Bothell Paint and Decorating Draft Cleanup Action Plan
Revision No. 1

Prepared for

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CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

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ACRONYMS AND ABBREVIATIONS

ARAR	applicable relevant and appropriate requirement
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAP	Cleanup Action Plan
CFR	Code of Federal Regulations
City	City of Bothell
COC	contaminant of concern
COPC	contaminant of potential concern
cPAH	carcinogenic polyaromatic hydrocarbon
Ecology	Washington State Department of Ecology
GFH	granular ferric hydroxide
HWA	HWA GeoSciences Inc
LUST	leaking underground storage tank
µg/L	microgram per liter
mg/kg	milligrams per kilogram
MRC™	Metals Remediation Compound
MTCA	Model Toxics Control Act
NPDES	National Pollutant Discharge Elimination System
RAO	remedial action objective
RI/FS	remedial investigation/feasibility study
sf	square feet
Site	Bothell Paint and Decorating site
SR	State Route
TPH	total petroleum hydrocarbons
UST	underground storage tank
WAC	Washington Administrative Code

1. INTRODUCTION

This Draft Cleanup Action Plan (CAP) is prepared for the Bothell Paint and Decorating site (Site) in Bothell, Washington (Figure 1-1). The CAP is being conducted under Agreed Order DE 6296, dated February 3, 2009, between the City of Bothell (City) and the Washington State Department of Ecology (Ecology). The purpose of the Agreed Order was to conduct a remedial investigation/feasibility study (RI/FS) and submit a CAP to address known contamination related to historical releases of hazardous substances.

The City currently owns the Site, a portion of which will accommodate the realignment of State Route (SR) 522, which is scheduled for construction in summer 2010. The 0.79-acre property consisting of two parcels is located on the south side of existing SR 522, between SR 522 and 180th Street NE. Current property use is mixed commercial and retail. Remnant portions of the property will be redeveloped as part of the City's overall Downtown Revitalization Plan. In general, cleanup approaches discussed in this document will address anticipated future property uses as envisioned in the Downtown Revitalization Plan. Figure 1.1 from the Bothell Downtown Subarea Plan is provided in Appendix A for reference. The figure shows proposed future land uses in the vicinity of the Site.

1.1 PURPOSE

This CAP was completed per the Agreed Order and Washington Administrative Code (WAC) 173-340-380, Model Toxics Control Act (MTCA) (Ecology 2007). The purpose of the CAP was to present a general conceptual-level description of the preferred cleanup action developed under the RI/FS (Parametrix 2009). The CAP was developed using information obtained during Site investigations that began in 1988 and are ongoing. MTCA requires a CAP to include:

- Applicable state and federal laws for the cleanup action.
- Cleanup standards for each hazardous substance and for each medium of concern.
- A brief summary of the other cleanup alternatives evaluated in the RI/FS.
- A description of the proposed cleanup action and a summary of the rationale used for selecting the proposed alternative.
- A description of the required institutional controls, the types and concentration of contaminants left on site, and measures that will be used to prevent contact with these substances.
- A schedule for implementation of the cleanup action.

2. SITE CONDITIONS

This section summarizes the Site history and the human health and environmental concerns.

2.1 SITE HISTORY

The Paint and Decorating site is located on the south side of SR 522, between downtown Bothell and the Sammamish River Slough (Figure 2-1), and comprises 0.79 acre. The property consists of two parcels: the Victory parcel (0.54 acre) and the Giannola parcel (0.25 acre). Historical operations on the Victory parcel included automobile repair and dealerships, retail paint and flooring, and sand blasting. Documented historical site use of the Giannola parcel is limited to residential usage and parking.

2.1.1 Victory Parcel

According to historical information and interviews, the Site has been developed since 1914. A leaking underground storage tank (LUST) removal was conducted in 1988. The tank containing gasoline and Stoddard solvent (petroleum distillates) was found to have released product to soil and groundwater.

A sand blasting contractor operated on this parcel for approximately 40 years. According to tenant information, sand blast grit and soil staining reportedly related to compressor blowdown have been observed to the west and south of the tenant space now occupied by McVay Welding. Sand blasting grit was reportedly removed, but stained soils were not assessed or removed.

Historical information indicates that one of the buildings was used as a garage and body shop, and that petroleum companies were listed as lessees of the property in the 1920s and 1930s.

Various Site soil and groundwater investigations have taken place since 1988. For a more detailed discussion of the Site history, physical characteristics, and previous investigations, see the RI/FS (Parametrix 2009).

2.1.2 Giannola Parcel

According to historical information and interviews, the subject property has been developed since at least 1919, and use was originally residential. In the 1960s, the residence was demolished and the property has been used for parking since that time.

2.2 HUMAN HEALTH AND ENVIRONMENTAL CONCERNS

The following sections include a discussion of the nature and extent of Site contamination to be addressed by the proposed cleanup action, a summary of the Site contaminants of potential concern (COPCs), and an assessment of risk.

2.2.1 Soil

This section summarizes the nature and extent of soil contaminated with COPCs that will be addressed by the proposed cleanup action.

2.2.1.1 Metals

Sampling for metals was conducted during the 2008 HWA GeoSciences Inc (HWA) investigation and RI. Specifically, samples were analyzed for arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury.

Elevated metals concentrations were observed from the center to over the southeastern portion of the Site to a depth of 4 to 5 feet. Based on the results of sampling during the 2008 HWA investigation (HWA 2008a, 2008b) and September 2009 RI/FS investigation, arsenic, cadmium, and lead above MTCA Method A cleanup levels remain in the soil. Barium, chromium, silver, lead, and mercury remain in the soil above ecological indicator concentrations.

2.2.1.2 Petroleum Hydrocarbons (including BTEX)

The LUST removal completed in 1988 removed a UST containing gasoline and Stoddard solvent (petroleum distillates) from the Site. Affected soil was left on the Site due to the proximity of the excavation to the building and a rock wall adjacent to the west and north sides of the UST excavation. A composite soil sample collected from the north and south sidewalls of the excavation contained 1,400 milligrams per kilogram (mg/kg) of gasoline-range petroleum hydrocarbons above MTCA Method A cleanup levels.

During the HWA Phase II investigation (HWA 2008b), motor oil concentrations next to the blowdown compressor pipe at VB-9 were 180,000 mg/kg at 0.5 foot and 29,000 mg/kg at 1.5 feet below ground surface (bgs). During the RI sampling, motor oil was detected in the two soil samples analyzed from borings BP-20 and BP-21 adjacent to VB-9, at concentrations less than MTCA Method A cleanup levels.

In RI boring BP-5, diesel-range hydrocarbon concentrations were detected at less than the MTCA Method A cleanup levels but greater than the ecological indicator at depths of 1 to 4 feet bgs. Benzene above the MTCA Method A cleanup levels was detected in BP-26 at a depth of 1 to 2 feet bgs. Motor oil hydrocarbons were detected in the shallow soil at the three new well locations (BPMW-1 through BPMW-3). All the soil samples (0.5 foot, 2 feet, and 5 feet) from BPMW-3 showed concentrations of motor oil hydrocarbons. The sample at 2 feet bgs exceeded Method A cleanup levels for motor oil.

