Remedial Investigation/Feasibility Study

TOC Holdings Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington 98032

Prepared for:

TOC Holdings Co.
2737 W. Commodore Way
Seattle, WA 98199

March 23, 2016

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ACRONYMS

Aerotech	Aerotech Environmental Consulting
ARAR	Applicable or Relevant and Appropriate Requirement
AS	air sparge or sparging
ASI	Additional Subsurface Investigation
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CAA	Cleanup Action Alternative
CAP	Cleanup Action Plan
CFR	Code of Federal Regulations
COC	Chemical of Concern
CSM	Conceptual Site Model
CUL	cleanup Level(s)
CVOC	chlorinated volatile organic compound(s)
DO	dissolved oxygen
DPE	dual-phase extraction
DRPH	diesel-range petroleum hydrocarbons
Ecology	Washington State Department of Ecology
EDB	ethylene dibromide or 1,2 dibromoethane
EDC	ethylene dichloride or 1,2 dichloroethane
EDD	Engineering Design Document
ESA	environmental site assessment
ESN	Environmental Services Network
FS	Feasibility Study
GRPH	Gasoline-range petroleum hydrocarbons
HASP	Health and Safety Plan
HydroCon	HydroCon Environmental LLC
LDPE	low-density polyethylene
LNAPL	light, nonaqueous phase liquid
LSI	Limited Site Investigation
MNA	monitored natural attenuation
MPE	multi-phase extraction
MRL	method reporting limit
MTBE	methyl tertiary butyl ether
MTCA	Model Toxics Control Act
NCP	National Contingency Plan
NFA	No Further Action
O&M	operations and maintenance
OMB	Office of Management and Budget

ACRONYMS (Continued)

ORPH	oil-range petroleum hydrocarbons
OSHA	Occupational Safety and Health Administration
PAHs	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PID	photoionization detector
PLP	Potentially Liable Party
POTW	publicly-owned treatment works
PSCAA	Puget Sound Clean Air Agency
PVC	polyvinyl chloride
RAOs	remedial action objectives
RCW	Revised Code of Washington
REC	recognized environmental condition
ROW	right-of-way
SI	Subsurface Investigation
SVE	soil vapor extraction
SVOCs	semi-volatile organic compounds
TCP	traffic control plan
TEE	Terrestrial Ecological Evaluation
Terracon	Terracon Consultants, Inc.
TOC	TOC Holdings Co.
TPH	total petroleum hydrocarbons
USC	United States Code
UST	underground storage tank
VIA	Vapor Intrusion Assessment
VI	vapor intrusion
VOCs	volatile organic compounds
VPH/EPH	volatile and extractable petroleum hydrocarbons
WAC	Washington Administrative Code

EXECUTIVE SUMMARY

HydroCon Environmental, LLC prepared this Remedial Investigation/Feasibility Study on behalf of TOC Holdings Co. for Facility No. 01-323, located at 301 Central Avenue North in Kent, Washington. This document was prepared in general accordance with the Washington State Model Toxics Control Act requirements for a Remedial Investigation/Feasibility Study promulgated in the Washington Administrative Code at Chapter 173-340-350.

The Property is a 0.31-acre square lot located at 301 Central Avenue North, Kent, Washington 97032. The Property address also includes 305 Central Avenue North and 215 East Smith Street. A 1,656-square foot restaurant, Taqueria El Rinconsito, is located in the southeastern portion of the Site. A paved parking lot and a drive-thru lane south of the restaurant comprise the remainder of the Property.

A retail gasoline service station was historically located in the eastern portion of the Property from at least 1935 to 1953. The facilities included two 500-gallon underground storage tanks (USTs), a fuel pump island and canopy, and a service bay with a “grease shed” and hoist. The 1953 gas station was demolished and replaced by Wagner’s Sav-Way gas station. The new service building was reportedly built in the western central portion of the Site. The gas station was demolished in approximately 1972 and replaced by the current restaurant structure. The former Time Oil Co. (now TOC Holdings Co.) was identified as the owner of a car wash building built in 1963 in the south central portion of the Site.

An ASTM Phase I Environmental Site Assessment conducted in 2010 listed some Recognized Environmental Conditions that were further investigated between 2010 and the present. Subsurface investigations conducted between 2010 and the present confirm that releases from former underground fuel storage tank systems (USTs) resulted in adverse environmental impacts to soil, groundwater, and soil gas. Laboratory analytical data indicate that concentrations of gasoline-, diesel- and heavy oil-range petroleum hydrocarbons, as well as benzene, toluene, ethylbenzene, total xylenes and naphthalene exceed the Washington State Model Toxics Control Act Method A cleanup levels in either soil or groundwater beneath the Property. Soil gas samples collected outside of, but adjacent to the perimeter of the restaurant building revealed concentrations of several volatile hydrocarbons above the Washington State Department of Ecology’s sub-slab vapor screening levels.

