Appendix A

Information on Historic Uses:
Adjacent and Upland Properties

Slip 4

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The purpose of this appendix is to document the available information on past uses of the properties adjacent to and upgradient of Slip 4. In addition, environmental sampling and cleanup activities prior to the mid-1990s are described and summarized. Properties adjacent to and upgradient of Slip 4 are shown in Figure A1.

A1. Georgetown Steam Plant and Flume

A1.1 Georgetown Steam Plant (GTSP)

The Seattle City Light Georgetown Steam Plant (GTSP) property is located on the northwest corner of King County International Airport/Boeing Field. The property contains the old powerhouse, which currently houses the Georgetown Power Plant Museum. The condenser pit in the powerhouse is connected to the GTSP flume and, until the 1960s, discharged cooling water from the steam plant to the flume. Figure A2 depicts the historic site features discussed below.

Past Use

The powerhouse was built in 1906 by Seattle Electric Company. It contained three turbo-generators: a 3,000 kW unit, an 8,000 kW unit, and a 10,000 kW unit installed in 1907, 1908, and 1917, respectively (Bridgewater Group 2000). When the plant was constructed, it was located along an oxbow of the Duwamish River. The following is a brief history of the property:

- Puget Sound Traction Power and Light Company (later Puget Sound Power and Light, now Puget Sound Energy) purchased Seattle Electric Company in 1912. After the purchase, the use of the steam plant declined. For a period of time, the plant was only used to supply steam to the company's car barns (Bridgewater Group 2000).
- In 1917, the oxbow near the plant was filled during the construction of the Duwamish Waterway. At that time, a pump house was built northwest of Slip 4 to supply feed water to the steam plant boilers, and the GTSP flume was constructed to carry the cooling water back to the waterway. A third turbine generator was installed. Steam to operate the plant was supplied by 16 boilers, which were fired with fuel oil or coal. From 1925 to 1945, the boilers were fired with coal (Bridgewater Group 2000).
- In 1951, the City of Seattle Department of Lighting (now Seattle City Light) purchased the property. The plant produced power for the area until the winter of 1964 (SEA 2004).
- In 1952, The Boeing Company leased part of the property. This included the area where the flume is located and areas adjacent to the flume. A facility drawing indicates that an oil-filled sump and transformers were present on the property (Boeing 1965). Boeing constructed buildings in the leased area, including a fuel laboratory. A portion of the flume was rerouted prior to building construction (Boeing 2005d, Boeing 2006c). Storage tanks for fuel and other materials were installed, as well as storm drains and water pipes (SEA 2004). In 1954, the City of Seattle allowed Boeing to connect a catch basin to a 24-inch City of Seattle sewer line located west of the steam plant building (Bridgewater Group 2000, City of Seattle 1954).

- In 1961, Boeing was allowed to use an area at the north end of the King County International Airport for fire drill training (located east of the steam plant property). This area is referred to as the North Boeing Field Fire Training Pit. In 1967, the City of Seattle gave Boeing a temporary permit to conduct fire training in an area approximately 50 feet southeast of the GTSP. This area is referred to as the former Boeing Fire Training Pit, although there is no indication that it was ever a "pit." Aerial photographs show an airplane fuselage was present at the time in this location. The permit expired in 1974 (SEA 2004).
- In 1963, a portion of the original GTSP property, including a large concrete oil storage tank, a warehouse, and a machinery shop, was sold to King County (Bridgewater Group 2000).
- The last production run of the steam plant was in the winter of 1964. From 1971 to 1977, the plant was maintained on "cold standby" (SEA 2004).
- In 1977, the plant was officially retired.
- In 1978, it was listed on the National Register of Historic Places.
- In 1980, the site was designated a national Historic Mechanical Engineering Landmark.
- In 1984, the plant became a City of Seattle Landmark (SEA 2004), and a National Historic Landmark.
- Since 1987, the plant has been a museum (Goldberg 2006a).
- During 1995 and 1996, King County expanded its operations onto the site. This included placement of soil piles on GTSP property (Bridgewater Group 2000).

Environmental Sampling/Cleanup

A number of environmental investigations have been conducted at the GTSP. Areas of chemical contamination were identified on the property, in sediments of the flume, and in Boeing storm drains connected to the flume. Contaminated soils and sediments have been removed from the site and flume in the past.

In 1978, Ecology inspected the site and noted that the large concrete oil storage tank was leaking. Replacement of the tank and lining of two sumps in front of the tank was recommended. Oil in the tank contained polychlorinated biphenyls (PCBs) at concentrations up to 3.4 mg/kg. The tank was demolished in approximately 1988. No PCBs were detected in any of the soil or concrete samples collected in the vicinity of the concrete oil storage tank (Bridgewater Group 2000).

Oil samples collected by Seattle City Light in 1980 from three oil feed underground storage tanks (USTs) located adjacent to the southwest corner of the Steam Plant were analyzed for PCBs. Results showed 10, 7, and 20 mg/kg respectively, in Tanks 1, 2, and 3. Soil samples collected at depths ranging from 0 to 15 inches and 120 to 126 inches did not show PCBs at a detection limit of 1 mg/kg (Bridgewater Group 2000).

In 1982, Environmental Protection Agency (EPA) investigations found metals, polynuclear aromatic hydrocarbons (PAHs), and PCBs in Duwamish waterway sediments in Slip 4 (Raven Systems & Research 1988). Sampling by Metro confirmed the presence of PCBs in the flume and in a Boeing storm drain (SEA 2004). Samples collected in 1984 confirmed PCB in soils on low-lying areas of the GTSP property, ranging from less than 0.1 to 91,000 mg/kg (Raven Systems and Research 1988). PCBs were also found in a drainage ditch leading from the northern part of King County International Airport (0.2 to 8.9 mg/kg) and in adjacent areas of the airport and Boeing-leased property under paved areas (190 to 223 mg/kg) (Raven 1988).

