish Date: Sat 10/12/19

Portland Harbor Superfund Site, Portland OR Pre-Remedial Design Investigation Study (PDI) Project Schedule D

ID	Task Name	Duration	Start	Finish	Predecessors	2017				2018				2019			
						Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	ASAOC and SOW	1 day	Mon 12/18/17	Mon 12/18/17													
2	Signed ASAOC and Finalize Work Plan	1 day	Mon 12/18/17	Mon 12/18/17													
3	Field Project Plans (QAPP, FSP, HASP, DQMP)	90 days	Mon 12/18/17	Sat 3/10/18													
4	Draft Project Plans QAPP/FSP/HASP/DQMP to EPA (due 30 days after signed ASAOC)	30 days	Mon 12/18/17	Tue 1/16/18	2												
5	EPA review of QAPP/FSP/HASP/DQMP	30 days	Tue 1/16/18	Mon 2/12/18	4												
6	Target expedited approval of Bathymetry FSP	16 days	Tue 1/16/18	Tue 1/30/18	4												
7	Revise Plans and submit to EPA	15 days	Mon 2/12/18	Sun 2/25/18	5												
8	Finalize Plans and Permitting Requirements	10 days	Sun 2/25/18	Tue 3/6/18	7												
9	Contact site owners for access/ Sub Contracting	15 days	Sun 2/25/18	Sat 3/10/18	7												
10	Field Sampling and Lab Analysis	594 days	Tue 1/30/18	Mon 7/15/19													
11	Collect Bathymetry Data	30 days	Tue 1/30/18	Mon 2/26/18	6												
12	Fish Tracking Study (Target mid-April; pilot completed June 2017)	400 days	Fri 4/6/18	Sun 3/31/19	9FS+30 days,8												
13	6-Month Fish Tracking Data Download (+60 days post-process)	60 days	Wed 10/10/18	Tue 12/4/18	12SS+210 days												
14	12-Month Fish Tracking Data Report to EPA	120 days	Sun 3/31/19	Mon 7/15/19	12												
15	Collect Surface Water and Upriver Sed Traps	376.38 days	Tue 3/6/18	Wed 2/6/19													
16	Collect SW transects - storm (Target March)	30 days	Tue 3/6/18	Mon 4/2/18	8												
17	Collect SW transects - summer low (Target July/Aug)	40 days	Tue 7/3/18	Tue 8/7/18	16												
18	Collect SW transects - winter flood (Target Dec)	30 days	Tue 11/13/18	Tue 12/11/18	17FS+110 days												
19	Collect last sediment trap	30 days	Wed 12/12/18	Tue 1/8/19	18												
20	Lab testing and data validation	60 days	Fri 12/14/18	Wed 2/6/19	19FS-90%												
21	Collect Surface Sediment Data and Porewater	169 days	Sat 3/10/18	Wed 8/8/18													
22	Boat 1 - collect sediment grabs (200 grabs/mth, random)	70 days	Sat 3/10/18	Sat 5/12/18	8,9,11												
23	Lab testing and data validation (sediment)	60 days	Sun 4/29/18	Thu 6/21/18	22FS-20%												
24	Database (sediment grabs)	20 days	Fri 6/22/18	Mon 7/9/18	23												
25	Boat 2 - collect upriver sediment (10 grabs/wk)	45 days	Sat 3/10/18	Thu 4/19/18	9												
26	Lab testing and data validation (upstream grabs)	60 days	Thu 4/19/18	Tue 6/12/18	25												
27	Boat 2 - Help finish surface grabs while waiting to retrieve porewater samples (175 SMA grabs)	25 days	Thu 4/19/18	Sat 5/12/18	25												
28	Boat 2 - deploy porewater sampler (Target July/Aug)	5 days	Tue 5/29/18	Sun 6/3/18	27FS+20 days												
29	Boat 2 - collect porewater samples (Target July/Aug)	14 days	Sun 6/3/18	Fri 6/15/18	28												
30	Lab testing and data validation (PW)	60 days	Fri 6/15/18	Wed 8/8/18	29												
31	Collect Sediment Cores	108 days	Mon 7/9/18	Sat 10/13/18													
32	Boat 3 - collect sediment cores (50/mth)	40 days	Mon 7/9/18	Tue 8/14/18	24,11												
33	Boat 4 - collect nearshore cores (60/mth)	30 days	Mon 7/9/18	Sun 8/5/18	24												
34	Lab testing and data validation (cores)	60 days	Fri 8/3/18	Tue 9/25/18	32FS-30%												
35	Database (cores)	20 days	Wed 9/26/18	Sat 10/13/18	34												
36	Collect Fish Tissue	90 days	Tue 8/14/18	Fri 11/2/18													



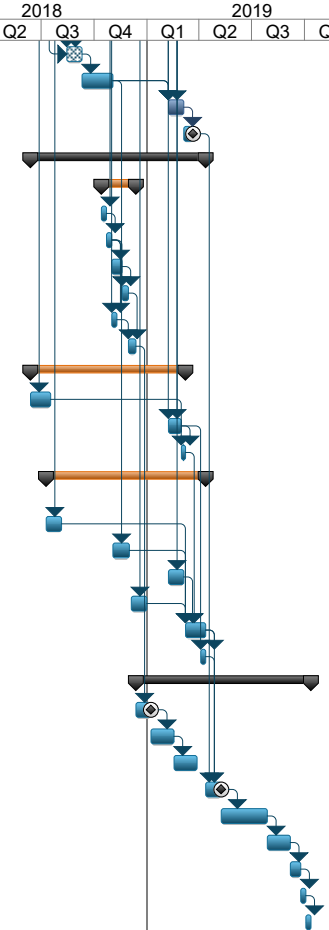
Task		Summary		External Milestone		Deadline	
Split		Project Summary		Manual Task			
Milestone		External Tasks		Progress			

Note: Timeline is shown in calendar days.
Last Updated: Mon 12/4/17

Project Start Date: Sun 1/1/17
Project Finish Date: Sat 10/12/19

Portland Harbor Superfund Site, Portland OR Pre-Remedial Design Investigation Study (PDI) Project Schedule D

ID	Task Name	Duration	Start	Finish	Predecessors	2017				2018				2019			
						Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
37	Collect Fish tissue (Target Aug/Sept 2018)	30 days	Tue 8/14/18	Sun 9/9/18	12FS-150%,8,32												
38	Lab testing and data validation (fish tissue)	60 days	Mon 9/10/18	Fri 11/2/18	37												
39	Database Management (completion)	30 days	Thu 2/7/19	Tue 3/5/19	35,38,20,30												
40	Send ALL field validated data to EPA	18 days	Tue 3/5/19	Thu 3/21/19	39												
41	Data Analysis and Evaluation	339.38 days	Tue 6/12/18	Fri 4/12/19													
42	Evaluate Sediment and SMAs	65 days	Sat 10/13/18	Wed 12/12/18													
43	Compile data into GIS maps and tables	10 days	Sat 10/13/18	Mon 10/22/18	35												
44	Calculate new sediment SWACs	10 days	Mon 10/22/18	Wed 10/31/18	43												
45	Evaluate MNR changes - sediment	20 days	Wed 10/31/18	Sun 11/18/18	44												
46	Refine SMA boundaries	10 days	Sun 11/18/18	Thu 11/29/18	44,45												
47	Evaluate technologies based on new elevations	10 days	Wed 10/31/18	Fri 11/9/18	44,11												
48	Run new footprints through decision tree	15 days	Thu 11/29/18	Wed 12/12/18	47,46												
49	Baseline Upriver	299.38 days	Tue 6/12/18	Fri 3/8/19													
50	Evaluate upriver - sediment	40 days	Tue 6/12/18	Tue 7/17/18	26												
51	Evaluate upriver - tissue, surface water, traps	25 days	Thu 2/7/19	Fri 3/1/19	38,20												
52	Evauate incoming contaminant loads	8 days	Fri 3/1/19	Fri 3/8/19	50,51												
53	Baseline Site - Conceptual Site Model (sediment, SW, tissue, fish tracking)	308.38 days	Mon 7/9/18	Fri 4/12/19													
54	Evaluate surface sediment conditions	30 days	Mon 7/9/18	Sun 8/5/18	24												
55	Evaluate tissue conditions	30 days	Fri 11/2/18	Fri 11/30/18	38												
56	Evaluate surface water data	30 days	Thu 2/7/19	Tue 3/5/19	20												
57	Evaluate SWAC segment size fish tracking study	30 days	Tue 12/4/18	Mon 12/31/18	13												
58	Summarize CSM baseline conditions/ evaluate CSM	40 days	Fri 3/8/19	Fri 4/12/19	54,57,55,56,52												
59	Compare site data to upriver	10 days	Thu 4/4/19	Fri 4/12/19	58FS-10 days,51												
60	Deliverables	340.38 days	Wed 12/12/18	Sat 10/12/19													
61	Pre-RD SMA Remedial Footprint Report to EPA (Due 1/7/19)	28 days	Wed 12/12/18	Mon 1/7/19	48												
62	EPA review	45 days	Mon 1/7/19	Sat 2/16/19	61												
63	Revised Pre-RD footprint report to EPA	45 days	Sat 2/16/19	Thu 3/28/19	62												
64	PDI Evaluation Report to EPA (Due 5/9/19)	30 days	Fri 4/12/19	Thu 5/9/19	40,58,59												
65	EPA review	90 days	Thu 5/9/19	Sun 7/28/19	64												
66	Revisions and Revised PDI Evaluation Report to EPA	45 days	Sun 7/28/19	Fri 9/6/19	65												
67	EPA Approval of PDI Evaluation Report (TBD)	20 days	Fri 9/6/19	Tue 9/24/19	66												
68	Posting of Electronic Final Files (TBD)	10 days	Tue 9/24/19	Thu 10/3/19	67												
69	ASAO/SOW Notice of Completion (TBD)	10 days	Thu 10/3/19	Sat 10/12/19	68												



Task		Summary		External Milestone		Deadline	
Split		Project Summary		Manual Task			
Milestone		External Tasks		Progress			

Note: Timeline is shown in calendar days.

Last Updated: Mon 12/4/17

Figure 13: Page 2 of 2

APPENDIX A

Summary of Data Collected Since the RI/FS

APPENDIX A
SUMMARY OF DATA COLLECTED SINCE THE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

Pre-Remedial Design Work Plan
Portland Harbor Superfund Site

SUMMARY OF DATA COLLECTED SINCE THE RI/FS

This appendix summarizes the eight environmental studies that were conducted after the remedial investigation (RI) was completed in 2008. The studies were conducted between 2008 and 2016 and included collection of surface and subsurface sediments, smallmouth bass (SMB) tissue samples, and sediment profile imaging (SPI)¹.

Field and Data Report, Downtown Portland Sediment Characterization Phase I and II, GSI and Hart Crowser, Inc. 2008 and June 2010

Phase I of the Downtown Portland Sediment Characterization (DPSC) was initiated by Oregon Department of Environmental Quality (ODEQ) in 2008 to assess the presence of environmental contaminants within the downtown Reach (River Mile [RM] 12 to RM 16). Between May and June 2008, 81 grab samples and 36 core samples were collected and analyzed for polychlorinated biphenyls (PCB) Aroclors, butyltins, dioxins/furans (D/F), metals, pesticides, polycyclic aromatic hydrocarbons (PAHs), semi-volatile organic compounds (SVOCs), and total petroleum hydrocarbons (TPHs). Surface sediment samples were collected by power-grab (with a maximum penetration capability of 22 centimeters) (GSI Water Solutions, Inc. [GSI] and Hart Crowser 2010).

ODEQ conducted a preliminary screening level evaluation of this data to identify areas where additional sampling was warranted to confirm the detection of elevated contaminants of concern (COCs), identify sources if possible, and delineate areas needing remediation. Concentrations of COCs in sediment were compared to screening values developed for the Portland Harbor Joint Source Control Strategy. Based on the relative proportion of samples exceeding screening values, ODEQ identified nine Focus Areas for additional investigation and source identification efforts (GSI and Hart Crowser 2010).

In Phase I, PCB Aroclors were detected in 69% of 100 surface and 70% of 20 subsurface sediment samples, with concentrations ranging from <1 microgram per kilogram (µg/kg) to 4,200 µg/kg and <1 µg/kg to 610 µg/kg, respectively. Total sum of dichlorodiphenyltrichloroethane and its derivatives (DDx) was detected in 88% of 100 surface and 75% of 20 subsurface samples, with concentrations ranging from <0.047 µg/kg to 144 µg/kg and <0.13 µg/kg to 300.5 µg/kg, respectively. Total PAHs were detected in 99% of 100 surface and 100% of 20 subsurface samples, with concentrations ranging from <0.28 µg/kg to 40,310 µg/kg and 72 µg/kg to 7,802 µg/kg, respectively.

¹ Any conclusions made by the Pre-RD group from the studies presented in Appendix A, or by the authors of these studies, have not yet been reviewed and approved by EPA.

Total D/F were detected in 93% of 58 surface and 14 subsurface samples, with concentrations ranging from <4.14 nanograms per kilogram (ng/kg) to 15,400 ng/kg and <2.88 ng/kg to 4,594 ng/kg, respectively (GSI and Hart Crowser 2010).

Phase II of the DPSC was conducted in 2010 to better understand the nature and extent of potential COCs within nine Focus Areas and the TriMet Supplemental Sampling Area. ODEQ identified the following Focus Areas: RM 12.1E, 12.4W, 12.5E, 12.9W, 13.1E, 13.3E, 13.5E, 14.1W, and 15.1E. Along with analysis of archived Phase I samples in these Focus Areas, an additional 27 grab samples and 9 core samples were collected between February and March 2010. Surface grabs were collected via Van Veen sampler, pneumatic power-grab sampler, diver-assisted grab samples, and, due to low water levels, dry-land sampling methods for one location. The average grab sample recovery depth was 11 centimeters below mudline (bml). Core samples were collected by vibracore with an average recovery depth of 4.8 feet bml. Surface grab samples and cores were analyzed for a focused set of target parameters (with a few exceptions). The “Partial Analyte Group” included PCB Aroclors, total organic carbon (TOC) and total solids; TriMet samples included grain size, metals, PAHs, pesticides, and TPHs (GSI and HartCrowser 2010).

In Phase II, PCB Aroclors were detected in 79% of 38 surface and 89% of 9 subsurface sediment samples, with concentrations ranging from <1.3 µg/kg to 520 µg/kg and <1.3 µg/kg to 147 µg/kg, respectively. Total DDX was detected in 98% of 40 surface and 100% of 10 subsurface samples, with concentrations ranging from <0.05 µg/kg to 73 µg/kg and <0.14 µg/kg to 73 µg/kg, respectively. Total PAHs were detected in 100% of 29 surface and 10 subsurface samples, with concentrations ranging from 4.0 µg/kg to 32,030 µg/kg and 76 µg/kg to 5,680 µg/kg, respectively. Total D/F were detected in 100% of 16 surface and 4 subsurface samples each, with concentrations ranging from 7.7 ng/kg to 7,021 ng/kg and 112 ng/kg to 2,351 ng/kg, respectively (GSI and Hart Crowser 2010).

Upon review of the Phase II data, ODEQ identified four areas which warranted follow-up evaluations: RM 12.1E, RM 12.5E, RM 12.9W, and RM 15.1E. These areas were referred to ODEQ’s Site Assessment Program to evaluate potential sources and the need for source control. As of 2011, ODEQ did not recommend additional in-river investigation in the Downtown Reach. ODEQ expects that concentrations will decline over time as sources are identified and addressed and natural recovery occurs. The Phase II investigation found that COCs were much lower than those found in the Site and ODEQ

believes the Downtown Reach is not a significant ongoing upstream source (ODEQ 2011).

Smallmouth Bass Tissue Sampling, GSI, September 2011

In September 2011, United States Environmental Protection Agency (EPA) and the City of Portland performed SMB sampling throughout the Study Area to support the Remedial Investigation/Feasibility Study (RI/FS). The study design and methods are described in the 2011 sampling and analysis plan (SAP) (GSI 2011). The SAP identified collection of individual (non-composited) SMB fish from 136 locations between RM 1 and RM 16, with 4 samples from RM 1 to RM 1.9, four from Multnomah Channel, 123 from the Study Area (including 11 from Swan Island Lagoon), and five from RM 15E. Each sample was identified for analysis of the full suite of PCB congeners, SVOCs, PAHs, and organochlorine pesticides (GSI 2011). The analytical laboratory contracted by EPA incorrectly prepared 75% of the samples as skin-off fillets, discarding the remainder of the carcass instead of processing the whole fish. Thus, results from the 2011 sampling effort are limited. Of the 32 reconstituted whole body Site samples with total PCB data, the mean concentration was 530 µg/kg with a standard deviation of 868 µg/kg (Legacy Site Services [LSS] 2015).

