



Remedial Investigation Report Evergreen Park Expansion Project Bremerton, Washington

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ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
Brem-Air	Brem-Air Disposal Company
BTEX	benzene, toluene, ethylbenzene, and xylenes
the City	City of Bremerton
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
MTCA	Washington State Model Toxics Control Act
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
TLC	thin-layer chromatography
TPH	total petroleum hydrocarbons
VOC	volatile organic compound
WA-EPH	Washington extractable petroleum hydrocarbons
WA-VPH	Washington volatile petroleum hydrocarbons

EXECUTIVE SUMMARY

An upland remedial investigation was conducted on five properties (collectively referred to as the site) that surround Smith's Cove in Bremerton, Kitsap County, Washington. These sites include Evergreen Park, Brem-Air Disposal Company, City Depot, Lofthus, and Puget Power. All the properties except Evergreen Park have been used for industrial purposes since the early 1900s. The remedial investigation was conducted to evaluate the environmental effects resulting from historical industrial uses. The City of Bremerton will mitigate potential exposure effects by redeveloping the former industrial site into a park, the Evergreen Park Expansion Project, that will be expanded around Smith's Cove.

Soil samples were collected from 23 stations that were spatially distributed across the subject properties. The samples, collected to a maximum depth of 12 ft, were submitted for petroleum hydrocarbon quantification and semivolatile organic, volatile organic, metals, and polychlorinated biphenyl analyses. Screening-level groundwater samples also were collected from 7 of the 23 stations and submitted for the same analyses.

Petroleum hydrocarbons are the primary compounds in onsite soil. Gasoline-, diesel-, and oil-range petroleum hydrocarbons are present in broad concentration ranges (i.e., from non-detect values to 11,600 mg/kg). Based on screening-level data, petroleum hydrocarbons also affect the groundwater. In particular, maximum concentrations of diesel-range hydrocarbons were documented at 30,800 $\mu\text{g/L}$. In addition, nearby offsite sources may contribute to onsite groundwater concentrations.

A screening-level comparison between the maximum concentrations and potential state cleanup goals indicates that the site does not present unacceptable risks to human health or the environment. Further, potential risk from affected soil or groundwater will be mitigated by construction activities associated with redeveloping the industrial site into a park.

1. INTRODUCTION

This report presents the results of the remedial investigation of five properties surrounding Smith's Cove in Bremerton, Kitsap County, Washington (Figures 1 and 2). The purpose of the remedial investigation was to characterize the properties on behalf of the City of Bremerton (the City). The City plans to redevelop these properties and expand Evergreen Park south around Smith's Cove. The current redevelopment scenario consists of demolishing the existing buildings and structures, importing clean fill material to increase the park's elevation above the cove, landscaping the new surface for playfields and recreational facilities, and determining whether to build a walking path along the edge of the park above the shoreline.

During the remedial investigation, the upland portions of five different properties (collectively referred to as the site) were investigated. Complete legal descriptions of the individual properties are provided in the *Draft Environmental Information to Support the Proposed Evergreen Park Expansion Project* (Failure 1996). The five properties are as follows:

- Evergreen Park
- Brem-Air Disposal Company (Brem-Air)
- City Depot
- Lofthus
- Puget Power.

The following sections summarize site background, previous investigations and objectives; field sampling procedures; laboratory analyses; investigation results; and an evaluation of

the results obtained during the remedial investigation. Appendix A presents borehole logs, and Appendix B contains a quality assurance summary for analytical data

1.1 SITE BACKGROUND

The five properties are located near Smith's Cove (Figure 2). Except for the northern portion of Evergreen Park, the principal sites surrounding the cove have been used for industrial or commercial purposes since the early 1900s. Available historical records and previous investigations were reviewed before the current investigation. Based on that review, complete information regarding historical and current operations for the subject properties was summarized in Failure (1996). A brief summary of each property follows:

- **Evergreen Park**—The City currently operates the land for recreational purposes. Although historical recreational uses are well documented throughout the park, past operations on the southern portion of the site included a small trash facility operated by the City's Sanitation Department.
- **Brem-Air**—This property has been inactive since early 1997. Brem-Air formerly operated a garbage truck maintenance and steel-box recycling service. Other past activities included coal storage, bulk petroleum storage, concrete manufacturing, auto freight depots, and small boat repair operations.
- **City Depot**—Although this property is currently vacant (i.e., all former buildings have been demolished and removed), it was used for automobile maintenance from at least 1947 to 1995. The City has rerouted 14th Street along the southern boundary of the property and plans to incorporate the land into Evergreen Park.

- **Lofthus**—The Lofthus site is primarily vacant land with two small commercial operations (R&H Automotive and Bremerton Amusement Company) located in the southeastern corner of the property. The property was used as a lumber yard and/or bulk fuel storage facility from the turn of the century until approximately 1991. Other past uses include a sheet metal shop and painting operations.
- **Puget Power**—A tower that supports overhead transmission lines across Port Washington Narrows is currently the only onsite structure. Records indicate that fuel storage tanks, transformers, and a substation were present from 1918 to 1928.

Portions of the properties located between Sheldon Boulevard and Smith's Cove were developed between 1928 and 1947 using artificial fill from an unknown source (Failure 1996). Although underlying native material has not been investigated, based on the general geology of the Bremerton area (USDA 1980) and on nearby well logs (Ecology 1995), the native soils probably begin at a depth of about 12 ft and are glacial till.

Smith's Cove is on Port Washington Narrows, a marine water body with daily tidal fluctuations of 5–10 ft. Groundwater occurs at a depth of less than 10 ft below ground surface (bgs) and is influenced by the tides. Because the groundwater in the subject area is saline, it has no potential use as potable water. Based on the topography at the subject site, local shallow groundwater likely flows toward Smith's Cove, and groundwater seeps are visible in Smith's Cove during low tide.

The only surface water tributary in the project area is an unnamed, ephemeral ditch leading from the Lofthus tank area to Smith's Cove. The ditch is approximately 2 ft wide and was dry during remedial investigation sampling activities.

1.2 SUMMARY OF PREVIOUS INVESTIGATIONS

Limited characterization has been performed on the Evergreen Park, Brem-Air, and Lofthus properties. Figure 3 presents historical sampling locations. A summary of available data for the subject properties is provided in Table 1. A brief discussion of available data is summarized from Failure (1996) below:

- **Evergreen Park**—During construction of a storm sewer along the southern boundary of the park in 1994, soils contaminated with total petroleum hydrocarbons (TPH) (including diesel and heavy oil), metals, and asbestos were discovered. Approximately 2,200 tons of affected soil associated with the storm sewer excavation were disposed at the Kitsap County Landfill. No other site characterization or remedial actions have occurred in this area of the site.

In 1996, PTI conducted a limited subsurface soil and groundwater investigation in the northeastern corner of the park using Geoprobe[®] methods (PTI 1996b). Low concentrations of diesel- and heavy oil-range petroleum hydrocarbons were identified in site soils, and the site is currently awaiting a No Further Action determination by the Washington State Department of Ecology (Ecology) under the Independent Remedial Action Program.

- **Brem-Air**—In 1993, Woodward-Clyde Consultants collected subsurface soil samples during a limited investigation (Woodward-Clyde 1993). The presence of TPH as diesel and heavy oil, petroleum solvents, volatile organic compounds (VOCs), and metals were confirmed in soils collected from the groundwater depth. No remedial actions have been conducted at this site.
- **City Depot**—No characterization had been conducted at the site.

- **Lofthus**—A single surface water sample that Ecology collected in 1992 indicated the presence of TPH, oil and grease, and lead. No other characterization previously had been conducted at the site.
- **Puget Power**—No onsite investigations had been performed. However, the soils underlying Highland Avenue and immediately adjacent to the site contained petroleum hydrocarbons, as observed during utility work performed by the City. The source of the contamination was not determined, and Chevron (located directly east and southeast of the Puget Power site [Figure 3]) removed a portion of the affected soil.

Complete information for these subject property investigations is presented in Failure (1996) and in the workplan prepared to support this investigation (PTI 1996a). In addition to the data available for the subject properties, a limited amount of data is also available for offsite properties, including the Chevron property. A summary of recent analytical data from groundwater monitoring activities at the Chevron property is presented in Table 2 (Pacific 1997).

The strategy for this remedial investigation was developed based on information from historical sources and existing data, where available. The objectives of the investigation are discussed in the following section.

1.3 OBJECTIVES OF THE REMEDIAL INVESTIGATION

In general, the primary goals of the remedial investigation were to 1) assess soil and fill stratigraphy, 2) evaluate the vertical and horizontal extent of contamination, 3) identify potential exposure pathways, and 4) evaluate the potential effect of contaminated soils, if present, on groundwater. Each site had additional specific sampling objectives, based on historical operations and previous investigations. The site-specific objectives were as follows:

- **Evergreen Park**—Additional subsurface soil sampling was required in the storm sewer area and in the area between the storm sewer and the northern portion of the park. Groundwater screening was also required.
- **Brem-Air**—Additional subsurface soil sampling was required in areas associated with buried objects and historical operations. Groundwater screening was also required.
- **Lofthus**—Subsurface soil sampling was required across the site, particularly in areas associated with former fueling and lumber yard operations. Groundwater screening was also required.
- **Puget Power**—Limited subsurface soil sampling was required in areas associated with former power-generating facilities. Groundwater screening was also required.
- **City of Bremerton (former Depot Building)**—Limited subsurface soil sampling was required in areas associated with former auto maintenance activities. Groundwater screening was also required.

The investigation was designed to provide data to address the above objectives by collecting the following soil and groundwater samples:

- Soil samples were to be collected from 24 boreholes at depths of 0–3, 3–6, and 6–9 ft bgs, or the groundwater-vadose zone interface. The boreholes were placed in potential source areas and/or at downgradient locations, based on historical operations and existing data. A sampling grid was not appropriate for the investigation because of the size (over 8 acres) and variability of the subject area. Sampling stations and depths were chosen to bracket potential contaminant concentrations throughout the subject area.

- Groundwater samples were to be collected from within the boreholes at 7 of the 24 proposed stations. Groundwater samples were generally collected from stations near potentially affected areas on each of the subject properties. These screening-level samples were intended to determine whether contaminants had migrated from soil to groundwater at the site.

Subsequent sections of this report describe the field sampling procedures and laboratory analytical methods, summarize the results of the current investigation, and evaluate the effects of analytical data on potential remediation options.

2. FIELD SAMPLING PROCEDURES

Field sampling included installation of 23 Geoprobe® boreholes to depths ranging from 9–13 ft bgs, collection of groundwater samples from 7 of the 23 Geoprobe® boreholes, and collection of one surface soil sample. The Geoprobe® drilling equipment was supplied and operated by Cascade Drilling of Woodinville, Washington. Field work was conducted from Monday, April 7 to Wednesday, April 9, 1997. Ecology personnel briefly visited the site during sampling activities on April 9, 1997.

All field work was conducted in accordance with the *Workplan for Field Sampling for Evergreen Park Expansion Project* (PTI 1996a) with the following exceptions:

- Subsurface soil and groundwater samples were collected using Geoprobe® equipment rather than the similar Strataprobe® equipment specified in the workplan.
- One of the 24 sampling stations specified in the workplan was not accessible; therefore, no samples were collected at that location. Station LF-02 on the Lofthus property was located within the footprint of a former aboveground tank and was surrounded by a 14-ft-high concrete wall (i.e., a confined space) that prohibited safe ingress and egress. All other stations were sampled as planned, with only minor adjustments (i.e., less than 20 ft) to avoid utilities or other obstructions.
- Laboratory analyses of samples included the new analytical methods (i.e., Washington extractable petroleum hydrocarbons [WA-EPH] and Washington volatile petroleum hydrocarbons [WA-VPH]) specified in an interim TPH policy (Ecology 1997), in addition to the analyses specified in the workplan.

- WA-EPH methods were used for analysis of polycyclic aromatic hydrocarbons (PAHs), rather than U.S. Environmental Protection Agency (EPA) Method 8270.

The field methods used for collecting soil and groundwater samples in this investigation are discussed in the following sections.

2.1 SOIL SAMPLES

Subsurface soil samples were collected from boreholes using Geoprobe[®] techniques that advance a stainless-steel sample core into the ground with truck-mounted hydraulics. For the collection of soil samples, the Geoprobe[®] was advanced to a depth (usually at least 9 ft bgs) that exceeded the groundwater interface. The water table was encountered at depths between 3.0–8.5 ft bgs over a 3-day period because of tidal fluctuations. Soil samples were collected continuously from the boreholes using a 1.5-in.-diameter, 3-ft-long, stainless-steel, split-spoon sampler. Soil lithology was logged continuously, and the color, texture, and grain size were characterized in the field, consistent with the Unified Soil Classification System. Soil borehole logs for all stations are provided in Appendix A.

Representative samples were collected along the length of each soil interval and transferred directly to a 2-oz. sample jar with no headspace for potential analysis of VOCs. The remaining soil from each interval was then homogenized, and small portions of the homogenized sample were placed into dedicated plastic Ziploc[®] bags for field screening and visual examination. The remainder of the homogenized soil sample was placed into the appropriate sample jar, sealed, and stored on ice in coolers. All soil samples were collected in sample containers provided by the laboratory. All soil samples were shipped to the analytical laboratory within 48 hours after collection under appropriate chain-of-custody procedures.

Before collecting samples, all sampling equipment was scrubbed with Alconox[®], rinsed with distilled water, rinsed with acetone and hexane, and then rinsed thoroughly with deionized water. The small volume of acetone and hexane rinsates was collected in an open container and allowed to evaporate in a well-ventilated area.

All soil samples were field screened. The potential presence of VOCs was determined using a photoionization detector (PID). Thin-layer chromatography (TLC) methods were used to test each sample for TPH. Observations of visible staining and/or sheen were also recorded. Table 3 summarizes the results of the field screening of the soil samples. Based on these results, a subset of the samples was selected for submittal to the laboratory for chemical analyses. Additional analyses for specific soil samples were selected based on historical information. The samples selected and the specified analytical suite for each sample are also shown in Table 3. All other soil samples collected were submitted for archive at the laboratory.

In addition to subsurface soil samples, one surface soil sample was collected from the ditch near the former tank supports on the Lofthus property. This station is identified as LF-03 on Figure 4. The sample was collected from 0–3 ft bgs using a stainless-steel hand auger and was field-screened as described above.

2.2 GROUNDWATER SAMPLES

Seven groundwater samples were collected from a temporary well screen advanced by the Geoprobe[®] rig at the locations shown in Figure 5. The depth to groundwater for each temporary well station is provided in Table 4. The bottom of the Geoprobe[®] well-screen sampler was driven below the groundwater interface (which ranged from 3.5–8.5 ft bgs) and opened to allow the groundwater to flow into the well screen. A peristaltic pump and new polyethylene tubing were used to purge groundwater from the well screen and collect groundwater samples for measurement of field parameters (i.e., temperature, pH, specific

conductivity, and dissolved oxygen). Field parameters were measured by placing Orion meter probes into a separate groundwater subsample aliquot. Field parameters were measured at all groundwater stations except station BA-05, where field observations of a heavy sheen precluded the use of monitoring probes. Field parameter measurements and observations of groundwater are presented in Table 4.

Once several temporary well-casing volumes were removed to reduce turbidity, the peristaltic pump was shut off, and groundwater samples were collected for chemical analyses of VOCs using a decontaminated, 7/16-in.-outside-diameter stainless-steel bailer and placed in the appropriate sample container. Once all of the VOC vials were filled, the pump was turned on, and water was pumped until turbidity was visibly reduced. The remaining sample containers (i.e., for non-VOC chemical analyses) were filled by pumping the water directly into the sample containers. All groundwater samples were collected in sample containers provided by the laboratory and placed on ice in a cooler. Non-dedicated groundwater sampling equipment was decontaminated between each sampling station as described above in the *Soil Samples* section.

All groundwater samples collected for metals analysis were filtered in the field using a dedicated Geotech[®] 0.45-micron filter; groundwater samples for all other analyses were not filtered. Samples submitted for petroleum hydrocarbon and VOC analyses were preserved with hydrochloric acid. Samples submitted for metals analyses were preserved with nitric acid. Samples submitted for polychlorinated biphenyl (PCB) analyses were collected in bottles that contained no preservative.

All groundwater sample containers were sealed, labeled with a unique sample identifier, wrapped in bubble wrap, and placed in Ziploc[®] bags to minimize breakage. The samples were stored on ice in coolers and shipped to the analytical laboratory within 48 hours after collection under appropriate chain-of-custody procedures. The specified analytical suite for each groundwater sample is shown in Table 3.

Following completion of each Geoprobe® borehole, the hole was abandoned and backfilled with bentonite chips from the bottom of the borehole to approximately 1 ft bgs and hydrated with water. The upper 1 ft was backfilled with native soil or patched with asphalt, as appropriate. The sampling stations were marked, and their locations were measured from utility lines, streets, and other permanent features.

2.3 QUALITY ASSURANCE

As specified in the workplan, appropriate measures were taken to ensure the quality of soil and groundwater samples. Field replicates (i.e., split samples) for soil samples were collected from Stations BA-03 (6–9 ft interval), CB-02 (0–3 ft interval), and LF-07 (0–3 ft interval). Field replicates for groundwater samples were collected from Stations BA-02 and CB-03. In addition, trip blanks were submitted for VOC analysis, and one soil equipment rinsate sample was collected and submitted for laboratory analysis. A quality assurance report is included in Appendix B.

Additional details on field sampling procedures, including standard operating procedures, can be found in the workplan for this investigation (PTI 1996a).

3. LABORATORY ANALYSES

The laboratory analyses requested for each of the soil and groundwater samples are listed in Table 3. After the workplan was developed, Ecology issued an interim TPH policy requiring new analytical methods (Ecology 1997). According to the current schedule, a final TPH policy and an analytical methodology will be released by the end of 1997. To satisfy the interim guidance, WTPH-D extended [EPA 8015 Modified] and WTPH-G/ benzene, toluene, ethylbenzene, and xylenes (BTEX) analyses (as specified in the workplan) were used in conjunction with the Ecology-proposed draft methods (i.e., WA-EPH and WA-VPH). In addition, the original analysis (EPA Method 8270) for PAHs was replaced with the WA-EPH analysis because selected PAHs are reported under the WA-EPH method.

Columbia Analytical Services in Kelso, Washington, conducted all laboratory analyses. The following sections summarize the methods used for the laboratory analyses of soil and groundwater samples. Additional details on the analytical procedures, including the data quality objectives, can be found in the workplan for this investigation (PTI 1996a).

3.1 SOIL SAMPLES

As discussed in the workplan, field screening data (i.e., PID readings, TLC, and sheen) were used to aid in the selection of soil samples for laboratory analyses. TLC results suggested elevated levels of hydrocarbons (both as diesel and heavy oil) in many of samples collected; however, few samples exhibited sheen or had PID readings above zero. Therefore, at least two samples from each borehole were submitted for hydrocarbon quantification using Method WTPH-D extended (EPA 8015 Modified). In general, the samples chosen for analysis were the surface sample and the deepest sample from each borehole in order to determine the extent of vertical contamination, if present. In some boreholes, all

of the samples were submitted for hydrocarbon quantification using WTPH-D extended (EPA 8015 Modified) based on potential historical impacts. Based on the results of the PID screening or historical information, a selected sample subset was also submitted for gasoline and BTEX quantification using WTPH-G/BTEX. Some samples were also submitted for VOC analysis by EPA Method 8260, metals (arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury) by EPA Series 6000 and 7000 methods, or PCBs by EPA Method 8080. Finally, selected samples were submitted to quantify TPH concentrations using the Ecology-proposed draft Methods WA-EPH and WA-VPH (Ecology 1997).

3.2 GROUNDWATER SAMPLES

All seven groundwater samples were submitted for TPH quantification using Methods WTPH-D extended (EPA 8015 Modified) and WTPH-G/BTEX. Samples selected based on historical information were also submitted for VOC analysis using EPA Method 8260 or for PCB analysis by EPA Method 8080. Selected samples were also submitted for dissolved metals (arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury) analysis using EPA Series 6000 and 7000 methods. Total metals were not analyzed because the temporary wells generated relatively turbid groundwater samples. Finally, selected samples were submitted to quantify hydrocarbons using the new Ecology-proposed draft Methods WA-EPH and WA-VPH (Ecology 1997).

4. INVESTIGATION RESULTS

The following sections present summaries of the results of the field investigation and the analytical data.

4.1 FIELD INVESTIGATION RESULTS

The subsurface lithology is heterogeneous across the site. Borehole logs are provided in Appendix A. Subsurface materials on the properties that were developed using fill (i.e., all properties except the City Depot parcel) consisted primarily of sandy gravel, sandy silt, and silty sand. Wood fill and brick debris were observed at various depths throughout the Lofthus site. An asphalt lens was observed at 2 ft bgs in all boreholes completed on the City Depot parcel. Native oxidized orange-brown coarse sand was also encountered in the City Depot boreholes at a depths of 3.0–5.5 ft bgs.

Results of soil screening are presented in Table 3. TLC field screening results were compared to concentrations reported by the laboratory, and the results suggest that TLC screening was effective in identifying the samples from each borehole that were appropriate for analysis. Most of the TLC samples (85 percent) accurately indicated the presence of TPH compounds. Over 61 percent of the TLC results were consistent with the analytical concentrations of petroleum hydrocarbons. In 15 percent of the samples, TLC provided false positives (i.e., instances where TPH compounds estimated to be present using TLC methods were not confirmed by the laboratory analyses). There were no instances of false negatives (i.e., instances where TLC methods failed to estimate the presence of TPH compounds that were determined to be present by the laboratory analyses).

Groundwater parameters are summarized in Table 4. The pH levels in groundwater ranged from 4.00–6.58. Specific conductivity levels (ranging from 105–904 $\mu\text{S}/\text{cm}$) indicate that groundwater has an approximate salinity content of 63–542 mg/L (Hem 1992).

4.2 ANALYTICAL RESULTS

Analytical results for the soil and groundwater samples collected in this investigation are presented below. A complete quality assurance report was prepared to evaluate the analytical results and is included in Appendix B.

4.2.1 Soil Samples

Results from the 58 soil samples collected from the 23 sampling stations on the properties surrounding Smith's Cove are summarized in the following tables:

- Table 5. Summary of 8015 Modified Results for Soil Samples
- Table 6. Summary of GAS/BTEX, EPH, and VPH Results for Soil Samples
- Table 7. Summary of VOC Results for Soil Samples
- Table 8. Summary of Metals Results for Soil Samples
- Table 9. Summary of PCB Results for Soil Samples.

Detected concentrations of analytical compounds in soil are shown in Figures 6 through 9. Samples associated with undetected values are not shown in these figures; however, complete analytical data are contained in the tables referenced above.

4.2.1.1 Petroleum Hydrocarbon Compounds

Oil-range hydrocarbons were detected in 90 percent of the soil samples, with concentrations ranging from 36–8,210 mg/kg (Figure 6). The highest concentration was detected at a depth of 6–9 ft bgs at Station BA-06, which is located near the border between the Brem-Air and Lofthus properties on the south shore of Smith's Cove. Diesel-range hydrocarbons were detected at six stations, with concentrations ranging from 16–11,600 mg/kg (Figure 7). The maximum concentration was detected at Station BA-05, located near the western end of the cove. Although gasoline-range hydrocarbons were detected at five stations, the concentrations were lower, ranging from 5.0–120 mg/kg (Figure 8). All of the gasoline-range detections were co-located with oil- and diesel-range hydrocarbon detections. Xylene concentrations ranged from 0.10–0.20 mg/kg (Figure 8); no other BTEX compounds were detected in soil samples.

Kerosene-range hydrocarbons also appeared to be present at Station LF-07 (Table 5). Although petroleum hydrocarbon compounds were tentatively identified as diesel at Stations BA-07 and LF-04 and tentatively identified as gasoline at Stations CB-02, BA-05, BA-07, LF-03, and LF-04, these samples may also contain kerosene-type petroleum hydrocarbons (see the quality assurance report included in Appendix B for further information). Data qualified with an "N" in Tables 5 and 6 reflect this uncertainty.

The new Ecology methods (WA-EPH and WA-VPH) provide petroleum hydrocarbon concentrations broken down by equivalent carbon ranges. This information is summarized for selected samples in Table 6. The current Ecology WTPH methods correlate with the new WA-EPH and WA-VPH methods, with co-located high concentrations of hydrocarbons (e.g., the high concentrations of oil and diesel at Station BA-07 correlate with high aromatic and aliphatic values for BA-07).

4.2.1.2 Other Analytical Compounds

Selected PAHs are also reported under Method WA-EPH. Pyrene was detected at 0.6 mg/kg at Station BA-05, benzo[a]pyrene was detected at 1.3 mg/kg at Station CB-02, and total benzofluoranthenes (including b and k isomers) were detected at 0.60 mg/kg at Station LF-07 (Figure 10).

VOCs were detected at six stations located spatially throughout the subject area (Stations CB-02, BA-05, BA-07, CF-01, LF-06, and LF-07; Figure 11). Methylene chloride was detected at five stations at concentrations ranging from 13–25 $\mu\text{g}/\text{kg}$. Concentrations of chlorinated benzene compounds, which were detected at Station BA-07, ranged from 11–47 $\mu\text{g}/\text{kg}$. Naphthalene was detected at Stations BA-05 and BA-07 at concentrations of 300 and 21 $\mu\text{g}/\text{kg}$, respectively.

Four metals (arsenic, barium, chromium, and lead) were detected at 13 stations throughout the site. Detected concentrations of arsenic were all below 5 mg/kg, with the exception of a concentration of 42 mg/kg at Station BA-04 (Figure 9). Barium concentrations ranged from 9–136 mg/kg, chromium concentrations ranged from 19–42.5 mg/kg, and lead concentrations ranged from 4–169 mg/kg.

There was one detection of the PCB congener Aroclor[®] 1260 at Station BA-07 at the detection limit (0.20 mg/kg), and a quality assurance review assigned an estimated qualifier to this sample.

4.2.2 Groundwater Samples

Results from analysis of seven groundwater samples collected from selected stations on the properties surrounding Smith's Cove are summarized in the following tables:

- Table 10. Summary of 8015 Modified Results for Groundwater Samples
- Table 11. Summary of GAS/BTEX, EPH, and VPH Results for Groundwater Samples
- Table 12. Summary of VOC Results for Groundwater Samples
- Table 13. Summary of Dissolved Metal Results for Groundwater Samples
- Table 14. Summary of PCB Results for Groundwater Samples.

Detected concentrations of analytical compounds in groundwater are shown in Figures 10 through 14. Samples associated with undetected values are not shown in these figures; however, complete analytical data are contained in the tables referenced above.

4.2.2.1 Petroleum Hydrocarbon Compounds

Concentrations of oil-range hydrocarbons were detected in two of the seven groundwater stations and ranged from 325–1,060 $\mu\text{g/L}$ (Figure 12). Diesel-range hydrocarbons were detected at three stations with concentrations ranging from 375–30,800 $\mu\text{g/L}$ (Figure 12). Gasoline-range hydrocarbons were also detected at three stations, at concentrations ranging from 88–1,900 $\mu\text{g/L}$ (Figure 13). Benzene was also detected at 150 $\mu\text{g/L}$ (using Method WTPH-G/BTEX) at Station BA-05; no other BTEX components were detected at concentrations above 13.0 $\mu\text{g/L}$ (Figure 13).

No kerosene-range hydrocarbon compounds were detected in groundwater samples; however, as discussed above, petroleum hydrocarbon compounds tentatively identified as diesel at Stations LF-04 and LF-06 and gasoline at Stations LF-04 and PP-01 may also contain kerosene-range compounds (see Appendix B for further information). Data qualified with an “N” in Tables 10 and 11 reflect this uncertainty.

The new Ecology methods (WA-EPH and WA-VPH) provide petroleum hydrocarbon concentrations broken down by equivalent carbon ranges. This information is summarized for the selected samples submitted for the new methods in Table 11. The current Ecology WTPH methods correlate with the new WA-EPH and WA-VPH methods, with co-located high concentrations of hydrocarbons (e.g., the high concentrations of oil and diesel at Station LF-04 correlate with high aromatic and aliphatic values for Station LF-04).

4.2.2.2 Other Analytical Compounds

Selected PAHs are also reported under Method WA-EPH. Naphthalene was detected at 27 $\mu\text{g/L}$ at Station BA-05, and acenaphthene was detected at the detection limit of 5.0 $\mu\text{g/L}$ at Station LF-04. Other than the petroleum solvents (i.e., BTEX) and naphthalene noted above, no other VOCs were detected in groundwater samples collected from the subject sites.

Barium was detected at Stations CB-03, BA-05 and LF-04 (Figure 14) at concentrations ranging from 11.5 to 86 $\mu\text{g/L}$. Mercury was detected at Station CB-03 at a concentration of 0.50 $\mu\text{g/L}$. PCBs were not detected in any of the groundwater samples.

5. EVALUATION OF RESULTS

The remedial investigation was conducted to evaluate the environmental effects from historical industrial uses. This section discusses these effects and provides a screening-level comparison between the maximum concentrations and potential state cleanup goals (which incorporate numerous conservative assumptions about exposure). Although this comparison suggests that the site does not present unacceptable risks to human health or the environment, the City will mitigate the potential risk, if any, from affected soil or groundwater by construction activities associated with redeveloping the industrial land into a park.

5.1 SUMMARY OF ENVIRONMENTAL EFFECTS

Over 100 analyses were performed on more than 50 soil samples collected from the site, and 35 analyses were performed on 7 groundwater samples. All samples were collected from locations associated with known or potential historical sources of contamination. Therefore, the City believes that the site has been adequately characterized.

Petroleum hydrocarbons are the primary compounds in onsite soil. Gasoline-, diesel-, and oil-range petroleum hydrocarbons are present in broad concentration ranges (i.e., from non-detect values to 11,600 mg/kg). The varying concentrations of petroleum hydrocarbons are likely due to the number of potential onsite and offsite sources and the heterogeneity of the subsurface fill materials. In addition, the tidal influence has likely smeared petroleum hydrocarbon compounds so that source-specific “hot spots” are difficult to delineate.

Petroleum hydrocarbons also affect the groundwater. In particular, diesel-range hydrocarbons were documented at maximum concentrations of 30,800 $\mu\text{g/L}$. The data suggest that a limited plume of free-phase hydrocarbons is present in groundwater. Many of the

stations that are directly adjacent to Smith's Cove, excluding Station BA-05, have lower concentrations than the more upland (i.e., upgradient) stations. This distribution suggests that natural attenuation processes are occurring near the shoreline, possibly as a result of the tidal influence of Smith's Cove. In addition, nearby offsite sources may be contributing to onsite groundwater concentrations. For example, in the nearby Chevron property, diesel-range petroleum hydrocarbons were detected at concentrations as high as 110,000 $\mu\text{g/L}$.

5.2 EVALUATION OF POTENTIAL CLEANUP GOALS

To address the effects on soil and groundwater, an appropriate remedial action can be identified under the Washington State Model Toxics Control Act (MTCA; WAC 173-340). According to MTCA, the process of evaluating releases to the environment includes the following steps:

1. **Remove active product source.** There are no onsite sources that are currently active. Although offsite sources may be contributing to onsite concentrations, the City's ability to mitigate these offsite sources is limited.
2. **Conduct interim actions as needed.** As noted above, there are no active sources associated with facility activities. Therefore, interim remedial actions are not applicable to this site.
3. **Characterize the site.** The goal of the remedial investigation is to provide data that will effectively characterize the extent of contamination.
4. **Identify cleanup levels.** Final cleanup levels will be developed and negotiated with Ecology during development of a cleanup action plan.

A screening-level evaluation of potential cleanup levels was performed to identify the cleanup goals, if any, that would be necessary to protect the environment for recreational use of the park. Even though the redevelopment plan for the site is recreational use, residential and commercial land use scenarios were evaluated as part of the initial screening. No specific cleanup levels exist for recreational facilities under MTCA. Residential and commercial levels provide a conservative comparison because exposure in a recreational setting is lower than that in a residential or commercial setting. For example, the MTCA risk equations for a residential scenario include the assumption that a young child incidentally ingests 200 mg/day of TPH-containing soil. For the commercial scenario, the assumed ingestion rate and frequency of exposure are slightly reduced, but a young child remains the receptor of concern. Within the context of this preliminary screen, potential cleanup levels are evaluated below.

The method for identifying potential cleanup levels varies depending on the constituents of concern. Concentrations of onsite petroleum hydrocarbon compounds can be compared to potential cleanup levels in one of two ways: using the default formula values provided by MTCA Methods A, B, or (if applicable) C or using the interim TPH policy (Ecology 1997). The interim TPH policy only applies to petroleum compounds; therefore, data for other analytical compounds are generally evaluated within the context of Methods A, B, or C.

Throughout the screening-level evaluation of cleanup goals, maximum onsite concentrations were used. Using maximum concentrations is environmentally conservative for two reasons: 1) it assumes the worst-case scenario where maximum concentrations of petroleum hydrocarbons are detected throughout the site, and 2) it assumes that the limited detections of non-petroleum hydrocarbon compounds are actually widespread throughout the site. The data collected for the remedial investigation do not support either assumption.

Cleanup levels are identified within the context of potential exposure pathways. Potential exposure pathways applicable to this site include direct contact with soil (i.e., ingestion), potential migration from soil to groundwater, ingestion of groundwater, and potential migration from groundwater to surface water. MTCA methods for deriving potential cleanup levels for each of these pathways are evaluated below. A summary of the screening-level evaluation is provided in Table 15.

5.2.1 Direct Contact with Soil

Potential cleanup levels for petroleum hydrocarbons and for other non-petroleum compounds are discussed below.

5.2.1.1 Petroleum Hydrocarbon Compounds

Potential cleanup levels for petroleum hydrocarbon compounds were evaluated using the interim TPH policy because concentrations of diesel- and oil-range petroleum hydrocarbons exceed the Method A default cleanup levels. Before the interim TPH policy was issued, Ecology required the use of generic Method A cleanup levels at most petroleum-affected sites. The interim TPH policy addresses limitations associated with the MTCA default values by recognizing that composition of TPH mixtures found at a specific site can vary widely. Using this approach allows site evaluations to better reflect the degree of hazard posed by the mixture composition found at a specific site.

The interim TPH policy evaluates protection against non-carcinogenic effects for humans exposed to soil by direct contact. Samples collected from Stations BA-05, BA-07, and LF-03 were chosen for this evaluation because they contained the highest levels of aliphatic and aromatic hydrocarbons. A total hazard index was calculated using residential and commercial factors (Table 16). The calculated hazard index of 0.42 at Station LF-03 is lower than the MTCA-specified non-carcinogenic target hazard index of 1.0. (A hazard

index of 1.0 or greater reflects the potential for adverse effects under the exposure conditions evaluated.) Residential hazard quotients for data from Station BA-05 and Station BA-07 are 0.27 and 0.33, respectively. These results are due, in part, to the predominantly oil-range hydrocarbon compounds, which tend to be associated with a lower risk because they generally contain fewer toxic constituents (e.g., aromatic hydrocarbon compounds) than the lighter petroleum hydrocarbon mixtures.

Potential risk from exposure to carcinogenic compounds (i.e., benzene and carcinogenic PAH compounds) resulting from direct contact with soil is also addressed in the interim TPH policy. The estimated site-specific risk is then compared to the acceptable residential and commercial cancer risk levels of 1.0×10^{-6} (i.e., a one-in-one-million incremental risk of developing cancer over a lifetime), as established by Ecology (1993) and U.S. EPA (1988). Only Stations CB-02 and LF-07 were used in this analysis because these are the only two stations from the entire site (i.e., from 20 soil samples analyzed for PAHs) with detected carcinogenic PAH compounds (Table 17). Thus, this risk estimate represents a worst-case scenario. For Station CB-02, the residential risk is 9.5×10^{-6} (based on the benzo[a]pyrene detection). Station LF-07 has a residential risk of 4.4×10^{-6} (based on the concentration of total benzofluoranthenes). The risk estimates based on commercial scenario assumptions, 2.4×10^{-6} for Station CB-02 and 1.1×10^{-6} for Station LF-07, slightly exceed the acceptable commercial risk level of 1.0×10^{-6} . In either case, direct exposure to affected soil will be further limited under the redevelopment scenario.

PAHs were also compared to MTCA Method B formula values as part of the initial screening step (Table 18). Method B values are more appropriate to use than Method A when sites are contaminated with numerous substances and environmental factors make cleanup difficult, as is the case within the context of this project. Benzo[a]pyrene and total benzofluoranthenes (both the b and k isomers) were detected in soil at concentrations (1.3 and 0.6 mg/kg, respectively) above the MTCA Method B formula values (0.137 mg/kg for both compounds). The maximum total concentration of carcinogenic PAH compounds (1.3 mg/kg) is also above the Method B formula value of 0.137 mg/kg.