2.2.1.3 SVOCs

SVOCs were detected in the one soil sample analyzed at BP-26. Total carcinogenic polyaromatic hydrocarbons (cPAHs) were above the MTCA Method A cleanup levels. This sample was a shallow soil sample collected in an area of potential future redevelopment outside of the new road alignment. Further investigation is required to determine the possible source of the cPAHs; therefore, the cPAHs are not addressed by this CAP.

2.2.2 Groundwater

This section summarizes the nature and extent of groundwater contaminated with COPCs that will be addressed by the proposed cleanup action.

2.2.2.1 Metals

Historical data from 2008 compiled by HWA showed MTCA Method A cleanup level exceedances of total arsenic in the groundwater at VB-11, BC-10, and BC-12; dissolved arsenic in the groundwater at VB-3 and VB-11; and total lead in groundwater at BC-10 and BC-12. A total of six groundwater samples collected during the RI were analyzed for metals; either total or dissolved arsenic was detected in all the samples at a concentration above MTCA Method A cleanup levels except the samples from BPMW-2 and BC-11.

2.2.3 Summary of Contaminants of Potential Concern

Based on the RI/FS, COPCs for soil at the Site to be addressed by the proposed cleanup action include:

- Metals (arsenic, barium, cadmium, chromium, lead, silver, and mercury)
- Total petroleum hydrocarbons (diesel- and motor oil-range)
- Aromatic hydrocarbons (benzene)

For groundwater, COPCs include:

- Metals (arsenic and lead)

2.2.4 Assessment of Risk

Complete exposure pathways developed under the RI/FS (Parametrix 2009) for the COPCs include the following:

- Current/future indoor retail worker:
  - Inhalation of vapors from the subsurface (groundwater and soil) in indoor air
  - Direct ingestion of contaminated groundwater used as drinking water.
- Current/future construction/utility worker:
  - Incidental soil ingestion and dermal contact
  - Inhalation of dust from the subsurface soil in outdoor air
  - Inhalation of vapors or dermal contact with groundwater in a trench or excavation.
- Current/future Site visitor or residence (adult and child):
  - Inhalation of dust from surface soil.
- Ecological receptors
  - Incidental soil ingestion and dermal contact
  - Inhalation of vapors from the subsurface soil in outdoor air or in a burrow
  - Inhalation of vapors from or dermal contact with groundwater in a burrow.

Exposure to contaminants could occur via the complete exposure pathways described above. Based on the nature of the Site and the extent of contamination, current risks appear limited. The likely greatest potential risk to human receptors is inhalation of contaminant vapors and dust in the workplace. Note, however, that only one of the occupied buildings on the Site is underlain (partially) by contaminated soil and groundwater with the potential to cause vapor intrusion. The second most likely exposure risk is to construction workers during soil-disturbing activities. Ecological receptors have limited risk of exposure because the majority of the Site contains buildings or pavement.

3. APPLICABLE STATE AND FEDERAL LAWS

This section discusses the applicable state and federal laws for the Site including applicable or relevant and appropriate requirements (ARARs), cleanup standards, and remedial action objectives (RAOs).

3.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Cleanup actions under MTCA (WAC 173-340-710) require the identification of all ARARs. Potential ARARs were identified for each medium of concern in the RI/FS (Parametrix 2009). The applicable state and federal laws specific to the proposed cleanup action are shown in Table 3-1.

3.2 CLEANUP STANDARDS

Based on the COPCs developed within the RI/FS, a list of specific hazardous substances and their associated cleanup levels was developed. Applicable cleanup levels were selected from WAC 173-340-720 through 173-340-760. A conservative approach was used to select standards that were most protective of human health and the environment for soil and groundwater. Selected standards by which media were evaluated against are listed below.

The following cleanup levels were selected for soil:

- MTCA Method A Soil Cleanup Levels for Unrestricted Land Use (WAC 173-340, Table 740-1)
- MTCA Ecological Indicator Soil Concentrations for Protection of Terrestrial Plants and Animals (Table 749-3)

For groundwater, the following cleanup levels were selected:

- MTCA Method A Cleanup Levels for Groundwater (WAC 173-340, Table 720-1) However, the upgradient concentration of arsenic in groundwater is 0.01 mg/L which is elevated with respect to Method A (0.005 mg/L).

Table 3-2 shows the cleanup levels of the specific COPCs determined under the RI/FS (Parametrix 2009) for each hazardous substance of concern and each medium of concern. For evaluation of nature and extent of contamination in order to determine the best cleanup action, the historical and current soil and groundwater analytical data were compared to the cleanup levels in Table 3-2. The values listed for each hazardous substance are the cleanup levels relevant to the Site. Where N/A is listed, regulatory values typically exists; however, those values are not applicable to the Site.

3.3 REMEDIAL ACTION OBJECTIVES

The following RAOs have been established for remediation alternatives:

- Achieve the MTCA Method A soil cleanup standards for heavy oil-range total petroleum hydrocarbons (TPH), benzene, arsenic, cadmium, and lead.
- Reduce or eliminate human exposure through direct contact (incidental ingestion, skin contact, and inhalation of vapors) with contaminated soil and groundwater that exceed protective regulatory levels.
- Reduce or eliminate risks to ecological receptors from contaminated soil and groundwater.
- Use permanent solutions to the maximum extent practicable (which includes consideration of cost-effectiveness).

4. REMEDIAL ALTERNATIVES SUMMARY

In this section, remediation alternatives developed under the RI/FS (Parametrix 2009) in accordance with MTCA requirements and guidelines are summarized.

4.1 REMEDIAL ALTERNATIVE DEVELOPMENT

Four remedial alternatives were developed that meet the RAOs and MTCA requirements. A No Action alternative was also discussed as a baseline comparison. Alternatives are summarized below.

4.1.1 Alternative 1—No Action

The No Action Alternative was retained throughout the alternative development and analysis process in the RI/FS (Parametrix 2009) as a baseline for comparison to other alternatives. The No Action Alternative consists of allowing the Site to remain in its present condition, with no measures to reduce or monitor soil and groundwater contamination beyond the planned construction of the SR 522 realignment.

4.1.2 Alternative 2—Chemical Oxidation, Electrokinetic Separation, Low Permeability Cap and Complexation

Alternative 2, involving chemical oxidation, electrokinetic separation, low permeability cap, and complexation, would consist of the following:

- Chemical oxidation would be used within the soil around monitoring well BPMW-3 at a depth of approximately 3 feet and an area with a radius of approximately 30 feet from the well up to the property line to remediate heavy oil-range TPH.
- Chemical oxidation would be used within the soil around historical boring VB-9 at a depth of approximately 4 feet and an area with a radius of approximately 25 feet from the boring to remediate heavy oil-range TPH.
- Electrokinetic separation would be used within the soil outside the SR 522 realignment footprint to a depth of approximately 4 feet and an area of approximately 1,200 square feet (sf) to remediate arsenic, cadmium, and lead. The liquid generated by electrokinetic separation would be treated via three ion exchange media vessels in series in a small treatment building.
- A low permeability cap (i.e., realignment of SR 522) with institutional controls would limit exposure to the majority of the metals-contaminated soil.
- Complexation would be used from a depth of 5 feet to 15 feet bgs to remediate arsenic in groundwater. A grid would be placed downgradient of each well that contains groundwater above cleanup levels.