Overflow from the low-lying area flowed into the storm drain system at North Boeing Field which discharged to the head of the flume (Raven 1988). This drainage system also received runoff from North Boeing Field, the former Boeing Fire Training Pit, and the North Boeing Field Fire Training Pit. In 1984, based on the presence of PCBs, Seattle City Light covered the drainage ditch and low-lying area with plastic, and King County diverted surface runoff from northern Boeing Field in order to minimize flow into the ditch and low-lying area (SEA 2004).

In 1985, Ecology performed a preliminary site assessment and identified North Boeing Field and the Georgetown Steam Plant as a potential source of PCBs, lead, and petroleum products (Ecology 1985).

During the late fall of 1985, Seattle City Light performed a cleanup of the unpaved low-lying areas, some drains into the flume, and the flume. Contaminated soils and sediments were removed and unpermitted connections into the flume were sealed. Subsequent sampling of the cleaned areas indicated that PCB concentrations were reduced to 11 mg/kg or less (Raven 1988, SEA 2004).

After the cleanup and the sealing of unpermitted drains, the flume continued to operate as a point of discharge for two permitted cooling water discharges from Boeing facilities. Overflow from low-lying areas at GTSP continued to enter the flume through a Boeing storm drain connected to the head of the flume (Raven 1988).

In 1986, Seattle City Light collected additional samples from the drainage ditch and flume. PCBs as Aroclor 1254 were detected in drainage ditch sediments at concentrations ranging from 4 to 15 mg/kg and in flume samples ranging from 1 to 123 mg/kg. The highest concentration was immediately downstream of where the discharge tunnel connects to the flume. Based on the renewed detection of PCBs, Boeing was notified by Seattle City Light of the need to terminate the two permitted cooling water connections to the flume. Samples collected in 1988 between the head of the flume and S. Myrtle Street showed concentrations of PCBs ranging from 0.25 to 14.26 mg/kg with highest concentrations found again at the head of the flume (Bridgewater Group 2000).

From 1989 to 1991, Seattle City Light continued to test the flume for PCBs. PCB concentrations ranged from 103 to 1.6 mg/kg, with concentrations decreasing with distance from the GTSP to less than 1 mg/kg at the Myrtle Street culvert. The same decrease in concentrations away from the GTSP was seen in the results from the 1998 sampling of the flume (Bridgewater Group 2002 and 2000, Raven Services Corporation 1989-1991).

Seattle City Light collected water and oil samples from the GTSP underground water tank in 1987. This tank was located south of the large, concrete oil storage tank (Figure A2). There were no PCBs above laboratory detection limits; however, oil and grease were detected in one sample at 20 mg/L. Copper and zinc were detected at 0.036 and 0.047 mg/L respectively in another sample. After emptying the tank, analysis showed the sludges in the tank contained PCBs as Aroclor 1260 at concentrations ranging from 1.3 to 2 mg/kg (Bridgewater Group 2000).

During 1988 and 1989, three feed oil USTs that formerly supplied oil to the boilers of the steam plant, the large concrete oil storage tank north of the site, and the steam plant diesel tank were all removed. No PCBs were found in soil samples collected when these tanks were removed (SEA 2004, Bridgewater Group 2000). A series of soil samples from these locations were also tested for petroleum hydrocarbons. Oil and grease, thin layer chromatography (TLC) PAHs, and TLC hydrocarbons were detected at 3,660, 200, and 250 mg/kg respectively in one soil sample collected at a depth of 14 feet near the large concrete storage tank. Another sample in this area had 60,000 mg/kg of TLC PAHs at a depth of 21 feet. Oil and grease were detected in a 0- to 1.2-foot-deep sample collected near the north feed oil UST at a concentration of 35,690 mg/kg. TPH concentrations in samples from the excavation of the three feed oil USTs ranged from 8.6 to 67,600 mg/kg (Bridgewater Group 2000).

In 1989, Seattle City Light collected soil, water, and surface wipe samples at the pump house that supplied water to the steam plant, located north of Slip 4 on the Duwamish Waterway. None of these samples showed PCBs at levels above the detection limits (Raven Services Corporation 1989–1991, Bridgewater Group 2000).

In September 1999, the GTSP site was added to Ecology's list of confirmed and suspected sites. Ecology and Public Health – Seattle and King County conducted a site hazard assessment at GTSP in 2001. The site was assigned a Washington Ranking Method ranking of 5 out of 5 (lowest level of concern for risk to human health and the environment.)

Environmental sampling conducted after 1999 is discussed in Section 3.4.1 of this Action Plan.

A1.2 Georgetown Flume

Current configuration and uses of the Georgetown Flume are described in Section 3.1.5 of this Action Plan. The Georgetown Flume (Figure A-3) was originally constructed to discharge cooling water from the GTSP into the Duwamish Waterway after the river was straightened in 1916. Except for annual test runs, routine cooling water discharges were discontinued in the 1960s when the steam plant was shut down (SEA 2004). At one time, the flume was a conduit for industrial wastewater discharges and runoff from an estimated 11.5 acres of the north end of the airport.

City-owned property adjacent to the flume has been leased to Boeing. As industrial development occurred in the area, discharge pipes from nearby properties and facilities were connected to the flume at numerous locations along its length. These included both permitted and unpermitted connections for stormwater, cooling water, and industrial wastewater discharges. Some documented examples of connections and uses of the flume are listed below:

- In 1962, overflow from an oil yard drain pit on the Boeing property was discharged to the flume via a 6-inch iron pipe (Bridgewater Group 2000).

- In 1964, Seattle City Light issued a permit (Permit No. 6-6131-202) to Boeing for the discharge of 600 gallons per minute (gpm) of cooling water into the flume near S. Myrtle Street (Van Hollebeke 1968).