In general, PAHs tend to be ubiquitous in the environment (ASTDR 1993), especially in areas paved with asphalt (e.g., the City Depot parcel). PAH concentrations in background environmental samples typically exceed risk-based concentrations for residential exposure assumptions. Typical background concentrations observed in urban soils for the carcinogenic PAHs detected onsite range from 0.165–62 mg/kg (Table 19). These data suggest that carcinogenic PAH compounds present only an incremental exposure risk when compared to typical background concentrations. Furthermore, the anticipated remedy for the site will limit exposure to these soils.

5.2.1.2 Non-Petroleum Compounds

The interim TPH policy only applies to petroleum compounds. Therefore, maximum site concentrations for non-petroleum hydrocarbon compounds were compared to MTCA Method B formula values (Table 18). Arsenic was detected in one sample at a level (42 mg/kg) that exceeds Method B carcinogenic formula values in soil (1.67 mg/kg). Arsenic concentrations in seven other soil samples range from 2–5 mg/kg, values that are within the typical range for natural background concentrations (1–10 mg/kg) in soils (Ecology 1994). There were no other detections of non-TPH compounds that were detected above MTCA Method B formula values in soil.

5.2.2 Potential Migration from Soil to Groundwater

Although current conditions of the soil do not appear to pose a significant threat to the environment, compounds in soil may leach into underlying groundwater and affect groundwater over the long term. Groundwater protection standards are addressed below.

petroleum hydrocarbon compounds present in site soil have a minimal potential to leach to underlying groundwater.

PAHs were also compared to MTCA Method B formula values as part of the initial screening step (Table 18). Maximum concentrations of benzo[a]pyrene, total benzo-fluoranthenes, and total carcinogenic PAHs exceed the MTCA Method B formula values for groundwater protection (i.e., the soil-to-groundwater pathway). Again, PAHs tend to have limited soil mobility; therefore, it is unlikely that these compounds will migrate to groundwater (Mackay et al. 1992). These PAH compounds were not detected in groundwater samples. Because this water is non-potable and no direct exposure is anticipated, the soil-to-groundwater pathway does not appear to pose significant risk.

5.2.2.2 Other Analytical Compounds

Maximum site concentrations for non-petroleum hydrocarbon compounds were compared to MTCA Method B formula values as an initial screening step (Table 18). Arsenic is the only non-petroleum compound that exceeds its MTCA Method B formula value for groundwater protection. The maximum concentration of arsenic in soil does not meet the MTCA Method B formula values for groundwater protection (Table 18). However, arsenic was not detected in groundwater samples at a detection limit of 5.0 $\mu\text{g/L}$. The method detection limit is within the typical range for natural background concentrations (<1.0–100 $\mu\text{g/L}$) in groundwater (PTI 1989). Thus, arsenic in soil does not appear to be a significant source to groundwater.

5.2.3 Direct Contact with Groundwater and Migration from Groundwater to Surface Water

The groundwater is currently not a source of drinking water. The City intends to permanently own the park, and groundwater is never anticipated to be used for drinking water.

Because the groundwater is non-potable, the next highest beneficial use of the groundwater dictates the potential cleanup levels. The groundwater seepage into Smith's Cove suggests that the alternative beneficial use is discharge to surface water. If surface water cleanup standards are applied, no adverse effects (e.g., visible oil sheen) are allowed. Implications of the groundwater-to-surface water pathway are discussed below.

5.2.3.1 Petroleum Hydrocarbon Compounds

The interim TPH policy does not provide potential numeric cleanup values for petroleum hydrocarbons in surface water, and MTCA values do not exist for gasoline-, diesel-, and oil-range petroleum hydrocarbons in surface water. Oil sheen was observed in Smith's Cove during field activities, however, and aesthetic qualities (including lack of visible oil sheen) appear to be the most likely cleanup goal for TPH compounds. Preventing adverse groundwater discharges to surface water may be evaluated.

For comparison purposes, maximum concentrations of toxic constituents of hydrocarbon compounds in groundwater are compared to MTCA Method B formula values for surface water in Table 18. The maximum concentration of benzene ($160 \mu\text{g/L}$) exceeded the MTCA Method B formula value ($43 \mu\text{g/L}$). The detection limits in groundwater for benzo[a]pyrene, total benzofluoranthenes, 1,2-dichlorobenzene, and methylene chloride were not sufficiently low to determine if these compounds meet the Method B formula values for surface water. Based on the age of contamination (i.e., ranging from 10 to 100 years) and flushing from tidal influence, it is unlikely that these chemicals would be present in the future. Benzene and other VOCs would be expected to undergo natural attenuation and degradation in surface water. Because it is unlikely that PAH compounds will migrate to groundwater due to their limited mobility in soil (Mackay et al. 1992), the potential effects on surface water from possible PAH compounds are minimal. Furthermore, if groundwater discharges were controlled for TPH compounds, the potential for these compounds to exceed MTCA Method B values would be greatly reduced.

5.2.3.2 Other Analytical Compounds

The detection limits for arsenic in groundwater were not sufficiently low to determine if this compound meets the MTCA Method B carcinogenic formula values for surface water. This formula value (0.098 $\mu\text{g/L}$) is well below typical method detection limits (5.0 $\mu\text{g/L}$) and cannot be achieved using standard analytical methods.

5.3 MITIGATION OF POTENTIAL EXPOSURE

The screening-level comparison between the maximum concentrations and potential MTCA cleanup levels indicates that the site does not present unacceptable risks to human health or the environment (Table 15). However, the construction activities associated with redevelopment of the property will reduce the risk of onsite exposure even further. The following goals will form the framework for determining final cleanup levels that apply to the site:

- Reduce the risk from direct soil contact
- Remove free-phase product from soil and/or groundwater
- Mitigate the leaching of constituents of concern from the soil to the groundwater
- Monitor groundwater concentrations.

These goals will be incorporated into the redevelopment of historical industrial facilities. In addition, it is in the City's best interest to mitigate other adverse effects on soil, groundwater, or surface water because of the high public visibility of this project.

Although final cleanup goals will be negotiated with Ecology, it is envisioned that a limited cleanup action plan and/or institutional controls may be implemented. Specifically, removal of onsite structures and the addition of clean fill sediments will eliminate direct contact with affected soil. Free-phase product may be removed from soil within defined areas (e.g., the utility trench near Station BA-05 near the end of the Smith's Cove) or from groundwater using an active or passive system placed within monitoring wells. This activity will mitigate the potential for constituents in soil to leach to groundwater and the possibility that constituents in groundwater could discharge to surface water.

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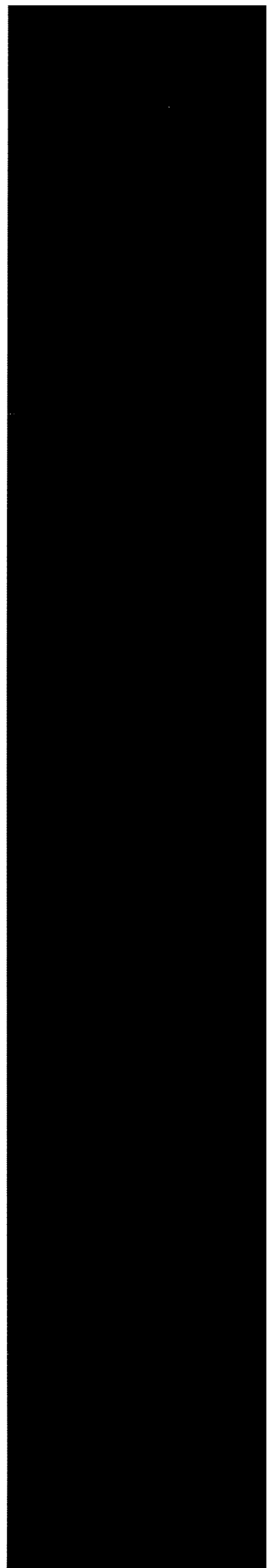
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Figures



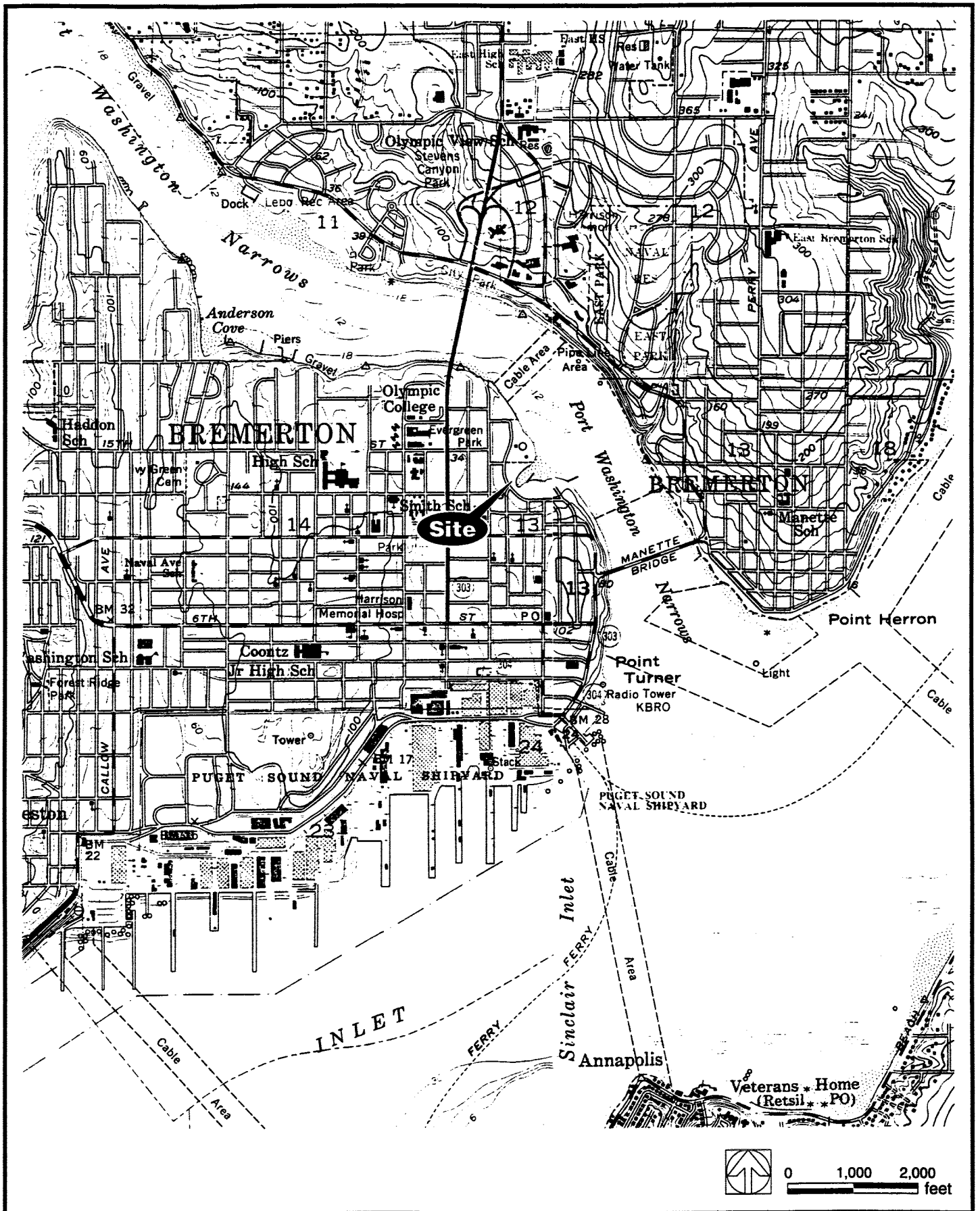


Figure 1. Site location map.

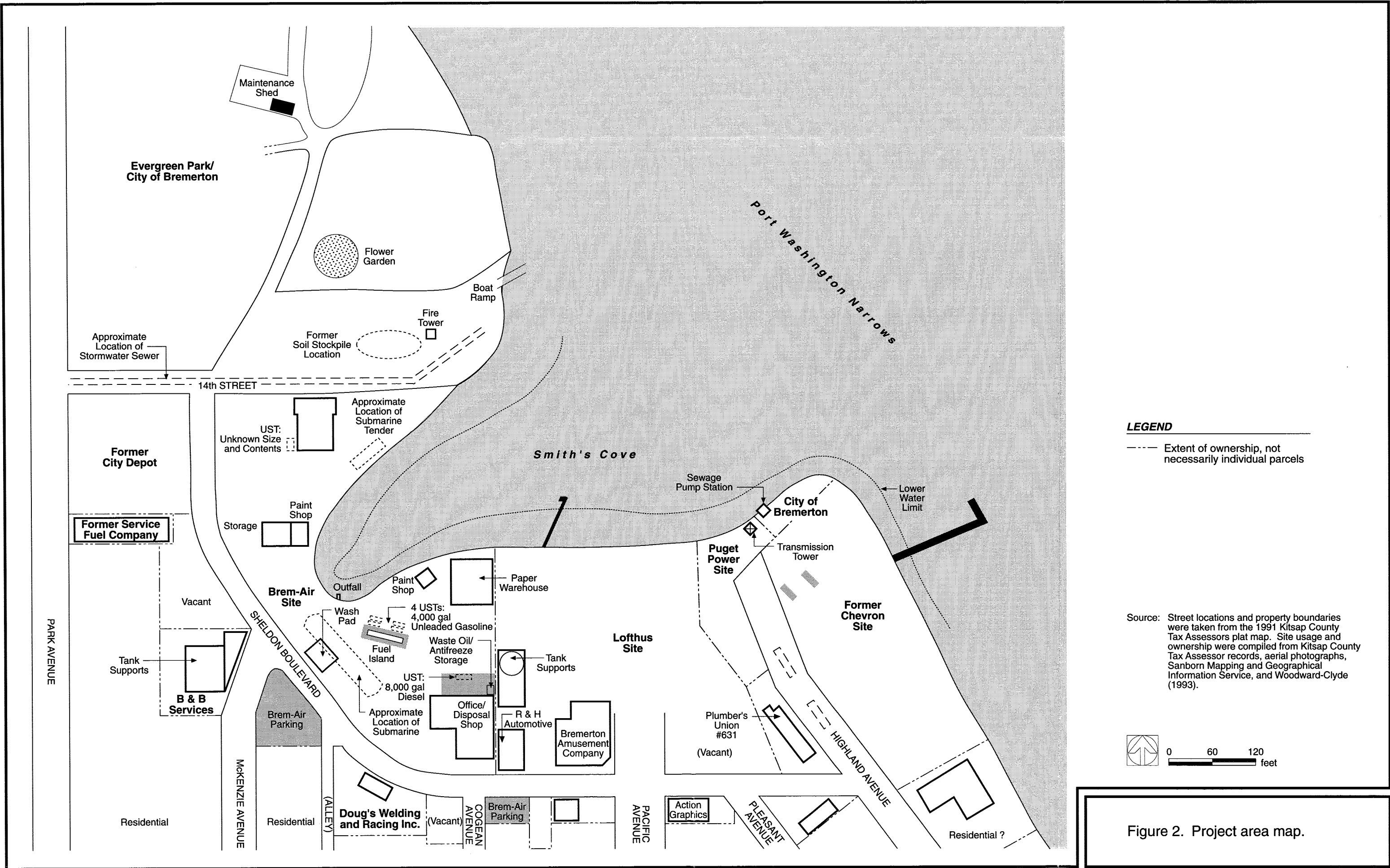


Figure 2. Project area map.

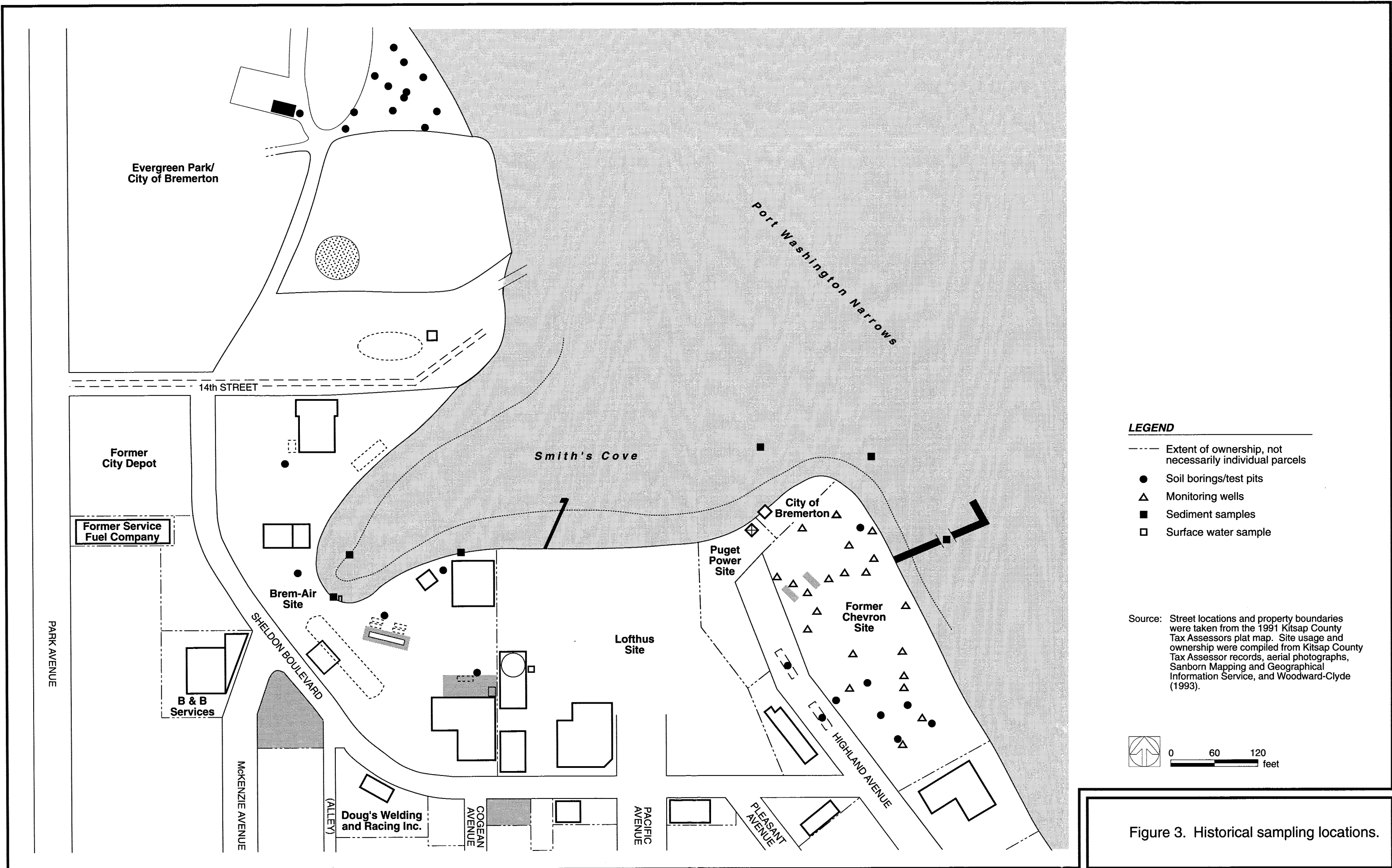
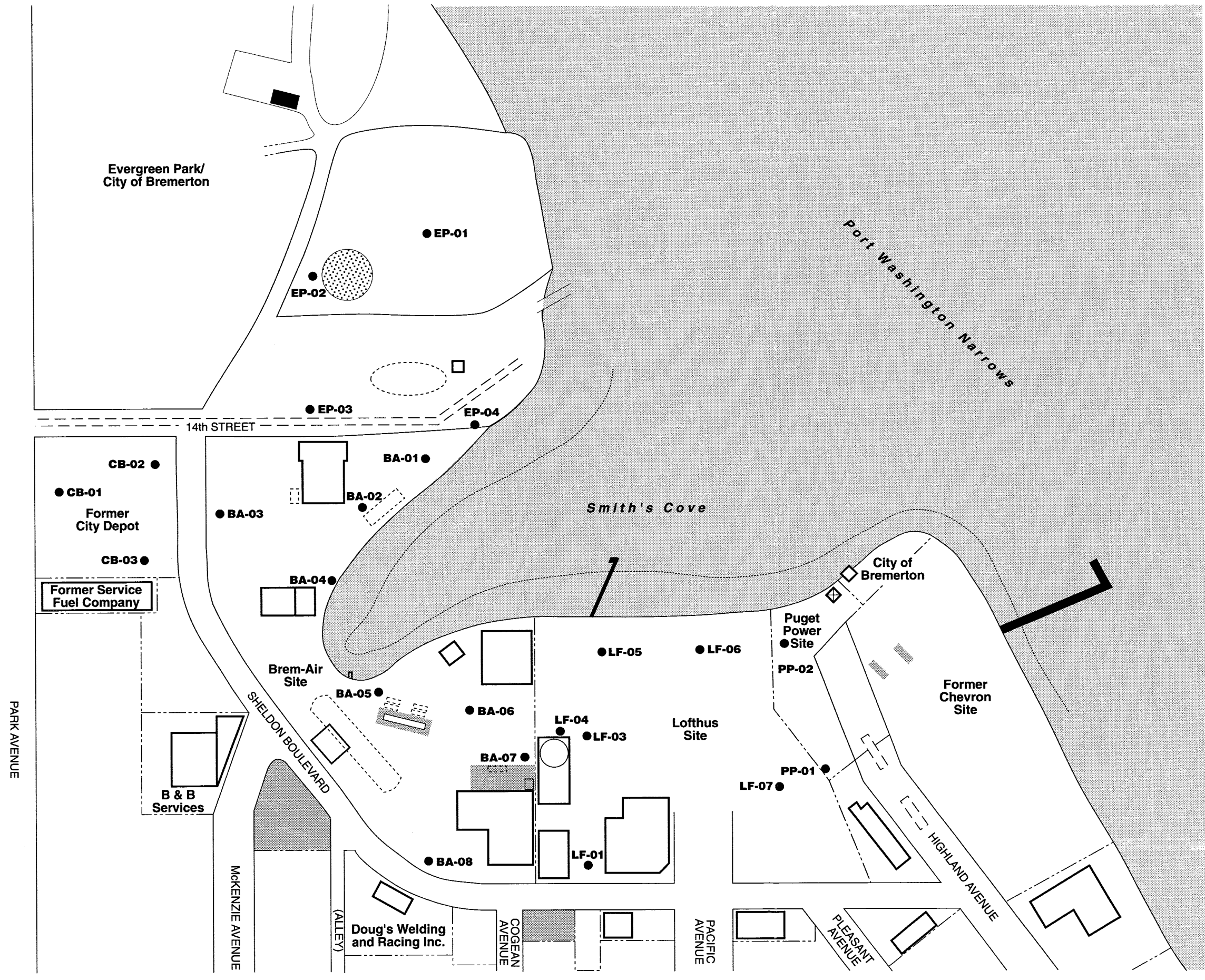


Figure 3. Historical sampling locations.



LEGEND

- Extent of ownership, not necessarily individual parcels
- Sampling location

Source: Street locations and property boundaries were taken from the 1991 Kitsap County Tax Assessors plat map. Site usage and ownership were compiled from Kitsap County Tax Assessor records, aerial photographs, Sanborn Mapping and Geographical Information Service, and Woodward-Clyde (1993).

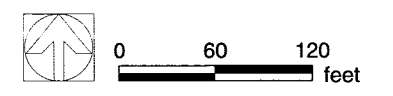
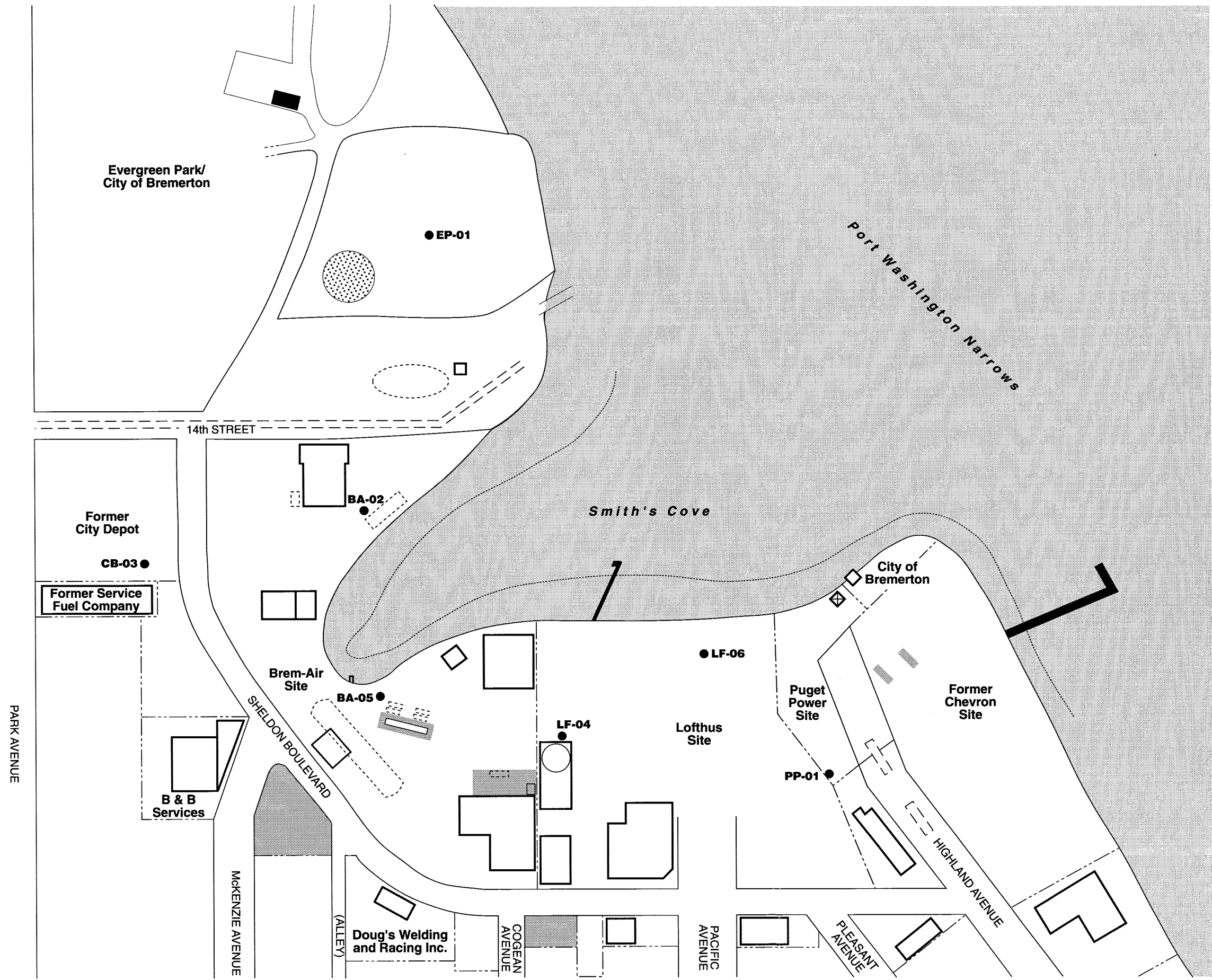


Figure 4. Remedial investigation soil sampling locations.



LEGEND

- Extent of ownership, not necessarily individual parcels
- Sampling location

Source: Street locations and property boundaries were taken from the 1991 Kitsap County Tax Assessors plat map. Site usage and ownership were compiled from Kitsap County Tax Assessor records, aerial photographs, Sanborn Mapping and Geographical Information Service, and Woodward-Clyde (1993).

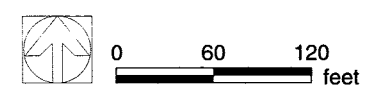
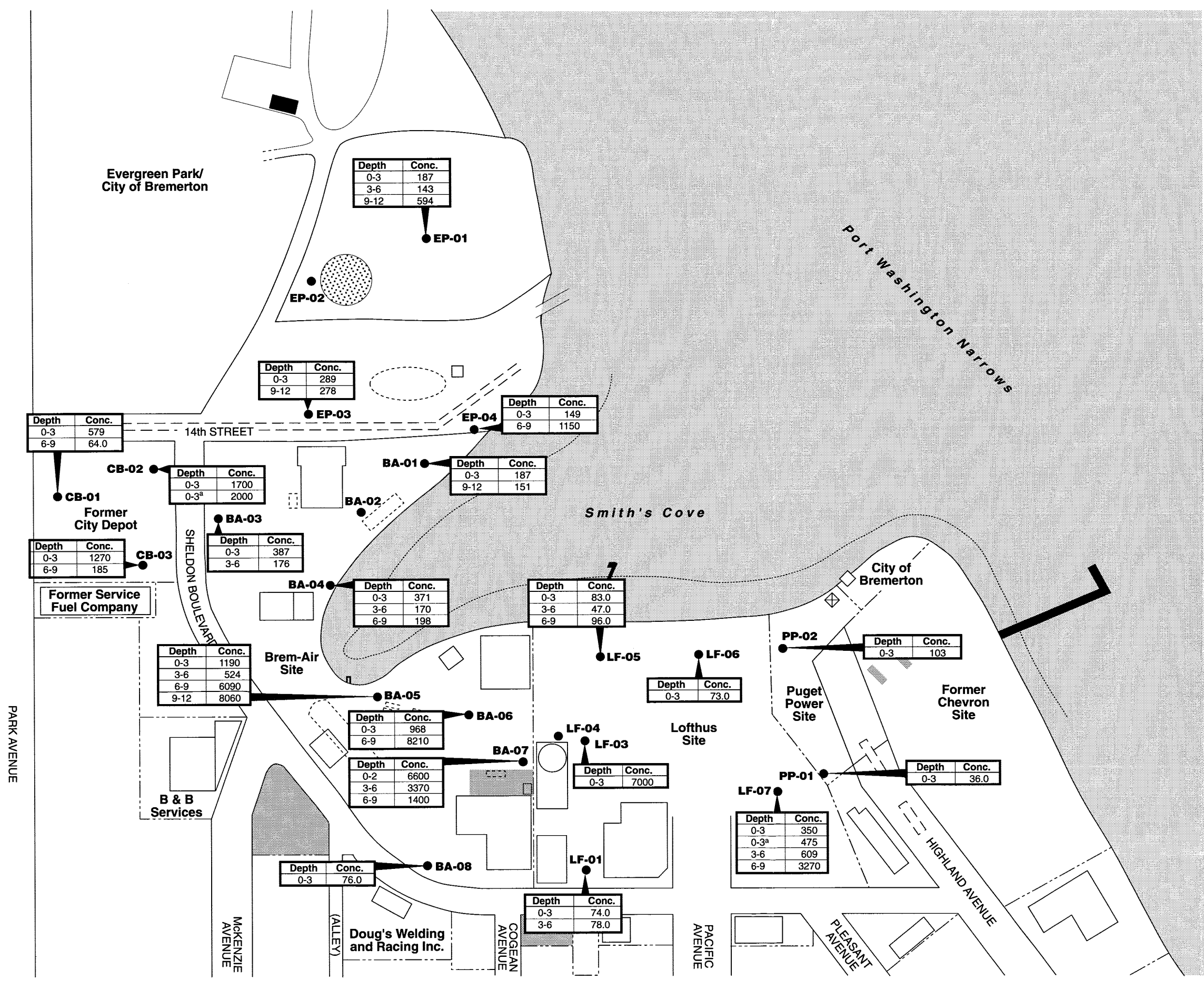


Figure 5. Remedial investigation groundwater sampling locations.



LEGEND

- Extent of ownership, not necessarily individual parcels
- Sampling location

NOTES: All depths are in feet.
 Results from EPA 8015 modified analytical method.
^a Duplicate sample

Source: Street locations and property boundaries were taken from the 1991 Kitsap County Tax Assessors plat map. Site usage and ownership were compiled from Kitsap County Tax Assessor records, aerial photographs, Sanborn Mapping and Geographical Information Service, and Woodward-Clyde (1993).

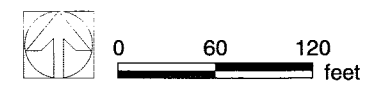
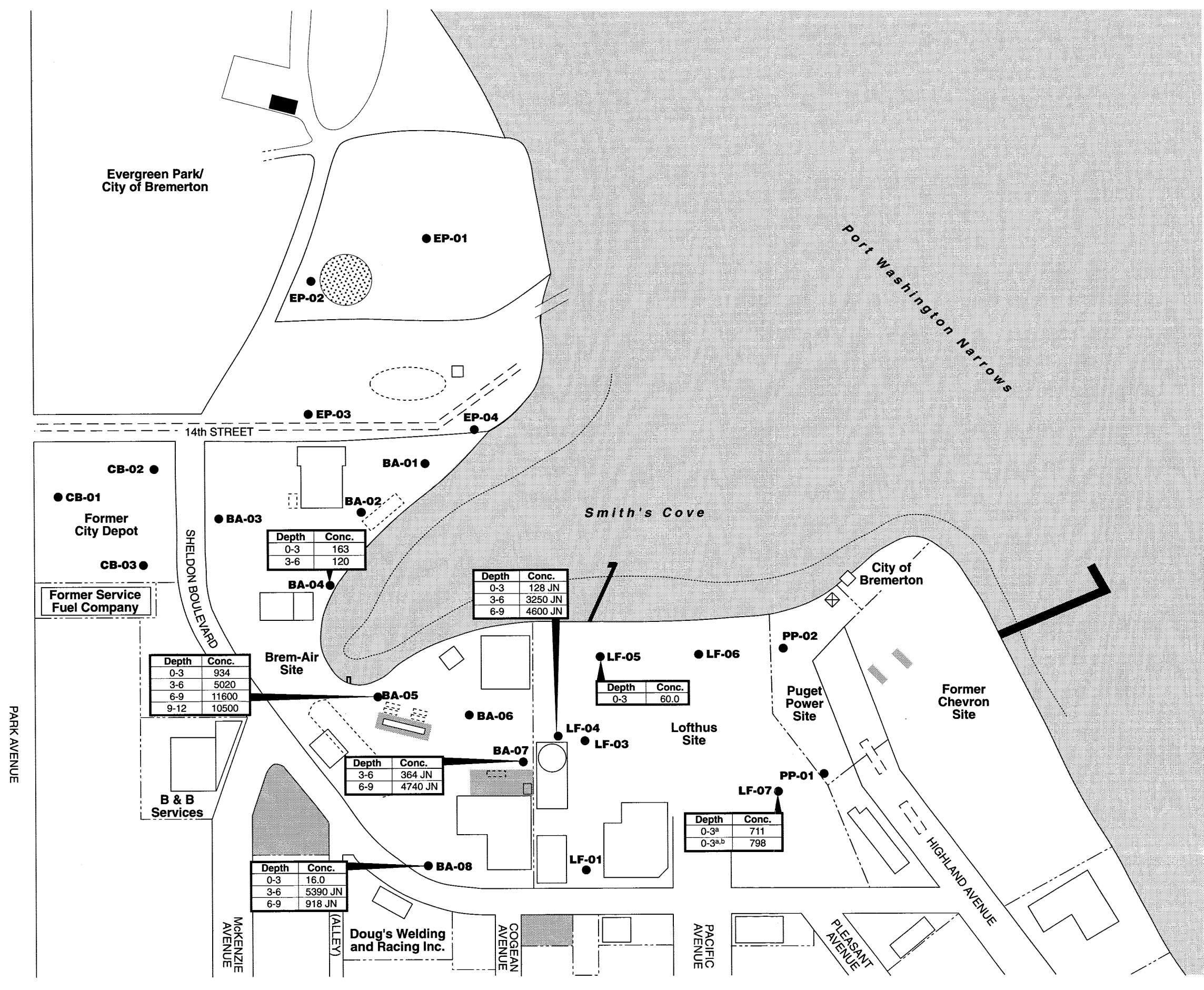


Figure 6. Detected concentrations (mg/kg) of oil-range hydrocarbons in soils.



LEGEND

- Extent of ownership, not necessarily individual parcels
- Sampling location
- J Estimated
- N Tentatively identified

NOTES: All depths are in feet.
 Results from EPA 8015 modified analytical method.
^a Detected concentrations are kerosene-range hydrocarbons
^b Duplicate sample

Source: Street locations and property boundaries were taken from the 1991 Kitsap County Tax Assessors plat map. Site usage and ownership were compiled from Kitsap County Tax Assessor records, aerial photographs, Sanborn Mapping and Geographical Information Service, and Woodward-Clyde (1993).

