FINAL DATA GAPS INVESTIGATION REPORT

University of Portland River Campus Property

Portland, Oregon

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1.0 INTRODUCTION

This report documents the most recent focused subsurface investigation conducted at the University of Portland (UP) River Campus Property (site), located at 5828 North Van Houten Place in Portland, Oregon. The work was done consistent with the Data Gaps Work Plan (AMEC Geomatrix, 2009b) and the Quality Assurance Project Plan (QAPP) (AMEC, 2006b) approved by the U.S. Environmental Protection Agency (EPA). This work and UP's plans for future redevelopment of the River Campus Property are outlined in the Statement of Work (SOW) attached to the Agreed Order on Consent (AOC) and Bona Fide Prospective Purchasers Agreement (BFPPA) entered into by UP and the EPA.

Environmental investigations have been conducted at the site since the 1990s to document areas affected by releases from historical industrial activities. These investigations have included a Remedial Investigation and Feasibility Study (RI/FS) for the site overseen by the Oregon Department of Environmental Quality (DEQ) that concluded with a Record of Decision (DEQ, 2005). In preparation for UP's purchase of the property, AMEC Earth & Environmental's Portland office (AMEC) (on behalf of UP) conducted a multi-increment sampling (MIS) investigation at the property (AMEC, 2006c). Additional investigations were undertaken in 2009 and 2010 to fill data gaps from those historical investigations and to provide the information necessary to complete an Engineering Evaluation/Cost Analysis (EE/CA) for remediation of the property. This report presents the results of soil sampling conducted in 2009 and groundwater sampling conducted in 2010 and summarizes conditions for each of the investigation areas based on available data from both the 2009-2010 investigations and historical investigations.

1.1 BACKGROUND

The site is situated on approximately 35 acres (1,524,600 square feet) bounded by the Willamette River to the south and west, the former McCormick and Baxter Creosoting Company property to the northwest, the main UP campus to the southeast (including the area along the river to the southeast), and residential housing and Waud Bluff to the north, northeast, and east.

Between the early 1900s and early 1990s, several companies acquired portions of the site and conducted various industrial operations, including wood products manufacturing and storage,

ship building and other marine operations, power generation, cooperage storage, chemical and soap manufacturing, scrap salvage storage, and concrete production. In the 1990s, several structures on the site were used for office, equipment, and materials storage for a hazardous waste remediation and emergency response contractor.

Most of the site structures were demolished in the 1990s. In 1997, Triangle Park, LLC (Triangle), purchased the site from Edward Hostmann, Inc. under a State of Oregon Prospective Purchase Agreement (PPA) with the DEQ. The property has been vacant since at least 1997, including from 1998 to 2004 when Triangle conducted an RI/FS under DEQ oversight. In 2005, DEQ issued a Record of Decision to Triangle to remediate soils at the site. In 2006, UP entered into a BFPPA with the EPA, as well as a separate PPA with DEQ, that led to UP's purchase of the property in December 2008. Under the terms of the BFPPA, the parties have agreed that the work at the site must be consistent with EPA Removal Action guidance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and performed with EPA oversight.

In preparation for purchase of the property, AMEC Earth & Environmental's Portland office (AMEC) (on behalf of UP) conducted a multi-increment sampling (MIS) investigation at the property (AMEC, 2006c). UP, AMEC Geomatrix, Inc. (AMEC Geomatrix), and EPA met in 2008 to discuss the results of the 2006 MIS investigation and to evaluate remaining data gaps at the site. For purposes of characterizing the nature and extent of contamination, the property has been divided into 25 separate investigation areas as shown in Figure 1. Each of the MIS investigation areas shown in Figure 1 was reviewed in relation to UP's development plans for the property to determine what additional characterization work may be warranted to support decision making in the Engineering Evaluation/Cost Analysis (EE/CA) phase of the scope of work. A summary of this meeting, including identified data gaps, was submitted to EPA in the form of a Meeting Notes Memorandum (Geomatrix, 2008) and is included as Appendix A. On September 9, 2009, UP submitted a Revised Data Gaps Work Plan (AMEC Geomatrix, 2009b), which outlined the scope and methods to be used to complete the additional characterization work needed to address those data gaps. EPA approved that work plan on September 24, 2009.

2.0 OBJECTIVES AND SCOPE OF WORK

The primary objective of the Data Gaps Investigation is to fill the existing subsurface data gaps as necessary to initiate the EE/CA. Additional sampling and analyses of soil and groundwater conducted were required to more precisely document the constituents of concern (COC) in soils and to evaluate impacts to groundwater at the site.

AMEC performed the following Data Gaps Investigation tasks:

- Collected additional discrete soil samples at three locations (RC-2, R-4, and RC-5) to determine the extent of previously identified areas with higher concentrations of COCs. These areas are termed "hot spots."
- Conducted additional multi-increment sampling of shallow soils in four subareas (3B1, 3B2, 3B3, and 3B4) for analysis of polychlorinated biphenyls (PCBs) and in seven subareas (6D1, 6D2, 6D3, RS1A, RS1B, RS1C, and RS1D) for analysis of dioxins.
- Conducted additional multi-increment sampling of soils at four depth intervals in one area that was previously inaccessible (Area 2A1) for analysis of PCBs, polycyclic aromatic hydrocarbons (PAHs), and metals.
- Analyzed several previously collected MIS soil samples from lower depth zones for dioxins (6D, RS1, and RS3).

