DRAFT CLEANUP ACTION PLAN
ULTRA CUSTOM CARE CLEANERS SITE
BOTHELL, WASHINGTON

City of Bothell

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Toxics Cleanup Program
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Table of Contents

LIST OF TABLES

LIST OF FIGURES (FOLLOWING TEXT)

DRAFT CLEANUP ACTION PLAN
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1 INTRODUCTION

1.1 PURPOSE

This document is the draft Cleanup Action Plan (dCAP) for the Ultra Custom Care Cleaners Site (Site) located in Bothell, Washington. The general location of the Site is shown in Figures 1 and 2. A CAP is required as part of the site cleanup process under Chapter 173-340 WAC, Model Toxics Control Act (MTCA) Cleanup Regulations. The purpose of the CAP is to identify the proposed cleanup action for the Site and to provide an explanatory document for public review. More specifically, this plan:

- Describes the Site
- Summarizes current site conditions;
- Summarizes the cleanup action alternatives considered in the remedy selection process;
- Describes the selected cleanup action for the Site and the rational for selecting this alternative;
- Identifies site-specific cleanup levels and points of compliance for each hazardous substance and medium of concern for the proposed cleanup action;
- Identifies applicable state and federal laws for the proposed cleanup action;
- Identifies residual contamination remaining on the Site after cleanup and restrictions on future uses and activities at the Site to ensure continued protection of human health and the environment;
- Discusses compliance monitoring requirements; and
- Presents the schedule for implementing the CAP.

Ecology has made a preliminary determination that a cleanup conducted in conformance with this CAP will comply with the requirements for selection of a remedy under WAC 173-340-360.

1.2 PREVIOUS STUDIES

Previous studies at the Site include the following:

CDM, 2009. *Draft Phase II Environmental Site Assessment, City of Bothell Crossroads Redevelopment Project, Bothell, Washington*, May 2009

CDM, 2011. *Supplemental Phase II Environmental Site Assessment, Former Raincheck Cleaners – Offsite Area, 18304 Bothell Way NE, Bothell, Washington,* April 17, 2011.

CDM Smith, 2013. *City of Bothell Crossroads Redevelopment Project, SR 527 and SR 522 Bothell, Washington*, draft letter report dated May 30, 2013.

Environmental Associates, Inc., 2016. *Limited Subsurface Sampling and Testing, Lot 6 & Proposed Lot 8, Northeast Corner of Bothell Way at Northeast 183rd Street, Bothell, Washington,* preeared for 360 Hotel Group, June 2, 2016.

EHS International, 2001a. *Phase I Environmental Site Assessment*, June 12, 2001 report to Bothell Police Department.

EHS International, 2001b. *Phase II Environmental Site Assessment and Limited hazardous Materials Survey*, August 15, 2001 report to Bothell Police Department.

Environmental Partners Inc., 2004. *Chlorinated VOC Nature and Extent Investigation Letter Report, Case Property 18300-18304 Bothell Way NE, Bothell, WA.* EPI Project No. 46101.0, November 30, 2004.

Farallon Consulting, 2002. *Subsurface Investigation Report, Ultra Custom Care Cleaners Property 18300 – 18304 Bothell Way Northeast, Bothell, Washington, Farallon PN: 733-001,* April 19, 2002.

Farallon Consulting, 2016. *Limited Groundwater Investigation Report, 10005 And 10011 Main Street Bothell, Washington*, August 18, 2016

HWA, 2011b. *New City Hall Soil & Ground Water Sampling, Bothell, Washington*, October 21, 2011.

HWA, 2011c. *Case Property Inspection and Sampling, Bothell, Washington*, November 29, 2011.

HWA, 2012. *Bothell Way NE, Drainage Improvements, Soil & Ground Water Sampling, Bothell, Washington*, January 9, 2012.

HWA, 2014a. *Source Area Interim Action Work Plan Ultra Custom Care Cleaners Site Bothell, Washington,* April 28, 2014.

HWA, 2014b. *Ground Water Modeling- New City Hall Building, Bothell, Washington,* July 14, 2014.

HWA, 2014c. *Interim Action Work Plan No. 2 Ultra Custom Care Cleaners Site Bothell, Washington*, November 7, 2014.

HWA, 2015a. *Ultra Custom Care Second Interim Action Cleanup Design Revision and Status Report*, February 7, 2015

HWA, 2015b. *Ultra Custom Care Cleaners Soil and Groundwater Investigation Bothell, WA,* August 20, 2015.

HWA, 2016. *UST Site Assessment Report Ultra Custom Care Cleaners Site 18125 Bothell Way NE Bothell, Washington*, January 4, 2016.

HWA, 2016b. *In Situ Bioremediation, Supplemental Injections, Second Round Plan Bothell, WA.* January 26, 2016

HWA, 2017. *Further Delineation of Site Boundary for Ultra and Riverside HVOC Sites Reconnaissance Ground Water Sampling Letter Report, Bothell, WA,* May 12, 2017.

HWA, 2018. *Reconnaissance Ground Water Sampling Letter Report. Ultra Custom Care Cleaners Hotel Parcel Explorations, Bothell, WA*, February 22, 2018.

HWA, 2015 – 2017. *Multiple Quarterly Ground Water Monitoring Reports*, 2/9/15 to 4/14/17

Parametrix, 2010. *Draft City Hall Site Environmental Site Assessment*. Prepared for City of Bothell. May 2010.

Terra Associates, Inc., 2011. *Geotechnical Report, Bothell City Hall, 18305 -101st Avenue NE Bothell, Washington,* Project No. T -6542, Prepared for City Investors Development, LLC, Seattle, Washington, July 15, 2011.

1.3 REGULATORY FRAMEWORK

The dCAP is being conducted under Agreed Order DE 9704, dated April 18, 2013, between the City of Bothell (City) and the Washington State Department of Ecology (Ecology) to address soil and ground water contamination related to historical releases of hazardous substances at the Site. Requirements under the Agreed Order include performance of a remedial investigation/feasibility study (RI/FS) and development of a dCAP.

There are no other local, state or federal regulatory actions at the site.

2 SITE DESCRIPTION

2.1 SITE HISTORY

Details of historic property use and the several site assessments performed to date at the Site can be found in the RI. The following is a summary of those assessments, some of which were carried out before the property became a formal MTCA site.

The Site as listed in Ecology's database is Ultra Custom Care Cleaners, which is located at and around 18304 Bothell Way NE (also known as the Bothell-Everett Highway), Bothell, WA 98011, at the northeast corner of the intersection of Bothell Way NE and NE 183rd Street (Figure 2). The City currently owns the property from which the contamination likely originated; this property is referred to herein as the former Case property (after the former owners). Contamination has migrated off the former Case property, as described below.

The 0.25 acre rectangular former Case property included a former, single story commercial building which most recently housed, from north to south, the Ultra Custom Cleaners dry cleaning facility, Frank's Hair Design hair salon, and the Laundry Basket Laundromat. The building was demolished in June 2013.

