# Ultra Custom Care Cleaners Site

# Cleanup Action Plan

**Prepared for**

City of Bothell
18415 101st Ave NE
Bothell, WA 98011

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**FINAL**

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The interpretations and conclusions contained in this report are based in part on site characterization data collected by others and provided by the City of Bothell. Floyd|Snider cannot assure the accuracy of this information.

# Executive Summary

This document presents the Cleanup Action Plan (CAP) for the Ultra Custom Care Cleaners Site (Site) in the downtown corridor of Bothell, Washington. The CAP was prepared for the Washington State Department of Ecology (Ecology) in collaboration with the City of Bothell (City). From the 1950s until 2012, dry-cleaning operations were conducted by Raincheck Cleaners and Laundry, NuLife Cleaners, and Ultra Custom Care Cleaners at buildings located at the Site's source property on the northeast corner of Bothell Way NE and NE 183rd Street. The original building at the source property was demolished and replaced in 1967. The source property has been vacant since February 2012, when the City acquired the property and demolished the existing building. The Site, which is defined by the extent of contamination resulting from the former dry-cleaning operations, includes areas of the source property, five downgradient private or City-owned properties, and three City rights-of-way (ROWs).

This CAP has been prepared to meet the requirements of the Model Toxics Control Act administered by Ecology under Chapter 173-340 of the Washington Administrative Code. This CAP describes Ecology's proposed cleanup action for this Site, sets forth the requirements that the cleanup must meet, and was developed using information presented in the Remedial Investigation (RI) and Feasibility Study (FS) report for the Site, which was prepared for the City by Floyd|Snider in 2021 (Floyd|Snider 2021).

The cleanup action selected by Ecology for the Site is composed of multiple remedial technologies identified in the RI/FS. The RI/FS identified chemicals of concern (COCs), which were targeted for remediation, confirmed to be present in groundwater and soil at the Site resulting from former Site activities, including chlorinated volatile organic compounds (cVOCs; tetrachloroethene [PCE] and its breakdown products trichloroethene, *cis*-1,2-dichloroethene, and vinyl chloride) and arsenic. Gasoline-range organics resulting from other operations on private properties downgradient of the source property are also a COC in soil.

Cleanup levels (CULs) are established in this CAP for the contaminants present in soil and groundwater. Soil CULs are based on the protection of groundwater from soil leaching. Soil CULs are also protective of human health if direct contact soil exposure occurs. Groundwater CULs are based on the protection of drinking water. Groundwater CULs are also protective of indoor air exposure associated with vapor intrusion into buildings at the Site.

The RI/FS considered four different cleanup action alternatives for soil and groundwater. Ecology selected the proposed cleanup action from among the four cleanup action alternatives presented in the RI/FS because it provides the greatest degree of overall environmental benefit for the associated cost.

The selected cleanup action consists of the following remedial components:

- Excavation of soil with PCE concentrations exceeding CULs on the source property
- Excavation amendment in the deepest source area excavation by mixing soil with sulfidated micro-zero-valent iron (S-MZVI) to facilitate destruction of cVOCs through

chemical reaction and stimulate anaerobic biological degradation by creating reducing conditions

- In situ treatment of shallow and deep downgradient groundwater by injection of targeted barriers consisting of liquid activated carbon (PlumeStop) and S-MZVI to adsorb and facilitate destruction of cVOCs in groundwater
- Monitored natural attenuation of groundwater following excavation and injection of PlumeStop and S-MZVI
- Institutional controls, if necessary, to control exposures to soil contamination left in place beneath the City ROW

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## List of Abbreviations

| Abbreviation | Definition |
|---|---|
| AO | Agreed Order |
| AOC | Area of Concern |
| ARAR | Applicable or Relevant and Appropriate Requirement |
| bgs | Below ground surface |
| CAP | Cleanup Action Plan |
| CCMP | Construction Compliance Monitoring Plan |
| CD | Consent Decree |
| City | City of Bothell |
| COC | Chemicals of concern |
| CSCSL | Confirmed and Suspected Contaminated Sites List |
| CSM | Conceptual site model |
| CUL | Cleanup level |
| cVOC | Chlorinated volatile organic compound |
| CY | Cubic yard |

| Abbreviation | Definition |
|---|---|
| DCE | *cis*-1,2-Dichloroethene |
| DRO | Diesel-range organics |
| Ecology | Washington State Department of Ecology |
| EDR | Engineering Design Report |
| FS | Feasibility Study |
| GRO | Gasoline-range organics |
| HASP | Health and Safety Plan |
| IC | Institutional Control |
| IM | Interim measure |
| LTCMP | Long-term compliance monitoring plan |
| µg/L | Micrograms per liter |
| MNA | Monitored Natural Attenuation |
| MTCA | Model Toxics Control Act |
| ORO | Oil-range organics |
| PCE | Tetrachloroethene |
| POC | Point of compliance |
| RACR | Remedial Action Completion Report |
| RAO | Remedial Action Objective |
| REL | Remediation level |
| RI | Remedial Investigation |
| ROW | Rights of way |
| SF | Square feet |
| Site | Ultra Custom Care Cleaners Site |
| SL | Screening level |
| S-MZVI | Sulfidated micro-zero-valent iron |
| TCE | Trichloroethene |
| TPH | Total petroleum hydrocarbon |
| UST | Underground storage tank |
| ZVI | Zero-valent iron |

# 1.0 Introduction

This document presents the Cleanup Action Plan (CAP) for the Ultra Custom Care Cleaners Site (Site), located in the downtown corridor of Bothell, Washington (Figure 1.1). This CAP was prepared pursuant to the requirements of Agreed Order (AO) No. DE 9704 (Ecology 2013) between the Washington State Department of Ecology (Ecology) and the City of Bothell (City).

Site Name: Ultra Custom Care Cleaners
Facility Site ID: 379891
Cleanup Site ID: 3172

Source Property Address: 18304 Bothell Way NE
Parcels: 072605-9003 and a portion of 072605-9191
Owners: City of Bothell

The "Site" is not defined by an address or property boundary under the Model Toxics Control Act (MTCA), but rather defined by the extent of contamination before cleanup activities begin (WAC 173-340-200). Therefore, the Site includes the source property and several adjacent or downgradient impacted properties (discussed further in Section 2.0). The source property for the Site, now an empty lot on the City's Municipal and City Hall Campus, is the former location of several dry-cleaning facilities with operations starting in the 1950s and is the source of a chlorinated volatile organic compound (cVOC) groundwater plume. The source property and adjacent cleanup sites are shown on Figure 1.2.

## 1.1 PURPOSE AND REGULATORY FRAMEWORK

This CAP is a requirement of the MTCA cleanup regulation (WAC 173-340). The purpose of the CAP is to identify the proposed cleanup action at the Site; to establish the actions required to achieve a reasonable restoration time frame at the Site; and to identify the necessary requirements of engineering and monitoring plans, as further described in this document.

Specific MTCA requirements for CAPs are set forth in WAC 173-340-380(1). Consistent with these requirements, this CAP provides the following:

- Site description and summary of current site conditions
- Cleanup standards for hazardous substances in each medium of concern
- Summary of the cleanup action alternatives considered in the Remedial Investigation (RI) and Feasibility Study (FS) for the Site (Floyd|Snider 2021)
- Description of the proposed cleanup action developed for the Site in accordance with WAC 173-340-350 through 173-340-380, including justification for selection of the cleanup action

- Description of the types, levels, and amounts of hazardous substances remaining at the Site, and the measures that will be used to prevent migration and contact with those substances
- Applicable state and federal laws for the proposed cleanup action
- Restoration time frame and compliance monitoring requirements
- Implementation schedule

Ecology has made a preliminary determination that a cleanup conducted in conformance with this CAP will comply with the requirements for selection of a cleanup action under WAC 173-340-360. These requirements include a cleanup action that will be protective of human health and the environment, attain federal and state requirements that are applicable or relevant and appropriate, comply with cleanup standards, provide for compliance monitoring, use permanent solutions to the maximum extent practicable, provide for a reasonable restoration time frame, and consider public concerns, as further described in this CAP.

# 2.0 Site Description

The Site is within Bothell's Downtown Core District Zone. The Site includes areas of the source property, five downgradient private or City-owned properties, and three City rights-of-way (ROWs). Current land use within the downtown core in the vicinity of the Site includes both commercial and residential use. The City anticipates future development in the vicinity of the Site will include commercial and residential use, consistent with its long-term development plans. The City owns the source property and two additional blocks downgradient of the source property (Figure 1.2).

This section describes the Site's history, including a brief history of pollutant-generating activities and the circumstances surrounding identification of the Site as a MTCA cleanup site (Section 2.1); previous studies and interim measures (IMs) completed at the Site (Section 2.2); the conceptual site model (CSM; Section 2.3); and areas of concern (AOCs) at the Site (Section 2.4).

## 2.1 SITE HISTORY

Subsurface contamination at the Site originated from historical dry-cleaning operations on the source property (Figure 1.2). The original building at the source property was located on the southwestern portion of the lot and was built in 1948. Raincheck Cleaners and Laundry occupied this building from the 1950s through 1967. In 1967, the Raincheck Cleaners and Laundry building was demolished, and a new building was constructed. The new building was occupied by NuLife Cleaners, followed by Ultra Custom Care Cleaners.

In 2002, an investigation identified cVOCs—tetrachloroethene (PCE) and its breakdown products trichloroethene (TCE) and *cis*-1,2-dichloroethene (DCE)—in groundwater in the vicinity of the dry-cleaning business and prompted Ecology's listing of the Site to the Confirmed and Suspected Contaminated Sites List (CSCSL) and numerous environmental investigations, including the investigations and IMs described in Section 2.2. The City acquired the property in February 2012 as part of the Downtown Redevelopment Plan and demolished the existing building to accommodate expansion of the City Hall municipal campus. The source property remains vacant at the southwest corner of the City Hall campus. It is almost entirely covered by concrete or pavement except for thin margins of compacted gravel (less than approximately 1 foot wide) along the property perimeter. Adjacent parcels north and east of the source property are vegetated.

On April 18, 2013, the City entered an AO with Ecology to perform a cleanup at the Site (Ecology 2013). In 2016 and 2018, the City prepared draft and revised RI/FS documents (HWA 2017a, 2018a) to summarize Site data and establish cleanup goals. Ecology subsequently requested additional data collection and characterization of the Site. Data gaps investigation field activities were conducted in 2020 and provided the information necessary to complete the RI/FS (Floyd|Snider 2021).

## 2.2 PREVIOUS STUDIES AND INTERIM MEASURES

Data from numerous environmental investigations were used to characterize soil and groundwater quality at the Site and were comprehensively described in the RI. Data characterization efforts were completed in five phases, which are briefly described as follows:

- **Preliminary Site Assessment (2001–2008).** In 2001, an initial Phase I Environmental Site Assessment identified recognized environmental conditions, including potentially contaminated soil and groundwater from historical dry-cleaning operations and use of underground storage tanks (USTs; HWA 2018b). Subsequent investigations confirmed the presence of contaminated soil and groundwater, which led to Ecology's addition of the Site to the CSCSL, Groundwater data collected during this phase were not used to establish current Site conditions.
- **Pre-Groundwater IM: Site Characterization (2009–2014).** Several investigations were completed at adjacent Ecology cleanup sites and to characterize Site contamination prior to planned redevelopment activities in Bothell's downtown core as part of the AO requirements. During these investigations, cVOCs were confirmed in soil and groundwater beneath the source property and in downgradient groundwater.
- **Ongoing Groundwater IM: Performance Monitoring and Site Characterization (2014–2016).** Between May 2014 and April 2016, groundwater IMs were performed at the Site to reduce concentrations of cVOCs in groundwater. Groundwater data were collected quarterly throughout the implementation of these IMs to evaluate their effectiveness.
- **Post-Groundwater IM: Site Characterization (2016–2018).** After completion of the groundwater IMs, three soil and groundwater subsurface investigations were completed to characterize the extent of remaining Site contamination. Additionally, data from quarterly groundwater monitoring events were collected to evaluate post-IM groundwater quality.
- **Data Gaps Investigation (2020).** In 2020, data were collected to fill remaining Site data gaps and to characterize current groundwater quality across the Site. These data formed the primary basis for the RI's description of current Site groundwater conditions.

Figure 2.1 shows soil and groundwater sampling locations used to delineate contamination in the RI. Groundwater locations representative of current conditions are included in Figure 2.1; therefore, only locations that were sampled in 2009 and later are shown.

