RI/FS Summary Report for Voluntary Cleanup Program Application, South Facilities, South Annex

Prepared for
King County Metro Transit

King County

November 2020

Prepared by
Parametrix

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CITATION

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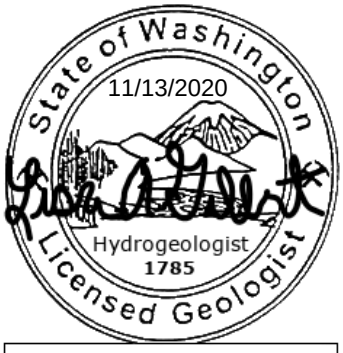
CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional hydrogeologist licensed to practice as such, is affixed below.



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ACRONYMS AND ABBREVIATIONS

BTEX	benzene, toluene, ethylbenzene, xylenes
CSCSL	confirmed and suspected contaminated sites list
CSM	conceptual site model
CUL	cleanup level
Ecology	Washington State Department of Ecology
MTCA	Model Toxics Control Act
NFA	no further action
NOEC	No Observed Effects Concentration
POC	point of compliance
TEE	terrestrial ecological evaluation
TPH	total petroleum hydrocarbons
USGS	U.S. Geological Survey
UST	underground storage tank
VCP	voluntary cleanup program
WDFW	Washington Department of Fish and Wildlife

1. INTRODUCTION

This report provides a summary of site characterization and cleanup activities that have been conducted at King County Metro's South Facilities/South Annex, located at 11911 E Marginal Way S, Tukwila, WA 98168 (the Property) to support Metro's Voluntary Cleanup Program (VCP) application to the Washington State Department of Ecology (Ecology). The VCP application seeks a No Further Action (NFA) determination by Ecology. Parametrix' services were performed under Work Order No. 13 to Contract No. E00635E19.

1.1 General Property Information

The Property encompasses King County Assessor's Parcel No 1023049066, located between State Route 599 and East Marginal Way South, approximately 1/4 mile south of the Duwamish River in the city of Tukwila (see Figure 1). The parcel is 16.93 acres in size. The property is zoned by the City of Tukwila as Manufacturing Industrial Center/Heavy (MIC/H). The Property is west-northwest of Metro Transit's existing South Base, located at 12200 East Marginal Way South.

King County Metro has been the occupant of the Property since 1987. The Property includes two separate facilities. The smaller western portion is referred to as the South Facilities and houses Metro's approximately 35,000 square foot Facilities Operations building. The larger eastern portion is referred to as the South Annex and operates as the Training and Safety Facility which currently contains several structures, parking lots, open storage, and a training yard (Figure 2).

1.2 Physical Setting

The elevation of the Property is approximately 15-feet above mean sea level. Topographically the Property is generally flat, with a slight slope to the west in the westernmost edge of the Property with overall slope toward the north (King County GIS; USGS 2017). The Property is located in the Duwamish River valley south of the Duwamish River (Figure 1).

1.2.1 Surface Water

The Property lies on a flat area within the river plain of the Duwamish River, which bends around the property approximately 1,100 feet to the north and 1,400 feet to the east. An intermittent drainage (Riverton Creek) runs through and along the north boundary of the Property and discharges to the Duwamish River (see Figure 1). The portions of the creek that run through the Property are referred to as the West and East branches of Riverton Creek and are partially piped; the remaining channelized flow is within concrete lined ditches (Figure 2).

1.2.2 Soil

Soils at the Property are classified as Urban Land by the National Resources Conservation Service (NRCS, 2020). The natural soil profile below the Property was buried during redevelopment of the Property in the 1980's. Up to five feet of sand and gravel fill underly the pavement of the Property.

1.2.3 Geology

Native soils below the Property contain a substantial component of organic material. Organic soils have been observed during excavations (Converse Consultants 1984; Parametrix 2020, PBS 2020b). Troost et al (2005) maps the surface geology of the Property as Quaternary peat (Qp) deposits. Quaternary alluvium (Qal) and Quaternary younger alluvium (Qyal) are mapped adjacent north of the Property. An outcrop of Tertiary bedrock is mapped southeast of the Property underlying the neighboring King County Metro South Base property.

Converse Consultants performed a geotechnical investigation of the South Base Annex prior to development in 1984. The borehole logs from the geotechnical investigation identified up to seven feet of peat and clayey silt prior to encountering black alluvial sands. The sands intermixed with silty layers and clayey silt down to a depth of at least 90 feet below ground surface.

Borehole and well logs completed during site investigations (discussed below) have encountered shallow fill (0-5 feet bgs) below the Property followed by layered silty peat and organics (5-13 ft bgs), followed by black alluvial sands (below 13 ft bgs).

The subsurface geology observed at the Property is consistent with the geologic mapping of the area.

1.2.4 Groundwater

Groundwater is shallow and occurs at a depth of approximately 5 ft below ground surface. The direction of shallow unconfined groundwater flow is inferred to be toward the north-northwest based on topography. Although historical reports (Woodward-Clyde 1995; AGI 1997) indicated the groundwater gradient was in a west-northwest direction, more recent groundwater elevations measured in 2019 (see Table 1) indicate a general northerly flow direction (Parametrix 2020). The water table below the Property may be tidally influenced due to the proximity to the Duwamish River. As discussed in Section 2.7 below, a water level study is underway to evaluate the seasonal gradient below the Property.

1.3 Property History and Use

Prior to development of the Property, the area was predominantly low-lying farmland. Aerial photographs dating to 1936 (King County iMAP 2020a) show the Property as farmland with the West Branch of Riverton Creek diverted into an irrigation canal routed north-south across the Property. A copy of the aerial is provided in Attachment A. The current West Branch of Riverton Creek (Figure 2) was completed during grading and filling of the Property in 1985 and flows through the Property within pipes and a concrete lined ditch that is located just east of the historical irrigation canal alignment. Surface water at the Property is further discussed in Section 3.3.1.

The Property is on Ecology's Confirmed and Suspected Contaminated Sites List (CSCSL) and is identified by Facility Site ID 8422289 and Cleanup Site Property ID 7790. Three USTs (one 550-gallon engine oil UST, one 10,000-gallon unleaded gasoline UST, and one 10,000-gallon UST partitioned for gasoline and diesel) in the South Facilities portion of the Property were removed in 1997 and were replaced with one 6,000-gallon UST (Site No 10103) containing unleaded gasoline.

The South Annex portion of the Property is in the process of being redeveloped. In order to support its new 250-bus (approximately) fleet, South Annex Base will include vehicle maintenance bays, steam bays, inspection bays, bus wash bays, bus fueling, full electric charging infrastructure, and approximately 8,400 square feet of maintenance offices and spaces. The project will include probable daylighting of

Riverton Creek and culvert replacements beneath South 120th Place and beneath the internal access driveway and parking lot on the South Facilities.

1.4 Surrounding Area History and Use

The area surrounding the Property is primarily developed for transportation and industrial land use. The neighboring site to the west was developed as Highway infrastructure in the mid-1960's when the West Marginal Way ramp was constructed (Kennedy Jenks 2015). At that time surface water was routed through a culvert beneath West Marginal Way easterly towards the historical West Branch of Riverton Creek. A stormwater ditch was also constructed on the east side of West Marginal Way along the west side of the Metro property carrying roadway runoff north towards the Duwamish (see Attachment A).

Highway 599 north of the Property was developed in the mid-1960's and has remained largely unchanged through the present. The area further north of Highway 599 was developed into an industrial park in the 1990's (King County Assessors records 2020). Neighboring properties to the south were developed into industrial warehouse buildings in 1986 (King County Assessors records 2020) during a similar timeframe as development of the Property. The neighboring property southeast was developed into the South Base in 1980. The Property and surrounding properties were annexed by the City of Tukwila in 1989 (Tukwila 2020a).

2. FIELD INVESTIGATIONS

In 1993, a total of 4,000 cubic yards of soil was reportedly excavated from the neighboring South Base during removal of USTs and remediated via thin spread over an asphalt surface in the south-central area of the South Annex portion of the Property (Enviros 1994; Black and Veach 1995). After one year the soil was re-sampled and all concentrations were reportedly below the Model Toxics Control Act (MTCA; WAC 173-340) Method A cleanup levels (CULs). The 'clean' soil was used as fill on the South Annex portion of the Property and the remaining contaminated material was reportedly transferred off the Property.

Two site assessments were conducted in the South Facilities portion of the Property in the 1990s: Woodward-Clyde (1995), a pre-construction site assessment study conducted in 1994 related to upgrade of the USTs; and AGI Technologies (1997) documenting site assessment actions performed in April 1997 during removal of three underground storage tanks (USTs). During the site investigations, TPH was detected in soil and groundwater and benzene was detected above the MTCA Method A CUL in one monitoring well. The data are summarized in Tables 2 and 3.

In 2015, Ecology conducted a Site Hazard Assessment (SHA) and assigned a ranking of 1 (highest priority). Ecology's SHA is provided in Attachment B. The SHA findings were based on the results of the site assessment studies conducted in the 1990's at the South Facility portion of the Property in the vicinity of the former USTs, including concentrations of benzene above the MTCA Method A CUL.

More recent investigations were conducted in 2019 and 2020. In the South Facilities portion of the Property, the investigations consisted of an initial resampling of four wells (DW-3, DW-4, SB-7 and SB-8) in September 2019 (Parametrix 2019), redevelopment and resampling of the wells in December 2019 (PBS 2020a), and a push probe investigation in April 2020 (Parametrix 2020). In the South Annex portion of the Property, a Phase II Environmental Site Assessment was conducted in 2020 (PBS 2020b) and a water level study is ongoing.

Key findings from each of these investigations are summarized in the sections below. The locations of site explorations are shown on Figures 2 and 3.

2.1 Pre-Construction Site Assessment, South Facilities (Woodward-Clyde 1995)

Soil and groundwater contamination were discovered during a pre-construction site assessment conducted in the vicinity of the former USTs prior to tank replacement.

In October 1994, soil was sampled from four borings (SB-1 through SB-4) and groundwater samples were collected from four dewatering wells (DW-1 through DW-4) installed within the original UST excavation. Soil samples were tested for gasoline-range total petroleum hydrocarbons (TPH-G), except for SB-2 which was tested for TPH using Method 418.1. Groundwater samples were tested for TPH diesel-range extended (TPH-Dx). All soil results were <5 mg/kg with the exception of the undifferentiated TPH was detected in soil at SB-2 (8,710 mg/kg) near the former oil tank, above the MTCA Method A CUL of 2,000 mg/kg. All groundwater results were <200 mg/L for heavy oil range (TPH-O; >C24), with no evidence of gasoline components noted.