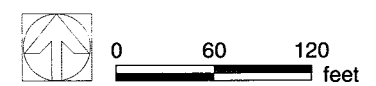
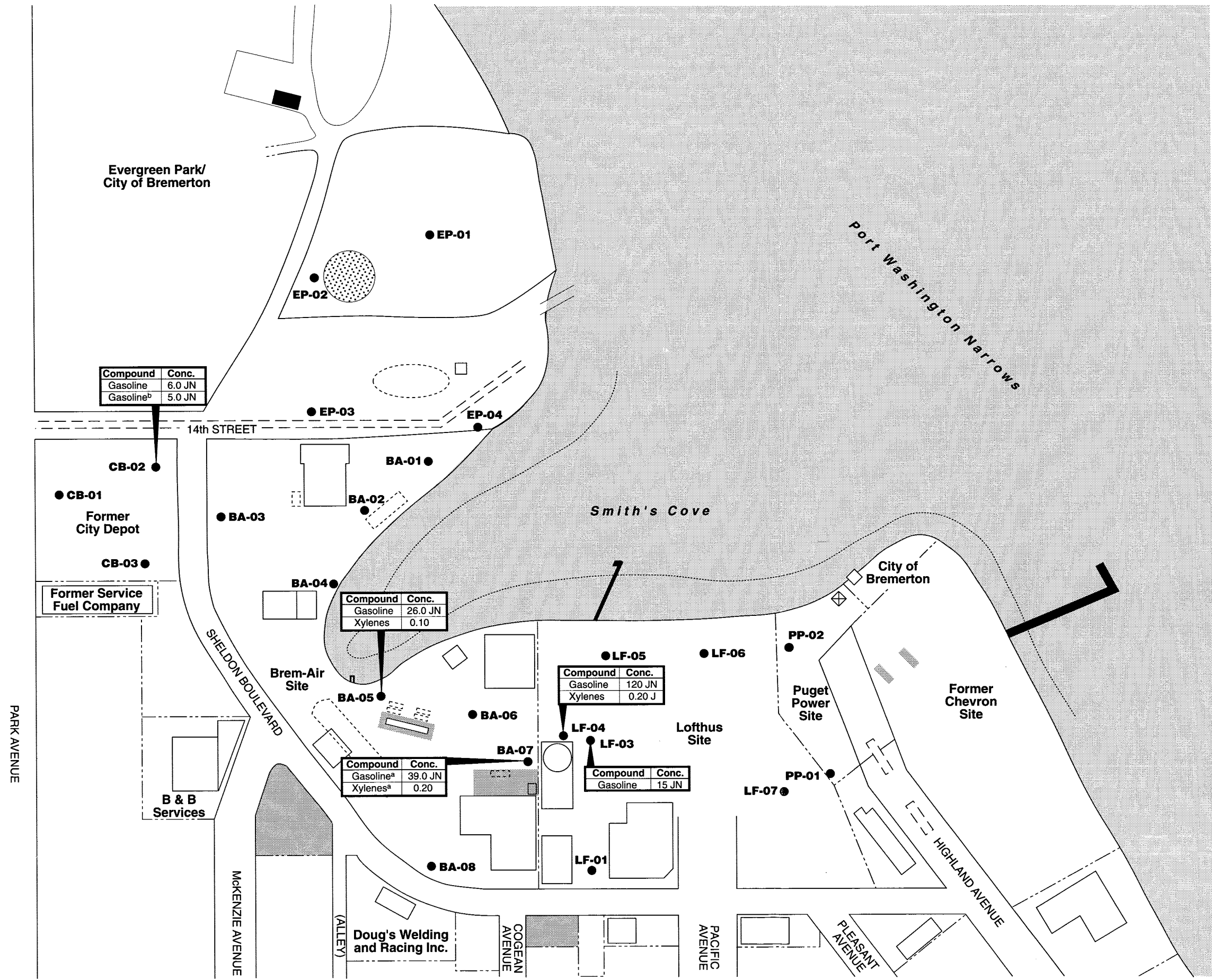


Figure 7. Detected concentrations (mg/kg) of diesel-range hydrocarbons in soils.



LEGEND

- Extent of ownership, not necessarily individual parcels
- Sampling location
- J Estimated
- N Tentatively identified

NOTES: All sample depths are 0-3 ft unless otherwise noted.

Results from WTPH-G/BTEX analytical method.

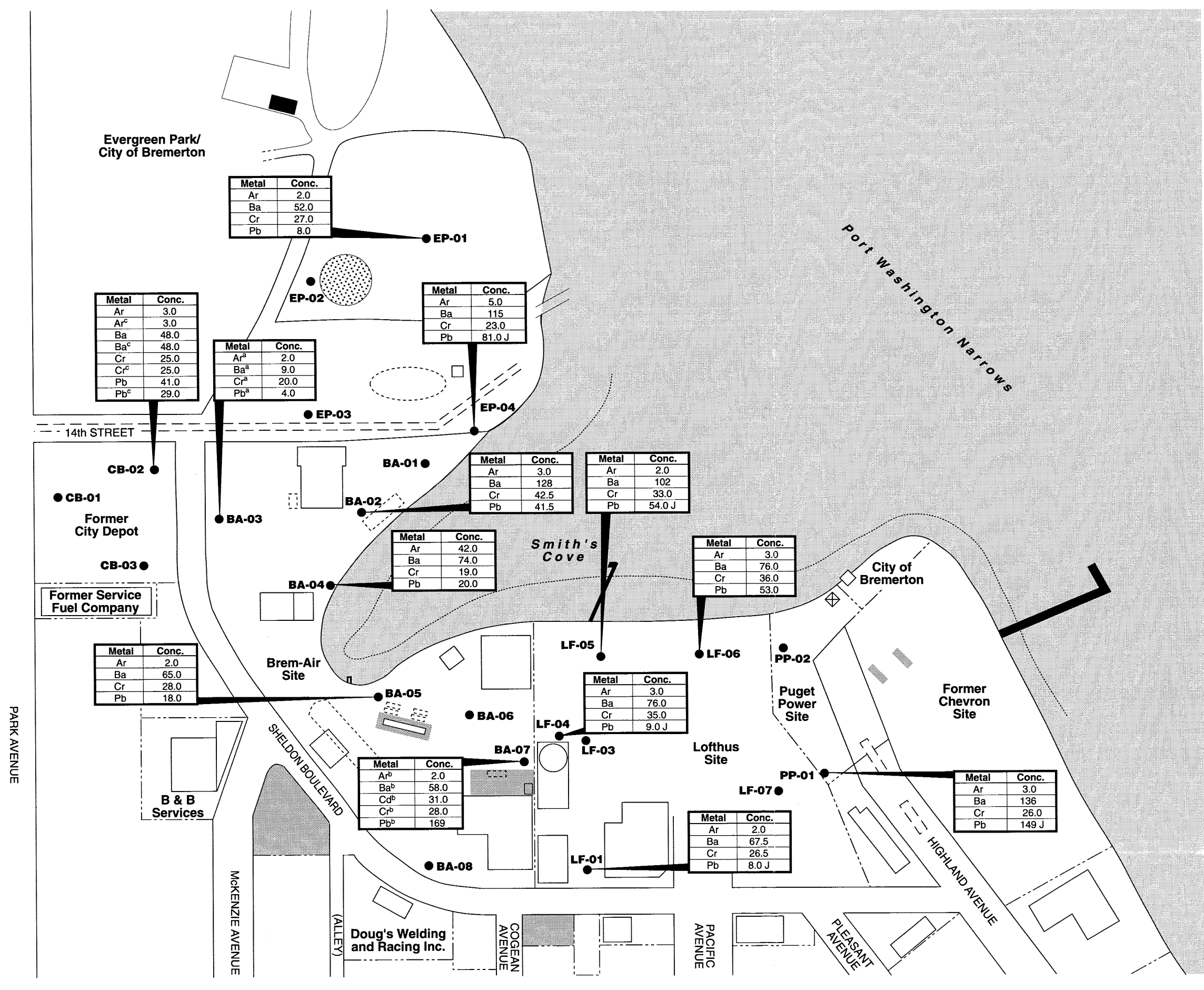
^a Sample depth of 0-2 ft

^b Duplicate sample

Source: Street locations and property boundaries were taken from the 1991 Kitsap County Tax Assessors plat map. Site usage and ownership were compiled from Kitsap County Tax Assessor records, aerial photographs, Sanborn Mapping and Geographical Information Service, and Woodward-Clyde (1993).



Figure 8. Detected concentrations (mg/kg) of gasoline-range hydrocarbons and BTEX in soil.



LEGEND

- Extent of ownership, not necessarily individual parcels
- Sampling location
- J Estimated

NOTES: All depths are 0-3 feet unless noted otherwise.

- ^a 6-9-foot sample depth
- ^b 0-2-foot sample depth
- ^c Duplicate sample

Results are from EPA Series 6000 and 7000 analytical methods.

Source: Street locations and property boundaries were taken from the 1991 Kitsap County Tax Assessors plat map. Site usage and ownership were compiled from Kitsap County Tax Assessor records, aerial photographs, Sanborn Mapping and Geographical Information Service, and Woodward-Clyde (1993).

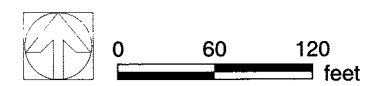
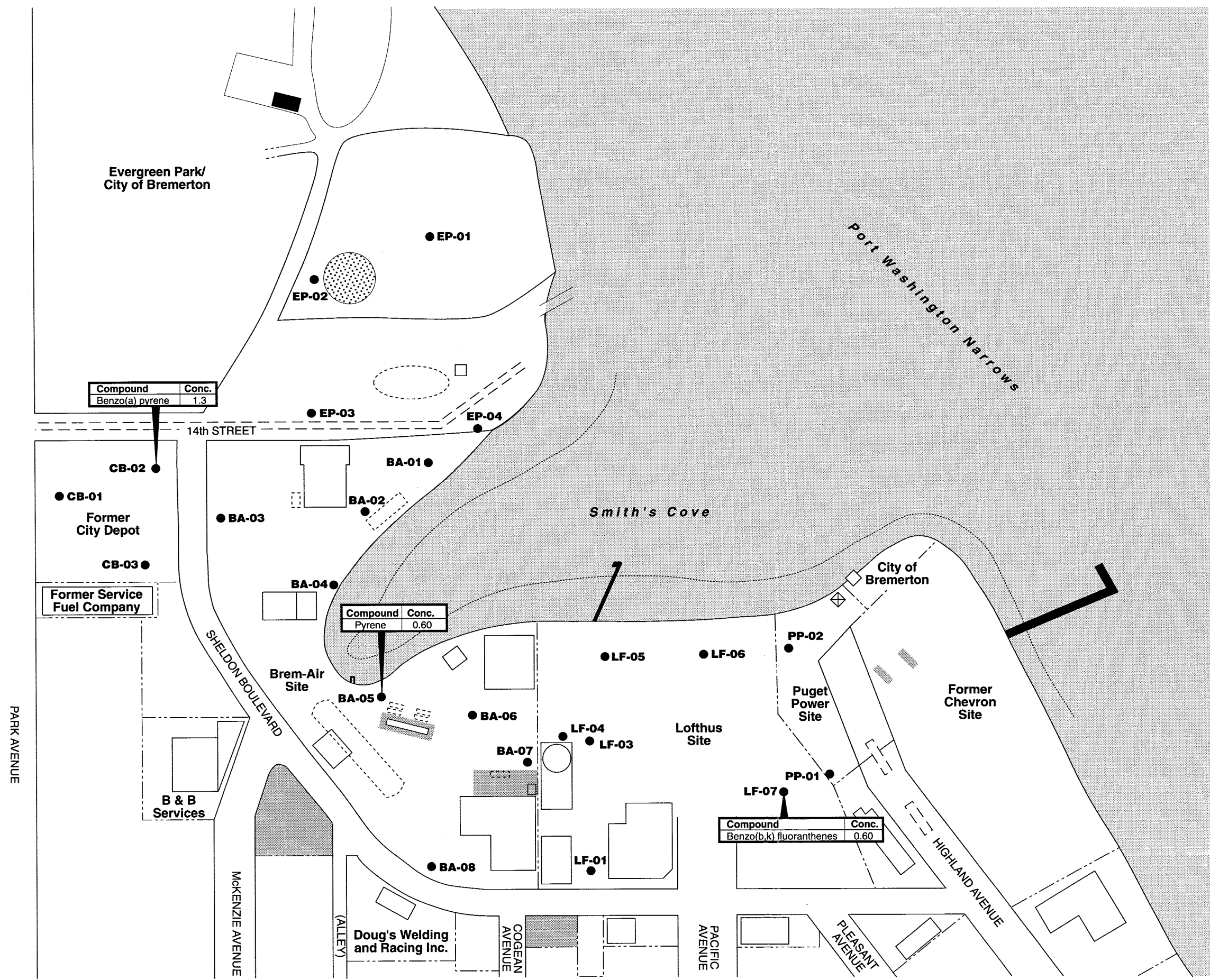


Figure 9. Detected concentrations (mg/kg) of metals in soil.



LEGEND

- Extent of ownership, not necessarily individual parcels
- Sampling location
- J Estimated
- N Tentatively identified

NOTES: All sample depths are 0-3 ft unless otherwise noted.

Results from WA-EPH analytical method.

^a Sample depth of 0-2 ft

^b Duplicate sample

Source: Street locations and property boundaries were taken from the 1991 Kitsap County Tax Assessors plat map. Site usage and ownership were compiled from Kitsap County Tax Assessor records, aerial photographs, Sanborn Mapping and Geographical Information Service, and Woodward-Clyde (1993).

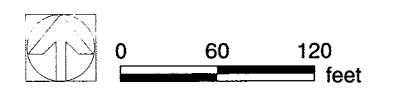
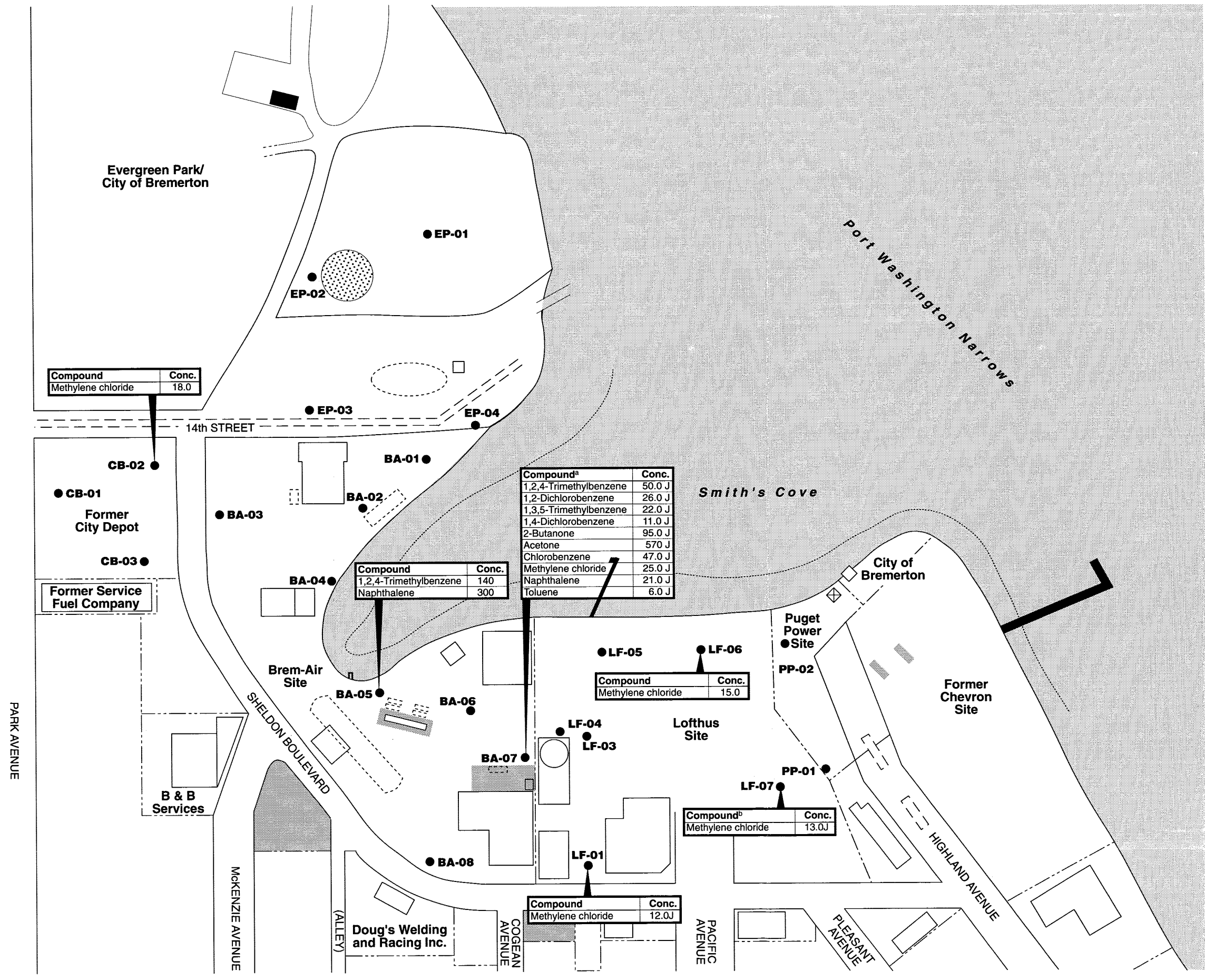


Figure 10. Detected concentrations (mg/kg) of polycyclic aromatic hydrocarbons in soil.



LEGEND

- Extent of ownership, not necessarily individual parcels
- Sampling location
- J Estimated

NOTES: All depths are 0-3 feet unless noted otherwise.
^a 0-2 foot sample depth
^b 3-6 foot sample depth
 Results from EPA 8260 analytical method.

Source: Street locations and property boundaries were taken from the 1991 Kitsap County Tax Assessors plat map. Site usage and ownership were compiled from Kitsap County Tax Assessor records, aerial photographs, Sanborn Mapping and Geographical Information Service, and Woodward-Clyde (1993).

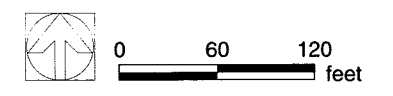
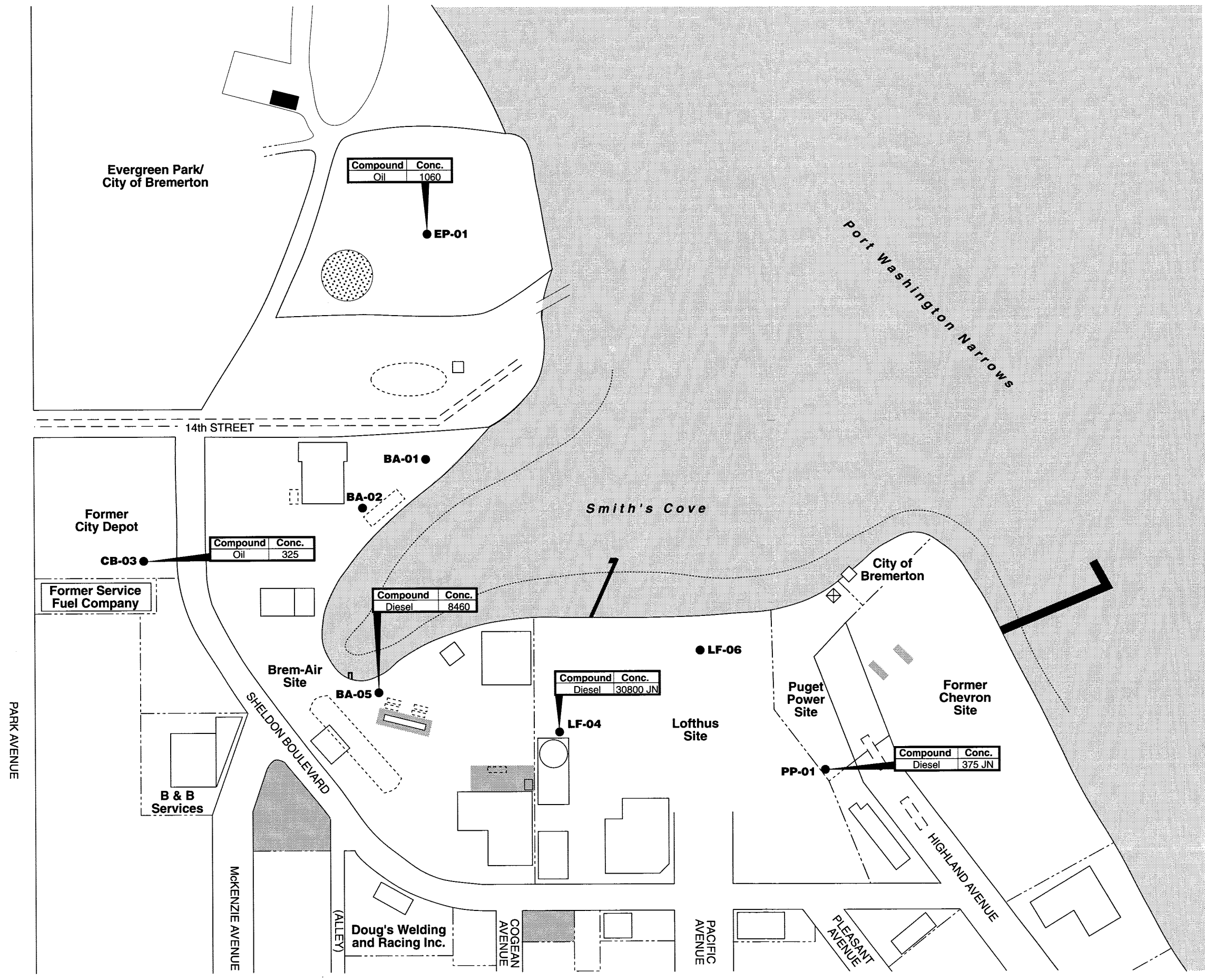


Figure 11. Detected concentrations (µg/kg) of VOCs in soil.



LEGEND

- Extent of ownership, not necessarily individual parcels
 - Sampling location
 - J Estimated
 - N Tentatively identified
- Results from EPA 8015 modified analytical method.

Source: Street locations and property boundaries were taken from the 1991 Kitsap County Tax Assessors plat map. Site usage and ownership were compiled from Kitsap County Tax Assessor records, aerial photographs, Sanborn Mapping and Geographical Information Service, and Woodward-Clyde (1993).

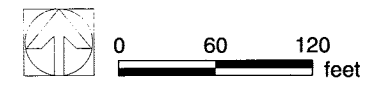
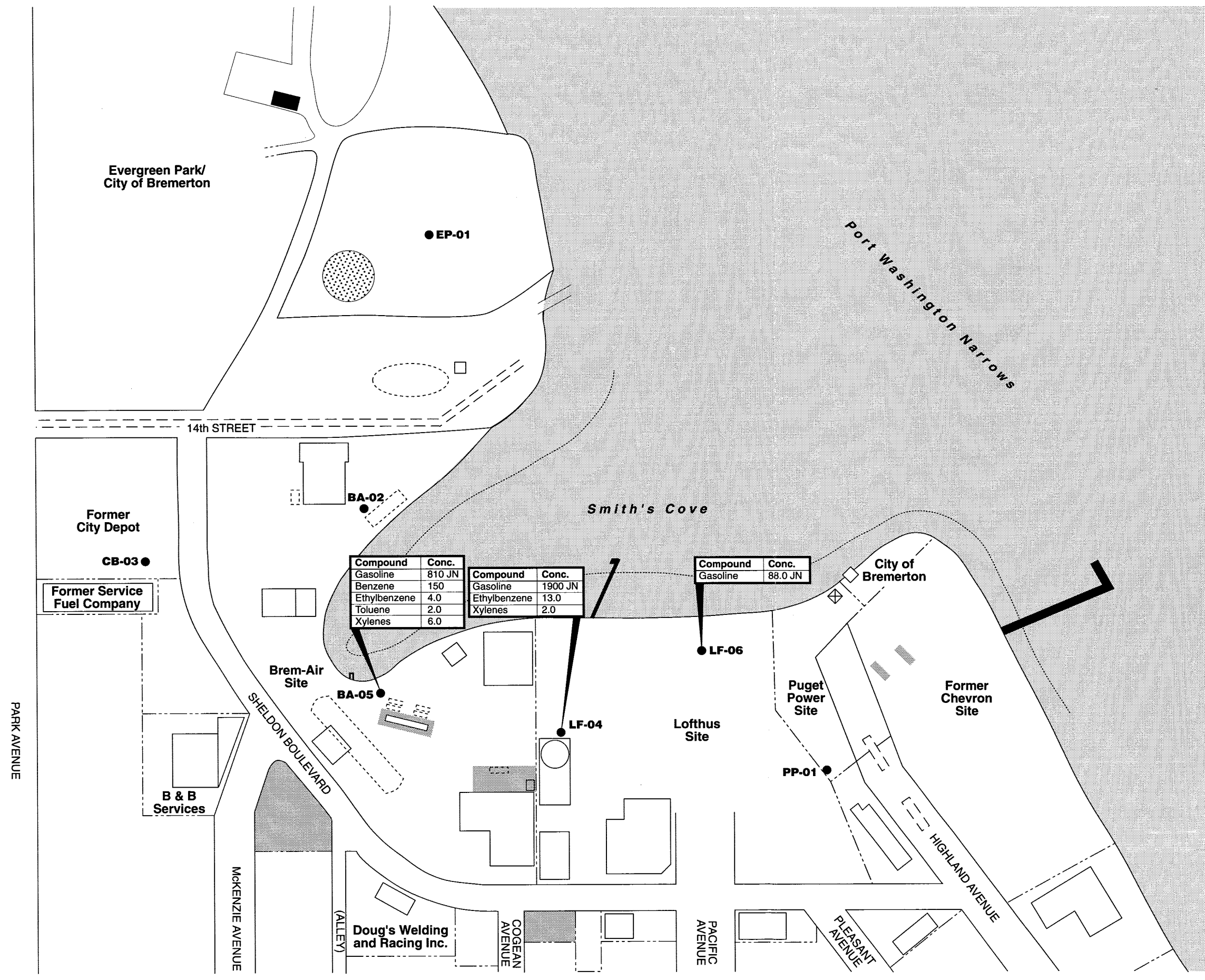


Figure 12. Detected concentrations (µg/L) of oil and diesel-range hydrocarbons in groundwater.



LEGEND

- Extent of ownership, not necessarily individual parcels
- Sampling location
- J Estimated
- N Tentatively identified

NOTE: Results from WTPH-G/BTEX analytical method.

Source: Street locations and property boundaries were taken from the 1991 Kitsap County Tax Assessors plat map. Site usage and ownership were compiled from Kitsap County Tax Assessor records, aerial photographs, Sanborn Mapping and Geographical Information Service, and Woodward-Clyde (1993).

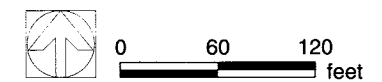
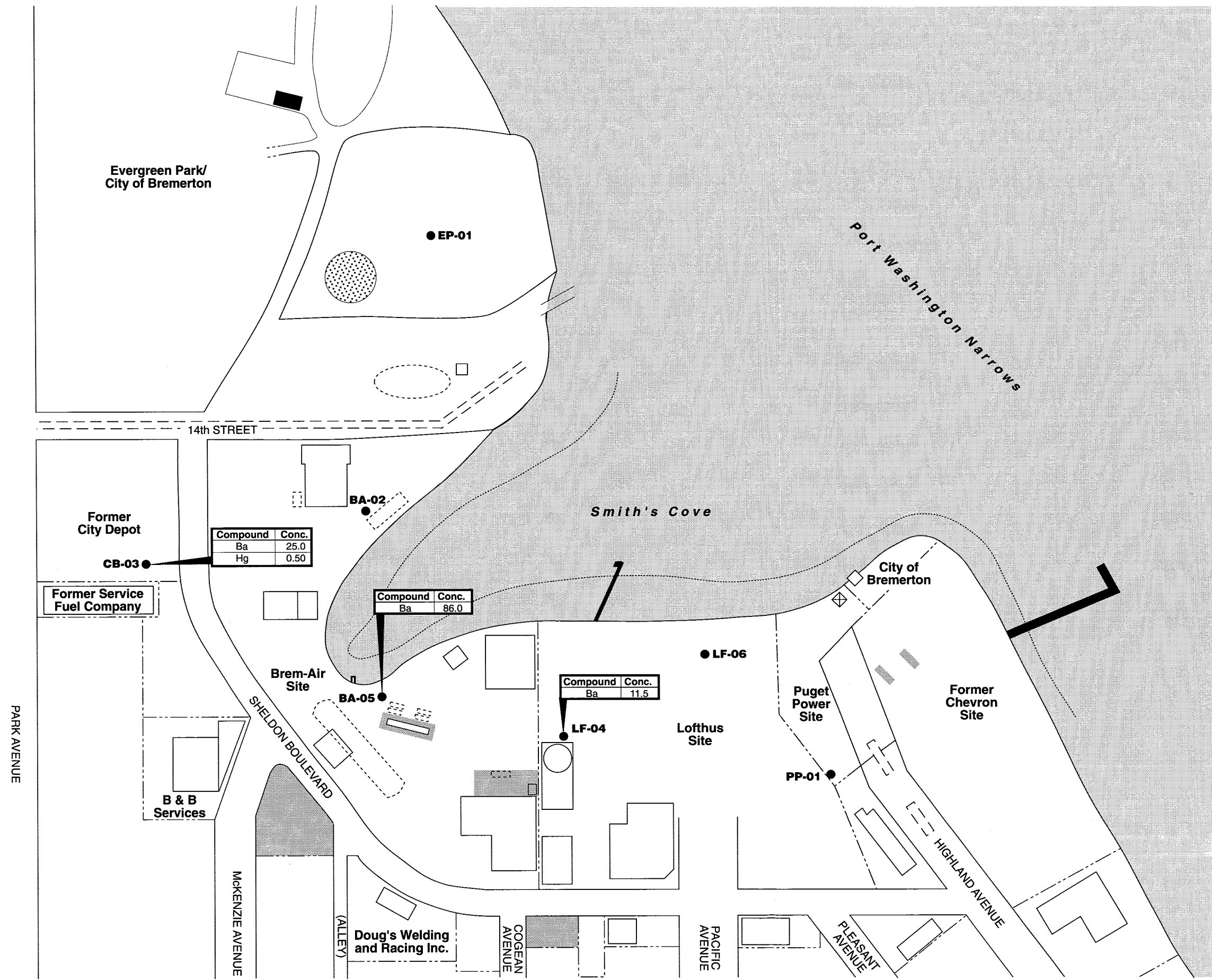


Figure 13. Detected concentrations ($\mu\text{g/L}$) of gasoline-range hydrocarbons and BTEX in groundwater.



LEGEND

- Extent of ownership, not necessarily individual parcels
- Sampling location
- J Estimated
- N Tentatively identified

Results from EPA Series 6000 and 7000 analytical methods.

Source: Street locations and property boundaries were taken from the 1991 Kitsap County Tax Assessors plat map. Site usage and ownership were compiled from Kitsap County Tax Assessor records, aerial photographs, Sanborn Mapping and Geographical Information Service, and Woodward-Clyde (1993).

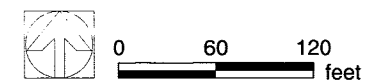


Figure 14. Detected concentrations ($\mu\text{g/L}$) of metals in groundwater.

Tables

TABLE 1. ANALYTICAL RESULTS FROM PREVIOUS INVESTIGATIONS

Site Name:	Brem-Air									
Station ID:	B-1	B-1	B-2	B-2	B-3	B-3	B-4	B-4	B-5	B-5
Medium:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample Depth:	2-3.5	5-6.5	2-3.5	5-6.5	2-3.5	5-6.5	2-3.5	5-6.5	2-3.5	5-6.5
TPH (ppm)										
Gasoline	--	--	--	--	--	--	--	--	--	8,600
Diesel	> 200	> 200	--	100	--	7,600	--	140	--	17,000
Oil	> 200	> 200	240	200	--	9,200	830	--	--	
Volatile Organic Compounds (ppb)										
Benzene	1.0 <i>U</i>	2.1	--	1.2 <i>U</i>	1.1 <i>U</i>	12 <i>U</i>	1.1 <i>U</i>	1.1 <i>U</i>	96	1,000
Toluene	1.0 <i>U</i>	1.6	--	1.2 <i>U</i>	5.8	12 <i>U</i>	3.4	1.1 <i>U</i>	11 <i>U</i>	29
Ethylbenzene	1.0 <i>U</i>	1.1 <i>U</i>	--	1.2 <i>U</i>	1.1 <i>U</i>	12 <i>U</i>	1.1 <i>U</i>	1.1 <i>U</i>	11 <i>U</i>	40
Xylenes	2.0 <i>U</i>	1.4	--	2.3 <i>U</i>	2.2 <i>U</i>	23 <i>U</i>	1.0	2.2 <i>U</i>	23 <i>U</i>	100
Methylene Chloride	2.0 <i>U</i>	2.3 <i>U</i>	--	6.3	8.1	23 <i>U</i>	2.8	3.0	23 <i>U</i>	21 <i>U</i>
Acetone	5.1 <i>U</i>	10	--	13	4.6	200	110	20	176	630
2-Butanone	5.1 <i>U</i>	5.7 <i>U</i>	--	5.8 <i>U</i>	5.4 <i>U</i>	58 <i>U</i>	18	5.2	57 <i>U</i>	52 <i>U</i>
1,2-Dichloropropane	1.0 <i>U</i>	1.1 <i>U</i>	--	1.2 <i>U</i>	12 <i>U</i>	1.1 <i>U</i>	1.1 <i>U</i>	11 <i>U</i>	11 <i>U</i>	10 <i>U</i>
Chlorobenzene	1.0 <i>U</i>	1.1 <i>U</i>	--	1.2 <i>U</i>	1.1 <i>U</i>	220	1.1 <i>U</i>	1.1 <i>U</i>	11 <i>U</i>	10 <i>U</i>
Semi-volatile Organic Compounds (ppm)										
Acenaphthene	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--
Benzo[a]anthracene	--	--	--	--	--	--	--	--	--	--
Benzo[a]pyrene	--	--	--	--	--	--	--	--	--	--
Benzo[b]fluoranthene	--	--	--	--	--	--	--	--	--	--
Benzo[ghi]perylene	--	--	--	--	--	--	--	--	--	--
Benzo[k]fluoranthene	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--
Dibenz[a,h]anthracene	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--
Metals (ppm)										
Lead	5.1	14.8	--	55	11.8	25.1	120	9.0	116	144
Chromium	29.6	30.1	--	38.7	53	39.2	43.5	37	36.3	51.2
Copper	16.5	24.6	--	31.8	25.7	28.4	24.6	20.5	33	57.1
Zinc	36.6	41.4	--	111	51.6	66.9	45.6	44.2	103	225

TABLE 1. (cont.)

Site Name:	Evergreen Park													
Station ID:	BS01	BS01	BS01	BS01	BS02	BS03	BS04	BS05	BS06	BS06	BS06	BS06	BS07	BS07
Medium:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample Depth:	2.5-4.5	4.5-6.5	6.5- 8.5	8.5-10.5	5.5-7.5	7-9	7.5-9.5	3.5-5.5	3.5-5.5	5.5-7.5	7.5-9.5	3.5-5.5	3.5-5.5	5.5-7.5
TPH (ppm)														
Gasoline	--	--	--	--	--	--	--	5 U	--	--	--	5 U	--	--
Diesel	99.3	26.9	100	10 U	34.6	515	33.9	10 U	130	20.1	10 U	60.1	25.6	--
Oil	488	169	293	25 U	377	1,200	124	25 U	944	146	25 U	650	245	--
Volatile Organic Compounds (ppb)														
Benzene	--	--	--	--	--	--	--	50 U	--	--	--	50 U	--	--
Toluene	--	--	--	--	--	--	--	50 U	--	--	--	50 U	--	--
Ethylbenzene	--	--	--	--	--	--	--	50 U	--	--	--	50 U	--	--
Xylenes	--	--	--	--	--	--	--	100 U	--	--	--	100 U	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Butanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Semi-volatile Organic Compounds (ppm)														
Acenaphthene	0.010 U	--	--	--	--	0.0193	--	--	--	--	--	--	--	--
Acenaphthylene	0.010 U	--	--	--	--	0.0655	--	--	--	--	--	--	--	--
Anthracene	0.010 U	--	--	--	--	0.0352	--	--	--	--	--	--	--	--
Benzo[a]anthracene	0.010 U	--	--	--	--	0.174	--	--	--	--	--	--	--	--
Benzo[a]pyrene	0.050 U	--	--	--	--	0.116	--	--	--	--	--	--	--	--
Benzo[b]fluoranthene	0.050 U	--	--	--	--	0.732	--	--	--	--	--	--	--	--
Benzo[ghi]perylene	0.050 U	--	--	--	--	0.850	--	--	--	--	--	--	--	--
Benzo[k]fluoranthene	0.050 U	--	--	--	--	0.0687	--	--	--	--	--	--	--	--
Chrysene	0.248	--	--	--	--	0.296	--	--	--	--	--	--	--	--
Dibenz[a,h]anthracene	0.050 U	--	--	--	--	0.050 U	--	--	--	--	--	--	--	--
Fluoranthene	0.0149	--	--	--	--	0.169	--	--	--	--	--	--	--	--
Fluorene	0.010 U	--	--	--	--	0.010 U	--	--	--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene	0.050 U	--	--	--	--	0.0586	--	--	--	--	--	--	--	--
Naphthalene	0.010 U	--	--	--	--	0.010 U	--	--	--	--	--	--	--	--
Phenanthrene	0.0156	--	--	--	--	0.120	--	--	--	--	--	--	--	--
Pyrene	0.0223	--	--	--	--	0.414	--	--	--	--	--	--	--	--
Metals (ppm)														
Lead	41	--	--	--	--	16.5	--	--	--	--	--	--	--	--
Chromium	39.4	--	--	--	--	24.7	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 1. (cont.)

