PHASE II ENVIRONMENTAL SITE ASSESSMENT REPORT

VOLUME I

South Park Bridge Replacement Project
Seattle, Washington

Prepared for

King County Department of Transportation

September 2009

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Prepared for

King County Department of Transportation
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Volume II

Hazardous Building Materials Survey – South Park Bridge Replacement, Property 1, Parcel 218500-0860, 1400 South Thistle Street, Seattle, Washington 98108-4458

Hazardous Building Materials Survey – South Park Bridge Replacement, Property 2, Parcel 218500-0895, 1239 South Rose Street, Seattle, Washington 98108-4458

Hazardous Building Materials Survey – South Park Bridge Replacement, Property 3, Parcel 218500-1045, 8456 Dallas Avenue South, Seattle, Washington 98108-4458

Hazardous Building Materials Survey – South Park Bridge Replacement, Property 4, Parcel 218560-0080, 1403 South Thistle Street, Seattle, Washington 98108-4458

Hazardous Building Materials Survey – South Park Bridge Replacement, Property 5, Parcel 788360-7345, 8457 Dallas Avenue South, Seattle, Washington 98108-4458

Introduction

This report is divided into two volumes: Volume I includes the main body of the phase II assessment text, including supporting appendices; Volume II includes detailed hazardous building materials information for each property surveyed. Volume II can be used as an independent document provided to abatement and demolition contractors.

Purpose

The King County Department of Transportation, Road Services Division (RSD) requires a Phase II Environmental Site Assessment in support of the South Park Bridge replacement project. RSD is replacing the existing South Park Bridge – located along 14th/16th Avenue South and crossing the Duwamish Waterway between unincorporated King County and Tukwila, Washington – with a new bascule bridge on an alignment immediately west of the existing bridge.

The Duwamish Waterway at this location has been designated a Superfund site, due to industrial contamination of the river sediments. As a result of current and historical industrial activities surrounding the existing bridge alignment, the adjacent properties are also likely to be contaminated to varying degrees. One purpose of the Phase II Environmental Site Assessment is to satisfy the appropriate inquiry element of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) innocent purchaser defense, as defined in 42 U.S.C. §9601(35)(B), where recognized environmental conditions have been identified. Another purpose is to provide information to support adequate controls to protect workers, the public, and the environment during construction.

To prepare for the acquisition of six properties in the South Park neighborhood necessary for project construction, RSD requested that Herrera Environmental Consultants (Herrera) perform soil and groundwater sampling and analytical testing at each property for comprehensive assessment purposes. Sampling was also conducted in three neighboring locations, due to known potential hazardous substance releases. For the purposes of this environmental site assessment, the six properties and three locations are referred to collectively as the "Site"; however, they do not represent the entire South Park Bridge replacement project site.

Assessment Limitations and Exceptions

Work for this assessment was performed in accordance with the ASTM *Standard Guide for Environmental Assessments: Phase II Environmental Site Assessment Process* (ASTM 2002), along with applicable guidance documents and generally accepted professional standards and practices for the type of work performed.

While information on subsurface conditions (including soil and groundwater quality) is believed to be representative of site conditions, those conditions may change within short distances. Additional subsurface materials and contaminants may be present at locations not investigated during this study.

Methodology and Limiting Conditions

On July 2, 2009, prior to conducting a Phase I Environmental Site Assessment, Herrera and King County RSD personnel devised both a preliminary plan for collecting soil and groundwater samples, and a phased approach for analyzing collected samples.

For each parcel to be acquired by King County, the sampling plan included an estimated quantity of soil samples based on available surface area, depth of soil samples (based on current and historical activities), and the location of temporary groundwater wells (based on the location of historical underground storage tanks (USTs). A phased soil and groundwater analysis approach was also developed to target both current and historical conditions. This preliminary plan was refined based on the Phase I Environmental Site Assessment completed on August 19, 2009.

Sample locations were adjusted in the field to avoid marked underground utilities, potential cultural resource areas identified by King County, and physical obstructions (e.g., broken down cars, boats being repaired). Samples were collected as close as possible to identified historic or current environmental concerns on or adjacent to the Site.

Background

Site Description

The Site is located in South Park, approximately 4 miles south of downtown Seattle (Figure 1). The South Park community lies south of the bridge that crosses the Duwamish Waterway, a man-made channel portion of the historic Duwamish River that drains into Elliott Bay to the north.

The Site is comprised of six properties located on or adjacent to 14th Avenue South, northwest of the existing bridge southern touchdown point (Figure 2). The six properties are identified by tax parcels 218500-0860, 218500-0895, 218500-1045, and 218560-0080 in unincorporated King County, and parcels 788360-7340 and 788360-7345 in Seattle. Portions of connecting and surrounding street right-of-ways (ROWs) are also part of the Site.

The properties are located within the northeast quarter of Section 32, Township 24 North, Range 4 East of the Willamette Meridian (King County 2009), centered at latitude 47º 31' 41.5" North and longitude 122º 18' 54" West on land that is flat, with a surface elevation of 10 to 20 feet above mean sea level (Herrera 2009). The Site is bordered by the Duwamish Waterway to the north, industrial property to the east, commercial and residential property to the south, and residential property to the west.

Physical Setting

Until the early part of the 20th century, most of the Duwamish River valley consisted of floodplains, freshwater wetlands, and tidal marshes occupied by shallow, meandering stream channels that eventually discharged to Elliott Bay to the north. Between 1913 and 1920, the main channel of the historical Duwamish River from its mouth at Elliot Bay to about 4.5 miles upstream was straightened and confined by U.S. Army Corps of Engineers dredging operations, to facilitate navigation and industrial development by creating the Lower Duwamish Waterway (LDW) (Wilbur 2004a). The original valley floodplain was raised 10 to 15 feet above flood levels, slightly above Mean Higher High Water (MHHW). Old, abandoned channels were filled with hydraulic and other fill material, including a channel between Dallas Avenue South and South Orr Street. The meanders disappeared, except for recesses adjacent to the main channel to accommodate high water flows and the turning of ships (e.g., Turning Basin 3, located upstream from the South Park Bridge, is a former stream channel of the historical Duwamish River).

Since the early 1900s, most of the upland areas north and south of the bridge and adjacent to the LDW have shifted from rural residential and farmlands to commercial and industrial development. Soon after completion of the existing South Park Bridge, commercial and industrial development expanded north and south of the waterway.

Legend

Project site properties

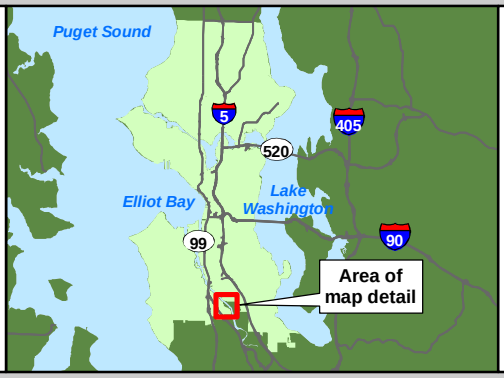

Figure 1. Vicinity map, South Park Bridge replacement project.

N

0 350 700 1,400 Feet

HERRERA ENVIRONMENTAL CONSULTANTS

Aerial Photography: King County (2002)

K:\Projects\05-03224-012\Project\vicinity_map.mxd

Legend

- Project site
- Parcel boundary
- Building
- Groundwater monitoring well location (MW)
- Pole-mounted transformer
- Recognized environmental condition (REC)
- 5 Site property number

Figure 2. Site map, South Park Bridge replacement project.

N

0 62.5 125 250 Feet

HERRERA ENVIRONMENTAL CONSULTANTS

Aerial Photography: King County (2002)

K:/Projects/05-03224-012/Project/site_map.mxd

Geology

The Site is situated within the Duwamish Valley, a relic estuary of Puget Sound that was carved and deepened by glacial ice and subsequently filled in by estuarine and alluvial deposits. Data from local borings indicate that the base of the trough, identified either as bedrock or very dense sediments that has been glacially overridden, lies between 20 feet below ground surface (bgs) south of the Site to about 100 feet bgs near the Duwamish Waterway.

Review of soil borings installed within and adjacent to the study area during earlier investigations indicates that fill, post-glacial alluvial deposits, and estuarine deposits underlie the Site. Fill, extending from ground surface to depths of 2 to 3 feet, consists of sand with varying amounts of silt mixed with brick, rubble, and wood. Old abandoned channels and oxbows of the historic Duwamish River, such as a channel between Dallas Avenue South and South Orr Street (Troost et al. 2005), were filled with both hydraulic and other fill material during development of the waterway in the early 1900s. The post-glacial alluvial deposits, consisting of organic-bearing interbedded sand and silt of the historic Duwamish River delta, were encountered in borings beneath the fill, extending down to a depth of approximately 60 feet. Estuarine sediments, identified by the presence of shell fragments in soft silty clay and sandy silt layers, were encountered underlying the alluvial deposits, with a thickness of about 45 feet. Dense sands and gravel were observed at approximately 95 feet deep (Wilbur 2004b); the base of the dense sand/gravel unit was not reached in any borings.

Hydrogeology (Groundwater)

Principal unconfined aquifers in the Duwamish Valley are found in the river alluvium or in the older unconsolidated deposits beneath the alluvium. Groundwater was encountered during Phase II sampling activities at depths ranging from 13.07 to 14.71 feet bgs in existing monitoring wells, and 8.5 to 14 feet bgs in push probe borings. Groundwater level fluctuations are common in the area due to seasonal precipitation and tides. Groundwater flow direction is generally toward the Duwamish Waterway and northward toward Elliott Bay. Localized changes in flow directions have been attributed to tidal fluctuations and preferential flow paths associated with subsurface construction (e.g., drains, bulkheads) or with natural features (e.g., filled historic river channels).

Site History and Land Use

Property 1 – Office/Garage, 1400 South Thistle Street

This fenced storage yard, located on the north half of the property and adjacent to the Duwamish Waterway, has been used to store vehicles and boats since the 1960s. Three closed-top, unlabeled metal drums were observed within the fenced yard during a 2007 site visit. Vehicles and trucks were parked inside the fenced yard, and a large motor was observed on a flatbed

truck. Surface stains due to spills or leaking fluids from motors and vehicle gas tanks were noted on the ground surface at various locations across the storage yard.

A King County Department of Development and Environmental Services (DDES) enforcement action directing the removal of inoperable junk and other debris from near the river bank on this property took place in 2001 (King County 2001). An office/garage building, built in 1953, occupies the southern portion of the property.

Based on the age of the house, asbestos containing material (ACM), lead-based paint (LBP), and light ballasts containing oil with polychlorinated biphenyls (PCBs) were assumed to be present.

Property 2 – Rooming House with Boat Storage Yard, 1239 South Rose Street

This property was used as a vehicle parking lot in the 1930s, according to historical property tax assessment records and city directories. The existing house was built in 1938, and is heated by an oil burner heating system. The remaining south portion of the property has been used for boat storage since the 1950s. Surface stains within the storage yard were noted based on historical aerial photographs (Wilbur 2004a); currently, asphalt pavement covers the storage yard. Several gallon- and pint-sized cans of paint and varnish were observed beneath a large boat in the process of being repainted.

Based on the age of the house, ACM, LBP, and light ballasts containing oil with PCBs were assumed to be present.

