PERIODIC REVIEW

Fox Ave Building
Facility Site ID#: 2282
Cleanup Site ID#: 5082

6900 Fox Ave S
Seattle, Washington

Northwest Regional Office

TOXICS CLEANUP PROGRAM

April 2022

1.0 INTRODUCTION

This document is a review by the Washington State Department of Ecology (Ecology) of post-cleanup site conditions and monitoring data to ensure that human health and the environment are being protected at the Fox Ave Building Site. Ecology contracted with Leidos, Inc. (Leidos) to assist in the technical review of the Site conditions, monitoring data, and ongoing cleanup actions in support of this periodic review by Ecology. The Leidos summary document is included as Appendix 6.8 and relevant excerpts are included within this periodic review.

Cleanup at this Site was implemented under the Model Toxics Control Act (MTCA) regulations, Chapter 173-340 Washington Administrative Code (WAC). Cleanup activities at this Site were completed under an Agreed Order in King County Superior Court. The primary contaminants of concern (COCs) are chlorinated volatile organic compounds (CVOCs). The MTCA cleanup levels for soil are established under WAC 173-340-740. The MTCA cleanup levels for groundwater are established under WAC 173-340-720.

WAC 173-340-420 (2) requires that Ecology conduct a periodic review of a site every five years under the following conditions:

(a) Whenever the department conducts a cleanup action
(b) Whenever the department approves a cleanup action under an order, agreed order or consent decree
(c) Or, as resources permit, whenever the department issues a no further action opinion;
(d) And one of the following conditions exists:
    1. Institutional controls or financial assurance are required as part of the cleanup
    2. Where the cleanup level is based on a practical quantitation limit
    3. Where, in the department's judgment, modifications to the default equations or assumptions using site-specific information would significantly increase the concentration of hazardous substances remaining at the site after cleanup or the uncertainty in the ecological evaluation or the reliability of the cleanup action is such that additional review is necessary to assure long-term protection of human health and the environment.

When evaluating whether human health and the environment are being protected, the factors the department shall consider include [WAC 173-340-420(4)]:

(a) The effectiveness of ongoing or completed cleanup actions, including the effectiveness of engineered controls and institutional controls in limiting exposure to hazardous substances remaining at the Site;
(b) New scientific information for individual hazardous substances or mixtures present at the Site;
(c) New applicable state and federal laws for hazardous substances present at the Site;
(d) Current and projected Site and resource uses;
(e) The availability and practicability of more permanent remedies; and
(f) The availability of improved analytical techniques to evaluate compliance with cleanup levels.

Ecology shall publish a notice of all periodic reviews in the Site Register and provide an opportunity for public comment.

2.0 SUMMARY OF SITE CONDITIONS

2.1 Site Description and History

The Site consists of the Cascade Columbia Distribution Co. facility (Cascade Columbia) and the down gradient properties impacted by the contaminated groundwater plume, which ultimately discharges to the Lower Duwamish Waterway (LDW) along the S Myrtle Street Embayment. Contamination at the Site is the result of industrial use since 1918. Since the groundwater from the Site reaches the LDW, it is a concern for source control to prevent recontamination of the LDW Superfund site.

Cascade Columbia is located on King County tax parcel number 0001800087 (Property) and is owned by Fox Avenue Building LLC. Other potentially impacted properties include King County tax parcel numbers 2734100270 (Whitehead Property), 0001800091 (Seattle Boiler Works), 2136200706 (Seattle Iron & Metals), 0001800113 (Dawn Food Products), and the Fox Ave S and S Myrtle St right-of-ways. The approximate extent of the contaminated groundwater plume (the Site) is depicted in Appendix 6.1.

Seattle Chain and Manufacturing Company leased the Property from King County from 1918 until 1937, when it purchased the Property. Seattle Chain and successor companies operated coke and oil fired furnaces and warehouses on the Property.

For the next 20 years, ownership of the Property changed hands several times. In 1956, Marian Properties LLC Enterprises bought the Property and leased a portion of it to Great Western Chemical (GWC). GWC operated a chemical and petroleum repackaging and distribution facility on the Property. GWC pumped bulk product through buried pipes, as well as hoses at the surface. The facility had a number of underground and above ground storage tanks which stored chemical and petroleum products, including solvents, acids, and lube oils.

From the 1960s through the 1980s, GWC replaced and upgraded many of their warehouse structures. Several other companies leased parts of the Property over the years. A number of chemicals and petroleum products were handled at the facility.

In 2003, Fox Avenue Building LLC bought the Property. Cascade Columbia Distribution Co. now leases the Property and uses the warehouse as a chemical distribution facility.

2.2 Site Investigations

In 1989, Great Western Chemical (GWC) closed six underground storage tanks (USTs) in place, which still remain under a concrete pad. The same year, GWC also decommissioned ten other USTs, and removed them from the Property in 1990. As part of an overall remodel, GWC retained the services of Hart Crowser to provide engineering assistance in the removal of the USTs.

In 1991, GWC entered into an Agreed Order (DE TC91-N203) with Ecology. Under this agreement, GWC agreed to do a Remedial Investigation/Feasibility Study (RI/FS).

In 1993, GWC finished the Remedial Investigation and Preliminary Risk Assessment Report (RI/PRA). More work was done following this report and summarized in a Supplemental RI/FS

report in 2000. Previous investigations and cleanup work performed by GWC and Fox Avenue Building since 2000 include:

- Soil and groundwater sampling
- Seep and soil vapor sampling
- Installation of groundwater monitoring wells
- Various other investigations to define the nature and extent of contamination
- Operation of a soil vapor extraction (SVE) system
- Pilot testing of various remediation technologies, including injections of chemical oxidants into groundwater
- Underground and above ground storage tank removals

In 2009, Ecology entered into an Agreed Order (DE 6486) with Fox Avenue Building requiring them to do the following:

- Perform an interim cleanup measure to control the discharge of tetrachloroethylene (PCE) to the LDW. This used Enhanced Reductive Dechlorination (ERD) to stimulate naturally-occurring bacteria to degrade contaminants.
- Perform a pilot test to see how effective ERD may be in degrading contaminants in soils in the source area for the plume.
- Perform a source area data gap investigation to better identify the measures and cost needed to clean up this area.
- Collect air samples to find whether PCE vapors are reaching the office part of the Fox Avenue Building facility. If so, evaluate restarting the existing SVE system to control vapor intrusion.
- Do a Supplemental FS to evaluate cleanup alternatives and enable Ecology to select a cleanup action that will achieve cleanup levels under state law within a reasonable time frame.
- Prepare a draft Cleanup Action Plan (CAP) that documents the cleanup action selected by Ecology.

Contaminants of concern (COCs) for the Site include:

- Benzene
- 1,1-dichloroethene (1,1-DCE)
- Pentachlorophenol
- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- Total petroleum hydrocarbons (TPH, mineral spirits to heavy oil range)
- Vinyl chloride (VC)

2.3 Selected Cleanup Actions

In 2012, Ecology issued the CAP for the Site, which identified active remediation using thermal treatment by electrical resistance heating (ERH), soil vapor extraction (SVE), and bio-polishing by enhanced reductive dechlorination (ERD), followed by monitored natural attenuation (MNA) as the selected cleanup action. In 2012, Ecology and Fox Avenue Building, LLC entered into Agreed Order DE 8985 to implement the remedy as outlined in the CAP. Per the CAP, active remediation will be performed until Site-specific remediation levels (RLs) are achieved for each of the active remediation technologies. Following active remediation, MNA will be implemented until the final Site-wide cleanup levels (CULs) are achieved in specified areas. MNA is estimated to extend over a period of 50 years following completion of the bio-polishing phase.

The CAP and other documents subdivide the full Site into three major areas known as Cleanup Action Areas (CAAs), as shown in Appendix 6.1. These include: the Main Source Area CAA, the Northwest Corner Plume CAA, and the Downgradient Groundwater Plume CAA.

The Cascade Columbia facility encompasses part of the Main Source Area CAA and all of the Northwest Corner Plume CAA. The Whitehead property (Seattle Iron & Metals truck parking facility) is located immediately to the south of Cascade Columbia and occupies a part of the Main Source Area CAA. The Main Source Area CAA is often subdivided into two sub-areas, due to the presence of two spatially distinct CVOC plumes: the Main Source Area and the Loading Dock Area. Fox Avenue S extends along the southwestern margins of these two properties, which also marks the margins of the Main Source Area CAA and the Northwest Corner Plume CAA.

The conditional point of compliance (CPOC) for groundwater is defined in the CAP as being along this downgradient (southwestern) margin of the Main Source Area CAA and the Northwest Corner Plume CAA (as shown in Appendix 6.1). This line corresponds to the northeastern margin of the Fox Avenue S right-of-way.

Any areas to the southwest (downgradient) of this CPOC line are part of the Downgradient Groundwater Plume CAA, and groundwater in this area must comply with RLs or CULs (as discussed in Sections 2.4 and 2.5 below). This CAA includes the Fox Avenue S corridor, Seattle Boiler Works property, S Myrtle Street corridor, and the S Myrtle Street Embayment where seeps are known to discharge into the LDW.

The RI identified two primary water bearing zones (WBZs) in the aquifer at the Site: a shallow zone referred to as the 1st WBZ, and a deeper zone referred to as the 2nd WBZ. The 1st WBZ is unconfined and extends from the water table, at 7 to 13 feet below ground surface (bgs), down to a confining layer (where locally present); the 1st WBZ has a thickness of approximately 3 to 8 feet, with a maximum depth of 21 feet bgs.

The 2nd WBZ is semi-confined (depending on whether the confining layer is locally present) and extends from as shallow as 15 feet to at least 80 feet bgs. The 2nd WBZ is commonly subdivided into varying depth ranges for sampling purposes. The locations of Site monitoring wells (distinguished by WBZ) and injection wells are shown in Appendix 6.2.

2.4 Cleanup Standards

Final cleanup levels for the Site were initially defined in Section 3.4 of the CAP, and were later amended by the First Amendment to the Agreed Order (DE 8985), which became effective on May 8, 2013. This amendment modified the MTCA Method B and Method C indoor air CULs for PCE and TCE, and established CULs for VC in these categories. The final CULs for the Site are summarized in the following table (Leidos, 2020):

Table 1. Revised Cleanup Levels for Fox Avenue Building Site

Chemical of Concern	Soil Cleanup Level	Groundwater Cleanup Level	Indoor Air Cleanup Level	
	Protection of Groundwater and Indoor Air [1]	Protection of Surface Water (µg/L)	MTCA Method B [2] (µg/m³)	MTCA Method C [3] (µg/m³)
Benzene	Empirical	51	NA	NA
1,1-DCE	Empirical	3.2	NA	NA
Pentachlorophenol	Empirical	3.0	NA	NA
PCE	Empirical	3.3	9.6	40
TCE	Empirical	30	0.37	2.0
TPH (mineral spirits to heavy-oil range)	Empirical	500	NA	NA
VC	Empirical	2.4	0.28	2.8

Table Notes:

1. Soil CULs have no numeric value. Instead, soil will be empirically demonstrated to be in compliance when indoor air and groundwater (at the CPOC) meet their respective CULs within the estimated restoration time frame.
2. MTCA Method B indoor air CULs are applied to the Seattle Boiler Works property.
3. MTCA Method C indoor air CULs are applied to the Cascade Columbia property.

µg/L = micrograms per liter
µg/m³ = micrograms per cubic meter

NA = Not applicable, the chemical is not a COC for indoor air

As previously stated, the conditional point of compliance (CPOC) for groundwater is the northeastern margin of Fox Avenue S, along the downgradient property boundary of both the Fox Avenue Building LLC property and the Whitehead property. Per the CAP, the approximate restoration time frame required to achieve Site CULs for groundwater is 50 years after completion of the ERD bio-polishing component of the cleanup action.

2.5 Remediation Levels

Due to the combination of multiple cleanup action components that are part of the selected cleanup action, the CAP also established remediation levels (RLs) for the project. RLs establish target concentrations for hazardous substances that must be achieved by a particular cleanup action component. Note: Cleanup levels are used to ultimately determine whether a remedial action is protective, not remediation levels.

The following RLs were established:

- **Soil: 10 milligrams per kilogram (mg/kg) total PCE and TCE**

  This RL was established for thermal treatment of soil in the Main Source Area CAA. The estimated timeframe to achieve this RL was approximately one year of active thermal treatment by ERH.

- **Groundwater: 250 micrograms per liter (µg/L) total CVOCs**

  This RL was established for bio-polishing by ERD in the Main Source Area CAA, Northwest Corner Plume CAA, and Downgradient Groundwater Plume CAA. The estimated restoration timeframes were as follows:

  - In the Main Source Area CAA, the groundwater RL was expected to be achieved at the CPOC within 5 years after completion of thermal treatment.
  - In the Northwest Corner Plume CAA, the groundwater RL was expected to be achieved at the CPOC within 5 years after completion of SVE treatment.
  - In the Downgradient Groundwater Plume CAA, the groundwater RL was expected to be achieved in the designated well network within 10 to 15 years after completion of thermal treatment.

- **Groundwater Seeps: Compliance with Site CULs**

  Although not specifically referenced in Section 3.6 (Remediation Levels) of the CAP, text in Section 4.2 of the CAP states: "The selected technology for groundwater treatment is ERD, which will occur until the groundwater remediation level of 250 µg/L total CVOCs is achieved throughout the downgradient plume and the groundwater seeps at the S Myrtle Street Embayment are in compliance with the cleanup levels." Compliance of the groundwater seeps with Site CULs should be considered as a RL for the ERD bio-polishing component of the cleanup action. Per the CAP, compliance with CULs at the point of discharge to surface water at the S Myrtle Street Embayment is expected within approximately 10 to 15 years following thermal treatment.

2.6 Current Cleanup Status

Thermal Treatment for Soil Remediation in Main Source Area CAA

Thermal treatment of the Main Source Area CAA portion of the Site by ERH was conducted from January to May 2013. Thermal treatment system design, construction, and operation were completed by TRS Group, Inc. Floyd|Snider (2013) reported that the volume of thermally treated soil at the Site was approximately 42,000 cubic yards, and that the system removed approximately 4,200 to 11,400 pounds of CVOCs (primarily PCE). This action was reportedly successful in achieving the RL established for this component of the cleanup action (10 mg/kg for total PCE + TCE in soil).

SVE for Soil Remediation in Northwest Corner Plume CAA

In the Northwest Corner Plume CAA, SVE was implemented to remove PCE from the vadose zone that would otherwise act as a long-term source of groundwater contamination, and to reduce sub-slab soil vapor CVOC concentrations beneath the Cascade Columbia building. The

system consisted of four vertical SVE wells (SVE-1 through SVE-4), which were installed in June 2012 and were connected to a vacuum blower. Vapor discharge from the system was treated through a series of two 1,200-pound granular activated carbon adsorption units. The SVE system was activated on September 19, 2012 and was operated on a generally continuous basis until July 10, 2013, when it was shut down for rebound analysis. The system was operated again from August 14 to August 28, 2013, when it was shut down permanently. Floyd|Snider (2013) reported that the SVE system removed an estimated 111 pounds of CVOCs from the subsurface.

ERD Bio-Polishing for Groundwater Remediation throughout Site

Initiation of the post-thermal ERD bio-polishing phase of the cleanup reportedly started in late 2013, with substrate injections to two injection wells screened in the 1st WBZ of the Loading Dock Area. Twenty-two additional injection wells were installed in February 2014. Three of these wells were installed in the Loading Dock Area and were screened in the 2nd WBZ. The other 19 wells were installed in the Main Source Area, with 8 wells screened in the 1st WBZ and 11 wells screened in the 2nd WBZ. In the Northwest Corner Area, three shallow injection wells were used. Substrate injections were initiated through the remainder of the Site in 2014, except for in the 1st WBZ of the Main Source Area, where the target temperature for injection was not reached until January 2015 due to thermal treatment in this area.

Planning of the ERD bio-polishing work at the Site has been a joint venture by multiple parties. The 2014 Annual Report (Floyd|Snider 2015) indicates that the Biopolish Work Plan and Work Plan Addendum were jointly developed using approaches developed by Landau Associates, CALIBRE, and Bioremediation Specialists; and additionally that Landau Associates developed the approach for bio-polishing the Main Source Area, CALIBRE developed the approach for bio-polishing the 1st WBZ of the Loading Dock, and Bioremediation Specialists developed the approach for bio-polishing the 2nd WBZ of the Loading Dock.

ERD bio-polishing injection and monitoring activities have been documented by Annual Reports prepared by Floyd|Snider for 2014 through 2018, and by CALIBRE for 2019. Primarily, injections have consisted of substrate addition by injection of soluble sugars or emulsified vegetable oil. However, bio-augmentation injections for inoculation of dechlorinating bacteria and additions of nutrients and buffers have also been performed. Substrate injections have generally occurred at least one or more times annually, with the most recent injection completed in January 2019 by Floyd|Snider. Injection plans, including substrate materials, volumes, number and location of injection wells, are revised based on the results of performance monitoring data, in order to tailor the bio-polishing injection program to changes in Site groundwater conditions.

2.7 Future Environmental Covenants

The CAP indicates that once RLs are achieved for groundwater, implementation of institutional controls (in the form of environmental covenants) will be required on affected properties where chemical concentrations in groundwater or indoor air exceed applicable CULs and are expected to remain greater than CULs for an extended time frame.

According to the CAP, institutional controls will likely include the following:

- Restriction in withdrawal of groundwater from the affected property for drinking purposes.

- Consent to long-term access for environmental monitoring and maintenance.
- The Cascade Columbia and Whitehead properties will be required to be maintained for industrial use only (as they are located upgradient of the groundwater CPOC at Fox Avenue) in a manner consistent with applicable zoning requirements.

The prior owner of the Whitehead property provided written agreement to the use of a CPOC (which would include an environmental covenant), which is included in the 2012 CAP. However, the Whitehead property was sold to 730 Myrtle LLC in November 2015. It should be confirmed in writing that the new property owner will accept an environmental covenant for their property.

The owner of the Seattle Boiler Works property has indicated that an environmental covenant on the Seattle Boiler Works property will not be allowed. Therefore, CULs must be met on the Seattle Boiler Works property.

An environmental covenant, once recorded with the county, prohibits activities that would result in the release of contaminants contained as part of the cleanup, and prohibits any use of the property that is inconsistent with the covenant (unless with Ecology's advanced approval). A covenant serves to assure the long-term integrity of the remedy. However, since the covenants have not yet been recorded, the protections afforded by a covenant are not present at this Site.

3.0 PERIODIC REVIEW

3.1 Effectiveness of Completed Cleanup Actions

The following sections summarize the compliance status of the three environmental media of concern, including ongoing/future cleanup actions and any contingency actions. In addition, Appendix 6.6 provides a summary in table form. Note: this periodic review included a review of data through 2019. Additional data has been submitted since that time, and will be evaluated during the next periodic review.

3.1.1 Soil

Results of post-thermal treatment soil confirmation sampling completed in May 2013 indicate that the RL for thermal treatment of the Main Source Area was achieved. As a result, no contingency actions as defined in the CAP are needed for this component.

Per the CAP, a future demonstration that soil concentrations at the Site are in compliance with the CULs will be made empirically based on compliance with CULs for groundwater and indoor air. Based on the expected restoration time frame for groundwater, compliance with soil CULs is not expected to be attained until 50 years following completion of bio-polishing by ERD.

3.1.2 Groundwater

Past and ongoing remedial actions appear to have been effective in reducing concentrations of volatile organic compounds in the subsurface, although some groundwater COCs currently remain at levels exceeding the CULs and RLs, and one of the expected time frames has now been missed (in the Northwest Corner Plume CAA). Continued groundwater monitoring and further implementation of the ongoing remedial action (ERD) is required by the CAP.

The Site groundwater data indicate that the following COCs have not achieved compliance with their respective RL/CUL criteria at the CPOC: total CVOCs, PCE, and VC. Compliance with criteria for benzene, 1,1-DCE, and TCE appear to have already been achieved.

Pentachlorophenol and TPH were not analyzed in the annual monitoring activities. The CAP indicates that pentachlorophenol and TPH concentrations were below CULs. The CAP also indicates that they would be monitored following remedial actions to confirm that the groundwater concentrations are stable or reducing over time.

Below is a summary of the groundwater/seep compliance levels presented in the CAP, and the current conditions.

Remediation Level of 250 µg/L Total CVOCs

- **Main Source Area CAA** (5 years after thermal treatment, or May 2018): This RL has been met at locations close to the CPOC, and thus contingency actions are not required. Compliance with the RL has not yet been consistently achieved in shallow or deep groundwater within the CAA upgradient of the CPOC, but is estimated to be reached within several years. As a result, annual groundwater monitoring should continue, along with recommended continuation of ERD injections.

- **Northwest Corner Plume CAA** (5 years after SVE activity, or August 2018): Compliance with this RL has been achieved in deep groundwater. The RL has not been consistently achieved in shallow groundwater directly adjacent to the CPOC, but is estimated to be reached within a small number of years. Because the RL was not consistently achieved within 5 years, this triggers one of the following contingency actions (CAP Section 6.5.2): ERD injections, SVE operations, and/or installing a permeable reactive barrier wall. Section 4.3 of the CAP indicates that continued ERD would be the action utilized until compliance with the RL is achieved.
- **Downgradient Groundwater Plume CAA** (10-15 years after thermal treatment, or 2023-2028): Compliance with this RL has been achieved for shallow groundwater. The RL is close to being achieved in deeper groundwater, and will likely be met by the 10-year date. Because the RL has not yet been consistently achieved, ERD shall continue in this area (per CAP Section 4.2).
- **Embayment Seeps**: Refer to discussions of compliance with CULs.

Cleanup Level of 3.3 µg/L PCE

- **Main Source Area CAA** (50 years after ERD treatment): Compliance with this CUL is required at the CPOC. Refer to the discussion of the Downgradient Groundwater Plume CAA below. .
- **Northwest Corner Plume CAA** (50 years after ERD treatment): Compliance with this CUL at the CPOC has not been achieved for shallow groundwater, but is estimated to be reached within several years. The CUL at the CPOC has already been achieved for deep groundwater.
- **Downgradient Groundwater Plume CAA** (50 years after thermal treatment): Compliance with this CUL has not been achieved in shallow or deeper groundwater, but is estimated to be reached within approximately 10 years.
- **Embayment Seeps** (10-15 years after thermal treatment): Compliance with this CUL has already been achieved for all seep samples.

Cleanup Level of 2.4 µg/L Vinyl Chloride

- **Main Source Area CAA** (50 years after ERD treatment): Compliance with this CUL is required at the CPOC. Refer to the discussion of the Downgradient Groundwater Plume CAA below.
- **Northwest Corner Plume CAA** (50 years after ERD treatment): Compliance with this CUL at the CPOC has not been achieved in shallow groundwater. Due to significant variability in concentrations, and ERD production of VC, it is difficult to estimate restoration time frame, but 50 years appears readily achievable. The CUL at the CPOC has already been achieved for deep groundwater.
- **Downgradient Groundwater Plume CAA** (50 years after thermal treatment): Compliance with this CUL has not been achieved in shallow or deeper groundwater. Due

to significant variability in concentrations, and ERD production of VC, it is difficult to estimate restoration time frame, but 50 years appears achievable.

- **Embayment Seeps** (10-15 years after thermal treatment): Compliance with this CUL has not yet been achieved for seep samples, but a downward temporal trend suggests consistent achievement within several years. ERD shall continue until the groundwater seeps at the S Myrtle Street Embayment are below cleanup levels, per the CAP (see discussion in Section 2.5).

Except for relatively low concentrations of VC in the seep samples (based on 2019 sampling), groundwater discharging from seeps appears to contain only low levels of COCs, well below the CAP compliance levels for protection of surface water. See Section 3.3.2 for a discussion of updated cleanup levels for protection of surface water.

Potential Rebound of CVOCs and Vinyl Chloride Variability

Production of VC through the action of ERD injections and retention in the aquifer is a long-term concern at this Site, and may need to be addressed in the future. The possible effect of rebounding concentrations for any COC is also a concern following termination of ERD injections at any given location. Because Site data do not yet indicate that the total CVOC RL for groundwater has been consistently achieved, and the VC CUL for seeps has not been achieved, ERD bio-polishing activities should continue in the Northwest Corner Plume CAA and the Downgradient Groundwater Plume CAA, per requirements in the CAP. Continuation of ERD activities is also recommended in the Main Source Area CAA.

Based on the uncertainty of timing for ERD to achieve compliance with the groundwater CVOC RL and for the VC CUL to be achieved in the downgradient areas between the CPOC and the embayment seeps, a more comprehensive evaluation of groundwater conditions at the Site should be performed. This evaluation should include:

- Additional sampling to assess the current concentrations and potential rebound of CVOCs in select monitoring wells and seeps. This resampling should be performed where results for any Site well or seep show exceedances in at least one of the last two sampling rounds (since January 2016) at each location. This would be applied on a Site-wide basis, regardless of spatial relationship to the CPOC. The wells and seeps recommended for sampling are provided in a table as Appendix 6.7, which includes 45 wells and 3 seep locations.
- Collection and interpretation of additional ERD performance monitoring data and preparation of an up-to-date bio-polishing injection plan to address current groundwater conditions at the Site.

3.1.3 Indoor Air/Soil Vapor

The potential for vapor intrusion (VI) was last assessed at the Site in 2013. Additional (updated) VI assessment is warranted, as soil and groundwater cleanup levels (nor remediation levels) at the Site are not calculated to be protective of indoor air. Prior VI assessment activities and data gaps are discussed below.

Cascade Columbia Property VI Assessment

For the Cascade Columbia portion of the Site, sub-slab soil vapor and indoor air sampling was conducted in March 2009, April 2013, and September 2013. Sub-slab sampling for two of three sampling probes was also conducted in November 2012. As previously discussed, a SVE system was operated in the Northwest Corner Plume CAA from September 2012 to August 2013. In addition to addressing PCE impacts to vadose zone soils that would otherwise act as a long-term source of groundwater contamination, the 2013 Construction Completion Report indicates that the SVE was operated to reduce vapor concentrations beneath the Cascade Columbia building.

