SITE CHARACTERIZATION REPORT

LAKE WASHINGTON APARTMENTS
PHASE II ENVIRONMENTAL SITE ASSESSMENT
SEATTLE, WASHINGTON

Prepared for
Bayside Washington, LLC

Prepared by
Herrera Environmental Consultants, Inc.

HERRERA

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SEATTLE, WASHINGTON

Prepared for
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May 16, 2012

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INTRODUCTION

This site characterization report describes field activities performed and associated analytical results for the Lake Washington Apartments property located at 9061 Seward Park Avenue South, Seattle, Washington (Figure 1). The Lake Washington Apartments is a low income housing development first constructed in 1948. The site covers approximately 16.5 acres and includes 34 buildings with 366 residential apartments. Site investigations focused on the potential for residual heating oil remaining in soil beneath Building 35 following underground tank removal in 1997. Both soil and groundwater samples were collected to determine extent of contamination and the potential for further movement through the environment.

In the late 1990s, the property underwent a complete renovation conducted by a joint venture consisting of A.F. Evans Company, Inc. and SouthEast Effective Development (SEED), a local nonprofit corporation. As part of the renovation, A.F. Evans Co. and SEED contracted to remove 18 underground storage tanks that previously had been used to store diesel heating oil (300-gallon capacity) and PS300 heating oil (1,800-gallon capacity). The 18 tanks were positioned in pairs at each of nine locations, adjacent to boiler rooms that supplied hot water radiant heat for the entire complex. Diesel oil was used to prime the boilers, and heavier oil was used once the systems were warmed up. During the tank removal process, buried drums (55-gallon capacity) containing diesel and water were found at seven of the locations. It is unknown what these drums were used for. During the course of tank removal, soil contamination was removed; however, some residual contamination was left in place beneath buildings and some utilities.

No groundwater was determined to be present in any of the tank removal excavations (excavations typically extended 10 to 15 feet below ground surface). A geotechnical survey of the property identified the presence of groundwater in three of five borings completed to depths ranging from 20 to 43 feet below ground surface, although the water was not associated with a consistent soil layer or depth (i.e., 12, 17, and 32 feet deep).

The Washington State Department of Ecology (Ecology) conducted a Periodic Review of the Lake Washington Apartments site file (Facility Site ID #2285) in February 2010, determining:

- Cleanup actions appear to be protective of human health, but that groundwater (the environment) had not been investigated. Because the No Further Action (NFA) letter had not clarified that groundwater had not been investigated, the letter may be rescinded.
- Soil cleanup levels have not been met at the standard point of compliance for the site; however, the soil cleanup action has been determined to comply with cleanup standards for human exposure since the long-term integrity of the containment system is ensured and the requirements for containment technologies are being met.

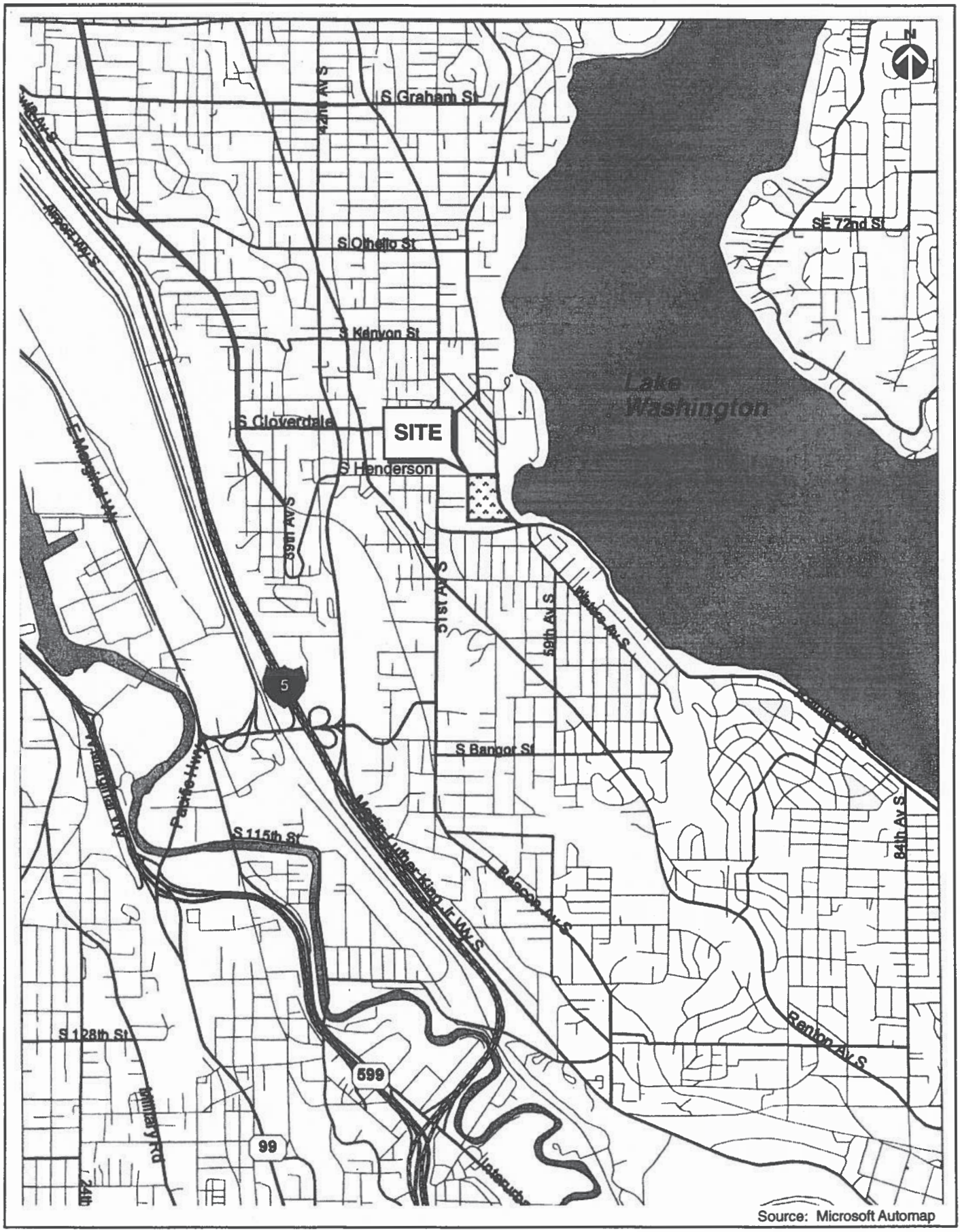


Figure 1. Vicinity map, Lake Washington Apartments, Seattle, Washington.

- The Restrictive Covenant for the property is in place and continues to be effective in protecting public health from exposure to hazardous substances and protecting the integrity of the cleanup action.
- Groundwater has not been investigated, so the soil-to-groundwater pathway could be a concern and additional cleanup actions may be required, depending on a groundwater investigation.

On November 18, 2011, Herrera Environmental Consultants, Inc. (Herrera) met with Ecology under the Voluntary Cleanup Program to determine a course of action at the site. A multi-phase approach was developed to first determine whether residual soil contamination continues to pose a potential threat to groundwater based on current concentrations and, if so, follow up definition of groundwater flow characteristics and groundwater quality would be performed.

SITE CONDITIONS

Physical Setting

The east boundary of the Seward Park Estates complex is located approximately 200 feet west of Lake Washington. The site is nearly flat at an elevation of 25 feet above sea level. The surface of Lake Washington is at 21 feet above sea level.