Historically, two dry cleaners operated on this property. Raincheck Cleaners and Laundry occupied a building from the 1950s through 1967 at the southwest corner of the parcel. That building was demolished in 1967, and a new building was constructed and occupied by NuLife Cleaner, apparently followed by Ultra Custom Cleaners, which was located at the northeast corner of the parcel. Former dry cleaning operations released halogenated volatile organic compounds (HVOCs) to the soil and ground water at the Site/Case property which migrated to downgradient public rights-of way (ROWs) and public and private properties. Figure 2 shows properties and other listed sites in the vicinity. Figure 3 shows the extent of the Site which is defined by the extent of chlorinated solvent contamination in soil and ground water.

Previous owners of the Case property, as identified in tax assessor records available online include, but are not limited to, Robert L. and Edna E. Case (prior to 1996), Harold H. and Mercedees (sic) H. Fricke (prior to 1994), Neil A. and Nancy L. McGee (1996), and City of Bothell (1996 to 2017). No contact information for previous owners was available in the online King County tax assessor records. The City of Bothell (contact information provided above) acquired the Site in 2012.

2.2 HUMAN HEALTH AND ENVIRONMENTAL CONCERNS

2.2.1 Conceptual Site Model

The conceptual model for the Site identifies the primary contaminant sources, release mechanisms, transport mechanisms, secondary contaminant sources, potential pathways, and exposure routes. Existing chemical data, site characterization data, and identification of potential human and ecological receptors were used to develop the model are shown on Figure 4.

2.2.2 Primary Sources of Contamination and Primary Release Mechanisms

The primary contaminant source at the Ultra Custom Care Cleaners Site is the dry cleaner solvent release from the former Raincheck Cleaners and Laundry facility. The primary contaminant associated with this release is PCE, with associated breakdown products TCE, cis-1,2-DCE, and vinyl chloride

The primary potential release mechanisms for contaminants associated with the former dry cleaners include leaks from equipment, or discharges (accidental or intentional) to floor drains, storm drains, or ground.

2.2.3 Secondary Sources and Release Mechanisms

When a released contaminant is retained in an environmental medium, such as soil, the medium functions as a secondary source for further chemical release. Secondary release mechanisms for contaminants potentially present at the Site include the following:

- Contaminant leaching from soils above and below the water table
- Leaching from separate phase liquids, e.g., a DNAPL mass of PCE within soil pore spaces, although no evidence of DNAPL has been found at the Site
- Volatilization from the vadose zone and water table

The degree of contaminant leaching is controlled by chemical properties of the contaminants, ground water chemical properties, physical properties of the soil, characteristics of the ground water flow system, and precipitation recharge. Volatilization is controlled by the concentration and chemical properties of the contaminants, physical properties of the soil, and soil gas characteristics.

2.2.4 Pathways and Potential Receptors

Potential exposure routes for human and ecological receptors include the following:

- *Dermal/Direct Contact*. Dermal contact with soil on Site is a potential intake mechanism for current and future on-site workers, future residents, and future visitors. Vertebrate wildlife tend to have thick fur coats or feathers which serve as barriers to chemicals that

they contact in the soil. However, such wildlife spend time grooming, and this leads to an increase in the potential for incidental soil ingestion as noted below. Plants and burrowing or ground-dwelling invertebrates (e.g., earthworms) are exposed directly to the soil.

- *Inhalation*. Suspended particulates from soil can be transported by air and inhaled by potential on-site and off-site receptors. Emissions of volatile chemicals from soil and ground water (human receptors only) may also be transported as vapors by air, but are considered to be pathways of secondary concern because, in ambient conditions, such vapors are rapidly diluted and degraded.
- *Ingestion*. Accidental ingestion of chemicals in Site soil and ground water are primary intake mechanisms for human receptors. Ingestion of chemicals in Site soil is a primary intake mechanism for ecological receptors. The following section describes specific exposure pathways of primary concern.

Potentially complete exposure pathways are:

- Current/future indoor worker:
  – Inhalation of vapors from the subsurface (ground water and soil) in indoor air
  – Dust inhalation
- Current/future construction/utility worker:
  – Incidental soil, surface water, and ground water ingestion and dermal contact
  – Inhalation of vapors from the subsurface soil in indoor or outdoor air
  – Dust inhalation
  – Inhalation of vapors from or dermal contact with ground water in a trench or excavation
- Current/future Site visitor (adult and child):
  – Inhalation of vapors from the subsurface (ground water and soil) in indoor or outdoor air

2.3 CLEANUP STANDARDS

2.3.1 Contaminants of concern

Based on information and data from The RI and previous studies, contaminants of concern (COCs) identified in soils and/or ground water at the Ultra Custom Care Cleaners Site include:

Soil:

- Chlorinated solvents (mostly PCE) in soil at the former Case property, Bothell Way NE roadway, and to a much lesser extent, some TCE, DCE, and vinyl chloride in other downgradient areas extending to the Bothell Landing site.

Ground Water:

- Chlorinated solvents (PCE, TCE, DCE, and vinyl chloride) at the Site (former Case property, Bothell Way NE roadway, and other downgradient areas).

2.3.2 Cleanup Levels

Cleanup levels for COCs that need to be addressed by the cleanup in affected media at the site (soil and ground water) are presented in Section 4.3.

3 CLEANUP ACTION ALTERNATIVES AND ANALYSIS

3.1 CLEANUP ACTION ALTERNATIVES

The initial technologies screened for the Site include:

- Source Control
  - Excavation and removal
  - Electrical resistive heating
- In situ ground water treatment
  - Chemical oxidation
  - Chemical reduction
  - Air sparging
  - Soil vapor extraction
  - In situ enhanced bioremediation
  - Bioremediation with Ground Water Recirculation
- Pump and treat
- Permeable reactive barriers
  - Zero valent iron
  - Funnel and gate with zero valent iron
- Monitored Natural attenuation
- Engineering controls
- Institutional controls

3.2 INITIAL SCREENING OF ALTERNATIVES

Cleanup alternatives considered for the Site were:

- Excavation and removal of soil, in situ bioremediation, monitored natural attenuation, engineering and institutional controls
- Permeable reactive barrier/ZVI, monitored natural attenuation, engineering and institutional controls
- In situ enhanced bioremediation, engineering controls, and institutional controls

3.3 DETAILED EVALUATION OF ALTERNATIVES

The preferred alternative was in situ enhanced bioremediation and institutional controls, and was recommended in accordance with remedy selection requirements under MTCA, and meets all threshold and other requirements specified in WAC 173-340-360.

The selected alternative was evaluated for compliance with the following, as detailed in the RI/FS:

- The minimum requirements in WAC 173-340-360(2)(a)&(b)
  - Protection of human health and the environment
  - Compliance with cleanup standards
  - Compliance with applicable or relevant and appropriate requirements (ARARs)
  - Provide for compliance monitoring
  - Use of permanent solutions to the maximum extent practicable (see also WAC 173-340-360(3))
  - Provide for a reasonable restoration timeframe (see also WAC 173-340-360(4))
  - Consideration of public concerns
- WAC 173-340-360(2)(c) Requirements for groundwater cleanup actions
- WAC 173-340-360(2)(e) Requirements for institutional controls (see also WAC 173-340-440)

4 DESCRIPTION OF SELECTED REMEDY

4.1 SITE DESCRIPTION

The source property consists of the addresses 18304 Bothell Way NE, Bothell, King County, Washington 98011, located at 47.59442 degrees north and -122.20723 degrees west in the northeast quarter of Section 7 of Township 26 north, Range 5 east. The King County Assessor's Office lists the parcel numbers of the property as 072605-9003 and a portion of parcel number 072605-9191.