The boundary of environmental impacts exceeding Ecology’s unrestricted Method A cleanup levels has been compiled from the results of historic and recent subsurface investigations. The Site boundary is defined as the area where soil, soil gas, and groundwater concentrations exceed the respective medium-specific cleanup or screening level. This area is located in the southeastern portion of the Property extending approximately 10 feet to the south into the City of Kent’s E. Smith Street right-of-way.

Using the Site definition described above, a feasibility study was conducted to develop and evaluate cleanup action alternatives that would facilitate selection of a final cleanup action at the Site in accordance with Chapter 173-340-350(8) of the Washington Administrative Code.

Two cleanup action alternatives were developed and evaluated in the course of this Remedial Investigation/Feasibility Study:

- **Cleanup Alternative 1—Air Sparge with Soil Vapor Extraction**. This alternative employs air sparging of contaminated groundwater to remediate volatile contaminants of concern by phase transfer, while remediating other nonvolatile target compounds by insitu aerobic biodegradation. A small area of oil-range petroleum hydrocarbon contamination in soil would also be removed and backfilled with clean fill. Contaminants transferred to the vapor phase from groundwater by air sparging, and those present in soil gas that potentially threaten the nearby building indoor air would be recovered by soil vapor extraction. Recovered soil vapor would be treated prior to atmospheric discharge. Air emissions would be controlled and monitored on a monthly basis in accordance with requirements of the Puget Sound Clean Air Agency. With an assumed life-cycle of 3 years, the estimated present worth cost for this alternative is $941,000.

- **Cleanup Alternative 2—Dual-Phase Extraction.** This alternative would recover contaminants in the groundwater via pipe drains located within the Property boundary while simultaneously extracting contaminated soil vapor. A small area of oil-range petroleum hydrocarbon contamination in soil would also be removed and backfilled with clean fill. The remedial system would lower the water table around the drains and expose more of the petroleum-contaminated soil in the vadose zone, thus providing more area for recovery of contaminants by soil vapor extraction. The system would also supply and sustain oxygen to the unsaturated zone to promote aerobic bioremediation of the petroleum hydrocarbons adsorbed to the soil. Extracted groundwater and vapor would be collected, treated and monitored monthly for disposal under permits with the City of Kent municipal sewer system and the Puget Sound Clean Air Agency, respectively. With an assumed life-cycle of 3 years, the estimated present worth cost for this alternative is $1,006,000.

Based on the results of this feasibility study, Cleanup Action Alternative 1 is the recommended alternative for the Site. A Cleanup Action Plan will be prepared based on the results of the feasibility study that will present more detail on the methods proposed to remediate contaminants and media of concern.

This executive summary is presented solely for introductory purposes. The information contained in this section should be used only in conjunction with the full text of this report. A complete description of the project, Site conditions, investigative methods, and investigation results is contained within this report.

1 INTRODUCTION

HydroCon Environmental, LLC (HydroCon) prepared this Remedial Investigation/Feasibility Study (RI/FS) for the TOC Holdings Co. (TOC) Facility No. 01-323, located at 301 Central Avenue North in Kent, Washington (hereinafter referred to as the Property) on behalf of TOC. The location of the Property is shown in Figure 1. This report was prepared for submittal to the Washington State Department of Ecology (Ecology) and developed to meet the general requirements for a RI/FS as defined by the Washington State Model Toxics Control Act (MTCA) Regulation in Chapters 173-340-350 and 173-340-360 of the Washington Administrative Code (WAC §173-340-350 and §173-340-360).

As established in WAC §173-340-200, the "Site" is defined by the full lateral and vertical extent of contamination that has resulted from the former operation of a retail gasoline service station on the Property. Based on the information gathered to date, the Site occupies the southeast portion of the Property and slightly off-Property to the south as described more fully in the RI. Figure 2 illustrates the location of the Property and the historical features that resulted in the releases of fuel hydrocarbons to soil and groundwater.

1.1 DOCUMENT PURPOSE AND OBJECTIVES

The RI and FS are separate activities with different purposes and objectives. The RI is completed prior to the FS to collect data necessary to characterize risks posed to human health and the environment from the conditions existing at the Site. The purpose of the FS is to develop and evaluate a range of remedial alternatives that mitigate the risks identified in the RI, and to recommend the most appropriate cleanup action alternative from a range of plausible alternatives comprised of remedial components proven to be effective from technical and cost perspectives.