Site Name:	Evergreen Park										Loftus
Station ID:	BS07	BS08	BS08	BS08	BS09	BS10	BS11	BS01	BS07	LOFTA11	
Medium:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	GW	GW	SW	
Sample Depth:	7.5-9.5	3.5-5.5	5.5-7.5	7.5-9.5	3.5-5.5	3.5-5.5	3.5-5.5	4.5	5	N/A	
TPH (ppm)											
Gasoline	--	--	--	--	--	--	--	0.05 U	0.05 U	--	
Diesel	10 U	44.8	29.1	102	10 U	52.2	124	0.25 U	0.25 U	--	
Oil	25 U	371	220	336	25 U	472	1,240	0.75 U	0.75 U	5.8	
Volatile Organic Compounds (ppb)											
Benzene	--	--	--	--	--	--	--	0.05 U	0.05 U	--	
Toluene	--	--	--	--	--	--	--	0.05 U	0.05 U	--	
Ethylbenzene	--	--	--	--	--	--	--	0.05 U	0.05 U	--	
Xylenes	--	--	--	--	--	--	--	0.10 U	0.10 U	--	
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	
Acetone	--	--	--	--	--	--	--	--	--	--	
2-Butanone	--	--	--	--	--	--	--	--	--	--	
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	
Semi-volatile Organic Compounds (ppm)											
Acenaphthene	--	--	--	--	--	--	--	--	--	--	
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	
Anthracene	--	--	--	--	--	--	--	--	--	--	
Benzo[a]anthracene	--	--	--	--	--	--	--	--	--	--	
Benzo[a]pyrene	--	--	--	--	--	--	--	--	--	--	
Benzo[b]fluoranthene	--	--	--	--	--	--	--	--	--	--	
Benzo[ghi]perylene	--	--	--	--	--	--	--	--	--	--	
Benzo[k]fluoranthene	--	--	--	--	--	--	--	--	--	--	
Chrysene	--	--	--	--	--	--	--	--	--	--	
Dibenz[a,h]anthracene	--	--	--	--	--	--	--	--	--	--	
Fluoranthene	--	--	--	--	--	--	--	--	--	--	
Fluorene	--	--	--	--	--	--	--	--	--	--	
Indeno[1,2,3-cd]pyrene	--	--	--	--	--	--	--	--	--	--	
Naphthalene	--	--	--	--	--	--	--	--	--	--	
Phenanthrene	--	--	--	--	--	--	--	--	--	--	
Pyrene	--	--	--	--	--	--	--	--	--	--	
Metals (ppm)											
Lead	--	--	--	--	--	--	--	--	--	0.241	
Chromium	--	--	--	--	--	--	--	--	--	--	
Copper	--	--	--	--	--	--	--	--	--	--	
Zinc	--	--	--	--	--	--	--	--	--	--	

Note: -- - not analyzed
 GW - groundwater
 N/A - not applicable
 SW - surface water
 U - undetected at detection limit shown

Complete data summaries are provided in Failure (1996).

**TABLE 2. ANALYTICAL RESULTS FROM MOST
RECENT CHEVRON GROUNDWATER MONITORING**

	Minimum Concentration ($\mu\text{g/L}$)	Maximum Concentration ($\mu\text{g/L}$)
TPH		
Gasoline	50 <i>U</i>	1,610,000
Diesel	275 <i>U</i>	110,000
Oil	825 <i>U</i>	27,600
Petroleum Solvents		
Benzene	0.5 <i>U</i>	1,140
Toluene	0.5 <i>U</i>	1,500
Ethylbenzene	0.5 <i>U</i>	124
Xylenes	1.0 <i>U</i>	1,170
Metals		
Dissolved Lead	3.0 <i>U</i>	45

Note: *U* - undetected at detection limit shown

All data (except dissolved lead) are from sampling events conducted in 1996.

Complete data summaries are provided in Pacific (1997).

TABLE 3. FIELD-SCREENING RESULTS FOR SOIL AND GROUNDWATER SAMPLES

Station I.D.	Depth Interval (feet)	Sample No.	Thin-Layer Chromatography		PID	Sheen Test	Laboratory Analyses						
			TPH as Oil (ppm)	TPH as Diesel (ppm)			WTPH-D ext.	WTPH-G/BTEX	WA- EPH	WA- VPH	VOCs-8260	PCBs- 8080	Metals
Evergreen Park													
EP-01	0-3.0	SO0001	1,500-7,500	150-750	2.2	ND	X	X		X	X	X	
	3.0-6.0	SO0002	15,000	750-1,500	3.4	ND	X						
	6.0-9.0	NR	1,500-7,500	750-1,500	2.3	ND							
	9.0-12.0	SO0003	1,500	150	4.2	ND	X						
	6.4	GW0001	NA	NA	NA	NA	X	X					
EP-02	0-3.0	SO0005	1,500-7,500	150-750	5.1	ND	X		X		X		
	3.0-6.0	SO0006	750-1,500	150	3	ND						X	
	6.0-9.0	SO0007	750-1,500	150	3.6	ND	X						
EP-03	0-3.0	SO0009	7,500-15,000	750-1,500	2.2	ND	X	X		X	X		
	3.0-6.0	SO0010	1,500-7,500	150-750	2.5	ND						X	
	6.0-9.0	SO0011	1,500-7,500	150-750	3.6	ND						X	
EP-04	9.0-12.0	SO0012	1,500-7,500	150-750	4.5	ND	X						
	0-3.0	SO0013	7,500-15,000	750-1,500	0	ND	X	X	X	X	X	X	
	3.0-6.0	SO0014	15,000	1,500	6.2	ND						X	
	6.0-9.0	SO0015	7,500-15,000	1,500	5.1	ND	X						
Brem-Air													
BA-01	0-3.0	SO0017	1,500-7,500	150-750	6.7	ND	X						
	3.0-6.0	SO0018	1,500-7,500	150-750	26	ND						X	
	6.0-9.0	SO0019	1,500-7,500	150-750	0	ND						X	
BA-02	9.0-12.0	SO0020	NA	NA	NA	NA	X						
	0-3.0	SO0021	1,500	150	30.2	ND	X	X	X	X		X	
	3.0-6.0	SO0022	1,500	150	52.4	ND						X	
	6.0-9.0	SO0023	150	15	28.8	ND						X	
	9.0-12.0	SO0024	NA	NA	NA	NA	X	X					
	6.0	GW0002	NA	NA	NA	NA	X	X			X		
BA-03	0-3.0	SO0025	1,500	150-750	164	ND	X						
	3.0-6.0	SO0026	> 7,500	750-1,500	15.1	ND	X						
	6.0-9.0	SO0027	1,500	150	12.7	ND	X	X	X	X	X		
BA-04	0-3.0	SO0029	1,500	150	0	ND	X	X		X	X	X	
	3.0-6.0	SO0030	7,500	750	24	ND	X		X				
	6.0-9.0	SO0031	1,500	150	34.6	ND	X						
BA-05	0-3.0	SO0033	15,000	1,500	39.5	SS	X	X	X	X	X	X	
	3.0-6.0	SO0034	< 15,000	750-1,500	68.6	MS	X						
	6.0-9.0	SO0035	15,000	1,500	32.6	MS	X						
	9.0-12.0	SO0036	15,000	1,500	25.9	HS	X						
	4.7	GW0003	NA	NA	NA	NA	X	X	X	X	X	X	
BA-06	0-3.0	SO0037	7,500-15,000	750-1,500	29.5	SS	X						
	3.0-6.0	SO0038	7,500-15,000	750-1,500	13.9	SS						X	
	6.0-9.0	SO0039	1,500	150-750	13	SS	X						
BA-07	0-2.0	SO0041	15,000	1,500	18.9	MS	X	X	X	X	X	X	
	3.0-6.0	SO0042	15,000	> 1,500	27.9	HS	X						
	6.0-9.0	SO0043	7,500	750	45.8	SS	X						
BA-08	0-3.0	SO0045	1,500	150	7.3	MS	X	X		X			
	3.0-6.0	SO0046	> 7500	> 750	36.7	HS	X						
	6.0-9.0	SO0047	1,500-7,500	150-750	24.7	SS	X						
City of Bremerton-Depot													
CB-01	0-3.0	SO0049	1,500	150	NA	ND	X						
	3.0-6.0	SO0050	750-1,500	150	NA	ND						X	
	6.0-9.0	SO0051	750	150	NA	ND	X						
CB-02	0-3.0	SO0053	1,500-7,500	750	NA	ND	X	X	X	X	X	X	
	3.0-6.0	SO0054	1,500	150-750	NA	ND						X	
	6.0-9.0	NR	750-1,500	15-150	NA	ND							
	9.0-12.0	SO0056	750-1,500	15-150	NA	ND	X						

TABLE 3. (cont.)

Station I.D.	Depth Interval (feet)	Sample No.	Thin-Layer Chromatography			Sheen Test	Laboratory Analyses							
			TPH as Oil (ppm)	TPH as Diesel (ppm)	PID		WTPH-D ext.	WTPH-G/BTEX	WA-EPH	WA-VPH	VOCs-8260	PCBs-8080	Metals	ARCHIVE
CB-03	0-3.0	SO0057	7,500-15,000	750-1,500	7.8	ND	X	X	X	X		X		
	3.0-6.0	SO0058	7,500-15,000	750-1,500	9.6	ND								X
	6.0-9.0	SO0059	7,500-15,000	750-1,500	6.6	ND	X							
	7.0	GW0004	NA	NA	NA	NA	X	X	X	X			X	
Loftus														
LF-01	0-3.0	SO0061	7,500-15,000	150-750	0.4	ND	X	X	X	X	X		X	
	3.0-6.0	SO0062	1,500-7,500	150	0	ND	X							
LF-03	0-3.0	SO0065	7,500-15,000	750-1,500	15.4	SS	X	X	X	X		X		
LF-04	0-3.0	SO0073	1,500	150	52	SS	X	X	X	X		X	X	
	3.0-6.0	SO0074	> 7500	750-1,500	151	SS	X							
	6.0-9.0	SO0075	1,500-7,500	1,500	179	SS	X							
	3.75	GW0005	NA	NA	NA	NA	X	X	X	X	X		X	
LF-05	0-3.0	SO0077	7,500	1,500	0	ND	X	X	X	X			X	
	3.0-6.0	SO0078	7,500	1,500	0	ND	X							
	6.0-9.0	SO0079	1,500	150	0	ND	X							
LF-06	0-3.0	SO0081	7,500-15,000	750-1,500	0	ND	X	X		X	X	X	X	
	3.0-6.0	SO0082	1,500	15-150	0	ND	X							
	6.0-9.0	SO0083	150	8-15	4.9	ND	X							
LF-07	5.0	GW0006	NA	NA	NA	NA	X	X				X		
	0-3.0	SO0085	150	15-150	0	ND	X							
	3.0-6.0	SO0086	> 7,500	750-1,500	0	ND	X	X	X	X	X			
	6.0-9.0	SO0087	1,500-7,500	150-750	0	ND	X							
Puget Power														
PP-01	0-3.0	SO0089	150-1,500	15-150	0	ND	X					X	X	
	3.0-6.0	SO0090	150-1,500	15-150	0	ND								X
	6.0-9.0	SO0091	150-1,500	15-150	0	ND	X							
	4.2	GW0007	NA	NA	NA	NA	X	X						
PP-02	0-3.0	SO0093	150-1,500	15-150	0	ND	X	X	X	X	X			
	3.0-6.0	SO0094	150-1,500	15-150	0	ND								X
	6.0-9.0	SO0095	150-1,500	15-150	0	ND	X							
Quality Assurance														
Duplicate 1	LF-07/3'	SO0097	NA	NA	NA	NA	X							
Duplicate 2	BA-03/9'	SO0098	NA	NA	NA	NA	X	X	X	X		X		
Duplicate 3	CB-02/3'	SO0101	NA	NA	NA	NA	X	X	X	X	X	X	X	
rinsate	N/A	GW0008	NA	NA	NA	NA	X	X	X	X	X	X	X	
Duplicate 1	BA-02/6'	GW0009	NA	NA	NA	NA	X	X				X		
Duplicate 2	CB-03/7'	GW0010	NA	NA	NA	NA			X	X			X	
Trip blank	N/A	GW0011	NA	NA	NA	NA		X		X	X			

- Note:**
- NA - not analyzed
 - ND - no sheen detected
 - NR - not enough volume recovered for sample collection
 - N/A - not applicable
 - TPH - total petroleum hydrocarbons
 - PID - photoionization detector
 - SO - soil sample
 - GW - groundwater sample
 - WTPH-D ext. - Washington State total petroleum hydrocarbons, diesel extended
 - WTPH-G/BTEX - Washington State total petroleum hydrocarbons, gasoline, benzene, toluene, ethylbenzene, and xylene
 - WA-EPH - Washington State extractable petroleum hydrocarbons
 - WA-VPH - Washington State volatile petroleum hydrocarbons
 - VOC - volatile organic compound
 - PCB - polychlorinated biphenyl
 - Metals - arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury

TABLE 4. FIELD PARAMETER MEASUREMENTS IN GROUNDWATER

Borehole ID	Sample ID	Date	Time	Water Level	Screen Interval	Temperature (°C)	pH	Specific Conductivity (ms/cm)	Dissolved Oxygen (mg/L)	Comments
EP-01	GW0001	4/8/97	0950	6.40	NA	11.9	6.39	576	NM	Water is turbid and dark grey, with a slight odor.
BA-02	GW0002	4/8/97	1220	6.00	6-12	25.0	6.58	NM	2.51	None.
BA-05	GW0003	4/8/97	1700	4.70	6-10	NM	NM	NM	NM	No parameters were measured because water appeared to be impacted.
CB-03	GW0004	4/9/97	1125	7.00	7-11	11.9	4.57	904	1.31	None.
LF-04	GW0005	4/7/97	1300	3.75	4-8	NM	NM	105	130.1 ^a	None.
LF-06	GW0006	4/7/97	1530	5.00	5-9	19.3	4.00	192	3.15	None.
PP-01	GW0007	4/7/97	1815	4.20	4-8	12.0	5.02	370	3.7	Water is light tan and cloudy, with no odor.

Note: NA - not available
 NM - not measured

Field notes taken from borehole logs and field notebook.

^a Probable measurement error.

TABLE 5. SUMMARY OF 8015 MODIFIED RESULTS FOR SOIL SAMPLES

Station	Sample Number	Date	Field rep.	Depth Range (ft.)	Gasoline dry	Mineral Spirits dry	Jet fuel dry	Kerosene dry	Diesel fuel dry	Oil dry
BA-01	SO0017	04/07/97		0 - 3	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ	10.0 U	187
BA-01	SO0020	04/07/97		9 - 12	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ	10.0 U	151
BA-02	SO0021	04/08/97		0 - 3	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	20.0 U
BA-02	SO0024	04/08/97		9 - 12	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	20.0 U
BA-03	SO0025	04/08/97		0 - 3	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	387
BA-03	SO0026	04/08/97		3 - 6	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	176
BA-03	SO0027	04/08/97	1	6 - 9	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	20.0 U
BA-03	SO0098	04/08/97	2	6 - 9	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	20.0 U
BA-04	SO0029	04/08/97		0 - 3	10.0 U	10.0 U	10.0 U	10.0 U	163	371
BA-04	SO0030	04/08/97		3 - 6	10.0 U	10.0 U	10.0 U	10.0 U	120	170
BA-04	SO0031	04/08/97		6 - 9	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	198
BA-05	SO0033	04/08/97		0 - 3	20.0 U	20.0 U	20.0 U	20.0 U	934	1190
BA-05	SO0034	04/08/97		3 - 6	20.0 U	20.0 U	20.0 U	20.0 U	5,020	524
BA-05	SO0035	04/08/97		6 - 9	20.0 U	20.0 U	20.0 U	20.0 U	11,600	6,090
BA-05	SO0036	04/08/97		9 - 12	20.0 U	20.0 U	20.0 U	20.0 U	10,500	8,060
BA-06	SO0037	04/08/97		0 - 3	20.0 U	20.0 U	20.0 U	20.0 U	10.0 U	968
BA-06	SO0039	04/08/97		6 - 9	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	8,210
BA-07	SO0041	04/09/97		0 - 2	102 JN	10.0 U	10.0 U	10.0 U	10.0 U	6,600
BA-07	SO0042	04/09/97		3 - 6	20.0 U	20.0 U	20.0 U	20.0 U	364 JN	3,370
BA-07	SO0043	04/09/97		6 - 9	10.0 U	10.0 U	10.0 U	10.0 U	4,740 JN	1,400
BA-08	SO0045	04/09/97		0 - 3	10.0 U	10.0 U	10.0 U	10.0 U	16.0	76.0
BA-08	SO0046	04/09/97		3 - 6	10.0 U	10.0 U	10.0 U	10.0 U	5,390 JN	20.0 U
BA-08	SO0047	04/09/97		6 - 9	10.0 U	10.0 U	10.0 U	10.0 U	918 JN	20.0 U
CB-01	SO0049	04/09/97		0 - 3	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	579
CB-01	SO0051	04/09/97		6 - 9	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	64
CB-02	SO0053	04/09/97	1	0 - 3	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	1,700
CB-02	SO0101	04/09/97	2	0 - 3	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	2,000
CB-02	SO0056	04/09/97		9 - 12	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	20.0 U
CB-03	SO0057	04/09/97		0 - 3	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	1270
CB-03	SO0059	04/09/97		6 - 9	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	185
EP-01	SO0001	04/08/97		0 - 3	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	187
EP-01	SO0002	04/08/97		3 - 6	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	143

TABLE 6. (cont.)

Analyte	BA-07	BA-08	CB-02	CB-02	CB-03	EP-01	EP-02	EP-03
	SO0041 04/09/97	SO0045 04/09/97	SO0053 04/09/97	SO0101 04/09/97	SO0057 04/09/97	SO0001 04/08/97	SO0005 04/08/97	SO0009 04/08/97
	0.00-2.00 FT	0.00-3.00 FT	0.00-3.00 FT 1	0.00-3.00 FT 2	0.00-3.00 FT	0.00-3.00 FT	0.00-3.00 FT	0.00-3.00 FT
Gas/BTEX								
Gasoline	39.0 <i>JN</i>	5.0 <i>U</i>	6.0 <i>JN</i>	5.0 <i>JN</i>	5.0 <i>U</i>	5.0 <i>U</i>		5.0 <i>U</i>
Benzene	0.050 <i>U</i>	0.050 <i>U</i>	0.050 <i>U</i>	0.050 <i>U</i>	0.050 <i>U</i>	0.050 <i>U</i>		0.1 <i>U</i>
Toluene	0.10 <i>U</i>	0.10 <i>U</i>	0.10 <i>U</i>	0.10 <i>U</i>	0.10 <i>U</i>	0.10 <i>U</i>		0.10 <i>U</i>
Ethylbenzene	0.10 <i>U</i>	0.10 <i>U</i>	0.10 <i>U</i>	0.10 <i>U</i>	0.10 <i>U</i>	0.10 <i>U</i>		0.10 <i>U</i>
Xylene isomers	0.20	0.10 <i>U</i>	0.10 <i>U</i>	0.10 <i>U</i>	0.10 <i>U</i>	0.10 <i>U</i>		0.10 <i>U</i>
Extractable Petroleum Hydrocarbons								
C ₈ -C ₁₀ Aliphatics	8.7		0.50 <i>U</i>	0.5 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
C ₁₀ -C ₁₂ Aliphatics	8.7		0.50 <i>U</i>	0.5 <i>U</i>	0.90		0.50 <i>U</i>	
C ₁₂ -C ₁₆ Aliphatics	42.3		5.4	2.1	16.0		0.50 <i>U</i>	
C ₁₆ -C ₂₁ Aliphatics	220		26.0	23.1	48.0		0.50 <i>U</i>	
C ₁₀ -C ₁₂ Aromatics	0.90		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
C ₁₂ -C ₁₆ Aromatics	3.4		0.50 <i>U</i>	1.1	2.0		0.50 <i>U</i>	
C ₁₆ -C ₂₁ Aromatics	88.0 <i>J</i>		21.0 <i>J</i>	25.3	28.0 <i>J</i>		0.50 <i>U</i>	
C ₂₁ -C ₃₄ Aromatics	520 <i>J</i>		310 <i>J</i>	431	400 <i>J</i>		0.50 <i>U</i>	
Naphthalene	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
2-Methylnaphthalene	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Acenaphthylene	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Acenaphthene	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Fluorene	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Phenanthrene	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Anthracene	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Fluoranthene	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Pyrene	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Benzo[a]anthracene	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Chrysene	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Total benzofluoranthenes (b + k)	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Benzo[a]pyrene	0.50 <i>U</i>		1.3	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Indeno[1,2,3-cd]pyrene + dibenz[a,h]anthracene	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Benzo[ghi]perylene	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	
Volatile Petroleum Hydrocarbons								
C ₅ -C ₆ Aliphatics	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>		5.0 <i>U</i>
C ₆ -C ₈ Aliphatics	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>		5.0 <i>U</i>
C ₈ -C ₁₀ Aliphatics	12.0	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>		5.0 <i>U</i>

TABLE 6. (cont.)

Analyte	BA-07	BA-08	CB-02	CB-02	CB-03	EP-01	EP-02	EP-03
	SO0041	SO0045	SO0053	SO0101	SO0057	SO0001	SO0005	SO0009
	04/09/97	04/09/97	04/09/97	04/09/97	04/09/97	04/08/97	04/08/97	04/08/97
			1	2				
	0.00-2.00 FT	0.00-3.00 FT	0.00-3.00 FT	0.00-3.00 FT	0.00-3.00 FT	0.00-3.00 FT	0.00-3.00 FT	0.00-3.00 FT
C ₁₀ -C ₁₂ Aliphatics	20.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U		5.0 U
C ₈ -C ₁₀ Aromatics	8.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U		5.0 U
C ₁₀ -C ₁₂ Aromatics	7.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U		5.0 U
C ₁₂ -C ₁₃ Aromatics	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U		5.0 U
Methyl Tert Butylether	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U		0.50 U
Benzene	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U		0.50 U
Toluene	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U		0.50 U
Ethylbenzene	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U		0.50 U
<i>para</i> - and <i>meta</i> -Xylene isomers	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U		0.50 U
<i>ortho</i> -Xylene	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U		0.50 U
Naphthalene	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U		0.50 U

TABLE 6. (cont.)

	EP-04 SO0013 04/07/97	LF-01 SO0061 04/07/97	LF-03 SO0065 04/08/97	LF-04 SO0073 04/07/97	LF-05 SO0077 04/07/97	LF-06 SO0081 04/07/97	LF-07 SO0086 04/07/97	PP-02 SO0093 04/07/97
Analyte	0.00-3.00 FT	0.00-3.00 FT	0.00-3.00 FT	0.00-3.00 FT	0.00-3.00 FT	0.00-3.00 FT	3.00-6.00 FT	0.00-3.00 FT
Gas/BTEX								
Gasoline	5.0 <i>UJ</i>	5.0 <i>UJ</i>	15.0 <i>JN</i>	120 <i>JN</i>	5.0 <i>UJ</i>	5.0 <i>UJ</i>	5.0 <i>UJ</i>	5.0 <i>U</i>
Benzene	0.050 <i>UJ</i>	0.050 <i>UJ</i>	0.050 <i>U</i>	0.050 <i>UJ</i>	0.050 <i>UJ</i>	0.050 <i>UJ</i>	0.050 <i>UJ</i>	0.050 <i>U</i>
Toluene	0.10 <i>UJ</i>	0.10 <i>UJ</i>	0.10 <i>U</i>	0.10 <i>UJ</i>	0.10 <i>UJ</i>	0.10 <i>UJ</i>	0.10 <i>UJ</i>	0.10 <i>U</i>
Ethylbenzene	0.10 <i>UJ</i>	0.10 <i>UJ</i>	0.10 <i>U</i>	0.10 <i>UJ</i>	0.10 <i>UJ</i>	0.10 <i>UJ</i>	0.10 <i>UJ</i>	0.10 <i>U</i>
Xylene isomers	0.10 <i>UJ</i>	0.10 <i>UJ</i>	0.10 <i>U</i>	0.20 <i>J</i>	0.10 <i>UJ</i>	0.10 <i>UJ</i>	0.10 <i>UJ</i>	0.10 <i>U</i>
Extractable Petroleum Hydrocarbons								
C ₈ -C ₁₀ Aliphatics	5.0 <i>U</i>	5.0 <i>U</i>	2.0	5.0 <i>U</i>	5.0 <i>U</i>		5.0 <i>U</i>	5.0 <i>U</i>
C ₁₀ -C ₁₂ Aliphatics	5.0 <i>U</i>	5.0 <i>U</i>	6.5	21.0	5.0 <i>U</i>		5.0 <i>U</i>	5.0 <i>U</i>
C ₁₂ -C ₁₆ Aliphatics	5.0 <i>U</i>	5.0 <i>U</i>	152	89.0	5.0 <i>U</i>		5.0 <i>U</i>	5.0 <i>U</i>
C ₁₆ -C ₂₁ Aliphatics	5.0 <i>U</i>	5.0 <i>U</i>	450	118	10.0		5.0 <i>U</i>	5.0 <i>U</i>
C ₁₀ -C ₁₂ Aromatics	5.0 <i>U</i>	5.0 <i>U</i>	0.50 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>		5.0 <i>U</i>	5.0 <i>U</i>
C ₁₂ -C ₁₆ Aromatics	5.0 <i>U</i>	5.0 <i>U</i>	7.6	6.0	5.0 <i>U</i>		5.0 <i>U</i>	5.0 <i>U</i>
C ₁₆ -C ₂₁ Aromatics	5.0 <i>U</i>	5.0 <i>U</i>	207	38.0	5.0 <i>U</i>		5.0 <i>U</i>	5.0 <i>U</i>
C ₂₁ -C ₃₄ Aromatics	6.0	5.0 <i>U</i>	480	22.0	10.0		24.0	5.0 <i>U</i>
Naphthalene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
2-Methylnaphthalene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
Acenaphthylene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
Acenaphthene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
Fluorene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
Phenanthrene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
Anthracene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
Fluoranthene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
Pyrene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
Benzo[a]anthracene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
Chrysene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
Total benzofluoranthenes (b + k)	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.60	0.50 <i>U</i>
Benzo[a]pyrene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
Indeno[1,2,3-cd]pyrene								
+ dibenz[a,h]anthracene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
Benzo[ghi]perylene	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>	0.50 <i>U</i>		0.50 <i>U</i>	0.50 <i>U</i>
Volatile Petroleum Hydrocarbons								
C ₅ -C ₆ Aliphatics	5.0 <i>UJ</i>	5.0 <i>UJ</i>	5.0 <i>U</i>	5.0 <i>UJ</i>	5.0 <i>UJ</i>	5.0 <i>U</i>	5.0 <i>UJ</i>	5.0 <i>U</i>
C ₆ -C ₈ Aliphatics	5.0 <i>UJ</i>	5.0 <i>UJ</i>	5.0 <i>U</i>	5.0 <i>UJ</i>	5.0 <i>UJ</i>	5.0 <i>U</i>	5.0 <i>UJ</i>	5.0 <i>U</i>
C ₈ -C ₁₀ Aliphatics	5.0 <i>UJ</i>	5.0 <i>UJ</i>	5.0 <i>U</i>	5.0 <i>UJ</i>	5.0 <i>UJ</i>	5.0 <i>U</i>	5.0 <i>UJ</i>	5.0 <i>U</i>

TABLE 7. (cont.)

Analyte	BA-04	BA-05	BA-07	CB-02	CB-02	EP-01	EP-03
	SO0029	SO0033	SO0041	SO0053	SO0101	SO0001	SO0009
	04/08/97	04/08/97	04/09/97	04/09/97	04/09/97	04/08/97	04/08/97
	0.00-3.00 FT	0.00-3.00 FT	0.00-2.00 FT	1 0.00-3.00 FT	2 0.00-3.00 FT	0.00-3.00 FT	0.00-3.00 FT
Carbon tetrachloride	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Chlorobenzene	5.0 U	10.0 U	47.0 J	5.0 U	5.0 U	5.0 U	5.0 U
Chloroethane	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Chloroform	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Chloromethane	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
cis-1,2-Dichloroethene	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
cis-1,3-Dichloropropene	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Dibromochloromethane	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Dibromomethane	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Dichlorodifluoromethane	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
EDB-Ethylene bromide	20.0 U	40.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
Ethylbenzene	5.0 U	23.0	15.0 J	5.0 U	5.0 U	5.0 U	5.0 U
Hexachlorobutadiene	20.0 U	40.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
Isopropylbenzene	20.0 U	40.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
Methylene chloride	10.0 U	20.0 U	25.0 J	18.0	10.0 U	10.0 U	10.0 U
N-Butylbenzene	20.0 U	40.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
N-Propylbenzene	20.0 U	40.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
Naphthalene	20.0 U	300	21.0 J	20.0 U	20.0 U	20.0 U	20.0 U
Sec Butylbenzene	20.0 U	40.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
Styrene	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Tert Butylbenzene	20.0 U	40.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
Tetrachloroethene	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Toluene	5.0 U	10.0 U	6.0 J	5.0 U	5.0 U	5.0 U	5.0 U
Trans-1,2-dichloroethene	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Trans-1,3-Dichloropropene	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Trichloroethene	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Trichlorofluoromethane	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Vinyl chloride	5.0 U	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Xylene isomers	5.0 U	29.0	57.0 J	5.0 U	5.0 U	5.0 U	5.0 U

TABLE 7. (cont.)

Analyte	LF-01		LF-06		LF-07		PP-02	
	S00061		S00081		S00086		S00093	
	04/07/97		04/07/97		04/07/97		04/07/97	
	0.00-3.00 FT		0.00-3.00 FT		3.00-6.00 FT		0.00-3.00 FT	
1,1,1,2-Tetrachloroethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
1,1,1-Trichloroethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
1,1,2,2-Tetrachloroethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
1,1,2-Trichloroethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
1,1-Dichloroethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
1,1-Dichloroethene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
1,1-Dichloropropene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
1,2,3-Trichlorobenzene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
1,2,3-Trichloropropane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
1,2,4-Trichlorobenzene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
1,2,4-Trimethylbenzene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
1,2-Dibromo-3-chloropropane	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
1,2-Dichlorobenzene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
1,2-Dichloroethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
1,2-Dichloropropane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
1,3,5-Trimethylbenzene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
1,3-Dichlorobenzene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
1,3-Dichloropropane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
1,4-Dichlorobenzene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
2,2-Dichloropropane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
2-Butanone (MEK)	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
2-Chlorotoluene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
2-Hexanone	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
4-Chlorotoluene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
4-Isopropyltoluene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
4-Methyl-2-pentanone (MIBK)	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
Acetone	50.0	UJ	50.0	U	50.0	UJ	50.0	UJ
Benzene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Bromobenzene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Bromochloromethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Bromodichloromethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Bromoform	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Bromomethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Carbon disulfide	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ

TABLE 6. (cont.)

Analyte	BA-02	BA-02	BA-03	BA-03	BA-04	BA-04	BA-05
	S00021	S00024	S00027	S00098	S00029	S00030	S00033
	04/08/97	04/08/97	04/08/97	04/08/97	04/08/97	04/08/97	04/08/97
			1	2			
	0.00-3.00 FT	9.00-12.00 FT	6.00-9.00 FT	6.00-9.00 FT	0.00-3.00 FT	3.00-6.00 FT	0.00-3.00 FT
C ₁₀ -C ₁₂ Aliphatics	5.0 U		5.0 U	5.0 U	5.0 U		20.0
C ₈ -C ₁₀ Aromatics	5.0 U		5.0 U	5.0 U	5.0 U		5.0 U
C ₁₀ -C ₁₂ Aromatics	5.0 U		5.0 U	5.0 U	5.0 U		14.0
C ₁₂ -C ₁₃ Aromatics	5.0 U		5.0 U	5.0 U	5.0 U		5.0 U
Methyl Tert Butylether	0.50 U		0.50 U	0.50 U	0.50 U		0.50 U
Benzene	0.50 U		0.50 U	0.50 U	0.50 U		0.50 U
Toluene	0.50 U		0.50 U	0.50 U	0.50 U		0.50 U
Ethylbenzene	0.50 U		0.50 U	0.50 U	0.50 U		0.50 U
<i>para</i> - and <i>meta</i> -Xylene isomers	0.50 U		0.50 U	0.50 U	0.50 U		0.50 U
<i>ortho</i> -Xylene	0.50 U		0.50 U	0.50 U	0.50 U		0.50 U
Naphthalene	0.50 U		0.50 U	0.50 U	0.50 U		0.60

TABLE 7. (cont.)

Analyte	LF-01		LF-06		LF-07		PP-02	
	S00061 04/07/97		S00081 04/07/97		S00086 04/07/97		S00093 04/07/97	
	0.00-3.00 FT		0.00-3.00 FT		3.00-6.00 FT		0.00-3.00 FT	
Carbon tetrachloride	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Chlorobenzene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Chloroethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Chloroform	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Chloromethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
cis-1,2-Dichloroethene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
cis-1,3-Dichloropropene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Dibromochloromethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Dibromomethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Dichlorodifluoromethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
EDB-Ethylene bromide	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
Ethylbenzene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Hexachlorobutadiene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
Isopropylbenzene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
Methylene chloride	12.0	J	15.0		13.0	J	10.0	UJ
N-Butylbenzene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
N-Propylbenzene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
Naphthalene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
Sec Butylbenzene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
Styrene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Tert Butylbenzene	20.0	UJ	20.0	U	20.0	UJ	20.0	UJ
Tetrachloroethene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Toluene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Trans-1,2-dichloroethene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Trans-1,3-Dichloropropene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Trichloroethene	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Trichlorofluoromethane	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Vinyl chloride	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ
Xylene isomers	5.0	UJ	5.0	U	5.0	UJ	5.0	UJ

Note: Results reported in $\mu\text{g}/\text{kg}$ dry weight.

U - undetected at the limit shown
 J - estimated

TABLE 8. SUMMARY OF METAL RESULTS FOR SOIL SAMPLES

Station	Sample Number	Date	Field rep.	Depth Range (ft.)	Arsenic	Barium	Cadmium	Chromium	Lead	Total	Selenium	Silver
					dry	dry	dry	dry	dry	mercury dry	dry	dry
BA-02	SO0021	04/08/97		0 - 3	3.0	128	1.0 U	42.5	41.5	0.20 U	1.0 U	2.0 U
BA-03	SO0027	04/08/97	1	6 - 9	2.0	9.0	1.0 U	20.0	4.0	0.20 U	1.0 U	2.0 U
BA-04	SO0029	04/08/97		0 - 3	42.0	74.0	1.0 U	19.0	20.0	0.20 U	1.0 U	2.0 U
BA-05	SO0033	04/08/97		0 - 3	2.0	65.0	1.0 U	28.0	18.0	0.20 U	1.0 U	2.0 U
BA-07	SO0041	04/09/97		0 - 2	2.0	58.0	1.0	38.0	169	0.20 U	1.0 U	2.0 U
CB-02	SO0053	04/09/97	1	0 - 3	3.0	48.0	1.0 U	25.0	41.0	0.20 U	1.0 U	2.0 U
CB-02	SO0101	04/09/97	2	0 - 3	3.0	48.0	1.0 U	25.0	29.0	0.20 U	1.0 U	2.0 U
EP-01	SO0001	04/08/97		0 - 3	2.0	52.0	1.0 U	27.0	8.0	0.20 U	1.0 U	2.0 U
EP-04	SO0013	04/07/97		0 - 3	5.0	115	1.0 U	23.0	81.0 J	0.20 U	1.0 U	2.0 U
LF-01	SO0061	04/07/97		0 - 3	2.0	67.5	1.0 U	26.5	8.0 J	0.20 U	1.0 U	2.0 U
LF-04	SO0073	04/07/97		0 - 3	3.0	76.0	1.0 U	35.0	9.0 J	0.20 U	1.0 U	2.0 U
LF-05	SO0077	04/07/97		0 - 3	2.0	102	1.0 U	33.0	54.0 J	0.20 U	1.0 U	2.0 U
LF-06	SO0081	04/07/97		0 - 3	3.0	76.0	1.0 U	36.0	53.0	0.20 U	1.0 U	2.0 U
PP-01	SO0089	04/07/97		0 - 3	3.0	136	1.0 U	26.0	149 J	0.20 U	1.0 U	2.0 U

Note: J - estimated
U - undetected at the limit shown

All results reported in mg/kg.