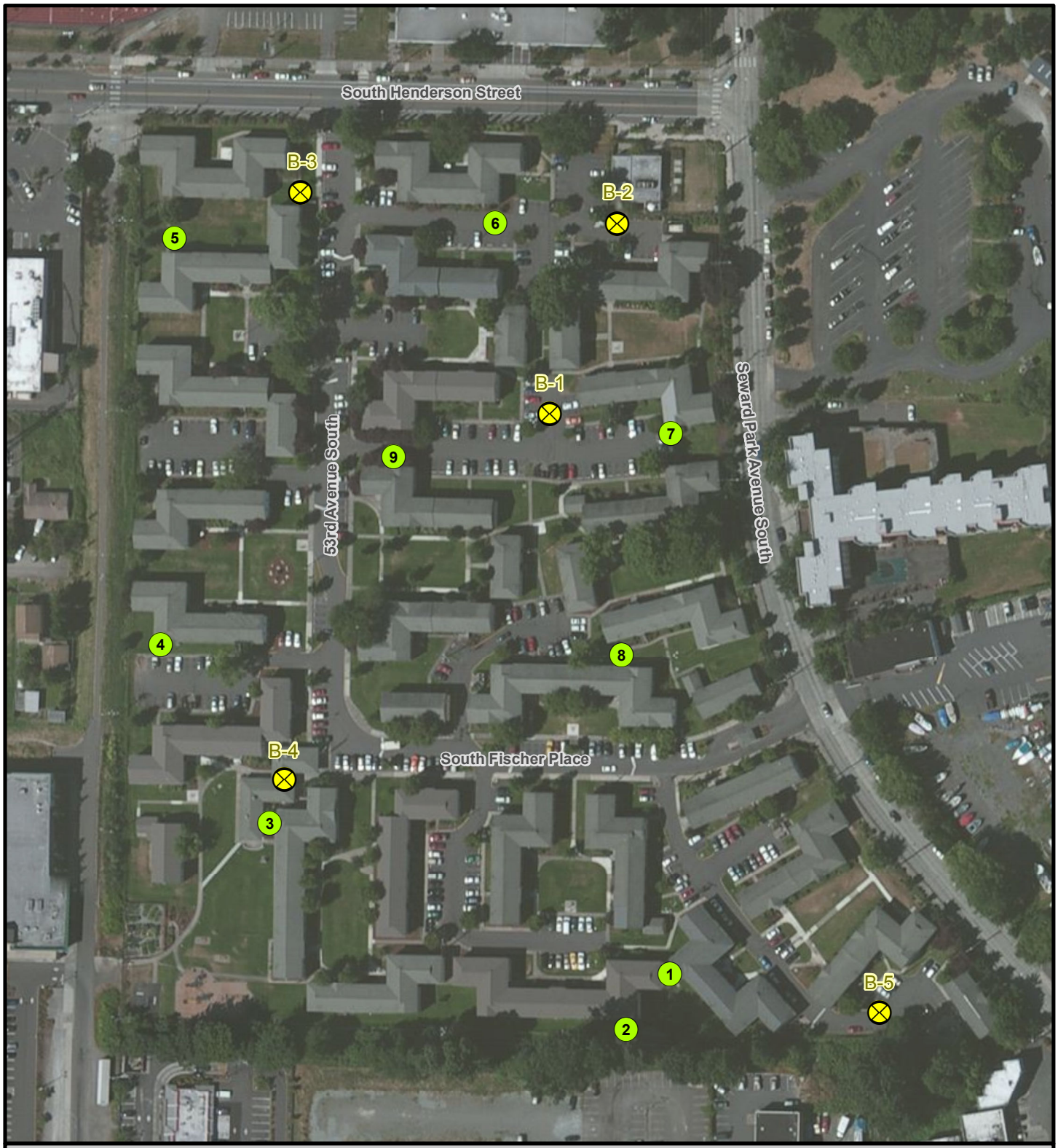
A geotechnical study conducted at the site included five test borings advanced to depths ranging from 20 to 44 feet below the existing grade (Terra Associates 1996). The borings indicated that near-surface site geology generally consisted of a fill-peat-clay-sand sequence in four of the five locations. Near-surface soil consists of very loose to medium dense silty sand at depths ranging from 2.5 to 9.5 feet below grade. Very soft to soft peat underlies the fill at four of the boring locations; fill at the northeast corner of the site is underlain by native sandy silt to silty fine sand to a depth of at least 22.5 feet (bottom of boring B-2). Peat layer thickness was 9.5 feet at B-1, nonexistent at B-2, 19.5 feet at B-3, 13.0 feet at B-4, and 7.0 feet at B-5. Very soft to very stiff clay was found beneath the peat at borings B-1, B-4, and B-5. Dense to very dense till-like soils consisting of silty fine to medium grained sand with gravel was found at the bottom of all borings.

In general, the series of soil layers identified during the geotechnical study was corroborated during tank removal. An imported fill material, consisting of varying amounts of clay, silt, sand, and gravel, was found overlying native soils. This fill layer ranged in thickness from 2.5 to 6.0 feet. Beneath the fill, native soils generally consisted of dark brown peat underlain by blue-gray clay. At some locations, the clay layer was overlain by a tan silty peat. Depth to the peat-clay interface ranged from 8 to 15 feet below ground surface.

Groundwater was encountered in three of the borings, at 12.5 feet in B-1, at 17.0 feet in B-2, and at 32.0 feet in B-4. No water was encountered at borings B-3 and B-5, with total depths of 33 and 20 feet, respectively. Ground water was not associated with a consistent soil series or depth across the site.

Historical Cleanup

The tanks were removed from all nine locations at the Lake Washington Apartments in October 1996, prior to extensive excavation of contaminated soil (Figure 2). Soil removal was based on the then-current MTCA method A cleanup level for diesel and heavier-than-diesel total petroleum hydrocarbon (TPH) fractions (200 milligrams per kilogram [mg/kg]). Cleanup to this level was achieved at most tank locations, except for TPH left in place adjacent to and beneath buildings or beneath limited pipe runs. Soil samples from site excavations were analyzed using the NWTPH-Dx method, with separate quantitation of diesel and heavier-than-diesel range petroleum hydrocarbons. Additional silica-gel cleanup was performed for selected samples based on the presence of peat, which was found to introduce an organic-rich matrix interference to petroleum hydrocarbon quantitation.



Legend

- Former tank location
- Geotechnical boring location

Figure 2. Site map Lake Washington Apartments, Seattle, Washington

N

0 75 150 300

Feet

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Aerial: Bing Maps, 2012

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Following initial removal of contaminated soils, a set of consistent conditions and physical limitations was identified – specifically, the presence of visible petroleum product in near-surface fill beneath the buildings and the tendency of water and sewer pipes located adjacent to and within each excavation to break. Based on these conditions, the following excavation approach was adopted:

- Excavations were limited laterally from the tanks by adjacent buildings, with the structures acting as a barrier to prevent facilitated transport of residual contamination by water from precipitation. The residual petroleum was not considered volatile and was not expected to affect air quality for residents (no problems had been reported in the past and none have since).
- Contamination was followed downward and outward away from buildings until concentrations approached the 200 mg/kg cleanup level. The excavation limit was a field decision based on the relative concentration level, the change in concentration over distance, and the presence of cover by pavement.
- To prevent undermining damage to utilities, piping not associated with the tanks was preserved by carefully clearing contaminated soil away from contact points. If piping failure was probable, a minimal amount of contaminated soil was left in place below the pipe (for bridging), to preserve pipe integrity. Some soil was left in place exceeding the 200 mg/kg TPH target cleanup level along limited pipe runs.

Although some contamination was left in place, most of it was covered by either buildings or pavement. An estimated 85 percent of contaminated soil was removed from the site, with little residual contamination available for downward transport. A significant amount of peat, high in organic matter, was considered an aid to retarding vertical transport of petroleum, as was the clay layer that appears to exist across a significant portion of the site. Figures depicting initial and final excavation boundaries and associated soil sampling results for each effort are provided for all nine former tank locations across the development in the Sampling and Analysis Plan for this investigation (Herrera 2011).

In 2001, the MTCA method A cleanup level for diesel- and heavy oil-range TPH was raised to 2,000 mg/kg. As such, almost all soil with residual TPH documented across the site following tank removal falls below the updated cleanup level. Contaminated soil was left at only one tank location (beneath Building 35 – Figure 2) at concentrations exceeding the current MTCA method A cleanup level (ranging between 2,100 and 6,600 mg/kg). Contaminated soil identified at Buildings 2, 5, and 12 were all over-excavated; contamination above the 2,000 mg/kg level was not left at any other building.

Based on conditions following tank and soil removal in 1997 and regulatory adjustment to the soil cleanup level, additional sampling was performed at Building 35 to determine current TPH concentrations. The original plan was to evaluate three representative soil samples from beneath the building using MTCA method B analysis to determine whether residual TPH posed a potential for groundwater contamination. Initial drilling determined the presence of TPH by visual and olfactory indications, as well as the presence of groundwater. As such, soil samples were collected for analysis according to MTCA method A protocols and a second field effort was initiated to further define the presence and condition of groundwater and the hydrogeologic regime.

FIELD WORK

Fieldwork was conducted in two phases 1) two hollow-stem boring borings were completed and soil samples collected beneath and adjacent to Building 35 to confirm the presence of residual heating oil and 2) eight vibratory push probe borings were advanced across the northeast portion of the apartment complex to both collect groundwater samples near Building 35 and to determine the extent and continuity of shallow clay extending away from the building.

Sampling Procedures

Pre-Drilling Activities

Prior to commencing drilling activities, utility locates were performed to identify underground utilities at each proposed boring location.

Hollow-stem Auger and Vibratory Push Probe Drilling and Soil Sampling Procedures

Initial borings were drilled using an auger drill rig equipped with 4.25-inch inside diameter hollow-stem auger flights. For the first boring, beneath Building 35, the auger was directed at an approximate 45 degree angle. Discrete soil samples were collected continuously using a drive split-spoon sampler 18 inches long by 3-inch outside diameter for soil classification and field screening. One sample was collected for laboratory analysis from soil either situated beyond the clean fill used to backfill the tank excavation following removal (beneath the building) or at the bottom of the backfill and above the clay layer (approximately 15 feet south of the building). The borings were backfilled with bentonite chips. The auger sampler was driven using a 300-pound downhole hammer with a drop of 24 inches.

Probe borings were advanced using a probe-drive sampler attached to driven probe rods. The borings were drilled into the clay layer to determine both top and bottom elevations, where found. During drilling, discrete soil samples for soil classification were collected continuously at 5-foot intervals using a probe-drive sampler 5 feet long by 2 inches outside diameter and lined with dedicated clear inert plastic Lexan® liners. The sampler was sealed with a piston stop pin while being pushed or driven to the desired sampling depth. The piston stop pin was retracted into the sampler while the sampler was pushed or driven to obtain a soil sample. Following retrieval, the soil-filled plastic liner was removed from the sampler and cut open to expose the soil core.