1.2 DOCUMENT ORGANIZATION

The RI section of this report presents historical information regarding the former use of the Property and Site, summarizes the information obtained during the review of historical information, and summarizes the scope and findings of historical subsurface investigations (SI) that have been conducted on the Site. The RI report is organized into the following sections:

- **Section 2**, **Background**. This section provides a description of the Property features and location; a summary of historical Property use; a description of the local geology, hydrology, and land use pertaining to the Property; and a description of the discovery of the release at the Property.
- **Section 3, Previous Investigations and Response Actions.** This section summarizes the scope and results of historical SIs conducted at the Site.
- **Section 4, Terrestrial Ecological Evaluation**. This section provides a discussion of the evaluation of potential impacts to ecological receptors from a release of hazardous substances.

- **Section 5, Conceptual Site Model.** This section provides a summary of the conceptual site model (CSM) derived from the results of the RI. Included is a discussion of confirmed and suspected source areas, the chemicals of concern (COCs), affected media, fate and transport characteristics of the release of hazardous substances, and a preliminary exposure assessment.

- **Section 6, Feasibility Study Introduction.** This section is a recapitulation of the RI findings and a description of the regulatory factors that influence the scope of the FS and development of cleanup action alternatives.

- **Section 7, Pilot Tests.** If pilot testing was completed as part of the development and analysis of cleanup action alternatives, the methods and results of those tests would be documented in this section. Because no pilot testing was completed as part of the RI/FS, this section has nothing to report. However, since pilot testing is likely to be included as part of the design of the recommended cleanup action alternative, pilot test methods and results would be reported in a Cleanup Action Plan (CAP), or Engineering Design Document (EDD) as the cleanup action proceeds.

- **Section 8, Feasibility Study.** The FS consists of the screening of remedial components, the development of cleanup action alternatives, the focused analysis of each alternative, and a comparative analysis of the alternatives weighed against the MTCA evaluation criteria for alternatives. A recommended cleanup action alternative is the result of the FS process.

- **Section 9, References.** This section lists references used to prepare this document.

- **Section 10, Limitations.** This section discusses constraints on the uses of this document.

2 BACKGROUND

This section provides a description of the Property features and location; a summary of current and historical land use practices on the Property and adjoining parcels, a description of potential future Property uses, and a description of the environmental, geological, and hydrogeological settings at the Site. This section also provides a summary of the SIs and interim remedial actions conducted at the Site, including a detailed description of the SIs performed in 2015.

2.1 PROPERTY LOCATION AND DESCRIPTION

The Property is a 0.31-acre square lot located at 301 Central Avenue North, Kent, Washington 97032 (Figure 1). The Property addresses also include 305 Central Avenue North and 215 East Smith Street. The Property is comprised of two tax lots (King County tax parcel Nos. 917960-1735 and 917960-1745) in Kent, King County, Washington. The Property is currently owned by the Vivolo Family Trust LLC.

A 1,656-square foot restaurant, Taqueria El Rinconsito, is located in the southeastern portion of the Site. A paved parking lot and a drive-thru lane south of the restaurant comprise the remainder of the Property.

2.2 PROPERTY LAND USE HISTORY

HydroCon reviewed a Limited Site Investigation (LSI) report prepared by Terracon Consultants, Inc. (Terracon 2013). The report was prepared for the Vivolo Family Trust LLC and includes information from a Phase I Environmental Site Assessment (ESA) prepared by Aerotech Environmental Consulting (Aerotec 2010, as reported in Terracon 2013).

According to Aerotech, a gas station was historically located in the eastern portion of the Property from at least 1935 to 1953 and the facilities included two 500-gallon underground storage tanks (USTs), a fuel pump island and canopy, and a service bay with a “grease shed” and hoist. The 1953 gas station was demolished and replaced by Wagner’s Sav-Way gas station. The new service building was reportedly built in the western central portion of the Site. The gas station was demolished in approximately 1972 and replaced by the current restaurant structure.

Site reconnaissance conducted by Aerotech identified a concrete patch with two apparent UST fill ports north of the restaurant, which Aerotech interpreted as evidence of the presence of possible USTs left in place. Aerotech identified the on-Site USTs, the historical Site use as gas stations, potential additional USTs, and the subsurface components of the hoist, as Recognized Environmental Conditions (RECs). Site features are shown on Figure 2.

According to historical assessor records obtained by Terracon, Time Oil Co. was identified as the owner of a car wash building built in 1963 in the south central portion of the Site.

