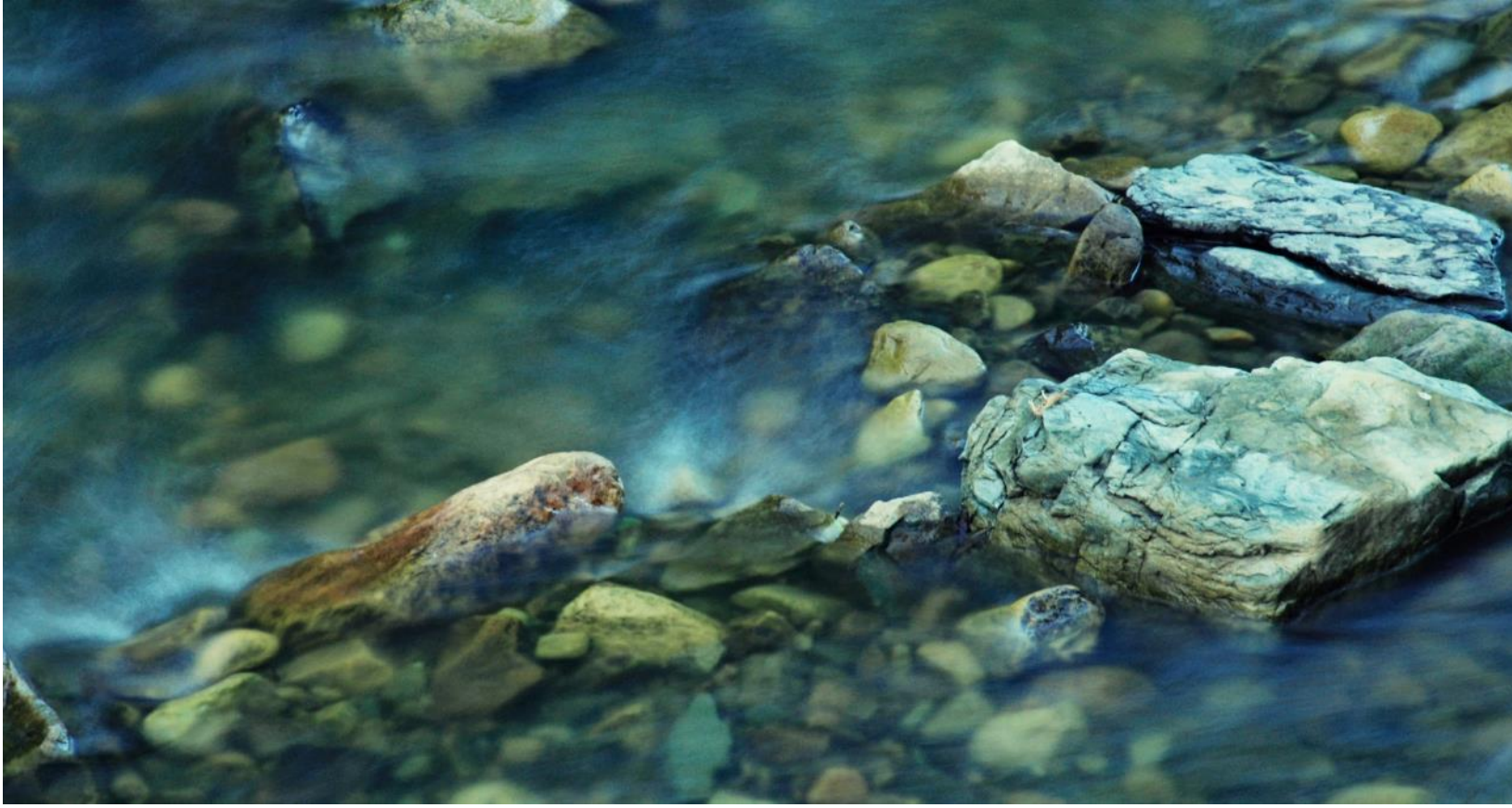

February 2020

ANCHOR QEA

Vapor Intrusion Evaluation Work Plan Revision 1

Prepared for Tahn Associates, LLC

February 2020

Vapor Intrusion Evaluation
Work Plan Revision 1

Prepared for
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FIGURES

ATTACHMENT A

ABBREVIATIONS

bgs	below ground surface
Carson Cleaners	Carson Cleaners Inc.
CLARC	Cleanup Levels and Risk Calculation
CVOC	chlorinated volatile organic compound
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
EPA	U.S. Environmental Protection Agency
eV	electron-volts
HASP	health and safety plan
Hg	mercury
HVOC	halogenated volatile organic compound
PCE	tetrachloroethylene
PID	photoionization detector
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
TCE	Trichloroethylene
TWA	time-weighted average
VI	vapor intrusion
VOC	volatile organic compound

1 Introduction

This Vapor Intrusion (VI) Evaluation Work Plan has been prepared in response to a November 7, 2019 request from the Washington State Department of Ecology (Ecology) to prepare a technical work plan for evaluation of potential VI risks at the following four Subject Properties:

- Former Carson Cleaners facility, located at 4701 Brooklyn Avenue NE (Ecology Facility/Site No. 15518216; CSID 14878)
- Christ Episcopal Church, located at 4548 Brooklyn Avenue NE
- Bank of America Financial Center, located at 4701 University Way NE
- Mixed commercial and residential unit, located at 4557 University Way NE

The general vicinity of the Subject Properties is shown in Figure 1 and the Subject Properties are shown in Figure 2.

Trichloroethylene (TCE), a solvent commonly used for dry cleaning, parts cleaning, and many other commercial and industrial uses, was measured above cleanup levels in groundwater at the Chevron 90129 gas station (Facility/Site No. 8196648, CSID No. 10632), located at 4700 Brooklyn Avenue NE. Ecology subsequently asked Tahn Associates, LLC, the current owner of certain property located at 4701 Brooklyn Avenue NE and which property formerly operated as a dry cleaner under the name Carson Cleaners Inc. (Carson Cleaners), to investigate potential VI risks at the Subject Properties.