Sampling locations are shown in Figure 1. In addition, groundwater samples were collected from direct-push borings at 11 locations shown on Figure 1. Analytical results for these groundwater samples are included in Appendix B.

The objectives of surface multi-increment soil sampling (0-1 foot) were to obtain data on concentrations of COCs in soil, use these data to evaluate the likely risk to human health and ecological receptors from direct contact with contaminated soil, and evaluate the potential for contaminants in soils at the site to migrate via stormwater to adjacent river sediments at concentrations above acceptable risk levels for human and ecological receptors. The objectives of the deeper multi-increment soil sampling (1-5 and 5-10 feet) were to obtain data on concentrations of COCs in soil and evaluate the risk of contaminants in soil leaching to groundwater, that could ultimately migrate to the Willamette River.

The work was conducted in accordance with the Revised Data Gaps Work Plan (AMEC Geomatrix, 2009b) and the EPA-approved Sampling and Analysis Plan (SAP) and QAPP produced for the 2006 MIS investigation (AMEC, 2006b).

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3.0 SCREENING LEVELS

To meet the objectives outlined in Section 2.0 above, analytical results for each investigation area obtained during historical and more recent investigations were compared to applicable EPA and DEQ screening levels where appropriate. Two sets of screening levels were applied at the site: one set for locations close to the river (Areas RS-1, RS-2, and RS-3) that present a potential risk to contaminate river sediments, and a second set for the remainder of the site.

To evaluate potential risks due to direct contact with affected media over the majority of the site (Areas 1–6), analytical results were screened against the EPA Regional Screening Levels (RSLs) for residential and industrial soil exposures (EPA, 2009a). Based on guidance and recommendations from EPA Region 10, the risk-based concentrations (RBCs) shown in these tables must be adjusted to reflect a cancer risk of 1×10^{-6} and a Hazard Quotient of 0.1. Based on guidance from EPA Region 10, the RBCs shown in the tables that are based on non-cancer effects have been divided by 10 to reflect the most recent revised hazard quotient. The tables of analytical results presented in Sections 5.0 and 6.0 present the RSLs for both residential and industrial exposure. The evaluation in this report is based on RSLs developed for residential exposure; RSLs based on industrial exposure are also presented for comparison.

Areas RS-1, RS-2, and RS-3 are located adjacent to the river (Figure 1), and contaminated soils in these areas present the greater potential to contaminate sediments outside the property boundary. To evaluate this risk, data from soil samples collected adjacent to the river (Areas RS-1, RS-2, and RS-3) were screened against the Portland Harbor Joint Source Control Strategy (JSCS) Screening Level Values (SLVs) for Soil/Stormwater Sediment (EPA/DEQ, 2007, Table 3.1).

Neither EPA RSLs nor JSCS screening criteria have been established for petroleum hydrocarbon fractions. Therefore, for these constituents, the state of Oregon risk-based cleanup levels (RBCs) established by the DEQ will be used (DEQ, 2009).

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4.0 METHODOLOGY

This section describes the sampling methods used for the additional soil sampling conducted in 2009, field conditions encountered during field activities, and any deviations in the work performed relative to the approved work plan (AMEC Geomatrix, 2009b). The additional MIS sampling was conducted in the same subareas of the site (Figure 1) as the original MIS sampling conducted by AMEC in 2006, except in most cases the original subareas of investigation were further divided to better define the extent of COC impacts. Unless otherwise noted, all work, including quality control measures used to complete these tasks, was conducted consistent with the methodology described in the work plan previously approved by EPA (AMEC, 2009a) and in the SAP and QAPP produced for the 2006 MIS sampling investigation (AMEC, 2006b).

Figure 1 shows the locations of sampling areas and individual sample locations. Boring logs for samples collected in 2009 are presented in Appendix C.

Demolition of the last remaining aboveground structures, concrete slabs, and foundations was completed at the site between June and September 2009 based on the EPA-approved work plan (AMEC, 2009a). The data gaps investigation was conducted after completion of the demolition.

4.1 SAMPLE COLLECTION AND ANALYSES

AMEC conducted soil sampling between October 19, 2009, and November 3, 2009, as shown on Figure 1. All soil sampling was conducted via direct-push drilling and sampling methods unless otherwise noted. The samples collected and analyses performed are described below for each area investigated.

- **Area 2A:** MIS sampling was conducted in Area 2A in 2006. However, a portion of this area (designated Area 2A1 for the data gaps work) had been inaccessible during the 2006 MIS investigation due to the presence of the former power house building, smokestack, and associated concrete slabs, foundation, and basement. Therefore Area 2A1 was investigated as part of the data gaps work once the building was demolished. In Area 2A1 (footprint of the former Power House building), MIS sampling was conducted at four depth intervals: A (0-1 foot), B (1-5 feet), C (5-10 feet), and D (10-14 feet). Samples from all sample intervals were analyzed for lead, PAHs, and PCBs. Samples from Interval A were also analyzed for several additional metals. Duplicate and triplicate sample sets were collected for the A Interval for quality assurance (QA) and quality control (QC).

