APPENDIX A: OREGON STREET PHASE II INVESTIGATION – FIELD WORK PERFORMED

Borehole Drilling, Soil, and Groundwater Sampling

The locations of the five boreholes (B06-1 through B06-5) drilled for the Oregon Street right-of-way Phase II investigation are presented in Figure 1. Some of the borehole locations were revised slightly from those initially proposed based on utility clearances and safety issues. Underground utility locating services were provided by One-Call Utility Locators and APS, a private locating company based in North Bend, Washington. A street use permit (Attachment A) was obtained from the Seattle Department of Transportation prior to drilling in the right-of-way.

ESN Northwest of Olympia, Washington, provided drilling services at Oregon Street on November 6, 2006. Two-inch diameter boreholes were drilled with a conventional truck-mounted, direct-push rig. Continuous soil cores of undisturbed material were collected from ground surface to total depths which ranged from 16 to 20 feet below ground. A PGG hydrogeologist observed drilling activities, visually classified the soil cores in geologic logs, and collected samples for lab analysis. Contaminant odors and visual characteristics indicating contamination were observed and recorded in the geologic logs. The soil types encountered were generally fine to gravelly sand to silty sand fill material from the surface to 7 to 13 feet below ground surface (bgs). Below the distinguishable fill, a homogenous fine to medium grained sand was observed in all boreholes. A sandy silt with organics present (interpreted as a tidal deposit) was observed near the bottom of B06-1. Geologic logs for the Phase II Investigation boreholes are presented in Figures 2 through 6.

Upon completion of drilling boreholes B06-1, B06-3, and B06-4 were backfilled with bentonite pellets from total depth to ground surface. Shallow groundwater samples were obtained from boreholes B06-2 and B06-5 before they were backfilled. Temporary wells with five foot screens were set at the bottom of the respective borings and groundwater samples were collected using a peristaltic pump. Following groundwater sample collection, the temporary wells were removed and the boreholes were backfilled with bentonite pellets to ground surface. Borehole locations were marked with stakes, paint, or pylons for future surveying by the Port of Seattle.

Soil samples for possible lab analysis were collected from each borehole at depths of 1 foot below ground, 2.5 feet below ground, and then at 2.5 feet intervals until total depths were reached. The samples were identified by borehole name followed by the collection depth in feet[3]. Soil samples were collected in plastic-lined core barrels and transferred to glass jars, with all samples collected and preserved according to methods appropriate for the analysis. Not all soil samples collected were submitted to the lab for analysis. To defray laboratory costs, four samples from each borehole were submitted for analysis. An

[3] For example, B06-4-12.5 was collected from borehole B06-4 at a depth of 12.5 feet below ground.

attempt to assess which samples had high contaminant concentrations was made using a photo-ionization detector (PID) meter. Due to instrumentation errors and sample moisture, this approach for identifying highly contaminated soils proved ineffective. Therefore, soil samples for lab analysis were chosen based on field observations of suspected contamination and also samples directly below suspected contaminated zones (to assess contaminant migration). If four soil samples per borehole were not identified using the above criteria, samples were selected to represent each sampling depth at the site.

OnSite Environmental Inc., a Washington-state certified laboratory, provided analytical services. The soil and groundwater samples were analyzed for the following parameters:

Matrix	Parameter	Analytical Method
Soil	Polyaromatic Hydrocarbons (PAHs)	EPA 8370C/SIM
	Polychlorinated Biphenyls (PCBs)	EPA 8082
	Diesel-extended hydrocarbons	NWTPH-Dx
	Metals (arsenic, cadmium, lead, copper, zinc, and nickel)	EPA 6010B
	Gasoline, benzene, ethylbenzene, toluene, and xylenes (BETX)[4]	NWTPH-Gx/BETX
Groundwater	Polyaromatic Hydrocarbons (PAHs)	EPA 8270C/SIM
	Polychlorinated Biphenyls (PCBs)	EPA 8082
	Diesel-extended hydrocarbons	NWTPH-Dx
	Dissolved Metals (arsenic, cadmium, lead, copper, zinc, and nickel)	EPA 200.8
	Gasoline, benzene, ethylbenzene, toluene, and xylenes (BETX)	NWTPH-Gx/BETX

[4] A minimum of one soil sample per borehole analyzed for NWTPH-Gx/BETX

Intertidal Sediment Sampling

Three locations in the intertidal zone were sampled on the banks of the Duwamish Waterway within the Oregon Street right-of-way (Figure 1). IT-1 is located in an outcrop of the upland bank composed of brown silt with roots and organic material and samples at this location were collected at approximately 6- and 12-inches below ground surface using a decontaminated stainless steel trowel. IT-2 is located in the gently sloped shore beach below the upland bank. The upper 12 inches of material at IT-2 is gray sand and gravel underlain by dark gray silt with a strong organic odor. Samples at IT-2 were collected at 6- and 16-inches below ground with a decontaminated stainless steel hand auger. IT-3 is located in the interstices of riprap protecting the City of Seattle outflow pipe. Samples at this location were collected at 6- and 12-inches below the surface of the interstitial material. Intertidal sediment samples were identified by sample location followed by the approximate collection depth in inches. Sediment samples were collected and preserved according to methods appropriate for the analysis and were analyzed by OnSite Environmental Inc., for the following parameters:

Matrix	Parameter	Analytical Method
Intertidal Sediment	Polyaromatic Hydrocarbons (PAHs)5	EPA 8370C/SIM
	Polychlorinated Biphenyls (PCBs)	EPA 8082
	Diesel-extended hydrocarbons	NWTPH-Dx
	Metals (arsenic, cadmium, lead, copper, zinc, and nickel)	EPA 6010B

[5] PAH analysis was not requested for IT-1-12 because the material was not visually distinguishable in the field from IT-1-6

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