This VI Evaluation Work Plan describes the proposed approach to assess whether chlorinated volatile organic compound (CVOC) impacts to groundwater may pose a short-term VI indoor air risk at the Subject Properties. The specific objectives for this work plan for each Subject Property are as follows:

1. Determine if releases of CVOCs have occurred within the building footprint via subslab soil gas sampling.[1]
2. Determine if releases of CVOCs have occurred at the building exterior via soil and soil gas sampling.
3. Determine if CVOC vapors have intruded within the building via indoor air sampling.
4. Report methodologies and findings to Ecology.

If detected, TCE concentrations will be compared to short-term risk levels to determine if any immediate action is required.

This work plan does not address source identification, geological setting, contaminant fate or transport, or plume delineation. If warranted, further consultation with Ecology will be required to determine the scope of supplemental investigations.

[1] Subslab soil gas sampling will be performed in a phased approach at the Bank of America Financial Center pending results of indoor air sampling at the property owner's request.

2 Background Information

As part of an environmental cleanup of the former Chevron 90129 gas station across the street from the former Carson Cleaners Property, halogenated volatile organic compounds (HVOCs) were discovered in the southwest portion of the Chevron property and along the perimeter of NE 47th Street. The most recent data received show that groundwater contamination above the screening levels in Ecology's Implementation Memo 22 (Ecology 2019) extends down NE 47th Street to at least University Way NE. The highest concentration of TCE was identified in monitoring well B-24 (see Attachment A). Ecology identified for this VI evaluation the former Carson Cleaners Property and three residential and/or commercial buildings within the 100-foot lateral screening distance.