- **Area 2B:** Discrete soil samples were collected at two locations (RC-2 and RC-4) from depths of 2 feet and 4 feet. The sample from RC-2 was collected to assess the extent of petroleum hydrocarbons identified during the 2006 MIS sampling in a sample of waste material that may potentially represent another hotspot. The

sample from location RC-4 was collected to delineate an area of elevated petroleum hydrocarbons identified by DEQ near boring GP-37 prior to the 2006 MIS sampling. Samples from RC-2 and RC-4 were analyzed for total petroleum hydrocarbons (TPH) in the diesel range (TPH-D) and motor oil range (TPH-Oil).

- **Area 3B:** MIS sampling was conducted in four subareas (Areas 3B1, 3B2, 3B3, and 3B4) at one depth interval (interval A: 0-1 foot) to further delineate areas within Area 3B with concentrations of PCBs above the screening levels. The samples were analyzed only for PCBs, as PAHs were adequately characterized in the original sampling.

- **Area 5A:** Discrete soil samples were collected at location RC-5 from depths of 5, 8, and 11.5 feet to further delineate the extent of an area with elevated concentrations of PAHs. The actual location of RC-5 was moved approximately 10 feet east from the proposed location due to drilling refusal at a depth of 7 feet below ground surface (bgs) at the originally proposed location. Large cobbles caused the refusal. Soil samples were analyzed for PAHs.

- **Area 6D:** MIS sampling was conducted in three subareas (Areas 6D1, 6D2, and 6D3) at one depth interval (Interval A: 0-1 foot) to better evaluate the extent of dioxins within the area. The samples were analyzed for dioxins. Additionally, the archived sample collected in 2006 for Interval B (1-5 feet) from Area 6D was analyzed for dioxins.

- **Area RS-1:** MIS sampling was conducted in four smaller subareas (Areas RS-1A, RS-1B, RS-1C, and RS-1D) at one depth interval (Interval A: 0-1 foot) to further delineate the extent of dioxins in Area 1. Several locations were sampled using hand auger instead of direct-push methods due to inaccessibility of this area to the drilling rig. All samples were analyzed for dioxins. Additionally, the archived sample collected in 2006 for Interval B (1-5 feet) from Area RS-1 was analyzed for dioxins.

- **Area RS-3:** The archived sample collected in 2006 for Interval B (1-5 feet) from Area RS-3 was also analyzed for dioxins to further delineate the extent of dioxins.

Boring logs for samples collected at depth intervals deeper than 0-1 foot are included in Appendix C. All samples were analyzed by Analytical Resources, Inc. (ARI), in Tukwila, Washington, or its subcontractor. Dioxin analyses were subcontracted to Test America, Inc. Several sample jars were broken during shipping of the first set of coolers to ARI, and samples were therefore recollected several days later during the same 2009 sampling event. All results were validated prior to use in this report. The analytical data reports and data validation memorandum are provided in Appendix D.

5.0 2009 DATA GAPS INVESTIGATION RESULTS

This section provides a brief summary of analytical results for the 2009 sampling. Figure 1 shows the 2009 and 2010 sample locations. Table 1 summarizes the results for soil samples collected in 2009 and 2010. Results from groundwater samples collected in 2010 are presented in Appendix B and Table 2.

A comparison of the latest results with previous results is presented in Section 6.0.

Area 2A1: PCBs were not detected above the EPA Regional Screening Levels in samples from any of the four depth intervals sampled in Area 2A1. The PAH compound benzo(a)pyrene was detected above the residential RSL in the MIS samples at all four depth intervals. Lead was detected at concentrations above the residential RSL (40 micrograms per kilogram [µg/kg]) in samples from Interval A and Interval B but below the RSL in samples from Interval C and Interval D. Arsenic was detected above the residential (0.39 milligrams per kilogram [mg/kg]) and industrial (1.6 mg/kg) RSL in the sample from Interval A.

Area 2B: TPH as diesel and motor oil was not detected at a concentration above the Oregon Risk Based Concentrations screening level (3,200 mg/kg) at either RC-2 or RC-4. These results establish the bounds of the known contamination near these locations.

Area 3B: Total PCBs were detected above the residential RSL in subareas 3B2 and 3B3, but below the residential RSLs for subareas 3B1 and 3B4. These results define the portions of Area 3B required to be managed as PCB contaminated during the EE/CA.

Area 5A: Several individual PAH compounds were detected at concentrations above the respective residential RSL in samples from the two deeper depths sampled (7.5–8.5 feet and 11–12 feet) at discrete sample location RC-5. The previously recognized hotspot in this vicinity (previously proposed excavation area A5-11; Figure 2) therefore extends at least as far as RC-5.

Area 6D: Dioxins expressed as the toxicity equivalent quotient (TEQ) of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) were detected at levels above the residential RSL of 4.5 picograms (10^{-12} grams) per gram (pg/g) in the MIS samples from each of the three subareas 6D1, 6D2, and 6D3. The TEQ values were highest in the two areas bordering the McCormick and Baxter National Priority List (NPL) site (Area 6D1 and 6D3). The dioxin TEQ in the archived B Interval sample [MI-6D(B)] collected in 2006 was below the RSL. It should be noted that EPA issued a draft interim recommended preliminary remediation

goal of 72 pg/g at the end of December 2009 (EPA, 2009b). All TEQs in Area 6D were below 72 pg/g.