In December 1994, one additional soil boring (SB-6) and three groundwater monitoring wells (SB-5, -7, and -8) were installed and soil and groundwater samples were tested for TPH-Dx. TPH-D

and TPH-O concentrations were detected in groundwater at SB-7 (550 ug/L and 723 ug/L, respectively) above the MTCA Method A CUL (500 ug/L).

2.2 Underground Storage Tank Closure Assessment Report, South Facilities (AGI Technologies 1997)

The three USTs were removed in 1997. Ten confirmation soil samples (S-1 through S-10) were collected and tested for TPH-G/BTEX (benzene, toluene, ethylbenzene, and xylenes) and TPH-Dx. All soil results were less than MTCA Method A CULs. A groundwater sample was collected from well DW-4, within the tank area, and tested for TPH-G/BTEX and TPH-Dx. The benzene concentration (9.5 ug/L) was above the MTCA Method A CUL (5 ug/L).

2.3 September 2019 Groundwater Sampling, South Facilities (Parametrix 2019)

On September 23, 2019, the four existing monitoring wells at the South Facilities (DW-4R [replacement for well DW-4], DW-3R [replacement for well DW-3], SB-7, and SB-8) were sampled on September 23, 2019. Samples were analyzed for TPH-G and BTEX by Method NWTPH Gx/EPA 8021B, and for TPH-D and TPH-O by Method NWTPH-Dx. The results showed that TPH constituents were below laboratory detection limits in the groundwater samples except for well SB 8 where TPH-D and TPH-O were detected at 470 ug/L and 670 ug/L, respectively, slightly above the MTCA Method A CUL (500 ug/L).

2.4 December 2019 Well Redevelopment and Groundwater Sampling, South Facilities (PBS 2020a)

On December 6, 2019, the four monitoring wells at the South Facilities (DW-4R, DW-3R, SB-7, and SB-8) were redeveloped and resampled. Samples were analyzed for TPH-G and BTEX by Method NWTPH Gx/EPA 8021B, and for TPH-D and TPH-O by Method NWTPH-Dx. The results showed that TPH-O was detected in sample SB-8 at a concentration of 399 µg/L, below (i.e. compliant with) the MTCA Method A CUL (500 µg/L). No analytes were detected above the laboratory reporting limits in the other samples.

2.5 2020 Push Probe Study (Parametrix 2020), South Facilities

On April 1, 2020, a push probe investigation was conducted at the South Facilities, consisting of sampling soil and groundwater at nine boring locations (20B1 through 20B9) shown on Figures 2 and 3. One groundwater sample from each location (20B1-W through 20B9-W) was analyzed for TPH-G and BTEX by Method NWTPH Gx/EPA 8021B, and for TPH-D and TPH-O by Method NWTPH-Dx. Six soil samples were collected, and four of the samples (20B1-5, 20B2-3.5, 20B3-4.5, and 20B4-4.5) were tested for TPH-D and TPH-O by Method NWTPH-Dx. The data are summarized in Table 4.

The findings of the push probe study were as follows:

- Diesel and oil-range hydrocarbons were present in groundwater in seven of the nine groundwater samples, and four of the samples, located in the northeastern portion of the Property, had concentrations greater than MTCA Method A CULs.

- No downgradient contamination above MTCA Method A CULs was observed in the one boring downgradient from the former UST area (20B8).
- The TPH detected in groundwater is believed to primarily reflect biogenic interference because it was removed by silica gel/acid cleanup. This interpretation is consistent with the geologic mapping as peat (Troost et al 2005) in the areas of TPH detections greater than CULs, and the observations of organic soil during this and previous investigations (Converse Consultants 1984).
- If highly organic soils (peat) were not present at the Property, the results from the investigation likely would be below MTCA Method A CULs since the magnitudes of the exceedances are less than the values expected to be attributable to biogenic interference.
- The biogenic interference from peat in the TPH-D and TPH-O groundwater analysis was consistent across the property and in areas of no suspected historical contamination.

2.6 2020 Phase II Environmental Site Assessment, South Annex (PBS 2020b)

In April 2020, a Phase II ESA was conducted at the South Annex portion of the Property. Borings E-1 and E-2 were placed near the western boundary of the Property adjacent to the South Facilities in order to identify any potential migration of soil and groundwater contamination from the former UST area. Borings E-3 through E-6 were located throughout the vehicle storage yards and within the presumed 1994 remediation area to assess any existing impacts to soil and groundwater from those historical uses. A total of twelve soil samples and six grab groundwater samples were analyzed for TPH-D by EPA Method NWTPH-Dx, TPH-G by EPA Method NWTPH-Gx, and BTEX.

The data are summarized in Attachment C and a summary of the pertinent findings of the Phase II Environmental Site Assessment are presented below:

- All contaminant concentrations in soil were below the laboratory method detection limit and/or MTCA CULs.
- TPH-D concentrations in groundwater exceeded the MTCA CUL in one location (E-1) in the northwest corner of the South Annex. The detections of diesel range TPH in groundwater in boring E-1 may be the results of migration of contaminants from the former UST system. However, analysis of sample E-1-W by Method NWTPH-Dx with silica gel cleanup did not detect diesel or heavy oil range TPH above laboratory reporting limits. The lack of diesel detections after silica gel cleanup suggests that the detected hydrocarbons are either naturally decaying organic material or a highly weathered or degraded petroleum product. This conclusion is further supported by the observance of organic rich silty soils in the 5 to 10-foot depth range in environmental and geotechnical soil borings across the Property, and peat mapped in the vicinity of boring E-1.

2.7 Water Level Study, South Facilities (PBS, ongoing)

A water level study is currently being conducted at the South Annex portion of the Property. These data are expected to be available in early 2021.

3. CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is a conceptual understanding of a site that identifies potential or suspected sources of hazardous substances, types and concentrations of hazardous substances, potentially contaminated media, and actual and potential exposure pathways and receptors. The media evaluated are groundwater, surface water, soil, and air.

3.1 Sources and Types of Hazardous Substances

The known source of hazardous substances is petroleum released from the former USTs that were removed in 1994 located in southwestern corner of the Property. An additional potential source of hazardous substances is the 1994 soils remediation area in the South Annex portion of the Property.

3.2 Potentially Contaminated Media

Potentially contaminated media include soil, groundwater, surface water, and air.

Although primary remediation of TPH-contaminated soils was conducted by excavation at the time of the UST removal, information presented in Section 2 indicates that minor residual TPH may still be present in the soils. Residual TPH in soil may be continuing to impact groundwater which is believed to discharge to Riverton Creek along the northern border of the Property and ultimately to the Duwamish River.

3.3 Exposure Pathways and Receptors

Potential exposure pathways consist of shallow groundwater contamination via contact with residual contaminated soils and discharge to surface water, and vapor contamination via releases from residual soil and groundwater.

3.3.1 Groundwater and Surface Water

Groundwater exposure could occur in downgradient drinking water wells and surface water exposure could occur in Riverton Creek and the Duwamish River. The East and West branches of Riverton Creek flow through the Property and discharge northward into Riverton Creek (Figure 2) which flows westward along the northern border of the Property and discharges into the Duwamish River. Flow through the Property is piped except for a portion of the West Branch which is channelized within a concrete lined ditch. The ability of salmon to access the Duwamish River downstream from the Property is uncertain. Groundwater flows in a northerly direction beneath the Property and discharges into Riverton Creek.

The SHA showed a Class 3 (seasonal or intermittent) stream along the west side of the Property and a Class 2 Salmonid stream traversing the east portion of the South Facilities. The Priority Habitats and Species (PHS) database maintained by the Washington Department of Fish and Wildlife (WDFW 2019) shows a fish-bearing stream on the west side, although fish passage south of the Property is shown as blocked (see map in Attachment A). King County defines Class 3 streams as those that are intermittent or ephemeral during years of normal rainfall and are not used by salmonids (King County, 2020).The Class 3 stream mapped along the west side of the Property appears to correlate with a stormwater ditch constructed in 1966 during roadway improvements. This Class 3 stormwater conveyance is likely not in hydraulic continuity with the local groundwater.

The location of the Class 2 salmonid stream in the SHA appears to have been mis-located but generally corresponds to the West Branch of Riverton Creek which now traverses the Property as displayed on Figure 2. City of Tukwila maps (Tukwila 2020b; Attachment A) display the East and West branches of Riverton Creek which correlate with the current stream locations presented on Figure 2.

Potential receptors include humans and aquatic organisms. However, concentrations of TPH in groundwater at the Property have been shown to be below MTCA Method A CULs and lower than the 3.04 mg/L no observed effects concentrations (NOECs) determined for weathered NWTPH-Dx in surface waters (Ecology 2020b).

3.3.2 Vapor Intrusion

Vapor intrusion could impact the Facilities Operation building. For petroleum releases, the measured benzene and TPH concentrations in soil and groundwater can be used to initially assess the vapor intrusion pathway (Ecology 2009, 2016b, 2018; EPA 2015). The Property is zoned as Industrial under WAC 173-340-745.

Current groundwater concentrations of BTEX are low, with recent benzene concentrations non-detect at less than 1 ug/L (below the minimum MTCA Method B residential screening level for vapor intrusion of 2.4 ug/L) and the highest historical benzene concentration measured in groundwater (9.5 ug/L) below the minimum MTCA Method C (industrial land use) groundwater screening level for vapor intrusion of 24 ug/L (Ecology 2020a). Although naphthalene concentrations have not been assessed per Ecology guidance (Ecology 2018), naphthalene concentrations are not expected to be above screening levels based on measured TPH concentrations. However, confirmation of naphthalene concentrations in groundwater should be completed during additional studies to compare with the MTCA Method C (89 ug/L) screening levels for the groundwater to vapor pathway.

In addition to the measured groundwater concentrations below MTCA Method C screening levels, the residual undifferentiated TPH near SB-2 occurs below the water table and is located approximately 40 ft from the adjacent building, greater than the 30 ft applicable separation distance. Therefore, the vapor intrusion pathway is minor and not considered complete based on screening criteria.

