

APPENDIX B

**PREVIOUS PROPERTY AND
RELATED OFF-PROPERTY INVESTIGATIONS**

B.1 1992 Roux Phase I Environmental Site Assessment

Roux Associates (“Roux”), of Concord, California, conducted a Phase I Environmental Site Assessment (“ESA”) of the Property in 1992 (Roux, 1992). Roux identified the following recognized environmental conditions (“RECs”) associated with the Property:

- The storage of fuel in the yard area, both historically and at the time of the Phase I ESA. Based on information provided by Maryatt Industries personnel, an extensive fuel release may have occurred before 1992;
- The storage of heating oil in USTs beneath the Property, both historically and at the time of the Phase I ESA. The Phase I ESA indicated that no integrity testing of the USTs had been performed since their installation in 1947;
- The storage and use of solvents on the Property, both historically and at the time of the Phase I ESA. Although the Phase I ESA did not discuss historical solvent handling and disposal practices, it indicated that solvent use at the time of the Phase I ESA was limited to approximately 10 gallons per month, some solvents were disposed of through the wastewater treatment plant, and solvent-containing material was disposed of in a sludge disposal container to the north of the wastewater treatment area; and
- The presence of potential polychlorinated biphenyl (“PCB”)-containing transformers on the Property. The Phase I ESA indicated that an explosion occurred at one of the transformers, although it did not describe the location of the transformer or indicate the source of the information.

Environmental concerns outside the Property that were referenced in the Phase I ESA included the storage of fuel in USTs beneath the 800 Aloha Street parcel, an unknown volume (and type) of chemicals released during a spill at the Esterline/Korry marine products facility immediately north of the Property, and the storage of fuel near the Property (historically and at the time of the Phase I ESA).

B.2 1992 Roux Phase II Environmental Site Assessment

Roux conducted a Phase II ESA at the Property in October 1992 to evaluate whether the RECs identified during the Phase I ESA had impacted soil or groundwater (Roux, 1993). Roux reportedly advanced six borings to depths between 15 and 36.5 feet bgs and completed them as monitoring wells MW1 through MW6. To avoid confusion with other wells labeled MW1 through MW6 (or MW-1 through MW-6), SES added the prefix “R-” in front of the well names. R-MW1 was drilled in the Property’s yard area, R-MW2 was drilled near the 1960s-era fuel dispenser located in the northeastern portion of the Property, R-MW3 and R-MW6 were drilled along the eastern Property boundary, R-MW4 was drilled in the sidewalk to the north of the property immediately south of the Property, and R-MW5 was advanced on the east side of the Dexter Avenue North ROW. Soil samples collected from the borings were submitted for laboratory analysis of CVOCs including tetrachloroethene (“PCE”), trichloroethene (“TCE”), trans-1,2-dichloroethene (“tDCE”), and vinyl chloride (“VC”).

Roux and another consultant (“DOF”) both collected groundwater samples from R-MW1 through R-MW6 and submitted them for analysis of CVOCs including PCE, TCE, tDCE, VC, DCE, and methylene chloride; gasoline-range organics (“GRO”); diesel-range organics (“DRO”); oil-range organics (“ORO”); and/or benzene, toluene, ethylbenzene, and total xylenes (“BTEX”).

The Phase II ESA confirmed that the former storage of fuel on the Property and former use of the Property as a dry cleaning facility resulted in the release of petroleum hydrocarbons and solvents to soil and/or groundwater beneath the Property, with elevated concentrations of PCE detected south and southeast of the Property boundaries. The investigation did not bound the vertical or horizontal extent of these constituents.

B.3 1997 Black and Veatch Phase II Environmental Site Assessment

Black & Veatch (“B&V”) conducted a Phase II ESA as part of the Denny Way/Lake Union combined sewer overflow project (Black and Veatch, 1998). The purpose of the investigation was to provide King County with geotechnical data for engineering design and to evaluate if properties along the project corridor had impacted soil and/or groundwater. The investigation included drilling 56 borings (53 completed as monitoring wells), excavation of 15 test pits, and installation of 5 pumping wells and 3 observation wells. Nine of the borings (BB-5, BB-7, BB-8, BB-10, BB-12, BB-13, BB-14, TB-12, and TB-18), and two pumping wells (PW-1 and PW-4) were located near the Property. B&V collected soil and groundwater samples from all borings drilled during the investigation. All samples were analyzed for GRO, DRO, and ORO, with selected soil and groundwater samples also analyzed for CVOCs, polycyclic aromatic hydrocarbons (“PAHs”), and BTEX.