Ecology requested a VI evaluation to determine whether environmental contamination in the 47th Street right-of-way has resulted in TCE concentrations from VI above the short-term indoor air action levels at the Subject Properties shown in Figure 2.

3 Scope of Work

This section describes the phases of work proposed to be completed. The VI evaluation will be conducted consistent with the Tier II Assessment presented in Ecology's draft 2009 VI guidance (Ecology 2009). In order to evaluate the groundwater-to-indoor-air-pathway, subslab soil vapor samples and indoor air samples will be collected at the following Subject Properties, if access is granted:

- Former Carson Cleaners facility, located at 4701 Brooklyn Avenue NE
- Christ Episcopal Church, located at 4548 Brooklyn Avenue NE
- Bank of America Financial Center, located at 4701 University Way NE[2]
- Mixed commercial and residential unit, located at 4557 University Way NE

3.1 Premobilization Activities

3.1.1 Building Construction and Documentation Inquiry

Prior to completing field assessments, Tahn Associates or its representative will request available records documenting the construction of the subject buildings (including the presence of floor drains, private utility lines, mixing rooms, or other relevant building features) and any subsurface utilities (including sewerage piping, water lines, or electrical service).

3.1.2 Premobilization Coordination and Reconnaissance Visit

Tahn Associates or its representative will obtain access for Anchor QEA personnel to the Subject Properties. Anchor QEA or another representative for Tahn Associates, LLC will contact the person(s) specified in the appropriate access agreement or contract to coordinate a reconnaissance visit to preplan the locations of concrete floor slab penetrations, exterior soil borings, indoor air samples, and ambient air samples. We will observe the interior and exterior spaces of the buildings for evidence of historical features (e.g., floor drains or floor sinks) and make note of current uses, layout, or potential modifications to subslab utilities. Anchor QEA or its driller will contact public and private locators to create a new utility location ticket to locate and map subsurface utilities in the site vicinity.

We will make note of the floor covering type and distribution, concrete expansion joints, seams, cuts, or cracks. We will perform a limited building inventory to document the types of chemicals used or stored at each Subject Property. Anchor QEA will select potential subslab vapor sampling locations and seek concurrence with the person designated in the appropriate access agreement or contract.

[2] Sampling will be performed at the Bank of America Financial Center using a phased approach at the property owner's request. Indoor air sampling will be performed during the first phase, and a second phase of subslab soil gas sampling will be performed depending on the results of the first phase and consultation with Ecology.

Sampling locations will be provided to Ecology for review and approval in an addendum to this work plan.

3.1.3 Health and Safety Plan

Prior to conducting assessment activities, Anchor QEA will prepare a project-specific health and safety plan (HASP). The HASP will be used in the field to identify and mitigate hazards, and it will be designed to complement Anchor QEA's Health and Safety Manual. Anchor QEA technicians will participate in an initial thorough discussion of the HASP prior to beginning work. In addition, health and safety "tailgate" meetings will be held at the beginning of each fieldwork day.

3.2 Interior Assessment

3.2.1 Subsurface Utility and Structure Clearance and Permitting

Following sample location identification in advance of performing intrusive subsurface exploration activities, Anchor QEA or its driller will conduct public utility locating activities to clear locations on public property. To further protect existing utility services and limit disruptions to each Subject Property operations, a private utility location contractor will be hired to locate subsurface utilities and potential obstructions at the selected exterior sampling locations.

3.2.2 Subslab Soil Vapor Sampling

Subslab soil vapor sampling at each Subject Property is designed to identify potential releases of CVOCs to the property, in or under the building. Figure 2 depicts the Subject Properties at which subslab soil vapor sampling will occur. At the property owner's request, subslab soil vapor sampling will be performed at the Bank of America Financial Center as a second phase pending the results of indoor air sampling and consultation with Ecology.

Subslab soil vapor sampling points will be installed and sampled per Ecology's "Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action" (Ecology 2009) with support from "Vapor Intrusion (VI) Investigations and Short-term Trichloroethene (TCE) Toxicity" (Implementation Memo 22; Ecology 2019).