The source property totals approximately 0.25 acres in size and includes a vacant lot that was previously occupied by a former single story commercial building which most recently housed, the Ultra Custom Cleaners dry cleaning facility and other retail establishments. The building was demolished in June 2013. Historically, two dry cleaners operated on this property. Raincheck Cleaners and Laundry occupied a building from the 1950s through 1967 at the southwest corner of the parcel. That building was demolished in 1967, and a new building was constructed and occupied by NuLife Cleaner, apparently followed by Ultra Custom Cleaners, which was located at the northeast corner of the parcel.

The properties to the north and east of the source property consist of the City of Bothell visitor center, City Hall, municipal offices, and associated grassy areas. To the west of the source property, across Bothell Way NE, is a recently constructed apartment building. South of the source property, across NE 183rd Street are commercial properties occupied by Ranch Drive-In and Washington Federal (bank). The Sammamish River is located approximately 1,145 feet south of the source property. General location of the property is shown on Figure 1. Figure 2 shows the source property, other listed sites in the vicinity and the location of the Sammamish River relative to the source property.

Per Washington's Model Toxic Control Act (MTCA), a "Site" is defined by "*the nature and extent of contamination associated with one or more releases of hazardous substances prior to any cleanup of the contamination. A Site is NOT defined by the property or parcel boundary*." Site boundaries are established through the RI process. The Site as defined by MTCA therefore consists of source property and any off-property areas that are impacted.

Figure 3 shows the approximate extent of the Site as defined by historic release areas and extent of contaminants of concern (COCs) at concentrations greater than MTCA cleanup levels. The contaminated soils and ground water originating from the source property are known to exist beneath the Site itself and extend south and east onto the adjacent and inferred downgradient city right-of-way (ROW) properties and nearby privately owned properties.

4.2 DESCRIPTION OF THE CLEANUP ACTION

Based on the results of the remedial investigation and feasibility study conducted under MTCA and the application of the selection of remedy criteria, the preferred cleanup alternatives for contaminated soil and ground water at the Site (developed in accordance with WAC 173-340-350 through 173-340-390) includes:

- In-situ bioremediation (two rounds already conducted as interim actions, with one or more additional rounds planned)
- Engineering controls
- Institutional controls

4.2.1 In-situ bioremediation

In situ bioremediation processes treat soil and groundwater using microorganisms to degrade organic contaminants. The microorganisms break down contaminants by using them as an energy source or cometabolizing them with an energy source. The primary COCs at the Site (PCE, TCE, DCE, and VC) respond most favorably to anaerobic bioremediation. To stimulate and enhance microbial activity, microorganisms (bioaugmentation) or amendments (biostimulation), such as organic substrates, other electron donors/acceptors, nutrients, or other compounds that affect treatment can be added. Biostimulation can be used where the bacteria necessary to degrade the contaminants are present but conditions do not favor their growth (e.g., anaerobic bacteria in an aerobic aquifer, aerobic bacteria in an anaerobic aquifer, lack of appropriate nutrients or electron donors/acceptors). Bioaugumentation can be used when the bacteria necessary to degrade the contaminants do not occur naturally at a site or occur at too low of a population to be effective.

Bioremediation of a chlorinated solvent like PCE at the Site involves addition of an energy source (electron donor, in this case emulsified vegetable oil) and/or addition of a microbial culture. This process requires that ground water must be very anaerobic and an electron donor be available for the microorganisms to carry out the process. Addition of electron donor helps make ground water anaerobic if it is not already. Most of the HVOC plume area is anaerobic from past bioremediation injections.

The process also requires the presence of certain specific types of bacteria to carry it to completion. Specifically, it requires bacteria (Dehalococcoides or Dhc) that convert vinyl chloride to the harmless end product ethene. These bacteria are often not present at all or not present in sufficient numbers, especially in shallow aquifers that are not anaerobic.

At this site bioremediation has been and will continue to be implemented in the form of injected biobarriers, at several locations along the plume length. The location of infrastructure, utilities and monitoring wells can impact the locations.

The most useful donor for installing biobarriers is emulsified vegetable oil. Emulsified oil essentially behaves like a dilute milk solution during injection, allowing the normally immiscible oil to be transported with water. Because of this behavior, implementation is possible via either wells or direct push injection, and coverage can be very complete. Within two months after injection, the emulsion "breaks" due to bacterial action, and the oil droplets adhere to the soil particles, leaving a barrier of electron donor in place. The oil droplets then dissolve slowly into ground water at a rate that is compatible with maintaining anaerobic conditions and supplying electrons to the microorganisms.

Cleanup Design – The in situ bioremediation methods would be similar to the interim actions already completed, with the following preliminary target areas for new biobarriers:

- Source area –additional injection at six existing injection wells
- Downgradient part of plume (upgradient of prior second injection row) intermediate and deep zones
- Additional areas as determined based on monitoring closer in time to the planned cleanup action (e.g., area around well BB-2)

Figure 5 shows the location of past treatment areas (biobarriers) completed as interim actions, and planned future biobarriers. Shallow target zones will be around 8-20 feet bgs, intermediate at 20-35 feet bgs, and deep zones around 35-45 feet bgs. Figure 5 shows the location of past treatment areas (biobarriers) completed as interim actions, and planned future biobarriers. Because much time will have elapsed after the last round of injections and the next planned round, final selection of new biobarriers or treatment areas (locations and depths) will be made after an additional round of new "baseline" ground water monitoring is conducted prior to further cleanup actions.

Injection protocol for each location will include the following elements:

- Mix hydrant water with granular zero-valent iron (ZVI) for approximately 24 hours to remove chlorine and create anoxic water (Oxidation/reduction potential [ORP] < - 100 mV, dissolved oxygen [DO] < 0.5 mg/L) in a tank large enough for the next day's injection volume.
- Inject small volume of anaerobic water (50 -100 gals) with oil
- Inject bioaugmentation culture
- Inject emulsified oil with micro ZVI in anaerobic water
- Short Water flush, no donor

The first step must be repeated each day when there will be an injection the following day. The final two steps will be repeated each day until the desired volume is achieved. The water flush after each injection is to minimize fouling of the well screen, sand pack and nearby formation.

Injection quantities will be determined based on past injection and tracer testing to measure and estimate injection flow rates, pressures, reagent travel times and distances, etc.

Contingency plan

Efficacy of the bioremediation injections ("cleanup") will be evaluated after performance monitoring at the end of the first 2.5 years (10 quarters) following the new round of bioremediation cleanup actions that will implemented per the dCAP. If any areas are not responding to treatment (HVOCs not degrading and/or bioremediation indicator analytes show unfavorable subsurface conditions), a contingency plan for additional bioremediation injections may be recommended.