- In 1969, Boeing was allowed to discharge an additional 100 gpm of cooling water from the hydraulic system of a testing machine and received a replacement permit to discharge a total of 700 gpm of cooling water into the flume. Both discharges were combined under a single temporary permit (6-6003-11-122) in 1969 (Henry 1969, Scarvie 1969, Bridgewater Group 2000)

- In 1965, a storm drain (distinct from the permit discharges described above) from the Boeing property was connected to the flume at the downstream end of the tunnel section and discharged to the flume until at least the mid-1980s. Sampling of this storm drain in 1984 found PCBs up to 520 mg/kg, and the drain was subsequently cleaned (Raven 1988, Bridgewater Group 2000). Based on Boeing facility plans (drawings 10-000-4504/SH M-1 and C3.YD-C100, dated 1985 and 1988, respectively), it appears that this drain was re-plumbed to King County (KC) Airport SD #3 sometime between 1985 and 1988. A City survey of the flume conducted in 2005 confirmed that this drain no longer connects to the flume (Herrera 2005).

- The flume was used by Boeing as a containment area for a 10,000-gallon methylene chloride tank beginning in 1982 (SCL 1982, Bridgewater Group 2000).

- Compressor cooling water from Boeing's Building 3-302 was discharged to the flume until 1987, when it was rerouted to the public storm drain (Cherberg 1987).

- A 1984–1985 survey mapped connections to the flume downstream of the two 42-inch concrete pipes (Geissinger 2003). Twenty-nine undocumented drains into the flume were located and closed. (The Seattle Engineering Department was notified, and City-side information cards stating "City Light Flume - Allow No Connections" were installed as a measure to prevent further connections to the flume.) Most were re-plumbed to the King County International Airport drainage system (KC Airport SD #3/PS44 EOF).

- In 1986, lubricating oil (maximum 10 gallons) was spilled to the flume from North Boeing Field (Wooten 1986).

- Boeing permits for cooling water discharge and use of the flume for containment of methylene chloride spills were discontinued in 1987.

The Willow Street Substation is unpaved and slopes toward the flume. Transformers were reportedly installed at this location in the 1960s, and were replaced in 1996 and 1998 with non-PCB transformers (Goldberg 2006b). No sampling has been conducted at this location.

The former Ellis Substation, located on the east side of the flume, just south of S. Myrtle Street, was decommissioned in 1990. A composite soil sample consisting of 10 subsamples, collected between the substation and the flume in 1984, contained 0.071 mg/kg PCBs (Raven 1991). In November of 1990, Seattle City Light sampled two transformer tap changers. PCBs were detected at concentrations of 12.1 and 9.2 mg/kg. The four concrete and four soil samples detected PCBs in one of the concrete samples at 0.2 mg/kg and in two of the soil samples at 0.1 and 0.5 mg/kg (Raven 1991). Additional samples were collected in 1991 from onsite soil and concrete equipment pads. PCBs were detected in two of the three soil samples (<0.1 to 0.5 mg/kg Aroclor 1254) and one of the four concrete samples (<0.1 to 0.2 mg/kg Aroclor 1254) (Raven 1991).

In February 1985 the U.S. Coast Guard investigated and Ecology cleaned up approximately 50 gallons of oil spilled into Slip 4 (Brugger 1985, Croll 1985). The spill was determined to be from the GTSP flume. Despite searching the entire length of the flume, no source was identified. Two oil samples contained 67 and 80 mg/L of PCBs (Brugger 1985).

A2. Crowley Marine Services

Past Use

The Crowley property (Tax Parcel 2136200641) is made up of two parcels. Parcel D is the southern two-thirds and Parcel F forms the northern one-third of the Crowley property (SEA 2004) (Figure A1). Past uses of these two parcels are summarized below (SEA 2004):

Parcel D, Southern Portion

- In 1904, this area was vacant.
- By 1929, the area was occupied by the Hydraulic Supply Manufacturing Company, a manufacturer of pipes, tanks, and perhaps hydraulic parts or equipment. At the time, the factory consisted of a main manufacturing building and a pipe-dipping vat located between this building and Slip 4, and a furnace located on the north end of the building apparently used to heat the vat located inside.
- By 1949, the Hydraulic Supply Manufacturing Company constructed a chain-manufacturing building between the pipe-dipping building and the Duwamish River. From this time until 1971, the buildings associated with this facility changed very little.
- By 1980, all structures were demolished, leaving uncovered soil.
- Between 1980 and 1985, what appears to be a loading ramp existed near the Crowley dock on the northern side of Slip 4.
- By 1985, the area was paved, the loading ramp was gone, and the dock that currently occupies the northwestern shoreline of Slip 4 was constructed.

Parcel D, Northern Portion

- In 1904, this area was vacant.

- By 1929, the Pankrantz Lumber Company occupied the site, including a large lumberyard, sawmill, refuse burner, boiler, and planer.
- In 1936, the lumber operation still existed. Logs were rafted in Slip 4 awaiting processing at the lumber mill. Milled lumber was stacked west of the buildings. A rail system with a working crane transported lumber between the storage area and the slip, and a rail spur extended from E. Marginal Way S. into the northern end of the facility.
- By 1946, all buildings once associated with Pankrantz Lumber were demolished and the site was being used as a pole yard.
- By 1949, two buildings had been constructed on the site and a pole-dipping tank had been installed at the terminus of the rail spur.
- By 1960, the pole-dipping tank had been removed and a building occupied the site. Logs were still bundled and rafted along the northwestern shoreline of Slip 4.
- By 1966, a steel-culvert manufacturing company occupied part of the site.
- By 1969, the area was almost vacant and remained so until at least 1980.
- By 1985, the area had been paved and was being operated as part of the Crowley container storage facility.

Parcel F

- In 1904, this area was vacant.
- Prior to 1929, the area was developed for residential use.
- By 1929, the area was occupied by the Washington Excelsior and Manufacturing Company, which manufactured excelsior (wood shaved into long, curly, straw-like pieces) for packing material.
- By 1950, part of the area of the former excelsior manufacturing operation was occupied by a manufacturer of aluminum windows and sashes.
- By 1985, the buildings that once housed the Washington Excelsior and Manufacturing Company had been demolished and much of the area was being used for shipping container storage.