RegenOx™ by Regenesis is the product used as the basis for Alternative 2 for the remediation of the organic soil contamination.

Electrokinetic separation for the metals soil contamination would consist of installing specialized monitoring wells that would include either an anode or cathode and liquid removal assembly to extract the concentrated metals from the subsurface for ex situ treatment and disposal. Ex situ treatment would consist of ion exchange media. The ion exchange media was chosen because it is the only single media that can remove arsenic, cadmium, and lead from a waste stream. The treated liquid would be recirculated back into the liquid removal assemblies to allow the removal of additional metals from the subsurface.

MRC™, also by Regenesis, is the product used as the basis for Alternative 2 for the remediation of the metals groundwater contamination. The product is injected into the subsurface via injection wells organized in a grid pattern.

Bench-scale treatability and pilot tests would be conducted to help refine the full-scale treatment approach for Alternative 2. Results of the treatability and pilot tests would be used to refine the full-scale treatment approach for both contaminated soil and groundwater.

The planned realignment of SR 522 would be maintained directly over the untreated soil contamination in order to eliminate exposure pathways associated with surface and subsurface soil. Institutional controls would be put in place to provide protection from exposure through the use of legal controls that limit access and exposure to the contaminated soil in the case of excavation in the area.

Groundwater monitoring would be conducted for four quarters after realignment of the roadway is complete to verify the contaminated groundwater in the area has been remediated. In order to adequately monitor the area, five downgradient wells would be installed and seven wells would be monitored for four successive quarters.

4.1.3 Alternative 3—Excavation, Off-Site Disposal, and Adsorption

Alternative 3, involving excavation, off-site disposal, and adsorption, would consist of the following:

- Excavation of the soil around monitoring well BPMW-3 at a depth of approximately 3 feet and an area with a radius of approximately 30 feet from the well up to the property line to remove heavy oil-range TPH.
- Excavation of the soil to a depth of approximately 4 feet and an area of approximately 10,800 sf to remove heavy oil-range TPH, arsenic, cadmium, and lead in the southeastern portion of the Site.
- Installation of a pump and treat system to remove contaminated groundwater and also remove the arsenic from the groundwater ex situ via filter vessels containing granular ferric hydroxide (GFH).

Approximately 1,900 cubic yards or 3,000 tons of contaminated soil would be excavated with heavy equipment. The contaminated soil would be trucked to a permitted landfill for final disposal. Confirmation soil sampling would take place on the sidewalls and bottom of the excavations. The excavated areas would then be backfilled with clean material.

A bench-scale treatability test would be conducted to help refine the full-scale groundwater treatment approach for Alternative 3. Results of the treatability test would also be used to determine if a pilot test is required before full-scale treatment is completed.

A total of four extraction wells would be installed at the Site. The extraction wells would be piped to a building containing the GFH treatment system. The GFH treatment system would be set up in a simple configuration in which arsenic-contaminated water passes through a GFH-packed media bed. A backwash system is also typically necessary to periodically remove accumulated solids from the filter beds.

The effluent of the treatment system would discharge to a storm drain located to the south of the Site that would discharge to the Sammamish River. The backwash water would be discharged to the sanitary sewer under a wastewater discharge permit.

After excavation, backfill, and installation of the groundwater pump and treat system, the planned realignment of SR 522 would be constructed over the un-excavated area. Institutional controls would be put in place to provide protection from exposure through the use of legal controls that limit access and exposure to the contaminated groundwater in the case of exposure in the area. Groundwater monitoring would be conducted for the life of the groundwater pump and treat system (i.e., 10 years) to verify the groundwater in the area has been remediated. In order to adequately monitor the area, five downgradient wells would be installed and a total of seven wells would be monitored annually for an assumed 10 years.

4.1.4 Alternative 4—Excavation, Off-Site Disposal, Low Permeability Cap, and Groundwater Extraction

Alternative 4, involving excavation, off-site disposal, groundwater extraction, and low permeability cap, would consist of the following:

- Excavation of the soil around monitoring well BPMW-3 at a depth of approximately 3 feet and an area with a radius of approximately 30 feet from the well up to the property line to remove heavy oil-range TPH.
- Excavation of the soil to a depth of approximately 4 feet and an area of approximately 2,200 sf to remove arsenic, cadmium, and lead in the southeastern portion of the site. A low permeability cap (i.e., realignment of SR 522) with institutional controls would limit exposure to the majority of the contaminated soil.
- Installation of a pump and treat system to remove contaminated groundwater and discharge the untreated groundwater to the sanitary sewer.

Approximately 330 cubic yards or 530 tons of contaminated soil would be excavated with heavy equipment. The contaminated soil would be trucked to a permitted landfill for final disposal. Confirmation soil sampling would take place on the sidewalls and bottom of the excavations. The excavated areas would then be backfilled with clean material.

A total of four extraction wells would be installed at the Site. The extraction wells would discharge to the sanitary sewer located to the south of the Site that would discharge to the King County wastewater treatment plant.

After excavation, backfill, and installation of the groundwater extraction system, the planned realignment of SR 522 would be constructed over the excavated area. Institutional controls would be put in place to provide protection from exposure through the use of legal controls that limit access and exposure to the contaminated groundwater in the case of exposure in the area. Groundwater monitoring would be conducted for the life of the groundwater extraction system to verify the groundwater in the area has been remediated. In order to adequately monitor the area, five downgradient wells would be installed and a total of seven wells would be monitored annually for an assumed 10 years.

4.1.5 Alternative 5—Excavation, Off-Site Disposal, Low Permeability Cap, and Monitored Natural Attenuation

Alternative 5, involving excavation, off-Site disposal, low permeability cap, and monitored natural attenuation, would consist of the following:

- Excavation of the soil around monitoring well BPMW-3 at a depth of approximately 3 feet and an area with a radius of approximately 30 feet from the well up to the property line to remove heavy oil-range TPH.

- Excavation of the soil to a depth of approximately 4 feet and an area of approximately 2,200 sf to remove arsenic, cadmium, and lead in the southeastern portion of the Site. A low permeability cap (i.e., realignment of SR 522) with institutional controls would limit exposure to the majority of the contaminated soil.
- Active groundwater remediation is not considered for Alternative 5. Natural attenuation via physical dilution and dispersion would be the primary mechanism for achieving the RAOs at the point of compliance.

Approximately 330 cubic yards or 530 tons of contaminated soil would be excavated with heavy equipment. The contaminated soil would be trucked to a permitted landfill for final disposal. Confirmation soil sampling would take place on the sidewalls and bottom of the excavations. The excavated areas would then be backfilled with clean material.