Areas RS-1: Dioxins expressed as the 2,3,7,8-TCDD TEQ were detected above the JSCS screening level of 0.0091 pg/g in the four subareas RS-1A, RS-1B, RS-1C, and RS-1D. The dioxin TEQ in the archived B and C Interval samples (MI-RS-1-B and MI-RS-1-C) collected in 2006 were also above the JSCS screening level, though somewhat lower than the values for the 2009 surface MIS samples.

Area RS-3: The result for the archived B Interval sample from Area RS-3 is presented in Appendix B.

6.0 EVALUATION OF RESULTS

This section describes the current COC levels throughout the site. Conditions are discussed separately for each of the individual investigation areas shown on Figure 1, and are discussed separately for those portions of the property not directly adjacent to the river. This discussion of the nature and extent of COCs incorporates available information for the site, including data from the 2009 data gaps investigation as well as previous historical investigations. The evaluation of individual areas is based on the screening levels for the site described in Section 3.0. This evaluation will serve as the basis for completing the EE/CA.

Figure 2 presents a broad overview of conditions at the site and summarizes the classes of COCs that have been found above screening levels for each investigation area. Arsenic was detected above the residential RSL (0.39 mg/kg) in the majority of MIS samples; but concentrations have all been below the area background concentration (7 mg/kg).[1] Therefore, arsenic is discussed in the text only for areas where arsenic exceeds the background concentration.

6.1 AREAS NOT ABUTTING THE RIVER

This section describes conditions in areas not located adjacent to the river. Data for these areas have been screened against the EPA RSLs, as described in Section 3.0.

6.1.1 Area 1A

Relevant analytical results from historical investigations in Area 1A are presented in Table 3. A summary of conditions in Area 1A is presented in Figure 3. Results from MIS samples collected in 2006 were all below the residential RSLs, except for arsenic. However, the arsenic concentrations were well below the area background levels of 7 mg/kg. No other COC was detected above screening levels in Area 1A (Figure 3). Therefore, no additional work is proposed for Area 1A.

6.1.2 Area 1B

Relevant analytical results from historical investigations in Area 1B are presented in Table 4. A summary of conditions in Area 1B is presented in Figure 3. Several PAH compounds were detected at concentrations greater than the respective RSLs in the MIS samples collected in 2006. Concentrations of individual PAHs ranged as high as 11,000 µg/kg. The highest concentrations of individual PAHs included benzo(a)pyrene at an estimated concentration of 2,100 µg/kg (compared to the RSL of 15 µg/kg). For the purposes of the EE/CA, soils in

[1] DEQ Memorandum dated October 28, 2002, RE: Default background concentrations for metals.

Area 1B will be assumed to be impacted with PAHs above screening levels to depths of at least 10 feet.

A metal box was discovered beneath a concrete slab in Area 1B in July 2009 during demolition activities (Figures 2 and 3). The box measured approximately 3 feet by 3 feet and contained an unknown, waxlike substance. The metal box and visibly impacted soil and concrete surrounding the box were characterized and disposed of as part of the demolition activities (AMEC, 2010). Samples of the material contained TPH-D at a concentration of 890 mg/kg and TPH-Oil at a concentration of 2,700 mg/kg. Several metals were detected in the sample, including beryllium at a concentration of 0.3 mg/kg, chromium at 13.8 mg/kg, copper at 22.5 mg/kg, lead at 51 mg/kg, nickel at 16 mg/kg, and zinc at 96 mg/kg. Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and PCBs were not detected above laboratory reporting limits. The location where the metal box was found is shown on Figures 2 and 3.

6.1.3 Area 1C

The most relevant analytical results from historical investigations in Area 1C are presented in Table 5. A summary of conditions in Area 1C is presented in Figure 3. Analytical results from 2006 MIS sampling for all analytes were below the applicable RSL, except for benzo(a)pyrene in the B Interval (1 to 5 feet).

6.1.4 Area 2A

Analytical results from the 2009 data gaps investigations and relevant results from historical investigations for Area 2A are presented in Table 6. A summary of conditions in Area 2A is presented in Figure 4. The former powerhouse building was located in Area 2A (Figure 4). Several portions of the building contained a basement level, and conditions of the soils beneath the building were unknown prior to 2009. MIS sampling was conducted beneath the former powerhouse building (subarea 2A1) in 2009 following demolition of the building and foundations.

Black ashlike material was discovered beneath the former smokestack in Area 2A during demolition of the building in July 2009. The ashlike material was characterized and disposed of following sampling and laboratory analysis (AMEC, 2010). Several metals were detected in the sample, including beryllium at a concentration of 1.0 mg/kg, chromium at 25 mg/kg, copper at 59.2 mg/kg, lead at 75 mg/kg, mercury at 0.15 mg/kg, nickel at 53 mg/kg, and zinc at 153 mg/kg. The location where the ashlike material was found is shown on Figure 4.