Following retrieval, each sample was logged by a licensed hydrogeologist for soil lithology. Soils encountered during drilling were classified in accordance with the Unified Soil Classification System (USCS; American Society for Testing and Materials [ASTM] D2488-90).

Visibly contaminated soil was placed into 55-gallon drums and clean soil was spread on the property.

Samples from the auger borings were prepared for chemical analysis by removing soil from the sampler and placement directly into jars provided by the analytical laboratory. Each sample was uniquely labeled denoting the sample identification number and depth, date, and time sampled. Soil samples were then placed into a chilled cooler for storage prior to delivery to the laboratory.

Vibratory Push Probe Groundwater Sampling Procedure

A peristaltic pump with disposable polyethylene and silicon tubing was used to collect groundwater samples. Prior to collecting samples, each push probe was purged for approximately 15 minutes at a flow rate of approximately 0.15 gallons per minute, until turbidity diminished. Due to the presence of silty clay, the water remained somewhat turbid at sample collection. During sample collection at LKWA-5, the temporary well was slow to recharge and it was pumped dry several times during sample collection. Sample containers were filled directly from the tubing. Purge water was placed into 55-gallon drums and stored onsite.

Decontamination Procedures

Decontamination was performed on all sampling equipment exposed to contaminated soil between boring locations. All sampling equipment was decontaminated prior to entry in the field. In addition, chemical-resistant gloves worn during sample collection were changed between sampling locations.

Decontamination of Soil Sampling Equipment

The following decontamination procedure was used for soil sampling equipment, including split-spoon samplers:

- Rinse with tap water
- Scrub with water and Liquinox detergent
- Rinse with tap water
- Rinse with deionized water.

Decontamination of Drilling Equipment and Temporary Well Casing

Drilling equipment, including sections of augers and drill rods were decontaminated between boring locations using a high-temperature pressure washer. The rinse water generated during decontamination of drilling equipment for this field investigation was contained in 55-gallon drums. New well casing and screen were used for each temporary well.

Sample Handling

All samples collected during this investigation were handled according to the procedures described in this section.

Sample Containers and Labeling

Soil and water samples were placed into containers supplied by the analytical laboratory and sample container labels were completed at the time of collection using a permanent waterproof pen or marker. Sample labels included the following information:

- Project name
- Sample identification
- Date and time of collection
- Initials of sampling personnel
- Analysis to be performed.

Sample Storage

Immediately following sample collection, sample containers were placed into a chilled cooler for storage prior to delivery to the analytical laboratory.

Sample Shipment and Delivery

Samples collected during this investigation were sent by laboratory courier to the analytical laboratory.

Chain of Custody

Sample information recorded on a chain-of-custody form included the following:

- Project name and location
- Project number
- Names of project manager and sampling personnel
- Sample identification
- Date and time of collection
- Analysis requested (for each sample)
- Number of sample containers
- Signature, date, and time (for each person releasing or accepting sample custody).

Sample Documentation

Sampling activities were documented in a dedicated field notebook. The notebook is labeled with the project name, project identification number, dates of field activities, and the name and phone number of the project manager. Entries into the field notebook were made in permanent ink and included:

- Date and atmospheric weather conditions
- Activities performed
- Name of sampling personnel
- General condition of sampling area
- Start and stop times of work
- Any unusual events or occurrences
- Description of soil profile.

Disposal of Investigation-Derived Waste

Disposal of Incidental Trash

Incidental trash generated during this investigation (including discarded nitrile gloves, used Ziploc® bags, paper towels, used bailers) were placed in plastic trash bags and disposed of as solid waste.

Disposal of Soil Cuttings

Soil cuttings generated during drilling were placed into 55-gallon drums and stored onsite until analytical results were reviewed. Drums associated with samples found to be contaminated were disposed of at a disposal facility permitted to accept the contamination found; clean soil was spread across the property.

Decontamination Water Disposal

Decontamination solutions and rinse water were stored onsite in 55-gallon drums; liquids were disposed of at a licensed facility.

ANALYTICAL PROCEDURES

The Sampling and Analysis Plan (Herrera 2011), prepared prior to the first phase of work, was altered based on evidence of petroleum hydrocarbons in the presence of groundwater in the first boring. Ecology's EPH method for nonvolatile aliphatic and nonvolatile aromatic petroleum fractions was replaced with the NWTPH-Dx method for the two soil and four groundwater samples. OnSite Environmental, an accredited Washington State Department of Ecology laboratory performed the analyses.

RESULTS

Subsurface Conditions

On March 12, 2012, two hollow-stem auger borings were advanced at the site; the first boring was advanced adjacent to Building 35 and angled at approximately 45 degrees to access contaminated soil left in place following tank removal in 1997. When visual evidence of petroleum contamination and wet conditions were encountered, it was decided to abandon further exploration beneath the building at the other two planned locations and focus on the potential for contaminant migration. A second hollow-stem auger boring was installed approximately 15 feet south of the building in the center of the earlier tank excavation. On April 26, 2012, eight vibratory push probes were advanced surrounding the southeast corner of Building 35 and expanding west, east, and south of the building to characterize shallow subsurface conditions. Groundwater was collected from the four probes immediately surrounding the building; soil lithology was recorded at all probe locations – probes were positioned to better define the extent of the shallow clay layer previously identified on the east side of the site. Boring locations are provided in Figure 3 and boring logs are provided in Appendix A.

Geologic Setting

Push probe boring logs indicate the following conditions:

- Borings LKWA-2 through -5, advanced on the south side and adjacent to Building 35, reflect the placement of backfill following tank removal, underlain by clay.
- Boring LKWA-6, approximately 80 feet northwest of the southeast corner of Building 35, indicates silt and sand down to 8 feet, underlain by 2.5 feet of clay, underlain by silt and sand; no peat was encountered.
- Boring LKWA-7, approximately 70 feet east of the southeast corner of Building 35, indicates sand and silt down to 20 feet; no peat or clay layers were encountered. Boring LKWA-9, approximately 120 feet west of the southeast corner of Building 35, indicates sand and silt down to 9 feet, underlain by at least 6 feet of peat, before encountering refusal due to a large piece of wood; no clay was encountered to a depth of 15.3 feet.
- Boring LKWA-8, approximately 165 feet south of the southeast corner of Building 35, indicates sand and gravel fill down to 8.5 feet, underlain by 8 feet of peat, and then alternating layers of clay, peat, and sand ranging from 0.5 to 2.5 feet in thickness to a total depth of 25 feet. Boring LKWA-10, approximately 500 feet south of the southeast corner of Building 35, indicates sand and gravel fill down to 8 feet, underlain by 9 feet of peat, 3.5 feet of silt, and then at least 5 feet of clay to a total depth of 25 feet.

Legend

- Probe boring location
- Geotechnical boring location

Figure 3. Boring location map, Lake Washington Apartments, Seattle, Washington

N

0 50 100 200

Feet

HERRERA

Aerial: Bing Maps, 2012

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In general, the series of soil layers identified during earlier site work was corroborated during this study. An imported fill material, consisting of varying amounts of clay, silt, sand, and gravel, was found overlying native soils, ranging in thickness from 7.0 to 14.5 feet. A clay layer was identified at Building 35, extending 500 feet south and ranging from 7 to 24 feet deep. No clay was encountered east or west of Building 35; however, the boring to the west was stopped short at 15.5 feet, due to refusal by a large piece of wood. Earlier geotechnical borings B-2 and B-3 further to the east and west of the building also did not identify any clay.

Hydrogeologic Conditions

Probes LKWA-3 through -6 were installed around the southeast corner of Building 35 with screens to collect groundwater samples; no screens were installed in the other four probes. As such, water levels were measured near the building, but only generally indicated at locations away from the building as "wet" zones on the boring logs. Based on an arbitrary survey datum of 100.00 feet established near the southeast corner of Building 35, relative groundwater elevations were measured at:

- 93.09 feet in LKWA-3
- 90.00 feet in LKWA-4
- 87.64 feet in LKWA-5
- 91.55 feet in LKWA-6.

Water was found on top of or within the shallow clay layer. Permanent monitoring wells were not established and allowed to equilibrate following development. Nevertheless, the 5.45 foot range between water levels in probes situated only tens of feet apart indicates that the water is not a pool of water with a near-level water table. Wet conditions were noted at LKWA-7, -8, and -10 at 10, 5, and 3 feet (to the east and south), respectively; wet conditions were not noted at LKWA-9 to the west.

The survey was conducted also to define clay layer surface (relative) elevations at all probes. Table 1 provides these data, along with clay layer thickness measurements. The top of the clay layer varies 4.5 feet between the four probes adjacent to Building 35 to as much as 20 feet between the southeast corner of Building 35 and LKWA-8, located 165 feet to the south. The clay surface appears to slope down from the corner of the building in all directions by approximately 1 percent to the north, 4 percent to the east and west, and 10 percent to the south. These relatively high slopes do not support the likely presence of a pool of water with a near-level water table.

Analytical Data

A data review was performed for chemical data collected for this project; both the laboratory data reports and a data quality summary are provided in Appendix B. Chemistry data met criteria associated with the method used and are considered acceptable for use; no data were qualified or rejected.