Further VI investigation should be conducted in order to resolve the following data gaps at the Cascade Columbia property:

- Except for the sampling event completed in March 2009, all VI assessment sampling performed on the Cascade Columbia property was conducted while the SVE system was operational, or soon after the system was shut down. The most recent round of VI sampling was conducted on September 5, 2013, only eight days after the system was shut down on August 28, 2013. This being the case, the data collected are not representative of subsurface soil vapor or indoor air conditions that would exist in equilibrium without the SVE system operating.
- Sub-slab soil vapor results for the September 2013 sampling round show significant increases in PCE and TCE concentrations relative to the previous sampling round. For sampling point SV-3, PCE was detected at 8,380 $\mu g/m^3$, which exceeds the current MTCA Method C sub-slab soil gas screening level (1,300 $\mu g/m^3$). TCE was detected in this sample at a concentration of 756 $\mu g/m^3$, which exceeds the current Method C sub-slab soil gas screening level (67 $\mu g/m^3$) and the short-term action level to protect women of child-bearing age in commercial/industrial settings (250 $\mu g/m^3$). Although the April and September 2013 indoor air sampling results indicate that indoor air was in compliance with CULs at the time of those events, the sub-slab sampling results indicate that significant potential for VI existed on the Cascade Columbia property after the SVE system was shut down in August 2013. If elevated PCE and TCE concentrations remain present in shallow soil vapor, there is still potential for VI impacts to indoor air under building-use or barometric pressure conditions that have not been evaluated by the VI assessment activities conducted to date. Note: CAP compliance is based on indoor air sampling results, not sub-slab soil gas. Soil gas results are presented here as a secondary line of evidence to demonstrate why additional indoor air sampling is needed to ensure protection of human health.
- Results from the April 2013 sampling event indicate that PCE was detected in indoor air at a concentration of 27 $\mu g/m^3$ at sample point IA-1 and 32 $\mu g/m^3$ at sample point IA-2. Although both of these results were less than the Method C CUL (40 $\mu g/m^3$), it must be noted that these results are not significantly less than the CUL and that these samples were collected while the SVE system was operating in this portion of the Site. Note that VC was not detected in any indoor air or sub-slab soil vapor samples at this property.
- Best practices for VI assessment generally recommend conducting at least one indoor air sampling event under a conservative “worst-case” scenario, such as during the winter

heating cycle when stack effects tend to create low-pressure zones inside buildings, which creates stronger gradients for migration of sub-slab vapor to indoor air spaces. The Cascade Columbia VI assessment data do not include data from sampling under these conditions. Future VI assessment sampling should also include meteorological monitoring and a discussion of how weather conditions during the sampling event may have impacted the results.

Seattle Boiler Works Property VI Assessment

Three memoranda summarizing VI assessment activities were prepared by Floyd|Snider regarding sampling conducted on the Seattle Boiler Works property in December 2012, April 2013, and July 2013. These memoranda also included previous VI sampling performed on the Seattle Boiler Works property in 2010 by URS Corporation. However, there is some inconsistency regarding when the work was performed. Sample dates presented in the data tables attached to the memos suggest that 2010 VI sampling consisted of sub-slab soil vapor sample collection in October and indoor air sampling in December of that year. However, the footnotes to these tables state that the soil gas and indoor air sampling was performed by URS Corporation in February 2010.

Further VI investigation should be conducted in order to resolve the following data gaps at the Seattle Boiler Works property:

- Indoor air sampling results for the Seattle Boiler Works property indicate that the Method B indoor air CULs for TCE and VC were exceeded at sampling point SBW-IA-Center in December 2012. TCE was measured at 0.43 $\mu g/m^3$ (CUL is 0.37 $\mu g/m^3$) and VC at 2.0 $\mu g/m^3$ (CUL is 0.28 $\mu g/m^3$).
- Sub-slab sampling results indicate that the current Method B sub-slab soil gas screening level for PCE (320 $\mu g/m^3$) was exceeded at all four locations sampled in July 2013 (the most recent sampling event) and that this screening level was consistently exceeded at sampling points SV-2 and SV-3 by one to two orders of magnitude. All of the sub-slab soil vapor sample results with detections of TCE exceed the current Method B sub-slab screening level (12 $\mu g/m^3$). Although TCE was reported as not-detected in 8 of the 16 sub-slab samples collected on the Seattle Boiler Works property, the reporting limit (100 $\mu g/m^3$) for 7 of the 8 samples was not low enough to allow comparison with the TCE screening level. For VC, 4 of the 16 sample results were detected and exceeded the Method B sub-slab soil gas screening level (9.4 $\mu g/m^3$). In 9 of the 12 non-detected results, the reporting limit (20 $\mu g/m^3$) was above the VC screening level. Note: CAP compliance is based on indoor air sampling results, not sub-slab soil gas. Soil gas results are presented here as a secondary line of evidence to demonstrate why additional indoor air sampling is needed to ensure protection of human health.
- Although the indoor air sampling results for this property suggest that indoor air has generally been in compliance with the Site CULs, these sub-slab sampling data indicate there is significant potential for VI risk on the Seattle Boiler Works property under meteorological or building use conditions that were not present at the time of previous indoor air sampling events. If CVOC concentrations in groundwater or soil vapor have rebounded after termination of ERD injections, the potential for VI could be higher than

previous sampling results indicate. Based on these data, additional indoor air assessment is warranted. Additionally, future indoor air assessment should consider and document meteorological conditions and building use in the sampling areas prior to and during collection of indoor air samples.

Whitehead Property

A VI assessment does not appear to have been completed for the Whitehead portion of the Site. While there are no buildings on the Whitehead property at present, a VI assessment would need to be completed if there were buildings in the future (or if there are other VI exposure routes, such as stormwater control systems with underground personnel access). The Whitehead property was sold to 730 Myrtle LLC in 2015.

3.2 New scientific information for individual hazardous substances or mixtures present at the Site

There is no new scientific information for the contaminants related to the Site.

3.3 New applicable state and federal laws for hazardous substances present at the Site

The following sections summarize new or updated laws or regulations that are applicable to the Site.

3.3.1 Vapor Intrusion

The VI assessment at this Site, though considered sufficient at the time, would be considered inadequate by current standards. Additional assessment of VI potential is warranted. Prior VI assessment activities and data gaps are discussed in Section 3.1.3 above.

VI assessments should be in accordance with Ecology's 2018 *Draft Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action*; Ecology's 2019 *Implementation Memorandum No. 22: VI Investigations and Short-Term TCE Toxicity;* and any other relevant regulations and guidance documents.

3.3.2 Cleanup Levels

The state water quality criteria were updated in 2016. Since the groundwater CULs for the Site are based on protection of surface water (Lower Duwamish Waterway), the groundwater CULs should be updated to be protective of surface water in accordance with the current state water quality criteria. The following table provides a summary.

Chemical of Concern	Current Groundwater CUL (µg/L)	PCUL (µg/L)	Basis for PCUL
Pentachlorophenol	3.0	0.002	Washington Toxics Rule 40 CFR 131.45
Benzene	51	1.6	State water quality criterion for human health WAC 173-201A-240

1,1-DCE	3.2	4,000	Washington Toxics Rule
PCE	3.3	2.9	Washington Toxics Rule
TCE	30	0.7	Washington Toxics Rule
VC	2.4	0.18	Washington Toxics Rule

PCUL = preliminary cleanup level for the Lower Duwamish Waterway (Ecology. May 17, 2021. Preliminary Cleanup Levels for Lower Duwamish Waterway.)

3.4 Current and projected site or resource use

Due to Washington State's Stay Home order related to the COVID-19 pandemic, a Site visit was not conducted for this periodic review. Based on Google Earth aerial photographs, the Site appears to still be occupied by industrial buildings and storage yards. The Cascade Columbia storage yard appears to include shipping containers, dumpsters, trucks and other vehicles, aboveground storage tanks, drums, and totes.

There do not appear to have been any changes in current or projected future site or resource uses.

3.5 Availability and practicability of more permanent remedies

The remedy selected will include containment of hazardous substances. While more permanent remedies may be available, they are still not practicable at this Site.

3.6 Availability of improved analytical techniques to evaluate compliance with cleanup levels

The analytical methods used at the time of the remedial action were capable of detection below selected Site cleanup levels.

4.0 CONCLUSIONS

Past and ongoing remedial actions appear to have been effective in reducing concentrations of volatile organic compounds in the subsurface, although some groundwater contaminants of concern (COCs) currently remain at levels exceeding the cleanup levels (CULs) and remediation levels (RLs). Continued groundwater monitoring and implementation of the ongoing remedial action is required by the Cleanup Action Plan (CAP).

The remedy is expected to be protective of human health and the environment once cleanup levels are met; however, the cleanup is still in process. The property owner should take the following actions (some of these actions may already be planned or are in progress), and provide the associated reports to Ecology:

- **Continue Enhanced Reductive Dechlorination (ERD) bio-polishing injections**: This includes those required by the CAP as a result of RL exceedances in the Northwest Corner Plume Cleanup Action Areas (CAAs) [at the conditional point of compliance (CPOC)] and the Downgradient Groundwater Plume CAA, as well as vinyl chloride (VC) CUL exceedances in the embayment seeps. In addition, due to RL exceedances upgradient of the CPOC in the Main Source Area CAA, additional ERD injections may be warranted there in support of meeting the restoration timeframes for the RL exceedances in the Downgradient Groundwater Plume CAA and the CUL exceedances in the embayment seeps.
- **Additional groundwater/seep monitoring and evaluation of ERD performance**: Production of VC through the action of ERD injections and retention in the aquifer is a long-term concern at this Site. The possible effect of rebounding concentrations for any COC is also a concern following termination of ERD injections at any given location. Based on the uncertainty of timing for ERD to achieve compliance with the groundwater CVOC RL and for the VC CUL to be achieved in the downgradient areas between the CPOC and the embayment seeps, a more comprehensive evaluation of groundwater conditions at the Site is warranted. This is also based on the variability in analytical results at some locations, and the fact that some locations have not been sampled since showing exceedances in prior years. This evaluation should include:
    - Additional sampling to assess the current concentrations and potential rebound of CVOCs in select monitoring wells and seeps, as well as to evaluate ERD performance. This resampling should be performed where results for any Site well or seep show exceedances in at least one of the last two sampling rounds (since January 2016) at each location. This would be applied on a Site-wide basis. The wells and seeps recommended for sampling are provided in a table as Appendix 6.7, which includes 45 wells and 3 seep locations. As part of this evaluation, an up-to-date bio-polishing injection plan should be prepared to address current groundwater conditions at the Site. Historical data tables should be included in future monitoring reports to aid in these evaluations.
    - Pentachlorophenol and total petroleum hydrocarbons (TPH) have not been included in annual groundwater monitoring. The CAP indicates that

pentachlorophenol and TPH would be monitored to confirm that the groundwater concentrations are stable or reducing over time.

- **Update groundwater CULs**: The state water quality criteria were updated in 2016. Since the groundwater CULs for the Site are based on protection of surface water (Lower Duwamish Waterway), the groundwater CULs should be updated to be protective of surface water in accordance with the current state water quality criteria.
- **Additional vapor intrusion (VI) assessment on the Cascade Columbia and Seattle Boiler Works properties:**
    - This conclusion is based on the most recent sub-slab soil vapor sampling results, which indicated that concentrations of PCE and TCE at Cascade Columbia and PCE, TCE, and VC at Seattle Boiler Works were present above MTCA sub-slab soil gas screening levels. Although the most recent indoor air sampling results for these properties were in compliance with Site CULs, the currently available data set does not provide a sufficient weight-of-evidence to demonstrate that a VI exposure pathway to indoor air is not present during normal/conservative conditions for building use and meteorological conditions. It should also be noted that during one of the prior sampling events, one location at Seattle Boiler Works showed indoor air CUL exceedances for TCE and VC.
    - Additionally, for the Cascade Columbia property, the VI assessment sampling conducted was not representative of equilibrium conditions in the subsurface because several of these sampling events were conducted during operation of the soil vapor extraction (SVE) system, or a few days after the system was shut down.
    - Future VI assessment on these properties needs to include documentation of building use and meteorological conditions before and during the sampling events, in order to demonstrate that the sampling was conducted under normal/conservative conditions for VI potential. This assessment should include sampling indoor air at various building locations and resampling all sub-slab vapor points. Conduct VI assessments in accordance with Ecology's 2018 *Draft Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action* and any other relevant regulations and guidance documents.
    - Some laboratory reporting limits were above the applicable screening levels. Therefore, it is unknown whether the associated samples were above or below those screening levels. Ensure that reporting limits for future laboratory analyses do not exceed the CULs or screening levels.
    - Adequate VI assessment is especially important since groundwater CULs were not calculated to be protective of VI. Therefore, a sufficient indoor air sampling program is needed to ensure that the remedy is protective of indoor air. The most recent indoor air sampling was conducted in 2013.
    - Ecology has published new guidance on short-term exposures to TCE, which must be addressed during the VI assessment (Ecology's 2019 *Implementation Memorandum No. 22: VI Investigations and Short-Term TCE Toxicity)*. TCE was detected at Cascade Columbia at a concentration of 756 $\mu g/m^3$ in a sub-slab soil

vapor sample, which exceeds the short-term action level to protect women of child-bearing age in commercial/industrial settings (250 μg/m^3). Therefore, TCE should be assessed as soon as possible.

- **Potential VI assessment on the Whitehead property**: A VI assessment does not appear to have been completed on the Whitehead property. While there are no buildings on the Whitehead property at present, a VI assessment would be necessary if there were buildings in the future (or if there are other VI exposure routes, such as stormwater control systems with underground personnel access).
- **Future Environmental Covenants**: Environmental covenants are anticipated on affected properties where chemical concentrations exceed applicable CULs. An environmental covenant, once recorded with the county, prohibits activities that would result in the release of contaminants contained as part of the cleanup, prohibits any use of the property that is inconsistent with the covenant, and serves to assure the long-term integrity of the remedy. However, since the covenants have not yet been recorded, the protections afforded by a covenant are not present at the Site. The CAP indicates that covenants will be recorded once RLs are achieved for groundwater. However, Ecology is concerned about the protectiveness of delaying institutional controls long-term, given the long restoration timeframes. Ecology may reevaluate this timeline at a future date.
    - The prior owner of the Whitehead property provided written agreement to the use of a CPOC, which would include an environmental covenant. However, the Whitehead property was sold to 730 Myrtle LLC in 2015. It should be confirmed in writing that the new property owner will accept an environmental covenant for their property, since it is part of the remedy.

It is the property owner's responsibility to continue to inspect the property to assure that the integrity of the remedy is maintained.

5.0 REFERENCES

Calibre. August 29, 2019. Technical Memorandum Summarizing June 2019 Site Wide Sampling for the Fox Avenue Site.

Ecology. June 2012. Cleanup Action Plan, Fox Avenue Site, Seattle, Washington.

Ecology. Various Dates. Fox Avenue Site File.

Floyd|Snider. June 10, 2011. Remedial Investigation/Feasibility Study, Fox Avenue Site, Seattle, Washington.

Floyd|Snider. September 2013. Construction Completion Report, Fox Avenue Site, Seattle, Washington.

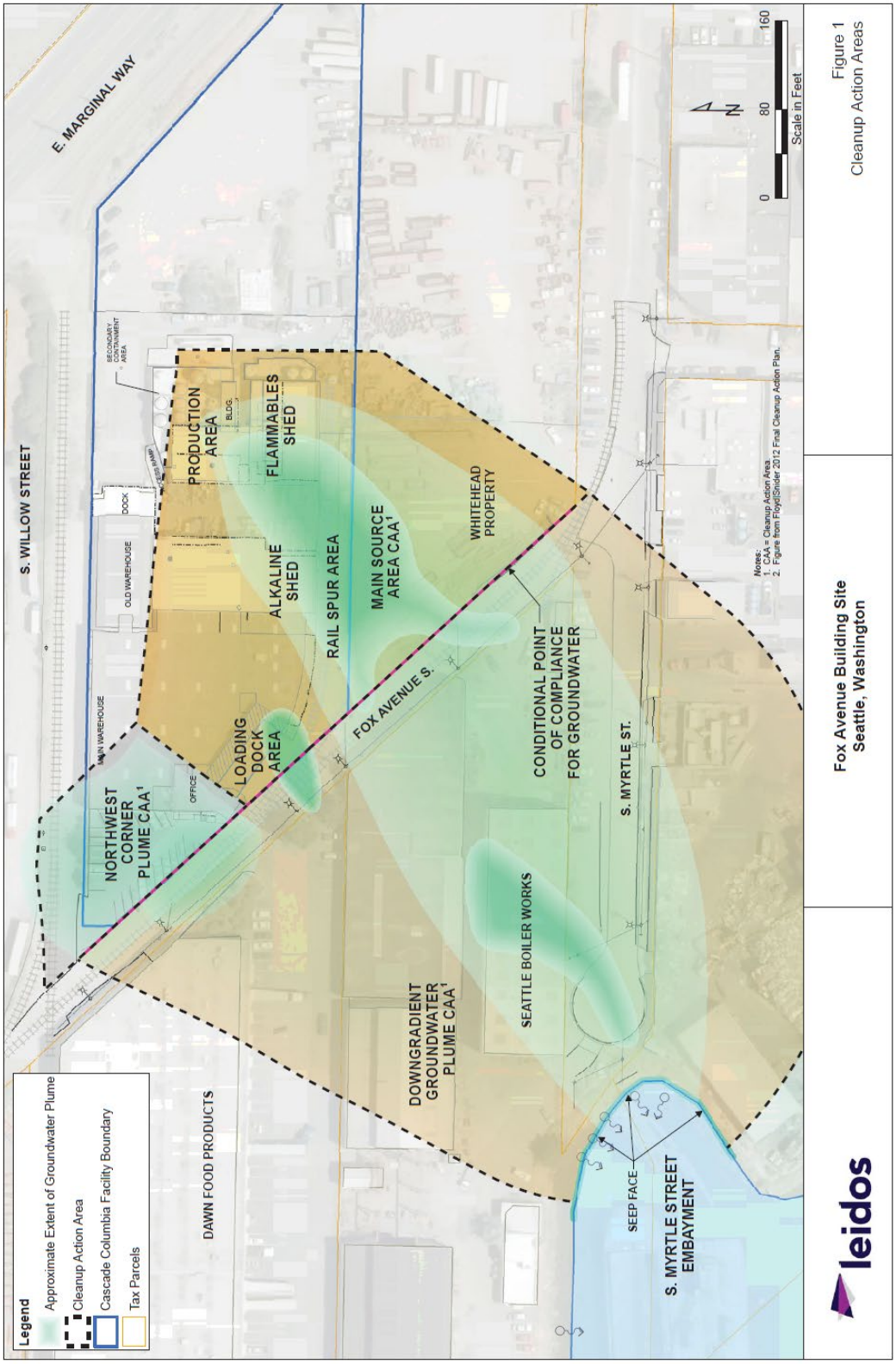
Floyd|Snider. March 2019. 2018 Annual Report, Fox Avenue Site, Seattle, Washington.

Google Earth. Various Dates. Aerial Photographs.

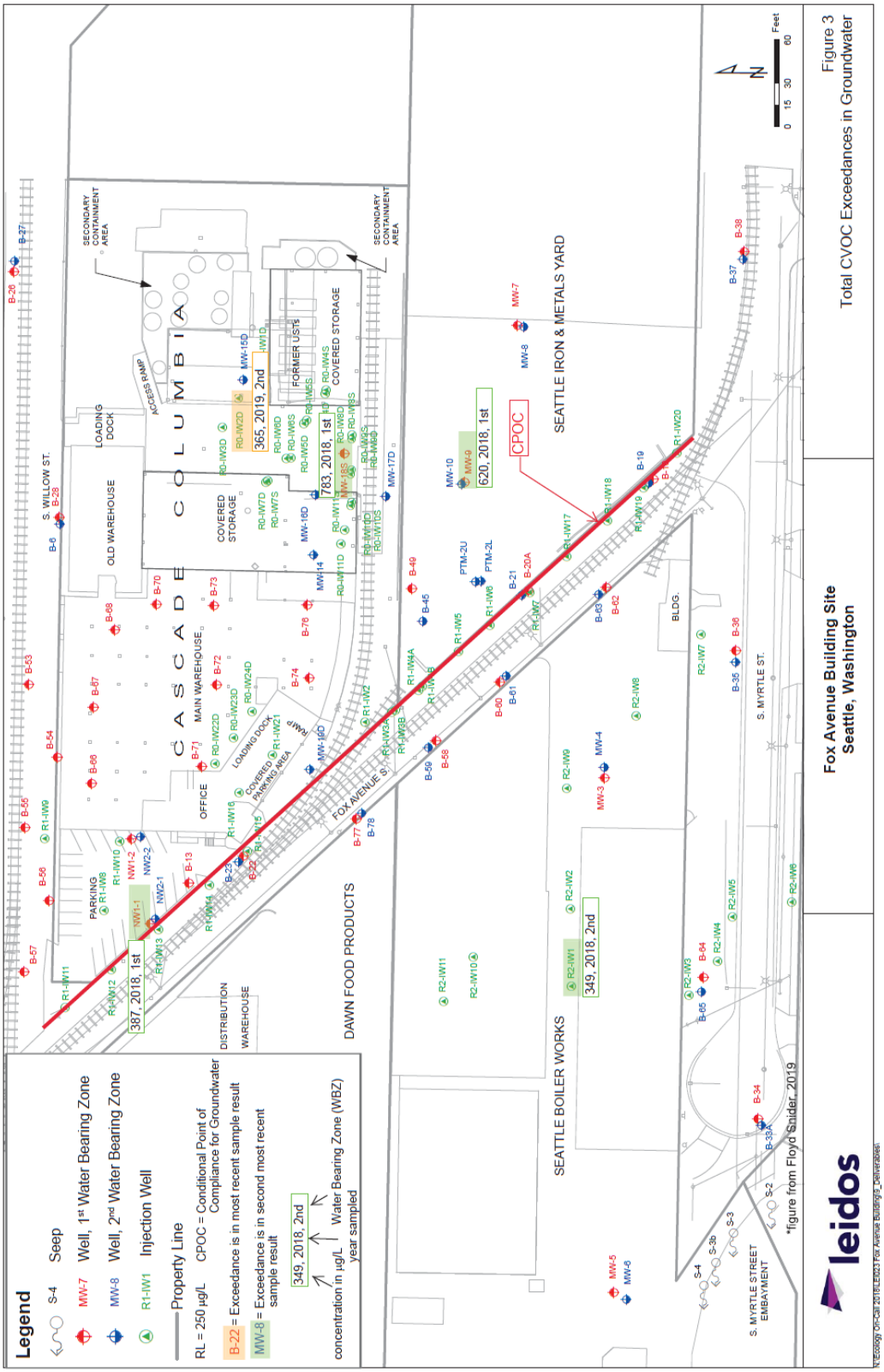
Leidos, Inc. December 31, 2020. Summary Report in Support of Periodic Review, Fox Avenue Building Site, Seattle, Washington.

