EXHIBIT A.
Cleanup Action Plan

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DRAFT
CLEANUP ACTION PLAN
BSB PROPERTY
KENT, WASHINGTON

APRIL 14, 2008

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BSB B.S.B. Diversified Company, Inc.

CAA Cleanup Action Alternative
CAP Cleanup Action Plan
CLARC Cleanup Levels and Risk Calculation
CMS Corrective Measures System
CAO Cleanup Action Objectives
CSM Conceptual Site Model
CUL Cleanup Level
CVOC Chlorinated Volatile Organic Compound

DCE Dichlorethene
DNAPL Dense Nonaqueous Phase Liquid

Ecology Washington State Department of Ecology
EP Toxicity Extraction Procedure Toxicity Test

FFS Focused Feasibility Study

HWMA Hazardous Waste Management Act
HVOC Halogenated Volatile Organic Compound
Hytek Hytek Finishes Company

IHS Indicator Hazardous Substances

MCL Maximum Contaminant Level
mg/kg milligrams per kilogram (same as parts per million)
mg/L milligrams per liter (same as parts per million)
MRL Method Reporting Limit
MTCA Model Toxics Control Act

NAPL Nonaqueous Phase Liquid
NGVD 29 National Geodetic Vertical Datum of 1929
NPV Net Present Value

O&M Operation & Maintenance

PCB Polychlorinated Biphenyl
PCE Perchloroethene (Tetrachloroethene)
PID Photoionization Detector
POC Point of Compliance
PVC Polyvinyl Chloride

RCRA Resource Conservation and Recovery Act
RI/FS Remedial Investigation/Feasibility Study
RCW Revised Code of Washington

SVOC Semi-volatile Organic Compound

TCA Trichlroethane
TCE Trichloroethene
TSDF Treatment, Storage, Disposal Facility

USEPA United States Environmental Protection Agency

VC Vinyl Chloride
VOC Volatile Organic Compound

WAC Washington Administrative Code

ZVI Zero Valent Iron

µg/L micrograms per liter (same as parts per billion)

1.0 INTRODUCTION

1.1 Purpose

This cleanup action plan (CAP) describes the selected cleanup action for a portion of the Kent Facility Site (Site) located in Kent, Washington see Figure 1, Parcel and Property Diagram. Specifically, this CAP selects a cleanup action for the B.S.B. Diversified Company, Inc. (BSB) property located at 8202 South 200th Street, Kent, Washington (referred to as the Property or Parcel G; see Figure 1), which is a source area of hazardous substances at the Site. The CAP has been developed in accordance with the Model Toxics Control Act (MTCA) under Chapter 70.105D of the Revised Code of Washington (RCW) and Chapter 173-340 of the Washington Administrative Code (WAC). Ecology will make cleanup action decisions for the remainder of the Site through a future CAP.

The selected cleanup action is based on site-specific data provided in the Focused Remedial Investigation Summary/Feasibility Study Report (FRI/FS) (PES Environmental 2008 and 2005) and documents referenced therein. The FRI/FS is on file at the Washington State Department of Ecology's (Ecology) northwest regional office located at 3190 160th Avenue SE, Bellevue, Washington, 98008-5452.

1.2 Document Organization

The work plan is organized into five sections. A brief description of each section is presented below.

- **Section 1 – Introduction.** Section 1 contains an overview of the CAP.
- **Section 2 – Background.** Section 2 provides a summary of the Property description and history, the investigations conducted at the Property, and the cleanup actions previously performed at the Property.
- **Section 3 – Site Conditions.** Section 3 discusses the hydrogeology and groundwater conditions at the Property.
- **Section 4 – Nature and Extent of Contamination.** Section 4 discusses the nature and extent of contamination in Property soil and groundwater.
- **Section 5 – Risks to Human Health and the Environment.** Section 5 outlines contaminant sources, exposure pathways, and receptors to Property contamination.
- **Section 6 – Cleanup Standards.** Section 6 discusses groundwater cleanup levels, points of compliance, and areas exceeding cleanup levels.

- **Section 7 – Summary of Cleanup Action Alternatives Evaluated.** Section 7 briefly presents the three cleanup action alternatives that were evaluated in the feasibility study.

- **Section 8 – Selected Cleanup Action.** Section 8 discusses the selected cleanup action, including the implementation approach and preliminary design considerations.

1.3 Declaration

In accordance with WAC 173-340-360(2)(a), the selected cleanup action meets the threshold requirements, is protective of human health and the environment, complies with applicable state and federal laws, and provide for compliance monitoring. The selected remedy is consistent with the preference of the State of Washington as stated in RCW 70.105D.030(1)(b) for permanent cleanup solutions.

1.4 Applicability

The cleanup standards and the selected cleanup action have been developed as an overall remediation process under Ecology oversight using MTCA authority; they should not be considered as setting precedents for other sites.

1.5 Administrative Record

The documents used to make the decisions discussed in this CAP are part of the administrative record for the Site. The entire administrative record for the Site is available for public review by appointment at Ecology's northwest regional office. To review or obtain copies of the above documents, contact Sally Perkins (Public Disclosure Coordinator) at (425) 649-7190.

2.0 BACKGROUND

2.1 Site Description

The Site includes Parcels A-F and G where Hazardous Substances have been deposited, stored, disposed of, placed, or otherwise come to be located and wherever Hazardous Substances from releases on Parcels A, B, C, D, E, F and G have come to be located. The Hexcel Parcels refer to parcels A, B, C, D, and E, currently owned and controlled by Hexcel Corporation, located at 19819 84th Avenue South in Kent, Washington. Parcel F is currently owned and controlled by Carr Prop II, LLC, located at 8311 South 200th Street. Parcel G refers to the parcel G property currently owned and controlled by BSB, located at 8202 S. 200th Street, Kent, Washington. These parcels are more particularly described in Figure 1, Parcel and Property Diagram, which is a detailed parcel diagram.

Remedial action at the Site has been proceeding on different schedules, with different persons undertaking different remedial actions for different portions of the Site under three separate administrative orders. A Focused Remedial Investigation/Feasibility Study (FRI/FS) has already been completed with respect to the Property, which is a source area of contamination. Similar documents have not yet been completed with respect to the rest of the Site. Ecology has determined that cleanup of the Site will occur in the most expeditious manner if remedy selection for, and cleanup of, the Property moves forward now, rather than waiting until documentation is completed and a remedy is selected for the areas of the Site beyond the Property.

2.2 Property Description

The BSB Property is located in Township 22 North, Range 4 East, Section 1H at a latitude of 47 degrees 25’ 22” North and a longitude of 122 degrees 13’ 51” West. The 4.2-acre Property is currently a fenced, vacant lot that slopes gently to the north. The area surrounding the Property is topographically flat and is zoned “Limited Industrial.” The Property is bounded on the north by South 200th Street and the Hexcel industrial facility. Commercial and industrial park properties are located to the west and south of the Property, and the Carr industrial facility is immediately to the east of the Property.

2.3 Property Ownership History

The Hytek Finishes Company (Hytek), a division of Criton Technologies, operated a metal finishing and electroplating plant at 8202 South 200th Street (now part of the Hexcel Facility). Criton Technologies also had an adjacent composite products manufacturing division named Heath Tecna Aerospace Company at 19819 84th Avenue South (also now part of the Hexcel facility). The Hytek division ceased Treatment, Storage, and Disposal Facility (TSDF) operations regulated under the federal Resource Conservation and Recovery Act (RCRA) and Washington’s Hazardous Waste Management Act (HWMA) in 1985. In 1987, BSB obtained both the Hytek and Heath Tecna Aerospace divisions, including real property described as Parcels A through G (Figure 2). In 1988, BSB sold the Heath Tecna Aerospace division and Parcels A through F to the Phoenix Washington Corporation, a wholly owned subsidiary of Ciba-Geigy. The Phoenix Washington Corporation subsequently changed its name to Heath Tecna Aerospace Company. BSB relocated Hytek’s operations off-site and sold the division in 1989, retaining ownership of Parcel G. By mid 1996, Hexcel had acquired Heath Tecna Aerospace Company, including Parcels A through F, and assumed obligations of Heath Tecna regarding Parcels A through F. Parcel F, located adjacent to Parcel G to the east, was sold by Hexcel in August 2003 to Carr Prop II, LLC.

2.4 Historical Waste Treatment Operations

A variety of industrial and hazardous wastes that were generated on Parcels A through E were formerly treated and stored in a waste treatment area located on Parcel G (Figure 3). The waste treatment area was located in the northeast and southern portions of Parcel G; a parking lot was located in the northwest portion of the parcel. Waste handling reportedly occurred on Parcel G between the mid 1950s, when electroplating operations were begun on the property north of South 200th Street, and 1985, when Hytek TSDF activities ceased.

Wastewater generated on Parcels A through E was transferred to Parcel G through pipes under South 200th Street (Hytek, 1985a). The pipe run entered the northeast corner of Parcel G and discharged into an equalizing lagoon; the discharged wastewater contained metals and inorganics. Approximately 40,000 gallons of wastewater were generated daily in 1981.

The waste treatment area was equipped to batch treat large volumes of dilute wastewater as well as highly concentrated plating baths. Treatment occurred in four 22,000-gallon treatment tanks located to the immediate west of the equalizing lagoon. The processes that were available included reduction/oxidation of chromium, cyanide, and nickel; neutralization of acids; precipitation of heavy metals; and dewatering of metal hydroxide sludges. The treated solution from the tanks was pumped into an unlined sludge settling lagoon (Figure 3); according to Hytek, (1985a), the sludge settling lagoon was used until approximately 1965 when it was filled and paved over. Treated water was then pumped into the sanitary sewer, and the wet sludge was pumped into drying beds located on the southeastern (late 1960s until 1979) or southwestern (1979 through 1985) portions of the property. Approximately 200,000 to 260,000 gallons of sludge were generated yearly.

A drum storage area was formerly located in the central portion of Parcel G. The area was used to store raw materials, store hazardous wastes awaiting shipment to disposal facilities or recyclers, and transfer chemicals. This area was used between the early 1960s and 1979. According to Hytek (1985a), the hazardous materials stored in this area primarily consisted of degreasing and paint stripping chemicals, including methyl ethyl ketone, trichloroethene (TCE), methylene chloride, phenol (in paint strips), hydrofluoric acid, nitric acid, and chromium and lead compounds. Any spills or container leakage that may have taken place in this area would have flowed to an unlined ditch running in an east-west direction near the southern boundary of this area; Hytek (1985a) states that the ditch was located near the fence line along the southern boundary of the northeastern waste treatment area.

2.5 Previous Investigations

In the early 1980s, the United States Environmental Protection Agency (USEPA) initiated investigations at the former Hytek Finishes Facility and Heath Tecna Aerospace Company properties. BSB conducted a series of investigations in subsequent years both on and off the BSB Property. The investigations on the Property (see Figure 4) included the following:

- Drilling 112 temporary borings;
- Installing 28 wells or piezometers, with subsequent abandonment of 10 of them;
- Analysis of 23 soil gas samples for volatile organic compounds (VOCs);
- Chemical analysis of 8 sludge samples, 1 effluent sample, 218 soil samples, and over 700 groundwater samples;
- Physical parameter analysis of 19 soil samples;
- Measurement of over 2,000 groundwater levels; and
- Field hydraulic conductivity testing at 14 locations.

The investigations off the Property (both upgradient and downgradient) included the following:

- Drilling 35 temporary borings;
- Installing 47 wells or piezometers, with subsequent abandonment of 6 of them;
- Analysis of 45 soil gas samples for VOCs;
- Chemical analysis of 10 soil samples and over 1,200 groundwater samples;
- Physical parameter analysis of 1 soil sample;
- Measurement of over 5,000 groundwater levels; and
- Field hydraulic conductivity testing at 24 locations.

These investigations are summarized in Table 1.

2.6 Property Remediation

Soil and groundwater cleanup actions have been conducted at the Property as part of RCRA and HWMA closure activities in the late 1980s and early 1990s. These cleanup actions have included:

- Removal and closure of solid and hazardous waste management units;
- Removal of contaminated solids from the former sludge settling lagoon and the former equalizing lagoon;
- Excavation of approximately 2,000 cubic yards of contaminated soil from the primary source area on the Property;
- Consolidation, stabilization, and isolation of dangerous waste solids in the former sludge drying beds;
- Capping of potentially impacted portions of the Property; and
- Installation and operation of a groundwater extraction and treatment corrective measures system (CMS).

Since August 1992, the CMS has removed groundwater contaminated with halogenated VOCs (HVOCs) beneath the former Hytek Finishes and Heath Tecna Aerospace Company Facilities. The CMS includes six groundwater recovery wells, an automated control system that monitors water levels and flow rates and controls pumping rates, a treatment system, and piping allowing discharge to the publicly-owned treatment works. Two of the recovery wells (HYR-1 and HYR-2) are located on the BSB property, and four of the recovery wells (CG-1 through CG-4) are located on the Heath Tecna/Hexcel property. Recovered groundwater, which was treated prior to disposal until 1995, is currently piped to the King County sewer treatment system. The system was separated by location of the recovery wells in April 2006, with BSB taking responsibility for HYR-1 and HYR-2, and Hexcel taking responsibility for CG-1 through CG-4.

As a result of these cleanup actions, conditions at the Property have stabilized, contaminated soil and waste has been treated and/or removed from the Property, over 10,000 pounds of VOCs have been removed and treated by operation of the existing CMS, and the potential risks to human health and the environment have been reduced and controlled. The CMS is designed to control off-Property migration of VOCs. Other potential Property exposures are also being controlled through a combination of engineering and institutional controls. However, residual VOC concentrations in groundwater and potential nonaqueous phase liquid (NAPL) may remain in the primary source area of the Property.

3.0 SITE CONDITIONS

3.1 Environmental Setting

The BSB Property lies in the Duwamish Valley between the Covington Plain on the east and the Des Moines Plain on the west. The Duwamish Valley is in the Duwamish-Green River Watershed, where major surface water bodies include the Green River, the Black River, the Duwamish River, Mill Creek, and Springbrook Creek. The closest surface water body to the Property is a ditch located about 2,000 feet northeast of the Property (Figure 1).

The Duwamish Valley is filled with over 300 feet of Quaternary alluvium interbedded with marine sand deposited after the last glaciation. Groundwater is found at shallow depths throughout the valley, with groundwater elevations in deeper wells generally higher than in shallower wells. Although 20 likely existing water supply wells were found within a 1-mile radius of the Property, none are downgradient of the Property, all but one are located east of Highway 167, and none are likely completed in the same hydrogeologic unit as the units investigated and monitored at the Property.

3.2 Hydrogeology

Figure 5 presents a typical cross section across the Property (location shown on Figure 4). Five hydrostratigraphic units (labeled by letter from shallowest to deepest) have been identified at the Property: two aquifers (referred to as Layers B and D) and three low-permeability zones (referred to as Layers A, C, and E/F). Layers A, C, E, and F are fine grained and exhibit low permeability. Layers B and D are composed of relatively high permeability sand.

Layer A. The uppermost portion of this unit is unsaturated or only seasonally saturated. The unit is laterally continuous and likely serves as a barrier to downward groundwater movement.

Layer B. The entire thickness of Layer B is saturated, and the Layer B sand forms the shallow aquifer at the Property. An intermediate silt largely divides Layer B into two subunits. For the purpose of assessing groundwater flow and the nature and extent of contamination, Layer B has historically been divided into two aquifer zones. The shallow aquifer zone is defined as the upper portion of Layer B, above the intermediate silt, and the intermediate aquifer zone is defined as the lower portion of Layer B, below the intermediate silt. Wells or piezometers at the Property monitor the shallow and/or intermediate aquifer zones. Both extraction wells at the Property intercept the shallow aquifer zone and upper portion of the intermediate aquifer zone.

Layer C. The silt of Layer C was encountered throughout the Property. This unit serves as an aquitard to vertical groundwater flow and a restriction to the vertical transport of contaminants at the Property. No wells or piezometers at the Property are screened in Layer C.

Layers D and E. The saturated sand of Layer D and transitional Layer E form the deeper aquifer at the Property, historically referred to as the deep aquifer zone. Although no aquifer tests have been conducted in the Layer D and E sand, it is likely that the horizontal hydraulic conductivity of the Layer D and E sand is similar to Layer B. Parcel G monitoring wells or piezometers monitor the deep aquifer zone.

Layers E and F. Similar to the Layer C silt, the silt and clay of transitional Layer E and Layer F serve as an aquitard to vertical groundwater flow and a restriction to the vertical transport of contaminants at the Property.

3.3 <u>Groundwater</u>

3.3.1 Occurrence

Depth to groundwater at the Property has varied from approximately 2 to 12 feet below grade, and groundwater elevations at the Property have varied from approximately 11 to 21 feet (relative to the National Geodetic Vertical Datum of 1929 [NGVD 29]) in wells screened in Layers A and B, and from approximately 14 to 21 feet in wells screened in Layers D and E. In well clusters, the Layer D potentiometric heads were generally higher than the Layer B potentiometric heads. Downward vertical gradients across Layer C occurred periodically during winter and spring recharge. Groundwater elevations have varied up to approximately 6.5 feet seasonally in wells completed in Layers A and B and up to approximately 5 feet seasonally in wells completed in Layers D and E. Groundwater elevations were highest winter to spring and lowest in the fall, lagging approximately 2 to 4 months behind precipitation.

3.3.2 Aquifer Properties

Horizontal hydraulic conductivities determined from a short-term pumping test in HYR-1 ranged from 43 to 56 feet/day (1.51×10^{-2} to 1.96×10^{-2} cm/sec). No aquifer tests were conducted in Layer D at the Property, but one conducted in a deep well on the Hexcel property yielded horizontal hydraulic conductivity results of 57 to 85 feet/day (2×10^{-2} to 3×10^{-2} cm/sec). The vertical hydraulic conductivities of the Layer B intermediate silt samples were 6.9×10^{-7} and 3.5×10^{-6} cm/sec, respectively, and the vertical hydraulic conductivities of the Layer C silt samples were 1.3×10^{-7} to 2.6×10^{-7} cm/sec. The vertical hydraulic conductivity of a Layer F soil sample collected east of 84th Avenue South was 3.6×10^{-7} cm/sec.

