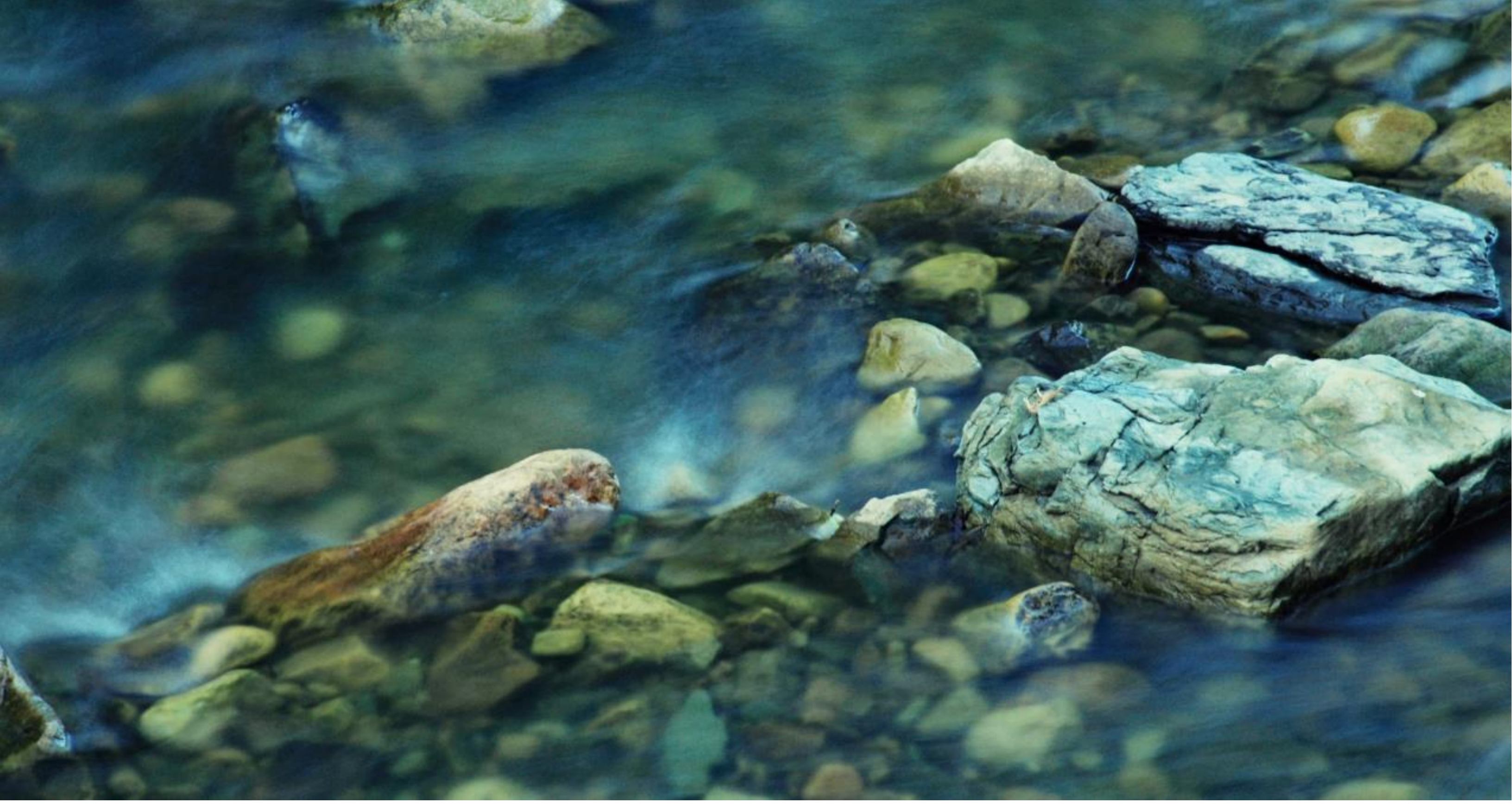

October 2021
Carson Cleaners Site
Facility ID: 15518216; Cleanup Site ID: 14878

Remedial Investigation Work Plan

Prepared for Tahn Associates, LLC

October 2021
Carson Cleaners Site
Facility ID: 15518216; Cleanup Site ID: 14878

Remedial Investigation Work Plan

Prepared for
Tahn Associates, LLC
664 164th Place Northeast
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Project Number: 202280-01.02
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ABBREVIATIONS

µg/L	micrograms per liter
µg/m³	micrograms per cubic meter
AO	Agreed Order No. DE 19805
bgs	below ground surface
Carson Cleaners	Carson Cleaners, Inc.
Chevron 90129 site	Chevron gas station, Facility/Site No. 8196648, CSID No. 10632
CSID	Cleanup Site Identification
CVOC	chlorinated volatile organic compound
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
FS	feasibility study
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mixed-use building	Mixed commercial and residential units – 4557 University Way Northeast, Seattle, Washington
MRL	method reporting limit
MTCA	Model Toxics Control Act
PCE	tetrachloroethylene
PID	photoionization detector
PLP	potentially liable party
QAPP	*Quality Assurance Project Plan*
RCW	Revised Code of Washington
RI	remedial investigation
RI Work Plan	*Remedial Investigation Work Plan*
SAP	*Sampling and Analysis Plan*
Site	4701 Brooklyn Avenue Northeast, Seattle, Washington
SPU	Seattle Public Utilities
Tahn	Tahn Associates, LLC
TCE	trichloroethylene
TCP	Toxics Cleanup Program
TEE	terrestrial ecological evaluation
UST	underground storage tanks
VI	vapor intrusion
VI Work Plan	*Vapor Intrusion Evaluation Final Work Plan*

VI Work Plan Addendum	*Vapor Intrusion Evaluation, Work Plan Revision 1*
VOC	volatile organic compound
WAC	Washington Administrative Code

1 Introduction

This *Remedial Investigation Work Plan* (RI Work Plan) has been prepared for Tahn Associates, LLC (Tahn), in accordance with the Washington State Department of Ecology (Ecology) Agreed Order (AO; No. DE 19805; Ecology 2021) to conduct a remedial investigation (RI) and feasibility study (FS) and prepare a draft Cleanup Action Plan for the property located at 4701 Brooklyn Avenue Northeast, 98105, in Seattle, Washington (Site; Figure 1). The building on the property was historically operated by Carson Cleaners, Inc., a dry cleaner, and the property is currently owned by Tahn. In a letter dated November 7, 2019, Ecology requested Tahn to investigate potential vapor intrusion (VI) risks on the property and at three off-property locations (Ecology 2019). Following completion of the requested VI investigation, Ecology and Tahn executed the AO. The RI Work Plan is the first deliverable to be prepared pursuant to the AO.

Dry-cleaning operations began on the property in the early 1960s and ended in approximately 2014. Trichloroethylene (TCE), a solvent commonly used for dry cleaning, parts cleaning, and many other commercial and industrial uses, was measured above cleanup levels in soil and groundwater at the property (Anchor QEA 2021) and at the Chevron 90129 gas station (Facility/Site No. 8196648, Cleanup Site Identification [CSID] No. 10632) (Chevron 90129 site), located at 4700 Brooklyn Avenue Northeast, indicating potential releases of chlorinated volatile organic compounds (CVOCs) during operations of Carson Cleaners and the Chevron 90129 gas station. In addition, there are multiple historical gas/service stations and dry-cleaning operations in the vicinity of the respective properties that may have contributed to the subsurface contamination (Figure 2).

1.1 Purpose and Objectives

The purpose of the RI Work Plan is to compile historical information, identify existing usable data, and develop a preliminary conceptual site model to identify data gaps and the means to acquire data to address them. The initial objective of the RI is to summarize all relevant environmental data and present an updated conceptual site model that defines the nature and extent of contamination, transport mechanisms, and potential exposure pathways and receptors associated with the Site in the applicable regulatory context. The RI will inform the development and evaluation of remedial alternatives in the FS.

1.2 Designated Project Roles and Responsibilities

As defined in the AO, Tahn has been identified by Ecology as a potentially liable party (PLP). The AO identifies the following Designated Project Coordinators:

Designated Project Coordinator for Ecology:
Dale Myers
Washington Department of Ecology
15700 Dayton Avenue North
Shoreline, Washington, 98133
Phone: (206) 594-0087
Email: damy461@ecy.wa.gov

Designated Project Coordinator for PLP:
Halah Voges
Principal Engineer
Anchor QEA, LLC
1201 3rd Avenue, Suite 2600
Seattle, Washington, 98101
Phone: (206) 903-3303
Email: hvoges@anchorqea.com

1.3 Regulatory Framework

The work outlined within this RI Work Plan will be completed as a requirement of the AO, pursuant to the Model Toxics Control Act (MTCA) Revised Code of Washington (RCW) 70A.305 and Washington Administrative Code (WAC) 173-340. At this time, the CVOC plume at the Site is considered to be comingled with the Chevron 90129 site petroleum-related contamination. However, per the AO, Tahn and previous property owners are not responsible for observed hydrocarbon releases and associated contamination. Therefore, this RI Work Plan will be limited to characterization of releases that may have occurred at the Carson Cleaners property, namely CVOCs. It is assumed that releases of petroleum hydrocarbons from adjacent sites, including Chevron's, are comingled with the CVOCs in the groundwater along Northeast 47th Street. As such, the remedial alternatives to be developed in the FS must be compatible with the remedial action(s) to be carried out by others for the remediation of the petroleum-related contamination.

All geologic and hydrogeologic work performed during this RI will be under the supervision and direction of a geologist or hydrogeologist licensed by the State of Washington or under the direct supervision of an engineer registered by the State of Washington, except as otherwise provided for by RCW 18.220 and 18.43. All engineering work performed during this RI will be under the direct supervision of a professional engineer registered by the State of Washington, except as otherwise provided for by RCW 18.43.130. All construction work performed during this RI will be under the direct supervision of a professional engineer or a qualified technician under the direct supervision of a professional engineer. The professional engineer will be registered by the State of Washington, except as otherwise provided for by RCW 18.43.130. Any documents submitted containing geologic, hydrogeologic, or engineering work will be under the seal of an appropriately licensed professional as required by RCW 18.220 and 18.43. Ecology will be notified, as necessary, of the identities of State of Washington licensed professionals supervising work during this RI.

1.4 Document Organization

This Work Plan includes seven sections and five appendices. The main text is organized as follows:

- **Section 1 – Introduction** presents information regarding the general site location, key team members, and the purpose and objectives of the project.
- **Section 2 – Site Background** provides information regarding the location, land use history, general topography, and hydrogeology, and summarizes previous environmental investigations.
- **Section 3 – Preliminary Conceptual Site Model** integrates available information to understand how hazardous substances move through the Site and identify potential exposure pathways and receptors.
- **Section 4 – Assessment of Data Gaps** identifies data gaps and the proposed data collection needed to address those gaps.
- **Section 5 – Remedial Investigation Approach and Rationale** describes the proposed RI scope of work.
- **Section 6 – Reporting** provides a brief summary of the proposed schedule and reporting.
- **Section 7 – References** provides a list of references used within the RI Work Plan.

2 Site Background

2.1 Property Description

The property is located northwest of the intersection of Brooklyn Avenue Northeast and Northeast 47th Street in Seattle, Washington and is King County parcel No. 881740-0125, which covers 0.38 acre (Figure 1). The area is zoned as SM-U 75-240, which allows for mixed residential and commercial businesses with typical street-front businesses on the lower level and residential units above.

The building on site is currently operated as the Meraki Tea Bar, a bubble tea shop on the lower floor. There are two residential apartment units above the tea bar. As of the most recent monitoring event conducted by Anchor QEA, tenants occupied the apartments above the tea bar. Proposed future uses at the property are not currently known.

2.2 Property Ownership History and Land Use

As identified in Section 1, Tahn is the current owner of the property. Tahn acquired the property through a Special Warranty Deed dated November 29, 2012, from an ownership group listed as Gary W. Rickert and the Wayne A. Rickert Testamentary Trust. The earliest record listed is a Special Warranty Deed dated December 3, 1953, from Washington Mutual Savings Bank to Walter H. and Nellie Helen Rickert. King County tax records indicate that a private residence occupied the property at that time. In the early 1960s, the residence was replaced by the existing building. Carson Cleaners apparently began dry-cleaning operations as a tenant in the new structure in the early 1960s and continued operations under the same name until approximately 2014, when the business was closed. Carson Cleaners is listed by the Washington State Secretary of State (UBI 600068512) as having been incorporated on March 24, 1972, and administratively dissolved on July 1, 2015 (Kennedy/Jenks 2019).

2.3 Physical Setting

2.3.1 Topography and Surface Features

The property is relatively flat and is located at an elevation of approximately 207 feet mean sea level. The area topography slopes slightly south and east, away from the existing building where stormwater is collected in street drains, which are independent of the sanitary sewer system in the area. The area is typical of urban developed land, primarily consisting of asphalt and concrete surfaces with little or no vegetation. The properties immediately adjacent to Carson Cleaners are similarly developed, and several of the adjacent properties are currently under construction and being redeveloped. Stormwater management at these properties may vary as redevelopment continues.

2.3.2 Geology and Hydrogeology

Puget Sound surface geology is dominated by repeated advances and recessions of glacial ice, which started approximately 750,000 years ago. Shallow soils at the Site consist of deposits from the last period of glaciation, Vashon Stade of the Fraser Glaciation Age. Soils at the Site are mapped as Vashon ice-contact deposits (Qvi), which consist of irregularly shaped bodies of glacial outwash-like deposits with lenses of lodgment till (Aspect 2016).

On July 24, 2020, at the direction of Anchor QEA's field geologist, Holt Services, Inc., advanced a soil boring using a Geoprobe drill rig. Previous to this work, no other soil borings had been completed on the property. The boring was advanced to 30 feet below ground surface (bgs). Soils collected were visually inspected by the Anchor QEA field geologist. The observed lithology consists of approximately 13 feet of gravelly sand fill-like material, followed by a layer of poorly graded sand that appeared to be a native contact. Below the poorly graded sand was a silty sand unit extending to 25 feet bgs. Another poorly graded sand layer followed the silty sand, and below the poorly graded sand, a gravelly sand extended to the end of the boring.

The observed water level at time of drilling was 22 feet bgs in the silty sand unit. Based on information collected from the Chevron 90129 site, groundwater flow is inferred to be predominantly southeast (Aspect 2016). However, seasonal fluctuations tend to affect the groundwater flow direction, changing it to the northeast at certain times of the year (Arcadis 2020). Additional information may be required to determine the groundwater depths, general flow direction, and seasonal variations across the Carson Cleaners site. It is Anchor QEA's understanding that dewatering was implemented at the Chevron 90129 site as a remedial activity and to facilitate development construction. The effect of this dewatering (or other dewatering) on historical and current groundwater flows has not yet been evaluated.

A review of groundwater characterization records in the vicinity indicates the potential presence of a deeper confined water-bearing zone in the area. Based on this information, characterization of deeper lithology on the property is required to determine the presence of and continuity with any deeper water-bearing zone, confined or otherwise.

The climate is characterized by mild temperatures and a rainy season, with considerable cloudiness during the winter months. Average winter daytime temperatures are in the 40s (degrees Fahrenheit), and nighttime readings are in the 30s. During the summer, daytime temperatures are usually in the 70s, with nighttime lows in the 50s. The middle of the dry season occurs in July or early August, with July being the driest month of the year. The rainy season extends from October to March, with December normally the wettest month. However, precipitation is rather evenly distributed throughout the winter and early spring months. More than 75% of the yearly precipitation falls during the rainy season. At the King County Airport (located approximately 8 miles south), average annual precipitation is 37 inches (Aspect 2016).

2.3.3 Utilities

The City of Seattle "DSO Water & Sewer Map" database (City of Seattle 2021) was queried to identify Site water, stormwater, and sewer piping (Figure 3). The query revealed a single connection to the Seattle Public Utilities (SPU) sanitary drainage main that conveys flows from north to south on Brooklyn Avenue Northeast. The on-property sewer appears to bifurcate into two side sewers on-property. A single catch basin in the southwestern parking lot conveys stormwater to the SPU Drainage Main that flows from east to west along Northeast 47th Street. A single water service line connects the building to the main under Brooklyn Avenue.

2.4 Previous Environmental Investigations and Results

This section summarizes the investigation conducted by Tahn and those conducted by others on adjacent sites. As part of an environmental cleanup of the Chevron 90129 site previously discussed, CVOCs were discovered in the southwest portion of the Chevron property and its perimeter along Northeast 47th Street. As described in Section 1, Ecology requested Tahn to investigate potential VI risks on the property and at three off-property locations (Ecology 2019).

2.4.1 On-Property

Tahn has completed two on-property investigations resulting from the 2019 Ecology letter (Ecology 2019). A *Vapor Intrusion Evaluation Final Work Plan* (VI Work Plan) was prepared on behalf of Tahn by Anchor QEA and approved by Ecology on January 14, 2020 (Anchor QEA 2020a). Reconnaissance of the Tahn property (and off-site buildings; Figure 4) was required to select the sampling locations, and an addendum to the VI Work Plan, *Vapor Intrusion Evaluation, Work Plan Revision 1* (VI Work Plan Addendum; Anchor QEA 2020b) was submitted to Ecology dated June 30, 2020. The VI Work Plan Addendum described the reconnaissance conducted on May 28, 2020, and proposed target sample locations for Ecology's review and approval. Immediately following Ecology's approval of the VI Work Plan Addendum on July 7, 2020, sampling coordination activities commenced to implement utility locating, sampling, and analysis in accordance with the approved VI Work Plan and VI Work Plan Addendum. The activities and results of the investigation are detailed in a memorandum dated October 5, 2020 (Anchor QEA 2020c), depicted in Figure 7, and summarized as follows:

- Installation of sub-slab soil gas vapor pins and sampling of sub-slab soil gas, indoor air, and outdoor ambient air were performed on July 23, 2020, at the target locations.
- Shallow exterior soil gas drilling activities and ambient air sampling were performed on July 24, 2020, at target locations.

- The VI investigation indicated no short-term risk from exposure to TCE due to VI on the property.
- Tetrachloroethylene (PCE) was detected in indoor air in the former Carson Cleaners building below the MTCA Method B (unrestricted land use) criterion.
- PCE and TCE were detected in the sub-slab sample below the residential short-term VI screening levels for sub-slab soil gas.
- Utility locates were completed prior to the start of VI investigation work. Due to the urban environment, utilities limited the locations where drilling was feasible. Future exterior investigations are likely to be limited, and proposed locations are likely to be adjusted based on utility locates at the start of future work.

Concurrent with the VI Work Plan (Anchor QEA 2020a) implementation, an opportunistic single direct-push reconnaissance well was installed in the southeast corner of the Carson Cleaners parking lot. The installation details, the results of soil testing, and two rounds of reconnaissance groundwater testing from well CC-MW-01 were reported in a February 2021 memorandum to Ecology (Anchor QEA 2021).

Soil samples are depicted in Figure 5 and summarized as follows:

- PCE was detected in all four soil samples at concentrations ranging from 2.3 to 13 milligrams per kilogram (mg/kg), all exceeding the MTCA Method A soil screening level for unrestricted land use (0.05 mg/kg).
- TCE was detected in the soil samples collected below the water table at concentrations of 0.0063 mg/kg and 0.025 mg/kg, respectively, below the MTCA Method A soil screening level for TCE (0.03 mg/kg).
- No other volatile organic compounds (VOCs) were detected above the laboratory reporting limit in any sample.
- Gasoline-range hydrocarbons were detected at 29 feet bgs in the saturated zone at a concentration of 11 mg/kg. This result does not exceed the MTCA Method A soil screening level for unrestricted land use (30 mg/kg). No other petroleum hydrocarbons were detected above the laboratory reporting limit in any sample.

Reconnaissance groundwater results are depicted in Figure 6 and summarized as follows:

- Gasoline-range hydrocarbons were detected during both monitoring events (August 14 and November 18, 2020) at concentrations of 1,860 and 2,050 micrograms per liter (µg/L), respectively. Both of these results exceed the MTCA Method A groundwater screening level of 800 µg/L. No other petroleum hydrocarbons were detected above the laboratory reporting limit in any sample.

- PCE and TCE were detected during both monitoring events (August 14 and November 18, 2020) at concentrations ranging from 2,100 to 2,700 µg/L and 100 to 140 µg/L, respectively. PCE exceeded the MTCA Method A groundwater cleanup level of 5 µg/L, and TCE exceeded the MTCA Method B screening level of 0.54 µg/L. No other VOCs were detected above the laboratory reporting limit in any sample.

2.4.2 Adjacent Properties

This section provides a brief summary of environmental investigations and cleanup actions at adjacent properties.

2.4.2.1 Tahn Off-Property VI Work Plan Summary

As detailed in Section 2.4.1, Tahn and Ecology developed the VI Work Plan (Anchor QEA 2020a) to characterize potential short-term impacts at three off-site buildings (Figure 5 and Figure 7). This subsection describes the investigation methods and results for each subject property.

- **Christ Episcopal Church, 4548 Brooklyn Avenue Northeast, Seattle, Washington**
  - Installation of sub-slab soil gas vapor pins and sampling of sub-slab soil gas and indoor air were performed on July 23, 2020.
  - Shallow exterior soil gas drilling activities and ambient air sampling were performed on July 24, 2020.
  - PCE was detected at a concentration of 2.3 micrograms per cubic meter ($\mu g/m^3$) in the indoor air sample. All other analytes in the indoor air sample were below laboratory reporting limits.
  - PCE was detected at a concentration of 4.1 $\mu g/m^3$ in the sub-slab gas sample. All other analytes in the sub-slab gas sample were below laboratory reporting limits.
  - All analytes were below laboratory reporting limits in the shallow soil gas sample.
- **Mixed Commercial and Residential Units – 4557 University Way Northeast, Seattle, Washington (mixed use building)**
  - Installation of sub-slab soil gas vapor pins and sampling of sub-slab soil gas and indoor air were performed on July 23, 2020.
  - All analytes in the indoor air sample were below laboratory reporting limits.
  - PCE was detected at a concentration of 18 $\mu g/m^3$ in the sub-slab gas sample. All other analytes in the sub-slab gas sample were below laboratory reporting limits.
- **Bank of America Financial Center – 4701 University Way Northeast, Seattle, Washington**
  - Shallow exterior soil gas drilling activities and ambient air sampling were performed on July 24, 2020.
  - PCE was detected at a concentration of 1.2 $\mu g/m^3$ in the indoor air sample. All other analytes in the indoor air sample were below laboratory reporting limits.

- PCE was detected at a concentration of 160 µg/m^3 in the shallow soil gas sample. All other analytes in the shallow soil gas sample were below laboratory reporting limits.

2.4.2.2 BP Brooklyn (Facility ID 4819383), 4557 Brooklyn Avenue Northeast, Seattle, Washington – Remediation Summary

The remediation history of this site was detailed by Cardno in the *Revised Corrective Action Report* (Cardno 2019a) and is summarized as follows:

- Remedial excavation was implemented at the property in order to remove residual petroleum contaminated soils and remediate groundwater.
- The excavation required the demolition of the station building.
- Three 2,000-gallon underground storage tanks (USTs), historically operated by ExxonMobil, were located under the former gas station building and removed during the excavation.
- The excavation was backfilled with certified clean import fill and compacted. The area was finished to grade with pervious asphalt.
- Upon completion of excavation and restoration activities, four compliance groundwater monitoring wells were installed within the excavation extents to evaluate post-excavation soil and groundwater conditions.
- Post-excavation monitoring indicated soil and groundwater exceedances of MTCA Method A screening levels, which were treated with chemical injections.
- Following chemical injections, routine groundwater monitoring and sampling demonstrated that groundwater across the site is less than the MTCA Method A screening levels (Cardno 2019b).
- On April 16, 2021, a *Request for No Further Action-Likely Determination* was submitted to Ecology (Cardno 2019b). The request is under review and pending decision.

2.4.2.3 Chevron 90129 Site (Facility ID 81966648), 4700 Brooklyn Avenue Northeast, Seattle, Washington – Remediation Summary

The remediation history of this site is presented as follows (Arcadis 2020):

- Petroleum hydrocarbon contamination was first encountered at the site in December 1989 during the removal of three gasoline USTs (two 12,000-gallon steel tanks and one 5,000-gallon steel tank), two pump islands, and associated fuel lines from the northern portion of the site. In addition, an undocumented, abandoned-in-place 1,000-gallon UST was discovered and removed from the southern portion of the site and along the eastern wall of the most recent UST pit.
- A 1990 site investigation led to the installation of air sparging and soil vapor extraction systems. There is no record of the system deactivation dates.
- Several site investigations continued through 2016 to monitor and delineate the contamination.

- In February 2017, three 12,000-gallon USTs were removed, and seven confirmation soil samples from the UST excavation and three samples from stockpiled pea gravel were collected. All soil analytical results were less than the MTCA Method A soil screening levels, except for one sample where benzene was detected at a concentration of 0.073 mg/kg.
- Remediation is ongoing at the property. Per a letter from Ecology on November 7, 2019 (Ecology 2019), it is understood that the hydrocarbon plume that originated from this property is comingled with the Carson Cleaners CVOC plume. Tahn is not responsible for remediation of the petroleum-related impacts to groundwater and soil.

2.4.3 Summary of Existing Environmental Data

Based on the results of the previous environmental investigations on the property and adjacent to the property, this section provides a summary of the laboratory analytical results and other pertinent notes. This RI Work Plan and the remedial efforts at the Site are focused solely on CVOCs. Therefore, this section is inclusive of CVOC data only. Existing petroleum-related contamination data have been omitted for the purpose of clarity.

2.4.3.1 Soil

This section describes available recent and relatively high-quality soil data from on- and off-property as depicted in Figure 5.