Property 3 – County Line Bar & Grill and Boat Storage Yard, 8456 Dallas Avenue South

The restaurant building, located on the south half of the property, adjacent to the intersection with Dallas Avenue South and 14th Avenue South, was built in 1943. The northern half of the property has been used for boat storage since the 1970s. Currently, asphalt pavement covers the boat storage yard. Stained soils across the property were observed in historical aerial photographs (Wilbur 2004a).

Based on the age of the house, ACM, LBP, and light ballasts containing oil with PCBs were assumed to be present.

Property 4 – Residence, 1401-1403 South Thistle Street

The backyard of this residence was described as a junkyard, with several abandoned vehicles and numerous plastic containers reportedly observed on the property during a 2004 site reconnaissance. A DDES enforcement action directing removal of inoperable vehicles, junk, and other debris from this property took place in 2005 (King County 2005). Visual observations during a 2007 site reconnaissance revealed no abandoned vehicles present, but two former box vans were used as storage of various building materials, containers, and other household items.

No visibly stained soil or other evidence of surface contamination indicating disposal of hazardous substances, illegal dumping, or improper use or storage of hazardous materials were observed on this property.

Based on the age of the house, ACM, LBP, and light ballasts containing oil with PCBs were assumed to be present.

Property 5 – Restaurant, 8457 Dallas Avenue South

This property consists of a small restaurant and paved parking lot. Historically, the property has been used as a shoe repair shop (1911 to 1964), a store and barber shop (1964 to 1973), and a restaurant (1973 to present). The restaurant building is indicated in aerial photographs as far back as 1946 and in Sanborn maps as far back as 1917.

Based on the age of the house, ACM, LBP, and light ballasts containing oil with PCBs were assumed to be present.

Property 6 – Vacant Lot, No Address

This property is currently vacant and is used for parking. Sanborn maps indicate that the property included a 2-story single-family dwelling and a single outbuilding as early as 1917; the home is indicated on the 1929 map, but is absent on the 1950 map. The property appears to be vacant in aerial photographs dating back to 1956; in a grainy aerial photograph from 1946, it appears that a structure, possibly a house, was located on the property. King County property records indicate that the site has been vacant, with no buildings present, since 1938. In 1994, the City of Seattle issued a Land Use Code Notice of Violation requiring the removal of inoperable vehicles and desisting of vehicle maintenance and junk storage on the premises.

Adjacent Property Land Use

The South Park area south of the bridge and waterway consists primarily of residential and commercial development on both sides of 14th Avenue South. Since the bridge was built in the early 1930s, commercial businesses along 14th Avenue South in South Park have included gasoline service stations, automotive-related businesses (e.g., parts and repair services, used sales lots), dry cleaners, restaurants, grocery stores, boat storage yards, light industrial offices, warehouses, and medical clinics. Most land use surrounding the South Park Bridge north and south of the waterway has remained the same for the last 60 to 70 years.

To the north, the Site is bounded by the Duwamish Waterway. Flow rates vary from a maximum of 12,000 cubic feet per second (cfs) to a low of 195 cfs, with an average flow of 1,500 cfs. The waterway is tidally influenced to river mile (RM) 12.1. The extent of saltwater intrusion varies from around RM 7.1 to RM 9.2, depending on tidal stage and freshwater discharge volume. The

saltwater wedge toe consistently extends as far as the South Park Bridge, but can extend further during low river discharges in the summer (USACE 1983).

To the east, properties beyond the existing South Park Bridge were developed in the 1920s. A gasoline station operated at 8510-8512 Dallas Avenue South from the 1920s to the 1940s. A dry cleaner business has been located at 8500-8506 14th Avenue South since the 1950s.

Adjacent properties to the south have generally been and remain residential, with commercial development along 14th Avenue South. The property located at 8507-8509 14th Avenue South operated from the mid-1960s to the mid-1980s as an auto parts and repair shop.

Properties adjacent to the west were generally developed in the 1920s as residential properties and have remained residential properties since that time.

Summary of Previous Assessments

The following summarizes the results of sampling activities performed on or adjacent to the Site since 2003, and summarizes Phase I Environmental Site Assessment findings that provided the basis for sampling and analysis performed in this Phase II assessment.

Preliminary Site Investigation for the South Park Bridge Project (Wilbur 2004b)

A total of six soil borings were drilled and sampled within or adjacent to the Site during a 2003 preliminary site investigation for the South Park Bridge Project (Figure 2). Three geotechnical borings (SB-6, SB-7, and SB-8) were drilled to approximately 100 feet deep using a mud rotary drill rig at proposed bridge support locations. Three shallow soil borings were drilled using a hollow-stem auger within a few feet of the geotechnical borings to a maximum depth of 25 feet and completed as groundwater monitoring wells (MW-6, MW-7, and MW-8).

A total of six soil samples were collected from each of the three shallow borings completed as monitoring wells, at 2.5-foot intervals to the water table, at the groundwater surface, and at the completed bottom depth of the boring. Groundwater was collected after development from each completed well. All soil and groundwater samples were analyzed for the potential presence of diesel- and lube oil-range hydrocarbons, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides/PCBs, and metals. In the geotechnical borings, soil samples were collected from 50, 75, and 100 feet. These samples were analyzed for the potential presence of petroleum hydrocarbons (diesel- and lube oil-range hydrocarbons), VOCs, SVOCs, and metals.

SB-6 / MW-6

MW-6 is located immediately north of Site property 4 along the new bridge alignment.

No chemical constituents were found to exceed Model Toxics Control Act (MTCA) method A cleanup levels in either soil or groundwater. Diesel-and lube oil-range hydrocarbons were found in soil at 50, 75, and 100 feet deep near the detection limit. Methylene chloride was found at low concentrations in all nine soil samples and acetone was found in six soil samples and in groundwater; both constituents are common laboratory contaminants and were not linked to any likely Site source.

Hexachlorobutadiene and trichlorofluoromethane were found in soil between four and six orders of magnitude below their respective MTCA method B cleanup levels. Bis(2-ethylhexyl)phthalate was found in soil between two and three orders of magnitude below the MTCA method B cleanup level collected 10, 12, and 110 feet bgs, respectively. No organic compounds other than acetone were detected in groundwater. Beryllium, chromium, copper, lead, nickel, and zinc were detected in most soil samples at background levels. Copper and zinc were both detected in groundwater between two and three orders of magnitude below MTCA Method B cleanup levels.

SB-7 / MW-7

MW-7 is located immediately south of Site property 4 along the new bridge alignment.

A number of polycyclic aromatic hydrocarbons (PAHs) were found to exceed MTCA method A cleanup levels in soil; there were no exceedances in groundwater. Diesel-and lube oil-range hydrocarbons were found in soil at 2, 5, 12.5, 17.5, 75, and 100 feet deep, below the cleanup level. Methylene chloride was found at one-third to one-fifth the MTCA method A cleanup level in the three deepest soil samples and acetone was found five to six orders of magnitude lower than the MTCA method B cleanup level in the six deepest samples; neither constituent was detected in groundwater. Bis(2-ethylhexyl)phthalate was found in soil approximately three orders of magnitude below the MTCA method B cleanup level collected 2 feet, 5 feet, and 25 feet bgs.

Fifteen PAHs were found in soil at 2, 5, and 12.5 feet, with total carcinogenic (cPAHs) found at 1.06 milligrams per kilogram (mg/kg), exceeding the MTCA method A cleanup level (0.1 mg/kg) at the water table (12.5 feet). PCBs were detected in soil approximately one-fifteenth the MTCA method A cleanup level collected 2 and 5 feet bgs. No organic compounds were detected in groundwater. Various metals were found throughout the soil profile, with only lead (304 mg/kg) exceeding its MTCA method A cleanup level (250 mg/kg) collected 2 feet bgs. Copper and zinc were both detected in groundwater at concentrations two to three orders of magnitude below their MTCA method B cleanup levels.

SB-8 / MW-8

MW-8 is located approximately 200 feet southeast of Site property 5, adjacent to the new bridge alignment.

Total cPAHs (0.13 mg/kg) were found to exceed the MTCA method A cleanup level (0.1 mg/kg) collected 4 feet bgs; samples collected at 2 and 24 feet bgs had cPAHs at one-third and one-half

the MTCA method A cleanup level. There were no exceedances in groundwater. Diesel-and lube oil-range hydrocarbons were found in soil at 2, 4, 75, and 90 feet deep, below the cleanup level. Methylene chloride was found at low concentrations in four soil samples and acetone was found in seven soil samples; both constituents are common laboratory contaminants and were not linked to any likely Site source. Neither constituent was detected in groundwater.

A number of VOCs generally associated with either dry cleaning or gasoline were found in soil at 14 feet deep and in groundwater. Tetrachloroethene, cis-1,2-dichloroethene, toluene, ethylbenzene, xylenes, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene were detected in soil one to six orders of magnitude below MTCA method A and B cleanup levels at the water table. Tetrachloroethene, trichloroethene, cis-1,2-dichloroethene, vinyl chloride, and chloroform were detected in groundwater at concentrations exceeding MTCA method A and B cleanup levels; benzene was found below the MTCA method A cleanup level. Bis(2-ethylhexyl)phthalate was found in soil more than two orders of magnitude below the MTCA method B cleanup level collected 2 feet bgs and di-n-butylphthalate was found five orders of magnitude below the MTCA method B cleanup level 7 feet bgs. Beryllium, chromium, copper, lead, nickel, and zinc were detected in most soil samples at background levels, with arsenic and cadmium found in two samples. Chromium, copper and zinc were detected in groundwater one-fifth to two orders of magnitude below MTCA method A and B cleanup levels.

Street Soil Sample Data from Dallas Avenue South and Vicinity (SPU 2005; Integral 2006)

Seattle Public Utilities (SPU) collected surface and near-surface soil samples in July through December 2004 from street surfaces, roadway shoulder ROWs, catch basin drop inlets, and residential yards to assess potential presence of PCBs and petroleum products (diesel and lube oil). A majority of the samples were collected along Dallas Avenue South, stretching past 17th Avenue South, about 925 feet east of the Site. PCBs exceeding the Ecology MTCA method A cleanup level for unrestricted land use (1 mg/kg PCBs) were detected in a large number of street dust, catch basin, and roadway samples, primarily near the intersection of Dallas Avenue South and 17th Avenue South. Diesel- and lube oil-range hydrocarbons also were detected at concentrations exceeding the MTCA method A cleanup level of 2,000 mg/kg in a number of samples collected across this area.

The nearest surface soil samples collected along Dallas Avenue South exceeding the PCB cleanup criterion were found approximately 200 feet east of 14th Avenue South (Figure 3). Composite samples of street dust and sediment from drop inlets inside catch basins were collected further west beyond the main contaminated area at 11 sample locations, including the southeast corner of 14th Avenue South and Dallas Avenue South (PCBs were found at 0.17 mg/kg in a catch basin, below the MCTA Method A cleanup level of 1 mg/kg).

Following the sampling effort in December 2004, SPU implemented extensive interim source control measures that included removing contaminated soil from roadway shoulders and replacement with clean gravel along Dallas Avenue South east of 14th Avenue South; grading and paving Dallas Avenue South, South Donovan Street, and 17th Avenue South roadways; and installing a temporary stormwater collection and treatment system to control stormwater runoff

from the newly paved roadways. PCBs may be encountered in surface soils in unpaved areas adjacent to Site properties.