3.3.3 Flow Direction and Velocity

Figure 6 presents a groundwater potentiometric surface contour map in the shallow aquifer zone for October 2003. This contour map, which includes off-Property wells and piezometers to provide areal context, is typical of those generated using data collected during periods of groundwater extraction. Groundwater flow in the shallow, intermediate, and deep aquifer zones is generally toward the northeast, with the contours showing groundwater capture by the extraction wells. Groundwater recharge likely occurs by precipitation and surface water (drainage ditches) infiltration in significant unpaved areas to the southwest of the Property. Groundwater discharge likely occurs to the 196th East Valley Highway Drainage Ditch, the closest reach of which is located about 2,000 feet northeast of the Property. A north-northeast to northeast flow direction was indicated by historical data collected before the groundwater extraction system was installed, with seasonal variations within a 20- to 30-degree range.

Using average horizontal hydraulic gradients, a typical effective porosity, and a range in horizontal hydraulic conductivities, the horizontal groundwater flow rate in the shallow, intermediate, and deep aquifer zones varied from 135 to 175, 115 to150, and 110 to 165 feet per year, respectively. Based on mean upward gradients, a conservative effective porosity, and a range in vertical hydraulic conductivities, the estimated upward groundwater flow rate across Layer C beneath the Property was 0.4 to 12 feet per 100 years.

4.0 NATURE AND EXTENT OF CONTAMINATION

4.1 Soil

4.1.1 Inorganic Constituents

Arsenic, chromium, and lead were not detected in the Extraction Procedure Toxicity Test (EP Toxicity) analyses of confirmation samples collected during closure of the equalizing and settling lagoons, and the southwestern drying beds. Copper, nickel, and zinc were not detected in the EP Toxicity analyses of confirmation samples from the southwestern drying beds. EP Toxicity cadmium was only detected (0.53 mg/L) in one drying bed confirmation sample, and EP Toxicity copper was only detected in two (0.2 and 1.0 mg/L) lagoon samples. EP Toxicity cadmium, nickel, and zinc were detected at low levels in most lagoon confirmation samples, ranging from 0.01 to 2.5 mg/L, 0.2 to 0.8 mg/L, and 0.1 to 0.2 mg/L, respectively.

4.1.2 Organic Constituents

Total chlorinated VOCs (CVOCs) detected in soil samples collected above the water table in the former drum storage area ranged from less than the laboratory Method Reporting Limit (MRL) to 111.6 mg/kg. Twelve VOCs were detected in at least one of the confirmation soil samples collected above the water table in the former drum storage area after excavation and off-Property disposal of soil, with TCE (0.1 to 130 mg/kg), cis-1,2-DCE (0.1 to 36 mg/kg), vinyl chloride (0.1 to 2 mg/kg), and methylene chloride (0.1 to 0.4 mg/kg) the compounds detected the most frequently.

The highest VOC concentrations and most frequent VOC detections in soil samples collected above and below the water table were in borings located in the former drum storage area and along the former ditch. TCE (0.002 to 2,000 mg/kg), trichlroethane (TCA) (0.002 to 61 mg/kg), trans-1,2-DCE (0.011 to 21 mg/kg), vinyl chloride (0.012 to 3.7 mg/kg), methylene chloride (0.012 to 0.084 mg/kg), toluene (0.010 to 60 mg/kg), and total xylenes (0.10 to 40 kg/kg) were detected the most often. Locations with few and relatively low-concentration VOC detections included the small drying bed north of the southwestern drying bed, the southwestern and southeastern drying beds, the east end of the former ditch, and the area north of the former waste handling facility.

Figure 7 presents total VOC isoconcentration contours in soil in both the upper and lower portions of Layer B that were generated during the 2000 Property source area investigation. The primary VOCs found during the source area investigation were TCE, cis-1,2-DCE, and vinyl chloride. Consistent with the previous soil sampling, the extent of contamination was centered around the location of the former drum storage area. Total VOC concentrations above 10 mg/kg were found between depths of 17 and 34 feet below grade, with maximum VOC concentrations typically located within or directly above the confining layers (i.e., intermediate silt layer in Layer B and the top of Layer C). The maximum total VOC concentration in the depth range of the intermediate silt was 329 mg/kg at a depth of 20 feet in SP-9, and the maximum total VOC concentration at the base of Layer B was 600 mg/kg at a depth of 34 feet in SP-11. Although these soil sampling investigations included monitoring for Dense Nonaqueous Phase Liquid (DNAPL), none was observed. While the Photoionization Detector (PID) readings measured during drilling were helpful in identifying soil samples for laboratory analysis, their inconsistent correlation with laboratory VOC results made them far less useful in identifying potential DNAPL zones. The highest soil laboratory VOC results indicate the potential presence of DNAPL, and the concentrations of TCE in groundwater are consistent with the likely presence of DNAPL.

4.2 <u>Groundwater</u>

This section provides a discussion of groundwater quality in monitoring wells installed within the boundaries of the Property and immediately north of the Property (between the Property and South 200th Street). Off-Property results are discussed when necessary to provide clarity to the results from investigations conducted at the Property.

4.2.1 Metals

In general, metals were either infrequently detected or detected at low concentrations in groundwater from Property wells. The results were low enough that only arsenic was considered in the development of indicator hazardous substances in Section 6.1.1.1. A brief discussion of the metals results follows.

Dissolved arsenic was infrequently detected in groundwater samples from shallow wells HYCP-3s, HYCP-5, and HYCP-6, but dissolved arsenic was frequently detected in groundwater samples from shallow wells HY-1s, HYCP-2, HYCP-4, and HYO-2. Detections ranged from the MRL of 5 µg/L to 34 µg/L, with the higher detections in HYCP-2 and HYCP-4. These detected concentrations were similar to those in upgradient shallow well HY-11s, where dissolved arsenic was frequently detected at concentrations ranging from 5 to 37 µg/L. Dissolved arsenic was not detected in intermediate wells HY-1i, HYCP-1i, and upgradient intermediate well HY-11i, but dissolved arsenic was frequently detected in intermediate well HYCP-3i at concentrations ranging from 6 to 19 µg/L. In the deep aquifer zone, dissolved arsenic was infrequently detected in HYCP-1d and frequently detected in upgradient well HY-11d. Detections ranged from 5 to

10 µg/L. The relatively uniform spread of arsenic results from upgradient to downgradient across the Property and the generally decreasing arsenic concentrations with depth indicate that the source of arsenic is shallow and either area-wide or upgradient of the Property. It should be noted that the Property is located in an area likely affected by the former Tacoma metals smelter that processed high-arsenic ore (Area-Wide Soil Contamination Task Force, 2003). Table 2 provides the dissolved arsenic data generated during groundwater sampling between 1999 and 2003.

Dissolved barium was detected in all but one HYCP-2, HYCP-5, and HY-1d samples, ranging from 7 to 32 µg/L. Dissolved cadmium was only detected in one HY-1s sample just above the MRL. Dissolved trivalent chromium was detected in one HY-1s sample near the MRL, and dissolved trivalent and hexavalent chromium, not detected in HYCP-2 and only detected once in HY-1s, was detected in all HYCP-5 and HY-1d samples, varying from 7.8 to 18 µg/L. Dissolved copper, largely undetected in HYCP-2 and HYCP-5, was detected in both of the HY-1d samples and some of the HY-1s samples; copper detections ranged from 2 to 26 µg/L. Dissolved nickel was not detected in HY-1s, HYCP-2, or HY-1d. HYCP-5 dissolved nickel concentrations varied from 48 to 114 µg/L. Dissolved zinc, infrequently detected in HYCP-2 and HYCP-5 but detected in all analyzed HY-1s and HY-1d samples, ranged from 2 to 120 µg/L. Dissolved antimony, beryllium, hexavalent chromium, lead, mercury, selenium, and silver were not detected in the HY-1s samples analyzed for those constituents.

4.2.2 Organic Constituents

No Polychlorinated Biphenyls (PCBs) or pesticides were detected in the groundwater samples analyzed, and only two Semi-volatile Organic Compounds (SVOCs) were detected at low concentrations in the analyzed groundwater samples.

VOCs in Direct-Push Borings. Fifteen VOCs were detected in groundwater samples collected from the direct-push borings drilled at the Property (sampled in the shallow and intermediate aquifer zones) in 1999 and 2000. The constituents with the highest detections were TCE, cis-1,2-DCE, and vinyl chloride; the detected concentrations were similar to those in monitoring well samples. The highest concentrations of VOCs were in borings located near and downgradient of the former drum storage area (GP-1b, GP-2b, GP-13b, and SP-12B), two borings at the north end of the former southeastern drying bed (SP-13 and SP-24), and four borings located near the western (upgradient) boundary of the Property (SP-15, SP-17, SP-18, and SP-21).

VOCs in Monitoring Wells. Since sampling of the wells began in the mid-1980s, 14 VOCs have been detected routinely during at least part of the sampling history. A summary of these VOC results for groundwater samples collected from the Property monitoring wells between 1999 and 2003 is presented in Table 2. TCE, cis-1,2-DCE, and vinyl chloride were detected at the highest concentrations and were the most frequently detected compounds. Groundwater VOC concentrations have decreased at the Property since implementation of the groundwater extraction system in August 1992.

Of less importance, a number of other constituents were detected between 1999 and 2003. Perchloroethene (Tetrachloroethene (PCE)) and 1,1-DCA were detected at least once in upgradient shallow well HY-11s, toluene was detected twice in upgradient intermediate well HY-11i, and vinyl chloride, 1,1-DCA, and toluene were detected at least once in upgradient deep well HY-11d. Except for one toluene detection in HY-11d (11 µg/L), the upgradient VOC detections were below 1 µg/L. Other VOCs that have been detected infrequently and at low concentrations in the Property monitoring wells have included acetone, chloroethane, carbon disulfide, chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, and 1,4-dichlorobenzene. Two of these (acetone and carbon disulfide) are chemicals used in analytical laboratories and may represent laboratory contamination of the samples.

4.2.3 VOC Time Trends

Shallow and Intermediate Monitoring Wells. TCE, cis- and trans-1,2-DCE, and vinyl chloride concentrations have varied in each well over time, with much of the shorter-term variation likely due to seasonal changes. VOC concentrations in Layer B (shallow and intermediate aquifer zone) monitoring wells have decreased significantly since activation of the groundwater recovery system in August 1992. VOC concentrations in wells located near the former drum storage area (HYCP-3s, HYCP-3i, and HYCP-4) have fluctuated the most with less significant longer-term VOC concentration declines than those apparent in Layer B monitoring wells installed further from the former drum storage area (HYCP-1i, HYCP-2, HYCP-5, HYCP-6, HYO-2, and Ls).

Deep Monitoring Wells. No TCE, cis- and trans-1,2-DCE, and vinyl chloride concentration time trends are apparent in HY-1d due to the infrequent detections. Though low in concentration, TCE, cis- and trans-1,2-DCE, and vinyl chloride concentrations in Ld have trended downward since activation of the groundwater recovery system. HYCP-1d vinyl chloride concentrations and, to a lesser degree cis- and trans-1,2-DCE concentrations, trended upward after 1996. These VOC detections were relatively low, but with the presence of the Layer C aquitard and the presence of higher hydraulic heads in Layer D than in Layer B, the increasing VOC trends in HYCP-1d were unexpected. HYCP-1d was installed in the same boring as HYCP-1i, and it was likely that the increasing VOC concentrations in HYCP-1d were due to downward groundwater flow through a leaking well seal induced during groundwater purging and sampling of HYCP-1d. BSB abandoned the HYCP-1i and HYCP-1d well pair well in January 2008 and replaced the pair with additional wells to verify the VOC concentrations in the deep aquifer immediately north of the Property. BSB is monitoring the new wells per an approved work plan under Agreed Order No. DE 2551. The results of this investigation will be evaluated to determine if any additional cleanup actions are needed to address the deep aquifer. Regardless of whether further cleanup actions related to the deep aquifer are needed, Ecology has determined that the cleanup actions outlined in this CAP are now necessary and appropriate to undertake.

4.2.4 Spatial Distribution of VOCs

VOC concentrations were typically higher in the groundwater samples collected from the upper portion of Layer B (i.e., above the intermediate silt layer) compared to groundwater samples collected from the lower portion of Layer B. The intermediate silt layer appears to have been effective in mitigating VOC migration into the lower portion of Layer B. At four locations

(GP-1, GP-13, GP-14, and the HYCP-3 groundwater monitoring well pair), however, groundwater VOC concentrations were higher in the lower portion of Layer B.

The horizontal distributions of TCE, cis-1,2-DCE, and vinyl chloride beneath the Property, the Hexcel Corporation property, and the Carr property are presented in isoconcentration contour maps for TCE, cis-1,2-DCE, and vinyl chloride prepared using the 2003 data (Figures 8, 9, and 10).

Groundwater impacted with VOCs at the Property originates primarily near the former drum storage area and adjacent ditch. Although groundwater analytical results from some borings (e.g., SP-18, SP-21, SP-30) installed upgradient of the former drum storage area and downgradient of the former sludge drying beds indicated elevated levels of cis-1,2-DCE, minimal levels of TCE were detected. Because much higher levels of TCE and cis-1,2-DCE have been detected within and near the former drum storage area (e.g., HYCP-3i, SP-12b) than have been detected at the downgradient edge of the former sludge lagoons (SP-19, SP-20, and SP-22), the investigation results indicate that the predominant source at the Property is located in the former drum storage area, not in the former sludge drying beds.

Another source of comparatively low-level VOCs in groundwater beneath the Property appears to be from a location to the southwest of the Property. Monitoring wells HY-1s and HY-1i, located cross-gradient of the former drum storage area, have had consistent detections of VOCs since installation with significant increases in VOC concentrations after activation of the groundwater recovery system. Groundwater samples collected from direct-push borings SP-15, SP-16, SP-17, SP-18, SP-19, and SP-21, located upgradient or cross-gradient of the former drum storage area, also contained elevated concentrations of cis-1,2-DCE or vinyl chloride.

The VOC plume extends from the former drum storage area to the northeast, in the direction of local groundwater flow. The maximum extent of the VOC plume is depicted in the vinyl chloride plot (Figure 10). The plume currently covers the northern half of the Property, the northwest corner of the Carr Property, and the southeastern portion of the Hexcel property. Groundwater recovery at HYR-1, HYR-2, CG-1, CG-2, CG-3, and CG-4, has resulted over time in a slightly smaller VOC plume footprint with considerably lower VOC concentrations in the plume. The continued presence of cis-1,2-DCE and vinyl chloride beyond the northern boundary of the Property (where groundwater is captured by recovery wells HYR-1 and HYR-2) is likely due to (1) dissolution or desorption into groundwater of secondary or residual source material north of the Property, (2) undiscovered sources near the former Hytek building, and/or (3) an off-Property VOC source southwest of the Property.

4.2.5 DNAPL

Direct-push drilling, continuous coring, visual examination of soil samples, PID screening of soil cores, and laboratory VOC analysis of soil and groundwater samples were used at the Property to try to identify the presence of DNAPL. DNAPL was not observed during drilling at the Property, but the highest soil laboratory VOC results indicate the potential presence of DNAPL. Similarly, DNAPL has not been observed in any monitoring well at the Property; however, two lines of indirect evidence indicate that DNAPL is likely present in or near the former drum storage area:

- **Groundwater VOC concentrations.** A common indicator for the potential presence of DNAPL upgradient of the area monitored is VOC concentrations greater than 1 percent of the water solubility of the DNAPL component of interest. The highest concentration of TCE in the 1999 through 2003 data set was 76,000 µg/L (HYCP-3i, April 2002), which is 7 percent of the solubility limit of TCE in water (1,100 mg/L); and

- **Persistence of contamination.** Contamination persistent at a location may be indicative of DNAPL upgradient of the location. TCE concentrations in recovery well HYR-1 have been fairly consistent for the last 9 years, indicating the likelihood of an upgradient DNAPL source.

5.0 RISKS TO HUMAN HEALTH AND THE ENVIRONMENT

5.1 Contaminant Sources and Migration Mechanisms

Based on historical waste treatment operations at the Property and the distribution of contaminants at the Property, it appears that the VOCs in the subsurface were sourced primarily by releases in the former drum storage area. The data also suggest contribution from a source upgradient of the Property. Possible release mechanisms in the former drum storage area include spillage during product transfer, leaks from product drums, and surface spillage of raw products washed into the former ditch at the southern edge of the former drum storage area.

Potential migration of contaminants in unsaturated soil is considered very limited due to the age of the releases, the presence of surface pavement, and the thin unsaturated zone. Pure-phase migration in the unsaturated zone is not considered an active migration pathway due to the age of the releases, contaminant leaching from the unsaturated zone to groundwater is not considered a significant migration pathway due to the presence of the surface pavement, and vapor transport by diffusion through the unsaturated zone is likely limited due to the thin unsaturated zone.

Elevated groundwater VOC concentrations and the persistence of VOC contamination at the Property indicate that DNAPL is likely present in or near the former Property drum storage area. The probable presence of DNAPL coupled with the difficulty of finding it with wells and borings suggests that it occurs at the Property primarily as disseminated residuals, blobs, and ganglia rather than extensive pooled accumulations. Given the age of the releases, the DNAPL source zone is likely stable, and the current active migration mechanism in saturated soil and groundwater is groundwater flow through the DNAPL source zone with subsequent transport of contaminants by groundwater to the groundwater recovery system.

5.2 Exposure Pathways and Receptors

Figure 11 presents the conceptual site model (CSM), which is based on the current and future industrial land use, the results of the water supply well search, the soil and groundwater sampling results, and the active and potentially active fate and transport mechanisms.

5.2.1 Soil

Currently, the vast majority of the Property is covered by asphalt pavement, an asphalt concrete cap, or concrete foundations. Property characterization data and confirmation soil sampling data indicate that VOCs are present in unsaturated and saturated soil in and around the former drum storage area. The potential future exposure pathways and receptors for contaminants in soil are the following:

- Exposure to site workers through direct contact with, ingestion of, or inhalation of vapors emanating from contaminated soil during Property maintenance or construction activities that disturb the existing structures or pavement (i.e., soil excavation); and

- Exposure to indoor workers in a future Property occupational setting through inhalation of vapors originating from contaminated soil and migrating up through a future building floor. This is not a current pathway because there are no structures on the Property. However, there is a potential that future Property development could include commercial or industrial buildings.