After excavation and backfill, the planned realignment of SR 522 would be constructed over the un-excavated area. Institutional controls would be put in place to provide protection from exposure through the use of legal controls that limit access and exposure to the contaminated groundwater in the case of exposure in the area. Groundwater monitoring would be conducted for approximately 10 years to ensure arsenic levels in groundwater do not exceed cleanup standards at the point of compliance. In order to adequately monitor the area, five downgradient wells would be installed and a total of seven wells would be monitored annually for an assumed 10 years.

4.2 REMEDIAL ALTERNATIVES COMPARISON

The five alternatives were compared in accordance with MTCA regarding the following criteria:

- Meet threshold requirements.
- Use permanent solutions to the maximum extent practicable including consideration for public concerns.
- Provide for a reasonable restoration time frame.
- Consider additional performance criteria.

4.2.1 Threshold Criteria

Alternatives 2 through 5 evaluated in the RI/FS (Parametrix 2009) would meet the MTCA threshold requirements as follows:

- Alternatives 2 through 5 would be protective of human health and the environment through a combination of physical barriers, institutional controls, contaminant destruction or removal, and compliance monitoring.
- Alternatives 2 through 5 would be in compliance with soil cleanup standards in accordance with WAC 173-340-740(6)(f) and groundwater cleanup standards by establishing a conditional point of compliance approximately 50 feet from the south and west property lines in accordance with WAC 173-340-720(8)(d)(ii) based on the discussion in Section 4.2.2.
- Alternatives 2 through 5 would be designed and implemented to meet the requirements of the ARARs; however, the discharges of either treated or contaminated groundwater via the extraction well system for Alternatives 3 and 4 may be limited by National Pollutant Discharge Elimination System (NPDES) contaminant discharge levels.

- Alternatives 2 through 5 would conduct health and safety protection monitoring during implementation to ensure that the safety of workers, surrounding populations, and the environment are protected. Alternatives 2 through 5 would also provide performance and confirmation monitoring to confirm cleanup standards have been attained and to monitor the long-term effectiveness of the cleanup action.

Alternative 1 does not meet any of the threshold requirements but was used in the RI/FS (Parametrix 2009) as a baseline for comparison to the other alternatives. Alternative 1 is not discussed further in this CAP.

4.2.2 Permanent Solutions

This section summarizes the evaluation of the remedial alternatives against the seven permanent solutions criteria. A summary of the permanent solutions criteria for each of the remedial alternatives is shown in Table 4-1.

4.2.2.1 Protectiveness

Alternatives 2, 3, 4, and 5 meet the goal of protectiveness because they all provide a permanent method of containment and reduce or eliminate exposure pathways. Alternative 3 is the most protective of the alternatives because of the complete removal of the contaminated soil and groundwater. Alternatives 2, 4, and 5 are also protective; however, the alternatives leave contaminated soil and/or groundwater in place and depend on institutional controls to limit exposures. Alternative 2 would provide the fastest remediation of both soil and groundwater.

4.2.2.2 Permanent Reduction in Toxicity, Mobility, and Volume

Alternatives 2, 3, 4, and 5 provide permanent reduction in the toxicity, mobility, and volume of contaminants in the environment. Alternative 3 provides the largest permanent reduction in toxicity, mobility, and volume due to the complete removal of the soil and groundwater contamination. Alternatives 2, 4, and 5 reduce the toxicity, mobility, and volume of the soil and groundwater contamination; however, the alternatives provide a slightly lesser permanent reduction because the low permeability cap only eliminates water infiltration into the subsurface and has no effect on toxicity or volume of the soil contamination left in place. However, the mobility of metals remaining in soil and the potential for contamination leaching to groundwater are greatly reduced or eliminated with the presence of the cap.

4.2.2.3 Cost

The capital, operations and maintenance, and total costs for the four alternatives are shown in Table 4-2.

4.2.2.4 Long-Term Effectiveness

All four alternatives are effective for soil contamination because either removal or containment would effectively reduce or minimize the risks to human health and the environment associated with the contaminants left in place. Institutional controls would be in place to ensure effectiveness of the remedy and to minimize exposure scenarios.

Alternative 5 would be less effective over the long term compared to the other three alternatives because the residual risk is greater due to contaminated soil and groundwater being left in place with contaminant levels greater than regulatory standards. Alternative 5 would require institutional controls in perpetuity. However, residual risk compared to the other alternatives would be minimal regarding exposure to contaminated soil and groundwater because the exposure pathways for direct contact, ingestion, and inhalation would be minimized or eliminated. Exposure and associated risk would be limited or negated because of the low permeability cap and implementation of institutional controls should future excavation in the area of residual contamination be completed.

Alternative 2 would be less effective than Alternative 4 over the long term because the residual risk is greater due to contaminated soil and groundwater being left in place with contaminant levels greater than regulatory standards. Alternative 2 would require institutional controls in perpetuity. The reliability of Alternative 2 is also slightly limited because there are many more factors determining the contaminant reduction quantity due to mixing, application rate, contaminant concentrations, and soil type. Also, remedial technologies used for Alternative 2 have not been used for many full-scale remediations regarding arsenic; therefore, long-term effectiveness is unknown and rebound of the contaminant concentrations is a possibility in both soil and groundwater. Also, complexation of arsenic may not be effective based on the current reducing conditions of the Site.

Alternative 3 would be the most effective over the long term because the risk associated with the contaminated soil is eliminated with excavation; moreover, the long-term risk associated with the contaminated groundwater is eliminated by removing the arsenic. Also, the magnitude of residual risk is small and institutional controls will not be required to manage the exposure to residual or remaining contaminated soil.

Alternative 4 would be less effective than Alternative 3 over the long term because the residual risk is greater due to contaminated soil being left in place with contaminant levels greater than regulatory standards. Alternative 4 would require institutional controls in perpetuity.

4.2.2.5 Management of Short-Term Risks

Short-term risks for implementation of the four alternatives are relatively low. Standard construction safety and traffic controls will be needed to provide safe operations. The primary risk to Site workers would be construction accidents during construction activities. Direct exposure to contaminated soil and groundwater would be limited because the quantity of soil and method of excavation or treatment do not typically require direct worker contact. Any contaminated soil and groundwater generated during construction activities would be managed in accordance with applicable laws for disposal.

The increased risk to the community for the four alternatives would primarily result from the increased traffic and construction resulting from the remedial actions. This risk can be controlled through increased traffic control and Site security during remedial activities.

Short-term risks to the environment would be minimized by acquiring and maintaining compliance with required construction permits. Also, Site security and prior use of the Site as a commercial retail and parking area help to minimize exposures to the environment.

4.2.2.6 Implementability (Technical and Administrative)

Alternative 2 is the least technically implementable of the alternatives because full-scale implementation of both electrokinetic separation and in situ complexation of arsenic has not been accomplished and the technologies have only been shown effective in bench-scale treatability testing. Administratively, Alternative 2 is readily implementable. Alternative 2 would require the shortest time to complete remediation; however, the technologies used could cause a rebound in contaminant of concern (COC) concentrations, which would substantially increase the completion time of the alternative.