Using a rotary-hammer drill, 1/2-inch-diameter holes will be advanced through the concrete floor slab to a depth of approximately 2 inches below the bottom of the concrete floor slab. A Vapor Pin, manufactured by Cox-Colvin & Associates, will be installed. The Vapor Pin installations are semipermanent and will be left in place for additional future assessment if needed. The Vapor Pin will be fitted with a flush mount cover to reduce tampering or trip hazards.

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. Subslab 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 11.7-electron-volt (eV) photoionization detector (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 vapor 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 subslab soil vapor samples will be submitted to a Washington certified environmental analytical laboratory and analyzed using U.S. Environmental Protection Agency (EPA) Method TO-15 for volatile organic compounds (VOCs). The list of analytes will include the following:

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

Results of the laboratory analysis will be compared to:

- Implementation Memo 22's short-term action levels for residential soil gas
- Implementation Memo 22's short-term action levels for commercial and industrial soil gas
- Cleanup Levels and Risk Calculation (CLARC) Method B value for residential soil gas
- CLARC Method B value adjusted for commercial use, described in Implementation Memo 21, Question 17 (Ecology 2018)

After 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.

3.2.3 Indoor Vapor 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 a 6-liter laboratory-certified evacuated Summa canister. Each Summa canister will be equipped with a pressure gauge and a calibrated critical orifice air flow controller.

Canister inlet valve heights will be about 3 to 3.5 feet 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 evacuated to a vacuum pressure of 25 to 30 inches mercury (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 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.

Samples will be collected using the methods outlined in Section 3.2.2. Analytical results will be compared to the standards referenced earlier. A comparison of results from samples collected at different depths may help identify the potential source of any CVOCs that are detected (groundwater or area-wide impacts versus localized sources).

3.3 Exterior Assessment

3.3.1 Exterior Soil Vapor Sampling

Anchor QEA will contract with a Washington licensed driller to advance one exterior soil boring at each of the Subject Properties. The locations for the exterior soil vapor samples will be selected during the reconnaissance visit and in consultation with persons identified in the appropriate access agreement or contract, and documented in an addendum to this work plan for Ecology review and approval. As stated earlier, the soil boring locations will be precleared by a third-party utility locating service.

A Geoprobe direct-push drill rig will be used to advance a dual-tube system of drilling rods to a minimum depth of approximately 5 feet below ground surface (bgs). The dual-rod system is composed of an outer rod with a casing diameter of 2.25 inches with a smaller diameter inner boring that is separate from the outer protective casing. The outer rod will keep the boring open during completion of the soil vapor sampling points described below.

Soil cores will be collected via dedicated Macro-Core sleeves in a 5-foot interval and screened with a 11.7 eV PID for total organic vapor content. A field geologist will make visual observations of the soil cores and record the characteristics of the soil (e.g., color, odor, and grain size), as well as any notable odors or staining (odors, staining, or elevated PID readings).

Following the completion of a soil boring, the boring will be converted into a temporary shallow soil gas sampling point. Soil gas sampling points will be constructed of new materials appropriate for environmental industry uses including these activities. A 6-inch stainless-steel wire screen, airstone filter, or filter tip (vapor sampling point) will be placed into the borehole to approximately 4.75 feet bgs, then clean quartz sand or inert glass beads (filter pack) will be placed into the borehole annulus to imbed the vapor sampling point into approximately 1 foot of gas-permeable filter pack material. Fine bentonite pellets will be placed above the filter pack to a thickness of approximately 1 foot, then hydrated; a second lift of 1-foot-thick hydrated bentonite will be placed to complete the seal. Coarse bentonite pellets will be hydrated and used to backfill the annulus; stabilizing rods and well centralizers will be used as necessary. An airtight valve will be attached to the end of the sampling tubing at the surface and temporarily covered by a traffic cone with signage.