TABLE 9. SUMMARY OF PCB RESULTS FOR SOIL SAMPLES

Station	Sample Number	Date	Field rep.	Depth Range (ft.)	Aroclor®							
					1016	1221	1232	1242	1248	1254	1260	
BA-03	SO0027	04/08/97	1	6 - 9	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
BA-03	SO0098	04/08/97	2	6 - 9	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
BA-05	SO0033	04/08/97		0 - 3	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
BA-07	SO0041	04/09/97		0 - 2	0.20 U	0.20 U	0.30 U	0.40 U	0.50 U	0.30 U	0.20 JN	0.10 U
CB-02	SO0053	04/09/97	1	0 - 3	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
CB-03	SO0057	04/09/97		0 - 3	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
EP-02	SO0005	04/08/97		0 - 3	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
EP-04	SO0013	04/07/97		0 - 3	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
LF-03	SO0065	04/08/97		0 - 3	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
LF-04	SO0073	04/07/97		0 - 3	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
LF-06	SO0081	04/07/97		0 - 3	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
PP-01	SO0089	04/07/97		0 - 3	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U

Note: All results reported in mg/kg.

- U* - undetected at the limit shown
- J* - estimated
- N* - tentatively identified

TABLE 10. SUMMARY OF 8015 MODIFIED RESULTS FOR GROUNDWATER SAMPLES

Analyte	Meas Basis	BA-02	BA-02	BA-05	CB-03	EP-01	LF-04	LF-06	PP-01
		GW0002	GW0009	GW0003	GW0004	GW0001	GW0005	GW0006	GW0007
		04/08/97	04/08/97	04/08/97	04/09/97	04/08/97	04/07/97	04/07/97	04/07/97
		1	2		1				
Gasoline	whl	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>
Mineral Spirits	whl	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>
Jet fuel	whl	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>
Kerosene	whl	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>	50.0 <i>U</i>
Diesel fuel	whl	50.0 <i>U</i>	50.0 <i>U</i>	8,460	50.0 <i>U</i>	50.0 <i>U</i>	30,800 <i>JN</i>	50.0 <i>U</i>	375 <i>JN</i>
Oil	whl	200 <i>U</i>	200 <i>U</i>	200 <i>U</i>	325	1,060	200 <i>U</i>	200 <i>U</i>	200 <i>U</i>

Note: All results reported in $\mu\text{g/L}$.

- U* - undetected at the limit shown
- J* - estimated
- N* - tentatively identified

TABLE 11. SUMMARY OF GAS/BTEX, EPH, AND VPH RESULTS FOR GROUNDWATER SAMPLES

Analyte	Meas. Basis	GW0002	GW0009	GW0003	GW0004	GW0010	GW0001	GW0005	GW0006	GW0007
		BA-02 04/08/97 1	BA-02 04/08/97 2	BA-05 04/08/97	CB-03 04/09/97 1	CB-03 04/09/97 2	EP-01 04/08/97	LF-04 04/07/97	LF-06 04/07/97	PP-01 04/07/97
Gas/BTEX										
Gasoline	whl	50.0 U	50.0 U	810 JN	50.0 U		50.0 U	1,900 JN	88 JN	50 U
Benzene	whl	0.50 U	0.50 U	150	0.50 U		0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	whl	1.0 U	1.0 U	4.0	1.0 U		1.0 U	13	1.0 U	1.0 U
Toluene	whl	1.0 U	1.0 U	2.0	1.0 U		1.0 U	1.0 U	1.0 U	1.0 U
Xylene isomers	whl	1.0 U	1.0 U	6.0	1.0 U		1.0 U	2.0	1.0 U	1.0 U
Extractable Petroleum Hydrocarbons										
C ₈ -C ₁₀ Aliphatics	whl			9 J	5.0 UJ	5.0 U		44		
C ₁₀ -C ₁₂ Aliphatics	whl			11 J	5.0 UJ	5.0 U		530		
C ₁₂ -C ₁₆ Aliphatics	whl			24 J	5.0 UJ	5.0 U		1,400		
C ₁₆ -C ₂₁ Aliphatics	whl			41 J	5.0 UJ	5.0 U		710		
C ₁₀ -C ₁₂ Aromatics	whl				5.0 U	5.0 U		450		
C ₁₂ -C ₁₆ Aromatics	whl			415	5.0 U	5.0 U		710		
C ₁₆ -C ₂₁ Aromatics	whl			160	5.0 U	5.0 U		840		
C ₂₁ -C ₃₄ Aromatics	whl			164	5.0 U	10		144		
Naphthalene	whl				5.0 U	5.0 U		11 U		
2-Methylnaphthalene	whl			50 U	5.0 U	5.0 U		114 U		
Acenaphthylene	whl			5.0 U	5.0 U	5.0 U		5.0 U		
Acenaphthene	whl			5.0 U	5.0 U	5.0 U		5.0		
Fluorene	whl			5.0 U	5.0 U	5.0 U		11 U		
Phenanthrene	whl			5.0 U	5.0 U	5.0 U		5.0 U		
Anthracene	whl			5.0 U	5.0 U	5.0 U		5.0 U		
Fluoranthene	whl			5.0 U	5.0 U	5.0 U		5.0 U		
Pyrene	whl			5.0 U	5.0 U	5.0 U		5.0 U		
Benzo[a]anthracene	whl			5.0 U	5.0 U	5.0 U		5.0 U		
Chrysene	whl			5.0 U	5.0 U	5.0 U		5.0 U		
Total benzofluoranthenes (b + k)	whl			5.0 U	5.0 U	5.0 U		5.0 U		
Benzo[a]pyrene	whl			5.0 U	5.0 U	5.0 U		5.0 U		
Indeno(1,2,3-cd)pyrene										
+ dibenz(a,h)anthracene	whl			5.0 U	5.0 U	5.0 U		5.0 U		
Benzo[ghi]perylene	whl			5.0 U	5.0 U	5.0 U		5.0 U		
Volatile Petroleum Hydrocarbons										
C ₅ -C ₆ Aliphatics	whl			95	50.0 U	50.0 U		50.0 U		
C ₆ -C ₈ Aliphatics	whl			62	50.0 U	50.0 U		50.0 U		
C ₈ -C ₁₀ Aliphatics	whl			59	50.0 U	50.0 U		100		

TABLE 11. (cont.)

Analyte	Meas. Basis	GW0002	GW0009	GW0003	GW0004	GW0010	GW0001	GW0005	GW0006	GW0007
		BA-02 04/08/97	BA-02 04/08/97	BA-05 04/08/97	CB-03 04/09/97	CB-03 04/09/97	EP-01 04/08/97	LF-04 04/07/97	LF-06 04/07/97	PP-01 04/07/97
Volatile Petroleum Hydrocarbons (cont.)										
C ₁₀ -C ₁₂ Aliphatics	whl			600	50.0 U	50.0 U		1,500		
C ₈ -C ₁₀ Aromatics	whl			83	50.0 U	50.0 U		180		
C ₁₀ -C ₁₂ Aromatics	whl			560	50.0 U	50.0 U		1,000		
C ₁₂ -C ₁₃ Aromatics	whl			50.0 U	50.0 U	50.0 U		50.0 U		
Methyl Tert Butylether	whl			5.0 U	5.0 U	5.0 U		5.0 U		
Benzene	whl			160	5.0 U	5.0 U		0.50 U		
Toluene	whl			5.0 U	5.0 U	5.0 U		1.0 U		
Ethylbenzene	whl			5.0 U	5.0 U	5.0 U		15		
<i>para</i> - and <i>meta</i> -Xylene isomers	whl			5.0 U	5.0 U	5.0 U		2.0		
<i>ortho</i> -Xylene	whl			5.0 U	5.0 U	5.0 U		1.0 U		
Naphthalene	whl			27	5.0 U	5.0 U		5.0 U		

Note: All results reported in $\mu\text{g/L}$.

- U* - undetected at the limit shown
- J* - estimated
- N* - tentatively identified

**TABLE 12. SUMMARY OF VOLATILE ORGANIC COMPOUND
RESULTS FOR GROUNDWATER SAMPLES**

Analyte	Meas. Basis	BA-05	LF-04
		GW0003 04/08/97	GW0005 04/07/97
1,1,1,2-Tetrachloroethane	whl	2.0 U	10.0 U
1,1,1-Trichloroethane	whl	2.0 U	10.0 U
1,1,2,2-Tetrachloroethane	whl	2.0 U	10.0 U
1,1,2-Trichloroethane	whl	2.0 U	10.0 U
1,1-Dichloroethane	whl	2.0 U	10.0 U
1,1-Dichloroethene	whl	2.0 U	10.0 U
1,1-Dichloropropene	whl	2.0 U	10.0 U
1,2,3-Trichlorobenzene	whl	10.0 U	40.0 U
1,2,3-Trichloropropane	whl	2.0 U	10.0 U
1,2,4-Trichlorobenzene	whl	10.0 U	40.0 U
1,2,4-Trimethylbenzene	whl	10.0 U	40.0 U
1,2-Dibromo-3-chloropropane	whl	10.0 U	40.0 U
1,2-Dichlorobenzene	whl	2.0 U	10.0 U
1,2-Dichloroethane	whl	2.0 U	10.0 U
1,2-Dichloropropane	whl	2.0 U	10.0 U
1,3,5-Trimethylbenzene	whl	10.0 U	40.0 U
1,3-Dichlorobenzene	whl	2.0 U	10.0 U
1,3-Dichloropropane	whl	2.0 U	10.0 U
1,4-Dichlorobenzene	whl	2.0 U	10.0 U
2,2-Dichloropropane	whl	2.0 U	10.0 U
2-Butanone (MEK)	whl	100 U	400 U
2-Chlorotoluene	whl	10.0 U	40.0 U
2-Hexanone	whl	100 U	400 U
4-Chlorotoluene	whl	10.0 U	40.0 U
4-Isopropyltoluene	whl	10.0 U	40.0 U
4-Methyl-2-pentanone (MIBK)	whl	100 U	400 U
Acetone	whl	100 U	400 U
Benzene	whl	130	10.0 U
Bromobenzene	whl	2.0 U	10.0 U
Bromochloromethane	whl	2.0 U	10.0 U
Bromodichloromethane	whl	2.0 U	10.0 U
Bromoform	whl	2.0 U	10.0 U
Bromomethane	whl	2.0 U	10.0 U
Carbon disulfide	whl	2.0 U	10.0 U
Carbon tetrachloride	whl	2.0 U	10.0 U
Chlorobenzene	whl	2.0 U	10.0 U
Chloroethane	whl	2.0 U	10.0 U
Chloroform	whl	2.0 U	10.0 U
Chloromethane	whl	2.0 U	10.0 U
cis-1,2-Dichloroethene	whl	2.0 U	10.0 U
cis-1,3-Dichloropropene	whl	2.0 U	10.0 U
Dibromochloromethane	whl	2.0 U	10.0 U
Dibromomethane	whl	2.0 U	10.0 U
Dichlorodifluoromethane	whl	2.0 U	10.0 U
EDB-Ethylene bromide	whl	10.0 U	40.0 U
Ethylbenzene	whl	4.0	14.0
Hexachlorobutadiene	whl	10.0 U	40.0 U
Isopropylbenzene	whl	10.0 U	40.0 U

TABLE 12. (cont.)

Analyte	Meas. Basis	BA-05	LF-04
		GW0003 04/08/97	GW0005 04/07/97
Methylene chloride	whl	5.0 U	20.0 U
N-Butylbenzene	whl	10.0 U	40.0 U
N-Propylbenzene	whl	10.0 U	40.0 U
Naphthalene	whl	36.0	40.0 U
Sec Butylbenzene	whl	10.0 U	40.0 U
Styrene	whl	2.0 U	10.0 U
Tert Butylbenzene	whl	10.0 U	40.0 U
Tetrachloroethene	whl	2.0 U	10.0 U
Toluene	whl	2.0 U	10.0 U
Trans-1,2-dichloroethene	whl	2.0 U	10.0 U
Trans-1,3-Dichloropropene	whl	2.0 U	10.0 U
Trichloroethene	whl	2.0 U	10.0 U
Trichlorofluoromethane	whl	2.0 U	10.0 U
Vinyl chloride	whl	2.0 U	10.0 U
Xylene isomers	whl	5.0	10.0 U

Note: All results reported in $\mu\text{g/L}$.

U - undetected at the limit shown

**TABLE 13. SUMMARY OF DISSOLVED METAL RESULTS
FOR GROUNDWATER SAMPLES**

Analyte	Meas. Basis	BA-05	CB-03	LF-04
		GW0003 04/08/97	GW0010 04/09/97 2	GW0005 04/07/97
Arsenic	dis	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>
Barium	dis	86.0	25.0	11.5
Cadmium	dis	4.0 <i>U</i>	4.0 <i>U</i>	4.0 <i>U</i>
Chromium	dis	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>
Lead	dis	2.0 <i>U</i>	2.0 <i>U</i>	2.0 <i>U</i>
Total mercury	dis	0.50 <i>U</i>	0.50	0.50 <i>U</i>
Selenium	dis	5.0 <i>U</i>	5.0 <i>U</i>	5.0 <i>U</i>
Silver	dis	10.0 <i>U</i>	10.0 <i>U</i>	10.0 <i>U</i>

Note: All results reported in $\mu\text{g/L}$.

U - undetected at the limit shown

**TABLE 14. SUMMARY OF PCB RESULTS
FOR GROUNDWATER SAMPLES**

Analyte	Meas Basis	BA-02	BA-02	LF-06
		GW0002 04/08/97 1	GW0009 04/08/97 2	GW0006 04/07/97
Aroclor® 1016	whl	0.20 <i>U</i>	0.20 <i>U</i>	0.2 <i>UJ</i>
Aroclor® 1221	whl	0.20 <i>U</i>	0.20 <i>U</i>	0.2 <i>UJ</i>
Aroclor® 1232	whl	0.20 <i>U</i>	0.20 <i>U</i>	0.2 <i>UJ</i>
Aroclor® 1242	whl	0.20 <i>U</i>	0.20 <i>U</i>	0.2 <i>UJ</i>
Aroclor® 1248	whl	0.20 <i>U</i>	0.20 <i>U</i>	0.2 <i>UJ</i>
Aroclor® 1254	whl	0.20 <i>U</i>	0.20 <i>U</i>	0.2 <i>UJ</i>
Aroclor® 1260	whl	0.20 <i>U</i>	0.20 <i>U</i>	0.2 <i>UJ</i>

Note: All results reported in $\mu\text{g/L}$.

- U* - undetected at the limit shown
- J* - estimated

TABLE 15. SUMMARY OF SCREENING LEVEL COMPARISON

Potential Exposure Pathway	Type of Compounds	Status
Direct exposure to soil	Petroleum hydrocarbons	Meets non-carcinogenic target hazard index of 1.0. Carcinogenic risk estimates slightly exceed acceptable risk levels; however, carcinogenic compounds present only an incremental exposure risk when compared to background.
	Non-petroleum hydrocarbons	Maximum arsenic concentration exceeds Method B values; however, all other samples are within typical range for natural background concentrations.
Potential migration from soil to groundwater	Petroleum hydrocarbons	Model results based on realistic scenario meet requirements for drinking water supplies.
	Non-petroleum hydrocarbons	PAHs exceed Method B values for groundwater protection, but PAHs were not detected in groundwater.
Direct contact with groundwater	Petroleum hydrocarbons	Drinking water is non-potable. Next alternative beneficial use is discharge to surface water (discussed below).
	Non-petroleum hydrocarbons	Drinking water is non-potable. Next alternative beneficial use is discharge to surface water (discussed below).
Migration from groundwater to surface water	Petroleum hydrocarbons	Surface water values are not provided for TPH compounds. Aesthetic qualities of surface water likely to be the cleanup goal. PAH and VOC detection limits higher than Method B cleanup levels. However, contaminants probably pose minimal risk to surface water because of degradation and tidal flushing.
	Non-petroleum hydrocarbons	Arsenic detection limits higher than Method B cleanup levels, which cannot typically be achieved using standard analytical methods.

TABLE 19. COMPARISON OF BACKGROUND SOIL CONCENTRATION DATA WITH SITE DATA FOR SELECTED PAH COMPOUNDS

Carcinogenic PAH Compound	Background Concentration Urban Soil	Maximum Site Concentration
Benzo[b]fluoranthene ^a	15-62	0.3
Benzo[k]fluoranthene ^a	0.300-26	0.3
Benzo[a]pyrene	0.165-0.22	1.3

Source: ATSDR (1993).

Note: All concentrations in mg/kg.

^a Data are reported as total benzofluoranthenes, including the b and k isomers. The total value has been divided in half for the separate isomers.

**TABLE 20. SOIL-TO-GROUNDWATER PATHWAY MODEL ASSUMPTIONS
FOR EVERGREEN PARK PROJECT**

Assumption	Site Condition
Impacts to soil extend from the surface to the water table.	In general, affected soil extends to a depth of at least 12 ft, which intersects the tidally influenced groundwater table.
The aquifer is unconsolidated and unconfined.	The aquifer is linked to the large tidal cycles and is unconfined.
The source is infinite.	There are no current or future sources, and contaminants are expected to degrade over time.
The receptor well is at the edge of the source and is screened within the plume.	No drinking water wells are located in the vicinity of the site.
There is no chemical or biological degradation in the unsaturated zone.	There is chemical and biological degradation in the unsaturated zone.
There is no attenuation of contaminants in the aquifer.	It is likely that some chemical or biological adsorption or degradation occurs in the aquifer.
Contaminants are uniformly distributed throughout the zone of contamination.	Contaminants appear to have been smeared throughout the subject site.

TABLE 21. SOIL-TO-GROUNDWATER PATHWAY CALCULATION FOR BREMERTON SITE

Compound	Concentration ^a (mg/kg)	Molecular			Solubility (mg/L)	Effective Solubility (mg/L)	Dilution Factor	Predicted Groundwater Concentration (mg/L)
		Weight (g/mol)	Moles (mmol/kg)	Mol. Fract. (percent)				
4.6 Acre Dilution Factor^c								
Aliphatics								
EC 5-6	0	81	0.00	0.00	28	0.00	13	
EC >6-8	0	100	0.00	0.00	4.2	0.00	13	
EC >8-10	0	130	0.00	0.00	0.33	0.00	13	0.000
EC >10-12	61	160	0.38	0.15	0.026	0.00	13	0.000
EC >12-16	89	200	0.45	0.18	5.90E-04	0.00	13	0.000
EC >16-21	118	270	0.44	0.17	1.00E-06	0.00	13	0.000
Aromatics								
Benzene	0	78	0.00	0.00	1780	0.00	13	
Toluene	0	92	0.00	0.00	520	0.00	13	
EC >8-10	8	120	0.07	0.03	65	1.73	13	0.133
EC >10-12	110	130	0.85	0.34	25	8.44	13	0.649
EC >12-16	6	150	0.04	0.02	5.8	0.09	13	0.007
EC >16-21	38	190	0.20	0.08	0.51	0.04	13	0.003
EC >21-35	22	240	0.09	0.04	0.01	0.00	13	0.000
Total Concentration								0.792
Target Level								1.000
10 Acre Dilution Factor^d								
Aliphatics								
EC 5-6	0	81	0.00	0.00	28	0.00	8	
EC >6-8	0	100	0.00	0.00	4.2	0.00	8	
EC >8-10	0	130	0.00	0.00	0.33	0.00	8	0.000
EC >10-12	61	160	0.38	0.15	0.026	0.00	8	0.000
EC >12-16	89	200	0.45	0.18	5.90E-04	0.00	8	0.000
EC >16-21	118	270	0.44	0.17	1.00E-06	0.00	8	0.000
Aromatics								
Benzene	0	78	0.00	0.00	1780	0.00	8	
Toluene	0	92	0.00	0.00	520	0.00	8	
EC >8-10	8	120	0.07	0.03	65	1.73	8	0.216
EC >10-12	110	130	0.85	0.34	25	8.44	8	1.054
EC >12-16	6	150	0.04	0.02	5.8	0.09	8	0.012
EC >16-21	38	190	0.20	0.08	0.51	0.04	8	0.005
EC >21-35	22	240	0.09	0.04	0.01	0.00	8	0.000
Total Concentration								1.288
Target Level								1.000

^a Station LF-04 was used for this table because it produced the highest total concentration using interim TPH policy calculation methods.

^b If the source area (i.e., area of contaminated material in the vadose zone) is less than 0.5 acre in size, water from precipitation is the only source of infiltration to the subsurface, and there is no upgradient contamination flowing into the site, a default value of 20 may be used as the dilution factor (DF). Otherwise, dilution factors are provided in U.S. EPA (1996).

^c This value is the DF computed by the SSL EPACMTP model at the 90th percentile protection limit.

^d This value is the median DF computed by the SSL Dilution Factor Model for 300 sites across the United States.

Appendix A

Soil Borehole Logs



Project City of Bremerton
 Location Bremerton, WA
 Contract Number CA5Q0503
 Geologist/Engineer S. Barnett/S. Doran

Drilling Date(s) 8 April 1997
 Drilling Contractor Cascade Drilling
 Drilling Method Geoprobe®
 Boring Dia. 1.5" O.D. I.D. Depth 12'
 Surface Description Grass (park area)
 Weather Conditions clouds, breeze, 55°F
 Well Casing Elevation NA
 Surface Pad Elevation 10' msl (est.)
 Total Well Casing Length NA

DEPTH IN FEET	SAMPLE NUMBER	OVM/ SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0						ML	0-0.5' SILT w/ SAND, high organics	No well constructed. Geoprobe® borehole abandoned immediately after drilling. Backfilled with 3/8" bentonite chips and hydrated.
1								
2	SO0001		80%			SM/GP	Silty SAND w/ gravel, med brown, moist, poorly graded, 5-10% silt, 10% gravel	
3								
4								
5	SO0002		40%			WF	5.0-5.5': wood chips + shell fragments, color change to gray @6.0'	
6								
7	No sample		10%				Water encountered @6.5' BGS	
8						WF	6.5-9.0': Wood chips with gravel, black to gray, wet, 5-10% gravel	
9								
10						SM/GP	Silty SAND with gravel, black, wet, 5-10% gravel, 5% silt	
11	SO0003		20%					
12						TD	Total depth = 12'	
13							Collected groundwater grab from top of water column @6.5' BGS GW0001	
14								
15								
16								
17								
18								
19								
20								

Appendix B

**Quality Assurance Review
Summary—Chemical Analyses**

QUALITY ASSURANCE REVIEW SUMMARY— CHEMICAL ANALYSES

INTRODUCTION

The quality assurance review was conducted to verify that the laboratory quality assurance and quality control (QA/QC) procedures for chemical analyses of soil and groundwater collected in support of the Evergreen Park Expansion Project were documented and that the data quality is high enough to meet the project data quality objectives (DQOs) established for the project. Data validation was completed to U.S. Environmental Protection Agency (EPA) Level 3 specifications, which assume that all results reported by the laboratory are correct. Data validation procedures were based on EPA national functional guidelines for evaluating organic and inorganic analyses (U.S. EPA 1994a,b). Data qualifiers were assigned, as necessary, during the quality assurance reviews. The data qualifiers are consistent with U.S. EPA (1994a,b), quality control requirements stated in the methods, and the DQOs established for the project (PTI 1996). The following laboratory deliverables were reviewed during the data validation process:

- Chain-of-custody documentation to verify completeness of the data
- The case narrative discussing analytical problems (if any) and procedures
- Sample preparation logs or data summary sheets to verify analytical holding times
- Instrument tuning (organic analyses only), instrument calibration, and calibration blank results to assess instrument performance

- Method blanks associated with each sample delivery group (SDG) to check for laboratory contamination
- Results for all laboratory quality control check samples, including surrogate compounds (organic analyses only), laboratory control samples (LCSs), matrix spikes, laboratory duplicate sample analyses, and internal standards (organic analyses only) to check analytical accuracy and precision
- Instrument and method reporting limits for all target analytes.

Calculations and transcriptions typically are not confirmed, and original instrument printouts are not reviewed during an EPA Level 3 quality assurance review. For this data review, however, all chromatograms generated for the petroleum hydrocarbon scan, gasoline, and polychlorinated biphenyl (PCB) analyses were reviewed to verify that all criteria for target analyte identification were met. In addition, results for all field quality control samples (replicate field samples, equipment rinsate blank, and a trip blank) were reviewed. These field quality control results provide additional information to support the quality assurance review.

The chemical analyses of the soil sample and groundwater samples discussed in this quality assurance review document are summarized in Tables 5 through 14 of the main body of this report.

SAMPLE DELIVERY GROUPS

The soil and groundwater samples collected were analyzed for the target analytes in five and two SDGs, respectively. The data packages for these SDGs contained all documentation and data necessary to conduct a complete quality assurance review. A summary of the samples for each matrix in each SDG is presented in Tables B-1 and B-2.

COMPLETENESS

The results reported by the laboratory were 100 percent complete. No data were rejected during the quality assurance review.

ANALYTICAL METHODS

Chemical analyses were completed for hydrocarbon identification (HCID); a petroleum hydrocarbon scan for 6 target analytes (i.e., gasoline, jet fuel, mineral spirits, kerosene, diesel, and oil); gasoline, benzene, toluene, ethylbenzene, and total xylenes (gas/BTEX); 23 extractable petroleum hydrocarbon (EPH) analytes; 14 volatile petroleum hydrocarbon (VPH) analytes; 7 PCBs; 63 volatile organic compounds (VOCs); and 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver). The methods used to conduct all analyses are summarized below.

Analyses for HCID (i.e., a hydrocarbon identification analysis for gasoline-, diesel-, and oil-range organics) and gas/BTEX were completed consistent with procedures specified by methods promulgated by the Washington State Department of Ecology (Ecology) (Ecology 1992). These analyses are completed using gas chromatography/flame ionization detection (GC/FID) for HCID and gasoline and gas chromatography/photoionization (GC/PID) detection for BTEX.

Analyses for a petroleum hydrocarbon scan were completed consistent with the procedure commonly referred to as EPA Method 8015 modified. This method is similar to a combination of Ecology methods WTPH-HCID and WTPH-D, extended (Ecology 1992) and modeled after SW-846 Method 8015 (U.S. EPA 1986) for the analysis of non-halogenated volatile organic compounds. The method is a GC/FID technique for the identification of

specific petroleum mixtures. For this project, results were reported for gasoline, mineral spirits, jet fuel, kerosene, diesel, and oil.

Analyses for the EPH target analytes were completed consistent with the draft method developed by Ecology (Ecology 1997a). The method is a GC/FID technique for the identification of C₈-C₁₀, C₁₀-C₁₂, C₁₂-C₁₆, and C₁₆-C₂₁ aliphatic fraction components, C₁₀-C₁₂, C₁₂-C₁₆, C₁₆-C₃₄ aromatic fraction components, and 17 polycyclic aromatic hydrocarbons.

Analyses for the VPH target analytes were completed consistent with the draft method developed by Ecology (Ecology 1997b). The method is a combination GC/PID and FID technique for the identification of C₅-C₆, C₆-C₈, C₈-C₁₀, and C₁₀-C₁₂ aliphatic fraction components, C₈-C₁₀, C₁₀-C₁₂, and C₁₂-C₁₃ aromatic fraction components, methyl-tert-butylether (MTBE), naphthalene, benzene, toluene, ethylbenzene, m- and p-xylene, and o-xylene.

Analyses for 7 PCB Aroclor[®] mixtures were completed consistent with procedures specified in U.S. EPA SW-846 Method 8080A (U.S. EPA 1994c) using gas chromatography/electron capture detection.

Analyses for 63 target VOCs were completed consistent with procedures specified in U.S. EPA SW-846 Method 8260A (U.S. EPA 1994c) using gas chromatography/mass spectrometry.

Analyses for the target metals (total metals in soil sample and dissolved metals in groundwater samples) were completed consistent with procedures specified in U.S. EPA SW-846 Method 6010A and applicable 7000-series methods (U.S. EPA 1986, 1992, and 1994c). Analyses for barium, cadmium, chromium, and silver were completed using inductively coupled plasma-atomic emission spectrometry according to SW-846 Method 6010A (U.S. EPA 1992); analyses for arsenic, lead, and selenium were completed according to SW-846 Methods 7060A, 7421, and 7740, respectively (U.S. EPA 1986 and 1994c) using graphite

furnace atomic absorption spectrometry; and, analyses for mercury were completed according to SW-846 Method 7471A (U.S. EPA 1994c) using cold vapor atomic absorption spectrometry.

HOLDING TIMES AND SAMPLE PRESERVATION

The analytical holding time constraints and sample preservation requirements specified in the analytical methods and PTI (1996) were met, with the exceptions noted below.

The VPH analysis of Sample GW0005 in SDG A5QSO00770 and the analysis of Samples GW0001 and GW0003 in SDG A5QSO00590 exceeded the 14-day holding criterion for acid-preserved water samples by 7 days and 6 days, respectively. No results were qualified for this exceedance because studies conducted by EPA (U.S. EPA 1989, 1995a) and Oak Ridge National Laboratory (ORNL) (ORNL 1989, 1996) have demonstrated that a holding time of ≥ 28 days is acceptable for water samples that are preserved to a pH < 2 with hydrochloric acid and stored in the dark at 4°C. The affected samples were preserved, stored in a dark refrigerator, and analyzed within the 28-day holding time.

For the EPH analyses associated with SDG A5QSO00330, the reanalysis of the C₁₆-C₂₁ and C₂₁-C₃₄ aliphatic fractions of Samples SO0033, SO0041, SO0053, and SO0057 exceeded the suggested 14-day holding time criterion by 9 to 10 days. The eight results reported for the C₁₆-C₂₁ and C₂₁-C₃₄ aliphatic fractions in these samples were qualified as estimated (*J*) during the quality assurance review.

Analyses for the petroleum hydrocarbon scan, gas/BTEX, EPH, VPH, VOC, and PCB target analytes associated with SDG A5QSO00130 exceeded the suggested 14-day holding time criterion for extraction and analysis. The affected data and action taken during the quality assurance review included the following:

- For the petroleum hydrocarbon scan analyses, 40 of the 60 total results reported for the more volatile target analytes (i.e., gasoline, mineral spirits, jet fuel, and kerosene) were qualified as estimated (*J*) because the holding time criterion for extraction was exceeded by 30 days. The affected samples included SO0013, SO0015, SO0017SO0020, SO0061, SO0062, SO0073, SO0074, SO0075, and SO0078). No results were rejected.
- For the gas/BTEX analyses, all 30 results reported for these five volatile constituents were qualified as estimated (*J*) because the holding time criterion for extraction was exceeded from between 32 to 33 days. The affected samples included SO0013, SO0073, SO0077, SO00871, and SO0086.
- For the EPH and PCB analyses, no results were qualified as estimated because the holding time criterion for extraction was exceeded by 30 days.
- For the VPH analyses, all 70 results reported for the affected samples were qualified as estimated (*J*) because the holding time criterion for extraction was exceeded by 30 days. The affected samples included SO0013, SO0073, SO0077, SO0081, and SO0086.
- For the VOC analyses, all 189 results reported for the affected samples were qualified as estimated (*J*) because the holding time criterion for extraction was exceeded by 30 days. The affected samples included SO0061, SO0086, and SO0093.

All samples associated with SDG A5QSO00130 were initially stored at 4°C from the date of collection (April 7, 1997) until April 14, 1997. On April 14, 1997, all samples were transferred to a storage condition of -20°C. On May 20, 1997, the extraction or analysis of the samples was started. Results for all extractable semivolatile organic compounds (i.e., diesel, oil, EPH target analytes, and PCBs) were not qualified because guidance

specified by the Puget Sound Estuarine Program (PSEP 1989) and EPA (U.S. EPA 1995b) recognize a 1-year holding time for the analysis of these extractable organic compounds if the samples are stored in the dark at -20°C .

No results for the more volatile organic compound constituents (i.e., gasoline, mineral spirits, jet fuel, kerosene, BTEX, MTBE, the VPH target analytes, and the VOC target analytes) were rejected for exceeding the holding times for the following reasons:

- The results reported for all volatile compound analyses in the affected SDG were similar to the results for the same target analytes reported for sample analyses that met all holding time requirements.
- The affected samples typically contained diesel or oil petroleum components, which when stored in the dark at -20°C until extraction should minimize any microbial degradation or evaporation processes that may result in the decomposition or loss of the target analytes.
- The EPA functional guidelines document states that because of the limited information concerning holding times for non-aqueous samples, qualification of data reported for these samples on the basis of holding times established for water samples is left to the discretion of the data reviewer (U.S. EPA 1994a).
- Studies conducted by ORNL (ORNL 1992, 1994) have indicated that a holding time of >30 days is acceptable for soil samples stored in the dark at -20°C , with a probability that the concentration of analyte in the sample is not statistically different than if the sample was analyzed within the suggested 14-day holding time limit.

Although no data associated with SDG A5QSO00130 were rejected for failing to meet the recommended holding times for completing sample extraction or analysis, a greater degree of uncertainty may be associated with these data.

INSTRUMENT PERFORMANCE

The performance of the analytical instrument, as documented by the laboratory, was acceptable. No changes in instrument performance that would have resulted in the degradation of data quality were indicated during any analysis sequence.

Mass Spectrometer Tuning

The mass spectrometer tuning checks made by the laboratory before sample analyses (VOCs only) were acceptable.

Initial and Continuing Calibration

Initial and continuing calibrations were completed for all applicable target analytes and met the criteria for acceptable performance and frequency of analysis, with eight exceptions. The control limit of 85–115 percent recovery for initial calibration verification (ICV) standards and continuing calibration verification (CCV) standards was not met in one ICV and seven CCVs.

For the VPH data reported in SDG A5QSO00770 and SDG A5QSO00010, the recovery of MTBE in the initial calibration verification standard (65 percent) and two CCV standards (42 and 51 percent) was low. These low recoveries indicate a decrease in instrument sensitivity and increase the possibility of the reporting of false negatives at a concentration near the method reporting limit. During the quality assurance review, the undetected results reported for MTBE in SDG A5QSO00770 for two soil and one water samples were qualified as estimated (*J*). No action was required for samples associated

Metals Data

The lower control limit of 75 percent recovery was not met in two instances. A matrix spike recovery of 63 percent was reported for selenium (Sample SO0021) associated with SDGs A5QSO0077O, A5QSO0001O, and A5QSO0059O. No results were qualified for this exceedance because the recovery met the laboratory-established control limit of 60–130, which more accurately reflects the accuracy the laboratory can routinely achieve.

A matrix spike recovery of 25 percent was reported for lead (Sample SO0061) associated with SDG A5QSO0013O. The five results reported for lead in this SDG (Samples SO0013, SO0061, SO0073, SO0077, and SO0089) were qualified as estimated (*J*) during the quality assurance review.

VOC Data

The lower control limit of 50 percent recovery was not met for 1,2-dichlorobenzene (41 percent) in the matrix spike duplicate analysis conducted on Sample SO0029 in SDG A5QSO0001O. No results were qualified because sample data are not qualified solely on the basis of matrix spike data, and the recovery of this analyte in the associated matrix spike and LCS was acceptable.

Laboratory Control Sample Recoveries

The recoveries reported by the laboratory for LCS and duplicate LCS analyses and the frequency of analysis met the criteria for acceptable performance, with one exception. For the EPH analyses associated with SDG A5QSO0001O and SDG A5QSO0033O, a recovery of 36 percent was reported for naphthalene for one LCS; this was below the lower

the petroleum component present may be a weathered kerosene-type petroleum hydrocarbon.

- The results as detected for gasoline in Samples GW0005 and GW0006 from the gas/BTEX analyses were qualified as presumptively present and estimated (the results reported by the laboratory were assigned a *JN* qualifier). These results were qualified because the sample chromatograms did not match the pattern indicative of a gasoline standard. Review of the sample chromatograms suggests the petroleum component present may be a weathered kerosene-type petroleum hydrocarbon.

SDG A5QSO00330

- The result reported as detected for gasoline in Sample SO0041 and the results reported as detected for diesel in Samples SO0042, SO0043, SO0046, and SO0047 (all results reported from the petroleum hydrocarbon scan analyses) were qualified as presumptively present and estimated (assigned a *JN* qualifier). These results were qualified because the sample chromatograms did not match the pattern indicative of gasoline (Sample SO0041) and diesel (Samples SO0042, SO0043, SO0046, and SO0047) standard chromatograms. Review of the sample chromatograms suggests the petroleum component present may be a weathered kerosene-type petroleum hydrocarbon for Samples SO0042 and SO0043 and a weathered diesel-type petroleum hydrocarbon for Samples SO0046 and SO0047.
- The results reported as detected for gasoline in Samples SO0033, SO0041, and SO0053 from the gas/BTEX analyses were qualified as presumptively present and estimated (assigned a *JN* qualifier). These results were qualified because the sample chromatograms did not match

the pattern indicative of a gasoline standard chromatogram. Review of the sample chromatograms suggests the petroleum component present may be a weathered kerosene-type component.