Lower Duwamish Dioxin Study (Integral 2008)

This technical memorandum addresses the distribution of dioxin and furan congeners found in archived samples with elevated PCB concentrations collected by SPU in the LDW vicinity. The nearest sample collected to the Site, approximately 600 feet east-southeast from Site property 5, identified a 2,3,7,8-tetrachlorodibenzo-*p*-dioxin toxicity equivalent (TCDD-TEQ) concentration of 95 nanograms per kilogram (ng/kg), well above the Model Toxics Control Act (MTCA) method B soil cleanup level for unrestricted land use of 11 ng/kg. Dioxin associated with street dirt may extend further to the north, impacting the subject Site.

South Park Bridge Phase I Environmental Site Assessment (Herrera 2009)

The Phase I Environmental Site Assessment revealed evidence of recognized environmental conditions in connection with the Site and neighboring properties (Table 1).

All Site properties used for boat storage have the potential for contamination associated with maintenance activities, including paints, solvents, and metals. Similarly, properties used for automobile storage and maintenance have the potential for release of petroleum products, solvents, and metals. Notices of land use violations indicated the potential for releases of chemicals associated with engine maintenance and storage of unknown materials. Site reconnaissance indicated the presence of chemical storage in containers and batteries. All Site properties, except Site property 6, include older buildings, indicating the potential presence of ACM, lead-based paint, and PCBs in electrical equipment (light fixtures, switches). All of these findings indicated recognized environmental conditions (RECs) exist for all Site properties.

Three groundwater monitoring wells were installed in 2003 adjacent to Site properties. Neither of the wells located within the Site (MW-6 and MW-7) indicated groundwater contamination present. Contamination indicating petroleum and dry cleaning fluid releases was identified in well MW-8, located adjacent to a dry cleaning business and downgradient from a historic gas station. Based on the location of MW-8, 200 feet from the Site, and the possible range of groundwater flow direction, the associated site was considered a REC.

An environmental regulatory database search revealed two listed properties of known or potential source of contamination within a 1/8-mile radius and upgradient of the Site. The Scott Andrew Property and Spencer Industries Property were considered RECs due to the nature of the release and distance from the site.

- Scott Andrew Property – A documented release of gasoline to soil and groundwater was identified during removal of three USTs associated with a historic gasoline service station and auto repair shop that operated at this location from the mid-1920s to the mid-1990s. A possibility exists for residual contamination present adjacent to and beneath the Site.

Figure 3.
Surface soil PCB concentrations, South Park Neighborhood, Seattle

Legend

Sample Locations

- □ Roadway Dust/Catch Basin Sample (SPU 2004-2006)
- △ Right of Way Soil (SPU 2004-2006)
- ○ Direct Push Sample (SPU/Integral February and March 2006)
- ⬠ Approximate Location of T117 Samples (Port of Seattle, February, April 2006, Windward 2006)

Total PCB Concentration (ppm)

- PCB not sampled
- PCB <1
- PCB 1-10
- PCB 10-50
- PCB >50

Notes:

Yard sample test results not shown.

Sample locations without data indicate PCB analysis was not conducted at this depth interval.

Source: Integral, 2006

N

0 40 80 160

Approximate scale in feet

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Table 1. Summary of recognized environmental conditions (RECs) based on historical and current use, South Park Bridge Replacement Project.

Address	Property Name	Distance [a]	Uses / Justification (Date of Operation)	Possible Condition	Possible Contaminant
1400 South Thistle Street	JRD King Property (Site Property 1)	Subject property	Building constructed in 1953, vehicle and boat storage since 1960s, historic fill	Release of petroleum products, paints, solvents; building materials	Petroleum, VOCs, SVOCs, metals, ACM, lead, PCBs
1239 South Rose Street	South Park Marina-Rose (Site Property 2)	Subject property	Residence constructed in 1938, boat maintenance, use of heating oil	Release of petroleum products, paints, solvents; UST; building materials	Petroleum, VOCs, SVOCs, metals, ACM, lead, PCBs
8456 Dallas Avenue South	South Park Marina-Dallas (Site Property 3)	Subject property	Building constructed in 1945, boat maintenance	Release of petroleum products, paints, solvents; building materials	Petroleum, VOCs, SVOCs, metals, ACM, lead
1403 South Thistle Street	Mort Property (Site Property 4)	Subject property	Residence constructed in 1915, automobile maintenance	Release of petroleum products, paints, solvents; building materials	Petroleum, VOCs, SVOCs, metals, ACM, lead
8457 Dallas Avenue South	Nguyen & Bach Property (Site Property 5)	Subject property	Building constructed in 1911	Building materials	ACM, lead
None	Prakash Property (Site Property 6)	Subject property	Building constructed in the early 1900s (demolished prior to 1938), vehicle parking, junk storage	Release of petroleum products	Petroleum, VOCs, SVOCs, metals
8507 14th Avenue South	Discount Market	Approximately 50 feet south of site	Historic auto parts and repair shop (1960s to 1980s)	Spills	Petroleum, solvents, metals
8510-12 Dallas Avenue South	Phumphrey S. Auto Repair / A-1 Radiator Service; Marshall Automotive Rebuild	Approximately 100 feet SSE of site center	Gasoline service station and automobile repair shop (mid-1930s to 1970s); Auto rebuild shop (1966); radiator service (1970)	USTs, spills	Petroleum, solvents, metals

Table 1 (continued). Summary of recognized environmental conditions (RECs) based on historical and current use, South Park Bridge Replacement Project.

Address	Property Name	Distance [a]	Uses / Justification (Date of Operation)	Possible Condition	Possible Contaminant
8500-8506 14th Avenue South	Regency Cleaners	Approximately 150 feet SSE of site	Historic (1950s) and current dry cleaners	Spills, discharges	Solvents
8410 Dallas Avenue South	Former Spencer Industries	Approximately 250 feet west of Site	Leaking USTs	Release of chlorinated solvents	VOCs
8520 14th Avenue South	Scott Andrews Property	Approximately 250 feet south of Site	Leaking USTs	Release of petroleum products from a UST	Petroleum
8700 Dallas Avenue South	Malarkey Asphalt / Port of Seattle	Approximately 800 feet SE of Site	Source of road oil	Spreading of road oil prior to paving in the area	Petroleum, PCBs, dioxins

[a] Distance of the listed site relative to the Site boundary.

ACM asbestos-containing material
PCBs polychlorinated biphenyls
SVOCs semi-volatile organic compounds
UST underground storage tank
VOCs volatile organic compounds

- Spencer Industries – A former aircraft manufacturing plant operated at this location from the 1940s through the late 1990s. Releases of chlorinated solvents have been reported.

A review of historic information revealed four properties located adjacent to the Site that were considered RECs due to historic and current operations.

- 8510-8512 Dallas Avenue South – A potential release of contaminants may have occurred associated with an historic auto garage with a gasoline service station that occupied the property from the 1920s to the 1940s (identified as the former gas station/auto repair property on Figure 2).

- 8500-8506 14th Avenue South – A potential release of contaminants appears to have occurred associated with an historic dry cleaning facility that operated at this location in the 1950s; the existing dry cleaners facility has operated at this location since 2003 (identified as the dry cleaner on Figure 2).

- 8507-8509 14th Avenue South – A potential release of contaminants may have occurred associated with an historic auto parts and repair shop that operated at this location from the mid-1960s to the mid-1980s. A potential exists for encountering petroleum products, solvents, and metals contamination in groundwater (identified as the former auto repair on Figure 2).

- 8700 Dallas Avenue South – Oil contaminated with PCBs may have been spread across roadways prior to paving in the area. Soil collected from road shoulders and catch basins along Dallas Avenue South between South 17th and South 14th Streets were found to contain both PCBs and dioxins. A potential exists for soil along road shoulders on the Site to be similarly contaminated.

Phase II Activities

Scope

The Phase II Environmental Site Assessment included soil, groundwater, and building material sampling and testing at six Site properties and adjacent ROWs. Soil was chiefly collected from near the surface and at depth using a push probe drill rig. Some soil was also sampled from the surface and near-surface, using hand tools. Groundwater samples were collected at monitoring wells installed for general site characterization in 2003, and from push probes at locations targeting potential releases from USTs or deep fill conditions. Building material was tested for ACM, lead, and hazardous waste toxicity characteristic to aid in demolition planning.

Conceptual Site Model and Sampling Plan

The conceptual site model is based on three types of contaminant sources and distribution mechanisms in the environment:

1. Limited surface spills and discharges with vertical transport – Five of the six Site properties historically have been used to store and maintain vehicles and boats. Therefore, it was assumed that limited discharges of petroleum products, solvents, and paints to surface soil may have occurred. Soil samples collected from the surface and from 3 feet deep across the properties were expected to verify these conditions. Potential surface soil contamination associated with general area-wide PCB and dioxin contamination found in the South Park neighborhood to the east was addressed through surface soil sampling along adjacent ROW areas.

2. Substantial releases to groundwater from USTs with lateral transport – The potential for more significant contamination associated with leaking USTs was expected to be found in groundwater, providing a mechanism for transport both onto and off of the Site. Groundwater samples collected downgradient from a known source and assumed tank locations was performed to assess Site conditions.

3. Building materials associated with structures – Hazardous materials include asbestos, lead in paint, and PCBs in light fixtures, switches, capacitors, and transformers. The potential exists for lead paint to be found in soil adjacent to buildings, but it is not expected to have moved significantly either downward or laterally through the soil. Asbestos and PCBs may be associated with structural material and fixtures, respectively.

General Sampling and Analysis Approach

Soil sampling was performed using hand tools to collect surface soil samples and a push probe drill rig to collect subsurface soil samples and groundwater samples. Near-surface and deeper soil samples were collected at each planned location; however, as part of the phased analysis procedure, only surface samples were initially screened for the presence of petroleum, with follow-up analyses performed on those samples indicating evidence of hydrocarbon presence. This assumed that petroleum presence would be indicative of other contamination associated with historical property use identified in the Phase I Environmental Site Assessment. The deeper samples associated with each affected surface sample were also analyzed for selected contaminant types.

Groundwater samples were obtained from probes at selected locations and from three existing monitoring wells using a low flow sampling method.

Destructive asbestos containing materials (ACM) samples were collected from each building. Where possible, samples were collected from inconspicuous areas or in areas that were damaged already.

The lead-based paint building inspection was performed using an X-ray fluorescence (XRF) meter. Paint-chip samples were collected when XRF results for a component type were inconclusive, or where it was deemed that painted materials could be segregated easily during demolition.

Building material samples were collected from two buildings and analyzed for hazardous waste characteristic based on lead (samples were not collected at all buildings, as planned, based on lack of owner consent).

Sampling and Chemical Analysis Methods

Twenty-two borings were advanced to total depths ranging from 1 to 20 feet using push-drive probe equipment (see Figure 4). Four of the 22 borings were completed with a post hole digger; two (PP1-3 and PP2-3) because of access issues and two (PP4-2 and PP4-3) because the borings were located in a historical river meander with a potential presence of historical cultural resources. A detailed description of soil and groundwater sampling field procedures is presented in Appendix A, geologic and hydrogeologic subsurface conditions are provided on soil boring logs in Appendix B, and site photographs documenting the boring installations are provided in Appendix C.

