

**DRAFT**

**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).

The summaries of the studies set forth in this Appendix A have been prepared by the Respondents, and have been neither approved nor disapproved by EPA. Inclusion of the findings and conclusions drawn from these studies, as stated in the Work Plan and Appendix A, should not be construed as an endorsement or acceptance by EPA. The data collected since the RI that have been validated will be reviewed by EPA and will be compiled and uploaded as appropriate into the project database.

### **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 sampler (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 ( $\mu\text{g}/\text{kg}$ )

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. 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: River Mile (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 Hart Crowser 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). Seven samples were submitted for grain size testing (the Tri-Met samples). The percent fines results among these 7 samples were 8%, 13%, 17%, 44%, 46%, 59%, and 64%; and one sample had 52% gravel.

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 Portland Harbor Superfund Site (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, the 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, EPA acknowledged in the FS that 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 individual samples 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 upriver whole body SMB was 0.23 mg/kg, with a standard deviation of 0.19 mg/kg. This data was not included in the FSRI.

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). 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). Respondents contend ~~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. Respondents contend that ~~These~~ results support the fish tissue studies indicating natural recovery is occurring throughout the Study Area Site.

#### **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 Site) 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 for the RM 11E Group 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 PHSSSite, 98 surface sediment samples were collected, and 27 surface sediment samples were collected within the Downtown Reach (RM 11.8 to RM 16.2). 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). Respondents contend that the results showed that PCBs in surface sediments were generally lower when compared to RI data co-located stations from the RI 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).

The highest cPAH concentrations were detected in the proximity of the former Gasco property and were consistent with pyrogenic manufactured gas plant (MGP)-derived tar wastes. Very few sediment samples from this study detected petroleum-derived PAHs. The mean concentrations of other COCs (PCBs, DDx, selected chlorinated D/F isomers, BaP Eq) in this study did not exceed PTW classifications (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 (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. Respondents contend that recent sampling indicates that newly deposited sediments are covering and/or mixing with the older surface sediments and in Swan Island Lagoon and that natural recovery is occurring (Geosyntec 2016). Respondents contend that 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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