Smallmouth Bass Tissue Study, Data Report, Kennedy/Jenks, March 2013

In late summer/early fall of 2012, the Lower Willamette Group (LWG) conducted fish tissue sampling and analysis under the oversight of EPA. The primary purpose of the sampling was to provide an additional line of evidence to support the monitored natural recovery (MNR) Site-wide evaluation presented in the draft FS (Kennedy/Jenks 2013a). A total of 83 discrete SMB samples were collected in the Study Area and 9 SMB samples were collected from RM 15 to RM 18. With one exception, 4 to 12 samples were collected per RM and in Swan Island Lagoon (n = 8); one sample was collected in RM 2. All fish were caught using conventional rods and reels, with the assistance of contract anglers from the Oregon Bass & Panfish Club and The Bass Federation of Oregon. All 92 samples were analyzed as whole-body individuals for lipids and PCB congeners.

In the Study Area, the concentrations of total PCBs in whole body SMB ranged from 0.092 milligrams per kilogram (mg/kg) to 6.47 mg/kg. The mean concentration of total PCBs in whole body SMB was 0.65 mg/kg, with a standard deviation of 1.19 mg/kg. Upriver, the concentrations of total PCBs in whole body SMB ranged from 0.051 mg/kg

to 0.63 mg/kg. The mean concentration of total PCBs in whole body SMB was 0.23 mg/kg, with a standard deviation of 0.19 mg/kg. This data was not included in the FS.

In summary, the mean 2012 PCB SMB tissue concentrations were lower than the mean concentrations of the combined 2002 and 2007 SMB data that were used in the RI/FS and risk assessments on an RM and Study Area basis, except for RM 10 (Kennedy/Jenks 2013a). The Pre-RD Group concludes, based on statistical comparisons of the two data sets on a Study Area-wide scale, total PCB congener concentrations in whole body SMB tissue show a statistically significant ($p < 0.05$) decrease from the 2002 and 2007 data (Kennedy/Jenks 2013b, LSS 2015). The 2012 SMB data support that natural recovery is occurring on a system-wide scale.

Characterization of the Lower Willamette River with Sediment Profile Imaging, Changes in Space and Time. Germano and Associates. June 2014

The purpose of the study was to provide information on the physical and biological features of the surface sediments in the Lower Willamette River through specialized photography and compare to similar work performed in many of the same locations as work performed in 2001 by the LWG during the RI. The 2014 effort used the same people and protocol as the 2001 work, but was enhanced by updated technology (Germano and Associates 2014). Results of the SPI showed significant recovery in benthic infaunal successional stage compared to the 2001 RI results. These results support the fish tissue studies indicating natural recovery is occurring throughout the Study Area.

Final Supplemental RI/FS Study Field Sampling and Data Report. River Mile 11 East, GSI, July 2014

The River Mile 11 East Early Action Area is part of the Portland Harbor Superfund Site (PHSS) and was identified as a PCB “hot spot” which required accelerated remediation as per the EPA’s settlement agreement in 2013. Surface sediment sampling was conducted in October 2013. The limited-access surface sediment samples were collected by divers using a hand-coring device during May 2014 (GSI 2014).

Nine surface (bank) soil samples were collected and analyzed for PCB Aroclors, hydrocarbons (diesel range and residual range hydrocarbons), PAHs, pesticides, metals, phthalates, SVOCs, TOC, total solids, grain size, and D/F. Surface soil samples were composited and represented the 0- to 1-foot depth (GSI 2014).

22 surface sediment samples were collected and analyzed for PCB Aroclors, TOC, total solids, and grain-size distribution. In addition, samples from six re-occupied stations were analyzed for organochlorine pesticides. Of the 22 samples, 12 were collected by a pneumatic power-grab sampler, and 10 samples were collected by divers. The target depth for surface sediment samples was 30 centimeters bml (with a minimum acceptable penetration of 20 centimeters) (GSI 2014).

Total PCB Aroclors were analyzed in 22 surface sediment samples with 100% detection frequency. Concentrations of total PCB Aroclors ranged from 2.5 µg/kg to 1,405 µg/kg, with a median concentration of 93.5 µg/kg. Total dichlorodiphenyltrichloroethane (DDT) was analyzed in six surface sediment samples with 100% detection frequency. Concentrations of total DDT ranged from 0.24 µg/kg to 9.5 µg/kg, with a median concentration of 2.05 µg/kg. Total D/F were analyzed in four samples with 100% detection frequency. Concentrations of total D/F ranged from 556 ng/kg to 2,160 ng/kg, with a median concentration of 1,357.5 ng/kg (GSI 2014).

Sediment Sampling Data Report, Portland Harbor, Kleinfelder, June 2015

The purpose of the 2014 sediment investigation was to: (i) assess the current concentrations of PCB Aroclors in surface sediments (0-30 centimeters) from RM 2 to RM 16.2; (ii) provide data to compare with prior results and with concentrations predicted by the sediment recovery food web model (FWM); and (iii) develop a dataset representative of current PCB concentrations to be used in developing future remedial actions. Samples were collected from November to December 2014 (Kleinfelder 2015).

Within the PHSS, 98 surface sediment samples were collected, and 27 surface sediment samples were collected within the Downtown Reach (RM 11.8 to RM 16). Samples were collected using a hydraulic power-grab sampler (maximum penetration of 30 centimeters bml) and analyzed for PCB Aroclors, TOC, and grain size (Kleinfelder 2015).

Total PCBs were detected in 113 of 125 (90%) surface sediment samples. In Site sediment samples, total PCBs ranged from <0.7 µg/kg to 5,180 µg/kg. One sample was reported at 7,420 µg/kg; however, due to analytical interference, this sample was flagged as non-detect. In the upstream area (RM 11.8 to 16.2), total PCBs ranged from <0.7 µg/kg to 61.1 µg/kg. TOC ranged from 820 mg/kg wet weight to 35,000 mg/kg wet weight. Grain size results for the upstream area showed a lower percentage of fines (silt and clay) compared to Site samples (Kleinfelder 2015). Results showed that PCBs in surface

sediments were generally lower when compared to RI data co-located stations suggesting that natural recovery is occurring.

Concentrations and Character of PAH in Sediments in Area of River Miles 5 to 6, 2015 Investigation, NewFields, March 2016

Two sampling events were conducted during 2014 and 2015 to investigate the nature and extent of PAHs in sediments in an area between RM 5 and the St. Johns Bridge (RM 6). The potential for Principal Threat Waste (PTW) was also assessed for the various possible dredge horizon intervals. Sediment samples were analyzed for PCBs, D/F, DDx, and carcinogenic polycyclic aromatic hydrocarbons (cPAHs) (Benzo[a]pyrene Equivalents [BaP Eq]) (NewFields 2016).

The sediment bed depth intervals sampled in this study included: (i) Interval A, Surface, 0 to 1-foot bml; (ii) Interval B, Future Channel, -48 to -49 feet below Columbia River Datum (CRD); (iii) Interval C, Future Overdredge, -51 to -52 feet below CRD; and (iv) Interval D, Future Overdredge (plus cap buffer), -53 to -54 feet below CRD. 53 samples were taken at Sampling Interval A, 15 samples were taken at Interval B, 34 samples were taken at Interval C, and 40 samples were taken at Interval D (NewFields 2016).

Total PCB Aroclors were detected in 26 of 31 (84%) sediment samples, with concentrations ranging from <0.02 µg/kg to 27.8 µg/kg. Total DDx were detected in 22 of 31 (71%) samples, with concentrations ranging from <0.036 µg/kg to 58.3 µg/kg. Total PAHs were detected in 100% of 150 samples, with concentrations ranging from 1.3 µg/kg to 1,376,830 µg/kg (reported as sum of 17 PAHs). Total D/F were detected in 100% of 31 samples, with concentrations ranging from 5.9 ng/kg to 5,291 ng/kg. The mean concentrations of PCBs, DDx, selected chlorinated D/F isomers, BaP Eq did not exceed PTW classifications (NewFields 2016).

**Sediment Sampling Data Report, Swan Island Lagoon, Geosyntec Consultants,
August 2016**

20 surface sediment (0-30 centimeters) samples were collected within Swan Island Lagoon (RM 8 to 9) during March 2016. Samples were analyzed for PCB Aroclors, TOC, and grain size. Sediment sample locations were co-located with previously sampled locations by the LWG for the RI/FS (1998-2007). The purpose of the study was to evaluate if natural recovery of sediments is occurring in Swan Island Lagoon by comparing the 2016 results to the older RI/FS results (Geosyntec 2016).

PCB Aroclors were detected in all 20 surface sediment samples, with concentrations ranging from 33.6 µg/kg to 996 µg/kg. 75% of these samples showed reduced PCB concentrations when compared with sample results collected over 10 years ago. These results also confirmed trends seen with PCB concentrations found in surface sediment samples collected by the 2015 Kleinfelder study. Recent sampling indicates that newly deposited sediments are covering and/or mixing with the older surface sediments both river-wide and in Swan Island Lagoon (Geosyntec 2016).

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APPENDIX B

Approach for Sampling of Surface Sediment

APPENDIX B

**APPROACH FOR SAMPLING OF SURFACE
SEDIMENT**

**Pre-Remedial Design Work Plan
Portland Harbor Superfund Site**

INTRODUCTION

This appendix details the proposed design and evaluation of the proposed 640-sample surface sediment sampling plan. It is organized into two sections, as shown below:

- Section B1: Sample Placement and Design; and
- Section B2: Sample Plan Statistical Evaluation.

The proposed plan consists of 428 stratified random samples and 212 targeted samples located in the Sediment Management Areas (SMAs), for a total of 640 samples. The density of stratified random samples is approximately 20 samples per bisected River Mile segment (distributed in 20 segments, plus a 20-sample segment in Swan Island Lagoon and 8 additional samples in inlet areas). Approximately 160 of the stratified random sample locations may fall within/immediately adjacent to the SMAs, enabling the delineation of the SMAs to take advantage of approximately 370 samples (212 SMA samples plus approximately 160 stratified random samples = approximately 370 samples).

This density of SMA sampling achieves the level of precision needed to delineate SMAs within an approximate 30% level of uncertainty, sufficient for the needs of the Pre-RD group and an initial dataset to inform on additional SMA delineation sampling events needed for higher levels of engineering design. The proposed 428 stratified random samples also meets the stratified random sample count necessary to meet the data objectives consistent with Section 3.2.2 of the Work Plan.

Section B1: Sample Placement and Design

Placement of the 640 surface sediment samples will be achieved through the following steps, and a conceptual figure showing the distribution of the samples is shown in Figure 1:

1. A sample grid consisting of 428 cells will be devised for the Site (River Miles 1.9 to 11.8). This grid will be used to place the stratified randomly placed samples. There will be three types of cells:

- a. **Shoal cells:** Shoal cells will be placed parallel along the center channel flow path (thalweg) of the center of the navigation channel in the areas of the river outside of the navigational channel (shoals). One set of shoal cells will be placed to the east of the navigational channel, and one set of shoal cells will be placed to the west side of the navigational channel. The length of each shoal cell will be approximately 0.067 miles such that approximately 30 shoal cells (15 on east shoal, 15 on west shoal) will be present per River Mile. The width of each shoal cell will be the distance between the navigational channel boundary and the river bank. 150 shoal cells will be placed on the east side of the river and 150 will be placed on the west side of the river for a total of 300 shoal cells.
- b. **Navigational cells:** Navigational cells will be placed parallel along the thalweg of the center of the navigation channel in the areas of the river within the navigational channel. One set of navigational cells will be placed to the east of the navigational channel thalweg centerline, and one set of navigational cells will be placed to the west side. The length of each navigational cell will be approximately 0.2 miles such that approximately 10 navigational cells (5 on eastern half of the channel, 5 on western half of the channel) will be present per River Mile. The width of each navigational cell will be the distance between the navigational channel boundary and the navigational channel thalweg centerline. 50 navigational cells will be placed on the eastern half of the navigational channel, and 50 navigational cells will be placed on the western half of the navigational channel.
- c. **Inlet cells:** Five areas of the Site (e.g., Swan Island Lagoon) do not conform well to the shoal grid placement, so these areas will be identified as inlets. In these areas, inlet cells will be placed such that the length of each cell is approximately 0.067 miles and the width is the bank-to-bank width of the inlet. Thus, these areas will be sampled at the same density as the shoal areas that border the navigational channel. 8 inlet cells will be placed in the smaller inlets, and 20 cells will be placed within Swan Island Lagoon.

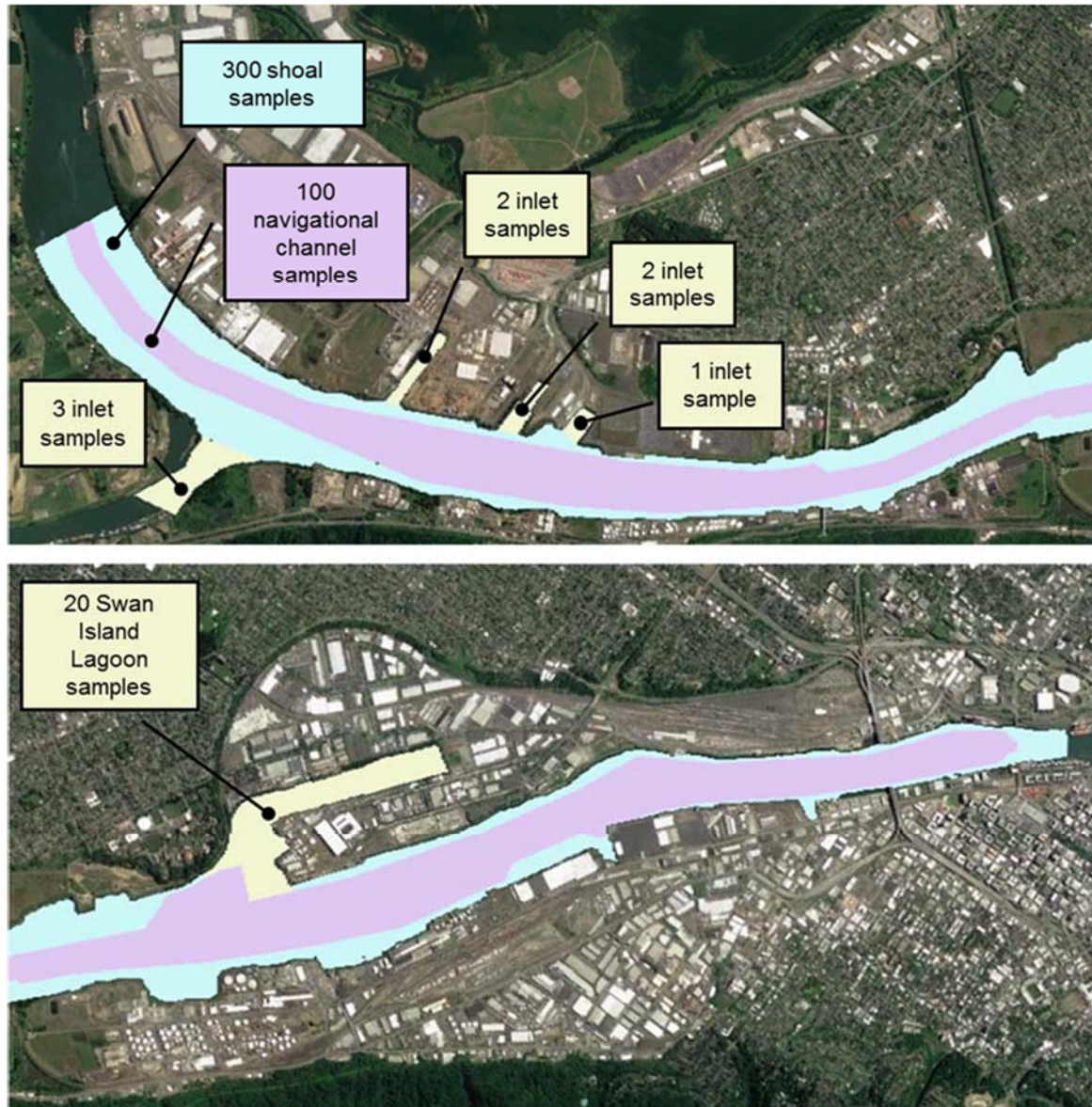


Figure 1. Conceptual distribution of the 428 stratified random samples among the shoal (light blue), navigational channel (purple), and inlet/Swan Island Lagoon (pale yellow) areas.