Groundwater collected from BB-5, BB-8, BB-10, BB-12, BB-13, and TB-18 had detectable concentrations of CVOCs, BTEX, and/or PAHs. PCE and its degradation products were found in groundwater samples collected from wells up to 360 feet east of the Property. The investigation did not bound the vertical or horizontal extent of these constituents.

B.4 2000 ThermoRetec Soil and Groundwater Testing Under the Building

ThermoRetec conducted a subsurface investigation in June 2000 at the Property to evaluate the lateral extent of solvent-impacted soil and groundwater at the Property (ThermoRetec, 2000). Nine borings (B-1 through B-3, B-4A, B-4B, B-4C, and B-5 through B-10) were drilled on the Property. Borings B-1 through B-3 and B-5 through B-10 were drilled to maximum depths between 9 and 20 feet bgs. Borings B-4A, B-4B, and B-4C hit refusal at approximately 2 to 3.5 bgs, so no soil samples were collected. Groundwater was encountered at depths ranging from 8 to 14.5 feet bgs, and reconnaissance groundwater samples were collected from borings B-2 and B-6 through B-10 using a peristaltic pump. Selected soil and reconnaissance groundwater samples were submitted for laboratory analysis of CVOCs, including PCE, TCE, cis-1,2-dichloroethene (“cDCE”), tDCE, VC, and chloroform.

The highest concentrations of solvents in soil were found in borings located near the former dry cleaning machines (B-2, B-6, B-8, and B-9), and the highest concentration of PCE in groundwater was found in a sample collected from boring B-9. Although the investigation did not bound the vertical or horizontal extent of CVOCs, it appeared to identify the potential source of CVOCs detected at the Property in previous investigations.

B.5 2001 GeoEngineers Supplemental Remedial Investigation

GeoEngineers, Inc. (“GeoEngineers”) conducted a supplemental RI at the Property in July 2001 to evaluate a potential source of subsurface CVOCs, one of the three dry cleaning machines in operation on the Property in the 1980s that may have leaked dry cleaning solvents into the subsurface (GeoEngineers, 2002). GeoEngineers drilled one soil boring (SB4) and three monitoring wells (MW1 through MW3). To avoid confusion with other soil borings and wells, SES added the prefix “G-” in front of the boring and well names. Monitoring well G-MW1 was drilled to an approximate maximum depth of 38 feet bgs near the former dry cleaning machines to evaluate the shallow groundwater, monitoring well G-MW2 was drilled in an approximate downgradient location from the former dry cleaning machines to a maximum depth of approximately 18 feet bgs to evaluate a shallow water-bearing zone, and boring G-SB4 was advanced next to a floor drain that was further downgradient from the former dry cleaning machines. G-SB4 was abandoned at approximately 18 feet bgs because of difficult drilling conditions and was replaced by monitoring well G-MW3 drilled nearby to an approximate depth of 38 feet bgs. During drilling, a perched water-bearing zone was encountered at approximately 10 feet bgs, and a deeper water-bearing zone was encountered at approximately 32 feet bgs. GeoEngineers collected groundwater samples from the perched water-bearing zone in all three monitoring wells using low-flow sampling techniques several days after well installation.

Soil samples collected from borings G-MW1 and G-SB4 and groundwater samples collected from G-MW1, G-MW2, and G-MW3 were submitted for laboratory analysis of CVOCs, including PCE, TCE, cDCE, tDCE, VC, 1,2-dichloroethane (“EDC”), and 1,3,5-trimethylbenzene; naphthalene; and BTEX. Soil samples with the highest detected concentrations of PCE were also submitted for analysis of leachable constituents. The supplemental RI indicated a source of subsurface solvents near the dry cleaning machines, with the highest concentrations of PCE in that area. Perched groundwater also contained elevated concentrations of PCE.