Environmental Sampling/Cleanup

Parcel D

Several investigations to assess conditions resulting from past site uses have been conducted at Parcel D (SEA 2004; Hart Crowser 1989a).

In 1988, samples from soil borings at two locations in Parcel D were analyzed for arsenic, phenols, pesticides, PCBs, and volatile organic compounds (VOCs). Arsenic detected at up to 1,600 mg/kg exceeds Washington State Model Toxics Control Act (MTCA) Method A soil cleanup levels (SEA 2004). Monitoring wells installed in these borings were used to sample

groundwater for metals, VOCs, semi-volatile organic compounds (SVOCs), pesticides, and PCBs. Arsenic and copper were found to exceed marine chronic surface water quality criteria.

In 1989, 33 additional soil samples were collected and two additional monitoring wells were installed and sampled to delineate the extent of arsenic contamination. Soil results indicated that elevated arsenic concentrations, up to 2,800 mg/kg, were limited to four hot spots in a 1-foot-thick layer of soil approximately 2.5 feet below ground surface (SEA 2004). The elevated arsenic was attributed to arsenic-containing wood preservatives used in the former pole-dipping facility. Arsenic concentrations in the additional monitoring wells did not exceed surface water quality criteria. This investigation concluded that migration of arsenic to the Duwamish River was not significant.

In early 1990, soil samples were collected from 14 additional soil borings throughout the site and analyzed for VOCs, SVOCs, PCBs, total petroleum hydrocarbons (TPH), chlorinated phenolics, and metals. Arsenic up to 1,760 mg/kg, TPH up to 29,000 mg/kg, carcinogenic PAHs (cPAHs) up to 1,396 mg/kg, and PCBs up to 2.5 mg/kg exceeded soil cleanup levels. These samples confirmed the localized zone of elevated arsenic found during previous investigations and identified additional areas of arsenic contamination in the vicinity of the former pole-dipping facility and an upland sediment disposal area located in the south-central portion of the site (SEA 2004). These soil samples identified additional areas of PAH contamination. Three additional monitoring wells were installed in the southwestern portion of the site and analyzed for VOCs, SVOCs, TPHs, chlorinated phenolics, and metals. Although several chemicals were detected in groundwater, only chrysene was detected—in a single sample—at a level (1.4 µg/L) exceeding water quality criteria. Based on a comparison of these results to nearby sediment data, Hart Crowser concluded that groundwater discharges from the site did not represent a threat to sediment quality (SEA 2004).

In late 1990, soil samples were collected from ten additional soil borings in the southwestern portion of the site and analyzed for arsenic, PAHs, and TPH. Arsenic and PAHs exceeded cleanup levels in a number of samples. Hart Crowser estimated that approximately 9,000 cubic yards of soil exceeded cleanup levels. Additional groundwater samples were also collected from seven existing wells and were analyzed for arsenic and PAHs. Carcinogenic PAHs exceeded water quality criteria for human consumption of aquatic organisms in four wells on the site.

There is no record of soil or groundwater remediation on Parcel D.

Parcel F

Several investigations to assess conditions resulting from past site use have been conducted at Parcel F, as described in SEA 2004.

In 1988, an 8,000-gallon diesel UST and a 2,000-gallon gasoline UST were removed from the northeastern portion of the property. Confirmation samples from both tank excavations indicated contaminant concentrations in remaining soil were below applicable cleanup levels.

In 1989, soil samples from the central and eastern portions of the parcel were collected and analyzed for pesticides, PCBs, and VOCs (Hart Crowser 1989b). PCBs were detected in samples collected beneath two storage sheds at concentrations of 120 µg/kg and 890 µg/kg, and

endosulfan I was detected at a concentration of 17.7 µg/kg, which is well below the MTCA Method B cleanup level (21,000 mg/kg). In addition, methylene chloride (8 µg/kg), ethylbenzene (up to a maximum of 96 µg/kg), toluene (up to 120 µg/kg), and total xylenes (640 µg/kg) were detected. However, none of the contaminants detected exceeded MTCA Method A soil cleanup levels for industrial sites. Two monitoring wells were installed; one in the diesel UST excavation and the other in one of the soil borings. Groundwater was sampled for metals, VOCs, SVOCs, pesticides, and PCBs. Few chemicals were detected, and only copper was detected above the marine chronic surface water criterion in one of the monitoring wells.

In 1990, soil samples were collected from five borings and analyzed for PCBs, TPH, VOCs, SVOCs, and metals. TPH exceeded cleanup levels in two surface samples collected in areas of visible soil staining. Several VOCs, SVOCs, and metals were detected in subsurface samples; however, none exceeded MTCA cleanup levels for industrial soils. PCBs were not detected. Three monitoring wells were installed and sampled for VOCs, SVOCs, PCBs, TPH, and metals. Bis(2-ethylhexyl)phthalate (BEHP) was detected above the surface-water quality criterion for the human consumption of aquatic organisms. Copper exceeded the marine chronic surface water quality criterion in one well. PCBs and TPH were not detected.

Except for the UST removals there are no records of soil or groundwater remediation on Parcel F.

In 1997 an equipment malfunction at Crowley resulted in a spill of 1 gallon of hydraulic oil (Ecology 2001).

A3. First South Properties

Past Use

The site was previously occupied by Washington Machinery and Storage Company, J.A. Jack & Son Lime Plant, and Northwest Precote. This property is also known as Parcel E. These past uses are summarized below (SEA 2004):

Washington Machinery and Storage Company

- In 1929, the Washington Machinery and Storage Company occupied a portion of the site. Facilities included a machine shop, and a railroad spur extended from E. Marginal Way S. into the property.
- By 1949, the facility expanded to include a separate building that housed an office and a laboratory. Grounds surrounding the machine shop were used to store machinery.
- In 1969, the Washington Machinery and Storage Company still appeared to be in operation, and the same buildings were present.
- By 1985, the office and laboratory building still existed, but the machine shop was gone.
- By 1990, all buildings associated with the Washington Machinery and Storage Company were gone.