- **On-Property:** Soils collected were visually inspected and field screened with a 11.7 electron volt lamp photoionization detector (PID) by the Anchor QEA field geologist. Four soil samples were collected from the soil boring based on field screening with a PID; two samples were collected above the groundwater table (14.5 and 18 feet bgs) and two samples were collected below the groundwater table (24 and 29 feet bgs; Anchor QEA 2021). A summary of the soil monitoring results is as follows, reported in Tables 1 through 8 and depicted in Figure 5:
  - PCE was detected in all four soil samples at concentrations ranging from 2.3 to 13 mg/kg, all exceeding the MTCA Method A soil screening level of 0.05 mg/kg for unrestricted land use.
  - TCE was detected in the soil samples collected below the water table at concentrations of 0.0063 and 0.025 mg/kg, which is below the MTCA Method A soil screening level for TCE of 0.03 mg/kg.
  - No other VOCs were detected above the laboratory reporting limit during the VI investigation work.
- **Off-Property:** Soil samples were also collected by the Chevron 90129 site during their RI and well installation. Samples were collected at four locations (MW-20, MW-21, MW-22, and MW-23) at various depths. A summary of the soil monitoring results is as follows and depicted in Figure 5:

- PCE was detected in the saturated zone at MW-21 at a concentration of 0.18 mg/kg, which was the highest concentration of PCE detected in off-property soil samples.
- PCE was detected in the vadose zone at MW-20 at concentrations ranging from 0.068 to 0.075 mg/kg. Vadose zone soil samples were not collected at the other locations.
- TCE was detected in the saturated zone at MW-21 at concentrations ranging from 0.063 to 0.38 mg/kg, which was the highest concentration of TCE detected in off-property soil samples.
- All other analytes were below MTCA screening levels.

2.4.3.2 Groundwater

This section details existing recent and relatively high-quality groundwater data from on- and off-property as depicted in Figure 6.

- **On-Property:** A groundwater monitoring well was installed following the completion of the opportunistic soil boring during the VI work. The well was screened from 20 to 30 feet bgs. The groundwater monitoring well was sampled twice after installation, the first event on August 14, 2020, and the second event on November 18, 2020. Water quality parameters were monitored during purging using a YSI Pro DSS water quality meter connected to a flow-through cell (Anchor QEA 2021). A summary of the monitoring results is as follows and depicted in Figure 6:
  - PCE and TCE were detected during both monitoring events (August 14 and November 18, 2020) at concentrations ranging from 2,100 to 2,700 µg/L and 100 to 140 µg/L, respectively. PCE exceeded the MTCA Method A groundwater screening level of 5 µg/L, and TCE exceeded the MTCA Method B screening level of 0.54 µg/L. No other VOCs were detected above the laboratory reporting limit in any sample.
- **Off-Property:** As part of an environmental cleanup of the Chevron 90129 site, CVOCs were discovered in the southwest portion of the Chevron property and along the perimeter of Northeast 47th Street. A brief summary is as follows, and a figure with all results was included in the Ecology letter (Ecology 2019):
  - The data indicates PCE, TCE, and vinyl chloride were detected above MTCA Method A groundwater screening levels at several wells.
  - PCE ranged from 7 to 260 µg/L, which exceeds the MTCA Method A groundwater screening level of 5 µg/L.
  - TCE ranged from 13 to 2,200 µg/L, which exceeds the MTCA Method B groundwater screening level of 0.54 µg/L.
  - Vinyl chloride ranged from 5 to 150 µg/L, which exceeds the MTCA Method B groundwater screening level of 0.03 µg/L.
  - Cis-1,2-dichloroethene ranged from 52 to 1200 µg/L, which exceeds the MTCA Method B screening level of 16 µg/L.

- Trans-1,2-dichloroethene was detected in one well at a concentration of 230 µg/L, which exceeds the MTCA Method B screening level of 160 µg/L.

As a result of the discovery, quarterly groundwater monitoring of these wells has been completed by the Chevron 90129 site. A brief summary of the 2020 quarterly monitoring, along with the final monitoring event at MW-26, is as follows, with all available 2020 quarterly monitoring data illustrated in Figure 6:

- The highest concentration of PCE was detected in MW-28 at 301 µg/L, which exceeds the MTCA Method A groundwater screening level of 5 µg/L.
- The highest concentration of TCE was detected in MW-27 at 1,170 µg/L, which exceeds the MTCA Method B groundwater screening level of 0.54 µg/L.
- The highest concentration of vinyl chloride was detected in MW-25 at 92.7 µg/L, which exceeds the MTCA Method B groundwater screening level of 0.03 µg/L.
- The highest concentration of cis-1,2-dichloroethene was detected in MW-25 at 1,170 µg/L, which exceeds the MTCA Method B screening level of 16 µg/L.
- Trans-1,2-dichloroethene was not detected in exceedance of the MTCA Method B screening level of 160 µg/L during the 2020 quarterly sampling events.
- MW-26 was decommissioned after the August 2019 sampling event. Results from this event indicate TCE, cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride were in exceedance of MTCA screening levels.

2.4.3.3 Vapor

The installation of sub-slab soil gas vapor pins and sampling of sub-slab soil gas and indoor air were performed on July 23, 2020, at target locations at four properties, which include Carson Cleaners, Christ Episcopal Church, Bank of America, and the mixed-use building. Sub-slab soil gas vapor pins were not approved for installation at the Bank of America property (Anchor QEA 2020b). A summary of the results is as follows, and results are depicted in Figure 7:

- **Indoor Air Results**
  - None of the indoor air samples exceeded MTCA Method B Indoor air screening levels (unrestricted) or the TCE Indoor Air Action Level for short-term exposures.
  - The most frequently detected analyte was PCE, which was detected above the method reporting limit (MRL) at three of the four locations, ranging from 1.2 to 3.7 µg/m^3. PCE was not detected in the mixed-use building.
  - Cis-1,2-dichloroethene and TCE were detected between the MRL and the method detection limit (MDL), at 0.22 and 0.12 µg/m^3, respectively, in the Bank of America building (these data were qualified as estimates).
  - Vinyl chloride and trans-1,2-dichloroethene were not detected above the MDL in any of the buildings.

- **Sub-Slab Soil Gas Results**
  - PCE was detected at all three sub-slab sample locations, ranging from 4.1 to 61 $\mu g/m^3$, which is below the Method B screening level of 320 $\mu g/m^3$. Based on the indoor air results, these sub-slab concentrations do not pose a long-term, chronic VI risk.
  - TCE was detected at one sub-slab sample location (SS-03) at a concentration of 2.6 $\mu g/m^3$, which is below the Method B screening level of 320 $\mu g/m^3$.
  - Vinyl chloride was detected between the MRL and MDL (SS-01) at a concentration of 0.23 $\mu g/m^3$, which is below the Method B screening level of 9.5 $\mu g/m^3$. Based on the indoor air results, this sub-slab detection does not pose a long-term, chronic VI risk.
  - There were no detections of trans-1,2-dichloroethene or cis-1,2-dichloroethene in sub-slab soil gas.
- **Exterior Shallow Soil Gas Results**
  - PCE was detected in two of three shallow exterior soil gas samples at concentrations ranging from 0.56 to 41,000 $\mu g/m^3$. There is no applicable PCE screening criterion.
  - TCE was detected in one sample between the MRL and MDL at 89 $\mu g/m^3$. There is no applicable TCE screening criterion.
  - Vinyl chloride, trans-1,2-dichloroethene, and cis-1,2-dichloroethene were not detected in shallow exterior soil gas.
- **Ambient Air Results**
  - There were no detections of CVOCs in ambient air.

3 Preliminary Conceptual Site Model

3.1 Contaminants and Potential Sources

The property was operated as a dry cleaner for approximately 50 years. Based on the existing data and Site history, it is assumed that the former Carson Cleaners operation is a likely source of dry-cleaning-related contamination to Site soil and groundwater (e.g., CVOCs). However, there are no known or documented releases. The CVOC plume appears to be comingled with the Chevron 90129 site hydrocarbon plume.

In addition, the following historical businesses depicted in Figure 2, which may have used chlorinated solvents during operations, have been documented in the vicinity of the Carson Cleaners property (Arcadis 2020):

- Chevron 90129 Gas Station, located at 4700 Brooklyn Avenue Northeast, was located approximately 150 feet east of Carson Cleaners.
- Max S Shell Service Station, located at 4556 Brooklyn Avenue Northeast, was located approximately 230 feet southeast of Carson Cleaners.
- Sanders M.H. Auto Repair, located at 4532 Brooklyn Avenue Northeast, was an auto repair shop from 1925 to 1944. It is located approximately 425 feet south-southeast of Carson Cleaners.
- Husky Laundry, located at 4703 University Way Northeast, was a “cleaner” in 1955 and located approximately 350 feet east-northeast of Carson Cleaners at the current Bank of America property.
- Ravenna Cleaners, located at 4709 University Way Northeast, was a “cleaner and dryer” from 1955 to 1960 and was located approximately 350 feet east-northeast of Carson Cleaners at the current Bank of America property.
- Home Style Laundry (also known as College Cleaners), located at 4733 University Way Northeast, was a “cleaner and dryer” site from 1940 to 1990. It was located approximately 400 feet northeast of Carson Cleaners.
- Nifty Cleaners, located at 4736 University Way Northeast, was a “cleaner and dryer” site in 1970, which was located approximately 500 feet northeast of Carson Cleaners.
- Clean N Shop, located at 4822 Brooklyn Avenue Northeast, was a “cleaner and dryer” in 1970, which was located approximately 250 feet north of Carson Cleaners.

3.2 Nature and Extent of Contamination

In the single on-property exploration advanced to date, PCE and TCE were detected in exceedance of MTCA Method A screening levels in soil samples collected above and below the groundwater table on the property. Additionally, PCE and TCE were detected in exceedance of MTCA Method A screening levels in the groundwater samples collected from two events, and cis-1,2-dichloroethene was detected in exceedance of the MTCA Method B criterion in the groundwater sample collected during one event from the on-property reconnaissance well. All other analytes were below Method A screening levels in the on-property groundwater samples.

During the site investigations at the Chevron 90129 site, TCE was identified at the highest concentrations on the southeast corner at well MW-26. This is noteworthy because Husky Cleaners occupied the current Bank of America property, which is slightly northeast of MW-26 (Figures 2 and 6). Lower concentrations of CVOCs were indicated between the Carson Cleaners property and MW-26. Additionally, MW-25, immediately south of the Bank of America property, had PCE concentrations in groundwater during the 2020 monitoring events that were higher than PCE concentrations in MW-27. This is also noteworthy because MW-27 is between Carson Cleaners and MW-25. This may be an indication of a secondary source of CVOCs, and additional investigation is outlined in Section 5.3 to further delineate this portion of the CVOC plume. As of 2019, MW-26 was abandoned and is no longer available for monitoring.

A VI study was conducted at Carson Cleaners and select neighboring properties, as discussed in Section 2.4.3.3. None of the indoor air samples exceeded MTCA Method B indoor air screening levels (unrestricted) or the TCE indoor air action level for short-term exposures.

3.3 Potential Receptors and Exposure Pathways

3.3.1 Potential Receptors

Human Receptors: Property use currently consists of the Meraki Tea Bar operating on the lower floor of the existing building. There are two residential apartment units above the tea bar. As of Anchor QEA's most recent monitoring event, tenants occupied the apartments above the tea bar. Proposed future uses at Carson Cleaners are not currently known.

Potential receptors include construction workers during excavation events, residential and commercial tenants, and customers of the operating business. Additionally, maintenance workers for city- or county-owned utilities may be potential receptors if vapors accumulate in utility corridors.

Ecological Receptors: A terrestrial ecological evaluation (TEE) has not been completed for this Site. Currently, terrestrial ecological receptors have not been identified. The Site is in an urban setting and completely covered by low permeable asphalt, concrete, and buildings. A TEE will be performed for the Site in accordance with WAC 173-340-7492 if required, but it is likely that an exemption from the TEE will be applicable based on insufficient habitat surrounding the Site to endanger ecological receptors.

3.3.2 Potential Exposure Pathways

An exposure pathway describes the mechanisms by which human or ecological exposure to site contaminants can occur. The known exposure pathways are described in the following subsections.

3.3.2.1 Soil

As previously discussed, the area is typical of urban, developed land, with limited to no vegetation. The Carson Cleaners property, adjoining sidewalks, alley, and streets are paved with asphalt or concrete. Current and future potentially complete exposure pathways for soil are workers contacting contaminated soils (skin contact or incidental ingestion) and/or inhaling contaminated soil particles or vapors during future remedial action activities or possible excavations if additional infrastructure is constructed on site. Contaminants in soil can leach to groundwater, acting as a secondary source. Therefore, the soil-to-groundwater pathway must also be considered in areas where there is a potentially complete groundwater exposure pathway.

3.3.2.2 Groundwater

Consumption of groundwater is unlikely. No drinking water wells are present on the property or within 1 mile of the Carson Cleaners property. Drinking water is supplied by the City of Seattle. However, groundwater underlying the Site may be considered as a potential source of drinking water or other beneficial use. Beneficial use and potability evaluations will be completed during the RI in accordance with applicable RCW and WAC regulations.

At this time, based on existing data, accidental contact or consumption of groundwater during investigation, remediation, and/or construction work and exposure to volatiles in groundwater during such activities are the only potential groundwater exposure pathways for human receptors at the Site.

3.3.2.3 Vapor Inhalation

Individuals inhaling indoor air contaminated via VI by the volatilization of contaminants in soil and groundwater is another potential exposure pathway. However, results from the VI investigation do not indicate an immediate health concern for building occupants.

Construction workers or utility workers may be exposed during remedial activities or other maintenance activities on nearby utilities. Workers may inhale vapors during excavations, trenching, or drilling or if they are working in utility corridors where vapors may have accumulated. At this time, accidental inhalation of vapors is considered a potentially complete exposure pathway for human receptors at the Site.

3.4 Proposed Screening Levels

Screening levels for soils, groundwater, and indoor and outdoor air will consider MTCA screening levels protective of unrestricted and commercial site uses, as well as those protective of groundwater and air quality. Where available, MTCA Method A and Method B soil, groundwater, and air screening levels will be used as initial screening criteria. The Method A values are conservative because they include default assumptions intended to be protective of groundwater at all sites; these assumptions may not be applicable to the conditions at the Site because groundwater is not a likely source of drinking water and groundwater near the Site does not discharge to surface water. Method B soil screening levels are applicable for unrestricted residential use. These residential criteria may not apply to the Site depending on zoning and commercial land uses; however, they provide a point of comparison for delineation of the nature and extent of contamination. For the purpose of this RI Work Plan, the most stringent and conservative screening levels were selected. Tables 9 through 11 provide a summary of the proposed screening levels to be considered at the Site.

4 Assessment of Data Gaps

4.1 Summary of Impacted Media

The horizontal extent of the CVOC groundwater plume is incomplete and will require additional borings and monitoring wells, both on- and off-property. Known CVOC detections are unbound in multiple horizontal directions. Vertical delineation will also be necessary, specifically within the source area, because a deeper water-bearing zone may be present at the Site and additional deeper borings may be required to determine the vertical extent of contamination and confirm the source of the contamination. Data collected from the proposed subsurface investigations will further define the horizontal and vertical extent of CVOCs in soil and groundwater, with an emphasis on collecting sufficient data to characterize Site conditions and evaluate possible cleanup alternatives.

4.1.1 Soil

Additional soil data are needed to better define the horizontal and vertical extent of CVOC impacts in soil. Additional soil borings on-property are needed to assess lithology, especially with respect to transport mechanisms and potential confining layers. Analytical results obtained from the soil boring during the Anchor QEA VI investigation indicate the highest levels of CVOC contamination are at the deepest interval sampled (29 feet below grade). Therefore, deeper borings are necessary to determine the vertical extent of soil contamination on-property.

As discussed in Section 3.2, it is suspected that a secondary source may exist near the Husky Cleaners property, now occupied by Bank of America. Based on these data, additional soil borings may be necessary near Bank of America to determine if a secondary source exists within this area.

Additional off-property soil samples will be collected at proposed groundwater monitoring wells. The additional soil analytical data will assist in confirming the source area and determining the potential volume of contaminated soils.

4.1.2 Groundwater

Multiple data gaps exist in relation to groundwater characterization. Groundwater flow direction, vertical contamination extent, and horizontal contamination extent are all unknown at this time. Additional wells are required on- and off-property to provide a sufficient groundwater monitoring network. The proposed groundwater monitoring wells will be installed with the intent of providing a monitoring network to confirm local groundwater flow direction, determine if a deeper water zone exists immediately beneath the Site, and delineate the vertical and horizontal extents of the CVOC contaminant plume. Based on decreasing CVOC concentrations measured in MW-22 and MW-23 in 2020, no additional wells are proposed at this time to the east but continued monitoring of MW-22 and MW-23 is proposed.

4.1.3 Vapor

The initial VI investigation air screening results identified no short-term risks; however, detected concentrations of CVOCs require confirmation as well as evaluation of chronic risks. Although additional soil vapor gas monitoring is not required, additional monitoring of indoor air and sub-slab vapors will assist in determining if chronic risks should be considered during development of remedial alternatives.

Sub-slab monitoring was not completed at the Bank of America property during the initial VI investigation. However, it may be beneficial to revisit access to complete sub-slab monitoring due to the elevated CVOC concentrations in groundwater near this site, which was formerly Husky Cleaners.

4.1.4 Potential Preferential Pathways

Utilities in use at the Carson Cleaners property include electric power, telephone, potable water, sanitary sewer, stormwater drains, and natural gas. Indoor and outdoor utility corridors may be acting as preferential migration pathways for contaminant transport. Given that no information is available regarding potential release(s) from the Carson Cleaners dry-cleaning operations and the limited available soil data, additional on-property soil characterization is required to determine if preferential pathways are present. CC-SB-01, CC-SB-02, CC-MW-2, and CC-MW-4, as shown in Figure 8, are intended to provide the additional soil characterization.

Further evaluation and assessment of geologic conditions is necessary at the Site to determine if a deeper water-bearing zone is present. Adjacent and nearby properties have identified a deep aquifer, but it is currently unknown if the deep aquifer is present at the Site and whether it is hydraulically connected with the upper water-bearing zone. Logging of soil borings will be performed to identify permeable and confining layers that may impact migration of CVOCs. Furthermore, significant amounts of fill, excavations, and dewatering on- and off-property may have created pathways that impact local groundwater flow direction and gradient.

4.1.5 Groundwater Flow Regime

Based on the Chevron 90129 site monitoring wells, depth to groundwater typically ranges from 15 to 19 feet bgs. Periodically, groundwater depths have been up to 21 to 26 feet at the end of summer and early fall in select wells for some years. Variability in water levels may be due to the backfill in former and current UST pits and/or perched conditions caused by dense silt layers. Previous groundwater contour maps of the Chevron 90129 site resemble a C-shape open to the east to southeast. Groundwater flow is inferred to be predominantly to the southeast, with a more easterly direction of flow in the southern portion and southerly in the northern portion of the Chevron 90129 site. A southeasterly direction of groundwater flow is consistent with data collected from BP Brooklyn (south of Carson Cleaners). Horizontal hydraulic gradients at the BP Brooklyn site range from 0.01

and 0.02 feet per foot. A review of groundwater data from the Sound Transit Northgate Link geotechnical data report indicated aquifers beneath the silt unit have an upward vertical hydraulic gradient. Groundwater flow directions in these deeper aquifers are to the southwest. Shallow groundwater flow is inferred to be predominantly southeast (Aspect 2016). However, seasonal fluctuations tend to affect the groundwater flow direction, changing it to the northeast at certain times of the year (Arcadis 2020).

Given the amount of fill, excavations, and dewatering on- and off-property, further investigation will assist in determining local groundwater flow direction, which will ultimately provide information to complete the delineation of the contaminant plume and characterize the source.

5 Remedial Investigation Approach and Rationale

5.1 Adaptive Management Approach

Adaptive management is a structured and iterative decision-making process that improves management decisions and reduces uncertainty over time as the outcomes of earlier decisions are monitored and lessons learned are incorporated. For the Site, two levels of adaptive management are anticipated.

While acquiring data, additional data needs may be identified in the field. For example, if field screening (visual, olfactory, or PID) indicates contamination is not bounded, additional borings may be advanced, in consultation with Ecology field oversight, to obtain needed information. This process can be resolved between the PLP and Ecology during the data acquisition process through field change documentation.

Following review and initial interpretation of preliminary analytical results, additional data needs may be identified to complete the RI. An example would be laboratory analytical results for CVOCs in soil or groundwater that indicate contamination beyond the anticipated horizontal or vertical limits. In this case, an addendum to this RI Work Plan would be required to obtain additional data to further delineate the extent of contamination.

5.2 Coordination with Adjacent Site Owners for Access

Coordination with adjacent property owners for access will be required. The use of existing off-property groundwater monitoring wells at the adjacent BP Brooklyn and Chevron 90129 sites would reduce the number of new monitoring well installations. Initially, the existing wells will need to be assessed for usability, but assuming they are structurally sound and screened at appropriate depths, there are several wells that may assist in CVOC plume delineation and source identification.

Access agreements were obtained prior to the VI evaluation from Bank of America, the mixed-use building, and the Christ Episcopal Church, and these agreements cover the additional work described in this RI Work Plan at these properties. At this time, it is unknown if additional buildings on adjacent properties will require VI monitoring, but, if such monitoring is necessary, access agreements will need to be obtained prior to initiating work. Anchor QEA will coordinate with legal counsel to acquire access to properties, as needed.

5.3 Remedial Investigation Scope of Work

All investigation and sampling activities described in this RI Work Plan will be completed in general accordance with the *Sampling and Analysis Plan* (SAP; Appendix A), *Quality Assurance Project Plan* (QAPP; Appendix B), *Inadvertent Discovery Plan* (Appendix C), and *Health and Safety Plan* (Appendix D). Investigation and sampling activities will be coordinated with adjacent properties to share data and limit the need for additional off-property wells. The rationale for monitoring locations presented in Sections 5.3.1 and 5.3.2 is outlined in Table 12.

5.3.1 Proposed Groundwater Characterization

Groundwater characterization will be conducted for relevant groundwater units, as determined in consultation with Ecology and based on initial investigation, to evaluate the presence of a deeper water-bearing zone at the property. Groundwater characterization will likely be conducted in two phases.

Phase 1 will consist of quarterly gauging, sampling, and testing of approximately 5 new locations and 12 existing wells for 1 year. The initial task for Phase 1 is to evaluate the condition of existing groundwater monitoring wells for use in delineating the CVOC plume. Existing wells that are designated for sampling, and for which access is obtained, will be developed prior to the first sampling event if deemed necessary based on the age of the well, condition of the well, or other factors noted during initial evaluation. The existing groundwater monitoring wells at adjacent sites that are proposed for evaluation and quarterly monitoring are shown in Figure 8. The elevations of screened intervals of these existing wells are provided in Table 13 and the available boring logs as Appendix E. Several boring logs were not located on Ecology's Environmental Information Management (EIM) database but will be requested during the RI to further develop the conceptual site model.

For the purpose of this RI Work Plan, it is assumed that groundwater monitoring wells at the adjacent BP Brooklyn and Chevron 90129 sites (south and east of the Carson Cleaners property) are suitable for monitoring purposes and that access will be granted. Installation of new wells will be performed as necessary to fill in spatial or depth-related data gaps not covered by the existing neighboring wells. Five new well locations are proposed for installation to fill known data gaps vertically and horizontally to the west and north of the Carson Cleaners property. Three new wells are proposed to the east of the Carson Cleaners property (CC-MW-2S, CC-MW-2D, and CC-MW-3). CC-MW-2S and CC-MW-2D will be installed in close proximity but as separate borings to discretely target the shallow and possible deep water bearing units. CC-MW-4D is intended to target the deep water bearing unit on the property. CC-MW-5 and CC-MW-6 will be installed in the shallow water bearing unit and are intended to fill data gaps and further define the nature and extent of contamination. All wells will be installed, developed, and monitored in general accordance with the SAP and QAPP (Appendices A and B). Each well included in the proposed Carson Cleaners monitoring network will be surveyed to obtain northing, easting, and elevations.

Groundwater analytical data will be collected on a quarterly basis for 1 year. Potentiometric surface maps will be prepared quarterly to evaluate seasonal changes in groundwater flow direction, if any.

Adaptative management may include step-out wells based on sampling results from proposed wells if necessary to delineate the nature and extent of contamination or characterize groundwater flow direction. Any additional well sampling or locations will be determined in consultation with Ecology in accordance with Section 5.1 of this RI Work Plan.

5.3.2 Proposed Soil Characterization

On-property soil sampling is proposed at three locations (Figure 8) to better inform the conceptual site model related to transport mechanisms, preferential pathways, site geology and hydrogeology, and nature and extent of contamination. CC-SB-01 and CC-SB-02 will be drilled to approximately 20 feet below grade, using direct-push methods, with soil samples collected per the SAP and QAPP (Appendices A and B). At locations CC-MW-02 and CC-MW-04, borings will be drilled using a rotosonic drill rig to a target depth of approximate 80 feet bgs to evaluate the presence of a deeper water-bearing zone and the vertical extent of CVOCs. The proposed 80-foot drilling depth should be considered a rough estimate and will likely vary based on actual conditions encountered. If contaminants are detected via field screening and suspected to exist at 80 feet bgs, drilling may continue until field screening indicates that the vertical extent of contamination has been identified. Depending upon the drilling depth achieved, a nested well pair may be installed with screened casing at both shallow and deep intervals. The nested well pair will be constructed in separate boreholes but close proximity, per the SAP and QAPP, in a manner that prevents contaminants from migrating deeper than in currently existing conditions.

Off-property soil sampling and logging will be conducted from soil borings during groundwater well installation at each of the proposed groundwater monitoring wells illustrated in Figure 8, as necessary, to delineate the nature and extent of contamination and improve the conceptual site model. Field screening methods, as outlined in the adaptive management section, will be used to determine when soil samples will be collected for laboratory analysis.

All soil samples will be collected in general accordance with the SAP and QAPP (Appendices A and B).

5.3.3 Proposed Vapor Characterization

Quarterly VI characterization, including indoor air and sub-slab sampling, will be conducted for three additional quarters at the four previously sampled locations listed as follows (the Bank of America sampling will consist of indoor air only, unless permission is granted to install a sub-slab monitoring point):

1. Former Carson Cleaners property
2. Mixed-use building
3. Christ Episcopal Church
4. Bank of America (current owner of the building is the University District Parking Association)

All air samples will be collected in general accordance with the SAP and QAPP (Appendices A and B).