Results for MIS samples collected in Subarea 2A1 were fairly consistent with the 2006 MIS results for Area 2A (Table 6). Selected PAH compounds were detected above the RSL in shallow soils in Area 2A and in all four depth intervals (0-14 feet bgs) in subarea 2A1. Lead was detected above the residential RSL (40 µg/kg) in the A interval (0-1 foot bgs) in Area 2A and in the A and B (0-5 feet bgs) depth intervals in Subarea 2A1.

Diesel and motor oil were detected above the screening level in a waste sample collected as part of 2006 MIS sampling in the depth range of 9–10 feet (WS-2A-16). This sample is part of the hot spot Area A2-1 further described in Section 6.1.5.

Direct-push groundwater sampling was conducted to characterize PAH concentrations in groundwater directly downgradient of Area 2A. Two borings were completed in March 2010 in Area 2B (RC-1 and RC-2) and one boring was completed in Area 5B (RC-3) (Figure 1). Groundwater sampling results are presented in Appendix B and Table 2.

6.1.5 Area 2B

Analytical results from the 2009 data gaps investigations and relevant results from historical investigations for Area 2B are presented in Table 7. A summary of conditions in Area 2B is presented in Figure 4. Analytical results from 2006 MIS sampling showed only lead and arsenic present above RSLs in surface soils, and benzo(a)pyrene present above RSLs in soil to at least 10 feet bgs. Area 2B also includes two small subareas that were previously proposed for excavation by DEQ, based on elevated concentrations of diesel, heavy oil, and lead. These areas (shown on Figure 4) were excluded from the earlier MIS sampling.

Previously proposed Excavation Area A2-3 (Figure 4) is an isolated lead hotspot at the historical sample location of TP-1, a test pit dug by Maul, Foster, and Alongi (MFA, 2002) in September 1996. The test pit showed lead concentrations as high as 4,260 mg/kg, well above the residential RSL of 40 mg/kg. The preliminary estimate for potential excavation for Area A2-3 is approximately 706 square feet of surface area excavated to a depth of 4 to 6 feet. Later samples collected at surrounding locations confirmed that the area with elevated concentrations of COCs is limited to the vicinity of TP-1.

Previously proposed Excavation Area A2-1 (Figure 4) is located in the vicinity of the historical sample location GP-37, a direct-push boring drilled in May 1999. The soil sample collected at a depth of 1.3 feet below ground surface from GP-37 contained diesel at a concentration of 26,000 mg/kg and elevated benzo(a)anthracene (190 µg/kg). The screening level for diesel is 3,200 mg/kg, and the RSL for benzo(a)anthracene is 150 µg/kg. Additional sampling showed that the diesel/heavy oil contamination extended north of GP-37, but that elevated concentrations of PAHs did not. Therefore, the originally proposed excavation area A2-1 was

revised to encompass the area of former sample location WS-2A-16 (Area 2A), where diesel and motor oil were detected at high concentrations. The preliminary estimate for the extent of potential excavation at Area A2-3 is approximately 2,400 square feet excavated to a depth of 10 to 12 feet.

6.1.6 Area 3A and the Former Building Area South of 3A

Relevant analytical results from historical investigations at Area 3A are presented in Table 8. A summary of conditions in Area 3A is presented in Figure 5. Analytical results from MIS samples were below the applicable RSLs for all analytes. Diesel was detected above the screening level in waste sample WS-3A-2A collected as part of 2006 MIS sampling in the depth range of 9–10 feet (Figure 5). Results for nearby sample GP-139, collected in 2000, similarly showed diesel present at depth and not in shallow soils; however all concentrations in sample GP-139 were lower than in the 2006 waste sample and below the screening level.

6.1.7 Area 3B

Analytical results from the 2009 data gaps investigations and relevant results from historical investigations for Area 3B are presented in Table 9. A summary of conditions in Area 3B is presented in Figure 5. Aroclor 1260 was detected in surface soils in this area (during the 2006 MIS Investigation) at a concentration of 490 µg/kg, which is above the residential RSL (220 µg/kg). PCBs were not detected in either of the two deeper MIS samples collected in 2006. Additional MIS sampling conducted in subareas 3B1, 3B2, 3B3, and 3B4 showed that only Subareas 3B2 and 3B3 showed concentrations of total PCBs that exceed the residential RSL. Benzo(a)pyrene was detected in the B interval (1-5 feet) 2006 MIS sample slightly above the residential RSL, but was not detected in the shallower or deeper sample.

6.1.8 Area 4

Relevant analytical results from historical investigations in Area 4 are presented in Table 10. Analytical results from MIS sampling for all analytes were below the applicable RSL.

6.1.9 Area 5A

Analytical results from the 2009 data gaps investigations and relevant results from historical investigations for Area 5A are presented in Table 11. A summary of conditions in Area 5A is presented in Figure 6. Lead and dioxins were the only analytes detected at concentrations above the RSL in the 2006 MIS samples in Area 5A. Lead and dioxins were both above the RSL in the 2006 MIS surface soil sample (0-1 foot). It should be noted that dioxins were below the December 2009 EPA proposed interim PRG of 72 pg/g. Area 5A does include two subareas that were previously proposed for excavation by DEQ, based on elevated concentrations of PAHs, PCBs, and TPH.