B.6 1992 through 2002 East Adjoining Properties Subsurface Investigations

800 Aloha Street

Fueling operations with a 1955-era UST system were suspended in October 1992 after discovery of a leaking fuel pump dispenser (Retec, 1993). A vapor survey indicated that VOCs were present in the vicinity of a 550-gallon UST, a 2,700-gallon UST, and the pump island. Vapor survey points near the eastern parcel boundary did not indicate elevated VOCs. The following year, E.P. Johnson (EPJ) removed the two USTs and product piping and excavated approximately 3,200 tons of petroleum-contaminated soil (PCS) from the parcel.

The excavation depth varied from 7 to 25 feet bgs, where groundwater prevented further excavation. Soil samples were collected from the sidewalls and bottom of the excavation and were submitted for laboratory analysis of RCRA 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver), GRO, DRO, ORO, BTEX, TCLP constituents, total PCBs, and/or CVOCs. Although elevated concentrations of GRO and BTEX were detected, CVOCs were not detected in the soil samples analyzed. The excavated PCS was disposed of off the site.

In March 1993, EPJ oversaw drilling of seven soil borings (SCLB-1 through SCLB-7) to maximum depths varying from 24 to 39 feet bgs, with borings SCLB-3 through SCLB-7 completed as monitoring wells MW-1 through MW-5, respectively. These wells were subsequently decommissioned after they were deemed to be screened across the upper and lower portions of an aquifer. In October 1993, RETEC oversaw the drilling of eight borings, five of which were completed as replacement monitoring wells (RB-1, RB-2, RB-3, and MW-6 through MW-10). The borings were advanced to maximum depths ranging from 17.5 to 25 feet bgs. In June 2002, Urban Redevelopment LLC (Urban, 2002) oversaw drilling of seven borings and the collection of 21 discrete soil samples (borings SCL-B100, SCL-B101, SCL-B102, SCL-MW101, SCL-MW102, SCL-MW103, and SCL-MW105 and soil samples SP-1 through SP-21). The locations and maximum depths of these sample locations, with exception of SCL-MW101 and SCL-MW105 (which were completed as monitoring wells) reportedly could not be confirmed. Soil samples were collected from each boring, and groundwater samples were collected from the monitoring wells after to their development and during subsequent groundwater monitoring events. Samples were submitted for laboratory analysis of ORO and BTEX, with selected samples also submitted for analysis of DRO, PAHs (including cPAHs), pentachlorophenol, CVOCs, and/or RCRA 8 metals.

Petroleum hydrocarbon and CVOC impacts originating from the Property were confirmed in groundwater beneath the 8th Avenue North ROW, in the vicinity of the 800 Aloha Street parcel. The origin of petroleum hydrocarbons in soil and groundwater at the 800 Aloha Street parcel was not delineated. The extent of PCE and its degradation products in groundwater was not defined to the northeast of the Property.

1992 753 9th Avenue North Parcel Investigations

Environmental Associates Inc. (EA) conducted a subsurface investigation at the parcel in June 1992. EA oversaw drilling borings to the east of the parcel within the Westlake Avenue North ROW near 1948-era USTs with 1000-, 300-, and 675-gallon capacities used to store gasoline, used oil, and fuel oil, respectively. The USTs were located west of the building within the asphalt-paved parking lot. The locations and depths of the borings are not known. Soil and groundwater samples were collected from the borings and analyzed for petroleum hydrocarbon identification (HCID). According to a Geotech Consultants, Inc. (“GeoTech”) summary of the June 1992 investigation (GeoTech, 1992), none of the soil or groundwater samples collected from the borings contained elevated concentrations of DRO, although groundwater in two wells located north of the building within the Aloha Street ROW had been impacted by petroleum hydrocarbons.

In July and September 1992, GeoTech removed the three USTs and observed pinholes in the gasoline and fuel USTs. Soil was excavated around each tank to depths between 12 and 14 feet bgs. GeoTech collected soil samples from the bottom of each excavation, from the stockpiled soil (which did not appear to be contaminated), and from test pits excavated along the western parcel boundary and in the northwest corner of the parcel. The samples were submitted for laboratory analysis of BTEX and HCID or GRO, and the results indicated petroleum impacts from approximately 4 feet to a depth of 12 to 14 feet bgs extending throughout the parking lot behind the building an unknown distance, under the building, and off the parcel. Petroleum impacts were also found in groundwater downgradient of the parcel. The excavations were backfilled with the stockpiled soil.