Soil vapor samples will be collected using the methods outlined in Section 3.2.2. Upon completion of the sampling activities, the sampling tubing will be removed and the upper 2 feet of the boring will be backfilled with neat cement grout to within 3 inches of the existing grade, then capped with concrete or asphalt cold patch to match existing conditions.

Analytical results will be compared to the standards referenced earlier. A comparison of results from samples collected at different depths may help identify the potential source of any CVOCs that are detected (groundwater or area-wide impacts versus localized sources).

3.3.2 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 evacuated to 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.

3.4 Quality Assurance and Quality Control

Quality assurance (QA) and quality control (QC) procedures will be followed to meet routine data quality objectives as listed in the laboratory analytical methods. The QA/QC program includes the collection, analysis, and evaluation of laboratory QC samples such as method blanks, duplicates, matrix spike samples, and surrogate spikes. QC samples collected in the field will include field duplicate samples, field equipment blanks for all media sampled, and VOC trip blanks for soil sample deliveries. Field and laboratory QC data will be reviewed as part of the QA/QC process. For this initial phase of work, a quality assurance project plan (QAPP) or formal validation report is not required.

3.5 Investigation-Derived Waste

Investigation-derived waste will include disposable personal protection equipment, drilling spoils, and decontamination water. Soils and water will be appropriately containerized and staged at 4701 Brooklyn Avenue NE. Every effort will be made to coordinate timely container collection by a third-party disposal company for off-site disposal at an appropriate disposal facility.

4 Reporting

Following the completion of investigative activities, an assessment report will be prepared for submittal to Ecology. Concurrent with the report submittal, uploading of the results to Ecology's Environmental Information Management (EIM) database will be initiated (electronic data deliverable submitted in EIM format to Ecology coordinator). The report will summarize the investigation field activities and observations and will include boring and sampling logs, analytical laboratory reports, tabulated results, and layout figures of Subject Properties. Analytical results will be compared to the screening values specified in the respective sections. Based on the results of the sampling activities and results, additional assessment activities may be warranted.

5 References

Ecology (Washington State Department of Ecology), 2009. *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action, Review DRAFT*. Toxics Cleanup Program, Washington State Department of Ecology. Publication No. 09-09-047. October 2009.