- The result reported as detected for Aroclor[®] 1260 in Sample SO0041 was qualified as presumptively present and estimated (assigned a *JN* qualifier). This result was qualified because the sample chromatogram did not match the pattern indicative of an Aroclor[®] 1260 standard chromatogram. The chromatogram of this sample contained a “hump-o-gram” that appears to be indicative of a petroleum product; however, sufficient peaks were present to meet the criteria for compound identification, as specified in the analytical method.

SDG A5QSO00590

- The results reported as detected for gasoline in Samples SO0065 and SO0101 from the gas/BTEX analyses were qualified as presumptively present and estimated (assigned a *JN* qualifier). These results were qualified because the sample chromatograms did not match the pattern indicative of a gasoline and diesel standard chromatogram. Review of the sample chromatograms suggests the petroleum component present may be a weathered kerosene-type petroleum hydrocarbon.
- The result reported as detected for gasoline in Sample GW0003 from the gas/BTEX analyses were qualified as presumptively present and estimated (assigned a *JN* qualifier). This result was qualified because the sample chromatograms did not match the pattern indicative of a gasoline chromatogram. Review of the sample chromatogram suggests the petroleum component present may be a weathered kerosene-type petroleum hydrocarbon.

FIELD QUALITY CONTROL SAMPLES

The results were acceptable for all field quality control samples. The field quality control samples included one equipment rinsate blank, one trip blank, three sets of soil sample field replicate samples, and two sets of groundwater field replicate samples.

Equipment Rinsate and Trip Blank

One equipment rinsate blank (Sample GW0008) and one trip blank (Sample GW0011) were submitted to the laboratory. Analyses were conducted for target analytes in each blank, except for total solids for the equipment rinsate blank and trip blank, and metals, petroleum hydrocarbon scan, EPH, and PCBs for the trip blank. No target analytes were detected at concentrations above the method reporting limits in either field blank. A summary of results for the equipment rinsate blank and trip blank is presented in Table B-7.

Field Replicates

Results were reported for three sets of soil field replicates and two sets of groundwater replicates. The field replicates collected are co-located samples. They provide information regarding reproducibility in analyte concentration and are not used to assess laboratory precision. All field replicate results were acceptable. A summary of results for the field replicates is presented in Tables B-8 and B-9.

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Tables

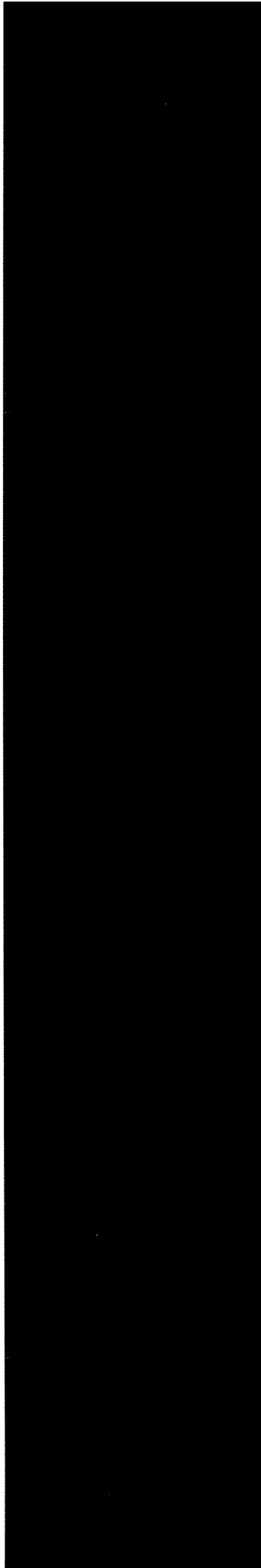


TABLE B-1. SOIL SAMPLES IN EACH SAMPLE DIGESTION GROUP

Sample Digestion Group CAS A5QS000010

Survey	Survey Station	Sampling Date	Sample ID	Field Rep	Sub-sample	Sample Type	Sample No.
EVPRK97	EP-01	04/08/97	EP-01-SO-0			SOIL	S00001
EVPRK97	EP-01	04/08/97	EP-01-SO-3			SOIL	S00002
EVPRK97	EP-01	04/08/97	EP-01-SO-9			SOIL	S00003
EVPRK97	EP-02	04/08/97	EP-02-SO-0			SOIL	S00005
EVPRK97	EP-02	04/08/97	EP-02-SO-6			SOIL	S00007
EVPRK97	EP-03	04/08/97	EP-03-SO-0			SOIL	S00009
EVPRK97	EP-03	04/08/97	EP-03-SO-9			SOIL	S00012
EVPRK97	BA-02	04/08/97	BA-02-SO-0			SOIL	S00021
EVPRK97	BA-02	04/08/97	BA-02-SO-9			SOIL	S00024
EVPRK97	BA-03	04/08/97	BA-03-SO-0			SOIL	S00025
EVPRK97	BA-03	04/08/97	BA-03-SO-3			SOIL	S00026
EVPRK97	BA-03	04/08/97	BA-03-SO-6	1		SOIL	S00027
EVPRK97	BA-04	04/08/97	BA-04-SO-0			SOIL	S00029
EVPRK97	BA-04	04/08/97	BA-04-SO-3			SOIL	S00030
EVPRK97	BA-04	04/08/97	BA-04-SO-6			SOIL	S00031

Sample Digestion Group CAS A5QS000130

Survey	Survey Station	Sampling Date	Sample ID	Field Rep	Sub-sample	Sample Type	Sample No.
EVPRK97	EP-04	04/07/97	EP-04-SO-0			SOIL	S00013
EVPRK97	EP-04	04/07/97	EP-04-SO-6			SOIL	S00015
EVPRK97	BA-01	04/07/97	BA-01-SO-0			SOIL	S00017
EVPRK97	BA-01	04/07/97	BA-01-SO-9			SOIL	S00020
EVPRK97	LF-01	04/07/97	LF-01-SO-0			SOIL	S00061
EVPRK97	LF-01	04/07/97	LF-01-SO-3			SOIL	S00062
EVPRK97	LF-04	04/07/97	LF-04-SO-0			SOIL	S00073
EVPRK97	LF-04	04/07/97	LF-04-SO-3			SOIL	S00074
EVPRK97	LF-04	04/07/97	LF-04-SO-6			SOIL	S00075
EVPRK97	LF-05	04/07/97	LF-05-SO-0			SOIL	S00077
EVPRK97	LF-05	04/07/97	LF-05-SO-3			SOIL	S00078
EVPRK97	LF-06	04/07/97	LF-06-SO-0			SOIL	S00081
EVPRK97	LF-07	04/07/97	LF-07-SO-3			SOIL	S00086
EVPRK97	PP-01	04/07/97	PP-01-SO-0			SOIL	S00089
EVPRK97	PP-02	04/07/97	PP-02-SO-0			SOIL	S00093

Sample Digestion Group CAS A5QS000330

Survey	Survey Station	Sampling Date	Sample ID	Field Rep	Sub-sample	Sample Type	Sample No.
EVPRK97	BA-05	04/08/97	BA-05-SO-0			SOIL	S00033
EVPRK97	BA-05	04/08/97	BA-05-SO-3			SOIL	S00034
EVPRK97	BA-05	04/08/97	BA-05-SO-6			SOIL	S00035

TABLE B-1. (cont.)

EVPRK97	BA-05	04/08/97	BA-05-SO-9		SOIL	S00036
EVPRK97	BA-06	04/08/97	BA-06-SO-0		SOIL	S00037
EVPRK97	BA-06	04/08/97	BA-06-SO-6		SOIL	S00039
EVPRK97	BA-07	04/09/97	BA-07-SO-0		SOIL	S00041
EVPRK97	BA-07	04/09/97	BA-07-SO-3		SOIL	S00042
EVPRK97	BA-07	04/09/97	BA-07-SO-6		SOIL	S00043
EVPRK97	BA-08	04/09/97	BA-08-SO-0		SOIL	S00045
EVPRK97	BA-08	04/09/97	BA-08-SO-3		SOIL	S00046
EVPRK97	BA-08	04/09/97	BA-08-SO-6		SOIL	S00047
EVPRK97	CB-01	04/09/97	CB-01-SO-0		SOIL	S00049
EVPRK97	CB-01	04/09/97	CB-01-SO-6		SOIL	S00051
EVPRK97	CB-02	04/09/97	CB-02-SO-0	1	SOIL	S00053
EVPRK97	CB-02	04/09/97	CB-02-SO-9		SOIL	S00056
EVPRK97	CB-03	04/09/97	CB-03-SO-0		SOIL	S00057

Sample Digestion Group CAS A5QS000590

Survey	Survey Station	Sampling Date	Sample ID	Field Rep	Sub-sample	Sample Type	Sample No.
EVPRK97	CB-03	04/09/97	CB-03-SO-6			SOIL	S00059
EVPRK97	LF-03	04/08/97	LF-03-SO-0			SOIL	S00065
EVPRK97	BA-03	04/08/97	BA-03-SO-6	2		SOIL	S00098
EVPRK97	CB-02	04/09/97	CB-02-SO-0	2		SOIL	S00101

Sample Digestion Group CAS A5QS000770

Survey	Survey Station	Sampling Date	Sample ID	Field Rep	Sub-sample	Sample Type	Sample No.
EVPRK97	LF-05	04/07/97	LF-05-SO-0			SOIL	S00077
EVPRK97	LF-05	04/07/97	LF-05-SO-6			SOIL	S00079
EVPRK97	LF-06	04/07/97	LF-06-SO-0			SOIL	S00081
EVPRK97	LF-06	04/07/97	LF-06-SO-3			SOIL	S00082
EVPRK97	LF-06	04/07/97	LF-06-SO-6			SOIL	S00083
EVPRK97	LF-07	04/07/97	LF-07-SO-0	1		SOIL	S00085
EVPRK97	LF-07	04/07/97	LF-07-SO-3			SOIL	S00086
EVPRK97	LF-07	04/07/97	LF-07-SO-6			SOIL	S00087
EVPRK97	PP-01	04/07/97	PP-01-SO-0			SOIL	S00089
EVPRK97	PP-01	04/07/97	PP-01-SO-6			SOIL	S00091
EVPRK97	PP-02	04/07/97	PP-02-SO-0			SOIL	S00093
EVPRK97	PP-02	04/07/97	PP-02-SO-6			SOIL	S00095
EVPRK97	LF-07	04/07/97	LF-07-SO-0	2		SOIL	S00097

TABLE B-2. GROUNDWATER SAMPLES IN EACH SAMPLE DIGESTION GROUP

Sample Digestion Group CAS A5QS000590

Survey	Survey Station	Sampling Date	Sample ID	Field Rep	Sub-sample	Sample Type	Sample No.
EVPRK97	EP-01	04/08/97	EP-01-GW			GRNDWATER	GW0001
EVPRK97	BA-02	04/08/97	BA-02-GW	1		GRNDWATER	GW0002
EVPRK97	BA-05	04/08/97	BA-05-GW			GRNDWATER	GW0003
EVPRK97	CB-03	04/09/97	CB-03-GW	1		GRNDWATER	GW0004
EVPRK97	BLANK	04/09/97	RBLANK-GW			RBLANK	GW0008
EVPRK97	BA-02	04/08/97	BA-02-GW	2		GRNDWATER	GW0009
EVPRK97	CB-03	04/09/97	CB-03-GW	2		GRNDWATER	GW0010
EVPRK97	BLANK	04/09/97	TBLANK-GW			TBLANK-W	GW0011

Sample Digestion Group CAS A5QS000770

Survey	Survey Station	Sampling Date	Sample ID	Field Rep	Sub-sample	Sample Type	Sample No.
EVPRK97	LF-04	04/07/97	LF-04-GW			GRNDWATER	GW0005
EVPRK97	LF-06	04/07/97	LF-06-GW			GRNDWATER	GW0006
EVPRK97	PP-01	04/07/97	PP-01-GW			GRNDWATER	GW0007

TABLE B-3. SOIL MATRIX SPIKE RECOVERIES

Lab	SDG	Survey	Sample Number	Analyte	Treatment Method	Meas. Basis	Spike No.	Spike Concentration	Spiked Sample Concentration	Sample Concentration	Percent Recovery
CAS	A5QSO00010	EVPRK97	S00021	ARSENIC	GFAA	DRY	1	10.00000	12.00000	3.0	90
				BAP	EPH	DRY	1	24.00000	16.30000	< IDL	68
				BAP	EPH	DRY	2	23.00000	19.80000	< IDL	86
				BARIUM	ICP	DRY	1	490.00000	606.00000	129	97
				BENZENE	VPH	DRY	1	1.20000	1.20000	< IDL	100
				BENZENE	VPH	DRY	2	1.20000	1.30000	< IDL	108
				BENZENE	B-TPH	DRY	3	1.20000	1.20000	< IDL	100
				BENZENE	B-TPH	DRY	4	1.20000	1.30000	< IDL	108
				C12C16-ALI	EPH	DRY	1	48.00000	32.60000	< IDL	68
				C12C16-ALI	EPH	DRY	2	46.00000	36.30000	< IDL	79
				C16C21-ARO	EPH	DRY	1	120.00000	82.30000	< IDL	69
				C16C21-ARO	EPH	DRY	2	115.00000	104.00000	< IDL	90
				C6C8-ALI	VPH	DRY	1	1.20000	1.20000	< IDL	100
				C6C8-ALI	VPH	DRY	2	1.20000	1.20000	< IDL	100
				C8C10-ARO	VPH	DRY	1	6.00000	6.20000	< IDL	103
				C8C10-ARO	VPH	DRY	2	6.00000	6.30000	< IDL	105
				CADMIUM	ICP	DRY	1	12.00000	12.00000	< IDL	100
				CHROMIUM	ICP	DRY	1	49.00000	92.00000	44.0	98
				DIESEL	8015	DRY	1	190.00000	124.00000	< IDL	65
				DIESEL	8015	DRY	2	190.00000	134.00000	< IDL	71
				ETHYLBENZ	VPH	DRY	1	1.20000	1.20000	< IDL	100
				ETHYLBENZ	VPH	DRY	2	1.20000	1.20000	< IDL	100
				ETHYLBENZ	B-TPH	DRY	3	1.20000	1.10000	< IDL	92
				ETHYLBENZ	B-TPH	DRY	4	1.20000	1.10000	< IDL	92
				GAS-HC	B-TPH	DRY	1	59.00000	55.00000	< IDL	93
				GAS-HC	B-TPH	DRY	2	61.00000	55.00000	< IDL	90
				LEAD	GFAA	DRY	1	5.00000	44.00000	43.0	NC
				MERCURY	CV	DRY	1	0.50000	0.50000	< IDL	100
				NAPTHALENE	EPH	DRY	1	24.00000	17.40000	< IDL	73
				NAPTHALENE	EPH	DRY	2	23.00000	20.50000	< IDL	89
				PHENANTHRN	EPH	DRY	1	24.00000	16.90000	< IDL	70
				PHENANTHRN	EPH	DRY	2	23.00000	21.40000	< IDL	93
				SELENIUM	GFAA	DRY	1	2.40000	1.50000	< IDL	63
				SILVER	ICP	DRY	1	12.00000	12.00000	< IDL	100
				TOLUENE	VPH	DRY	1	1.20000	1.30000	< IDL	108

TABLE B-3. (cont.)

		TOLUENE	VPH	DRY	2	1.20000	1.30000	< IDL	108		
		TOLUENE	B-TPH	DRY	3	1.20000	1.20000	< IDL	100		
		TOLUENE	B-TPH	DRY	4	1.20000	1.30000	< IDL	108		
EVPRK97	S00029	11-2CLETHE	8260	DRY	1	58.00000	47.00000	< IDL	81		
		11-2CLETHE	8260	DRY	2	58.00000	45.00000	< IDL	78		
		12-2CLBNZ	8260	DRY	1	58.00000	32.00000	< IDL	55		
		12-2CLBNZ	8260	DRY	2	58.00000	24.00000	< IDL	41		
		3CLETHENE	8260	DRY	1	58.00000	60.00000	< IDL	103		
		3CLETHENE	8260	DRY	2	58.00000	62.00000	< IDL	107		
		BENZENE	8260	DRY	1	58.00000	48.00000	< IDL	83		
		BENZENE	8260	DRY	2	58.00000	45.00000	< IDL	78		
		CLBNZ	8260	DRY	1	58.00000	41.00000	< IDL	71		
		CLBNZ	8260	DRY	2	58.00000	34.00000	< IDL	59		
		NAPTHALENE	8260	DRY	1	58.00000	23.00000	< IDL	40		
		NAPTHALENE	8260	DRY	2	58.00000	17.00000	< IDL	29		
		TOLUENE	8260	DRY	1	58.00000	44.00000	< IDL	76		
		TOLUENE	8260	DRY	2	58.00000	39.00000	< IDL	67		
CAS	A5QSO00130	EVPRK97	S00013	BAP	EPH	DRY	1	21.00000	18.40000	< IDL	88
				BAP	EPH	DRY	2	20.00000	14.20000	< IDL	71
				C12C16-ALI	EPH	DRY	1	42.00000	24.00000	< IDL	57
				C12C16-ALI	EPH	DRY	2	40.00000	26.00000	< IDL	65
				C16C21-ARO	EPH	DRY	1	105.00000	75.00000	< IDL	71
				C16C21-ARO	EPH	DRY	2	100.00000	70.00000	< IDL	70
				NAPTHALENE	EPH	DRY	1	21.00000	13.90000	< IDL	66
				NAPTHALENE	EPH	DRY	2	20.00000	10.60000	< IDL	53
				PHENANTHRN	EPH	DRY	1	21.00000	16.70000	< IDL	80
				PHENANTHRN	EPH	DRY	2	20.00000	15.30000	< IDL	77
EVPRK97	S00061	11-2CLETHE	8260	DRY	1	55.00000	68.00000	< IDL	124		
		11-2CLETHE	8260	DRY	2	55.00000	60.00000	< IDL	109		
		12-2CLBNZ	8260	DRY	1	55.00000	46.00000	< IDL	84		
		12-2CLBNZ	8260	DRY	2	55.00000	41.00000	< IDL	75		
		3CLETHENE	8260	DRY	1	55.00000	48.00000	< IDL	87		
		3CLETHENE	8260	DRY	2	55.00000	43.00000	< IDL	78		
		ARSENIC	GFAA	DRY	1	9.00000	10.00000	2.0	89		
		BARIIUM	ICP	DRY	1	450.00000	508.00000	74.0	96		
		BENZENE	VPH	DRY	1	1.10000	1.10000	< IDL	100		
		BENZENE	VPH	DRY	2	1.10000	1.20000	< IDL	109		
		C6C8-ALI	VPH	DRY	1	1.10000	1.20000	< IDL	109		
		C6C8-ALI	VPH	DRY	2	1.10000	1.40000	< IDL	127		
		C8C10-ARO	VPH	DRY	1	5.50000	7.20000	< IDL	131		
		C8C10-ARO	VPH	DRY	2	5.50000	7.90000	< IDL	144		

TABLE B-3. (cont.)

				CADMIUM	ICP	DRY	1	11.00000	11.00000	< IDL	100
				CHROMIUM	ICP	DRY	1	45.00000	72.00000	29.0	96
				CLBNZ	8260	DRY	1	55.00000	48.00000	< IDL	87
				CLBNZ	8260	DRY	2	55.00000	43.00000	< IDL	78
				ETHYLBENZ	VPH	DRY	1	1.10000	1.10000	< IDL	100
				ETHYLBENZ	VPH	DRY	2	1.10000	1.20000	< IDL	109
				GAS-HC	B-TPH	DRY	1	56.00000	49.00000	< IDL	88
				LEAD	GFAA	DRY	1	4.00000	11.00000	10.0	25
				MERCURY	CV	DRY	1	0.50000	0.50000	< IDL	100
				NAPTHALENE	8260	DRY	1	55.00000	35.00000	< IDL	64
				NAPTHALENE	8260	DRY	2	55.00000	34.00000	< IDL	62
				SELENIUM	GFAA	DRY	1	2.00000	2.00000	< IDL	100
				SILVER	ICP	DRY	1	11.00000	11.00000	< IDL	100
				STYRENE	8260	DRY	1	1.50000	1.30000	< IDL	87
				STYRENE	8260	DRY	2	1.50000	1.40000	< IDL	93
				TOLUENE	VPH	DRY	1	1.10000	1.10000	< IDL	100
				TOLUENE	VPH	DRY	2	1.10000	1.10000	< IDL	100
				XYLENE	8260	DRY	1	56.00000	49.00000	< IDL	88
				XYLENE	8260	DRY	2	55.00000	47.00000	< IDL	85
CAS	A5QS000330	EVPRK97	S00033	PCB-1260	GC	DRY	1	1.40000	1.20000	< IDL	86
				PCB-1260	GC	DRY	2	1.40000	1.20000	< IDL	86
		EVPRK97	S00057	DIESEL	8015	DRY	1	170.00000	615.00000	450	97
				DIESEL	8015	DRY	2	170.00000	625.00000	450	103
CAS	A5QS000590	EVPRK97	S00098	BAP	EPH	DRY	1	24.00000	19.80000	< IDL	83
				BAP	EPH	DRY	2	22.00000	19.40000	< IDL	88
				C12C16-ALI	EPH	DRY	1	48.00000	34.30000	< IDL	71
				C12C16-ALI	EPH	DRY	2	44.00000	31.20000	< IDL	71
				C16C21-ARO	EPH	DRY	1	120.00000	103.00000	< IDL	86
				C16C21-ARO	EPH	DRY	2	110.00000	96.00000	< IDL	87
				NAPTHALENE	EPH	DRY	1	24.00000	20.40000	< IDL	85
				NAPTHALENE	EPH	DRY	2	22.00000	19.20000	< IDL	87
				PHENANTHRN	EPH	DRY	1	24.00000	20.90000	< IDL	87
				PHENANTHRN	EPH	DRY	2	22.00000	19.40000	< IDL	88
		EVPRK97	S00101	11-2CLETHE	8260	DRY	1	55.00000	48.00000	< IDL	87
				11-2CLETHE	8260	DRY	2	55.00000	44.00000	< IDL	80
				12-2CLBNZ	8260	DRY	1	55.00000	37.00000	< IDL	67
				12-2CLBNZ	8260	DRY	2	55.00000	32.00000	< IDL	58
				3CLETHENE	8260	DRY	1	55.00000	42.00000	< IDL	76
				3CLETHENE	8260	DRY	2	55.00000	39.00000	< IDL	71
				BENZENE	8260	DRY	1	55.00000	48.00000	< IDL	87
				BENZENE	8260	DRY	2	55.00000	45.00000	< IDL	82

TABLE B-3. (cont.)

		CLBNZ	8260	DRY	1	55.00000	41.00000	< IDL	75
		CLBNZ	8260	DRY	2	55.00000	37.00000	< IDL	67
		NAPTHALENE	8260	DRY	1	55.00000	19.00000	< IDL	35
		NAPTHALENE	8260	DRY	2	55.00000	15.00000	< IDL	27
		TOLUENE	8260	DRY	1	55.00000	43.00000	< IDL	78
		TOLUENE	8260	DRY	2	55.00000	39.00000	< IDL	71
CAS	A5QSO00770	EVPRK97	S00081						
		11-2CLETHE	8260	DRY	1	54.00000	46.00000	< IDL	85
		11-2CLETHE	8260	DRY	2	54.00000	45.00000	< IDL	83
		12-2CLBNZ	8260	DRY	1	54.00000	35.00000	< IDL	65
		12-2CLBNZ	8260	DRY	2	54.00000	30.00000	< IDL	56
		3CLETHENE	8260	DRY	1	54.00000	40.00000	< IDL	74
		3CLETHENE	8260	DRY	2	54.00000	41.00000	< IDL	76
		BENZENE	8260	DRY	1	54.00000	46.00000	< IDL	85
		BENZENE	8260	DRY	2	54.00000	46.00000	< IDL	85
		CLBNZ	8260	DRY	1	54.00000	38.00000	< IDL	70
		CLBNZ	8260	DRY	2	54.00000	37.00000	< IDL	69
		NAPTHALENE	8260	DRY	1	54.00000	17.00000	< IDL	31
		NAPTHALENE	8260	DRY	2	54.00000	17.00000	< IDL	31
		TOLUENE	8260	DRY	1	54.00000	43.00000	< IDL	80
		TOLUENE	8260	DRY	2	54.00000	43.00000	< IDL	80
		EVPRK97	S00093						
		C5C6-ALI	VPH	DRY	1	1.20000	1.20000	< IDL	100
		C5C6-ALI	VPH	DRY	2	1.20000	1.20000	< IDL	100

NC: Not calculated because the sample concentration is greater than
or equal to 4 times the spike concentration.

TABLE B-4. WATER MATRIX SPIKE RECOVERIES

Lab	SDG	Survey	Sample Number	Analyte	Treatment Method	Meas. Basis	Spike No.	Spike Concentration	Spiked Sample Concentration	Sample Concentration	Percent Recovery
CAS	A5QS000590	EVPRK97	GW0003	11-2CLETHE	8260	WHL	1	50.00000	50.00000	< IDL	100
				11-2CLETHE	8260	WHL	2	50.00000	49.00000	< IDL	98
				12-2CLBNZ	8260	WHL	1	50.00000	48.00000	< IDL	96
				12-2CLBNZ	8260	WHL	2	50.00000	48.00000	< IDL	96
				3CLETHENE	8260	WHL	1	50.00000	50.00000	< IDL	100
				3CLETHENE	8260	WHL	2	50.00000	50.00000	< IDL	100
				BENZENE	8260	WHL	1	50.00000	180.00000	130	100
				BENZENE	8260	WHL	2	50.00000	180.00000	130	100
				CLBNZ	8260	WHL	1	50.00000	49.00000	< IDL	98
				CLBNZ	8260	WHL	2	50.00000	48.00000	< IDL	96
				NAPTHALENE	8260	WHL	1	50.00000	76.00000	36.0	80
				NAPTHALENE	8260	WHL	2	50.00000	78.00000	36.0	84
				TOLUENE	8260	WHL	1	50.00000	52.00000	< IDL	104
		TOLUENE	8260	WHL	2	50.00000	52.00000	< IDL	104		
		EVPRK97	GW0004	DIESEL	8015	WHL	1	2000.00000	1840.00000	< IDL	92
					8015	WHL	2	2000.00000	1930.00000	< IDL	97
				GAS-HC	B-TPH	WHL	1	1000.00000	820.00000	< IDL	82
				GAS-HC	B-TPH	WHL	2	1000.00000	870.00000	< IDL	87
		EVPRK97	GW0008	BAP	EPH	WHL	1	100.00000	99.00000	< IDL	99
					EPH	WHL	2	100.00000	86.00000	< IDL	86
				C12C16-ALI	EPH	WHL	1	200.00000	140.00000	< IDL	70
				C12C16-ALI	EPH	WHL	2	200.00000	99.00000	< IDL	50
				C16C21-ARO	EPH	WHL	1	500.00000	499.00000	< IDL	100
				C16C21-ARO	EPH	WHL	2	500.00000	397.00000	< IDL	79
				NAPTHALENE	EPH	WHL	1	100.00000	74.00000	< IDL	74
				NAPTHALENE	EPH	WHL	2	100.00000	56.00000	< IDL	56
				PHENANTHRN	EPH	WHL	1	100.00000	85.00000	< IDL	85
				PHENANTHRN	EPH	WHL	2	100.00000	80.00000	< IDL	80
		EVPRK97	GW0009	BENZENE	B-TPH	WHL	1	100.00000	93.00000	< IDL	93
B-TPH	WHL				2	100.00000	100.00000	< IDL	100		
ETHYLBENZ	B-TPH			WHL	1	100.00000	57.00000	< IDL	57		
ETHYLBENZ	B-TPH			WHL	2	100.00000	67.00000	< IDL	67		
TOLUENE	B-TPH			WHL	1	100.00000	77.00000	< IDL	77		
TOLUENE	B-TPH			WHL	2	100.00000	89.00000	< IDL	89		
EVPRK97	GW0010	BENZENE	VPH	WHL	1	100.00000	94.00000	< IDL	94		

TABLE B-4. (cont.)

		BENZENE	VPH	WHL	2	100.00000	100.00000	< IDL	100		
		C6C8-ALI	VPH	WHL	1	100.00000	57.00000	< IDL	57		
		C6C8-ALI	VPH	WHL	2	100.00000	62.00000	< IDL	62		
		C8C10-ARO	VPH	WHL	1	500.00000	440.00000	< IDL	88		
		C8C10-ARO	VPH	WHL	2	500.00000	500.00000	< IDL	100		
		ETHYLBENZ	VPH	WHL	1	100.00000	91.00000	< IDL	91		
		ETHYLBENZ	VPH	WHL	2	100.00000	100.00000	< IDL	100		
		TOLUENE	VPH	WHL	1	100.00000	94.00000	< IDL	94		
		TOLUENE	VPH	WHL	2	100.00000	100.00000	< IDL	100		
CAS	A5QSO00770	EVPRK97	GW0005	11-2CLETHE	8260	WHL	1	200.00000	220.00000	< IDL	110
				11-2CLETHE	8260	WHL	2	200.00000	210.00000	< IDL	105
				12-2CLBNZ	8260	WHL	1	200.00000	200.00000	< IDL	100
				12-2CLBNZ	8260	WHL	2	200.00000	200.00000	< IDL	100
				3CLETHENE	8260	WHL	1	200.00000	220.00000	< IDL	110
				3CLETHENE	8260	WHL	2	200.00000	220.00000	< IDL	110
				ARSENIC	GFAA	DIS	1	40.00000	44.00000	< IDL	110
				BAP	EPH	WHL	1	100.00000	93.00000	< IDL	93
				BAP	EPH	WHL	2	100.00000	91.00000	< IDL	91
				BARIUM	ICP	DIS	1	2000.00000	2040.00000	12.0	101
				BENZENE	VPH	WHL	1	200.00000	200.00000	< IDL	100
				BENZENE	VPH	WHL	2	200.00000	200.00000	< IDL	100
				CADMIUM	ICP	DIS	1	50.00000	52.00000	< IDL	104
				CHROMIUM	ICP	DIS	1	200.00000	206.00000	< IDL	103
				CLBNZ	8260	WHL	1	200.00000	200.00000	< IDL	100
				CLBNZ	8260	WHL	2	200.00000	200.00000	< IDL	100
				LEAD	GFAA	DIS	1	20.00000	21.00000	< IDL	105
				MERCURY	CV	DIS	1	1.00000	1.30000	< IDL	130
				NAPHTHALENE	EPH	WHL	3	100.00000	67.00000	< IDL	67
				NAPHTHALENE	EPH	WHL	4	100.00000	84.00000	< IDL	84
				NAPHTHALENE	8260	WHL	1	200.00000	240.00000	< IDL	120
				NAPHTHALENE	8260	WHL	2	200.00000	240.00000	< IDL	120
				PHENANTHRN	EPH	WHL	1	100.00000	91.00000	< IDL	91
				PHENANTHRN	EPH	WHL	2	100.00000	111.00000	< IDL	111
				SELENIUM	GFAA	DIS	1	10.00000	10.00000	< IDL	100
				SILVER	ICP	DIS	1	50.00000	60.00000	< IDL	120
				TOLUENE	VPH	WHL	1	200.00000	210.00000	< IDL	105
				TOLUENE	VPH	WHL	2	200.00000	210.00000	< IDL	105
		EVPRK97	GW0007	DIESEL	8015	WHL	1	2700.00000	2330.00000	375	72
				DIESEL	8015	WHL	2	2700.00000	2480.00000	375	78

TABLE B-5. SOIL RELATIVE PERCENT DIFFERENCE OF LABORATORY DUPLICATES

Data Package	Survey	Sample No.	Analyte	Treat- ment	Meth- od	Meas. basis	Mean	Units	RPD
CAS	A5QS00010	EVPRK97	S00021		GFAA	DRY	3.0	mg/kg	0
			Barium		ICP	DRY	128	mg/kg	2
			Cadmium		ICP	DRY	NC*		
			Chromium		ICP	DRY	42.5	mg/kg	7
			Lead		GFAA	DRY	41.5	mg/kg	7
			Total mercury		CV	DRY	NC*		
			Selenium		GFAA	DRY	NC*		
			Silver		ICP	DRY	NC*		
			Total solids (dry wt. as % of wet wt		160.3	WET	81.5	%	0

Data Package	Survey	Sample No.	Analyte	Treat- ment	Meth- od	Meas. basis	Mean	Units	RPD
CAS	A5QS000130	EVPRK97	S00061		GFAA	DRY	2.0	mg/kg	0
			Barium		ICP	DRY	67.5	mg/kg	19
			Cadmium		ICP	DRY	NC*		
			Chromium		ICP	DRY	26.5	mg/kg	19
			Lead		GFAA	DRY	8.0	mg/kg	50
			Total mercury		CV	DRY	NC*		
			Selenium		GFAA	DRY	NC*		
			Silver		ICP	DRY	NC*		
		S00078	Total solids (dry wt. as % of wet wt		160.3	WET	83.7	%	3

Data Package	Survey	Sample No.	Analyte	Treat- ment	Meth- od	Meas. basis	Mean	Units	RPD
CAS	A5QS000330	EVPRK97	S00033		160.3	WET	93.3	%	1

Data Package	Survey	Sample No.	Analyte	Treat- ment	Meth- od	Meas. basis	Mean	Units	RPD
CAS	A5QS000770	EVPRK97	S00077		160.3	WET	87.0	%	1

* Mean and RPD not calculated because one or more replicates was undetected.

TABLE B-6. WATER RELATIVE PERCENT DIFFERENCE OF LABORATORY DUPLICATES

Data Package	Survey	Sample No.	Analyte	Treat- ment	Meth- od	Meas. basis	Mean	Units	RPD
CAS A5QS000590	EVPRK97	GW0010	Total mercury		CV	DIS	0.50	ug/L	0
CAS A5QS000770	EVPRK97	GW0005	Arsenic		GFAA	DIS	NC*		
			Barium		ICP	DIS	11.5	ug/L	9
			Cadmium		ICP	DIS	NC*		
			Chromium		ICP	DIS	NC*		
			Lead		GFAA	DIS	NC*		
			Total mercury		CV	DIS	NC*		
			Selenium		GFAA	DIS	NC*		
			Silver		ICP	DIS	NC*		

* Mean and RPD not calculated because one or more replicates was undetected.

TABLE B-7. SUMMARY OF BLANK RESULTS

Analyte	Meas. Basis	GW0008		GW0011	
		BLANK	BLANK	BLANK	BLANK
		04/09/97	04/09/97	04/09/97	04/09/97
		RBLANK	TBLANK	TBLANK-W	TBLANK-W
Metals					
Arsenic	dis	5.0	u		
Barium	dis	5.0	u		
Cadmium	dis	4.0	u		
Chromium	dis	5.0	u		
Lead	dis	2.0	u		
Total mercury	dis	0.50	u		
Selenium	dis	5.0	u		
Silver	dis	10.0	u		
8015 modified					
Gasoline	whl	50.0	u		
Mineral Spirits	whl	50.0	u		
Jet fuel	whl	50.0	u		
Kerosene	whl	50.0	u		
Diesel fuel	whl	50.0	u		
Oil	whl	200	u		
Extractable Petroleum Hydrocarbons					
C8-C10 Aliphatics	whl	5.0	u		
C10-C12 Aliphatics	whl	5.0	u		
C12-C16 Aliphatics	whl	5.0	u		
C16-C21 Aliphatics	whl	5.0	u		
C10-C12 Aromatics	whl	5.0	u		
C12-C16 Aromatics	whl	5.0	u		
C16-C21 Aromatics	whl	5.0	u		
C21-C34 Aromatics	whl	5.0	u		
Naphthalene	whl	5.0	u		
2-Methylnaphthalene	whl	5.0	u		
Acenaphthylene	whl	5.0	u		
Acenaphthene	whl	5.0	u		
Fluorene	whl	5.0	u		
Phenanthrene	whl	5.0	u		
Anthracene	whl	5.0	u		
Fluoranthene	whl	5.0	u		
Pyrene	whl	5.0	u		
Benzo[a]anthracene	whl	5.0	u		
Chrysene	whl	5.0	u		
Total benzofluoranthenes (b + k)	whl	5.0	u		
Benzo[a]pyrene	whl	5.0	u		
Indeno(1,2,3-cd)pyrene + dibenz(a,h)anthracene	whl	5.0	u		
Benzo[ghi]perylene	whl	5.0	u		
Volatile Petroleum Hydrocarbons					
C5-C6 Aliphatics	whl	50.0	u	50.0	u
C6-C8 Aliphatics	whl	50.0	u	50.0	u
C8-C10 Aliphatics	whl	50.0	u	50.0	u
C10-C12 Aliphatics	whl	50.0	u	50.0	u
C8-C10 Aromatics	whl	50.0	u	50.0	u
C10-C12 Aromatics	whl	50.0	u	50.0	u
C12-C13 Aromatics	whl	50.0	u	50.0	u
Methyl Tert Butylether	whl	5.0	u	5.0	u
Benzene	whl	5.0	u	5.0	u
Toluene	whl	5.0	u	5.0	u
Ethylbenzene	whl	5.0	u	5.0	u
para- and meta-Xylene isomers	whl	5.0	u	5.0	u
ortho-Xylene	whl	5.0	u	5.0	u
Naphthalene	whl	5.0	u	5.0	u

TABLE B-8. (cont.)