5.4 Data Management and Evaluation

The results of all sampling, laboratory reports, and test results generated during the RI will be provided to Ecology. Pursuant to WAC 173-340-840(5), all sampling data will be submitted to Ecology in both printed and electronic formats in accordance with Section VII Ecology's Toxics Cleanup Program (TCP) Policy 840 (Data Submittal Requirements), and/or any subsequent procedures specified by Ecology for data submittal. Ecology has updated Policy 840 related to data submittal requirements for TCP sites. Policy 840 requires environmental monitoring data collected at TCP sites as part of site investigations and cleanups to be submitted into Ecology's EIM system at the time of submittal for Ecology review of any report containing these data.

Environmental data validation will be performed in accordance with the project QAPP (Appendix B).

If requested, Ecology and/or its authorized representative will be permitted to take split or duplicate samples of any samples collected during the RI. Ecology will be notified 7 days in advance of any sample collection or work activity at the Site. Ecology may, upon request, allow the PLP and/or their authorized representative to take split or duplicate samples of any samples collected by Ecology, provided that doing so does not interfere with Ecology's sampling.

In accordance with WAC 173-340-830(2)(a), all hazardous substance analyses must be conducted by a laboratory accredited under WAC 173-50 for the specific analyses to be conducted, unless otherwise approved by Ecology.

6 Reporting

Results of this investigation will be provided to Ecology in an RI Report. The RI Report will include, at a minimum, the following:

- Summary of investigation methods and findings
- Figures and tables summarizing observations and compiled analytical data
- Copies of boring and groundwater sampling logs, data validation findings, and analytical laboratory reports
- Data evaluation and a discussion of potential CVOC sources, nature and extent and potential migration and exposure pathways; schedule and reporting will be in compliance with Exhibit C, Schedule of Deliverables in the AO

7 References

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Tables

Table 1
Indoor Air Analytical Results

Sample ID	Location	Sample Type	Chemical Names	Results ($\mu g/m^3$)
CC-IA-01-072320	Christ Episcopal Church Property	Indoor Air	Vinyl Chloride	0.79 U
			Trans-1,2-Dichloroethene	0.10 U
			Cis-1,2-Dichloroethene	0.10 U
			Trichloroethylene (TCE)	0.10 U
			Tetrachloroethylene (PCE)	2.30
CC-IA-02-072320	Mixed Commercial and Residential Building	Indoor Air	Vinyl Chloride	0.081 U
			Trans-1,2-Dichloroethene	0.11 U
			Cis-1,2-Dichloroethene	0.11 U
			Trichloroethylene (TCE)	0.10 U
			Tetrachloroethylene (PCE)	0.098U
CC-IA-03-072320	Former Carson Cleaners Facility	Indoor Air	Vinyl Chloride	0.08 U
			Trans-1,2-Dichloroethene	0.10 U
			Cis-1,2-Dichloroethene	0.11 U
			Trichloroethylene (TCE)	0.10 U
			Tetrachloroethylene (PCE)	3.70
CC-IA-04-072320	Bank of America	Indoor Air	Vinyl Chloride	0.086 U
			Trans-1,2-Dichloroethene	0.11 U
			Cis-1,2-Dichloroethene	0.11 U
			Trichloroethylene (TCE)	0.11 U
			Tetrachloroethylene (PCE)	1.20

Notes:
Bold: Exceeds applicable MTCA method cleanup level
$\mu g/m^3$: micrograms per cubic meter
U: Not detected above method detection limit
MTCA: Model Toxics Control Act

Table 2
Former Carson Cleaners Facility Ambient Air Analytical Results

Sample ID	Location	Sample Type	Chemical Names	Results ($\mu g/m^3$)
CC-AA-00-072420	Former Carson Cleaners Facility	Ambient Air	Vinyl Chloride	0.083 U
			trans-1,2-Dichloroethene	0.11 U
			cis-1,2-Dichloroethene	0.11 U
			Trichloroethylene (TCE)	0.10 U
			Tetrachloroethylene (PCE)	0.10 U

Notes:
Bold: Exceeds applicable MTCA method cleanup level
U: Not detected above method detection limit
$\mu g/m^3$: microgram per cubic meter
MTCA: Model Toxics Control Act

Table 3
Sub-Slab Soil Gas Anayltical Results

Sample ID	Location	Sample Type	Chemical Names	Results ($\mu g/m^3$)
CC-SS-01-072320	Christ Episocopal Church Property	Sub-Slab Soil Gas	Vinyl Chloride	0.088 U
			trans-1,2-Dichloroethene	0.11 U
			cis-1,2-Dichloroethene	0.12 U
			Trichloroethylene (TCE)	0.11 U
			Tetrachloroethylene (PCE)	4.10
CC-SS-02-072320	Mixed Commercial and Residential Building	Sub-Slab Soil Gas	Vinyl Chloride	0.092 U
			trans-1,2-Dichloroethene	0.12 U
			cis-1,2-Dichloroethene	0.12 U
			Trichloroethylene (TCE)	0.12 U
			Tetrachloroethylene (PCE)	18
CC-SS-03-072320	Former Carson Cleaners Facility	Sub-Slab Soil Gas	Vinyl Chloride	0.089 U
			trans-1,2-Dichloroethene	0.12 U
			cis-1,2-Dichloroethene	0.12 U
			Trichloroethylene (TCE)	2.60
			Tetrachloroethylene (PCE)	61

Notes:

Bold: Exceeds applicable MTCA method cleanup level

U: Not detected above method detection limit

$\mu g/m^3$: microgram per cubic meter

MTCA: Model Toxics Control Act

Table 4
Shallow Exterior Soil Gas Analytical Results

Sample ID	Location	Sample Type	Chemical Names	Results ($\mu g/m^3$)
CC-SG-01-072420	Christ Episcopal Church Property	Shallow Exterior Soil Gas	Vinyl Chloride	0.37 U
			trans-1,2-Dichloroethene	0.48 U
			cis-1,2-Dichloroethene	0.48 U
			Trichloroethylene (TCE)	0.46 U
			Tetrachloroethylene (PCE)	0.44U
CC-SG-03-072420	Former Carson Cleaners Facility	Shallow Exterior Soil Gas	Vinyl Chloride	23 U
			trans-1,2-Dichloroethene	30 U
			cis-1,2-Dichloroethene	30 U
			Trichloroethylene (TCE)	29U
			Tetrachloroethylene (PCE)	41000
CC-SG-04-072420	Bank of America	Shallow Exterior Soil Gas	Vinyl Chloride	0.092 U
			trans-1,2-Dichloroethene	0.12 U
			cis-1,2-Dichloroethene	0.12 U
			Trichloroethylene (TCE)	0.12 U
			Tetrachloroethylene (PCE)	160

Notes:

Bold: Exceeds applicable MTCA method cleanup level

U: Not detected above method detection limit

$\mu g/m^3$: microgram per cubic meter

MTCA: Model Toxics Control Act

Table 5
Former Carson Cleaners Facility Groundwater Analytical Results

Sample ID	Location	Sample Type	Chemical Names	Results (µg/L)
CC-MW-01-20200814	Former Carson Cleaners Facility	Groundwater	Gasoline Range Organics	**1860**
			Vinyl Chloride	0.05 U
			trans-1,2-Dichloroethene	0.05 U
			cis-1,2-Dichloroethene	1.3
			Trichloroethylene	**100**
			Tetrachloroethylene	**2100**
CC-MW-01-20201118	Former Carson Cleaners Facility	Groundwater	Gasoline Range Organics	**2020**
			Vinyl Chloride	0.05 U
			trans-1,2-Dichloroethene	0.05 U
			cis-1,2-Dichloroethene	63
			Trichloroethylene	**140**
			Tetrachloroethylene	**2700**
CC-MW-1001-20201118*	Former Carson Cleaners Facility	Groundwater	Gasoline Range Organics	**2050**
			Vinyl Chloride	0.05 U
			trans-1,2-Dichloroethene	0.05 U
			cis-1,2-Dichloroethene	1.3
			Trichloroethylene	**140**
			Tetrachloroethylene	**2600**

Notes:

*: field duplicate

Bold: Exceeds applicable MTCA method cleanup level

U: Not detected above method detection limit

µg/L: micrograms per liter

MTCA: Model Toxics Control Act

Table 6
Former Carson Cleaners Facility Soil Analytical Results

Sample ID	Location	Sample Type	Chemical Names	Results (µg/kg)
CC-MW-01-14.5-072420	Former Carson Cleaners Facility	Soil	Vinyl Chloride	5.8 U
			trans-1,2-Dichloroethene	5.8 U
			cis-1,2-Dichloroethene	5.8 U
			Trichloroethylene	5.8 U
			Tetrachloroethylene	**2600**
CC-MW-01-18-072420	Former Carson Cleaners Facility	Soil	Vinyl Chloride	5.9 U
			trans-1,2-Dichloroethene	5.9 U
			cis-1,2-Dichloroethene	5.9 U
			Trichloroethylene	5.9 U
			Tetrachloroethylene	**2300**
CC-MW-01-24-072420	Former Carson Cleaners Facility	Soil	Vinyl Chloride	6.4 U
			trans-1,2-Dichloroethene	6.4 U
			cis-1,2-Dichloroethene	6.4 U
			Trichloroethylene	6.4 U
			Tetrachloroethylene	**3100**
CC-MW-01-124-072420*	Former Carson Cleaners Facility	Soil	Vinyl Chloride	5.9 U
			trans-1,2-Dichloroethene	5.9 U
			cis-1,2-Dichloroethene	5.9 U
			Trichloroethylene	**6.3**
			Tetrachloroethylene	**4200**
CC-MW-01-29-072420	Former Carson Cleaners Facility	Soil	Vinyl Chloride	6.1 U
			trans-1,2-Dichloroethene	6.1 U
			cis-1,2-Dichloroethene	6.1 U
			Trichloroethylene	**25**
			Tetrachloroethylene	**13000**

Notes:

*: field duplicate

Bold: Exceeds applicable MTCA method cleanup level

U: Not detected above method detection limit

MTCA: Model Toxics Control Act

Table 7
Chevron 90129 Site Historical Groundwater Analytical Results

MW-17*						
	2019		2020			
Analyte	August	December	Q1	Q2	Q3	Q4
PCE	**7**	**9.5**	4.05	--	--	--
TCE	**3**	**3.7**	**5.1**	--	--	--
CIS	**52**	**61**	**47.2**	--	--	--
TRANS	0.8	1.3 J	3.53	--	--	--
VC	0.2 U	0.22 U	0.5 U	--	--	--
MW-18						
	2019		2020			
Analyte	August	December	Q1	Q2	Q3	Q4
PCE	3	3.8	2.94	3.9	4.53	2.23
TCE	0.2 U	0.85 U	0.5 U	0.5 U	0.056	0.04 U
CIS	0.2 U	0.69 U	0.5 U	0.5 U	0.1 U	0.1 U
TRANS	0.2 U	0.39 U	0.5 U	0.5 U	0.2 U	0.2 U
VC	0.2 U	0.22 U	0.5 U	0.5 U	0.1 U	0.1 U
MW-19						
	2019		2020			
Analyte	August	December	Q1	Q2	Q3	Q4
PCE	0.2 U	0.41 U	0.5 U	0.5 U	0.138	0.083 J
TCE	0.2 U	0.85 U	0.5 U	0.5 U	0.04 U	0.04 U
CIS	0.2 U	0.69 U	0.5 U	0.5 U	0.1 U	0.1 U
TRANS	0.2 U	0.39 U	0.5 U	0.5 U	0.2 U	0.2 U
VC	0.2 U	0.22 U	0.5 U	0.5 U	0.1 U	0.1 U
MW-20						
	2019		2020			
Analyte	August	December	Q1	Q2	Q3	Q4
PCE	**64**	**100**	**52**	**107**	**116**	**138**
TCE	**13**	**20**	**21.6**	**13.7**	**7.19**	**9.47**
CIS	7	9.2	10.2	5.96	2.28	3.37
TRANS	0.5	0.72 J	0.984	0.54	0.143 J	0.267
VC	0.2 U	0.22 U	0.5 U	0.5 U	0.1 U	0.1 U
MW-21						
	2019		2020			
Analyte	August	December	Q1	Q2	Q3	Q4
PCE	2	0.41 U	0.5 U	0.5 U	0.124	0.042 J
TCE	**4**	0.85 U	0.5 U	0.5 U	0.093	0.04 U
CIS	0.4	0.69 U	0.5 U	0.5 U	0.1 U	0.1 U
TRANS	0.2 U	0.39 U	0.5 U	0.5 U	0.2 U	0.2 U
VC	0.2 U	0.22 U	0.5 U	0.5 U	0.1 U	0.1 U

Table 7
Chevron 90129 Site Historical Groundwater Analytical Results

MW-22						
	2019		2020			
Analyte	August	December	Q1	Q2	Q3	Q4
PCE	2 U	1.1 J	1.11	5 U	1.99	2.29
TCE	**370**	**410**	**447**	**384**	**233**	**158**
CIS	**740**	**670**	**546**	**503**	**215**	**167**
TRANS	6	3.3	4.31	3.43 J	3.1	2.11
VC	**5**	**6.4**	**5.13**	**5 J**	**1.57**	1 U
MW-23						
	2019		2020			
Analyte	August	December	Q1	Q2	Q3	Q4
PCE	0.2 U	0.41 U	0.5 U	5 U	0.36 J	1 U
TCE	**23**	**130**	**59.8**	**14**	**12.8**	**6.68**
CIS	**340**	**440**	**418**	**238**	**317**	**248**
TRANS	2	6.4	5.52	2.18 J	3.37	2.31
VC	**16**	**22**	**7.85**	**4.24 J**	**8.2**	**5.48**
MW-25						
	2019		2020			
Analyte	August	December	Q1	Q2	Q3	Q4
PCE	**24**	**16**	4.49	**22.8**	**15.6**	**29.2**
TCE	**320**	**600**	**530**	**496**	**695**	**837**
CIS	**1200**	**1400**	**1170**	**865**	**801**	**767**
TRANS	82	110	107	97.2	105	93.5
VC	**150**	**180**	**92.7**	**53.7**	**47.3**	**27.7**
MW-26*						
	2019		2020			
Analyte	August	December	Q1	Q2	Q3	Q4
PCE	5	--	--	--	--	--
TCE	**2200 E**	--	--	--	--	--
CIS	**820 E**	--	--	--	--	--
TRANS	**230**	--	--	--	--	--
VC	**38**	--	--	--	--	--
MW-27						
	2019		2020			
Analyte	August	December	Q1	Q2	Q3	Q4
PCE	4 U	0.53 J	12.5 U	12.5 U	2.5 U	3.9
TCE	**780**	**830**	**1050**	**1170**	**346**	**638**
CIS	**700**	**630**	**473**	**554**	**173**	**317**
TRANS	55	71	49.5	59.7	22.5	45
VC	**23**	**18**	**11.4 J**	**12.6**	**5.7**	**9.85**

Table 7
Chevron 90129 Site Historical Groundwater Analytical Results

MW-28						
	2019		2020			
Analyte	August	December	Q1	Q2	Q3	Q4
PCE	**260**	**410**	**64.3**	**238**	**212**	**301**
TCE	**770**	**1800**	**158**	**713**	**325**	**638**
CIS	**250**	**320**	**68.6**	**142**	**70.5**	**136**
TRANS	6	6.3	1.63	3.26	1.88	3.98
VC	**8**	**12**	**2.17**	**4.01**	**2.62**	0.5 U

MW-29						
Analyte	2019		2020			
	August	December	Q1	Q2	Q3	Q4
PCE	0.2 U	0.41 U	0.5 U	0.5 U	0.044 J	0.1 U
TCE	0.2 U	0.85 U	0.5 U	0.216 J	0.04 U	0.04 U
CIS	0.2 U	0.69 U	0.5 U	0.5 U	0.1 U	0.1 U
TRANS	0.2 U	0.39 U	0.5 U	0.5 U	0.2 U	0.2 U
VC	0.2 U	0.22 U	0.5 U	0.5 U	0.1 U	0.1 U

Notes:

All analytes in μg/L unless otherwise noted.

*: Well decomissioned

Bold: Exceeds applicable MTCA method cleanup level

E: Reported result is an estimate because it exceeds the calibration range.

J: Analyte was positively identified. The reported result is an estimate.

U: Analyte was not detected at or above the reported result.

μg/L: micrograms per liter

CIS: cis-1,2-dichloroethene

MTCA: Model Toxics Control Act

PCE: tetrachloroethylene

Q1 to Q4: fiscal quarter

TCE: trichloroethylene

TRANS: trans-1,2-dichloroethene

VC: vinyl chloride

Table 8
Chevron 90129 Site Historical Soil Analytical Results

Sample Location	Date	Sample Depth (feet)	Analyte	Result (mg/kg)
MW20	8/10/2019	10.5	cis-1,2-Dichloroethene	0.0005 U
			trans-1,2-Dichloroethene	0.0005 U
			Trichloroethylene	0.0005 U
			Vinyl Chloride	0.0006 U
			Tetrachloroethylene	**0.068**
		18	cis-1,2-Dichloroethene	0.0005 U
			trans-1,2-Dichloroethene	0.0005 U
			Trichloroethylene	0.0005 U
			Vinyl Chloride	0.0006 U
			Tetrachloroethylene	**0.075**
		28	cis-1,2-Dichloroethene	0.0005 U
			Tetrachloroethylene	0.03
			trans-1,2-Dichloroethene	0.0005 U
			Trichloroethylene	0.025
			Vinyl Chloride	0.0006 U
		30	cis-1,2-Dichloroethene	0.0007
			trans-1,2-Dichloroethene	0.0005 U
			Trichloroethylene	0.003
			Vinyl Chloride	0.0006 U
			Tetrachloroethylene	**0.06**
MW21	8/9/2019	25	cis-1,2-Dichloroethene	0.003
			Tetrachloroethylene	0.032
			trans-1,2-Dichloroethene	0.0004 U
			Vinyl Chloride	0.0005 U
			Trichloroethylene	**0.063**
		26.5	cis-1,2-Dichloroethene	0.019
			trans-1,2-Dichloroethene	0.0007
			Vinyl Chloride	0.0006 U
			Tetrachloroethylene	**0.18**
			Trichloroethylene	**0.38** E
MW22	8/8/2019	23	cis-1,2-Dichloroethene	0.087
			Tetrachloroethylene	0.001
			trans-1,2-Dichloroethene	0.0004 U
			Trichloroethylene	0.006
			Vinyl Chloride	0.0005 U
		28.5	cis-1,2-Dichloroethene	0.0006 U
			Tetrachloroethylene	0.0006 U
			trans-1,2-Dichloroethene	0.0006 U
			Trichloroethylene	0.0006 U
			Vinyl Chloride	0.0007 U

Table 8
Chevron 90129 Site Historical Soil Analytical Results

Sample Location	Date	Sample Depth (feet)	Analyte	Result (mg/kg)
MW23	8/8/2019	25	cis-1,2-Dichloroethene	0.15
			Tetrachloroethylene	0.0005 U
			trans-1,2-Dichloroethene	0.0008
			Trichloroethylene	0.0005 U
			Vinyl Chloride	0.005

Notes:

All Analytes in mg/kg unless otherwise noted.

Bold: Exceeds applicable MTCA method cleanup level

E: Reported result is an estimate because it exceeds the calibration range.

U: Analyte was not detected at or above the reported result.

mg/kg: milligrams per kilogram

MTCA: Model Toxics Control Act

Table 9
MTCA Soil Screening Levels

Volatile Organics (mg/kg)	Method	Screening Level (unrestricted land use) (mg/kg)	Level (non-cancer) (mg/kg)	Level (cancer) (mg/kg)
1,2-Dichloroethene, cis-	GC/MS - 8260C	--	160	--
1,2-Dichloroethene, trans-	GC/MS - 8260C	--	1,600	--
Tetrachloroethylene (PCE)	GC/MS - 8260C	0.05	480	480
Trichloroethylene (TCE)	GC/MS - 8260C	0.03	40	12
Vinyl Chloride	GC/MS - 8260C	--	240	0.67

Notes:

--: not applicable

mg/kg: milligrams per kilogram

MTCA: Model Toxics Control Act

Table 10
MTCA Groundwater Screening Levels

Volatile Organics (µg/L)	Method	Groundwater Screening Level (µg/L)	Screening Level (non-cancer) (µg/L)	Screening Level (cancer) (µg/L)
1,2-Dichloroethene, cis-	GC/MS - 8260C	--	16	--
1,2-Dichloroethene, trans-	GC/MS - 8260C	--	160	--
Tetrachloroethylene (PCE)	GC/MS - 8260C	5.00	48.00	21.00
Trichloroethylene (TCE)	GC/MS - 8260C	5.00	4.00	0.54
Vinyl Chloride	GC/MS - 8260C	0.20	24.00	0.03

Notes:

--: not applicable

µg/L: micrograms per liter

MTCA: Model Toxics Control Act

Table 11
MTCA Vapor Intrusion Screening Levels

Volatile Organics	Method	Vapor Intrusion Method B Screening Levels				
		Risk	Indoor Air Screening Level Method B (non-cancer) (µg/m^3)	Indoor Air Screening Level Method B (cancer) (µg/m^3)	Sub-Slab Soil Gas Screening Level Method B (non-cancer) (µg/m^3)	Sub-Slab Soil Gas Screening Level Method B (cancer) (µg/m^3)
1,2-Dichloroethene, cis-	EPA TO-15	--	--	--	--	--
1,2-Dichloroethene, trans-	EPA TO-15	--	18	--	--	--
Tetrachloroethylene	EPA TO-15	Cancer	18	9.6	610	320
Trichloroethylene	EPA TO-15	Cancer	0.91	0.33	30	11
Vinyl Chloride	EPA TO-15	Cancer	46	0.28	1,500	9.5

Notes:

--: not applicable

µg/m^3: micrograms per cubic meter

MTCA: Model Toxics Control Act

Table 12
Proposed Monitoring Location Rationale

Location	Status	Proposed Action	Well Purpose
Soil Borings			
CC-SB-01	Proposed	Direct push soil boring.	Identify source, attempt to identify release mechanism, determine if utility corridors are creating preferential pathways, and quantify extents of vadose zone contamination.
CC-SB-02	Proposed	Direct push soil boring.	Identify source, attempt to identify release mechanism, determine if utility corridors are creating preferential pathways, and quantify extents of vadose zone contamination.
Groundwater Monitoring and Soil Characterization			
CC-MW-2	Proposed	Install GW monitoring well. Collect soil samples during installation per field screening results. Collect 4 quarters of GW monitoring.	Deep boring to identify upgradient shallow aquifer contamination and determine presence of deeper aquifer.
CC-MW-3	Proposed	Install GW monitoring well. Collect soil samples during installation per field screening results. Collect 4 quarters of GW monitoring.	Identify upgradient boundaries characterization and shallow aquifer contamination.
CC-MW-4	Proposed	Install GW monitoring well. Collect soil samples during installation per field screening results. Collect 4 quarters of GW monitoring.	Deep boring near suspected source to identify the source and shallow aquifer contamination and determine presence of deeper aquifer.
CC-MW-5	Proposed	Install GW monitoring well. Collect soil samples during installation per field screening results. Collect 4 quarters of GW monitoring.	Delineate CVOC plume and collect soil samples to assist in determining if a secondary source exists from the former Husky Cleaners site.
CC-MW-6	Proposed	Install GW monitoring well. Collect soil samples during installation per field screening results. Collect 4 quarters of GW monitoring.	Delineate southern boundary of CVOC plume.
Groundwater Monitoring			
CC-MW-1	Existing	Collect 4 quarters of GW monitoring.	Monitor seasonal/temporal trends in known CVOC concentrations based on degradation or groundwater flow direction.
MW8 (BP)	Existing	Collect 4 quarters of GW monitoring.	Delineate southern boundary of CVOC plume.
MW27 (BP)	Existing	Collect 4 quarters of GW monitoring.	Delineate southern boundary of CVOC plume.
MW28 (BP)	Existing	Collect 4 quarters of GW monitoring.	Delineate southern boundary of CVOC plume.
MW29 (BP)	Existing	Collect 4 quarters of GW monitoring.	Delineate southern boundary of CVOC plume and assist in determining if utility corridors are acting as preferential pathways.
MW-18 (Chevron)	Existing	Collect 4 quarters of GW monitoring.	Monitor trends in known CVOC concentrations and delineate northern boundary of CVOC plume.
MW-20 (Chevron)	Existing	Collect 4 quarters of GW monitoring.	Monitor trends in known CVOC concentrations.
MW-22 (Chevron)	Existing	Collect 4 quarters of GW monitoring.	Monitor trends in known CVOC concentrations and delineate southeastern boundary of CVOC plume.
MW-23 (Chevron)	Existing	Collect 4 quarters of GW monitoring.	Monitor trends in known CVOC concentrations and delineate southeastern boundary of CVOC plume.
MW-25 (Chevron)	Existing	Collect 4 quarters of GW monitoring.	Monitor trends in known CVOC concentrations and assist in determining if a secondary source exists from the former Husky Cleaners site.
MW-27 (Chevron)	Existing	Collect 4 quarters of GW monitoring.	Monitor trends in known CVOC concentrations and assist in determining if a secondary source exists from the former Husky Cleaners site.
MW-28 (Chevron)	Existing	Collect 4 quarters of GW monitoring.	Monitor trends in known CVOC concentrations and assist in determining if a secondary source exists from the former Husky Cleaners site.