J.A. Jack & Son Lime Plant and Northwest Precote

- In 1946, there was a lime plant between the Washington Machinery and Storage Company office and Slip 4. The plant was operated by J.A. Jack & Son. An aerial photograph shows a barge located in Slip 4 near the lime plant, tied to a wooden bulkhead along the southeastern shore. A crane-operated bucket loader appears to be moving sand or lime between the barge and adjacent uplands.
- By 1960, a portion of shoreline north of the loading facility shown in the 1946 photograph appears to have been filled and contained by a retaining wall. Lime plant operations appear to have continued into the 1960s but had ceased by 1969.
- By 1946, Northwest Precote, Inc., an asphalt plant, was established south of the lime plant and adjacent to Webster Street.
- By 1969, four new tanks, apparently associated with the asphalt plant, had been constructed along the waterfront.
- In 1980, the asphalt plant appeared to be operating.
- By 1990, the asphalt plant had been demolished.

Environmental Sampling/Cleanup

The following information is from a site summary prepared by SEA (2004).

Several investigations were conducted at Parcel E from 1988 through 1996 to assess site conditions. The initial investigation identified chemical contamination in soils. A number of cleanup actions followed, including soil removal and groundwater monitoring. Ecology ultimately determined that no further action was required at this property.

Following a preliminary groundwater and subsurface soil investigation performed at the parcel by Hart Crowser in March 1989, Landau conducted a more extensive investigation in June 1990 (Hart Crowser 1991). This investigation included the collection of 33 soil samples from 10 of 12 borings and groundwater samples from the three wells, which were analyzed for VOCs, SVOCs, PCBs, TPH, and metals analyses. The borings were primarily located in the vicinity of two identified USTs (Landau 1990).

Most locations sampled during the Landau investigation were excavated during later remedial activities (Hart Crowser 1991, 1996). In the remaining locations, the maximum detected TPH concentration of 2,600 mg/kg exceeded the MTCA Method A soil cleanup level for industrial properties and detection limits were above MTCA cleanup levels of 2,000 µg/kg for cPAHs. The maximum concentrations of cadmium (2.7 mg/kg) and lead (1,190 mg/kg) were slightly above the Method A soil cleanup level (2.0 mg/kg and 1,000 mg/kg, respectively). The maximum total chromium concentration (20.7 mg/kg) exceeded the MTCA cleanup level for hexavalent chromium (19.0 mg/kg) but is below the level for trivalent chromium (2,000 mg/kg). No PCBs were detected in the soil samples (Landau 1990).

Maximum concentrations of arsenic (0.093 mg/L), copper (0.132 mg/L), and zinc (0.211 mg/L) detected in groundwater samples exceeded marine chronic surface water quality criteria for dissolved metals (0.036 mg/L, 0.0037 mg/L, and 0.085 mg/L, respectively). Detected concentrations of VOCs and low molecular weight polycyclic aromatic hydrocarbons (LPAHs) were below surface water quality criteria for human consumption of aquatic organisms. No TPH or PCBs were detected in the groundwater samples (Landau 1990).

In 1991, five USTs were excavated and removed from the site, four additional monitoring wells were installed, and 22 test pits were excavated (Hart Crowser 1991). The five USTs removed from the parcel included:

- 8,000-gallon diesel tank
- 12,500-gallon buried railroad tank car containing heavy oil
- 1,000-gallon tank thought to contain stove oil
- 2,500-gallon diesel tank
- 1,000-gallon tank containing a soil/oil mixture (possibly a previous attempt to close the tank in place)

Approximately 1,500 cubic yards of visibly stained soil and rubble associated with the USTs were excavated from the site and disposed of at permitted offsite facilities (Hart Crowser 1991). The test pits were excavated to assess the horizontal and vertical extent of the petroleum contaminated soils associated with the USTs and the area of the former asphalt plant. Concentrations of TPH ranged from less than 10 to 25,000 mg/kg. The MTCA Method A cleanup level is 2,000 mg/kg. Hart Crowser (1991) attributed these concentrations to the use of oil for dust control and roadway stabilization.

Groundwater was sampled in October 1990, January 1991, and April 1991 from four monitoring wells, and was analyzed for VOCs, SVOCs, and TPHs. Analytical results indicated decreasing concentrations of TPHs and LPAHs and no detected VOC or cPAH concentrations. Hart Crowser (1991) analyzed the maximum constituent concentrations detected in groundwater to evaluate potential impacts to Slip 4. They compared all groundwater concentrations from the UST excavation area to calculated worst-case criteria based on MTCA surface water protection and sediment quality criteria. They did not consider attenuation, dispersion, or dilution during transport. Hart Crowser determined that TPH and 2-methylnaphthalene concentrations in groundwater exceeded the worst-case criteria. One former well sample exceeded the criterion for 2-methylnapthalene. TPH concentrations were declining and 2- methylnaphthalene in the downgradient well nearest Slip 4 was below the worst-case criterion (Hart Crowser 1991).

Evergreen Marine Leasing applied to Ecology for a No Further Action (NFA) determination for the site in the fall of 1994. Ecology determined further remedial action was required (Marten & Brown 1997). Beginning in 1996 more TPH-contaminated soil was removed based on Ecology's recommendations (Marten & Brown 1997; Hart Crowser 1996). Ecology issued a NFA determination for the TPH-diesel release in 1997. The NFA was conditioned on conducting groundwater monitoring for TPH and filing of a Restrictive Covenant for the site (Ecology

1997). Monitoring documented compliance with the NFA and monitoring was terminated by Ecology in 1998 (Ecology 1998).