C5-C6 Aliphatics	DRY	5.0U	5.0U	mg/kg	NC	NC
C6-C8 Aliphatics	DRY	5.0U	5.0U	mg/kg	NC	NC
C8-C10 Aliphatics	DRY	5.0U	5.0U	mg/kg	NC	NC
C8-C10 Aromatics	DRY	5.0U	5.0U	mg/kg	NC	NC
Ethylbenzene	DRY	0.50U	0.50U	mg/kg	NC	NC
Methyl Tert Butylether	DRY	0.50U	0.50U	mg/kg	NC	NC
Naphthalene	DRY	0.50U	0.50U	mg/kg	NC	NC
ortho-Xylene	DRY	0.50U	0.50U	mg/kg	NC	NC
para- and meta-Xylene isomers	DRY	0.50U	0.50U	mg/kg	NC	NC
Toluene	DRY	0.50U	0.50U	mg/kg	NC	NC

Station: EVPRK97 CB-02
 Date: 04/09/97
 Sample ID: CB-02-S0-0
 Subsample: Depth: 0.00-0.91 m.

Analyte	Meas. basis	1	2	Units	Mean	RPD/RSD
Benzene	DRY	0.50U	0.50U	mg/kg	NC	NC
C10-C12 Aliphatics	DRY	5.0U	5.0U	mg/kg	NC	NC
C10-C12 Aromatics	DRY	5.0U	5.0U	mg/kg	NC	NC
C12-C13 Aromatics	DRY	5.0U	5.0U	mg/kg	NC	NC
C5-C6 Aliphatics	DRY	5.0U	5.0U	mg/kg	NC	NC
C6-C8 Aliphatics	DRY	5.0U	5.0U	mg/kg	NC	NC
C8-C10 Aliphatics	DRY	5.0U	5.0U	mg/kg	NC	NC
C8-C10 Aromatics	DRY	5.0U	5.0U	mg/kg	NC	NC
Ethylbenzene	DRY	0.50U	0.50U	mg/kg	NC	NC
Methyl Tert Butylether	DRY	0.50U	0.50U	mg/kg	NC	NC
Naphthalene	DRY	0.50U	0.50U	mg/kg	NC	NC
ortho-Xylene	DRY	0.50U	0.50U	mg/kg	NC	NC
para- and meta-Xylene isomers	DRY	0.50U	0.50U	mg/kg	NC	NC
Toluene	DRY	0.50U	0.50U	mg/kg	NC	NC

Station: EVPRK97 BA-03
 Date: 04/08/97
 Sample ID: BA-03-S0-6
 Subsample: Depth: 1.83-2.74 m.

Analyte	Meas. basis	1	2	Units	Mean	RPD/RSD
Arsenic	DRY	2.0		mg/kg	NC	NC
Barium	DRY	9.0		mg/kg	NC	NC
Cadmium	DRY	1.0U		mg/kg	NC	NC
Chromium	DRY	20.0		mg/kg	NC	NC
Diesel fuel	DRY	10.0U	10.0U	mg/kg	NC	NC
Gasoline	DRY	10.0U	10.0U	mg/kg	NC	NC
Jet fuel	DRY	10.0U	10.0U	mg/kg	NC	NC
Kerosene	DRY	10.0U	10.0U	mg/kg	NC	NC
Lead	DRY	4.0		mg/kg	NC	NC
Total mercury	DRY	0.20U		mg/kg	NC	NC
Mineral Spirits	DRY	10.0U	10.0U	mg/kg	NC	NC
Oil	DRY	20.0U	20.0U	mg/kg	NC	NC

TABLE B-8. (cont.)

Aroclor(R) 1016	DRY	0.10U	0.10U	mg/kg	NC	NC
Aroclor(R) 1221	DRY	0.10U	0.10U	mg/kg	NC	NC
Aroclor(R) 1232	DRY	0.10U	0.10U	mg/kg	NC	NC
Aroclor(R) 1242	DRY	0.10U	0.10U	mg/kg	NC	NC
Aroclor(R) 1248	DRY	0.10U	0.10U	mg/kg	NC	NC
Aroclor(R) 1254	DRY	0.10U	0.10U	mg/kg	NC	NC
Aroclor(R) 1260	DRY	0.10U	0.10U	mg/kg	NC	NC
Selenium	DRY	1.0U		mg/kg	NC	NC
Silver	DRY	2.0U		mg/kg	NC	NC
Total solids (dry wt. as % of wet wt.)	WET	82.3	81.8	%	82.1	1

Station: EVPRK97 CB-02

Date: 04/09/97

Sample ID: CB-02-S0-0

Subsample: Depth: 0.00-0.91 m.

Analyte	Meas. basis	1	2	Units	Mean	RPD/RSD
1,1-Dichloroethane	DRY	5.0U	5.0U	ug/kg	NC	NC
1,1-Dichloroethene	DRY	5.0U	5.0U	ug/kg	NC	NC
1,1-Dichloropropene	DRY	5.0U	5.0U	ug/kg	NC	NC
1,1,1-Trichloroethane	DRY	5.0U	5.0U	ug/kg	NC	NC
1,1,1,2-Tetrachloroethane	DRY	5.0U	5.0U	ug/kg	NC	NC
1,1,2-Trichloroethane	DRY	5.0U	5.0U	ug/kg	NC	NC
1,1,2,2-Tetrachloroethane	DRY	5.0U	5.0U	ug/kg	NC	NC
EDB-Ethylene bromide	DRY	20.0U	20.0U	ug/kg	NC	NC
1,2-Dichlorobenzene	DRY	5.0U	5.0U	ug/kg	NC	NC
1,2-Dichloroethane	DRY	5.0U	5.0U	ug/kg	NC	NC
1,2-Dichloropropane	DRY	5.0U	5.0U	ug/kg	NC	NC
cis-1,2-Dichloroethene	DRY	5.0U	5.0U	ug/kg	NC	NC
1,2,3-Trichlorobenzene	DRY	20.0U	20.0U	ug/kg	NC	NC
1,2,3-Trichloropropane	DRY	5.0U	5.0U	ug/kg	NC	NC
1,2,4-Trichlorobenzene	DRY	20.0U	20.0U	ug/kg	NC	NC
1,2,4-Trimethylbenzene	DRY	20.0U	20.0U	ug/kg	NC	NC
1,2-Dibromo-3-chloropropane	DRY	20.0U	20.0U	ug/kg	NC	NC
1,3-Dichlorobenzene	DRY	5.0U	5.0U	ug/kg	NC	NC
1,3-Dichloropropane	DRY	5.0U	5.0U	ug/kg	NC	NC
1,3,5-Trimethylbenzene	DRY	20.0U	20.0U	ug/kg	NC	NC
1,4-Dichlorobenzene	DRY	5.0U	5.0U	ug/kg	NC	NC
2-Butanone (methyl ethyl ketone, MEK)	DRY	20.0U	20.0U	ug/kg	NC	NC
2-Chlorotoluene	DRY	20.0U	20.0U	ug/kg	NC	NC
2-Hexanone	DRY	20.0U	20.0U	ug/kg	NC	NC
2,2-Dichloropropane	DRY	5.0U	5.0U	ug/kg	NC	NC
Dibromochloromethane	DRY	5.0U	5.0U	ug/kg	NC	NC
Dibromomethane	DRY	5.0U	5.0U	ug/kg	NC	NC
Dichlorodifluoromethane	DRY	5.0U	5.0U	ug/kg	NC	NC
Bromodichloromethane	DRY	5.0U	5.0U	ug/kg	NC	NC
Trichloroethene	DRY	5.0U	5.0U	ug/kg	NC	NC
Trichlorofluoromethane	DRY	5.0U	5.0U	ug/kg	NC	NC
4-Chlorotoluene	DRY	20.0U	20.0U	ug/kg	NC	NC
4-Methyl-2-pentanone (MIBK)	DRY	20.0U	20.0U	ug/kg	NC	NC
Tetrachloroethene	DRY	5.0U	5.0U	ug/kg	NC	NC
4-Isopropyltoluene	DRY	20.0U	20.0U	ug/kg	NC	NC
Hexachlorobutadiene	DRY	20.0U	20.0U	ug/kg	NC	NC

TABLE B-8. (cont.)

Acetone	DRY	50.0U	50.0U	ug/kg	NC	NC
Arsenic	DRY	3.0	3.0	mg/kg	3.0	0
Barium	DRY	48.0	48.0	mg/kg	48.0	0
Benzene	DRY	5.0U	5.0U	ug/kg	NC	NC
Bromobenzene	DRY	5.0U	5.0U	ug/kg	NC	NC
Bromochloromethane	DRY	5.0U	5.0U	ug/kg	NC	NC
Bromomethane	DRY	5.0U	5.0U	ug/kg	NC	NC
Bromoform	DRY	5.0U	5.0U	ug/kg	NC	NC
cis-1,3-Dichloropropene	DRY	5.0U	5.0U	ug/kg	NC	NC
Cadmium	DRY	1.0U	1.0U	mg/kg	NC	NC
Carbon tetrachloride	DRY	5.0U	5.0U	ug/kg	NC	NC
Chloroform	DRY	5.0U	5.0U	ug/kg	NC	NC
Chromium	DRY	25.0	25.0	mg/kg	25.0	0
Chlorobenzene	DRY	5.0U	5.0U	ug/kg	NC	NC
Chloroethane	DRY	5.0U	5.0U	ug/kg	NC	NC
Chloromethane	DRY	5.0U	5.0U	ug/kg	NC	NC
Carbon disulfide	DRY	5.0U	5.0U	ug/kg	NC	NC
Diesel fuel	DRY	20.0U	10.0U	mg/kg	NC	NC
Ethylbenzene	DRY	5.0U	5.0U	ug/kg	NC	NC
Gasoline	DRY	20.0U	10.0U	mg/kg	NC	NC
Isopropylbenzene	DRY	20.0U	20.0U	ug/kg	NC	NC
Jet fuel	DRY	20.0U	10.0U	mg/kg	NC	NC
Kerosene	DRY	20.0U	10.0U	mg/kg	NC	NC
Lead	DRY	41.0	29.0	mg/kg	35.0	34
Total mercury	DRY	0.20U	0.20U	mg/kg	NC	NC
Methylene chloride (dichloromethane)	DRY	18.0	10.0U	ug/kg	NC	NC
Mineral Spirits	DRY	20.0U	10.0U	mg/kg	NC	NC
n-Butyl benzene	DRY	20.0U	20.0U	ug/kg	NC	NC
N-Propylbenzene	DRY	20.0U	20.0U	ug/kg	NC	NC
Naphthalene	DRY	20.0U	20.0U	ug/kg	NC	NC
Oil	DRY	1700	2000	mg/kg	1850	16
Aroclor(R) 1016	DRY	0.10U		mg/kg	NC	NC
Aroclor(R) 1221	DRY	0.10U		mg/kg	NC	NC
Aroclor(R) 1232	DRY	0.10U		mg/kg	NC	NC
Aroclor(R) 1242	DRY	0.10U		mg/kg	NC	NC
Aroclor(R) 1248	DRY	0.10U		mg/kg	NC	NC
Aroclor(R) 1254	DRY	0.10U		mg/kg	NC	NC
Aroclor(R) 1260	DRY	0.10U		mg/kg	NC	NC
Selenium	DRY	1.0U	1.0U	mg/kg	NC	NC
Silver	DRY	2.0U	2.0U	mg/kg	NC	NC
Total solids (dry wt. as % of wet wt.)	WET	91.1	90.9	%	91.0	0
Styrene	DRY	5.0U	5.0U	ug/kg	NC	NC
Sec Butylbenzene	DRY	20.0U	20.0U	ug/kg	NC	NC
Trans-1,2-dichloroethene	DRY	5.0U	5.0U	ug/kg	NC	NC
trans-1,3-Dichloropropene	DRY	5.0U	5.0U	ug/kg	NC	NC
Toluene	DRY	5.0U	5.0U	ug/kg	NC	NC
Tert Butylbenzene	DRY	20.0U	20.0U	ug/kg	NC	NC
Vinyl chloride (CH ₂ --CHCl)	DRY	5.0U	5.0U	ug/kg	NC	NC
Xylene isomers (total)	DRY	5.0U	5.0U	ug/kg	NC	NC

Station: EVPRK97 LF-07

Date: 04/07/97

Sample ID: LF-07-S0-0

Subsample: Depth: 0.00-0.91 m.

TABLE B-8. (cont.)

Analyte	Meas. basis	1	2	Units	Mean	RPD/RSD
Diesel fuel	DRY	10.0U	10.0U	mg/kg	NC	NC
Gasoline	DRY	10.0U	10.0U	mg/kg	NC	NC
Jet fuel	DRY	10.0U	10.0U	mg/kg	NC	NC
Kerosene	DRY	711JN	798JN	mg/kg	755	12
Mineral Spirits	DRY	10.0U	10.0U	mg/kg	NC	NC
Oil	DRY	350	475	mg/kg	413	30
Total solids (dry wt. as % of wet wt.)	WET	85.5	84.3	%	84.9	1

TABLE B-9. WATER RELATIVE PERCENT DIFFERENCE OF FIELD REPLICATES

Station: EVPRK97 BA-02
 Date: 04/08/97
 Sample ID: BA-02-GW
 Subsample: Depth: 1.83-1.83 m.

Analyte	Meas. basis	1	2	Units	Mean	RPD/RSD
Benzene	WHL	0.50U	0.50U	ug/L	NC	NC
Ethylbenzene	WHL	1.0U	1.0U	ug/L	NC	NC
Gasoline Range Organics	WHL	50.0U	50.0U	ug/L	NC	NC
Toluene	WHL	1.0U	1.0U	ug/L	NC	NC
Xylene isomers (total)	WHL	1.0U	1.0U	ug/L	NC	NC

Station: EVPRK97 CB-03
 Date: 04/09/97
 Sample ID: CB-03-GW
 Subsample: Depth: 2.13-2.13 m.

Analyte	Meas. basis	1	2	Units	Mean	RPD/RSD
2-Methylnaphthalene	WHL	5.0U	5.0U	ug/L	NC	NC
Acenaphthene	WHL	5.0U	5.0U	ug/L	NC	NC
Acenaphthylene	WHL	5.0U	5.0U	ug/L	NC	NC
Anthracene	WHL	5.0U	5.0U	ug/L	NC	NC
Benzo[a]anthracene	WHL	5.0U	5.0U	ug/L	NC	NC
Benzo[a]pyrene	WHL	5.0U	5.0U	ug/L	NC	NC
Benzo[ghi]perylene	WHL	5.0U	5.0U	ug/L	NC	NC
C10-C12 Aliphatics	WHL	5.0UJ	5.0U	ug/L	NC	NC
C10-C12 Aromatics	WHL	5.0U	5.0U	ug/L	NC	NC
C12-C16 Aliphatics	WHL	5.0UJ	5.0U	ug/L	NC	NC
C12-C16 Aromatics	WHL	5.0U	5.0U	ug/L	NC	NC
C16-C21 Aliphatics	WHL	5.0UJ	5.0U	ug/L	NC	NC
C16-C21 Aromatics	WHL	5.0U	5.0U	ug/L	NC	NC
C21-C34 Aromatics	WHL	5.0U	10.0	ug/L	NC	NC
C8-C10 Aliphatics	WHL	5.0UJ	5.0U	ug/L	NC	NC
Chrysene	WHL	5.0U	5.0U	ug/L	NC	NC
Fluoranthene	WHL	5.0U	5.0U	ug/L	NC	NC
Fluorene	WHL	5.0U	5.0U	ug/L	NC	NC
Indeno(1,2,3-cd)pyrene + dibenz(a,h)anth	WHL	5.0U	5.0U	ug/L	NC	NC
Naphthalene	WHL	5.0U	5.0U	ug/L	NC	NC
Phenanthrene	WHL	5.0U	5.0U	ug/L	NC	NC
Pyrene	WHL	5.0U	5.0U	ug/L	NC	NC
Total benzofluoranthenes (b + k)	WHL	5.0U	5.0U	ug/L	NC	NC

Station: EVPRK97 CB-03
 Date: 04/09/97
 Sample ID: CB-03-GW
 Subsample: Depth: 2.13-2.13 m.

TABLE B-9. (cont.)

Analyte	Meas. basis	1	2	Units	Mean	RPD/RSD
Benzene	WHL	5.0U	5.0U	ug/L	NC	NC
C10-C12 Aliphatics	WHL	50.0U	50.0U	ug/L	NC	NC
C10-C12 Aromatics	WHL	50.0U	50.0U	ug/L	NC	NC
C12-C13 Aromatics	WHL	50.0U	50.0U	ug/L	NC	NC
C5-C6 Aliphatics	WHL	50.0U	50.0U	ug/L	NC	NC
C6-C8 Aliphatics	WHL	50.0U	50.0U	ug/L	NC	NC
C8-C10 Aliphatics	WHL	50.0U	50.0U	ug/L	NC	NC
C8-C10 Aromatics	WHL	50.0U	50.0U	ug/L	NC	NC
Ethylbenzene	WHL	5.0U	5.0U	ug/L	NC	NC
Methyl Tert Butylether	WHL	5.0U	5.0U	ug/L	NC	NC
Naphthalene	WHL	5.0U	5.0U	ug/L	NC	NC
ortho-Xylene	WHL	5.0U	5.0U	ug/L	NC	NC
para- and meta-Xylene isomers	WHL	5.0U	5.0U	ug/L	NC	NC
Toluene	WHL	5.0U	5.0U	ug/L	NC	NC

Station: EVPRK97 BA-02

Date: 04/08/97

Sample ID: BA-02-GW

Subsample: Depth: 1.83-1.83 m.

Analyte	Meas. basis	1	2	Units	Mean	RPD/RSD
Diesel fuel	WHL	50.0U	50.0U	ug/L	NC	NC
Gasoline	WHL	50.0U	50.0U	ug/L	NC	NC
Jet fuel	WHL	50.0U	50.0U	ug/L	NC	NC
Kerosene	WHL	50.0U	50.0U	ug/L	NC	NC
Mineral Spirits	WHL	50.0U	50.0U	ug/L	NC	NC
Oil	WHL	200U	200U	ug/L	NC	NC
Aroclor(R) 1016	WHL	0.20U	0.20U	ug/L	NC	NC
Aroclor(R) 1221	WHL	0.20U	0.20U	ug/L	NC	NC
Aroclor(R) 1232	WHL	0.20U	0.20U	ug/L	NC	NC
Aroclor(R) 1242	WHL	0.20U	0.20U	ug/L	NC	NC
Aroclor(R) 1248	WHL	0.20U	0.20U	ug/L	NC	NC
Aroclor(R) 1254	WHL	0.20U	0.20U	ug/L	NC	NC
Aroclor(R) 1260	WHL	0.20U	0.20U	ug/L	NC	NC

Station: EVPRK97 CB-03

Date: 04/09/97

Sample ID: CB-03-GW

Subsample: Depth: 2.13-2.13 m.

Analyte	Meas. basis	1	2	Units	Mean	RPD/RSD
Arsenic	DIS		5.0U	ug/L	NC	NC
Barium	DIS		25.0	ug/L	NC	NC
Cadmium	DIS		4.0U	ug/L	NC	NC
Chromium	DIS		5.0U	ug/L	NC	NC
Diesel fuel	WHL	50.0U		ug/L	NC	NC

TABLE B-9. (cont.)

Gasoline	WHL	50.00		ug/L	NC	NC
Jet fuel	WHL	50.00		ug/L	NC	NC
Kerosene	WHL	50.00		ug/L	NC	NC
Lead	DIS		2.00	ug/L	NC	NC
Total mercury	DIS		0.50	ug/L	NC	NC
Mineral Spirits	WHL	50.00		ug/L	NC	NC
Oil	WHL	325		ug/L	NC	NC
Selenium	DIS		5.00	ug/L	NC	NC
Silver	DIS		10.00	ug/L	NC	NC



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December 12, 1996

Ms. Judith Aitkin
Ms. Elaine Atkinson
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Bellevue, Washington 98008-5452

RECEIVED

DEC 16 1996

DEPT. OF ECOLOGY

Subject: Results of Sediment Sampling Near the Seawall Repair Project in Evergreen Park
PTI Contract CA5Q-06-05

Dear Ms. Aitkin and Ms. Atkinson:

On behalf of Failure Analysis Associates and the City of Bremerton (the City), PTI Environmental Services (PTI) is submitting this letter report to document the results of sediment sampling performed to support the Evergreen Park seawall restoration project in Bremerton, Washington. Provided as attachments to this letter are:

- Figure 1. Location of Evergreen Park, Bremerton, Washington
- Figure 2. Sediment station location map
- Table 1. Acid/base/neutral (ABN) compound analytical results
- Table 2. Conventional parameter analytical results
- Table 3. Petroleum hydrocarbon compound analytical results
- Copies of laboratory analytical data reports.

INTRODUCTION

Evergreen Park is located in Bremerton, Washington (Figure 1), between 14th Street on the south, Park Drive on the north, Park Avenue to the west, and the Port Washington Narrows to the east (Figure 2). Specifically, the offshore area associated with the seawall in the north-eastern corner of the park was addressed in this investigation. The upland portion associated with this corner of the park has confirmed petroleum hydrocarbon compound contamination of subsurface soils. The seawall will be repaired under Phase I of the City's park redevelopment project. The scope of the repair project includes improving the seawall structure,

removing existing concrete debris on the shoreline, and placing stairways to provide egress from the beach. The Washington State Department of Ecology (Ecology) requested that three sediment samples (the minimum number required for designation of a station cluster) be collected along the beach to confirm the absence of contamination in the vicinity of the seawall.

FIELD INVESTIGATION METHODS

On Thursday, October 3, 1996, Greg Bawden and Sherrill Doran of PTI arrived onsite and inspected the seawall area. Three stations were chosen along the beach offshore from the locations of the previous subsurface boreholes. These stations were spaced approximately equidistantly along the seawall. However, as a results of tidal conditions (i.e., low tide was recorded at 6.2 ft below mean lower low water), exposed sediment was accessible only in small areas between the boulders and concrete debris that comprise the seawall. Station locations were moved slightly from the previously selected points to these accessible areas. Actual sample locations were documented by direct measurement (i.e., measuring from known, permanent markers) and are shown in Figure 2. Field personnel noted an eddy that suggested the possible presence of a storm water outfall. The eddy was located approximately 30 ft offshore from the seawall and approximately 10 ft northwest along the shore from station EPSED03. ?

Three intertidal sediment samples were collected during low tide within 5 ft of the existing seawall. All sediments were sampled in accordance with standard methods used by U.S. EPA (1986). All sampling utensils (i.e., stainless steel scoops and bowls) were rinsed with distilled water, scrubbed with Alconox[®] detergent, and sequentially rinsed with distilled water, acetone, hexane, and laboratory-grade distilled de-ionized water before sampling. One set of decontaminated bowls and scoops was allocated to each sampling station. Sampling personnel also wore new nitrile gloves at each sampling station.

At each station, three sediment grab samples were collected from the upper 0–10 cm of the sediment surface using stainless steel scoops. After collection, the three grab samples from a given station were composited in a stainless steel bowl to achieve uniform texture and color. Descriptions of the composite sediment were noted in a field logbook. Sediments were fairly uniform coarse sands and gravels with shell fragments and small pieces of debris. No odors or obvious contamination were noted in any of the samples collected. All stations were exposed to asphalt that had sloughed off of the seawall. Although care was taken to discard pieces of asphalt that were large enough to see, some asphalt fragments may have been indistinguishable from coarse sands and gravels. Sediment was transferred from the stainless steel bowl to precleaned glass containers with Teflon[®]-lined lids. Samples were stored on ice at 4°C and delivered via an overnight delivery service to Columbia Analytical Service laboratory in Kelso, Washington, within 48 hours from sample collection.

All three shallow sediment samples were submitted for analysis of ABN compounds according to Ecology-recommended protocols using EPA Method 8270. Based on confirmed diesel and heavy oil contamination of soil in the adjacent upland portion of the site, samples were also submitted for petroleum quantification using Method WTPH-D extended. Samples were also analyzed for grain size, total organic carbon (TOC), and percent solids. As a result of the relatively low levels of upland contamination and the swift offshore currents, toxicity testing was not considered necessary during this phase of the investigation.

RESULTS

All ABN compounds were undetected at standard method detection limits (MDLs). All ABN results are reported on an organic carbon-normalized basis, and because of the very low organic content of the samples (i.e., 25 to 30 percent TOC), some of the organic carbon-normalized detection limits were slightly above Washington State sediment quality standards (SQS). These standards represent regulatory goals established by WAC 173-204-300 through 173-204-340 that define numerical criteria for sediment contaminant concentrations. SQS represent the lowest concentrations that result in no adverse affects to biological resources in Puget Sound sediments. All ABN analytical results are compared to the SQS in Table 1. Conventional sediment parameters are summarized in Table 2.

At all three stations, diesel-range petroleum hydrocarbon compounds were undetected at an MDL of 25 mg/kg. At stations EPSED01, EPSED02, and EPSED03, petroleum hydrocarbon compounds as heavy oil were detected at 92.2 mg/kg, 180 mg/kg, and 81.3 mg/kg, respectively. Although there are no SQS for petroleum hydrocarbon compounds, all of these concentrations are below the Model Toxics Control Act (MTCA) Method A cleanup standard (200 mg/kg for heavy oil). Petroleum hydrocarbon compound results are compared to MTCA Method A cleanup standards in Table 3.

QUALITY ASSURANCE AND QUALITY CONTROL

The overall quality of the data reported by the laboratory for the analyses requested is acceptable. Data quality was assessed by reviewing the laboratory case narratives, which summarize the results of analytical quality control measurements for each sample delivery group. The performance of the analytical instruments used for the analysis of ABNs, petroleum hydrocarbon compounds and TOC were evaluated in terms of the percent relative standard deviation for initial calibrations and the percent difference for continuing calibrations. Results reported for method blanks (ABNs, petroleum hydrocarbon compounds, and TOC) were reviewed to determine if target analytes reported as detected in the samples were potentially attributed to contamination that may have be introduced at the laboratory. Analytical accuracy was quantified as the recovery of matrix spike and laboratory control sample (blank spike) analyses for all target analytes except total solids and grain size distribution. Extraction efficiency was quantified as the recovery of surrogate compound recoveries

reported for ABN and petroleum hydrocarbon compound analyses. Analytical precision was quantified as the relative percent difference (RPD) between duplicate sample analyses for TOC and total solids analyses and the relative standard deviation between triplicate sample analyses for grain size distribution determinations. Analytical precision for the ABN and petroleum hydrocarbon compound analyses was quantified as the RPD between duplicate matrix spikes.

The control limits for initial and continuing calibration matrix spike recoveries, laboratory control sample recoveries, surrogate compound recoveries, and duplicate and triplicate sample analyses were not exceeded, with three exceptions. The control limit for the percent difference for continuing calibration was not exceeded for di-*n*-butylphthalate; however, no data were qualified for this exceedance because the analyte was not detected in one sample and was restated as undetected in two samples as a result of method blank contamination. The matrix spike duplicate recovery and the RPD between the matrix spike and matrix spike duplicate recovery for pentachlorophenol exceeded the respective control limits. However, no data were qualified on the basis of the matrix spike duplicate recovery and RPD because all other quality control measurements for pentachlorophenol used to determine accuracy (matrix spike, laboratory control sample, and surrogate recoveries) were acceptable.

The only target analytes detected in the method blanks included bis(2-ethylhexyl)phthalate and di-*n*-butylphthalate. Bis(2-ethylhexyl)phthalate was detected in all three samples and di-*n*-butylphthalate was detected in samples EPSED02 and EPSED03. These five results were restated as undetected at the concentrations reported by the laboratory because they were at concentrations of less than five times the concentrations found in the method blank.

The detection of diesel-range petroleum hydrocarbon compounds in sample EPSED02 was assigned an "O" qualifier by the laboratory to indicate the sample contained an oil component that partially eluted in the diesel range. The sample chromatograms were compared to standard chromatograms during the quality assurance review. Comparison of the chromatograms indicated that diesel-range petroleum hydrocarbon compounds were not present in sample EPSED02; therefore, this result was restated as undetected at the method reporting limit and assigned a *U* qualifier.

Review of sample and standard chromatograms indicated that oil-range petroleum hydrocarbon compounds were present in samples EPSED01 and EPSED03. Although the laboratory correctly reported results for these compounds as undetected at the method reporting limit, the concentrations of the oil-range petroleum hydrocarbon compounds were above the estimated method detection limit. During the quality assurance review, the undetected results reported by the laboratory for oil-range petroleum hydrocarbon compounds were restated as detected at the concentrations indicated on the instrument quantitation reports and qualified as estimated (*J*). These results were qualified as estimated because the concentrations are above the estimated method detection limit but below the method reporting limit.

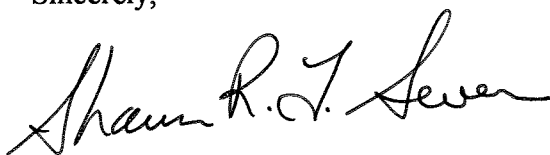
The laboratory quantified the presence of oil-range petroleum hydrocarbon compounds using a 10W-30 motor oil. It was noted in the field sampling notebook that large and small pieces of asphalt were mixed in with the sediment at all sampling locations. Although large pieces of asphalt were discarded during sampling, small pieces of asphalt were unavoidably included with the sediment collected. Asphalt yields a chromatogram very similar to that of oil. Because the samples likely contained small pieces of asphalt, the oil-range petroleum hydrocarbon compound identified in the samples may have been the result of asphalt and not of oil. In addition, if the oil-range petroleum hydrocarbon compounds are attributable to asphalt and not oil, the reported concentrations may be biased either low or high.

CONCLUSIONS

Based on the results of the sediment investigation, the shoreline associated with the seawall area does not appear to have been significantly impacted by upland contamination. There were no ABN compounds detected at concentrations above the SQS. The presence of low levels of oil-range petroleum hydrocarbon compounds may be indicative of asphalt-related interference during sample collection, and the concentrations of these compounds were below MTCA Method A cleanup standards for heavy oil. No further investigation is warranted in this portion of Evergreen Park.

If you have any questions about this investigation or report, please do not hesitate to contact me at (206) 643-9803.

Sincerely,

A handwritten signature in cursive script that reads "Shawn R.T. Sever".

Shawn R.T. Sever, Ph.D.
Principal Scientist

Ms. Aitkin and Ms. Atkinson

December 12, 1996

Page 6

REFERENCES

U.S. EPA. 1986. General QA/QC considerations for collecting environmental samples in Puget Sound. U.S. Environmental Protection Agency, Region 10, Office of Puget Sound, Puget Sound Estuary Program, Seattle, WA.

Figures

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DEFINITION

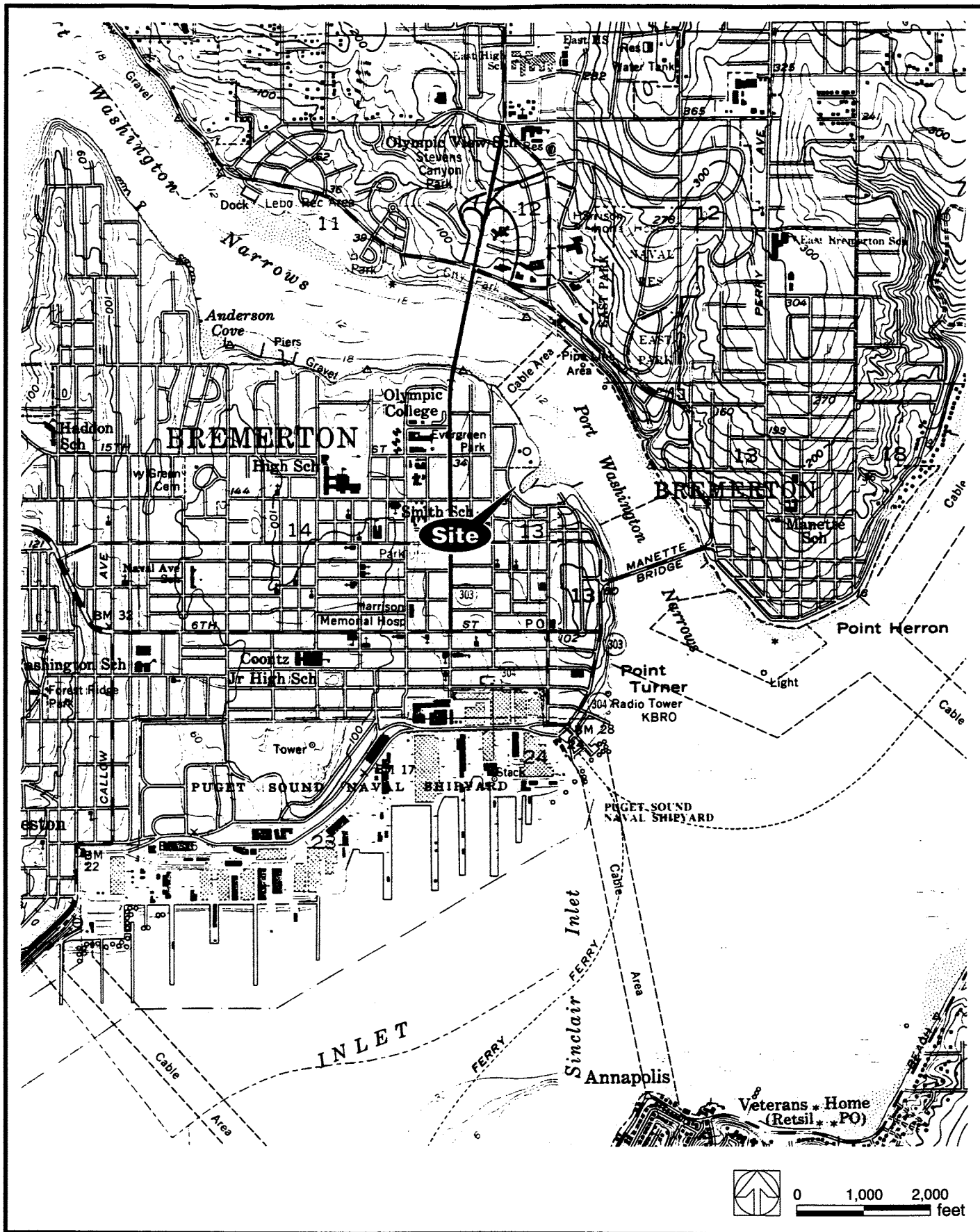


Figure 1. Location of Evergreen Park, Bremerton, Washington.

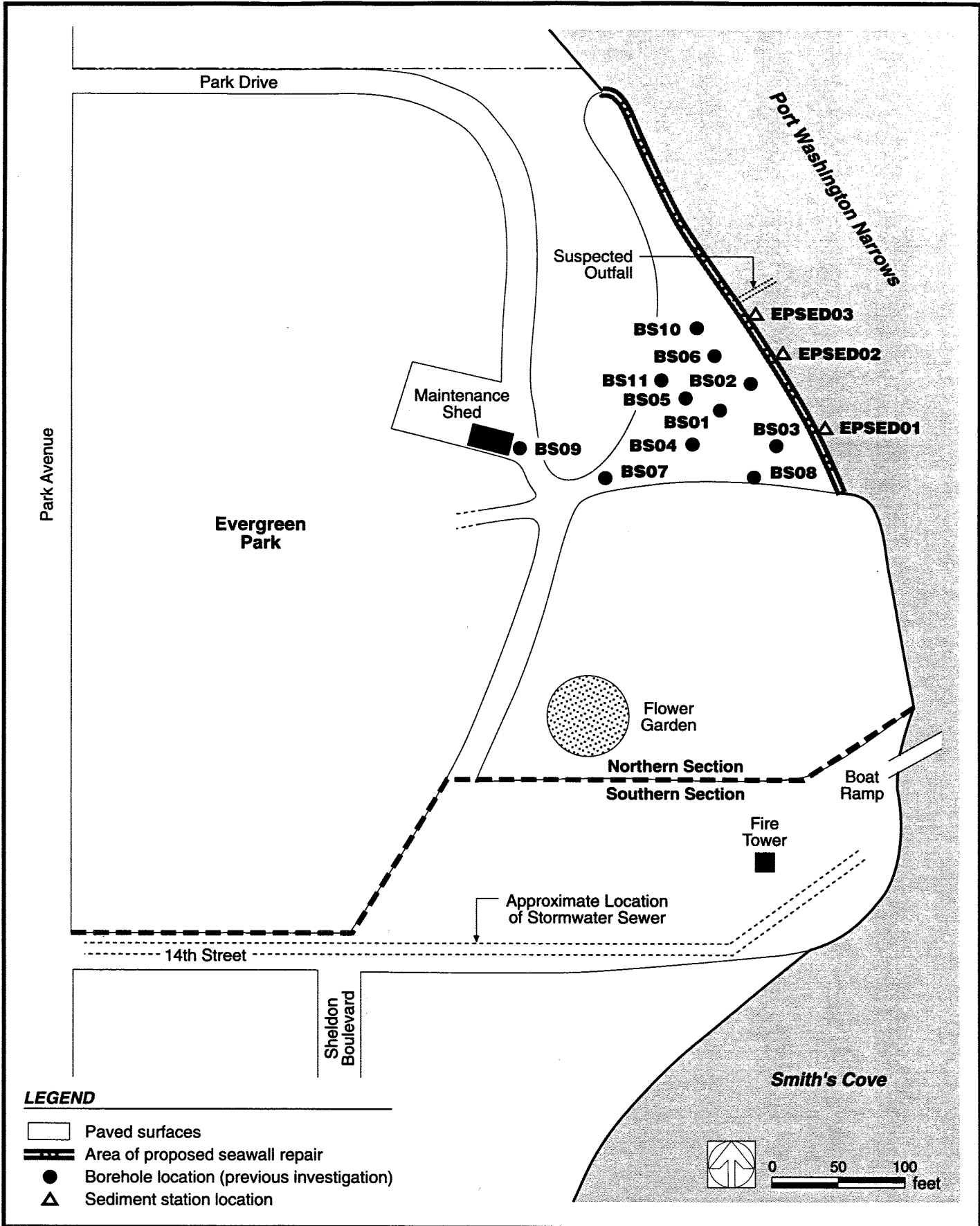


Figure 2. Sediment station location map.