Previously proposed Excavation Area A5-11 (Figure 6) is located in the vicinity of historical sample location GP-82, a direct-push sample collected in June 1999. GP-82 showed elevated concentrations of PAHs, including benzo(a)pyrene at 75,000 µg/kg, at a depth of 5 feet. The residential RSL for benzo(a)pyrene is 15 µg/kg. Samples collected in 2005 at DP-A5-36 and DP-A5-38 showed lower concentrations to the east and west, but the 2005 sample collected at a depth of 8 feet at DP-A5-37, located approximately 15 feet south of GP-82, showed concentrations of PAHs well above the residential RSL. The 2009 sample collected at RC-5, approximately 25 feet south of DP-A5-37, also showed elevated PAHs at depth, though the concentrations were several orders of magnitude lower than those seen in the 8-foot-deep sample at DP-A5-37. The hot spot represented by Area A5-11 is estimated to be approximately 1,100 square feet in area and 12-14 feet deep. Area A5-11 has been extended to the south since results from RC-5 indicate that contamination extends at least as far as sample location RC-5.

Potential Excavation Area A5-12A/B (Figure 6) is located surrounding the historical sample locations GP-88, GP-89, and GP-160, direct-push samples collected in June 1999 and August 2000. This potential excavation area extends into Area RS-2 and a small sliver of Area 5B. GP-89 is located in Area RS-2. Samples collected at a depth of 0.5 foot at GP-88 and GP-160 showed total PCB concentrations of 360 µg/kg and 1,300 µg/kg, respectively, which are above the JSCS and RSLs. Elevated diesel and arsenic were also detected in this area. Six borings (DP-A5-39 through DP-A5-44) were conducted by AMEC in November 2005 near GP-88, GP-89 and GP-160 to confirm the results. PCBs were not detected in any of the 2005 samples. This area of elevated concentrations is estimated to be approximately 6500 square feet in area and 1 to 2 feet deep, except for arsenic which is elevated at depth only (12 to 14 feet bgs).

Stained soil was observed in Area 5A following removal of a concrete slab during demolition in 2009. The area of stained soil appeared to measure approximately 15 to 20 feet in diameter. The location of the stained soil is shown in Figure 6.

6.1.10 Area 5B

Relevant analytical results from historical investigations in Area 5B are presented in Table 12. A summary of conditions in Area 5B is presented in Figure 6. Benzo(a)pyrene was detected slightly above the RSL in all three depth intervals (0-10 feet) during the 2006 MIS sampling. Dioxin levels slightly above the screening level were also detected in the MIS surface soil sample from Area 5B, but below the December 2009 EPA proposed interim PRG of 72 pg/g.

Direct-push groundwater sampling was conducted in Area 5B in March 2009 to characterize PAH concentrations in groundwater directly downgradient of Area 2A. One direct-push boring (RC-3) was installed, as shown in Figure 6, and grab groundwater samples were collected for analysis of PAHs. Results of the 2010 groundwater sampling are presented in Appendix B and Table 2.

6.1.11 Area 6A

Relevant analytical results from historical investigations in Area 6A are presented in Table 13. Selected PAH compounds were detected above the residential RSLs in the A and B interval (0-5 feet) MIS soil samples collected in 2006. Dioxins were detected in the MIS sample from the surface soil interval (0-1 foot) at a concentration above the residential RSL, but below the December 2009 EPA proposed interim PRG of 72 pg/g. Lead was detected above the RSL only in the deepest MIS interval sample (5-10 feet).

As shown in Table 13, COCs were also detected above RSLs in several waste samples collected at depths of 3 to 8.5 feet. The soil sample at location WS-6A-23 showed elevated concentrations of diesel at 3 to 4 feet. The cluster of three waste samples (WS-6A-8b, -8c, and -9a), collected from an area of approximately 1,600 square feet, showed elevated concentrations to a depth of 8 to 9 feet for one or more of the following analytes: diesel, motor oil, and selected PAH compounds.

Direct-push groundwater sampling was conducted in March 2009 at four direct-push locations (RC-6, RC-7, RC-8, and RC-9) located downgradient of Area 6A in Area 6C and Area RS-2 to determine if soil contamination is impacting groundwater (Figure 6 and Figure 7). These samples will also help assess any impacts to groundwater due to migration of COCs toward the river from farther upgradient in Area 1B. Groundwater samples from these borings were analyzed for PAHs, tributyltin (TBT), and diesel/motor oil. Results of the 2010 groundwater sampling are presented in Appendix B and Table 2.

A summary of soil conditions in Area 6A is presented in Figure 8.

6.1.12 Area 6B

Analytical results for Area 6B are presented in Table 14. A summary of conditions in Area 6B is presented in Figure 8. PAHs were detected above the RSL in the 2006 MIS sample from the surface soil interval, but not at greater depth intervals.

The groundwater sampling conducted downgradient of Area 6A will help determine if soil conditions are causing impacts to groundwater downgradient of this area, prior to groundwater discharge to the river.

6.1.13 Area 6C

Relevant analytical results from historical investigations in Area 6C are presented in Table 15. A summary of conditions in Area 6C is presented in Figure 7. Lead and benzo(a)pyrene were detected above the residential RSL in the 2006 MIS surface soil sample. Benzo(a)pyrene was also detected in the C Interval MIS sample (5-10 feet) at a concentration slightly above the residential RSL.