Soil and groundwater sample analytical results are summarized in Table 2. The two soil samples collected from beneath Building 35 and from 15 feet south of the southeast corner of

the building found diesel-range petroleum hydrocarbons at concentrations well below the MTCA method A cleanup level for unrestricted land use. No petroleum hydrocarbons were detected in the three groundwater samples collected from the north, east, and south of Building 35 where soil contamination was left in place following tank removal. Diesel-range petroleum hydrocarbons were found to exceed the MTCA method A cleanup level immediately east of the building.

Table 1. Shallow clay layer survey data, Lake Washington Apartments Phase II Environmental Site Assessment, Seattle, Washington.

Location	Ground Surface Elevation (feet)	Top of Clay Elevation (feet)	Thickness of Clay (feet)
LKWA-3	101.09	93.9	5.5
LKWA-4	101.70	91.7	4.0
LKWA-5	101.44	89.4	>3.0
LKWA-6	101.75	92.8	2.0
LKWA-7	100.24	<80.2	Not encountered
LKWA-8	97.86	73.9	0.3
LKWA-9	100.10	<84.8	Not encountered
LKWA-10	97.74	77.7	>5.0

Arbitrary Datum 100 feet

Table 2. Soil and groundwater sampling results, Lake Washington Apartments Phase II Environmental Site Assessment, Seattle, Washington.

	Diesel-range Petroleum Hydrocarbons	Lube-oil Range Petroleum Hydrocarbons
MTCA method A Cleanup Level – Soil (mg/kg)[a]	2,000	2,000
LKWA-1	44	76
LKWA-2	88	210
MTCA method A Cleanup Level – Groundwater (µg/L)	500	500
LKWA-3	280 U	450 U
LKWA-4	**1,200**	470 U
LKWA-5	260 U	420 U
LKWA-6	300 U	480 U

[a] Method A soil cleanup level for unrestricted land use (Ecology 2007).
µg/L microgram per liter
mg/kg milligram per kilogram
U The analyte was not detected above the associated reporting limit
Bold values indicate a result above the MTCA cleanup level

FINDINGS AND CONCLUSIONS

Two confirmation soil samples collected from tank removal excavation sidewalls in 1997 determined that petroleum-impacted soil remained beneath the southeast corner of Building 35 at concentrations greater than 2,000 mg/kg. The excavation could not reach appreciably beneath the building, due to structural constraints. At the time of cleanup, contamination was interpreted as impacting only soil above a 10-foot deep layer of clay. Soil samples collected from across the base of the excavation indicated that cleanup had been achieved, except beneath the building wall at two locations at 4 and 7 feet beneath the ground surface. Because groundwater was not evident above the clay layer, no further characterization was pursued.

During a 2010 Periodic Review conducted by Ecology, it was determined that the soil-to-groundwater pathway could be a concern and additional cleanup actions may be necessary. Because the NFA letter had not clarified the fact that groundwater had not been investigated, it was determined that the letter may be rescinded. This Phase II investigation was conducted to clarify soil and shallow groundwater conditions at the site.

A Sampling and Analysis Plan (Herrera 2011) was developed to investigate the soil-to-groundwater pathway by collecting three soil samples from beneath the building and evaluating the potential for groundwater impact according to MTCA method B. If the potential for impact was indicated, additional groundwater characterization would be required.

Soil sample LKWA-1 was collected from beneath Building 35 adjacent to historical samples EXC-6-6 and EXC- 6-7 indicating contamination at 8.5 and 4 feet below ground surface, respectively (diesel-range hydrocarbons at 5,300 mg/kg half-way up the excavation sidewall and 28 mg/kg at the base of the excavation). For the Phase II investigation, Boring LKWA-1 was advanced starting 4 feet away from the base of the building and angled at approximately 45 degrees in an attempt to access soil 4 feet below the building wall. Indications of petroleum were evident approximately 4.5 feet beneath the building as fuel odor. Drilling continued down until water was evident, approximately 10.5 feet beneath the building. The presence of petroleum and water together at this location indicated the need for further characterization of groundwater. Soil sample LKWA-2, collected 15 feet from the building and 7.5 feet deep in wet soil further indicated the need for additional characterization; however, sample analysis determined that soil was not contaminated above the MTCA method A cleanup level at either location.

Based on initial auger sampling results, push probes were installed to determine:

1) the lateral and vertical extent of clay found to exist beneath Building 35 during tank removal

2) the extent of groundwater present on top of the clay

3) groundwater quality near the building.

Probes LKWA-3 through -6 were installed immediately adjacent to the southeast corner of Building 35; probes LKWA-7 through -10 were installed at locations between the building and historical geotechnical borings (Figure 3).

Extent of Clay

Clay had previously been identified south of Building 35 in geotechnical borings B-1, B-4, and B-5, but not in geotechnical borings B-2 and B-3, located 100 and 200 feet east and west of the former tank location. Clay had also been identified in tank excavations at Buildings 35, 29, 15, 12, and 9 (tanks 6, 7, 1, 2, and 3, respectively). During the current investigation, clay was identified at all drilled locations, except to the east and west — LKWA-7 was located approximately half way between the former tank location and geotechnical boring B-2; LKWA-9 was located approximately half way between the former tank location and geotechnical boring B-3. LKWA-9 hit refusal at 15 feet, which is 3 to 8 feet deeper than clay found at the east end of Building 35, 120 feet away. The inferred lateral and vertical extent of the shallow clay layer identified at the site is shown in Figure 4, based on boring log and tank excavation information. The shallow clay layer appears to extend across a large portion of the site with a top elevation ranging from 9 to 22 feet below ground surface. At the former tank location, the clay layer ranged from 2 to 5.5 feet thick. Although this layer thins out to 4 inches at LKWA-8 (165 feet to the south), no discontinuities were apparent based on sampling performed at approximate 200-foot intervals extending from the north end of the property to the south.

Extent of Groundwater Present on Top of the Clay

The clay layer does not have a level surface beneath Building 35. Groundwater does not appear to perch as a succinct water body on top of a near-level clay layer near the former tank location — groundwater was identified on top of the clay at LKWA-3 and within the clay layer at LKWA-4, -5, and -6. It is possible that water may accumulate across a very small area defined as the clay base of the tank excavation, in an approximate 20-foot radius extending from the southeast corner of the building to the east, south, and west.