A4. Boeing Plant 2

Past Use

Boeing has manufactured airplane parts at Plant 2 since 1936 (SEA 2004). The entire Boeing Plant 2 facility occupies 109 acres between E. Marginal Way S. and the Duwamish River on the southeastern side of Slip 4. About 17.5 acres of this property drains to Slip 4. Building 2-122 is located adjacent to Slip 4 and was built in the early 1990s to house the Integrated Aircraft Systems Laboratory (Boeing 1993). The facility is paved with small landscaped areas. The grounds between the parking area and Slip 4 include public walking trails and trees. A single-family residence is located on Webster Street northeast of Building 2-122 (Weston 1998).

Past use of the property is summarized in below:

- Prior to 1936, the area was agricultural and residential, with some homes having small orchards and gardens. One home had been built on the Slip 4 shoreline.
- By 1946, the one home on Slip 4 had been removed and the shoreline was not otherwise developed.
- By 1960, all homes within the Plant 2 boundaries had been removed and Building 2-01 had been constructed adjacent to Slip 4 and the Duwamish Waterway. Parking lots occupied the remainder of the property.
- By the early 1990s, Building 2-01 had been removed and Building 2-122 was built within its footprint and that of the previous parking area. Landscaped parking and grounds incorporating stormwater controls currently surround Building 2-122.

Environmental Sampling/Cleanup

There have been a number of investigations at the north end of Boeing Plant 2 from 1990 through 1994 to assess conditions resulting from past site uses and to document soil removal and cleanup actions (SEA 2004). These include:

- Phase II Subsurface Environmental Assessment, Proposed Integrated Aircraft Systems Laboratory Building, Seattle, Washington (Weston, October 1990)
- Supporting Documentation for Engineer's Certification of Closure, Boeing Plant II, 2-01 Building Dangerous Waste Sump (CH2M Hill, December 1991)
- Leaking Underground Storage Tank Investigation, Proposed Integrated Aircraft System Laboratory Construction Site, Plant II, Seattle, Washington (Weston, January 1992)
- Release Assessment, Boeing—Plant 2, Seattle/Tukwila, Washington (Weston, March 1994)

In 1990, Weston performed a preconstruction environmental assessment of soil and groundwater around the perimeter of the former Building 2-01 at the north end of Plant 2 adjacent to Slip 4. One surface soil sample, 36 subsurface soil samples from 21 soil borings, and groundwater samples were collected from six push-probe borings.

Soil Sampling

The soil samples were analyzed for VOCs, PAHs, SVOCs, pesticides/PCBs, TPH, and Resource Conservation and Recovery Act (RCRA) metals; groundwater samples were analyzed for VOCs, unfiltered metals, and oil and grease. Four of the soil borings and three of the push-probe groundwater stations were located along the north side of the former building along the shoreline of Slip 4. One composite surface soil sample collected adjacent to electrical transformers near the southeast corner of Building 2-01 contained 14 mg/kg PCBs (Weston 1990). This exceeds the MTCA Method A soil cleanup level of 10 mg/kg.

In subsurface soil, acetone up to 190 µg/kg; 2-butanone up to 34 µg/kg; 1,1,1-trichloroethane up to 6 µg/kg; and trichloroethene up to 9 µg/kg were the only VOCs detected. All were below their MTCA Method A cleanup levels. Several PAHs were detected in subsurface soil at individual concentrations ranging from 71 to 28,000 µg/kg. In the seven subsurface soil samples analyzed for base neutral extractable acids (BNAs), di-n-octylphthalate up to 200 µg/kg; naphthalene at 28,000 µg/kg; and methylnaphthalene at 8,800 µg/kg were detected. Only naphthalene and several cPAHs in sample B-24, located in the parking lot south of the former 2-01 building, exceeded the MTCA cleanup levels. PCBs were not detected in any of the subsurface soil samples. TPHs were detected in two subsurface soil samples at concentrations up to 103 mg/kg, below MTCA cleanup levels. Metals were detected in subsurface soil at concentrations near background, except for copper (310 mg/kg), lead (160 mg/kg), and zinc (220 mg/kg) in one sample. Cadmium in sample B-36, near the southeast corner of the former 2-01 building, was the only metal that exceeded the MTCA Method A soil cleanup level for industrial properties (Weston 1990).

Remediation in these areas was completed as part of the 2-122 building construction.

Groundwater Sampling

Vinyl chloride at 2.0 µg/L was the only VOC detected in groundwater. This is below the water quality criterion for human consumption of aquatic organisms (530 µg/L). Chromium (up to 11 mg/L), copper (2.7 mg/L), lead (0.7 mg/L), nickel (3.8 mg/L), and zinc (2.4 mg/L) were the only metals detected in groundwater. All of these metals were detected in one or more samples at concentrations that exceeded their respective marine chronic water quality criteria. However, because the groundwater samples collected using push-probe sampling methods were typically turbid, metals concentrations were not considered representative of ambient metals concentrations in groundwater. Oil and grease were detected in several groundwater samples at concentrations ranging from 0.8 to 12 mg/L (Weston 1990).

The dangerous waste sump (an RCRA Treatment, Storage, or Disposal unit) in Building 2-01 was removed and closed in 1991 (CH2M Hill 1991). The sump was constructed of reinforced concrete and handled materials containing acetone, 2-butanone, toluene, and petroleum

hydrocarbons. During closure activities, the dangerous waste sump was steam-cleaned with a detergent solution. Concrete and underlying soils were then sampled for comparison to closure performance standards. PCBs were not analyzed during closure activities. Following demolition of Building 2-01, the sump was demolished, and 343 tons of concrete and associated soil were disposed of at the hazardous waste landfill in Arlington, Oregon. An additional 270 tons of soil were excavated and disposed of at Arlington during three additional rounds of sampling and excavation. The maximum constituent concentrations detected prior to closure were 700 µg/kg for acetone, 31 µg/kg for 2-butanone, 8.3 µg/kg for toluene, and 100 mg/kg for TPH. The final excavation sidewall and floor soil samples were below performance standards: 100 µg/kg for acetone, 100 µg/kg for 2-butanone, 5 µg/kg for toluene, and 25 mg/kg for TPH. Soil and groundwater sampling results from the 1990 preconstruction environmental assessment around Building 2-01 were also used in the closure certification to document clean closure of the sump (CH2M Hill 1991). Ecology approved interim status closure of the Building 2-01 dangerous waste sump in July 1992 (Ecology 1992). The closure of the sump is not referred to as "final closure," since other dangerous waste management units remain in operation at Plant 2 (CH2M Hill 1991).