There is the potential for exposure to site workers or off-Property residents/workers through consumption of contaminants that may leach from soil to groundwater. This is currently an incomplete pathway because (1) leaching is limited by the presence of the asphalt cap, (2) migration of contaminated Property groundwater is controlled by the Property groundwater recovery system, and (3) there are currently no groundwater supply wells located within the extent of the plume or within 1-mile downgradient of the Property. Furthermore, future cleanup actions will all include maintenance of (or improvements to) the existing cap. As a result, this is not considered a significant future exposure pathway.

Because the residual contaminated soil is located entirely beneath pavement, there is no potential for exposure to terrestrial ecological receptors. Furthermore, the Property qualifies for an exclusion from a terrestrial ecological evaluation in accordance with the requirements of WAC 173-340-7491(c). Specifically, there is no area of contiguous undeveloped land on the Property or within 500 feet of the contaminated soil (requirement is less than 1.5 acres), and the Property does not contain any of the hazardous substances of concern listed in WAC 173-340-7491(1)(c)(ii). As a result, this is not considered a significant future exposure pathway.

5.2.2 Groundwater

Property groundwater is currently captured and extracted by two groundwater recovery wells (HYR-1 and HYR-2). Local groundwater flow outside of the Property capture zone flows to the northeast. Some of this groundwater is currently captured by the CG extraction wells located along 84th Avenue South on the Hexcel parcels. The remainder of the groundwater not captured by the CG extraction wells continues flowing northeast, eventually discharging into the 196th East Valley Highway Drainage Ditch, approximately 2,000 feet northeast of the Property.

Groundwater contamination in areas of the Site downgradient of the Property (e.g., on the Hexcel property) is being addressed through separate investigation and cleanup activities and is not addressed in this CAP.

5.2.2.1 Potential Groundwater Ingestion Exposure Pathways

Twenty water supply wells may be located within a 1-mile radius of the Property. However, none of the potential water supply wells are located closer than 2,000 feet of the Property; none are reported to be between the Property and the 196th East Valley Highway Drainage Ditch, the local point of discharge for downgradient groundwater; and all are completed either at significantly greater depths than the deepest impacts at the Property or at significantly higher elevations (beneath the Covington Plain) than the Property impacts. Residences and businesses in the Kent valley adjacent to the Property are serviced by public water districts, so there is a low probability that groundwater in an aquifer hydraulically connected to the shallow aquifer at the Property will be used for water supply in the future.

King County's Groundwater Protection Program 2002 Annual Report indicates that arsenic is present at naturally elevated concentrations in the glacial and bedrock aquifers that feed the alluvial aquifer in the vicinity of the Property. Furthermore, background monitoring well HY-11s, which represents background for the Property, contains dissolved arsenic at concentrations of up to 37 µg/L. Background arsenic levels are therefore above the drinking water standard (Maximum Contaminant Level (MCL)) of 10 µg/L and orders of magnitude higher than the MTCA Method B groundwater cleanup level of 0.0583 µg/L.

Regardless, unless in the future the groundwater beneath the Property and between the Property and the 196th East Valley Highway Drainage Ditch is determined by Ecology to be nonpotable, the groundwater at the Site is considered potable and the potential groundwater ingestion pathway must be considered by Ecology. WAC 173-340-720(1), (2). If a determination of nonpotability is made in the future, then cleanup levels based on the protection of drinking water beneficial uses will no longer apply.

5.2.2.2 Potential Groundwater to Indoor Air Exposure Pathway

Indoor workers in a future Property occupational setting could potentially be exposed through inhalation of vapors originating from contaminated groundwater and migrating up through the soil and a building floor. This is not a current pathway because there are no structures on the Property. However, there is a potential that future Property development could include commercial or industrial buildings. Therefore, this is a potential future pathway.

5.2.2.3 Potential Groundwater to Surface Water Exposure Pathway

Groundwater downgradient of the Hexcel property (across 84th Avenue South) has been the subject of an ongoing groundwater investigation being conducted jointly by BSB and Hexcel in accordance with a separate agreed order. Based on the available information, the low VOC concentrations in the wells located east of 84th Avenue South, the presence of active containment systems at the Hexcel and BSB properties, and the distance to the drainage ditch indicate that the ditch is not likely a current receptor. In the absence of ongoing containment at the Property and at the Hexcel parcels, however, VOCs would have the potential to migrate to the ditch and enter surface water. Therefore, this is a potential future exposure pathway.

Possible receptors associated with the potential future surface water exposure pathway include humans through consumption of aquatic organisms and through consumption of surface water (i.e., drinking water scenario). As noted above, residences and businesses in the Kent valley adjacent to the Property are serviced by public water districts, so the probability is extremely low that surface water from the drainage ditch would be used as a drinking water source. There is the small potential, however, that persons may attempt to catch fish from the ditch and consume these fish. In addition to the potential human exposures considered above, aquatic organisms that may use the 196th East Valley Highway Drainage Ditch as habitat also have the potential to be exposed to VOCs in the future if remedial action is not undertaken.

5.2.2.4 Summary of Groundwater Exposure Pathways

Summarizing the above discussion, the potential future exposure pathways and receptors for contaminants in groundwater associated with the Property are the following:

- Potential exposure, if drinking water wells are installed, to drinking water users through ingestion of groundwater;
- Potential exposure to recreational (fishing) users of the surface water (i.e., the 196th East Valley Highway Drainage Ditch) through consumption of aquatic organisms;
- Potential exposure of aquatic organisms in surface water (i.e., the 196th East Valley Highway Drainage Ditch) via direct contact; and
- Potential exposure to indoor workers in a Property occupational setting through inhalation of vapors originating from contaminated shallow groundwater that may migrate up through a future building floor.

6.0 CLEANUP STANDARDS

6.1 Groundwater Cleanup Levels

MTCA-defined cleanup standards (WAC 173-340-700(2)) are composed of three separate components: cleanup levels, points of compliance, and additional regulatory requirements. Groundwater cleanup levels and points of compliance are the two primary components and are described in the following sections. Soil cleanup standards are not discussed since soil remediation (excavation, on-site soil stabilization, and/or capping) has already been completed.

Cleanup levels have not been developed for the groundwater-to-indoor air and soil-to-indoor air pathways as part of the Focused Feasibility Study (FFS). These potential pathways are only a concern if future Property development includes construction of habitable structures on the Property. Any future development of the Property will have to consider this pathway and incorporate engineering controls (e.g., vapor barriers) as appropriate to control potential exposures, subject to Ecology's written approval. These engineering controls are well established. A restrictive (environmental) covenant to be recorded with the deed for the Property that will require future property owners to obtain Ecology's written approval before undertaking any activities, including construction, that could create a new exposure pathway for hazardous substances or release hazardous substances to the environment.

6.1.1 Development of Cleanup Levels

6.1.1.1 Selection of Indicator Hazardous Substances

The investigation results indicate that 14 individual VOCs, dissolved arsenic, and total cyanide have been detected during routine groundwater sampling at the Property. Table 2 summarizes the Property VOC, dissolved arsenic, and total cyanide detections between 1999 and 2003, including the frequency of detection, maximum detected concentration, and minimum detected concentration. These results were evaluated consistent with the approach presented in WAC 173-340-703, which reduces the number of hazardous substances being considered during development of cleanup actions by eliminating those substances that contribute a small percentage of the overall threat to human health and the environment. The remaining hazardous substances are designated as indicator hazardous substances (IHSs) for purposes of defining Property cleanup requirements.

The parameters listed in Table 2 were first evaluated based on their frequency of detection, with parameters detected less than 5 percent of the time dropped from consideration. Benzene, methylene chloride, PCE, and 1,1,1-TCA were dropped as IHSs based on frequencies of detection less than 5 percent.

The remaining parameters were then evaluated to determine if any were detected at concentrations below naturally occurring background concentrations. Based on this evaluation, arsenic was dropped as an IHS based on the similarity of the frequency and range of arsenic detections in the Property wells and upgradient well HY-11s. As noted above, arsenic has been detected at concentrations up to 37 µg/L in HY-11s, while the maximum concentration detected in the remaining Property monitoring wells was 27 µg/L in well HYCP-2.

The remaining 11 parameters include 10 VOCs and total cyanide and are considered potential IHSs. Further screening of these potential IHSs was conducted by comparing the detected concentrations of these parameters against the range of published cleanup levels and standards. The range of published groundwater cleanup levels was identified using Ecology's online *Cleanup Levels and Risk Calculation (CLARC)* tool (https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx) and other published standards including water quality criteria established under USEPA's National Toxic Rule (40 CFR 131). Both MTCA Method A and Method B cleanup levels were identified. Table 3 summarizes these published cleanup levels and standards for the 10 VOCs and cyanide as well as the frequency of detection and maximum detected concentration for each parameter.

As can be seen in Table 3, the maximum concentrations of 1,1-DCA, ethylbenzene, toluene, and total xylenes were less than any of the published cleanup levels or standards; these four VOCs are dropped from consideration as IHSs. Of the remaining six VOCs, TCE, vinyl chloride, and cis-1,2-DCE were frequently detected and detected at concentrations well above their published cleanup levels and standards; these three VOCs were retained as IHSs. The three remaining VOCs (trans-1,2-DCE, 1,1-DCE, and 1,2-DCA) are co-located with, and present in much lower concentrations than, the detections of TCE, cis-1,2-DCE, and vinyl chloride. The maximum concentrations for all three of these VOCs were much lower than the published surface water standard that would apply to the groundwater-to-surface water pathway. Based on this analysis, trans-1,2-DCE, 1,1-DCE, and 1,2-DCA do not contribute a significant percentage of the overall risk to human health and were dropped from consideration as IHSs.

Cyanide was detected in 18 percent of samples and at a maximum concentration of 40 µg/L. This maximum concentration is well below the lowest of the published cleanup level or standard based on the protection of human health (140 µg/L), but above both the chronic and acute surface water quality standards based on protection of aquatic organisms (5.2 µg/L and 22 µg/L, respectively). It should be noted that the cyanide results reported in Tables 2 and 3 are for total cyanide, while the published water quality standards are for free or dissociable cyanide. Free cyanide values would be lower than the total cyanide values. A careful review of the data in shows that of the 20 detections, eight are at the Method Reporting Limit (MRL) of 10 µg/L. Nine of the 12 remaining detections, including the maximum detected value, are from monitoring well HYCP-3i located in the center of the source area.

Monitoring results downgradient of the Property on the Hexcel property also show sporadic, low-level detections of cyanide at or slightly above the MRL. Downgradient of the Hexcel property, the cyanide detections are even more sporadic than immediately downgradient of the Property. Because the intermittent presence of low-level cyanide on and downgradient of the Property does not represent a risk to human health, and the potential impacts on the receiving water are minimal given the distance between the detections that are marginally above the standards and the receiving water, cyanide was not considered an IHS for purposes of cleanup alternative development.

To summarize, the following hazardous substances were selected as IHSs:

- TCE;
- cis-1,2-DCE; and
- Vinyl chloride.

6.1.1.2 Determination of Cleanup Levels

MTCA provides several methods for determining cleanup levels for IHSs, including Method A (tables and applicable state and federal laws), Method B (universal method), and Method C (conditional method). Method C is typically used where Method A or B cleanup levels are impracticable to achieve or for certain industrial properties. The applicability of Method A is described in WAC 173-340-704(1). Method A may be used to establish cleanup levels at sites that have few hazardous substances and meet one of the following criteria:

- Sites undergoing a routine cleanup action as defined by WAC 173-340-200; or

- Sites where numerical standards are available either in the MTCA regulations or applicable state and federal laws for all IHSs.

The three IHSs for this Property have numerical standards. Furthermore, the cleanup actions contemplated for the Property are consistent with the criteria listed in WAC 173-340-200 under the definition of "routine cleanup action," and there are a limited range of cleanup actions available. Therefore, cleanup levels for the Property cleanup action were determined using Method A.

Based on the potential future pathways identified in the conceptual site model (Figure 11), groundwater cleanup levels were identified for the IHSs for the groundwater-to-surface water pathway for the following receptor: protection of humans through consumption of aquatic organisms (TCE, cis-1,2-DCE, and vinyl chloride). No cleanup levels have been developed for the potential aquatic ecological receptors for these substances because there are no promulgated standards available and the human health standards are assumed to be protective. Method A cleanup levels based on protection of surface water receptors are described in WAC 173-340-730(2). Consistent with this chapter, the numerical standards for each of the IHSs are (Table 3):

- TCE – 30 µg/L;
- cis-1,2-DCE – 70 µg/L; and
- Vinyl Chloride – 2.4 µg/L.

With the exception of cis-1,2-DCE, these standards are from USEPA's water quality criteria established under the National Toxics Rule (40 CFR Part 131) for protection of human health from consumption of aquatic organisms. There is no surface water standard for cis-1,2-DCE, so the lowest available human health based standard of 70 µg/L was used (state MCL).

Ecology has decided that for this CAP the vinyl chloride cleanup level will be the MTCA Method A cleanup level for the protection of groundwater (0.2 µg/L). This cleanup level is based on the protection of drinking water beneficial uses. If cleanup levels based on the protection of drinking water beneficial uses no longer apply in the future, this CAP will be amended accordingly.

6.2 Groundwater Point of Compliance

The point of compliance (POC) refers to the point or points where cleanup levels will be attained. Under the RCRA Post-closure Permit (WAD 07 665 5182) the POC is the downgradient property boundary. In addition, given the nature of groundwater contamination on the Property (see Section 4.2), and as discussed in detail in the focused feasibility study, the source area at the Property does not lend itself to aggressive active treatment. Ecology has thus determined that it is not practicable to attain cleanup levels throughout all groundwater on the Property. The Property boundary will therefore be used as the conditional point of compliance for the purposes of evaluating potential cleanup alternatives. WAC 173-340-720(8)(c).

6.3 Areas Exceeding Groundwater Cleanup Levels

The current distributions of TCE, cis-1,2-DCE, and vinyl chloride in Layer B groundwater are presented in Figures 8, 9, and 10, respectively. Layer B groundwater beneath the northern half of the Property exceeds the cis-1,2-DCE and vinyl chloride cleanup levels. A wedge-shaped section of Layer B groundwater from the former drum storage area northeast to the property boundary exceeds the TCE cleanup level.

Layer D groundwater at a deep aquifer well immediately north of the northeast corner of the Property exceeds the 0.2 µg/L vinyl chloride cleanup level. The likely source of VOCs detected is a faulty well seal. BSB has abandoned the well in January 2008, replaced it with additional wells to verify the VOC concentrations in the deep aquifer immediately north of the Property, and is monitoring the new wells per an approved work plan under Agreed Order No. DE 2551.

6.4 Applicable Local, State, and Federal Laws

Cleanup actions must comply with applicable local, state and federal laws. WAC 360(2)(a)(iii); WAC 173-340-710; RCW 70.105D.090. In certain cases, obtaining a permit is required. In other cases, the cleanup action must comply with the substantive requirements of the law, but is exempt from the procedural requirements of the law (RCW 70.105D.090; WAC 173-340-710(9)).

Persons conducting remedial actions have a continuing obligation to determine whether additional permits or approvals are required, or whether substantive requirements for permits or approvals must be met. In the event that either BSB or Ecology becomes aware of additional permits or approvals or substantive requirements that apply to the remedial action, they shall promptly notify the other party of this knowledge (WAC 173-340-710(9)(e)).

6.4.1 Required Permits

The cleanup Action at Parcel G will require the following permits:

- No non-exempt permits have been identified.

6.4.2 Substantive Requirements

The Cleanup Action at Parcel G will meet the applicable substantive requirements of the following exempt permits or approvals (as identified at the time of entry of this Decree):

- City of Kent Grade and Fill Permit.

BSB has a continuing obligation to determine whether additional permits or approvals addressed in RCW 70.105D.090(1) are required for the remedial actions to be conducted under the Consent Decree.

7.0 SUMMARY OF CLEANUP ACTION ALTERNATIVES EVALUATED

7.1 Cleanup Action Objectives

Cleanup Action Objectives (CAOs) form the basis for evaluating potential cleanup technologies and actions for the Property. CAOs are based on an evaluation of the data collected during previous investigations and on the established cleanup levels. The focus of the CAOs is protection of human health. As described above, the Property qualifies for an exclusion from a terrestrial ecological evaluation in accordance with the requirements of WAC 173-340-7491(c). Therefore, no terrestrial ecological-based CAOs are developed. Although the site conceptual model (Figure 11) identifies the groundwater-to- surface water pathway as a potentially complete future pathway for aquatic organisms, there are no IHSs for this pathway because there are no promulgated standards for these substances and the human health standards are assumed to be protective. Therefore, there are no aquatic ecological-based CAOs for this FFS.

The following human health-based CAOs are proposed for use at the Property.

7.1.1 Soil Cleanup Action Objectives

The CAO for soil at the Property is as follows: Control incidental ingestion of and dermal contact with soil, and inhalation of particulates and vapors from soil, by future subsurface construction workers on the Property. Contain groundwater that may be impacted by soils containing contaminants of concern.

7.1.2 Groundwater Cleanup Action Objectives

The CAOs for groundwater at the Property are as follows:

- Control ingestion of groundwater containing IHSs at concentrations exceeding the applicable cleanup levels;
- Control migration of groundwater containing IHSs at concentrations exceeding the applicable cleanup levels to surface water from the Property; and
- Control inhalation of VOC--containing vapors from groundwater by subsurface construction workers on the Property.

7.2 General Response Actions

General response actions are the general approaches that can be used, either alone or in combination with other response actions, to meet the CAOs. Like the CAOs, general response actions are medium specific.

7.2.1 Presumed Response Actions

For both soil and groundwater, CAOs address potential exposure of subsurface construction workers on the Property. In order to address this potential future exposure pathway, BSB incorporated a presumed response action into all Cleanup Action Alternatives (CAAs) developed. This presumed response action establishes specific procedures to ensure that the potential risks to workers on the Property are adequately assessed prior to and during invasive work on the Property and that adequate protective measures (e.g., personal protective clothing, respiratory protection) are used.

All CAAs include a surface cap either through maintenance of the existing cap, replacement or repair of the cap should it be damaged during implementation of other CAA technologies, and/or incorporation of buildings and other impervious features when the property is redeveloped. All CAA's will include completion of the on-going deep aquifer investigation.

All CAAs include establishing institutional controls to prevent the extraction of groundwater for domestic or agricultural use.

The general response actions that address the remaining CAOs are described below.

7.2.2 Soil General Response Actions

The presumed response actions described above address all of the CAOs for unsaturated soil at the Property and no additional general response actions are required.