The 428-cells will be designed such that:

- 3 times the number of samples will be placed in the shoals relative to the navigational channel. The addition of inlet samples (which are in inlet sections of the river shoals) will slightly increase the number of shoal samples relative to navigational channels, such that 23% of the final sample count will represent navigational channel samples.
 - The sample design will be evenly balanced between east and west. Due the presence of inlets, approximately: 225 (53%) of samples will be on the eastern side and 203 (47%) of will be on the western side.
 - Approximately 40 stratified randomized samples will be present per each River Mile (20 on east and 20 on west). This targets 15 samples on each shoal and 5 samples on each side of the navigational channel.
 - Robust sample sizes will be achieved in four segments (Segment 1 = River Mile 9 to 11.9, Segment 2 = River Mile 7.5 to 9, Segment 3 = River Mile 5 to 7.5, and Segment 4 = River Mile 1.9 to 5), as well as the four segments bisected into east and west portions, and Swan Island Lagoon (these segments are shown in Figure 3 of the Workplan).
2. In each cell, a location will be stratified randomly to determine and receive the sample location. The sample location will be selected via a stratified random number generator to determine the x- and y-coordinates. The randomization process will exclude areas that were within 20 feet of the shoreline to avoid placing samples in the intertidal zones or in areas that could not be reached with the sample vessel. Stratified random sample locations will be visually inspected (aerial imagery) to ensure that the sample will not be placed in an area that could not be reached with the sample vessel (e.g., underneath piers or other fixed infrastructure), with a re- randomization of the location if needed.²
 3. 212 additional samples will be added to enable 2-dimensinoal delineation of the Alternative F Mod active Sediment Management Area (SMA) footprint. These samples (“SMA Samples”) are not randomly placed samples. They will be placed in two successive steps.

² Any sample locations that require substantial modification (such as re-randomization) due to obstructions will be reviewed and approved by EPA.

- a. The first step in SMA sample placement will assume a surface sediment sample will be placed at each of the 60 proposed sediment core locations (the 30 proposed bank core locations are not included).
 - b. The second step in SMA sample placement will consist of selecting 152 sample locations within and immediately adjacent to the SMAs such that a sediment sample would be present approximately every 300 feet within the SMAs. Some of these placements may be co-located with sample locations sampled in 2004.
4. Some stratified random sampling locations may be obstructed (e.g., located at bulkheads, under ships or docks) or may simply not yield sediment (i.e., no recovery). To handle these situations two-additional agreed upon backup sampling locations will be included in the field sampling plan. The agreed upon backup locations will be generated using the same randomization procedure used to select the primary sampling locations. When a location cannot be practically collected at a specified location or moved a limited distance from the originally specified location (e.g., within the anchor length) and collected, or no sediment is recovered, the field sampling crew will move to the agreed upon backup sampling locations. If samples cannot be collected at the original or two backup stratified random locations, an alternate sampling location and rationale for the location will be provided to EPA for concurrence.

The 212 SMA samples specifically placed within and immediately adjacent to the SMAs plus many stratified random sample locations near the SMAs will also be used to aid in delineation.

In summary, the 640 surface sample count will have the following distributions:

- 428 stratified random samples and 212 targeted SMA samples (640 total);
- Approximately 20 samples per bisected River Mile (distributed in 20 segments plus Swan Island Lagoon), achieving EPA's goal of approximately 20 samples per rolling River Mile can be achieved in the 20 segments, plus Swan Island Lagoon;
- Among the stratified random samples, 100 will be located in the navigation channel and 328 will be located in the shoaled areas (approximate 25/75 distribution); and
- The stratified random samples will be distributed among the 9 segments as shown in Table 1 (Figure 3 of the workplan).

In addition to these 640 samples, the Pre-RD group may choose to collect additional sample locations (pending details in the Field Sampling Plan (FSP)) to enable additional re-occupations of locations sampled in 2004.

Table 1. Expected distribution of the 428 stratified random samples within each of the 9 segments.

Segment	Number of Stratified Random Samples
1W	58
1E	59
2W	29
2E	30
Swan Island Lagoon	20
3W	50
3E	48
4W	63
4E	71
Total	428

Section B2: Sample Plan Statistical Evaluation

The ability of the sample plan to meet various data objectives in a statistically robust manner was evaluated using several statistical approaches, as detailed below. It should be noted that these approaches are conservative and tend to overestimate sample size requirements, as they are based on the 2004 PCB data. Recently-collected data have suggested concentrations of PCBs in surface sediment have decreased significantly since 2004 such that many areas are converging on lower, ambient levels of PCBs. This convergence would result in lower variability in hypothetical 2018 data (and future data), which would greatly improve the precision and power of data and lower necessary sample size requirements for the data evaluations discussed below.

Additionally, the below statistical evaluations are considered initial efforts and may be augmented by additional or alternate evaluations (as needed) if any revisions to the sampling plan are considered or other aspects of the data objectives are emphasized.

Initial SMA Delineation for Allocation

The proposed sample placement density within/adjacent to the SMAs is approximately 1 sample per 70,000 ft² and a spacing of approximately 290 to 300 ft between each sample. Via a Monte Carlo simulation using a hypothetical 20-sample evaluation area and an approximated Site-wide 2004 PCB sediment data distribution, we

calculated the average area that would be indicated by the number of samples that would exceed the PCB RAL of 75 µg/kg and indicate designation for inclusion within an SMA. The Monte Carlo simulation calculated the sum of the individual 70,000-ft² areas 1000 times to simulate potential results for the final total SMA area sizes. 80% of the total SMA area estimates (area that would be indicated above the PCB RAL) were within ± 25% to 38% (average of 31%) of the median estimate. This approximate level of ±30% precision was considered satisfactory for the initial SMA delineation. Additional information may be required for final SMA delineation.

Spatially Weighted Average Concentration (SWAC) Determination

Spatially Weighted Average Concentrations (SWACs) for PCBs in the proposed plan were calculated using a simplified approach in which equal polygon areas were assumed for each proposed sample point and a random concentration of PCBs were assigned from approximated 2004 PCB sediment data distributions for each of the 8 segments. SWACs were calculated for each of the 8 segments shown in Table 1, assuming approximately 40 samples were present in each segment, except for segment 2W, which is expected to receive fewer samples due to its shoreline configuration and River Mile length. Actual sample sizes for the final sample plan are expected to be higher (Table 1), and this analysis will be updated in the FSP. Using Monte Carlo simulation, the PCB SWAC and 95% Confidence Intervals (95% CIs) around the SWAC were calculated 1000 times for each the 8 segments. Swan Island Lagoon, within 2E, was also assessed in an additional evaluation (segment 9) and it was noted that the proposed sample size and placement would be sufficiently robust to meet SWAC data objectives if Swan Island Lagoon is evaluated as its own segment.

Sediment contaminant data from the SMA delineation effort will be used to delineate SMAs, and updated bathymetric data from this effort will be used to support remedial design using the ROD's decision trees. The stratified random sediment sampling effort, in conjunction with water, sediment trap, and fish data will be used to update the current conditions and provide a baseline for long-term monitoring and remedy effectiveness evaluations.

Comparing Differences in Concentrations to RI/FS Datasets

A variety of data evaluation approaches will likely be used to evaluate differences in concentrations of PCBs in surface sediment between the RI/FS dataset and new pre-design data, including regression and multi-variate analyses and consideration of various other data, including water depth, grain size, organic carbon, and other sample location-specific factors that influence natural recovery processes. Data will be evaluated spatially, including statistical comparisons of SWACs estimated in 2018, and compared to the RI/FS dataset, including the 2004 data which is the most robust single event dataset in the RI. The ROD describes a requirement for a robust dataset to detect measurable differences over time. These proposed locations included in this work plan is sufficiently robust for multiple comparisons. Additional approaches or sensitivity analyses that include portions (or the entirety) of data from samples collected inside or outside of the SMAs may be conducted, in particular, spatial weighting of the data using SWAC or equivalent geostatistical analyses.

PCB Natural Recovery Power Analysis

As noted above, the proposed plan will achieve approximately 20 samples per bisected River Mile, and each of these samples is represented by a 3-point composite. EPA's statistical power analysis (Figure 9 of Appendix A of the June 6 draft plan³, shown in Figure 3 below) indicates that 20 samples bisected River Mile segment would likely be sufficient to achieve statistical power to evaluate their stated goal of evaluating natural recovery for PCBs (the basis of the 20 stratified random samples per bisected River Mile segment sample size determination). The proposed-sampling approach is projected at a level of statistical power of 0.9 power for PCBs according to EPA calculations⁴.

3 EPA. 2017. Portland Harbor Superfund Site Sampling Plan for Pre-Remedial Design, Baseline, and Long-Term Monitoring. Revised Working Draft. June 6.

4 This power analysis was based on PCBs; the same analysis based on DDx and PAHs indicates higher sample sizes are needed, but these chemicals are located in hotspots at the Site such that the power analysis likely overestimates the sample sizes needed.

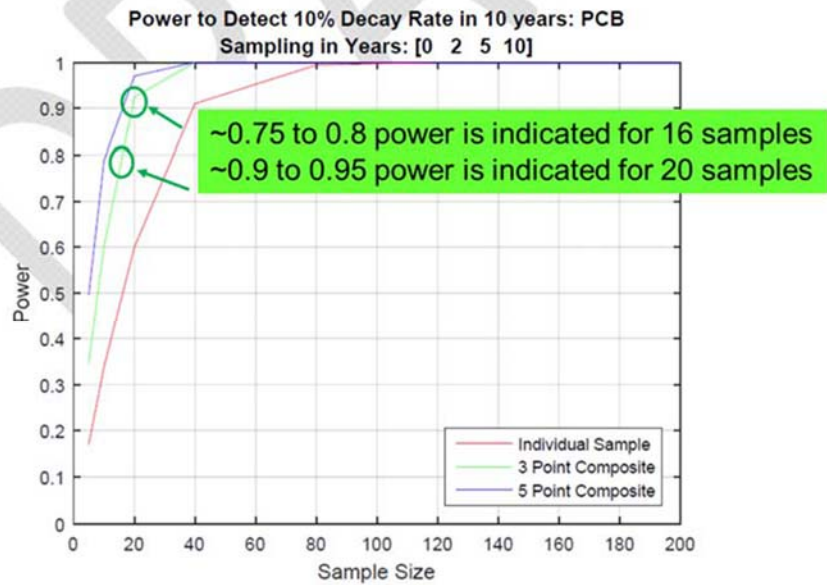


Figure 9. Power to detect a 10% annualized recovery rate in sediment by monitoring in year 0, 2, 5 and 10 for total PCBs.

Figure 3. Reproduction of Figure 9 in Appendix A of EPA's draft June 6, 2017 sampling plan. The green ovals, arrows, and text box have been added (see discussion).

APPENDIX C

Power Analysis of Fish Tissue Sample Size

APPENDIX C
POWER ANALYSIS FOR FISH TISSUE SAMPLE SIZE
PREPARED BY AECOM

Pre-Remedial Design Work Plan
Portland Harbor Superfund Site

POWER ANALYSIS FOR FISH TISSUE SAMPLE SIZE, PREPARED BY AECOM

Provided below is the initial evaluation of fish tissue sample size and analysis. More detailed information, including collection methodology, will be provided in the Sampling and Analysis Plan (SAP) that will be submitted with the other SAPs for review and approval and comment by EPA.

A statistical analysis was performed using the 2012 smallmouth bass (SMB) tissue data set for the Portland Harbor Superfund Site (Kennedy/Jenks Consultants, 2013) to estimate sample sizes for re-baselining fish tissue chemistry. Prior analyses of 2002, 2007, and 2012 data for polychlorinated biphenyls (PCBs) in SMB indicate fish tissue concentrations have declined over time. The primary focus of this analysis was to estimate the number of SMB samples needed to determine with statistical significance whether PCB concentrations have continued to decline since 2012. Comparison of historical and new means and 95% confidence intervals, as well as trend analysis, provide robust and statistically-valid approaches for evaluating the data to evaluate natural recovery, and are likely to be used following data collection in 2018.

An important aspect of monitoring design is power analysis, which was performed to estimate the difference that can be detected between the 2012 and re-baselining fish tissue data sets. This was illustrated by calculating the effect size (d) or the standardized difference between two means that could be detected (Cohen, 1988); and the minimum detectable difference (MDD) as a function of sample size and variance. The MDD is the difference between two means that must exist to detect a statistically significant effect/difference. The MDD is a commonly employed technique to indicate the potential significant difference at a given sample size in fish tissue monitoring (e.g., United States Environmental Protection Agency [EPA], 2000).

METHODS AND RESULTS

Two scenarios were evaluated: (i) assuming sample size equivalent to the 2012 smallmouth bass data set (n=83 Study Area, n= 9 upriver background); and (ii) assuming sample size equivalent to the targets set forth in the 2012 work plan (n=95 Study Area, n=10 upriver background) (Windward Environmental, 2012). The sample size calculations were performed considering two spatial scales: (i) site-wide; and (ii) four 2 to 3-mile segments.¹ Both spatial scales are relevant to evaluation of SMB in the risk assessment and bioaccumulation modeling.² Sample size estimation

¹ The segmentation is based on prior analysis of the available data (Wolf, 2015).

² A spatial scale of 2 to 3 mile segments may better reflect the home range of SMB which ranges from 0.5 to 5.5 miles (Scott and Crossman, 1998). Based on a radio-tracking study of predator species in the Lower Willamette River, the median total distance traveled (upstream and downstream) by SMB was 4.3 kilometers (km) (2.7 miles), with 25th and 75th percentiles of 0.8 km and 8.0 km (Friesen, 2005).

to support statistical analysis of trend/natural recovery on an individual river mile (RM) basis is not a data use objective; large sample sizes would be needed to detect trends with adequate power. The power analysis was performed using the following assumptions:

- Confidence = 95% (alpha [α] = 0.05);
- Power = 80% (1- β = 0.80); and
- PCB data lognormally distributed.

The assumption that PCB concentrations in the 2012 whole body SMB data set are lognormally distributed is based on distribution testing performed using @Risk v.6 (Palisades, 2012). Table 1 presents summary statistics for the 2012 SMB data set. PCB fish tissue concentrations were log (base 10) transformed for the power analyses. The assumptions of 95% confidence (α = 0.05) and power of 80% are used by convention to support statistically significant results (e.g., EPA, 2000). However, statistically robust changes may still be concluded using less stringent hypothesis test statistics (e.g., lower confidence or power).

The calculation of effect size (Cohen's d) was performed using the pwr package (Champely, 2017) in the R statistical computing (R Core Team, 2015). The calculation of the minimum detectable difference (MDD) as a function of the sample size and variance in the 2012 data was performed using the following formula and expressed as a percentage of the 2012 mean³ (Harcum and Dressing, 2015):

$$\text{MDD} = \sqrt{[(4\sigma^2 (Z(1-(\alpha/2)) + Z(1-\beta))^2) \div N]}$$

where:

N = total sample size (number of samples in 2012 and new baseline)

σ = standard deviation (assumed equal to 2012 sample populations)

$Z(1-(\alpha/2)) = 1.96$

$Z(1-\beta) = 0.84$

MDD = minimum detectable difference between 2012 and new baseline means

³ While log transforming the data results in the power analysis being on the population geometric mean, results using the techniques described here are considered to be adequate practical approximations for the purpose of this analysis.