4.2.2 Ground Water Monitoring

Performance monitoring following the in-situ bioremediation will include sampling and analysis of ground water at existing and new monitoring wells for HVOCs and bioremediation indicator parameters. Two new shallow monitoring wells will be installed at the upgradient end of the plume; and new shallow, intermediate and deep zone monitoring wells will be installed at the downgradient end of the plume (see Figure 14). Existing shallow wells UCCMW-26 and UCCMW-27 will be decommissioned when development occurs in those areas.

Efficacy of the cleanup will be evaluated via existing and new monitoring wells at quarterly and semi-annual monitoring events. Existing and proposed new wells to be monitored are shown on Figure 5, and include:

Quarterly	Semiannually*
SHALLOW	
MW-1	BI-3
UCCMW-7	BB-3
UCCMW-8	UCCMW-5
UCCMW-10	UCCMW-16
UCCMW-17	UCCMW-18
UCCMW-19	UCCMW-24
UCCMW-20	UCCMW-32****
UCCMW-21	UCCMW-33****
UCCMW-25	
BB-2	
INJ-2 (injection well)	
UCCMW-26	
UCCMW-27	
**UCCMW-28 S	
**UCCMW-29 S	
INTERMEDIATE	
***UCCMW-28 I	

***UCCMW-29 I	
***UCCMW-30 I	
***UCCMW-31 I	
DEEP	
***UCCMW-28 D	UCCMW-4
***UCCMW-29 D	
***UCCMW-30 D	
***UCCMW-31 D	

* In addition to listed quarterly wells. Semiannual wells may be monitored more frequently as needed.

**New shallow monitoring wells to be installed to replace UCCMW-26 and UCCMW-27 which will be decommissioned prior to new construction in those locations.

*** New intermediate and deep wells

**** New shallow wells

If a well is below cleanup level for a sufficient period of time (> 1 year), monitoring may be discontinued until all wells reach cleanup levels, at which time monitoring of those well(s) will be resumed for confirmation monitoring.

All ground water samples will be analyzed for HVOCs and field parameters, including DO, ORP and pH. Selected samples will be analyzed for bioremediation indicator parameters, including :

- Total organic carbon (TOC)
- Methane/ethene/ethane
- Nitrate
- Sulfate
- Soluble ferrous iron
- Dhc/vinyl chloride reductase (VcrA) – is this an enzyme indicative of vinyl chloride reduction activity by Dhc bacteria
- Sodium (Na+)

HVOCs and ethene/ethane will be monitored to show that the parent VOC (PCE) is being transformed, at least in part to harmless ethene or ethane. Field parameters, nitrate, sulfate, ferrous iron and methane will be monitored to show that the appropriate conditions have been achieved for degradation of chlorinated ethenes and for survival of the bioaugmentation culture.

Initially, TOC will serve as an indicator of the presence of the injected fluid. Each 1% of emulsified oil contains approximately 400 mg/L of lactate and 9,600 mg/l of emulsified oil. The lactate will inject/migrate like water initially until bacteria begin to metabolize it (days to weeks). Emulsified oil will also migrate essentially with water although a portion (larger droplets) will be filtered out in the smaller pore throats of the aquifer. For example, if 1% oil

were injected, the detection of 2-300 mg/L of TOC would indicate that lactate (slightly diluted) had reached that location. The detection of 6,000 mg/L of TOC would indicate emulsified oil had reached that location. Additionally, the Na+ concentration of the injected oil (due to the presence of sodium lactate, sodium bicarbonate) can be used as a tracer if distinct enough from background. Na+ will only be analyzed in hydrant water and wells immediately down gradient of injection points. Monitoring of Na+ will cease when it arrives in a well.

Within 2-3 months, the emulsion will break due to bacterial degradation of the emulsifiers and the oil droplets will adhere to the soil. This residual oil will slowly dissolve into ground water and provide a long-term source of donor for the degradation process. TOC will be monitored long-term as an indicator of the longevity of the emulsified oil. TOC concentrations of 20-100 mg/L indicate the slow dissolution process and that oil is still present.

4.2.3 Ground Water Monitoring and Cleanup Schedule and Contingency plan

Performance monitoring will be conducted initially for 2.5 years (10 quarters) after the next round of bioremediation cleanup action, at which time the efficacy of the cleanup will be evaluated. If any areas are not responding to treatment (HVOCs not degrading and/or bioremediation indicator analytes show unfavorable subsurface conditions), a contingency plan for additional bioremediation injections may be recommended. At that time, monitoring parameters (wells, analytes, time intervals, etc.) may also be modified as needed, in consultation with Ecology.

Performance monitoring will continue until all wells reach cleanup levels for at least one year. The restoration timeframe is estimated up to 8 years. Criteria for terminating active biotreatment (i.e., no further injections) will include continued reduction of HVOC mass, shrinking of the plume, and all wells with HVOCS exceeding cleanup levels displaying favorable redox and bioremediation indicators. Favorable redox and bioremediation indicators are described in Section 4.2.1 and include oxidation-reduction potential and dissolved oxygen showing anoxic conditions, presence of methane and ethene, and the favorable progression of generation and degradation of PCE daughter products.

4.2.4 Engineering controls

If buildings are planned over any areas where vapor intrusion screening or testing at that time indicates a vapor intrusion risk, vapor intrusion mitigation will be conducted. Most of the plume is currently under roadways, and the source area will be under an open-air public plaza park feature. Two future hotel buildings are planned at the upgradient end of the plume, upgradient of the source area.

Portions of both buildings overly areas which contains HVOCs in ground water above VI screening criteria (see Section 4.4). These buildings will be underlain by a Stego Wrap brand vapor barrier. The vapor barrier will be a 20 mil virgin polyolefin resin, multi-layer plastic extrusion-blown film membrane. This product meets or exceeds Class A vapor retarding per

ASTM E1745, which is the highest level of vapor retardation under this ASTM standard. All seams will be sealed, and slab penetrations (utilities, etc.) booted and sealed with ASTM E1643-compliant methods and materials (i.e.,: Stego Tape, Stego Mastic, Stego Crete Claw® Tape and StegoTack® Tape). The building area overlying the low HVOC ground water concentrations will be an open-air parking garage, therefore the vapor barrier system is extremely conservative.

4.2.5 Institutional controls

Institutional controls will be applied to any remnant HVOC soil and ground water impacts after cleanup. Institutional Control areas will be determined after several years of monitoring, and will be selected based on monitoring results. Institutional controls will take the form of environmental covenants (deed restrictions), which will document the remedial action in Ecology and County property records, and include provisions which 1) prohibit activities that may impact the remedial action, create new exposure pathways, or create access to, or release of remaining contaminants, 2) ensure the provisions are met by property lessees, 3) ensure conveyance of the covenant with the land, 4) require notification of property transactions, and 5) allow site access to the regulatory agency. Institutional controls may be lifted or modified pending compliance monitoring results.

4.3 CLEANUP STANDARDS AND POINT OF COMPLIANCE

Cleanup standards consist of appropriate cleanup levels applied at a defined point of compliance that meet applicable state and federal laws (WAC 173-340-700). Cleanup levels are described below.