7.2.3 Groundwater General Response Actions

The general response actions for groundwater at the Property are as follows:

- Institutional controls (e.g., monitoring, environmental covenant);
- Engineering controls (e.g., surface cap, vapor barriers);
- Groundwater containment (e.g., hydraulic controls, vertical barriers);
- Ex situ groundwater treatment/discharge; and
- In situ groundwater source treatment (e.g., in situ oxidation, enhanced bioremediation).

The first four of these groundwater general response actions are currently being utilized at the Property.

7.3 Cleanup Action Alternatives Evaluated

7.3.1 Alternative 1 – Enhanced Groundwater Extraction System

The enhanced groundwater extraction system alternative builds on the existing extraction system and consists of a total of seven extraction wells located along the downgradient boundary of the Property, discharge of extracted groundwater to the King County sanitary sewer system for treatment, and maintenance of the existing capping at the Property. A detailed description of the installation, operations and maintenance, monitoring, performance evaluation, and reporting for the enhanced groundwater extraction system is provided in PES' report[1] dated June 1, 2004 (PES, 2004b). Figure 12 provides the proposed locations of the existing and new extraction wells.

Under this alternative, BSB would enhance the existing extraction system at the Property with the addition of five new extraction wells to assure and significantly augment future performance. Groundwater would be extracted from each well with a submersible pump and transferred through individual, underground conveyance lines to an aboveground manifold. At the manifold, the individual conveyance lines from HYR-1 through HYR-7 would be joined together into a common header from which extracted groundwater would be discharged to the sanitary sewer under the existing waste discharge permit.

Twenty-seven monitoring wells are currently located on the Property and immediately adjacent to the north, east, and southwest sides of the Property (Figure 12). Thirteen of these wells are shallow, six are intermediate, and eight are deep. To supplement existing monitoring points, one new monitoring well (G4) and 13 piezometers (P-1 through P-13) would be installed in Unit B in conjunction with extraction well installation.

The cap for the Property would consist of the existing cap that covers the former settling basin, the former equalization lagoon, and the former sludge drying beds that encompass an approximate total area of 75,000 square feet. Each cap consists of two geotextile layers, a Polyvinyl Chloride (PVC) liner, a granular backfill layer, a crushed rock base layer, and asphalt concrete pavement.

Institutional controls (which include property use restrictions through an environmental covenant (including a prohibition on domestic or agricultural use of groundwater)), maintenance requirements for engineered controls (e.g. inspections), and financial assurances, will be implemented to limit or prohibit activities that may interfere with the integrity of the cleanup action. The environmental covenant will limit activities that may create a new exposure pathway (e.g., indoor air pathway or subsurface worker pathway) without Ecology's approval.

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[1] This report, entitled *Corrective Action and Postclosure Monitoring and Implementation Plan,* was developed to describe how the enhanced groundwater extraction system approach would be implemented. To avoid confusion with the current Interim CAPMIP included in Exhibit D of BSB's Agreed Order, it will be referred to as PES 2004b.

Total capital costs for this Alternative 1 would be approximately $390,000. The Net Present Value (NPV) of recurring and future costs over the 30-year project life would be approximately $4,150,000. The total estimated NPV for this alternative is $4,540,000.

7.3.2 Alternative 2 – Slurry Wall Containment and Gradient Control Using Zero Valent Iron (ZVI) Reactor Vessels

Alternative 2 includes installing a slurry wall around, and a cap over, all of the Property and gradient control within the Property containment area using ZVI reactor vessels.

Figure 13 provides a conceptual layout of the slurry wall alignment, capped area, and location of the ZVI reactor vessel system.

In this alternative, the entire Property would be (1) capped and (2) contained by a soil-bentonite slurry wall keyed into the Layer C silt aquitard and equipped with ZVI reactor vessels. The slurry wall would follow the perimeter of the Property, and the reactor vessels would be located within the northeast (i.e., downgradient) corner of the wall (Figure 13). The cap would minimize surface water infiltration, the slurry wall would prevent groundwater from passing into the contaminated area, and the ZVI reactor vessels would destroy contaminants in the groundwater that is allowed to exit the containment cell by directing it through the ZVI reactor vessels. This alternative is similar to a funnel-and-gate arrangement, but differs in that the funnel is closed at the top (upgradient boundary) so that flow through both the contaminated area and the ZVI reactor vessels is nearly eliminated except for small amounts of water that may infiltrate the slurry wall and cap, and for flows induced by seasonal changes in water levels in the surrounding aquifer. Minimizing flow through the reactor vessels in this manner significantly reduces the mass of ZVI needed and maximizes its effective treatment life.

The wall would be approximately 2-ft thick, 1,820 ft long, and extend to an average depth of approximately 40 ft bgs (average depth to Layer C). The slurry used at the Property would be made of soil from the Property and bentonite mixed on-site to provide a designed maximum hydraulic conductivity of 1×10^{-7} cm/sec.

The reactor vessels would be constructed such that they would contain sufficient ZVI to provide the required contact time at the maximum anticipated flow velocities through the vessels. The reactor vessel system would consist of the following major components:

A collection trench located inside the slurry wall near the northeast corner of the containment area;

The reactor vessels, which would consist of a series of concrete vaults that would contain the required amount of ZVI;

A discharge pipe from the reactor vessels that would lead through the slurry wall to the infiltration gallery located outside the wall; and

An infiltration gallery located outside the slurry wall in the northeast corner of the Property that would infiltrate the treated groundwater from the ZVI reactor vessels back into the shallow aquifer.

The amount of ZVI required to effectively treat groundwater flowing through the vessels, is based primarily on: (1) the reaction kinetics of the ZVI with contaminants in Property groundwater and, (2) the flow rate of groundwater out of the containment area (i.e., system hydraulics). Based on the evaluation of these factors, approximately 1,850 cubic feet of ZVI would provide the required contact time and treatment. With this amount of ZVI and the hydraulic parameters defined below, the reactor vessels would provide at least the minimum required residence time of 3.5 days and would effectively treat the groundwater flowing out of the containment area to at or below cleanup levels.

After the slurry wall construction is complete, the portions of the existing low permeability asphalt cap that are damaged during the construction of the slurry wall would be repaired to their original condition. The northern portion of the Property would have a new asphalt cover installed in a manner that would result in a continuous cover system over all of the Property. Approximately 5,000 to 10,000 cubic yards of imported fill would be used to create adequate surface grades on the new asphalt cover to promote runoff of precipitation. Runoff from the capped areas would be directed into culverts, pipes, or ditches and ultimately into the storm sewer system along South 200th Street.

Performance monitoring for Alternative 2 would ensure that the groundwater exiting the containment area through the ZVI reactor vessels was being treated to achieve cleanup levels. To accomplish this, a piezometer would be installed near the infiltration gallery outside the slurry wall. Water levels measured monthly in this piezometer would be used to determine whether water levels outside the slurry wall were falling or rising and whether the valve on the discharge side of the reactor vessels would be open or closed. When groundwater elevations inside the containment cell are higher than groundwater elevations outside the cell, the valve would be left open, and when groundwater elevations on the outside of the containment cell are higher than groundwater elevations inside the cell, the valve would be closed.

When the hydraulic gradient is outward and groundwater is flowing out through the reactor vessels, groundwater samples would be collected to confirm that the required treatment objectives were being achieved. These samples would be collected from the inlet of the first reactor vessel and the discharge pipe leading from the last ZVI reactor vessel to the infiltration gallery. Annually, samples will be collected to evaluate inorganic parameters that may effect the system operation. When gradients are directed into the containment area and the backflow prevention valve is closed, water quality samples would not be collected.

Institutional controls (which include property use restrictions through an environmental covenant (including a prohibition on domestic or agricultural use of groundwater)), maintenance requirements for engineered controls (e.g. inspections), and financial assurances, will be implemented to limit or prohibit activities that may interfere with the integrity of the cleanup action. The environmental covenant will limit activities that may create a new exposure pathway (e.g., indoor air pathway or subsurface worker pathway) without Ecology’s approval.

Total capital costs for Alternative 2 would be approximately $2,350,000. The NPV of recurring and future costs over the 30-year project life would be approximately $820,000. The total estimated NPV for this alternative is $3,170,000.

7.3.3 Alternative 3 – Slurry Wall Containment and Gradient Control Using Groundwater Extraction

Alternative 3 includes installing a slurry wall around, and a cap over, all of the Property, hydraulic gradient control within the containment area using groundwater extraction, and treatment of the extracted groundwater prior to discharge to the sanitary sewer. Figure 14 provides a conceptual layout of the slurry wall alignment, capped area, and location of the gradient control extraction wells.

This alternative is very similar to Alternative 2, except that that the ZVI reactor vessels used in Alternative 2 for gradient control are replaced with groundwater extraction within the slurry wall containment area. In Alternative 3, the entire Property would be (1) capped and (2) contained by a soil-bentonite slurry wall keyed into the Layer C silt aquitard. The slurry wall would follow the entire perimeter of the Property, and three to five groundwater extraction wells would be installed within the containment area (Figure 14). The cap and slurry wall would deflect the bulk of surface infiltration and groundwater from passing into the contaminated area, and groundwater extraction wells would pump groundwater at a rate sufficient to prevent groundwater from flowing out of the containment area through the slurry wall or Layer C.

The wall would be approximately 2-ft thick and 1,780 ft long and extend to an average depth of approximately 40 ft bgs (average depth to Layer C). The slurry used at the Property would be made of soil from the Property and bentonite mixed on-site to provide a designed maximum hydraulic conductivity of 1×10^{-7} cm/sec. The slurry wall would effectively eliminate the movement of VOC-contaminated groundwater from the Property. To ensure that contaminated groundwater does not leave the Property containment area, groundwater would be extracted with wells from within the containment cell to ensure maintenance of inward hydraulic gradients across the slurry wall and Layer C.

The extracted groundwater would ultimately be discharged to the sanitary sewer under a King County Waste Discharge Permit. Because of the VOC concentrations in the groundwater inside the slurry wall, it is assumed that the extracted groundwater would require pretreatment prior to discharge. Given the relatively low flow rate of 0.6 gpm (i.e., 860 gallons per day), the groundwater would be treated on a batch basis using air stripping. Extracted groundwater would be collected in a 2,000-gallon receiving tank, and then processed through a small air stripper in approximately 500-gallon batches at a rate of approximately 5 gpm. Emissions from the air stripper would be treated using two activated carbon adsorption vessels. The treated groundwater would be discharged into the sanitary sewer. The cap for this alternative would be the same as described for Alternative 2.

Institutional controls (which include property use restrictions through an environmental covenant (including a prohibition on domestic or agricultural use of groundwater)), maintenance requirements for engineered controls (e.g. inspections), and financial assurances, will be implemented to limit or prohibit activities that may interfere with the integrity of the cleanup action. The environmental covenant will limit activities that may create a new exposure pathway (e.g., indoor air pathway or subsurface worker pathway) without Ecology's approval.

Total capital costs for Alternative 3 would be approximately $1,610,000. The NPV of recurring and future costs over the 30-year project life would be approximately $2,850,000. The total estimated NPV for this alternative is $4,460,000.

7.4 Cleanup Action Evaluation Criteria

Per WAC 173-340-360(2), the criteria for evaluating cleanup action alternatives include the following:

Threshold Requirements

- Protect human health and the environment;
- Comply with cleanup standards (WAC 173-340-700 through –760);
- Comply with applicable state and federal laws (WAC 173-340-710); and
- Provide for compliance monitoring.

Other Requirements

- Use permanent solutions to the maximum extent practicable;
- Provide for a reasonable restoration time frame; and
- Consider public concerns.

In addition to these criteria, Ecology's expectations for cleanup actions are listed in WAC 173-340-370. If the evaluation of cleanup action alternatives concludes that more than one alternative meets the cleanup action selection criteria, a disproportionate cost analysis can be conducted pursuant to WAC 173-340-360(3)(e) to determine if the incremental costs of one alternative over that of a lower cost alternative exceed the incremental degree of benefits achieved by the alternative over that of the other lower cost alternative.

7.5 Evaluation of Cleanup Action Alternatives

7.5.1 Protectiveness

All of the alternatives would achieve containment of VOCs at the downgradient Property boundary, thereby protecting the potential human receptors for the groundwater to surface water pathway. All three alternatives address the potential exposure of subsurface construction workers on the Property in the same fashion by ensuring that the potential risks to workers are adequately assessed prior to and during subsurface work and that adequate protective measures (e.g., personal protective clothing, respiratory protection) are used. Similarly, all three alternatives address the potential future indoor air pathway by requiring that this pathway be evaluated and engineering controls (e.g., vapor barriers) incorporated, as appropriate, to control potential exposures if future Property development includes construction of habitable structures.

Finally, all three alternatives include establishing institutional controls to prevent the domestic or agricultural use of groundwater and provide for the maintenance of the remedy.

7.5.2 Compliance With Cleanup Standards

All three alternatives would achieve compliance with the groundwater cleanup standards by controlling migration of VOC-containing groundwater from the Property to downgradient receptors. The primary difference between the alternatives would be the technology employed to achieve containment.

All three alternatives would achieve the cleanup standard for protection of future outside and indoor workers at the Property through the use of institutional controls to require the use of appropriate engineering controls and evaluation of the indoor air pathway if future Property development activities result in the construction of a habitable building.

7.5.3 Compliance with Regulatory Requirements

All of the alternatives would comply with the applicable legal requirements, including MTCA. Where off-Property management and disposal of wastes is required, the applicable solid and dangerous waste regulations would govern cleanup activities. Alternatives 1 and 3 include discharge of groundwater to the sanitary sewer; for these alternatives, a King County Industrial Waste Discharge Permit would be obtained and complied with. Alternative 3 also includes emission control equipment to prevent the discharge of VOCs from the groundwater treatment system to the atmosphere; this system would meet the substantive requirements of the Puget Sound Clean Air Agency regulations.

7.5.4 Compliance Monitoring

All three cleanup action alternatives include compliance monitoring to assess the ongoing performance of the alternative and to monitor compliance with cleanup goals. Of the three alternatives, Alternative 1 would have the most involved compliance monitoring (see the PES 2004b report for details), with significant water quality sampling, water level monitoring, and numerical modeling required to document compliance with the performance objectives. The compliance monitoring associated with Alternatives 2 and 3 would be simpler and the performance objectives easier to document compared to Alternative 1.

7.5.5 Use of Permanent Solutions

The comparative evaluation of this criterion is presented in the Focused Feasibility Study. The sub-criteria that are most important in differentiating the three alternatives, and will be used as the basis for the disproportionate cost analysis, are permanence, long-term effectiveness, and cost. These three sub-criteria are discussed below, while the disproportionate cost analysis is presented in the Focused Feasibility Study.

7.5.5.1 Permanence

The main differentiating factors regarding the permanence of the three alternatives are: (1) the amount and complexity on the long-term Operation & Maintenance (O&M) activities required to maintain containment and (2) how well the alternative maintains containment should O&M activities be interrupted. Alternative 1 would be the most O&M intensive, as it would require the ongoing O&M of seven extraction wells, periodic replacement of the extraction wells, and the associated control and discharge systems. Performance monitoring associated with Alternative 1 would also be more intensive than the other two alternatives, and include significant data evaluation and modeling to demonstrate system performance. Alternative 3 would be the next most O&M intensive alternative. Although the slurry wall would function without maintenance, the groundwater extraction and treatment systems would require ongoing O&M similar in nature to Alternative 1 in order to maintain hydraulic control inside the containment cell. Alternative 2 would be the least dependent on ongoing O&M actions to maintain its effectiveness in that the encircling slurry wall would provide containment without maintenance, and the ZVI reactor vessels would function passively with only adjustment of the valve on the discharge side of the vessels to minimize backflow through the vessels and the potential need for periodic “refreshing” of the vessels every several decades, if at all.

In summary, Alternative 2 rates the highest of the three alternatives under the permanence criterion. Alternative 3 rates lower and Alternative 1 rates the lowest due to their need for significant regular ongoing O&M.

7.5.5.2 Long-Term Effectiveness

The main factors evaluated relative to the long-term effectiveness of the three alternatives are: (1) the certainty of success of the alternative and (2) how reliable the alternative would be. With respect to the certainty of success factor, there is a high degree of certainty that all three alternatives will be effective at preventing migration of VOCs from the Property over the long term.

The reliability of the three alternatives would also be high. In general, Alternative 1 would be the least reliable because it would require more O&M compared to Alternatives 2 and 3. The reliability of both Alternatives 2 and 3 would also be high due to the use of the slurry wall as the primary mechanism for containment. The differences between Alternatives 2 and 3 would be how hydraulic gradients inside the containment cell would be managed. The ZVI reactor vessels used in Alternative 2 would function completely passively and with the exception of adjustment of the valve on the discharge side of the vessels to minimize backflow through the vessels and the potential need for infrequent “refreshing” of the ZVI (e.g., every 30 years), would require no active maintenance.

The positive aspect of the reliability of Alternative 3’s approach to gradient control is the well understood and somewhat simpler technology used (groundwater extraction), which has been demonstrated effective over the long term at many sites. On the other hand, the reliability of this approach would be adversely affected by the need for ongoing O&M including periodic replacement of the extraction wells and the significant O&M required for the air stripper system.

Ecology believes Alternative 2 would be the most effective over the long term because it would utilize passive controls that do not require regular O&M. Ecology believes that Alternatives 1 and 3, although still effective over the long term, would be somewhat less reliable than the Alternative 2 due to their relatively greater ongoing O&M demands..

7.5.5.3 Cost

Based on the overall net present value (capital costs plus 30 years of O&M), Alternatives 1 and 3 have essentially the same cost of $4.5 million. The major cost factor for these two alternatives is the costs associated with ongoing O&M of the groundwater extraction systems. Alternative 2, although it has the highest capital costs, has an overall net present value cost of approximately $3.2 million because it does not have high ongoing O&M costs.

7.5.6 Restoration Time Frame

All three alternatives rely on containment as the primary means to provide protection of human health and the environment and achieve compliance with cleanup standards. Contaminant destruction is a secondary process for all three alternatives with timeframes that are difficult to accurately project. As a result, all three alternatives will all have essentially the same restoration time frame and the comparison of the alternatives for this criterion is not a differentiating factor between the alternatives.