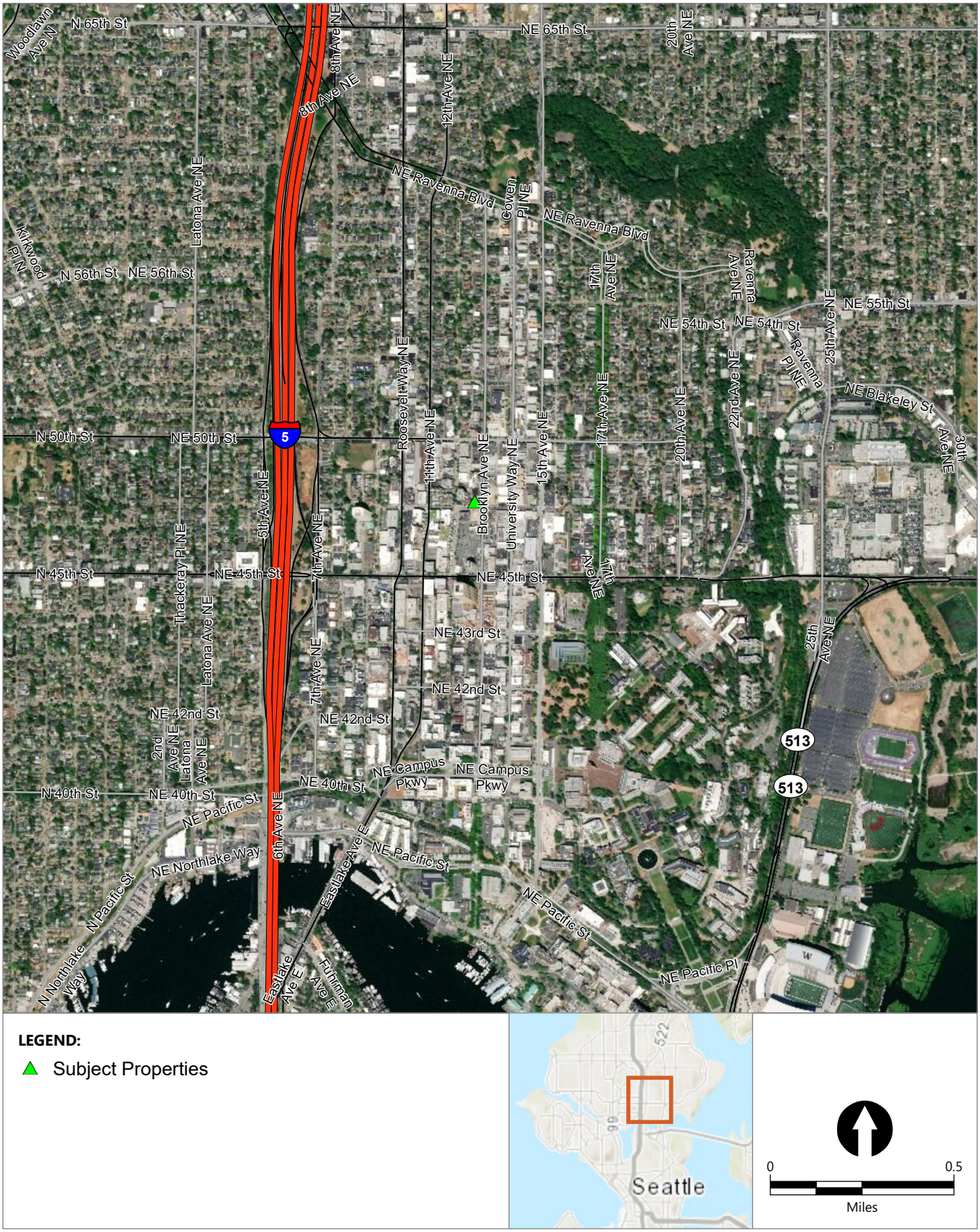
Ecology, 2018. *Frequently Asked Questions (FAQs) Regarding Vapor Intrusion (VI) and Ecology's 2009 Draft VI Guidance*. Toxics Cleanup Program Implementation Memo 21. Publication No. 18-09-046. November 15, 2018.

Ecology, 2019. *Vapor Intrusion (VI) Investigations and Short-term Trichloroethene (TCE) Toxicity*. Toxics Cleanup Program Implementation Memo 22. Publication No. 18-09-047. October 1, 2019.

EPA (U.S. Environmental Protection Agency), 2012. Memorandum to: Rick Albright, Office of Environmental Cleanup, U.S. Environmental Protection Agency. Regarding: OEA Recommendations Regarding Trichloroethylene Toxicity in Human Health Risk Assessments. From Joyce C. Kelly, Office of Environmental Assessment, U.S. Environmental Protection Agency. December 13, 2012.

ITRC (Interstate Technology and Regulatory Council), 2007. *Vapor Intrusion Pathway: A Practical Guideline*. January 2007.

Figures



LEGEND:

▲ Subject Properties

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Figure 1
Vicinity Map

VI Evaluation Work Plan

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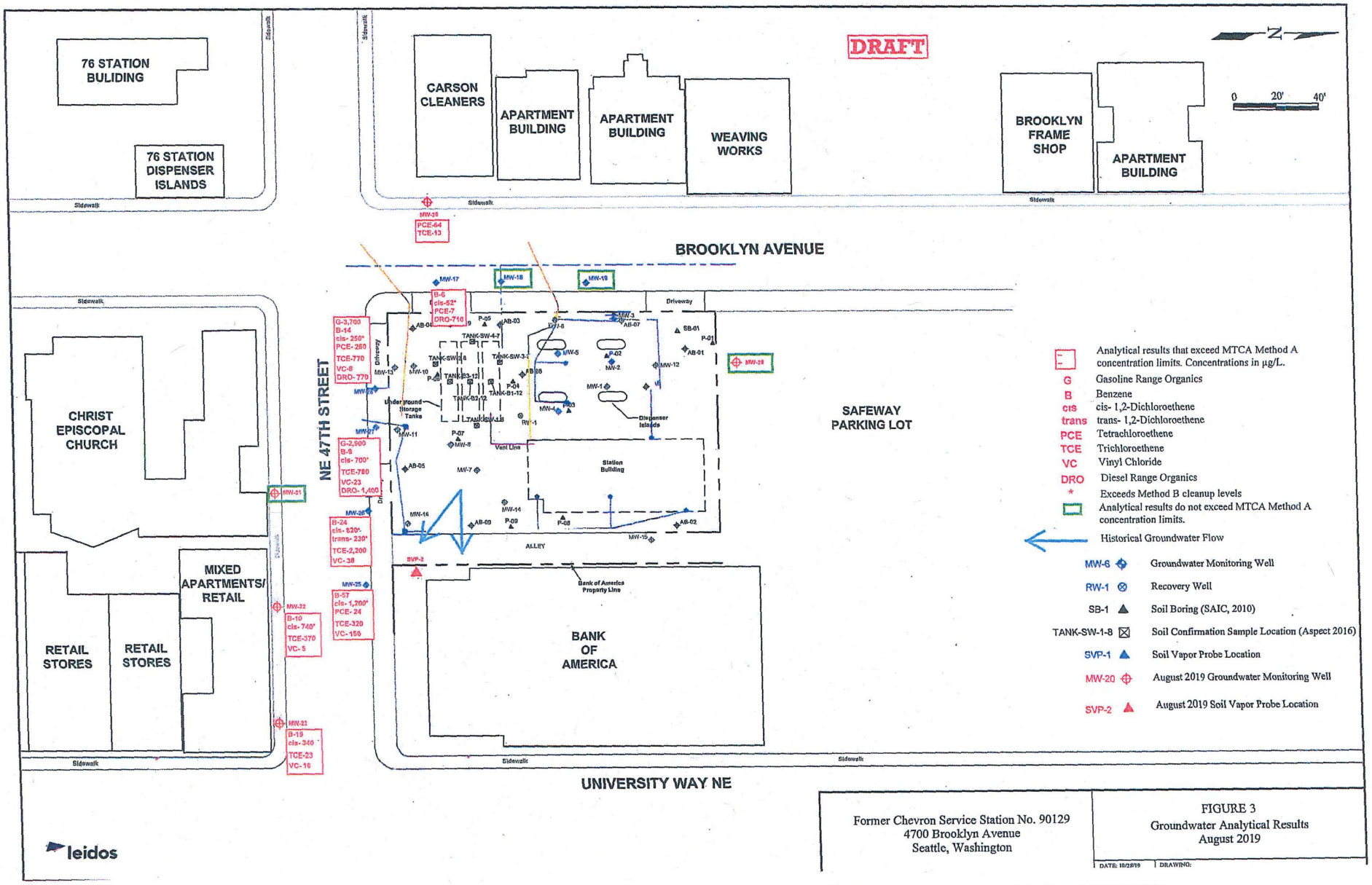
Figure 2
Subject Properties and Area of Concern
VI Evaluation Work Plan

Attachment A
Groundwater Analytical Results
August 2019 (page 4 of Ecology letter dated November 7, 2019 to Tahn Associates, LLC)



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Former Chevron Service Station No. 90129
4700 Brooklyn Avenue
Seattle, Washington

FIGURE 3
Groundwater Analytical Results
August 2019

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