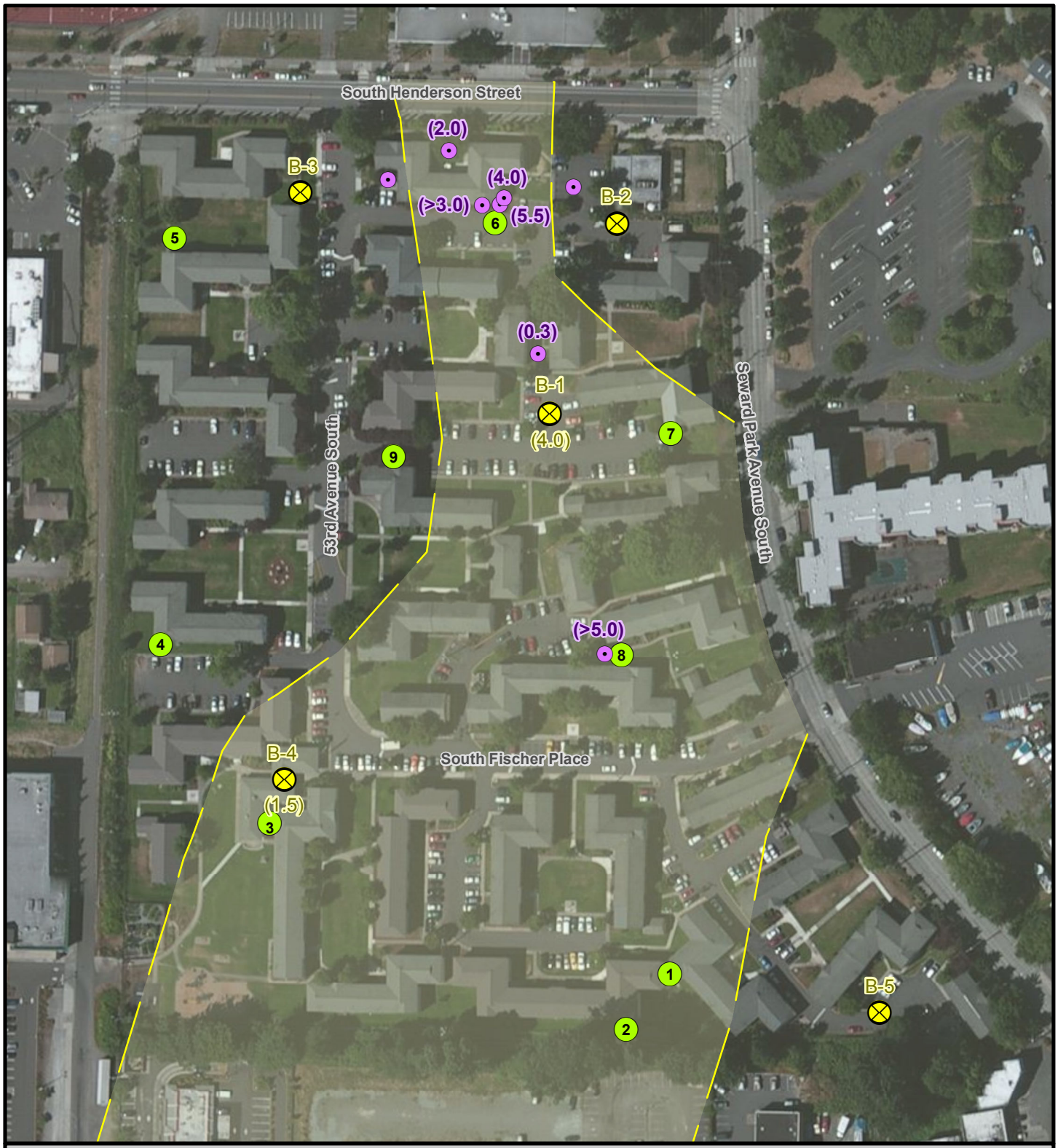
Groundwater Quality

One groundwater sample was found contain petroleum hydrocarbons at a concentration greater than the MTCA method A cleanup level immediately east of the building. No petroleum hydrocarbons were detected in three nearby groundwater samples collected from approximately 12.5 feet to the south (LKWA-3), 30 feet to the southwest (LKWA-5), and 60 feet to the northwest (LKWA-6).This included two samples collected from the former tank excavation footprint, indicating that contamination is restricted to a very small zone east of the building.

Summary

A 2- to 5.5-foot thick shallow clay layer at the former tank location appears to effectively constrain residual soil and groundwater contamination to a small pocket beneath the southeast corner of Building 35. Groundwater does not appear to exist as a continuous pool perched on the clay, which has a very uneven surface. No petroleum hydrocarbons are evident in groundwater only 12.5 feet away to the south, indicating very limited migration 15

years following tank removal. Based on this analysis, it is requested that no further action be required at the site.



Legend

- Probe boring location (clay layer thickness in feet)
- Former tank location (clay layer thickness in feet)
- Geotechnical boring location
- Shallow clay layer (inferred)

Figure 4. Extent of shallow clay layer (inferred), Lake Washington Apartments, Seattle, Washington.

N

0 75 150 300

Feet

HERRERA

Aerial: Bing Maps, 2012

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APPENDIX A

Boring Logs

Boring No. B-1

Logged by: DKW

Date: 6/7/96

Approximate Elev. 22

Graph/ USCS	Soil Description	Relative Density	Depth (ft.)	Sample	(N) Blows/ foot	Water Content (%)
SM	(3.5 inches asphaltic concrete) 4 inches brown silty sand with angular gravel (1.5 to 3 inches) (FILL)	Loose			6	35.4
	Blue-grey gravelly silty sand, moist to damp. (FILL)		5		1	24.2
	Grey gravelly silty sand with CLAY, moist. (FILL)	Very Loose			3	198.6
PT	Dark brown PEAT, wet.	Very Soft				
	Lost sample, use spt retrieve for peat.		10		1	
	Brown PEAT, wet.	Very Soft			2	387.0
	Brown PEAT.	Very Soft	15		1	
ML CL	Grey clayey SILT to silty CLAY, damp to wet.	Very Soft				
			20			
SM	Blue/grey silty fine SAND with trace organics, wet.	Loose			5	23.5
	Grey silty fine to medium SAND with trace organics, wet.	Medium Dense	25		13	23.3
SM SP	Grey slightly silty to clean SAND with occasional gravel, wet	Medium Dense	30			
SM →	Grey gravelly silty SAND, moist. (TILL)	Very Dense			52	19.5

Boring terminated at 33.5 feet.
Backfill with drill spoil.
Upper seal: 1 bag bentonite chips at 4 feet and 2.5 bags concrete/pea gravel 4 feet to surface.
Water level at end of drilling measured at 20.5 feet.
Groundwater encountered at 12.5 feet.
*Water level after pull out at 2.5 feet below surface.
Suspect high due to hole caving.

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Geotechnical Consultants

BORING LOG
SEWARD PARK ESTATES
SEATTLE, WASHINGTON

Proj. No. T-2911	Date 7/96	Figure A-2

Boring No. B-2

Logged by: DKW

Date: 6/7/96

Approximate Elev. 24

Graph/ USCS	Soil Description	Relative Density	Depth (ft.)	Sample	(N) Blows/ foot	Water Content (%)
SM	2 inches asphaltic concrete. 2.5 inches crushed rock base. Grey gravelly silty sand, wet. (FILL)					
ML	Grey clayey fine sandy silt wet. (FILL)	Loose			9	
	Grey silty sand, wet. (FILL)	Loose				
ML	Brown fine sandy SILT, moist.	Dense	5		49	14.6
	Brown fine sandy SILT with occasional gravel, moist.	Very Dense			94/11"	14.9
ML/SM	Brown fine sandy SILT grades to silty sand with occasional gravel, moist.	Very Dense	10		70	16.8
ML	Brown to tan fine sandy SILT, moist.	Hard	15		50/5"	16.8
				▼	50/4"	16.8
ML	Blue grey fine sandy SILT, moist.	Hard	20			
SM	Blue/grey silty fine SAND, moist.	Very Dense			50/5.5"	12.7

Boring terminated at 22.5 feet.
Groundwater at 17 feet.

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BORING LOG
SEWARD PARK ESTATES
SEATTLE, WASHINGTON

Proj. No. T-2911	Date 7/96	Figure A-3

Boring No. B-3

Logged by: DKW

Date: 6/10/96

Approximate Elev. 26

Graph/ USCS	Soil Description	Relative Density	Depth (ft.)	Sample	(N) Blows/ foot	Water Content (%)
	Brown gravelly silty sand. (FILL)					5.2
	Lost ring. Redrive SPT.					
SM	Blue/grey silty sand with gravel, moist. (FILL)	Medium Dense			13	
	Blue/grey silty sand with gravel, wet.	Medium Dense	5		22	10.9
ML	Blue/grey gravelly sandy silt with clay, moist. (FILL)	Medium Dense			16	10.9
	Brown PEAT.	Very Soft	10		2	401.9
	Brown PEAT, wet.	Soft				
		Soft	15		2	426.5
PT	Brown PEAT, wet.	Very Soft			1	369.1
	Brown PEAT with trace clay, wet.	Very Soft	20			
					2	
	Brown PEAT with some SAND, wet.	Very Soft	25		7	27.4
SM	Grey silty SAND with clay and gravel, wet.	Loose	30			
ML / SM	Grey sandy SILT with gravel to gravelly silty SAND, moist. (Till)	Very Dense			50/2"	15.1

Boring terminated at 33 feet.
Seal with 3 bags bentonite chips and 1 bag pea gravel at top.
Backfill with soil drill spoil.
Water table/seepage not observed at termination.

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BORING LOG
SEWARD PARK ESTATES
SEATTLE, WASHINGTON

Proj. No. T-2911 | Date 7/96 | Figure A-4

Boring No. B-4

Logged by: DKW

Date: 6/10/96

Approximate Elev. 24

Graph/ USCS	Soil Description	Relative Density	Depth (ft.)	Sample	(N) Blows/ foot	Water Content (%)
SM	Grey silty sand with gravel. (FILL)					
PT	Brown PEAT, wet.	Medium Stiff			9	128.9
	Brown PEAT and WOOD, wet.	Soft	5		1	258.0
	Brown PEAT, wet.	Very Soft			1	634.5
	Brown PEAT some SAND, wet.	Very Soft	10		1	349.4
	Brown PEAT, wet, sand in shoe	Very Soft			1	430.5
CL	Grey silty CLAY, wet.	Very Soft	15		1	46.4
ML	Blue grey elastic SILT with fine SAND.	Stiff			11	34.9
CH	Tan silty CLAY, moist. qu=1.0 to 1.25 tsf	Stiff	20		14	48.0
	Brown to blue grey silty CLAY, moist.	Medium Stiff	25		8	45.0
	Grey silty CLAY, moist.	Medium Stiff	30 ▼		7	30.8
	Grey silty CLAY with fine sand lenses. qu=1.5tsf	Very Stiff	35		26	38.8
SM	Grey silty SAND with clay, wet. (Till-like)	Very Dense	40		82	15.5

Boring terminated at 44 feet.
Water level at 32 feet at termination. Hole caved at pull out.
Backfill hole with 3 bags bentonite chips and 1 bag pea gravel and replace sod.

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BORING LOG
SEWARD PARK ESTATES
SEATTLE, WASHINGTON

Proj. No. T-2911	Date 7/96	Figure A-5

Boring No. B-5

Logged by: DKW

Date: 6/10/96

Approximate Elev. 24

Graph/ USCS	Soil Description	Relative Density	Depth (ft.)	Sample	(N) Blows/ foot	Water Content (%)		
SM	Grey silty sand with gravel, wet, peat in shoe. (FILL)	Loose			4	21.0		
PT	Brown PEAT, wet.	Very Soft	5		1	406.7		
PT	Brown PEAT with wood chips, wet.	Very Soft			1	315.0		
MH	Blue/grey elastic clayey SILT.	Very Stiff	10		19	31.9		
SM	Brown silty fine to medium SAND, moist.	Dense			41	13.9		
SM	Brown gravelly silty SAND, moist.	Very Dense	15		51	11.5		
SM	On cobbles rock; chips in shoe.	Very Dense			50/2"			

Boring terminated at 20 feet.
Dry hole.
Patch and bentonite chips pea gravel.