7.5.7 Public Acceptance

During the preparation of the Focused Feasibility Study, Ecology carefully considered input from the downgradient property owner (Hexcel) with respect to how the cleanup action alternatives may or may not affect Hexcel's property investigation and cleanup activities. Additional consideration of public concerns will occur in the context of the public review and comment period.

8.0 SELECTED CLEANUP ACTION

8.1 <u>Selected Cleanup Action</u>

Based on the evaluation above, Ecology believes Alternative 2 is superior to Alternatives 1 and 3 under the evaluation criteria, including the "use of permanent solutions to maximum extent practicable" criterion. Alternative 1 compares less favorably to the criteria than both Alternatives 2 and 3. Alternative 2 is also the least costly alternative over the long term; Alternative 2 costs $3.2 million followed by Alternatives 1 and 3 which both cost approximately $4.5 million. Therefore under the MTCA regulations [WAC 173-340-360(3)(e)(ii)(C)], Alternative 2 is selected as the preferred alternative for implementation at the Property.

Ecology Expectations. WAC 173-340-370 outlines a series of eight expectations that Ecology has regarding selection and implementation of cleanup actions. Selection of Alternative 2 for implementation at the Property is consistent with these expectations in that it:

Uses engineering controls (containment) to contain large volumes of materials where treatment is impracticable;

Minimizes migration of hazardous substances by preventing precipitation and runoff from contacting contaminated soils and waste materials;

Takes active measures to prevent releases of hazardous substances to surface waters via groundwater discharges; and

Does not result in a greater overall threat to human health and the environment compared to other alternatives.

There is an expectation or preference for treatment technologies. However, this expectation is applicable to "areas of hazardous substances that lend themselves to treatment." The ZVI reactor vessels will provide treatment for the VOCs that pass through it, although at a low rate. As discussed in detail in the focused feasibility study, the source area at the Property does not lend itself to more aggressive treatment and, therefore, alternatives based on aggressive treatment technologies were not developed or evaluated as part of the FFS. (Note also that the historical cleanup actions at the Property have included significant treatment of contaminants in both soil and groundwater.)

8.2 <u>Implementation of Selected Cleanup Action</u>

8.2.1 Overall Implementation Approach

The final selection and implementation of Alternative 2 as the preferred cleanup action will include the following general steps:

BSB or a third party will prepare a detailed design of the alternative;

Following Ecology's approval of the final design, BSB or a third party will construct the cleanup action (e.g., slurry wall, ZVI reactor vessels, surface cap);

BSB or a third party will conduct long-term operations, maintenance, and compliance monitoring activities; and

BSB or a third party will conduct periodic reviews (WAC 173-340-429) to evaluate the effectiveness of the remediation. Additional remediation or contingency plans will be implemented if Ecology determines that contaminated groundwater above cleanup levels is issuing from the BSB property due to failure of the ZVI reactor vessel system.

8.3 Additional Requirements

8.3.1 Institutional Controls

Institutional controls will be incorporated in the cleanup action since contaminants exceeding the MTCA Method B cleanup levels will remain on the Property (WAC 173-340-440(4)(a)). The intent of the institutional controls will be to preserve the integrity of the cleanup action. Institutional controls will include filing an environmental covenant under chapter 64.70 RCW in the real property records to notify potential purchasers of the Property of this Cleanup Action Plan. The environmental covenant will limit activities that may create a new exposure pathway (e.g., indoor air pathway or subsurface worker pathway), result in the release of hazardous substances, or interfere with the integrity of the Cleanup Action without Ecology's written approval. Any future development of the Property will have to consider the indoor air pathway and incorporate engineering controls (e.g., vapor barriers) as appropriate to control potential exposures, subject to Ecology's written approval.

8.3.2 Financial Assurances

Financial assurances will be established and maintained sufficient to implement this Cleanup Action Plan, including maintaining institutional and engineering controls on the Property and maintaining compliance monitoring (WAC 173-340-440(11); WAC 173-303-64620).

8.3.3 Substantive Requirements

Chapter 70.105D RCW exempts cleanup actions conducted under a consent decree from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 and of any laws requiring or authorizing local government permits or approvals. The selected cleanup action will be conducted in compliance with the substantive requirements of local government regulations. There are no federal or state permits required for the selected cleanup action.

8.3.4 Work Plans

Work plans for the selected cleanup action will be prepared and submitted to Ecology for review. Work plans will include an engineering design report, construction plans and specifications, compliance monitoring plan, and an operation and maintenance (O&M) plan. The engineering design report will document the selected cleanup action design in sufficient detail that construction plans and specifications may be developed. The elements of WAC 173-340-400(4)(a) will be included in the engineering design report, and the elements listed in WAC 173-340-400(4)(b) will be included in the construction plans and specifications. The compliance monitoring plan will include a sampling and analysis plan and a discussion of data analysis and evaluation procedures. The compliance monitoring plan will discuss protection monitoring, performance monitoring, and confirmational monitoring (WAC 173-340-410), including the method of confirming that the discharge from the ZVI reactor vessels has met cleanup levels in a reasonable restoration time frame after installation. In accordance with WAC 173-340-400(4)(c), an O&M plan will be prepared detailing the plans to ensure the effective operation of the selected cleanup action.

8.3.5 Periodic Review

Per WAC 173-340-420, a periodic review is required at sites where an institutional control is part of the cleanup action. The review is to be performed within 5 years of the start of cleanup and at a frequency no greater than every 5 years, thereafter. Since an institutional control is included in the selected cleanup action, a periodic review will be conducted to document the performance of the cleanup action.

8.4 Schedule

The remedy design and construction of the cleanup action will be completed in accordance with the attached Schedule (Appendix A). The Schedule in Appendix A anticipates installation of the cleanup action during the 2008 construction season. Given the timing of this CAP, there is little tolerance for delays for the 2008 installation construction season. Accordingly, the Schedule identifies milestone points at which Ecology will determine whether circumstances preclude compliance with the schedule. If Ecology determines that circumstances preclude installation of the cleanup action during the 2008 construction season, BSB will submit a revised schedule to Ecology for 2009 construction season construction within 60 days of Ecology's decision.

TABLES

Table 1

Summary of Site Investigations Performed
BSB Property, Kent, Washington

Investigation	Year	Purpose	Summary of Work Performed
FIT investigation	1980 -1981	Initial investigation of waste treatment area by USEPA	Installation of 6 on-site wells, soil/groundwater sampling, and water level measurement
Phase 1 investigation	1982	Provide for additional on-site and off-site groundwater monitoring as recommended by USEPA	Installation of 4 on-site and off-site wells, groundwater sampling, water level measurement, and hydraulic conductivity testing
Phase 2 investigation	1983 - 1984	Provide for additional waste treatment area sampling and groundwater monitoring as agreed to with USEPA	Sampling of equalizing basin soil and water, sampling of drying bed sludge, installation and sampling of 5 off-site wells, sampling groundwater in 6 off-site test holes, water level measurement, and hydraulic conductivity testing
Phase 3 investigation	1984	Provide for additional groundwater monitoring as agreed to with USEPA	Sampling 14 on-site and off-site soil borings, installation of 3 off-site wells and 3 temporary off-site piezometers, groundwater level measurement, groundwater sampling, hydraulic conductivity testing, surface water sampling, and sewer monitoring
Compliance well installation	1984 - 1985	Provide for additional on-site soil sampling and on-site well installation	Sampling 5 on-site soil borings, installation of 14 on-site wells, 4 off-site wells, and two temporary on-site piezometers, groundwater level measurement, and hydraulic conductivity testing
Soil gas survey	1986	Evaluate the extent of the groundwater VOC plume	Collect soil gas samples from 69 on-site and off-site temporary soil gas probes
Groundwater investigation	1987	Fulfill investigation requirements of RCRA Section 3013 order	Sludge drying bed sampling, sampling 35 on-site and off-site soil borings, installation of 6 on-site and off-site piezometers and 15 on-site and off-site wells, collecting groundwater samples from 4 test borings, groundwater level measurement, hydraulic conductivity testing, and groundwater sampling
Parcel G unsaturated soil investigation	1988	Evaluate the extent of VOCs in Parcel G unsaturated soil	Sampling 25 shallow, on-site soil borings
Pilot recovery program investigation	1989	Fulfill requirements of post-closure permit	Installation of 2 on-site wells, replacement of 2 on-site wells, installation of 1 on-site and 4 off-site recovery wells, installation of 5 off-site observation wells, recovery well and aquifer testing, and recovery well groundwater sampling

Table 1

Summary of Site Investigations Performed
BSB Property, Kent, Washington

Investigation	Year	Purpose	Summary of Work Performed
Groundwater monitoring	1988 - 2004	Provide baseline data prior to remediation system operation and assess groundwater conditions during remediation system operation	Monthly water level measurements in and biannual to quarterly groundwater sampling of up to 43 on-site and off-site wells
Parcel G source area investigation	1999 - 2000	Investigate the extent of VOCs beneath Parcel G, especially near the former drum storage area	Sampling 58 on-site soil borings, grain size analysis, vertical hydraulic conductivity testing, and in-situ hydraulic conductivity testing

Notes:

Table 2

Summary Statistics for Groundwater Samples Collected Between 1999 and 2003
BSB Property, Kent, Washington

Constituent	Total Samples Analyzed	Non-Detections	Qualified Detections	Unqualified Detections	Frequency of Detection	Maximum Detection (µg/L)	Minimum Detection (µg/L)	Comments
Vinyl Chloride	124	10	3	111	92%	8,200	0.84	Highest concentrations in intermediate zone
Methylene Chloride	124	119	0	5	4.0%	110	6	Highest concentrations in intermediate zone, not detected in deep zone
trans-1,2-Dichloroethene	124	62	3	59	50%	190	0.14	Highest concentrations in intermediate zone, not detected in deep zone
cis-1,2-Dichloroethene	124	18	4	102	85%	42,000	0.6	Highest concentrations in intermediate zone
1,1-Dichloroethene	124	88	4	32	29%	80	0.18	Highest concentrations in shallow zone, not detected in deep zone
1,1-Dichloroethane	124	61	8	55	51%	270	0.18	Highest concentrations in shallow zone, not detected in deep zone
1,2-Dichloroethane	124	116	2	6	6.5%	1.1	0.66	Not detected in deep zone
1,1,1-Trichloroethane	124	122	0	2	1.6%	78	1.5	Not detected in intermediate/deep zones
Trichloroethene	124	77	1	46	38%	76,000	1.2	Highest concentrations in intermediate zone, not detected in deep zone
Tetrachloroethene	124	123	0	1	0.8%	3.8	3.8	Not detected in shallow/deep zones
Toluene	112	83	10	19	26%	180	0.12	Highest concentrations in intermediate zone
Ethylbenzene	112	104	1	7	7.1%	55	0.24	Not detected in deep zone
Total Xylenes	112	98	0	14	13%	130	1	Not detected in deep zone
Benzene	112	111	0	1	0.9%	1.6	1.6	Not detected in shallow/deep zones
Dissolved Arsenic	110	57	0	53	48%	0.0274	0.0051	Decreasing concentrations with depth
Total Cyanide	110	90	0	20	18%	0.04	0.01	

Table 3
Potentially Applicable Groundwater Cleanup Levels and Standards
BSB Property, Kent, Washington

CAS Number	Chemical of Potential Concern	Frequency of Detection (%)	Maximum Detected Concentration (μg/L)	Potentially Applicable Cleanup Levels and Standards									Retained as IHS?	
				Surface Water Cleanup Levels and Standards (μg/L)					Groundwater Cleanup Levels and Drinking Water Maximum Contaminant Levels (μg/L)					
				Protection of Human Health			Protection of Aquatic Organisms							
					EPA Recommended Criteria (National Toxics Rule)		State Surface Water Quality Standards							
				Method B Surface	Water + Organism	Organism Only	Freshwater Acute	Freshwater Chronic	Method A	Method B	State MCL	Federal MCL	Human Health	Aquatic Organisms
57-12-5	Cyanide	18	40	51,900	140	140	22.0[b]	5.2[b]	–	320	200	200	No	No[c]
75-34-3	1,1-Dichloroethane (1,1-DCA)	51	270	–	–	–	–	–	–	800	–	–	No	No
75-35-4	1,1-Dichloroethene (1,1-DCE)	29	80	1.93	330	7,100	–	–	–	400	7[a]	7	No	No
107-06-2	1,2-Dichloroethane (1,2-DCA or EDC)	6.5	1.1	59.4	0.38	37	–	–	5	0.481	5[a]	5	No	No
156-59-2	cis-1,2-Dichloroethene (cis-1,2-DCE)	85	42,000	–	–	–	–	–	–	80	70[a]	70	Yes	No
156-60-5	trans-1,2-Dichloroethene (trans-1,2-DCE)	50	190	32,800	140	10,000	–	–	–	160	100[a]	100	No	No
100-41-4	Ethylbenzene	7.1	55	6,910	530	2,100	–	–	700	800	700[a]	700	No	No
79-01-6	Trichloroethene (TCE)	38	76,000	55.6	2.5	30	–	–	5	0.11	5[a]	5	Yes	No
108-88-3	Toluene	26	180	48,500	1,300	15,000	–	–	1,000	1,600	1,000[a]	1,000	No	No
1330-20-7	Total Xylenes	13	130	–	–	–	–	–	1,000	1,600	10,000[a]	10,000	No	No
75-01-4	Vinyl Chloride	92	8,200	3.69	0.025	2.4	–	–	0.2	0.0291	2[a]	2	Yes	No

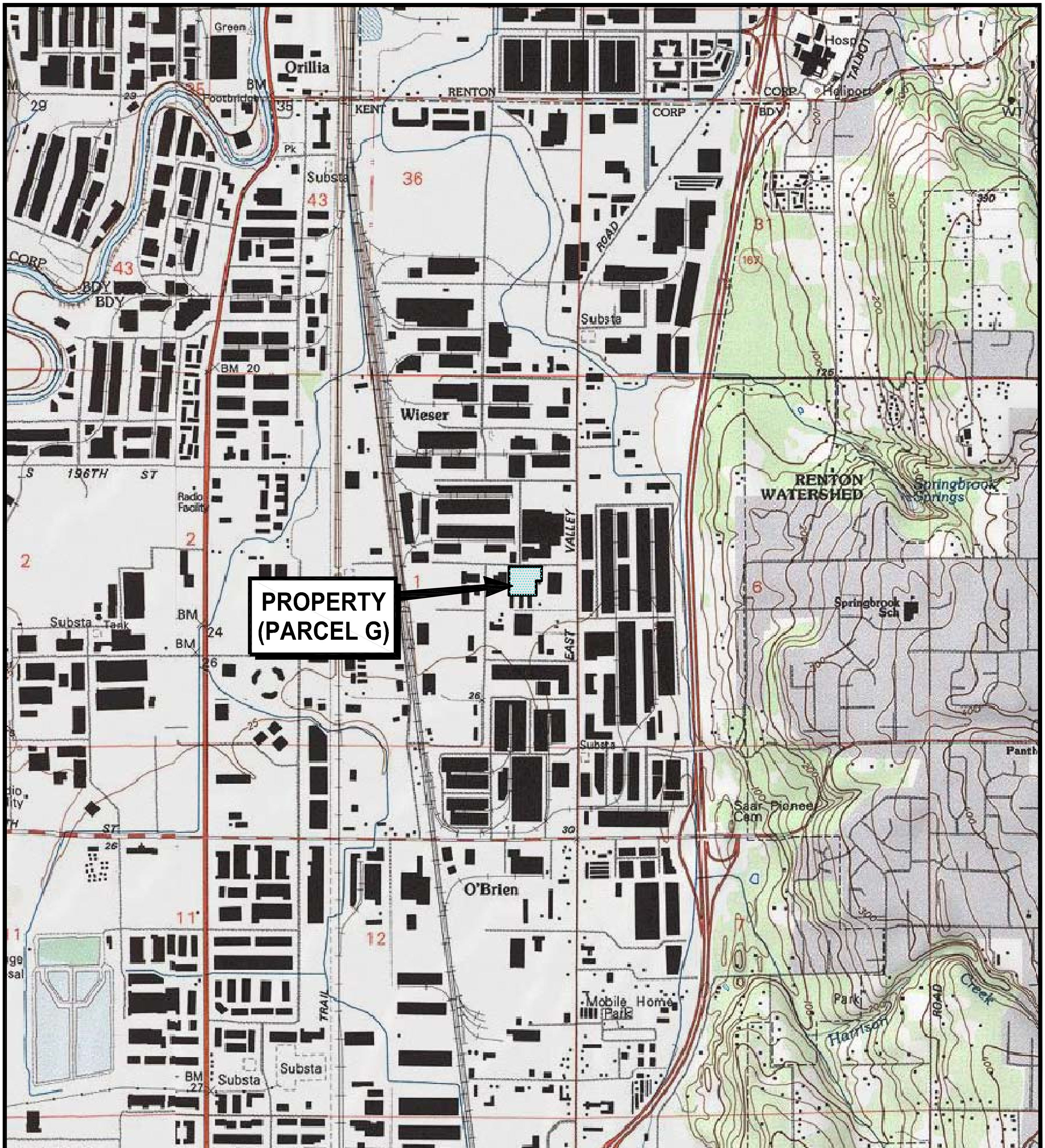
Notes:
1. CUL = cleanup level, – = not available.
2. Method A groundwater cleanup levels from WAC 173-340-900, Table 720-1.
3. Method B groundwater and surface water cleanup levels from Ecology's on-line Cleanup Levels and Risk Calculations under the Model Toxics Control Act Cleanup Regulation (CLARC) tool, (https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx).
4. State MCL = Washington State maximum contaminant level (from WAC 246-290-310).
5. Federal MCL = Federal maximum contaminant level (from http://www.epa.gov/safewater/mcl.html#mcls; last accessed 5/26/05).
6. Washington State surface water quality standards from WAC 173-201A-040.
7. EPA National Recommended Water Quality Criteria from http://www.epa.gov/waterscience/criteria/wqcriteria.html; last accessed 5/26/05.

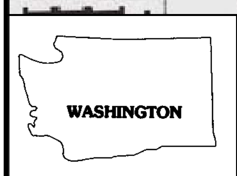
[a] Federal MCLs adopted by reference.

[b] Surface water standards are for free cyanide; test results represent total cyanide.

[c] See Section 7.4.1 for rationale regarding not including cyanide as an IHS.