Since petroleum-impacted soil was found in soil at depths above those of the USTs in the test pits advanced near the western property boundary, it was concluded that the contamination was likely coming from a source west to southwest of the parcel. It is not known if CVOCs were analyzed in any of the samples.

B.7 2004 and 2009 DOF Groundwater Sampling

DOF collected groundwater samples at the Property in December 2004 (DOF, 2004) and January 2009 (DOF, 2009). In December 2004, DOF sampled monitoring well G-MW3, and in January 2009, DOF sampled Property wells G-MW1, G-MW2, R-MW1, R-MW2, and R-MW3, and four wells outside the Property (R-MW5, R-MW6, BB-8, and BB-8A). Monitoring well R-MW4 had been decommissioned before the January 2009 groundwater sampling event. Groundwater samples were submitted for laboratory analysis of VOCs (2004) and GRO, BTEX, and halogenated VOCs, including PCE, TCE, cDCE, tDCE, and VC (2009). During the 2004 sampling of G-MW3, the highest concentration of PCE in groundwater at that time was detected.

B.8 2008 CH2M Hill 9th Avenue Sewer Upgrade Environmental Investigation

In April 2008, CH2M Hill conducted an environmental investigation along the 9th Avenue North corridor between Republican and Aloha Streets to evaluate if any soil and/or groundwater contamination was present along the proposed sewer alignment footprint (CH2M Hill, 2008). Four soil borings were drilled in the 9th Avenue North ROW using a hollow-stem auger rig to maximum depths of 7 to 26 feet bgs. Boring CHB-07 was advanced northeast of the Property between Ward and Aloha Streets, boring CHB-08 was drilled to the east of the Property at the eastern projection of Roy Street, boring CHB-09 was advanced to the southeast of the Property between Roy and Mercer Streets; and CHB-10 was drilled to the south-southeast of the Property between Mercer and Republican Streets. Reconnaissance groundwater samples were collected from borings CHB-07, CHB-08, and CHB-09 using temporary well screens. Soil and groundwater samples were not collected from boring CHB-10 because the potential for contamination in that boring location was considered low. Soil and reconnaissance groundwater samples were submitted for laboratory analysis of GRO, DRO, ORO, and CVOCs.

The investigation found petroleum and CVOC impacts beneath the 9th Avenue ROW. Based on the soil and groundwater CVOC concentrations at boring CHB-08, the eastern boundary of the CVOC contamination did not extend beyond the 9th Avenue North ROW between Aloha and Roy Streets. However, the eastern boundary of CVOC contamination was inexact since CH2M did not report precise locations of borings CHB-07, CHB-08 and CHB-09.

B.9 2010 and 2011 Groundwater Sampling Events

SES collected groundwater samples from monitoring wells located at the Site in May 2010 and June 2011 using low flow sampling methods (SES, 2013b). In May 2010, SES collected groundwater samples from wells BB-8, BB-8A, BB-12, BB-12A, and BB-13 and submitted them for laboratory analysis of PCE, TCE, cDCE, tDCE, VC, DCE, and methylene chloride. In June 2011, SES collected groundwater samples from Property wells G-MW1, G-MW2, G-MW3, R-MW1, R-MW2, and R-MW3, and five wells outside the Property: R-MW5, R-MW6, BB-8, BB-8A, and MW-9 (located across the 8th Avenue North ROW near the 800 Aloha Street parcel). The samples were submitted for analysis of GRO, DRO, ORO, BTEX, and/or VOCs, including PCE, TCE, cDCE, tDCE, 1,1-DCE, methylene chloride, 1,2-dibromoethane (“EDB”), EDC, naphthalene, 1,3,5- and 1,2,4-trimethylbenzene, and acetone.

The results of the 2010 and 2011 groundwater sampling events indicated that although PCE and its degradation products were still present in groundwater, concentrations had slightly attenuated since previous investigations.

B.10 2011 and 2012 Preferred Pathway Investigation

Between April 2011 and March 2012, SES conducted an investigation to evaluate the configuration and integrity of the Property’s sanitary sewer system, including the sewer line cleanouts, drains, and sumps (SES, 2013b). In April 2011, a plumbing company video recorded the condition of accessible portions of the Property’s sanitary sewer lines. The contractor video recorded the southern line from Sump No. 4 to near Sump No. 2, the eastern line from Sump No. 2 to near the 8th Avenue North ROW, and the northern line from just north of Sump No. 5 to the eastern side of the northwest wing of Building A (Figure 2). No obvious structural damage was observed in the videos of the southern or eastern lines, but part of the northern sanitary sewer line appeared to be damaged.