Several IMs have been completed to address contamination from the source property; key IMs include the following:

- In May and August 2014, in situ chemical oxidation injection IMs were performed across the source property. Groundwater monitoring showed that chemical oxidation IMs were ineffective (HWA 2014a).

- Bioinjection IMs were completed in 2015 and 2016. To foster the correct geochemical conditions for effective cVOC treatment, the injection substrate used included three components: (1) water and granular zero-valent iron (ZVI), which removes chlorine and creates anoxic groundwater conditions; (2) emulsified vegetable oil, micro-ZVI, and dispersant in anaerobic water, which provide an energy source for the bioaugmentation culture and disperses the injection substrate into groundwater; and (3) bioaugmentation culture, a bacterial culture capable of converting PCE to *cis*-1,2-DCE. These IMs successfully reduced concentrations of cVOCs in groundwater within the target areas. Figure 2.2 shows bioinjection locations associated with the groundwater IMs completed.
  - **January 2015.** Six 4-inch-diameter injection wells were installed. Bioremediation substrate injected into these wells treated deep groundwater on the source property. Additionally, 11 1-inch-diameter injection wells were installed on the source property to treat shallow groundwater. Bioremediation substrate was injected in the 11 shallow injection wells, and in three additional downgradient direct push bioinjection rows.
  - **April 2016.** The second bioinjection IM was completed. Bioremediation substrate was injected in the source area (five existing injection wells and 10 direct push bioinjections) and in three downgradient direct push bioinjection rows.

Implementation of IMs at the Site has resulted in a discontinuous plume of cVOCs in groundwater. Areas within and immediately downgradient of the IM injection areas have been successfully remediated; however, cVOCs in groundwater remain at elevated concentrations between the targeted IM areas.

Previous IMs to address cVOCs in groundwater at the Site have also created intentional, temporary changes to the chemical conditions in groundwater by adding ZVI. ZVI releases electrons, which assist in the breakdown of cVOCs and also cause arsenic to be more soluble in water. Arsenic occurs naturally in soil in the Puget Sound region; therefore, when ZVI is added at the Site, arsenic present in soil in the saturated zone temporarily dissolves to groundwater. This process is temporary and reversible.

In addition to the investigations and interim actions completed at the Site, many soil removal actions were completed as part of redevelopment of the City’s downtown core. Activities that resulted in removal of contaminated soil include the following:

- **Targeted Soil Excavation on the Source Property**. In November 2015, a former home heating oil tank and its contents were excavated and removed from the source property (HWA 2016). Confirmation samples were collected to document that all potentially impacted soils were removed.
- **Utility Excavations.** Total petroleum hydrocarbon (TPH) impacted soils were removed following discovery of a UST during a utility excavation adjacent to the Speedy Glass property (PSI 1998).

- **Roadway Realignment in the Downtown Core.** This work removed some shallow soil contamination present in the roadway and ROW near the source property
- **Remediation of the Bothell Landing Site.** Targeted excavations were performed at the Bothell Landing Site to remove TPH sources and excavate TPH-contaminated soil (HWA 2014b), followed by groundwater treatment with oxygen-release compound. The Bothell Landing Site is shown on Figure 1.2; its footprint is within the boundary of cVOC contamination from the source property.

### 2.3 CONCEPTUAL SITE MODEL

The CSM describes when and where the Site was contaminated; what media were affected; where the contamination migrated (pathways); and who and what could be harmed from the contamination (receptors). Figures 2.3 and 2.4 illustrate this concept on a cross-sectional view: Figure 2.3 shows the alignment of the cross-section, and Figure 2.4 is the CSM cross-section.

Existing contamination at the Site originated from historical releases associated with former dry-cleaning operations, which occurred at the source property between the 1950s and 2012. Contamination is present in soil on the source property near where the original release occurred. Dry-cleaning solvent released in the liquid phase at the historically unpaved ground surface migrated downward through permeable shallow soils into groundwater, which is generally encountered between 5 to 13 feet below ground surface (bgs) at the Site. Once in groundwater, contamination continues to migrate downward, because dry-cleaning solvents are denser than water. Contamination also moves laterally in the direction of groundwater flow, which is generally southward toward the Sammamish River (Floyd|Snider 2021). Figure 1.2 shows the Sammamish River relative to the source property, and Figure 2.4 shows the direction of groundwater flow.

For the purposes of characterizing the extent of contamination, the groundwater aquifer at the Site has been split into the following two zones:

- Shallow Groundwater: Between approximately 5 and 25 feet bgs
- Deep Groundwater: Approximately 25 feet bgs and deeper

Because dry-cleaning solvents are denser than water, cVOC groundwater contamination is found at deeper depths with increasing distance from the source property. This means that closer to the source property, most contamination is present in the shallow groundwater zone, whereas further from the source property, contamination is present in the deep groundwater zone. Soil at the Site is composed primarily of glacial recessional and advance outwash, which is composed of sand and silt with gravel near the surface, followed by consolidated glacial till, as illustrated on Figure 2.4. The groundwater contamination is present mainly within the outwash layer, which is more permeable than the underlying dense glacial till layer that forms a natural barrier that prevents further downward migration of contamination. As shown in Figure 2.2, previous IM injections were successful in remediating portions of the shallow groundwater plume. The footprint of the Site is defined by the areas where cVOCs are present in soil on the source property and by the plume of cVOC contamination in groundwater originating at the source property. Releases of petroleum (gasoline-range organics [GRO], diesel-range organics [DRO] and/or oil-range organics [ORO]) to shallow soil have also occurred in the course of operations at other downgradient properties within the Site boundary defined by the groundwater cVOC plume. These petroleum releases are generally limited to shallow soil and have not impacted groundwater, and many have been removed by excavation (refer to Section 2.2 above).

The source property and many of the adjacent and downgradient properties are almost totally covered by pavement, including roadways, sidewalks, and parking lots. Based on the Site configuration of paved surfaces and known occurrences of shallow soil contamination, there is no potential for erosion and transport of contaminants from soil by stormwater. Groundwater contaminants do not reach the Sammamish River.

Based on the current understanding of the Site, the only media of concern are soil and groundwater. Receptors and exposure pathways are identified for each of these media below, based on active or potentially active transport mechanisms for site contaminants. Based on the current understanding of the Site, current land use, and previous environmental studies, there are three primary transport mechanisms, as listed below:

- Volatilization of hazardous substances in the vadose zone and water table
- Sinking of dry-cleaning solvents that are denser than groundwater
- Flow of water downgradient, generally south, of the source property within groundwater

**Soil.** For impacted soil, a potential exposure pathway consists of direct contact with shallow impacted soil in unpaved areas by future workers or within future excavations related to redevelopment activities.

Terrestrial ecological receptors are not expected to be affected because of the limited habitat on the Site and adjacent parcels. However, burrowing or ground-dwelling invertebrates, and plants are exposed directly to soil. Screening levels (SLs) for protection of ecological receptors were considered in development of cleanup levels (CULs) for contaminants resulting from Site activities.

The entirety of the source property is paved aside from thin margins of crushed gravel along the property boundary; therefore, leaching of PCE in soil in the vadose zone is not expected to be a major source of contamination to groundwater. Limited PCE in saturated soil on the source property leaching to groundwater is assumed to be an ongoing source of contamination to groundwater. The parcels immediately upgradient of the source property are unpaved; therefore, stormwater infiltrating from upgradient also has some potential to cause infiltration through contaminated soil. Soil CULs are set to protect groundwater for drinking water use via the soil-to-groundwater (leaching) pathway.

**Groundwater.** There are no known drinking water wells in the immediate vicinity of the Site, and the use of Site groundwater as a drinking water source is unlikely given the Downtown Core zoning classification of the Site. However, groundwater is considered potable in accordance with WAC 173-340-720, because Ecology has not issued a non-potability determination for the Site. This pathway is incomplete but still forms the basis of groundwater CULs, because it is protective of other direct contact exposure scenarios that may be encountered at the Site (e.g., digging trenches for utility work).

Dry-cleaning solvents are volatile and present a potential risk to indoor air quality if present in high concentrations and if structures are located or built over contaminated areas. A potential exposure pathway consists of inhalation of vapors within potential future buildings that may be constructed over these areas. People in a building with a potential vapor intrusion pathway are potential receptors.

## 2.4 AREAS OF CONCERN

AOCs for development of a cleanup action encompass Site soil and groundwater locations where recent results exceed CULs for chemicals of concern (COCs) associated with Site activities including cVOCs and arsenic. AOCs are illustrated on Figure 2.5. There are six discrete areas where cVOCs exceed CULs in groundwater. If left untreated, groundwater in these areas would travel downgradient (in a south-southeast direction), contaminating areas that are currently in compliance with CULs.

**Source Property cVOC AOC.** This includes soil and groundwater contamination located within the source property. There are three localized PCE hotspots in soil at the source property. Most PCE contamination is present in shallow vadose zone soil at depths less than 3 feet bgs. Contamination is deepest in the southernmost hotspot, where contamination may be as deep as 9.5 feet bgs. Shallow soil contamination is unlikely to be an ongoing source to groundwater while the source property remains paved but may be a future source to groundwater via infiltration. The limited area of the southernmost hotspot where contamination is present in the saturated zone is presumed to be a continuing source to groundwater.

Groundwater contamination is present in shallow groundwater on the southern parcel of the source property. PCE was measured on the source property at a maximum concentration of 130 micrograms per liter (µg/L) in the 2020 monitoring event (Table 6.1 of the RI/FS; Floyd|Snider 2021).

**Shallow Groundwater cVOC AOC.** Contamination in this AOC was partially addressed by previous groundwater IMs. As a result of these IMs, groundwater contamination in the shallow groundwater zone is present in four discrete groundwater plumes or hotspots, as shown on Figure 2.5. Contamination is located at properties and City ROWs south of the source property. Contamination in this AOC is deepest in the hotspot on the southern portion of the Speedy Glass property, where PCE contamination remains at depths of 10 to 19 feet bgs.

Residual low-level soil contamination is present in the City ROW near the intersection of Bothell Way NE and NE 183rd Street. This contamination may have migrated with groundwater and partitioned onto soil. Residual soil contamination is well understood and located under pavement. It is included in this AOC as a potential future source to groundwater, even though it is unlikely to represent a source to groundwater.

**Deep Groundwater cVOC AOC.** Groundwater contamination is present in the deep groundwater zone at properties and City ROWs south of the source property. The maximum depth of contamination is approximately 35 feet bgs on the majority of the Site. This depth corresponds to the depth of the confining layer of glacial till present across the deep groundwater plume extent.

**Arsenic AOC.** There are three discrete groundwater hotspots where arsenic exceeds its CUL, which together constitute the arsenic AOC. Two hotspots are in the shallow groundwater zone; one hotspot is in the deep groundwater zone. Each hotspot is centered on or immediately downgradient of bioinjection locations where groundwater geochemistry was intentionally altered to create reducing conditions (Figure 2.5). This change in geochemistry caused naturally occurring arsenic present in soil to leach into groundwater. When geochemical conditions of the aquifer return to pre-injection conditions, arsenic concentrations should return to natural background levels without requiring active remediation.

# 3.0 Chemicals of Concern and Cleanup Standards

This section describes the Site's COCs (Section 3.1); cleanup standards for groundwater (Section 3.2); and cleanup standards for soil (Section 3.3).

Cleanup standards are composed of a CUL combined with a point of compliance (POC), which is the location where the CUL must be met. CULs protect the active or potentially active exposure pathways discussed in Section 2.3 for each of the impacted media present at the Site.

## 3.1 CHEMICALS OF CONCERN

COCs were identified by comparing Site data to SLs that are protective of all the potential exposures to Site contamination in accordance with MTCA. This evaluation identifies the chemicals that pose the greatest overall threat to human health and the environment due to toxicity, spatial distribution, and/or concentrations present.

This evaluation found that certain cVOCs are COCs in both soil and groundwater. PCE releases are the source of all cVOC contamination at the Site. When PCE degrades in the environment, it forms TCE, *cis*-1,2-DCE, and vinyl chloride as its breakdown products. This process occurs primarily within groundwater. Additional COCs at the Site are arsenic in groundwater and GRO in soil. However, these chemicals had rare detections at elevated concentrations and do not represent a significant exposure risk. In summary, the Site COCs include the following:

- **Groundwater.** PCE and breakdown products of PCE (TCE, *cis*-1,2-DCE, and vinyl chloride); and arsenic.
- **Soil.** PCE and GRO.