FIGURES





0 2000 4000

Scale in Feet

N

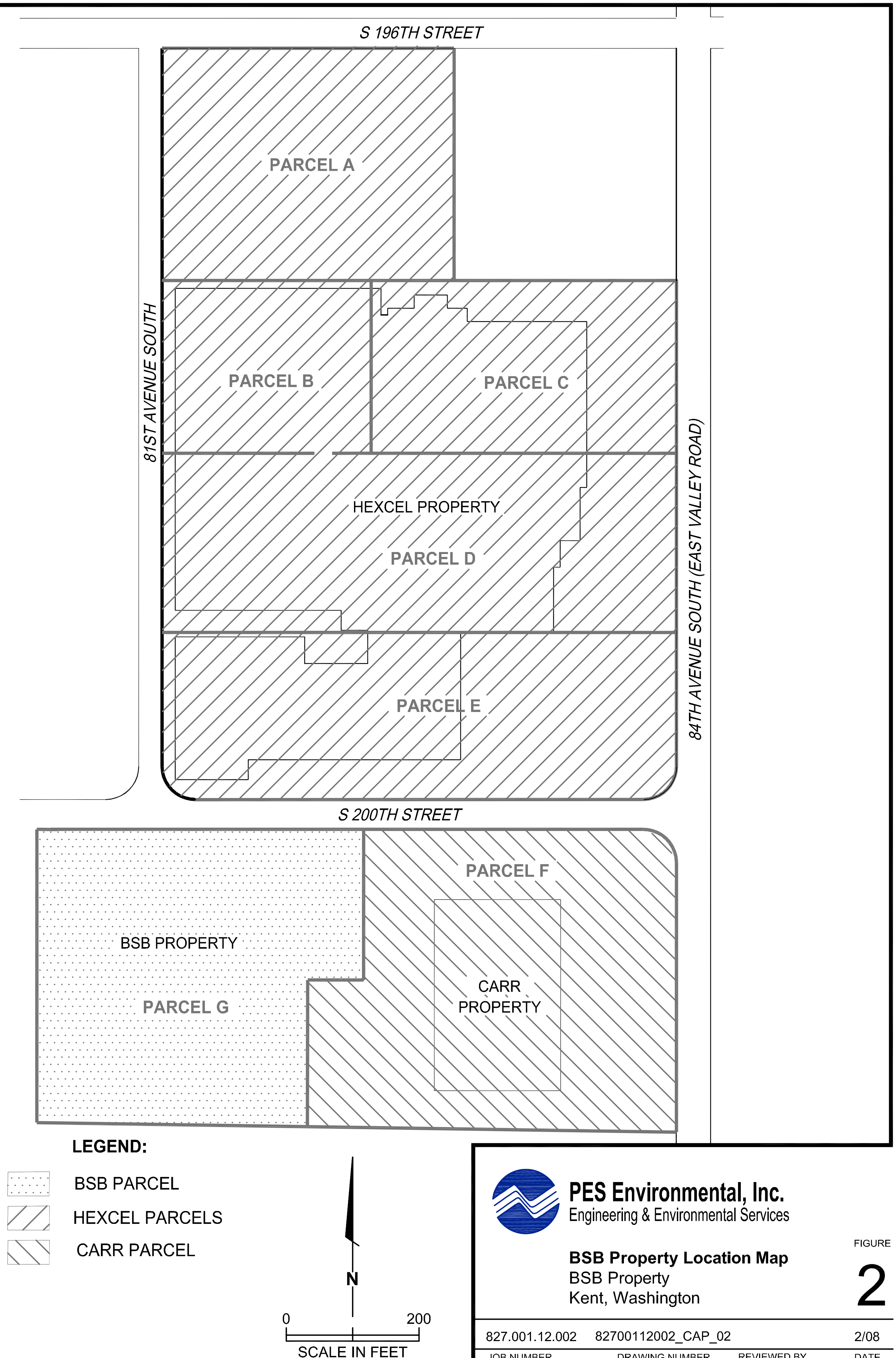
U.S.G.S. Topo Map - Renton, WA, 7.5-minute quadrangle.1949 revised 1994.

PES Environmental, Inc.
Engineering & Environmental Services

Property Location Map
BSB Property
Kent, Washington

FIGURE
1

827.001.12.002	82700112002_CAP_01		2/08
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

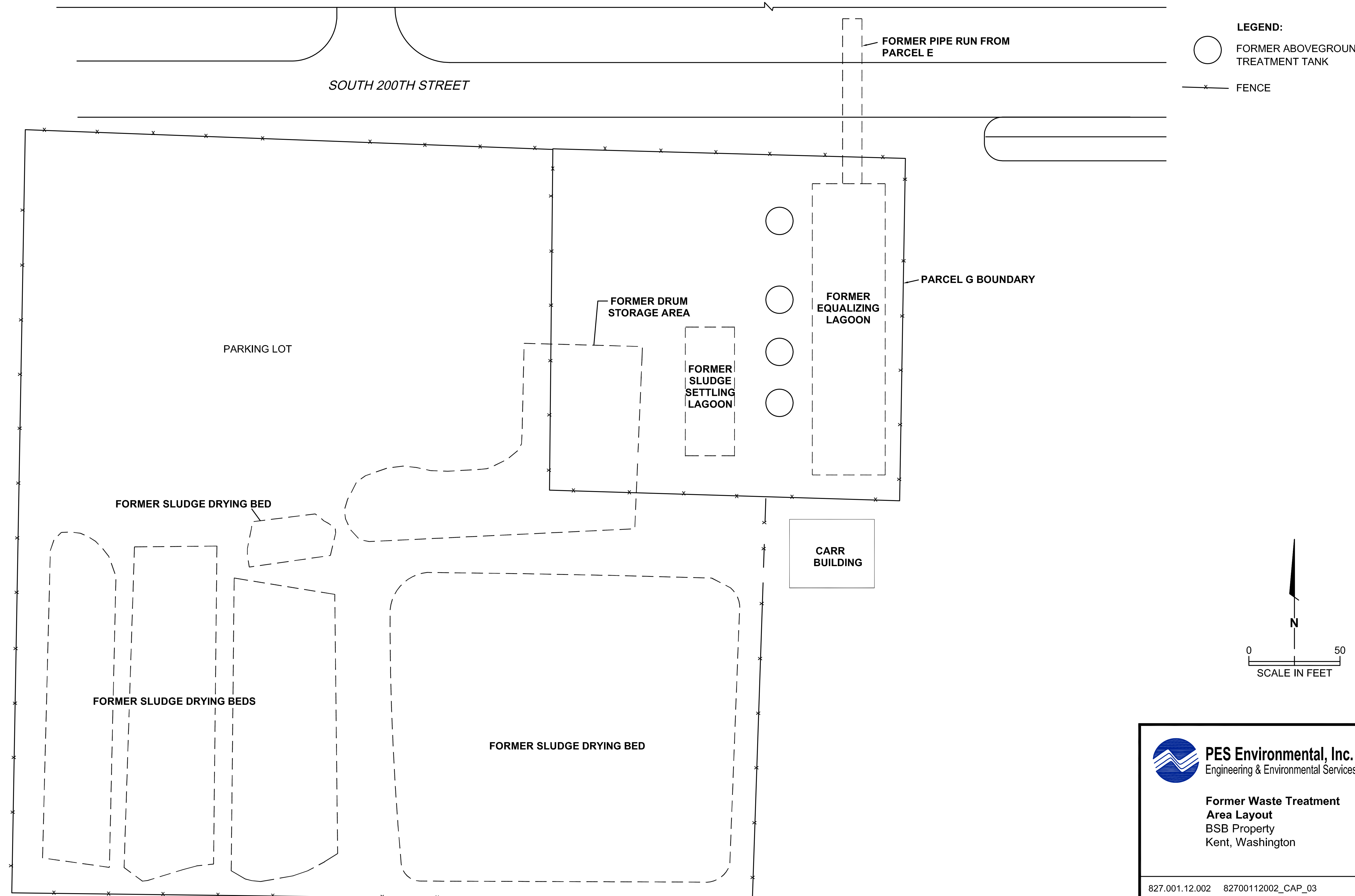


PES Environmental, Inc.
Engineering & Environmental Services

BSB Property Location Map
BSB Property
Kent, Washington

FIGURE
2

827.001.12.002	82700112002_CAP_02		2/08
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



PES Environmental, Inc.
Engineering & Environmental Services

Former Waste Treatment Area Layout
BSB Property
Kent, Washington

FIGURE
3

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
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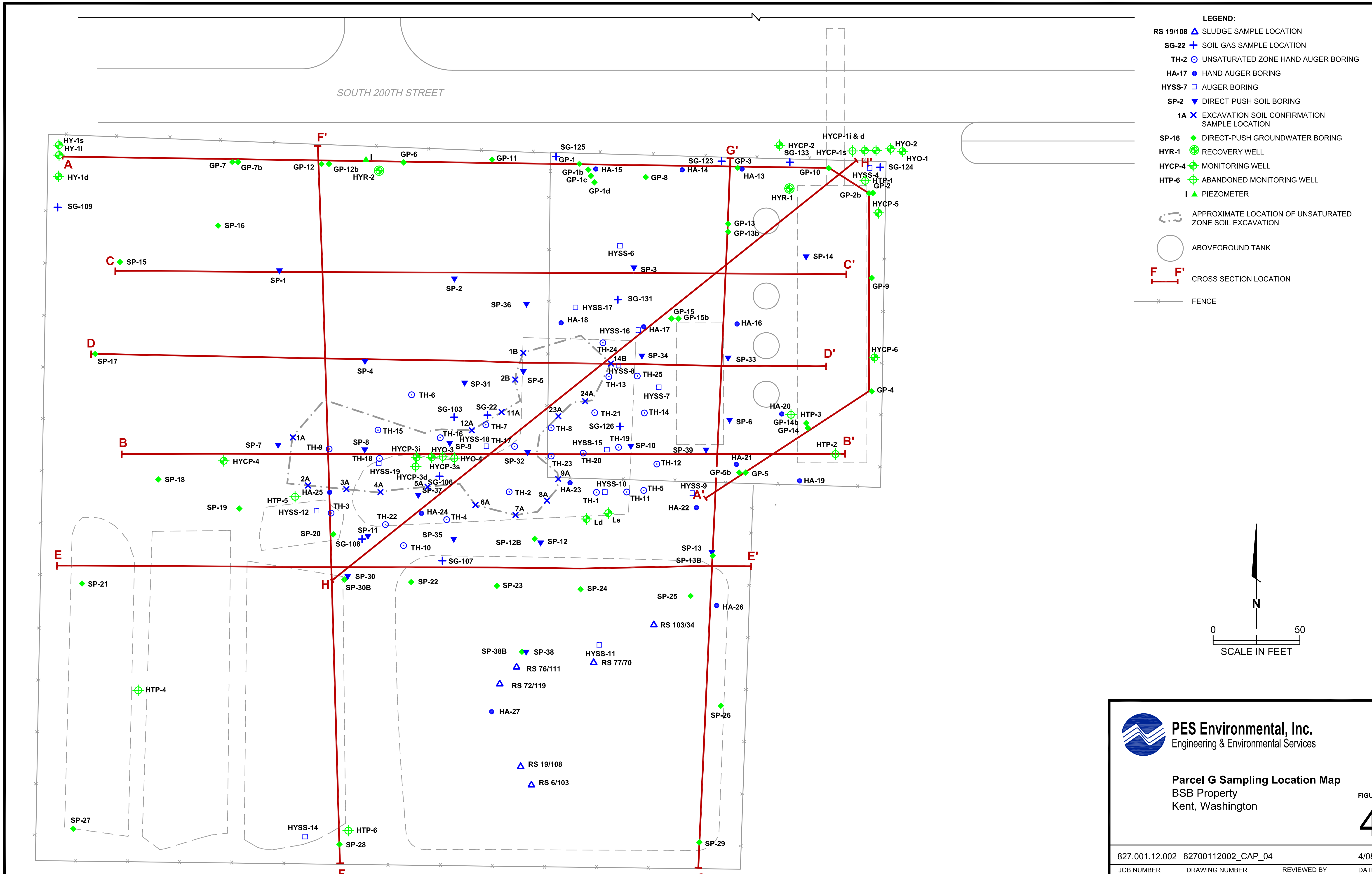

PES Environmental, Inc.
Engineering & Environmental Services

Parcel G Sampling Location Map
BSB Property
Kent, Washington

FIGURE
4

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
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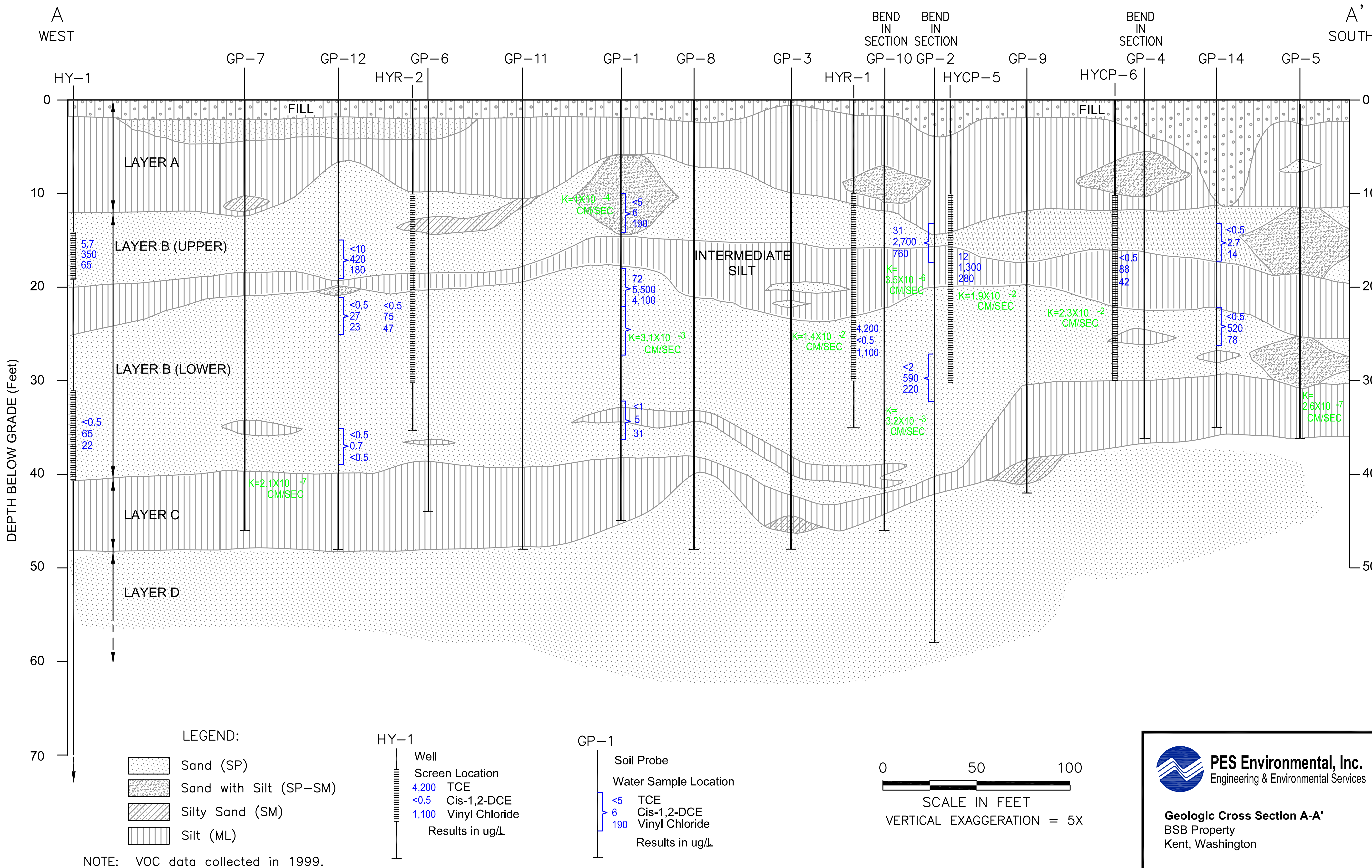


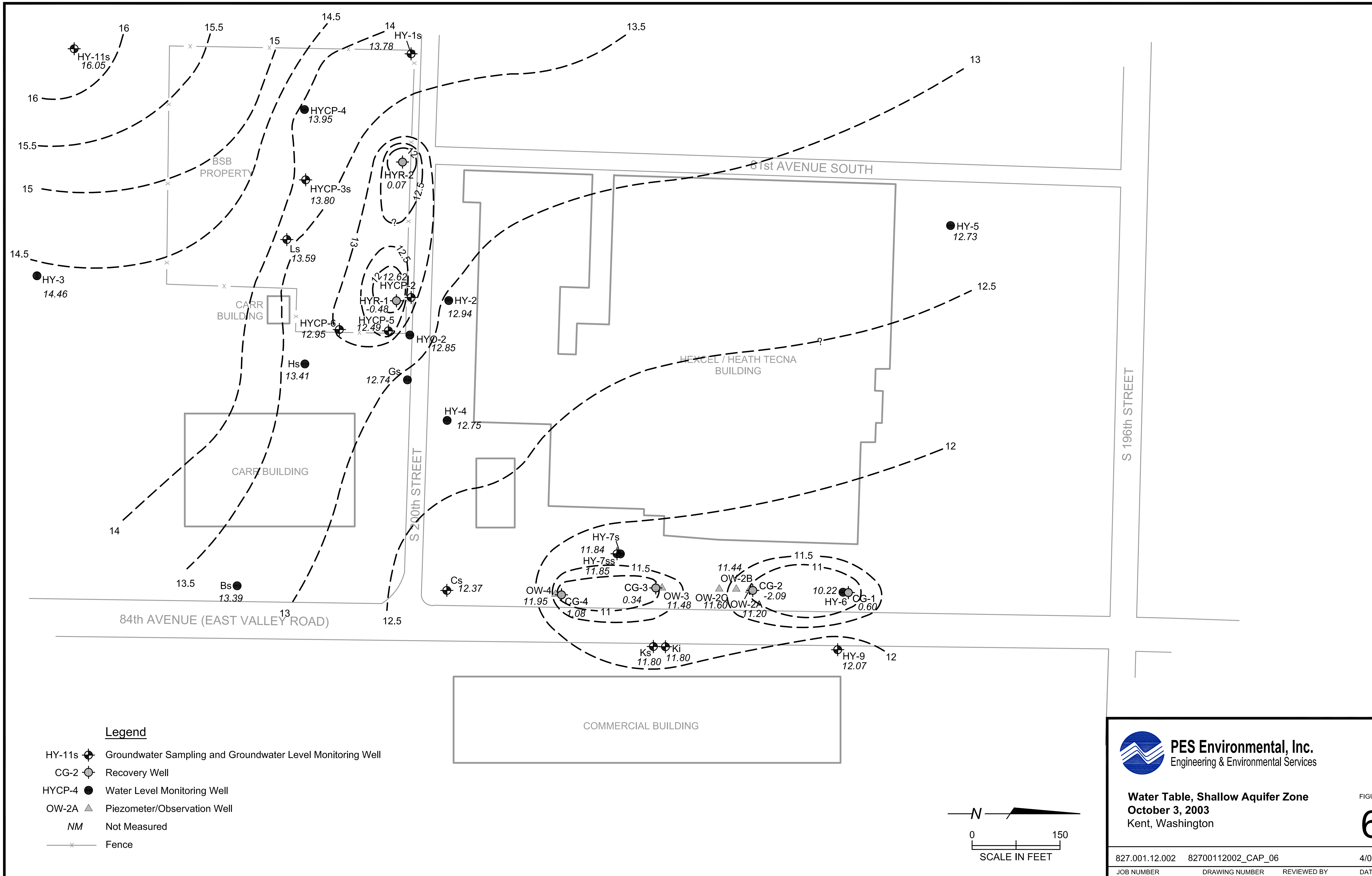
Source: IT Corporation (2001)