Notes:
CVOC: chlorinated volatile organic compound
GW: groundwater

Table 13
Existing Monitoring Well As-Built Information

Site	Monitoring Well	Wellhead Elevation (feet)	Screened Interval (feet bgs)	Screened Interval (feet)	Total Well Depth (feet bgs)	Total Well Depth (feet)
BP Brooklyn	MW-8	214.2	5 - 25	209.2 - 189.2	25	189.2
BP Brooklyn	MW-27	215.3	15 - 26.5	200.3 - 188.8	26.5	188.8
BP Brooklyn	MW-28	214.4	15 - 26.5	199.4 - 187.9	26.5	187.9
BP Brooklyn	MW-29	213.0	15 - 26.5	198.0 - 186.5	26.5	186.5
Former Chevron Station	MW-18	216.0	10 - 25	206 - 191	25	191.0
Former Chevron Station	MW-20	215.9	13 - 28	202.9 - 187.9	28	187.9
Former Chevron Station	MW-22	212.9	11 - 26	201.9 - 186.9	26	186.9
Former Chevron Station	MW-23	211.7	15 - 25	196.7 - 186.7	25	186.7
Former Chevron Station	MW-25	212.9	15 - 30	197.9 - 182.9	30	182.9
Former Chevron Station	MW-27	214.4	10 - 25	204.4 - 189.4	25	189.4
Former Chevron Station	MW-28	214.4	10 - 25	204.4 - 189.4	25	189.4

Notes:

Vertical Datum: NAVD88

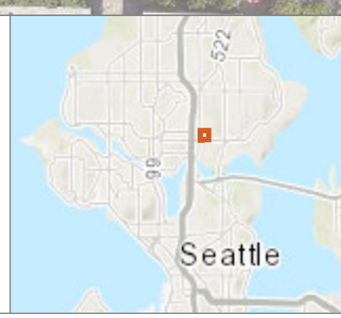
bgs: below ground surface

NA: not available

Figures

LEGEND:

Former Carson Cleaners Facility



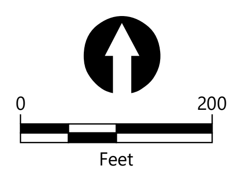


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Figure 1
Vicinity Map
Remedial Investigation Work Plan
Carson Cleaners Site

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Figure 2
Potentially Relevant Historical Operations and Sites
Remedial Investigation Work Plan
Carson Cleaners Site

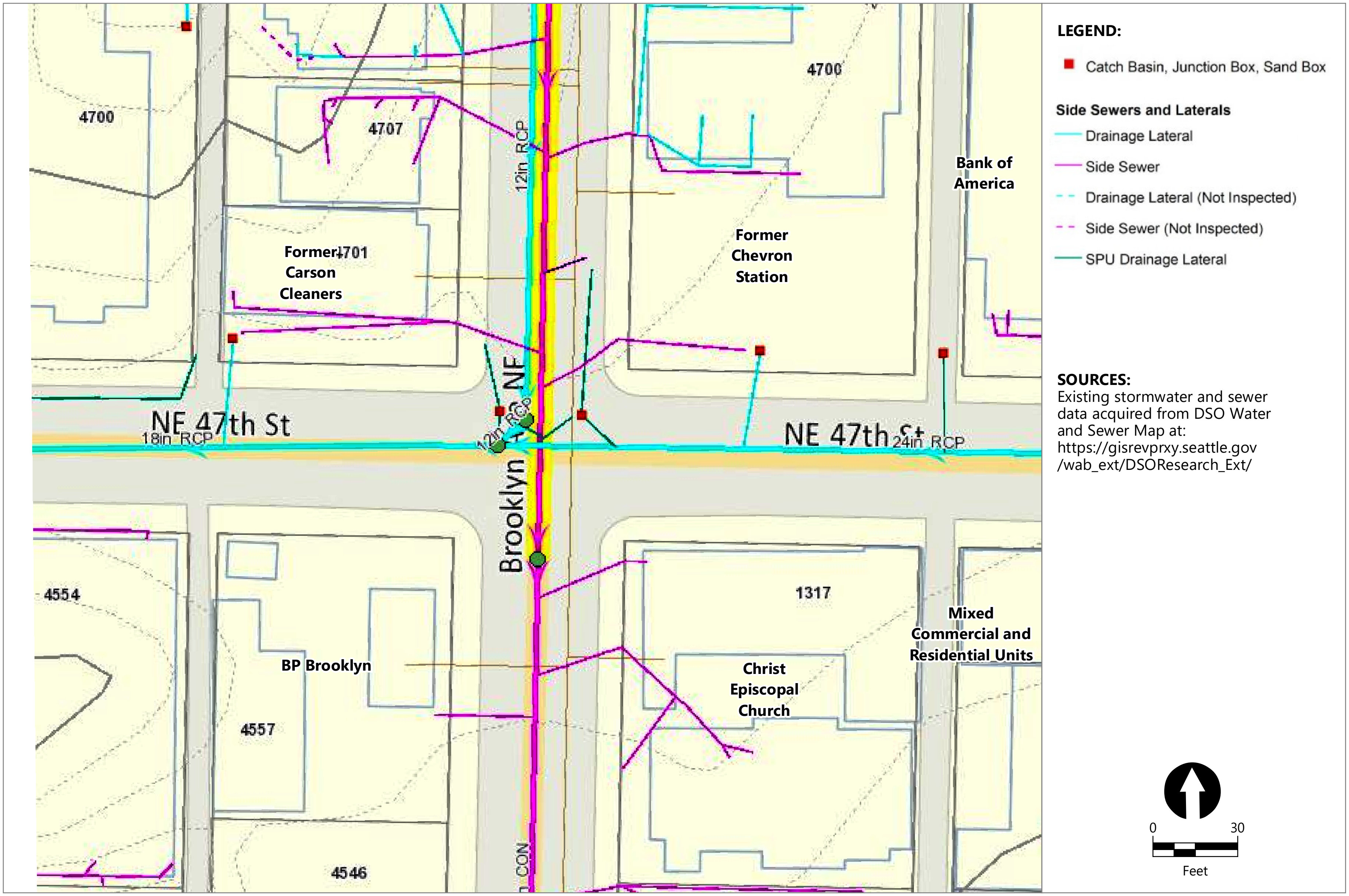

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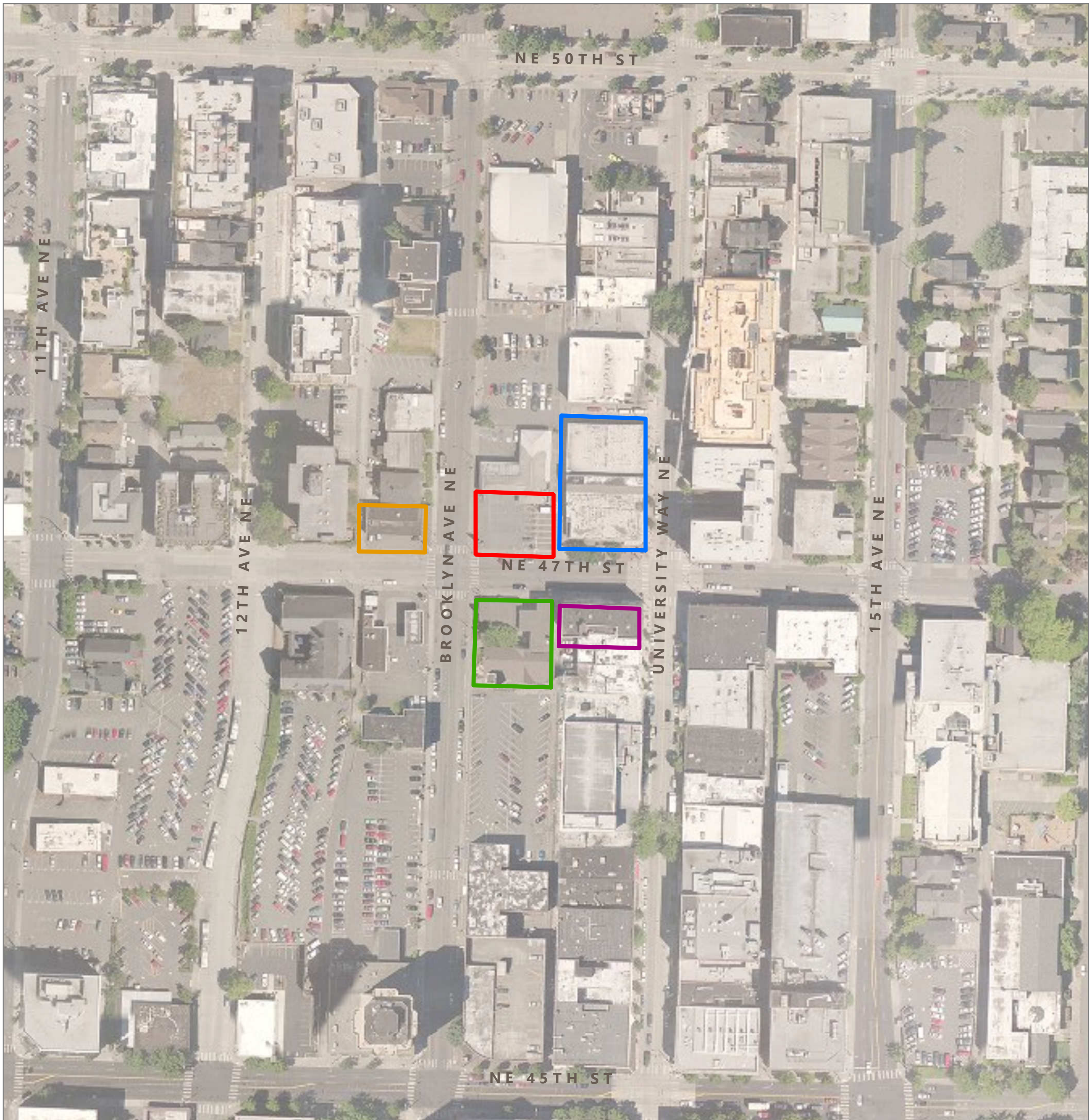
Figure 3
Existing Stormwater and Sewer Layout
Remedial Investigation Work Plan
Carson Cleaners Site



LEGEND:

- Bank of America (4701 University Way NE)
- Christ Episcopal Church (4548 Brooklyn Ave. NE)
- Former Carson Cleaners Facility (4701 Brooklyn Ave. NE)
- Mixed Commercial and Residential Units (4557 University Way NE)
- Former Chevron Station (4700 Brooklyn Avenue NE)

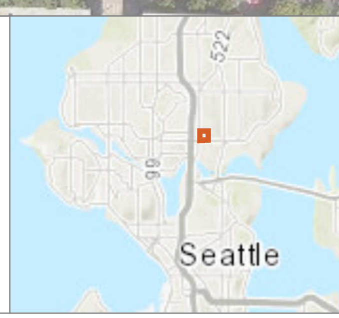


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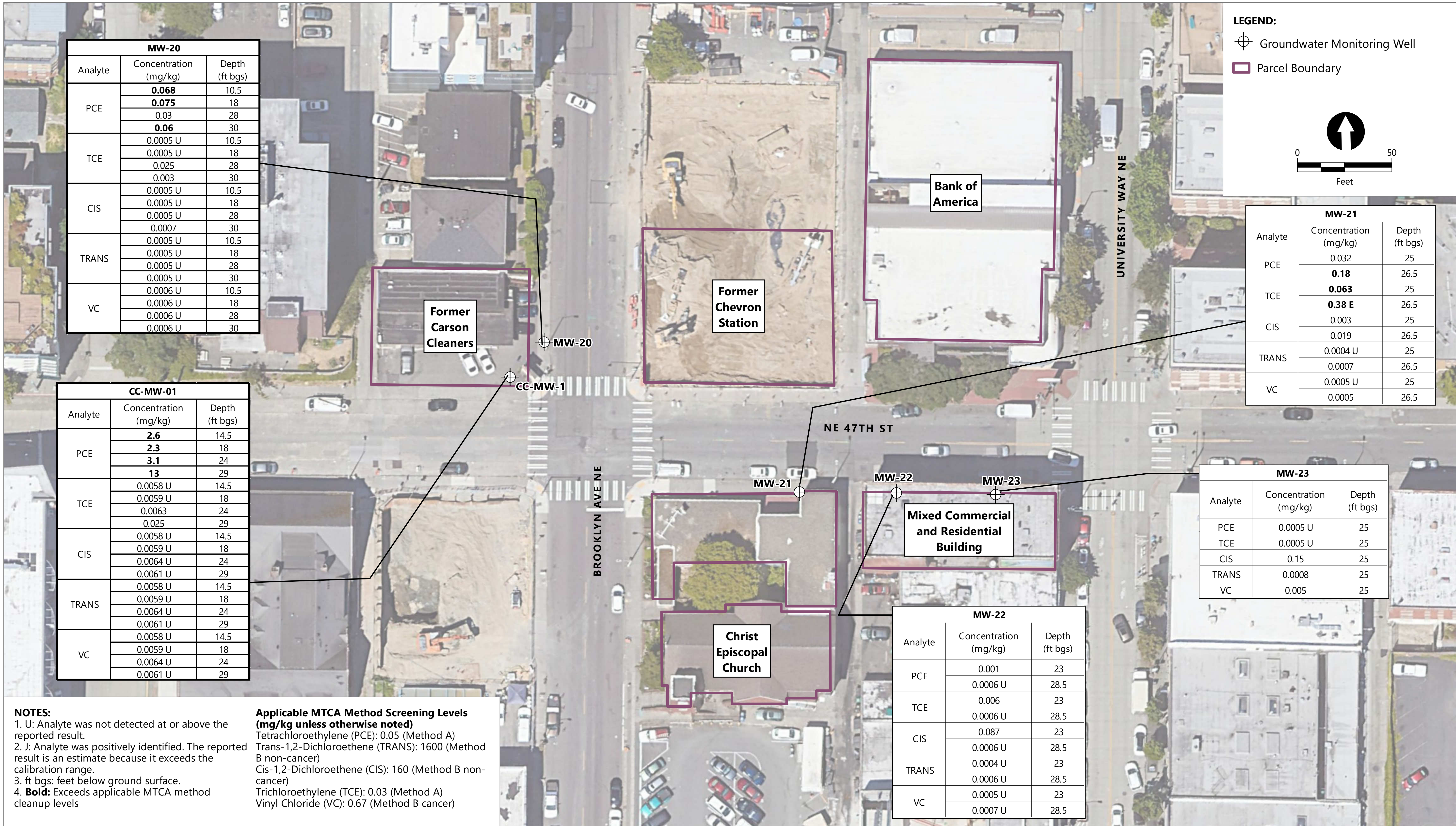
Figure 4
Site Layout with Adjacent Properties
Remedial Investigation Work Plan
Carson Cleaners Site



MW-20

Analyte	Concentration (mg/kg)	Depth (ft bgs)
PCE	**0.068**	10.5
	0.075	18
	0.03	28
	0.06	30
TCE	0.0005 U	10.5
	0.0005 U	18
	0.025	28
	0.003	30
CIS	0.0005 U	10.5
	0.0005 U	18
	0.0005 U	28
	0.0007	30
TRANS	0.0005 U	10.5
	0.0005 U	18
	0.0005 U	28
	0.0005 U	30
VC	0.0006 U	10.5
	0.0006 U	18
	0.0006 U	28
	0.0006 U	30

CC-MW-01

Analyte	Concentration (mg/kg)	Depth (ft bgs)
PCE	**2.6**	14.5
	2.3	18
	3.1	24
	13	29
TCE	0.0058 U	14.5
	0.0059 U	18
	0.0063	24
	0.025	29
CIS	0.0058 U	14.5
	0.0059 U	18
	0.0064 U	24
	0.0061 U	29
TRANS	0.0058 U	14.5
	0.0059 U	18
	0.0064 U	24
	0.0061 U	29
VC	0.0058 U	14.5
	0.0059 U	18
	0.0064 U	24
	0.0061 U	29

MW-21

Analyte	Concentration (mg/kg)	Depth (ft bgs)
PCE	0.032	25
	0.18	26.5
TCE	**0.063**	25
	0.38 E	26.5
CIS	0.003	25
	0.019	26.5
TRANS	0.0004 U	25
	0.0007	26.5
VC	0.0005 U	25
	0.0005	26.5

MW-23

Analyte	Concentration (mg/kg)	Depth (ft bgs)
PCE	0.0005 U	25
TCE	0.0005 U	25
CIS	0.15	25
TRANS	0.0008	25
VC	0.005	25

MW-22

Analyte	Concentration (mg/kg)	Depth (ft bgs)
PCE	0.001	23
	0.0006 U	28.5
TCE	0.006	23
	0.0006 U	28.5
CIS	0.087	23
	0.0006 U	28.5
TRANS	0.0004 U	23
	0.0006 U	28.5
VC	0.0005 U	23
	0.0007 U	28.5

NOTES:
1. U: Analyte was not detected at or above the reported result.
2. J: Analyte was positively identified. The reported result is an estimate because it exceeds the calibration range.
3. ft bgs: feet below ground surface.
4. **Bold:** Exceeds applicable MTCA method cleanup levels

Applicable MTCA Method Screening Levels (mg/kg unless otherwise noted)
Tetrachloroethylene (PCE): 0.05 (Method A)
Trans-1,2-Dichloroethene (TRANS): 1600 (Method B non-cancer)
Cis-1,2-Dichloroethene (CIS): 160 (Method B non-cancer)
Trichloroethylene (TCE): 0.03 (Method A)
Vinyl Chloride (VC): 0.67 (Method B cancer)

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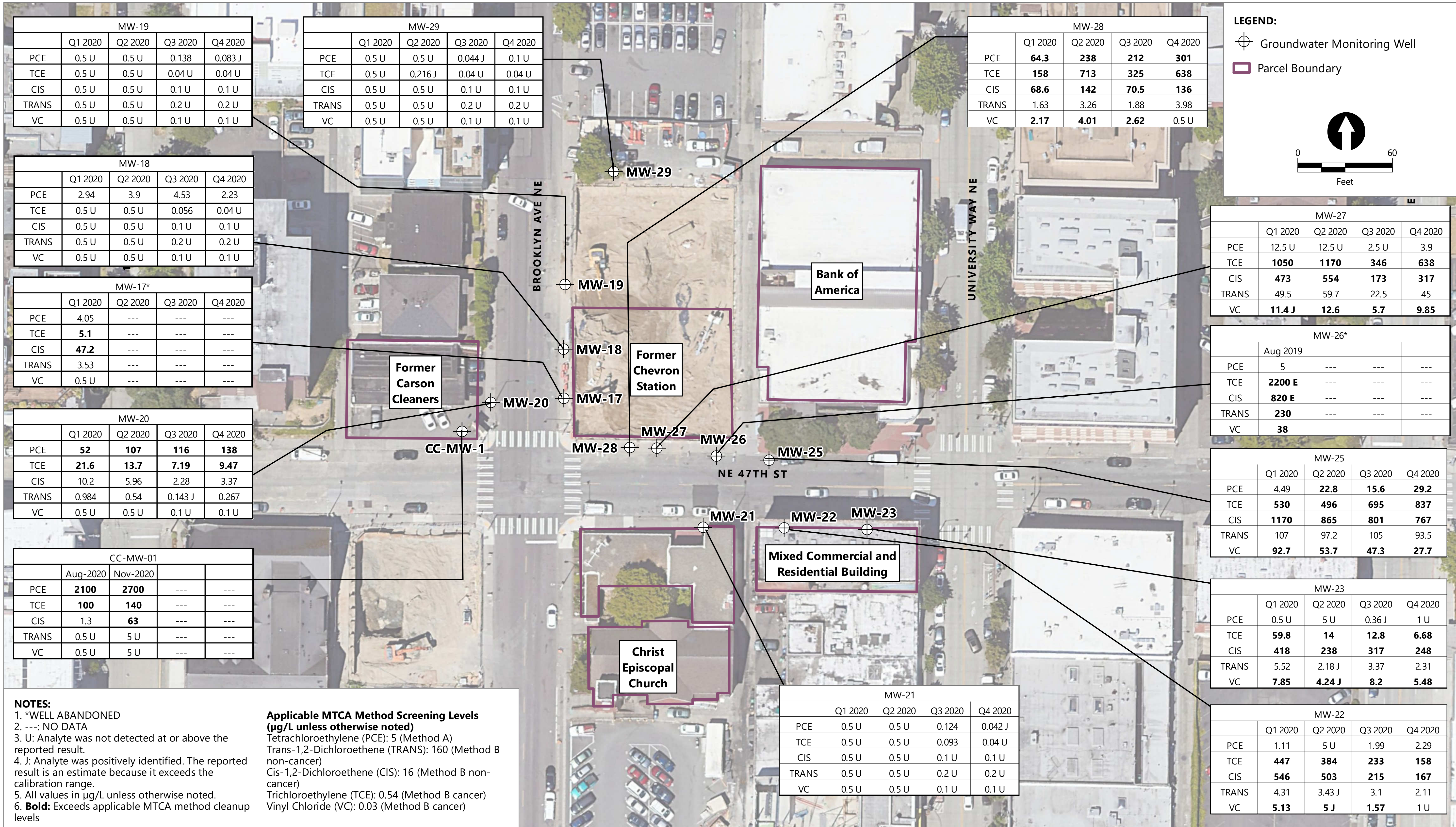
Figure 5
Existing Soil Analytical Results
Remedial Investigation Work Plan
Carson Cleaners Site



MW-19				
	Q1 2020	Q2 2020	Q3 2020	Q4 2020
PCE	0.5 U	0.5 U	0.138	0.083 J
TCE	0.5 U	0.5 U	0.04 U	0.04 U
CIS	0.5 U	0.5 U	0.1 U	0.1 U
TRANS	0.5 U	0.5 U	0.2 U	0.2 U
VC	0.5 U	0.5 U	0.1 U	0.1 U

MW-29				
	Q1 2020	Q2 2020	Q3 2020	Q4 2020
PCE	0.5 U	0.5 U	0.044 J	0.1 U
TCE	0.5 U	0.216 J	0.04 U	0.04 U
CIS	0.5 U	0.5 U	0.1 U	0.1 U
TRANS	0.5 U	0.5 U	0.2 U	0.2 U
VC	0.5 U	0.5 U	0.1 U	0.1 U

MW-28				
	Q1 2020	Q2 2020	Q3 2020	Q4 2020
PCE	**64.3**	**238**	**212**	**301**
TCE	**158**	**713**	**325**	**638**
CIS	**68.6**	**142**	**70.5**	**136**
TRANS	1.63	3.26	1.88	3.98
VC	**2.17**	**4.01**	**2.62**	0.5 U

MW-18				
	Q1 2020	Q2 2020	Q3 2020	Q4 2020
PCE	2.94	3.9	4.53	2.23
TCE	0.5 U	0.5 U	0.056	0.04 U
CIS	0.5 U	0.5 U	0.1 U	0.1 U
TRANS	0.5 U	0.5 U	0.2 U	0.2 U
VC	0.5 U	0.5 U	0.1 U	0.1 U

MW-27				
	Q1 2020	Q2 2020	Q3 2020	Q4 2020
PCE	12.5 U	12.5 U	2.5 U	3.9
TCE	**1050**	**1170**	**346**	**638**
CIS	**473**	**554**	**173**	**317**
TRANS	49.5	59.7	22.5	45
VC	**11.4 J**	**12.6**	**5.7**	**9.85**

MW-17*				
	Q1 2020	Q2 2020	Q3 2020	Q4 2020
PCE	4.05	---	---	---
TCE	**5.1**	---	---	---
CIS	**47.2**	---	---	---
TRANS	3.53	---	---	---
VC	0.5 U	---	---	---

MW-26*				
	Aug 2019			
PCE	5	---	---	---
TCE	**2200 E**	---	---	---
CIS	**820 E**	---	---	---
TRANS	230	---	---	---
VC	**38**	---	---	---

MW-20				
	Q1 2020	Q2 2020	Q3 2020	Q4 2020
PCE	**52**	**107**	**116**	**138**
TCE	**21.6**	**13.7**	**7.19**	**9.47**
CIS	10.2	5.96	2.28	3.37
TRANS	0.984	0.54	0.143 J	0.267
VC	0.5 U	0.5 U	0.1 U	0.1 U

MW-25				
	Q1 2020	Q2 2020	Q3 2020	Q4 2020
PCE	4.49	**22.8**	**15.6**	**29.2**
TCE	**530**	**496**	**695**	**837**
CIS	**1170**	**865**	**801**	**767**
TRANS	107	97.2	105	93.5
VC	**92.7**	**53.7**	**47.3**	**27.7**

CC-MW-01				
	Aug-2020	Nov-2020		
PCE	**2100**	**2700**	---	---
TCE	**100**	**140**	---	---
CIS	1.3	**63**	---	---
TRANS	0.5 U	5 U	---	---
VC	0.5 U	5 U	---	---

MW-23				
	Q1 2020	Q2 2020	Q3 2020	Q4 2020
PCE	0.5 U	5 U	0.36 J	1 U
TCE	**59.8**	**14**	**12.8**	**6.68**
CIS	**418**	**238**	**317**	**248**
TRANS	5.52	2.18 J	3.37	2.31
VC	**7.85**	**4.24 J**	**8.2**	**5.48**

MW-21				
	Q1 2020	Q2 2020	Q3 2020	Q4 2020
PCE	0.5 U	0.5 U	0.124	0.042 J
TCE	0.5 U	0.5 U	0.093	0.04 U
CIS	0.5 U	0.5 U	0.1 U	0.1 U
TRANS	0.5 U	0.5 U	0.2 U	0.2 U
VC	0.5 U	0.5 U	0.1 U	0.1 U

MW-22				
	Q1 2020	Q2 2020	Q3 2020	Q4 2020
PCE	1.11	5 U	1.99	2.29
TCE	**447**	**384**	**233**	**158**
CIS	**546**	**503**	**215**	**167**
TRANS	4.31	3.43 J	3.1	2.11
VC	**5.13**	**5 J**	**1.57**	1 U

NOTES:
1. *WELL ABANDONED
2. ---: NO DATA
3. U: Analyte was not detected at or above the reported result.
4. J: Analyte was positively identified. The reported result is an estimate because it exceeds the calibration range.
5. All values in µg/L unless otherwise noted.
6. **Bold:** Exceeds applicable MTCA method cleanup levels

Applicable MTCA Method Screening Levels (µg/L unless otherwise noted)
Tetrachloroethylene (PCE): 5 (Method A)
Trans-1,2-Dichloroethene (TRANS): 160 (Method B non-cancer)
Cis-1,2-Dichloroethene (CIS): 16 (Method B non-cancer)
Trichloroethylene (TCE): 0.54 (Method B cancer)
Vinyl Chloride (VC): 0.03 (Method B cancer)