There are no current or former sources at the Site that would contribute to a release of arsenic. Elevated arsenic concentrations are expected to be present within the boundaries of the cVOC plume due to reducing geochemical conditions caused by IMs performed at the Site. Reducing conditions can cause the release of naturally occurring arsenic in native soils into groundwater. This process is reversible; arsenic concentrations are expected to decline to natural background levels after the aquifer returns to its pretreatment geochemical conditions.

## 3.2 CLEANUP STANDARDS FOR GROUNDWATER CHEMICALS OF CONCERN

Groundwater cleanup standards ensure that groundwater is protective of human health, ecological receptors, and the environment.

### 3.2.1 Cleanup Levels for Groundwater

The highest beneficial use of groundwater is assumed to be drinking water. However, groundwater cleanup standards are protective of all active or potentially active exposure pathways at the Site, considering both current and future land use. Criteria protective of each pathway were developed, and then the lowest (most protective) CUL was selected as the CUL for each chemical.

The Site CUL for arsenic is based on the natural background concentration (Ecology 2022a). The CULs for cVOCs are based on MTCA Method A, which is protective of all pathways for a simple site with a single contaminant source (e.g., PCE releases from former dry cleaning operations). The CUL for arsenic has been adjusted from the value presented in the Site RI/FS, to reflect an updated Ecology study on background metals concentrations, which was issued since completion of the RI/FS. CULs for each groundwater COC are summarized in Table 3.1.

**Table 3.1**
**Groundwater Cleanup Levels**

| Analyte | CAS No. | CUL (µg/L) | CUL Basis | Toxicity Basis (1) |
|---|---|---|---|---|
| **Total Metals** | | | | |
| Arsenic | 7440-38-2 | 8.0 | Background | Carcinogenic (2) |
| **Chlorinated Volatile Organic Compounds** | | | | |
| PCE | 127-18-4 | 5.0 | MTCA Method A | Carcinogenic |
| TCE | 79-01-6 | 5.0 | MTCA Method A | Carcinogenic |
| *cis*-1,2-DCE | 156-59-2 | 70 | Federal MCL | Short-Term/Acute |
| Vinyl chloride | 75-01-4 | 0.20 | MTCA Method A | Carcinogenic |

Notes:

1. In accordance with WAC 173-340-720(9)(c)(v), compliance with CULs will be determined using an upper percentile concentration for CULs based on short-term or acute toxic effects on human health or the environment, and the true mean concentration for CULs based on chronic or carcinogenic effects.
2. The lowest human-health risk-based criterion is protective of the cancer endpoint, which is adjusted upward to natural background (Ecology 2022a).

Abbreviations:

CAS Chemical Abstracts Service
CUL Cleanup level
DCE *cis*-1,2-Dichloroethene
MCL Maximum contaminant level
MTCA Model Toxics Control Act
PCE tetrachloroethene
RI Remedial Investigation
TCE trichloroethene

### 3.2.2 Remediation Levels for Groundwater

Groundwater remediation levels (RELs) based on vapor intrusion to a commercial building were developed to aid in determining whether groundwater concentrations are protective of commercial activities on private property in areas overlying plumes while the remedy is in process. The RELs were calculated consistent with Section 4.4 of Ecology's vapor intrusion guidance (Ecology 2022b), assuming that workers are exposed for a duration of 45 hours per week for 50 weeks per year. Short-term RELs are presented in Table 3.2.

**Table 3.2**
**Groundwater Remediation Levels for Vapor Intrusion**

| Analyte | CAS No. | REL (µg/L) |
|---|---|---|
| PCE | 127-18-4 | 120 |
| TCE | 79-01-6 | 12 (1) |
| Vinyl chloride | 75-01-4 | 1.5 |

Note:
1 A short-term action level of 31 µg/L is additionally applicable for TCE and will be assessed by performance monitoring where groundwater contamination may be present beneath buildings.

Abbreviations:
CAS Chemical Abstracts Service
PCE Tetrachloroethene
REL Remediation level
TCE Trichloroethene

The standard POC where these CULs apply is groundwater throughout the Site, to the maximum depth where contamination from the Site is present. The standard POC applies to all groundwater COCs. Compliance is determined for each groundwater monitoring well individually in accordance with WAC 173-340-720(9)(c).

### 3.3 CLEANUP STANDARDS FOR SOIL CHEMICALS OF CONCERN

CULs were developed for each chemical that was retained as a soil COC. The standard POC where these CULs apply is soil throughout the Site, up to the maximum depth where contamination from the Site is present. CULs are summarized in Table 3.3. These CULs are protective of unrestricted current and future land use for a site where the ecological exposure pathway is not active.

**Table 3.3**
**Soil Cleanup Levels**

| Analyte | CAS No. | CUL (mg/kg) | CUL Basis |
|---|---|---|---|
| **Chlorinated Volatile Organic Compounds** | | | |
| PCE | 127-18-4 | 0.050 | Protection of Groundwater |
| **Total Petroleum Hydrocarbons** | | | |
| Gasoline-range organics | GRO | 30 | Protection of Groundwater |

Abbreviations:
CAS Chemical Abstracts Service
CUL Cleanup level
GRO Gasoline-range organics
mg/kg Milligrams per kilogram
PCE Tetrachloroethene

The standard POC where these CULs apply is soil throughout the Site, to the maximum depth where contamination from the Site is present. The standard POC applies to both soil COCs.

# 4.0 Cleanup Action Evaluation

Remedial technologies were reviewed and considered to address both soil and groundwater contamination at the Site. This section presents a summary of the preliminary screening of remedial technologies (Section 4.1); cleanup alternatives (Section 4.2); and cleanup alternatives evaluation criteria (Section 4.3). Section 5.0 describes the proposed cleanup action.

## 4.1 PRELIMINARY SCREENING OF TECHNOLOGIES

Passive and active remedial technologies applicable for the site-specific COCs at concentrations measured at the Site were evaluated in the FS (Floyd|Snider 2021). The site-specific groundwater COCs are four cVOCs (PCE, TCE, *cis*-1,2-DCE, and vinyl chloride) and arsenic. PCE and GRO are soil COCs. The goal of this screening was to identify technologies that would address contamination resulting from former Site activities. Although GRO was retained as a COC for the Site due to its presence on downgradient properties within the Site footprint at concentrations exceeding the CUL, releases of GRO are not associated with activities that occurred at the Site and is, therefore, not targeted for cleanup.

A preliminary screening of the remedial technologies was completed in the FS in accordance with WAC 173-340-350(8)(b). The objective of the screening was to remove technologies from further evaluation if they clearly did not meet the minimum requirements of the Remedial Action Objectives (RAOs) or had a disproportionate cost to apply based on the site conditions.

Based on this preliminary screening step completed in the FS, the following technologies were retained for further consideration as part of the cleanup action alternative evaluation in one or more AOCs:

- Institutional Controls (ICs)
- Engineering Controls
- Monitored Natural Attenuation (MNA)
- Surface Capping
- In Situ Groundwater Treatment by Bioremediation
- In Situ Groundwater Treatment by Activated Carbon
- Soil Excavation and Landfill Disposal

These retained technologies were evaluated for each AOC and then aggregated into Site-wide alternatives, as described in Section 4.2. Additional details on all the technologies evaluated are in the FS.

## 4.2 CLEANUP ACTION ALTERNATIVE EVALUATION

Four cleanup action alternatives were evaluated in the FS to address soil and groundwater contamination at the Site. The cleanup action alternatives consider each of the AOCs, ranging from most protective to least protective, and employ combinations of active remedial technologies and passive technologies that either eliminate or manage current and potential future exposure to contaminated media at the Site. The following alternatives were evaluated in the FS:

- **Alternative 1: Soil Excavation and Plume-Wide Activated Carbon and S-MZVI Injection Barriers**
  - Excavation to remove soil exceeding CULs Site-wide
  - Source Area cVOC AOC groundwater treatment with activated carbon and sulfidated micro-zero-valent iron (S-MZVI) in situ injection
  - In situ groundwater treatment by injection of liquid activated carbon and S-MZVI mixture (such as the proprietary Plume Stop mixture) in six equally spaced barriers along the length and width of the cVOC groundwater plume in the Shallow and Deep Groundwater cVOC AOCs
- **Alternative 2: Source Area Excavation and Targeted Activated Carbon and S-MZVI Injection Barriers**
  - Excavation to remove PCE-contaminated soil exceeding CULs on the Source Property cVOC AOC
  - Source area groundwater treatment with S-MZVI soil mixing in the deep excavation on the Source Property cVOC AOC
  - In situ groundwater treatment by injection of liquid activated carbon and S-MZVI in five focused barriers along the length of the cVOC groundwater plume in the Shallow and Deep Groundwater cVOC AOCs
  - ICs
- **Alternative 3: In Situ Bioremediation Treatment Zones**
  - In situ groundwater treatment using emulsified vegetable oil substrate to enhance bioremediation in three zones, including the Source Property cVOC AOC, and the Shallow and Deep Groundwater cVOC AOCs
  - ICs
- **Alternative 4: Source Area Treatment and Monitored Natural Attenuation**
  - In situ groundwater treatment in the Source Property cVOC AOC by injecting activated carbon and S-MZVI
  - MNA of cVOCs in groundwater
  - Contingency soil vapor assessment
  - ICs

MNA and groundwater monitoring would also be a component of each of the four alternatives.

### 4.3 PROPOSED CLEANUP ACTION ALTERNATIVE AND RATIONALE FOR SELECTION

Each of the four alternatives were screened relative to mandatory MTCA threshold requirements provided in WAC 173-340-360(2)(a), and other MTCA requirements for evaluation described in WAC 173-340-360(2)(b). These four alternatives were also evaluated according to the MTCA DCA procedures (WAC 173-340-360(2)(a-b)) to compare the costs and benefits of the cleanup alternatives and identify the alternative that is permanent to the maximum extent practicable.

Following consideration of the FS, Ecology has determined that the preferred alternative (Alternative 2) is the proposed cleanup action for the Site. The selected cleanup action has the lowest cost per degree of benefit and provides the greatest level of environmental benefit and permanence per dollar spent, making it the most permanent remedy to the maximum extent practicable.

The selected cleanup action meets the MTCA threshold requirements provided in WAC 173-340-360(2)(a), as described below:

- **Protect Human Health and the Environment.** The selected cleanup action will protect human health and the environment in both the short and long term. The remedy will permanently reduce the identified risks presently posed to human health and the environment through a combination of soil excavation, in situ groundwater treatment, and natural attenuation.
- **Comply with Cleanup Standards.** The selected cleanup action is expected to comply with the cleanup standards for groundwater and soil within a reasonable time frame.
- **Comply with Applicable State and Federal Laws.** The selected cleanup action is expected to comply with all state and federal laws and regulations.
- **Provide for Compliance Monitoring.** The selected cleanup action will include compliance monitoring for soil and groundwater to assess the effectiveness and permanence of each remedy element.

Cleanup alternatives must also fulfill other MTCA requirements described in WAC 173-340-360(2)(b) and listed below:

- **Use Permanent Solutions to the Maximum Extent Practicable.** The selected cleanup action utilizes excavation, which will permanently remove soil contaminant mass in the subsurface and effectively eliminate a significant source of contamination to groundwater. In situ treatment of groundwater will permanently degrade remaining groundwater contamination.
- **Provide for a Reasonable Restoration Time Frame.** Soil CULs will be met immediately upon completion of excavation. The restoration time frame for cVOCs in Site-wide groundwater is estimated to be 6 to 8 years, and the restoration time frame for all contaminants in groundwater to achieve CULs is 7 to 10 years. This is a reasonable restoration time frame given the size of the Site and current commercial usage of the properties at the Site.

- **Consider Public Concerns.** This document is being presented to the public and stakeholders for review and comment. The RI/FS will also be presented concurrently for public comment. Any comments received during the public comment period will be reviewed by Ecology prior to issuance of a final RI/FS CAP and addressed in a responsiveness summary. The final CAP will incorporate modifications, as needed, based on public comment.

The selected remedy also meets the additional RAOs established for the Site, including the following:

- **Prevent transport of contaminants from the Site by groundwater migration.** The selected cleanup action includes downgradient groundwater treatment to prevent further migration of contaminated groundwater from the Site.
- **Remediate contaminants in a manner that (a) does not interfere with or restrict proposed Site development and future use plans and (b) minimizes impacts to private businesses during remedial construction.** The selected cleanup action will not install permanent structures that may prevent future development and proposes to clean up soil and groundwater to concentrations compatible with unrestricted future property use. The preferred alternative uses minimally invasive construction methods to implement cleanup on private properties.
- **Properly manage any contaminated soil or groundwater generated during Site cleanup and ensure that these activities do not result in unacceptable exposure to contamination.** The selected cleanup action is not intended to generate contaminated wastewater. Contaminated soil generated during excavation will be handled in accordance with Federal and State regulations.