3.4 Terrestrial Ecological Evaluation

The Property qualifies for a Simplified Terrestrial Ecological Evaluation (TEE) in accordance with WAC 173-3407492(2)(i) since the total area that may still contain undifferentiated TPH above MTCA A CULs (see Figure 3) is not expected to be more than 350 square feet.

The Property is fully paved, preventing contact of terrestrial organisms to contaminated soil or groundwater. The West Branch of Riverton Creek traverses the South Facilities portion of the Property within a pipe and concrete lined channel. Therefore, there is no direct groundwater-surface water interaction in the area near the historical release. As noted above, the levels of TPH-D and TPH-O are below the NOECs, suggesting a restrictive covenant may be appropriate if residual soil contamination is found surrounding SB-2.

4. CLEANUP LEVELS

4.1 Cleanup Levels

Considering the current land use and potential future land use, MTCA level A CULs (WAC 173-340-720(3) for groundwater and WAC 173-340-730(2) for soil are the adopted criteria for screening levels. Method A may be used to establish CULs at sites that have few hazardous substances and that meet one of the following criteria:(a) Sites undergoing a routine cleanup action as defined in WAC 173-340-200; or(b) Sites where numerical standards are available in this chapter or applicable state and federal laws for all indicator hazardous sub-stances in the media for which the Method A CUL is being used.

Soils at the Property contain a substantial component of organic material. As per the guidance on contaminated site assessments (Ecology 2016), when analyzing for NWTPH-Dx it is permissible to use silica gel cleanup methods if the waters contain a significant amount of naturally occurring non-petroleum organics which may contribute to biogenic interferences. Organic soils have consistently been observed during Property excavations (Converse Consultants 1984; Parametrix 2020, PBS 2020b). Published geologic mapping shows soils along the northern portion of the Property in the area of TPH detections great than CULs as peat (Troost et al 2005).

Since the Property is zoned Industrial, MTCA Method C groundwater screening levels for vapor intrusion are appropriate.

4.2 Point of Compliance

In accordance with WAC 173-340-200, Point of compliance (POC) means the point or points where CULs established in accordance with WAC 173-340-720 through 173-340-760 shall be attained. It is recommended that the POC be established at the northern boundary of the Property.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The following conclusions can be drawn based on the site investigations conducted:

- The SHA ranking of 1 was based largely on the Woodward Clyde (1995) and AGI (1997) reports addressing the UST removal area in the South Facilities portion of the Property that found benzene in groundwater at a concentration above the CUL. More recent data have shown that the groundwater concentrations used to prepare the SHA have been attenuated. Subsequent site characterization activities in 2019 and 2020 did not detect benzene in groundwater in wells (DW-3R, DW-4R, SB-7, SB-8) or in temporary borings.
- The SHA noted the presence of a Class 3 stream west of and adjacent to the Property and a Class 2 salmon-bearing stream traversing the South Facilities portion of the property. Some of the SHA's assumptions regarding the Property's environmental setting have been further clarified. Class 3 streams are not fish-bearing and the Class 3 stream mapped is actually a manmade stormwater ditch constructed in 1966 that is likely not in hydraulic continuity with the groundwater. The SHA referenced a northwesterly groundwater flow direction toward this Class 3 stream. The groundwater flow direction observed in 2019 and 2020 is primarily more northerly than previously reported. The Class 2 salmon-bearing stream identified in the SHA appears to align with the West Branch of Riverton Creek which is either piped or conveyed in a concrete-lined ditch through the Property and is therefore never in connection with contaminated soil or groundwater. The ability of salmon to access the Duwamish River from Riverton Creek downstream from the Property is also uncertain.
- In the South Facilities portion of the Property, remaining groundwater concentrations above MTCA Method A CULs include TPH-D and TPH-O in the vicinity of well SB-8. However, in 2020, samples were collected both upgradient and downgradient of SB-8. TPH-D and TPH-O were found in several samples slightly above MTCA Method A CULs. The samples were also analyzed for TPH-D and TPH-O using silica gel cleanup which indicated biogenic interference because the samples were non-detect following the use of silica gel. This interpretation is consistent with observed organic soils and geologic mapping as peat and occurring in areas where no suspected contamination is present. Some undifferentiated TPH may also still be present in saturated soils near SB-2 where the 1994 soil sample result for undifferentiated TPH (8,710 mg/kg using Method 418.1 without silica gel cleanup) was above the MTCA A CUL and has an estimated area of approximately 200 sq ft. However, this sample was collected below the water table and was likely similarly affected by biogenic interference.
- In the South Annex portion of the Property, no TPH or benzene above MTCA Method A CULs have been detected other than one soil sample (E-1). E-1 reported concentrations of TPH-D and TPH-O in groundwater that was likely influenced by biogenic interference, and benzene was not detected. Following silica gel treatment sample E-1 was non-detect for TPH-D and TPH-O.
- Current groundwater concentrations at both the South Facilities and South Annex properties for TPH-D and TPH-O prior to silica gel treatment are below the 3.04 mg/L NOECs related to weathered TPH-D and TPH-O for freshwater aquatic life, with no detections of benzene. This indicates the groundwater to surface water pathway is not complete.

- The vapor intrusion risk to the on-site building from historical contamination was examined and the pathway does not appear to be complete based upon vapor intrusion screening levels. However, further analysis of naphthalene should be completed to completely eliminate the pathway.
- The Property has met the eligibility criteria and individual provisions for Model Remedy 1 (Ecology 2016c), and therefore it is not necessary to conduct a Feasibility Study or Disproportionate Cost Analysis.

5.2 Recommendations

The following additional activities are recommended to confirm the environmental status of the Property:

- Conduct an additional push probe investigation at the South Facilities to investigate the status of the undifferentiated TPH located near SB-2 and to collect groundwater samples west and northwest of the building downgradient from the former USTs and along the POC to confirm the absence of contaminants. Convert two of the push probes to monitoring wells. Figure 4 displays the approximate location of the planned boreholes and wells.
- If soil contamination remains near SB-2, develop a restrictive covenant to enable a NFA determination from Ecology.
- Conduct four quarters of sampling of the two new and four existing monitoring wells and analyze samples for TPH-Dx, TPH-G, BTEX, and naphthalene determine seasonality, and further refine the relationship of the peat biogenic interference with the TPH analysis and address the groundwater to vapor pathway.
- Survey the two new wells and conduct four quarters of water level monitoring at the six wells.
- Analyze water level data from the South Annex study along with water levels from the South Facilities to evaluate seasonal groundwater flow directions.

5.3 VCP Opinion Request

Parametrix on behalf of our client, King County Metro, is seeking a VCP opinion on the historical cleanup actions performed at the Property, the recent observations, and the planned future investigation of the Property required to achieve a NFA determination from Ecology.

6. REFERENCES

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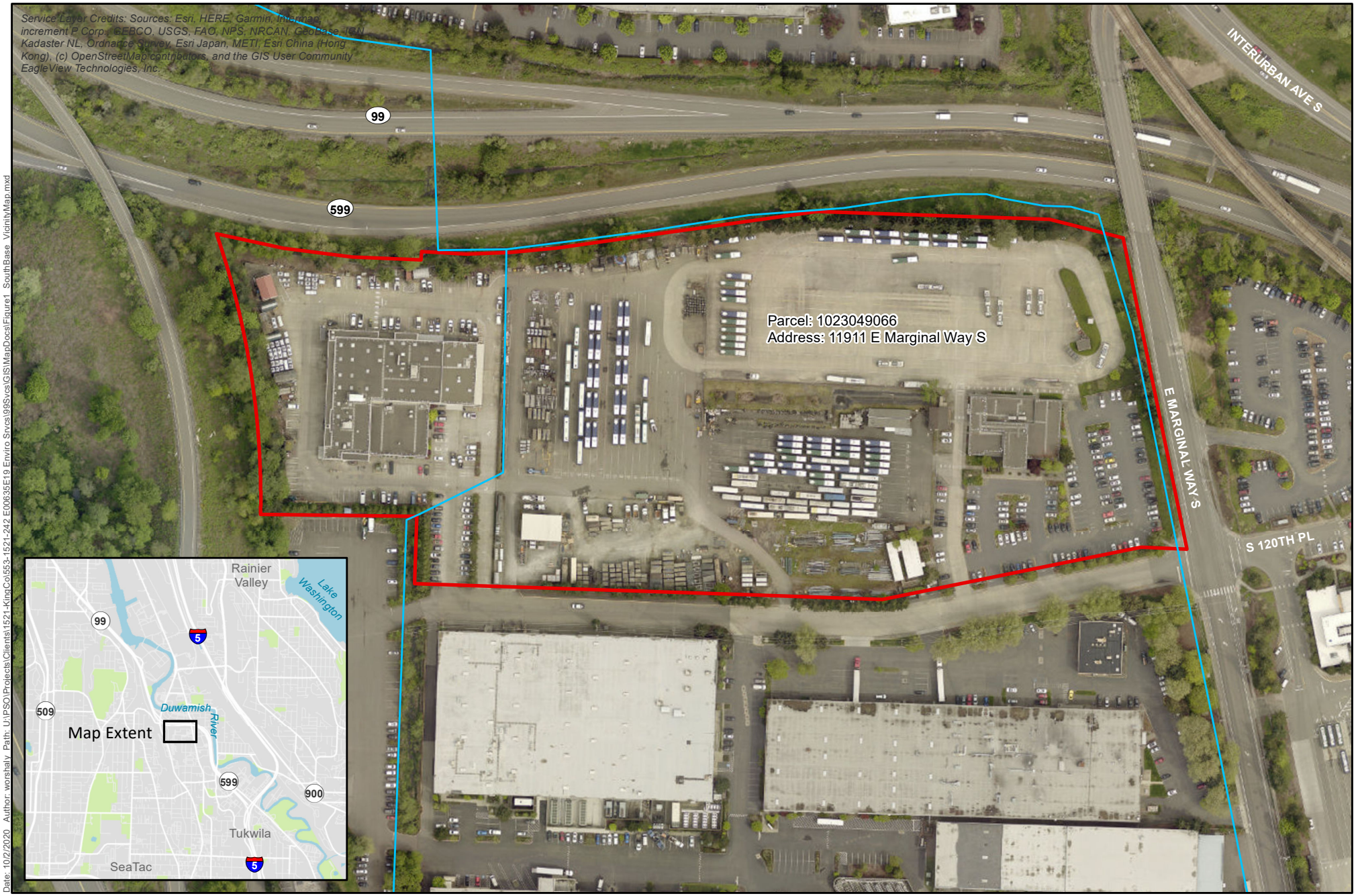
FIGURES