Soil

Samples from each boring were prepared for chemical analysis by removing soil from the sampler and placement directly into jars provided by the analytical laboratory. Each sample was uniquely labeled denoting the sample identification number and depth, date and time sampled,

Legend

- Project site
- Parcel boundary
- Building
- Push probe sampling location
- Groundwater monitoring well location
- (5) Site property number (includes S. Thistle St, 14th Avene S, and 16th Avenue S ROW locations)
- Hand sample location

Figure 4. Sample location map, South Park Bridge replacement project.

N

0 62.5 125 250 Feet

HERRERA ENVIRONMENTAL CONSULTANTS

Aerial Photography: King County (2002)

K:/Projects/05-03224-012/Project/Sample locations.mxd (07/31/2009) JAS

and job number. Soil samples were then placed into a chilled cooler for storage prior to delivery to the laboratory.

Samples were analyzed based on the following methods (Ecology 1997; EPA 2007):

- Hydrocarbon Identification – NWTPH-HCID
- Gasoline-range organics/BTEX – NWTPH-Gx/EPA method 8021B
- Diesel- and heavy oil-range organics – NWTPH-Dx
- Volatile organics – EPA method 8260B
- Semi-volatile organics – EPA method 8270D-SIM
- Polychlorinated biphenyls – EPA method 8082
- RCRA metals (arsenic, barium cadmium, lead, selenium, silver) – EPA method 6010B
- RCRA metals (mercury) – EPA method 7471A

Groundwater

Groundwater samples were collected by pumping directly from the probe or well into sample containers provided by the laboratory. Samples were analyzed based on the following methods (Ecology 1997; EPA 2007):

- Hydrocarbon Identification – NWTPH-HCID
- Gasoline-range organics/BTEX – NWTPH-Gx/EPA method 8021B
- Diesel- and heavy oil-range organics – NWTPH-Dx
- Volatile organics – EPA method 8260B
- Semi-volatile organics – EPA method 8270D-SIM
- Polychlorinated biphenyls – EPA method 8082
- RCRA metals (arsenic, barium cadmium, lead, selenium, silver) – EPA method 200.8
- RCRA metals (mercury) – EPA method 7470A

Building Materials

Asbestos

Building materials were characterized based on the Asbestos Hazard Emergency Response Act (AHERA) survey and sampling requirements (details are further discussed Volume II). Asbestos samples were collected by wetting the surface of the material to be sampled, collecting an appropriate amount of each suspect material using various sampling implements (e.g., hammer and chisel, box cutter, needle nose pliers, etc.), and placed into laboratory-provided plastic baggies. Techniques included cutting with a razor knife or scraping with a chisel to minimize damage to the surrounding materials. Gloves were worn during sampling and sampling implements were cleaned with wet wipes between each sample location to prevent cross-contamination. The baggies were labeled with a unique sample number, the material was photographed, and the location was recorded on a building diagram.

Roof patching material was used to seal roofing surfaces. Interior sampling locations were not patched because of the poor condition of the materials being sampled and scheduled building demolition.

Samples were analyzed based on the following method:

- Asbestos – Bulk samples were analyzed by Polarized Light Microscopy (PLM) dispersion staining EPA Method 600/R-93/116.

Lead-based Paint

Field measurements for lead on painted surfaces were conducted by X-ray diffraction using a MAP 4 X-Ray Fluorescence meter. At least three calibration check readings were made before beginning each building inspection. Additional calibration check readings were made every 4 hours or after inspection work was completed for the day, or according to the manufacturer's instructions, whichever was more frequent.

Testing combinations in each room were identified, characterized by the "room equivalent", the component type, and the substrate. A room equivalent is an identifiable part of a building (e.g., room, exterior, foyer, etc.). Painted surfaces included any surface coated with paint, shellac, varnish, stain, paint covered by wallpaper, or any other coating. Wallpaper was assumed to cover paint unless physical evidence indicated no paint was present.

At least one individual XRF reading was taken for each testing combination in each room equivalent. For walls, at least four readings were taken in each room equivalent (one reading on each wall). A different visible color did not by itself result in a separate testing combination.

Paint-chip samples were collected when XRF results for a component type were inconclusive. Paint-chip samples contained all layers of paint (not just peeled layers), always including the bottom layer. Samples were analyzed based on the following method (EPA 2007):

- Lead paint – EPA method 6010B

PCB Survey

The buildings were surveyed for the number and location of fluorescent light ballasts marked as non-PCB, the number and location of other fluorescent light ballasts that must be assumed to contain PCBs, and the number and location of electrical transformers or capacitors.

Hazardous Waste

Waste designation was performed for construction debris, per owner's consent, in accordance with toxicity characteristic leaching procedure (TCLP) analysis. Samples were only collected at Site properties 2 and 3.

Various tools were used to break, crack, crush, cut, etc., components of the waste. Sample collection tools were decontaminated after each sample was collected using wet wipes and misting the tool with an Alconox/water solution prior to wiping with the wet wipe.

Site property 3 building components were collected in proportion to the volume of that component in the entire building. Sample size for each sub-component was a minimum of 2 square inches to a maximum of 4 square inches. The subsamples were composited and the overall sample consisted of approximately 100 grams (a full 1-gallon plastic bag). Sample locations were not-repaired upon completion of sampling activities because of the scheduled demolition and dilapidated condition of the building.

During the survey, a piece of cement-asbestos board (CAB) was collected from the ground adjacent to the outside of Site property 2. The sample was collected to verify appropriate disposal for this material because it will be handled separately from non-asbestos containing building materials during demolition.

Samples were analyzed based on the following methods (EPA 2007):

- TCLP lead – EPA method 1311/6010B

Sampling Locations

The following provides details on specific environmental sample locations, sample numbers, sample media, and analytical requirements for each Site property. Building sample locations were based on individual building characteristics, determined during surveys conducted immediately prior to the sampling process. Environmental sample locations are indicated on Figure 4; building sample locations are provided in Volume II of this report.

Property 1 JRD King 1400 South Thistle

Table 2 provides a summary of planned sampling and analysis at Property 1. Three borings (PP1-1, PP1-2, and PP1-4) were advanced in areas of the property associated with storage and maintenance of engines and other equipment, with soil samples collected near the surface and 3 feet deep. A fourth boring (PP1-3) was completed inside of a building and only a near-surface soil sample was collected because of access limitations. The boring closest to the Duwamish Waterway (PP1-4) was advanced to groundwater and soil samples were collected at 6 and 9 feet deep to characterize fill historically added along the shoreline. Fill was observed in this boring to 14.5 feet bgs; a groundwater sample was collected from the boring.

Table 2. Sampling and Analysis Plan for Site Property 1, South Park Bridge Replacement Project.

Sample Characteristics			Analysis Plan	
Quantity Collected	Media	Depth (ft)	Initial	Follow-up
4	Soil	>1	HCID 8260B 8270D-SIM 6010B/7470A	TPH-Gx TPH-Dx
3	Soil	3		TPH-Gx TPH-Dx 8260B 8270D-SIM 6010B/7470A
1	Soil	3	HCID 8260B 8270D-SIM 6010B/7470A	TPH-Gx TPH-Dx
1	Soil	6	HCID 8260B 8270D-SIM 6010B/7470A	TPH-Gx TPH-Dx
1	Soil	9	HCID 8260B 8270D-SIM 6010B/7470A	TPH-Gx TPH-Dx
1	Groundwater		HCID 8260B 8270D-SIM 6020/7471A	TPH-Gx TPH-Dx

Initial screening analysis was performed at each shallow location, with follow-up analyses performed if screening indicated a release. The 3-foot deep samples associated with positive surface screening results also were analyzed. Six- and 9-foot deep soil samples were screened for petroleum products and analyzed for volatiles, semi-volatiles, and metals; follow up analysis was performed for petroleum hydrocarbons based on screening results. Groundwater was analyzed similar to the deeper soil samples.

Property 2 South Park Marina-Rose 1239 South Rose Street

Table 3 provides a summary of planned sampling and analysis at Property 2. Three borings (PP2-1, PP2-2, and PP2-3) were advanced in areas of the property associated with storage and maintenance of engines, boats, and other equipment, with soil samples collected near the surface and 3 feet deep. A fourth boring (PP2-4) was advanced adjacent to an existing heating oil underground storage tank (UST), with soil samples collected 6 and 9 feet deep beneath the tank; a groundwater sample was collected. There was no petroleum odor associated with the heating oil tank or evidence of sheen when pumping the groundwater for sample collection.

Table 3. Sampling and Analysis Plan for Site Property 2, South Park Bridge Replacement Project.

Sample Characteristics			Analysis Plan	
Quantity Collected	Media	Depth (ft)	Initial	Follow-up
3	Soil	>1	HCID	TPH-Gx TPH-Dx 8260B 8270D-SIM 6010B/7470A
3	Soil	3		TPH-Gx TPH-Dx 8260B 8270D-SIM 6010B/7470A
1	Soil	6	TPH-Dx	
1	Soil	9	TPH-Dx	
1	Groundwater		TPH-Dx	

Initial screening analysis was performed at each shallow location, with follow-up analyses performed if screening indicated a release. The 3-foot deep samples associated with positive surface screening results also were analyzed. Six- and 9-foot deep soil samples were analyzed for heating oil (diesel). Groundwater was analyzed for diesel only.

Property 3 South Park Marina-Dallas 8456 Dallas Avenue South

Table 4 provides a summary of planned sampling and analysis at Property 3. Four borings (PP3-1, PP3-2, PP3-3, and PP3-4) were advanced in areas of the property associated with storage and maintenance of engines, boats, and other equipment, with soil samples collected near the surface and 3 feet deep. Access issues resulted in moving boring PP3-4 further north than originally planned.

Initial screening analysis was performed at each shallow location, with follow-up analyses performed if screening indicates a release. The 3-foot deep samples associated with positive surface screening results also were analyzed.

Table 4. Sampling and Analysis Plan for Site Property 3, South Park Bridge Replacement Project.

Sample Characterization			Analysis Plan	
Quantity Collected	Media	Depth (ft)	Initial	Follow-up
4	Soil	>1	HCID	TPH-Gx TPH-Dx 8260B 8270D-SIM 6010B/7470A
4	Soil	3		TPH-Gx TPH-Dx 8260B 8270D-SIM 6010B/7470A

Property 4 Mort Property 1403 South Thistle Street

Table 5 provides a summary of planned sampling and analysis at Property 4. Three borings (PP4-1, PP4-2, and PP4-3) were advanced in areas of the property associated with storage and maintenance of engines and other equipment, with soil samples collected near the surface and 3 feet deep. Borings PP4-2 and PP4-3 were only advanced to 1 foot deep because they were located within areas mapped as potentially containing historical cultural resources (this information was provided by King County in the field).

Table 5. Sampling and Analysis Plan for Site Property 4, South Park Bridge Replacement Project.

Sample Characteristics			Analysis Plan	
Quantity Collected	Media	Depth (ft)	Initial	Follow-up
3	Soil	>1	HCID	TPH-Gx TPH-Dx 8260B 8270D-SIM 6010B/7470A
4	Soil	>1	6010 (lead)	
4	Soil	1	6010 (lead)	
1	Soil	3		TPH-Gx TPH-Dx 8260B 8270D-SIM 6010B/7470A

Initial screening analysis was performed at each shallow location, with follow-up analyses performed if screening indicated a release. The 3-foot deep sample associated with positive surface screening results also was analyzed.