4.3.1 Soil

Soil cleanup levels are the MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses (WAC 173-340-900, Table 740-1), and MTCA Method B Direct Contact values:

- PCE 0.05 mg/kg (Method A)
- TCE 0.03 mg/kg (Method A)
- Cis-1,2 DCE 160 mg/kg (Method B)
- VC 175 mg/kg (Method B)

Method A Soil Cleanup Levels were selected because they are protective of human health, and the Site is relatively straightforward and only involves a few hazardous substances. Method B values were used for COCs with no Method A value.

4.3.2 Ground Water

Appropriate levels of cleanup for ground water are determined by the highest beneficial use of that ground water. Shallow, likely perched, ground water present at the Site is not currently used for drinking water, and no water wells are located near the Site. The appropriate ground water cleanup levels for the Site are MTCA Method A for ground water (WAC 173-340, Table 720-1) and are provided below.

- PCE 5 µg/L (Method A)
- TCE 5 µg/L (Method A)
- Cis-1,2 DCE 16 µg/L (Method B)
- VC 0.2 µg/L (Method A)

4.3.3 Point of Compliance

The point of compliance is the specific location(s) at which a particular cleanup level must be met in order to demonstrate compliance of a cleanup action. MTCA defines standard and conditional points of compliance.

4.3.3.1 Soil

The standard soil point of compliance under MTCA (WAC 173-340-740 (6)(b-(d))) is:

- For soil cleanup levels based on protection of ground water, the point of compliance shall be established throughout the Site
- For soil cleanup levels based on protection from vapors, the point of compliance shall be established throughout the Site from the ground surface to the uppermost ground water saturated zone
- For soil cleanup levels based on human exposure via direct contact or other exposure pathways where contact with the soil is required to complete the pathway, the point of compliance shall be established in the soils throughout the Site from the ground surface to 15 feet below ground surface.

MTCA recognizes that, for cleanup actions that involve containment or capping, cleanup levels may not be met at the standard point of compliance, but the cleanup action would be determined to comply with cleanup standards provided:

- The selected remedy is permanent to the maximum extent practicable
- The cleanup action is protective of human health and terrestrial ecological receptors
- Institutional controls are implemented to limit activities that could interfere with the long-term integrity of the containment system

- Compliance monitoring and periodic reviews are conducted
- The capped or contained COCs and measures to prevent migration and contact with them are specified in a CAP

The cleanup alternatives are evaluated based on standard soil point of compliance for removal and treatment alternatives (WAC 173-340-740(6)(a)-(e), and for containment remedies (WAC 173-340-740(6)(f)).

4.3.3.2 Ground Water

The standard ground water point of compliance under MTCA (WAC 173-340-720(8)(b)) is in ground water throughout the Site from the uppermost level of the saturated zone to the lowest depth which could potentially be affected.

For this Site, the standard ground water point of compliance is proposed for petroleum hydrocarbon and arsenic impacts, i.e., ground water throughout the Site.

4.4 APPLICABLE, RELEVANT AND APPROPRIATE REQUIREMENTS

Cleanup actions under MTCA (WAC 173-340-710) require the identification of all applicable or relevant and appropriate requirements (ARARs). These requirements are defined as:

"Applicable" requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a site.

"Relevant and appropriate" requirements means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site.

The potential ARARs for the Site include three types:

- Chemical-specific
- Location-specific
- Action-specific

Chemical-specific ARARs are typically health- or risk-based values that when applied to site-specific conditions represent cleanup standards. Location-specific ARARs are related to the geographical position and/or physical condition of the site and may affect the type of remedial action selected. Action-specific ARARs are usually technology-based or activity-based requirements or limitations on actions or conditions taken with respect to specific hazardous substances. The action-specific requirements do not determine the selected remedial alternative, but indicate how or to what level a selected alternative must perform.

Potential ARARs were identified for each medium of potential concern. These potential ARARs are shown in Table 1.

4.5 RESTORATION TIMEFRAME

Another component of the cleanup standard is a reasonable restoration timeframe. Per Section 4.2.3, the restoration timeframe is estimated up to 8 years.

4.6 COMPLIANCE MONITORING

Compliance monitoring requirements (specified in WAC 173-340-410) include the following elements:

- Protection monitoring to confirm that human health and the environment are adequately protected during implementation of an alternative
- Performance monitoring to confirm that cleanup standards or other performance standards are met
- Confirmation monitoring to monitor the long-term effectiveness of the remedy after completion of the alternative

The Site remedy would include performance monitoring by ground water monitoring for up to 8 years, and compliance monitoring after cleanup levels are reached.

Monitoring details are provided in Section 4.2.2.

4.7 SCHEDULE FOR IMPLEMENTATION

Interim action cleanups were completed in 2016. The relative order of future cleanup elements is as follows:

- In-situ bioremediation additional injections
- Performance monitoring – several (up to 8) years after in-situ bioremediation, depending on results
- Engineering controls – depending on building construction schedules

- Institutional controls
- Confirmation monitoring – one year after cleanup levels are met Site-wide

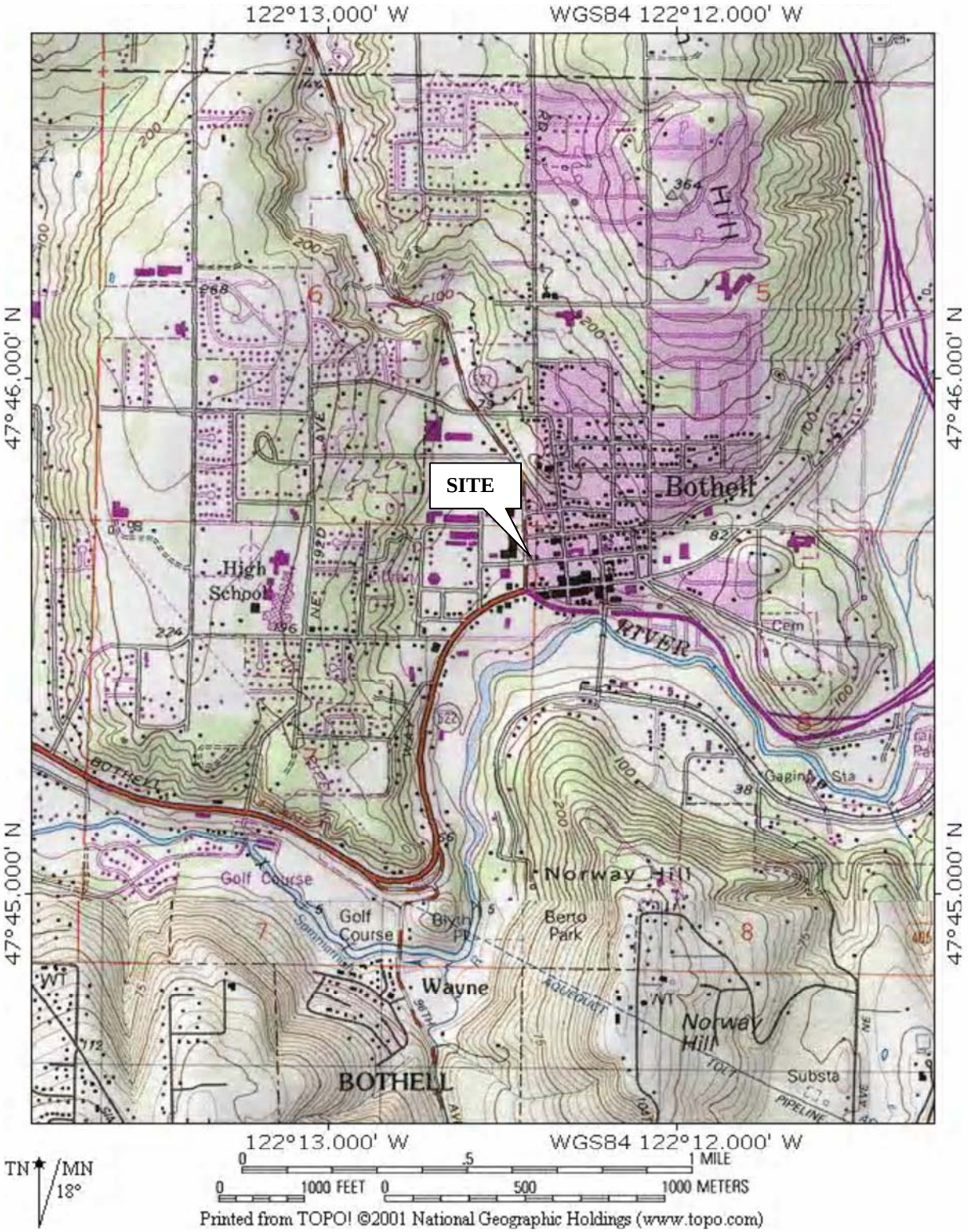
In-situ bioremediation additional injections will commence after approval of the dCAP, sometime in 2018. Institutional controls (environmental covenant) will be determined after several years of monitoring, and will be selected based on monitoring results.. The cleanup is expected to reach cleanup levels within 8 years.