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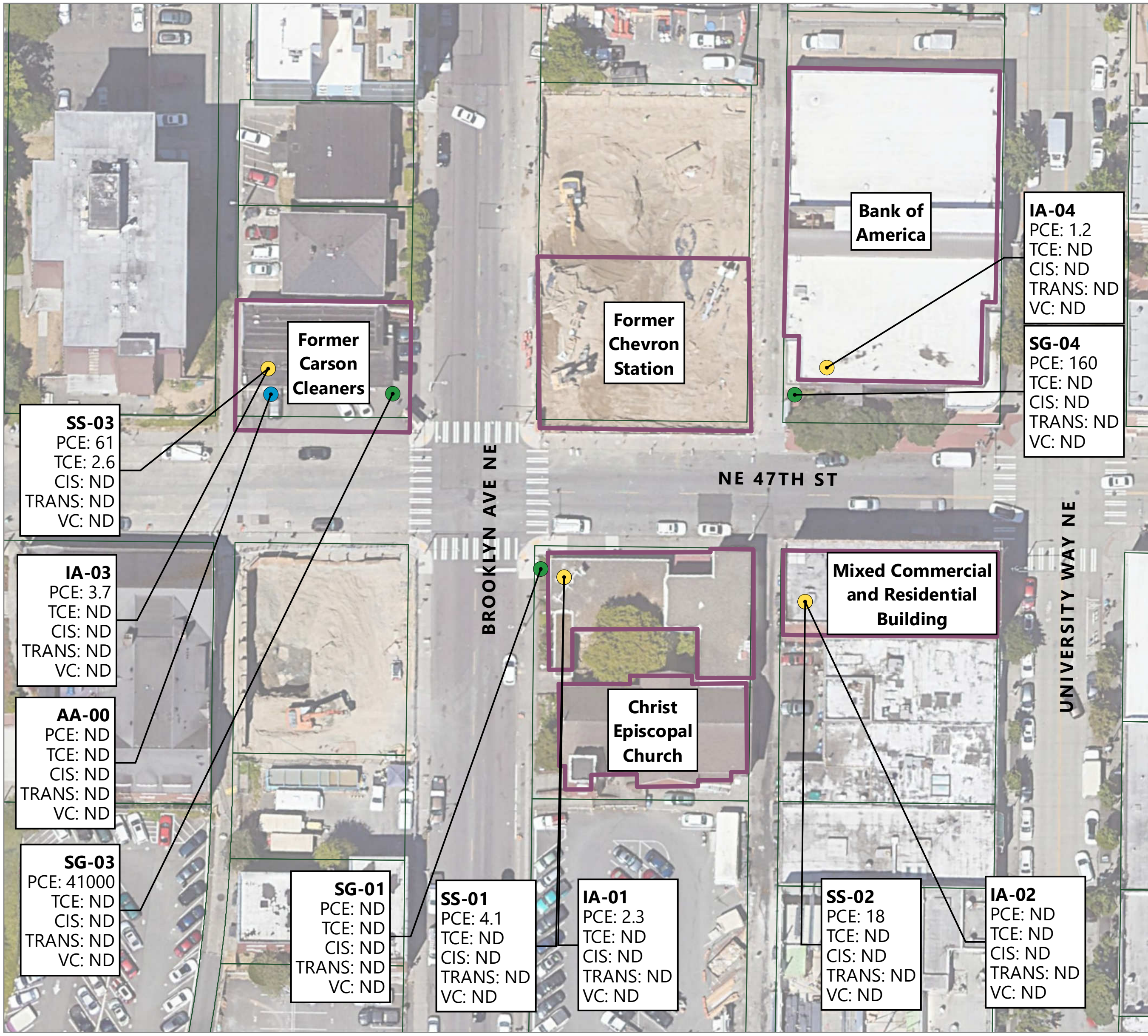
Filepath: Q:\Jobs\CascadiaLawGroup_0544\FormerCarsonCleaners\Maps\RI_Workplan\AQ_CC_RIWP_Fig06_GW_Analytical_Historical_Exceedance.mxd

ANCHOR QEA

Figure 6
Existing Groundwater Analytical Results
Remedial Investigation Work Plan
Carson Cleaners Site



LEGEND:

- Parcel
- Building

Sampling Locations

- Ambient Air
- Exterior Boring
- Interior Sample (indoor air/sub-slab location)

NOTES:

Concentration in µg/m³ unless otherwise noted
PCE: Tetrachloroethylene
TCE: Trichloroethylene
CIS: cis-1, 2-Dichloroethene
TRANS: trans-1, 2-Dichloroethene
VC: Vinyl Chloride
ND: Non-Detect
BOLD: Exceeds vapor intrusion Method B cleanup levels

__Vapor Intrustion Method B Cleanup Levels__

Indoor Air Method B Cancer:
-PCE: 9.60
-TCE: 0.33
-CIS: Not established
-TRANS: 18 (Method B non-cancer)
-VC: 0.28

Sub-Slab Soil Gas Method B Cancer:
-PCE: 320
-TCE: 11
-CIS: Not established
-TRANS: Not established
-VC: 9.5

Shallow Soil Gas Screening Levels Not Established

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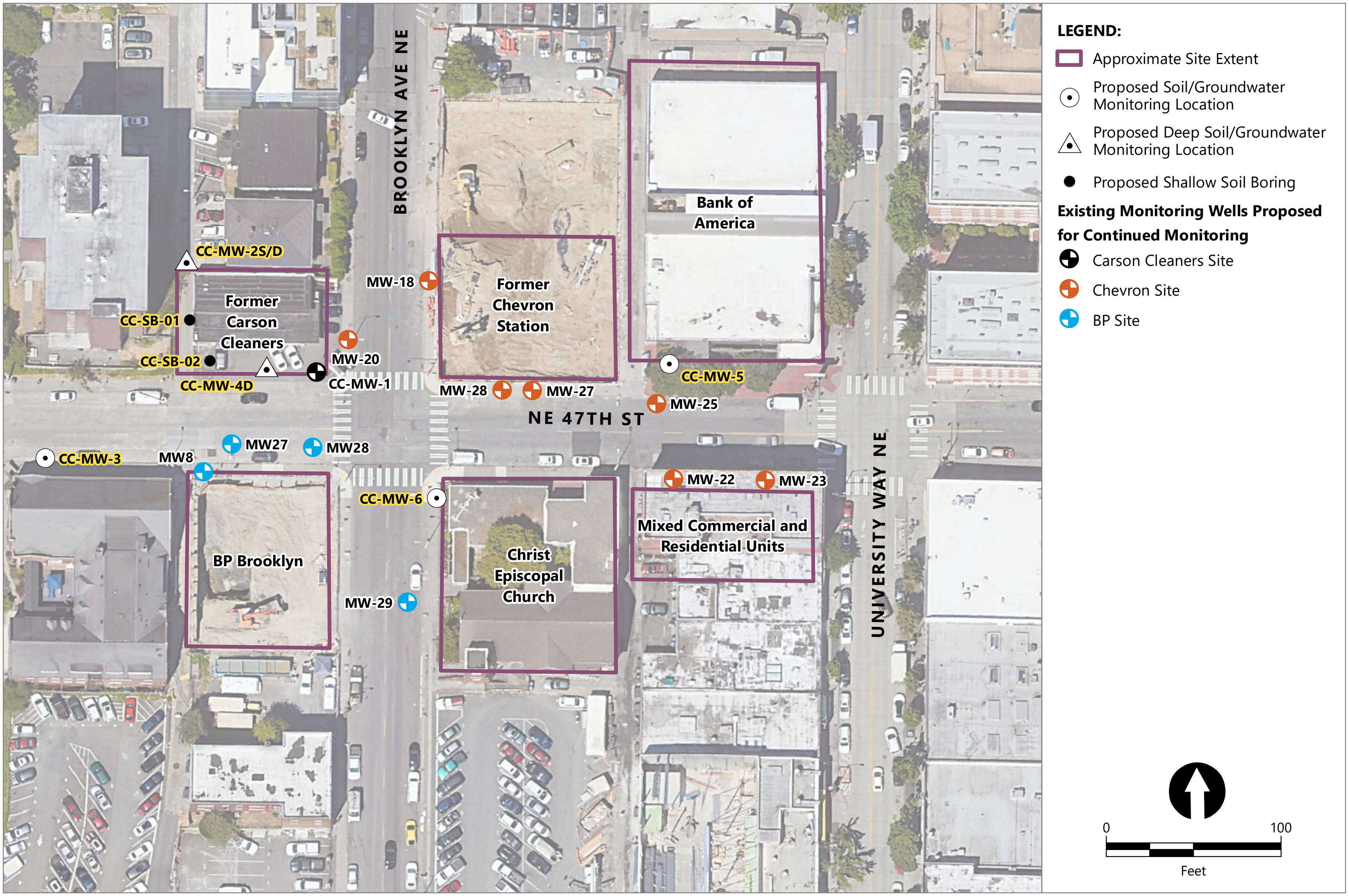
ANCHOR QEA

Figure 7
Existing Vapor Intrusion Results
Remedial Investigation Work Plan
Carson Cleaners Site



Publish Date: 2021/09/27, 11:29 AM | User: epipkin
Filepath: Q:\Jobs\CascadiaLawGroup_0544\FormerCarsonCleaners\Maps\RI_Workplan\AQ_CC_RIWP_Fig08_ProposedSampleLocations.mxd

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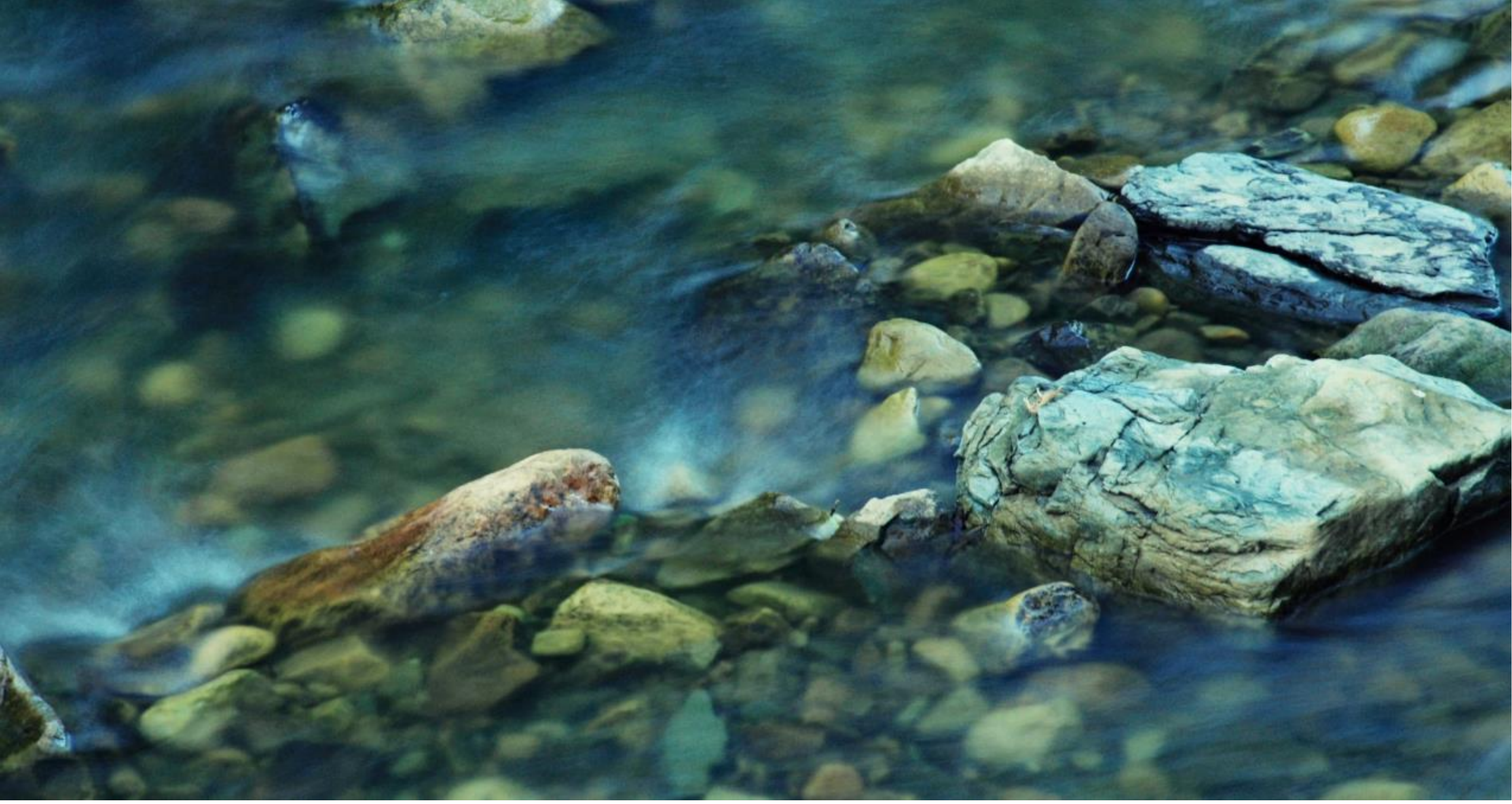
Figure 8
Proposed Soil and Groundwater Sample Locations
Remedial Investigation Work Plan
Carson Cleaners Site

Appendix A
Sampling and Analysis Plan



October 2021
Carson Cleaners Site

Sampling and Analysis Plan

Prepared for Tahn Associates LLC and Washington State Department of Ecology

October 2021
Carson Cleaners Site

Sampling and Analysis Plan

Prepared for
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TABLE OF CONTENTS

TABLE

EXHIBITS

ABBREVIATIONS

ALS	ALS Environmental
AO	Agreed Order No. DE 19805
ASTM	ASTM International
bgs	below ground surface
COC	chain-of-custody
CVOC	chlorinated volatile organic compounds
DQO	data quality objective
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
GPS	global positioning system
HASP	Health and Safety Plan
Hg	mercury
NTU	nephelometric turbidity units
PCE	tetrachloroethylene
PID	photoionization detector
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan
RL	reporting limits
SAP	Sampling and Analysis Plan
Site	Carson Cleaners area
Tahn	Tahn Associates, LLC
TCE	trichloroethylene
TWA	time-weighted average
VOCs	volatile organic compounds

1 Introduction

This Sampling and Analysis Plan (SAP) describes procedures for the collection, processing, and handling of groundwater, air, and subsurface soil data under the Remedial Investigation Work Plan (RIWP). Tahn Associates LLC (Tahn) is implementing this work under the requirements of the 2021 Agreed Order (AO) No. DE 19805, effective June 17, 2021, between Tahn and the Washington State Department of Ecology (Ecology) for the former Carson Cleaners area (Site). A vicinity map is presented as Figure 1 of the RIWP.

The Quality Assurance Project Plan (QAPP; Appendix B of the RIWP), Inadvertent Discovery Plan (Appendix C of the RIWP), and Health and Safety Plan (HASP; Appendix D of the RIWP) will be followed during all field work described in this SAP. Components of this work that rely on ASTM International (ASTM) standards will refer to currently adopted versions of the standards to ensure data quality.

1.1 Purpose and Objective

This SAP, which is Appendix A of the RIWP, details the methods and processes that will be used to collect data as part of the Remedial Investigation (RI) objective laid out in Section 1.1 of the RIWP. This SAP is being implemented to support the RI.

1.2 Document Organization

The remainder of this document is organized into the following sections:

- Section 1 – Introduction
- Section 2 – Project Management and Responsibilities
- Section 3 – Scope of Work
- Section 4 – Sample Identification and Positioning Procedures
- Section 5 – Field Documentation, Decontamination, Sample Handling, and Waste Management
- Section 6 – Chemical and Physical Testing
- Section 7 – Field Sampling Schedule

2 Project Management and Responsibilities

This section describes the project management structure for implementing this SAP. Additional information about staff responsible for project management and other roles is defined in the QAPP (Appendix B of the RIWP).

2.1 Project Planning and Coordination

Dale Myers of Ecology will serve as the government project manager and will conduct the overall project coordination, review reports, and coordinate with Tahn and Anchor QEA. Gavin Casson will serve as the Anchor QEA task and field manager and is responsible for executing this SAP by overseeing the collection and analysis of field samples and reporting the analytical results to Ecology.

2.2 Laboratory Planning and Coordination

Jennifer Marsalla, of Anchor QEA, will serve as the project chemist and quality assurance (QA) manager and laboratory coordinator. She is responsible for subcontracting the state-certified laboratory and ensuring observation of established protocols for sample processing, decontamination, sample preservation, holding times, chain-of-custody (COC) documentation, and data management. She will provide QA oversight of the analytical and data validation programs, ensuring that the chemistry data are valid and usable for their intended purpose, and that all sample processing and analytical procedures meet the quality control (QC) requirements identified in the QAPP.

2.3 Subcontractor Support

Samples collected by Anchor QEA will be analyzed by ALS Environmental (ALS), located in Simi-Valley, California, and Kelso, Washington. ALS is accredited by Ecology. All chemical testing will adhere to SW-846 QA/QC procedures and analysis protocols[1] or follow the appropriate ASTM or Standard Method protocols. If more current analytical methods are available, the laboratory may use them.

Nicole Bryson will serve as the laboratory manager at ALS. The laboratory manager will oversee all laboratory operations associated with the receipt of the environmental samples, chemical analyses, and laboratory report preparation for this project. The laboratory manager will review all laboratory reports and prepare case narratives describing any anomalies and exceptions that occurred during analyses.

[1] U.S. Environmental Protection Agency, 1998. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*; Third Edition; Final Update III-A. March 1999.

The data validator project manager will be Christina Rink, of Laboratory Data Consultants, who will serve as the primary contact and perform all applicable data validation.

2.4 Health and Safety Program

An updated site-specific HASP is included in Appendix D of the RIWP. A job safety analysis specific to the sample collection described herein has been added to the updated HASP and includes identification of potential physical and chemical hazards and key project personnel.

3 Scope of Work

Additional soil, vapor, and groundwater characterization is required to understand the nature and extent of contamination at the Site. All investigation and sampling activities described will be completed to support the RIWP and will be in general accordance with the QAPP, Inadvertent Discovery Plan, and HASP. Investigation and sampling activities will be coordinated with adjacent properties to share data and limit the need for additional off-property wells.

3.1 Pre-Field Activities

Before mobilizing to the site, Anchor QEA will perform the following activities:

- Update the site-specific HASP and prepare job safety analyses and traffic control plans, as appropriate.
- Secure access agreements from the City of Seattle for the right-of-way, as appropriate.
- Secure access agreements from neighboring properties, as appropriate.
- Notify the property owners and property tenants approximately 30 days before field work commences.
- Notify Ecology approximately 21 days prior to commencing field work.
- Mark the proposed sample locations and contact Washington 811 at least 72 hours prior to conducting subsurface activities to mark known public utilities within the work area.
- Contract and oversee a private utility locator to conduct a private utility scan, including the use of ground-penetrating radar, of the entire property to identify potential conflicting utilities or other underground structures in addition to potential preferential pathways.

3.2 Monitoring Well Installation and Development

Four monitoring well locations (CC-MW-2S, CC-MW-3, CC-MW-5, and CC-MW-6) will be installed throughout the shallow water bearing unit of the Site to further delineate the nature and extent of contaminated groundwater. Proposed monitoring well locations are shown in Figure 8 of the RIWP.

Proposed borings within 5 feet of an identified utility will be pre-cleared using a combination of air knife, vacuum truck, and/or hand auger to a minimum depth of 5 feet below ground surface (bgs). During pre-clearance, soil samples will be collected by hand auger at approximately 2.5 feet bgs and screened for volatile organic compounds (VOCs) using an 11.7 eV lamp photoionization detector (PID). After pre-clearance activities, soil samples will be collected from 5-foot intervals. Soil sampling activities are discussed in detail in Section 3.5 of this SAP.

After pre-clearance activities, monitoring wells will be installed using a sonic drill operated by a Washington State licensed well driller. Each borehole will be logged using the Unified Soil Classification System and screened for VOCs using a calibrated PID.

All materials used for monitoring well construction shall be clean and free of contaminants. Monitoring wells shall be constructed using 2-inch-diameter Schedule 40 polyvinyl chloride (PVC) casing and screen. The screened intervals shall be constructed of 0.010-slot screen size. All casings and screens shall be flush-jointed and threaded. The use of PVC cement or primer is prohibited. The casings shall be fitted with a threaded bottom cap of the same material as the casing and that is free draining.

The screened interval of the monitoring wells will typically extend a minimum of 2 feet above the highest expected groundwater levels, with the total depth to be determined based on field screening results. The filter pack surrounding the screened interval shall consist of 20/40 fine sand, with a minimum of 1 foot of filter pack above the screened interval. The filter pack shall be overlain with a minimum 1-foot-thick layer of fully hydrated bentonite chips, with a cement/bentonite grout on top of the bentonite seal to the ground surface. The anticipated well construction details are shown in Exhibit 1.

All monitoring wells will be completed with flush-mount covers at the ground surface. The well casing shall be cut 2 to 3 inches bgs and capped to prevent infiltration of surface water. A cast-iron valve box assembly shall be centered in an 18-inch-diameter concrete pad sloping away from the valve box.

Following installation (at least 24 hours), the monitoring wells will be developed to flush the sand pack around the screen and to remove any debris present in the well casing. Monitoring wells will be surged for at least 10 minutes with a device equipped with a surge-block in order to move water in and out of the well screen to loosen and flush out sediment from the well screen and from the filter sand pack. The well will then be pumped until at least 10 casing volumes of water have been removed, water quality parameters (pH, specific conductivity, turbidity, and temperature) have stabilized to +/-10% of the previous reading, and sediment is removed from the well. Ideally, development will continue until turbidity is below 50 nephelometric turbidity units (NTU); however, this is not always possible with poorly producing wells, or with wells installed in silty or clayey soils. If the well runs dry prior to 10 casing volumes being removed or water quality parameters having stabilized and recharges within 30 minutes purging dry, at least three rounds of surging and purging dry will be completed. If the well is purged dry and does not recover within 5 hours, the well will be considered developed.

3.3 Deep Monitoring Well Installation and Development

Two monitoring well locations (CC-MW-2D and CC-MW-4D) will be installed in the deeper water bearing zone (Deep Zone) and will be drilled with sonic drilling methods. These locations will be double cased to prevent possible downward infiltration of groundwater impacted by chlorinated volatile organic compounds (CVOCs) to the Deep Zone. The borehole for the monitoring well will be advanced through the upper water bearing zone (Shallow Zone) until the low-permeability confining unit has been visually identified in soil samples. A large-diameter drill casing (at least 8 inches) will be advanced in the borehole to a depth at least 1 foot below the top of the confining unit. Bentonite chips sufficient to fill the bottom 2 feet of the inside of the casing will then be added and allowed to hydrate for at least 20 minutes. During the time required for hydration, the volume of the residual water inside the casing will be removed with a bailer or submersible pump while potable water is added to the bottom of the borehole via tremie pipe to prevent the potentially CVOC-impacted Shallow Zone groundwater from being "dragged down" into the Deep Zone.

After the required time for bentonite hydration has passed, the borehole will be advanced with a smaller diameter drill casing (usually 6 inches) through the bentonite seal and below the confining unit into the Deep Zone (to a depth below the bottom of the confining unit at least the length of the filter pack, which usually extends 2 feet above the top of the screen).

Following well installation, the larger diameter outer casing can either be left in place to seal off the Shallow Zone or removed. If removed, the annular space will be backfilled with bentonite grout from the bottom of the casing to the ground surface via tremie pipe.

Well construction materials and installation and development methods will be the same as described in Section 3.2.

3.4 Groundwater Sampling and Analysis

Following completion of monitoring well installations and development, groundwater samples will be collected from the newly installed wells (4 shallow and 2 deep) and from 12 existing groundwater monitoring wells located on the Carson Cleaners property and adjacent properties, assuming access to these wells is acquired. For the deep wells, a single sample will be collected to determine the presence or absence of CVOCs in the deeper water bearing unit. If the wells do not detect CVOCs, no further testing will be conducted. If the deeper wells detect CVOCs at or above CVOC screening levels, sampling will be conducted for an additional three quarters. For each of the shallow wells, groundwater samples will be collected for four consecutive quarters during the Phase 1 effort, as described in the following sections. Pending Ecology approval of the RIWP, Anchor QEA anticipates initiating the first sampling event in the fourth quarter of 2021 or first quarter of 2022.

3.4.1 Water Level Measurements

The top of the well casing rim of each well in the monitoring network will be surveyed to obtain northing, easting, and elevations referenced to the North American Vertical Datum of 1988. Water levels will be measured to the nearest 0.01 foot in each monitoring well relative to the top of the surveyed casing rim using an electronic water meter. The water level measurements will be converted to elevations referenced to mean sea level and included in the groundwater monitoring report.

3.4.2 Groundwater Sample Collection Procedures

Groundwater samples will be obtained from monitoring wells using a peristaltic pump and polyethylene tubing. Groundwater will be collected using low-flow sampling protocols, purging the well at 0.5 liter per minute or less using a peristaltic pump through tubing placed within the well casing. A YSI Pro DSS water quality meter (or similar) with a flow-through cell will be used to monitor the following water quality parameters during purging:

- pH
- Specific conductance (in millisiemens per centimeter)
- Temperature (in degrees Celsius)
- Dissolved oxygen (in milligrams per liter)
- Oxidation reduction potential (in millivolts)
- Turbidity (in NTUs)

Groundwater samples at each location will be collected after ambient groundwater conditions have been reached, such that specific conductance and turbidity are stable for three successive readings (i.e., the readings are within +/-10%). All water quality parameters will be recorded on the groundwater sampling forms, provided as Exhibit 2 of this SAP.

Groundwater samples will be collected directly into laboratory-provided bottles once water quality parameters stabilize and will subsequently be placed in a cooler on ice. All groundwater samples will be shipped via FedEx overnight under COC procedures to ALS in Kelso, Washington.

3.4.3 Laboratory Analyses

Chemical analyses will be performed per the specifications in the QAPP for groundwater quality analysis. Groundwater samples will be submitted to ALS for the following analyses:

- CVOCs per U.S. Environmental Protection Agency (EPA) Method 8260C

Laboratory data will be subjected to a standard EPA Level 2B data validation review prior to use in data reduction and reporting as discussed in Section 5.4 of the RIWP.

3.5 Soil Characterization

This section describes the procedures that will be used to collect subsurface soil samples needed to provide the additional data described in the RIWP. The target sampling locations are depicted in Figure 8 in the RIWP.