# 5.0 Description of Cleanup Action

The cleanup action proposed by Ecology for implementation at the Site is shown on Figure 5.1 and is composed of a combination of remedial technologies, which are further described below. More specific design plans will be developed in the Engineering Design Report (EDR), which will be prepared prior to implementation of the cleanup action.

This section presents the cleanup action components, Applicable or Relevant and Appropriate Requirements (ARARs) for the cleanup action, restoration time frame; compliance monitoring; contingency actions; hazardous substances to remain in place; and ICs and engineering controls.

## 5.1 CLEANUP ACTION COMPONENTS

The cleanup action consists of the following components:

**Soil Excavation and Off-Site Disposal.** Shallow PCE contamination greater than proposed CULs in soil within the Source Property cVOC AOC will be excavated in three distinct areas as shown on Figure 5.1.

- The 5.5-foot excavation in the northwest portion of the Source Property cVOC AOC will remove PCE in shallow vadose zone soil that is greater than the CUL. Approximately 137 cubic yards (CY) of soil will be removed in total. Dewatering and shoring are not anticipated to be necessary to complete the excavation.
- The 5-foot excavation in the eastern portion of the Source Property cVOC AOC will remove PCE in shallow vadose zone soil greater than the CUL. Approximately 34 CY of soil will be removed in total. Dewatering and shoring are not anticipated to be necessary to complete the excavation. Given the age of the single sample result used to interpolate the extent of this excavation area, the presumed maximum excavation extent is included as a contingency and additional predesign data may be collected to replace the older data and to define the necessary extent of the excavation to remove contaminated soil.
- The 9-foot excavation in the south-central portion of the Source Property cVOC AOC is designed to remove PCE in vadose zone and saturated zone soil greater than the CUL. It is assumed that contaminated soil in this area is intermittently in contact with groundwater. Approximately 376 CY of soil will be removed in total. Dewatering is not anticipated to be necessary to complete the excavation, but shoring or sloped sidewalls will be necessary.
- Excavated areas will be backfilled with clean imported fill and restored with an asphalt or gravel surface. Removal of contaminated soil that exceeds Site CULs will eliminate potential ongoing sources of contamination to groundwater via leaching.

**In Situ Groundwater Treatment.** S-MZVI will be placed in the bottom of the 9-foot excavation and, prior to backfill, mixed with an excavator with clean material to stimulate biodegradation in the Source Property cVOC AOC. In situ groundwater treatment will also be conducted throughout the groundwater plume to address cVOCs (specifically, PCE and vinyl chloride) at concentrations that are greater than their respective CULs. A mixture of liquid-activated carbon and S-MZVI, such as proprietary PlumeStop with S-MZVI mixture, will be injected under low pressure into the subsurface using a direct push drill rig to provide even distribution within the target groundwater treatment zones. The target treatment zone is expected to be 10 to 20 feet bgs in shallow groundwater (barriers 1 and 2), 15 to 25 feet bgs in the shallow to deep transition zone (barrier 3), and 25 to 35 feet bgs in deep groundwater (barriers 4 and 5). The colloidal matrix will coat soil particles to increase the adsorption of groundwater contaminants and act as a passive treatment zone to immobilize contaminants and passively treat groundwater as it flows downgradient. The design of in situ groundwater treatment will be further refined by predesign investigation prior to remedy implementation, and treatment progress will continue to be monitored throughout remedy implementation. The application of in situ treatment barriers will be adjusted as needed to ensure efficient degradation of cVOCs.

**MNA and Groundwater Monitoring.** MNA for groundwater is a component of the cleanup action after the removal of the soil source contamination. MNA is appropriate because source control is being conducted to the maximum extent practicable, there is evidence that biodegradation is occurring, and the groundwater contamination does not pose a risk to human health where MNA is proposed. Groundwater contamination does not pose a risk to ecological receptors because it does not reach the Sammamish River. As part of MNA, post-remedy groundwater monitoring will be required after cleanup action implementation. Long-term groundwater compliance monitoring will be implemented in accordance with a long-term compliance monitoring plan (LTCMP), which will be developed and approved by Ecology after implementation of the cleanup action. The LTCMP will describe long-term post-construction groundwater monitoring, including specific monitoring locations and frequency, and adaptive management to ensure the long-term protectiveness of the cleanup action. Groundwater compliance will be determined based on a comparison of groundwater data to Site CULs.

**Institutional Controls.** A Contaminated Soil and Groundwater Protocol (City of Bothell 2022) is incorporated into City of Bothell Development Standards, which apply to all permitted construction within Downtown Bothell. The protocol will be implemented as an IC, if necessary, to address remaining soil contamination in the ROW. The protocol additionally addresses development on private properties where contamination is known or suspected to exist. If a change in land use that could increase human health risk from vapor intrusion occurs on any private property within the Site during remedy implementation, the developer must fulfill state requirements including vapor intrusion assessment in accordance with current Ecology guidance. After remedy implementation is complete, ICs would not be required on private properties where CULs are met. ICs are described in further detail in Section 5.7.

Together, the individual technologies remove contaminant mass soil through excavation and in groundwater through adsorption and degradation. The cleanup action is a comprehensive final remedy for the Site that is compliant with all the applicable remedy selection requirements under

MTCA provided in WAC 173-340-360(2)(a) and WAC 173-340-360(2)(b) as well as the RAOs for the Site, as described in Section 4.4.

A detailed plan for implementing the cleanup action will be presented in an EDR for the Site. Predesign data will be collected prior to submittal of the EDR in accordance with an Ecology-approved Predesign Investigation Work Plan. The EDR will incorporate additional predesign data that are necessary to refine certain design elements of the cleanup action (for example, injection spacing and depth, injection rates, and reagent quantities).

## 5.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The cleanup action must comply with MTCA cleanup regulations (WAC-173-340), federal laws, and substantive requirements of applicable local and state laws. ARARs are often categorized as location-specific, action-specific, or chemical-specific. ARARs for this cleanup action are summarized in Table 5.1.

Location-specific ARARs will be met through compliance with all applicable local, state, and federal regulations based on the physical location of the Site. Action-specific ARARs will be met through implementation of construction activities in compliance with all applicable construction-related requirements such as disposal for excavated soil and compliance with all applicable drilling-related requirements. Chemical-specific ARARs will be met through compliance with CULs.

Implementation of the cleanup action would typically trigger a suite of environmental permits; however, cleanup actions conducted under a Consent Decree (CD) with Ecology are exempt from the state and local ARAR procedural requirements, such as permitting and approval requirements (WAC 173-340-710(9)(b)). Cleanup actions must, however, demonstrate compliance with the substantive requirements of those ARARs (WAC 173-340-710(9)(c)). Cleanup actions are not exempt from procedural requirements of federal ARARs.

## 5.3 RESTORATION TIME FRAME

The soil CUL for PCE is expected to be met following completion of soil excavation, which is expected to take approximately 1 to 2 weeks from the start of construction. ICs and a ROW contamination protocol would be implemented as necessary to manage future exposures where contamination will remain in place as described in Section 5.6. The restoration time frame for cVOCs in groundwater is expected to be 6 to 8 years after injections are complete. Site groundwater is expected to return to natural geochemical conditions, resulting in restoration of arsenic to natural background concentrations less than the CUL, within 1 to 2 years of achieving the CULs for cVOCs.

## 5.4 COMPLIANCE MONITORING

Compliance monitoring to ensure the protectiveness of the cleanup action will be implemented in accordance with WAC 173-340-410. Detailed monitoring elements for construction will be described in a Construction Compliance Monitoring Plan (CCMP), which will be prepared as part of remedial design. The CCMP will include a Health and Safety Plan (HASP), Sampling and Analysis Plan, and Quality Assurance Project Plan for monitoring and sample collection during cleanup action implementation. The CCMP will be included as an appendix to the Engineering Design Report, which will describe the approach and criteria for the engineering design of soil and groundwater cleanup actions at the Site. A post-remedy LTCMP will describe required long-term operations, maintenance, and monitoring after remedy implementation to ensure the long-term protectiveness of the remedy and will include a Groundwater Monitoring Plan and an updated HASP.

The purpose of the three types of compliance monitoring identified in WAC 173-340-410, with respect to how they will be implemented as part of the cleanup action implementation, is described as follows:

- **Protection monitoring** is used to confirm that human health and the environment are adequately protected during construction of the cleanup action and post-construction monitoring. Protection monitoring requirements will be described in Site-specific HASPs that address worker activities during the cleanup action construction and postconstruction groundwater monitoring. Protection monitoring will additionally include monitoring during remedy implementation to ensure that RELs for the vapor intrusion pathway are met where buildings are present at the Site. Protection monitoring requirements for vapor intrusion will be detailed in the CCMP.
- **Performance monitoring** is used to confirm that the cleanup action has attained cleanup standards and other performance standards. Performance monitoring will be conducted to document that remedial goals are being achieved, including cVOC reduction in groundwater after PlumeStop and S-MZVI injections. The combined liquid activated carbon and S-MZVI injections throughout the plume are designed to address groundwater contamination through adsorption, dechlorination, and degradation of PCE and its breakdown products.
- **Confirmation monitoring** is used to confirm the long-term effectiveness of the cleanup action after attainment of the cleanup standards. Confirmation samples would be collected along the sidewalls and bottom of the excavation to confirm that PCE concentrations in soil comply with the cleanup standards. Confirmation groundwater monitoring would be conducted following results from performance monitoring that verify that groundwater concentrations of cVOCs are less than CULs. Long-term monitoring of groundwater may be required to verify that the remedy remains effective. This is likely to be conducted through periodic reviews of the Site overseen by Ecology.

### 5.5 CONTINGENCIES

Ecology may require contingency actions, if data indicate that further action is necessary to control short-term vapor intrusion prior to compliance with cleanup standards on certain parcels, or that Site groundwater will not achieve CULs within the restoration time frame.

### 5.5.1 Short-Term Contingencies (Updated August 2022)

The potential for vapor intrusion was evaluated in the RI relative to current commercial properties within 30 feet horizontally of shallow cVOC groundwater plumes. When contaminant breakdown is complete and cVOC concentrations meet their groundwater CULs after remediation, cVOC concentrations in groundwater will also meet vapor intrusion SLs protective of potential future residential land use. However, before groundwater CULs for PCE breakdown products are achieved, additional contingency actions, such as vapor intrusion assessment or mitigation, may be necessitated by future changes in land use at private properties within 30 feet horizontally of shallow groundwater cVOC plumes. Short-term contingencies triggered by future changes in land use on private properties are addressed by the City's Soil and Groundwater Contamination Protocol.

Further, while the remedy is in process, groundwater concentrations must meet the RELs in Table 3.2 to ensure protection of commercial buildings overlying the plumes. If groundwater concentrations exceed the RELs, Ecology may require mitigation measures to address short-term worker exposures.

### 5.5.2 Long-Term Contingencies (Updated August 2022)

The potential exists that groundwater may not meet cVOC CULs in the AOC within 6 to 8 years, due to factors such as excess contaminant mass in groundwater or unfavorable groundwater geochemistry limiting the rate of degradation. It is expected that remedy performance will be continually assessed, and the application of in situ treatment will be adjusted as needed to ensure efficient degradation of cVOCs. Procedures for making adjustment to the application of in situ treatment will be developed in accordance with applicable Agency guidance and best practices (for example, U.S. Environmental Protection Agency and Interstate Technology Regulatory Council guidance documents). Compliance monitoring data analysis and recommended adjustments to the selected remedy of in situ treatment barriers will be presented in annual reports to Ecology during remedy implementation.

If groundwater compliance monitoring data continue to indicate that cVOC concentrations are not declining at a rate sufficient to reach CULs within 6 to 8 years, additional contingency action(s) will be evaluated. Ecology will determine whether a contingency action is necessary. Ecology will consider factors such as the severity of predicted CUL exceedance and volumetric proportion of groundwater not expected to reach CULs.

Potential contingency actions, if necessary, are anticipated to include application of other materials to bind contaminants, accelerate biodegradation and/or augment natural attenuation. If a contingency action is determined to be necessary, the proposed action will be detailed in a work plan for Ecology review and approval.