The effect size analysis indicates that replicating the 2012 sample sizes (actual or target sample sizes) will allow for moderate differences between the means to be detected on a site-wide basis (Cohen's d of ~ 0.4). For the four segments, the 2012 sample sizes will allow for large differences between the means to be detected (Cohen's d of ~ 0.8).⁴

Results of the MDD analysis are summarized in Table 2 for the full Site (RM 2-12), each of the four segments, and the upriver background area. The MDD analysis was also performed excluding Segment 1 (RM 9-12), which has the highest mean and variance; eight of the ten highest 2012 PCB SMB samples were from Segment 1, which includes the RM11 area. Table 2 includes MDD results for combined Segments 2, 3, and 4 (RM 2-9).

As shown in Table 2, sample sizes consistent with the 2012 program (actual or target) result in a MDD of about 30% on a site-wide basis. The MDD improves slightly (about 1%) when the 2012 target sample size is used (increase of 12 samples site-wide). When the area with high variance is removed (Segment 1), the MDD is about 23% for the remainder of the Site.

On a river segment basis, sample sizes of 20 to 23 result in MDDs of about 28% to 40% in Segments 2, 3, and 4. In Segment 1 (RM 9-12) where variance is highest, sample sizes of 22 to 28 result in a MDD of about 60%. For upriver background, a sample size of 9 to 10 results in an MDD of about 60%. For upriver background, the means for the 2002 ($n=6$ composite samples) and 2012 ($n=9$ discrete samples) SMB data sets are similar (170 micrograms per kilogram [$\mu\text{g/kg}$] and 230 $\mu\text{g/kg}$, respectively).

Based on prior trend analysis indicating a decline of about 4% per year (Nielsen, 2015), the maximum change that could be expected in the new baseline data would be approximately 24% in 2018 from the 2012 site-wide mean assuming a linear response (declines may become asymptotic over time as conditions reach equilibrium). Based on the MDD values calculated in this analysis, sample sizes consistent with the 2012 program should be sufficient to detect a change of this magnitude on a site-wide basis (excluding Segment 1/RM11 area) with a high degree of statistical significance.

⁴ The Cohen's d statistic is a standardized measure of the size of the effect that can be observed between two means, with smaller values indicating smaller differences can be observed. Per Cohen (1977): 0.2 = small effect; 0.5 = moderate effect; and 0.8 = large effect.

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Table 1
Summary Statistics for 2012 Smallmouth Bass Data Set
Portland Harbor Superfund Site
Pre-Remedial Design Baseline Study

Domain	River Miles	2012 SMB Data (a)					
		n	Minimum (ug/kg)	Maximum (ug/kg)	Mean (ug/kg)	SD (ug/kg)	CV
Site-wide	2-12	83	92.4	6470	648.7	1185.9	1.8
Segment 1	9-12	22	134	6470	1531.6	2057.7	1.3
Segment 2	7.5-9 & SIL	23	118	1060	331.3	203.7	0.6
Segment 3	5-7.5	19	92.4	440	225.1	85.4	0.4
Segment 4	2-5	19	148	1280	434.2	299.8	0.7
Upriver Background	15-18	9	50.7	634	234.0	187.5	0.8

Notes

(a) PCB wet weight data from 2012 Smallmouth Bass Tissue Study (whole body). Kennedy/Jenks 2013.

n = sample size

CV = coefficient of variation

SD = standard deviation

SMB = smallmouth bass

Table 2
Summary of Power Analysis for Smallmouth Bass Sample Size
Portland Harbor Superfund Site
Pre-Remedial Design Baseline Study

Domain	River Miles	2012 SMB Data (a)				Sample Size Equals 2012 Actual Catch		Sample Size Equals 2012 Targets			Increase in MDD due to attaining targets
		n	Mean log ₁₀ PCB (ug/kg)	SD log ₁₀ PCB (ug/kg)	Geometric Mean (ug/kg)	MDD log PCB (ug/kg)	MDD (%)	n	MDD log PCB (ug/kg)	MDD (%)	
Site-wide	2-12	83	2.56	0.38	364	0.17	31.6%	95	0.16	30.7%	0.9%
Segments 2, 3 & 4 (b)	2-9	61	2.45	0.23	282	0.12	23.9%	67	0.12	23.4%	0.5%
Segment 1	9-12	22	2.87	0.52	745	0.44	63.5%	28	0.41	61.2%	2.4%
Segment 2	7.5-9 & SIL	23	2.46	0.22	290	0.18	33.8%	23	0.18	33.8%	0.0%
Segment 3	5-7.5	19	2.32	0.16	211	0.14	28.3%	21	0.14	27.6%	0.6%
Segment 4	2-5	19	2.56	0.27	359	0.24	42.8%	23	0.23	41.2%	1.6%
Upriver Background	15-18	9	2.26	0.33	180	0.44	63.8%	10	0.43	62.8%	1.0%

Notes

(a) PCB data from 2012 Smallmouth Bass Tissue Study. Kennedy/Jenks 2013.

(b) Site-wide domain after exclusion of Segment 1 (highest 2012 SMB PCB levels were observed in RM11 area).

Analyses performed using alpha of 0.05 and power of 0.80.

n = sample size

MDD = Minimum Detectable Difference

SD = standard deviation of the log base 10 transformed mean

SMB = smallmouth bass

APPENDIX D

Calculation of Whole Body – Fillet Ratios for Focused Chemicals of Concern in Smallmouth Bass Tissue

APPENDIX D
CALCULATION OF WHOLE BODY – FILLET RATIOS
FOR FOCUSED CHEMICALS OF CONCERN IN
SMALLMOUTH BASS TISSUE
PREPARED BY AECOM

Pre-Remedial Design Work Plan
Portland Harbor Superfund Site

Appendix D
Calculation of Whole Body - Fillet Ratios for Focused Chemicals of Concern in Smallmouth Bass Tissue

Location	Fraction (a)		DDx (b)				Dioxins_Furans (b)				PCB_Congeners (b)			
	Body w/o fillet	Fillet	Body w/o fillet µg/kg	Fillet µg/kg	Whole Body (c) µg/kg	Ratio WB:F	Body w/o fillet pg/g	Fillet pg/g	Whole Body (c) µg/kg	Ratio WB:F	Body w/o fillet pg/g	Fillet pg/g	Whole Body (c) µg/kg	Ratio WB:F
SB010E	0.71	0.28	92.02	7.87	67.95	8.63	4.78	0.55	3.57	6.45	857040	83375	635686	7.62
SB010W	0.71	0.29	254.22	15.55	184.21	11.85	13.50	1.17	9.88	8.48	1117067	122842	825177	6.72
SB011E	0.76	0.23	43.11	6.41	34.29	5.35	9.66	1.12	7.61	6.81	8162565	1481605	6554652	4.42
SB011W	0.75	0.24	86.47	7.36	66.60	9.05	10.37	1.25	8.07	6.46	675258	83874	526546	6.28
SB02E	0.68	0.31	127.54	14.91	91.78	6.16	8.19	0.87	5.86	6.76	1997918	199566	1427353	7.15
SB03E	0.72	0.28	129.37	13.75	96.38	7.01	5.60	0.66	4.19	6.39	371940	40694	277425	6.82
SB03W	0.73	0.26	135.96	14.37	103.62	7.21	7.33	0.91	5.62	6.21	264052	26961	201006	7.46
SB04E	0.72	0.27	123.33	14.85	93.24	6.28	10.30	1.37	7.82	5.70	1855376	241418	1407655	5.83
SB04W	0.73	0.27	172.39	18.07	129.92	7.19	6.93	1.15	5.34	4.62	379264	38773	285558	7.36
SB05W	0.76	0.24	184.29	17.03	143.62	8.43	7.75	0.89	6.08	6.85	345978	34276	270171	7.88
SB06E	0.74	0.26	116.97	11.38	89.25	7.84	7.03	0.78	5.39	6.90	872325	82290	664932	8.08
SB06W	0.75	0.24	279.18	20.47	215.42	10.52	16.54	1.67	12.87	7.70	352513	28952	272752	9.42
SB07E	0.72	0.27	153.26	12.34	114.06	9.24	34.49	3.71	25.92	6.98	2687788	210859	1998729	9.48
SB07W	0.77	0.23	1843.30	180.58	1461.08	8.09	430.22	57.27	344.43	6.01	678402	65752	537571	8.18
SB08E	0.75	0.25	81.59	9.46	63.19	6.68	12.12	1.56	9.43	6.05	369306	43015	286074	6.65
SB08W	0.66	0.33	593.47	48.25	408.18	8.46	43.44	4.21	30.10	7.16	651255	51441	447423	8.70
SB09E	0.65	0.34	100.62	10.99	69.18	6.29	8.13	0.97	5.62	5.78	496991	53205	341323	6.42
SB09W	0.71	0.28	238.42	20.06	175.81	8.76	10.83	0.93	7.99	8.63	1318052	104333	970079	9.30
Average	0.72	0.27	Average Ratio			7.95	Average Ratio			6.66	Average Ratio			7.43
			Standard Deviation			1.64	Standard Deviation			0.96	Standard Deviation			1.33
			Table B3-3 of Final FS (EPA 2016)			7.17	Table B3-3 of Final FS (EPA 2016)			6.13	Table B3-3 of Final FS (EPA 2016)			8.02

Notes:

(a) Fractions calculated using fillet and body without fillet weights in Table 3-3 of Round 3B Fish and Invertebrate Tissue and Collocated Sediment Field Sampling Report (Integral and Windward 2008). Average of individuals in composite sample.

(b) Smallmouth bass tissue chemistry data from SCRA database (sum of detected congeners for dioxins_furans and PCBs).

(c) Whole body concentration calculated as sum of (fillet concentration X fillet mass fraction) + (body w/o fillet concentration X body w/o fillet mass fraction).

Abbreviations:

w/o - without; DDx - sum of dichlorodiphenyltrichloroethane and its derivatives; µg/kg - microgram per kilogram; pg/g - picogram per gram; WB - whole body; F - fillet; FS - Feasibility Study

Statement of Work Attachment B

DRAFT Program Data Management Plan for the Portland Harbor Including Electronic Data Deliverable Format

DRAFT Program Data Management Plan

Portland Harbor Pre-Remedial Design Investigation – Portland Harbor Superfund Site

Prepared by
U.S. Environmental Protection Agency Region 10
December 2017



**DRAFT Program Data Management Plan for the Portland
Harbor
Pre-Remedial Design Investigation
Portland Harbor Superfund Site
TITLE AND APPROVAL SHEET**

Eva DeMaria

EPA Remedial Project Manager

Date

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Appendices

Appendix A – Required Data Elements
Appendix B – Data Element Valid Values

Definitions and Acronyms

DMP	data management plan
EPA	U.S. Environmental Protection Agency
ERT	EPA Emergency Response Team located in Edison, NJ
HUC	hydrologic unit code
ID	identification
PDI	pre-design investigation
RM	river mile
RPM	Remedial Project Manager (EPA Region 10)
Scribe	data management application (created for ERT)
Scribe.NET	web-based portal for archiving Scribe project files and data

1.0 Introduction

To ensure that environmental data collected at the Portland Harbor Superfund Site adhere to certain standards and practices, a programmatic level data management plan (DMP) was developed that provides overall guidance and data requirements for the various performing parties who conduct sampling under the pre-design investigation (PDI). While this DMP is a standalone document, it is to be used in concert with the PDI statement of work, Region 10 data management plan, and the respective quality management plans developed for each performing party sampling effort.

1.1 Site Background

The site is located along the lower reach of the Willamette River in Portland, Oregon, and extends from approximately river mile (RM) 1.9 to 11.8. While the site is extensively industrialized, it is within a region characterized by commercial, residential, recreational, and agricultural uses. Land use along the lower Willamette River in the site includes marine terminals, manufacturing, other commercial operations, public facilities, parks, and open spaces. The State of Oregon owns certain submerged and submersible lands underlying navigable and tidally influenced waters. The ownership of submerged and submersible lands is complicated and has changed over time.

This lower reach was once a shallow, meandering portion of the Willamette River but has been redirected and channelized via filling and dredging. A federally maintained navigation channel, extending nearly bank-to-bank in some areas, doubles the natural depth of the river and allows transit of large ships into the active harbor. Much of the river bank contains overwater piers and berths, port terminals and slips, and other engineered features. While a series of dams in the upper Willamette River watershed moderate's fluctuations of flow in the lower portions of the river, flooding still occurs approximately every 20 years, with the last occurring in 1996.

Armoring to stabilize banks covers approximately half of the harbor shoreline, which is integral to the operation of activities that characterize Portland Harbor. Riprap is the most common bank-stabilization measure. However, upland bulkheads and rubble piles are also used to stabilize the banks. Seawalls are used to control periodic flooding as most of the original wetlands bordering the Willamette in the Portland Harbor area have been filled. Some river bank areas and adjacent parcels have been abandoned and allowed to revegetate, and beaches have formed along some modified shorelines due to relatively natural processes.

Development of the river has resulted in major modifications to the ecological function of the lower Willamette River. However, several species of invertebrates, fishes, birds, amphibians, and mammals, including some protected by the Endangered Species Act, use habitats that occur within and along the river. The river is also an important rearing site and pathway for migration of anadromous fishes, such as salmon and lamprey. Various recreational fisheries, including salmon, bass, sturgeon, crayfish, and others, are active within the lower Willamette River.

1.2 Objective and Scope

The objective of this DMP is to ensure that environmental data and supportive information are collected and managed in a manner that preserves, protects, and makes the information available to all stakeholders, performing parties, and other affected groups. This DMP applies to data and information collected in support of the Portland Harbor Superfund Site by the performing parties involved in the pre-design sampling activities. While it does not cover all information (e.g., photos,

field logs) that is managed for specific projects, it is intended to address those types of data deemed critical to overall decision making for the site. The subsections below identify the general data categories, performing parties collecting environmental data, and major sampling activities.

1.2.1 Data Categories

This plan identifies standard data elements and data management processes for the following data categories:

- Project identification information
- Environmental sampling data
- Locational data

The individual data elements for each of these categories represent the minimal amount of information that is needed for project specific decision making and data sharing among stakeholders and performing parties. These are further identified in the Data Management section.

1.2.2 Major Stakeholder Groups, Performing Parties, and Community Groups

The major stakeholder groups, performing parties, and community groups have been identified as those groups who are actively involved in site-wide planning and environmental data collection for this site. The major stakeholders, performing parties, and community groups collecting and sharing data are:

- Memorandum of understanding members
 - U.S. Environmental Protection Agency (EPA) Region 10
 - Oregon Department of Environmental Quality
 - Confederated Tribes and Bands of the Yakama Nation
 - Confederated Tribes of the Grand Ronde Community of Oregon
 - Confederated Tribes of Siletz Indians
 - Confederated Tribes of the Umatilla Indian Reservation
 - Confederated Tribes of the Warm Springs Reservation of Oregon
 - Nez Perce Tribe
 - National Oceanic and Atmospheric Administration
 - Oregon Department of Fish and Wildlife
 - U.S. Department of the Interior
- Performing parties (see the Portland Harbor Community Advisory Group for an extensive list of parties involved)
 - Lower Willamette Group
 - River Mile 11 East
 - Early Action Sites
 - Other groups yet to be defined.
- Primary community groups

- Community Advisory Group
- Willamette Riverkeeper
- Portland Harbor Community Advisory Group

1.2.3 Major Data Collection Activities

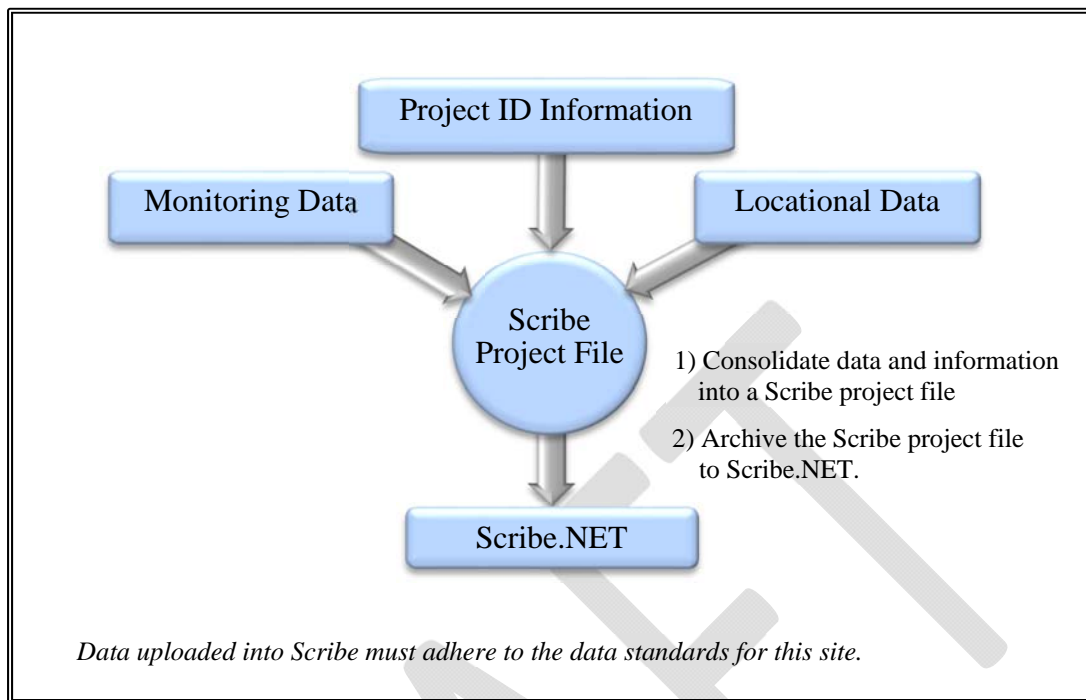
Each performing party is to implement an investigation baseline sampling for updating existing site-wide data and provide a baseline dataset to be used for future long-term monitoring.