TABLES

ATTACHMENTS

Figures



Date: 10/2/2020 Author: worshaly Path: U:\PSO\Projects\Clients\1521-KingCo\553-1521-242 E00635E19 Enviro Srvcs\99Svcs\GIS\MapDocs\Figure1 SouthBase VicinityMap.mxd

Parametrix

Source: King County

Project Location

Stream

0 50 100 200 Feet

Figure 1

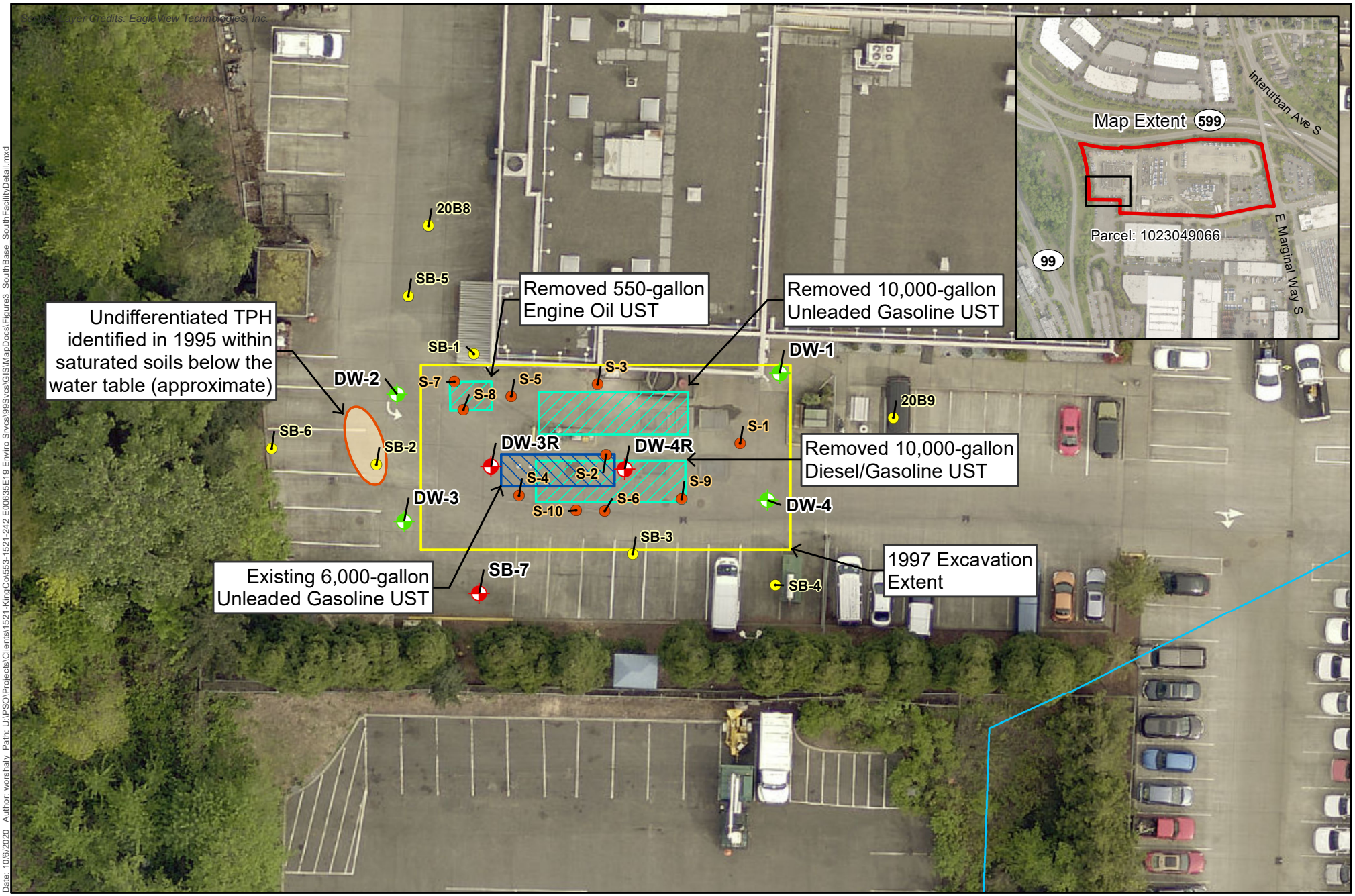
Site Map

King County Metro Transit S Facilities/S Annex

Tukwila, WA

Figure 2
Monitoring Well and Soil Sample Locations
King County Metro Transit S Facilities/S Annex

Tukwila, WA



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Source: King County

Project Location
Stream
1997 Excavation Extent
Existing UST
Removed UST
Undifferentiated TPH below water table (approximate)
Borehole
Soil Sample
Monitoring Well (Existing)
Monitoring Well (Historical)

0 10 20 40 Feet

Figure 3
South Facility Area Detail
King County Metro Transit S Facilities/S Annex

Tukwila, WA

Source: King County

Project Location
Stream
Borehole
Soil Sample
Proposed Borehole
Monitoring Well (Existing)
Monitoring Well (Historical)
Proposed Well

0 35 70 140 Feet

Figure 4
Proposed Borehole and Monitoring Well Locations
King County Metro Transit S Facilities/S Annex

Tukwila, WA

Date: 11/12/2020 Author: worshaly Path: U:\PSO\Projects\Clients\1521-KingCo\553-1521-242 E00635E19 Enviro Srvcs\99Svcs\GIS\MapDocs\Figure4 SouthBase ProposedLocs.mxd

Tables

Table 1. Groundwater Elevations, King County Metro South Facilities, 11911 E Marginal Way S, Tukwila, WA

Well	Reference Elevation[1]	September 23, 2019		December 17, 2019		April 1, 2020	
		Depth to Groundwater (ft)	Groundwater Elevation (ft NAVD88)	Depth to Groundwater (ft)	Groundwater Elevation (ft NAVD88)	Depth to Groundwater (ft)	Groundwater Elevation (ft NAVD88)
DW-3R*	13.63	5.21	8.42	4.84	8.79	4.48	9.15
DW-4R	14.00	5.58	8.42	5.15	8.85	4.82	9.18
SB-7	14.05	5.66	8.39	5.23	8.82	4.86	9.19
SB-8	14.19	6.28	7.91	5.80	8.39	5.33	8.86

Notes:

[1] N rim PVC in ft NAVD88**

*Well has been damaged and casing is not vertical

Table 2. Groundwater Analytical Data, King County Metro South Facilities, 11911 E Marginal Way S, Tukwila, WA

Well ID	Date Sampled	pH	Conductivity µmhos/cm	Temperature deg C	Diesel Range Organics mg/L	Heavy Oil Range Organics mg/L	Gasoline Range Organics µg/L	Lead, Total mg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	m, p-Xylene µg/L	o-Xylene µg/L
Cleanup Level					**0.5**	**0.5**	**1000**	**0.015**	**5**	**1000**	**700**	**1000**	**1000**
DW-1	10/11/94	6.81	484	18.6	- -	0.2 U	- -	0.003 U	- -	- -	- -	- -	- -
DW-2	10/11/94	6.46	449	18.9	- -	0.2 U	- -	0.003 U	- -	- -	- -	- -	- -
DW-3	10/11/94	6.60	474	19.2	- -	0.2 U	- -	0.003 U	- -	- -	- -	- -	- -
DW-4	10/11/94	6.61	501	19.6	- -	0.2 U	- -	0.003 U	- -	- -	- -	- -	- -
DW-4 Dup (MW-5)	10/11/94	- -	- -	- -	- -	0.2 U	- -	0.003 U	- -	- -	- -	- -	- -
DW-4	04/23/97	- -	- -	- -	0.5 U	- -	100 U	- -	**9.5**	2.3	1 U	1 U	1 U
DW-3R	09/23/19	- -	- -	- -	0.26 U	0.41 U	100 U	- -	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
DW-3R	12/17/19	- -	- -	- -	0.0499 U	0.0998 U	50 U	- -	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
DW-4R	09/23/19	- -	- -	- -	0.27 U	0.43 U	100 U	- -	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
DW-4R	12/17/19	- -	- -	- -	0.0497 U	0.0994 U	50 U	- -	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
SB-5	12/19/94	6.45	541	14.0	0.2 U	0.2 U	- -	- -	- -	- -	- -	- -	- -
SB-6	12/19/94	- -	- -	- -	0.2 U	0.236	- -	- -	- -	- -	- -	- -	- -
SB-7	12/19/94	6.29	498	10.8	**0.55**	**0.723**	- -	- -	- -	- -	- -	- -	- -
SB-7	09/23/19	- -	- -	- -	0.28 U	0.44 U	100 U	- -	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
SB-7	12/17/19	- -	- -	- -	0.0498 U	0.0997 U	50 U	- -	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
SB-8	12/19/94	6.15	700	14.3	0.495	0.326	- -	- -	- -	- -	- -	- -	- -
SB-8	09/23/19	- -	- -	- -	0.47	**0.67**	400 U	- -	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U
SB-8	12/17/19	- -	- -	- -	0.0498 U	0.399	50 U	- -	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

concentration is above Model Toxics Control Act WAC 173-340 (MTCA) Method A Cleanup Level

- - = not analyzed

Gasoline cleanup level is presented for the circumstance in which benzene is not detected

Table 3. Soil Analytical Data, King County Metro South Facilities, 11911 E Marginal Way S, Tukwila, WA