If arsenic concentrations in groundwater remain elevated at concentrations greater than 2 times the CUL after cVOC concentrations have met the CULs in accordance with the LTCMP, additional monitoring of arsenic and geochemical parameters in groundwater at selected well locations may be considered to more closely evaluate the return to natural geochemical conditions at the Site. An IC restricting the groundwater from being used as drinking water may be required if arsenic concentrations remained elevated after remedy implementation.

More detailed information regarding the triggers for contingency actions and scope of such actions would be presented in the LTCMP.

## 5.6 HAZARDOUS SUBSTANCES TO REMAIN IN PLACE

The hazardous substances that will remain in place after implementation of the cleanup action include limited areas of PCE and TPH in soil.

PCE that will remain in soil includes one isolated area in the ROW near the intersection of NE 183rd Street and Bothell Way NE, approximately 90 feet southwest of the source property. Contamination at this location was measured at concentrations of 0.12 to 0.15 milligrams per kilogram and is presumed to extend to approximately 8 feet bgs. It is well-bounded by other soil samples less than the CUL, encompassing an approximate area of 750 square feet (SF) or less (approximately 220 CY). The detected PCE in soil at this location was attributed to adsorption to soil from highly PCE-contaminated groundwater and is expected to attenuate with ongoing groundwater treatment to reduce PCE. Existing data in this location may be supplemented or replaced by data collected for remedial design or as part of implementation of the cleanup action to document current conditions. A ROW contamination protocol is proposed as an IC to address this remaining area of PCE contamination if data show that current PCE concentrations are greater than the CUL.

GRO exceeding the CUL and other TPH constituents detected at elevated concentrations relative to ecological SLs and MTCA criteria within the footprint of the Site are associated with other cleanup sites or the UST on Speedy Glass property. This TPH is not associated with releases from the Site. An IC is not proposed for these areas of soil contamination that are unrelated to the Site. A single, isolated location on the source property where total DRO and ORO in soil exceed SLs for terrestrial ecological receptors may be associated with Site activities. The total area is less than 350 SF; therefore, an IC (i.e., a wildlife barrier to prevent future exposure to contaminated soil by ecological receptors) is not required per WAC 173-340-7492(2)(a)(i).

The extents of cVOC contamination in groundwater will be verified during remedial design to ensure that the selected remedy addresses all groundwater cVOC contamination. cVOC contamination in groundwater will be addressed with in situ treatment and is expected to achieve CULs. Arsenic is expected to achieve natural-background-based groundwater CULs after equilibration to natural geochemical conditions. Groundwater will achieve CULs throughout the standard POC, which is Site-wide; therefore, no groundwater contamination that exceeds CULs will remain in place after implementation of the cleanup action.

## 5.7 INSTITUTIONAL AND ENGINEERING CONTROLS

ICs are typically required to address remaining cVOC-contaminated soil exceeding the soil CUL. Because the remaining contamination will be beneath pavement in the Bothell Way NE ROW, and the cVOC concentrations in soil do not exceed SLs for worker protection in this area, the IC would primarily address limiting infiltration and disposition of contaminated soil and associated water (such as stormwater or decontamination wash water) during any future ROW work.

ICs would not be required for vapor intrusion on private property after implementation of the cleanup action, if groundwater CULs are met. Shallow groundwater contamination beneath the southern parcel of the source property and Speedy Glass and Ranch Drive-In properties currently exceeds the vapor intrusion SLs for unrestricted land use. Protection monitoring during remedy implementation will monitor groundwater for comparison to RELs developed for the current commercial usage of the Speedy Glass and Ranch Drive-in properties and inform potential mitigation measures, if determined to be necessary. If a change in land usage occurs on these private properties during remedy implementation, further vapor intrusion assessment and mitigation would be required for future development in accordance with the City's Soil and Groundwater Contamination Protocol.

If CULs are not met after remedy implementation, the City may address this contingency with a parcel restriction for future development permit applications. The parcel restriction would require that any development of an enclosed structure designed for residential use either (a) conduct additional vapor intrusion assessment in accordance with the most current Ecology guidance at the time of assessment or (b) install presumptive vapor intrusion mitigation measures.

# 6.0 Proposed Schedule for Implementation

Implementation of the cleanup action defined in this CAP is expected to occur over the next several years and may occur in phases, which will be more specifically determined as part of engineering design and will consider the City's redevelopment needs. It is expected that proposed source removal via soil excavation will occur first, followed by in situ groundwater treatment. Documentation of the completion of the cleanup action construction will be presented in a Construction Completion Report submitted to Ecology. Groundwater compliance monitoring will follow the cleanup action construction.

The following table outlines a generalized schedule proposed for the cleanup action based on the expected chronology of key activities and deliverables.

**Proposed Schedule of Deliverables and Activities**

| Implementation Step or Deliverable | Due Date (1) or Time Frame |
|---|---|
| Submit Agency Review Draft Pre-Remedial Design Work Plan | Within 90 days of effective date of CD |
| Finalize Pre-Remedial Design Work Plan | 30 days after receipt of Ecology's final comments |
| Implement Pre-Remedial Design Work Plan | Initiate within 45 days of Ecology approval of final Work Plan |
| Submit Agency Review Draft EDR | Within 90 days of receipt of validated Pre-Remedial Design data |
| Finalize EDR | 90 days after receipt of Ecology final comments |
| Acquire project permits | Prior to start of construction |
| Remedial Action Construction | Initiate within 120 days of Ecology approval of the EDR or after permit acquisition and contractor notice to proceed |
| Submit Agency Review Draft Construction Completion Report | 180 days following construction completion |
| Submit Final Construction Completion Report | 45 days after receipt of Ecology's final comments |
| Submit Agency Review Draft LTCMP (2) | 180 days following construction completion |
| Finalize LTCMP (3) | 45 days following receipt of Ecology's final comments on LTCMP |
| Implement Final LTCMP | In accordance with schedules established in the Final LTCMP; groundwater compliance monitoring to begin no later than 1 year after construction completion |

Notes:

1 Schedule is in calendar days.
2 The LTCMP may be an appendix to the Construction Completion Report.
3 The LTCMP will be a "living" document and may be modified as deemed appropriate with Ecology concurrence.

Abbreviations:

CD Consent Decree
EDR Engineering Design Report
LTCMP Long-term compliance monitoring plan

# 7.0 References

City of Bothell. 2022. *Bothell Design and Construction Standards and Specifications, Appendix E: Contaminated Soil and Groundwater Protocol*. Public Works Department.

Floyd|Snider. 2021. *Remedial Investigation and Feasibility Study*. Prepared for City of Bothell. July.

HWA GeoSciences, Inc. (HWA). 2014a. *Interim Action Work Plan No. 2, Ultra Custom Care Cleaners Site, Bothell, Washington*. 7 November.

_____. 2014b. *Soil Cleanup Report Bothell Landing Brownfields Site, Bothell, Washington*. 8 December.

_____. 2016. *Ultra Custom Care Cleaners Site, In Situ Bioremediation, Supplemental Injections, Second Round Plan, Bothell, Washington*. 26 January.

_____. 2017a. *Remedial Investigation/Feasibility Study, Ultra Custom Care Cleaners Site, Bothell, Washington*. Prepared for City of Bothell. 5 September.

_____. 2017b. Final Remedial Investigation Report, Bothell Riverside Site, Bothell, Washington. Prepared for City of Bothell. 18 December.

_____. 2018a. *Remedial Investigation/Feasibility Study, Ultra Custom Care Cleaners Site, Bothell, Washington*. Prepared for City of Bothell. 12 April.

_____. 2018b. *Remedial Investigation/Feasibility Study Report, Bothell Landing Site, Bothell, Washington*. Prepared for City of Bothell. 24 May.

Professional Service Industries, Inc. (PSI). 1998. *Contaminated Soil and Water Removal, and Sampling and Analysis Results, Storm Sewer Installation Immediately West of Speedy Auto Glass Facility, 18206 Bothell Way NE, Bothell, Washington, PSI Project No. 578-8H004*. Letter from Jeffry S. Thompson and Gil Cobb, Professional Service Industries, Inc., to Denny Wright, City of Bothell. 4 September.

Washington State Department of Ecology (Ecology). 2013. *Agreed Order No. DE 9704*. 18 April.

_____. 2018. *Frequently Asked Questions (FAQs) Regarding Vapor Intrusion (VI) and Ecology's 2009 Draft VI Guidance. Implementation Memorandum No. 21*. Publication No. 18-09-046. November.

_____. 2021. *Draft Guidance for Evaluating Vapor Intrusion in Washington State*. Investigation and Remedial Action. Toxics Cleanup Program. Publication No. 09-09-047. Originally published October 2009. Revised February 2016 and April 2018.

_____. 2022a. *Natural Background Groundwater Arsenic Concentrations in Washington State*. Study Results. Toxics Cleanup Program. Publication No. 14-09-044. January.

_____. 2022b. *Guidance for Evaluating Vapor Intrusion in Washington State, Investigation and Remedial Action*. Toxics Cleanup Program. Publication NO. 09-09-047. March.

**Ultra Custom Care Cleaners Site**

# Cleanup Action Plan

# Tables

**FINAL**

**Table 5.1**
**Applicable Local, State, and Federal Laws for the Selected Cleanup Alternative**

| Standard, Requirement, or Limitation [(1)] | Description |
|---|---|
| **Location-Specific Requirements [(2)]** | |
| **Downtown Subarea Regulations** | |
| City of Bothell—Downtown Subarea Regulations (BMC Chapter 14.04) | Implements the requirements imposed on the City of Bothell to guide private and public investment activities and support the growth and continued revitalization of Bothell's downtown. |
| **Cultural Resources** | |
| Native American Graves Protection and Repatriation Act (25 USC 3001 through 3113; 43 CFR Part 10)<br>Washington's Indian Graves and Records Law (RCW 27.44) | These statutes prohibit the destruction or removal of Native American cultural items and require written notification of inadvertent discovery to the appropriate agencies and Native American tribe. These programs are applicable to the remedial action if cultural items are found. The activities must cease in the area of the discovery; a reasonable effort must be made to protect the items discovered; and notice must be provided. |
| Archaeological Resources Protection Act (16 USC 470aa et seq.; 43 CFR part 7) | This program sets forth requirements that are triggered when archaeological resources are discovered. These requirements only apply if archaeological items are discovered during implementation of the selected remedy. |
| National Historic Preservation Act (16 USC 470 et seq.; 36 CFR parts 60, 63, and 800) | This program sets forth a national policy of historic preservation and provides a process that must be followed to ensure that impacts of actions on archaeological, historic, and other cultural resources are protected. |
| **Action-Specific Requirements [(3)]** | |
| **Evaluate Environmental Impacts** | |
| SEPA Rules (RCW 43.21C, WAC 197-11) | Establishes the state's policy for protection and preservation of the natural environment. |
| **Construction and Maintenance of Wells** | |
| Washington Administrative Code: UIC Program (WAC 173-218) | Establishes requirements to protect groundwater by regulating the discharge of fluids from injection wells. The UIC program is administered under Title 40 CFR parts 144, 145, 146, and 147 and authorized by the SDWA. |
| Washington Administrative Code: Minimum Standards for Construction and Maintenance of Wells (WAC 173-160) | Establishes requirements for construction, abandonment, and decommissioning of monitoring wells and soil borings. |
| Washington Administrative Code: Regulation and Licensing of Well Contractors and Operators (WAC 173-162) | Establishes requirements for licensing and training well contractors and operators. |
| **Upland Disposal of Investigation-Derived Waste** | |
| Resource Conservation and Recovery Act (42 USC 6921-6949a; 40 CFR Part 268, Subtitles C and D) | Establishes requirements for the identification, handling, and disposal of hazardous and nonhazardous waste. |
| Dangerous Waste Regulations (RCW 70.105; WAC 173-303) | Establishes regulations that are the state equivalent of RCRA requirements for determining whether a waste is a state dangerous waste. This regulation also provides requirements for the management of dangerous wastes. |
| Solid Waste Disposal Act (42 USC Sec. 325103259, 6901-6991; 40 CFR 257,258)<br>Federal Land Disposal Requirements (40 CFR part 268) | Protects health and the environment and promotes conservation of valuable material and energy resources. |
| Minimum Functional Standards for Solid Waste Handling (WAC 173-304) | Sets minimum functional standards for the proper handling of all solid waste materials originating from residences, commercial, agricultural, and industrial operations as well as other sources. |
| Solid Waste Handling Standards (WAC 173-350 and WAC 173-351) | Establishes minimum standards for handling and disposal of solid waste. Solid waste includes wastes that are generated by site remediation, including contaminated soils, construction and demolition wastes, and garbage. Soils classified as "contained-in-waste" must be delivered to a solid waste landfill permitted under WAC 173-351 inside Washington State. |
| **Upland Disposal of Investigation-Derived Waste** | |
| City of Bothell—Municipal Code for Utilities and Infrastructure: Grading (BMC Chapter 18.05) | The provisions of the grading chapter (18.05) apply to grading, excavation, and earthwork construction, including fills and embankments. No grading should be performed without obtaining a permit from the City of Bothell. |