4.8 PUBLIC PARTICIPATION

The dCAP will be distributed for public review and comment, with a 30-day comment period. Public participation procedures will be outlined in a Public Participation Plan prepared by Ecology.

TABLE 1
ULTRA CUSTOM CARE CLEANERS SITE
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

ARAR	Applicability
Soil	
Model Toxics Control Act (WAC 173-340-740, -747)	MTCA cleanup levels are applicable to Site soil.
Groundwater	
Model Toxics Control Act (WAC 173-340-720)	MTCA cleanup levels are applicable to Site groundwater.
Surface Water	
Model Toxics Control Act (WAC 173-340-730)	MTCA cleanup levels are applicable to the Site if remedial activities cause a release to surface water.
Air	
Washington Clean Air Act and Implementing Regulations (WAC 173-400; WAC 173-460; WAC 173-490)	Applicable for excavation activities.
Model Toxics Control Act (WAC 173-340-750)	MTCA cleanup levels are applicable to the Site if remedial activities cause a release to air.
Miscellaneous	
Protection of Wetlands, Executive Order 11990 (40 CFR Part 6, Appendix A)	This Act would be potentially applicable to remedial activities at the Site.
Native American Graves Protection and Repatriation Act (43 CFR Part 10)	This Act is applicable to remedial actions at the Site because it is possible that the disturbance of Native American materials could occur as a result of work in subsurface excavations at the Site. Such materials are not known to be present at the Site, but could be inadvertently uncovered during soil removal.
National Historic Preservation Act (36 CFR Parts 60, 63, and 800)	This Act is applicable to subsurface work at the Site. No such Sites are known to be present in the area.
Washington Hazardous Waste Management Act (WAC 173-303)	This regulation is applicable to handling of contaminated media at the Site. The contamination policy allows contaminated media to be consolidated within the same area of a site without triggering Resource Conservation and Recovery Act or Washington dangerous waste regulations.
Department of Transportation of Hazardous Wastes (49 CFR 105 – 180)	Applicable to remedial activities that involve the off-site transportation of hazardous waste.
Washington Solid Waste Handling Standards (WAC 173-350)	These regulations are applicable to solid nonhazardous wastes and are relevant and appropriate to on-site remedial actions governing contaminated media management.
Washington Water Well Construction Act Regulations (WAC 173-160)	These regulations are applicable to the installation, operation, or closure of monitoring and treatment wells at the Site.