Between April and June 2011, SES collected sludge samples from Sump No. 2 through Sump No. 5, located on the basement level, and from one of the 1925-era water treatment drainage trenches located on the first floor of the building. Sludge samples were also collected from sewer line cleanouts No. 1 and No. 2, located in Building C (Figure 2). Sump No. 1 was dry and contained no residual fluid. Each sample was analyzed for VOCs. Additional stratified samples of water, sludge mixed with water, and sludge were collected from Sump No. 4 and submitted for laboratory analysis.

In July 2011, SES cleaned and saw cut a hole in the base of Sump No. 4 to assess its structural integrity and to evaluate whether the sump had leaked. SES collected a soil sample from approximately 1 foot below the base of the sump. In February 2012, SES excavated two test pits (EX01 and EX02) along the southern sewer line alignment near Sump No. 2 (Figure 2) to observe the conditions and structural integrity of the sewer line in the area of boring B-9 (Figure 4), which exhibited elevated concentrations of PCE in shallow soil. Test pit EX01 exposed the 6-inch-diameter, cast iron sewer line, and although the line appeared to sag slightly at the belled joint connections, no obvious perforations or breaks in the line were observed. SES collected soil samples from excavation EX01 and submitted for analytical testing for CVOCs. Based on the low photoionization detector (PID) measurements in screened soil samples, SES did not submit soil samples from EX02 for laboratory analysis.

The elevated concentrations of CVOCs in sludge samples from Sump Nos. 2, 4, and 5 and cleanouts Nos. 1 and 2 indicated that the PCE waste stream from Property dry cleaning was disposed of through the sewer lines connected to those sumps and cleanouts. The soil PCE concentrations adjacent to Sump Nos. 2 and 4 indicated leakage from those sewer lines or sumps into the subsurface. The lateral extent of PCE in shallow soil was not determined during the investigation.

B.11 2012 Subsurface Soil and Groundwater Investigations

Windward Environmental LLC (“Windward”) conducted a subsurface soil and groundwater investigation at the Site in January and February 2012 to further evaluate the lateral and vertical extent of contamination beneath the Property and to confirm if contaminated soil and groundwater extended to the east outside the Property (Windward, 2012). Four soil borings (P-03, P-06, P-07, and P-08) were drilled during the investigation using a sonic drilling rig. P-03 and P-06 were drilled in the sidewalk of 8th Avenue North to evaluate impacts to the east of the Property, P-07 was drilled near monitoring well R-MW1 to better evaluate the vertical extent of solvent contamination previously encountered in soil collected from R-MW1. P-03, P-06, and P-07 were drilled to approximate maximum depths of 80 feet bgs. P-08 was drilled in the yard area to evaluate the vertical extent of solvent contamination previously identified in soil collected from boring B-6. P-08 was drilled with a hollow-stem auger at an approximate 25-degree angle from vertical to a maximum length of 81.5 feet of auger; the boring extended approximately 34.5 feet laterally beneath Building C to an actual maximum depth of approximately 74 feet bgs.

Reconnaissance groundwater samples were collected from borings P-06 and P-08 during drilling activities at depths of 20, 40, and 60 feet bgs. After the reconnaissance groundwater samples were collected, borings P-03, P-06, P-07, and P-08 were completed as monitoring wells MW-01 through MW-04, respectively, each with approximately 10 feet of well screen. To avoid confusion with other soil borings and wells, SES added the prefix “W-” in front of the well names. After development of the wells, Windward collected groundwater samples from W-MW-01 through W-MW-04 near the bottom of the well screens (70 to 80 feet bgs) using bladder pumps. Windward also collected groundwater samples from Property monitoring wells G-MW1, G-MW2, G-MW3, R-MW1, R-MW2, and R-MW3, and five monitoring wells outside the Property (R-MW5, R-MW6, MW-9, BB-8, and BB-13).

Windward measured groundwater levels in each monitoring well, as well as from monitoring wells SCS-1 through SCS-5, located on the 800 Aloha Street parcel. Selected soil, reconnaissance groundwater, and monitoring well groundwater samples were submitted for laboratory analysis of VOCs, including PCE, TCE, cDCE, tDCE, VC, EDC, BTEX, and 1,3,5- and 1,2,4-trimethylbenzene.