Elevated lead concentrations identified during the lead paint survey conducted on the residence indicated the need for further soil sampling adjacent to the building; therefore, a total of eight soil samples were collected from areas adjacent to the house. Six-inch deep and 12-inch deep soil samples were collected from two soil sampling locations near the southwest (SW) side of the house and two soil sampling locations near the southeast (SE) side of the house. The soil sampling was conducted at a distance of 1 foot and 3-feet from the each side of the house. The soil samples collected for lead analysis only were labeled: 4SW-1-6, 4SW-1-12, 4SW-3-6, 4SW-3-12, 4SE-1-6, 4SE-1-12, 4SE-3-6, and 4SE-3-12.

Property 5 Nguyen & Bach Property 8457 Dallas Avenue South

No soil or groundwater samples were collected from this property.

Property 6 Prakash Property No Address

Table 6 provides a summary of planned sampling and analysis at Property 6. Three borings (PP6-1, PP6-2, and PP6-3) were advanced in areas of the property associated with storage and maintenance of engines and other equipment, with soil samples collected near the surface and 3 feet deep.

Table 6. Sampling and Analysis Plan for Site Property 6, South Park Bridge Replacement Project.

Sample Characteristics			Analysis Plan	
Quantity Collected	Media	Depth (ft)	Initial	Follow-up
3	Soil	>1	HCID	TPH-Gx TPH-Dx 8260B 8270D-SIM 6010B/7470A
3	Soil	3		TPH-Gx TPH-Dx 8260B 8270D-SIM 6010B/7470A

Initial screening analysis was performed at each shallow location, with follow-up analyses performed if screening indicated a release. The 3-foot deep samples associated with positive surface screening results also were analyzed.

Property 7 King County South Thistle Street ROW

Table 7 provides a summary of planned sampling and analysis at Property 7. Surface soil and groundwater samples were collected from the ROW beneath the elevated portion of 16th Avenue South from boring PP7-1; the boring location was moved from its planned position to the east to

avoid encountering historical resources. Additionally, monitoring well MW-6 was sampled for groundwater (the groundwater sample is identified as MW6-GW-81709).

Table 7. Sampling and Analysis Plan for Site Property 7, South Park Bridge Replacement Project.

Sample Characterization			Analysis Plan	
Quantity Collected	Media	Depth (ft)	Initial	Follow-up
1	Soil	Surface	TPH-Dx 8082 1613B 6010B/7470A	
1	Groundwater			TPH-Gx TPH-Dx
1	Groundwater (MW-6)		TPH-Gx TPH-Dx 8260B 8270D-SIM 6020/7471A	

Surface soil was analyzed for diesel/lube oil-range petroleum, PCBs, and dioxins to address historical road oiling; groundwater was analyzed for potential analysis of gasoline-range hydrocarbons and VOCs if the groundwater collected from both boring locations on Site property 9 indicated contamination may have moved that far north; this was not the case. Groundwater at MW-6 was analyzed for petroleum, volatiles, semi volatiles, and metals.

Property 8 King County 14th Avenue South ROW

Table 8 provides a summary of planned sampling and analysis at Property 8. One boring was advanced in the ROW where storage and maintenance of engines and other equipment may have occurred, with soil samples collected near the surface and 3 feet deep. Additionally, monitoring wells MW-7 and MW-8 were sampled for groundwater (the groundwater samples are identified as MW7-GW-81709 and MW8-GW-81709, respectively).

Initial screening analysis was performed at the shallow boring location, with follow-up analyses performed if screening indicates a release. The 3-foot deep samples associated with positive surface screening results also were analyzed. Groundwater was analyzed for VOCs, SVOCs, PCBs, and metals, based on previous sampling results at each location.

Table 8. Sampling and Analysis Plan for Site Property 8, South Park Bridge Replacement Project.

Sample Characterization			Analysis Plan	
Quantity Collected	Media	Depth (ft)	Initial	Follow-up
1	Soil	>1	HCID	TPH-Gx TPH-Dx 8260B 8270D-SIM 8082 6010B/7470A
1	Soil	3		TPH-Gx TPH-Dx 8260B 8270D-SIM 8082 6010B/7470A
1	Groundwater (MW-7)		TPH-Dx 8260B 8270D-SIM 8082 6020/7471A	
1	Groundwater (MW-8)		TPH-Gx TPH-Dx 8260B 8270D-SIM 6020/7471A	

Property 9 King County 16th Avenue South ROW

Table 9 provides a summary of planned sampling and analysis at Property 9. One boring (PP9-2) was advanced in the ROW adjacent to a historic service station (8510 Dallas Avenue South), with soil samples collected 3, 6, and 9 feet deep; groundwater also was sampled at this location (depth of 14 feet). One boring (PP9-1) was advanced in the right-of-way about 250 feet to the north (downgradient) of PP9-2, with surface soil and groundwater sampled (depth of 8 feet).

The surface soil sample collected north of the historic gas station was analyzed for diesel/lube oil-range hydrocarbons, PCBs, and dioxin to address road oiling. Initial screening analysis was performed at the gas station boring location (PP9-2), with follow-up analyses performed if screening indicated a release. Groundwater was collected for petroleum screening near the historic gas station, with follow-up analyses performed for specific petroleum fractions, VOCs, SVOCs, and metals based on the screening result. The groundwater sample collected from 250 feet to the north of the historic gas station (PP9-1) was to be analyzed for specific petroleum hydrocarbon fractions based on screening near the gas station.

Table 9. Sampling and Analysis Plan for Site Property 9, South Park Bridge Replacement Project.

Sample Characterization			Analysis Plan	
Quantity Collected	Media	Depth (ft)	Initial	Follow-up
1	Soil (north of historic gas station)	Surface	TPH-Dx 8082 1613B 6010B/7470A	
1	Soil	3	HCID	TPH-Gx TPH-Dx 8260B 8270D-SIM 6010B/7470A
1	Soil	6		TPH-Gx TPH-Dx 8260B 8270D-SIM 6010B/7470A
1	Soil	9		TPH-Gx TPH-Dx 8260B 8270D-SIM 6010B/7470A
1	Groundwater (historic gas station)		HCID	TPH-Gx TPH-Dx 8260B 8270D-SIM 6010B/7470A
1	Groundwater (north of historic gas station)			TPH-Gx/BTEX

Results

Subsurface Conditions

Geologic Setting

Fill material was encountered in each push probe boring. The material included topsoil, crushed rock, sandy gravel, and gravelly sand and was pale brown, dark brown, or grayish brown in color. Two borings (PP1-4 and PP9-1) located within 100 feet of the Duwamish Waterway encountered fill material to respective depths of 14 and 8 feet bgs (Figure 4). A piece of concrete found at 14 feet bgs (in boring PP1-4) and organic material including roots (in boring PP9-1) may have been an historical ground surface level.

It is possible that native soils (black fine to coarse sand with silt lenses) were observed at 14.5 feet bgs near the bottom of boring PP9-2, but based on the history of dredging and filling in the area, it is difficult to distinguish native soils from dredge material. Sand with characteristic white and brown grains was found in many of the borings, including PP9-2 at 14 feet bgs. This sand may be dredged fill material used when the Duwamish channel was straightened in the early 1900s.

An historic meander channel of the Duwamish River, located between Dallas Avenue South and South Orr Street, was noted by King County as an area having the potential to contain cultural resources; a licensed geologist from King County was on site to observe soil sampling activities in this area. No cultural resources were identified.

Hydrogeologic Conditions

Groundwater was encountered in five push probe borings (PP1-4, PP2-4, PP7-1, PP9-1, and PP9-2) at depths ranging from 8.5 to 14 feet bgs. Groundwater was also measured at depths of 13.07 to 14.71 feet bgs in three existing monitoring wells (MW-6, MW-7, and MW-8). The monitoring wells and borings were sampled on different days and times, and no correlation between groundwater elevations and river elevations associated with rising or falling tides was attempted.

Analytical Data

A data review was performed for all chemical data collected for this project; a data quality summary is provided in Appendix D. In general, chemistry data met project criteria and are considered acceptable for use, and no data were rejected. Data with minor qualifications are described below:

- The criteria for one Internal standard failed during VOCs analysis for sample PP4-1-3.0. Bromobenzene and all later eluting compounds were qualified as estimated detection limits (UJ).

- The total chromium result for sample PP8-1-3.0 and total lead result for sample 4SW-1-6 were qualified as estimated, due to laboratory duplicate criteria exceedances.

Analytical results are presented separately for soil, groundwater, and building materials below.

Soil

A total of 50 soil samples were collected from 8 separate properties; no samples were collected from Site property 5, which had no RECs identified in the Phase I assessment (Figure 4). Forty-two of these samples were collected to evaluate potential surface spills and discharges to soil, and eight samples were collected surrounding the house on Site property 4 where field personnel measured elevated lead concentrations in the building's exterior paint.

Initial HCID screening was performed on 22 samples collected across the Site; and additional analyses were performed on select samples from Site property 1 where historic fill was identified. Based on HCID results, follow-up analysis was performed on samples where lube oil was detected; several archived samples collected during the investigation were not analyzed. The analytical results for each property are summarized in text and tables below.

Property 1

A total of nine soil samples were collected at Site property 1 at depths ranging from 0.5 feet bgs to 9 feet bgs (a planned 3-foot deep sample located inside the building could not be collected with hand equipment due to refusal). HCID analysis was performed on four surface soil samples (PP1-1-0.5, PP1-2-0.5, PP1-3-0.5, and PP1-4-0.5) and on the three subsurface samples at location PP1-4, which is closest to the Duwamish Waterway. Lube oil-range hydrocarbons were detected in two surface soil samples (PP1-1-0.5 and PP1-3-0.5) at concentrations below the MTCA method A cleanup level of 2,000 mg/kg; petroleum hydrocarbons were not detected in other surface or subsurface soil samples analyzed. Arsenic was detected in one sample (PP1-1-0.5) at a concentration of 23 mg/kg, slightly above the MTCA method A cleanup level of 20 mg/kg. Other analytes, including VOCs, SVOCs, and cPAHs were also detected in the soil samples, but at concentrations below MTCA cleanup levels (see Table 10).

Property 2

A total of seven soil samples were collected at Site property 2 at depths ranging from 0.5 feet bgs to 8 feet bgs where groundwater was encountered (a planned 3-foot deep sample located inside a building could not be collected with hand equipment due to refusal). HCID analysis was performed on three surface soil samples (PP2-1-0.5, PP2-2-0.5, and PP2-3-0.5) and two subsurface soil samples (PP2-4-6.0 and PP2-4-8.0) adjacent to an existing heating oil tank. No petroleum hydrocarbons were detected.

Table 10. Soil analytical results for Site property 1.