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BORING LOG
SEWARD PARK ESTATES
SEATTLE, WASHINGTON

Proj. No. T-2911 | Date 7/96 | Figure A-6

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SOIL BORING AND MONITORING WELL CONSTRUCTION RECORD

Boring # LKWA1
Total depth 16.5
Sheet 1 of 1

Project name Lake WA Apts
Project number 11-05186-000
Client
HEC rep. B. Carpenter

Drilling Contractor Cascade
Location 5' west of chimney footing 4' from bldg 35
Start date 3/20/17
Compl. date 3/20/17
26' west of SE Corner Bldg 35 (4' south of Bldg)

Drilling method HSA (45° Angle)
Sampling method split spoon
Ground elevation —
Air monitoring (Y/N) No
Instrument(s) —

Instrument reading (ppm)	Sample type, interval	% recovery	Blow counts	Depth (feet, BGS)	Water level (feet)	Soil group	Soil description	Well Details
				1			Topsoil / Fill Brown silty SAND w/ gravel, cobbles (Fill), damp	
				2				
				3				
				4				
				5			Brown - Blue Silty CLAY, tr. Sand, gravel, peat, damp (Fill)	
	X	65		6				
				7			Alternating layers Dark Brown peat, gray silty CLAY, damp Fuel odor	
	X	100		8				
				9			As above fuel odor	
				10				
	X	75		11			As above fuel odor	
				12				
				13			LKWA1-12.5 @ 12:30	
	X	75		14			Wood fragments	
				15			Wet @ 15', fuel odor, NAPL product on water	
	X	75		16			Blue gray silty CLAY	
				17				

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SOIL BORING AND MONITORING WELL CONSTRUCTION RECORD

Boring # LKWA2
Total depth 11.5
Sheet 1 of 1

Project name Lake wa Apts.
Project number 11-05186-000
Client LakeWA Apts LLC
HEC rep. B. Carpenter

Drilling Contractor Cascade
Location Curb corner 15' SE corner of Bldg 35
Start date 3/20/12
Compl. date 3/20/12

Drilling method HSA
Sampling method split spoon
Ground elevation -
Air monitoring (Y/N) No
Instrument(s) -

Instrument reading (ppm)	Sample type, interval	% recovery	Blow counts	Depth (feet, BGS)	Water level (feet)	Soil group	Soil description	Well Details
				1			Topsoil Brown silty SAND, w/ gravel, cobbles dry	
				2				
				3				
				4				
			12	5				
X		60	18	6			As above, damp 4" gray CLAY w/ Sand pet (fill) liner plastic / pea gravel 12	
			20	7				
X			12	8			pea gravel wet LKWA2-7.5@13:30	
		100	12					
			13	9			Blue gray Silty CLAY	
				10			Water running into hole / in pea gravel	
X			12					
		100	18	11			As above	
			20					
				12				
				13				
				14				
				15				

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SOIL PROBE BORING RECORD

Boring ID LKWA-3
Total depth 15
Sheet 1 of 1

Project name	Lake WA Apts	Drilling Contractor	Cascade	Drilling method	Push-probe rig
Project number	11-05186-000	Location	Lake WA Apts	Sampling method	5 ft core tube with plastic liner
Client	EPMI		4 ft S of SE Corner of Building 35	Ground elevation	NA
HEC rep.	Bruce Carpenter	Start date	4/26/12	Air monitoring (Y/N)	No
		Compl. date	4/26/12	Instrument(s)	NA

Sample type, interval	% recovery	Water level (feet)	Depth (feet, BGS)	Soil group	Soil description
5-foot long probe sampler	40		1	SW	Brown silty gravelly SAND, (fill), moist
			2		
			3		
			4		
			5		
5-foot long probe sampler	45		6		
			7		
		▽	8		SWL 8 feet
			9	CL	Brown silty gravelly CLAY, faint fuel odor wet at 9 feet
			10		
5-foot long probe sampler	95		11		
			12	CH	Blue gray silty CLAY, moist
			13		
			14	SM	Light gray silty SAND, moist
			15		
					Temporary screen set from 5 to 15 feet to collect water sample. Borehole backfilled with bentonite chips.

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SOIL PROBE BORING RECORD

Boring ID LKWA-4
Total depth 15
Sheet 1 of 1

Project name	Lake WA Apts	Drilling Contractor	Cascade	Drilling method	Push-probe rig
Project number	11-05186-000	Location	Lake WA Apts	Sampling method	5 ft core tube with plastic liner
Client	EPMI		8.5 ft N of SE Corner of Building 35	Ground elevation	NA
HEC rep.	Bruce Carpenter	Start date	4/26/12	Air monitoring (Y/N)	No
		Compl. date	4/26/12	Instrument(s)	NA

Sample type, interval	% recovery	Water level (feet)	Depth (feet, BGS)	Soil group	Soil description
5-foot long probe sampler	60		1	SW	Brown silty gravelly SAND, (fill), moist
			2		
			3		
			4		
				GP	Pea gravel, (fill)
5-foot long probe sampler	100		5	SW	Brown gravelly SAND, (fill), moist
			6		
			7		
			8		
			9	CL	Dark Brown silty gravelly CLAY, fuel odor, moist
			10		
5-foot long probe sampler	95	▽	11	CH	Blue gray silty CLAY, moist
			12		SWL 11.7 feet
				SC	Blue gray gravelly silty clayey SAND, moist
			13	CH/MH	Blue gray silty CLAY/clayey SILT, moist
			14		
			15	SP	Light brown gravelly SAND, dense, moist
					Temporary screen set from 5 to 15 feet to collect water sample. Borehole backfilled with bentonite chips.

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SOIL PROBE BORING RECORD

Boring ID LKWA-5
Total depth 15
Sheet 1 of 1

Project name	Lake WA Apts	Drilling Contractor	Cascade	Drilling method	Push-probe rig
Project number	11-05186-000	Location	Lake WA Apts	Sampling method	5 ft core tube with plastic liner
Client	EPMI		28 ft W of SE Corner of Building 35	Ground elevation	NA
HEC rep.	Bruce Carpenter	Start date	4/26/12	Air monitoring (Y/N)	No
		Compl. date	4/26/12	Instrument(s)	NA

Sample type, interval	% recovery	Water level (feet)	Depth (feet, BGS)	Soil group	Soil description
5-foot long probe sampler	35		1–5	SW	Brown gravelly SAND, trace of silt, (fill), moist
5-foot long probe sampler	75		6–10	MH	Brown clayey SILT, trace of sand, organic material, moist
5-foot long probe sampler	100	▽	11–15	CH	Blue gray silty CLAY, moist SWL 13.8 feet
					Temporary screen set from 5 to 15 feet to collect water sample. Borehole backfilled with bentonite chips.

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SOIL PROBE BORING RECORD

Boring ID LKWA-6
Total depth 15
Sheet 1 of 1

Project name	Lake WA Apts	Drilling Contractor	Cascade	Drilling method	Push-probe rig
Project number	11-05186-000	Location	Lake WA Apts	Sampling method	5 ft core tube with plastic liner
Client	EPMI		North of Building 35	Ground elevation	NA
HEC rep.	Bruce Carpenter	Start date	4/26/12	Air monitoring (Y/N)	No
		Compl. date	4/26/12	Instrument(s)	NA

Sample type, interval	% recovery	Water level (feet)	Depth (feet, BGS)	Soil group	Soil description
5-foot long probe sampler	60		1	ML	Dark brown sandy gravelly SILT, moist
			2		
			3		
			4		
			5	SM	Gray silty gravelly SAND, moist
5-foot long probe sampler	80		6	ML	Dark brown clayey SILT, organic material, moist
			7		
			8	CL	Dark brown and beige silty CLAY, moist
			9		
			10	CH	Blue gray silty CLAY, moist
5-foot long probe sampler	100	▽	11	ML	SWL 10.2 feet Blue gray gravelly sandy SILT with trace of clay, moist
			12	SM	Light brown and red-brown, mottled, silty SAND, trace of gravel, dense, moist
			13		
			14		
			15		
					Temporary screen set from 5 to 15 feet to collect water sample. Borehole backfilled with bentonite chips.

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SOIL PROBE BORING RECORD

Boring ID LKWA-7
Total depth 20
Sheet 1 of 1

Project name	Lake WA Apts	Drilling Contractor	Cascade	Drilling method	Push-probe rig
Project number	11-05186-000	Location	Lake WA Apts	Sampling method	5 ft core tube with plastic liner
Client	EPMI		East of dumpsters near Building 35	Ground elevation	NA
HEC rep.	Bruce Carpenter	Start date	4/26/12	Air monitoring (Y/N)	No
		Compl. date	4/26/12	Instrument(s)	NA

Sample type, interval	% recovery	Water level (feet)	Depth (feet, BGS)	Soil group	Soil description
5-foot long probe sampler	90		1	SW	Brown silty gravelly SAND, (fill), moist
			2		
			3		
			4		
			5		
5-foot long probe sampler	10		6		
			7		
			8		
			9		
			10		wet
5-foot long probe sampler	90		11		
			12		
			13		
			14		
				SM	Brown silty SAND, wet
			15		Brown silty SAND, trace of gravel, damp
5-foot long probe sampler	100		16		
			17	ML	Gray SILT, trace of clay, dry
			18		
			19		
			20		Borehole backfilled with bentonite chips.