Elevated concentrations of PCE were found to extend to the northeast of the suspected source area previously identified near boring G-SB4/G-MW3, indicating a potential source area near P-07/W-MW-03. Concentrations of PCE and/or its degradation products were found at greater depths (40 to 82 feet bgs) than those explored during previous investigations, although based on the fact that conductor casing was not used during drilling in areas of suspected dense, non-aqueous phase liquid (“DNAPL”), the deeper presence of CVOCs could have been due to drag down during drilling. The lateral and vertical extents of impacted soil and groundwater were not determined during the investigation.

B.12 2012 and 2013 SES Remedial Investigation

SES conducted an RI at the Site between July 2012 and March 2016 (SES, 2013b and 2016). The purpose of the work was to fill data gaps, evaluate the lateral and vertical extent of soil and groundwater contamination, collecting soil vapor data, and collecting sufficient data to conduct an FS. The RI included drilling and sampling soil borings and monitoring well borings, installing and developing monitoring wells, collecting reconnaissance groundwater samples, measuring groundwater levels, collecting groundwater samples, installing and sampling soil vapor probes, and conducting aquifer (slug) tests.

Boring and Well Installation

Forty-four soil borings were drilled during the RI (borings B101 through B128, B130, B131, and DB01 through DB14). Borings B101 through B106 were drilled with a sonic drilling rig, and borings B107 through B131 were drilled with a hollow-stem auger drill rig. Due to the presence of extensive subsurface utilities, borings B101, B104, B106, B108, B112, B113, B115, B116, B117, B122, B123, and B126 through B128 were cleared with a vactor truck or by hand before drilling. The diameter of the conductor casing or auger was reduced at specific depths in two of the borings to reduce the potential for downward migration during drilling: at 40 and 80 feet bgs in B102 and at 50 feet bgs in B111.

Relatively undisturbed, discrete soil samples were collected from each boring drilled with a sonic rig and at 5-foot intervals from each boring drilled with a hollow-stem auger through the maximum depth drilled. Soil samples were collected from the center of the core sample to avoid cross-contamination. Select portions of recovered soil core samples were placed in a plastic bag and screened for VOCs with a photoionization detector (“PID”). Select soil samples were submitted for laboratory analysis based on field screening results, previous data, and the location of the sample relative soil-groundwater interface. Laboratory analyses included PCE, TCE, cDCE, tDCE, VC, EDC, EDB, 1,3,5-trimethylbenzene and 1,2,4-trimethylbenzene by EPA Method 8260C. Soil samples collected from DB02, DB14, and B107 were also submitted for analysis of GRO by Ecology Method NWTPH-Gx and BTEX by EPA Method 8260C.

Reconnaissance groundwater samples were collected from B101 through B106, B115, B116, B122, B124, B126, DB01 through DB05, DB05A, DB10, DB13, and DB14. Samples were collected using a temporary screen and a peristaltic or bladder pump and were submitted for laboratory analysis of PCE, TCE, cDCE, tDCE, VC, EDC, EDB, 1,3,5-trimethylbenzene and 1,2,4-trimethylbenzene by EPA Method 8260C. The reconnaissance groundwater samples collected from borings B104 and DB14 (at 60 and 80 feet bgs) were also analyzed for GRO by Ecology Method NWTPH-Gx and/or BTEX by EPA Method 8260C. Additional reconnaissance groundwater samples collected from borings B102, B103, and B105 at each of the depths sampled were field filtered with a 0.45-micron filter due to the high turbidities.

Monitoring wells were installed in borings B101 through B131 (designated with a “MW” prefix and the boring number) and were constructed of 2-inch-diameter Schedule 40 PVC, with 10-foot-long screens, 0.010-inch wide slots, and #2/12 silica sand annular backfill around the screens. Concrete was used as the well seal with flush mount steel monuments installed at the surface. SES identified three water-bearing zones during drilling activities: a shallow water-bearing zone comprised of fill and encountered to depths of 10 to 20 feet bgs, a relatively thick intermediate water-bearing zone composed of dense to very dense, heterogeneous glacial soil (found between 25 and 80 feet bgs, divided into an upper “A” zone and a lower “B” zone), and a deep water-bearing zone composed of glacial outwash deposits. Table 1 provides the well completion details grouped by water-bearing zone.