The following types of activities may be completed and will be dependent on the specific sampling identified in each respective EPA-approved sampling plan submitted by each performing party:

- Surface sediment sampling
- Fish tissue sampling
- Surface water sampling
- Sediment coring
- Downtown reach and upriver reach sampling
- Porewater background sampling for metals

2.0 Data Management

Effective data management among the Portland Harbor performing parties relies upon delivery of a minimal amount of data to a central repository using a common data management platform. The platform selected for the Portland Harbor PDI is Scribe, and the repository is the Region 10 subscription to Scribe.NET. Regardless of the data management systems that are in use by the performing parties, the Scribe software and Scribe.net repository is required for consolidation and access to project information, sampling data, and applicable locational data for each sampling activity. For many projects Scribe will already be in use for managing environmental samples. In those cases, the same Scribe project files can be used to document the project information, receive the sampling data, and publish the complete set of information to Scribe.NET. The overall data management process is illustrated on Figure 1.

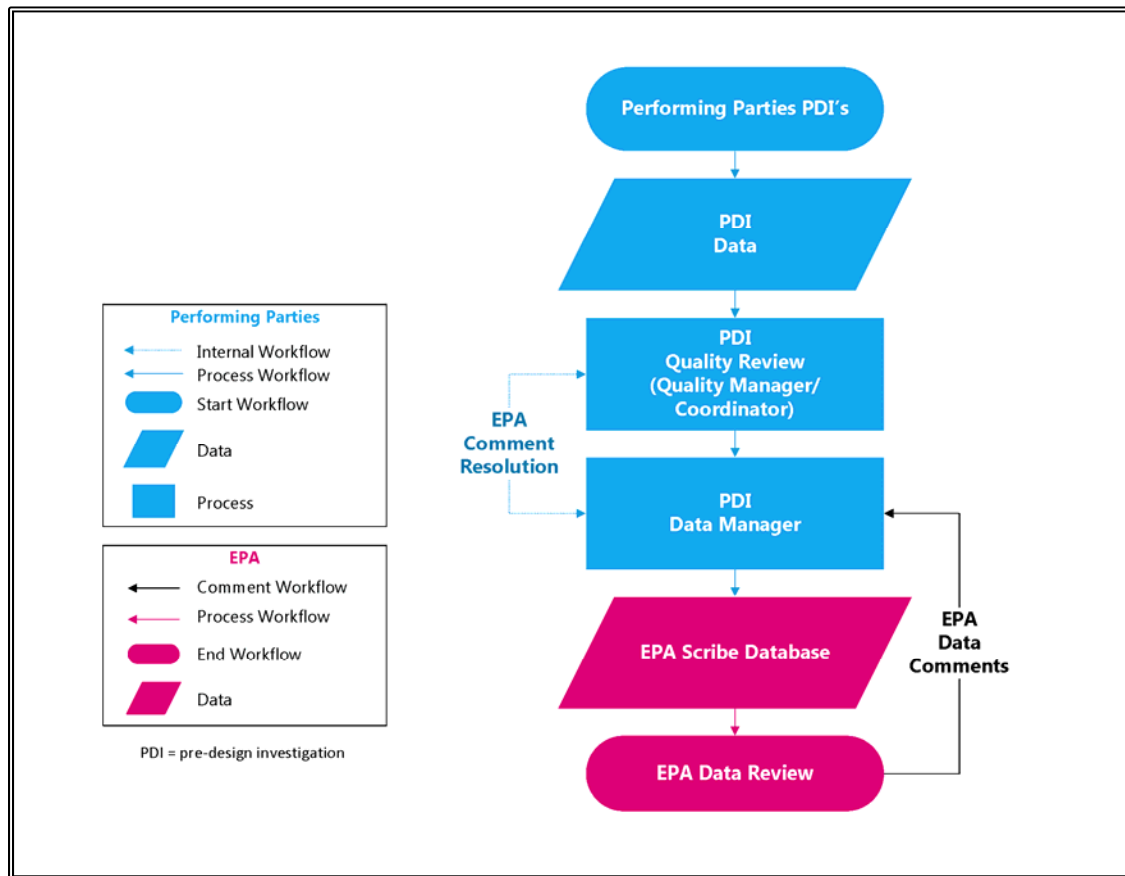
Figure 1. Data Consolidation and Archiving

2.1 Data Management Platform

The data management platform selected for the Portland Harbor PDI is Scribe. This software is based on a Microsoft database and is available for download (www.ert.org). In addition to the Scribe software, an EPA Region 10 template, which contains the required data fields, data lists, and validation criteria, needs to be downloaded and installed. For each project, a Scribe project file is created. Here, the project-specific information is entered, which identifies both the performing party or group conducting the sampling and the type of sampling activity performed.

2.2 Roles and Responsibilities

The major roles and responsibilities for data management are identified for the performing parties in addition to the role of the data manager within each organization. Figure 2 provides an overview of the workflow between EPA Region 10 and the performing parties.

Figure 2. Process Workflow

2.2.1 Performing Parties

EPA Region 10 has the primary responsibility for oversight of all sampling and monitoring activities. EPA has identified the minimal data elements and data delivery requirements that would allow it to achieve its oversight goals and share data among the other stakeholders, performing parties, and community groups. Each of the performing parties is responsible for collecting the necessary data elements covered under their respective sampling activity as approved by EPA, and providing that information to EPA by submitting EDD's or entering or uploading the information into a Scribe project file, and publishing (archiving) the complete file to Scribe.NET. Coordination with EPA and ODEQ will be essential to assure data requirements for a sampling event are met. To accomplish this task on a project-specific basis, the performing party will need:

- DMPs to cover their respective sampling activities
- A data manager designated to complete the Scribe project file or EDD's

Details regarding the roles and responsibilities of the data manager are provided in the following section.

2.2.2 Data Manager

Each of the performing parties will need to designate a data manager to create the EDD submittals or create and manage the Scribe project file and upload the file to Scribe.net. Regardless of the

data management system each performing party utilizes, a Scribe EDD's or Scribe project file is required for consolidation and archiving of the project data to a designated national server. The major responsibilities of the data manager are to:

- Creation of EDD submittals or the Creation of the Scribe project file
- Coordination with EPA and/or ODEQ regarding all data matters.
- Participate in Portland Harbor management coordination calls for ongoing discussion and updates or revision suggestions to this DMP

Designation and training for the data manager can be coordinated with the EPA Scribe.NET data coordinator if direct use of Scribe project files is completed. Web training sessions are also available from the EPA Emergency Response Team (ERT) on a regular basis. To begin, the data manager will need to go to the ERT website (www.ert.org) and download on to their computer:

- Scribe (Version 3.9.4 or current)
- EPA Region 10 template or Portland Harbor Region 10 template (once developed)

Once these have been installed, the EPA Region 10 template will need to be selected during the startup of Scribe after which it will become the default template for future projects. As a security measure, once a Scribe project file has been started, it stays locked to the originating computer until it has been relinquished by the data manager. Data and information can be uploaded into Scribe via an import wizard or hand entered through the user interface. During use, it is a recommended practice to regularly back up the Scribe project file to Scribe.net to preserve the information in the event the originating computer is lost, stolen, or experiences a system failure.

It is anticipated that there will be no coordination with respect to the EPA regional laboratory program for any of the sampling events to occur under each performing party. Contact may be made to discuss specific requirements regarding Scribe EDD submittals and/or Region 10 Scribe template.

2.2.3 EPA Remedial Project Managers

Administration of the EPA's oversight of the performing parties at the Portland Harbor site resides with the EPA Superfund Remedial Project Manager (RPM). The RPM will work directly with the performing parties on the direction and type of environmental sampling activities conducted. This includes data quality objective development; approval of sampling plans; and acceptance of sampling reports, assessments, and data for entry into the agency's administrative record. Central to this role is the identification of critical data needs on each approved sampling activity at each sediment management area. The RPM will receive site DMP-suggested updates from the data manager data management coordination calls and task updates to the Portland harbor DMP as necessary.

2.2.4 EPA Regional Scribe.NET Data Coordinator

The EPA Scribe.NET data coordinator (to be determined) is the project's EPA Scribe data management point of contact and reviews all EPA Region 10 Scribe deliverables for adherence to the EPA Region 10 DMP.

The EPA Scribe.NET data coordinator will communicate with all performing parties regarding all data issues related to the management of data, Scribe EDD submittals and/or Scribe templates. The coordinator will also be the central point of contact for all technical information and database requirements related to the publishing of data to Scribe.

2.3 Data Elements

As stated in Section 1.2.1, the plan identifies standard data elements for project identification information, environmental sampling data, and locational data. A complete list of data elements is provided in Appendix A and the valid values in Appendix B. Valid values are also provided as drop-down entry items in the Region 10 Scribe template / Portland Harbor template (when available). The following sections summarize the information in these appendices as they relate to the major data categories.

2.3.1 Project Identification Information

Project identifiers provide the necessary descriptive information (metadata) about the project. This allows data users an efficient way of categorizing and searching archived Scribe project files. A complete list of these data elements is found in Appendix A under the Site and Event Categories. Critical among these is identification of the project, monitoring organization, and type of monitoring activity (see Appendix A; Events – Activity data element). The Activity data type is a Superfund identifier that distinguishes environmental data by its intended programmatic use (i.e., Performance Evaluation, Remedial Action). The EPA Region 10 template contains a list of valid values for the Activity data element. It is important for the data manager to verify with the EPA RPM on the agreed upon Activity type during the project planning.

2.3.2 Environmental Monitoring Data

The data elements for environmental monitoring data allow for a complete identification of the analytical results such that the data may be subject to interpretation. This includes the identification of the sample matrix, sample collection time, measurement parameter, units of measurement, limits of detection, dates of analysis, analytical method, and so on. A complete list of these data elements and their descriptors are in Appendix A under the Samples and Lab Results categories. For data being uploaded into the Lab Results table of Scribe, the sample numbers must match up against the sample numbers that are already loaded into the Samples table.

2.3.3 Locational Data

The locational data establish the spatial representativeness of the environmental sample and are critical for data analysis. These include latitude, longitude, datum, elevation, and geomethod for sample collection points. Additional spatial identifiers for water monitoring (e.g., hydrologic unit codes [HUCs]) have been added for this site as these were identified as required geospatial identifiers by EPA. Valid values for the HUCs have been incorporated into the Region 10 template. A complete list of the locational data elements is in Appendix A under the Location and Samples categories.

2.4 Data Repository

The repository for archiving and retrieving Scribe project files is Scribe.net. This repository resides within a national server maintained by ERT and is accessed directly from Scribe. For each project file, a unique ID is assigned at the time the file is first published to Scribe.net. Access to the archived Scribe project file can be granted to other stakeholders, performing parties, and groups upon submitting a request to ERT; however, the repository files can only be updated from the computer that originated the file (unless the Scribe project file is relinquished by the originator in Scribe).

3.0 Data Verification

If the Scribe project is initiated by a performing party for Portland Harbor, Scribe is configured to undergo a self-inspection of information as part of the data generation or file upload process. The Region 10 template contains auditor rules for verification of Scribe project files as they are uploaded to Scribe.net. Close observance of these rules is the responsibility of the data manager.

4.0 Data Reporting Procedures

Final project information, monitoring, and locational data are delivered to EPA in the form of an EDD or Scribe project file that has been fully populated and published to Scribe.net. Upon completion of Scribe project file and upload to Scribe.NET, the performing party data manager notifies the EPA RPM and the EPA Scribe.NET data coordinator and provides the Scribe project ID number (assigned at the time of publishing to Scribe.net) associated with the project for identification and access by EPA Region 10.

5.0 Data Access

Stakeholders are provided access to the Portland Harbor subscription of Scribe.net. Data access is performed through Scribe. For all the Portland Harbor Scribe project files, each stakeholder, performing party, or primary community groups has data access rights and can download the Scribe project file from Scribe. Only the originating performing party data manager can update files that have been published to Scribe.net.

Appendix A – Required Data Elements



Appendix A Data
Element Dictionary F

DRAFT

Region 10 Data Element Dictionary and Example Electronic Data Deliverables

- This document is meant to serve as a guide to assist Region 10 Superfund data providers who are responsible for submitting project and monitoring location information for archive to Scribe.net.
- It can serve as a preliminary guide to assist data providers who are in the process of planning data collection activities and need to determine the necessary data elements for their projects and/or prepare to receive data from the Superfund Contract Lab Program (CLP) or Region 10 Manchester Environmental Lab (MEL).
- The data elements in this file represent a complete list of the data types used by all the EPA Regions and are produced in CLP Electronic Data Deliverables. Many of these data fields are not used by Region 10 and are labeled as “Not Applicable” or “NA”.
- Required data elements are clearly labelled and represent the minimum amount of information needed to represent lab results and to describe the sample disposition in terms of location, date/time of sample collection, matrix types, etc.
- The layout of this data element dictionary is to facilitate corrections to information submitted by field personnel (through COC XML resubmittals) and/or to upload lab data back into the Scribe Lab Results Table.

Questions should be submitted to Don Matheny (matheny.don@epa.gov) or Jennifer Crawford (crawford.jennifer@epa.gov)

The Data Element Dictionary (next tab) contains the following information.

Data Element Field Names

EDD Type - identifies the association of the data element as either a "Lab Result" or as "Sample" related information.

Required, Optional, Conditional, Not Applicable (R/O/C/NA) - Identifies the data element as required, etc. The details for some conditional data elements may be found in the description column.

Description or Preferred Values - General description of the data element, where the values are derived and possible values.

Field Format/Length - Identifies the data element format type and field length.

Origin - Identifies the origin of the data element. Some elements are "pass through" fields originating from Scribe or lab scheduling (i.e., RSCC). Otherwise these may be generated by the lab or during validation.

Scribe Table.DataFieldName - Name of the corresponding Scribe Table and Data Field Name(s) for that data element. A data element may correspond to more than one Scribe data field.

COC XML Field Name - Name of the corresponding XML tag for that data element. Required for elements that originate from Scribe.

EDD Data Element Updated w/resubmittal of COC XML? - (Y or N) Identifies if the data element may be updated through a COC XML that is resubmitted at a later time after samples have arrived at the lab.

Upload into Scribe from EDD? - (Y or N) Identifies whether the data element is uploaded into the Scribe "Lab Results Table".

Comments - additional explanation of data element.