Alternative 3 is technically implementable and GFH treatment of arsenic has been used in full-scale operations at multiple facilities; however, due to the limited groundwater chemistry data available for the

Site (i.e., silica and phosphorus), the level of 4 micrograms per liter (µg/L) of arsenic (background) within the effluent may not be attainable. Also, acquiring an NPDES permit for the discharge of treated water through the storm drain into the Sammamish River may not be feasible. Alternatives 3 and 4 are equal in the completion time to remediate the Site.

Alternative 4 is technically implementable and the technologies have been used in full-scale operations at multiple facilities. The alternative depends on the acceptance of the arsenic-laden groundwater by the King County wastewater treatment plant without pretreatment. Depending on the effluent metals concentrations from the Site, acquiring a wastewater discharge permit may not be feasible. Alternatives 3 and 4 are equal in the completion time to remediate the Site.

Alternative 5 is technically implementable and the technologies have been used in full-scale operations at multiple facilities. Alternative 5 would be less administratively implementable because groundwater contamination exceeding cleanup standards would remain; however, based on limited groundwater sampling conducted during the RI, the arsenic levels in groundwater may be below cleanup standards at the point of compliance.

4.2.2.7 Consideration of Public Concerns

Ecology prepared a public participation program in accordance with WAC 173-340-410 for the Site. The City and Ecology will take into consideration reasonable public comments with respect to the final remedy for the soil contamination at the Site.

4.2.3 Reasonable Restoration Time Frame

This section compares each of the alternatives regarding each reasonable restoration time frame criterion.

4.2.3.1 Reasonable Restoration Time Frame Criteria and Evaluation

Factors to be considered when determining whether a cleanup action provides for a reasonable restoration time frame and a discussion regarding the alternatives follow:

- Potential risk posed by the Site to human health and the environment—Currently, the only risks posed by the Site are from direct exposure to the contaminated soil or to the occasional worker who may encounter contaminated soil and groundwater during trenching activities. The majority of the facility is paved thereby reducing the chance of direct exposure to contaminated soil. Procedures can be taken to protect the worker’s health during trenching activities. These facts are unaffected by any alternative; therefore, a fast restoration time frame is not required by the risk posed by the Site.
- Practicability of achieving a shorter restoration time frame—The cleanup time frame is less than six months for Alternative 2 for both soil and groundwater. The cleanup time frame for Alternatives 3, 4, and 5 is approximately 30 days for soil and up to approximately 10 years for groundwater. The groundwater cleanup time frame for Alternatives 3 and 4 depends on the ability of the pump and treat system to contain and extract the arsenic from the subsurface.
- Current and future use of the Site, surrounding area, and associated resources that are or may be affected by releases from the Site—The current use of the Site, surrounding area, and associated resources are not anticipated to change until the realignment of SR 522. New receptors will not be introduced and further impacts to groundwater resources are not anticipated.

- Availability of alternative water supply—An alternative water supply is not necessary for the Site because any water used by current Site occupants comes from the municipal water supply. The perched groundwater that is affected is not used as a water supply.
- Likely effectiveness and reliability of institutional controls—Institutional controls, including excavation limitations and notifications, will be effective and reliable in preventing contact with the contaminated soil and groundwater.
- Ability to control and monitor migration of hazardous substances—The migration of contaminants within the soil will be controlled by each of the alternatives. Groundwater monitoring will be performed to verify migration of the contaminants is not taking place.
- Toxicity of hazardous substances at the Site—The toxicity of the contamination at the Site does not warrant a fast restoration time frame. Direct exposure to the contaminated soil is unlikely due to the current and future use of the Site. Groundwater exposure is also unlikely because the water is not used by the occupants of the Site or any off-Site receptors.
- Natural processes and reduced concentrations of hazardous substances—The natural degradation of petroleum hydrocarbons has been documented at numerous other sites. The natural degradation of metals would occur through dilution and dispersion.

Based on consideration of all the subcriteria associated with the evaluation of the reasonable restoration time frame, as well as the various scenarios associated with the Site, Alternatives 2, 3, 4, and 5 provide restoration within a reasonable time frame.

4.2.4 Additional Performance Criteria

In addition to meeting the minimum requirements, MTCA provides direction regarding the requirements of alternatives on a number of other performance criteria. These criteria and the performance of the alternatives based on the criteria are as follows:

- Alternatives 2, 4, and 5 will require institutional controls to notify workers prior to excavation in the area that contaminated soil exists at levels above regulatory levels and to prevent potential exposure to contaminated groundwater at the Site.
- Alternatives 2 through 5 prevent the migration of hazardous substances through the use of caps, destruction, containment, and monitoring; however, under Alternative 5 groundwater contamination is allowed to migrate to allow dilution and dispersion to reduce arsenic groundwater concentrations to below cleanup standards.
- Alternatives 2, 3, and 4 do not rely on the use of dilution or dispersion to achieve cleanup levels or eliminate exposure pathways. Alternative 5 does rely on the use of in situ groundwater dilution and dispersion to achieve arsenic cleanup levels at the point of compliance. Alternative 5 is approximately six to 10 times less costly than the other alternatives. The incremental degree of benefits of the active groundwater remediation for Alternatives 2, 3, and 4 is minimal versus the use of dilution and dispersion under Alternative 5. Also, the incremental residual risks and exposure scenarios associated with Alternative 5 are minimal as compared to the other alternatives.
- Remediation levels are not included as part of the implementation of the remedial alternatives.

5. PROPOSED CLEANUP ACTION

Based on the analysis discussed above, Alternative 5, involving excavation, off-Site disposal, low permeability cap, and monitored natural attenuation, is the proposed cleanup action. Alternative 5 would consist of the following:

- Excavation of the soil around monitoring well BPMW-3 at a depth of approximately 3 feet and an area with a radius of approximately 30 feet from the well up to the property line to remove heavy oil-range TPH. BPMW-3 is located adjacent to the northern property line and additional contamination may be present underneath the existing roadway.
- Excavation of the soil to a depth of approximately 4 feet and an area of approximately 2,200 sf to remove arsenic, cadmium, and lead in the southeastern portion of the Site. A low permeability cap (i.e., realignment of SR 522) with institutional controls would limit exposure to the majority of the contaminated soil.
- Active groundwater remediation is not considered for Alternative 5. Natural attenuation via physical dilution and dispersion would be the primary mechanism for achieving the RAOs at the point of compliance.

Approximately 330 cubic yards or 530 tons of contaminated soil would be excavated with heavy equipment (see Figure 5-1). The contaminated soil would be trucked to the Allied Waste Third and Lander Recycling and Transfer Station. The contaminated soil would then be transported to the Roosevelt Regional Landfill in Klickitat County for final disposal. Confirmation soil sampling would take place on the sidewalls and bottom of the excavations. An estimated eight confirmation soil samples would be collected. The excavated areas would then be backfilled with clean material.