PES Environmental, Inc.
Engineering & Environmental Services

Geologic Cross Section A-A'
BSB Property
Kent, Washington

FIGURE 5

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
827.001.12.002	82700112002_CAP_05		4/08



Water Table, Shallow Aquifer Zone
October 3, 2003
Kent, Washington

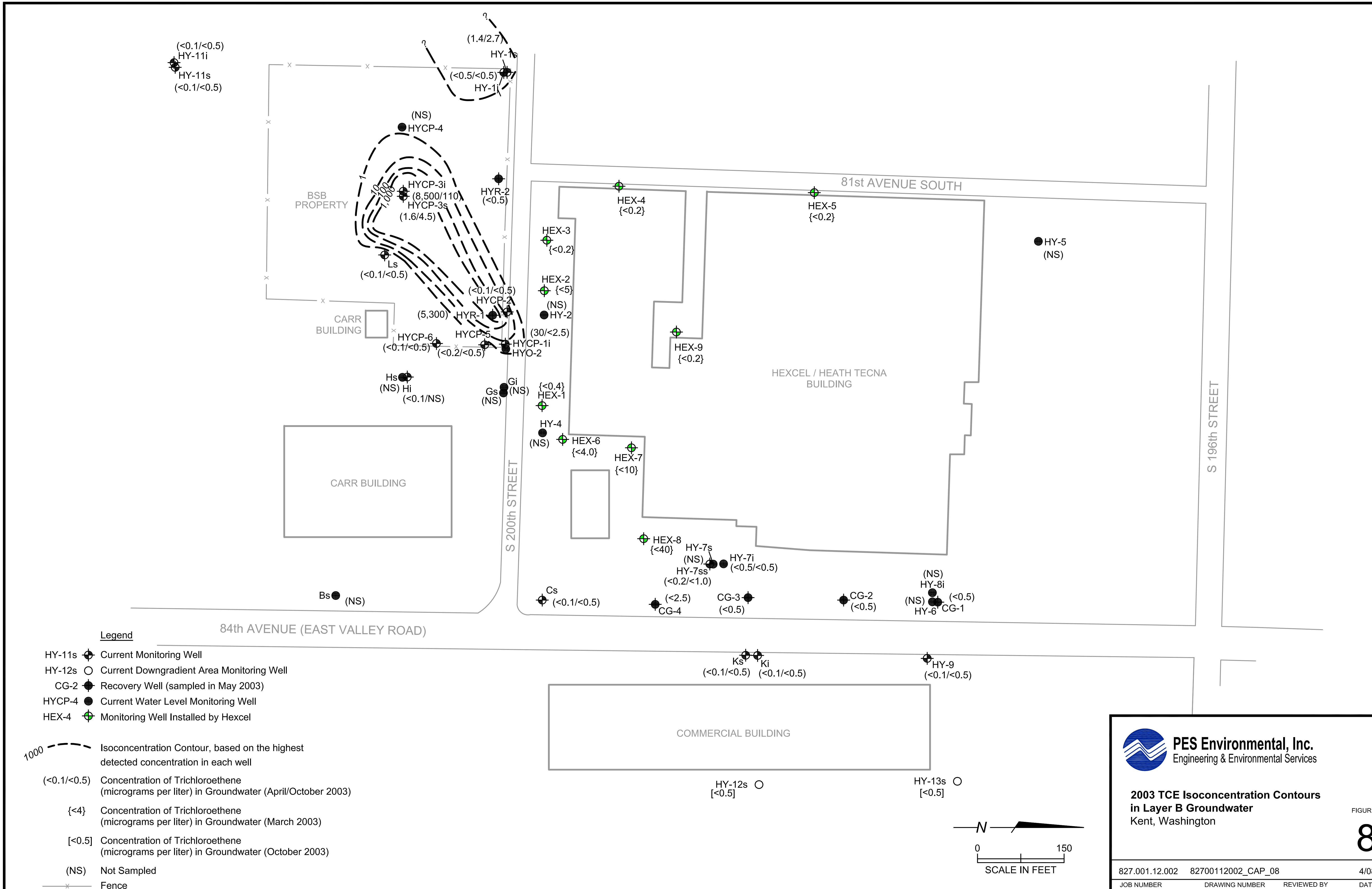
FIGURE 6

PES Environmental, Inc.
Engineering & Environmental Services

Extent of VOCs in BSB Property Soil
BSB Property
Kent, Washington

FIGURE
7

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
827.001.12.002	82700112002_CAP_07		4/08

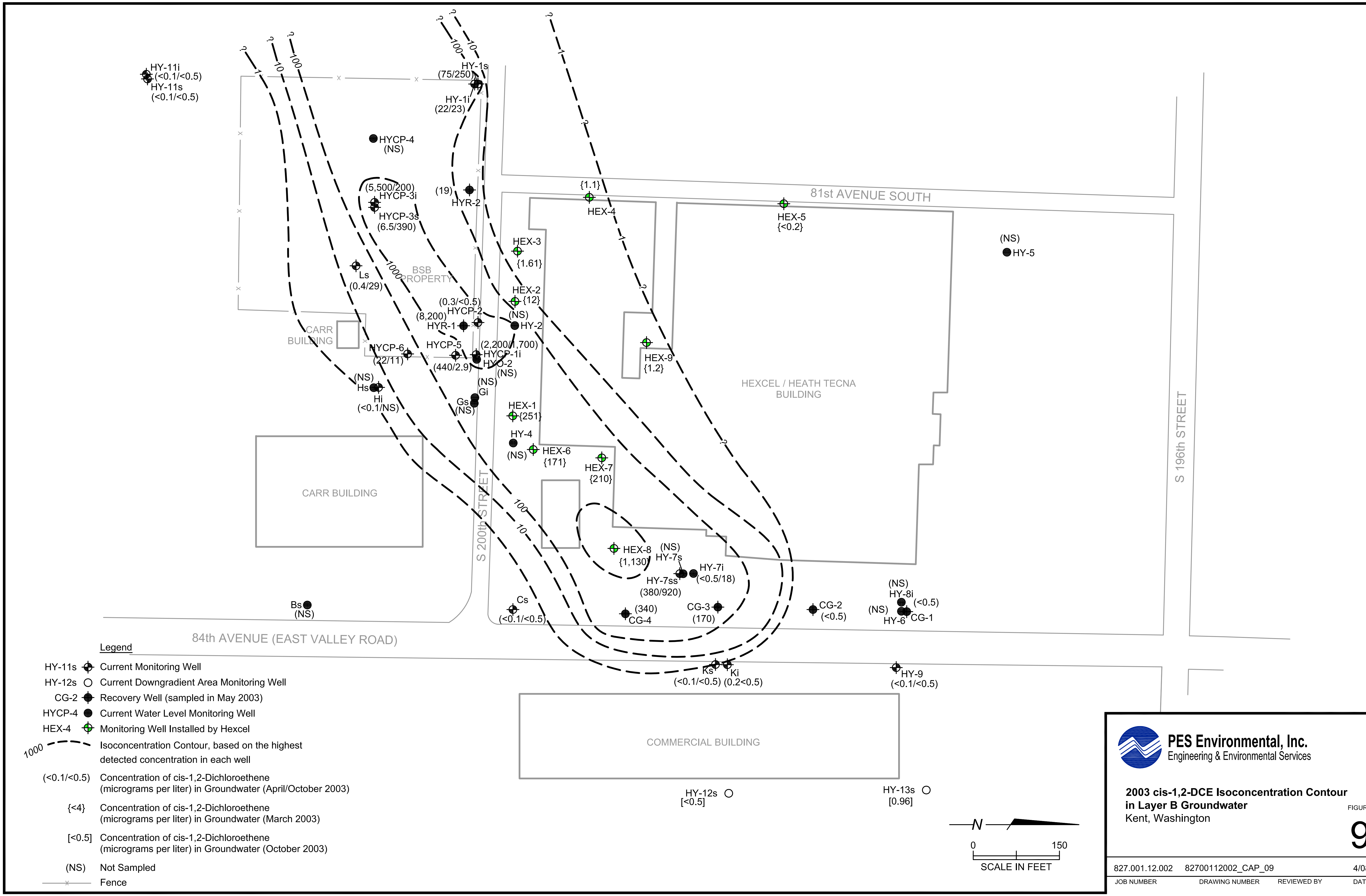


PES Environmental, Inc.
Engineering & Environmental Services

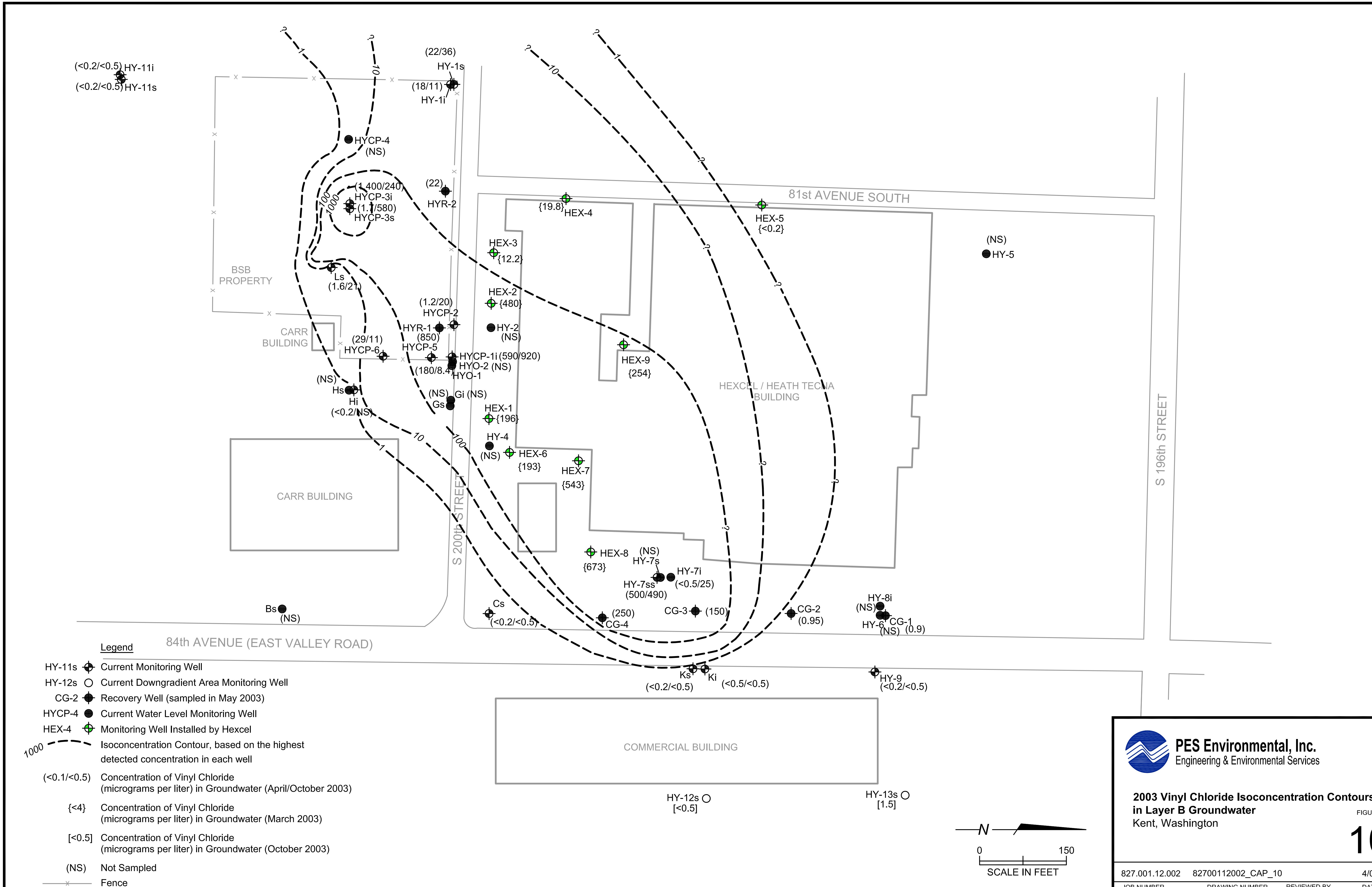
2003 TCE Isoconcentration Contours in Layer B Groundwater
Kent, Washington

FIGURE 8

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
827.001.12.002	82700112002_CAP_08		4/08



HY-11i
(<0.1/<0.5)
HY-11s
(<0.1/<0.5)
HY-1s
(75/250)
HY-1i
(22/23)
HYCP-4
(NS)
(5,500/200)
HYCP-3i
HYCP-3s
(6.5/390)
(19)
HYR-2
{1.1}
HEX-4
81st AVENUE SOUTH
HEX-5
{<0.2}
(NS)
HY-5
HEX-3
{1.61}
Ls
(0.4/29)
BSB
PROPERTY
HEX-2
{12}
(0.3/<0.5)
HYCP-2
(8,200)
HYR-1
(NS)
HY-2
CARR
BUILDING
HYCP-6
(22/11)
HYCP-5
(440/2.9)
(2,200/1,700)
HYCP-1i
HYO-2
(NS)
HEX-9
{1.2}
HEXCEL / HEATH TECNA
BUILDING
(NS)
Hs
Hi
(<0.1/NS)
(NS)
Gi
Gs
(NS)
HEX-1
{251}
HY-4
(NS)
HEX-6
{171}
HEX-7
{210}
CARR BUILDING
S 200th STREET
S 196th STREET
HEX-8
{1,130}
(NS)
HY-7s
HY-7i
(<0.5/18)
HY-7ss
(380/920)
Bs
(NS)
Cs
(<0.1/<0.5)
(340)
CG-4
CG-3
(170)
CG-2
(<0.5)
(NS)
HY-8i
(<0.5)
(NS)
HY-6
CG-1
84th AVENUE (EAST VALLEY ROAD)
Ks
(<0.1/<0.5)
Ki
(0.2<0.5)
HY-9
(<0.1/<0.5)
COMMERCIAL BUILDING
HY-12s
[<0.5]
HY-13s
[0.96]
Legend
HY-11s Current Monitoring Well
HY-12s Current Downgradient Area Monitoring Well
CG-2 Recovery Well (sampled in May 2003)
HYCP-4 Current Water Level Monitoring Well
HEX-4 Monitoring Well Installed by Hexcel
1000 Isoconcentration Contour, based on the highest detected concentration in each well
(<0.1/<0.5) Concentration of cis-1,2-Dichloroethene (micrograms per liter) in Groundwater (April/October 2003)
{<4} Concentration of cis-1,2-Dichloroethene (micrograms per liter) in Groundwater (March 2003)
[<0.5] Concentration of cis-1,2-Dichloroethene (micrograms per liter) in Groundwater (October 2003)
(NS) Not Sampled
Fence
N
0
150
SCALE IN FEET
PES Environmental, Inc.
Engineering & Environmental Services
2003 cis-1,2-DCE Isoconcentration Contour
in Layer B Groundwater
Kent, Washington
FIGURE
9
827.001.12.002
82700112002_CAP_09
4/08
JOB NUMBER
DRAWING NUMBER
REVIEWED BY
DATE