Well Development

SES used a submersible pump to develop the monitoring wells, surging and purging the wells until a minimum of five well volumes was removed and the groundwater no longer appeared turbid. Due to the lack of conductor casing reduction during the drilling of monitoring wells W-MW-02, W-MW-03, and W-MW-04 were substantially redeveloped before collecting groundwater samples to remove residual contaminant mass that was likely carried down the borehole during the initial installation by Windward.

Aquifer Testing

SES conducted slug testing of thirteen monitoring wells in March 2013. The tested wells included Intermediate A wells MW107, MW108, MW109, MW110, MW114, MW115, and MW116; Intermediate B wells MW111, W-MW-01, and W-MW-02; and deep wells MW104, MW105, and MW113. An 8-foot-long, 1-inch-diameter piece of PVC filled with sand was used as the slug, and pressure transducers/dataloggers were used to record the water level changes during the tests. SES conducted falling head and rising head tests in all wells but MW111, which was only evaluated with a falling head test. The data were analyzed with commercial software. Table 2 provides the results.

Groundwater Level Measurement

SES measured groundwater levels eight times between September 4, 2012, and February 1, 2016. At each well, depth to groundwater was measured from the top of the PVC well casing using an electronic water level meter. Table 3 provides the groundwater elevation data.

Groundwater Sampling

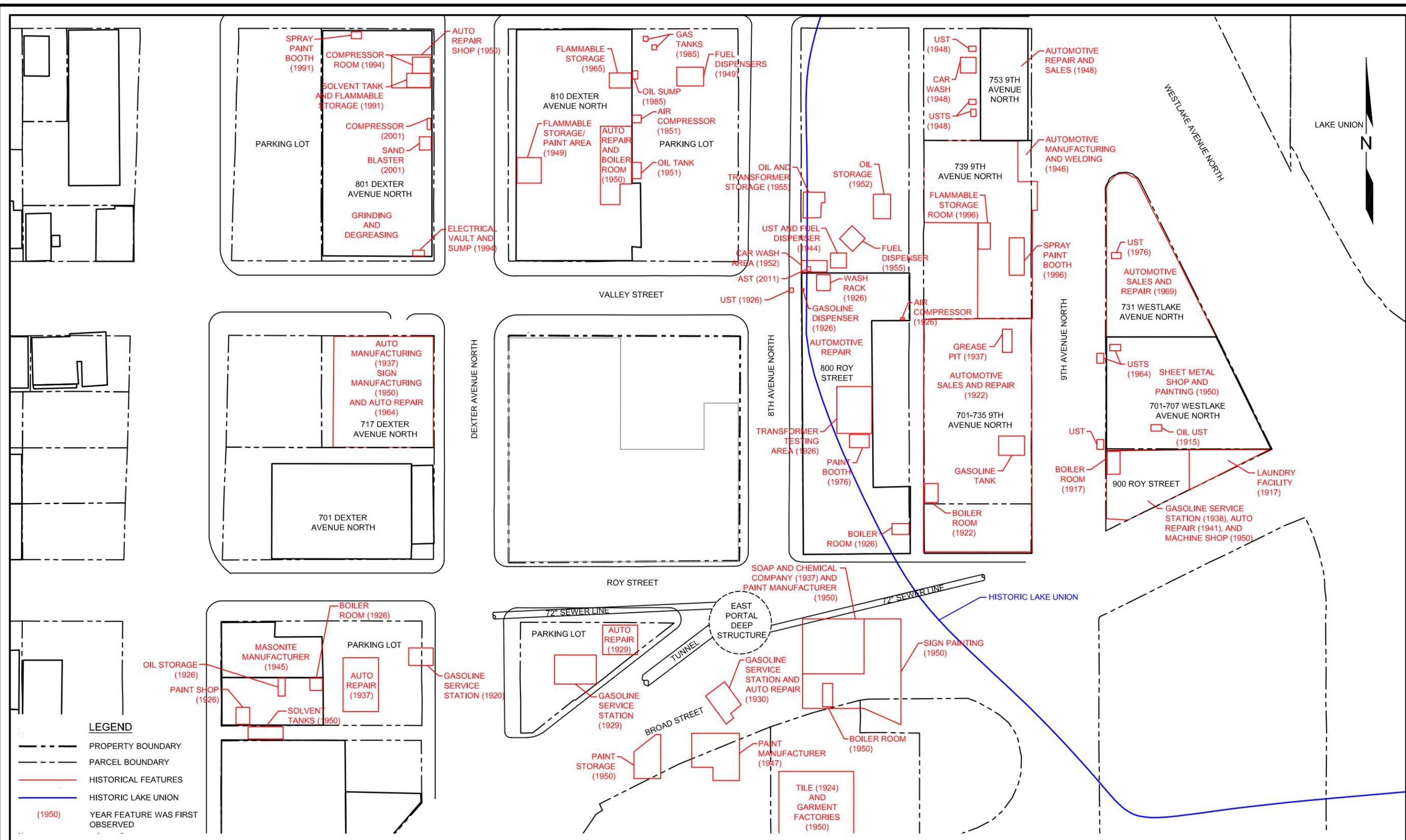
SES collected groundwater samples from the existing monitoring wells and the newly installed monitoring wells (at least 24 hours after development) between July 2012 and March 2013 using low-flow sampling techniques and either a peristaltic pump or a bladder pump.