3.5.1 Subsurface Soil Sampling

At each on- and off-property groundwater monitoring well location, subsurface soil samples will be collected at the proposed locations identified in Table 1 of this SAP and depicted in Figure 8 of the

RIWP to delineate the nature and extent of contamination and improve the conceptual site model. Subsurface soil samples will target vadose zone intervals with visual/olfactory/PID indications of contamination, if identified. During utility pre-clearance activities, soil samples will be collected by hand auger at approximately 2.5 feet bgs and screened for VOCs using a PID. After pre-clearance activities, soil samples will be collected from 5-foot intervals and logged from pre-clearance to terminal depth. Each borehole will be logged using the Unified Soil Classification System and screened for VOCs using a calibrated PID. Soil samples may be submitted for laboratory analysis based on field observations. Where no VOCs are detected with the PID, the field geologist will select three representative samples from the upper, middle, and lower vadose zone soils for testing.

Two additional soil sampling locations (CC-SB-01 and CC-SB-02), omitting groundwater well installations, are proposed along the south and west portions of the property. If located within 5 feet of an identified utility, the borings will be pre-cleared by a combination of air knife, vacuum truck, and/or hand auger to a minimum depth of 5 feet bgs. Boreholes will be advanced using a push probe to a depth of 25 feet bgs or until the groundwater table is encountered, whichever is less.

3.5.2 Subsurface Soil Boring Sampling Methods

At each of the locations listed in Table 1 of this SAP and depicted in Figure 8 of the RIWP, the boring will be documented as follows:

- Samples will be photographed, with respective boring identification and sample location markers visible in the photos.
- The following information, at a minimum, will be logged by the field geologist: sample depth, Unified Soil Classification System description, soil moisture, occurrence of groundwater, and physical indications of potential contamination (e.g., odor or staining).
- All soil samples to be submitted for VOC analyses will be collected in accordance with EPA Method 5035A. The soil aliquot for VOC analysis will be collected from the undisturbed soil sample core using a laboratory-supplied, modified disposable plastic syringe as required by EPA Method 5035A and placed in pre-weighed laboratory-supplied vials.

The recommended containers, preservation techniques, and holding times are presented in Table 2 of the QAPP.

3.6 Vapor Characterization

Initial indoor air screening results identified no short-term risks; however, detected concentrations of CVOCs require confirmation as well as evaluation of chronic risks. For the RIWP, quarterly vapor intrusion characterization will be conducted for three additional quarters at the following four locations:

1. Former Carson Cleaners property
2. Mixed-use building
3. Christ Episcopal Church
4. Bank of America (current owner of the building is the University District Parking Association)

Sampling will consist of ambient air, indoor air, and sub-slab vapor characterization (where allowed). No further monitoring of shallow soil vapors exterior of the buildings is proposed.

3.6.1 Sub-slab Soil Vapor Sampling

Sub-slab soil vapor sampling is designed to identify potential releases of CVOCs to the property, in or under the building. Figure 7 of the RIWP depicts the properties at which sub-slab soil vapor sampling has occurred and will continue for three quarters. At the property owner's request, sub-slab soil vapor sampling was not performed and will not be performed at the Bank of America Financial Center unless otherwise determined.

Using previously installed vapor pins, tubing will be fitted to the vapor pin and an airtight valve will be attached to the end of the tubing at the surface. A helium tracer will be applied in a shroud encompassing the vapor sampling probe to test for leaks in the vapor pin seal. Sub-slab vapor will be purged using a peristaltic pump. Vapor grab samples will be collected in Tedlar bags to test for the presence or absence of helium tracer gas and total organic vapor content using a parts per million detection-range, hand-held PID. If 10% or more of the shroud-applied helium is detected in the grab sample, the vapor pin will be removed and reset, then the helium leak will be tested again until the point is sealed.

A minimum 2-hour equilibration period will be allowed prior to sampling activities. At each location, a 60-second shut-in test will be completed on the sampling train to check for leaks in the aboveground fittings. An approximately 100 inches of water (in-H20) vacuum will be induced in the sample train. If there is an observable loss of vacuum, the sample assembly will be refitted, and the test will be repeated.

Approximately three volumes of the sampling equipment will be extracted from the vapor sampling point, at a rate of no more than 200 milliliters per minute prior to sampling. Soil gas samples will be collected from the locations using 6-liter, batch certified, Summa canisters with 8-hour collection valves. The soil gas and sub-slab soil vapor samples will be submitted to a Washington certified environmental analytical laboratory and analyzed using EPA Method TO-15 for VOCs. The list of analytes will include the following:

- VOCs detected in monitoring wells:
  - Tetrachloroethylene (PCE)
  - Trichloroethylene (TCE)
  - Cis-1,2-Dichloroethene
  - Trans-1,2-Dichloroethene
  - Vinyl chloride

Results of the laboratory analysis will be compared to the screening levels discussed in Section 3.4 of the RIWP. After three quarters of testing, if it has been determined no further assessment is needed, vapor pins and flush mount covers will be removed, and the borings will be filled with a neat cement grout and completed with concrete to the top of slab.

3.6.2 Indoor Air Sampling

Commercial indoor air samples will be 8-hour, time-weighted average (TWA) samples. The TWA samples will be collected using integrated passive air samplers consisting of 6-liter laboratory-certified evacuated Summa canisters. Each Summa canister will be equipped with a pressure gauge and a calibrated critical orifice air flow controller.

Canister inlet valve heights will be approximately 3 to 3.5 feet above grade to approximate a sitting receptor in a commercial space. Canisters will be clearly labeled with signs indicating the purpose of the canisters and that the canisters are not to be interfered with or moved. The TWA Summa canisters will be provided with a vacuum of 25 to 30 inches mercury (Hg) by the laboratory. A final vacuum reading greater than ambient (i.e., 0 inches Hg) indicates a valid sample; however, canister closure will be targeted for a vacuum pressure of 5 inches Hg to provide a margin of safety. Canister pressures will be checked within 1 to 2 hours after beginning sampling to evaluate whether air flow controllers are functioning properly. Observed hourly pressure losses greater than one-tenth of the initial pressure will be considered indicative of a faulty flow controller. Any canisters observed to have a faulty flow controller will be replaced with a backup canister and flow controller.

Analytical results will be compared to the standards referenced in Section 3.4 of the RIWP.

3.6.3 Ambient Air Sampling

Ambient air sample locations will be 8-hour, TWA samples. The sample will be collected using a 6-liter laboratory-certified evacuated Summa canister. The Summa canister will be equipped with a pressure gauge and a calibrated critical orifice air flow controller for collection of the TWA samples. Canister inlet valves will be placed at a height of approximately 6 feet above ground surface, consistent with Ecology guidance, and near HVAC inlets where feasible.

The background sample Summa canisters will be provided with a vacuum pressure of 25 to 30 inches Hg by the laboratory. A final vacuum pressure reading greater than ambient (i.e., 0 inch Hg) indicates a valid sample; however, canister closure will be targeted for a vacuum pressure of 5 inches Hg to provide a safety margin. Canister pressure will be checked within 1 to 2 hours after beginning sampling to evaluate whether the air flow controller is functioning properly. Observed hourly pressure losses greater than one-tenth of the initial pressure will be considered indicative of a faulty flow controller. If the canister is observed to have a faulty flow controller, it will be replaced with a backup canister and flow controller.

Atmospheric conditions during the sampling period, including temperature, barometric pressure, wind direction, wind speed, and precipitation totals, will be recorded using publicly available meteorological data from a weather station (located within about 0.5 mile from the commercial building where sampling will occur). Observations will be recorded both at the beginning and at the end of the sample period.

4 Sample Identification and Positioning Procedures

This section of the SAP describes the procedures that will be used to identify samples and sample locations including QA/QC methods.

4.1 Sample Identification and Labels

Each sample will be assigned a unique alphanumeric identifier. The identifier will have the format of "Project Identifier-Station ID-Media Code-Interval-Date." Samples will be identified according to the following procedure:

- The project identifier will be "CC" to denote Carson Cleaners.
- The station ID will correspond to sample locations shown in Figure 8 of the RIWP.
- The media code will be "SO" for soil.
- The media code will be "GW" for groundwater.
- The media code will be "SS" for sub-slab soil gas.
- The media code will be "IA" for indoor air.
- The media code will be "AA" for ambient air.
- The interval will indicate the depth bgs.
- Date of collection, in the form of YYYYMMDD.
- For field QA/QC samples, the station ID will be FD for field duplicates, FB for field blanks, and RB for rinse blanks, followed by the sequential number for the QA/QC sample.
- For example, a soil sample collected on October 31, 2021, from soil boring CC-MW-04 at 14 feet bgs will have an ID of CC-MW-04-SO-14-20211031; a sub-slab vapor sample collected on October 31, 2021, from vapor point SS-01 will have an ID of CC-SS-01-20211031.

Each sample will have an adhesive plastic or waterproof paper label affixed to the container or bag and will be labeled at the time of collection. The following information will be recorded on the container label at the time of collection:

- Project name
- Sample ID
- Date and time of sample collection
- Analysis to be performed

4.2 Station Positioning

A handheld differential global positioning system (GPS) will be used to navigate to the proposed groundwater monitoring well and soil boring locations. GPS coordinates for each location are provided in Table 1 of this SAP. The proposed locations will be adjusted in the field based on identified utilities, overhead obstructions, and access to the location. Installed locations will be surveyed relative to the Washington State Plane Coordinates, North; North American Datum 1983.

4.3 Field Quality Assurance/Quality Control Samples

Field QA/QC samples will be collected and used to evaluate the variability resulting from sample handling and the efficiency of field decontamination procedures (Section 5.2 of this SAP). All field quality control samples will be documented in the project field logbook. A summary of the field QA/QC sample analysis is presented in Table 4 of the QAPP.

4.3.1 Field Duplicates

Field duplicates will be collected at a frequency of one per 20 samples. The field duplicates will be prepared by dividing samples into two distinct samples for the laboratory (the original sample and a duplicate). The samples will be processed in the same way as the original sample and will be submitted to the laboratory as blind samples for CVOC analysis.

4.3.2 Trip Blank Samples

Trip blank samples will be used to monitor possible VOC cross contamination occurring during sample transport. Trip blank samples are prepared and supplied by the laboratory pouring organic-free reagent grade water into a VOC vial prior to the collection of the field samples. The trip blank sample vials are placed with and accompany the VOC water and soil samples through the entire transporting process. One trip blank will be collected for each soil sampling round and each groundwater sampling round where VOC analyses are conducted. Trip blanks are not required for VOC vapor sampling.

5 Field Documentation, Decontamination, Sample Handling, and Waste Management

5.1 Field Documentation

A complete record of field activities will be maintained. Documentation necessary to meet data quality objectives (DQOs) for this project includes field notes and field forms, sample container labels, and COC forms. The field documentation will provide descriptions of all sampling activities, sampling personnel, and weather conditions and it will record all modifications, decisions, and/or corrective actions to the study design and procedures identified in this SAP.

A field logbook made of water-resistant paper will be maintained during field operations. All entries will be made legibly, in indelible ink, and will be signed and dated daily. Information recorded will include the following:

- Date, time, place, and location of sampling
- On-site personnel and visitors
- Daily safety discussion and any safety issues
- Field measurements and their units
- Observations about site, location, and samples (weather, odors, appearance, etc.)
- Equipment decontamination verification

Field logbooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occur during project field activities. Entries will be factual, detailed, and objective. Unless restricted by weather conditions, all original data recorded in field logbooks and on sample identification tags, COC records, and field forms will be written in waterproof ink. If an error is made, the individual responsible may make corrections simply by crossing out the error with a single line and adjacently recording the correct information, with their initials and the date of correction. The erroneous information must not be obliterated. All documentation, including voided entries, will be maintained within project files.

5.2 Equipment Decontamination

The following general decontamination procedures will be followed for field sampling equipment:

- Pre-wash rinse with tap or site water.
- Wash with a solution of tap water or site water and phosphate-free soap (e.g., Alconox).
- Rinse three times with distilled water.
- Cover (no contact) all decontaminated items with aluminum foil.
- Store in a clean, closed container for next use.

5.3 Sample Storage and Delivery

Sample container requirements, holding times, and preservation requirements are outlined in Table 2 of the QAPP. Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with sample material must meet high standards of cleanliness. All equipment and instruments that will be used and are in direct contact with various media collected for chemical analyses must be made of glass, stainless steel, or HDPE, and will be cleaned prior to each day's use and between sampling or compositing events.

5.3.1 Chain-of-Custody Procedures

COC procedures will be followed for all samples throughout the collection, handling, and analysis processes. The principal document used to track possession and transfer of samples is the COC form. Each sample will be represented on a COC form the day it is collected. All manual data entries will be made using an indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, and then dating and initialing the change. Blank lines and spaces on the COC form will be lined out, dated, and initialed by the individual maintaining custody. Electronic COC forms generated from a custom field application will be emailed directly to the laboratory and QA managers.

A COC form will accompany each shipment of samples to the analytical laboratory. Each person in custody of samples will sign the COC form and ensure the samples are not left unattended unless properly secured. Copies of all COC forms will be retained in the project files.

All samples will be shipped or hand delivered to the analytical laboratory no later than 1 day after collection. Samples collected on Friday may be held until the following Monday for shipment, provided that this delay does not jeopardize any holding time requirements.

Specific sample shipping procedures are as follows:

- Coolers or containers holding samples for analysis may be shipped via overnight delivery to the laboratory. In the event that Saturday delivery is required, the field coordinator will contact the analytical laboratory before 3 p.m. on Friday to ensure that the laboratory is aware of the number of containers shipped and the airbill tracking numbers for those containers. Following each shipment, the field coordinator will call the laboratory and verify that the shipment from the day before has been received and is in good condition.
- Coolant ice will be sealed in separate plastic bags and placed in the shipping containers.
- Individual sample containers will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest or other suitable container.
- Glass jars will be separated in the shipping container by shock-absorbent material (e.g., bubble wrap) to prevent breakage.

- The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container, and consultant's office name and address) to enable positive identification.
- COC forms will be enclosed in a plastic bag and taped to the inside lid of the cooler.
- A minimum of two signed and dated custody seals will be placed on adjacent sides of each cooler prior to shipping.
- Each cooler will be wrapped securely with strapping tape, labeled "Glass – Fragile" and "This End Up," and will be clearly labeled with the laboratory's shipping address and the consultant's return address.

Upon transfer of sample possession to the analytical laboratory, the person(s) transferring custody of the sample container will sign the COC form. Upon receipt of samples at the laboratory, the custody seals will be broken, and the receiver will record the condition of the samples on a sample receipt form. COC forms will be used internally in the laboratory to track sample handling and final disposition.

5.4 Investigation-Derived Waste Management

Soil cuttings, decontamination water, and well development water will be placed into 55-gallon drums and stored on site until analytical results are received, and a waste disposal profile has been set up with Anchor QEA's waste disposal contractor. At that time, the drums will be disposed of in accordance with Washington State waste regulations. No hazardous materials will be used during field work for this study.

6 Chemical and Physical Testing

The samples will be analyzed for CVOCs. Analytical methods and expected reporting limits (RLs) for each parameter are included in Table 1 of the QAPP (Appendix B of the RIWP). Samples will be submitted to ALS for analyses. The laboratory will be responsible for the following:

- Analyze the samples following the methods described in the QAPP and laboratory Standard Operating Procedures.
- Follow documentation and custody procedures.
- Meet all RL requirements.
- Meet QA/QC frequency and DQO requirements described in the QAPP.
- Deliver electronic data files as specified in the QAPP.
- Meet turnaround times for deliverables as described in the QAPP.
- Allow Ecology and the QA/QC contractor to perform laboratory and data audits.

7 Field Sampling Schedule

Following Ecology approval of the RIWP and associated documents, sampling will be conducted in accordance with the AO. The field investigation is expected to be completed within 365 days. The actual start and end dates for the sampling events will depend on Ecology's approval of the project plans and coordination with subcontractors and property owners. Other conditions that may affect the sampling schedule are weather, contractor availability, and equipment availability.

Tables

Table 1
Proposed Sampling Locations

Proposed Sample Location ID	Easting	Northing	Media	Approximate Target Depth (ft bgs)
CC-SB-01	1275409.05	245449.49	Soil	25
CC-SB-02	1275420.14	245425.88	Soil	25
CC-MW-2S/D	1275407.81	245483.9	Soil and Groundwater	35/80
CC-MW-3	1275324.93	245371.77	Soil and Groundwater	35
CC-MW-4D	1275452.45	245422.14	Soil and Groundwater	80
CC-MW-5	1275682.97	245419.26	Soil and Groundwater	35
CC-MW-6	1275548.34	245344.96	Soil and Groundwater	35

Notes:
1. Horizontal Datum WA State Plane North Zone, NAD83, U.S. Feet.
ft bgs: feet below ground surface
NA: Not Applicable

Exhibit 1

Proposed Well Construction Detail

PROPOSED WELL CONSTRUCTION DETAIL

DATE: TBD	CLIENT: Tahn Associates	Facility ID: 15518216 | Cleanup Site ID: 14878

WELL/BORING NO: TBD

STATE PLANE COORDINATES:
NORTH TBD
EAST TBD

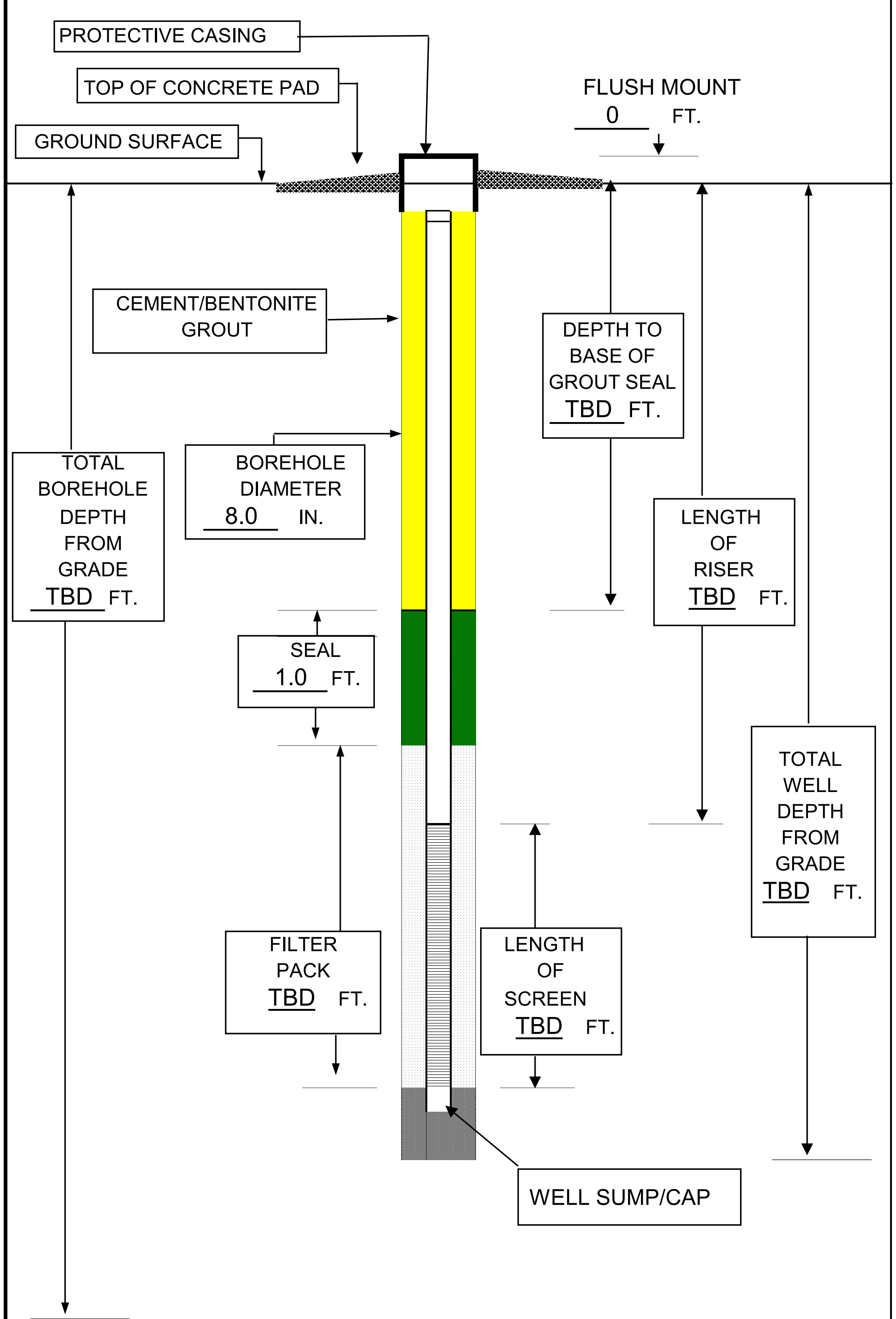
PROJECT NAME: Carson Cleaners Site
ADDRESS: 4701 Brooklyn Ave NE
Seattle, Washington

TOP OF SLAB ELEVATION: TBD

WELL CONTRACTOR: TBD

TOP OF CASING ELEVATION: TBD

WELL SCHEMATIC



ALL ELEVATIONS ARE IN FEET NGVD

CONSTRUCTION DATA

CASING INFORMATION

MATERIAL: [x] PVC [ ] STAINLESS [ ] CARBON [ ] OTHER

DIAMETER: [x] 2" [ ] 4" [ ] 6" [ ] OTHER ____ IN.

JOINTS: [X] THREADED [ ] WELDED [ ] SCREWED [ ] COUPLED [ ] OTHER

SCHEDULE: 40

SCREEN INFORMATION

MATERIAL: [x] PVC [ ] STAINLESS [ ] TEFLON [ ] OTHER

DIAMETER: [x] 2" [ ] 4" [ ] 6" [ ] OTHER ____ IN

SLOT: [x] 0.010 [ ] 0.020 [ ] OTHER ____ IN

CENTRALIZER: [ ] YES [X] NO

FILTER PACK MATERIAL

20/40 SAND [x]

OTHER [ ] #0

BENTONITE WELL SEAL

[ ] 1/2-INCH PELLETS
[ ] 1/4-INCH PELLETS
[X] CHIPS
[ ] OTHER

SURFACE PROTECTION

CONCRETE PAD: [ ] 3'X3' [ ] 4'X4' [x] OTHER TBD IN fmc

WELL SUMP/CAP

[ ] YES
[x] NO
LENGTH ____ FT.

ANCHOR QEA

Exhibit 2

Groundwater Sampling Forms

ANCHOR QEA

1201 3rd Avenue, Suite 2600
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

Groundwater Collection Form: Water Quality Monitoring

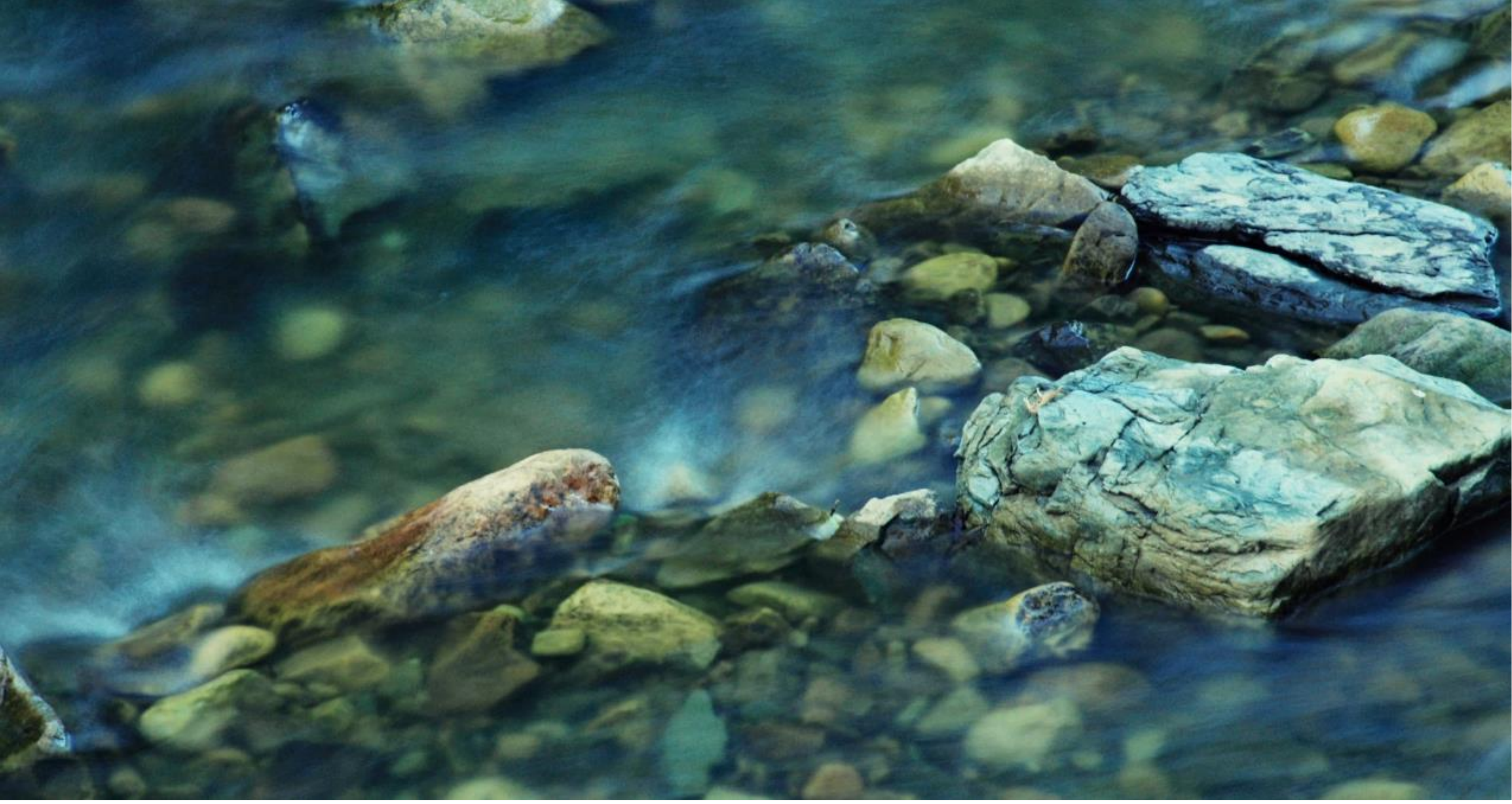
Well ID:		**Date:**	**Sampler:**
Project Name:		**Project Number:**	
Method:			
Initial Depth to Water		Total Depth to Well	
Weather Observations:			

Time	Depth to Water (feet)	Rate (mL/m)	Cum. Vol (mL)	Temp (°C)	pH	Spec. Cond. (mS/cm)	ORP (mV)	Turbidity (NTU)	Comments

Notes:

Sample ID:

Appendix B
Quality Assurance Project Plan



October 2021
Carson Cleaners Site

Quality Assurance Project Plan

Prepared for Than Associates, LLC, and Washington State Department of Ecology

October 2021
Carson Cleaners Site

Quality Assurance Project Plan

Prepared for
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Washington State Department of Ecology
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Prepared by
Anchor QEA, LLC
1201 3rd Avenue, Suite 2600
Seattle, WA 98101

TABLE OF CONTENTS

TABLES

ABBREVIATIONS

ALS	ALS Environmental
AO	Agreed Order No. DE 19805
ASTM	ASTM International
COC	chain-of-custody
DQO	data quality objective
Ecology	Washington State Department of Ecology
EDL	estimated detection limit
EIM	Environmental Information Management
EPA	U.S. Environmental Protection Agency
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MD	matrix duplicate
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan
RL	reporting limit
RPD	relative percent difference
SAP	Sampling and Analysis Plan
Site	Carson Cleaners site
Tahn	Tahn Associates, LLC

1 Introduction

This Quality Assurance Project Plan (QAPP) describes procedures for the laboratory analysis of air, groundwater, and subsurface soil data as Appendix B to the Remedial Investigation Work Plan (RIWP). Tahn Associates, LLC (Tahn), is implementing this work under the requirements of the Washington State Department of Ecology (Ecology) Agreed Order (AO; No. DE 19805) between Tahn and Ecology regarding the Carson Cleaners site (Site) located in Seattle, Washington. A vicinity map is presented as Figure 1 of the RIWP.