Data Element Field Names	EDD Type	Required, Optional, Conditional, Not Applicable (R/O/C/NA)	Description or Preferred Values		Field Format/Length	
CASE_NUMBER	Lab Results	C	Unique ID that identifies groups of sample batches under a specific project. Required for the Contract Lab Program. Valid values are determined by the CLP Contract.	Possible values are determined by the CLP Contract.	Text	5
SAMPLE_DELIVERY_GROUP	Lab Results	C	A set of samples scheduled under a Case Number (max = 20). Required for the Contract Lab Program.	Possible values are determined by the CLP Contract.	Text	30
SAMPLE_ID	Lab Results	C	EPA Sample Number. Required if data are reported by the Contract Lab Program.	Possible values are determined by the CLP Contract.	Text	25
CAS_NUMBER	Lab Results	R	Chemical Abstracts Service (CAS) Registry Number for the chemical compound or element reported.	Possible values are determined by the CAS Registry.	Text	50
ANALYTE	Lab Results	R	Name of the chemical compound or element that was measured.	Name comprised of any combination of alpha-numeric values which may also contain hyphens and commas.	Text	60
FINAL_RESULT	Lab Results	R	The final validated result of the chemical compound or element that was measured.	Numeric value which may be integer or decimal.	Text	8
RESULT_UNITS	Lab Results	R	The units of measurement for the "Final Result" and "Lab Result".	Possible values are determined by the CLP Contract or the lab. Examples: ug/kg, mg/kg, ug/L, mg/L, ug	Text	20
FINAL_VALIDATION_QUALIFIER	Lab Results	R	National Functional Guidelines Data Validation or MEL Data Qualifiers. These should be identified in the QAPP.	Possible values assigned by the National Functional Guidelines or QAPP.	Text	10
DATA_VAL_LABEL	Lab Results	R	EPA Data Validation Label Code from the "Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use". Identifies the rigor of the data validation or review.	Possible values assigned by the guidance document.	Text	250
SAMPLE_ADJUSTED_CRQL	Lab Results	R	The Contract Required Quantitation Limit (CRQL) or lab's Reporting Limit that has been adjusted for sample weight, sample volume, dilution, percent solids, etc.	Numeric value which may be integer or decimal.	Text	8
SAMPLE_ADJUSTED_MDL	Lab Results	R	The Method Detection Limit (MDL) that has been adjusted for sample weight, sample volume, dilution, percent solids, etc.	Numeric value which may be integer or decimal.	Text	8
LAB_RESULT	Lab Results	C	The pre-validated analytical result as reported by the testing lab (CLP only).	Numeric value which may be integer or decimal.	Text	8
LAB_QUALIFIERS	Lab Results	C	Lab Applied Data Qualifier(s). Qualifier codes which describe certain aspects of data utility or quality (e.g., non-detect, estimated value, etc.).	Possible value defined by either the CLP Statement of Work or the lab.	Text	10
METHOD_CRQL	Lab Results	R	Un-adjusted CRQL or Reporting Limit	Numeric value which may be integer or decimal.	Text	8
NONMOISTURE_SAMPLE_ADJUSTED_CRQL	Lab Results	NA	Contract Required Quantitation Limit (CRQL) or Reporting Limit that is adjusted for sample weight, volume, dilution, BUT NOT percent solids. Created by the data review program used to validate CLP data.	Numeric value which may be integer or decimal.	Text	8
CRQL_UNITS	Lab Results	R	Sample Adjusted Contract Required Quantitation Limit (CRQL) or Reporting Limit Units of Measurement.	Possible values are determined by the CLP Contract or the lab. Examples: ug/kg, mg/kg, ug/L, mg/L, ug	Text	20
INSTRUMENT_MDL	Lab Results	O	Instrument Detection Limit (MDL) that is not adjusted for sample mass/volume or percent moisture (solids).	Numeric value which may be integer or decimal.	Text	8
NONMOISTURE_SAMPLE_ADJUSTED_MDL	Lab Results	NA	Method Detection Limit (MDL) that is adjusted for sample weight, volume, dilution, BUT NOT percent solids. Created by the data review program used to validate CLP data.	Numeric value which may be integer or decimal.	Text	8
MDL_UNITS	Lab Results	R	MDL Measurement Units	Possible values are determined by the CLP Contract or the lab. Examples: ug/kg, mg/kg, ug/L, mg/L, ug	Text	20
PERCENT_SOLIDS	Lab Results	R	The Percent Solids for soils and sediments. Used to determine the dry weight basis of the chemical analyses.	Reported as a "Percent".	Text	8
PERCENT_MOISTURE	Lab Results	R	The Percent Moisture content for soils or sediments. Used to determine the dry weight basis of the chemical analyses.	Reported as a "Percent".	Text	8
DILUTION_FACTOR	Lab Results	R	Dilution Factor applied to the digest or extract. The dilution factor is only applied when the laboratory has diluted the extract or digest due to a high concentration of analyte(s).	Integer values e.g., 1, 2, 3, etc.	Text	8
ANALYSIS_FRACTION	Lab Results	R	Identifies the type of analysis fraction or method category of the analysis.	Possible values determined by the CLP Contract or reporting Lab.	Text	100
ANALYSIS_LEVEL	Lab Results	C	The concentration range or level performed by the lab for the analytical methods.	Possible values are determined by the CLP Contract. Examples: trace, low, med	Text	15
REPORTING_BASIS	Lab Results	R	Indicates whether the results were adjusted due to the moisture content of the sample.	For Water samples = WET, For Soil and Sediment samples = DRY or WET depending upon whether moisture correction was applied.	Text	10
SAMPLE_DATE_TIME	Samples	R	The Date & Time of Sample Collection	For all field samples (including Field Blank and Performance Evaluation samples) = MM/DD/YYYY HH:MM:SS	Date/Time	20
DATE_SHIPPED	Samples	R	Date of Sample Shipment.	For all field samples (including Field Blank and Performance Evaluation samples) = MM/DD/YYYY. For Matrix Spike, Post-Digestion Spike, Duplicates, Matrix Spike Duplicate = Ship Date of associated Parent Sample	Date	20
DATE_TIME_RECEIVED	Samples	R	Date & Time of Sample Receipt at Lab.	For all field samples (including Field Blank and Performance Evaluation samples) = MM/DD/YYYY HH:MM:SS For Matrix Spike, Post-Digestion Spike, Duplicate, Matrix Spike Duplicate = Sample Receipt Date and Time of associated Parent Sample	Date/Time	20

Data Element Field Names	EDD Type	Required, Optional, Conditional, Not Applicable (R/O/C/NA)	Description or Preferred Values		Field Format/Length	
PREP_DATE_TIME	Lab Results	R	Date & Time of Sample Digestion/Extraction.	For all laboratory samples = MM/DD/YYYY HH:MM:SS For Matrix Spike, Post-Digestion Spike, Duplicate, Matrix Spike Duplicate = Sample Receipt Date and Time of associated Parent Sample	Date/Time	20
ANALYSIS_DATE_TIME	Lab Results	R	The Date & Time of Analysis of the sample digest or extract.	For all laboratory samples = MM/DD/YYYY HH:MM:SS	Date/Time	20
LAB_SAMPLE_TYPE	Lab Results	R	Identifies types of samples as either "field" or specific lab QCbut does not identify field QC types. Required by the Contract Lab Program.	Possible values are determined by the CLP Contract or Reporting Lab. Examples: Field_Sample, Method_Blank, Matrix_Spike, Serial_Dilution, etc.	Text	40
SAMPLE_MATRIX	Lab Results	R	Identifies the matrix type of soil, water, etc. as reported by the lab. Required by the Contract Lab Program.	Possible values are determined by the CLP Contract or reporting Lab. Examples: Water, Soil, Sediment, Wipe, Filter	Text	20
RESULT_COMMENT	Lab Results	C	Concatenated result information (can be from FORM I Comment Field)	Comments are recorded in the Lab and reported.	Text	250
LAB_NAME	Samples	R	Laboratory Name (long name)	Possible values are determined by the CLP Contract or reporting Lab.	Text	50
LAB_CODE	Samples	C	An abbreviated form of the Lab Name.	Possible values are determined by the CLP Contract. The abbreviated lab name is a code used for reporting.	Text	30
CONTRACT_NUMBER	Samples	C	Laboratory Contract Number assigned under the CLP.	Possible values are determined by the CLP Contract or reporting Lab.	Text	30
METHOD_NUMBER_OR_CLP_SOW	Lab Results	R	CLP SOW Value or "Method Source:Method Number", e.g., SW-9060A	Valid EPA or other reference methods or CLP SOW editions. Examples: ISM01.3, 6010, 8270, etc.	Text	100
MA_NUMBER	Lab Results	C	The Modified Analysis (MA) Number is a tracking number used by the CLP for non-standard or altered methods.	Possible values are determined by the CLP Contract or reporting Lab.	Text	30
TR_COC_NUMBER	Samples	R	The Traffic Report (TR) /Chain of Custody Form Number is a unique tracking number assigned to the COC.	Long segmented number separated by hyphens.	Text	30
LAB_SAMPLE_ID	Samples	C	Laboratory Sample ID (internal ID#). Labs issue their own sample IDs for internal sample tracking and reporting purposes.	Possible values are determined by the CLP Contract or reporting Lab.	Text	25
LAB_FILE_ID	Lab Results	C	Laboratory File ID (Internal to the lab only)	Possible values are determined by the CLP Contract or reporting Lab.	Text	25
INSTRUMENT_ID	Lab Results	C	Unique Instrument Identification Number	Possible values are determined by the CLP Contract or reporting Lab.	Text	25
SAMPLE_ALIQUOT	Lab Results	R	The mass or volume of sample that removed for extraction or digestion.	Numeric value may be an integer or decimal.	Text	8
SAMPLE_ALIQUOT_UNITS	Lab Results	R	The units of measurement for the mass or volume of sample that removed for extraction or digestion.	Examples: "g" for grams, "mL" for milliliters.	Text	20
FINAL_VOLUME	Lab Results	R	The final volume of the sample Digest or Extract.	Numeric value may be an integer or decimal.	Text	8
FINAL_VOLUME_UNITS	Lab Results	R	Volume of Sample Digest /Extract Units	For Organic: uL For Inorganic: mL	Text	20
SOIL_EXTRACT_VOLUME	Lab Results	C	The volume of extract used for a Medium Level VOC soils analysis.	Numeric value may be an integer or decimal.	Text	8
SOIL_EXTRACT_VOLUME_UNITS	Lab Results	C	Soil Extract Volume Units (Medium VOA)	For Organic (VOA): uL	Text	20
SOIL_ALIQUOT_VOLUME	Lab Results	C	The volume of aliquot removed from the extract used for a Medium Level VOC soils analysis.	Numeric value may be an integer or decimal.	Text	8
SOIL_ALIQUOT_VOLUME_UNITS	Lab Results	C	Soil Aliquot Volume Units (Medium VOA)	For Organic (VOA): uL	Text	20
PURGE_VOLUME	Lab Results	C	For analysis of Volatile Organic Compounds, the volume of an aqueous sample that is used to "purge" the VOCs.	Numeric value may be an integer or decimal.	Text	8
PURGE_VOLUME_UNITS	Lab Results	C	Purge Volume Units (VOA)	For Organic (VOA only): mL	Text	20
SPIKE_ADDED	Lab Results	C	Amount Added for Lab Matrix Spike or Spike Duplicate sample or Laboratory Control Sample	Numeric value may be an integer or decimal.	Text	8
CONCENTRATED_EXTRACT_VOLUME	Lab Results	C	Concentrated Extract Volume (SVOA/PEST/PCB)	Numeric value may be an integer or decimal.	Text	8
CONCENTRATED_EXTRACT_VOLUME_UNITS	Lab Results	C	Concentrated Extract Volume Units (SVOA/PEST/PCB)	For Organic (SVOA, Pesticides, PCBs): uL	Text	20
INJECTION_VOLUME	Lab Results	C	The volume of extrac injected into the instrument. (SVOA/PEST/PCB)	Numeric value may be an integer or decimal.	Text	8
INJECTION_VOLUME_UNITS	Lab Results	C	Injection Volume Units (SVOA/PEST/PCB)	For Organic (SVOA, Pesticides, PCBs): uL	Text	20
PREPARATION_METHOD	Lab Results	R	Type of Extraction for Organics or Digestion for Inorganics. "SONC" for sonication etc. (SVOA/PEST/PCB) of Organics and most relevant method digestion numbers for Inorganic.	Possible values are determined by the CLP Contract or reporting Lab. For Organic: Sonication, Soxhlet, Pressurized_Fluid , Liq_Liq, Liq_Membrane For Inorganic: 200.7, 200.8, 3050B, 3015A, 3051A, 7300, 7470A, 7471B, Midi-distillation, Micro-distillation	Text	100
GPC_CLEANUP	Lab Results	C	Cleanup Type (SVOA/PEST/PCB)	For Organic (SVOA, Pesticides, PCBs): Y or N	Text	20
GPC_FACTOR	Lab Results	C	1.0 if no GPC, 2.0 if GPC is performed (SVOA/PEST/PCB)	"1.0 if no GPC, 2.0 if GPC is performed" derived from presence or absence of GPC value in CLEANUP_TYPE field	Text	8
DECANTED	Lab Results	C	Identifies if the Lab decanted the sample in a Yes or No response. (SVOA/PEST/PCB)	Possible values are determined by the CLP Contract or reporting Lab. For Organic (SVOA, Pesticides, PCBs): Decanted or Not_Decanted	Text	20

Data Element Field Names	EDD Type	Required, Optional, Conditional, Not Applicable (R/O/C/NA)	Description or Preferred Values		Field Format/Length	
PH	Lab Results	C	The pH Determination of a soil or water sample. Reported in pH Units (SVOA/PEST/PCB, and Inorganic water samples)	Numeric value may be an integer or decimal.	Text	8
COLOR_BEFORE	Lab Results	O	Description of sample before & after digestion. Used in CLP Metals analysis of waters.	Possible values are determined by the CLP Contract or reporting Lab.	Text	100
COLOR_AFTER	Lab Results	O	Description of sample before & after digestion. Used in CLP Metals analysis of waters.	Possible values are determined by the CLP Contract or reporting Lab.	Text	100
CLARITY_BEFORE	Lab Results	O	Description of sample before & after digestion. Used in CLP Metals analysis of waters.	Possible values are determined by the CLP Contract or reporting Lab.	Text	100
CLARITY_AFTER	Lab Results	O	Description of sample before & after digestion. Used in CLP Metals analysis of waters.	Possible values are determined by the CLP Contract or reporting Lab.	Text	100
TEXTURE	Lab Results	O	Description of sample. Used in CLP Metals analysis of soil/sediments.	Possible values are determined by the CLP Contract or reporting Lab.	Text	100
ARTIFACTS	Lab Results	O	Description of sample. Used in CLP Metals analysis of soil/sediments.	Possible values are determined by the CLP Contract or reporting Lab.	Text	100
COOLER_TEMP	Samples	R	Recorded temperature of the sample cooler upon Receipt at the Lab.	Recorded in Degrees Celcius.	Text	8
SAMPLE_FRACTION	Lab Results	C	Identifies the representativeness of a water sample due to any pretreatment (e.g., filtration at 0.45 micron).	"D" for dissolved (filtered at 0.45 micron), "F" for other filtered, "T" for total (unfiltered). If "F" is used then the filter size/type should be entered in the Result Comment field.	Text	1
METHOD_SPECIATION	Lab Results	C	Part of a chemical characteristic (Nitrogen "As" ...)	Determined by the analytical method.	Text	30
SAMPLE_SUBMATRIX	Samples	R	Scribe Matrix, expanded to include surface water, surface sediment etc. Use a custom list in Scribe	Examples: Air, AirIndoor, Sediment, Sediment Subsurface, Sediment Surface, Soil, Soil Surface, Soil Subsurface, SoilGas, Tissue, Waste, Waste SolidWaste, Waste LiquidWaste, Water, Water SurfaceWater, Water GroundWater, Water Potable, Water SepticEffluent, Water Stormwater	Text	40
SAMPLING_REASON	Samples	R	General program or technical reason for the study. Program reasons are specific and tie the data collection to more prescribed data uses.	Examples: Emergency Response, Site Investigation, Preliminary Assessment, Site Assessment, Remedial Investigation, Remedial Action	Text	30
SAMPLE_COLLECTION_METHOD	Samples	R	Sample Collection Method (i.e., Grab, Composite, Discrete Interval)	Examples: Grab, Composite, Discrete Interval	Text	30
EPA_REGION	Samples	R	"EPA Region" plus the Regional designation number (EPA Region 10)	Valid Values: "EPA Region" + 1 - 10	Text	15
STATION_LOCATION	Samples	R	Station Location Codes	Determined by the project.	Text	50
LOCATION_DESCRIPTION	Sample	R	Further describes the Station Location.	Determined by the project.	Text	100
SCRIBE_SAMPLE_NUMBER	Samples	R	The Scribe / field sample number. This may be Scribe generated or a Regionally assigned number.	Possible value determined by the Scribe Project Manager or the Regional Sample Control Coordinator.	Text	50
LOCATION_ZONE	Samples	R	The type of area that is impacted by the sample location.	Examples: Lake, Land, River/Stream, Well	Text	25
LATITUDE	Samples	R	The geographic latitude where the sample was collected or field measurement was taken.	12 character decimal degrees. Decimal places should be carried out to a minimum of 6 places in order to ensure minimal accuracy.	Text	12
LONGITUDE	Samples	R	The geographic longitude where the sample was collected or field measurement was taken.	12 character decimal degrees (preceded by a negative sign "-" for North America). Decimal places should be carried out to a minimum of 6 places in order to ensure minimal accuracy.	Text	12
DATUM	Samples	R	The horizontal coordinate system reference Datum name.	WGS84	Text	50
GEOMETHOD	Samples	R	The method used to determine latitude and longitude.	GPS, Survey	Text	30
SURFACE_ELEVATION	Samples	C	The determined elevation of a geographic point where the sample was collected or field measurement was taken. This is required for groundwater monitoring wells and where surface elevation data is needed for a project.	In feet or meters, need to provide for GW Wells that have been surveyed and not just GPS.	Text	8
SURFACE_ELEVATION_UNITS	Samples	C	The units of measurement for the surface elevation data. This is required when surface elevation measurements are reported.	meters, feet	Text	20
SURFACE_ELEVATION_METHOD	Samples	C	The method used to determine the surface elevation. This is required when surface elevation measurements are reported.	GPS, Survey	Text	30
SURFACE_ELEVATION_DATUM	Samples	C	The vertical control datum for the surface elevation measurement. This is required when surface elevation measurements are reported.	NAVD88	Text	50
TOP_DEPTH	Samples	C	Top depth of Sample Collection (for cores) or depth of sample collection for a monitoring well.	Numeric value may be an integer or decimal.	Text	8
BOTTOM_DEPTH	Samples	C	Depth To bottom of sample collection for a core sample.	Numeric value may be an integer or decimal.	Text	8
TOP_DEPTH_UNITS	Samples	C	Units of Sample Depth	Feet or meters	Text	20
BOTTOM_DEPTH_UNITS	Samples	C	Units of the Bottom Depth	Feet or meters	Text	20
SAMPLER_NAME	Samples	R	Sampler Name	Full name of the sampler.	Text	30
SAMPLING_COMPANY_CONTACT	Samples	R		Full name of the sampling contact. Person usually coordinates sample collection on behalf of the sampling company.	Text	50
SAMPLING_COMPANY_NAME	Samples	R	Sampling Company Name	Full name of the sampling company.	Text	50