6.0 APPENDICES

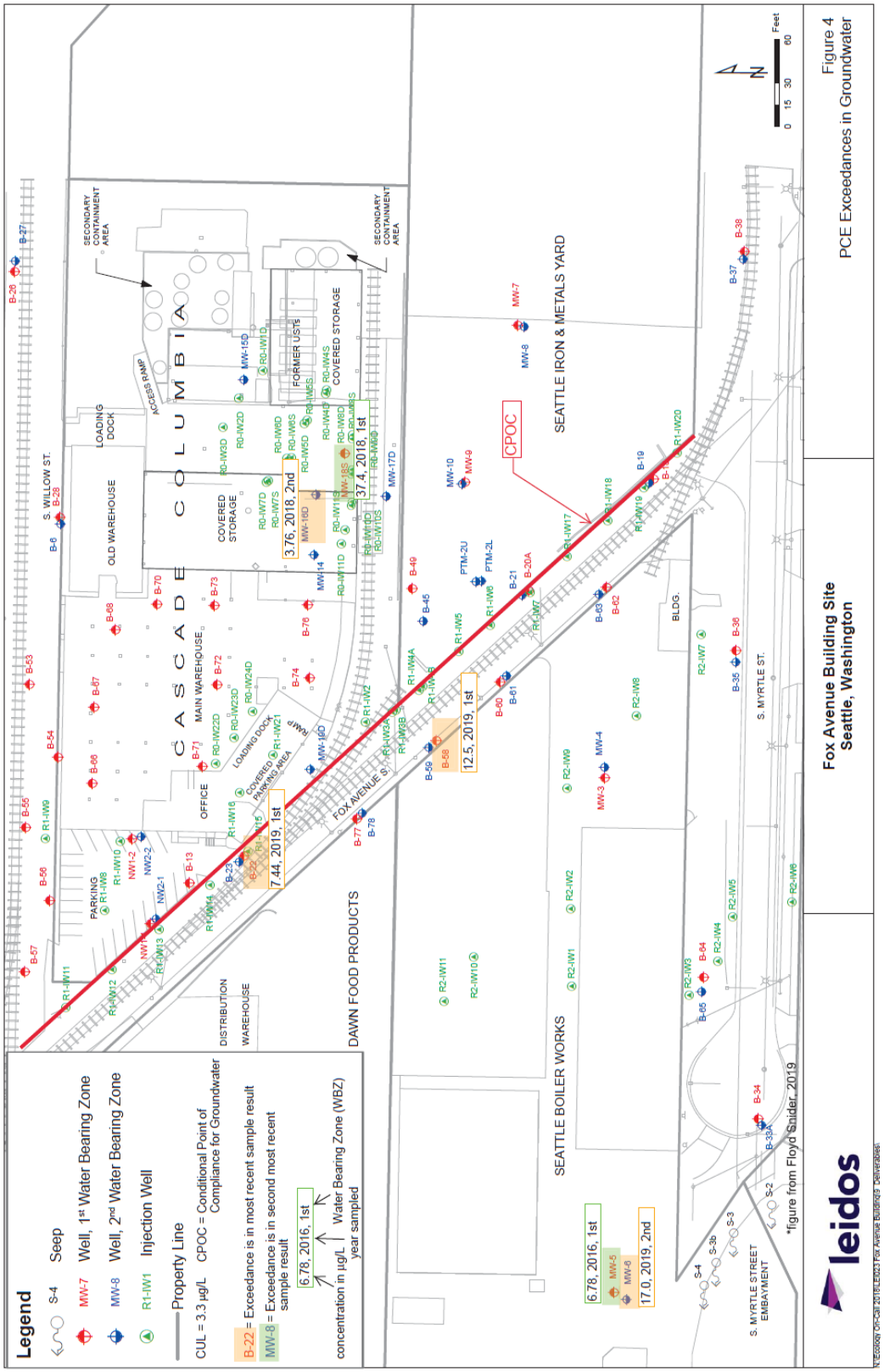
6.1 Site Plan Showing Cleanup Action Areas



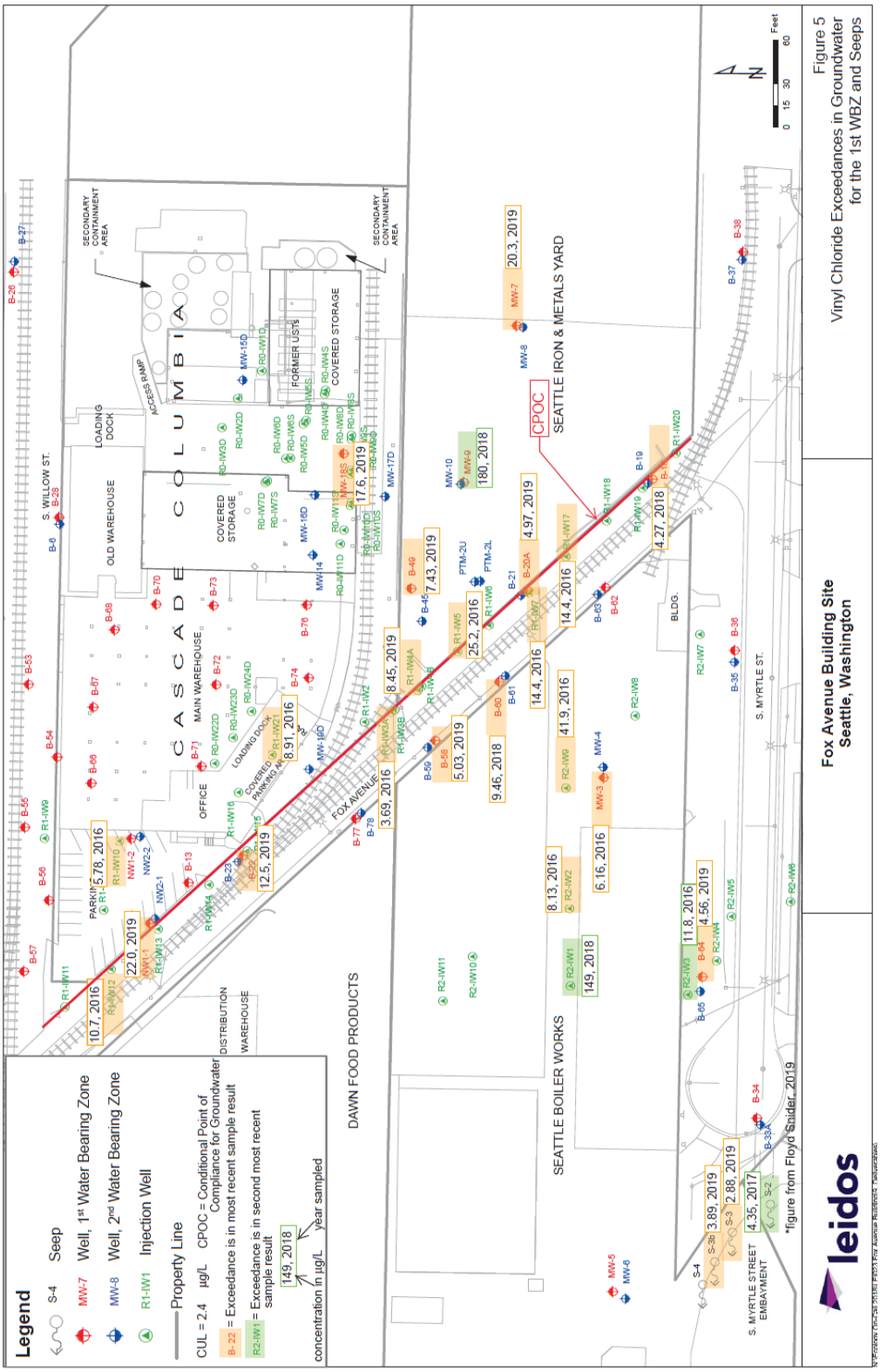
6.2 Site Plan Showing Total CVOC Exceedances in Groundwater



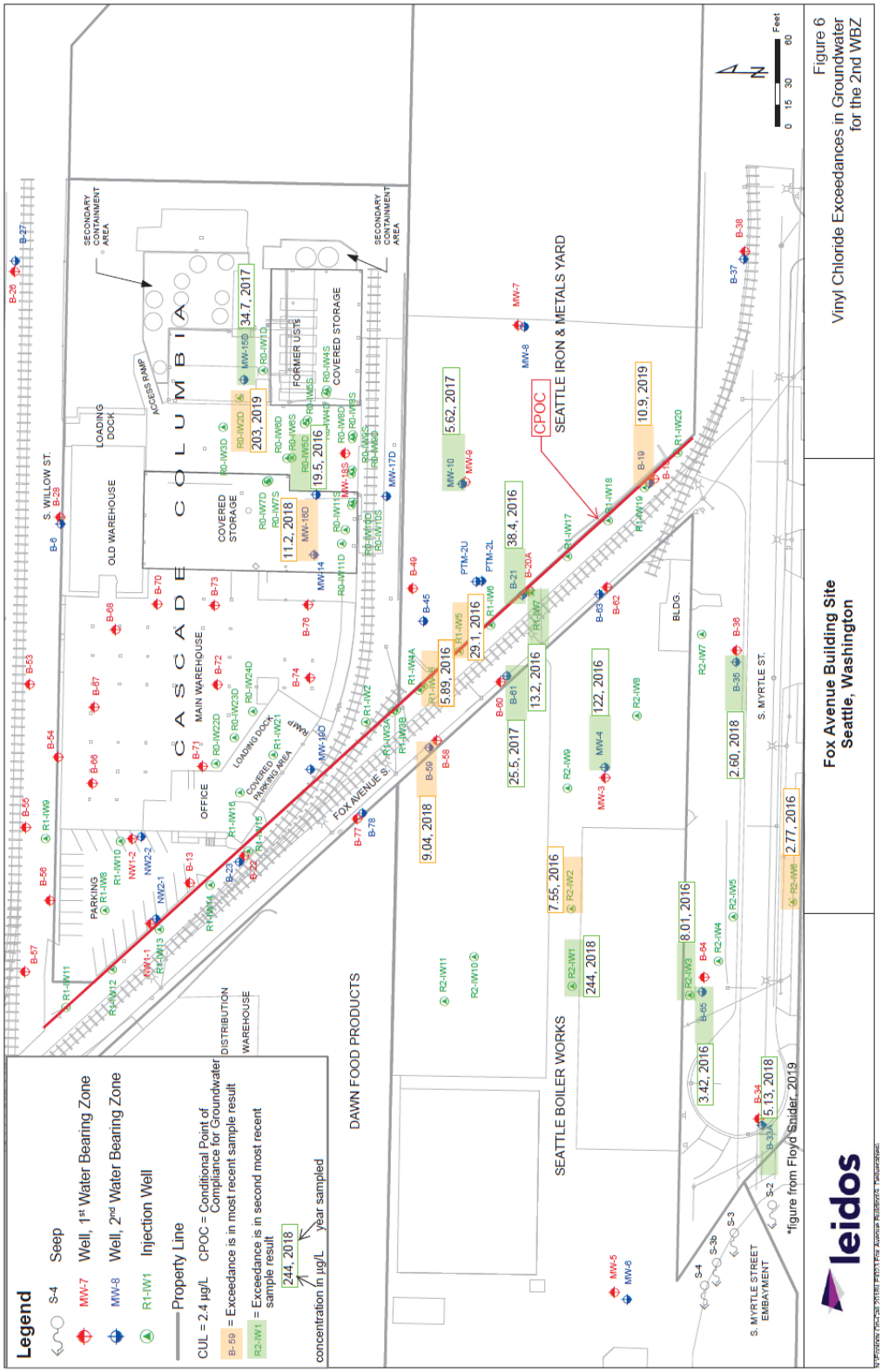
6.3 Site Plan Showing PCE Exceedances in Groundwater



6.4 Site Plan Showing Vinyl Chloride Exceedances in Groundwater for the 1st Water Bearing Zone and Seeps



6.5 Site Plan Showing Vinyl Chloride Exceedances in Groundwater for the 2nd Water Bearing Zone



6.6 Summary Table of Remedy Elements, Cleanup Compliance, and Further Actions

Table 2. Summary of Remedy Elements, Cleanup Compliance, and Recommendations for Fox Avenue Building Site

Media	Technology	Remediation Level or Cleanup Level	Location	Restoration Time Frame	Compliance with RL or CUL	Conclusions and Recommended Actions
Main Source Area CAA						
Soil	ERH	PCE + TCE: 10 mg/kg (RL, mean soil concentration)	Treatment area	1 year of ERH (=2013)	Met in all but 3 samples; however, 95% UCL for mean concentration was met for all data	Successfully met, and no contingency actions are required.
	Various	Empirical demonstration based on meeting GW and indoor air CULs*	See GW and indoor air	For GW, 50 years post-ERD*	See GW and indoor air	No actions are required at this time. GW CULs at CPOC are not required to be met for 50 years post-ERD.
GW	ERD (polishing)	Total CVOCs: 250 µg/L (RL)	At CPOC	5 years post-ERH (=2018)	*At CPOC:* compliant with RL *Upgradient of CPOC:* recent exceedances at MW-9, MW-18S, R0-IW2D	RL at CPOC has been met, and thus no contingency actions are required. However, RL has not been met in areas upgradient of CPOC, so GW monitoring should continue and further ERD is recommended. RL compliance in upgradient areas is expected within several years.
Indoor Air/ Soil Vapor	ERH/SVE	PCE: 40 µg/m³ (Method C air CUL)	Cascade Columbia buildings	Not specified	Compliant with indoor air CUL, but sub-slab soil gas SL was exceeded	Most sampling was performed during or soon after SVE operation. Potential exists for VI impacts. Further indoor air assessment is recommended.
	ERH/SVE	TCE: 2.0 µg/m³ (Method C air CUL)			Compliant with indoor air CUL, but sub-slab soil gas SL was exceeded	
	ERH/SVE	VC: 2.8 µg/m³ (Method C air CUL)			All sample results are ND	

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Table 2. Summary of Remedy Elements, Cleanup Compliance, and Recommendations for Fox Avenue Building Site

Media	Technology	Remediation Level or Cleanup Level	Location	Restoration Time Frame	Compliance with RL or CUL	Conclusions and Recommended Actions
Northwest Corner Plume CAA						
Soil	SVE	None	Treatment area	1 year of SVE (=2013)	Run only until asymptotic concentrations (1 year)	No actions are required.
GW	SVE/ERD	Total CVOCs: 250 µg/L (RL)	At CPOC	5 years post-SVE (=2018)	*At CPOC:* recent exceedance at NW1-1 *Upgradient of CPOC:* compliant with RL	CAP requires continued ERD operations for contingency actions. RL compliance is expected within a few years.
	MNA	PCE: 3.3 µg/L (CUL)^	At CPOC	50 years post-ERD	*At CPOC:* recent exceedances at B-22 *Upgradient of CPOC:* compliant with RL	No actions are required at this time. CUL compliance is expected within several years.
	MNA	VC: 2.4 µg/L (CUL)^	At CPOC	50 years post-ERD	*At CPOC:* recent exceedances at R1-IW12, NW1-1, B-22 *Upgradient of CPOC:* recent exceedance at R1-IW10	No actions are required at this time. CUL compliance timing is uncertain but expected in less than 50 years after ERD.
Downgradient Groundwater Plume CAA						
GW	ERD	Total CVOCs: 250 µg/L (RL)	Designated well network	10-15 years post-ERH (=2023-2028)	Recent exceedance at R2-IW1	CAP requires continued ERD operations until compliance with RL. Compliance is expected within a few years (possibly by 2023).
	MNA	PCE: 3.3 µg/L (CUL)	All down-gradient wells	50 years post-ERD	Recent exceedances at B-58, MW-5, MW-6	No actions are required at this time. CUL compliance is expected within ~10 years.
	MNA	VC: 2.4 µg/L (CUL)	All down-gradient wells	50 years post-ERD	Large number of recent exceedances	No actions are required at this time. CUL compliance timing is uncertain but expected within 50 years after ERD.

Table 2. Summary of Remedy Elements, Cleanup Compliance, and Recommendations for Fox Avenue Building Site

Media	Technology	Remediation Level or Cleanup Level	Location	Restoration Time Frame	Compliance with RL or CUL	Conclusions and Recommended Actions
Seeps	ERD/MNA	PCE: 3.3 µg/L (CUL)	All embayment seeps	10-15 years post-ERH (=2023-2028)	Compliant with CULs	No actions are required.
	ERD/MNA	VC: 2.4 µg/L (CUL)			Recent exceedances at S-2, S-3, S-3b	CAP requires continued ERD operations until compliance with CUL. Seep CUL compliance is expected within several years.
Indoor Air/ Soil Vapor	ERH	PCE: 9.6 µg/m³ (Method B air CUL)	Seattle Boiler Works buildings	10-15 years post-ERH (=2023-2028)	Compliant with indoor air CUL, but sub-slab soil gas SL was exceeded.	Potential exists for VI impacts. Further indoor air assessment is recommended.
	ERH	TCE: 0.37 µg/m³ (Method B air CUL)			One sample exceeded the indoor air CUL, and sub-slab soil gas SL was exceeded.	
	ERH	VC: 0.28 µg/m³ (Method B air CUL)			One sample exceeded the indoor air CUL, and sub-slab soil gas SL was exceeded.	

* The text of Sections 3.4, 3.5, and 3.5.1 of the CAP states that this soil cleanup standard will involve meeting GW CULs at the CPOC (as applied in this report). However, one sentence in Section 3.5.1 states that both the RL and CULs for GW will be met at the CPOC. If compliance with the RL is included, this would affect the restoration time frame listed in this table, which would be 5 years after completion of ERH/SVE (=2018).

^ The table on page 4-3 of the CAP states that both the RL and CULs shall be met at the Northwest Corner Plume CPOC (as applied in this report). However, the text in CAP Sections 4.3, 5.3, and 6.5 does not refer to the requirement for CULs.

A "recent exceedance" for GW/seeps refers to an exceedance of an RL or CUL in at least one of the last two sampling rounds since the beginning of 2016.

GW = Groundwater
ND = Not detected
SL = Screening level

6.7 Wells and Seeps Recommended for Resampling and Evaluation

Table B-1. Wells and Seeps Recommneded for Resampling

Well/Seep	WBZ	Resample Well/Seep	Site-Wide Exceedances for Last Two Sampling Rounds That Trigger Resampling^		
			PCE (CUL)	VC (CUL)	Total CVOCs (RL)
Wells Located Upgradient of the Groundwater CPOC					
Main Source Area					
MW-15D	2	Yes		X	
MW-16D	2	Yes	X	X	
MW-17D	2				
MW-18S	1	Yes	X	X	X
R0-IW1D	2				
R0-IW2D	2	Yes		X	X
R0-IW3D	2				
R0-IW4D	2				
R0-IW4S	1				
R0-IW5D	2				
R0-IW5S	1				
R0-IW6D	2	Yes		X	
R0-IW6S	1				
R0-IW7D	2				
R0-IW7S	1				
R0-IW8D	2				
R0-IW8S	1				
R0-IW9D	2				
R0-IW9S	1				
R0-IW10D	2				
R0-IW10S	1				
R0-IW11D	2				
R0-IW11S	1				
R1-IW2 (Fox Ave)	2				
Loading Dock					
R0-IW22 (35)*	2s				
R0-IW22 (55)*	2d				
R0-IW23 (35)*	2s				
R0-IW23 (55)*	2d				
R0-IW24 (35)*	2s				
R0-IW24 (55)*	2d				
R1-IW21	1	Yes		X	
MW-19D	2				
Northwest Corner					
NW1-1	1	Yes		X	X
NW1-2	1				
R1-IW10	1	Yes		X	
Whitehead (Seattle Iron & Metals Yard)					
B-45	2				
B-49	1	Yes		X	
MW-07	1	Yes		X	
MW-08	2				
MW-09	1	Yes		X	X
MW-10	2	Yes			X

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Table B-1. Wells and Seeps Recommneded for Resampling

Well/Seep	WBZ	Resample Well/Seep	Site-Wide Exceedances for Last Two Sampling Rounds That Trigger Resampling^		
			PCE (CUL)	VC (CUL)	Total CVOCs (RL)
Wells/Seeps Within the Downgradient Groundwater Plume CAA					
Fox Avenue (NE side of street right-of-way)					
B-18	1	Yes		X	
B-19	2	Yes		X	
B-20A	1	Yes		X	
B-21	2	Yes		X	
B-22 (NWC)	1	Yes	X	X	
R1-IW3A	1	Yes		X	
R1-IW4A	1	Yes		X	
R1-IW4B	2	Yes		X	
R1-IW5*	1	Yes		X	
R1-IW5*	2	Yes		X	
R1-IW7*	1	Yes		X	
R1-IW7*	2	Yes		X	
R1-IW12 (NWC)	1	Yes		X	
R1-IW15 (NWC)	2				
R1-IW17*	1				
R1-IW17*	2				
Fox Avenue (SW side of street right-of-way)					
B-58	1	Yes	X	X	
B-59	2	Yes		X	
B-60	1	Yes		X	
B-61	2	Yes		X	
B-62	1				
B-63	2				
B-77	1				
B-78	2				
Seattle Boiler Works					
MW-03	1	Yes		X	
MW-04	2	Yes		X	
MW-05	1	Yes	X		
MW-06	2	Yes	X		
R2-IW1*	1	Yes		X	
R2-IW1*	2	Yes		X	X
R2-IW2*	1	Yes		X	
R2-IW2*	2	Yes		X	
R2-IW8	2				
R2-IW9	1	Yes		X	
R2-IW10	1				
R2-IW11	1				
Myrtle Street					
B-33A	2	Yes		X	
B-35	2	Yes		X	
B-64	1	Yes		X	
B-65	2	Yes		X	
R2-IW3*	1	Yes		X	
R2-IW3*	2	Yes		X	
R2-IW4	2				
R2-IW6	2	Yes		X	

Table B-1. Wells and Seeps Recommneded for Resampling

Well/Seep	WBZ	Resample Well/Seep	Site-Wide Exceedances for Last Two Sampling Rounds That Trigger Resampling^		
			PCE (CUL)	VC (CUL)	Total CVOCs (RL)
Seeps					
S-2	--	Yes		X	
S-13 (Calibre S-3)	--	Yes		X	
S-3b	--	Yes		X	
S-16 (Calibre S-4)	--				
Total Wells to Resample:		45			
Total Seeps to Resample:		3			

Notes:
(Fox Ave) = One well traditionally included in the Fox Avenue ("Row 1") area, but is on the upgradient side of the CPOC for groundwater.
(NWC) = Wells traditionally included in Northwest Corner area, but are on the downgradient side of the CPOC for groundwater.
WBZ = Water bearing zone (1 = shallow, 2 = deep; 2s = shallower WBZ-2 at 35 ft, 2d = deeper WBZ-2 at 55 ft)
* Individual wells with two different sampling depths
^ These site-wide exceedances of RLs or CULs are determined for the entire site area, for the last two sampling rounds specific to each well, regardless of location with respect to CPOC, considering that upgradient contaminated groundwater may migrate to the CPOC without further actions.

6.8 Leidos Summary Report in Support of Periodic Review

Fox Avenue Building Site

Summary Report
In Support of Periodic Review

FINAL

Prepared for

DEPARTMENT OF ECOLOGY
State of Washington

Toxics Cleanup Program
Northwest Regional Office
Washington State Department of Ecology
Bellevue, Washington

Prepared by

leidos

Leidos, Inc.
18939 120th Ave NE, Suite 112
Bothell, WA 98011

December 31, 2020

Limitation of Use: Leidos' project activities were restricted to retrieval and analysis of a limited number of environmental sample results, and from records made available by Ecology or third parties during the project. In preparing this report, Leidos has relied on written information provided by secondary sources, including information provided by the customer. Leidos has made no independent investigations concerning the accuracy or completeness of the information relied upon. Because the project activities consisted of collecting and evaluating a limited supply of information, Leidos may not have identified all potential items of concern and, therefore, Leidos warrants only that the project activities under this contract have been performed within the parameters and scope communicated by Ecology and reflected in the contract. Maps and other figures presented in this report were accurate based on the information available to Leidos at the time that the evaluation was conducted.

This report is intended to be used in its entirety. Taking or using in any way excerpts from this report is not permitted, and any party doing so does at its own risk.

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Acronyms and Abbreviations

bgs	below ground surface
CAA	Cleanup Action Area
CAP	Cleanup Action Plan
COC	chemical of concern
CPOC	conditional point of compliance
CUL	cleanup level
CVOC	chlorinated volatile organic compound
DCE	dichloroethene
Ecology	Washington State Department of Ecology
ERD	enhanced reductive dechlorination
ERH	electrical resistance heating
LDW	Lower Duwamish Waterway
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
mg/kg	milligrams per kilogram
MNA	monitored natural attenuation
MTCA	Model Toxics Control Act
NA	not applicable
PCE	tetrachloroethene (perchloroethylene)
RL	remediation level
SVE	soil vapor extraction
TCE	trichloroethene
TPH	total petroleum hydrocarbons
UCL	upper confidence limit
VC	vinyl chloride
VI	vapor intrusion
WBZ	water bearing zone

1.0 Introduction

This report was prepared by Leidos on behalf of the Washington State Department of Ecology (Ecology), in support of the periodic review (5-year review) process for the ongoing cleanup action at the Fox Avenue Building Site (the Site) in the Lower Duwamish Waterway (LDW) area of Seattle. This report provides an evaluation of available post-remediation analytical data by reviewing the results, progress, and potential data gaps in the monitoring and technical aspects of the remediation, as initially set forth in the Cleanup Action Plan (CAP) for this Site (Ecology 2012). The overall conclusions and recommendations for this report are summarized in Section 4 below.

2.0 Project Background

2.1 Overview

The Site consists of the Cascade Columbia Facility (Fox Avenue Building LLC property), located at 6900 Fox Avenue S in Seattle, Washington, and certain downgradient properties impacted by a groundwater contaminant plume, which eventually discharges to the LDW along the S Myrtle Street Embayment. The primary contaminants of concerns at the Site are chlorinated volatile organic compounds (CVOCs).

In 2012, Ecology issued the CAP for the Site, which identified active remediation using thermal treatment by electrical resistance heating (ERH), soil vapor extraction (SVE), and bio-polishing by enhanced reductive dechlorination (ERD), followed by monitored natural attenuation (MNA) as the selected cleanup action. Per the CAP, active remediation will be performed until Site-specific remediation levels (RLs) are achieved for each of the active remediation technologies. Following active remediation, MNA will be implemented until the final Site-wide cleanup levels (CULs) are achieved in specified areas. MNA is estimated to extend over a period of 50 years following completion of the bio-polishing phase.

Chemicals of concern (COCs) identified for the Site include:

- Benzene
- 1,1-dichloroethene (1,1-DCE)
- Pentachlorophenol
- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- Total petroleum hydrocarbons (TPH, mineral spirits to heavy oil range)
- Vinyl chloride (VC).

The CAP and other documents subdivide the full Site into three major areas known as Cleanup Action Areas (CAAs) (Figure 1 of this document, adapted from Figure 2.3 of the CAP). These include: the Main Source Area CAA, the Northwest Corner Plume CAA, and the Downgradient Groundwater Plume CAA. The Cascade Columbia facility encompasses part of the Main Source Area CAA and all of the Northwest Corner Plume CAA. The Whitehead property (Seattle Iron & Metals truck parking facility) is located immediately to the south of Cascade Columbia and

occupies a part of the Main Source Area CAA. The Main Source Area CAA is often subdivided into two sub-areas, due to the presence of two distinct CVOC plumes: the Main Source Area and the Loading Dock Area. Fox Avenue S extends along the southwestern margins of these two properties, which also marks the margins of the Main Source Area CAA and the Northwest Corner Plume CAA. The conditional point of compliance (CPOC) for groundwater is defined in the CAP as being along this downgradient (southwestern) margin of the Main Source Area CAA and the Northwest Corner Plume CAA. This line corresponds to the northeastern margin of the Fox Avenue S right-of-way. Therefore, any areas to the southwest (downgradient) of this line are part of the Downgradient Groundwater Plume CAA, and groundwater in this area must comply with RLs or CULs as discussed in Section 2.2 below. This CAA includes the Fox Avenue S corridor, Seattle Boiler Works property, S Myrtle Street corridor, and the S Myrtle Street Embayment where seeps are known to discharge into the LDW (Figure 1).

The Remedial Investigation identified two primary water bearing zones (WBZs) in the aquifer at the Site: a shallow zone referred to as the 1st WBZ, and a deeper zone referred to as the 2nd WBZ. The 1st WBZ is unconfined and extends from the water table, at 7 to 13 feet below ground surface (bgs), down to a confining layer (where locally present); the 1st WBZ has a thickness of approximately 3 to 8 feet, with a maximum depth of 21 feet bgs. The 2nd WBZ is semi-confined (depending on whether the confining layer is locally present) and extends from as shallow as 15 feet to at least 80 feet bgs. The 2nd WBZ is commonly subdivided into varying depth ranges for sampling purposes. The locations of all Site monitoring wells (distinguished by WBZ) and all injection wells (undistinguished by depth) are shown on Figure 2.

2.2 Site-Specific Cleanup Levels and Remediation Levels

2.2.1 Site Cleanup Levels

Final cleanup levels for the Site were initially defined in Section 3.4 of the CAP, and were later amended by the First Amendment to the Agreed Order, which became effective on May 8, 2013. This amendment modified the Model Toxics Control Act (MTCA) Method B and Method C indoor air CULs for PCE and TCE, and established CULs for VC in these categories. The final CULs for the Site are summarized in Table 1.

As stated above, the CPOC for groundwater is the northeastern margin of Fox Avenue S, along the downgradient property boundary of both the Fox Avenue Building LLC property and the Whitehead property. Per Section 4 of the CAP, the approximate restoration time frame required to achieve Site CULs for groundwater is 50 years after completion of the ERD bio-polishing component of the cleanup action.