After excavation and backfill, the planned realignment of SR 522 would be constructed over the excavated area. The roadway construction would consist of a minimum of 4 inches of asphaltic concrete paving on top of a minimum of 12 inches of engineered subbase. Institutional controls would be put in place to provide protection from exposure through the use of legal controls that limit access and exposure to the contaminated groundwater in the case of exposure in the area. The necessity for specific institutional controls would be evaluated during remedial design. Groundwater monitoring would be conducted for approximately 10 years to ensure arsenic levels in groundwater do not exceed cleanup standards at the point of compliance. In order to adequately monitor the area, five downgradient wells would be installed and a total of seven wells would be monitored annually for an assumed 10 years. A remediation time frame of 10 years was assumed as a measure to compare each of the applicable alternatives; however, the remediation time frame could vary greatly based on various parameters including actual arsenic concentrations and speciation, subsurface lithology, groundwater flow, and background arsenic concentration.

This proposed cleanup action is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate, complies with cleanup standards, meets the threshold criteria, provides a high likelihood of achieving the RAOs within a reasonable restoration time frame, and meets the additional performance criteria. Furthermore, the risks discussed in Section 2.2.4 are mitigated under the proposed cleanup action because the action either removes the contaminants to levels that are protective to receptors or the action places engineering and administrative controls to prevent exposure.

The comparison of the alternatives in the RI/FS (Parametrix 2009) notes that Alternative 3 more closely matches the evaluation criteria set forth by MTCA; however, based on a disproportional cost analysis, Alternative 5 was the recommended preferred alternative. The incremental degree of benefits of the active groundwater remediation alternatives is minimal compared to Alternative 5 because the restoration time frame is not substantially decreased, the treatment technologies associated with active groundwater treatment may not be able to treat arsenic to cleanup levels, and current off-Site groundwater arsenic levels downgradient from the Site are less than cleanup standards. The risks and potential exposure scenarios for human health and the environment associated with Alternative 5 compared to Alternative 3 are minimal and do not justify a 10-fold cost differential.

5.1 INSTITUTIONAL CONTROLS AND FINANCIAL ASSURANCES

WAC 173-340-360(2)(e) requires cleanup actions to use institutional controls and financial assurances where required under WAC 173-340-440. Institutional controls are actions taken to limit or prohibit activities that may interfere with the integrity of an interim or cleanup action or that may result in exposure of hazardous substances at a site. They are required to ensure the continued protection of human health and the environment and the integrity of an interim action.

The required institutional controls for the proposed cleanup action may include:

- Restrictive covenants that might apply to the use of the land or resources including use of soil and groundwater in the area and digging to a depth where contaminated soil and/or groundwater is encountered;
- Maintenance (e.g., monitoring wells will have to be periodically inspected and repaired when needed);
- Financial assurances (The City may be required to show that they have enough funds to cover all costs associated with the cleanup, including design, construction, monitoring, and any institutional controls); and
- Placement of notices in local zoning or building department records or state lands records, including the use of zoning maps describing land use restrictions.

Specific institutional controls will be determined for the Site during remedial design of the proposed cleanup action.

The institutional controls will be necessary at the Site because the proposed cleanup action will leave in-place soil contaminated with arsenic, barium, cadmium, chromium, lead, silver, and mercury and groundwater contaminated with arsenic and lead above Site cleanup standards.

6. SCHEDULE

The proposed cleanup action is planned to be completed during construction of the realignment of SR 522. The realignment of SR 522 is anticipated to begin during the second quarter of 2010. The removal and disposal of contaminated soil and backfill of the excavated area will be completed within approximately 30 days of the start of construction of the SR 522 realignment in the area.

Long-term groundwater monitoring in the area will be conducted for approximately 10 years after the completion of the SR 522 realignment to verify the soil contamination is not continuing to affect groundwater and cleanup levels for Site contamination are met at the point of compliance.

7. REFERENCES

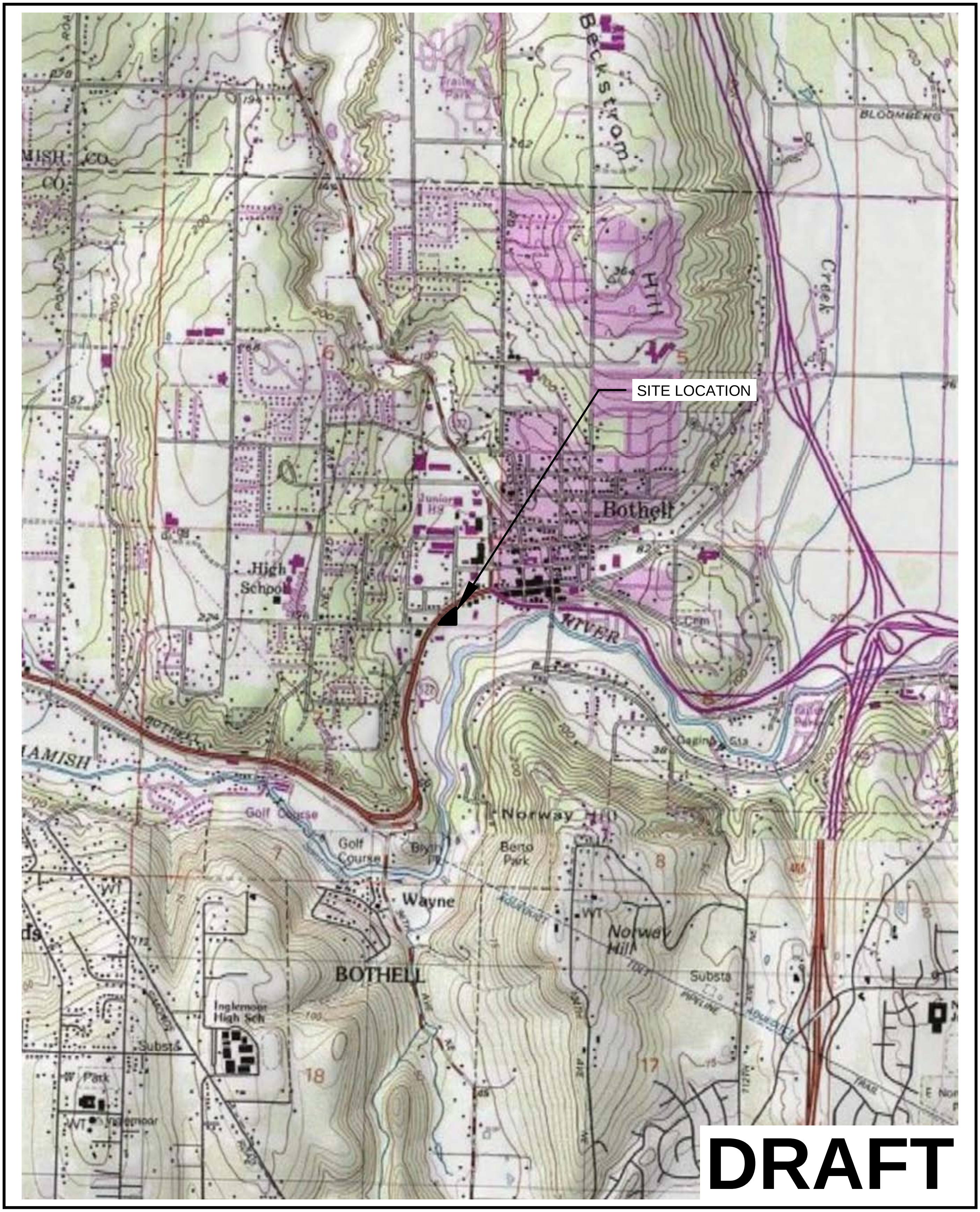
Ecology (Washington State Department of Ecology). 2007. Model Toxics Control Act Cleanup Regulations. Washington Administrative Code (WAC) 173-340. November 2007.