In 1994, Boeing performed a Release Assessment under an Administrative Order on Consent for a 3008(h) RCRA corrective action (Weston 1994). The assessment included an evaluation of groundwater quality data from the north end of Plant 2 in the vicinity of Slip 4, but did not include an evaluation of soil chemical data from this area. In addition to the analytical results for the push-probe groundwater samples collected from the perimeter of the former 2-01 building, the Release Assessment included data from three monitoring wells that were temporarily installed in the parking lot east of the building in the area now occupied by Building 2-122. The full suite of groundwater analytes is not known. Arsenic (up to 30 mg/L) and chromium (up to 60 mg/L) were detected in unfiltered groundwater samples collected from the wells (Weston 1994). The maximum detected metals concentrations exceeded their respective marine chronic water quality criteria.

Underground Storage Tanks

A leaking UST was removed in 1991 from an area just outside of the southeast corner of the former 2-01 building (Weston 1992). The 10,000-gallon Tank PL-3 was installed in 1954 to hold bunker C fuel oil. A total of 541 tons of petroleum-contaminated soil were removed from the vicinity of the former UST. The maximum soil TPH concentration measured from the removed material was 16,000 mg/kg of TPH (Method WTPH-418.1). Following soil removal, the bottom of the excavation contained soil with a TPH concentration of 420 mg/kg of diesel (method 8015). Additional soil was not removed due to the presence of 1 to 2 feet of groundwater in the excavation bottom. One soil sample from the excavation was also analyzed for PCBs; no PCBs were detected. There is no information in Ecology files that TPH impacts to groundwater were subsequently investigated (SEA 2004).

A5. North Boeing Field

North Boeing Field (NBF) is leased by Boeing from King County International Airport, with the exception of a few acres on either side of the GTSP flume which is leased from the City of Seattle. The 130-acre site is located between E. Marginal Way S. to the west and King County

International Airport to the east (see Figure 5 of this Action Plan). Ellis Avenue S. forms the northern border, as does the Federal Aviation Administration Tower for the southern extent of the site. The head of Slip 4 is approximately 150 feet from the northwestern boundary of NBF. Stormwater from the southern portion of NBF does not discharge to Slip 4.

Environmental Sampling/Cleanup

There have been numerous investigations and cleanups on the NBF property. Much of the work is the result of environmental investigations done prior to new construction or facility modification. The following is a list of reports filed with the Department of Ecology. There may be other reports that have been archived or filed under other facility names that are not on this list.

- Field and Laboratory Services Utilidor Project North Boeing Field (Groundwater Technology 1990a)
- Soil Sampling and Analyses Inlet Development Facility (Groundwater Technology 1990b)
- Supplemental Pre-Construction Environmental Investigation Proposed 3-801 Building Site (Seacor 1991)
- Building 3-354 Preconstruction Environmental Assessment (Groundwater Technology 1991a)
- Preconstruction Environmental Assessment Building 3-840 Expansion (Groundwater Technology 1991b)
- Pre-Construction Environmental Investigation Proposed 7-027-1/2/3 and 3-360/361/365 Building Sites (Seacor 1992a)
- Independent Cleanup Action report, Flight Line Utilities Project Concourse C (Seacor 1992b)
- Site Assessment Main Fuel Farm (Seacor 1992e)
- Soil and Groundwater Investigation, Fire Training Center - North Boeing Field (Landau 1992a)
- Cleanup Action Program North Boeing Field Fire Training Center, King County Airport (Landau 1992b)
- Independent Soil Remedial Action Report, Flight Test Engineering Laboratory 3-801 Building Location (Seacor 1992c)
- Site Assessment Investigation 3-800 Building (Seacor 1992d)
- North Boeing Field Storm Drain System PCB sampling (Landau 1993a)
- Storm Drain System Cleanout North Boeing Field (Landau 1993b)
- Report of Permanent Closure Former Underground Storage Tank near Fire training Center (Landau 1993c)

- Remedial Action North Boeing Field Fire Training Center, King County Airport (Landau 1993d)
- Pre-Closure Site Assessment Investigation F&G Facility (Seacor 1994a)
- Supplemental Site Assessment Investigation Green Hornet Area (Seacor 1994b)
- Independent Soil Remedial Action Green Hornet Area (Seacor 1994c)
- Report For UST Decommissioning Site Assessment And Monitoring Well Abandonment F&G Facility (Seacor 1994d)
- Site Assessment And Independent Soil Cleanup Action During the Decommissioning of an Oil/Water Separator, Main Fuel Farm, North Boeing Field (Seacor 1994e)
- Site Assessment During The Decommissioning Of Underground Storage Tanks BF-22 and BF-23, 3-374 Building (Seacor 1994f)
- Independent Soil Cleanup Action Report Proposed 3-333 Building Location (Seacor 1996)
- Remedial Action Report, Proposed West Wing 3-333 Building Fuel Test Laboratory (AGI 1998a)
- Site Investigation Oil/Water Separator UBF-55 (AGI 1998b)

Metro asked Boeing to provide information about a number of oil/water separators at North Boeing Field that were identified during a 1985 inspection as possibly discharging to the storm drain. Of particular concern was the Building 3-315 drum storage/oil separator facility which appeared to collect drainage from drums of various fuels, oils, and solvents, as well as an electrical transformer/capacitor station (Lampe 1985). Boeing has indicated that these units do not currently discharge to the storm drain (Boeing 2005d).