Area 6C includes a subarea (Area A6-14B) that was proposed for excavation by DEQ, based on elevated PAH and PCB concentrations. Area A6-14B extends partly into Areas RS-1d and RS-1c. Area A6-14B (Figure 7) is located around the historical sample locations GP-126, GP-171, GP-172, and GP-173, direct-push samples collected in June 1999 and August 2000. Samples collected at GP-126, GP-171, and GP-172 were analyzed for PCBs and PAHs. Samples collected at GP-173 were analyzed for PAHs. Results showed elevated concentrations of PCBs at GP-126, GP-171, and GP-172 ranging from 150 to 1,300 µg/kg in samples collected at depths of 0.5 foot to 7 feet. Samples collected at GP-173 and to a lesser extent GP-172 showed elevated concentrations of PAHs.

Three borings (DP-A6-51 through DP-A6-53) were conducted by AMEC in December 2005 to confirm the results; however, conditions at the site had changed significantly since the earlier sampling events. A ramp leading down to the Willamette River had been cut in this area for use by barges accessing the neighboring McCormick & Baxter site for remediation. As a result, the surface grade was different for the 2005 sampling than it had been for the 1999/2000 sampling, and contaminated soil is likely to have been disturbed as part of the ramp construction. PCBs were not detected in any of the samples, and PAHs were not detected above the residential RSL or the JSCS screening levels. Maps depicting the historical sample locations indicate that DP-A6-51 and DP-A6-52 were completed quite close to the 1999/2000 sample locations. To confirm this hypothesis, AMEC Geomatrix used a global positioning system (GPS) to locate the ramp location so that it could be compared to the location of the historical borings. The location of the ramp is shown on Figure 7 and was measured in the field to be approximately 25 feet wide and 8 to 10 feet deep, confirming that most, if not all, of the contaminated soil was removed as part of ramp construction.

Direct-push groundwater sampling was conducted in Area 6C in March 2010 to characterize groundwater directly downgradient of Area 6A. Three direct-push borings (RC-6 through RC-8) were installed, and grab groundwater samples were collected for analysis of PAHs, tributyltin, and TPH-D. Results of the 2010 groundwater sampling are presented in Appendix B and Table 2.

6.1.14 Area 6D

Relevant analytical results from historical investigations in Area 6D are presented in Table 16; analytical results for dioxins are presented in Table 17. A summary of conditions in Area 6D is presented in Figure 8. Levels of PAHs and dioxins above the residential RSL were detected in the 2006 MIS surface soil sample from Area 6D. Additional characterization of Area 6D soils for dioxins was completed in 2009. Area 6D was divided into three smaller subareas (Areas 6D1, 6D2, and 6D3) for MIS sampling of surface soils (0 to 1 foot), as shown in Figure 8. Additionally, the archived B Interval MIS sample (depth range of 1 to 5 feet) was analyzed for dioxins. Concentrations of dioxins are above the residential RSL (4.5 pg/g) in all three subareas, but are highest in the two areas bordering the McCormick & Baxter property. Elevated levels of dioxins are limited to shallow soils; the result for the deeper B Interval sample (1 to 5 feet bgs) was below the residential RSL. It should be noted that all dioxin results for Area 6D and subareas were below the December 2009 EPA proposed interim PRG of 72 pg/g.

As shown in Table 16, COCs were also detected above RSLs in several waste samples collected at depths of 2 to 10 feet. The soil sample at location WS-6D-8 showed elevated concentrations of diesel and motor oil at 2 to 2.5 feet. The cluster of three waste samples collected at WS-6D-13A, -13B, and -14B showed elevated concentrations of diesel, motor oil, gasoline, PAHs, and VOCs in an area of approximately 800 square feet and at depths of 4 to10 feet.

Direct-push groundwater samples were collected in March 2010 for analysis of pentachlorophenol from four direct-push locations (RC-10, RC-11, RC-12, and RC-13) near the McCormick & Baxter property boundary, as shown in Figure 8. These samples were collected to asses groundwater conditions along the western margin of Area 6D near the property boundary to evaluate pentachlorophenol concentrations in groundwater, since elevated concentrations are known to be present on the adjacent McCormick & Baxter NPL site. Results of the 2010 groundwater sampling are presented in Appendix B and Table 2.

6.2 AREAS ADJACENT TO THE RIVER

This section describes results from the data gaps investigation and conditions in areas located directly adjacent to the river. These areas, designated RS areas, were separated from the other delineated areas on site to evaluate conditions along the riverfront where potential contamination of river sediments is of greater likelihood. In evaluating conditions in Areas RS-1, RS-2, and RS-3, analytical results have been screened against JSCS screening levels, except for TPH (which is screened against DEQ levels), as described in Section 3.0.

6.2.1 Area RS-1

Relevant analytical results from historical investigations in Area RS-1 are presented in Table 18; analytical results for dioxins are presented in Table 19. Dioxins, selected PAH compounds, total PCBs, lead, and tributyltin were all detected above JSCS screening levels in the 2006 MIS samples. The PAH indeno(1,2,3-c.d)pyrene was detected above the JSCS in the B and C Intervals to a depth of at least 10 feet bgs. Total PCBs and tributyltin were detected above the JSCS screening levels in all three depth intervals, to a depth of at least 10 feet bgs; lead was above the JSCS screening levels in the upper A and B Intervals (0-5 feet).