HWA. 2008a. Phase II Environmental Site Assessment, Giannola Parcel/Parcel No. 9457200072, Bothell, Washington. Prepared for City of Bothell. April 30, 2008.

HWA. 2008b. Phase II Environmental Site Assessment, Victory Development Property Parcel No. 9457200081, Bothell, Washington. Prepared for City of Bothell. April 30, 2008.

Parametrix. 2009. Bothell Paint and Decorating Remedial Investigation/Feasibility Study Revision No. 0. Prepared by Parametrix, Bellevue, Washington. November 2009.

FIGURES



Parametrix DATE: Dec 03, 2009 FILE: BR1647019P02T0411_F-01-1 **Image Source: USGS Bothell Quadrangle 1981**

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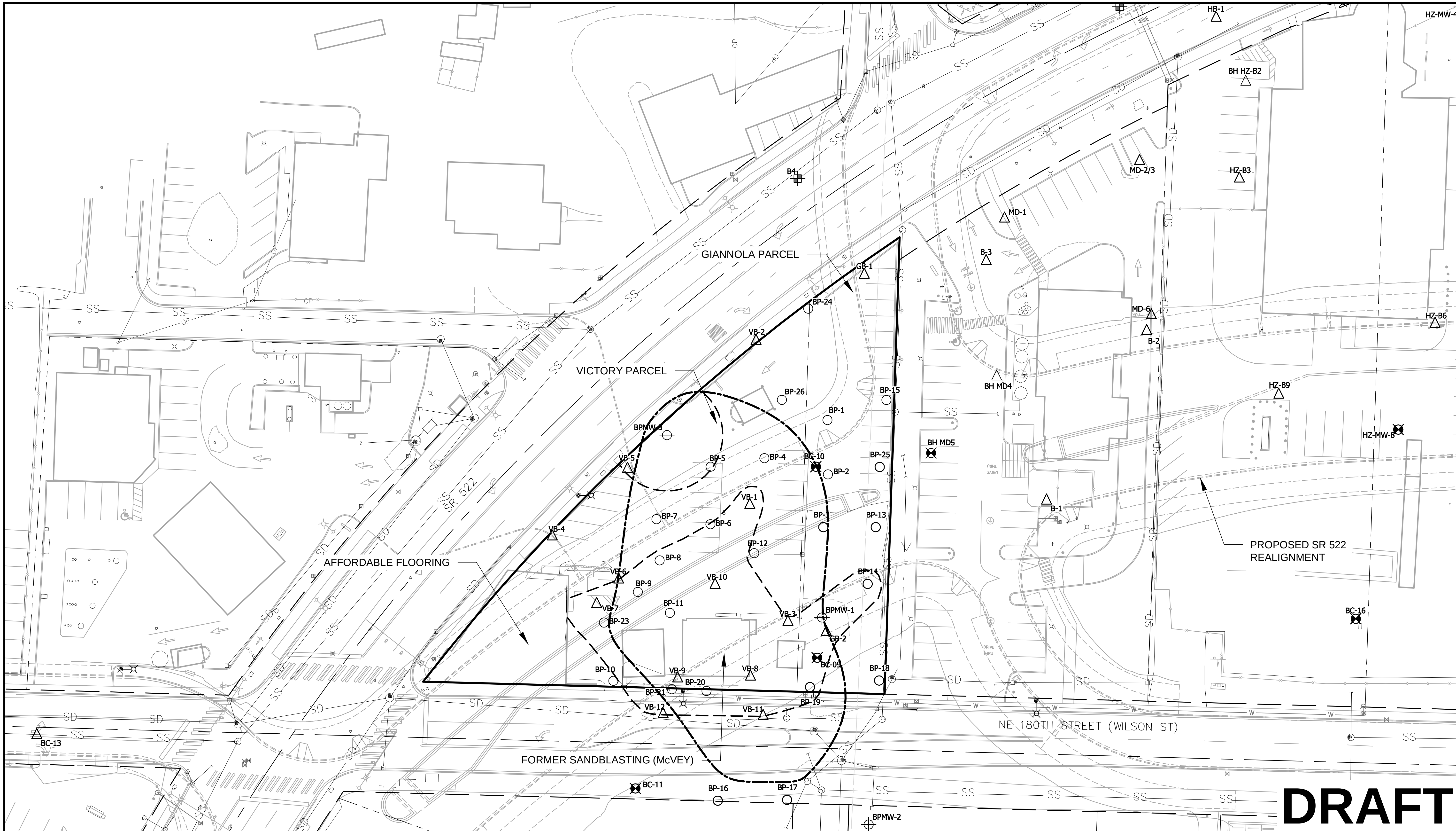
SCALE IN FEET