2.2.2 Remediation Levels

Due to the combination of multiple cleanup action components that are part of the selected cleanup action, the CAP also established remediation levels for the project (Section 3.6 of the CAP). RLs establish target concentrations for hazardous substances that must be achieved by a particular cleanup action component. More simply, they can be thought of as “interim cleanup levels” that can be used to evaluate the progress of individual components of the selected cleanup action. The following RLs were established for the project:

- **Soil (10 milligrams per kilogram [mg/kg] total PCE and TCE)** – This RL was established for thermal treatment of soil in the Main Source Area CAA. The estimated time frame to achieve this RL was approximately one year of active thermal treatment by ERH.
- **Groundwater (250 µg/L total CVOCs)** – This RL was established for bio-polishing by ERD in the Main Source Area CAA, Northwest Corner Plume CAA, and Downgradient Groundwater Plume CAA.
    - In the Main Source Area CAA, the groundwater RL was expected to be achieved at the CPOC within 5 years after completion of thermal treatment.
    - In the Northwest Corner Plume CAA, the groundwater RL was expected to be achieved at the CPOC within 5 years after completion of SVE treatment.
    - In the Downgradient Groundwater Plume CAA, the groundwater RL was expected to be achieved in the designated well network within 10 to 15 years after completion of thermal treatment.
- **Groundwater seeps (compliance with Site CULs)** – Although not specifically referenced in Section 3.6 (Remediation Levels) of the CAP, text in Section 4.2 of the CAP states, "The selected technology for groundwater treatment is ERD, which will occur until the groundwater remediation level of 250 µg/L total CVOCs is achieved throughout the downgradient plume and the groundwater seeps at the S Myrtle Street Embayment are in compliance with the cleanup levels." Based on this statement, it appears that compliance of the groundwater seeps with Site CULs should be considered as a RL for the ERD bio-polishing component of the cleanup action. Per the CAP, compliance with CULs at the point of discharge to surface water at the S Myrtle Street Embayment is expected within approximately 10 to 15 years following thermal treatment (see also CAP Sections 4.4, 5.2, and Table 6.1).

2.3 Status of the Selected Cleanup Action

As previously discussed in Section 2.1, the selected cleanup action includes the following active remediation components, which are to be followed by MNA to achieve the final Site CULs:

- Thermal treatment of the Main Source Area CAA by ERH
- SVE for vadose zone soil treatment in the Northwest Corner Plume CAA
- ERD for groundwater in the Main Source Area CAA, Northwest Corner Plume CAA, and Downgradient Groundwater Plume CAA.

The following subsections provide additional details to summarize the status of each of these active remediation components of the cleanup action.

2.3.1 Thermal Treatment for Soil Remediation in Main Source Area CAA

Thermal treatment of the Main Source Area portion of the Site by ERH was conducted from January to May 2013. Thermal treatment system design, construction, and operation were completed by TRS Group, Inc. Floyd|Snider (2013) reported that the volume of thermally treated soil at the Site was approximately 42,000 cubic yards, and that the system removed approximately 4,200 to 11,400 pounds of CVOCs (primarily PCE). This action was reportedly

successful in achieving the RL established for this component of the cleanup action (10 mg/kg for total PCE + TCE in soil).

2.3.2 SVE for Soil Remediation in Northwest Corner Plume CAA

In the Northwest Corner Plume CAA, SVE was implemented to remove PCE from the vadose zone that would otherwise act as a long-term source of groundwater contamination, and to reduce sub-slab soil vapor CVOC concentrations beneath the Cascade Columbia building. The system consisted of four vertical SVE wells (SVE-1 through SVE-4), which were installed in June 2012 and were connected to a vacuum blower. Vapor discharge from the system was treated through a series of two 1,200-pound granular activated carbon adsorption units. The SVE system was activated on September 19, 2012 and was operated on a generally continuous basis until July 10, 2013, when it was shut down for rebound analysis. The system was operated again from August 14 to August 28, 2013, when it was shut down permanently. Floyd|Snider (2013) reported that the SVE system removed an estimated 111 pounds of CVOCs from the subsurface.

2.3.3 ERD Bio-Polishing for Groundwater Remediation throughout Site

Initiation of the post-thermal ERD bio-polishing phase of the cleanup reportedly started in late 2013, with substrate injections to two injection wells screened in the 1st WBZ of the Loading Dock Area. Twenty-two additional injection wells were installed in February 2014. Three of these wells were installed in the Loading Dock Area and were screened in the 2nd WBZ. The other 19 wells were installed in the Main Source Area, with 8 wells screened in the 1st WBZ and 11 wells screened in the 2nd WBZ. In the Northwest Corner Area, three shallow injection wells were used. Substrate injections were initiated through the remainder of the Site in 2014, except for in the 1st WBZ of the Main Source Area, where the target temperature for injection was not reached until January 2015 due to thermal treatment in this area.

Planning of the ERD bio-polishing work at the Site has been a joint venture by multiple parties. The 2014 Annual Report (Floyd|Snider 2015) indicates that the Biopolish Work Plan and Work Plan Addendum were jointly developed using approaches developed by Landau Associates, CALIBRE, and Bioremediation Specialists; and additionally that Landau Associates developed the approach for bio-polishing the Main Source Area, CALIBRE developed the approach for bio-polishing the 1st WBZ of the Loading Dock, and Bioremediation Specialists developed the approach for bio-polishing the 2nd WBZ of the Loading Dock. That report includes no other details regarding this relationship; therefore, it is unclear why the bio-polishing work was divided in this fashion or if it resulted in inconsistencies between areas.

ERD bio-polishing injection and monitoring activities have been documented by Annual Reports prepared by Floyd|Snider for 2014 through 2018, and by CALIBRE for 2019. Primarily, injections have consisted of substrate addition by injection of soluble sugars or emulsified vegetable oil. However, bio-augmentation injections for inoculation of dechlorinating bacteria and additions of nutrients and buffers have also been performed. Substrate injections have generally occurred at least one or more times annually, with the most recent injection completed in January 2019 (Floyd|Snider 2019). Injection plans, including substrate materials, volumes, number and location of injection wells, are revised based on the results of performance monitoring data, in order to tailor the bio-polishing injection program to changes in Site groundwater conditions.

3.0 Status of Compliance with Cleanup and Remediation Levels

The following subsections provide a summary and discussion of monitoring results and compliance with cleanup criteria for each of the contaminated media present at the Site: soil, groundwater (including seeps), and indoor air/soil vapor. Table 2 presents remedy elements, compliance with cleanup criteria, review conclusions, and recommended further actions.

3.1 Soil

In the Main Source Area, an RL of 10 mg/kg for total PCE + TCE in soil was established for the ERH component of the cleanup, per the CAP. Results of soil confirmation sampling conducted in May 2013 indicate that the RL was met in all except three soil confirmation samples, which contained total PCE + TCE concentrations of 15.4 to 26.9 mg/kg (Floyd|Snider 2013). However, statistical analysis of these data was conducted to determine the 95 percent upper confidence limit (UCL) of the mean PCE + TCE concentration in each treatment area. The results of this analysis were used to demonstrate compliance with the ERH RL for soil.

Per the CAP, compliance with soil CULs will also be empirically demonstrated through compliance with groundwater CULs[1] (at the CPOC for groundwater along Fox Avenue S) and compliance with indoor air CULs. According to this empirical demonstration process, recent groundwater sampling results thus indicate that soil CULs at the Site have not been achieved to date. However, per the CAP, compliance with Site CULs is expected to be achieved within approximately 50 years following the ERD bio-polishing phase of the cleanup.

3.2 Groundwater

Per the CAP, ERD bio-polishing will be performed following ERH or SVE treatment until groundwater conditions achieve compliance with an RL of 250 µg/L total CVOCs. This was expected to be achieved approximately 5 years following ERH/SVE treatment, at the CPOC (downgradient margin) of the Main Source Area CAA and the Northwest Corner Plume CAA. It is also expected to be achieved approximately 10 to 15 years following ERH treatment, in the designated well network located within the Downgradient Groundwater Plume CAA. In addition, the expected time frame required to achieve CULs for COCs in groundwater is 50 years after completion of the ERD bio-polishing activity, for the Northwest Corner Plume CAA[2] and for the Downgradient Groundwater Plume CAA. The remedy elements and time frames are summarized in the table within CAP Section 4.3.

To evaluate the groundwater results at the Site since termination of ERH and SVE, the following data synthesis process was used in this report. All available COC data from the annual

[1] The text of Sections 3.4, 3.5, and 3.5.1 of the CAP states that this soil cleanup standard will involve meeting groundwater CULs at the CPOC. However, other text in Section 3.5.1 states that both the RL and CULs for groundwater will be met at the CPOC. Compliance with the RL would affect the restoration time frame listed above, which would be 5 years after SVE/ERH).

[2] The table on page 4-3 of the CAP states that CULs (e.g., PCE and VC) and the RL shall be met at the Northwest Corner Plume CPOC. However, the text in CAP Sections 4.3, 5.3, and 6.5 does not refer to the CULs.

monitoring reports (2014 to 2019) were compiled into data summary tables (Appendix A). The available data included benzene, 1,1-DCE, TCE, PCE, VC, and total CVOCs. TPH and pentachlorophenol were not monitored during this time interval, and results are not included in this summary report. The COC concentrations in these tables are screened against the RL and the CULs for the entire Site, regardless of location with regard to the CPOC, and exceedances of these criteria are highlighted.

As explained further below, the analytical results show a significant amount of temporal variability between monitoring rounds, including with regard to exceedances of criteria. To compare only the most recent sampling results for any well or seep to the COC criteria (RL or CUL) is not a representative measure of the data during the period of recent years. However, to compare data that are too old is likewise not representative of current conditions. In order to address this variability and timing issue, the following data evaluation procedure was employed in this summary report.

For analytical data collected during the last four years of annual monitoring (May 2016 to June 2019), exceedances in the sample results (Appendix A) are presented in Figures 3 to 6. Specifically, the two most recently measured concentrations at each well or seep during this interval were considered for preparing the figures. If a COC exceedance of an RL/CUL was identified in the result from the most recent sampling event, that result was designated in the figures with an orange color. If the second most recent sample result was an exceedance (and the most recent was not an exceedance), then that result was designated with a green color. This procedure allows for temporal variability in sample results to be addressed for criteria evaluation purposes. Following this step, the only COCs that showed at least one recent sample exceedance during this time interval are total CVOCs, PCE, and VC. Note that benzene, 1,1-DCE, and TCE showed no recent exceedances (see data tables in Appendix A).

Figure 3 presents exceedances for total CVOCs in samples from the 1st and 2nd WBZs. Figure 4 presents exceedances for PCE in samples from the 1st and 2nd WBZs. Figure 5 presents exceedances for VC in samples from the 1st WBZ and from seeps along the S. Myrtle Street Embayment. Figure 6 presents exceedances for VC in samples from the 2nd WBZ. These four figures also list the sampling year of each presented exceedance, and which WBZ the sample was derived from (for Figures 4 and 5).

Note that, per the CAP, the RL for total CVOCs and the CULs for individual VOCs (i.e., PCE and VC) do not specifically apply in the area upgradient of the CPOC. However, these VOC exceedances for the RL and CULs are shown in these upgradient CAAs on Figures 4 through 6 and in Appendix A tables. This is presented as such to indicate where these exceedances are located throughout the Site, because groundwater with elevated concentrations in upgradient areas would be expected to migrate downgradient toward the CPOC, without any further action. This is consistent with data presentation in the annual monitoring reports (e.g., Floyd|Snider 2019, Calibre 2019).

For the three COCs showing more recent exceedances (total CVOCs, PCE, and VC), additional older data were also tabulated to aid in providing “baseline” (pre-CAP) analytical data for evaluation over a longer time frame. Analytical results for groundwater and seep sampling during 2009 and 2010 (from Appendix F of Floyd|Snider 2011) are included in the data summary tables (Appendix A of this report). Note that for cases where multiple samples were collected

during the sampling intervals listed in Appendix A tables, the maximum concentration is presented for each COC.

To further evaluate the data, graphs were created to show temporal trends of COC analytical results for samples collected between 2009 and 2019 from select wells. Wells were selected that had a significant number of samples collected, and which show a range of analytical results and recent exceedances, to depict the variable nature of sample concentrations through time. Figure 7 presents a graph of total CVOC concentrations for samples from both WBZs, including three wells upgradient of the CPOC and one downgradient. Figure 8 presents a graph of PCE concentrations for samples from both WBZs. Figure 9 presents a graph of VC concentrations for samples from the 1st WBZ, while Figure 10 presents a graph of VC concentrations from the 2nd WBZ. Figures 8 through 10 each include one upgradient and three downgradient wells.

As stated above, the analytical data collected during this time period show a significant amount of temporal variability. This is likely a result of natural variability combined with responses to active remediation, especially as a result of episodes of ERD bio-polishing. Although PCE and TCE concentrations are reduced by ERD, this process also generates VC. Depending on the timing and proximity of injections to the sampled wells, and other factors, COC concentrations would be expected to vary significantly. General downward trends in COC concentrations through time may be a result of chlorinated VOCs reacting to proximal substrate injections (reductive dechlorination). An increase in concentration through time may result from a rebound effect after injections have initially modified the groundwater chemistry, or from production of VC in the aquifer due to ERD processes.

A recent example of a significant rebound in concentration is seen at injection well R0-IW2D in the Main Source Area, where concentrations of VC in 2014 reached as low as 0.75 µg/L (Figure 10 and Appendix A). The concentration later climbed to 92.8 µg/L in 2015, and then reached as low as 0.2U µg/L in May 2018. However, the concentration in June 2019 spiked up to 203 µg/L.

An example of a rapidly declining concentration is from monitoring well MW-16D in the Main Source Area (see Appendix A). Concentrations of total CVOCs ranged from 6,760 µg/L (January 2015) to 79.4 µg/L (May 2015) to 1.70 µg/L (September 2015) to 1U µg/L (May 2016). However concentrations did rebound slightly following this date, but have been below the RL since May 2015.

Another example of variability, at the downgradient Seattle Boiler Works property, is seen at well R2-IW1 (2nd WBZ). At this well, concentrations of VC were measured at 582 µg/L in 2015, followed by values of 64.2 to 265 µg/L in 2016, then 244 µg/L in 2018, and finally 0.2U µg/L in June 2019 (Figure 6 and Appendix A).

Some other sample results have shown steep declines in concentration over the last year. For example, for total CVOC concentrations in wells MW-09 and R2-IW1 have dropped significantly in 2019, to levels far below the RL (Figures 3 and 7). On the other hand, the total CVOC concentration in well R0-IW2D has climbed above the RL in 2019, for the first time since 2014.

Another example of a recent steep decline in concentration is VC at well MW-09 (Figures 5 and 9). Sample concentrations from this well have dropped from 180 µg/L to 0.2U µg/L between 2018 and 2019.

This variability in concentration through time at many wells and seeps makes it difficult to estimate when concentrations would remain consistently below RLs or CULs, in order to approximate restoration time frame. Based on the examples above, groundwater concentrations identified in the most recent sampling round (June 2019) may not be representative of future conditions at any given location. In addition, the change in the suite of wells sampled during each round results in gaps in the dataset regarding full compliance (see Appendix A).

The following text describes details of exceedance or compliance of COC RL/CULs for the three Cleanup Action Areas.

3.2.1 Main Source Area CAA

Total CVOCs

Per the CAP, the groundwater RL of 250 µg/L total CVOCs was expected to be achieved in the Main Source Area CAA at the downgradient margin CPOC within 5 years after completion of thermal treatment (completed in May 2013). The current report follows the evaluation method of the annual monitoring reports (Floyd|Snider and Calibre), whereas any RL exceedances within this CAA are called out and considered for potential further action.

Based on the data and evaluation of results in Appendix A, Figure 3, and Figure 7, this compliance has not yet been consistently achieved at wells within this CAA, located upgradient of the CPOC (as close as 80 feet from the CPOC). However, it has been achieved at wells close to the CPOC. Although only one sample concentration (well R0-IW2D) exceeded the RL in June 2019, the variability during this and the previous few sampling rounds provides uncertainty that sampling in upcoming years will consistently yield concentrations all below the RL. The primary wells of concern for RL exceedances are MW-09 (1st WBZ), MW-18S (1st WBZ), and R0-IW2D (2nd WBZ). It may require several years for concentrations in all wells to achieve consistent compliance with the RL.

PCE

The expected time frame required to achieve Site CULs for COCs in groundwater is 50 years after completion of the ERD bio-polishing activity. For PCE concentrations in groundwater, in the last two sampling events, only two wells (MW-16D and MW-18S) have shown concentrations above the CUL (3.3 µg/L) (see Appendix A, Figure 4 and Figure 8). However, the CAP does not require compliance with the PCE groundwater CUL at this CAA; therefore, any PCE exceedances are evaluated downgradient from this area, within the Downgradient Groundwater Plume CAA.

VC

For VC concentrations in shallow and deeper groundwater during the last two sampling events, several wells in this CAA have shown concentrations above the CUL (2.4 µg/L) (see Appendix A and Figures 5, 6, 9, and 10). However, the CAP does not require compliance with the VC groundwater CUL at this CAA; therefore, any VC exceedances are evaluated downgradient from this area, within the Downgradient Groundwater Plume CAA.

3.2.2 Northwest Corner Plume CAA

Total CVOCs

The groundwater RL of 250 µg/L total CVOCs was expected to be achieved in the Northwest Corner Plume CAA at the CPOC within 5 years after completion of SVE activity (completed August 2013). Based on the data and evaluation of results (Appendix A, Figure 3 and Figure 7), this compliance appears close to being achieved for shallow groundwater. The CUL has already been achieved for deep groundwater in this CAA. The only well of concern (NW1-1, 1st WBZ, located along the CPOC) has a sample concentration that exceeded the RL in May 2018, but with a concentration below the RL in June 2019. Additional samples are required to confirm that concentrations from this well will remain consistently below the RL. Other wells in the CAA and on the downgradient edge along Fox Avenue S have sample concentrations below the RL.

PCE

The expected time frame required to achieve Site CULs for COCs in groundwater is 50 years after completion of the ERD bio-polishing activity. For this CAA, the CPOC is located at the downgradient property margin. For PCE concentrations in groundwater, only one well (B-22, 1st WBZ) has recently shown concentrations above the CUL (3.3 µg/L) (see Appendix A, Figure 4 and Figure 8). This well is associated with the Northwest Corner Plume but is located in the Fox Avenue right-of-way on the downgradient side of the CPOC line. The sample concentrations from B-22 have ranged from 7.44 to 99.7 µg/L since 2016, with the 2019 result being the lowest. The overall long-term concentration trend at this well is downward (Figure 8), and is expected to reach consistent compliance with the CUL within several years. Thus, groundwater in this CAA is expected to readily achieve compliance with the PCE CUL within 50 years after termination of ERD activity.

VC

For VC in shallow groundwater, concentrations are mostly relatively low, with a maximum concentration of 63.1 µg/L in NW1-1 in 2018 and 22.0 µg/L in 2019 (see Appendix A, Figure 5 and Figure 9). One well at the CPOC, R1-IW12, has not been sampled since 2016. This well will require additional sampling to confirm consistent concentrations below the CUL. Concentration trends for VC in shallow groundwater in this area are somewhat irregular, but the relatively low current concentrations suggest that they may achieve compliance with the VC CUL within 50 years after termination of ERD activity.

For VC in deeper groundwater, there is only one deep well (R1-IW15), with no concerns for contamination in this area (see Appendix A and Figure 6). Deeper groundwater in this area is currently in compliance with the VC CUL.

3.2.3 Downgradient Groundwater Plume CAA

Total CVOCs

Per the CAP, the groundwater RL of 250 µg/L total CVOCs is expected to be achieved in the Downgradient Groundwater Plume CAA within 10 to 15 years after completion of thermal treatment and SVE activities (completed in 2013). Based on the data and evaluation of results in

Appendix A, Figure 3, and Figure 7, this compliance will very likely take place during that time range. The only well of concern (R2-IW1, 2nd WBZ) has a sample concentration that exceeded the RL in May 2018, but with a concentration below the RL (non-detected) in June 2019. Since May 2015, the concentrations from R2-IW1 have varied from 800 to 1U µg/L. This variability above and below the RL is likely to continue, but the overall temporal trend is generally downward (Figure 7). Given that the time frame of 10 to 15 years after treatment is still several years in the future, this CAA is expected to be in compliance before that time. The shallow groundwater sample concentrations are currently in compliance with this RL.

PCE

The expected time frame required to achieve CULs for COCs in groundwater is 50 years after completion of the ERD bio-polishing activity. For PCE concentrations in groundwater, in the last sampling event (2019), two wells showed concentrations above the CUL (3.3 µg/L) (see Appendix A, Figure 4, and Figure 8). The sample concentration from well B-58 (1st WBZ) exceeded the CUL in June 2019 (12.5 µg/L) but was non-detected (1U µg/L) prior to that, since May 2015. This is a case of unexplained variability in the sample results. The sample concentration from well MW-06 (2nd WBZ) has exceeded the CUL in all six samples ever collected, but has a long steady decline in concentration (Figure 8). If this trend continues similarly into the future, it should become compliant within approximately 7 to 10 years. One additional well, MW-05 (1st WBZ), has not been sampled frequently in recent years; the sample concentration equaled the RL (3.30 µg/L) in 2018, and was about twice the CUL in 2016. The long-term concentration trend is flat; additional sampling will be required to confirm that the concentration is remaining below the CUL. In summary, groundwater in this CAA is expected to achieve compliance with the PCE CUL far in advance of 50 years after termination of ERD activity. The embayment seep sample concentrations are currently in compliance with this CUL.

VC

For VC concentrations in shallow groundwater, in the last two sampling events (2018-2019), several wells in this CAA have shown concentrations above the CUL (2.4 µg/L) (see Appendix A, Figure 5, and Figure 9). The sample concentration from well R2-IW1 measured 149 µg/L in May 2018, but was non-detected at 0.2U µg/L in June 2019. The sample concentration from well B-58 was 57.8 µg/L in 2018 and was 5.03 µg/L in 2019 (Figure 9). This well and other wells with CUL exceedances in recent years will require additional sampling to confirm consistent concentrations below the CUL. Also, a number of wells in this area have not been sampled since 2016. Concentration trends for VC in shallow groundwater in this area are quite irregular, and it is too early to estimate if groundwater in this CAA would achieve compliance with the VC CUL within 50 years after termination of ERD activity.

The expected time frame required to achieve CULs for COCs in the embayment seep samples is 10 to 15 years following thermal treatment (completed in 2013). The VC concentrations for seep samples (S-3 and S-3b) are shown in temporal plots in the 2019 Annual Report (Calibre 2019). The trend lines in these graphs suggest that VC in seeps will achieve compliance with this CUL within a few years, but there is some variability in the data (see Appendix A and Figure 5), and the ERD process can generate additional VC in the aquifer and seeps. In addition, the seep VC data in the annual reports (compiled in Appendix A) shows some differences with the older seep

sample results as presented in the Calibre 2019 graphs; this lends further uncertainty to the trend lines and the expected timing.

For VC concentrations in deeper groundwater, results have varied significantly in recent sampling rounds (see Appendix A, Figure 6, and Figure 10). For well R2-IW1, concentrations in the last two sampling events (2018-2019) have been 244 µg/L and 0.2U µg/L. Since 2014, well B-61 sample concentrations have ranged up to 1,100 µg/L, but in 2018 the concentration was 0.2U µg/L. Recent concentrations in other wells in this area exceed the CUL but are lower than the above values; however, a number of wells have not been sampled since 2016. Concentration trends for VC in deep groundwater in this area are quite irregular, and it is too early to estimate if groundwater in this CAA would achieve compliance with the VC CUL within 50 years after termination of ERD activity.

3.3 Indoor Air/Soil Vapor

Vapor intrusion (VI) assessment activities completed to date are documented in the following five memoranda prepared by Floyd|Snider, which are included as Appendix E of the Fox Avenue Site Construction Completion Report (Floyd|Snider 2013):

1. Vapor Intrusion Monitoring at Seattle Boiler Works: December 2012 (dated February 4, 2013)
2. Vapor Intrusion Monitoring at Cascade Columbia: April 2013 (dated June 14, 2013)
3. Vapor Intrusion Monitoring at Seattle Boiler Works: April 2013 (dated June 14, 2013)
4. Post-thermal Vapor Intrusion Monitoring at Seattle Boiler Works: July 2013 (dated August 12, 2013)
5. Vapor Intrusion Monitoring at Cascade Columbia: September 2013 Results (dated September 30, 2013)

The following two sections summarize the VI assessments at the Cascade Columbia property and at the Seattle Boiler Works property.

3.3.1 Cascade Columbia Property VI Assessment

For the Cascade Columbia portion of the Site, sub-slab soil vapor and indoor air sampling data are presented for sampling events conducted in March 2009, April 2013, and September 2013. Sub-slab sampling results for two of three sampling probes is also provided from a sampling event conducted in November 2012. As previously discussed in Section 2.3.2, a SVE system was operated in the Northwest Corner Plume CAA from September 2012 to August 2013. In addition to addressing PCE impacts to vadose zone soils that would otherwise act as a long-term source of groundwater contamination, Section 3 of the Floyd|Snider (2013) Construction Completion Report indicates that the SVE was operated to reduce vapor concentrations beneath the Cascade Columbia building.

A complete summary of the VI assessment data collected for the Cascade Columbia portion of the Site is provided in the memorandum dated September 30, 2013. In that memorandum, Floyd|Snider concludes that there is no evidence of VI at levels greater than the applicable CULs and states that no further activities were planned at that time.

Based on Leidos' review of the sub-slab and indoor air sampling results for the Cascade Columbia property, Leidos recommends that further VI investigation be considered for this area of the Site for the following reasons.