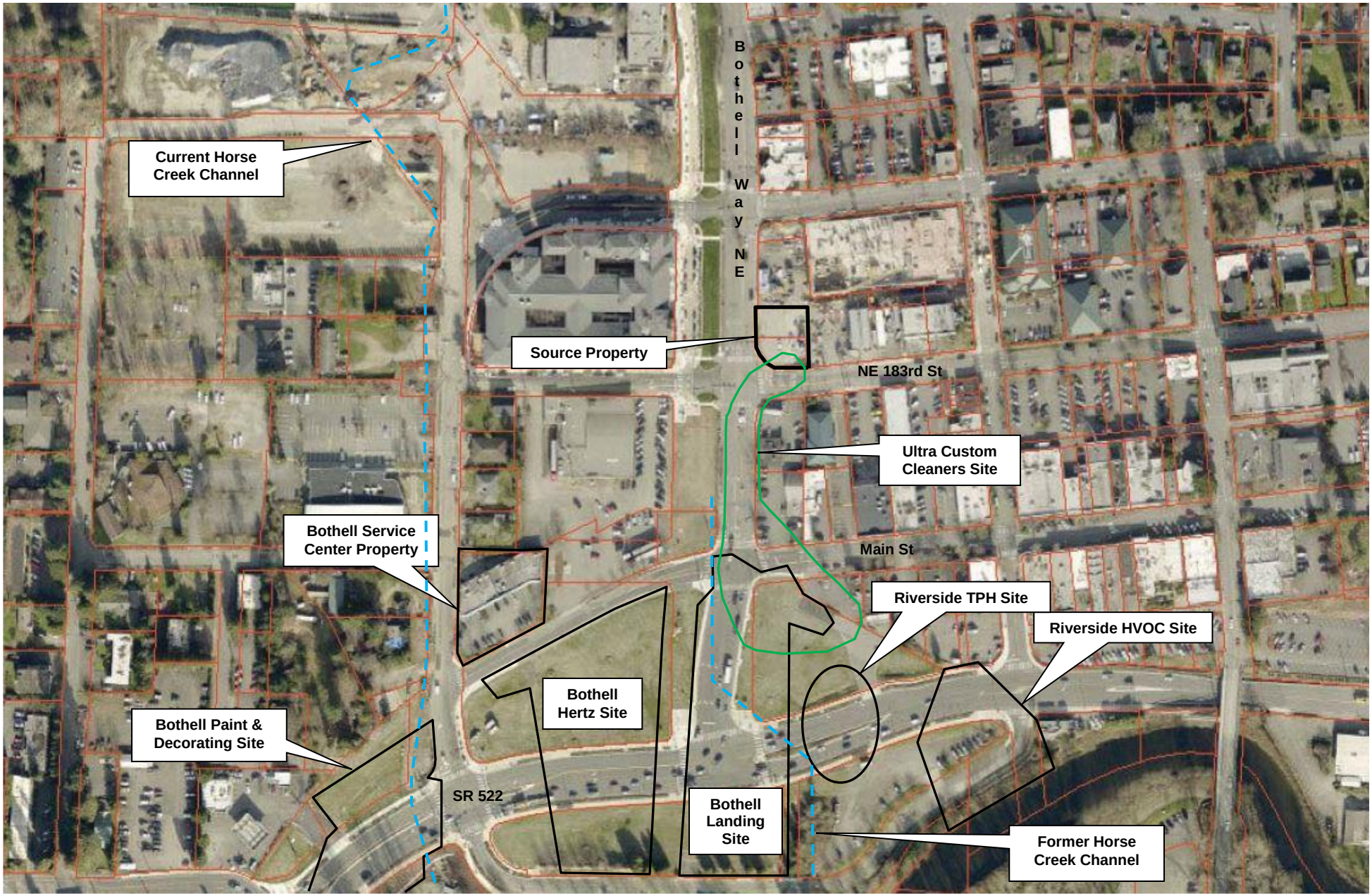
SITE VICINITY

ULTRA CUSTOM CARE CLEANERS SITE
RI/FSdCAP
BOTHELL, WASHINGTON

FIGURE NO.
1

PROJECT NO.
2007-098

HWA GEOSCIENCES INC.



HWA GeoSciences Inc.

0' 50' 100' 200'

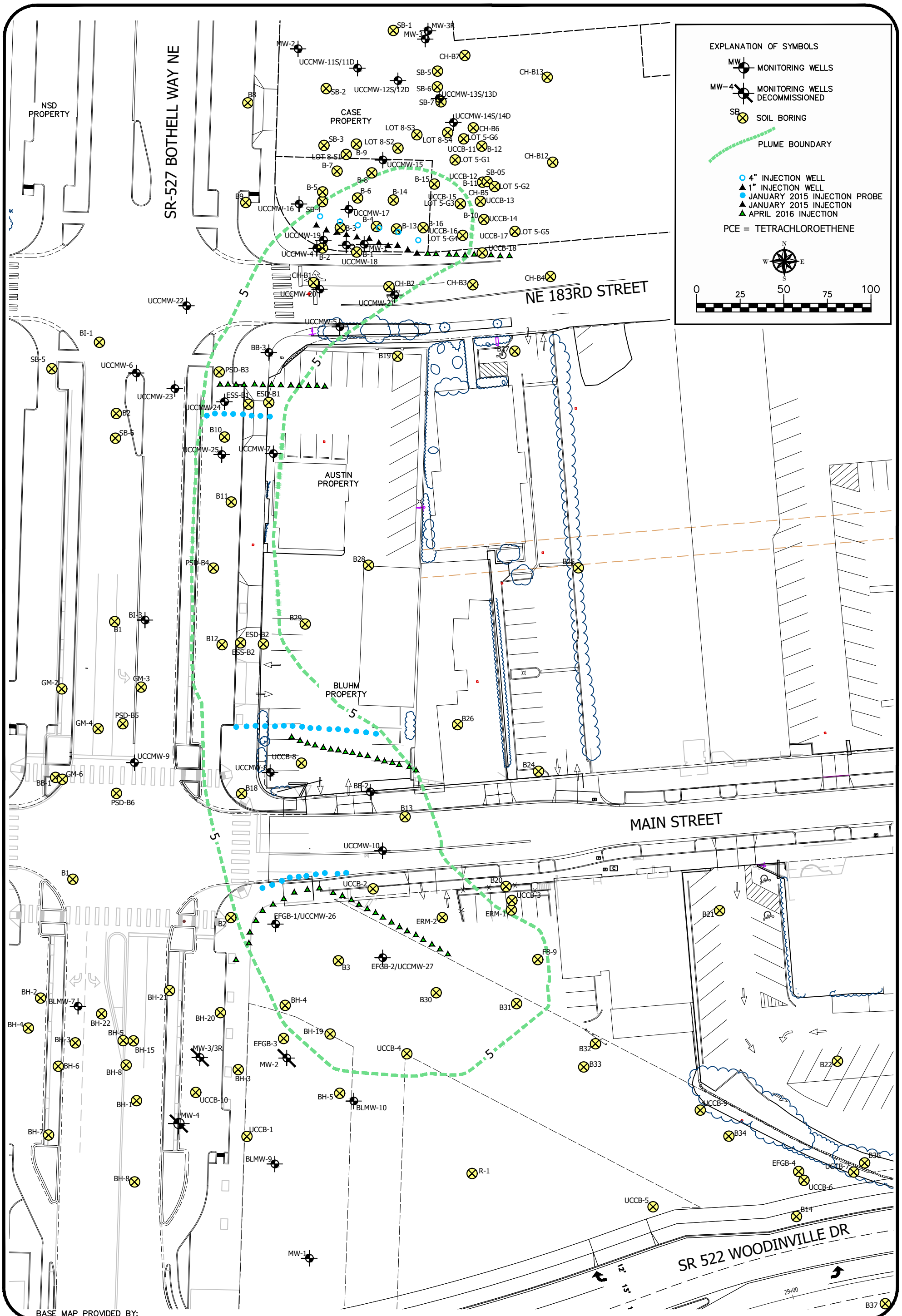
N

SITE LOCATION & ADJACENT PROPERTIES

ULTRA CUSTOM CARE CLEANERS SITE
RI/FSdCAP
BOTHELL, WASHINGTON

FIGURE NO.
2

PROJECT NO.
2007-098



HWA GeoSciences Inc.	ULTRA CUSTOM CARE CLEANERS SITE RI/FSdCAP BOTHELL, WASHINGTON	SITE AND EXPLORATION PLAN	DRAWN BY: BFM CHECK BY: AS/NK DATE: 08.28.2017	FIGURE # 3 PROJECT # 2007-098-21 TASK 2039