Location	Petroleum			VOCs				SVOCs												cPAHs								PCBs	Metals					
	HCID	Lube Oil	Diesel	Acetone	Methylene Chloride	2-Buta-none	Tetra-chloro-ethylene	Naphtha-lene	Dimethyl-phthalate	Acenaph-thene	Fluor-ene	Phenan-threne	Anthra-cene	Di-n-butyl-phthalate	Fluoran-thene	Pyrene	Butyl-benzyl-phthalate	Benzo-[g,h,i]-perylene	bis(2-Ethyl-hexyl)-phthalate	Benzo(a)-anthra-cene	Chry-sene	Benzo[b]-fluoran-thene	Benzo[k]-fluoran-thene	Benzo[a]-pyrene	Indeno[1, 2,3-cd]-pyrene	Dibenz [a,h]-anthra-cene	Total cPAHs	Aroclor 1260	Arsenic	Barium	Cad-mium	Chrom-ium [c]	Lead
MTCA Method A Soil Cleanup Level [a]	*na*	2,000	2,000	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	0.1	*na*	*na*	0.1	1	20	*na*	2	2000	250
MTCA Method B Soil Cleanup Level [b]	*na*	*na*	*na*	8000	130	48000	1.9	1600	80000	4800	3200	*na*	24000	8000	3200	2400	16000	*na*	71.4	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	5600	*na*	*na*	*na*
PP1-1-0.5	Lube Oil	92										0.01			0.033	0.042		0.042		0.018	0.031	0.037	0.012	0.035	0.023	0.0083	0.04514		23	78	0.65	34	80
PP1-1-3.0		ND										0.022			0.055	0.056		0.028		0.027	0.027	0.042	0.013	0.039	0.024	0.0079	0.05066			49		16	19
PP1-2-0.5	ND																																
PP1-2-3.0																																	
PP1-3-0.5	Lube Oil	75					0.006								0.016	0.016		0.019		0.01	0.011	0.02		0.017	0.012		0.02131			38		11	16
PP1-4-0.5	ND																																
PP1-4-3.0	ND											0.021	0.0085		0.075	0.071		0.042		0.043	0.045	0.037	0.048	0.052	0.036	0.012	0.07005			49		22	19
PP1-4-6.0	ND			0.0091					0.2	0.0083		0.019	0.0092		0.078	0.085		0.07	0.042	0.043	0.071	0.089	0.076	0.069	0.063	0.02	0.09881			49	0.6	17	44
PP1-4-9.0	ND											0.008			0.021	0.019		0.017		0.014	0.014	0.024		0.02	0.013		0.02524			40		14	25

Notes: Values reported in milligrams per kilogram (mg/kg).
Values exceeding the MTCA method A or B cleanup levels are highlighted.
HCID – Hydrocarbon identification
VOCs – Volatile organic compounds
SVOCs - Semi-volatile organic compounds
cPAHs – carcinogenic polycyclic aromatic hydrocarbons
PCBs – Polychlorinated biphenyls
ND – Analyte was not detected above the practical quantitation limit.
na = Soil cleanup level for this constituent not available.

[a] Method A soil cleanup level for unrestricted land use (Ecology 2007).
[b] Method B soil cleanup level for direct contact pathway (ingestion) (Ecology 2009).
[c] 2,000 mg/kg cleanup level for chromium III (most sites); 19 mg/kg cleanup level for chromium VI (typically applicable to sites where chromium VI was used in an industrial process).

Property 3

A total of eight soil samples were collected at Site property 3 at depths of 0.5 and 3.0 feet bgs. HCID analysis was performed on four surface soil samples (PP3-1-0.5, PP3-2-0.5, PP3-3-0.5, and PP3-4-0.5). Lube oil-range hydrocarbons were detected in three of the samples at concentrations below the MTCA method A cleanup level of 2,000 mg/kg; petroleum hydrocarbons were not detected in other subsurface soil samples analyzed. Other analytes, including VOCs, SVOCs, and cPAHs were also detected in samples, but at concentrations below MTCA cleanup levels (see Table 11).

Property 4

A total of 12 soil samples were collected at Site property 4. Three surface soil samples (PP4-1-0.5, PP4-2-0.5, PP4-3-0.5) were submitted for HCID analysis. Lube oil was detected in sample PP4-1-0.5; follow-up analysis was performed on that sample and the corresponding subsurface sample (PP4-1-3) for gas- and diesel-range petroleum hydrocarbons, VOC, SVOCs, and total RCRA metals. The concentrations of total cPAHs (0.302 mg/kg) and lead (280 mg/kg) in the subsurface sample exceeded MTCA method A cleanup levels of 0.1 mg/kg, and 250 mg/kg, respectively. All other VOC, SVOC, and metals concentrations were well below MTCA cleanup levels (see Table 12).

Lead was also detected in seven out of eight soil samples (4SW-1-6, 4SW-1-12, 4-SW-3-6, 4SW-3-12, 4SE-1-6, 4SE-1-12, and 4SE-3-12) collected to characterize potential lead-paint contamination in soil adjacent to the house. Seven of the eight samples exhibited lead concentrations exceeding the MTCA method A cleanup level of 250 mg/kg.

Property 6

A total of six soil samples were collected at Site property 6 at depths of 0.5 and 3.0 feet bgs. Three surface soil samples (PP6-1-0.5, PP6-2-0.5, and PP6-3-0.5) were submitted for HCID analysis; no petroleum hydrocarbons were identified.

Property 7

One surface soil sample (PP7-1-0) was collected at Property 7 and submitted for analysis of diesel-range petroleum hydrocarbons, PCBs, and dioxins. Lube oil-range hydrocarbons (200 mg/kg) and PCBs (0.061 mg/kg) were detected in the sample at concentrations below their MTCA method A cleanup levels of 2,000 mg/kg and 1 mg/kg, respectively. Barium (49 mg/kg), chromium 25 mg/kg), and lead (23 mg/kg) were also detected in the sample at concentrations below their respective MTCA method A or B cleanup levels of 5,600 mg/kg, 2,000 mg/kg, and 250 mg/kg. Dioxins and furans were found at a TCDD-TEQ concentration of 1.1215 ng/kg, below the MTCA method B soil cleanup level for unrestricted land use of 11 ng/kg. Concentrations of individual congeners that were not detected were estimated to be present at one-half of the reported detection limit.

Property 8

A total of two soil samples were collected at Site property 8 at depths of 0.5 and 3.0 feet bgs. The surface soil sample (PP8-1-0.5) was submitted for HCID analysis; follow-up analysis was performed on that sample and the corresponding subsurface sample (PP8-1-3.0) for gas- and diesel-range petroleum hydrocarbons, VOC, SVOCs, and total RCRA metals. The concentrations of total cPAHs (0.1384 mg/kg) and lead (310 mg/kg) in the subsurface sample exceeded MTCA method A cleanup levels of 0.1 mg/kg and 250 mg/kg, respectively. All other SVOC, PCBs, and metals concentrations were well below MTCA cleanup levels (see Table 13).

Property 9

A total of four soil samples were collected at Site property 9 at depths ranging from the soil surface to 9.0 feet bgs. One surface soil sample (PP9-1-0) was submitted for HCID and dioxin analysis and one subsurface soil sample (PP9-2-9.0) was submitted for HCID analysis only; follow-up analysis was performed on the surface sample only for gas- and diesel-range petroleum hydrocarbons, VOCs, SVOCs, and total RCRA metals. PCBs were detected at 0.084 mg/kg, below the MTCA method A cleanup level of 1.0 mg/kg. Barium (55 mg/kg), chromium (27 mg/kg), and lead (23 mg/kg) were found at concentrations well below their respective MTCA method A and B cleanup levels of 5,600 mg/kg, 2,000 mg/kg, and 250 mg/kg. No VOCs, SVOCs, or other metals were detected. Dioxins and furans were found at a 2,3,7,8 TCDD-TEQ concentration of 8.2886 ng/kg, below the MTCA method B soil cleanup level for unrestricted land use of 11 ng/kg. Concentrations of individual congeners that were not detected were estimated to be present at one-half of the reported detection limit.

Groundwater

Property 1

One groundwater sample (PP1-4-GW) was collected at Site property 1. Naphthalene and barium were detected in the sample at concentrations below MTCA method B cleanup levels; no other analytes were detected.

Property 2

One groundwater sample (PP2-4-GW) was collected at Site property 2 adjacent to the heating oil tank and submitted for HCID analysis; no petroleum hydrocarbons were identified.

Property 7

Two groundwater samples were collected at Site property 7. Sample PP7-1-GW was submitted for analysis of gasoline- and diesel-range petroleum hydrocarbons; neither of these constituents was detected in the sample. Sample MW6-GW-81709 was submitted for analysis of gasoline- and diesel-range petroleum hydrocarbons, VOCs, PAHs, and total RCRA metals (dissolved). Lead was detected at a concentration of 3.1 mg/L, below the MTCA method A cleanup level of 15 mg/L; no other constituents were detected.

Table 11. Soil analytical results for Site property 3.

Location	Petroleum			VOCs				SVOCs												cPAHs								PCBs	Metals				
	HCID	Lube Oil	Diesel	Acetone	Methylene Chloride	2-Buta-none	Tetra-chloro-ethylene	Naphtha-lene	Dimethyl-phthalate	Acenaph-thene	Fluor-ene	Phenan-threne	Anthra-cene	Di-n-butyl-phthalate	Fluoran-thene	Pyrene	Butyl-benzyl-phthalate	Benzo-[g,h,i]-perylene	bis(2-Ethyl-hexyl)-phthalate	Benzo(a)-anthra-cene	Chry-sene	Benzo[b]-fluoran-thene	Benzo[k]-fluoran-thene	Benzo[a]-pyrene	Indeno[1, 2,3-cd]-pyrene	Dibenz [a,h]-anthra-cene	Total cPAHs	Aroclor 1260	Arsenic	Barium	Cad-mium	Chrom-ium [c]	Lead
MTCA Method A Soil Cleanup Level [a]	*na*	2,000	2,000	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	0.1	*na*	*na*	0.1	1	20	*na*	2	2000	250
MTCA Method B Soil Cleanup Level [b]	*na*	*na*	*na*	8000	130	48000	1.9	1600	80000	4800	3200	*na*	24000	8000	3200	2400	16000	*na*	71.4	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	5600	*na*	*na*	*na*
PP3-1-0.5	ND																																
PP3-1-3.0																																	
PP3-2-0.5	Lube Oil	190		0.043		0.0073				0.0084		0.053	0.016		0.11	0.099		0.051		0.049	0.071	0.057	0.047	0.055	0.039	0.013	0.07621			76	0.64	30	26
PP3-2-3.0		ND																												15		6.6	
PP3-3-0.5	Lube Oil	900										0.022	0.018		0.03	0.035		0.1		0.016	0.035	0.034	0.0091	0.027	0.018	0.011	0.03616			49		13	30
PP3-3-3.0		ND																												16		5.6	
PP3-4-0.5	Lube Oil	130																												39		92	11
PP3-4-3.0		ND																												14		8.1	

Notes: Values reported in milligrams per kilogram (mg/kg).
Values exceeding the MTCA method A or B cleanup levels are highlighted.
HCID – Hydrocarbon identification
VOCs – Volatile organic compounds
SVOCs - Semi-volatile organic compounds
cPAHs – carcinogenic polycyclic aromatic hydrocarbons
PCBs – Polychlorinated biphenyls
ND – Analyte was not detected above the practical quantitation limit.
na = Soil cleanup level for this constituent not available.

[a] Method A soil cleanup level for unrestricted land use (Ecology 2007).
[b] Method B soil cleanup level for direct contact pathway (ingestion) (Ecology 2009).
[c] 2,000 mg/kg cleanup level for chromium III (most sites); 19 mg/kg cleanup level for chromium VI (typically applicable to sites where chromium VI was used in an industrial process).