- Except for the sampling event completed in March 2009, all VI assessment sampling performed on the Cascade Columbia property was conducted while the SVE system was operational, or soon after the system was shut down. The most recent round of VI sampling was conducted on September 5, 2013, only eight days after the system was shut down on August 28, 2013. This being the case, the data collected are not representative of subsurface soil vapor or indoor air conditions that would exist in equilibrium sometime after the SVE system was shut down.
- Sub-slab soil vapor results for the September 2013 sampling round show significant increases in PCE and TCE concentrations relative to the previous sampling round. For sampling point, SV-3, PCE was detected at 8,380 µg/m^3, which exceeds the current MTCA Method C sub-slab soil gas screening level (1,300 µg/m^3). TCE was detected in this sample at a concentration of 756 µg/m^3, which exceeds the current Method C sub-slab soil gas screening level (67 µg/m^3). Although the April and September 2013 indoor air sampling results indicate that indoor air was in compliance with CULs at the time of those events, the sub-slab sampling results indicate that significant potential for VI existed on the Cascade Columbia property after the SVE system was shut down in August 2013. If elevated PCE and TCE concentrations remain present in shallow soil vapor, there is still potential for VI impacts to indoor air under building-use or barometric pressure conditions that have not been evaluated by the VI assessment activities conducted to date.
- Results from the April 2013 sampling event indicate that PCE was detected in indoor air at a concentration of 27 µg/m^3 at sample point IA-1 and 32 µg/m^3 at sample point IA-2. Although both of these results were less than the Method C CUL (40 µg/m^3), it must be noted that these results are not significantly less than the CUL and that these samples were collected while the SVE system was operating in this portion of the Site. Note that VC was not detected in any indoor air or sub-slab soil vapor samples at this property.
- Best practices for VI assessment generally recommend conducting at least one indoor air sampling event under a conservative "worst-case" scenario, such as during the winter heating cycle when stack effects tend to create low-pressure zones inside buildings, which creates stronger gradients for migration of sub-slab vapor to indoor air spaces. The Cascade Columbia VI assessment data do not include data from sampling under these conditions. Future VI assessment sampling should also include meteorological monitoring and a discussion of how weather conditions during the sampling event may have impacted the results.

3.3.2 Seattle Boiler Works Property VI Assessment

Floyd|Snider prepared three memoranda summarizing VI assessment activities conducted in December 2012, April 2013, and July 2013. These memoranda also include previous VI sampling performed on the Seattle Boiler Works property in 2010 by URS Corporation. However, there is some inconsistency regarding when the work was performed. Sample dates presented in the data tables attached to the memos suggest that 2010 VI sampling consisted of

sub-slab soil vapor sample collection in October and indoor air sampling in December of that year. However, the footnotes to these tables state that the soil gas and indoor air sampling was performed by URS Corporation in February 2010.

The most recent VI monitoring memorandum for the Seattle Boiler Works property is dated August 12, 2013 and includes a summary of all the VI sampling results for that portion of the Site. In this memorandum, Floyd|Snider concluded that continued sampling of indoor air is not necessary, as all concentrations were either non-detect or much less than current MTCA Method B CULs. Floyd|Snider also stated that no further indoor air or sub-slab sampling activities are planned for the Seattle Boiler Works property, as all thermal operations have come to an end and post-thermal indoor air results remain at less than final CULs.

Based on the information that was available to Leidos at the time of this review, Leidos recommends that further evaluation of the VI assessment data for the Seattle Boiler Works property is warranted, based on the following:

- Indoor air sampling results for the Seattle Boiler Works property indicate that the Method B indoor air CULs for TCE and VC were exceeded at sampling point SBW-IA-Center in December 2012. TCE was measured at 0.43 $\mu g/m^3$ (CUL is 0.37 $\mu g/m^3$) and VC at 2.0 $\mu g/m^3$ (CUL is 0.28 $\mu g/m^3$).
- Sub-slab sampling results indicate that the current Method B sub-slab soil gas screening level for PCE (320 $\mu g/m^3$) was exceeded at all four locations sampled in July 2013 (the most recent sampling event) and that this screening level was consistently exceeded at sampling points SV-2 and SV-3 by one to two orders of magnitude. All of the sub-slab soil vapor sample results with detections of TCE exceed the current Method B sub-slab screening level (12 $\mu g/m^3$). Also, TCE was reported as not-detected in 8 of the 16 sub-slab samples collected on the Seattle Boiler Works property. However, for 7 of those 8 samples, the reporting limit (100 $\mu g/m^3$) was not low enough to allow comparison with the TCE screening level. For VC, 4 of the 16 sample results were detected and exceeded the Method B sub-slab soil gas screening level (9.4 $\mu g/m^3$). In 9 of the 12 non-detected results, the reporting limit (20 $\mu g/m^3$) was above the VC screening level.
- Although the indoor air sampling results for this property suggest that indoor air has generally been in compliance with the Site CULs, these sub-slab sampling data indicate there is significant potential for VI risk on the Seattle Boiler Works property (possibly under meteorological or building use conditions that were not present at the time of previous indoor air sampling events). Based on these data, Leidos believes that additional indoor air assessment is warranted. Additionally, future indoor air assessment should consider and document meteorological conditions and building use in the sampling areas prior to and during collection of indoor air samples.

4.0 Conclusions and Recommendations

The following sections summarize the conclusions and recommendations for the three environmental media of concern, based on our review of the Fox Avenue Building Site documents. Table 2 presents remedy elements, compliance with cleanup criteria, review conclusions, and recommended further actions.

4.1 Soil

Results of post-thermal treatment soil confirmation sampling completed in May 2013 indicate that the RL for thermal treatment of the Main Source Area was achieved. As a result, no contingency actions as defined in the CAP are needed for this component.

Per the CAP, a future demonstration that soil concentrations at the Site are in compliance with the CULs will be made empirically based on compliance with CULs for groundwater and indoor air. Based on the expected restoration time frame for groundwater, compliance with soil CULs is not expected to be attained until 50 years following completion of bio-polishing by ERD. CAP contingency actions associated with groundwater and indoor air are discussed below.

4.2 Groundwater

Past and ongoing remedial actions appear to have been highly effective in significantly reducing concentrations of volatile organic compounds in the subsurface, although some groundwater COCs currently remain at levels exceeding the CAP criteria, and one of the expected time frames has now been missed. Continued groundwater monitoring and further implementation of the ongoing remedial action (ERD) is required by the CAP.

The Site groundwater data indicate that the following COCs have not achieved compliance with their respective RL/CUL criteria at or upgradient from the point of compliance: total CVOCs, PCE, and VC. Compliance with criteria for benzene, 1,1-DCE, and TCE appear to have already been achieved. Pentachlorophenol and TPH were not analyzed in the annual monitoring activities and were not addressed in this summary report.

Below is a summary of the groundwater/seep compliance levels presented in the CAP, and the current conditions based on our review and interpretation of the data.

Remediation Level of 250 µg/L Total CVOCs

- Main Source Area CAA (5 years after thermal treatment, or May 2018): This RL has been met at locations close to the CPOC, and thus contingency actions are not required. However, compliance with the RL has not yet been consistently achieved in shallow or deep groundwater within the CAA upgradient of the CPOC, but is estimated to be reached within several years. As a result, annual groundwater monitoring should continue, along with recommended continuation of ERD injections.
- Northwest Corner Plume CAA (5 years after SVE activity, or August 2018): Compliance with this RL has not been consistently achieved in shallow groundwater adjacent to the CPOC, but is estimated to be reached within a small number of years. Because the RL was not consistently achieved within 5 years, this triggers one of the following

contingency actions (CAP Section 6.5.2): ERD injections, SVE operations, and/or installing a permeable reactive barrier wall. Section 4.3 of the CAP indicates that continued ERD would be the action utilized until compliance with the RL is achieved. This RL has already been achieved for deep groundwater.

- Downgradient Groundwater Plume CAA (10-15 years after thermal treatment, or 2023-2028): Compliance with this RL is close to being achieved in deeper groundwater, and will likely be met by the 10-year date. Because the RL has not yet been consistently achieved, ERD shall continue in this area (per CAP Section 4.2): The RL has already been achieved for shallow groundwater.
- Embayment Seeps: CAP does not require compliance.

Cleanup Level of 3.3 µg/L PCE

- Main Source Area CAA: CAP does not require compliance.
- Northwest Corner Plume CAA (50 years after ERD treatment): Compliance with this CUL has not been achieved for shallow groundwater, but is estimated to be reached within several years. The CUL has already been achieved for deep groundwater.
- Downgradient Groundwater Plume CAA (50 years after thermal treatment): Compliance with this CUL has not been achieved in shallow or deeper groundwater, but is estimated to be reached within approximately 10 years.
- Embayment Seeps (10-15 years after thermal treatment): Compliance with this CUL has already been achieved for all seep samples.

Cleanup Level of 2.4 µg/L Vinyl Chloride

- Main Source Area CAA: CAP does not require compliance.
- Northwest Corner Plume CAA (50 years after ERD treatment): Compliance with this CUL has not been achieved in shallow groundwater. Due to significant variability in concentrations, and ERD production of VC, it is difficult to estimate restoration time frame, but 50 years appears readily achievable. The CUL has already been achieved for deep groundwater.
- Downgradient Groundwater Plume CAA (50 years after thermal treatment): Compliance with this CUL has not been achieved in shallow or deeper groundwater. Due to significant variability in concentrations, and ERD production of VC, it is difficult to estimate restoration time frame, but 50 years appears achievable.
- Embayment Seeps (10-15 years after thermal treatment): Compliance with this CUL has not yet been achieved for seep samples, but a downward temporal trend suggests consistent achievement within several years.

Except for relatively low concentrations of VC in the seep samples (based on 2019 sampling), this discharging groundwater appears to contain only low levels of COCs, well below the CAP compliance levels for protection of surface water (provided in Table 1).

Production and retention of VC in the aquifer through the action of ERD injections is a long-term concern at this Site, and may need to be addressed in the future. The possible effect of rebounding concentrations for any COC is also a concern following termination of ERD injections at any given location. Because Site data do not yet indicate that the total CVOC RL for groundwater has been consistently achieved, and the VC CUL for seeps has not been achieved,

ERD bio-polishing activities should continue in the Northwest Corner Plume CAA and the Downgradient Groundwater Plume CAA, per requirements in the CAP. Continuation of ERD activities is also recommended in the Main Source Area CAA.

Based on the uncertainty of timing for ERD to achieve compliance with the groundwater CVOC RL and for the VC CUL to be achieved in the downgradient areas between the CPOC and the embayment seeps, Leidos recommends that a more comprehensive evaluation of groundwater conditions at the Site be considered. This evaluation should include:

- Additional sampling to assess the current concentrations and potential rebound of CVOCs in select monitoring wells and seeps. This resampling should be performed where results for any Site well or seep show exceedances in at least one of the last two sampling rounds (since January 2016) at each location. This would be applied on a Site-wide basis, regardless of spatial relationship to the CPOC. A listing of recommended wells and seeps to be sampled is presented in Appendix B, which includes 45 wells and 3 seep locations.
- Collection and interpretation of additional ERD performance monitoring data and preparation of an up-to-date bio-polishing injection plan to address current groundwater conditions at the Site.

4.3 Indoor Air/Soil Vapor

With regard to soil vapor and indoor air conditions at the Site, Leidos believes that additional assessment of VI potential is warranted on both the Cascade Columbia and Seattle Boiler Works properties. This conclusion is based on the most recent sub-slab soil vapor sampling results, which indicated that concentrations of PCE and TCE were present above MTCA sub-slab soil gas screening levels, in addition to VC at Seattle Boiler Works. Although the most recent indoor air sampling results for these properties were in compliance with Site CULs, the currently available data set does not provide a sufficient weight-of-evidence to demonstrate that a VI exposure pathway to indoor air is not present during worst-case scenarios for building use or meteorological conditions.

Additionally, for the Cascade Columbia property, the VI assessment sampling conducted was not representative of equilibrium conditions in the subsurface because several of these sampling events were conducted during operation of the SVE system, or several days after the system was shut down. Leidos recommends that future VI assessment on these properties include documentation of building use and meteorological conditions before and during the sampling events, in order to demonstrate that the sampling was conducted under “worst-case” conditions for VI potential.

4.4 Summary of Recommended Actions

The three main actions recommended from this periodic review of available data for the Site are summarized on the following page.

1. Additional ERD bio-polishing injections. This recommendation includes those mandated by the CAP as a result of RL exceedances in the Northwest Corner Plume CAA (at the CPOC) and the Downgradient Groundwater Plume CAA, as well as VC CUL exceedances in the embayment seeps. In addition, due to RL exceedances upgradient of the CPOC in the Main Source Area CAA, additional ERD injections are recommended there. This should include review of additional ERD performance monitoring data and preparation of a revised bio-polishing injection plan to address current groundwater conditions.
2. Additional groundwater/seep monitoring throughout the Site. This recommendation is based on following: the RL and CUL exceedances in recent years at many locations on the Site, some locations that have not been sampled since showing exceedances in prior years, the variability shown in analytical results at some locations, and the need to evaluate rebound in concentrations. A list of recommended wells and seeps to sample is included in Appendix B.
3. Additional VI assessment at the Site. This recommendation is based on the potential for VI impacts at the Site. This is supported by the fact that most of the sampling at the Cascade Columbia property was conducted while SVE treatment was ongoing, one location at Seattle Boiler Works showed indoor air CUL exceedances for TCE and VC, some reporting limits were too high, and sub-slab soil vapor concentrations exceed screening levels at both properties. This assessment would include sampling indoor air at various building locations and resampling all sub-slab vapor points.

5.0 References

Calibre. 2019. *Technical Memorandum Summarizing June 2019 Site Wide Sampling for the Fox Avenue Site*. Memo addressed to Sunny Becker, Washington State Department of Ecology; from Tom McKeon, Calibre. August 29.

Ecology (Washington State Department of Ecology). 2012. *Cleanup Action Plan, Fox Avenue Site, Seattle, Washington*. Toxics Cleanup Program, Northwest Regional Office, Bellevue. Final CAP signed on June 19.

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Floyd|Snider. 2015. *2014 Annual Report, Fox Avenue Site, Seattle, Washington*. Prepared for Fox Avenue Building LLC. April.

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Floyd|Snider. 2018. *2017 Annual Report, Fox Avenue Site, Seattle, Washington*. Prepared for Fox Avenue Building LLC. April.

Floyd|Snider. 2019. *2018 Annual Report, Fox Avenue Site, Seattle, Washington*. Prepared for Fox Avenue Building LLC. March.

TABLES

Table 1. Revised Cleanup Levels for Fox Avenue Building Site

Chemical of Concern	Soil Cleanup Level	Groundwater Cleanup Level	Indoor Air Cleanup Level	
	Protection of Groundwater and Indoor Air [1]	Protection of Surface Water (µg/L)	MTCA Method B [2] (µg/m^3)	MTCA Method C [3] (µg/m^3)
Benzene	Empirical	51	NA	NA
1,1-DCE	Empirical	3.2	NA	NA
Pentachlorophenol	Empirical	3.0	NA	NA
PCE	Empirical	3.3	9.6	40
TCE	Empirical	30	0.37	2.0
TPH (mineral spirits to heavy-oil range)	Empirical	500	NA	NA
VC	Empirical	2.4	0.28	2.8

Table Notes:

1. Soil CULs have no numeric value. Instead, soil will be empirically demonstrated to be in compliance when indoor air and groundwater (at the CPOC) meet their respective CULs within the estimated restoration time frame.
2. MTCA Method B indoor air CULs are applied to the Seattle Boiler Works property.
3. MTCA Method C indoor air CULs are applied to the Cascade Columbia property.

µg/L = micrograms per liter

µg/m^3 = micrograms per cubic meter

NA = Not applicable, the chemical is not a COC for indoor air

Table 2. Summary of Remedy Elements, Cleanup Compliance, and Recommendations for Fox Avenue Building Site

Media	Technology	Remediation Level or Cleanup Level	Location	Restoration Time Frame	Compliance with RL or CUL	Conclusions and Recommended Actions
Main Source Area CAA						
Soil	ERH	PCE + TCE: 10 mg/kg (RL, mean soil concentration)	Treatment area	1 year of ERH (=2013)	Met in all but 3 samples; however, 95% UCL for mean concentration was met for all data	Successfully met, and no contingency actions are required.
	Various	Empirical demonstration based on meeting GW and indoor air CULs*	See GW and indoor air	For GW, 50 years post-ERD*	See GW and indoor air	No actions are required at this time. GW CULs at CPOC are not required to be met for 50 years post-ERD.
GW	ERD (polishing)	Total CVOCs: 250 µg/L (RL)	At CPOC	5 years post-ERH (=2018)	*At CPOC:* compliant with RL	RL at CPOC has been met, and thus no contingency actions are required. However, RL has not been met in areas upgradient of CPOC, so GW monitoring should continue and further ERD is recommended. RL compliance in upgradient areas is expected within several years.
					Upgradient of CPOC: recent exceedances at MW-9, MW-18S, R0-IW2D	
Indoor Air/ Soil Vapor	ERH/SVE	PCE: 40 µg/m^3 (Method C air CUL)	Cascade Columbia buildings	Not specified	Compliant with indoor air CUL, but sub-slab soil gas SL was exceeded	Most sampling was performed during or soon after SVE operation. Potential exists for VI impacts. Further indoor air assessment is recommended.
	ERH/SVE	TCE: 2.0 µg/m^3 (Method C air CUL)			Compliant with indoor air CUL, but sub-slab soil gas SL was exceeded	
	ERH/SVE	VC: 2.8 µg/m^3 (Method C air CUL)			All sample results are ND	

Table 2. Summary of Remedy Elements, Cleanup Compliance, and Recommendations for Fox Avenue Building Site

Media	Technology	Remediation Level or Cleanup Level	Location	Restoration Time Frame	Compliance with RL or CUL	Conclusions and Recommended Actions
Northwest Corner Plume CAA						
Soil	SVE	None	Treatment area	1 year of SVE (=2013)	Run only until asymptotic concentrations (1 year)	No actions are required.
GW	SVE/ERD	Total CVOCs: 250 µg/L (RL)	At CPOC	5 years post-SVE (=2018)	*At CPOC:* recent exceedance at NW1-1 *Upgradient of CPOC:* compliant with RL	CAP requires continued ERD operations for contingency actions. RL compliance is expected within a few years.
	MNA	PCE: 3.3 µg/L (CUL)^	At CPOC	50 years post-ERD	*At CPOC:* recent exceedances at B-22 *Upgradient of CPOC:* compliant with RL	No actions are required at this time. CUL compliance is expected within several years.
	MNA	VC: 2.4 µg/L (CUL)^	At CPOC	50 years post-ERD	*At CPOC:* recent exceedances at R1-IW12, NW1-1, B-22 *Upgradient of CPOC:* recent exceedance at R1-IW10	No actions are required at this time. CUL compliance timing is uncertain but expected in less than 50 years after ERD.
Downgradient Groundwater Plume CAA						
GW	ERD	Total CVOCs: 250 µg/L (RL)	Designated well network	10-15 years post-ERH (=2023-2028)	Recent exceedance at R2-IW1	CAP requires continued ERD operations until compliance with RL. Compliance is expected within a few years (possibly by 2023).
	MNA	PCE: 3.3 µg/L (CUL)	All down-gradient wells	50 years post-ERD	Recent exceedances at B-58, MW-5, MW-6	No actions are required at this time. CUL compliance is expected within ~10 years.
	MNA	VC: 2.4 µg/L (CUL)	All down-gradient wells	50 years post-ERD	Large number of recent exceedances	No actions are required at this time. CUL compliance timing is uncertain but expected within 50 years after ERD.

Table 2. Summary of Remedy Elements, Cleanup Compliance, and Recommendations for Fox Avenue Building Site

Media	Technology	Remediation Level or Cleanup Level	Location	Restoration Time Frame	Compliance with RL or CUL	Conclusions and Recommended Actions
Seeps	ERD/MNA	PCE: 3.3 µg/L (CUL)	All embayment seeps	10-15 years post-ERH (=2023-2028)	Compliant with CULs	No actions are required.
	ERD/MNA	VC: 2.4 µg/L (CUL)			Recent exceedances at S-2, S-3, S-3b	CAP requires continued ERD operations until compliance with CUL. Seep CUL compliance is expected within several years.
Indoor Air/ Soil Vapor	ERH	PCE: 9.6 µg/m^3 (Method B air CUL)	Seattle Boiler Works buildings	10-15 years post-ERH (=2023-2028)	Compliant with indoor air CUL, but sub-slab soil gas SL was exceeded.	Potential exists for VI impacts. Further indoor air assessment is recommended.
	ERH	TCE: 0.37 µg/m^3 (Method B air CUL)			One sample exceeded the indoor air CUL, and sub-slab soil gas SL was exceeded.	
	ERH	VC: 0.28 µg/m^3 (Method B air CUL)			One sample exceeded the indoor air CUL, and sub-slab soil gas SL was exceeded.	

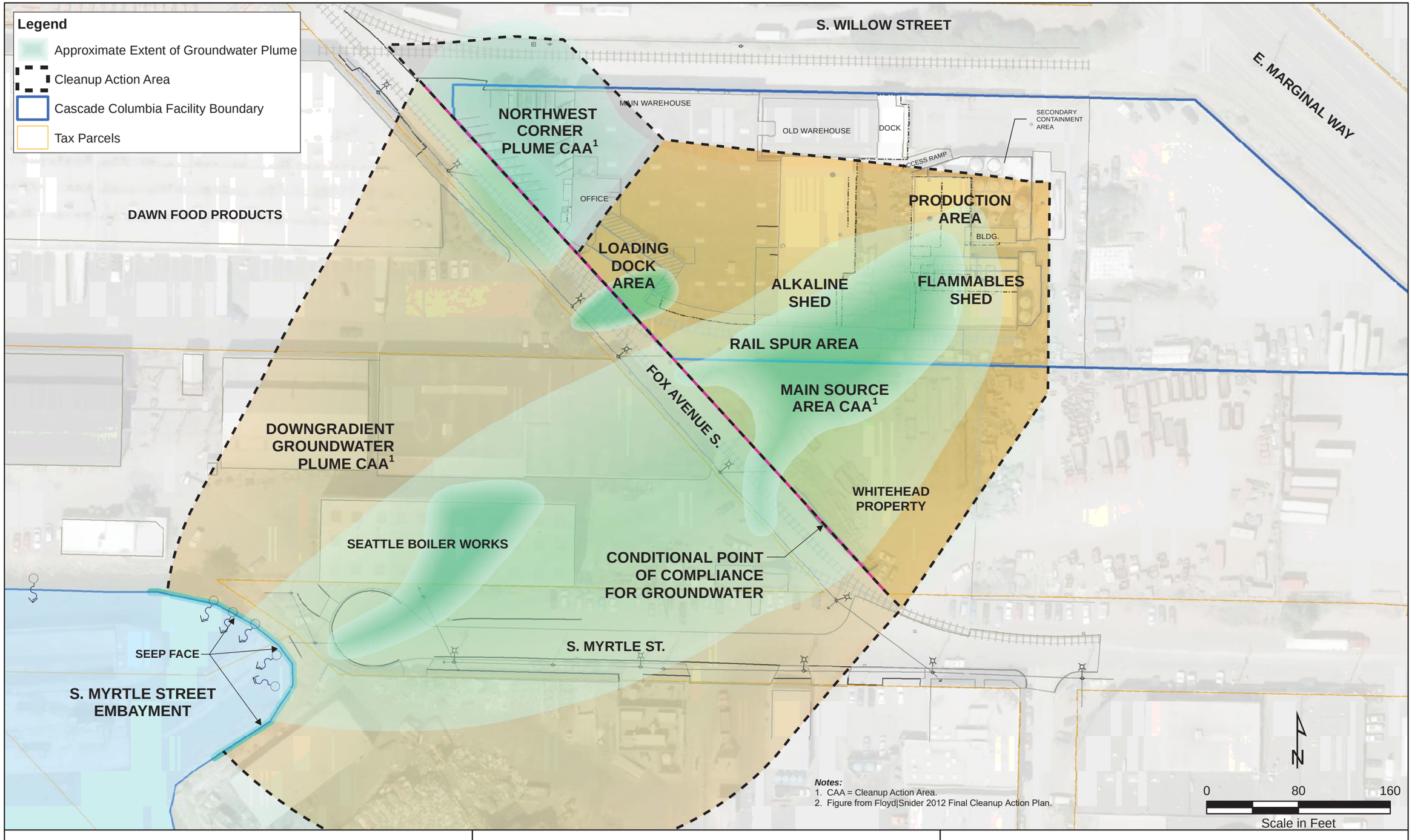
* The text of Sections 3.4, 3.5, and 3.5.1 of the CAP states that this soil cleanup standard will involve meeting GW CULs at the CPOC (as applied in this report). However, one sentence in Section 3.5.1 states that both the RL and CULs for GW will be met at the CPOC. If compliance with the RL is included, this would affect the restoration time frame listed in this table, which would be 5 years after completion of ERH/SVE (=2018).

^ The table on page 4-3 of the CAP states that both the RL and CULs shall be met at the Northwest Corner Plume CPOC (as applied in this report). However, the text in CAP Sections 4.3, 5.3, and 6.5 does not refer to the requirement for CULs.

A "recent exceedance" for GW/seeps refers to an exceedance of an RL or CUL in at least one of the last two sampling rounds since the beginning of 2016.