1.1 Purpose and Objectives

The purpose of this QAPP is to provide confidence in the analytical results through a system of quality assurance (QA)/quality control (QC) performance checks with respect to sample collection methods, laboratory analyses, data reporting, and corrective action procedures to achieve compliance with established performance and data quality criteria. The QA/QC procedures are to ensure that the data derived from this investigation are defensible and usable for their intended purpose.

The analytical methods and QA procedures described here will be followed by Anchor QEA and its contractors during sample collection activities described in the RIWP and the associated Sampling and Analysis Plan (SAP; Appendix A to the RIWP). The objective of this QAPP is to ensure that data of sufficiently high quality are generated to support the project data quality objectives (DQOs).

1.2 Document Organization

The remainder of this QAPP is organized into the following sections:

- Section 1 – Introduction
- Section 2 – Project Management
- Section 3 – Data Generation and Acquisition
- Section 4 – Data Validation and Usability
- Section 5 – Data Analysis, Recordkeeping, and Reporting Requirements
- Section 6 – References

2 Project Management

This section identifies key project personnel, describes the studies to be performed, and outlines project DQOs and criteria.

2.1 Project Organization

Responsibilities of the team members, as well as laboratory project managers, are described in the following subsections. The Remedial Investigation (RI) is being completed by Tahn and Anchor QEA as described in the RIWP, this QAPP, and the associated SAP (Appendix A to the RIWP).

2.1.1 Project Planning and Coordination

Dale Myers of Ecology will serve as the Ecology Designated Project Coordinator and will review reports and coordinate with Tahn and Anchor QEA. Halah Voges, PE, of Anchor QEA is the Designated Project Coordinator on behalf of Tahn and is responsible for executing the AO and RI in consultation with Ecology. Gavin Casson will serve as the Anchor QEA task and field coordinator.

2.1.2 Field Sample Collection

The sampling will be completed by Anchor QEA and its subconsultants as described in the RIWP and SAP (Appendix A to the RIWP). Subconsultants will follow the QA/QC and analytical protocols established in this QAPP.

2.1.3 Quality Assurance/Quality Control Management

Jennifer Marsalla of Anchor QEA will serve as the project chemist, QA manager, and laboratory coordinator. She is responsible for subcontracting the state-certified laboratory, ensuring observation of established protocols for sample processing, decontamination, sample preservation, holding times, chain-of-custody (COC) documentation, and data management. She will provide QA oversight of the field sampling, analytical, and data validation programs, ensuring that the chemistry data are valid and usable for their intended purpose and that all sample processing and analytical procedures meet the QC requirements identified in the QAPP.

2.1.4 Laboratory Project Managers

The laboratory project managers for the chemical testing will oversee laboratory operations associated with the receipt of the environmental samples, chemical analyses, and laboratory report and electronic deliverables preparation for this project. They will review the laboratory reports and prepare case narratives describing any anomalies and exceptions that occurred during sample preparation and analyses. They will also notify the project QA manager of any QA/QC problems when they are identified to allow for quick resolution. Samples collected by Anchor QEA will be analyzed by ALS Environmental (ALS), in Simi-Valley, California and Kelso, Washington. ALS is accredited by Ecology. All chemical testing will adhere to SW-846 or TO-15 QA/QC procedures and analysis protocols (EPA 1999a, 1999b). If more current analytical methods are available, the laboratory may use them. Nicole Bryson will serve as the laboratory project manager at ALS. The data validation project manager will be Christina Rink of Laboratory Data Consultants, LLC, who will serve as the primary contact and oversee all applicable data validation.

2.2 Problem Definition and Background

The RIWP describes the investigations that will be performed as part of the RI at the Site. A detailed project overview, site description, project figures, and supporting field sampling details are provided in the RIWP and the SAP (Appendix A to the RIWP). Details of sample locations and depths are included in Table 1 of the SAP (Appendix A to the RIWP).

2.3 Data Quality Objectives and Criteria

The DQOs for this project are to develop and implement procedures that will ensure the collection of representative data of known, acceptable, and defensible quality to achieve the project objectives described in the RIWP and SAP (Appendix A to the RIWP). The quality of the laboratory data is assessed by precision, accuracy, representativeness, comparability, completeness, and sensitivity (see Section 3.4).

3 Data Generation and Acquisition

Data generation and acquisition begin with the development of the rationale for locating and selecting environmental samples for analysis and end with the generation and reporting of analytical data for those samples by the analytical laboratories.

3.1 Sampling Design

The sampling design, including the rationale for locating and selecting environmental samples for analyses, is detailed in the SAP (Appendix A to the RIWP).

3.2 Sampling Methods and Handling Requirements

Sample collection procedures are described in detail in the SAP (Appendix A to the RIWP). Sampling procedures are generally consistent with U.S. Environmental Protection Agency (EPA) protocols or other approved sample collection standards. Guidelines for sample handling and storage are presented in Table 2 of this QAPP.

3.3 Analytical Methods

Analytical methods for chemical analyses are listed in Table 1, corresponding to the surface and subsurface sample collection and analytical programs described in the SAP (Appendix A to the RIWP).

In completing analyses for this project, the laboratories are expected to meet the following minimum requirements:

- Adhere to the methods outlined in this QAPP, including methods referenced for each analytical procedure.
- Follow documentation, custody, and sample tracking procedures.
- Notify the project QA manager of any QA/QC problems when they are identified.
- Provide a detailed discussion of any modifications made to approved analytical methods.
- Deliver Adobe PDF and electronic data as specified.
- Meet reporting requirements for deliverables.
- Meet turnaround times for deliverables.
- Implement QA/QC procedures, including the DQOs, laboratory QA requirements, and performance evaluation testing requirements.
- Allow laboratory and data audits to be performed, if deemed necessary.

Analytical methods, and target reporting limits (RLs) for samples are presented in Table 1. Table 4 presents the field and laboratory QA/QC sample frequency requirements (e.g., matrix spikes [MSs] and laboratory control samples [LCS]).

3.4 Measurements of Data Quality

The overall DQO for field sampling and laboratory analysis is to produce data of known and appropriate quality to support the project objectives. DQOs for the project are provided in Table 3. The quality of laboratory data is assessed by precision, accuracy, representativeness, comparability, completeness, and sensitivity. The definitions for the data quality indicators are discussed in the following sections.

3.4.1 Precision

Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling, and laboratory analysis. ASTM International (ASTM) recognizes two levels of precision: repeatability—the random error associated with measurements made by a single test operator on identical aliquots of test material in a given laboratory, with the same apparatus, under constant operating conditions; and reproducibility—the random error associated with measurements made by different test operators, in different laboratories, using the same method but different equipment to analyze identical samples of test material (ASTM 2002).

In the laboratory, "within-batch" precision is measured using replicate sample or QC analyses and is expressed as the relative percent difference (RPD) between the measurements. The "batch-to-batch" precision is determined from the variance observed in the analysis of standard solutions or laboratory control samples from multiple analytical batches.

Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit (MDL), where the percent error (expressed as RPD) increases. The equation used to express precision is as follows (Equation 1):

Equation 1

$$\mathrm{RPD} = \frac{(C1 - C2)\ x\ 100\%}{(C1 + C2)/2}$$

where:

RPD = relative percent difference
C1 = larger of two values
C2 = smaller of two values

3.4.2 Accuracy

Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the mean value of results from ongoing analyses of LCSs, standard reference materials, and standard solutions. In addition, spiked project samples are also measured; this indicates the accuracy or bias in the actual sample matrix. Accuracy is expressed as percent recovery of the measured value, relative to the true or expected value. If a measurement process produces results for which the mean is not the true or expected value, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination). Analytical laboratories use several QC measures to eliminate analytical bias, including systematic analysis of method blanks, LCSs, and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, only the net, or total, bias can be evaluated in a measurement.

Laboratory accuracy will be evaluated against quantitative laboratory control sample and MS recovery performance criteria outlined in Table 3. Surrogate spike recoveries will be evaluated against laboratory control limits, and internal standard recoveries will be evaluated against method criteria. Accuracy can be expressed as a percentage of the true or reference value or as a percentage of the spiked concentration. The equation used to express accuracy is as follows (Equation 2):

Equation 2

$$\%\text{R} = \frac{100\%\ x\ (S - U)}{Csa}$$

where:
%R = percent recovery
S = measured concentration of spiked aliquot
U = measured concentration of unspiked aliquot
Csa = actual concentration of spike added

Field accuracy will be controlled by adherence to sample collection procedures outlined in the SAP (Appendix A to the RIWP).

3.4.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an environmental condition. For the sampling program, the list of analytes has been identified to provide a comprehensive assessment of the known and potential contaminants at the Site.

3.4.4 Comparability

Comparability expresses the confidence with which one dataset can be evaluated in relation to another dataset. For this program, comparability of data will be established through the use of standard analytical methodologies, reporting formats, and the use of common traceable calibration standards and reference materials.

3.4.5 Completeness

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows (Equation 3):

Equation 3

$$C = \frac{(\text{Number of acceptable data points}) \times 100}{(\text{Total number of data points})}$$

where:

C = Completeness (%)

3.4.6 Sensitivity

Sensitivity is measured by the achievable laboratory detection and RLs. The MDL is defined as the minimum concentration at which a given target analyte can be measured and reported with 99% confidence that the analyte concentration is greater than zero. Laboratory RLs are defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The estimated detection limit (EDL) is defined as the sample and analyte-specific detection limit achievable at the time of analysis.

The sample-specific EDL, MDL, and RL will be reported by the laboratory and will take into account any factors relating to the sample analysis that might decrease or increase the RL (e.g., dilution factor, percent moisture, or sample mass). In the event that the MDL and RL are elevated for a sample due to matrix interferences and subsequent dilution or reduction in the sample aliquot, the data will be evaluated by Anchor QEA and the laboratory to determine if an alternative course of action is required or possible. If this situation cannot be resolved readily (i.e., RLs less than criteria are achieved), Ecology will be contacted to discuss an acceptable resolution.

3.5 Laboratory Quality Control

Laboratory QC procedures, where applicable, include initial and continuing instrument calibrations, LCSs, sample replicates, MSs, surrogate spikes (for organic analyses), and method blanks. Table 4 lists the frequency of analysis for laboratory QA/QC samples, and Table 3 summarizes the DQOs for precision, accuracy, and completeness.

Results of the QC samples from each analytical batch will be reviewed by the analyst immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine if control limits have been exceeded. If control limits are exceeded in the sample group, the QA/QC manager may be contacted to determine if corrective action is required. Corrective action may include repreparation and/or reanalysis of affected samples or possible method modifications if the concern is determined to be due to method failure.

3.6 Field Quality Control

Anchor QEA personnel will identify and label samples in a consistent manner to ensure that field samples are traceable, and labels provide the information necessary for the laboratory to properly conduct the required analyses. Samples will be placed in appropriate containers and preserved for shipment to the laboratory. The analytical laboratories will provide certified pre-cleaned sample containers (Table 2). The laboratories will maintain documentation certifying the cleanliness of bottles and the purity of preservatives provided.

Field QA will consist of following procedures for acceptable practices for collection and handling of samples. Adherence to these procedures will be complemented by periodic and routine equipment inspection. Field QA samples will be collected along with the environmental samples. Field QA samples are useful in identifying possible problems resulting from sample collection or sample processing in the field. The collection of field QA samples includes trip blanks and field duplicates as specified in Table 4. Trip blanks will be used to verify that field collection and transport activities did not contaminate the sample with CVOCs. Field duplicate samples will be collected at a frequency of one per sampling event or 1 in 20 samples collected, whichever is more frequent.

Field QA samples will also include the collection of additional volume or mass for soil and water samples to ensure that the laboratory has a sufficient sample amount to analyze the method and program-required analytical QA/QC (matrix duplicate [MD]/MS/matrix spike duplicate [MSD]) samples as specified in Table 4. Additional sample volume or mass to meet this requirement will be collected at a frequency of 1 in 20 samples processed. The sample collection team will confirm with the laboratory the appropriate extra volume or mass required for these analyses. The samples designated for MS/MSD analyses should be clearly marked on the COC form.

Field QA samples will be documented on the field forms or in a log book and verified by the project QA manager or designee. Procedures for collecting field duplicates and trip blanks are included in Section 4.3 of the SAP (Appendix A to the RIWP).

4 Data Validation and Usability

Data generated in the field and at the laboratories will be verified and validated according to methods and procedures described in this section.

4.1.1 Data Review, Validation, and Verification

Laboratory data will be provided in both PDF and EQuIS electronic format. The analytical data will undergo EPA Stage 2B validation (EPA 2009). During the validation process, analytical data will be evaluated for QAPP, method, and laboratory QC compliance, and their validity and applicability for program purposes will be determined. Based on the findings of the validation process, data validation qualifiers may be assigned. The validated project data, including qualifiers, will be entered into the project database, thus enabling this information to be retained or retrieved, as needed.

4.1.2 Validation and Verification Methods

Field and laboratory data for this task will undergo a formal verification and validation process. All entries into the database will be verified. All errors found during the verification of field data, laboratory data, and the database will be corrected prior to release of the final data.

Data verification includes a review for completeness and accuracy by the field coordinator and laboratory manager; review by the data manager for outliers and omissions; and the use of performance criteria to identify laboratory QC sample outliers. Data verification will be conducted manually by Anchor QEA staff or by an external validator.

For this program, Stage 2B validation (EPA 2009) will be conducted following national functional guidelines for data validation (EPA 2011, 2020), this QAPP, and professional judgment. Data will be reviewed with regard to the following, as appropriate to the particular analysis:

- Data completeness
- Holding times
- Method reporting limits, MDLs, and EDLs
- LCS/laboratory control sample duplicates (LCSDs) or Standard Reference Materials
- MS/MSDs
- Internal standard area counts
- Surrogate recoveries
- Method blanks
- Initial calibration data
- Continuing calibration data
- Instrument performance checks

Data will be validated in accordance with the project-specific DQOs (Table 3), the analytical method criteria, and the laboratory's internal performance standards based on its standard operating procedures. This report will be peer reviewed prior to finalization. All validated data will be entered into the database established for this program, and a final data file will be exported. Verification of the database export against the PDF data report will be performed by the QA manager or designee. Any errors found in the data file export will be corrected in the database and reviewed for systemic reporting errors.

4.1.3 Reconciliation with User Requirements

The QA manager will review data at the completion of the task to determine if DQOs have been met. If data do not meet the project's specifications, the QA manager will review the errors and determine if the problem is due to calibration/maintenance, sampling techniques, or other factors and will suggest corrective action, if appropriate. The problem will be corrected by retraining, revising techniques, or replacing supplies/equipment if possible; if not, the DQOs will be reviewed for feasibility. If specific DQOs are not achievable, the QA manager will recommend appropriate modifications. If matrix interference is suspected to be the cause of the exceedance, adequate laboratory documentation must be presented to demonstrate that instrument performance or laboratory technique did not bias the result. In cases where the DQOs have been exceeded and corrective actions did not resolve the outlier, data will be qualified per EPA national functional guidelines (EPA 2011, 2020). In these instances, the usability of data will be determined by the extent of the exceedance. Rejected data will be assigned an "R" qualifier and will not be used for any purposes.

5 Data Analysis, Recordkeeping, and Reporting Requirements

This section describes the data analysis, recordkeeping, and data reporting elements of the QAPP.

5.1 Analysis of Chemistry Data

The chemical results will be processed using the data management rules presented in Section 3 of this QAPP.

5.2 Recordkeeping and Data Report

This project will require central project files to be maintained at Anchor QEA for a minimum of 10 years. Project records will be stored and maintained in a secure manner. Electronic data will be maintained in the Anchor QEA central database and backed up regularly as part of routine file maintenance. At the conclusion of the data acquisition and validation, all records, including field records, laboratory data reports, data validation reports, and other relevant documentation, will be provided to Ecology in a data report. The data report will include the following:

- A description of field events
- Deviations from sample, analysis, and validation described in this QAPP
- Field and laboratory records, including laboratory COC forms
- Chemical and physical testing results, sampling depth, and final data qualifiers
- A summary of the sampling results
- A summary of data quality and usability
- Laboratory reports

When the testing results are validated and finalized, they will be loaded into Ecology's Environmental Information Management (EIM) database.

6 References

ASTM (ASTM International), 2002. *Standard Practices for Use of the Term Precision and Bias in ASTM Test Methods*, 177-90a.

EPA (U.S. Environmental Protection Agency), 1999a. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*. Third Edition; Final Update III-A. March 1999.

EPA, 1999b. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition*. January.

EPA, 2009. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*. Office of Solid Waste and Emergency Response. EPA 540-R-08-005. January 13, 2009.

EPA, 2011. *USEPA Contract Laboratory Program National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review*. Office of Superfund Remediation and Technology Innovation. EPA 540-R-11-016. September 2011.

EPA, 2020. *National Functional Guidelines for Organic Superfund Methods Data Review*. Office of Superfund Remediation and Technology Innovation. EPA-540-R-20-005. November 2020.

Tables

Table 1
Analyte List, Analytical Methods, and Target Reporting Limits

Analyte	Analytical Method	Vapor Target Reporting Limit (µg/m³)	Groundwater Target Reporting Limit (µg/L)	Soil Target Reporting Limit (µg/kg)
Volatile Organic Compounds				
Tetrachloroethene (PCE)	USEPA 8260C-SIM or TO-15	0.025	0.02	5.0
Trichloroethene (TCE)	USEPA 8260C-SIM or TO-15	0.025	0.02	5.0
1,2-Dichloroethene-cis	USEPA 8260C-SIM or TO-15	0.025	0.02	5.0
1,2-Dichloroethene-trans	USEPA 8260C-SIM or TO-15	0.025	0.02	5.0
Vinyl chloride	USEPA 8260C-SIM or TO-15	0.05	0.02	5.0

Notes:
µg/kg: microgram per kilogram
µg/L: microgram per liter
µg/m^3: micrograms per cubic meter

Table 2
Guidelines for Sample Handling and Storage

Parameter	Sample Size	Container Size and Type	Holding Time	Sample Preservation Technique
Soil				
Volatile organic compounds	15 g	3 x 40 mL VOA vial / 1 x 2 oz glass with septa lid (for TS)	14 days	Sodium bisulfate or methanol / None, 0 - 6°C
Groundwater				
Volatile organic compounds	40 mL	3 x 40 mL VOA vial	14 days	HCl to pH<2, 0 - 6°C
Air				
Volatile organic compounds	6 L	6 L Summa or Silco canister	30 days	Ambient

Notes:

°C: degrees Celsius

g: gram

L: liter

mL: milliliter

oz: ounce

VOA: volatile organic analysis

Table 3
Data Quality Objectives

Parameter	Precision	Accuracy[a]	Completeness
Soil			
VOCs	± 35% RPD	50 – 150% R	95%
Water			
VOCs	± 30% RPD	60 – 140% R	95%
Air			
VOCs	± 25% RPD	50 – 150% R	95%

Notes:

a: Accuracy goals apply to laboratory control samples and matrix spike samples, as applicable to the analysis.

R: recovery

RPD: relative percent difference

VOC: volatile organic compound

Table 4

Quality Assurance/Quality Control Sample Analysis Summary

Analysis Type	Initial Calibration[a]	Ongoing Calibration[b]	Laboratory Control Samples	Matrix Spikes[c]	Laboratory or Matrix Spike Duplicates[c]	Method Blanks	Surrogate Spikes	Field Duplicate[e]	Trip blanks[f]
VOCs	As needed	Every 12 hours	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample	1 per 20 samples	Every sample

Notes:

a. Initial calibration verification and calibration blank must be analyzed after initial calibration and before samples are analyzed.

b. Initial calibrations are considered valid until the ongoing continuing calibration no longer meets method specifications. At that point, a new initial calibration is performed.

c. As applicable to the method. Matrix spikes cannot be analyzed on air samples.

d. Calibration and certification of drying ovens and weighing scales are conducted bi-annually.

e. As applicable to the method. Field duplicates can not be collected for air samples.

f. As applicable to the method. Trip blanks can not be collected for air samples.

VOC: volatile organic carbon

Appendix C
Inadvertent Discovery Plan

INADVERTENT DISCOVERY PLAN

PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS

To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6000 or visit https://ecology.wa.gov/accessibility. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.

Site Name(s): Carson Cleaners Location: Seattle, WA

Project Lead/Organization: Anchor QEA County: King

If this Inadvertent Discovery Plan (IDP) is for multiple (batched) projects, ensure the location information covers all project areas.

1. INTRODUCTION

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, as part of Agency Terms and Conditions for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive 21-02 or Section 106).

Once completed, **the IDP shall always be kept at the project site** during all project activities. All staff, contractors, and volunteers shall be familiar with its contents and know where to find it.

2. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic artifacts. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural features, such as rock drawings.
- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. ***Always assume these are live and never touch or move***.
- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items, toys, food containers, and other items associated with homes or farming sites.

The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

3. ON-SITE RESPONSIBILITIES

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to ***Stop-Protect-Notify***. **If you suspect that the discovery includes human remains, also follow Sections 5 and 6.**

STEP A: Stop Work.

All work must stop immediately in the vicinity of the discovery.

STEP B: Protect the Discovery.

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

STEP C: Notify Project Archaeologist (if applicable).

If the project has an archaeologist, notify that person. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

STEP D: Notify Project and Washington Department of Ecology (Ecology) contacts.

Project Lead Contacts

Primary Contact		Alternate Contact	
Name:	Halah Voges	Name:	Gavin Casson
Organization:	Anchor QEA	Organization:	Anchor QEA
Phone:	206-903-3303	Phone:	206-709-6849
Email:	hvoges@anchorqea.com	Email:	gcasson@anchorqea.com

Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager		Alternate or Cultural Resource Contact	
Name:	Dale Myers	Name:	
Program:	Toxics Cleanup Program	Program:	
Phone:	(425) 389-2521	Phone:	
Email:	DAMY461@ECY.WA.GOV	Email:	

STEP E: Ecology will notify DAHP.

Once notified, the Ecology Cultural Resource Contact or the Ecology Project Manager will contact DAHP to report and confirm the discovery. To avoid delay, the Project Lead/Organization will contact DAHP if they are not able to reach Ecology.

DAHP will provide the steps to assist with identification. DAHP, Ecology, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Lead/Organization and Ecology of additional steps to further protect the site.

Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.

DAHP Contacts:

Name: Rob Whitlam, PhD
Title: State Archaeologist
Cell: 360-890-2615
Email: Rob.Whitlam@dahp.wa.gov
Main Office: 360-586-3065

Human Remains/Bones:

Name: Guy Tasa, PhD
Title: State Anthropologist
Cell: 360-790-1633 (24/7)
Email: Guy.Tasa@dahp.wa.gov

4. TRIBAL CONTACTS

In the event cultural resources are discovered, the following tribes will be contacted. See Section 10 for Additional Resources.

Tribe: Stillaguamish
Name: Kerry Lyste
Title: Cultural Resources
Phone: 360.572.3072
Email: KLyste@stillaguamish.com

Tribe: Snoqualmie
Name: Steve Mullen-Moses
Title: Cultural Resources
Phone: 425.888.6551
Email: Steve@snoqualmietribe.us

Tribe: Tulalip
Name: Richard Young
Title: Cultural Resources
Phone: 425.239.0182
Email: ryoung@tulaliptribes-nsn.gov

Tribe: Muckleshoot
Name: Laura Murphy
Title: Cultural Resources
Phone: 253.876.3272
Email: laura.murphy@muckleshoot.nsn.us

Please provide contact information for additional tribes within your project area, if needed, in Section 11.

5. FURTHER CONTACTS (if applicable)

If the discovery is confirmed by DAHP as a cultural or archaeological resource, or as human remains, and there is a partnering federal or state agency, Ecology or the Project Lead/Organization will ensure the partnering agency is immediately notified.

Federal Agency:

Agency:
Name:
Title:
Phone:
Email:

State Agency:

Agency:
Name:
Title:
Phone:
Email:

6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL REMAINS

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under ***Stop-Protect-Notify.*** For specific instructions on how to handle a human remains discovery, see: *RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions.*

Suggestion: If you are unsure whether the discovery is human bone or not, contact Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist
Guy.Tasa@dahp.wa.gov
(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.