Well ID	Date Sampled	Sample Depth ft	Lead, Total mg/Kg	Diesel Range Organics mg/Kg	Heavy Oil Range Organics mg/Kg	Gasoline Range Organics mg/Kg	Total Petroleum Hydrocarbons mg/Kg	Benzene mg/Kg	Ethylbenzene mg/Kg	Toluene mg/Kg	m, p-Xylene mg/Kg	o-Xylene mg/Kg
Cleanup Level			**250**	**2000**	**2000**	**100**	**2000**	**0.03**	**6**	**7**	**9**	**9**
SB-1	10/11/94	10-11.5	1.2 J	- -	- -	5 U	- -	- -	- -	- -	- -	- -
SB-2	10/11/94	7.5-9	- -	- -	- -	- -	**8710**	- -	- -	- -	- -	- -
SB-3	10/11/94	7.5-9	- -	- -	- -	5 U	- -	- -	- -	- -	- -	- -
SB-4	10/11/94	7.5-9	- -	- -	- -	5 U	- -	- -	- -	- -	- -	- -
SB-4 Dup (SB-5)	10/11/94	7.5-9	- -	- -	- -	5 U	- -	- -	- -	- -	- -	- -
SB-5	12/12/94	5-6.5	- -	25 U	54.7	- -	- -	- -	- -	- -	- -	- -
SB-6	12/12/94	7-9	- -	25 U	25 U	- -	- -	- -	- -	- -	- -	- -
SB-7	12/12/94	5-6.5	- -	25 U	25 U	- -	- -	- -	- -	- -	- -	- -
SB-8	12/12/94	10-11.5	- -	25 U	25.5	- -	- -	- -	- -	- -	- -	- -
SB-8 Dup (SB-9)	12/12/94	10-11.5	- -	25 U	25 U	- -	- -	- -	- -	- -	- -	- -
S-1	04/23/97	5	- -	27 U	55 U	5.5 U	- -	0.055 U	0.055 U	0.055 U	0.055 U	0.055 U
S-3	04/23/97	6	- -	26 U	52 U	5.3 U	- -	0.053 U	0.053 U	0.053 U	0.053 U	0.053 U
S-4	04/23/97	7	- -	26 U	53 U	5.6 U	- -	0.056 U	0.056 U	0.15	0.087	0.62
S-5	04/23/97	4	- -	28 U	56 U	5.2 U	- -	0.052 U	0.052 U	0.052 U	0.052 U	0.052 U
S-6	04/23/97	3	- -	26 U	52 U	5.1 U	- -	0.051 U	0.051 U	0.051 U	0.051 U	0.051 U
S-7	04/23/97	7	- -	26 U	51 U	5.2 U	- -	0.052 U	0.052 U	0.052 U	0.052 U	0.052 U
S-8	04/23/97	6	- -	26 U	52 U	5.4 U	- -	0.054 U	0.054 U	0.054 U	0.054 U	0.054 U
S-9	04/28/97	13	- -	35 U	70 U	7 U	- -	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U
S-10	04/28/97	13	- -	33 U	67 U	6.7 U	- -	0.067 U	0.067 U	0.067 U	0.067 U	0.067 U

concentration is above Model Toxics Control Act WAC 173-340 (MTCA) Method A Cleanup Level

- - = not analyzed

Table 4. Push Probe Investigation Results, April 1, 2020, King County Metro South Facilities, 11911 E Marginal Way S, Tukwila, WA

Sample ID	TPH-Diesel	TPH-Heavy Oil	TPH-Gasoline	Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene
Groundwater								
MTCA Method A Cleanup Level	**0.5**	**0.5**	**1000**	**5**	**1000**	**700**	**1000**	**1000**
Units	**mg/L**	**mg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**
20B1-W	<0.23	**0.52**	<100	<1	<1	<1	<1	<1
reanalysis*	<0.22	<0.22	- -	- -	- -	- -	- -	- -
20B2-W	**0.24**	**0.27**	140	<1	<1	<1	<1	<1
reanalysis*	<0.22	<0.22	- -	- -	- -	- -	- -	- -
20B3-W	<0.23	**0.57**	<100	<1	<1	<1	<1	<1
reanalysis*	<0.23	<0.23	- -	- -	- -	- -	- -	- -
20B4-W	<0.25	**0.53**	<100	<1	<1	<1	<1	<1
reanalysis*	<0.25	<0.25	- -	- -	- -	- -	- -	- -
20B5-W	<0.24	0.25	<100	<1	<1	<1	<1	<1
reanalysis*	<0.24	<0.24	- -	- -	- -	- -	- -	- -
20B6-W	<0.24	<0.24	<100	<1	<1	<1	<1	<1
20B7-W	<0.22	0.49	<100	<1	<1	<1	<1	<1
reanalysis*	<0.22	<0.22	- -	- -	- -	- -	- -	- -
20B8-W	<0.24	0.43	<100	<1	<1	<1	<1	<1
reanalysis*	<0.24	<0.24	- -	- -	- -	- -	- -	- -
20B9-W	<0.24	<0.24	<100	<1	<1	<1	<1	<1
Soil (mg/kg)								
MTCA Method A Cleanup Level	**2000**	**2000**						
Units	**mg/kg**	**mg/kg**						
20B1-5	<32	68	- -	- -	- -	- -	- -	- -
20B2-3.5	<43	<86	- -	- -	- -	- -	- -	- -
20B3-4.5	<32	<64	- -	- -	- -	- -	- -	- -
20B4-4.5	<31	<62	- -	- -	- -	- -	- -	- -

concentration is above Model Toxics Control Act WAC 173-340 (MTCA) Method A Cleanup Level

Gasoline cleanup level is presented for the circumstance in which benzene is not detected

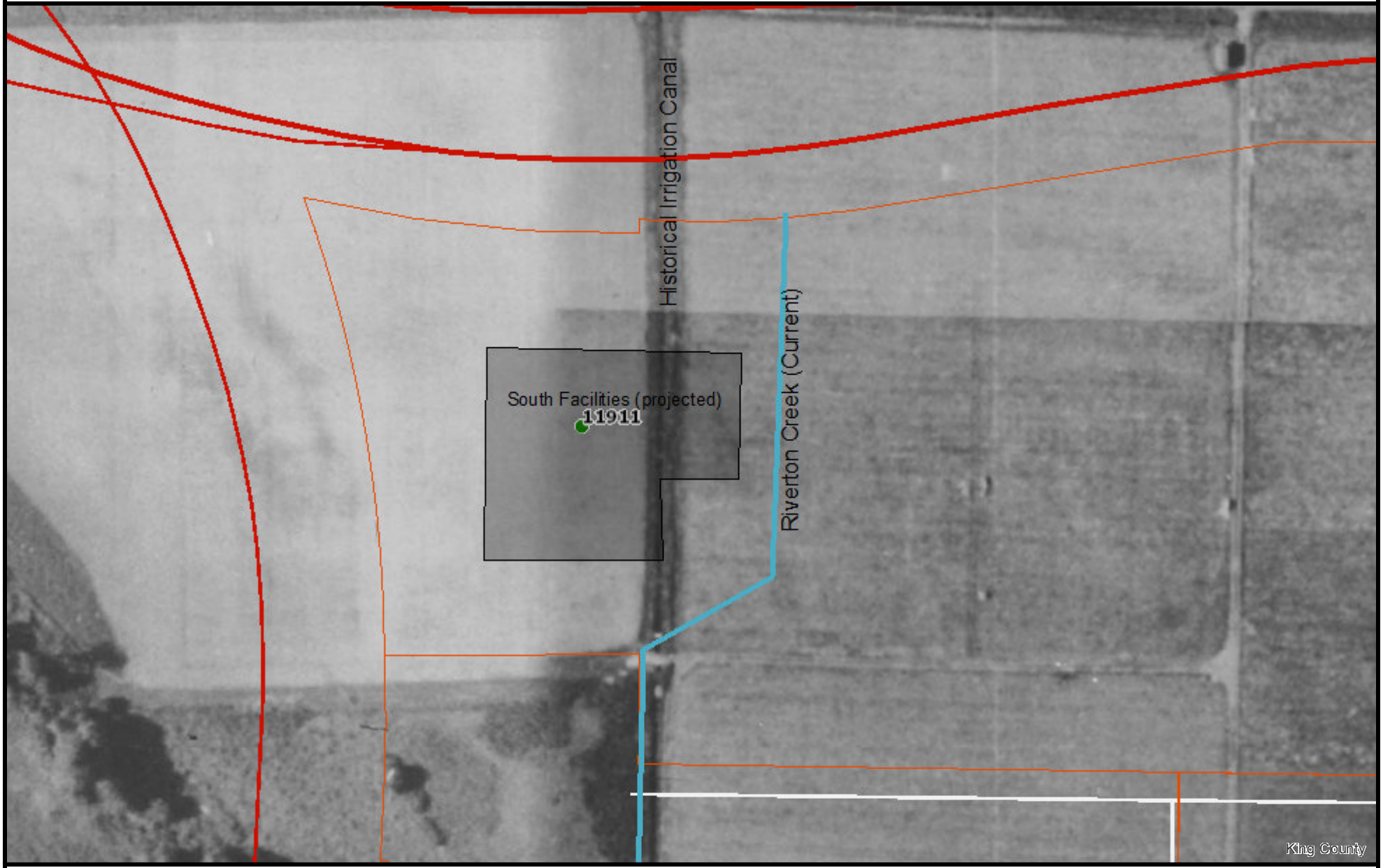
*Reanalysis after silica gel/acid cleanup

- - = not analyzed

Attachment A

Stream Mapping

King County iMap 1936



Date: 11/11/2020 Notes:

N

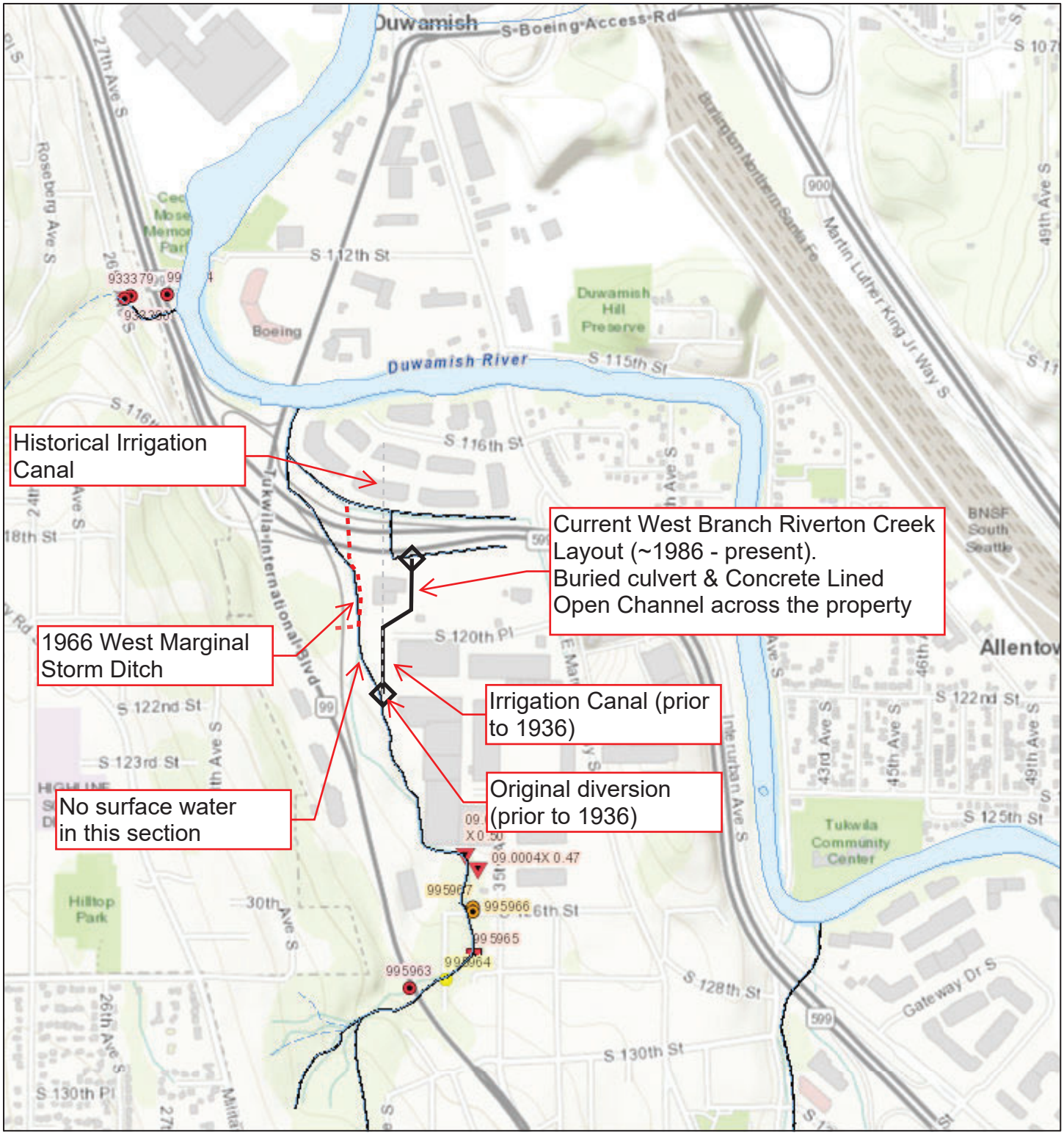
King County

0 0.0225 0.045 0.09 Miles

N

WASHINGTON STATE DEPARTMENT OF
NATURAL RESOURCES
WASHINGTON GEOLOGICAL SURVEY

Geology Portal



September 10, 2019

1:18,056

0 0.15 0.3 0.6 mi

0 0.25 0.5 1 km

All SalmonScape Species

Culverts

- Total Blockage
- Total Blockage, Fishway Present
- Partial Blockage
- Partial Blockage, Fishway Present
- Unknown Blockage
- Unknown Blockage, Fishway Present

USGS/NHD

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Tukwila iMap

11/2/2020, 12:54:10 PM

WaterBodies

Streams

1:4,514

0 0.03 0.05 0.1 mi

0 0.04 0.08 0.16 km

Pictometry International Corp., Tukwila Technology Services

City of Tukwila

Attachment B

2015 Ecology Site Hazardous Assessment

SITE HAZARD ASSESSMENT
Worksheet 1
Summary Score Sheet

SITE INFORMATION:

Cleanup Site ID: 7790

King County Metro Transit S Annex

Facility/Site ID: 8422289

11911 East Marginal Way S

Seattle, King County, WA 98168

Section:	10	Latitude:	47.49588
Township:	23N	Longitude:	-122.28676
Range:	4E	Tax/Parcel ID:	1023049066

Site scored/ranked for the Hazardous Sites List Publication: August 2015

SITE DESCRIPTION:

The King County Metro Transit S Annex site (Site) is a former Metro bus parking, fueling, and maintenance garage facility located in Seattle, King County, Washington. The 16.15-acre property is located approximately 1,350 feet from the Lower Duwamish Waterway (LDW), and zoned for Manufacturing Industrial Center/Heavy Industrial (MIC/H) use.

Two streams that discharge to the LDW are located near the area where hazardous substances were released (see the Site Overview Map), including a Class 3 stream located approximately 50 feet west of the Site, and a Class 2 stream located under the Site (presumably in a culvert).

Adjacent properties include: The main Metro South Base site to the southeast [Site Identification (CSID) 7077] across East Marginal Way; general manufacturing/industrial and warehouse facilities to the north and south (properties to the north are located on the opposite side of Highway 599 from the Site); and greenbelt space and highway interchange to the west.

The Site is currently operated as a Metro bus parking, fueling, and maintenance facility by King County Transit.

Current activities performed at the property generally include: Bus parking, fueling, and maintenance; facilities maintenance; general materials storage and vehicle parking; and administration.

Parking and storage areas are generally located in the central and northern portions of the property, administrative offices are located in the southeastern portion of the property, and maintenance facilities are located in the western portion of the property.

The property area where hazardous substances associated with CSID 7790 were released (i.e., the "Site"; discussed in the following sections) is located near the southwestern portion of the maintenance building in the western portion of the property, as shown on the attached Site Overview Map.

SITE BACKGROUND:

A summary of prior operations/tenants at the subject property is presented below.

From	To	Operator/Tenant	Activity
1994	2015	King County Transit	Metro maintenance and administration

SITE CONTAMINATION:

In 1995 the King County Metro Transit S Annex site was reported to Washington State Department of Ecology (Ecology) and placed on the Leaking Underground Storage Tank (LUST) list.

Four soil borings (SB-1 through SB-4) were advanced, and soil samples collected, in the vicinity of three underground storage tanks (USTs) in October 1994 (Woodward Clyde, 1995). The three USTs included one 550-gallon engine oil UST, one 10,000-gallon unleaded gasoline UST, and one 10,000-gallon UST (partitioned for gasoline and diesel), and were located south of the southwestern portion of the facility stores and

maintenance building. AGI Technologies (1997) indicated that the USTs were installed in 1986 and were constructed of fiberglass. Groundwater samples were collected in October 1994 from four existing de-watering wells located in the UST cavity (reportedly installed at the same time as the USTs).

Soil samples from three borings (SB-1, -3, and -4) were submitted for laboratory analysis of gasoline-range total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, and xylenes (BTEX), and lead (SB-1 only). The soil sample from boring SB-2 was submitted for analysis of undifferentiated TPH. Four dewatering well samples were submitted for analysis of diesel- and oil-range TPH, and total lead.

Undifferentiated TPH was detected in SB-2 (soil) at a concentration 8,710 mg/kg, above the MTCA Method A soil cleanup level for diesel- and oil- range petroleum hydrocarbons. No other analytes were detected in the October 1994 soil or groundwater samples at concentrations above the laboratory reporting limits.

Four additional soil borings (SB-5 through SB-8) were advanced in December 1994 (Note: SB-8 is located northeast of the facility Sotres and Maintenance Building). Three of the borings (SB-5, -7, and -8) were reportedly completed as groundwater monitoring wells (Woodward Clyde, 1995); however, the maps provided in the report show the locations as soil borings only and it is unclear if these were temporary or permanent wells. Soil and groundwater samples collected from each of the borings, and were analyzed for diesel- and oil-range TPH.

Diesel-range TPH was detected in soil samples from SB-5 and SB-8 at a maximum concentration of 54.7 mg/kg, below the MTCA Method A soil cleanup level. Oil-range TPH was detected in three groundwater samples at concentrations above the laboratory reporting limit [maximum concentration of 723 micrograms per liter (ug/L) at SB-7], and diesel-range TPH in two samples (maximum concentration of 550 ug/L at SB-7). The diesel- and oil-range TPH concentrations detected in groundwater sample SB-7 were above the MTCA Method A groundwater cleanup level.

PAST REMEDIATION ACTIVITIES:

The three USTs described in the previous section were removed from the Site in April 1997 (AGI Technologies, 1997). Soil samples were collected from the excavation area margins following UST removal and were analyzed for gasoline-, diesel-, and oil-range TPH and BTEX constituents. Ten soil samples were collected from the vicinity of the former 10,000-gallon diesel and gasoline USTs, and three from the vicinity of the former 550-gallon oil UST. No analytes were detected in soil samples at concentrations above the laboratory reporting limits except toluene at a concentration of 0.15 mg/kg, and total xylenes at a concentration of 0.71 mg/kg, both below the MTCA Method A soil cleanup level.

One groundwater sample was collected from dewatering well DW-4 and contained toluene (2.3 ug/L) and benzene (9.5 ug/L) at concentrations above the laboratory reporting limits. The detected benzene concentration was above the MTCA Method A groundwater cleanup level.

No additional information regarding subsequent soil sampling or groundwater monitoring was available in Ecology's Site file.

Following removal of the three USTs in 1997, one new unleaded gasoline UST was installed at the same approximate location as the previous 10,000-gallon USTs, and is listed in Ecology's UST database as "operational" with a capacity of 5,000-9,999 gallons.

CURRENT SITE CONDITIONS:

The most recent sampling data available is for the UST removal performed in April 1997. Confirmational soil samples collected following UST removal contained concentrations of toluene and xylenes above the laboratory reporting limits, but below the MTCA Method A soil cleanup levels. However, a groundwater sample collected down-gradient from the UST area in 1997 contained benzene at a concentration above the MTCA Method A groundwater cleanup level. In addition, groundwater samples collected from borings SB-6, -7, and -8 contained TPH at concentrations above the laboratory reporting limits, including diesel- and oil-range concentrations above the MTCA Method A groundwater cleanup level at SB-7.

Based on the available information, soil with TPH concentrations above MTCA Method A soil cleanup levels was excavated from the immediate vicinity of the USTs during removal, but analytical results for previous samples

collected outside the excavation margins suggest that residual impacts to soil and groundwater remain at the Site.

The King County GIS website depicts two streams in the vicinity of the UST area at the Site. Both are generally oriented north-south and drain to the LDW either directly or via a drainage ditch located north of the site across Highway 599. A stream listed as Class 3 (most likely seasonal or intermittent) is shown adjacent to the western property margin and identified as part of the Duwamish River basin. Sections of the streambed are visible on recent aerial photographs, but it is mostly obscured by vegetation. The Class 3 stream is located down-gradient and within approximately 50 feet of the former UST area, indicating a potential for migration of soil and groundwater contaminants to surface water.