**Table 5.1**
**Applicable Local, State, and Federal Laws for the Selected Cleanup Alternative**

| Standard, Requirement, or Limitation [1] | Description |
|---|---|
| **Action-Specific Requirements [3] (cont.)** | |
| **Wastewater/Stormwater Discharge** | |
| Water Pollution Control / State Waste Discharge Permit Program / NPDES Permit Program<br>RCW 90.48; WAC 173-216, WAC 173-220 | Washington State has been delegated authority to issue NPDES permits. CWA Section 301, 302, and 303 require states to adopt water quality standards and implement a NPDES permitting process. The Washington Water Pollution Control Law and regulations address this requirement. |
| NPDES<br>(CWA Part 402) | |
| King County Industrial Waste Program | The King County Industrial Waste Program monitors discharge of liquid waste to the wastewater (sanitary sewer) system. Any discharges during construction to the wastewater system must be approved by King County prior to discharge. The King County Industrial Waste Program monitors volume and water quality of liquid waste discharged to the system. |
| **Worker Safety** | |
| Occupational Health and Safety Standards: Hazardous Waste Operations and Emergency Response/General Occupational Health Standards<br>(Health and Safety 29 CFR 1901.120; and WAC 296-62) | The HAZWOPER standard regulates health and safety operations for hazardous waste sites. The health and safety regulations describe federal requirements for health and safety training for workers at hazardous waste sites. |
| Occupational Safety and Health Act<br>(29 USC 653, 655, 657)<br>Occupational Safety and Health Standards<br>(29 CFR 1910) | Employee health and safety regulations for construction activities and general construction standards as well as regulations for fire protection, materials handling, hazardous materials, personal protective equipment, and general environmental controls. Hazardous waste site work requires employees to be trained prior to participation in site activities, medical monitoring, monitoring to protect employees from excessive exposure to hazardous substances, and decontamination of personnel and equipment. |
| Washington Industrial Safety and Health Act<br>(RCW 49.17)<br>Washington Safety Standards for Construction Work/General Occupational Health Standards<br>(WAC 296-62, WAC 296-155) | Adopts the OSHA standards that govern the conditions of employment in all workplaces. The regulations encourage efforts to reduce safety and health hazards in the workplace and set standards for safe work practices for dangerous areas such as trenches, excavations, and hazardous waste sites. |
| **Worker Safety** | |
| Federal, State, and Local Air Quality Protection Programs<br>State Implementation of Ambient Air Quality Standards<br>NWAPA Ambient and Emission Standards<br>Regional Standards for Fugitive Dust Emissions<br>Toxic Air Pollutants | Regulations promulgated under the federal Clean Air Act (42 USC 7401) and the Washington State Clean Air Act (RCW 70.94) govern the release of airborne contaminants from point and non-point sources. Local air pollution control authorities such as the PSCAA have also set forth regulations for implementing these air quality requirements. These requirements may be applicable to the Site for the purposes of dust control should the selected remedial alternatives require excavation activities. WAC 173-340-750 establishes air cleanup standards, which applies to concentrations of hazardous substances in the air originating from a remedial action at the Site. |
| **Miscellaneous** | |
| Noise Control Act of 1974/Maximum Environmental Noise Levels<br>(RCW 70.107, WAC 173-60) | Establishes maximum noise levels. |
| National Electrical Code (NFPA 70) and the Seattle Electric Code Supplement for Class 1 Division 2 Environments. | Establishes restrictions and guidelines for temporary and/or permanent electrical installations. |
| **Chemical-Specific Requirements [4]** | |
| **Groundwater Requirements** | |
| Model Toxics Control Act<br>(WAC 173-340) | Establishes Washington State administrative processes and standards to identify, investigate, and clean up facilities where hazardous substances are located. |
| Drinking Water Standards—State MCLs<br>(WAC 246-290-310) | Establishes standards for contaminant levels in drinking water for water system purveyors. |

**Table 5.1**
**Applicable Local, State, and Federal Laws for the Selected Cleanup Alternative**

| Standard, Requirement, or Limitation [1] | Description |
|---|---|
| **Chemical-Specific Requirements [4] (cont.)** | |
| **Groundwater Requirements (cont.)** | |
| National Recommended Water Quality Standards<br>40 CFR 131 | These water quality standards define the water quality goals of the water body by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. States adopt water quality standards from 40 CFR 131 to protect public health or welfare, enhance the quality of water, and serve the purposes of the CWA. Washington State water quality standards (MCLs) are presented in WAC. |
| Washington State Maximum Contaminant Levels<br>(WAC 246-290-310) | |
| **Soil Requirements** | |
| MTCA<br>(WAC 173-340) | Establishes Washington State administrative processes and standards to identify, investigate, and clean up facilities where hazardous substances are located. |
| **Air Requirements** | |
| MTCA<br>(WAC 173-340-750) | Establishes screening and cleanup levels to evaluate groundwater and soil vapor to indoor air risk for occupants of buildings |

Notes:

1 Projects conducted under a consent decree are exempt from the procedural requirements of most state and local permits (RCW 70.105D.090); however, the remedial actions must still comply with the substantive requirements of the exempt permits. Therefore, for exempt permits, the statutory review timelines do not apply; actual timelines will be based on negotiations with the jurisdiction or agency, which should result in an expedited review timeline.

2 Location-specific requirements are applicable to the specific area where the Site is located and can restrict the performance of activities, including cleanup actions, solely because they occur in specific locations.

3 Action-specific requirements are applicable to certain types of activities that occur or technologies that are used during the implementation of cleanup actions.

4 Chemical-specific requirements are applicable to the types of contaminants present at the Site. The cleanup of contaminated media at the Site must meet the CULs developed under MTCA; these CULs are considered chemical-specific requirements.

Abbreviations:

BMC Bothell Municipal Code
CFR Code of Federal Regulations
CWA Clean Water Act
HAZWOPER Health and Safety for Hazardous Waste Operations and Emergency Management
MCL Maximum Contaminant Level
MTCA Model Toxics Control Act
NFPA National Fire Protection Association
NPDES National Pollutant Discharge Elimination System
NWAPA Northwest Air Pollution Authority
OSHA Occupational Safety and Health Act
PSCAA Puget Sound Clean Air Authority
RCRA Resource Conservation and Recovery Act
RCW Revised Code of Washington
SDWA Safe Drinking Water Act
SEPA State Environmental Policy Act
Site Ultra Custom Care Cleaners Site
UIC Underground Injection Control
USC United States Code
WAC Washington Administrative Code

**Ultra Custom Care Cleaners Site**

# Cleanup Action Plan

# Figures

**FINAL**


Note:
· Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

0 1,500 3,000 6,000
Scale in Feet
N

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**Cleanup Action Plan**
**Ultra Custom Care Cleaners Site**
**Bothell, Washington**

Figure 1.1
Vicinity Map

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12/8/2022

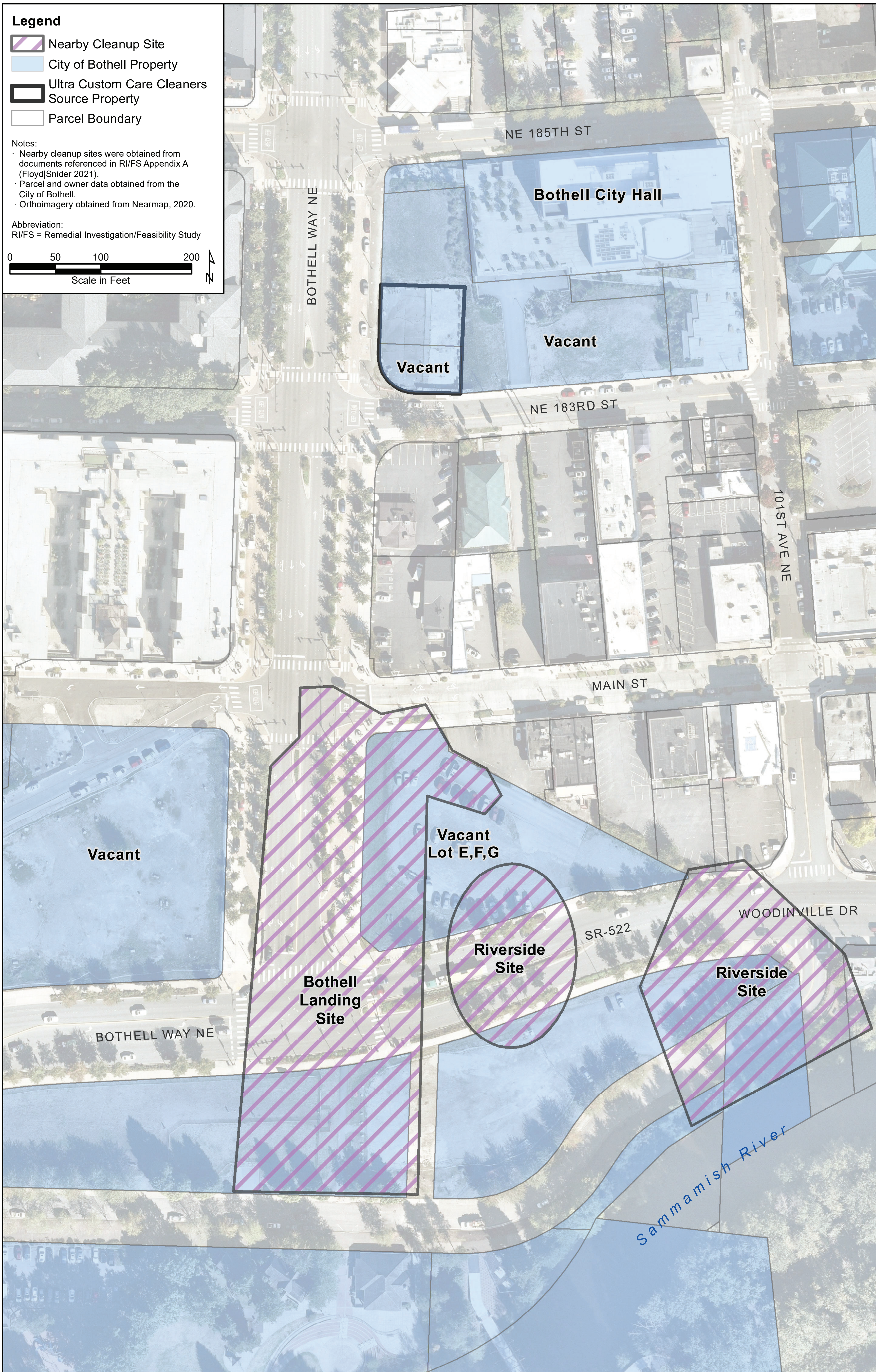


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Figure 1.2
Source Property and Adjacent Sites