Terracon (2013) reviewed historical aerial photographs to obtain information on the history of development of the Property and nearby areas. The Property was developed as a gas station as early as 1936 and all gas station structures had been removed by 1972. The current building was present in 1990. Two adjoining properties were reviewed: Strains Cascade Facility/Jack in the Box and Burdic Feed. Terracon concluded that on the basis of releases and the SIs, the relative position of the properties, and groundwater flow direction, there is potential for an off-site release from the former Strains Cascade Facility to impact the Property.

2.3 FUTURE PROPERTY LAND USE

HydroCon is not aware of future plans for development or redevelopment of the Property. The Property is within the City of Kent's general commercial – mixed use zoning overlay (City of Kent Website, 2016). As such, future development can include commercial and residential uses developed in conjunction with each other, with up to 2 structures. A minimum of 25 percent of the gross floor space must be permitted as commercial use and residential use cannot be permitted before the commercial use (City of Kent, 2016).

2.4 ENVIRONMENTAL SETTING

The marine climate of the Kent area is generally mild and experiences moderate seasonal fluctuations in temperature. Average temperatures (in degrees Fahrenheit) range from 60s in the summer to 40s in the winter. The warmest month of the year is August, which has an average maximum temperature of 78 degrees Fahrenheit. The coldest month of the year is January, which has an average minimum daily temperature of 46 degrees Fahrenheit. The average annual precipitation reported for the Kent area is 39.1 inches and generally occurs in the form of rain. The wettest month of the year is December, during which the area receives an average precipitation total of 5.99 inches. The driest month of the year is July, during which the area receives an average precipitation total of 0.83 inches (Western Regional Climate Center 2016).

2.5 GEOLOGIC AND HYDROGEOLOGIC SETTING

This section summarizes the regional and local topography, geology, hydrogeology, and groundwater use.

2.5.1 Topography

The topography of the area is generally flat at an elevation of 40 feet (Figure 1). The East Hill area begins rising approximately 100 feet to the east. Mill Creek is the nearest water body, lying approximately 1,500 feet to the east. The Green River is 4,700 feet to the southwest at its nearest point, which flows to the northwest to its discharge to the Puget Sound.

2.5.2 Regional Geology

The Site lies within the Duwamish Valley, located between the Cascades and Puget Sound. The Duwamish Valley is a former extension of the Puget Sound waterway that became partly filled to above sea level with lacustrine and alluvial deposits. The alluvium, primarily from the Green and White rivers,

forms a thick deposit that fills the deep glacial trough that is now the Duwamish Valley. Postglacial sediments have accumulated continuously in Duwamish Valley since retreat of the Vashon glacier. Shallow soils typically consist of channel gravels and sands that occur in present and abandoned channels of the main rivers or silt, clay, and peat of overbank deposits (Mullineaux, 1970).

Soils in the Duwamish Valley typically consist of the Oridia-Seattle-Woodinville association. These soils are generally poorly-drained silt loams. The alluvium in much of the lower Duwamish Valley is characterized by medium- to medium to fine-grained sand and silt that was deposited in a delta complex when the valley was a submerged marine embayment; these sediments generally do not yield appreciable volumes of water to wells (Woodward et. al., 1995).

2.5.3 Regional Hydrogeology

The main aquifer in the area is the recent alluvial aquifer (Qal) that occurs with the Pacific/Algona/Auburn area, and the Renton area. The Qal aquifer generally occurs at depths of less than 100 feet, is unconfined, and is in hydraulic connection with multiple surface water systems (White, Green and Cedar rivers). Aquifer recharge is from direct infiltration of the ground surface, and lateral groundwater inflow from deeper aquifers in adjacent uplands. Natural aquifer discharge is to the rivers. Other alluvial aquifers, mapped as Qvr, Qva, Qc_2, Qc_3 and Qc_3 are also present in the area and contribute to the Kent water supply system (Pace 2011).

2.5.4 Groundwater Use

The City of Kent is served by multiple groundwater sources located throughout its water system service area. These include Clark Springs, Kent Springs, East Hill Wells, Garrison Well, Armstrong Springs Wells, Seven Oaks Well, Summit Well, O'Brian Well, 208th Street Well, and 212th Street Wells. These sources of supply are served by aquifers that underlie the Green and Cedar River basins. These sources are responsible for meeting all of Kent's existing and projected water supply demand (Pace 2011). It appears that additional water supply wells are also in use. According to Ecology's online well log database (Ecology 2015a), the City of Kent owns 17 water supply wells within a 1-mile radius of the Site, with well depths ranging from 23 to 598 feet with well casings ranging up to 36 inches.