The second stream, located east of the UST area, is listed as a Class 2 Salmonid stream (unnamed) by King County and identified as an SAO (Sensitive Areas Ordinance) stream. This stream is located approximately 150 feet east and northeast of the UST area, but is not visible on recent aerial photographs and is presumably located in a culvert beneath the Site (the areas where the stream is shown are either paved or have a graded gravel surface). The Class 2 stream appears to be located up-gradient from the UST area; however, its proximity to impacted soil and groundwater indicates a potential for migration of soil and groundwater contaminants to surface water, although to a lesser degree than the Class 3 stream west of the Site.

Listings for both of these streams are provided in the Priority Habitats and Species (PHS) database maintained by the Washington Department of Fish and Wildlife. The Class 3 stream located west of the former UST area (i.e., down-gradient) is listed as a priority area for the occurrence and migration of coho and coastal cutthroat salmon, and the Class 2 stream located east of the former UST area (i.e., up-gradient) is listed as a priority area for the occurrence of coho salmon. Both streams are also listed as a priority area for the occurrence of the western pond turtle, which is also listed by the State as an endangered species.

Site contaminants inlcude diesel- and oil-range TPH in soil and groundwater, and benzene in groundwater.

The approximate depth to groundwater is 7 feet below ground surface, with groundwater flowing to the west-northwest (based on map included in Woodward Clyde, 1995). Subsurface soils are sand, silty sand, and silt (based on boring logs and excavations).

SPECIAL CONSIDERATIONS:

Checked boxes indicate routes applicable for Washington Ranking Method (WARM) scoring

☑ **Surface Water**

A Class 3 stream adjacent to the western property margin dicharges to the LDW. The stream is located approximately 50 feet down-gradient of the former UST area, indicating a potential for contaminant transport via the surface water pathway.

☑ **Air**

Volatile compound (benzene) detected in groundwater at a concentration above the MTCA Method A cleanup level indicates a potential for contaminant transport via the air pathway.

☑ **Groundwater**

Concentrations of diesel-range TPH, oil-range TPH, and benzene were detected in groundwater samples above MTCA Method A groundwater cleanup levels.

ROUTE SCORES:

Surface Water/ Human Health:	19.5	Surface Water/ Environment:	26.4
Air/ Human Health:	23.5	Air/ Environment:	1.5
Groundwater/ Human Health:	55.2		

Overall Rank: 1

SITE HAZARD ASSESSMENT
Worksheet 1
Summary Score Sheet

REFERENCES:

1 AGI Technologies, 1997, Underground Storage Tank Closure Assessment Report, Facilities Maintenance South UST Project, June 18th 1997.

2 Ecology Water Resources Explorer, accessed June 2015. https://fortress.wa.gov/ecy/waterresources/map/WaterResourcesExplorer.aspx

3 King County GIS Center iMAP application, Property Information, Groundwater Program, and Sensitive Areas mapsets. Accessed June 2015. http://www.kingcounty.gov/operations/GIS/Maps/iMAP.aspx

4 Missouri Census Data Center, Circular Area Profiles - 2010 census data around a point location. http://mcdc.missouri.edu/websas/caps10c.html. Accessed June 2015.

5 National Climatic Data Center 2011 Local Climatological Data for Seattle, Seattle Tacoma Airport. http://www1.ncdc.noaa.gov/pub/orders/IPS-90B1F39F-6CFA-4A6B-AA82-5ED1FF897CCC.pdf

6 WARM Scoring Manual

7 WARM Toxicological Database

8 Washington Department of Fish and Wildlife, online Priority Habitats and Species database. Accessed June 2015. http://wdfw.wa.gov/mapping/phs/disclaimer.html

9 Washington Department of Transportation 24-hour Isopluvial Maps, January 2006 update. http://www.wsdot.wa.gov/publications/fulltext/Hydraulics/Wa24hrIspoluvials.pdf

10 Woodward-Clyde, 1995, Pre-Construction Site Assessment Report, South Operating Base Facility Annex, January 1995.

SITE HAZARD ASSESSMENT
Worksheet 2
Route Documentation

Cleanup Site ID: 7790 King County Metro Transit S Annex

Facility/Site ID: 8422289

1. SURFACE WATER ROUTE

List those substances to be considered for scoring:

Benzene, diesel (oil not scored as toxicity data is not available in WARM)

Explain the basis for choice of substances to be used in scoring:

Confirmed releases to soil and groundwater based on analytical tests; close proximity to surface water (stream drainging to LDW down-gradient of former UST area).

List those management units to be considered for scoring:

Surface water

Explain basis for choice of unit to be used in scoring:

Potential for transport of contaminants in soil and groudwater to surface water

2. AIR ROUTE

List those substances to be considered for scoring:

Benzene

Explain the basis for choice of substances to be used in scoring:

Confimed release of volatile compound to groundwater based on analytical tests; potential for transport via the air pathway

List those management units to be considered for scoring:

Soil vapor

Explain basis for choice of unit to be used in scoring:

Potential for vapor transport

3. GROUNDWATER ROUTE

List those substances to be considered for scoring:

Benzene, diesel (oil not scored as toxicity data is not available in WARM)

Explain the basis for choice of substances to be used in scoring:

Confirmed release to groundwater based on analytical tests

List those management units to be considered for scoring:

Groundwater

Explain basis for choice of unit to be used in scoring:

Prior detection of contaminants at concentrations above MTCA cleanup levels

Worksheet 4

Surface Water Route

CSID: 7790 **Site Name:** King County Metro Transit S Annex

1.0 Substance Characteristics

1.1 Human Toxicity

Substance	Drinking Water Standard Value	Acute Toxicity Value	Chronic Toxicity Value	Carcinogenicity Value
benzene	8	3	X	5
TPH (as diesel)	4	5	3	X

Highest Value 8

Bonus Points? 0

Human Health Toxicity Value 8

1.2 Environmental Toxicity

Substance	Acute Water Quality Criteria ug/L	Value	Non-human Mammalian Acute Toxicity mg/kg	Value
benzene	5,300	2	3,306	3
TPH (as diesel)	2,300	2	490	5

Environmental Toxicity Value 2

1.3 Substance Quantity

Amount: approximately 600 square feet

Basis: estimated aerial extent of soil and groundwater impacts described in available reports

Substance Quantity Value 5

2.0 Migration Potential

2.1 Containment Containment Value 10

Explain Basis: potential for impacted groundwater discharge to surface water

2.2 Surface Soil Permeability Soil Permeability Value 3

medium permeability; sand, silty sand, and silt

2.3 Total Annual Precipitation Total Precipitation Value 3

37 inches

2.4 Max 2-yr/24-hour Precipitation 2YR/24HR Precipitation Value 3

2.4 inches

2.5 Floodplain Floodplain Value 0

not in 100-year or 500-year flood plain

2.6 Terrain Slope Slope Value 1

less than 2%

Worksheet 4

Surface Water Route

CSID: 7790 **Site Name:** King County Metro Transit S Annex

3.0 Targets

3.1 Distance to Surface Water	<50 feet	Surface Water Distance Value	10
distance to stream located west of the release area			
3.2 Population Served within 2 miles		Population Value	2
3 people			
3.3 Area Irrigated within 2 miles		Irrigation Value	11
200 acres			
3.4 Distance to Nearest Fishery Resource	<50 feet	Fishery Value	12
stream located along western property margin			
3.5 Distance to and Name of Nearest Sensitive Environment		Sensitive Environment Value	12
	<50 feet		
stream located along western property margin			
4.0 Release		Release to Surface Water Value	0

Explain basis for scoring a release to surface water

No confirmed release to surface water; potential for groundwater to discharge to surface water

Pathway Scoring - Surface Water Route, Human Health Pathway

$SW_H = (SUB_{SH}*40/175)*[(MIG_S*25/24) + REL_S + (TAR_{SH}*30/115)]/24$

Where:

SUB_{SH} = (Human Toxicity Value + 3)*(Containment + 1) + Substance Quantity	SUB_{SH}	126
MIG_S = Soil Permeability + Annual Precip + Rainfall Frequency + Floodplain + Slope	MIG_S	10
REL_S = Release to Surface Water	REL_S	0
TAR_{SH} = Distance to Surface Water + Population Served by Surface Water + Area Irrigated	TAR_{SH}	22.3
	SW_H	19.5

Pathway Scoring -Surface Water Route, Environmental Pathway

$SW_E = (SUB_{SE}*40/153)*[(MIG_S*25/24) + REL_S + (TAR_{SE}*30/34)]/24$

Where:

SUB_{SE} = (Env Tox Value + 3) * (Containment + 1) + Substance Qty	SUB_{SE}	60
MIG_S = Soil Permeability + Annual Precip + Rainfall Frequency + Floodplain + Slope	MIG_S	10
REL_S = Release to Surface Water	REL_S	0
TAR_{SE} = Distance to Surface Water + Distance to Fishery + Distance to Sensitive Environment	TAR_{SE}	34.0
	SW_E	26.4

Worksheet 5

Air Route

CSID: 7790 **Site Name:** King County Metro Transit S Annex

1.0 Substance Characteristics

1.1 Introduction (WARM Scoring Manual) - Please Review before scoring

1.2 Human Toxicity

Substance	Ambient Air Standard Value	Acute Toxicity Value	Chronic Toxicity Value	Carcinogenicity Value
benzene	10	3	X	5

Highest Value 10

Bonus Points? 0

Toxicity Value 10

1.3 Mobility

Gaseous Mobility	Max Value:	4
Particulate Mobility	Soil Type:	
	Erodibility:	
	Climatic Factor:	

Mobility Value 4

1.4 Final Human Health Toxicity/Mobility Matrix Value **HH Final Matrix Value** 20

1.5 Environmental Toxicity/Mobility

Substance	Non-human Mammalian Inhalation Toxicity (mg/m3)	Acute Value	Mobility Value	Table A-7 Matrix Value
benzene	31,947	3	4	6

Env. Final Matrix Value 6

1.6 Substance Quantity

Amount: approximately 600 square feet

Basis: Footprint of estimated area of soil impacts from reports

Substance Quantity Value 4

Worksheet 5

Air Route

CSID: 7790 **Site Name:** King County Metro Transit S Annex

2.0 Migration Potential

2.1 Containment Containment Value: 5

Explain Basis: Spill/discharge to subsurface only with no vapor collection system

3.0 Targets

3.1 Nearest Population Population Distance Value: 10

300 feet Workers at adjoining property

3.2 Distance to and name of nearest sensitive environments Sensitive Environment Value: 7

<50 feet habitat for State Endangered species (western pond turtle)