GW = Groundwater
ND = Not detected
SL = Screening level

FIGURES



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Fox Avenue Building Site
Seattle, Washington

Figure 1
Cleanup Action Areas

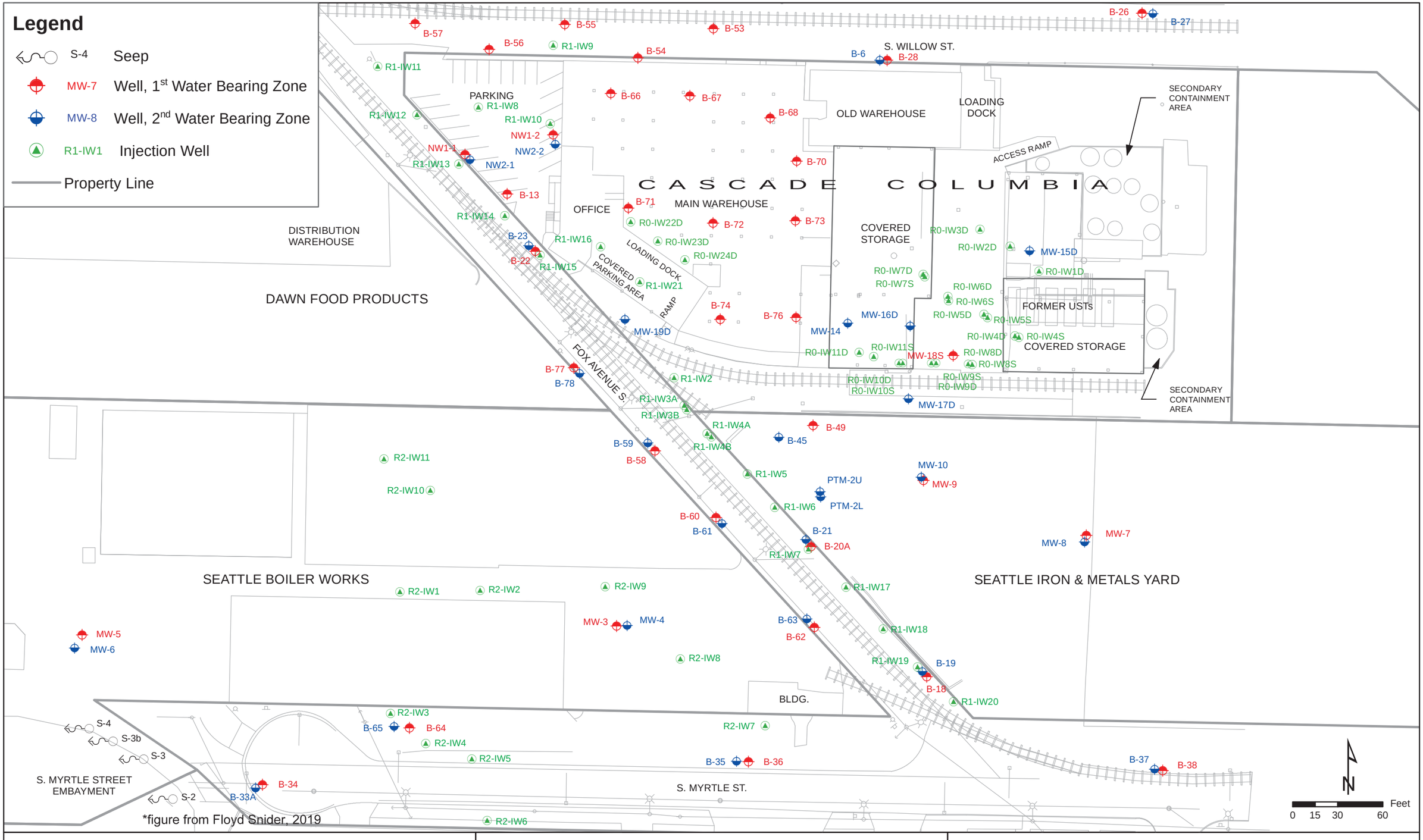

*figure from Floyd Snider, 2019

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Fox Avenue Building Site
Seattle, Washington

Figure 2
Site Plan Showing Wells and Seeps

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Legend

- S-4 — Seep
- MW-7 — Well, 1st Water Bearing Zone
- MW-8 — Well, 2nd Water Bearing Zone
- R1-IW1 — Injection Well
- Property Line

RL = 250 µg/L

CPOC = Conditional Point of Compliance for Groundwater

B-22 = Exceedance is in most recent sample result

MW-8 = Exceedance is in second most recent sample result

349, 2018, 2nd

concentration in µg/L — Water Bearing Zone (WBZ) — year sampled

387, 2018, 1st

365, 2019, 2nd

783, 2018, 1st

620, 2018, 1st

349, 2018, 2nd

CASCADE COLUMBIA

OLD WAREHOUSE

LOADING DOCK

MAIN WAREHOUSE

OFFICE

COVERED STORAGE

FORMER USTs

COVERED STORAGE

SECONDARY CONTAINMENT AREA

SECONDARY CONTAINMENT AREA

ACCESS RAMP

PARKING

DISTRIBUTION WAREHOUSE

LOADING DOCK

COVERED PARKING AREA

RAMP

DAWN FOOD PRODUCTS

FOX AVENUE S.

S. WILLOW ST.

SEATTLE BOILER WORKS

SEATTLE IRON & METALS YARD

BLDG.

S. MYRTLE STREET EMBAYMENT

S. MYRTLE ST.

CPOC

B-26 B-27 B-57 B-55 B-53 B-56 R1-IW9 B-54 B-6 B-28 R1-IW11 B-66 B-67 B-68 R1-IW12 R1-IW8 R1-IW10 NW1-1 NW1-2 NW2-2 NW2-1 R1-IW13 B-70 B-13 B-71 R1-IW14 R0-IW22D B-72 B-73 B-23 R1-IW16 R0-IW23D R0-IW24D B-22 R1-IW15 R1-IW21 R0-IW3D R0-IW2D MW-15D R0-IW7D R0-IW7S R0-IW6D R0-IW6S R0-IW5D R0-IW5S R0-IW4S R0-IW8D R0-IW8S R0-IW9S R0-IW9D MW-16D MW-14 R0-IW11D R0-IW11S MW-18S R0-IW10D R0-IW10S MW-17D B-74 B-76 MW-19D B-77 B-78 R1-IW2 R1-IW3A R1-IW3B R1-IW4A R1-IW4B B-49 B-45 B-59 B-58 R1-IW5 PTM-2U PTM-2L R1-IW6 B-60 B-61 B-21 B-20A R1-IW7 MW-10 MW-9 MW-8 MW-7 R1-IW17 R1-IW18 B-63 B-62 R1-IW19 B-19 B-18 R1-IW20 R2-IW11 R2-IW10 R2-IW1 R2-IW2 R2-IW9 MW-3 MW-4 R2-IW8 R2-IW7 MW-5 MW-6 R2-IW3 B-65 B-64 R2-IW4 R2-IW5 B-35 B-36 B-37 B-38 S-4 S-3b S-3 S-2 B-34 B-33A R2-IW6

*figure from Floyd Snider, 2019

N

0 15 30 60 Feet

leidos

Fox Avenue Building Site
Seattle, Washington

Figure 3
Total CVOC Exceedances in Groundwater

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Legend

- S-4 — Seep
- MW-7 — Well, 1st Water Bearing Zone
- MW-8 — Well, 2nd Water Bearing Zone
- R1-IW1 — Injection Well
- Property Line

CUL = 3.3 µg/L CPOC = Conditional Point of Compliance for Groundwater

B-22 = Exceedance is in most recent sample result

MW-8 = Exceedance is in second most recent sample result

6.78, 2016, 1st
concentration in µg/L | year sampled | Water Bearing Zone (WBZ)

CASCADE COLUMBIA

S. WILLOW ST.

PARKING

OLD WAREHOUSE

LOADING DOCK

SECONDARY CONTAINMENT AREA

ACCESS RAMP

OFFICE

MAIN WAREHOUSE

DISTRIBUTION WAREHOUSE

COVERED PARKING AREA

LOADING DOCK

RAMP

COVERED STORAGE

FORMER USTs

COVERED STORAGE

7.44, 2019, 1st

3.76, 2018, 2nd

37.4, 2018, 1st

DAWN FOOD PRODUCTS

FOX AVENUE S.

12.5, 2019, 1st

CPOC

SEATTLE BOILER WORKS

SEATTLE IRON & METALS YARD

6.78, 2016, 1st

MW-5

MW-6

17.0, 2019, 2nd

BLDG.

S. MYRTLE STREET EMBAYMENT

S. MYRTLE ST.

*figure from Floyd Snider, 2019

N

0 15 30 60 Feet

leidos	**Fox Avenue Building Site** **Seattle, Washington**	Figure 4 PCE Exceedances in Groundwater

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Legend

- S-4 — Seep
- MW-7 — Well, 1st Water Bearing Zone
- MW-8 — Well, 2nd Water Bearing Zone
- R1-IW1 — Injection Well
- Property Line

CUL = 2.4 µg/L CPOC = Conditional Point of Compliance for Groundwater

B- 22 = Exceedance is in most recent sample result

R2-IW1 = Exceedance is in second most recent sample result

149, 2018

concentration in µg/L year sampled

CASCADE COLUMBIA

DAWN FOOD PRODUCTS

SEATTLE BOILER WORKS

SEATTLE IRON & METALS YARD

DISTRIBUTION WAREHOUSE

OFFICE

MAIN WAREHOUSE

OLD WAREHOUSE

LOADING DOCK

COVERED STORAGE

FORMER USTs

SECONDARY CONTAINMENT AREA

ACCESS RAMP

COVERED PARKING AREA

LOADING DOCK

FOX AVENUE

S. WILLOW ST.

S. MYRTLE ST.

S. MYRTLE STREET EMBAYMENT

BLDG.

CPOC

10.7, 2016
5.78, 2016
22.0, 2019
12.5, 2019
8.91, 2016
17.6, 2019
3.69, 2016
8.45, 2019
7.43, 2019
5.03, 2019
25.2, 2016
9.46, 2018
180, 2018
14.4, 2016
8.13, 2016
41.9, 2016
14.4, 2016
4.97, 2019
20.3, 2019
149, 2018
6.16, 2016
4.27, 2018
11.8, 2016
4.56, 2019
3.89, 2019
2.88, 2019
4.35, 2017

B-55 B-57 B-56 B-53 B-54 B-26 B-27 B-6 B-28 B-66 B-67 B-68 B-70 B-13 B-71 B-72 B-73 B-23 B-22 B-74 B-76 B-77 B-78 B-49 B-45 B-59 B-58 B-60 B-61 B-21 B-20A B-63 B-62 B-19 B-18 B-65 B-64 B-35 B-36 B-37 B-38 B-34 B-33A

R1-IW9 R1-IW11 R1-IW12 R1-IW10 R1-IW13 R1-IW14 R1-IW16 R1-IW15 R1-IW21 R1-IW2 R1-IW3A R1-IW3B R1-IW4A R1-IW4B R1-IW5 R1-IW6 R1-IW7 R1-IW17 R1-IW18 R1-IW19 R1-IW20

R2-IW11 R2-IW10 R2-IW1 R2-IW2 R2-IW9 R2-IW8 R2-IW3 R2-IW4 R2-IW5 R2-IW7 R2-IW6

R0-IW22D R0-IW23D R0-IW24D R0-IW3D R0-IW2D R0-IW1D R0-IW7D R0-IW7S R0-IW6D R0-IW6S R0-IW5D R0-IW5S R0-IW4D R0-IW4S R0-IW11D R0-IW11S R0-IW8D R0-IW8S R0-IW10D R0-IW10S R0-IW9S R0-IW9D

MW-15D MW-16D MW-14 MW-18S MW-17D MW-10 MW-9 MW-7 MW-8 MW-3 MW-4 MW-5 MW-6

NW1-2 NW2-2 NW1-1 NW2-1

PTM-2U PTM-2L

S-4 S-3b S-3 S-2

N

0 15 30 60 Feet

*figure from Floyd Snider, 2019

leidos

Fox Avenue Building Site
Seattle, Washington

Figure 5
Vinyl Chloride Exceedances in Groundwater for the 1st WBZ and Seeps

N:\Ecology On-Call 2018\LEI023 Fox Avenue Building\9_Deliverables\

Legend

- S-4 — Seep
- MW-7 — Well, 1st Water Bearing Zone
- MW-8 — Well, 2nd Water Bearing Zone
- R1-IW1 — Injection Well
- Property Line

CUL = 2.4 µg/L CPOC = Conditional Point of Compliance for Groundwater

B- 59 = Exceedance is in most recent sample result

R2-IW1 = Exceedance is in second most recent sample result

244, 2018

concentration in µg/L year sampled

CASCADE COLUMBIA

DAWN FOOD PRODUCTS

SEATTLE BOILER WORKS

SEATTLE IRON & METALS YARD

CPOC

S. WILLOW ST.

PARKING

OFFICE

MAIN WAREHOUSE

OLD WAREHOUSE

LOADING DOCK

ACCESS RAMP

SECONDARY CONTAINMENT AREA

COVERED STORAGE

FORMER USTs

DISTRIBUTION WAREHOUSE

COVERED PARKING AREA

LOADING DOCK

RAMP

FOX AVENUE S.

BLDG.

S. MYRTLE ST.

S. MYRTLE STREET EMBAYMENT

34.7, 2017	MW-15D
203, 2019	R0-IW2D
11.2, 2018	MW-16D
19.5, 2016	R0-IW5D
9.04, 2018	B-59
5.89, 2016	R1-IW3B
29.1, 2016	R1-IW5
25.5, 2017	B-61
38.4, 2016	B-21
13.2, 2016	R1-IW7
7.55, 2016	R2-IW2
244, 2018	R2-IW1
122, 2016	MW-4
10.9, 2019	B-19
8.01, 2016	R2-IW3
3.42, 2016	B-65
2.60, 2018	B-35
5.13, 2018	B-33A
2.77, 2016	R2-IW6
5.62, 2017	MW-10

*figure from Floyd Snider, 2019

N

0 15 30 60 Feet

leidos

Fox Avenue Building Site
Seattle, Washington

Figure 6
Vinyl Chloride Exceedances in Groundwater for the 2nd WBZ

N:\Ecology On-Call 2018\LEI023 Fox Avenue Building\9_Deliverables\

Figure 7: Graph of Total CVOCs in Groundwater

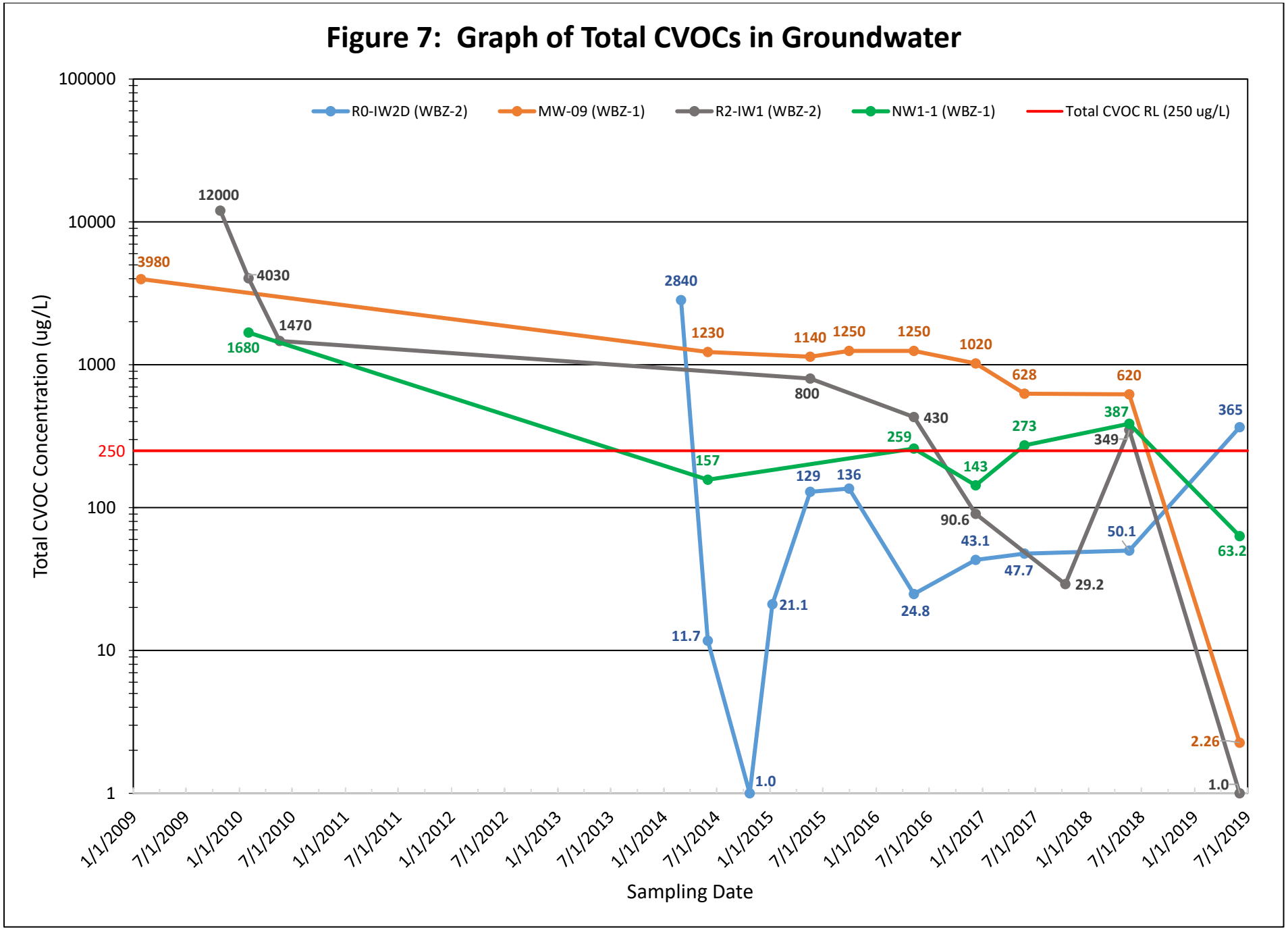


Figure 8: Graph of PCE in Groundwater

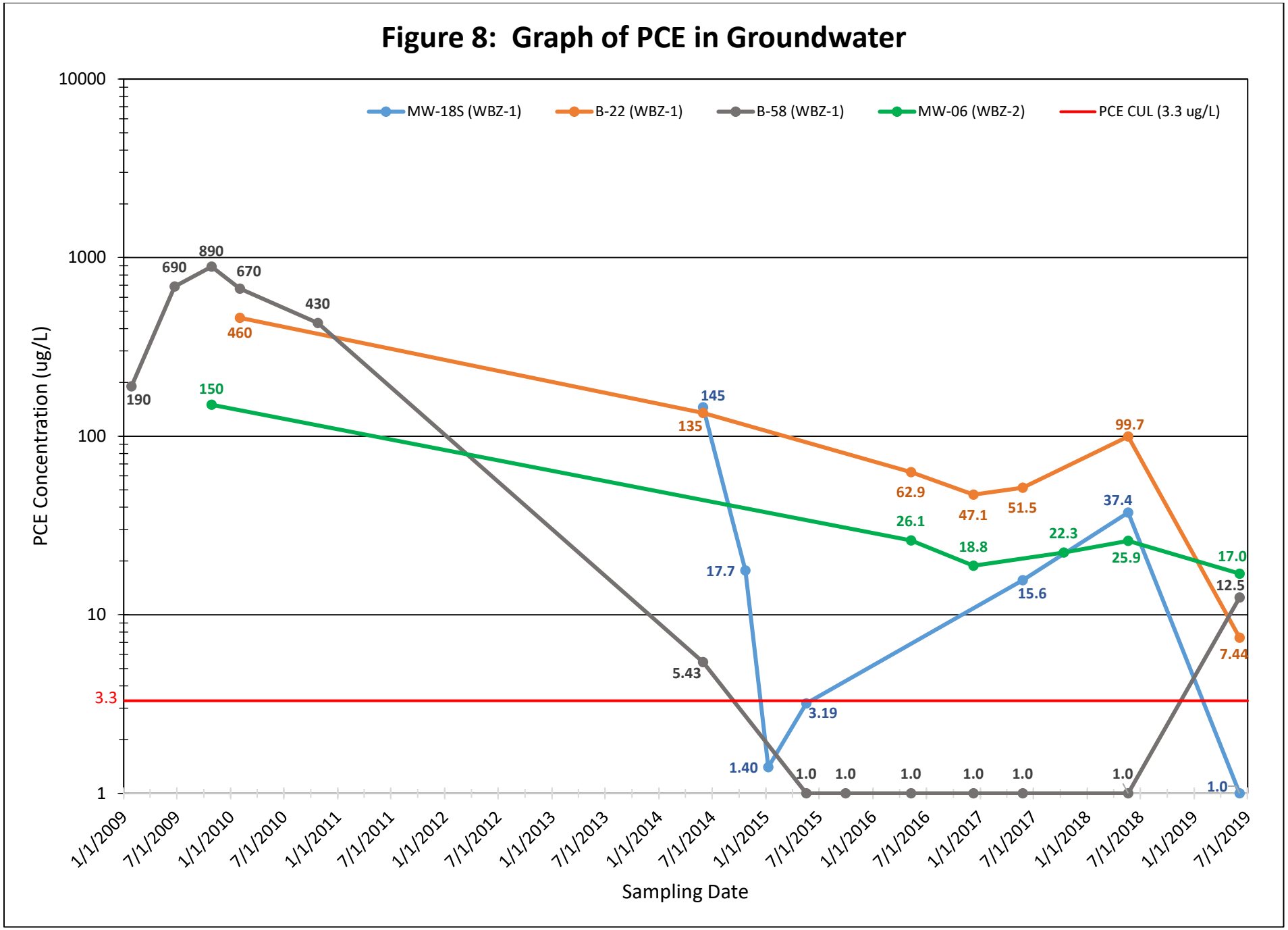


Figure 9: Graph of Vinyl Chloride in Groundwater (WBZ-1)

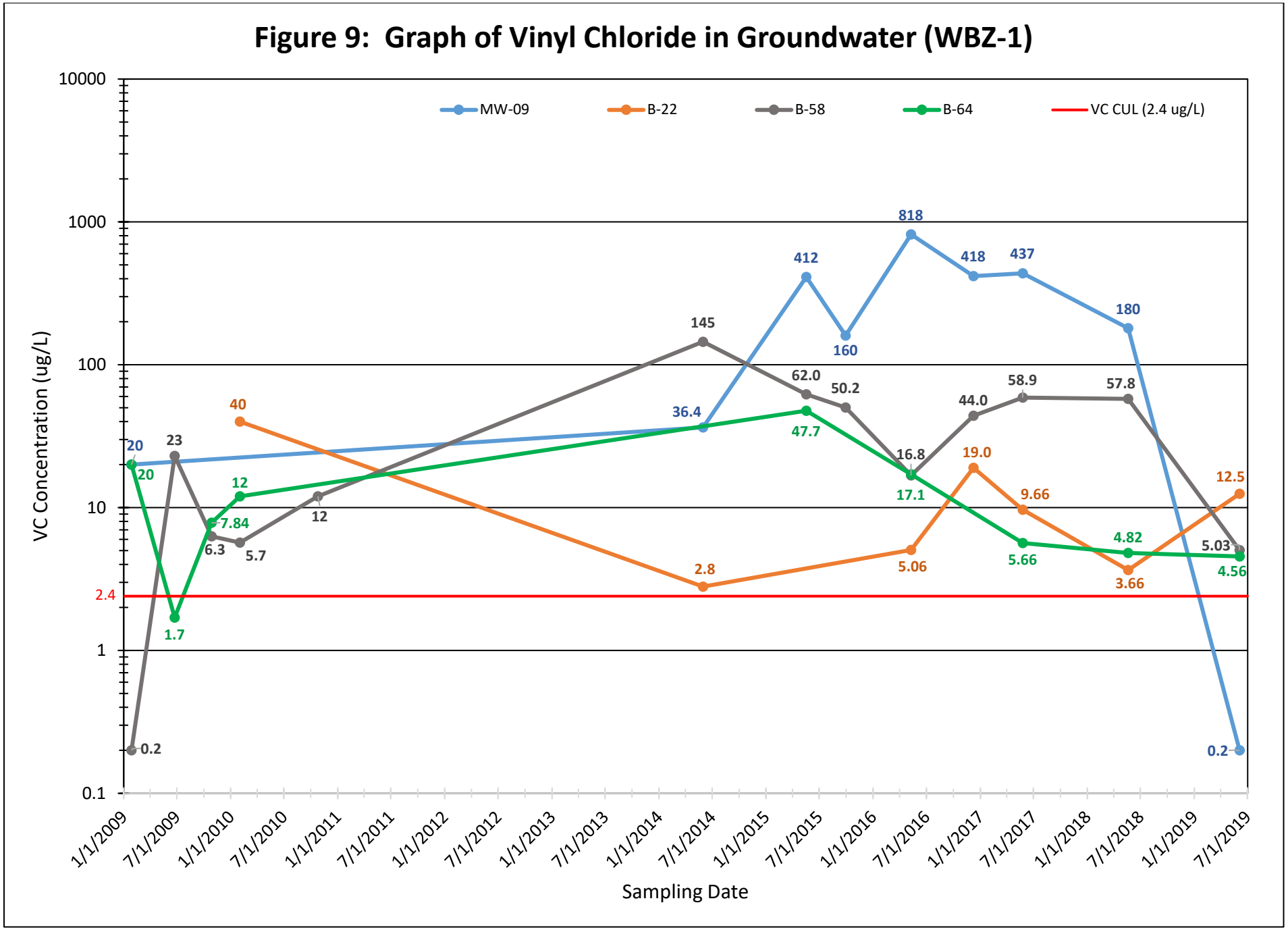
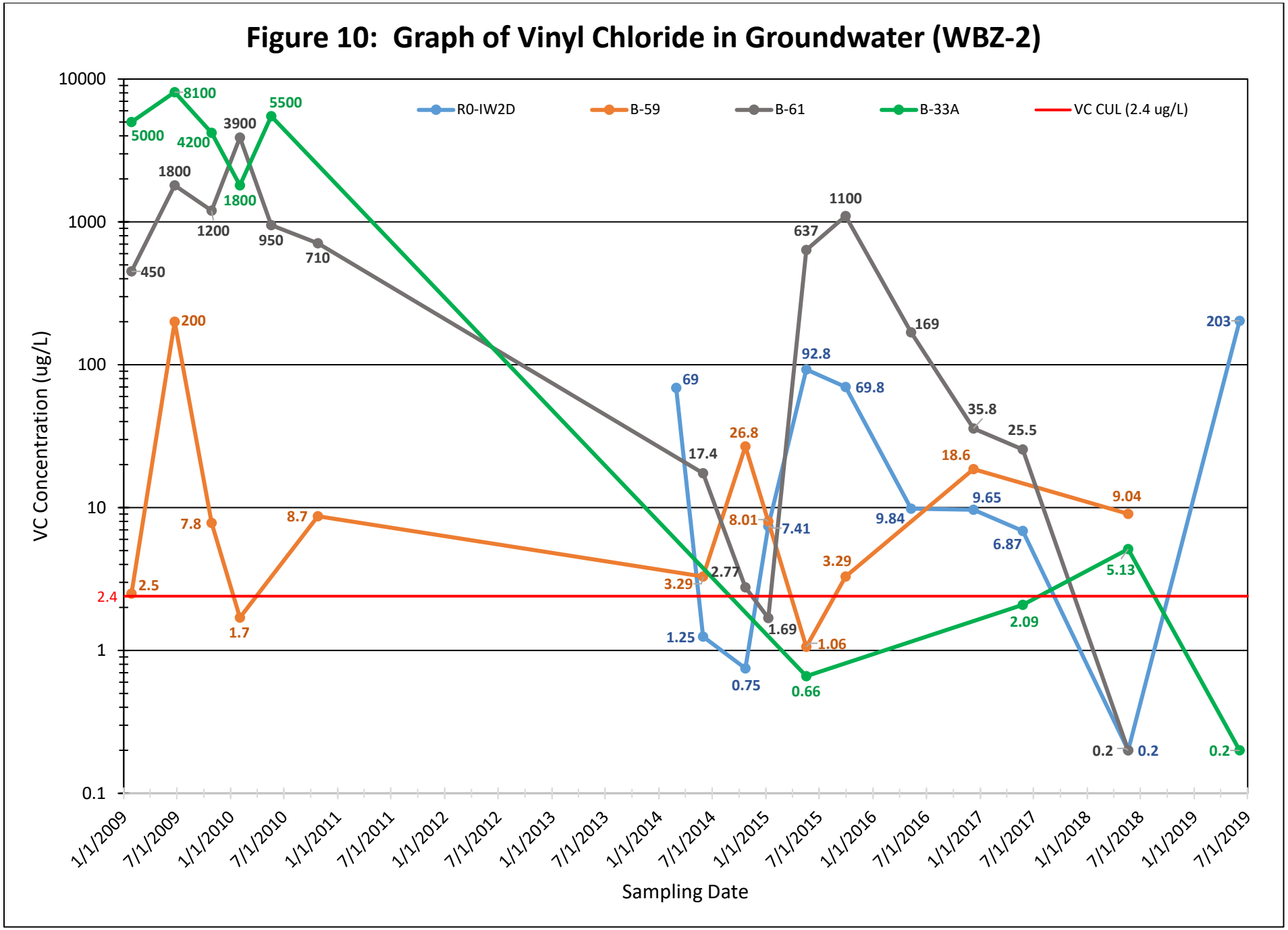