Data Element Field Names	EDD Type	Required, Optional, Conditional, Not Applicable (R/O/C/NA)	Description or Preferred Values		Field Format/Length	
PROJECT_NAME	Samples	R	Site Name / Project Name	Assigned by the Sample Control Coordinator.	Text	50
SITE_PROJECT_CODE	Samples	R	Regional Project Code	Assigned by the Sample Control Coordinator.	Text	50
SITE_EVENT_ID	Samples	R	EventID. Use to group data by sampling/monitoring events (i.e. EOC, Site Assessment) (Primary Key)	A unique ID used by Scribe.	Text	50
STATE	Samples	R	State where sample collection occurred. This field is populated in CLPSS during ASR entry	2 Character State Abbreviation	Text	20
CITY	Samples	R	City where sample collection occurred. This field is populated in CLPSS during ASR entry	Full City Name	Text	60
CERCLIS	Samples	R	CERLIS ID	The CERCLIS identification. Used only by the Superfund program.	Text	20
SCRIBE_SITE_NUMBER	Samples	R	Scribesite key (Primary Key)	A unique ID used by Scribe.	Text	12
SCRIBE_NET_PROJECT_ID	Samples	R	ScribeNetID Project ID	A unique ID used by Scribe.	Text	4
SCRIBE_SAMPLES_ID	Samples	NA	Scribe Database AutoGenerated Number	A unique ID used by Scribe.	Text	4
SAMPLE_TAG	Samples	R	Container ID codes - autogenerated if left blank	A unique ID used by Scribe.	Text	15
SCRIBE_COMMENT	Samples	C	Comment field from Scribe	Filled in by sampler to denote special sample treatment or conditions. Required if the entry is filled in by Scribe.	Text	255
FIELD_SAMPLE_TYPE	Samples	R	Distinguishes field samples from lab QC, field QC and other associated sample types.	Possible values used in the Scribe template. Example: "Field Sample", etc.	Text	30
VERSION_CODE		NA	Reserved for use by another Region.			
DATA_PROVIDER		NA	Reserved for use by another Region.			
PARENT_SAMPLE_NAME		NA	Reserved for use by another Region.			
PARENT_SAMPLE_LOCATION		NA	Reserved for use by another Region.			
LAB_REPLICATE_TYPE		NA	Reserved for use by another Region.			
SAMPLE_SOURCE		NA	Reserved for use by another Region.			
ORGANIC_YN		NA	Reserved for use by another Region.			
PRESERVATIVE		NA	Reserved for use by another Region.			
TEST_BATCH_TYPE		NA	Reserved for use by another Region.			
PREP_BATCH_ID		NA	Reserved for use by another Region.			
ANALYSIS_TYPE		NA	Reserved for use by another Region.			
SAMPLE_ANALYSIS_LOCATION		NA	Reserved for use by another Region.			
COLUMN_ID		NA	Reserved for use by another Region.			
RUN_BATCH_ID		NA	Reserved for use by another Region.			
ANALYSIS_BATCH_ID		NA	Reserved for use by another Region.			
ANALYST_NAME		NA	Reserved for use by another Region.			
ANALYTE_TYPE		NA	Reserved for use by another Region.			
REPORTABLE_RESULT		NA	Reserved for use by another Region.			
DETECT_FLAG		NA	Reserved for use by another Region.			
TIC_RETENTION_TIME		NA	Reserved for use by another Region.			
TIC_RETENTION_TIME_UNITS		NA	Reserved for use by another Region.			
EXPECTED_VALUE		NA	Reserved for use by another Region.			
QC_ORIGINAL_CONC		NA	Reserved for use by another Region.			
QC_SPIKE_MEASURED		NA	Reserved for use by another Region.			
QC_SPIKE_RECOVERY	Lab Results	R	Percent Recovery of lab QC types (matrix spikes, surrogates, etc).	Numbers are represented as "%".	Text	8
QC_DUP_ORIGINAL_CONC		NA	Reserved for use by another Region.			
QC_DUP_SPIKE_ADDED		NA	Reserved for use by another Region.			
QC_DUP_SPIKE_MEASURED		NA	Reserved for use by another Region.			
QC_DUP_SPIKE_RECOVERY		NA	Reserved for use by another Region.			
QC_RPD		NA	Reserved for use by another Region.			
QC_SPIKE_LCL		NA	Reserved for use by another Region.			
QC_SPIKE_UCL		NA	Reserved for use by another Region.			
QC_RPD_CL		NA	Reserved for use by another Region.			
QC_SPIKE_STATUS_FLAG		NA	Reserved for use by another Region.			
QC_DUP_SPIKE_STATUS_FLAG		NA	Reserved for use by another Region.			
QC_RPD_STATUS		NA	Reserved for use by another Region.			
SAMPLE_RUN		NA	Reserved for use by another Region.			
PARAMID		NA	Reserved for use by another Region.			
PAR_VAL_UNCERT		NA	Reserved for use by another Region.			
RESULT_ERROR_DELTA		NA	Reserved for use by another Region.			
INTERPRETED_QUALIFIERS		NA	Reserved for use by another Region.			
SYS_LOC_CODE		NA	Reserved for use by another Region.			
TASK_CODE		NA	Reserved for use by another Region.			
COLLECTION_QUARTER		NA	Reserved for use by another Region.			
SAMPLE_CLASS		NA	Reserved for use by another Region.			

Data Element Field Names	EDD Type	Required, Optional, Conditional, Not Applicable (R/O/C/NA)	Description or Preferred Values		Field Format/Length	
COMPOSITE_DESC		NA	Reserved for use by another Region.			
LEACH_LOT		NA	Reserved for use by another Region.			
LEACHATE_METHOD		NA	Reserved for use by another Region.			
LEACHATE_DATE		NA	Reserved for use by another Region.			
LEACHATE_TIME		NA	Reserved for use by another Region.			
RESP		NA	Reserved for use by another Region.			
CUSTOM_FIELD_1		NA	Reserved for use by another Region.			
CUSTOM_FIELD_2		NA	Reserved for use by another Region.			
CUSTOM_FIELD_3		NA	Reserved for use by another Region.			
COMMENT		NA	Reserved for use by another Region.			

Origin	Scribe Table.DataFieldName	COC XML Field Name	EDD Data Element Updated w/resubmittal of COC XML?	Upload into Scribe from EDD?	Comments
Scribe / Lab	COC.CaseNumber	Site.CaseNumber	N	N	In Scribe this is found in the "COC.CaseNumber" and "Site.CaseNumber" fields. In the xml file it is the Site.CaseNumber element. There's no place for this in the Scribe LabResults Table.
Lab	LabResults.Lab_Batch_No		N	Y	Generated by the Lab.
Lab	SamplesTags.CLP_Samp_No LabResults.CLP_Samp_No	Sample.SampleNo	N	Y	Originates in Scribe from the "SamplesTags.CLP_Sample_No" field and is also uploaded into the "LabResults.Sample_CLP_No" field. Generated by Lab in EDD.
Lab	LabResults.Cas_No		N	Y	Generated by the Lab.
Lab	LabResults.Analyte		N	Y	Generated by the Lab.
Lab / Data Reviewer	LabResults.Result		N	Y	Generated by the Lab & verified by Data Reviewer. May be edited in EDM whereas the "Lab_Result" field below cannot be edited during data validation. The Final_Result field is mandatory for MEL and other (sub-contracted, government, etc.) labs.
Lab	LabResults.Result_Units		N	Y	Generated by the Lab.
EDM / Data Reviewer	LabResults.Result_Qualifier		N	Y	Generated by the EDM or Data Reviewer.
EDM / Data Reviewer	LabResults.QA_Comment		N	Y	Generated by the EDM or Data Reviewer. The Scribe LabResults Table will utilize the QA Comment field in order to accommodate this critical data element.
Lab	LabResults.Quantitation_Limit		N	Y	Generated by the Lab.
Lab	LabResults.MDL		N	Y	Generated by the Lab.
Lab			N	N	There's no data field for this in the Scribe LabResults Table. The "Final_Result" data element which passes validation/lab verification will be uploaded into the Scribe lab results table.
Lab	LabResults.Lab_Result_Qualifier		N	Y	Generated by the Lab.
Lab	LabResults.Reporting_Limit		N	Y	Generated by the Lab.
EDM			N	N	There's no data field for this in the Scribe LabResults Table. Not used by Region 10.
Lab	LabResults.Quantitation_Limit_Units LabResults.Reporting_Limit_Units		N	Y	Generated by the Lab. The Quantitation and Reporting Limit data elements as we're applying them use the same units of measurement so this data element needs to be uploaded into two different fields.
Lab			N	N	There's no data field for this in the Scribe LabResults Table. R10 Does not use this field.
EDM			N	N	There's no data field for this in the Scribe LabResults Table. R10 Does not use this field.
Lab	LabResults.MDL_Units		N	Y	Generated by the Lab.
Lab	LabResults.Percent_Solids		N	Y	Generated by the Lab.
Lab	LabResults.Percent_Moisture		N	Y	Generated by the Lab.
Lab	LabResults.Dilution_Factor		N	Y	Generated by the Lab.
Lab	LabResults.Analysis		N	Y	Generated by the Lab.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab	LabResults.Basis		N	Y	Generated by the Lab.
Scribe	Samples.SampledDate LabResults.Date_Collected	Location.SampleDate, Location.SampleTime	N	Y	Originates in Scribe but is not overwritten in COC XML resubmittals. This is due to the ability to edit this information in EDM during data validation. To allow overwrite via COC XML resubmittal would violate a business rule against duel overwrite input pathways and introduce an vulnerability to the system. Sample Date & Time are concatenated from two Scribe COC XML fields.
Scribe	COC.DateShipped	TrInfo.DateShipped	Y	N	There's no data field for this in the Scribe LabResults Table and it already appears in the COC Table.
Lab	LabResults.Date_Received		N	Y	Generated by the Lab. Need to double check the date/time fields in the LabResults Table. The Scribe Table Defn. file shows the length of these fields to be "8" but we need them to be "20".

Origin	Scribe Table.DataFieldName	COC XML Field Name	EDD Data Element Updated w/resubmittal of COC XML?	Upload into Scribe from EDD?	Comments
Lab	LabResults.Date_Extracted		N	Y	Generated by the Lab.
Lab	LabResults.Date_Analyzed		N	Y	Generated by the Lab.
Lab	LabResults.QC_Type		N	Y	Generated by the Lab. This data type uses Lab QC long names (e.g., "Laboratory_Control_Sample") and perfectly matches the data definition of the QC_Type data field. The previously identified Sample_Type_Code was only 10 characters long.
Lab	LabResults.Matrix_ID		N	Y	Generated by the Lab. CLP has it's definitions but does it also need to match up with the Samples.Matrix Scribe data field? I thought these were populated separately.
Lab	LabResults.Comments		N	Y	Generated by the Lab. For the CLP this was concatenated from the Form I comment field to provide information such as size fraction.
Lab	LabResults.Lab_Name		N	Y	Generated by the Lab.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab	LabResults.Analytical_Method		N	Y	Generated by the Lab.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Scribe	SamplesTags.COC LabResults.Lab_Coc_No	Analysis.TRNo	N	Y	Generated by the Lab.
Lab	LabResults.Lab_Samp_No		N	N	Generated by the Lab.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab	LabResults.SubSample_Amount		N	Y	Generated by the Lab.
Lab	LabResults.SubSample_Amount_Unit		N	Y	Generated by the Lab.
Lab	LabResults.Final_Volume		N	Y	Generated by the Lab.
Lab	LabResults.Final_Volume_Unit		N	Y	Generated by the Lab.
Lab			N	N	There's no data field for this in the Scribe LabResults Table. The analysis requires the use of too many fields (e.g., final volume is already filled).
Lab			N	N	There's no data field for this in the Scribe LabResults Table. The analysis requires the use of too many fields (e.g., final volume is already filled).
Lab			N	N	There's no data field for this in the Scribe LabResults Table. The analysis requires the use of too many fields (e.g., final volume is already filled).
Lab			N	N	There's no data field for this in the Scribe LabResults Table. The analysis requires the use of too many fields (e.g., final volume is already filled).
Lab	LabResults.Final_Volume		N	Y	Generated by the Lab.
Lab	LabResults.Final_Volume_Unit		N	Y	Generated by the Lab.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab			N	N	There's no data field for this in the Scribe LabResults Table. The analysis requires the use of too many fields (e.g., final volume is already filled).
Lab			N	N	There's no data field for this in the Scribe LabResults Table. The analysis requires the use of too many fields (e.g., final volume is already filled).
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab	LabResults.Extraction_Method		N	Y	Generated by the Lab.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.