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12/8/2022

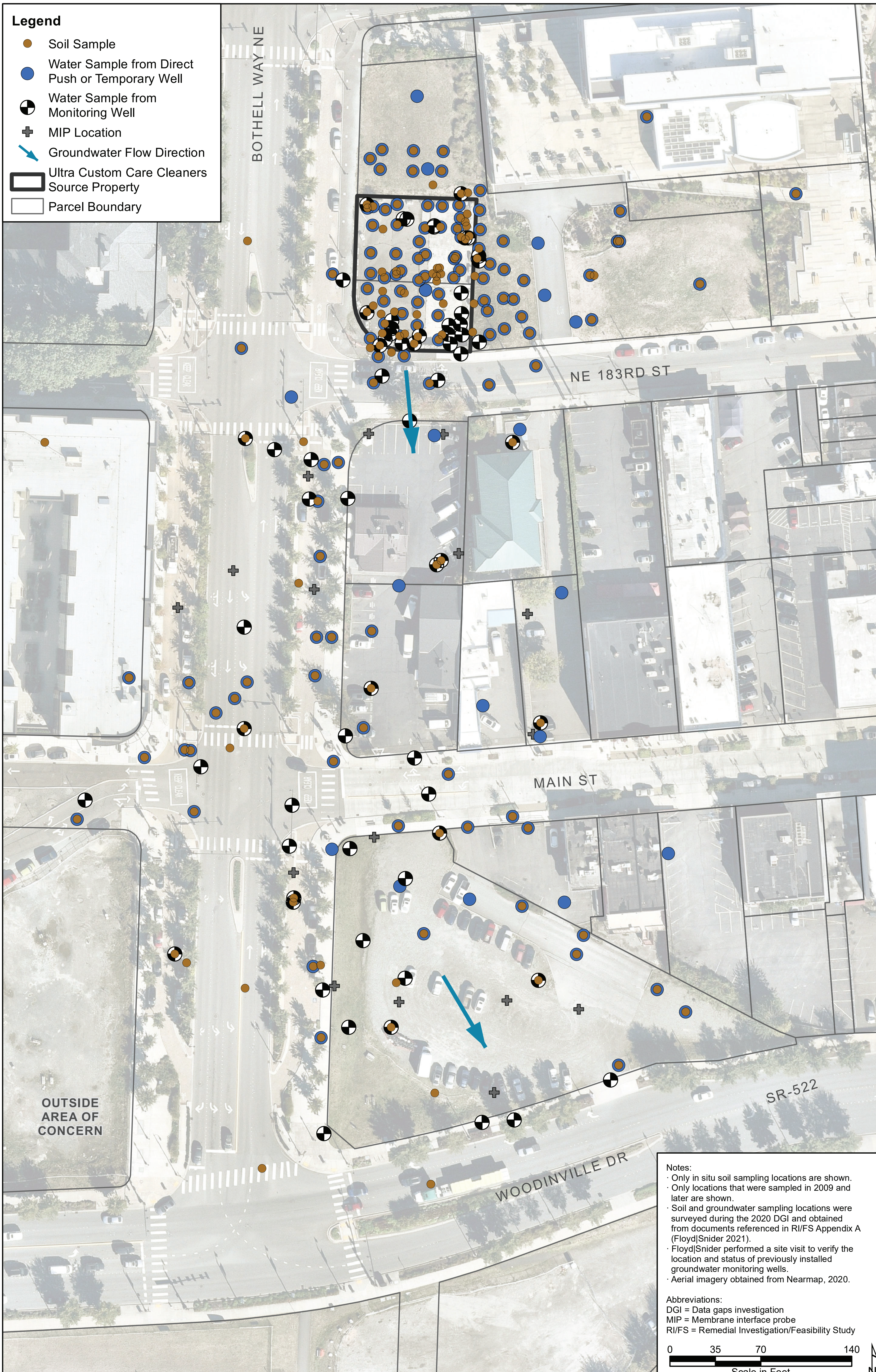


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Figure 2.1
Sampling Locations

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12/8/2022

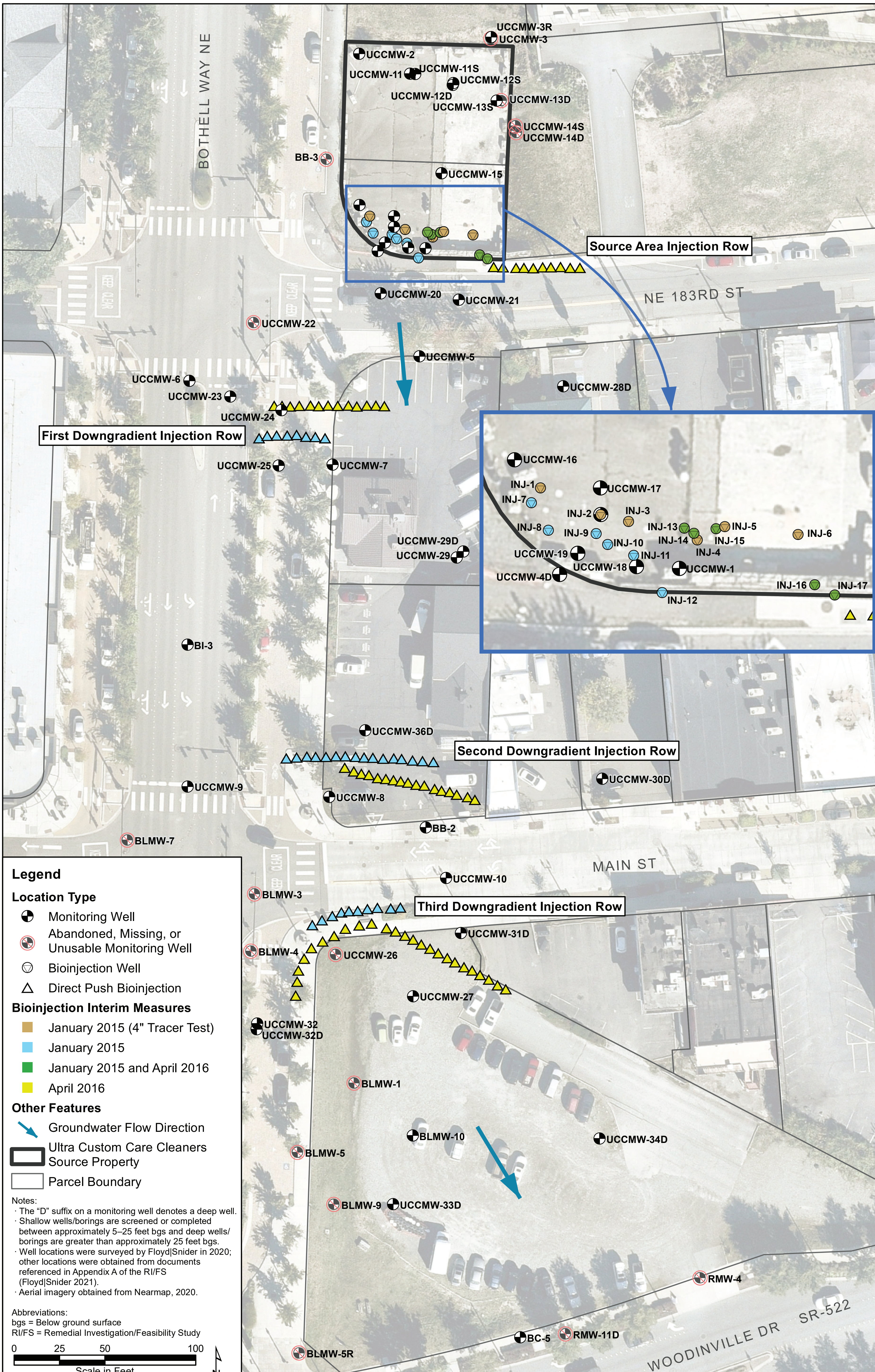


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Figure 2.2
Bioinjection Interim Measures

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12/8/2022

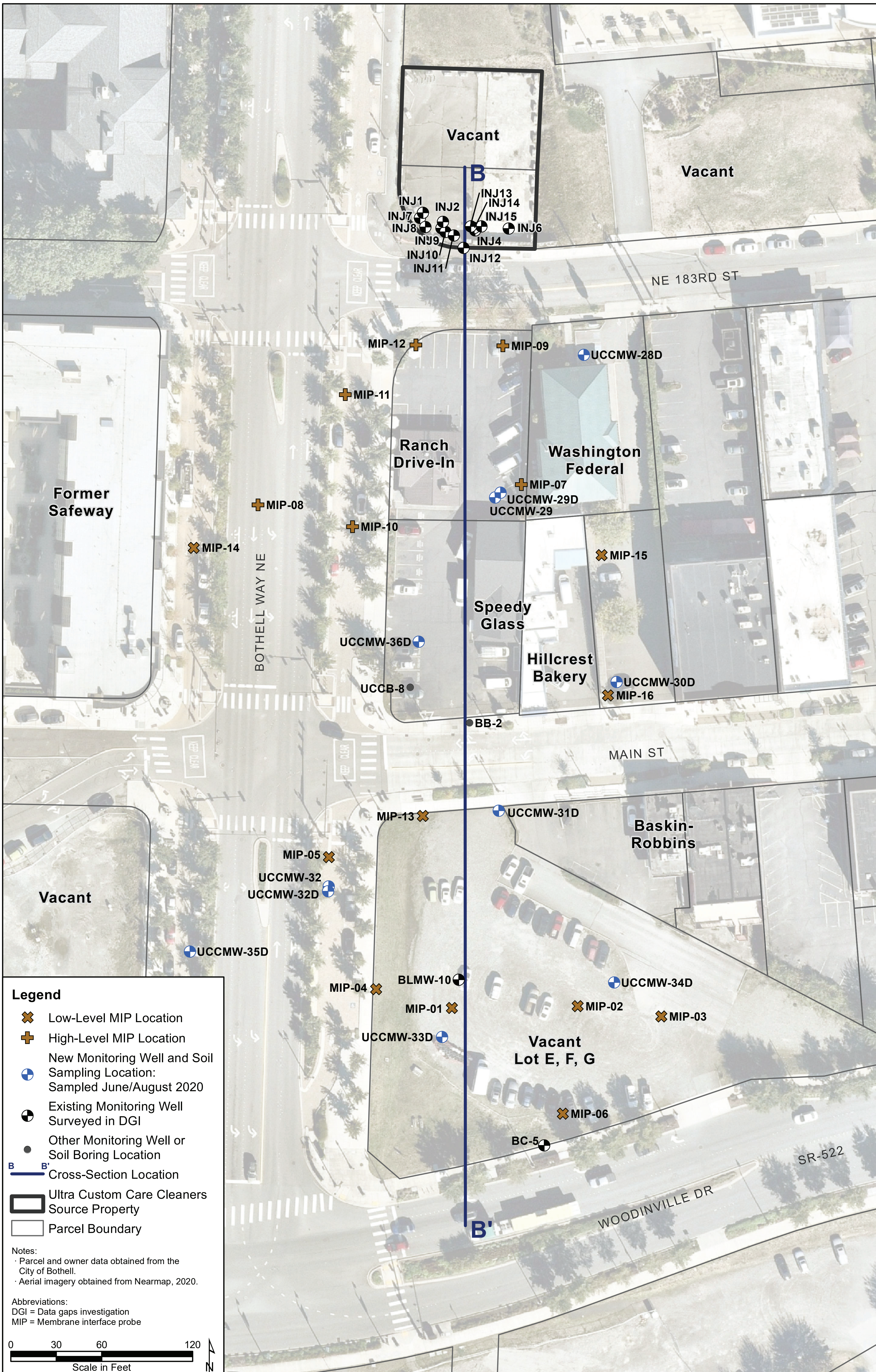


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Figure 2.3
Location of Conceptual Site Model Cross-Section Line

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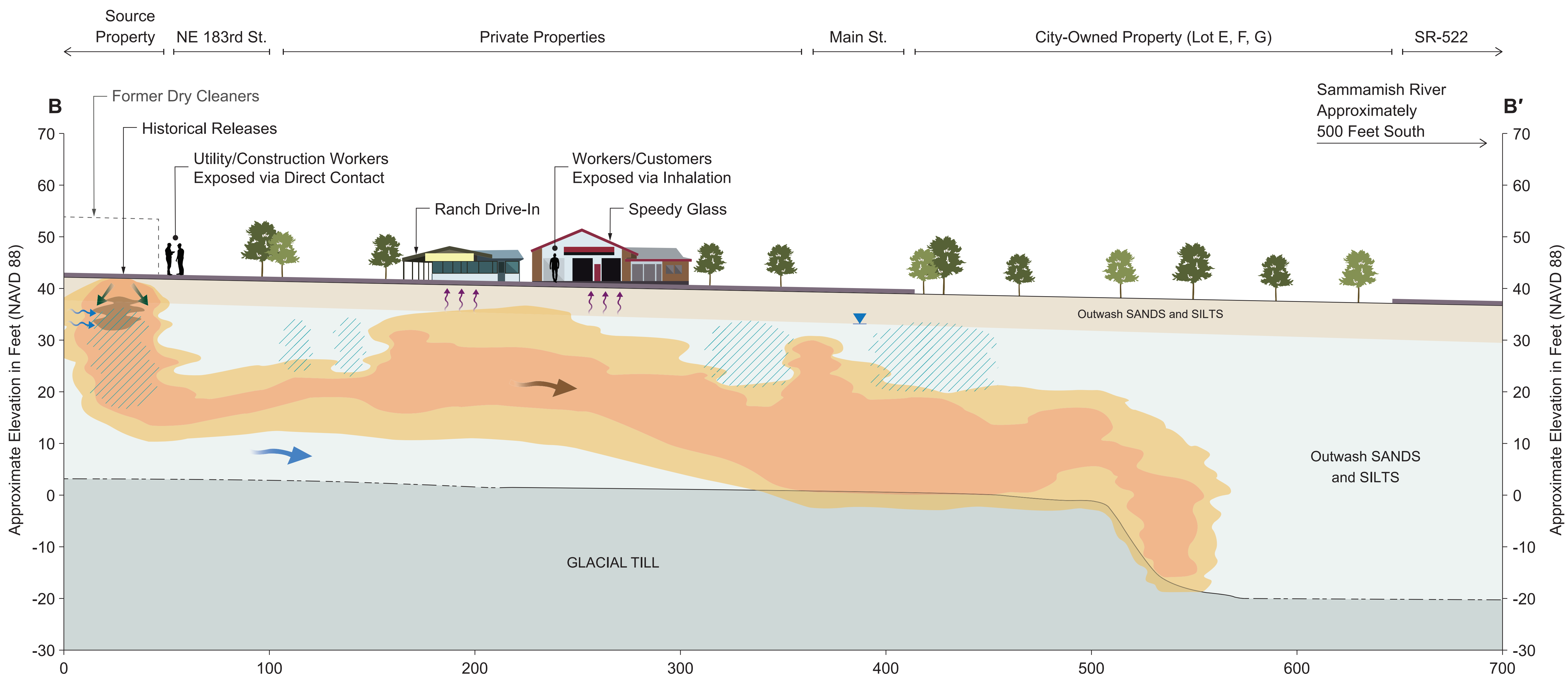
12/8/2022