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SOIL PROBE BORING RECORD

Boring ID LKWA-8
Total depth 25
Sheet 1 of 2

Project name	Lake WA Apts	Drilling Contractor	Cascade	Drilling method	Push-probe rig
Project number	11-05186-000	Location	Lake WA Apts	Sampling method	5 ft core tube with plastic liner
Client	EPMI		Between Buildings 31 and 32	Ground elevation	NA
HEC rep.	Bruce Carpenter	Start date	4/26/12	Air monitoring (Y/N)	No
		Compl. date	4/26/12	Instrument(s)	NA

Sample type, interval	% recovery	Water level (feet)	Depth (feet, BGS)	Soil group	Soil description
5-foot long probe sampler	80		1	SM	Brown gravelly silty SAND, (fill), moist
			2		
			3	SW	Gray silty gravelly SAND, (fill), moist
			4		
			5		
5-foot long probe sampler	80		6	GP	Pea GRAVEL, (fill), wet
			7		
			8	GW	Gray gravelly SAND, (fill), wet
			9	PT	PEAT, moist
			10		
5-foot long probe sampler	100		11		Changes from light brown to dark brown PEAT, moist
			12		
			13		
			14		
			15		
5-foot long probe sampler	100		16		
			17	OH	Brown silty CLAY zones within PEAT
			18		
			19		
				OH	Brown silty CLAY, moist
			20	SM	Gray silty SAND, moist

HERRERA ENVIRONMENTAL CONSULTANTS

SOIL PROBE BORING RECORD

Boring ID LKWA-8
Total depth 25
Sheet 2 of 2

Project name	Lake WA Apts	Drilling Contractor	Cascade	Drilling method	Push-probe rig
Project number	11-05186-000	Location	Lake WA Apts	Sampling method	5 ft core tube with plastic liner
Client	EPMI		Between Buildings 31 and 32	Ground elevation	NA
HEC rep.	Bruce Carpenter	Start date	4/26/12	Air monitoring (Y/N)	No
		Compl. date	4/26/12	Instrument(s)	NA

Sample type, interval	% recovery	Water level (feet)	Depth (feet, BGS)	Soil group	Soil description
5-foot long probe sampler	40			PT	Brown PEAT, moist
			21		
				CL	Gray brown silty CLAY, moist
			22		
			23		
			24	PT	Brown PEAT, moist
				CH	Blue gray silty CLAY (4-inches thick), moist
			25	SM	Blue gray silty SAND, moist
					Borehole backfilled with bentonite chips.

HERRERA ENVIRONMENTAL CONSULTANTS

SOIL PROBE BORING RECORD

Boring ID LKWA-9
Total depth 15.3
Sheet 1 of 1

Project name	Lake WA Apts	Drilling Contractor	Cascade	Drilling method	Push-probe rig
Project number	11-05186-000	Location	Lake WA Apts	Sampling method	5 ft core tube with plastic liner
Client	EPMI		8.5 feet W of SW corner of Buildings 35	Ground elevation	NA
HEC rep.	Bruce Carpenter	Start date	4/26/12	Air monitoring (Y/N)	No
		Compl. date	4/26/12	Instrument(s)	NA

Sample type, interval	% recovery	Water level (feet)	Depth (feet, BGS)	Soil group	Soil description
5-foot long probe sampler	55		0–5	SM	Brown gravelly SAND, (fill), moist
			5		wet
5-foot long probe sampler	80		5–9	ML	Brown gray SILT, moist
5-foot long probe sampler	95		9–15	PT	Brown PEAT, moist
			15		Large piece of wood at 15 feet prevented drilling beyond that depth.
					Borehole backfilled with bentonite chips.

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SOIL PROBE BORING RECORD

Boring ID LKWA-10
Total depth 25
Sheet 1 of 2

Project name	Lake WA Apts	Drilling Contractor	Cascade	Drilling method	Push-probe rig
Project number	11-05186-000	Location	Lake WA Apts	Sampling method	5 ft core tube with plastic liner
Client	EPMI		20 feet W of Building 24	Ground elevation	NA
HEC rep.	Bruce Carpenter	Start date	4/26/12	Air monitoring (Y/N)	No
		Compl. date	4/26/12	Instrument(s)	NA

Sample type, interval	% recovery	Water level (feet)	Depth (feet, BGS)	Soil group	Soil description
5-foot long probe sampler	80		1	SM	Brown gravelly SAND, (fill), moist
			2		
			3	GW	Gray GRAVEL, trace of sand, (fill), wet
			4		
			5	GP	Pea GRAVEL (fill), wet
5-foot long probe sampler	75		6		
			7		
			8	PT	Brown PEAT, moist
			9		
			10		
5-foot long probe sampler	70		11		
			12		
			13		
			14		
			15		
5-foot long probe sampler	85		16		
			17	OL	zones of organic SILT
			18		
			19		
			20		

HERRERA ENVIRONMENTAL CONSULTANTS

SOIL PROBE BORING RECORD

Boring ID LKWA-10
Total depth 25
Sheet 2 of 2

Project name	Lake WA Apts	Drilling Contractor	Cascade	Drilling method	Push-probe rig
Project number	11-05186-000	Location	Lake WA Apts	Sampling method	5 ft core tube with plastic liner
Client	EPMI		20 feet W of Building 24	Ground elevation	NA
HEC rep.	Bruce Carpenter	Start date	4/26/12	Air monitoring (Y/N)	No
		Compl. date	4/26/12	Instrument(s)	NA

Sample type, interval	% recovery	Water level (feet)	Depth (feet, BGS)	Soil group	Soil description
5-foot long probe sampler	100			CH	Olive gray silty CLAY, moist
			21		
			22		
			23		
			24		
					2-inches of wood fragments
			25	CH	Blue-gray silty CLAY, moist
					Borehole backfilled with bentonite chips.

APPENDIX B

Analytical Data

Herrera Environmental Consultants, Inc.

Memorandum

To Project File 11-05186-000

From Gina Catarra, Herrera Environmental Consultants

Date May 9, 2012

Subject Data Quality Assurance Review of Lake Washington Apartments Phase II Environmental Site Assessment Data

This memorandum presents a review of data quality for two soil and four groundwater samples collected at the Lake Washington Apartments Phase II Environmental Site Assessment site on March 20 and April 24, 2012. All samples were analyzed by OnSite Environmental of Redmond, Washington by Ecology's NWTPH-Dx method.

Results for the following samples were validated.

Sample ID	Date Collected	Matrix	Laboratory Batch Number
LKWA1-12.5	3/20/2012	Soil	1203-159
LKWA2-7.5	3/20/2012	Soil	1203-159
LKWA-3	4/20/2012	Groundwater	1204-175
LKWA-4	4/20/2012	Groundwater	1204-175
LKWA-5	4/20/2012	Groundwater	1204-175
LKWA-6	4/20/2012	Groundwater	1204-175

Laboratory performance was reviewed in accordance with quality control (QC) criteria outlined in the *Lake Washington Apartments Phase II Environmental Site Assessment Sampling and Analysis Plan* (SAP)(Herrera 2011) and the specified analytical method.

Quality control data summaries submitted by the laboratories were reviewed; raw data were not submitted by the laboratories. Data validation results are summarized below, followed by definitions of data qualifiers.

Custody, Preservation, Holding Times, and Completeness—Acceptable with Discussion

The samples were properly preserved and sample custody was maintained from sample collection to receipt at the laboratory. All samples were analyzed within the required holding times (7 days for water samples and 14 days for soil samples). The laboratory reports were complete and contained results for all samples and tests requested on the chain-of-custody (COC) forms.

The SAP specified that only soil samples would be collected and analyzed by Ecology's EPH method for nonvolatile aliphatic and nonvolatile aromatic petroleum fractions. Both soil and groundwater samples collected from the site were submitted to the laboratory for analysis by Ecology's NWTPH-Dx method. No data were qualified due to the change in analytical method.

Laboratory Reporting Limits—Acceptable

The laboratory reporting limits were reasonable for the specified analytical method.

Method Blank Analysis – Acceptable

Method blanks were analyzed at the required frequency. Method blanks did not contain levels of target analytes above the laboratory reporting limits.

Surrogate Analysis—Acceptable

Surrogate o-Terphynl was analyzed with each sample. The percent recovery values for all samples met the 50 to 150 percent control limits established by the method.

Matrix Spike Analysis—Not Analyzed

Matrix spike (MS) samples were not analyzed, which is acceptable per the analytical method.

Laboratory Duplicate Analysis—Acceptable

Laboratory duplicates were analyzed at the required frequency. The relative percent difference (RPD) was not calculated for either the soil or water duplicate, as both values were less than the reporting limit.

Data Quality Assessment Summary

The data quality for all samples was found to be acceptable based on holding time, reporting limit, method blank, surrogate, and laboratory duplicate criteria. Usability of the data is based on the guidance documents previously noted. Upon consideration of the information presented here, the data are acceptable as reported.