Purging and sampling of monitoring wells MW102, MW104, MW106, and MW112 were performed using a bladder pump and dedicated polyethylene tubing. During purging, temperature, pH, specific conductivity, dissolved oxygen (“DO”), turbidity, and oxidation-reduction potential (“ORP”) were measured, with each well purged until these parameters stabilized. Groundwater samples were submitted for laboratory analysis of PCE, TCE, cDCE, tDCE, VC, EDC, EDB, 1,3,5-trimethylbenzene and 1,2,4-trimethylbenzene by EPA Method 8260C. Select groundwater samples were also submitted for analysis of BTEX by EPA Method 8260C, and the MW107 sample was also submitted for laboratory analysis of GRO by Ecology Method NWTPH-Gx and DRO/ORO by Ecology Method NWTPH-Dx.

Soil Vapor Probe Installation and Sampling

In March 2013, SES conducted a soil vapor investigation event in the sidewalk west of the 800 Aloha Street parcel. The investigation involved the installation of permanent soil vapor monitoring points SV01, SV02, and SV03 with a direct-push drill rig and collecting of soil vapor samples using 6-liter summa canisters. The soil vapor monitoring points consisted of 6-inch-long, stainless steel mesh implants at an approximate depth of 12.75 feet bgs connected to a riser composed of 0.5-inch-diameter, Teflon-lined polyethylene tubing. Flush-with-grade monuments were installed over the monitoring points. Soil vapor samples were collected in the vadose zone just above the groundwater capillary fringe at depths ranging from 11.75 to 12.75 feet bgs. The sample depths were selected to simulate sub-slab soil vapor samples. To ensure representative samples, a minimum of three “dead” volumes were purged from the soil vapor monitoring points before sample collection, and helium was added to an enclosure over the sampling train and probe to assess for leaks during sampling of the soil vapor. The samples were submitted for laboratory analysis and analyzed for the presence of PCE, TCE, cDCE, tDCE, and VC by EPA Modified Method TO-15 SIM.

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LEGEND

- PROPERTY BOUNDARY
- - - PARCEL BOUNDARY
- HISTORICAL FEATURES
- HISTORIC LAKE UNION
- (1950) YEAR FEATURE WAS FIRST OBSERVED



DATE: 03/07/13
 DRAWN BY: NAC
 CHECKED BY: DRAFT
 CAD FILE: 0797-001_2013RI_HIST_OFF

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 PROJECT NUMBER: 0797-001
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 CITY, STATE: SEATTLE, WASHINGTON

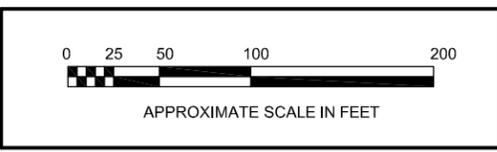
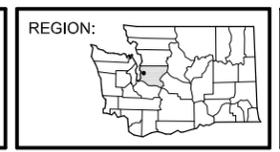


FIGURE 7
 HISTORICAL OFF-PROPERTY FEATURES

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