Figure 10: Graph of Vinyl Chloride in Groundwater (WBZ-2)



Appendix A
Summary Data Tables for Selected Chemicals of Concern

Table A-1. Benzene Concentrations

Well/Seep	WBZ	Concentration of Benzene (ug/L) (CUL = 51 ug/L)											
Sampling Interval:		Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Wells Located Upgradient of the Groundwater CPOC													
Main Source Area													
MW-15D	2		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U	
MW-16D	2		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U	
MW-17D	2		2.04	8.96	9.61	7.26	11.2	6.05	4.81	4.23		5.87	
MW-18S	1		1.18	1.92		1.27	1.37	1.12	1 U	1 U		1 U	1 U
R0-IW1D	2	1 U											
R0-IW2D	2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U	1 U
R0-IW3D	2	1 U											
R0-IW4D	2	10											
R0-IW4S	1	4.3											
R0-IW5D	2	1.8											
R0-IW5S	1	4.8											
R0-IW6D	2	1 U	1 U	1 U	1 U	50 U		1 U	1 U	1 U		1 U	
R0-IW6S	1	5.3											
R0-IW7D	2	1 U											
R0-IW7S	1	2.7											
R0-IW8D	2	4.4											
R0-IW8S	1	3.1											
R0-IW9D	2	6.1											
R0-IW9S	1	1.4	1.08			1 U	1 U	1 U	1 U	1 U		1 U	
R0-IW10D	2	3.9											
R0-IW10S	1	1.7											
R0-IW11D	2	1 U											
R0-IW11S	1	1.3											
R1-IW2 (Fox Ave)	2					1 U		1 U					
Loading Dock													
R0-IW22 (35)*	2s	1 U						1 U					
R0-IW22 (55)*	2d	1 U											
R0-IW23 (35)*	2s	1 U											
R0-IW23 (55)*	2d	1 U											
R0-IW24 (35)*	2s	1 U											
R0-IW24 (55)*	2d	1 U											
R1-IW21	1		2.58					1 U					
MW-19D	2		1 U										

Table A-1. Benzene Concentrations

Well/Seep	WBZ	Concentration of Benzene (ug/L) (CUL = 51 ug/L)											
Sampling Interval:		Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Northwest Corner													
NW1-1	1		1 U					1 U	1 U	1 U		1 U	1 U
NW1-2	1		1 U										
R1-IW10	1							1 U					
Whitehead (Seattle Iron & Metals Yard)													
B-45	2		1.59	3.13	1.61	1.56	2.00	1.34	1 U	1 U		1 U	
B-49	1		1 U	1.47		1 U	1 U	1 U	1 U	1 U		1 U	1 U
MW-07	1							1 U		1 U		1 U	1 U
MW-08	2							2.92		1 U		1 U	
MW-09	1		8.71			5.22	4.60	1.50	1 U	1 U		1 U	1 U
MW-10	2		3.64	3.94	3.57	2.95	2.14	1 U	1 U	1 U		1 U	
Wells/Seeps Located Within the Downgradient Groundwater Plume CAA													
Fox Avenue (NE side of street right-of-way)													
B-18	1		11.8			3.76		2.35				1.39	
B-19	2		1 U			1 U		1 U				1 U	1 U
B-20A	1		12.0			3.61	3.90	1 U	1 U	1 U		1 U	1 U
B-21	2		1.87			3.14	5.99	7.59	1 U	6.10			
B-22 (NWC)	1		1 U					1 U	1 U	1 U		1 U	1 U
R1-IW3A	1					1 U		1 U					
R1-IW4A	1					1 U		1 U				1 U	1 U
R1-IW4B	2					1 U		1 U				1 U	
R1-IW5*	1							1 U					
R1-IW5*	2						1 U	1 U					
R1-IW7*	1							1 U					
R1-IW7*	2						1.37	1.08				1 U	
R1-IW12 (NWC)	1							1 U					
R1-IW15 (NWC)	2							1 U				1 U	
R1-IW17*	1					1.56		2.37				1 U	
R1-IW17*	2					1 U		2.44				1 U	
Fox Avenue (SW side of street right-of-way)													
B-58	1		1.70			1.29	1.37	1 U	1.01	1 U		1 U	1 U
B-59	2		1.79	1.55	1.69	1.57	1.15	1 U				1 U	
B-60	1		3.48			1.52	1.06	1 U	1 U	1 U		1 U	
B-61	2		2.33	3.06	4.22	5.40	5.95	3.58	2.49	1 U		1.59	
B-62	1		1 U					1 U					
B-63	2		1 U					4.66				3.73	
B-77	1		1.07					1 U					
B-78	2		1 U					1 U					

Table A-1. Benzene Concentrations

Well/Seep	WBZ	Concentration of Benzene (ug/L) (CUL = 51 ug/L)											
Sampling Interval:		Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Seattle Boiler Works													
MW-03	1					5.22	4.71	2.20					
MW-04	2					10.6	6.69	6.09	7.71				
MW-05	1							1 U				1 U	
MW-06	2							1 U	1 U		1 U	1 U	1 U
R2-IW1*	1					2.07		1.45	1.20		1 U	1.29	1 U
R2-IW1*	2					2.15		1.62	1.19		1 U	1.49	1 U
R2-IW2*	1					1 U		1.42					
R2-IW2*	2					1 U		1.27					
R2-IW8	2					2.47		3.18				1.17	
R2-IW9	1					2.37		1.61					
R2-IW10	1							1 U			1 U		
R2-IW11	1					1 U							
Myrtle Street													
B-33A	2					13.2		10.1	9.05	1 U		9.77	7.09
B-35	2							7.28				2.51	1.84
B-64	1					1.19		1 U		1 U		1 U	1 U
B-65	2					1.16		1.01				2.20	
R2-IW3*	1							7.56		5.86			
R2-IW3*	2					8.93		6.82		4.41			
R2-IW4	2					3.09		2.56					
R2-IW6	2							5.57					
Seeps													
S-2	--		1 U			1.25		1 U		1 U		1 U	
S-13 (Calibre S-3)	--		9.31			5.24		7.89		6.01		7.34	3.96
S-3b	--		1.39			1 U		1.32		1 U		1.27	1 U
S-16 (Calibre S-4)	--		1 U			1 U		1 U					

(Fox Ave) = One well traditionally included in the Fox Avenue ("Row 1") area, but is on the upgradient side of the CPOC for groundwater.
(NWC) = Wells traditionally included in Northwest Corner area, but are on the downgradient side of the CPOC for groundwater.
WBZ = Water bearing zone (1 = shallow, 2 = deep; 2s = shallower WBZ-2 at 35 ft, 2d = deeper WBZ-2 at 55 ft)
U = Non-detected at that concentration
* Individual wells with two different sampling depths
For field duplicate samples, only the higher concentration is reported in this table.
Yellow highlighted concentrations exceed the benzene cleanup level of 51 ug/L (NO exceedances for benzene).
Blank cells represent wells/seeps that were not sampled during this time interval.

Table A-2. 1,1-Dichloroethene Concentrations

Well/Seep	WBZ	Concentration of 1,1-Dichloroethene (ug/L) (CUL = 3.2 ug/L)											
Sampling Interval:		Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Wells Located Upgradient of the Groundwater CPOC													
Main Source Area													
MW-15D	2		1.67	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U	
MW-16D	2		3.24	1.68	4.07	1 U	1 U	1 U	1 U	1 U		1 U	
MW-17D	2		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U	
MW-18S	1		2.85	3.98		1.02	1 U	1 U	1 U	1 U		1 U	1 U
R0-IW1D	2	1 U											
R0-IW2D	2	2.3	1 U	1 U	1 U			1 U	1 U	1 U		1 U	1 U
R0-IW3D	2	1 U											
R0-IW4D	2	1 U											
R0-IW4S	1	1 U											
R0-IW5D	2	1 U											
R0-IW5S	1	1 U											
R0-IW6D	2	1 U	1 U	1 U	1 U	50 U		1 U	1 U	1 U		1 U	
R0-IW6S	1	1 U											
R0-IW7D	2	1 U											
R0-IW7S	1	1 U											
R0-IW8D	2	1.6											
R0-IW8S	1	2.2											
R0-IW9D	2	1 U											
R0-IW9S	1	1.8	4.25					1 U	1 U	1 U		1 U	
R0-IW10D	2	1 U											
R0-IW10S	1	1 U											
R0-IW11D	2	1 U											
R0-IW11S	1	1 U											
R1-IW2 (Fox Ave)	2					1 U		1 U					
Loading Dock													
R0-IW22 (35)*	2s	1 U											
R0-IW22 (55)*	2d	1 U											
R0-IW23 (35)*	2s	1 U											
R0-IW23 (55)*	2d	1 U											
R0-IW24 (35)*	2s	1 U											
R0-IW24 (55)*	2d	1 U											
R1-IW21	1		1 U					1 U					
MW-19D	2		1 U										

Table A-2. 1,1-Dichloroethene Concentrations

Well/Seep	WBZ	Concentration of 1,1-Dichloroethene (ug/L) (CUL = 3.2 ug/L)											
Sampling Interval:		Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Northwest Corner													
NW1-1	1		1 U					7.50	1 U			1 U	1 U
NW1-2	1		1 U										
R1-IW10	1												
Whitehead (Seattle Iron & Metals Yard)													
B-45	2		1 U	7.66	2.73	1.99	1 U	1 U	1 U			1 U	
B-49	1		1.16	1.65		1.23	1 U	4.00	1 U	1 U		1 U	1 U
MW-07	1							1 U				1 U	1 U
MW-08	2							1 U				1 U	
MW-09	1		2.54			1.33	1.82	8.10	5.20			1 U	1 U
MW-10	2		1 U	3.95	2.56	1.15	1 U	1 U	1 U			1 U	
Wells/Seeps Located Within the Downgradient Groundwater Plume CAA													
Fox Avenue (NE side of street right-of-way)													
B-18	1		1 U			1 U		1 U				1 U	
B-19	2		3.08			1 U		1 U				1 U	1 U
B-20A	1		2.23			1.59	1.57	1 U	1 U			1 U	1 U
B-21	2		1 U			1 U	1 U	1 U	1 U				
B-22 (NWC)	1		1.29					1 U	1 U			1 U	1 U
R1-IW3A	1					1 U		1 U					
R1-IW4A	1					1 U		1 U				1 U	1 U
R1-IW4B	2					1 U		1 U				1 U	
R1-IW5*	1							1 U					
R1-IW5*	2						1 U	1 U					
R1-IW7*	1							1 U					
R1-IW7*	2						1 U	1 U				1 U	
R1-IW12 (NWC)	1												
R1-IW15 (NWC)	2											1 U	
R1-IW17*	1					1 U		1 U				1 U	
R1-IW17*	2					1 U		1 U				1 U	
Fox Avenue (SW side of street right-of-way)													
B-58	1		1 U			1 U	1 U	1 U	1 U			1 U	1 U
B-59	2		1 U	1 U	1 U	1 U	1 U	1 U				1 U	
B-60	1		1 U			2.01	2.56	1 U	1 U			1 U	
B-61	2		1 U	1 U	1 U	1 U	1.01	1 U	1 U			1 U	
B-62	1		1 U					1 U					
B-63	2		1 U					1 U				1 U	
B-77	1		1 U					1 U					
B-78	2		1 U					1 U					

Table A-2. 1,1-Dichloroethene Concentrations

Well/Seep	WBZ	Concentration of 1,1-Dichloroethene (ug/L) (CUL = 3.2 ug/L)											
Sampling Interval:		Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Seattle Boiler Works													
MW-03	1					1 U	1 U	1 U					
MW-04	2					1 U	1 U	1 U	1 U				
MW-05	1							1 U				1 U	
MW-06	2							1 U	1 U			1 U	1 U
R2-IW1*	1					1 U		1 U	1 U			1 U	1 U
R2-IW1*	2					1 U		1 U	1 U			1 U	1 U
R2-IW2*	1					1 U		1 U					
R2-IW2*	2					1 U		1 U					
R2-IW8	2					1 U		1 U				1 U	
R2-IW9	1							1 U					
R2-IW10	1							1 U			1 U		
R2-IW11	1					1 U							
Myrtle Street													
B-33A	2					1 U		1 U	1 U			1 U	1 U
B-35	2							1 U				1 U	1 U
B-64	1					1 U		1 U				1 U	1 U
B-65	2					1 U		1 U				1 U	
R2-IW3*	1							1 U					
R2-IW3*	2					1 U		1 U					
R2-IW4	2					1 U		1 U					
R2-IW6	2							1 U					
Seeps													
S-2	--		1 U			1 U		1 U				1 U	
S-13 (Calibre S-3)	--		1 U			1 U		1 U				1 U	1 U
S-3b	--		1 U			1 U		1 U				1 U	1 U
S-16 (Calibre S-4)	--		1 U			1 U		1 U					

(Fox Ave) = One well traditionally included in the Fox Avenue ("Row 1") area, but is on the upgradient side of the CPOC for groundwater.
(NWC) = Wells traditionally included in Northwest Corner area, but are on the downgradient side of the CPOC for groundwater.
WBZ = Water bearing zone (1 = shallow, 2 = deep; 2s = shallower WBZ-2 at 35 ft, 2d = deeper WBZ-2 at 55 ft)
U = Non-detected at that concentration
* Individual wells with two different sampling depths
For field duplicate samples, only the higher concentration is reported in this table.
Yellow highlighted concentrations exceed the 1,1-DCE cleanup level of 3.2 ug/L.
Not all 1,1-DCE results were received for 2017 (only data available on EIM).
Blank cells represent wells/seeps that were not sampled during this time interval.

Table A-3. Trichloroethene Concentrations

Well/Seep	WBZ	Concentration of Trichloroethene (ug/L) (CUL = 30 ug/L)											
Sampling Interval:		Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Wells Located Upgradient of the Groundwater CPOC													
Main Source Area													
MW-15D	2		118	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U	
MW-16D	2		0.5 U	8.11	8.51	0.5 U	0.5 U	0.5 U	2.86	0.5 U		0.796	
MW-17D	2		0.738	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U	
MW-18S	1		50.1	23.2		0.74	1.10	0.81	2.82	4.95		16.9	0.5 U
R0-IW1D	2	91											
R0-IW2D	2	1,000	0.77	0.5 U	0.63	1.02	0.87	0.77	1.38	1.47		2.18	10.0
R0-IW3D	2	170								1.38			
R0-IW4D	2	0.5 U											
R0-IW4S	1	2.3											
R0-IW5D	2	1.5											
R0-IW5S	1	0.5 U											
R0-IW6D	2	0.5 U	0.5 U	0.72	1.28	32.5		1.92	3.49			2.81	
R0-IW6S	1	3.2											
R0-IW7D	2	120											
R0-IW7S	1	3.8											
R0-IW8D	2	3.2											
R0-IW8S	1	55											
R0-IW9D	2	0.5 U											
R0-IW9S	1	34	66.6			0.66	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U	
R0-IW10D	2	0.5 U											
R0-IW10S	1	7.7											
R0-IW11D	2	0.5 U											
R0-IW11S	1	21											
R1-IW2 (Fox Ave)	2					0.5 U		0.5 U					
Loading Dock													
R0-IW22 (35)*	2s	1.8											
R0-IW22 (55)*	2d	0.5 U											
R0-IW23 (35)*	2s	1.3											
R0-IW23 (55)*	2d	0.5 U											
R0-IW24 (35)*	2s	5.1											
R0-IW24 (55)*	2d	3.5											
R1-IW21	1		2.61					0.5 U					
MW-19D	2		0.5 U										

Table A-3. Trichloroethene Concentrations

Well/Seep	WBZ	Concentration of Trichloroethene (ug/L) (CUL = 30 ug/L)											
Sampling Interval:		Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Northwest Corner													
NW1-1	1		34.8					15.6	0.5 U	0.5 U		0.5 U	0.5 U
NW1-2	1		15.2										
R1-IW10	1							0.5 U					
Whitehead (Seattle Iron & Metals Yard)													
B-45	2		0.83	3.03	2.26	2.05	0.53	0.5 U	0.65	0.5 U		0.5 U	
B-49	1		42.2	26.1		8.32	17	8.78	26.6	2.94		1.83	0.5 U
MW-07	1							39.2		34.7		5.05	0.5 U
MW-08	2							0.5 U		0.5 U		0.5 U	
MW-09	1		162			35.1	84.1	48.5	56.5	6.47		0.5 U	0.5 U
MW-10	2		0.5 U	2.46	1.21	0.5 U	0.5 U	0.60	0.73	0.5 U		0.5 U	
Wells/Seeps Located Within the Downgradient Groundwater Plume CAA													
Fox Avenue (NE side of street right-of-way)													
B-18	1		1.38			0.5 U		0.5 U				0.5 U	
B-19	2		0.5 U			0.5 U		0.5 U				0.5 U	0.5 U
B-20A	1		11.7			5.23	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U	0.5 U
B-21	2		0.5 U			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U			
B-22 (NWC)	1		33.8					28.9	33.9	38.0		29.5	8.07
R1-IW3A	1					1.33		0.53					
R1-IW4A	1					2.02		0.5 U				1.73	1.93
R1-IW4B	2					0.5 U		0.5 U				0.5 U	
R1-IW5*	1							0.5 U					
R1-IW5*	2						0.5 U	0.5 U					
R1-IW7*	1							0.5 U					
R1-IW7*	2						0.5 U	0.5 U				0.5 U	
R1-IW12 (NWC)	1							0.5 U					
R1-IW15 (NWC)	2							0.5 U				0.5 U	
R1-IW17*	1					0.5 U		0.5 U				0.5 U	
R1-IW17*	2					0.5 U		0.5 U				0.5 U	
Fox Avenue (SW side of street right-of-way)													
B-58	1		3.04			0.5 U	1.77	2.30	0.58	0.5 U		0.5 U	2.66
B-59	2		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U		0.5 U	
B-60	1		3.51			22.6	12.7	0.5 U	0.5 U	0.5 U		0.5 U	
B-61	2		0.5 U	0.5 U	0.5 U	0.5 U	0.82	0.5 U	0.56	0.5 U		0.5 U	
B-62	1		1.13					0.5 U					
B-63	2		0.5 U					0.5 U				0.5 U	
B-77	1		2.31					0.57					
B-78	2		0.5 U					0.5 U					

Table A-3. Trichloroethene Concentrations

Well/Seep	WBZ	Concentration of Trichloroethene (ug/L) (CUL = 30 ug/L)											
Sampling Interval:		Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Seattle Boiler Works													
MW-03	1					2.35	0.5 U	0.5 U					
MW-04	2					0.5 U	0.5 U	0.5 U	0.5 U				
MW-05	1							1.10				0.583	
MW-06	2							12.7	9.60		22.1	15.8	11.5
R2-IW1*	1					0.5 U		0.76	1.02		0.5 U	0.5 U	0.5 U
R2-IW1*	2					0.5 U		0.78	1.08		0.5 U	0.5 U	0.5 U
R2-IW2*	1					0.5 U		0.89					
R2-IW2*	2					0.5 U		0.89					
R2-IW8	2					0.5 U		0.5 U				0.5 U	
R2-IW9	1							0.5 U					
R2-IW10	1							0.5 U			0.5 U		
R2-IW11	1					0.5 U							
Myrtle Street													
B-33A	2					0.5 U		0.5 U	0.5 U	0.5 U		0.5 U	0.5 U
B-35	2							0.5 U				0.5 U	0.5 U
B-64	1					1.79		0.5 U		0.5 U		0.5 U	0.5 U
B-65	2					0.5 U		0.5 U				0.5 U	
R2-IW3*	1							0.5 U		0.5 U			
R2-IW3*	2					0.5 U		0.5 U		0.5 U			
R2-IW4	2					0.5 U		0.5 U					
R2-IW6	2							0.5 U					
Seeps													
S-2	--		0.5 U			0.5 U		0.5 U		0.5 U		0.5 U	
S-13 (Calibre S-3)	--		0.805			0.67		0.67		0.5 U		0.717	0.5 U
S-3b	--		7.55			6.74		0.5 U		0.5 U		1.10	0.5 U
S-16 (Calibre S-4)	--		0.5 U			0.5 U		0.5 U					

(Fox Ave) = One well traditionally included in the Fox Avenue ("Row 1") area, but is on the upgradient side of the CPOC for groundwater.
(NWC) = Wells traditionally included in Northwest Corner area, but are on the downgradient side of the CPOC for groundwater.
WBZ = Water bearing zone (1 = shallow, 2 = deep; 2s = shallower WBZ-2 at 35 ft, 2d = deeper WBZ-2 at 55 ft)
U = Non-detected at that concentration
* Individual wells with two different sampling depths
For field duplicate samples, only the higher concentration is reported in this table.
Yellow highlighted concentrations exceed the TCE cleanup level of 30 ug/L.
Blank cells represent wells/seeps that were not sampled during this time interval.

Table A-4. Tetrachloroethene Concentrations

Well/Seep	WBZ	Concentration of Tetrachloroethene (ug/L) (CUL = 3.3 ug/L)																
		Prior to Implementation of CAP (2009-2010)						*After Implementation of CAP (2014-2019)*										
Sampling Interval:		Jan 2009	Apr-Jul 2009	Oct 2009	Jan-Feb 2010	Apr-Jun 2010	Oct-Nov 2010	Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Wells Located Upgradient of the Groundwater CPOC																		
Main Source Area																		
MW-15D	2								150	1.28	1.24	1 U	1 U	1 U	1 U	1 U		1 U	
MW-16D	2								1 U	1.42	1.99	1 U	1 U	1 U		3.42		3.76	
MW-17D	2								1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U	
MW-18S	1								145	17.7	1.40	3.19				15.6		37.4	1 U
R0-IW1D	2							1 U											
R0-IW2D	2							650	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U	2.46
R0-IW3D	2							110											
R0-IW4D	2							1 U											
R0-IW4S	1							1 U											
R0-IW5D	2							1 U											
R0-IW5S	1							1 U											
R0-IW6D	2							1 U	1 U	1 U	1 U	50 U		1 U	1 U	1 U		1 U	
R0-IW6S	1							1 U											
R0-IW7D	2							150											
R0-IW7S	1							1 U											
R0-IW8D	2							1 U											
R0-IW8S	1							58											
R0-IW9D	2							1 U											
R0-IW9S	1							56	105			1 U	1 U	1 U	1 U	1 U		1 U	
R0-IW10D	2							1 U											
R0-IW10S	1							16											
R0-IW11D	2							1 U											
R0-IW11S	1							1.9											
R1-IW2 (Fox Ave)	2	20 **U**	5.6	3.9	13							1 U		1 U					
Loading Dock																		
R0-IW22 (35)*	2s							1 U											
R0-IW22 (55)*	2d							1 U											
R0-IW23 (35)*	2s							1 U											
R0-IW23 (55)*	2d							1 U											
R0-IW24 (35)*	2s							1 U											
R0-IW24 (55)*	2d							1 U											
R1-IW21	1								1.37					1 U					
MW-19D	2								1 U										
Northwest Corner																		
NW1-1	1				1,600				49.1					1 U	1 U	1 U		1 U	1 U
NW1-2	1				680				85.6										
R1-IW10	1													1 U					

Table A-4. Tetrachloroethene Concentrations

Well/Seep	WBZ	Concentration of Tetrachloroethene (ug/L) (CUL = 3.3 ug/L)																	
		Prior to Implementation of CAP (2009-2010)						*After Implementation of CAP (2014-2019)*											
Sampling Interval:		Jan 2009	Apr-Jul 2009	Oct 2009	Jan-Feb 2010	Apr-Jun 2010	Oct-Nov 2010	Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Whitehead (Seattle Iron & Metals Yard)																			
B-45	2	200 **U**							1 U	1.55	1 U	1 U	1.38	1 U	2.15	1 U		1 U	
B-49	1								98.6	13.0		11.7	17.4	13.7	121	4.34		1.36	1 U
MW-07	1	300												64.0		15.5		1 U	1 U
MW-08	2	12 J												1 U		1 U		1 U	
MW-09	1	3,000							11.8			114	130	55.5	42.5	17.6		1 U	1 U
MW-10	2	20 **U**					1 U		1 U	5.50	5.03	2.89	1.57	1.13	1 U	1 U		1 U	
Wells/Seeps Located Within the Downgradient Groundwater Plume CAA																			
Fox Avenue (NE side of street right-of-way)																			
B-18	1	150			24		1.0		1 U			1 U		1 U				1 U	
B-19	2	20 **U**			3.7				1 U			1 U		1 U				1 U	1 U
B-20A	1	42.4							1 U			1 U	1 U	1 U	1 U	1 U		1 U	1 U
B-21	2	1 U							1 U			1 U	1 U	1 U	1 U	1 U			
B-22 (NWC)	1				460				135					62.9	47.1	51.5		99.7	7.44
R1-IW3A	1	1,600		18								1 U		1 U					
R1-IW4A	1	3,100	1,700 J		2,000	7.8 J						1 U		1 U				1 U	1 U
R1-IW4B	2	560	5.6		32	1.13						1 U		1 U				1 U	
R1-IW5*	1	1,300												1 U					
R1-IW5*	2	420				1 U							1 U	1 U					
R1-IW7*	1				280									1 U					
R1-IW7*	2	49.6	660	100 **U**	90	1.2							1 U	1 U				1 U	
R1-IW12 (NWC)	1													1 U					
R1-IW15 (NWC)	2													1 U				1 U	
R1-IW17*	1											1 U		1 U				1 U	
R1-IW17*	2											1 U		1 U				1 U	
Fox Avenue (SW side of street right-of-way)																			
B-58	1	190	690	890	670		430		5.43			1 U	1 U	1 U	1 U	1 U		1 U	12.5
B-59	2	23	18	14	45		1.2		1 U	1 U	1 U	1 U	1 U	1 U				1 U	
B-60	1	60	39	92	42	28	420		1 U			2.11	1 U	1 U	1 U	1 U		1 U	
B-61	2	1 U	5.7	10 **U**	14	20 **U**	0.82 J		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U	
B-62	1				130		660		1.52					1 U					
B-63	2				10 **U**		1 U		1 U					1 U				1 U	
B-77	1								12.8										
B-78	2								1 U					1 U					
Seattle Boiler Works																			
MW-03	1			270	190	140						1 U	1 U	1 U					
MW-04	2			12	7.0 J	4.4 J						1 U	1 U	1 U	1 U				
MW-05	1			4.1										6.78				3.30	
MW-06	2			150										26.1	18.8		22.3	25.9	17.0
R2-IW1*	1			280	35	10 **U**						1 U		1 U	1.02		1 U	1 U	1 U
R2-IW1*	2			58	44	10 **U**						1 U		1 U	1.05		1 U	1 U	1 U
R2-IW2*	1			260		20						1 U		1 U					