Table 12. Soil analytical results for Site property 4.

	Petroleum			VOCs				SVOCs												cPAHs								PCBs	Metals				
Location	HCID	Lube Oil	Diesel	Acetone	Methylene Chloride	2-Buta-none	Tetra-chloro-ethylene	Naphtha-lene	Dimethyl-phthalate	Acenaph-thene	Fluor-ene	Phenan-threne	Anthra-cene	Di-n-butyl-phthalate	Fluoran-thene	Pyrene	Butyl-benzyl-phthalate	Benzo-[g,h,i]-perylene	bis(2-Ethyl-hexyl)-phthalate	Benzo(a)-anthra-cene	Chry-sene	Benzo[b]-fluoran-thene	Benzo[k]-fluoran-thene	Benzo[a]-pyrene	Indeno[1, 2,3-cd]-pyrene	Dibenz [a,h]-anthra-cene	Total cPAHs	Aroclor 1260	Arsenic	Barium	Cad-mium	Chrom-ium [c]	Lead
MTCA Method A Soil Cleanup Level [a]	*na*	2,000	2,000	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	0.1	*na*	*na*	0.1	1	20	*na*	2	2000	250
MTCA Method B Soil Cleanup Level [b]	*na*	*na*	*na*	8000	130	48000	1.9	1600	80000	4800	3200	*na*	24000	8000	3200	2400	16000	*na*	71.4	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	5600	*na*	*na*	*na*
PP4-1-0.5	Lube Oil	250			0.0097							0.027	0.008		0.008	0.067		0.028	0.041	0.026	0.029	0.038	0.013	0.035	0.022	0.008	0.04599			240		67	91
PP4-1-3.0		300		0.012	0.011			0.0076		0.0074	0.0093	0.14	0.042		0.33	0.44	0.036	0.17	0.13	0.19	0.21	0.16	0.17	0.23	0.14	0.036	0.3017			130	1.1	22	280
PP4-2-0.5	ND																																
PP4-3-0.5	ND																																
4SW-1-6																																	810
4SW-1-12																																	1200
4SW-3-6																																	330
4SW-3-12																																	260
4SE-1-6																																	280
4SE-1-12																																	670
4SE-3-6																																	240
4SE-3-12																																	340

Notes: Values reported in milligrams per kilogram (mg/kg).
Values exceeding the MTCA method A or B cleanup levels are highlighted.
HCID – Hydrocarbon identification
VOCs – Volatile organic compounds
SVOCs - Semi-volatile organic compounds
cPAHs – carcinogenic polycyclic aromatic hydrocarbons
PCBs – Polychlorinated biphenyls
ND – Analyte was not detected above the practical quantitation limit.
na = Soil cleanup level for this constituent not available.

[a] Method A soil cleanup level for unrestricted land use (Ecology 2007).
[b] Method B soil cleanup level for direct contact pathway (ingestion) (Ecology 2009).
[c] 2,000 mg/kg cleanup level for chromium III (most sites); 19 mg/kg cleanup level for chromium VI (typically applicable to sites where chromium VI was used in an industrial process).

Table 13. Soil analytical results for Site property 8.

Location	Petroleum			VOCs				SVOCs												cPAHs								PCBs	Metals					
	HCID	Lube Oil	Diesel	Acetone	Methylene Chloride	2-Buta-none	Tetra-chloro-ethylene	Naphtha-lene	Dimethyl-phthalate	Acenaph-thene	Fluor-ene	Phenan-threne	Anthra-cene	Di-n-butyl-phthalate	Fluoran-thene	Pyrene	Butyl-benzyl-phthalate	Benzo-[g,h,i]-perylene	bis(2-Ethyl-hexyl)-phthalate	Benzo(a)-anthra-cene	Chry-sene	Benzo[b]-fluoran-thene	Benzo[k]-fluoran-thene	Benzo[a]-pyrene	Indeno[1, 2,3-cd]-pyrene	Dibenz [a,h]-anthra-cene	Total cPAHs	Aroclor 1260	Arsenic	Barium	Cad-mium	Chrom-ium [c]	Lead
MTCA Method A Soil Cleanup Level [a]	*na*	2,000	2,000	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	0.1	*na*	*na*	0.1	1	20	*na*	2	2000	250
MTCA Method B Soil Cleanup Level [b]	*na*	*na*	*na*	8000	130	48000	1.9	1600	80000	4800	3200	*na*	24000	8000	3200	2400	16000	*na*	71.4	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	5600	*na*	*na*	*na*
PP8-1-0.5	Lube Oil	420	ND									0.04	0.0074		0.049	0.06		0.025	0.038	0.028	0.028	0.037	0.011	0.033	0.019	0.0075	0.04353	0.1		50		23	100
PP8-1-3.0		240	ND									0.022	0.014	0.067	0.18	0.17		0.057	0.047	0.12	0.14	0.097	0.083	0.1	0.05	0.02	0.1384	0.09		49	1.1	32	310

Notes: Values reported in milligrams per kilogram (mg/kg).
Values exceeding the MTCA method A or B cleanup levels are highlighted.
HCID – Hydrocarbon identification
VOCs – Volatile organic compounds
SVOCs - Semi-volatile organic compounds
cPAHs – carcinogenic polycyclic aromatic hydrocarbons
PCBs – Polychlorinated biphenyls
ND – Analyte was not detected above the practical quantitation limit.
na = Soil cleanup level for this constituent not available.

[a] Method A soil cleanup level for unrestricted land use (Ecology 2007).
[b] Method B soil cleanup level for direct contact pathway (ingestion) (Ecology 2009).
[c] 2,000 mg/kg cleanup level for chromium III (most sites); 19 mg/kg cleanup level for chromium VI (typically applicable to sites where chromium VI was used in an industrial process).

Property 8

Two groundwater samples were collected at Site property 8. Sample MW7-GW-81709 was submitted for analysis of diesel-range petroleum hydrocarbons, VOCs, PAHs, PCBs, and total RCRA metals; none of these analytes were detected in the sample. Sample MW8-GW-81709 was submitted for gasoline- and diesel-range petroleum hydrocarbons, VOCs, PAHs, and total RCRA metals. Three VOCs were detected, with both trichloroethene (22 mg/L) and tetrachloroethene (62 mg/L) exceeding their respective MTCA method B cleanup levels of 0.49 and 0.081 mg/L. No other constituents were detected.

Property 9

Two groundwater samples (PP9-1-GW and PP9-2-GW) were collected at Site property 9; the samples were analyzed for gasoline-range hydrocarbons and HCID analysis, respectively. No petroleum hydrocarbons were detected in either sample.

Hazardous Building Materials

Detailed results, including building material information, sampling protocol and requirements, sampling maps and location-specific analytical results, are provided in Volume II of this report; a summary of the results is provided below.

Property 1

Asbestos

A total of 23 asbestos samples were collected from structures located on Site property 1; 15 from the shop building, 6 from the storage shed, and 1 from the boat shed. No asbestos was detected in any of the samples collected at concentrations greater than 1 percent[1].

Lead-based Paint

A total of 17 XRF assays were conducted at Site property 1, not including pre, post, and periodic calibration tests. Results indicate that there were no painted components that contained lead exceeding EPA levels. The remainder of the assays were negative or showed trace levels of lead in the paint. Five representative bulk samples were collected of paints in the building to confirm low levels of lead content and submitted for total lead analysis; four from the shop building and one from the storage shed. No lead was detected in any of the samples at concentrations above 0.5 percent lead by weight[2].

[1] The Environmental Protection Agency (EPA) does not regulate materials containing less than 1% asbestos.

[2] The EPA defines lead-based paint as a concentration of 1.0 milligram per centimeter squared, 0.5 percent by weight, or greater by total lead analysis (equivalent to 5,000 ppm). Therefore, the EPA does not regulate paint containing less than 0.5 percent of lead by weight.

Lead in Building Materials

The owner did not give approval for collecting painted building materials for the designation of the waste stream based on TCLP testing. Based on results from the XRF lead-based paint inspection and the bulk paint chips collected and analyzed, it is not expected that the interior or exterior waste stream of the building will exceed regulatory limits. The demolition contractor will be required to define the waste stream by collecting and analyzing TCLP samples prior to demolition.

Other Hazardous Building Materials

Fluorescent light fixtures were observed throughout the building. These fixtures were not inspected for the presence of PCB light ballasts. Therefore, all light fixtures are assumed to contain PCB light ballasts, including seven 4-foot, two bulb lights with two ballasts.

There were no cooling systems in the building that could contain chlorofluorocarbons (CFCs) and no other suspect CFC equipment was noted in the building. No heating system thermostats containing mercury components were observed.

Property 2

Asbestos

A total of 53 asbestos samples were collected from structures located on Site property 2; 40 from the residence, 3 from boat shed A, 1 from boat shed B, and 9 from boat shed C. A summary of ACM identified throughout Site property 2 structures is shown in Table 14.

Table 14. Summary of asbestos-containing materials identified at Site property 2.

Material	Location	Friable	Quantity
Shower/tub surround adhesive (assumed)	Main floor bathroom	No	75 SF
Light heat shield (assumed)	Front porch	Yes	1 EA
Ceramic wall tile adhesive (assumed)	Kitchen backsplash and trim	No	10 SF
Cement asbestos board siding	Exterior	Yes	1,900 SF
Chimney flue patch	Basement on chimney	No	3 SF
Sheet vinyl flooring	Kitchen nook	Yes	20 SF

Note: This table is not to be used without the complete survey document including appendices for additional information.

Lead-based Paint

A total of 80 XRF assays were conducted, not including pre, post, and periodic calibration tests. Results indicate that interior doors and door frames painted white, the fiberboard panels in the stairwell and the exterior trim painted dark brown, and one wall of the basement contained lead exceeding EPA levels. Remaining interior painted surfaces were painted with typical residential paints that contain trace amounts of lead well below the EPA level. One representative bulk sample was collected for each inconclusive XRF result (five total samples) and submitted for

total lead analysis. No lead was detected in any of the samples at concentrations above 0.5 percent lead by weight.

Lead in Building Materials

One TCLP sample was collected from the painted building CAB siding found next to the building; no lead was detected in the sample. The building owner would not allow destructive testing of the residence required for waste designation. Remaining building components will require waste designation prior to building demolition.

Other Hazardous Building Materials

Fluorescent light fixtures were observed throughout the building. These fixtures were not inspected for the presence of PCB light ballasts. Therefore, all light fixtures are assumed to contain PCB light ballasts, including six 4-foot, four bulb lights with two ballasts.

There were no cooling systems in the building that could contain CFCs and no other suspect CFC equipment was noted in the building. No heating system thermostats containing mercury components were observed.

Property 3

Asbestos

A total of 83 asbestos samples were collected from structures located on Site property 3; 80 from the former restaurant building, 2 from the boat shed, and 1 from the storage shed. A summary of ACM identified throughout Site property 3 structures is shown in Table 15 below.