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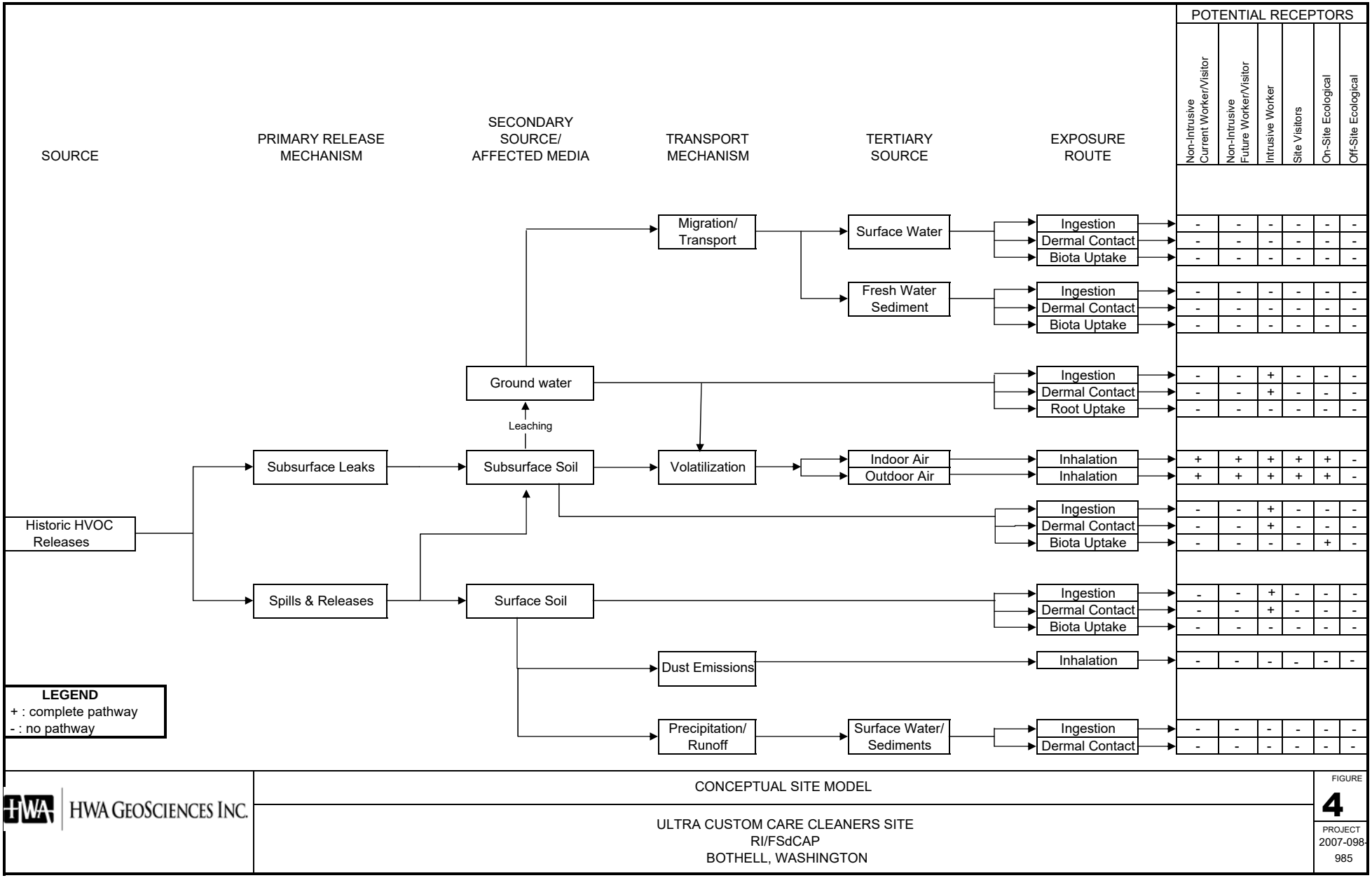


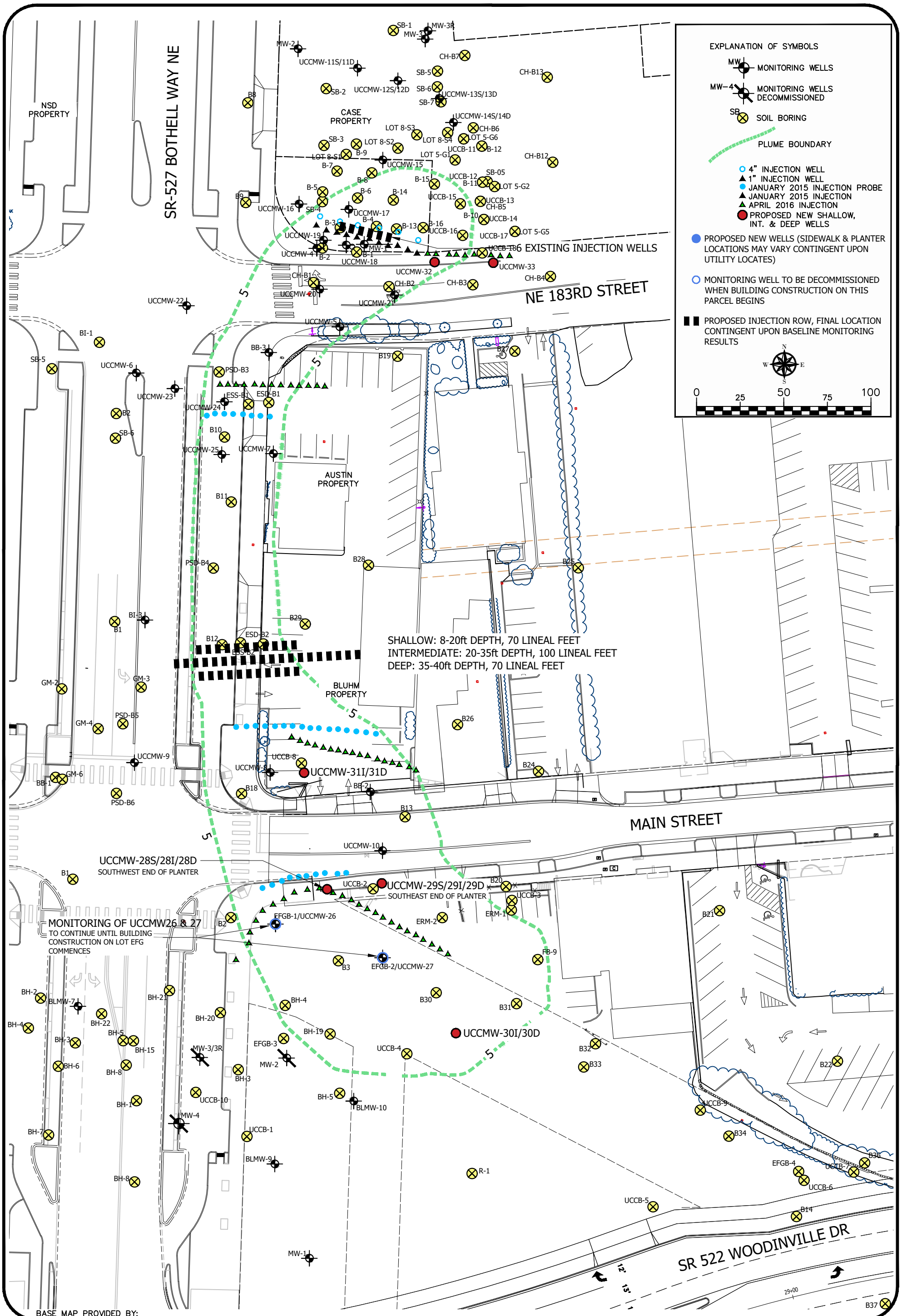
HWA GeoSciences Inc.

CONCEPTUAL SITE MODEL

ULTRA CUSTOM CARE CLEANERS SITE
RI/FSdCAP
BOTHELL, WASHINGTON

FIGURE
4

PROJECT
2007-098-985



BASE MAP PROVIDED BY:

HWA GEOSCIENCES INC.

ULTRA CUSTOM CARE CLEANERS SITE
RI/FSdCAP
BOTHELL, WASHINGTON

CLEANUP & MONITORING LOCATIONS

DRAWN BY	BFM
CHECK BY	AS/NK
DATE:	08.28.2017
FIGURE #	5
PROJECT #	2007-098-21 TASK 2039

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