**Legend**

- Pavement
- Contact Boundary Between Lithologies (dashed where inferred)
- Groundwater Level
- Groundwater Flow Direction (approximate)
- Plume Migration
- Downward Migration through Vadose Zone
- Injections
- Soil Contamination
- cVOCs in Groundwater (approximate) >2x CUL
- cVOCs in Groundwater (approximate) >1–2x CUL
- Leaching to Groundwater
- Vapor Intrusion

Abbreviations:
CUL = Cleanup level
cVOC = Chlorinated volatile organic compound
NAVD 88 = North American Vertical Datum of 1988

Horizontal Scale in Feet: 0, 50, 100
Vertical Scale in Feet: 0, 20, 40

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Figure 2.4
Conceptual Site Model Cross-Section

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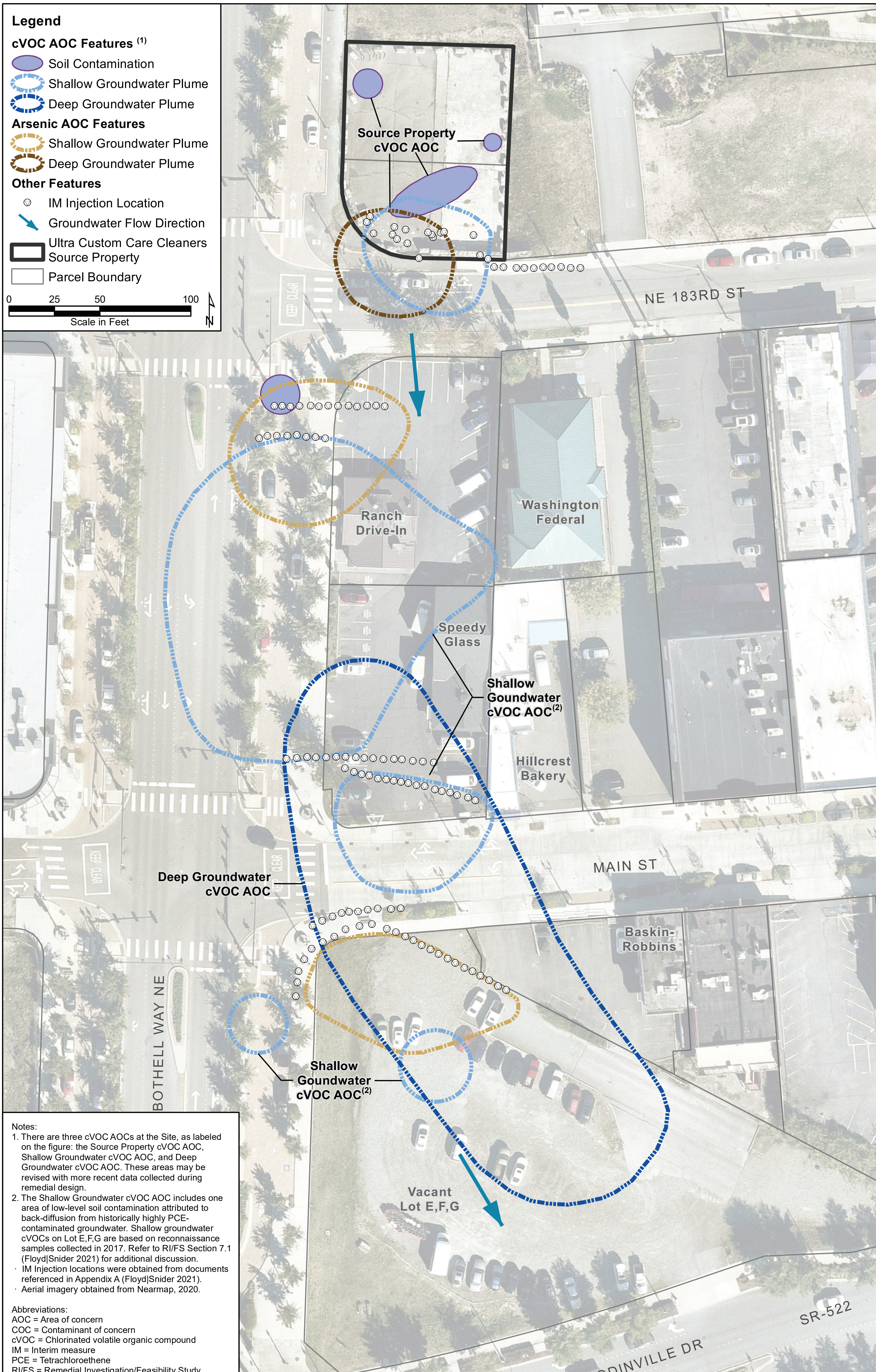
6/15/2022




Notes:

1. There are three cVOC AOCs at the Site, as labeled on the figure: the Source Property cVOC AOC, Shallow Groundwater cVOC AOC, and Deep Groundwater cVOC AOC. These areas may be revised with more recent data collected during remedial design.
2. The Shallow Groundwater cVOC AOC includes one area of low-level soil contamination attributed to back-diffusion from historically highly PCE-contaminated groundwater. Shallow groundwater cVOCs on Lot E,F,G are based on reconnaissance samples collected in 2017. Refer to RI/FS Section 7.1 (Floyd|Snider 2021) for additional discussion.

- IM Injection locations were obtained from documents referenced in Appendix A (Floyd|Snider 2021).
- Aerial imagery obtained from Nearmap, 2020.

Abbreviations:
AOC = Area of concern
COC = Contaminant of concern
cVOC = Chlorinated volatile organic compound
IM = Interim measure
PCE = Tetrachloroethene
RI/FS = Remedial Investigation/Feasibility Study

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Figure 2.5
Summary of Areas of Concern and COCs

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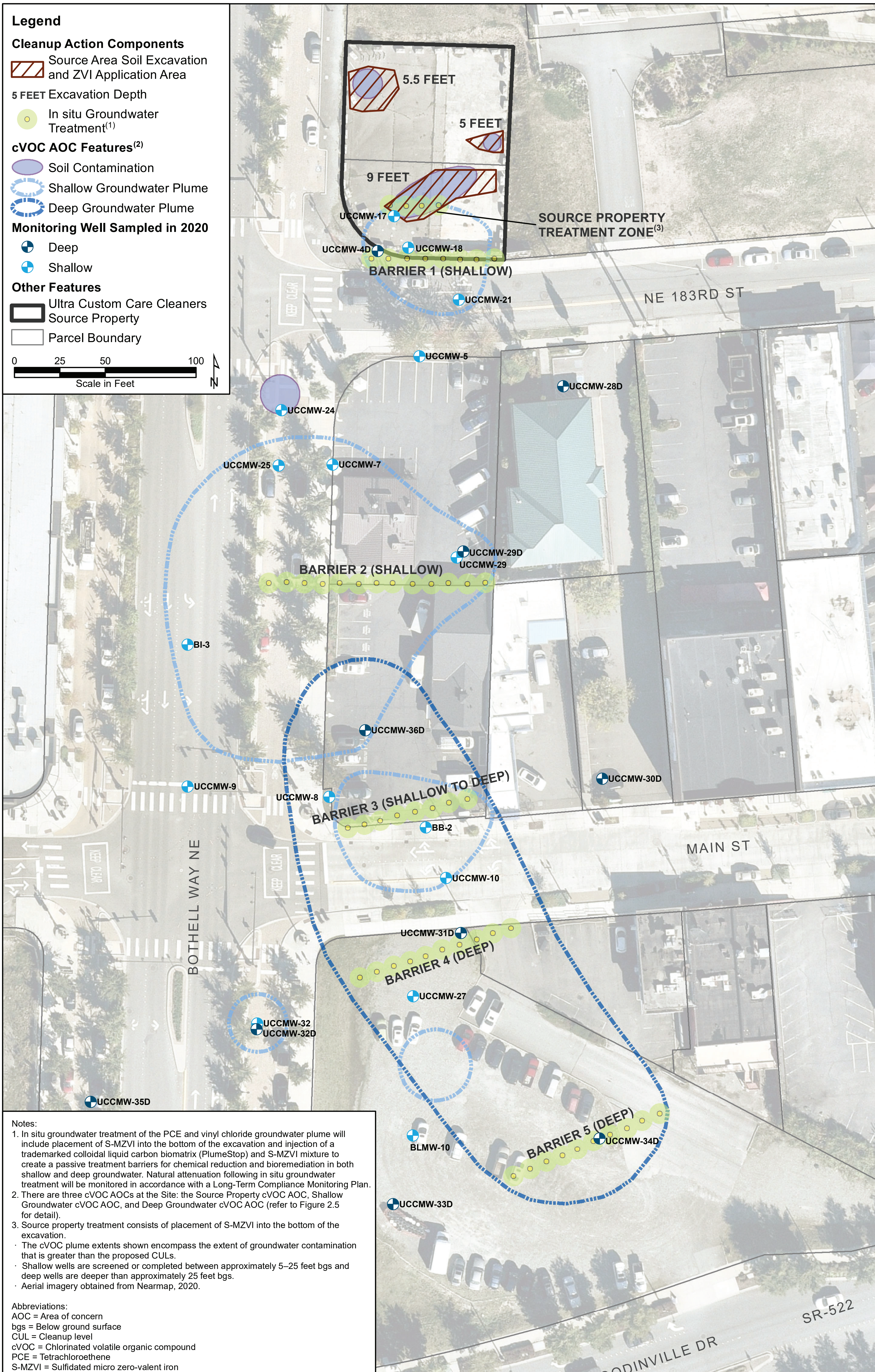
12/8/2022




Notes:

1. In situ groundwater treatment of the PCE and vinyl chloride groundwater plume will include placement of S-MZVI into the bottom of the excavation and injection of a trademarked colloidal liquid carbon biomatrix (PlumeStop) and S-MZVI mixture to create a passive treatment barriers for chemical reduction and bioremediation in both shallow and deep groundwater. Natural attenuation following in situ groundwater treatment will be monitored in accordance with a Long-Term Compliance Monitoring Plan.
2. There are three cVOC AOCs at the Site: the Source Property cVOC AOC, Shallow Groundwater cVOC AOC, and Deep Groundwater cVOC AOC (refer to Figure 2.5 for detail).
3. Source property treatment consists of placement of S-MZVI into the bottom of the excavation.

- The cVOC plume extents shown encompass the extent of groundwater contamination that is greater than the proposed CULs.
- Shallow wells are screened or completed between approximately 5–25 feet bgs and deep wells are deeper than approximately 25 feet bgs.
- Aerial imagery obtained from Nearmap, 2020.

Abbreviations:
AOC = Area of concern
bgs = Below ground surface
CUL = Cleanup level
cVOC = Chlorinated volatile organic compound
PCE = Tetrachloroethene
S-MZVI = Sulfidated micro zero-valent iron
ZVI = Zero-valent iron

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Figure 5.1
Cleanup Action Components

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