Table A-4. Tetrachloroethene Concentrations

Well/Seep	WBZ	Concentration of Tetrachloroethene (ug/L) (CUL = 3.3 ug/L)																	
		Prior to Implementation of CAP (2009-2010)						*After Implementation of CAP (2014-2019)*											
Sampling Interval:		Jan 2009	Apr-Jul 2009	Oct 2009	Jan-Feb 2010	Apr-Jun 2010	Oct-Nov 2010	Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
R2-IW2*	2			24		120						1 U		1 U					
R2-IW8	2											1 U		1 U				1 U	
R2-IW9	1													1 U					
R2-IW10	1													1 U			1 U		
R2-IW11	1											1 U							
Myrtle Street																			
B-33A	2	20 **U**	1 U	10 **U**	5 **U**	20 **U**						1 U		1 U	1 U	1 U		1 U	1 U
B-35	2				10									1 U				1 U	1 U
B-64	1	20 **U**	94	150	31							1.11		1 U		1 U		1 U	1 U
B-65	2	20 **U**	1 U	100 **U**	5 **U**							1 U		1 U				1 U	
R2-IW3*	1				100 **U**									1 U		1 U			
R2-IW3*	2	20 **U**	4.3	2.6	3 U	2.7						1 U		1 U		1 U			
R2-IW4	2	1 U	1.7	2.9								1 U		1 U					
R2-IW6	2	20 **U**	1 U	10 **U**	5.6	10 **U**								1 U					
Seeps																			
S-2	--		1 U						1 U			1 U		1 U		1 U		1 U	
S-13 (Calibre S-3)	--		1 U						1 U			1 U		1 U		1 U		1 U	1 U
S-3b	--								16.7			2.95		1 U		1 U		1 U	1 U
S-16 (Calibre S-4)	--		55						1 U			1 U		1 U					

(Fox Ave) = One well traditionally included in the Fox Avenue ("Row 1") area, but is on the upgradient side of the CPOC for groundwater.
(NWC) = Wells traditionally included in Northwest Corner area, but are on the downgradient side of the CPOC for groundwater.
WBZ = Water bearing zone (1 = shallow, 2 = deep; 2s = shallower WBZ-2 at 35 ft, 2d = deeper WBZ-2 at 55 ft)
U = Non-detected at that concentration (bolded where ND value exceeds the CUL)
* Individual wells with two different sampling depths
For field duplicate samples, only the higher concentration is reported in this table.
Gray highlighted concentrations exceed the PCE cleanup level of 3.3 ug/L (before implementation of CAP).
Yellow highlighted concentrations exceed the PCE cleanup level of 3.3 ug/L (after implementation of CAP).
Blank cells represent wells/seeps that were not sampled during this time interval.

Table A-5. Vinyl Chloride Concentrations

Well/Seep	WBZ	Concentration of Vinyl Chloride (ug/L) (CUL = 2.4 ug/L)																
		Prior to Implementation of CAP (2009-2010)						*After Implementation of CAP (2014-2019)*										
Sampling Interval:		Jan 2009	Apr-Jul 2009	Oct 2009	Jan-Feb 2010	Apr-Jun 2010	Oct-Nov 2010	Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Wells Located Upgradient of the Groundwater CPOC																		
Main Source Area																		
MW-15D	2								121	926	6,510	23.8	0.405	8.64	0.02 U	34.7		0.2 U	
MW-16D	2								2,240	1,080	4,210	75.8	0.328	0.2 U	0.2 U	0.2 U		11.2	
MW-17D	2								53.5	17.4	21.8	6.01	2.56	2.13	0.2 U	0.235		0.2 U	
MW-18S	1								4.71	41.4		123	66.0	209	511	179		373	17.6
R0-IW1D	2							6.7											
R0-IW2D	2							69	1.25	0.75	7.41	92.8	69.8	9.84	9.65	6.87		0.2 U	203
R0-IW3D	2							4.9											
R0-IW4D	2							1.1											
R0-IW4S	1							5.8											
R0-IW5D	2							22											
R0-IW5S	1							3.5											
R0-IW6D	2							620	5.18	8.05	15.3	45.0		11.0	19.5	15.9		0.2 U	
R0-IW6S	1							3.6											
R0-IW7D	2							21											
R0-IW7S	1							1.9											
R0-IW8D	2							370											
R0-IW8S	1							8.1											
R0-IW9D	2							2,200											
R0-IW9S	1							5.6	6.35			16.6	2.71	0.2 U	0.2 U	0.2 U		0.2 U	
R0-IW10D	2							1,800											
R0-IW10S	1							4.8											
R0-IW11D	2							590											
R0-IW11S	1							2.5											
R1-IW2 (Fox Ave)	2	250	190	50	110							0.86		0.44					
Loading Dock																			
R0-IW22 (35)*	2s							0.2 U											
R0-IW22 (55)*	2d							1.3											
R0-IW23 (35)*	2s							3.1											
R0-IW23 (55)*	2d							6.9											
R0-IW24 (35)*	2s							47											
R0-IW24 (55)*	2d							57											
R1-IW21	1								52.7					8.91					
MW-19D	2								20.7										

Table A-5. Vinyl Chloride Concentrations

Well/Seep	WBZ	Concentration of Vinyl Chloride (ug/L) (CUL = 2.4 ug/L)																	
		Prior to Implementation of CAP (2009-2010)						*After Implementation of CAP (2014-2019)*											
Sampling Interval:		Jan 2009	Apr-Jul 2009	Oct 2009	Jan-Feb 2010	Apr-Jun 2010	Oct-Nov 2010	Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Northwest Corner																			
NW1-1	1				4 **U**				11.6					24.2	27.2	34.9		63.1	22.0
NW1-2	1				5.8				2.51										
R1-IW10	1													5.78					
Whitehead (Seattle Iron & Metals Yard)																			
B-45	2	460							1,030	10,700	3,220	2,220	164	5.92	45.9	0.2 U		0.2 U	
B-49	1								5.14	17.2		460	35.2	124	0.2 U	38.6		48.9	7.43
MW-07	1	16.6												4.25		4.13		0.2 U	20.3
MW-08	2	200												67.0		0.2 U		0.2 U	
MW-09	1	20							36.4			412	160	818	418	437		180	0.2 U
MW-10	2	13,000					1,700		274	1,630	1,440	529	782	81.2	30.1	5.62		0.2 U	
Wells/Seeps Located Within the Downgradient Groundwater Plume CAA																			
Fox Avenue (NE side of street right-of-way)																			
B-18	1	3,400			1,200		96		193			136		19.4				4.27	
B-19	2	36			19				241			47.9		22.4				10.3	10.9
B-20A	1	4 **U**							102 J			61.5	179	71.5	12.0	11.7		14.1	4.97
B-21	2	0.2 U							0.2 U			286	41.4	67.8	38.4	0.2 U			
B-22 (NWC)	1				40				2.8					5.06	19.0	9.66		3.66	12.5
R1-IW3A	1	140		370								3.80		3.69					
R1-IW4A	1	290	1,500 J		420	210						51.9		6.92				8.45	8.45
R1-IW4B	2	1,100	350		98	130						19.3		5.89					
R1-IW5*	1	110	395										1.51	25.2					
R1-IW5*	2	140				360								29.1					
R1-IW7*	1				7,500									14.4					
R1-IW7*	2	13,000	5,200	7,300	8,800	3,500							7.60	13.2				0.2 U	
R1-IW12 (NWC)	1		5,400											10.7					
R1-IW15 (NWC)	2													0.49				0.2 U	
R1-IW17*	1											32.2		1.25				0.2 U	
R1-IW17*	2											16.3		1.14				0.2 U	
Fox Avenue (SW side of street right-of-way)																			
B-58	1	0.2 U	23	6.3	5.7		12		145			62.0	50.2	16.8	44.0	58.9		57.8	5.03
B-59	2	2.5	200	7.8	1.7		8.7		3.29	26.8	8.01	1.06	3.29		18.6			9.04	
B-60	1	4 **U**	0.2 U	1.4	12	15	38		52.0			47.6	134	78.2	7.80	0.2 U		9.46	
B-61	2	450	1,800	1,200	3,900	950	710		17.4	2.77	1.69	637	1,100	169	35.8	25.5		0.2 U	
B-62	1				49		1,400		0.2 U					0.2 U					
B-63	2				10,000 J		66		65.3					1.41				1.54	
B-77	1								0.934					0.2 U					
B-78	2								30.0					0.2 U					

Table A-5. Vinyl Chloride Concentrations

Well/Seep	WBZ	Concentration of Vinyl Chloride (ug/L) (CUL = 2.4 ug/L)																	
		Prior to Implementation of CAP (2009-2010)						*After Implementation of CAP (2014-2019)*											
Sampling Interval:		Jan 2009	Apr-Jul 2009	Oct 2009	Jan-Feb 2010	Apr-Jun 2010	Oct-Nov 2010	Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Seattle Boiler Works																			
MW-03	1			12	16	26						100	36.5	6.16					
MW-04	2			2,500	3,900	3,200						0.90	14.9	122	0.7				
MW-05	1			100										0.2 U				0.2 U	
MW-06	2			28										4.33	1.87		0.2 U	0.2 U	0.2 U
R2-IW1*	1			170	810	250						416		180	55.2		15.0	149	0.2 U
R2-IW1*	2			2,700	940	280						582		265	64.2		17.7	244	0.2 U
R2-IW2*	1			170		230						0.96		8.13					
R2-IW2*	2			4,500		1,100						2.03		7.55					
R2-IW8	2											8.98		2.20				0.2 U	
R2-IW9	1													41.9					
R2-IW10	1													1.90			0.2 U		
R2-IW11	1											13.9							
Myrtle Street																			
B-33A	2	5,000	8,100	4,200	1,800	5,500						0.66				2.09		5.13	0.2 U
B-35	2				5,000									0.2 U				2.60	0.501
B-64	1	20	1.7	7.84	12							47.7		17.1		5.66		4.82	4.56
B-65	2	9,800	260	1,800	5,800							347		3.42				0.2 U	
R2-IW3*	1				2,100									11.8		0.2 U			
R2-IW3*	2	7,800		0.2 U	8,500	4,300						80.0		8.01		0.2 U			
R2-IW4	2	90	2,400	720								1.25		0.58					
R2-IW6	2	4,200	5,700	180	520	240								2.77					
Seeps																			
S-2	--		0.2 U						0.2 U			30.9		7.39		4.35		0.2 U	
S-13 (Calibre S-3)	--		1,400						372			7.49		27.1		13.3		11.7	2.88
S-3b	--								136			72.8		46.4		10.9		39.8	3.89
S-16 (Calibre S-4)	--		0.2 U						0.2 U			0.2 U		0.2 U					

(Fox Ave) = One well traditionally included in the Fox Avenue ("Row 1") area, but is on the upgradient side of the CPOC for groundwater.
(NWC) = Wells traditionally included in Northwest Corner area, but are on the downgradient side of the CPOC for groundwater.
WBZ = Water bearing zone (1 = shallow, 2 = deep; 2s = shallower WBZ-2 at 35 ft, 2d = deeper WBZ-2 at 55 ft)
U = Non-detected at that concentration (bolded where ND value exceeds the CUL)
* Individual wells with two different sampling depths
For field duplicate samples, only the higher concentration is reported in this table.
Gray highlighted concentrations exceed the vinyl chloride cleanup level of 2.4 ug/L (before implementation of CAP).
Yellow highlighted concentrations exceed the vinyl chloride cleanup level of 2.4 ug/L (after implementation of CAP).
Blank cells represent wells/seeps that were not sampled during this time interval.

Table A-6. Total Chlorinated Volatile Organic Compound Concentrations

Well/Seep	WBZ	Concentration of Total CVOCs (ug/L) (RL = 250 ug/L)																
		Prior to Implementation of CAP (2009-2010)						*After Implementation of CAP (2014-2019)*										
Sampling Interval:		Jan 2009	Apr-Jul 2009	Oct 2009	Jan-Feb 2010	Apr-Jun 2010	Oct-Nov 2010	Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Wells Located Upgradient of the Groundwater CPOC																		
Main Source Area																		
MW-15D	2								972	936	6,530	23.8	0.405	10.0	18.2	42.0		1 U	
MW-16D	2								6,930	2,780	6,760	79.4	1.70	1 U	18.1	3.42		22.5	
MW-17D	2								124	21.4	24.6	7.12	2.56	2.13	1 U	0.235		1 U	
MW-18S	1								920	1,970		212	120	243	912	466		783	25.9
R0-IW1D	2							951											
R0-IW2D	2							2,840	11.7	1 U	21.1	129	136	24.8	43.1	47.7		50.1	365
R0-IW3D	2							370											
R0-IW4D	2							193											
R0-IW4S	1							738											
R0-IW5D	2							50.5											
R0-IW5S	1							384											
R0-IW6D	2							1,220	8.13	8.72	26.6	174		21.6		33.0		30.5	39.7
R0-IW6S	1							857 J											
R0-IW7D	2							369											
R0-IW7S	1							506											
R0-IW8D	2							1,480											
R0-IW8S	1							821											
R0-IW9D	2							2,560											
R0-IW9S	1							803	844			106	13.7	1 U	1.01			1 U	
R0-IW10D	2							1,970											
R0-IW10S	1							539											
R0-IW11D	2							599											
R0-IW11S	1							538 J											
R1-IW2 (Fox Ave)	2	980	467	144	202							0.86		0.44					
Loading Dock																			
R0-IW22 (35)*	2s							3.30											
R0-IW22 (55)*	2d							2.70											
R0-IW23 (35)*	2s							18.3											
R0-IW23 (55)*	2d							24.9											
R0-IW24 (35)*	2s							90.5											
R0-IW24 (55)*	2d							102											
R1-IW21	1								105					13.2					
MW-19D	2								45.8										

Table A-6. Total Chlorinated Volatile Organic Compound Concentrations

Well/Seep	WBZ	Concentration of Total CVOCs (ug/L) (RL = 250 ug/L)																	
		Prior to Implementation of CAP (2009-2010)						*After Implementation of CAP (2014-2019)*											
Sampling Interval:		Jan 2009	Apr-Jul 2009	Oct 2009	Jan-Feb 2010	Apr-Jun 2010	Oct-Nov 2010	Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Northwest Corner																			
NW1-1	1				1,680				157					259	143	273		387	63.2
NW1-2	1				750				139										
R1-IW10	1													5.78					
Whitehead (Seattle Iron & Metals Yard)																			
B-45	2	5,050							2,050	18,100	5,140	3,910	218	5.92	49.9			1 U	
B-49	1								644	1,240		859	204	265	172	125		84.4	12.4
MW-07	1	368												184		171		60.6	49.8
MW-08	2	310												67.0				16.9	
MW-09	1	3,980							1,230			1,140	1,250	1,250	1,020	628		620	2.26
MW-10	2	30,200					3,580		7,840	8,320	5,660	2,270	915	112	39.6	8.92		1.60	
Wells/Seeps Located Within the Downgradient Groundwater Plume CAA																			
Fox Avenue (NE side of street right-of-way)																			
B-18	1	3,850			1,440		419		319			169		22.2				4.27	
B-19	2	123			92.7				902			144		60.9				29.2	57.4
B-20A	1	42.4							1,450 J			1,500	1,180	168	15.5	43.6		27.5	7.43
B-21	2	1 U							5.41			1,180	293	69.3	40.2				
B-22 (NWC)	1				1,140				454					209	210	175		194	144
R1-IW3A	1	2,210		4,640								5.13		4.22					
R1-IW4A	1	5,810	4,920 J		13,100	2,760 J						86.2		6.92				12.2	17.5
R1-IW4B	2	2,230	395		185	150						20.4		8.42				1 U	
R1-IW5*	1	1,640												29.9					
R1-IW5*	2	912				1,280							1.51	33.9					
R1-IW7*	1				8,140									14.4					
R1-IW7*	2	14,300	5,330	7,470	9,720	4,530							7.60	13.2				1 U	
R1-IW12 (NWC)	1													35.4					
R1-IW15 (NWC)	2													7.10				1.12	
R1-IW17*	1											34.2		1.25				1 U	
R1-IW17*	2											18.9		1.14				1 U	
Fox Avenue (SW side of street right-of-way)																			
B-58	1	212	1,050	1,100 J	777		838		461			183	133	109	249	188		88.4	26.1
B-59	2	80	399	28.4	51.9		37.9 J		3.29	26.8	8.01	1.06	3.29	18.6				9.04	
B-60	1	61.7	45.9	98.4	85.8	52.1	966		1,570			731	620	185	7.80			9.46	
B-61	2	1,410	3,430	2,310	6,230	2,270 J	1,070 J		34.9	14.7	13.6	809	1,590	199	41.6	28.5		1 U	
B-62	1				251		3,230		8.58					1 U					
B-63	2				20,200 J		326		72.1					3.49				3.51	
B-77	1								31.5					1.72					
B-78	2								40.2					1 U					

Table A-6. Total Chlorinated Volatile Organic Compound Concentrations

Well/Seep	WBZ	Concentration of Total CVOCs (ug/L) (RL = 250 ug/L)																	
		Prior to Implementation of CAP (2009-2010)						*After Implementation of CAP (2014-2019)*											
Sampling Interval:		Jan 2009	Apr-Jul 2009	Oct 2009	Jan-Feb 2010	Apr-Jun 2010	Oct-Nov 2010	Feb-Mar 2014	May-Jun 2014	Oct 2014	Jan 2015	May 2015	Sep-Nov 2015	May 2016	Dec 2016	May 2017	Oct 2017	May 2018	Jun 2019
Seattle Boiler Works																			
MW-03	1			376	298	237 J						194	84.3	11.4					
MW-04	2			6,150	7,860	7,230 J						12.4	21.3	126	4.48				
MW-05	1			132										10.3				3.88	
MW-06	2			391										112	122		130	78.6	76.5
R2-IW1*	1			2,550	3,910	1,450						572		319	80.6		26.1	237	1 U
R2-IW1*	2			12,000 J	4,030	1,470						800		430	90.6		29.2	349	1 U
R2-IW2*	1			2,530		1,140						0.96		9.02					
R2-IW2*	2			11,900		3,730						2.03		8.44					
R2-IW8	2											13.8		5.04				1 U	
R2-IW9	1													54.8					
R2-IW10	1													5.88			1.44		
R2-IW11	1											22.4							
Myrtle Street																			
B-33A	2	7,100	11,300	7,500	2,630 J	7,100						8.89		23.9	22.8	5.09		9.37	1 U
B-35	2				6,220									2.21				2.60	0.501
B-64	1	178	171	229	83							232		43.5		17.5		11.3	9.11
B-65	2	32,800	773	3,300	11,200							418		7.58				3.68	
R2-IW3*	1				5,100									17.4		6.34			
R2-IW3*	2	19,900	11,400	818	14,500	9,720						94.3		13.8		6.38			
R2-IW4	2	107	3,910	1,120								5.79		3.91					
R2-IW6	2	5,400	5,810	440	700	355 J								6.22					
Seeps^																			
S-2	--		14						1.60			36.4		9.99		6.65		1 U	
S-13 (Calibre S-3)	--		3,210						458			22.0		40.4		26.0		24.2	5.34
S-3b	--								485			390		166		46.1		112	9.85
S-16 (Calibre S-4)	--		181						1 U			1 U		1 U					

(Fox Ave) = One well traditionally included in the Fox Avenue ("Row 1") area, but is on the upgradient side of the CPOC for groundwater.
(NWC) = Wells traditionally included in Northwest Corner area, but are on the downgradient side of the CPOC for groundwater.
WBZ = Water bearing zone (1 = shallow, 2 = deep; 2s = shallower WBZ-2 at 35 ft, 2d = deeper WBZ-2 at 55 ft)
U = Non-detected at that concentration
* Individual wells with two different sampling depths
^ Seep sample concentrations do not need to comply with this RL, but these results are added here for completeness.
For field duplicate samples, only the higher concentration is reported in this table.
Gray highlighted concentrations exceed the total CVOC remediation level of 250 ug/L (before implementation of CAP).
Yellow highlighted concentrations exceed the total CVOC remediation level of 250 ug/L (after implementation of CAP).
Blank cells represent wells/seeps that were not sampled during this time interval.

Appendix B
Wells and Seeps Recommended for Resampling

Table B-1. Wells and Seeps Recommneded for Resampling

Well/Seep	WBZ	Resample Well/Seep	Site-Wide Exceedances for Last Two Sampling Rounds That Trigger Resampling^		
			PCE (CUL)	VC (CUL)	Total CVOCs (RL)
Wells Located Upgradient of the Groundwater CPOC					
Main Source Area					
MW-15D	2	Yes		X	
MW-16D	2	Yes	X	X	
MW-17D	2				
MW-18S	1	Yes	X	X	X
R0-IW1D	2				
R0-IW2D	2	Yes		X	X
R0-IW3D	2				
R0-IW4D	2				
R0-IW4S	1				
R0-IW5D	2				
R0-IW5S	1				
R0-IW6D	2	Yes		X	
R0-IW6S	1				
R0-IW7D	2				
R0-IW7S	1				
R0-IW8D	2				
R0-IW8S	1				
R0-IW9D	2				
R0-IW9S	1				
R0-IW10D	2				
R0-IW10S	1				
R0-IW11D	2				
R0-IW11S	1				
R1-IW2 (Fox Ave)	2				
Loading Dock					
R0-IW22 (35)*	2s				
R0-IW22 (55)*	2d				
R0-IW23 (35)*	2s				
R0-IW23 (55)*	2d				
R0-IW24 (35)*	2s				
R0-IW24 (55)*	2d				
R1-IW21	1	Yes		X	
MW-19D	2				
Northwest Corner					
NW1-1	1	Yes		X	X
NW1-2	1				
R1-IW10	1	Yes		X	
Whitehead (Seattle Iron & Metals Yard)					
B-45	2				
B-49	1	Yes		X	
MW-07	1	Yes		X	
MW-08	2				
MW-09	1	Yes		X	X
MW-10	2	Yes			X

Table B-1. Wells and Seeps Recommneded for Resampling

Well/Seep	WBZ	Resample Well/Seep	Site-Wide Exceedances for Last Two Sampling Rounds That Trigger Resampling^		
			PCE (CUL)	VC (CUL)	Total CVOCs (RL)
Wells/Seeps Within the Downgradient Groundwater Plume CAA					
Fox Avenue (NE side of street right-of-way)					
B-18	1	Yes		X	
B-19	2	Yes		X	
B-20A	1	Yes		X	
B-21	2	Yes		X	
B-22 (NWC)	1	Yes	X	X	
R1-IW3A	1	Yes		X	
R1-IW4A	1	Yes		X	
R1-IW4B	2	Yes		X	
R1-IW5*	1	Yes		X	
R1-IW5*	2	Yes		X	
R1-IW7*	1	Yes		X	
R1-IW7*	2	Yes		X	
R1-IW12 (NWC)	1	Yes		X	
R1-IW15 (NWC)	2				
R1-IW17*	1				
R1-IW17*	2				
Fox Avenue (SW side of street right-of-way)					
B-58	1	Yes	X	X	
B-59	2	Yes		X	
B-60	1	Yes		X	
B-61	2	Yes		X	
B-62	1				
B-63	2				
B-77	1				
B-78	2				
Seattle Boiler Works					
MW-03	1	Yes		X	
MW-04	2	Yes		X	
MW-05	1	Yes	X		
MW-06	2	Yes	X		
R2-IW1*	1	Yes		X	
R2-IW1*	2	Yes		X	X
R2-IW2*	1	Yes		X	
R2-IW2*	2	Yes		X	
R2-IW8	2				
R2-IW9	1	Yes		X	
R2-IW10	1				
R2-IW11	1				
Myrtle Street					
B-33A	2	Yes		X	
B-35	2	Yes		X	
B-64	1	Yes		X	
B-65	2	Yes		X	
R2-IW3*	1	Yes		X	
R2-IW3*	2	Yes		X	
R2-IW4	2				
R2-IW6	2	Yes		X	

Table B-1. Wells and Seeps Recommneded for Resampling

Well/Seep	WBZ	Resample Well/Seep	Site-Wide Exceedances for Last Two Sampling Rounds That Trigger Resampling^		
			PCE (CUL)	VC (CUL)	Total CVOCs (RL)
Seeps					
S-2	--	Yes		X	
S-13 (Calibre S-3)	--	Yes		X	
S-3b	--	Yes		X	
S-16 (Calibre S-4)	--				
Total Wells to Resample:		45			
Total Seeps to Resample:		3			

Notes:

(Fox Ave) = One well traditionally included in the Fox Avenue ("Row 1") area, but is on the upgradient side of the CPOC for groundwater.

(NWC) = Wells traditionally included in Northwest Corner area, but are on the downgradient side of the CPOC for groundwater.

WBZ = Water bearing zone (1 = shallow, 2 = deep; 2s = shallower WBZ-2 at 35 ft, 2d = deeper WBZ-2 at 55 ft)

* Individual wells with two different sampling depths

^ These site-wide exceedances of RLs or CULs are determined for the entire site area, for the last two sampling rounds specific to each well, regardless of location with respect to CPOC, considering that upgradient contaminated groundwater may migrate to the CPOC without further actions.