3.3 Population within 0.5 miles Population Value: 39

1498 population

4.0 Release Release to Air Value: 0

Explain basis for scoring a release to air:

No confirmed release to air

Pathway Scoring - Air Route, Human Health Pathway

$AIR_H = (SUB_{AH}*60/329)*[REL_A+(TAR_{AH}*35/85)]/24$

Where:

SUB_{AH} =(Human toxicity + 5) * (Containment + 1) + Substance Qty	SUB_{AH}	154
REL_A = Release to Air	REL_A	0
TAR_{AH} = Nearest Population + Population within 1/2 mile	TAR_{AH}	48.7
	AIR_H	23.5

Pathway Scoring - Air Route, Environmental Pathway

$AIR_E = (SUB_{AE}*60/329)*[REL_A+(TAR_{AE}*35/85)]/24$

Where:

SUB_{AE} =(Environmental Toxicity Value +5)*(Containment +1) +Substance Qty	SUB_{AE}	70
REL_A = Release to Air	REL_A	0
TAR_{AE} = Nearest Sensitive Environment	TAR_{AE}	7.0
	AIR_E	1.5

Worksheet 6

Groundwater Route

CSID: 7790 **Site Name:** King County Metro Transit S Annex

1.0 Substance Characteristics

1.1 Human Toxicity

Substance	Drinking Water Standard Value	Acute Toxicity Value	Chronic Toxicity Value	Carcinogenicity Value
benzene	8	3	X	5
TPH (as diesel)	4	5	3	X

Highest Value 8

Bonus Points? 0

Toxicity Value 8

1.2 Mobility

Cations/Anions Max Value:

Solubility Max Value: 3 Mobility Value 3

1.3 Substance Quantity

Amount: >10-100 cubic yards

Basis: Residual impacted soil quantity based on site reports

Substance Quantity Value 2

2.0 Migration Potential

2.1 Containment Containment Value 10

Explain Basis: Contaminated soil present

2.2 Net Precipitation >10-20 inches Net Precipitation Value 2

2.3 Subsurface Hydraulic Conductivity Conductivity Value 3

Primarily sand and silt

2.4 Vertical Depth to Groundwater 7 feet

Confirmed release: Yes Depth to Aquifer Value 8

3.0 Targets

3.1 Groundwater Usage Private supply with alternate sources Aquifer Use Value 4

3.2 Distance to Nearest Drinking Water Well 4,200 feet

City of Seattle municipal well Well Distance Value 2

3.3 Population Served within 2 Miles Population Served Value 100

10,000 people

Worksheet 6

Groundwater Route

CSID: 7790 **Site Name:** King County Metro Transit S Annex

3.4 Area Irrigated by GW Wells within 2 miles Area Irrigated Value 4

35 acres

4.0 Release Release to Groundwater Value 5

Explain basis for scoring a release to groundwater:

Release confirmed by analytical results for groundwater samples

Pathway Scoring - Groundwater Route, Human Health Pathway

$GW_H = (SUB_{GH}*40/208)*[(MIG_G*25/17)+REL_G+(TAR_{GH}*30/165)]/24$

Where:

SUB_{GH} =(Human toxicity + mobility + 3) * (Containment + 1) + Substance Qty	SUB_{GH}	156
MIG_G=Depth to Aquifer+Net Precip + Hydraulic Conductivity	MIG_G	13
REL_G = Release to Groundwater	REL_G	5
TAR_{GH} = Aquifer Use + Well Distance + Population Served + Area Irrigated	TAR_{GH}	110.4
	GW_H	55.2

Washington Ranking Method

Route Scores Summary and Ranking Calculation Sheet

Site Name: King County Metro Transit S Annex **CSID:** 7790

Site Address: 11911 East Marginal Way S, Seattle, WA 98168 **FSID:** 8422289

HUMAN HEALTH ROUTE SCORES

Enter Human Health Route Scores for all Applicable Routes:

Pathway	Route Score	Quintile Group
Surface Water	19.5	3
Air	23.5	3
Groundwater	55.2	5

H= 5
M= 3
L= 3

$$\frac{H^2 + 2M + L}{8} = \frac{25 + 6 + 3}{8}$$

Human Health Priority Bin Score: **5**

rounded up to next whole number

ENVIRONMENT ROUTE SCORES

Enter Environment Route Scores for all Applicable Routes:

Pathway	Route Score	Quintile Group
Surface Water	26.4	3
Air	1.5	1

H= 3
L= 1

$$\frac{H^2 + 2L}{7} = \frac{9 + 2}{7}$$

Environment Priority Bin Score: **2**

rounded up to next whole number

Comments/Notes:

FINAL MATRIX RANKING **1**

FOR REFERENCE:

Final WARM Bin Ranking Matrix

Human Health Priority	Environment Priority 5	4	3	2	1	N/A
5	1	1	1	1	1	1
4	1	2	2	2	3	2
3	1	2	3	4	4	3
2	2	3	4	4	5	3
1	2	3	4	5	5	5
N/A	3	4	5	5	5	NFA

Quintile Values for Route Scores - February 2015 Values

Quintile	Human Health Surface Water	Human Health Air	Human Health Ground Water	Environment Surface Water	Environment Air
5	>= 30.7	>= 37.6	>= 51.6	>= 50.9	>= 29.9
4	>= 23.1	>= 23.8	>= 40.9	>= 31.2	>= 22.5
3	>= 14.1	>= 15.5	>= 33.2	>= 23.6	>= 14.0
2	>= 7.0	>= 8.5	>= 23.5	>= 11.0	>= 1.6
1	<= 6.9	<= 8.4	<= 23.4	<= 10.9	<= 1.5

Quintile value associated with each route score entered above

Legend:

- Property location (approximate)
- Former underground storage tank (UST) location
- Soil boring location (approximate) for soil and groundwater samples
- UST removal excavation area soil sample location (approximate)
- Dewatering well location (approximate)
- Sample with soil or groundwater concentrations above MTCA
- Approximate estimated area of impacted soil (Woodward-Clyde, 1995)

Notes:

1. All locations are approximate. Scale is approximate.

N

KC Metro Transit S Annex
11911 E Marginal Way S
Seattle, WA 98168

DEPARTMENT OF ECOLOGY
State of Washington

Site Overview Map

CSID 7790
CSID7790.vsd

Attachment C

South Annex Data Table

TABLE 1
ANALYTICAL RESULTS FOR SOIL AND GROUNDWATER
King County Metro South Base Annex Phase II Investigation
11911 E Marginal Way, Tukwila, Washington
PBS Project No. 41484.004

Location	Depth (feet bgs)	Result								
		TPH					BTEX			
		Gasoline	Diesel	Diesel *with SGC* [a]	Heavy Oil	Heavy Oil *with SGC* [a]	Benzene	Toluene	Ethyl-Benzene	Total Xylenes
Soil Samples (mg/kg)										
Adopted Criteria[b]		**100**	**2,000**	**2,000**	**2,000**	**2,000**	**0.03**	**7**	**6**	**9**
E-1	4	< 5	< 50	--	< 250	--	< 0.02	< 0.02	< 0.02	< 0.06
	11	< 5	< 50	--	< 250	--	< 0.02	< 0.02	< 0.02	< 0.06
E-2	5	< 5	< 50	--	< 250	--	< 0.02	< 0.02	< 0.02	< 0.06
	11	< 5	< 50	--	< 250	--	< 0.02	< 0.02	< 0.02	< 0.06
E-3	6	< 5	< 50	--	< 250	--	< 0.02	< 0.02	< 0.02	< 0.06
	12	< 5	< 50	--	< 250	--	< 0.02	< 0.02	< 0.02	< 0.06
E-4	5.5	< 5	< 50	--	< 250	--	< 0.02	< 0.02	< 0.02	< 0.06
	12	< 5	< 50	--	< 250	--	< 0.02	< 0.02	< 0.02	< 0.06
E-5	5.5	< 5	< 50	--	< 250	--	< 0.02	< 0.02	< 0.02	< 0.06
	11	< 5	< 50	--	< 250	--	< 0.02	< 0.02	< 0.02	< 0.06
E-6	6	< 5	< 50	--	< 250	--	< 0.02	< 0.02	< 0.02	< 0.06
	12	< 5	< 50	--	< 250	--	< 0.02	< 0.02	< 0.02	< 0.06
Groundwater Grab Samples (µg/L)										
Adopted Criteria[b]		**1,000**	**500**	**500**	**500**	**500**	**5**	**1,000**	**700**	**1,000**
E-1	--	< 100	**640[c]**	< 50	480[c]	< 250	< 1	< 1	< 1	< 3
E-2	--	< 100	140[c]	--	< 250	--	< 1	< 1	< 1	< 3
E-3	6.9[d]	< 100	86[c]	--	< 250	--	< 1	< 1	< 1	< 3
E-4	6.6[d]	< 100	450[c]	--	440[c]	--	< 1	< 1	< 1	< 3
E-5	7.2[d]	< 100	310[c]	--	330[c]	--	< 1	< 1	< 1	< 3
E-6	7.1[d]	< 100	89[c]	--	< 250	--	< 1	< 1	< 1	< 3

Notes:
Gasoline range TPH analyzed by Northwest Total Petroleum Hydrocarbon Method - Volatile Petroleum Products (Extended) (NWTPH-Gx)
Diesel and heavy oil range TPH analyzed by Northwest Total Petroleum Hydrocarbon Method - Semi-volatile Petroleum Products (Extended) (NWTPH-Dx)
BTEX analyzed by Environmental Protection Agency Method 8021B
bold indicates concentration exceeds Adopted Criteria
< Analyte not detected at or above the indicated laboratory reporting limit
-- Not Analyzed / Not Measured

Abbreviations & Acronyms:
BTEX - Benzene, toluene, ethylbenzene and xylenes
mg/kg - milligrams per kilogram
µg/L - microgram per liter
bgs - below ground surface
toc - top of casing
SGC - Silica Gel Cleanup
TPH - total petroleum hydrocarbons

Footnotes:
[a] Sample extracts passed through a silica gel column prior to analysis (Silica Gel Cleanup)
[b] Washington State Department of Ecology Model Toxics Control Act Method A Cleanup Level for Unrestricted Land Use as established in WAC 173-340-900
[c] The sample chromatographic pattern does not resemble the fuel standard used for quantitation
[d] Depth to static groundwater from ground surface, measured in temporary well