Figure 1-1
City of Bothell
Bothell Paint & Decorating Site
Site Vicinity



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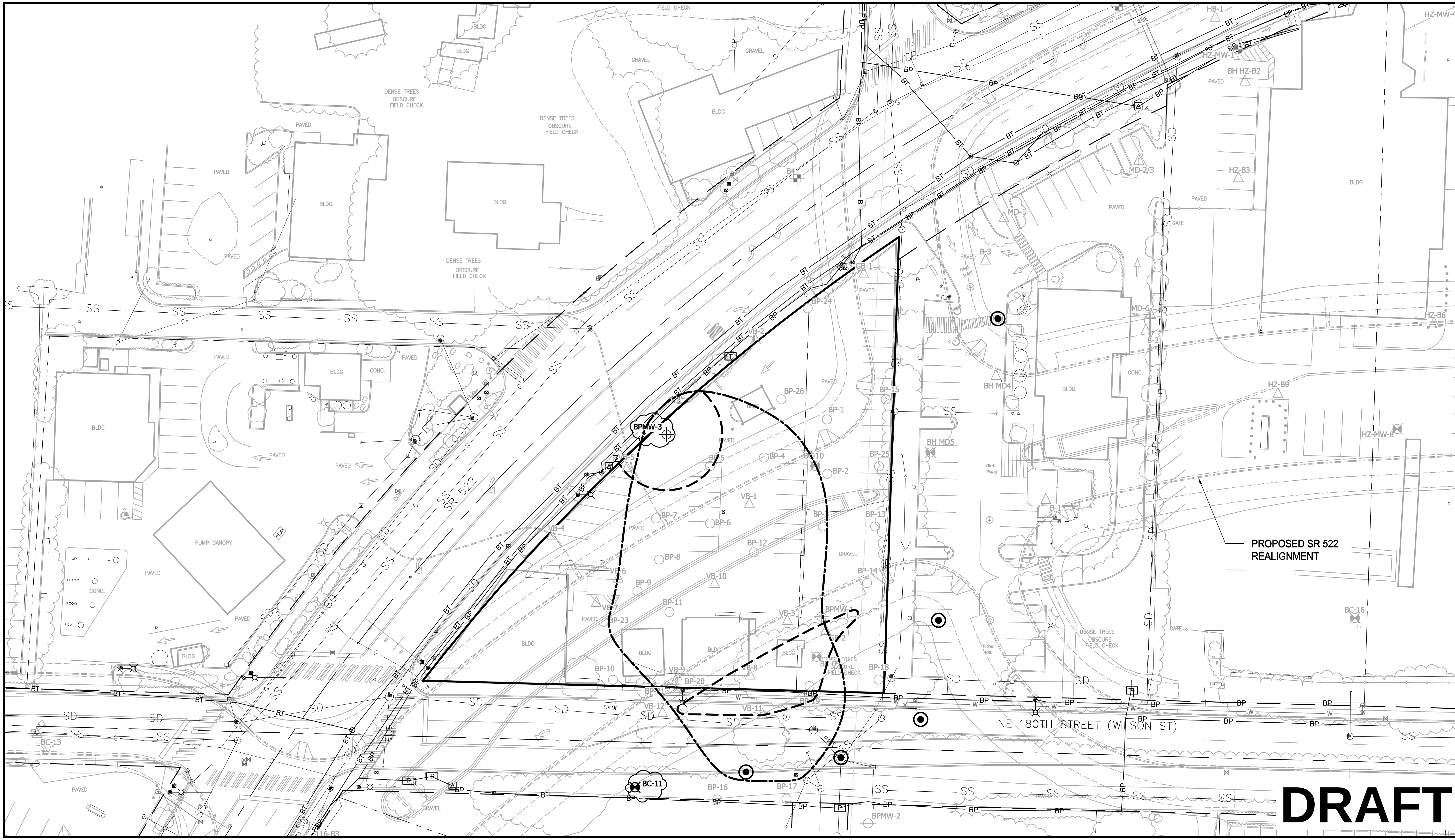
SCALE IN FEET

LEGEND

- △ HWA 2007 PHASE II ESA BORINGS
- HWA 2007 PHASE II ESA WELL LOCATIONS
- ○ PMX 2009 RI/FS BORING LOCATIONS
- EXISTING BUILDING
- PMX 2009 RI/FS WELL LOCATIONS
- CDM 2009 ROW BORING LOCATIONS
- APPROX LIMITS OF CONTAMINATED SOILS
- SITE BOUNDARY
- PARCEL BOUNDARY
- ESTIMATED AREA OF GROUNDWATER CONTAMINATED WITH ARSENIC ABOVE MTCA METHOD A CLEAN UP LEVEL

Figure 2-1
City of Bothell
Bothell Paint & Decorating Site
Site Plan



Parametrix DATE: Dec 08, 2009 FILE: BR1647019P02T0411_F-05-1

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SCALE IN FEET

LEGEND

- PROPOSED NEW MONITORING WELLS
- SITE BOUNDARY
- AREAS OF SOIL REMEDIATION VIA EXCAVATION
- EXISTING MONITORING WELL TO BE USED FOR LONG TERM MONITORING
- ESTIMATED AREA OF GROUNDWATER CONTAMINATED WITH ARSENIC ABOVE MTCA METHOD A CLEAN UP LEVEL

Figure 5-1
City of Bothell
Bothell Paint & Decorating Site
Proposed Cleanup Action

TABLES

Table 3-1. 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 Code of Federal Regulations [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 the 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 area of 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 potentially applicable to the installation, operation, or closure of monitoring and treatment wells at the Site.

Table 3-2. Cleanup levels

	Medium of Concern			
	Soil			Groundwater
Hazardous Substance	**MTCA A (mg/kg)**	**Ecological Indicator Concentration (mg/kg)**	**Background Concentration (mg/kg)**	**MTCA A (mg/L)**
Benzene	0.030	Not Available	None	N/A
Diesel	2,000	200	None	N/A
Motor Oil	2,000	Not Available	None	N/A
Arsenic	20	7	7.30	0.005
Barium	Not Available	102	Not Available	N/A
Cadmium	2	4	0.77	N/A
Chromium	N/A	42	48.15	N/A
Lead	250	50	16.83	0.015
Silver	Not Available	2	Not Available	N/A
Mercury	N/A	0.1	0.07	N/A

N/A – Not Applicable

Table 4-1. Remedial Alternative Permanent Solutions Criteria Summary

Criteria	Remedial Alternatives				
	1. No Action	**2. Chemical Oxidation, Electrokinetic Separation, Low Permeability Cap, and Complexation**	**3. Excavation, Off-site Disposal, and Adsorption**	**4. Excavation, Off-site Disposal, Low Permeability Cap, and Groundwater Extraction**	**5. Excavation, Off-site Disposal, and Low Permeability Cap**
Protectiveness	Low	Medium	High	Medium	Medium
Permanence	Low	Medium	High	Medium	Medium
Cost	$0	$3,200,000	$3,800,000	$2,200,000	$340,000
Long-Term Effectiveness	Low	Low to Medium	High	Medium	Medium
Short-Term Risks	High	Low	Low	Low	Low
Implementability	High	Low	Medium	Medium	Medium
Public Concern	High	Medium	Low	Low	Medium

Table 4-2. Remedial Alternatives Estimated Costs

Criteria	Remedial Alternatives				
	1. No Action	**2. Chemical Oxidation, Electrokinetic Separation, Low Permeability Cap, and Complexation**	**3. Excavation, Off-site Disposal, and Adsorption**	**4. Excavation, Off-site Disposal, Low Permeability Cap, and Groundwater Extraction**	**5. Excavation, Off-site Disposal, and Low Permeability Cap**
Construction Costs	$0	$3,013,100	$2,040,290	$346,768	$217,689
Operation and Maintenance Costs	$0	$190,854	$1,760,559	$1,847,789	$118,854
Total Costs	$0	$3,203,954	$3,800,849	$2,194,557	$336,542

APPENDIX A

Bothell Downtown Subarea Plan (Figure 1.1)

C. The Envisioned Future Downtown

This section provides an overview of the desired physical outcomes intended to result from implementing the combined regulations and planned public actions contained in this Plan.

The Downtown Subarea is composed of a multitude of privately held properties and miles of public rights-of-way under public ownership. The overarching purpose of the Downtown Plan is to orchestrate investment in changes made to this multiplicity of properties to produce greater value than any separate development could achieve, by providing a common purpose that all investors can rely upon, contribute to, and derive value from. This section describes the common purpose to which all investments shall be directed: a vision of the future that is sufficiently specific to provide a common purpose, yet broad enough to respond to opportunities and to the changes in the marketplace that will inevitably arise.

Note: The specific outcomes described and illustrated in this section are not part of the formal regulating code, and new development proposals will not be required to mimic the specific designs presented in the illustrations.

Fig. 1.1 A vision of potential future development in downtown Bothell showing one scenario focusing on redevelopment in the core area