Legend

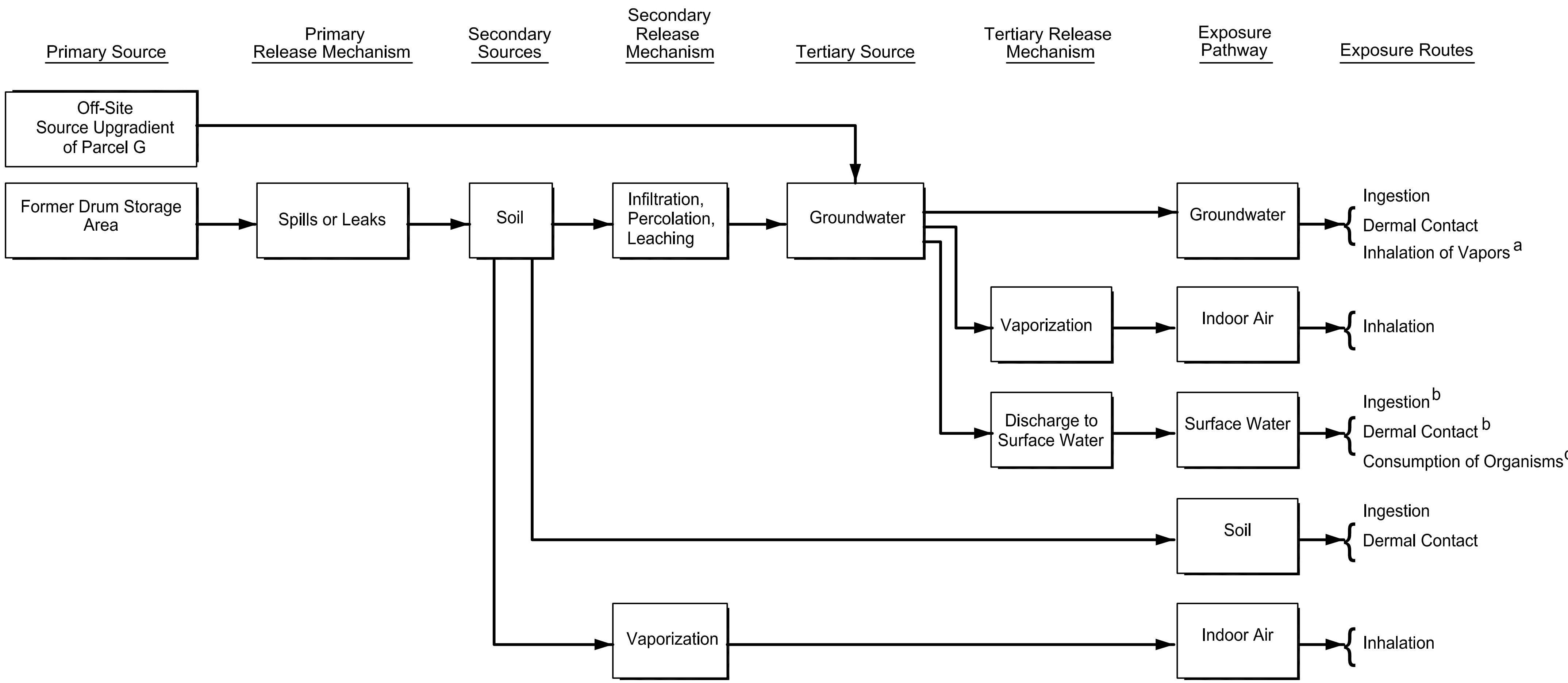
HY-11s	Current Monitoring Well
HY-12s	Current Downgradient Area Monitoring Well
CG-2	Recovery Well (sampled in May 2003)
HYCP-4	Current Water Level Monitoring Well
HEX-4	Monitoring Well Installed by Hexcel
1000	Isoconcentration Contour, based on the highest detected concentration in each well
(<0.1/<0.5)	Concentration of Vinyl Chloride (micrograms per liter) in Groundwater (April/October 2003)
{<4}	Concentration of Vinyl Chloride (micrograms per liter) in Groundwater (March 2003)
[<0.5]	Concentration of Vinyl Chloride (micrograms per liter) in Groundwater (October 2003)
(NS)	Not Sampled
	Fence

PES Environmental, Inc.
Engineering & Environmental Services

2003 Vinyl Chloride Isoconcentration Contours in Layer B Groundwater
Kent, Washington

FIGURE
10

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
827.001.12.002	82700112002_CAP_10		4/08



Exposure Pathway	RECEPTORS On-Site: Site/ Office Worker	Off-Site: Site Worker/ Resident	Off-Site: Ecological
Groundwater	X	X	
Indoor Air (groundwater vaporization)	O	X	
Surface Water		O	O
Soil	O	X	
Indoor Air (soil vaporization)	O	X	

LEGEND:
- ● Current Complete Pathway
- O Potential Future Pathway
- X Incomplete Pathway

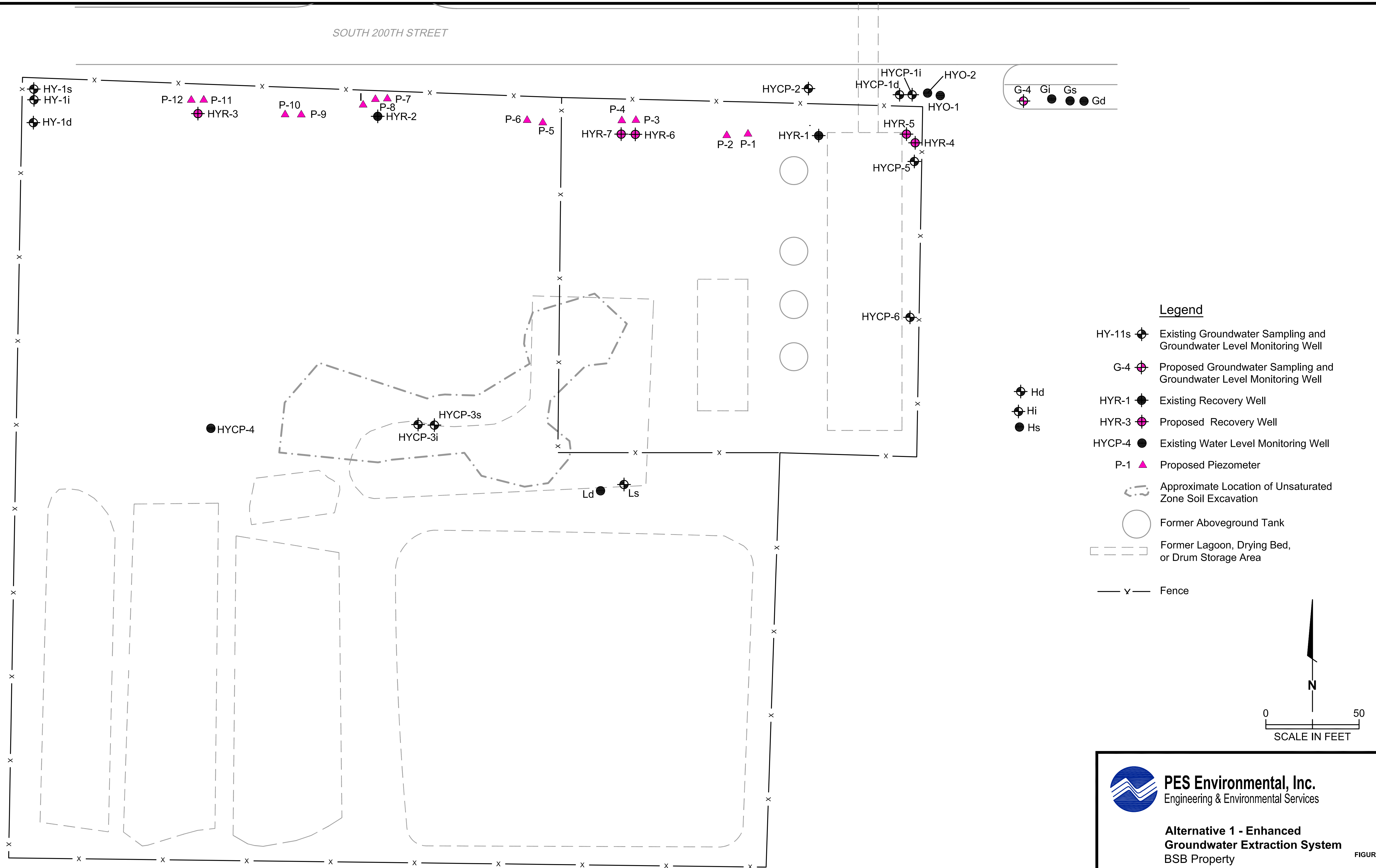
FOOTNOTE:
a From household use, such as showering.
b Ecological exposure route.
c Human exposure route.

PES Environmental, Inc.
Engineering & Environmental Services

Conceptual Site Model
BSB Facility
Kent, Washington

FIGURE 11

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
827.001.12.002	82700112002_CAP_11		4/08

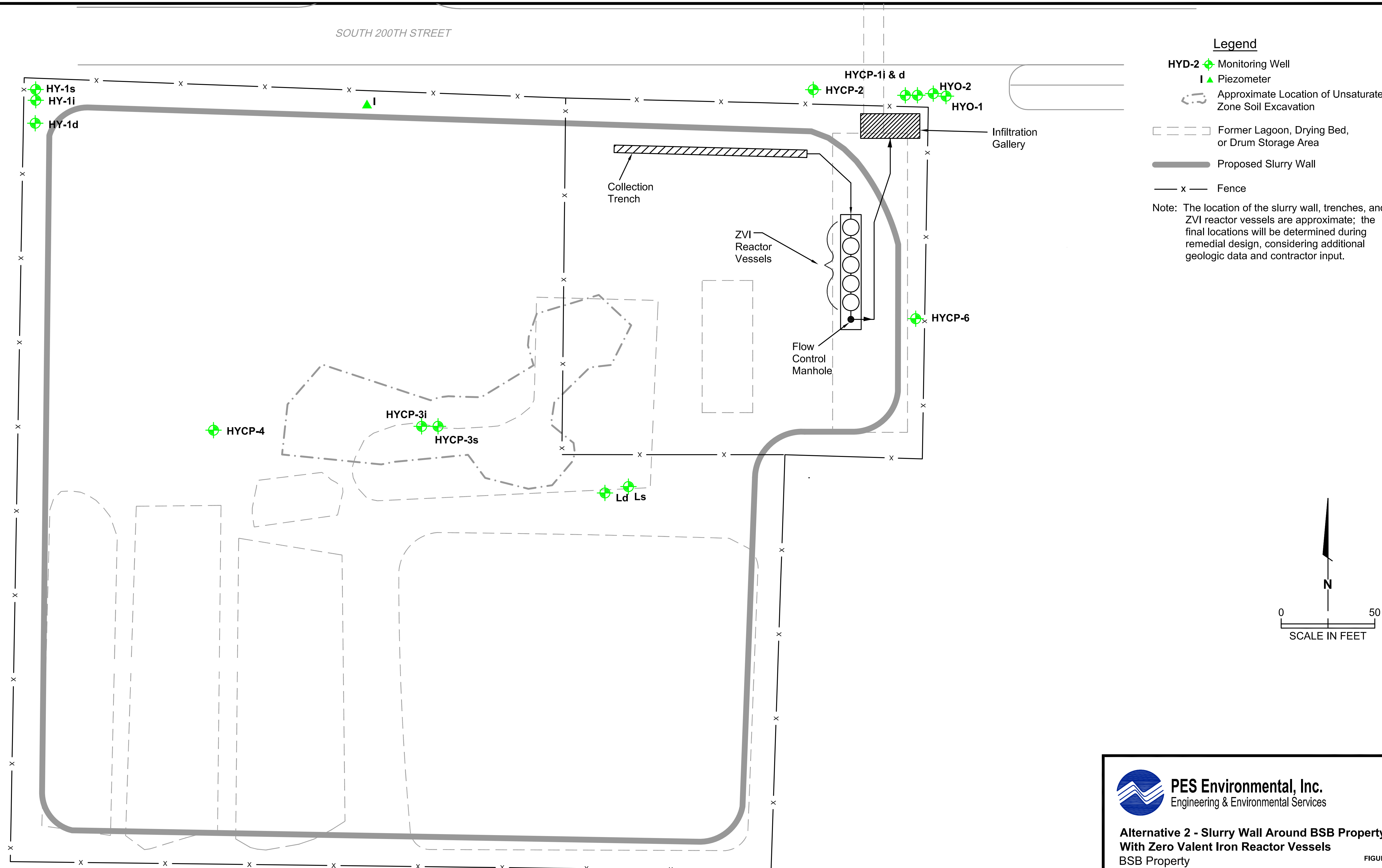


PES Environmental, Inc.
Engineering & Environmental Services

Alternative 1 - Enhanced Groundwater Extraction System
BSB Property
Kent, Washington

FIGURE
12

827.001.12.002	82700112002_CAP_12		4/08
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

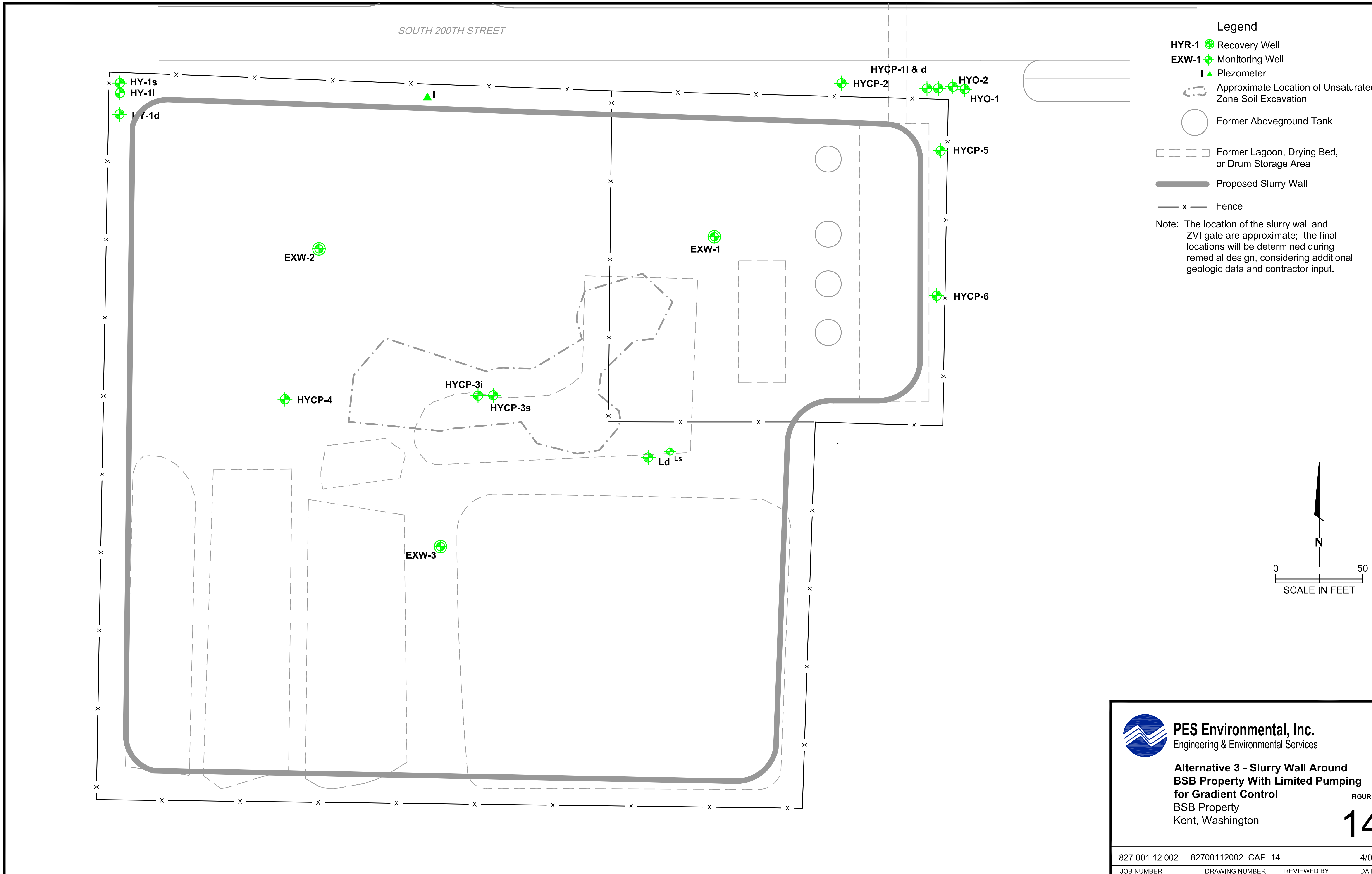


PES Environmental, Inc.
Engineering & Environmental Services

Alternative 2 - Slurry Wall Around BSB Property With Zero Valent Iron Reactor Vessels
BSB Property
Kent, Washington

FIGURE
13

827.001.12.002	82700112002_CAP_13		4/08
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



PES Environmental, Inc.
Engineering & Environmental Services

Alternative 3 - Slurry Wall Around BSB Property With Limited Pumping for Gradient Control
BSB Property
Kent, Washington

FIGURE
14

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
827.001.12.002	82700112002_CAP_14		4/08

APPENDIX A

SCHEDULE FOR 2008 DESIGN AND CONSTRUCTION

Preliminary Schedule for Remedy Selection and Design (2008 Construction)
BSB Diversified, Kent, Washington

Timescale: Qtr 4, 2007 (ovember 20, ecember 20) | Qtr 1, 2008 (anuary 200, ebruary 200, March 2008) | Qtr 2, 2008 (April 2008, May 2008, June 2008) | Qtr 3, 2008 (July 2008, August 2008, ptember 20) | Qtr 4, 2008 (ctober 200, ovember 20)

ID	Task Name	Date
1		
2	Ecology/BSB Agree to Proceed with Remedy	11/19
3	Prepare Scope and Budget	12/7
4	**Cleanup Action Plan, FFS, SEPA, PPP, and Consent Decree (CD)**	
5	Prepare Draft CAP, Final FS, SEPA Checklist, and CD	3/7
6	Prepare Public Participation Plan (PPP)	3/17
7	Ecology Review of DCAP, Final FS, SEPA Checklist, PPP, and Draft CD	3/28
8	Finalize CAP, FFS, SEPA Checklist and DNS, and CD for Public Comment	4/18
9	Public Comment Period	5/21
10	Review of Public Comments and Evaluate Status and Ability to Proceed in 2008	5/21
11	Response to Public Comments	6/11
12	BSB Signs Consent Decree	6/20
13	Attorney General Files Consent Decree with Court	6/27
14	Court Issues Consent Decree	6/27
15	Effective Date of Consent Decree	6/27
16		
17	**Remedy Design**	
18	Begin Design Process	12/7
19	**Design Scoping and Investigation**	
20	Develop Investigation Scope of Work	1/4
21	Conduct Surveying	1/25
22	Conduct Design Investigation	1/28
23	Summarize Investigation Data	2/11
24	**Prepare Design**	
25	Preliminary Civil Design (grading, paving, stormwater)	3/18
26	Identify Substantive Permit Requirements	3/18
27	30 Percent Design Status Meeting	3/18
28	Prepare Slurry Wall and ZVI Reactor Design	4/17
29	60 Percent Design Status Meeting	4/17
30	Prepare 100% Design Submittal, Including O&M Plan and Compliance Monitoring Plan	5/2
31	Ecology Review of 100% Design Submittal	5/30
32	BSB Review Ecology Comments. Evaluate Status and Ability to Proceed in 2008	5/30
33	Prepare Final Design Package	6/20
34	Ecology Approves Final Design	6/20
35		
36	**Construction**	
37	Prior to BSB Committing to Trenching Contractor Evaluate Status and Ability to Proceed in 2008	6/20
38	Bid Solicitation and Contracting	7/24
39	Construction	10/16

Project: Design Schedule_2008_Com|
Date: Mon 4/14/08

Legend: Task; Progress; Milestone; Summary; Rolled Up Task; Rolled Up Milestone; Rolled Up Progress; Split; External Tasks; Project Summary; Group By Summary