   Enter contact information below (required):

   - Local Medical Examiner or Coroner name and phone: King County Medical Examiner's Office 206-731-3232, ext. 4
   - Local Law Enforcement main name and phone: North Precinct 206-684-0850
   - Local Non-Emergency phone number (911 if without a non-emergency number): 911

2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
4. If the remains are determined to be non-forensic, cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per RCW 27.44.055, RCW 68.50, and RCW 68.60, DAHP will have jurisdiction over non-forensic human remains. Ecology staff will participate in consultation.

The Project Lead/Organization may also participate in consultation.

- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in RCW 27.44.055, RCW 68.50, and RCW 68.60.
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Lead/Organization will comply with applicable state and federal laws, and the above protocol.

7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological resources discovered during construction are protected by state law RCW 27.53 and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessments are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, Ecology, affected tribes, and the archaeologist.

An archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, Ecology, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to Ecology, the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in **Section 6**.

8. PROCEEDING WITH WORK

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), Ecology, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

9. ORGANIZATION RESPONSIBILITY

The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the site and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

10. ADDITIONAL RESOURCES

Informative Video

Ecology recommends that all project staff, contractors, and volunteers view this informative video explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

Ecology's IDP Video (https://www.youtube.com/watch?v=ioX-4cXfbDY)

Informational Resources

DAHP (https://dahp.wa.gov)

Washington State Archeology (DAHP 2003)
(https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

Association of Washington Archaeologists (https://www.archaeologyinwashington.com)

Potentially Interested Tribes

Tribal Contacts: Interactive Map of Tribes by Area
(https://dahp.wa.gov/archaeology/tribal-consultation-information)

Tribal Contacts - WSDOT Tribal Contact Website
(https://wsdot.wa.gov/tribal/TribalContacts.htm)

11. ADDITIONAL INFORMATION

Please add any additional contact information or other information needed within this IDP.

Additional Tribal Contacts:

Tribe: Suquamish

Name: Dennis Lewarch

Title: Cultural Resources

Phone: 360.394.8529

Email: dlewarch@suquamish.nsn.us

Implement the IDP if you see…

Chipped stone artifacts.

Examples are:

- Glass-like material.
- Angular material.
- "Unusual" material or shape for the area.
- Regularity of flaking.
- Variability of size.

Stone artifacts from Oregon.

Stone artifacts from Washington.

Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.

Implement the IDP if you see…

Ground stone artifacts.

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.

Above: Fishing Weight - credit CRITFC Treaty Fishing Rights website.

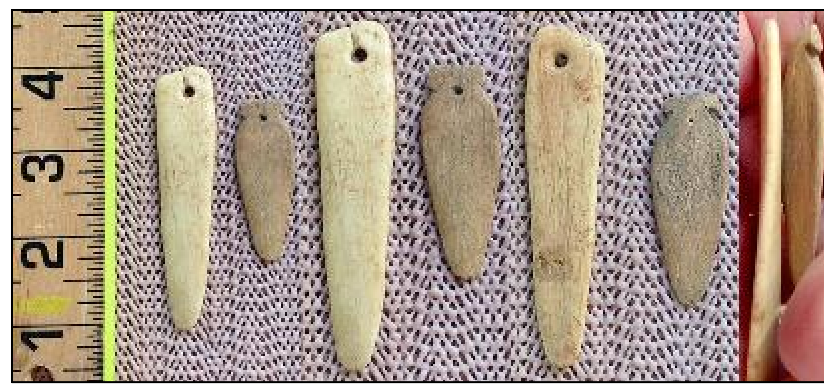
Artifacts from unknown locations (left and right images).

Implement the IDP if you see…

Bone or shell artifacts, tools, or beads.

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a “shoehorn”.
- Variability of size.
- Beads from shell (dentalium) or tusk.



Upper Left:*Bone Awls from Oregon.*

Upper Center: *Bone Wedge from California.*

Upper Right: *Plateau dentalium choker and bracelet, from Nez Perce National Historical Park, 19th century, made using Antalis pretiosa shells Credit: Nez Perce - Nez Perce National Historical Park, NEPE 8762, Public Domain.*

Above: *Tooth Pendants.*

Right: Bone Pendants. Both from Oregon and Washington.

Implement the IDP if you see…

Culturally modified trees, fiber, or wood artifacts.

Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.

Left and Below: *Culturally modified tree and an old carving on an aspen (Courtesy of DAHP). These are examples of above ground cultural resources.*

Right, Top to Bottom: *Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry.*

Implement the IDP if you see…

Strange, different, or interesting looking dirt, rocks, or shells.

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- “Unusual” accumulations of rock (especially fire-cracked rock).
- “Unusual” shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a “layer cake” appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the “unusual” or out of place (for example, rock piles in areas with otherwise few rocks).

Shell Midden pocket in modern fill discovered in sewer trench.

Underground oven. Courtesy of DAHP.

Shell Midden with fire cracked rock.

Hearth excavated near Hamilton, WA.

Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.

Left: Top to Bottom: *Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Right: *Collections of historic artifacts discovered during excavations in eastern Washington cities.*

Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.

Main Image: *Dishes, bottles, work boot found at the North Shore Japanese bath house (ofuro) site, Courtesy Bob Muckle, Archaeologist, Capilano University, B.C. This is an example of an above ground resource.*

Right, from Top to Bottom: *Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

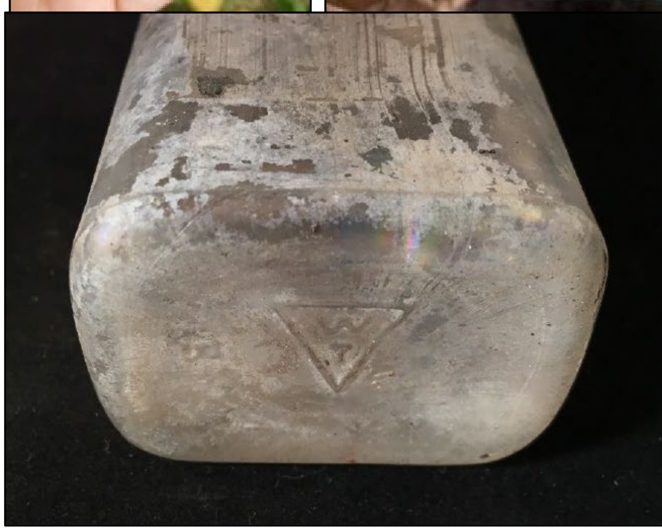
Implement the IDP if you see…

- Old munition casings – if you see ammunition of any type – ***always assume they are live and never touch or move!***
- Tin cans or glass bottles with an older manufacturer's technique – maker's mark, distinct colors such as turquoise, or an older method of opening the container.

Far Left: *.303 British cartridge found by a WCC planting crew on Skagit River.* ***Don't ever touch something like this!***

Left: *Maker's mark on bottom of old bottle.*

Right: *Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.*



Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).

Can opening dates, courtesy of W.M. Schroeder.

Implement the IDP if you see…

Historic foundations or buried structures.

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.

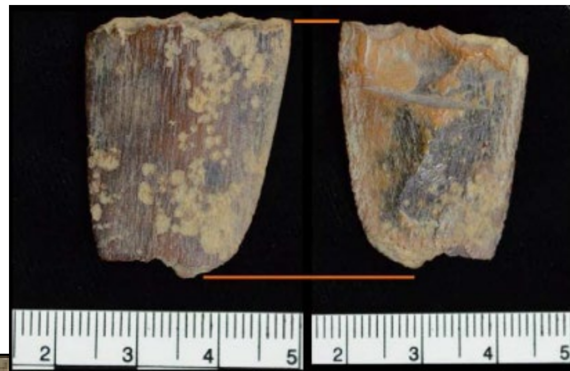
Counter Clockwise, Left to Right: *Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks (above ground historic resources) uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.*

Implement the IDP if you see…

Potential human remains.

Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.



Center: *Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45KI1200).*

Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.

Directly Above: *This is a real discovery at an Ecology sewer project site.*

What would you do if you found these items at a site? Who would be the first person you would call?

Hint: *Read the plan!*

Appendix D
Health and Safety Plan

Appendix E
Historical Boring Logs

BORING LOG MW27

(Page 1 of 1)

Cardno®

Date Drilled:	: 03/24/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Hollow-Stem Auger
Sampling Method:	: Hand Auger; Split Spoon
Borehole Diameter:	: 8"
Casing Diameter:	: 2"
Total Depth:	: 26.5'
First GW Depth:	: 20'
Ecology Unique Well ID:	BLU372

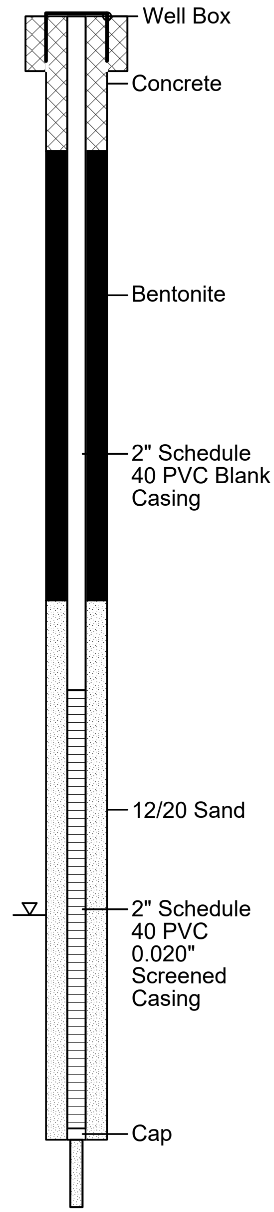
Project No.:	: 031162
Site:	: Former Mobil Station 99D9T, Seattle, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: ______________________________

Sample Condition: No Recovery; Sampled Interval; Described Sample; Preserved Sample

Water Levels: After Completion; During Drilling

Well: MW27
Elevation: 215.30 ft amsl

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0						10" Concrete; borehole was cleared to 8' bgs on 03/23/20 using water knife, air knife, and hand tools
5		0.5			SW	SAND: fine- to coarse-grained, brown, damp, well graded, low plasticity; trace silt and fine-gravel; 100% recovery (0/5/85/10)
10	16 22 25	0.1				brown, damp; 100% recovery (0/5/90/5)
15	18 25 28	0.0			SP	SAND: medium to coarse-grained, gray brown, damp, low plasticity; trace silt and gravel; 100% recovery (0/5/85/10)
20	19 18 22	0.0				wet; 100% recovery (0/5/90/5)
25	11 15 25	0.0				gray, no gravel; 100% recovery (0/5/95/0)
30						



Backfill Materials:

5 50-lb. bags of Sand
2 50-lb. bags of Bentonite Chips
4 50-lb. bags of Concrete

BORING LOG MW28

(Page 1 of 1)

Project No.:	: 031162
Site:	: Former Mobil Station 99D9T, Seattle, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: ______________________________

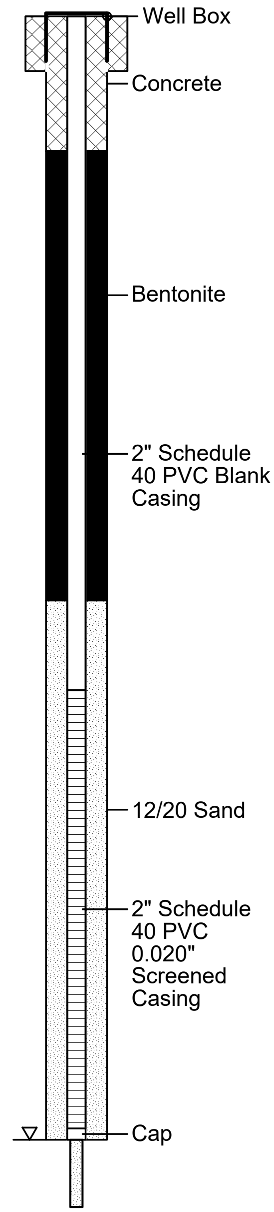
Date Drilled:	: 03/24/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Hollow-Stem Auger
Sampling Method:	: Hand Auger; Split Spoon
Borehole Diameter:	: 8"
Casing Diameter:	: 2"
Total Depth:	: 26.5'
First GW Depth:	: 25'
Ecology Unique Well ID:	BLU373

Sample Condition
- No Recovery
- Sampled Interval
- Described Sample
- Preserved Sample

Water Levels
- After Completion
- During Drilling

Well: MW28
Elevation: 214.37 ft amsl

Depth (ft)	Blow Count	OVM/PID (ppmv)	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0				10" Concrete; borehole was cleared to 8' bgs on 03/23/20 using water knife, air knife, and hand tools
5		0.0	GW	GRAVEL with Sand: fine gravel to cobbles, rounded to subangular; fine-to coarse-grained sand, brown, wet, well graded; trace silt, occasional silty clasts <0.5" in diameter; 100% recovery (0/5/30/65)
10	10 20 25	0.0	SP	SAND: medium-to coarse-grained, brown, damp, moderately graded, low plasticity; 100% recovery (0/0/100/0)
15	11 16 25	0.1	SP	100% recovery
20	11 15 18	0.0	SP	100% recovery
25	13 28 34	0.0	SP	gray, wet, trace silt; 100% recovery (0/5/95/0)
30				



Backfill Materials:

5 50-lb. bags of Sand
4 50-lb. bags of Bentonite Chips
4 50-lb. bags of Concrete

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BORING LOG MW29

Date Drilled:	: 03/25/20
Drilling Co.:	: Holocene Drilling, Inc.
Drilling Method:	: Hollow-Stem Auger
Sampling Method:	: Hand Auger; Split Spoon
Borehole Diameter:	: 8"
Casing Diameter:	: 2"
Total Depth:	: 26.5'
First GW Depth:	: 25'
Ecology Unique Well ID:	BLU375

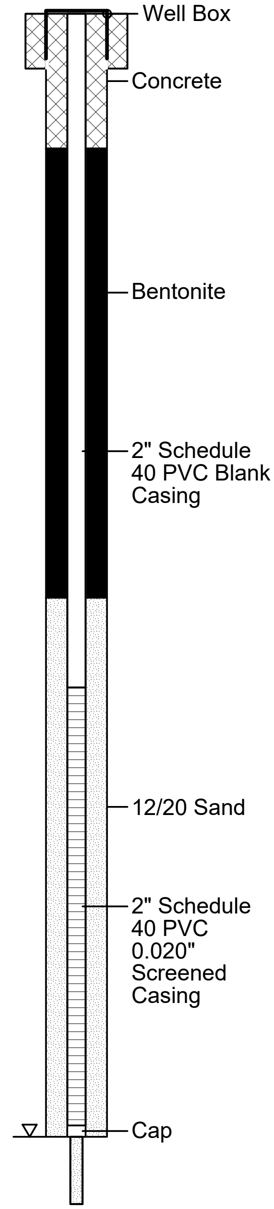
Project No.:	: 031162
Site:	: Former Mobil Station 99D9T, Seattle, WA
Logged By:	: Paul Prevou
Reviewed By:	: Keri Chappell, L.G. 2719
Signature:	: ______________________________

Sample Condition: No Recovery; Sampled Interval; Described Sample; Preserved Sample

Water Levels: ▼ After Completion; ▽ During Drilling

Well: MW29
Elevation: 213.03 ft amsl

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION (%clay/silt/sand/gravel)
0						10" Concrete; borehole was cleared to 8' bgs on 03/25/20 using water knife, air knife, and hand tools
5		0.2				SAND: medium-to coarse-grained, brown, wet, moderately graded, low plasticity; trace gravel; 100% recovery (0/0/90/10)
10	5 10 16	0.1				light brown, damp; no gravel; 100% recovery (0/0/100/0)
					SP	
15	14 20 22	0.0				trace silt; 90% recovery (0/5/95/0)
20	15 28 27	0.1				trace gravel; 100% recovery (0/5/90/5)
25	18 25 30	0.0				gray, wet, no gravel; 100% recovery (0/10/90/0)
30						



Backfill Materials:

3 50-lb. bags of Sand
2 50-lb. bags of Bentonite Chips
4 50-lb. bags of Concrete

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Monitoring Well: MW-18

Project: Former Chevron Station # 90129	Date Started: 1/18/2018	Total Boring Depth: 25 ft	Well Diameter: 2 in. in
Client: Chevron EMC	Date Completed: 1/18/2018	Hole Diameter: 12 in. in.	Well Screen: 10 slot ft
Location: 4700 Brooklyn Ave, Seattle, WA	Driller: Cascade Drilling	Well Depth: 25 ft	Filter Pack: 10/20 Colorado
Logged By: A. Wisher	Drill Method: VAC/Sonic	TOC Elevation: 215.95 ft	Well Casing: Schedule 40 PVC

MOISTURE CONTENT	ORGANIC VAPOR (ppm)	SAMP. INTERVAL	ANALYTICAL SAMPLE	U.S.C.S. SYMBOL	GRAPHIC LOG	DEPTH (ft)	LITHOLOGY/DESCRIPTION	WELL DIAGRAM
						0–1	-ASPHALT (2.0 in)-	Well Box BKH455
						1	-CONCRETE (10.0 in)-	Schedule 40 PVC Riser
dry	0.2			SM-SP		2–3	(SM-SP) Light brown loose silty SAND with occasional gravel, no odor, no sheen	Concrete Seal
dry	0.0			SM-SP		4	(SM-SP) SAA, no odor, no sheen	Bentonite
damp	0.2			SM-SP		6–7	(SM-SP) Light brown loose silty coarse SAND with occasional gravel, no sheen, no odor	
damp	0.1			SM-SP		8	(SM-SP) SAA, no odor, no sheen	
						9	(SM-SP) SAA, no odor, no sheen	
damp	0.1			SM-SP		10–11		
						12	-FILL-	
	0.1			SM/ML		12–14	(SM/ML) Gray dense sandy SILT to silty SAND with 10-20% gravel	
wet	0.2 0.2			SM		15	(SM) Brown silty SAND, no odor, no sheen	
				SM/ML		16–18	(SM/ML) Gray dense silty SAND to sandy SILT with cobbles, water at 15.0 ft, no odor, no sheen	10/20 Sand Filter Pack
						19	SAA	
saturated				SM		20–21	(SM) Gray soft silty SAND, no odor	
				SM		22–23	(SM) SAA	
				SM		24	(SM) Gray silty SAND, heaving	
						25	Bottom of borehole at 25.0 feet.	

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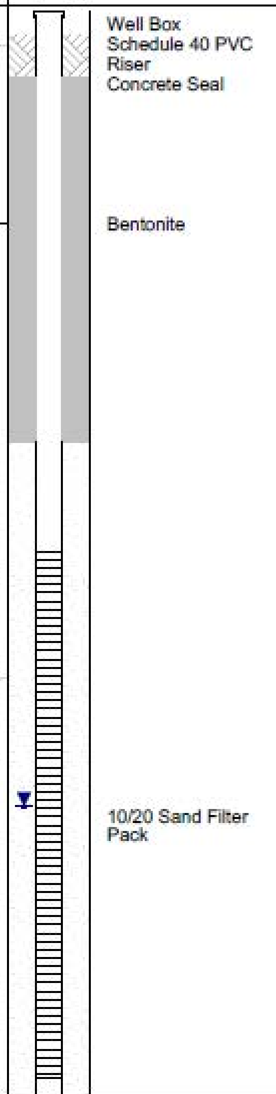
Monitoring Well: MW-25

Project: Former Chevron Station # 90129	Date Started: 1/15/2018	Total Boring Depth: 30 ft	Well Diameter: 2 in. in
Client: Chevron EMC	Date Completed: 1/22/2018	Hole Diameter: 9 in. in.	Well Screen: 10 slot ft
Location: 4700 Brooklyn Ave, Seattle, WA	Driller: Cascade Drilling	Well Depth: 30 ft	Filter Pack: 10/20 Colorado
Logged By: A. Wisher	Drill Method: VAC/Sonic	TOC Elevation: 212.81 ft	Well Casing: Schedule 40 PVC

MOISTURE CONTENT	ORGANIC VAPOR (ppm)	SAMP. INTERVAL	ANALYTICAL SAMPLE	U.S.C.S. SYMBOL	GRAPHIC LOG	DEPTH (ft)	LITHOLOGY/DESCRIPTION
						0–1	-ASPHALT (2.0 in)- -CONCRETE (10.5 in.)-
dry	2.0					2	
				SM		3	(SM) Light brown dense fine silty SAND with gravel and cobbles, approximately 50% silt, no odor, no sheen
dry	6.0					4	
				SM		5	(SM) Light brown dense fine silty SAND with gravel and cobbles, no odor, no sheen
dry	0.2					6	
						7	
dry	0.2			SM		8	(SM) SAA
dry	5.0			SM		9	(SM) SAA, slight sheen, no odor
dry	3.0					10	-FILL-
						11	
						12	(SM) SAA, no sheen, no odor
				SM		13	
						14	(SM) SAA, no sheen, no odor
dry	3.0			SM		15	
						16	(SM) SAA, no sheen, no odor
				SM		17	
				SM		18	(SM) SAA, no sheen, slight odor
damp	1.0					19	(SM) Gray silty SAND, no sheen, slight odor
				SM		20	
						21	
wet	0.2					22	(SM) SAA, no sheen, no odor
				SM		23	
wet	1.1					24	(SM) SAA, no sheen, no odor
				SM		25	
						26	(SM) SAA, no sheen, no odor
				SM		27	
damp	2.0			SM		28	(SM) SAA, no sheen, no odor
damp	5.2			SM		29	(SM) Gray silty SAND with gravel, no sheen, moderate odor Note: Odor volitalized quickly
						30	Bottom of borehole at 30.0 feet.
						31	
						32	
						33	
						34	
						35	

WELL DIAGRAM



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Monitoring Well: MW-27

Project: Former Chevron Station # 90129	Date Started: 1/16/2018	Total Boring Depth: 25 ft	Well Diameter: 2 in. in
Client: Chevron EMC	Date Completed: 1/23/2018	Hole Diameter: 9 in. in.	Well Screen: 10 slot ft
Location: 4700 Brooklyn Ave, Seattle, WA	Driller: Cascade Drilling	Well Depth: 25 ft	Filter Pack: 10/20 Colorado
Logged By: A. Wisher	Drill Method: VAC/Sonic	TOC Elevation: 214.43 ft	Well Casing: Schedule 40 PVC

MOISTURE CONTENT	ORGANIC VAPOR (ppm)	U.S.C.S. SYMBOL	DEPTH (ft)	LITHOLOGY/DESCRIPTION
			0	-CONCRETE SIDEWALK (4.0 in)-
dry	0.1	SM	2	(SM) Light brown loose silty fine SAND with occasional gravel, no odor, no sheen
moist	0.4	SM	4	(SM) Dark brown hard silty SAND with occasional gravel, no odor, no sheen
			5	-FILL-
moist	0.6	ML/SM	6	(ML/SM) Light brown dense sandy SILT to silty SAND, occasional gravel, no odor, no sheen
wet	0.4	SP	8	(SP) Brown medium SAND with trace silt and pebbles, no odor, no sheen
dry	1.2	SP	10	(SP) SAA, no odor, no sheen
dry	2.1		11	
dry	30.1	SP	12	(SP) SAA, moderate odor, no sheen
			12.5	-GLACIAL TILL-
dry	16.0	SM	14	(SM) Gray hard silty SAND, moderate odor, no sheen
dry	50.0	SM	15	(SM) SAA, moderate odor, no sheen
damp	18.1	SM	16	(SM) SAA, moderate odor, no sheen
damp	27.2	SM	18	(SM) SAA, moderate odor, no sheen
damp	65.5	SM	20	(SM) SAA, moderate odor, no sheen
wet	12.5	SM	22	(SM) SAA, slight odor, no sheen
wet	4.1		23	
wet	5.1	SM	25	(SM) SAA, no odor, no sheen
			25	Bottom of borehole at 25.0 feet.

WELL DIAGRAM:
Well Box
Schedule 40 PVC Riser
Concrete Seal
Bentonite
10/20 Sand Filter Pack

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Monitoring Well: MW-28

Project: Former Chevron Station # 90129	Date Started: 1/17/2018	Total Boring Depth: 25 ft	Well Diameter: 2 in. in
Client: Chevron EMC	Date Completed: 1/23/2018	Hole Diameter: 9 in. in.	Well Screen: 10 slot ft
Location: 4700 Brooklyn Ave, Seattle, WA	Driller: Cascade Drilling	Well Depth: 25 ft	Filter Pack: 10/20 Colorado
Logged By: A. Wisher	Drill Method: VAC/Sonic	TOC Elevation: 214.44 ft	Well Casing: Schedule 40 PVC

MOISTURE CONTENT	ORGANIC VAPOR (ppm)	SAMP. INTERVAL	ANALYTICAL SAMPLE	U.S.C.S. SYMBOL	GRAPHIC LOG	DEPTH (ft)	LITHOLOGY/DESCRIPTION	WELL DIAGRAM
						0–1	-CONCRETE SIDEWALK (12 in.)-	Well Box Schedule 40 PVC Riser Concrete Seal
damp	0.3			SM		2–3	(SM) Light brown loose silty SAND with occasional pebbles, no odor, no sheen	
wet	0.3			SM		4–5	(SM) Light brown loose silty SAND, approximately 30% silt with occasional pebbles, no odor, no sheen	Bentonite
damp	0.8			SM		6–7	(SM) Light brown loose silty SAND with occasional pebbles, no odor, no sheen	
damp	0.6			SM		8–9	(SM) SAA, no odor, no sheen	
dry	20.1			SM		10–11	(SM) SAA, no odor, no sheen	
dry	50			SM		12–13	(SM) SAA, moderate odor, no sheen -FILL-	
dry	100.3					13	no sheen, moderate odor	
	205			SM		14–15	(SM) Dark gray silty SAND, moderate odor, no sheen	
				SM		16–17	(SM) SAA, slight odor, no sheen	
				SM		18–19	(SM) SAA, slight odor, no sheen	10/20 Sand Filter Pack
				SM		20–21	(SM) SAA, contains large woody debris, slight odor, no sheen	
				SM		22	(SM) SAA, contains woody debris, slight odor, no sheen	
moist	10.8			SM		23	(SM) SAA, slight odor, no sheen	
wet	25			SM		24	(SM) SAA, slight odor, no sheen	
						25	Bottom of borehole at 25.0 feet.