Lead-based Paint

A total of 86 XRF assays were conducted at Site property 3, not including pre, post, and periodic calibration tests. Results indicate that the wood posts on the south side of the building contained lead exceeding EPA levels. The remainder of assays were negative or showed trace levels of lead in the paint. Three representative bulk samples were collected of paints in the former restaurant building to confirm low levels of lead content and submitted for total lead analysis. Lead was detected above 0.5 percent by weight in the yellow exterior wood post paint (sample 3-02-LBP) at a concentration of 0.58 percent by weight.

Table 15. Summary of asbestos-containing materials identified at Site property 3.

Material	Location	Friable	Quantity
Cement asbestos board soffit	West end of building exterior	Yes	100 SF
Vinyl floor tile and mastic under carpet (multiple layers of flooring)	Throughout east bar, kitchen, and restaurant	No	3,500 SF
Vent sealant	Roof top HVAC vents	No	75 SF

Material	Location	Friable	Quantity
Exterior wall sealant	North side of exterior on lower roof level	No	25 LF
Composition roofing sealant	East boat shed roof	No	600 SF
Bar mirror mastic (assumed)	West wall behind bar	No	60 SF
Fire door (assumed)	Various locations in restaurant/bar	No	3 EA

Note: This table is not to be used without the complete survey document including appendices for additional information presented in Volume 2.

Lead in Building Materials

One TCLP sample was collected from former restaurant building components in proportion to the volume of that component in the entire building. Building waste did not designate as hazardous and can be disposed as construction debris. Recycling of individual building components may change this designation based on a change of material mix used in the calculation and would require additional TCLP sampling.

Other Hazardous Building Materials

Fluorescent light fixtures were observed throughout the building. These fixtures were not inspected for the presence of PCB light ballasts. Therefore, all light fixtures are assumed to contain PCB light ballasts, including:

- 11 – 4-foot, two bulb lights with one ballast
- 1 – 4-foot, one bulb light with one ballast
- 3 – exit signs with batteries.

There is one cooling system on the roof that likely contains CFCs, no other suspect CFC equipment was noted in the building. No heating system thermostats containing mercury components were observed.

Property 4

Asbestos

A total of 30 asbestos samples were collected from the house located on Site property 4. The only ACM identified in the house was the kitchen sink undercoating (3 percent chrysotile).

Lead-based Paint

A total of 65 XRF assays were conducted, not including pre, post, and periodic calibration tests. Results indicate that original paint on the siding, interior trim, exterior trim, and the interior wood walls in the laundry room all contained lead exceeding EPA levels. Remaining interior painted surfaces were painted with typical residential paints that contain trace amounts of lead, well below the EPA level. Based on XRF assay results, no bulk paint chip samples were collected for analysis.

Lead in Building Materials

The owner did not give approval for collecting painted building materials for the designation of the waste stream based on TCLP testing. Based on the high results of the XRF assays for the exterior siding, exterior and interior trim, and interior wood walls, building waste should be segregated (painted waste verses unpainted waste) to limit the amount of hazardous waste disposal. This type of waste segregation would not require additional TCLP sampling, as long as the painted debris is disposed as a hazardous waste.

Other Hazardous Building Materials

Fluorescent light fixtures were observed throughout the building. These fixtures were not inspected for the presence of PCB light ballasts. Therefore, all light fixtures are assumed to contain PCB light ballasts, including four 4-foot, two bulb lights with one ballast.

There were no cooling systems in the building that could contain CFCs and no other suspect CFC equipment was noted in the building. No heating system thermostats containing mercury components were observed.

Property 5

Asbestos

A total of 21 asbestos samples were collected from the restaurant building located on Site property 5. The only ACM identified in the building were gray roof seam sealant and vent sealant at 5 percent chrysotile and 3 percent chrysotile, respectively.

Lead-based Paint

A total of 39 XRF assays were conducted, not including pre, post, and periodic calibration tests. Results indicate that painted gypsum wallboard on the south wall in the kitchen and the painted wood siding on the north wall of the exterior contained lead exceeding EPA levels. Remaining interior painted surfaces were painted with typical residential paints that contain trace amounts of lead well below the EPA level. One representative bulk sample was collected for each inconclusive XRF result (two total samples) and submitted for total lead analysis. No lead was detected in any of the samples at concentrations above 0.5 percent lead by weight.

Lead in Building Materials

The owner did not give approval for collecting painted building materials for the designation of the waste stream based on TCLP testing. Based on the results from the XRF lead-based paint inspection and the results of the bulk paint chips collected and analyzed, it is not expected that the interior or exterior waste stream of the building will exceed regulatory limits. The demolition contractor will be required to define the waste stream by collecting and analyzing TCLP samples prior to demolition.

Other Hazardous Building Materials

Fluorescent light fixtures were observed throughout the building. These fixtures were not inspected for the presence of PCB light ballasts. Therefore, all light fixtures are assumed to contain PCB light ballasts, including eleven 4-foot, two bulb lights with two ballasts

There were no cooling systems in the building that could contain CFCs and no other suspect CFC equipment was noted in the building. No heating system thermostats containing mercury components were observed.

Findings and Conclusions

Recognized Environmental Conditions

Twelve properties were identified in the Phase I Environmental Site Assessment as exhibiting RECs that could impact the Site, including each of the six Site properties and six neighboring properties. Sampling conducted across the Site identified chemicals associated with seven of the properties (Table 16). Only a small portion of the chemicals detected were found to exceed MTCA or EPA cleanup levels.

Table 16. Summary of detected chemicals associated with properties identified as RECs.

Address	Property Name	Possible Condition	Chemicals Detected
1400 South Thistle Street	JRD King Property (Site Property 1)	Release of petroleum products, paints, solvents; building materials	Lube oil-range hydrocarbons, VOC, SVOCs, arsenic
1239 South Rose Street	South Park Marina-Rose (Site Property 2)	Release of petroleum products, paints, solvents; UST; building materials	ACM, LBP
8456 Dallas Avenue South	South Park Marina-Dallas (Site Property 3)	Release of petroleum products, paints, solvents; building materials	Lube oil-range hydrocarbons, VOC, SVOCs, ACM, LBP
1403 South Thistle Street	Mort Property (Site Property 4)	Release of petroleum products, paints, solvents; building materials	Lube oil-range hydrocarbons, VOC, SVOCs, lead, ACM, LBP
8457 Dallas Avenue South	Nguyen & Bach Property (Site Property 5)	Building materials	ACM, LBP
None	Prakash Property (Site Property 6)	Release of petroleum products	None
8507 14th Avenue South	Discount Market	Spills	None
8510-12 Dallas Avenue South	Phumphrey S. Auto Repair / A-1 Radiator Service; Marshall Automotive Rebuild	USTs, spills	None
8500-8506 14th Avenue South	Regency Cleaners (adjacent to MW-8)	Spills, discharges	VOCs
8410 Dallas Avenue South	Former Spencer Industries	Release of chlorinated solvents	None
8520 14th Avenue South	Scott Andrews Property	Release of petroleum products from a UST	None
8700 Dallas Avenue South	Malarkey Asphalt/Port of Seattle	Spreading of road oil prior to paving in the area	Lube oil-range hydrocarbons, PCBs, dioxins

ACM asbestos containing materials
LBP lead based paint
PCBs polychlorinated biphenyls
UST underground storage tank

Affected Media

Chemicals or materials exceeding cleanup levels for each media of concern are discussed below.

Soil

Properties with soil samples exceeding MTCA cleanup levels included:

Site Property	Sample	Chemical	Concentration Found (mg/kg)	Cleanup Level (Method A) (mg/kg)
1	PP1-1-0.5	Arsenic	23	20
4	PP4-1-3.0	cPAHs	0.3017	0.1
	PP4-1-3.0	Lead	280	250
	4SW-1-6	Lead	810	250
	4SW-1-12	Lead	1200	250
	4SW-3-6	Lead	330	250
	4SW-3-12	Lead	260	250
	4SE-1-6	Lead	280	250
	4SE-1-12	Lead	670	250
	4SE-3-12	Lead	340	250
8	PP8-1-3.0	cPAHs	0.1384	0.1
		Lead	310	250

The elevated arsenic concentration found on Site property 1 only slightly exceeds the cleanup level and is within the range of background concentrations found in western Washington. There was no specific source of arsenic identified in the Phase I assessment and no other samples on the property to indicate wide-spread contamination.

Elevated lead concentrations found on Site property 4 primarily represent the presence of LBP surrounding the house. Samples were collected from 1 and 3 feet away from the house at depths of 6 and 12 inches. Paint falling from buildings onto the ground usually does not move laterally or vertically to any great extent under natural conditions. Very small grains of blue paint were noted in soil at all sampled locations.

Elevated lead and cPAH concentrations found at the south end of Site property 4 and adjacent Site property 8 are indicative of residues associated with working on engines. Although concentrations exceed cleanup levels, no major source of contamination is indicated.

Groundwater

Only one property had a groundwater sample exceeding MTCA cleanup levels:

Site Property	Sample	Chemical	Concentration Found (mg/L)	Cleanup Level (Method B) (mg/L)
8	MW8-GW-81709	Tetrachloroethene	62	0.081
		Trichloroethene	22	0.49

Elevated tetrachloroethene and trichloroethene concentrations in MW-8 are higher than those found during sampling conducted in 2003 (17 and 15 ug/L, respectively). No vinyl chloride was found in the 2009 sample, compared to a high concentration (65 ug/L) found in the 2003 sample. It appears that the dry cleaner at 8500-8506 14th Avenue South is a continuing source of contamination to the area.

Building Materials

Properties with building material samples exceeding EPA cleanup levels included:

Site Property	Material
2	ACM, LBP
3	ACM, LBP
4	ACM, LBP
5	ACM, LBP

Sampling results indicate the need for ACM abatement prior to demolition of structures on four of the properties. LBP is present with lead concentrations high enough to potentially designate materials as a hazardous waste. Additional sampling of representative materials will be necessary at all properties listed to determine waste segregation needs.

Recommendations

Minor contamination has been found at the South Park Bridge southern touchdown area. Chemicals of concern were found in surface and near-surface soils at most properties, resulting from sporadic work conducted on vehicles and boats. Concentrations rarely exceed MTCA cleanup levels.

Unsampled Areas

Only three or four locations were sampled on each property to determine representative conditions. Many unsampled areas were inaccessible due to obstructions (e.g., parked boats (on blocks), sheds, trailers, vehicles, and large containers). These obstructions will be cleared prior to construction. It is expected that the same chemicals of concern identified on each property will be found in these unsampled areas. Although cleanup levels were rarely exceeded, it would be prudent to consider the top 3 feet of soil at most properties to still be potentially contaminated. Periodic testing should be conducted as soil is stockpiled prior to disposal or reuse.

Site Property 4

Lead-contaminated soil found surrounding the house on Site property 4 should be segregated from other soil, based on its potential for designation as a hazardous waste. Soil removed to a depth of at least 2 feet and up to at least 5 feet from the building should be sampled for lead toxicity using the TCLP. Additional samples should be collected from the excavated surface and analyzed for lead to verify complete removal.

Groundwater

Only groundwater associated with the dry cleaners at the southeast corner of 14th Avenue South and Dallas Avenue South was found to be contaminated. Dry cleaner solvents are considered a hazardous waste and must be managed as such. Any dewatering performed in this area may be impacted. There is no minimum cleanup level associated with this type of contamination; no compounds can be detected in samples collected from dewatering activities. Affected water must be treated by a facility permitted for dry cleaning solvent waste.

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