Additional characterization of Area 6D soils for dioxins was completed in 2009. RS-1 was divided into four separate smaller areas (Areas RS-1a, RS-1b, RS-1c, and RS-1d; see Figure 7) for MIS sampling of surface soils (0 to 1 foot) for dioxin analysis. Additionally, the archived B Interval sample (depth range of 1 to 5 feet) and C Interval sample from the 2006 MIS investigation were analyzed for dioxins. Dioxins levels are above the JSCS screening level (0.0091 pg/g) in all four subareas. The result for the deeper B Interval sample (1 to 5 feet bgs) was lower than the results for the surface samples (2.9 pg/g) but still above the JSCS screening level; therefore, the archived C Interval sample was also analyzed. Results for the archived C Interval sample are presented in Appendix B and Table 19.

6.2.2 Area RS-2

Relevant analytical results from historical investigations in Area RS-2 are presented in Table 20. Conditions in Area RS-1 are summarized in Figure 6. Total PCBs, dioxins, and lead were detected at levels above the JSCS screening levels in the 2006 MIS surface soil sample. Neither PCBs nor lead were detected above the JSCS screening levels in either of the two deeper MIS samples. Tributyltin was also detected in the shallow (0-1 foot) and deep (5-10 feet) MIS soil samples from Area RS-2 at concentrations above the JSCS screening levels.

Area RS-2 also includes portions of a subarea (potential Excavation Area A5-12A/12B), which extends into Area 5A, that was planned for excavation by DEQ, based on elevated concentrations of PCBs and petroleum hydrocarbons, as described in Section 6.1.9.

Area RS-2 also includes a second subarea (potential Excavation Area A5-13) that was proposed for excavation by DEQ, based on elevated PCB concentrations. Area A5-13 (Figure 6) is located surrounding the historical sample location GP-79, a direct-push sample collected in June 1999 that contained elevated PCBs at 0.5 feet bgs, but not at depth. Nearby samples (GP-150, GP-151, GP-152, DP-A5-48, and DP-A5-49) were collected in 2000 and

2005 surrounding GP-79. This potential excavation area is estimated to be approximately 500 square feet in area and 1 to 2 feet deep.

Direct-push groundwater sampling was conducted in Area RS-2 in March 2010 to characterize groundwater directly downgradient of Area 6A. One direct-push boring (RC-9) was installed in Area RS-2, as shown in Figure 6, and grab groundwater samples were collected for analysis of PAHs, tributyltin, and TPH-D. Results of the 2010 groundwater sampling are presented in Appendix B and Table 2.

6.2.3 Area RS-3

Relevant analytical results from historical investigations in Area RS-3 are presented in Table 21. Conditions in Area RS-3 are summarized in Figure 9. Total PCBs were detected above the JSCS screening level (0.39 µg/kg) in the 2006 MIS surface soil sample. PCBs were not detected in either of the deeper MIS samples. Lead was also detected above the JSCS screening level (17 mg/kg) in 2006 MIS samples from all three depth intervals at concentrations ranging from 30 to 37 mg/kg. Dioxins were detected at concentrations above the JSCS screening level in the 2006 MIS surface soil sample. The archived B Interval (depth range of 1 to 5 feet) MIS sample was analyzed as part of the data gaps investigation to determine if elevated levels of dioxins are present at depth. The results for the archived B Interval sample are presented in Appendix B and Table 19.

Area RS-3 also includes two subareas that were planned for excavation by DEQ, based on elevated concentrations of PAHs and PCBs. Potential Excavation Area A4-5 (Figure 9) is located surrounding the historical sample locations of GP-73 (a direct-push boring conducted in June 1999) and GP-149 (a direct-push boring conducted in August 2000). Analytical results showed a PCB concentration of 5,020 µg/kg for the sample collected at a depth of 5 feet at GP-73 and low-level PAHs in samples collected at depths of 0.5 feet and 4 feet at GP-149. The PAHs were deemed a concern due to the proximity to the river. Three borings (DP-A4-15, DP-A4-16, and DP-A4-17) were conducted by AMEC in November 2005 to confirm the results; nearby samples from GP-147 and GP-148 also help bound this hot spot. The potential excavation area is estimated to be approximately 700 square feet in area and 6 feet deep.

Potential Excavation Area A4-8 (Figure 9) is located surrounding the historical sample locations GP-59 (a direct-push boring conducted in May 1999) and GP-143 (a direct-push boring conducted in August 2000). Low-level PAHs were detected at these locations, mostly below JSCS screening levels. Six borings (DP-A4-23 through DP-A4-28) were conducted by AMEC in November 2005 to confirm the results. Results for these samples were mostly non-detect for PAHs. This potential excavation area is estimated to be approximately

650 square feet in area, and most contamination to be removed would be at depth only, at approximately 5 to 14 feet bgs.

As shown in Table 21, arsenic and lead were also detected above the JSCS screening levels in waste sample WS-RS-3-1 collected at a depth of 5 to 8 feet.

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7.0 SCHEDULE AND REPORTING

Results presented in this report will be used to prepare the EE/CA in 2010.

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