Definition of Data Qualifiers

The following data qualifier definitions are taken from *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (USEPA 2002):

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J The associated value is an estimated quantity.

UJ The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

R The data are unusable. (Note: analyte may or may not be present.)

References

Herrera. 2011. Lake Washington Apartments Phase II Environmental Site Assessment Sampling and Analysis Plan. Prepared for Lake Washington Apartments, LLC. by Herrera Environmental Consultants, Seattle, Washington. December 2011.

USEPA. 2002. Contract laboratory program national functional guidelines for inorganic data review. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C. (EPA-540/R-01/008).

OnSite Environmental Inc.

14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

March 26, 2012

Bruce Carpenter
Herrera Environmental Consultants, Inc.
2200 6th Avenue, Suite 1100
Seattle, WA 98121

Re: Analytical Data for Project 11-05186-000
Laboratory Reference No. 1203-159

Dear Bruce:

Enclosed are the analytical results and associated quality control data for samples submitted on March 21, 2012.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: March 26, 2012
Samples Submitted: March 21, 2012
Laboratory Reference: 1203-159
Project: 11-05186-000

Case Narrative

Samples were collected on March 20, 2012 and received by the laboratory on March 21, 2012. They were maintained at the laboratory at a temperature of 2°C to 6°C.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Date of Report: March 26, 2012
Samples Submitted: March 21, 2012
Laboratory Reference: 1203-159
Project: 11-05186-000

NWTPH-Dx
(with acid/silica gel clean-up)

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**LKWA1-12.5**					
Laboratory ID:	03-159-01					
Diesel Range Organics	**44**	35	NWTPH-Dx	3-22-12	3-22-12	
Lube Oil	**76**	70	NWTPH-Dx	3-22-12	3-22-12	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*80*	*50-150*				
Client ID:	**LKWA2-7.5**					
Laboratory ID:	03-159-02					
Diesel Range Organics	**88**	31	NWTPH-Dx	3-22-12	3-22-12	
Lube Oil	**210**	62	NWTPH-Dx	3-22-12	3-22-12	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*100*	*50-150*				

Date of Report: March 26, 2012
Samples Submitted: March 21, 2012
Laboratory Reference: 1203-159
Project: 11-05186-000

NWTPH-Dx
QUALITY CONTROL
(with acid/silica gel clean-up)

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0322S2					
Diesel Range Organics	**ND**	25	NWTPH-Dx	3-22-12	3-22-12	
Lube Oil Range Organics	**ND**	50	NWTPH-Dx	3-22-12	3-22-12	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*112*	*50-150*				

Analyte	Result		Recovery		Limits	RPD	Limit	Flags
DUPLICATE								
Laboratory ID:	03-122-02							
	ORIG	DUP						
Diesel Range Organics	**ND**	**ND**				NA	NA	
Lube Oil Range Organics	**ND**	**ND**				NA	NA	
Surrogate:								
o-Terphenyl			*110*	*109*	*50-150*			

Date of Report: March 26, 2012
Samples Submitted: March 21, 2012
Laboratory Reference: 1203-159
Project: 11-05186-000

% MOISTURE

Date Analyzed: 3-22-12

Client ID	Lab ID	% Moisture
LKWA1-12.5	03-159-01	29
LKWA2-7.5	03-159-02	19

OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-napthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

Y - Sample extract treated with an acid/silica gel cleanup procedure.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

Chain of Custody

OnSite Environmental Inc.
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Company: Herrera Environmental
Project Number: 11-05186-000
Project Name: Lake WA Apartments
Project Manager: Bruce Carpenter
Sampled by: Bruce Carpenter

Turnaround Request (in working days)

(Check One)

- ☐ Same Day ☐ 1 Day
- ☐ 2 Days ☐ 3 Days
- ☒ Standard (7 Days) (TPH analysis 5 Days)
- ☐ _____ (other)

Laboratory Number: 03-159

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx	Volatiles 8260B	Halogenated Volatiles 8260B	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082	Organochlorine Pesticides 8081A	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA / MTCA Metals (circle one)	TCLP Metals	HEM (oil and grease) 1664	% Moisture
1	LKWA1-12.5	3/20/12	1230	Soil					X												X
2	LKWA2-7.5	3/20/12	1330	Soil					X												X

	Signature	Company	Date	Time
Relinquished		Herrera	3/21/12	900
Received			3/21/12	1330
Relinquished				
Received				
Relinquished				
Received				

Comments/Special Instructions

Sent via courier

Reviewed/Date

Reviewed/Date

Chromatograms with final report ☐

Data Package: Level III ☐ Level IV ☐ Electronic Data Deliverables (EDDs) ☐ _____

OnSite Environmental Inc.

14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

May 3, 2012

Peter Jowise
Herrera Environmental Consultants, Inc.
2200 6th Avenue, Suite 1100
Seattle, WA 98121

Re: Analytical Data for Project 11-05186-000
Laboratory Reference No. 1204-175

Dear Peter:

Enclosed are the analytical results and associated quality control data for samples submitted on April 27, 2012.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: May 3, 2012
Samples Submitted: April 27, 2012
Laboratory Reference: 1204-175
Project: 11-05186-000

Case Narrative

Samples were collected on April 26, 2012 and received by the laboratory on April 27, 2012. They were maintained at the laboratory at a temperature of 2°C to 6°C.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Date of Report: May 3, 2012
Samples Submitted: April 27, 2012
Laboratory Reference: 1204-175
Project: 11-05186-000

NWTPH-Dx
(with acid/silica gel clean-up)

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**LKWA-3**					
Laboratory ID:	04-175-01					
Diesel Range Organics	**ND**	0.28	NWTPH-Dx	5-2-12	5-2-12	
Lube Oil Range Organics	**ND**	0.45	NWTPH-Dx	5-2-12	5-2-12	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*83*	*50-150*				
Client ID:	**LKWA-4**					
Laboratory ID:	04-175-02					
Diesel Range Organics	**1.2**	0.29	NWTPH-Dx	5-2-12	5-2-12	
Lube Oil Range Organics	**ND**	0.47	NWTPH-Dx	5-2-12	5-2-12	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*88*	*50-150*				
Client ID:	**LKWA-5**					
Laboratory ID:	04-175-03					
Diesel Range Organics	**ND**	0.26	NWTPH-Dx	5-2-12	5-2-12	
Lube Oil Range Organics	**ND**	0.42	NWTPH-Dx	5-2-12	5-2-12	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*88*	*50-150*				
Client ID:	**LKWA-6**					
Laboratory ID:	04-175-04					
Diesel Range Organics	**ND**	0.30	NWTPH-Dx	5-2-12	5-2-12	
Lube Oil Range Organics	**ND**	0.48	NWTPH-Dx	5-2-12	5-2-12	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*80*	*50-150*				

Date of Report: May 3, 2012
Samples Submitted: April 27, 2012
Laboratory Reference: 1204-175
Project: 11-05186-000

NWTPH-Dx
QUALITY CONTROL
(with acid/silica gel clean-up)

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0502W1					
Diesel Range Organics	**ND**	0.25	NWTPH-Dx	5-2-12	5-2-12	
Lube Oil Range Organics	**ND**	0.40	NWTPH-Dx	5-2-12	5-2-12	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*104*	*50-150*				

Analyte	Result		Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE							
Laboratory ID:	04-174-01						
	ORIG	DUP					
Diesel Range Organics	**ND**	**ND**			NA	NA	
Lube Oil Range Organics	**ND**	**ND**			NA	NA	
Surrogate:							
o-Terphenyl			*84* *83*	*50-150*			

OnSite Environmental Inc.

Data Qualifiers and Abbreviations

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ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

Chain of Custody

OnSite Environmental Inc.
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Company: Herrera Environmental
Project Number: 11-05186-000
Project Name: LK WA Apts.
Project Manager: Peter Jowise
Sampled by: Bruce Carpenter

Turnaround Request (in working days)

(Check One)

- ☐ Same Day
- ☐ 1 Day
- ☐ 2 Day
- ☐ 3 Day
- ☒ Standard (7 working days)
  (TPH analysis 5 working days)
- ☐ _____ (other)

Laboratory Number: 04-175

Requested Analysis

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	# of Cont.	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Dx	Volatiles by 8260B	Halogenated Volatiles by 8260B	Semivolatiles by 8270D / SIM	PAHs by 8270D / SIM	PCBs by 8082	Pesticides by 8081A	Herbicides by 8151A	Total RCRA Metals (8)	TCLP Metals	HEM by 1664	% Moisture
1	LKWA-3	4/24/12	955	W	2			X											
2	LKWA-4		1105		2			X											
3	LKWA-5		1330		2			X											
4	LKWA-6		1240		2			X											

	Signature	Company	Date	Time
Relinquished by	/Bruce A. Carpenter	Herrera Environmental	4/27/12	8:00
Received by		OBE	4/27/12	1200
Relinquished by				
Received by				
Relinquished by				
Received by				

Comments/Special Instructions: Sent Via Courier

Reviewed by/Date

Reviewed by/Date

Chromatograms with final report ☐

DISTRIBUTION LEGEND: White - OnSite Copy Yellow - Client Copy