Tables

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TABLE 1. ACID/BASE/NEUTRAL COMPOUND ANALYTICAL RESULTS

Analyte	Station			Sediment Quality Standards
	EPSED01	EPSED02	EPSED03	
Nonionizable Organic Chemicals (mg/kg organic carbon)				
Total LPAH ^a	20.7 U	20.0 U	24.0 U	370
Naphthalene	3.4 U	3.3 U	4.0 U	99
Acenaphthylene	3.4 U	3.3 U	4.0 U	66
Acenaphthene	3.4 U	3.3 U	4.0 U	16
Fluorene	3.4 U	3.3 U	4.0 U	23
Phenanthrene	3.4 U	3.3 U	4.0 U	100
Anthracene	3.4 U	3.3 U	4.0 U	220
2-Methylnaphthalene	3.4 U	3.3 U	4.0 U	38
Total HPAH ^b	34.5 U	33.3 U	42.4 L	960
Fluoranthene	3.4 U	3.3 U	4.0 U	160
Pyrene	3.4 U	3.3 U	4.0 U	1,000
Benz[a]anthracene	3.4 U	3.3 U	4.0 U	110
Chrysene	3.4 U	3.3 U	4.0 U	110
Total benzofluoranthenes (b + k)	6.9 U	6.7 U	8.0 U	230
Benzo[a]pyrene	3.4 U	3.3 U	4.0 U	99
Indeno[1,2,3-cd]pyrene	3.4 U	3.3 U	4.0 U	34
Dibenz[a,h]anthracene	3.4 U	3.3 U	4.0 U	12
Benzo[ghi]perylene	3.4 U	3.3 U	6.4	31
1,2-Dichlorobenzene	3.4 U	3.3 U	4.0 U	2.3
1,4-Dichlorobenzene	3.4 U	3.3 U	4.0 U	3.1
1,2,4-Trichlorobenzene	3.4 U	3.3 U	4.0 U	0.81
Hexachlorobenzene	3.4 U	3.3 U	4.0 U	0.38
Dimethyl phthalate	3.4 U	3.3 U	4.0 U	53
Diethyl phthalate	3.4 U	3.3 U	4.0 U	61
Di-n-butyl phthalate	3.4 U	5.3 U	9.6 U	220
Butylbenzyl phthalate	3.4 U	3.3 U	4.0 U	4.9
Bis[2-ethylhexyl]phthalate	55.2 U	43.3 U	72.0 U	47
Di-n-octyl phthalate	3.4 U	3.3 U	4.0 U	58
Dibenzofuran	3.4 U	3.3 U	4.0 U	15
Hexachlorobutadiene	3.4 U	3.3 U	4.0 U	3.9
N-nitrosodiphenylamine	3.4 U	3.3 U	4.0 U	11
Ionizable Organic Compounds (mg/kg dry weight)				
Phenol	0.010 U	0.010 U	0.010 U	0.42
2-Methylphenol	0.010 U	0.010 U	0.010 U	0.063
4-Methylphenol	0.010 U	0.010 U	0.010 U	0.67
2,4-Dimethylphenol	0.010 U	0.010 U	0.010 U	0.029
Pentachlorophenol	0.050 U	0.050 U	0.050 U	0.36
Benzyl alcohol	0.050 U	0.050 U	0.050 U	0.057
Benzoic acid	0.050 U	0.050 U	0.050 U	0.65

Note: Where chemical criteria in this table represent the sums of individual compounds (e.g., total LPAHs and total HPAHs), and a chemical analysis identified an undetected value for one or more individual compounds, the detection limit was used for calculating the sum of the respective compounds.

Outlined results show exceedences of Sediment Quality Standards.

L - this summation included detected and undetected results

U - undetected at the detection limit shown

^a The LPAH criterion represents the sum of the following low molecular weight polycyclic aromatic hydrocarbon compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.

^b The HPAH criterion represents the sum of the following high molecular weight polycyclic aromatic hydrocarbon compounds: fluoranthene, pyrene, benz[a]anthracene, chrysene, total benzofluoranthenes, benz[a]pyrene, indeno[1,2,3-cd]pyrene, dibenz[a,h]anthracene, and benzo[ghi]perylene.

TABLE 2. CONVENTIONAL PARAMETER ANALYTICAL RESULTS

Analyte	Station		
	EPSED01	EPSED02	EPSED03
Total organic carbon	0.29	0.30	0.25
Total solids	80.9	85.3	81.1
Phi class less (size greater) than -1.00	36.5	22.1	35.2
Phi class -1.00+ to 0.00	5.1	3.9	8.1
Phi class 0.00+ to 1.00	19.3	16.4	19.3
Phi class 1.00+ to 2.00	41.1	47.9	35.5
Phi class 2.00+ to 3.00	3.9	5.5	5.5
Phi class 3.00+ to 4.00	0.25	0.46	0.58
Phi class 4.00+ to 8.00	0.21	0.25	0.31
Phi class greater (size smaller) than 8	0.52	0.63	0.57

Note: All results are reported on a percent dry-weight basis except total solids, which are reported on a percent wet-weight basis.

TABLE 3. PETROLEUM HYDROCARBON COMPOUND ANALYTICAL RESULTS

Analyte	Station			MTCA Method A Soil Cleanup Standard
	EPSED01	EPSED02	EPSED03	
Petroleum Hydrocarbon Compounds (mg/kg dry weight)				
Diesel-Range	25.0 <i>U</i>	25.0 <i>U</i>	25.0 <i>U</i>	200
Oil-Range	92.2 <i>J</i>	180	81.3 <i>J</i>	200

Note: *J* - estimated

MTCA - Model Toxics Control Act

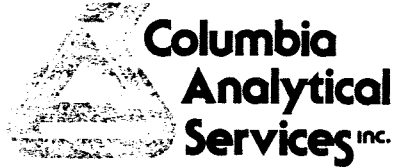
U - undetected at the detection limit shown

Attachment A

**Laboratory Analytical
Reports**

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1996



October 24, 1996

Service Request No.: K9606314

Sherrill Doran
PTI Environmental Services
15375 SE 30th Place, Suite 250
Bellevue, WA 98007

Re: **Evergreen Park/CA5Q-0605**

Dear Sherrill:

Enclosed are the results of the sample(s) submitted to our laboratory on October 7, 1996. Preliminary results were transmitted via facsimile on October 22, 1996. For your reference, these analyses have been assigned our service request number K9606214.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 246.

Respectfully submitted,

Columbia Analytical Services, Inc.

A handwritten signature in cursive script that reads "Abbie Spielman".

Abbie Spielman
Client Services Manager

AS/sm

Page 1 of 358

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
J	Estimated concentration. The value is less than the method reporting limit, but greater than the method detection limit.
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

COLUMBIA ANALYTICAL SERVICES, INC.

Client: PTI Environmental Services, Inc. **Service Request No.:** K9606314
Project: Evergreen park/CA5Q0605 **Date Received:** 10/7/96
Sample Matrix: Sediment

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier III data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), Matrix/Duplicate Matrix Spike (MS/DMS), Laboratory Control Sample (LCS), Initial Continuing Calibration Verification Standards (ICV/CCV), and Initial Continuing Calibration Blanks (ICB/CCB).

All EPA recommended holding times have been met for analyses in this sample delivery group.

The following difficulties were experienced during analysis of this batch:

The Method Blank for GC/MS SIM contained low levels of several phthalate compounds above the Method Reporting Limit. In accordance with CAS QA/QC policy, all sample results which are less than twenty times the level found in the Method Blank have been flagged. The analyte concentration may be considered an estimate because this analyte was also found in the method blank.

The ending oil CCV for WTPH-D analysis was slightly outside of control limits due to contamination from previous sample. Instrument maintenance was performed and the next CCV met acceptance limits. The quality of the sample data was not adversely affected.

The Duplicate Matrix Spike (MS) recovery of Pentachlorophenol for sample EPSED03 was outside the normal CAS control limits because of suspected matrix interference and due to the non-homogeneous sample matrix. Spike recoveries for this compound were within acceptance limits for the associated Matrix Spike and Laboratory Control Sample, and no further corrective action was taken.

Approved by Ami Spelman Date 10/14/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96

Total Solids

Prep Method: NONE
Analysis Method: 160.3 Modified
Test Notes:

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
EPSED01	K9606314-001	10/8/96	80.2	
EPSED02	K9606314-002	10/8/96	85.3	
EPSED03	K9606314-003	10/8/96	81.1	

Approved By: _____



Date: _____

10/10/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

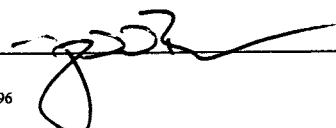
Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Extracted: NA
Date Analyzed: 10/21/96

Carbon, Total Organic (%)
ASTM Method D4129-82 Modified
Units: Percent
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
EPSED01	K9606314-001	0.05	0.28
EPSED02	K9606314-002	0.05	0.30
EPSED03	K9606314-003	0.05	0.25
Method Blank	K9606314-MB	0.05	ND

Approved By: _____



Date: _____

10/22/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI
Project: Evergreen Park/CA5q-0605
Sample Matrix Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Analyzed: 10/21/96

Particle Size Determination
 Puget Sound Estuary Program Protocol

Sample Name: EPSED01
Lab Code: K9606314-01

Sand Fraction: Dry Weight (Grams) 83.5196
 Sand Fraction: Weight Recovered (Grams) 83.5900
 Sand Fraction: Percent Recovery 100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	19.6036	24.3
Very Coarse Sand	-1 to 0 Ø	4.7122	5.85
Coarse Sand	0 to 1 Ø	17.4483	21.7
Medium Sand	1 to 2 Ø	37.8077	46.9
Fine Sand	2 to 3 Ø	3.7803	4.69
Very Fine Sand	3 to 4 Ø	0.2247	0.28
Silt	4 to 8 Ø	0.1750	0.22
Clay	> 8 Ø	0.4850	0.60
Total		84.2368	105

Approved By: *Amy Phillips*

Date: 10/21/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI
Project: Evergreen Park/CA5q-0605
Sample Matrix Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Analyzed: 10/21/96

Particle Size Determination
 Puget Sound Estuary Program Protocol

Sample Name: EPSED01
Lab Code: K9606314-001d

Sand Fraction: Dry Weight (Grams) 87.1736
 Sand Fraction: Weight Recovered (Grams) 87.1427
 Sand Fraction: Percent Recovery 100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	36.5334	45.2
Very Coarse Sand	-1 to 0 Ø	3.6549	4.52
Coarse Sand	0 to 1 Ø	14.5512	18.0
Medium Sand	1 to 2 Ø	29.7447	36.8
Fine Sand	2 to 3 Ø	2.4675	3.05
Very Fine Sand	3 to 4 Ø	0.1711	0.21
Silt	4 to 8 Ø	0.1400	0.17
Clay	> 8 Ø	0.3950	0.49
	Total	87.6578	108

Approved By: *Amy Phillips* Date: 10/21/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI
Project: Evergreen Park/CA5q-0605
Sample Matrix Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Analyzed: 10/21/96

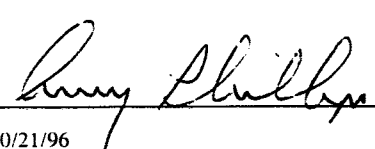
Particle Size Determination
 Puget Sound Estuary Program Protocol

Sample Name: EPSED01
Lab Code: K9606314-001t

Sand Fraction: Dry Weight (Grams) 86.3286
 Sand Fraction: Weight Recovered (Grams) 86.2365
 Sand Fraction: Percent Recovery 100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	32.2197	40.1
Very Coarse Sand	-1 to 0 Ø	3.9432	4.91
Coarse Sand	0 to 1 Ø	14.6162	18.2
Medium Sand	1 to 2 Ø	31.9483	39.7
Fine Sand	2 to 3 Ø	3.2903	4.09
Very Fine Sand	3 to 4 Ø	0.2045	0.25
Silt	4 to 8 Ø	0.1900	0.24
Clay	> 8 Ø	0.3800	0.47
	Total	86.7922	108

Approved By: _____



Date: 10/21/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI
Project: Evergreen Park/CA5q-0605
Sample Matrix Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Analyzed: 10/21/96

Particle Size Determination
 Puget Sound Estuary Program Protocol

Sample Name: EPSED02
Lab Code: K9606314-002

Sand Fraction: Dry Weight (Grams) 82.3031
 Sand Fraction: Weight Recovered (Grams) 82.3084
 Sand Fraction: Percent Recovery 100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	18.8835	22.1
Very Coarse Sand	-1 to 0 Ø	3.3673	3.94
Coarse Sand	0 to 1 Ø	14.0256	16.4
Medium Sand	1 to 2 Ø	40.8826	47.9
Fine Sand	2 to 3 Ø	4.7265	5.53
Very Fine Sand	3 to 4 Ø	0.3951	0.46
Silt	4 to 8 Ø	0.2150	0.25
Clay	> 8 Ø	0.5400	0.63
	Total	83.0356	97.2

Approved By: _____

Henry Phillips

Date: 10/21/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI
Project: Evergreen Park/CA5q-0605
Sample Matrix Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Analyzed: 10/21/96

Particle Size Determination
 Puget Sound Estuary Program Protocol

Sample Name: EPSED03
Lab Code: K9606314-003

Sand Fraction: Dry Weight (Grams) 84.9048
 Sand Fraction: Weight Recovered (Grams) 85.0711
 Sand Fraction: Percent Recovery 100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	28.7203	35.2
Very Coarse Sand	-1 to 0 Ø	6.5989	8.08
Coarse Sand	0 to 1 Ø	15.7535	19.3
Medium Sand	1 to 2 Ø	28.9718	35.5
Fine Sand	2 to 3 Ø	4.5248	5.54
Very Fine Sand	3 to 4 Ø	0.4749	0.58
Silt	4 to 8 Ø	0.2500	0.31
Clay	> 8 Ø	0.4650	0.57
Total		85.7592	105

Approved By: *Amy Sullivan*

Date: 10/21/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Extracted: 10/17/96
Date Analyzed: 10/21,22/96

Total Petroleum Hydrocarbons as Diesel and Oil
Washington DOE Method WTPH-D
Units: mg/Kg (ppm)
Dry Weight Basis

Analyte: Diesel Oil*
Method Reporting Limit: 25 100

Sample Name	Lab Code	Diesel	Oil*
EPSED01	K9606314-001	ND	ND
EPSED02	K9606314-002	50(O)	180
EPSED03	K9606314-003	ND	ND
Method Blank	K961017-MB	ND	ND

* Quantified using 30-weight motor oil as a standard.
O Quantitated as diesel. The sample contained an oil component that partially eluted in the diesel range.

Approved By: Loren E. Portwood Date: 10/23/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Extracted: 10/10/96

Base Neutral/Acid Semivolatile Organic Compounds
 EPA 3550A in Conjunction with GC/MS SIM Method
 Units: ug/Kg (ppb)

Sample Name:	EPSED01	EPSED02	EPSED03
Lab Code:	K9606314-001	K9606314-002	K9606314-003
Date Analyzed:	10/14/96	10/14/96	10/14/96

Base Neutral Analyte	MRL			
1,2-Dichlorobenzene	10	ND	ND	ND
1,4-Dichlorobenzene	10	ND	ND	ND
1,2,4-Trichlorobenzene	10	ND	ND	ND
Naphthalene	10	ND	ND	ND
Hexachlorobutadiene	10	ND	ND	ND
2-Methylnaphthalene	10	ND	ND	ND
Dimethyl Phthalate	10	ND	ND	ND
Acenaphthylene	10	ND	ND	ND
Acenaphthene	10	ND	ND	ND
Dibenzofuran	10	ND	ND	ND
Diethyl Phthalate	10	ND	ND	ND
Fluorene	10	ND	ND	ND
N-Nitrosodiphenylamine	10	ND	ND	ND
Hexachlorobenzene	10	ND	ND	ND
Phenanthrene	10	ND	ND	ND
Anthracene	10	ND	ND	ND
Di-n-butyl Phthalate	10	ND	16 E	24 E
Fluoranthene	10	ND	ND	ND
Pyrene	10	ND	ND	ND
Butyl Benzyl Phthalate	10	ND	ND	ND
Benz(a)anthracene	10	ND	ND	ND
Bis(2-ethylhexyl) Phthalate	10	160 E	130 E	180 E
Chrysene	10	ND	ND	ND
Di-n-octyl Phthalate	10	ND	ND	ND
Benzo(b)fluoranthene	10	ND	ND	ND
Benzo(k)fluoranthene	10	ND	ND	ND

E Estimated concentration; see case narrative.

Approved By: _____



Date: 10/22/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Extracted: 10/10/96

Base Neutral/Acid Semivolatile Organic Compounds
EPA 3550A in Conjunction with GC/MS SIM Method
Units: ug/Kg (ppb)

Sample Name:	EPSED01	EPSED02	EPSED03
Lab Code:	K9606314-001	K9606314-002	K9606314-003
Date Analyzed:	10/14/96	10/14/96	10/14/96

Base Neutral Analyte	MRL			
Benzo(a)pyrene	10	ND	ND	ND
Indeno(1,2,3-cd)pyrene	10	ND	ND	ND
Dibenz(a,h)anthracene	10	ND	ND	ND
Benzo(g,h,i)perylene	10	ND	ND	ND

Approved By: _____ Date: 10/22/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Extracted: 10/10/96

Base Neutral/Acid Semivolatile Organic Compounds
EPA 3550A in Conjunction with GC/MS SIM Method
Units: ug/Kg (ppb)

Sample Name:	EPSED01	EPSED02	EPSED03
Lab Code:	K9606314-001	K9606314-002	K9606314-003
Date Analyzed:	10/14/96	10/14/96	10/14/96

Acid Analyte	MRL			
Phenol	10	ND	ND	ND
Benzyl Alcohol	50	ND	ND	ND
2-Methylphenol	10	ND	ND	ND
4-Methylphenol	10	ND	ND	ND
2,4-Dimethylphenol	10	ND	ND	ND
Benzoic Acid	50	ND	ND	ND
Pentachlorophenol	50	ND	ND	ND

Approved By: _____



Date: _____

10/22/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: NA
Date Received: NA
Date Extracted: 10/10/96

Base Neutral/Acid Semivolatile Organic Compounds
EPA 3550A in Conjunction with GC/MS SIM Method
Units: ug/Kg (ppb)

Sample Name: **Method Blank**
Lab Code: K961010-SB2
Date Analyzed: 10/14/96

Base Neutral Analyte	MRL	
1,2-Dichlorobenzene	10	ND
1,4-Dichlorobenzene	10	ND
1,2,4-Trichlorobenzene	10	ND
Naphthalene	10	ND
Hexachlorobutadiene	10	ND
2-Methylnaphthalene	10	ND
Dimethyl Phthalate	10	ND
Acenaphthylene	10	ND
Acenaphthene	10	ND
Dibenzofuran	10	ND
Diethyl Phthalate	10	40
Fluorene	10	ND
N-Nitrosodiphenylamine	10	ND
Hexachlorobenzene	10	ND
Phenanthrene	10	ND
Anthracene	10	ND
Di-n-butyl Phthalate	10	13
Fluoranthene	10	ND
Pyrene	10	ND
Butyl Benzyl Phthalate	10	ND
Benz(a)anthracene	10	ND
Bis(2-ethylhexyl) Phthalate	10	236
Chrysene	10	ND
Di-n-octyl Phthalate	10	ND
Benzo(b)fluoranthene	10	ND
Benzo(k)fluoranthene	10	ND

Approved By: _____

06314SVM.JS1 - MB 10/22/96

Date: 10/24/96

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: NA
Date Received: NA
Date Extracted: 10/10/96

Base Neutral/Acid Semivolatile Organic Compounds
EPA 3550A in Conjunction with GC/MS SIM Method
Units: ug/Kg (ppb)

Sample Name: **Method Blank**
Lab Code: K961010-SB2
Date Analyzed: 10/14/96

Base Neutral Analyte	MRL	
Benzo(a)pyrene	10	ND
Indeno(1,2,3-cd)pyrene	10	ND
Dibenz(a,h)anthracene	10	ND
Benzo(g,h,i)perylene	10	ND

Approved By: _____ Date: 10/22/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: NA
Date Received: NA
Date Extracted: 10/10/96

Base Neutral/Acid Semivolatile Organic Compounds
EPA 3550A in Conjunction with GC/MS SIM Method
Units: ug/Kg (ppb)

Sample Name: **Method Blank**
Lab Code: K961010-SB2
Date Analyzed: 10/14/96

Acid Analyte	MRL	
Phenol	10	ND
Benzyl Alcohol	50	ND
2-Methylphenol	10	ND
4-Methylphenol	10	ND
2,4-Dimethylphenol	10	ND
Benzoic Acid	50	ND
Pentachlorophenol	50	ND

Approved By: _____ Date: 10/22/96

3S3PBNA/102094

06314SVM.JS1 - MB 10/22/96

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APPENDIX A
LABORATORY QA/QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96

Duplicate Summary
Total Solids

Prep Method: NONE
Analysis Method: 160.3 Modified
Test Notes:

M. Hill
11/13/96

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Date Analyzed	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
EPSED01	K9606314-001	10/8/96	80.2	81.6	80.9	2	

Approved By: _____

X

Date: _____

10/28/96

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Analyzed: 10/21/96

Carbon, Total Organic (%)
 ASTM Method D4129-82 Modified
 Units: Percent
 Dry Weight Basis

Mills/acc

LABORATORY CONTROL SAMPLE

	True Value	Measured Value	Percent Recovery
Source: ERA 542 Lot #01125	0.62	0.68	✓ 110

CALIBRATION VERIFICATION STANDARD

	True Value	Measured Value	Percent Recovery
CCV 1 Result	20.0	20.8	✓ 104 100 100
CCV 2 Result	20.0	20.1	
CCV 3 Result	20.0	20.1	

LABORATORY BLANK

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND

DUPLICATE ANALYSIS

Sample Name	Lab Code	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
EPSED01	K9606314-001D	0.05	0.28	0.29	0.28	✓ 4

MATRIX SPIKE ANALYSIS

Sample Name	Lab Code	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery
EPSED01	K9606314-001MS	0.05	6.00	0.28	6.25	✓ 100

Approved By: _____

[Signature]

Date: _____

10/22/96

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Extracted: 10/17/96
Date Analyzed: 10/21,22/96

Surrogate Recovery Summary
Total Petroleum Hydrocarbons as Diesel and Oil
Washington DOE Method WTPH-D

Sample Name	Lab Code	Percent Recovery o-Terphenyl
EPSED01	K9606314-001	115
EPSED02	K9606314-002	79
EPSED03	K9606314-003	80
EPSED03	K9606314-003MS	83
EPSED03	K9606314-003DMS	86
Lab Control Sample	K961017-LCS	84
Method Blank	K961017-MB	87

CAS Acceptance Limits: 56-116

Approved By: Loren E. Portwood Date: 10/23/96

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Extracted: 10/17/96
Date Analyzed: 10/22/96

Matrix Spike/Duplicate Matrix Spike Summary
Total Petroleum Hydrocarbons as Diesel and Oil
Washington DOE Method WTPH-D
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name: EPSED03
Lab Code: K9606314-003

Analyte	Percent Recovery									
	Spike Level		Sample Result	Spike Result		Percent Recovery		CAS Acceptance Limits	Relative Percent Difference	CAS RPI Acceptance Limit
	MS	DMS		MS	DMS	MS	DMS			
Diesel	190	200	ND	176	177	93	89	19-145	5	40

Approved By: Loren E. Portwood Date: 10/22/96

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
LCS Matrix: Sediment

Service Request: K9606314
Date Collected: NA
Date Received: NA
Date Extracted: 10/17/96
Date Analyzed: 10/21/96

Laboratory Control Sample Summary
Total Petroleum Hydrocarbons as Diesel and Oil
Washington DOE Method WTPH-D
Units: mg/Kg (ppm)

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Diesel	150	128	85	60-120

Approved By: _____

Yoman E. Portwood

Date: _____

10/23/96

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605

Service Request: K9606314
Date Analyzed: 10/21/96

Continuing Calibration Verification (CCV) Summary
Total Petroleum Hydrocarbons as Diesel and Oil

Sample Name: CCV2
Lab Code: 1021F031
Test Notes:

Units: mg/L (ppm)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Diesel	WTPH-D	1000	972	97	

Approved By: Lucas E. Portwood Date: 10/23/96

LCS 52595

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605

Service Request: K9606314
Date Analyzed: 10/21/96

Continuing Calibration Verification (CCV) Summary
Total Petroleum Hydrocarbons as Diesel and Oil

Sample Name: CCV3
Lab Code: 1021F055
Test Notes:

Units: mg/L (ppm)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Diesel	WTPH-D	1000	1000	100	

Approved By: _____

Loren E. B. Wood

Date: _____

10/23/96

LCS 52595

06314PHC.VN1 - CCV 3 10/23/96

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COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605

Service Request: K9606314
Date Analyzed: 10/22/96

Continuing Calibration Verification (CCV) Summary
Total Petroleum Hydrocarbons as Diesel and Oil

Sample Name: CCV4
Lab Code: 1021F079
Test Notes:

Units: mg/L (ppm)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Diesel	WTPH-D	1000	1020	102	

Approved By: Loren E. Dantwood Date: 10/23/96

LCS-5255

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605

Service Request: K9606314
Date Analyzed: 10/22/96

Continuing Calibration Verification (CCV) Summary
Total Petroleum Hydrocarbons as Diesel and Oil

Sample Name: CCV5
Lab Code: 1021F103
Test Notes:

Units: mg/L (ppm)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Diesel	WTPH-D	1000	998	100	

Approved By: Loren E. Portwood Date: 10/23/96

LCS 52595

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605

Service Request: K9606314
Date Analyzed: 10/22/96

Continuing Calibration Verification (CCV) Summary
Total Petroleum Hydrocarbons as Diesel and Oil

Sample Name: CCV6
Lab Code: 1021F115,119
Test Notes:

Units: mg/L (ppm)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Diesel	WTPH-D	1000	969	97	
Oil	WTPH-D	500	391	78(A)	

A Outside acceptance limits; see case narrative.

Approved By: Joan E. Portwood Date: 10/23/96

LCS/52595

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605

Service Request: K9606314
Date Analyzed: 10/21/96

Continuing Calibration Blank (CCB) Summary
Total Petroleum Hydrocarbons as Diesel and Oil

Sample Name: CCB1
Lab Code: 1021F009
Test Notes:

Units: mg/L (ppm)
Basis: NA

Analyte	Analysis Method	MRL	Result	Result Notes
Diesel	WTPH-D	25	ND	
Oil	WTPH-D	100	ND	

Approved By: _____

Lynn E. Portwood

Date: _____

10/23/96

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605

Service Request: K9606314
Date Analyzed: 10/21/96

Continuing Calibration Blank (CCB) Summary
Total Petroleum Hydrocarbons as Diesel and Oil

Sample Name: CCB2
Lab Code: 1021F033
Test Notes:

Units: mg/L (ppm)
Basis: NA

Analyte	Analysis Method	MRL	Result	Result Notes
Diesel	WTPH-D	25	ND	
Oil	WTPH-D	100	ND	

Approved By: John E. Portwood Date: 10/23/96

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605

Service Request: K9606314
Date Analyzed: 10/21/96

Continuing Calibration Blank (CCB) Summary
Total Petroleum Hydrocarbons as Diesel and Oil

Sample Name: CCB3
Lab Code: 1021F057
Test Notes:

Units: mg/L (ppm)
Basis: NA

Analyte	Analysis Method	MRL	Result	Result Notes
Diesel	WTPH-D	25	ND	
Oil	WTPH-D	100	ND	

Approved By: Loren E. Fortwood Date: 10/23/96

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605

Service Request: K9606314
Date Analyzed: 10/22/96

Continuing Calibration Blank (CCB) Summary
Total Petroleum Hydrocarbons as Diesel and Oil

Sample Name: CCB4
Lab Code: 1021F081
Test Notes:

Units: mg/L (ppm)
Basis: NA

Analyte	Analysis Method	MRL	Result	Result Notes
Diesel	WTPH-D	25	ND	
Oil	WTPH-D	100	ND	

Approved By: Tom E. Fortwood Date: 10/23/96

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605

Service Request: K9606314
Date Analyzed: 10/22/96

Continuing Calibration Blank (CCB) Summary
Total Petroleum Hydrocarbons as Diesel and Oil

Sample Name: CCB5
Lab Code: 1021F105
Test Notes:

Units: mg/L (ppm)
Basis: NA

Analyte	Analysis Method	MRL	Result	Result Notes
Diesel	WTPH-D	25	ND	
Oil	WTPH-D	100	ND	

Approved By: _____

Lynn E. Fortwood

Date: _____

10/23/96

LCS/52595

06314PHC.VN1 - CCB (5) 10/23/96

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COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605

Service Request: K9606314
Date Analyzed: 10/22/96

Continuing Calibration Blank (CCB) Summary
Total Petroleum Hydrocarbons as Diesel and Oil

Sample Name: CCB6
Lab Code: 1021F117
Test Notes:

Units: mg/L (ppm)
Basis: NA

Analyte	Analysis Method	MRL	Result	Result Notes
Diesel	WTPH-D	25	ND	
Oil	WTPH-D	100	ND	

Approved By: _____

Loren E. Portwood

Date: _____

10/23/96

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Extracted: 10/10/96
Date Analyzed: 10/13-14/96

Surrogate Recovery Summary
 Base Neutral/Acid Semivolatile Organic Compounds
 EPA 3550A in Conjunction with GC/MS SIM Method

Sample Name	Lab Code	2FP	P e r c e n t			R e c o v e r y		
			PHL	TBP	NBZ	FBP	TPH	
EPSED01	K9606314-001	56	61	51	67	48	54	
EPSED02	K9606314-002	55	59	45	69	48	46	
EPSED03	K9606314-003	57	57	60	75	54	54	
EPSED03	K9606314-003MS	69	68	76	85	59	58	
EPSED03	K9606314-003DMS	59	71	60	78	52	50	
Lab Control Sample	K961010-SL2	70	81	56	84	66	65	
Method Blank	K961010-SB2	77	86	56	87	68	72	

CAS Acceptance Limits: 5-106 5-96 5-110 5-134 5-120 15-145

2FP 2-Fluorophenol
 PHL Phenol-d6
 TBP 2,4,6-Tribromophenol
 NBZ Nitrobenzene-d5
 FBP 2-Fluorobiphenyl
 TPH p-Terphenyl-d14

Approved By: _____ Date: 10/22/96

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
Sample Matrix: Sediment

Service Request: K9606314
Date Collected: 10/3/96
Date Received: 10/7/96
Date Extracted: 10/10/96
Date Analyzed: 10/14/96

Matrix Spike/Duplicate Matrix Spike Summary
 Base Neutral/Acid Semivolatile Organic Compounds
 EPA 3550A in Conjunction with GC/MS SIM Method
 Units: ug/Kg (ppb)

Sample Name: EPSED03
Lab Code: K9606314-003

Analyte	Spike Level		Sample Result	Spike Result		Percent Recovery		CAS Advisory Limits	Relative Percent Difference
	MS	DMS		MS	DMS	MS	DMS		
	Phenol	690		660	ND	455	432		
2-Chlorophenol	690	660	ND	457	383	66	58	20-105	13
1,4-Dichlorobenzene	460	440	ND	182	179	40	41	23-102	3
N-Nitrosodi-n-propylamine	460	440	ND	425	359	92	82	30-111	12
1,2,4-Trichlorobenzene	460	440	ND	229	207	50	47	27-109	6
4-Chloro-3-methylphenol	690	660	ND	569	484	82	73	23-108	12
Acenaphthene	460	440	ND	318	265	69	60	43-117	14
4-Nitrophenol	690	660	ND	548	407	79	62	22-113	25
2,4-Dinitrotoluene	460	440	ND	331	258	72	59	32-108	20
Pentachlorophenol	690	660	ND	287	87	42	13 A	18-112	105
Pyrene	460	440	ND	517	244	112	55	24-143	68

A Outside acceptance limits; see case narrative.

Approved By: _____ Date: 10/26/96

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.
Project: Evergreen Park/CA5Q-0605
LCS Matrix: Sediment

Service Request: K9606314
Date Collected: NA
Date Received: NA
Date Extracted: 10/10/96
Date Analyzed: 10/13/96

Laboratory Control Sample Summary
 Base Neutral/Acid Semivolatile Organic Compounds
 EPA 3550A in Conjunction with GC/MS SIM Method
 Units: ug/Kg (ppb)

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Advisory Limits
Phenol	730	564	77	32-96
2-Chlorophenol	730	487	67	34-102
1,4-Dichlorobenzene	490	276	56	39-98
N-Nitrosodi-n-propylamine	490	422	86	39-104
1,2,4-Trichlorobenzene	490	286	58	43-99
4-Chloro-3-methylphenol	730	572	78	36-102
Acenaphthene	490	347	71	44-112
4-Nitrophenol	730	486	67	23-113
2,4-Dinitrotoluene	490	353	72	39-106
Pentachlorophenol	730	311	43	31-113
Pyrene	490	367	75	44-126

Approved By: _____



Date: _____

10/24/96

LCS/120594

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APPENDIX B
CHAIN OF CUSTODY

K 6314

Project: (Name and Number) Evergreen Park - CASQ-0605				Samplers: (Signature) Sherrill Doran / [Signature]													Sampling Contact: Sherrill Doran Phone: 206/643-9803						
Sample No.	Tag No.	Date	Time	Sample Matrix								Analyses Requested							Ship Samples to: CAS 1317 S. 13th Ave. Kelso, WA 98626 Attn: Abbie Spielman 360/577-7222				
				Groundwater	Soil	Surface Water	Sediment	Other	Other	Concentration (L M H)	Composite or Grab	APN/PSEP	TPH-D extended	TOC	% Solids	grain size	Extra Container	Archive	Remarks				
EPSED01	99742	10/3/96	1635				X				L	C	✓	✓	✓	✓							500 mL; no pres.
	99743																						500 mL; no pres.
	99744																		✓	✓			grain site duplicate - 500 mL
	99745																		✓	✓			grain site triplicate - 500 mL
EPSED02	99746		1645										✓	✓	✓	✓							500 mL; no pres.
	99747																						500 mL; no pres.
EPSED03	99748		1705										✓	✓	✓	✓							500 mL; no pres.
	99749																						500 mL; no pres.
	99750																		✓	✓			MS duplicate; 500 mL, no pres.
	99751																		✓	✓			MS triplicate; 500 mL, no pres.
	99752																		✓	✓			MSD duplicate; 500 mL, no pres.
	99753																		✓	✓			MSD triplicate; 500 mL, no pres.

Method of Shipment: Fed Ex Overnight Condition of Samples Upon Receipt: _____ Custody Seal Intact: Yes No None Broken by: _____

Relinquished by: Sherrill Doran (Signature) Received by: Fed Ex Overnight (Signature) Date/Time: 10/4/96 1645

Relinquished by: _____ (Signature) Received by: _____ (Signature) Date/Time: _____

Relinquished by: _____ (Signature) Received by Mobile Lab for Field Analysis: _____ (Signature) Date/Time: _____

Received for Lab by: Laik. K. (Signature) CAS-K Date/Time: 100796 0800