Origin	Scribe Table.DataFieldName	COC XML Field Name	EDD Data Element Updated w/resubmittal of COC XML?	Upload into Scribe from EDD?	Comments
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Lab			N	N	There's no data field for this in the Scribe LabResults Table.
Scribe	LabResults.Total_Or_Dissolved		N	Y	Generated by the Lab.
Lab			N	N	Generated by the Lab. There's no data field for this in the Scribe LabResults Table.
Scribe	Samples.Matrix	Location.Matrix	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Site.Site_Action	Sites.Action	N	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Samples.SampleCollection	Location.CompositeGrab	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Site.EPARegionNumber	Sites.EPARegionNumber	N	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Location.Location	Station.StationName	N	N	Originates in Scribe but is not overwritten in COC XML resubmittals. This is due to the ability to edit this information in EDM during data validation. To allow overwrite via COC XML resubmittal would violate a business rule against duel overwrite input pathways and introduce an vulnerability to the system.
Scribe	Location.LocationDescription	Location.LocationDescription	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Samples.Samp_No LabResults.Samp_No	Location.SampleIdentifier	Y	Y	Originates in Scribe in the "Samples.Samp_No" field but is also uploaded into the "LabResults.Sample_CLP_No" field.
Scribe	Location.LocationZone	Location.LocationZone	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Location.Latitude	Location.LatitudeX	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Location.Longitude	Location.LongitudeY	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Location.Datum	Location.Datum	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Location.GeoMethod	Location.LocationMethod	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Location.Surf_Elev	Location.SurfaceElevation	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Location.Surf_Units	Location.SurfaceElevationUnits	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Location.ElevMethod	Location.SurfaceElevationMethod	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Location.ElevDatum	Location.SurfaceElevationDatum	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Samples.Samp_Depth	Location.Depth	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Samples.Samp_Depth_To	Location.DepthTo	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Samples.Samp_Depth_Units	Location.DepthUnit	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Samples.Samp_Depth_Units	Location.DepthUnit	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Samples.Sampler	Location.SamplerName	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Site.CTRContact	Sites.ProjectLeader	Y	N	Already in Scribe. No place for it in the Scribe LabResults Table.
Scribe	Site.Contractor	Sites.SamplingCompany	N	N	Already in Scribe. No place for it in the Scribe LabResults Table.

[illegible]

Appendix B – Data Element Valid Values



ValidValues_SCRIBE
_Draft PH_DMP_DRA

DRAFT

R10 Draft PHSS Valid Values

[illegible]

R10 Draft PHSS Valid Values

[illegible]

R10 Draft PHSS Valid Values

[illegible]

R10 Draft PHSS Valid Values

[illegible]

R10 Draft PHSS Valid Values

[illegible]

R10 Draft PHSS Valid Values

[illegible]

R10 Draft PHSS Valid Values

[illegible]

R10 Draft PHSS Valid Values

[illegible]

R10 Draft PHSS Valid Values

[illegible]

R10 Draft PHSS Valid Values

Category (Database Table)	Data Element (Database Field)
LabResults	Analyte
LabResults	Analyte
LabResults	Analyte
LabResults	Analyte
LabResults	Analyte
LabResults	Analyte
LabResults	Analyte
LabResults	Analyte
LabResults	Analyte
LabResults	Analyte
LabResults	Analyte
LabResults	Analyte
LabResults	Result_Units
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Total_or_Dissolved
LabResults	Analytical_Method
LabResults	Basis
LabResults	Basis
LabResults	Lab_Name
LabResults	QA_Comment
LabResults	QA_Comment
LabResults	QA_Comment
LabResults	QA_Comment
LabResults	QA_Comment
LabResults	Result_Qualifier
LabResults	Result_Qualifier
LabResults	Result_Qualifier
LabResults	Result_Qualifier
LabResults	Result_Qualifier
LabResults	Result_Qualifier
LabResults	Validated
LabResults	Validated

R10 Draft PHSS Valid Values

Category (Database Table)	Data Element (Database Field)
LabResults	ValidationLevel
LabResults	ValidationLevel
LabResults	ValidationLevel
LabResults	ValidationLevel
LabResults	ValueType
LabResults	ValueType
LabResults	ValueType
LabResults	ValueType
LabResults	ValueType

R10 Draft PHSS Valid Values

Valid Value
Remedial Design
Remedial Design Oversight
Y
N
US EPA Region 10
ODEQ
US
051
NAD83
UNKWN
WGS84
NAVD88
NGVD29
OTHER
UNKWN
Altimetry
GPS
Interpolation
Other
Survey
GPS-Unspecified
Unknown
GPS
Interpolation
Survey
Ft
Meter
17090012
170900120201
170900120202
170900120301
170900120305
170900120304
170900120302
170900120303
170900120102
170900120104
170900120101
170900120103
Borehole
Canal Transport
Combined Sewer
Estuary
Facility Industrial
Facility Other
Lake
Land
Land Flood Plain
Landfill
Ocean
Other-Ground Water
Other-Seawater
Other-Surface Water
Other-Surface Water

R10 Draft PHSS Valid Values

Valid Value
Pond-Stormwater
Reservoir
River/Stream
River/Stream
Seep
Spring
Storm Sewer
Test Pit
Waste Pit
Waste Sewer
Well
Wetland Undifferentiated
OR
Lower Willamette
Pre-Design
Design
Air
Air Indoor
Asbestos
Biological
Benthic
Drinking Water
Dust
Filtered Water
Ground Water Dissolved
Ground Water Total
Habitat
Lab Sand
Liquid Waste
Porewater Dissolved
Porewater Total
Potable Water
Saline Water Dissolved
Saline Water Total
Sand
Sediment
Sediment <2mm
Sediment <63um
Sediment 125-250um
Sediment 63-125um
Sediment 63-250um
Sediment Bulk
Sediment Subsurface
Sediment Surface
Septic Effluent
Soil
Soil Gas
Soil Subsurface
Soil Surface
Solid Waste
Stormwater
Surface Water
Surface Water Dissolved
Surface Water Total
Tissue
Waste
Subsurface Soil/Sediment
Surface Soil/Sediment

R10 Draft PHSS Valid Values

Valid Value
Ft
Activity Trap
A-Frame Net
Anchor Box Dredge
Artificial Substrate
Backpack Electroshock
Beach Seine Net
Beam Trawl
Benthic Corer (Other)
Benthic Dredge (Other)
Benthic Grab (Other)
Birge Closing Net
Black Light Trap
Block Net
Boat-Mounted Electroshock
Bod Dredge
Bongo Net
Boomerang Corer
Boomerang Grab
Box Corer
Box Sampler
Brail
Bucket
Burrell Epibenthic Sled
Campbell Grab
Cast Net
Center Bag
Chain Dredge
Clam-Shell Grab
Clarke-Bumpus Net
Concussion
Creel Survey
Danish Seine Net
Dart Corer (Gravity)
D-Frame Net
DH-81
DH-95
Dietz-Lafond Grab
Dip Net
Draw Down
Drift Gill Net
Drilled Sampler
Drive Sampler (Generic)
Drop Net
Ekman Grab
Electric Seine
Electroshock (Other)
Emergence Trap
English Umbrella Net
Erwin Piston Corer
Ewing Gravity Corer
Experimental Brail
Experimental Gill Net
Fish Weir
Free Fall Grab
Fry Trap
Funnel Trap
Fyke Net
Glass Slide

R10 Draft PHSS Valid Values

Valid Value
Glass Slide Device
Gravity Corer (Generic)
Hand Corer
Herring Trawl
Hess Sampler
Hester-Dendy
Hook And Line
Hydraulic Grab
Hydroacoustics
Hydroplastic (PVC) Corer
Insect Trap
Isaacs-Kidd Trawl
Juday Trap
Kemmerer Bottle
Kick Net
Kullenberg Gravity Corer
Larval Light Fish Trap
Long Line
Marmap Neuston Net
Minnow Seine Net
Miscellaneous (Other)
Mochness Net
Modified Surber Sampler
MTD Net
Nansen Bottle
Natural Substrate
Net Vertical Tow (Other)
Net/Horizontal Tow (Other)
Net/Non Tow (Other)
Niskin Bottle
Norpac Net
Orange-Peel Grab
Original Surber Sampler
Other Toxicant
Otter Trawl
Pair Trawl
Pamatmat Multiple Quartz Corer
Peterson Grab
Petite Ponar Grab
Phleger Corer (Gravity)
Pipe Dredge
Piston Corer (Generic)
Plankton Net
Plexiglass Slide Device
Plexiglass Trap
Plummet Net
Polar Orga. Chem. Integrative Sampler
Ponar Grab
Pound Net
Pram Electroshock
Probe/Sensor
Pull Sled
Pump/Air Lift
Pump/Bailer
Pump/Centrifugal
Pump/Jet
Pump/Non-Submersible
Pump/Peristaltic
Pump/Piston

R10 Draft PHSS Valid Values

Valid Value
Pump/Rotary
Pump/Submersible
Pump/Turbine
Purse Seine Net
Push Net
Push Point Sampler
Radiello
Rectangular Net
Remotely Operated Vehicle
Rock Basket
Roller Frame Trawl
Rotenone
Roving Drop Net
Scoop Fish Grab
Sediment Trap
Seine Net
Semipermeable Membrane Device
Set (Passive) Gill Net
Shelby Tube
Ship Sea Chest
Shipek Grab
SHOVEL
Shrimp Trawl
Simple Conical Net
Single-Vessel Operated Tow Net
Smith-McIntire Grab
Sodium Cyanide
Spear/Gun
Spear/Hand
Spear/Hawaiian Sling
Split Spoon
Square-Mouth Net
Stainless Steel Spoon
Stationary Drop Net
Still Camera
Stop Net
Storm Water Sampler
Stovepipe Sampler
Stream-Side Electroshock
Suction Dredge
Summa
Surber Sampler
Syringe
Terminal Bag
Tile Plate
Tow Net
Towed Dredge
Trammel Net
Trap Net
Trap Substrate (Other)
Traveling Screen
Trot Line
T-Sampler
Tucker Net
Two-Vessel Operated Tow Net
Van Dorn Bottle
Van Veen Grab
Variable Mesh Gill Net
Vibrating Corer

R10 Draft PHSS Valid Values

Valid Value
Video Camera
Vinyl Tube
Visual Sighting
Water Bottle
Water Sampler (Other)
WBH-96
Whirl-pak bag
Wisconsin-Style Net
Yankee Trawl
Young Grab
<Performing Parties> Will be added as they are defined and organized into groups
Depth Integrated Sample
Field Duplicate
Field Msr/Obs
Field Sample
Incremental Sampling Horiz
Incremental Sampling Vert
QC Blank - Bottle/Preservative
QC Blank - Field
QC Blank - Filter
QC Blank - Rinsate/Equipment
QC Blank - Trip
Sample-Composite Without Parents
<To be determined from performing party site specific sampling plan>
1,1-Dichloroethane
1,1-Dichloroethene
1,1-Dichloroethylene
1,1,1-Trichloroethane
1,1,1,-Trichloroethane
1,1,2-Trichloroethane
Trichloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethane
1,2-Dibromoethane
Dibromoethane
1,2-Dichloroethane
Ethylene dichloride
1,2-Dichloropropane
Propylene dichloride
1,2,3-Trichloropropane
1,2,3,4,7,8-HxCDF
1,2,3,7,8-PeCDD
1,2,4-Trichlorobenzene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2-Butanone
Methyl Ethyl Ketone
2-Hexanone
2-Chloroethylvinyl Ether
2,4,5-TP (Silvex)
2,2'-oxybis(1-Chloropropane)
2,3,4,6-Tetrachlorophenol
2,3,4,7,8-PeCDF
2,3,7,8-TCDF
2,3,7,8-TCDD-Dioxin
2,3,7,8-TCDD
2,4,5-Trichlorophenol

Valid Value
2,4,6-Trichlorophenol
2,4-Dichlorophenol
2,4-D
2,4-Dimethylphenol
Dinitrophenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
2-Chloronaphthalene
2-Chlorophenol
2-Methylnaphthalene
o-Cresol
2-Methylphenol
2-Nitroaniline
2-Nitrophenol
3,3'-Dichlorobenzidine
3,3'- Dichlorobenzidine
3-Nitroaniline
Methyl isobutyl ketone
4-Methyl-2-Pentanone
4-Bromophenyl- phenylether
4-Bromophenyl phenyl ether
3-Methyl-4-chlorophenol
4-Chloro-3-methylphenol
4-Chloro-3- methylphenol
4-Chloroaniline
4-Chlorophenyl phenyl ether
4-Chlorophenyl- phenyl ether
4-Methylphenol
p-Cresol
4-Nitroaniline
4-Nitrophenol
Acenaphthene
Acenaphthylene
Acrolein
Acrylonitrile
Aldrin
Aluminum
Aluminim
Anthracene
Antimony
Arsenic
Benzene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(ghi)perylene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Benzoic Acid
Benzyl alcohol
bis(2-Chloroethoxy) methane
Bis(2-chloroethyl) ether
bis(2-Chloroethyl)ether
bis(2-Ethylhexyl) phthalate
Di(2-ethylhexyl)phthalate
Bromochloromethane
Bromodichloromethane
Dichlorobromomethane

Valid Value
Tribromomethane
Bromoform
Bromomethane
Methyl Bromide
Butylbenzylphthalate
Butyl benzyl phthalate
Cadmium
Carbazole
Carbon Disulfide
Tetrachloromethane
Carbon Tetrachloride
Chlorobenzene, total
Chlorobenzene
Chlorobenzene (each)
Chlorodibromomethane
Dibromochloromethane
Chloroethane
Chloroform
Methyl Chloride
Chloromethane
Chromium
Chrysene
cis-1,2-Dichloroethylene
cis-1,2-Dichloroethene
cis-1,3-Dichloropropene
Copper
Cyanide
Cyanide, free (total)
Dibenzo(a,h)anthracene
Dibenzo(a,h)- anthracene
Dibenzofuran
Dibromomethane
Dichlorodifluoromethane
DDD
4,4'-DDD
p,p'-DDD
p,p'-DDE
4,4'-DDE
EDDE
DDE
p,p'-DDT
Total DDT
4,4'-DDT
DDT
Dieldrin
Diethylphthalate
Dimethyl phthalate
Dimethylphthalate
Di-n-butyl phthalate
Di-n-butylphthalate
n-Butylphthalate
Di-n-octyl phthalate
Di-n-octylphthalate
Endosulfan I
a-Endosulfan
b-Endosulfan
Endosulfan II
Endosulfan sulfate
Endrin

Valid Value
Endrin aldehyde
Endrin ketone
Ethyl benzene
Ethylbenzene
Fluoranthene
Fluorene
Heptachlor
Heptachlor Epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(1,2,3-c,d)pyrene
Indeno(1,2,3-cd)- pyrene
Iodomethane
Isophorone
Isopropylbenzene
Manganese
Mercury
Mercury, Inorganic
Methoxychlor
Methylmercury
2-Methyl-4,6-Dinitrophenol
4,6-Dinitro-2- methylphenol
4,6-Dinitro-2-methylphenol
Methylene chloride
Dichloromethane
Methyl tert-Butyl Ether
Naphthalene
Nickel
Nitrobenzene
N-Nitroso-di-n propylamine
N-Nitrosodi-n-propylamine
N-Nitrosodiphenylamine
N-Nitroso diphenylamine
Pentachlorophenol
Phenanthrene
Phenol
Pyrene
Selenium
Silver
Styrene
Tetrachloroethylene
Tetrachloroethene
Toluene
Toxaphene
1,2-Trans-Dichloroethylene
trans-1,2-Dichloroethylene
trans-1,2-Dichloroethene
trans-1,3-Dichloropropene
trans-1,4-Dichloro-2-Butene
Tributyl tin
Trichloroethylene
Trichloroethene
Trichlorofluoromethane
Vanadium
Vinyl Acetate
Vinyl Chloride
Xylene

R10 Draft PHSS Valid Values

Valid Value
Xylene, total
Xylenes (total)
Zinc
alpha-BHC
a-BHC
beta-BHC
b-BHC
g-BHC
gamma-BHC (Lindane)
Lindane (g-BHC)
delta-BHC
d-BHC
<To be determined from performing party site specific sampling plan>
Total
Dissolved
NA
DI Leach
MWM (Meteoric Water Mobility Ext)
SPLP
Suspended
TCLP
Acid Soluble
Bioavailable
Comb Available
Extractable
Filterable
Fixed
Free Available
Inorganic
Non-filterable
Non-settleable
Non-volatile
Organic
Pot. Dissolved
Settleable
Supernate
Total Recoverable
Total Residual
Vapor
Volatile
WAD
<To be determined from performing party site specific sampling plan>
Wet
Dry
<To be determined from performing party site specific sampling plan>
Final
Accepted
Preliminary
Rejected
Validated
J
U
UJ
J-
J+
R
Yes
No

R10 Draft PHSS Valid Values

Valid Value
S2BVEM
S3VEM
S4VEM
NA
Actual
Calculated
Blank Corrected Calc
Control Adjusted
Estimated