Environmental investigations have been conducted by Boeing in preparation for construction of Building 3-333. These investigations, as well as sampling related to oil/water separator UBF-55, are described in Section 3.4.2 of this Action Plan.

A6. Washington Air National Guard

The Seattle Air National Guard Station (ANGS) property is located at 6736 Ellis Avenue South. The station consists of 7.5 acres and four buildings (34,698 total square feet). The property is leased from King County by the U.S. Air Force, who in turn licenses the property to the Washington State Military Department for Air National Guard use. The current mission of the 143rd Communications Squadron is to provide mobile communication support and telephone/teletype support for airports and airfields.

Seattle ANGS consists of a Communications/Administration Building, an Aerospace Ground Equipment motor vehicle building, a paint storage building, and Mobility Storage. Seattle ANGS activities that generate waste oils, cleaning solvents, paint wastes, and thinners are conducted at the following locations: Aerospace Ground Equipment Motor Vehicle Maintenance, Power Production, and Communications/Administration. In the past, small

amounts of hazardous materials have been spilled or released into the environment at the station. However, during recent years, hazardous wastes have typically been collected and disposed of by a contractor or through the Defense Reutilization and Marketing Office at Fort Lewis, Washington.

Past Use

Seattle ANGS was built during World War II by the War Department and was used by the Army Air Force as the "Aircraft Factory School" during the war. In 1948, the property was given to King County as surplus property and was subsequently leased to the Washington Air National Guard. In 1948, the station consisted of 17 acres of land, including an aircraft parking ramp, leased from King County. At that time, the property contained 15 buildings (including a number of small shed structures), all of which were subsequently demolished. No site plans or photographs depicting these buildings or the general station layout have been located.

In 1951, a new property lease decreased the size of the station from 17 acres to its present size of 7.5 acres, and buildings were constructed for headquarters, mess hall, warehouse, and vehicle service requirements. Replacement of all buildings was begun in 1980 and completed in 1984, with the exception of the Mobility Warehouse, which was completed in 1988.

The Preliminary Assessment/Site Inspection report (OpTech 1995) noted that except for an aerial photograph of very poor resolution of the general area taken in 1940, no site plans or photographs depicting the station layout and its activities during the World War II period were found.

Solid wastes generated from the 1950s through 1968 at the Station were reportedly burned and/or buried in the northeastern comer of the site, or disposed of off site. Wastes generated during this period included radio tubes, solvents, used motor oils, kerosene, batteries, brake fluid, spray paints, and paint thinners/removers. Additionally, interviews with site workers indicate that chlorinated solvents may have been used at the Station in the 1970s and 1980s. In particular, workers recalled using solvents in the former paint shop that existed in the southern portion of the site prior to 1984 (ERM 2001). Based on the worker interviews, it is possible that small quantities of solvents leaked or spilled during storage and use. As a result of the Preliminary Assessment (PA)/Site Investigation (SI), an area approximately 175 feet long by 175 feet wide in the northeastern corner of the Station was designated as ERP Site 1 – Burial Site.

The Burial Site Air Operations Center (AOC) is located in the northeast corner of Seattle ANGS, approximately 70 feet east of Building 202, the AGE Vehicle Maintenance Building. From the early 1950s to 1968, various waste items were burned and buried in the area northeast of the old gravel parking lot. The probable wastes associated with this site include radio tubes, solvents, waste motor oils, kerosene, batteries, brake fluid, spray paints, paint thinners and removers, methyl ethyl ketone, xylene, and naphtha.

The Station previously had a wash rack in the southern portion of the site, as well as several USTs. According to a station plan dated 1982, there were four USTs previously located at the station: a 4,000-gallon motor gasoline UST, a 2,000-gallon diesel fuel UST, a 2,000-gallon UST (contents unknown), and a fourth UST (size and contents unknown).

The former washrack and underground storage tanks were removed in the 1980s and 1990s during station remodeling and prior to the Remedial Investigation (RI). A building that contained a paint shop and a battery shop also existed in the southern portion of the site; this building was demolished in the mid-1980s during Station remodeling. Finally, a waste burial site (ERP Site 1) reportedly existed in the northeastern corner of the Station from the 1950s through 1968. However, no conclusive evidence of historical waste burial or burning activity was discovered in this area during the PA/SI or RI.

Environmental Sampling/Cleanup

The Phase II RI, conducted in 1998 and 1999, detected trichloroethylene (TCE), tetrachloroethene (PCE), and benzene in shallow groundwater at concentrations above cleanup standards. Other constituents investigated in soil and groundwater (semivolatile organic compounds, TPH, radionuclides, and metals) were either not detected, were detected at concentrations below cleanup standards, or were consistent with area or regional background concentrations. The TCE detected in groundwater beneath the southern portion of the Station was the only contaminant considered to present a potential risk to human health or the environment, due to its persistence at concentrations above the MTCA Method A Cleanup Level (ERM 1999). The results suggested that the groundwater contamination in the southern portion of the Station was most likely caused by minor releases or incidental spills of TCE during historical Station operations. No evidence of TCE migration beneath the site from offsite sources was identified.

There is no evidence of residual dense non-aqueous phase liquid (i.e., liquid TCE) at the site. The highest TCE concentration detected in groundwater (83 µg/L) was well below the 10,000 µg/L level considered to be indicative of potential dense non-aqueous phase liquid.

The groundwater was treated with potassium permanganate in 2004. The treatment area was in the southern portion of the station, and was approximately 150 feet wide and 200 feet long. The treatment area corresponded to the area identified previously as having dissolved TCE concentrations above 5 µg/L. Based on the results of post-treatment monitoring, Ecology issued a “no further action” determination on October 18, 2005 (Ecology 2005b).

References

References are listed in Section 7.0 of this Action Plan.

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