2.5.5 Site Geology and Hydrogeology

The locations of borings and wells advanced at the Site are shown in Figure 2. Based on the results of the investigations summarized in later sections of this report, subsurface soil beneath the Property, to a depth of 15 feet, consists primarily of sand with varying amounts of silt. Silt is present at the bottom of Boring HC07. Gravel and gravel fill are present in some borings to a depth of approximately 3 feet. Groundwater was present in monitoring wells at a depth of approximately 7 to 8 feet bgs and flows towards the west with a very low gradient.

3 PREVIOUS INVESTIGATIONS & RESPONSE ACTIONS

The following provides a summary of the methods and findings of prior SIs at the Site, including the discovery of soil and groundwater contamination. Soil, groundwater, and soil gas analytical results are summarized in Tables 1 through 9. The locations of 2013 and 2014 sampling locations and other Site features are shown on Figure 2. Summaries of soil, groundwater, and soil gas sampled in 2015, which focus on the nature and extent of impacts, are provided on Figures 3 through 9.

This section includes references to cleanup levels (CULs); unless otherwise specified, these refer to MTCA Method A CULs for Unrestricted Land Use for soil and groundwater. Only MTCA Method B CULs are published for soil gas.

3.1 RELEASE DISCOVERY

Due diligence efforts conducted by others suggested that Time Oil Co. had previously owned a gasoline service station on the Property and a limited SI identified impacts to soil and groundwater exceeding CULs. Following this discovery, TOC conducted additional SIs on the Property.

3.2 AEROTECH PHASE I ENVIRONMENTAL SITE ASSESSMENT (2010)

As noted in Section 2.2, Aerotech conducted a Phase I ESA and determined that a gasoline service station that previously occupied the Property operated six USTs and associated product piping and pumps. Service station operations were present at the Site between 1936 and approximately 1972.

3.3 TERRACON LIMITED PHASE II ESA (2013)

Terracon (2013) conducted a LSI to investigate the RECs identified in the prior Phase I ESA completed by Aerotech. The scope of work for the LSI included reviewing historical reports, investigating known and suspected UST locations by geophysical survey, and conducting exploratory excavations with concurrent assessment of potential impacts to soil and groundwater from releases from existing or previously undocumented USTs. The LSI confirmed the presence of a minimum of four USTs in the northeast portion of the Site and up to three possible USTs south of the restaurant.

Soil and groundwater samples were collected from seven borings, five near the USTs located on the northeast portion of the Site and two near suspected USTs located south of the restaurant (Figure 2). Fourteen soil samples (from borings B01 through B07, Tables 1 and 2) were analyzed for gasoline-range petroleum hydrocarbons (GRPH) diesel- range hydrocarbons (DRPH), oil-range hydrocarbons (ORPH) and volatile organic compounds (VOCs) including benzene, ethylbenzene, toluene, xylenes (BTEX), 1,2-dibromoethane (EDB), 1,2-dichloroethane (EDC), methyl tertiary-butyl ether (MTBE), naphthalene, lead, 1,2,3-trimethylbenzene, acetone,

isopropylbenzene, methyl ethyl ketone, n-butylbenzene, n-propylbenzene, p-isopropylbenzene, sec-butylbenzene, and tert-butylbenzene.

Seven groundwater samples (TMW-01 through TMW-07, Table 3) were analyzed for GRPH, DRPH, ORPH, BTEX, n-propylbenzene, n-butylbenzene, sec-butylbenzene, 1,3-dichlorobenzene, isopropylbenzene, p-isopropylbenzene, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, 1,2,3-trimethylbenzene, and naphthalenes.

GRPH, ethylbenzene, and naphthalene were detected in soil above their respective CULs from one boring (B-06) south of the restaurant. Groundwater collected from this same boring had exceedances of GRPH, DRPH, and some volatile organic compounds (VOCs).

UST removal activities were postponed in order to prepare for the decommissioning of all tanks at once and to ensure sufficient time to address the City of Kent permitting requirements.

3.4 TERRACON INTERIM REMEDIAL ACTION (JUNE 2014)

An interim remedial action to permanently close five of the USTs by removal and off-Site disposal, and one of the USTs by closure-in-place was completed in June 2014 (Terracon 2014). In the northeast portion of the Site, one 6,000-gallon UST and one 5,000-gallon UST used to store gasoline (based on odors) were removed. In the area south of the restaurant, four USTs with capacities ranging from 500 to 800 gallons used to store gasoline (based on field observations and soil analytical results) were encountered. Three of the USTs were removed and one close to the East Smith Street ROW was decommissioned in place (Figure 2).

Soil sampling conducted by Terracon during the interim remedial action included 6 confirmation samples and 4 soil stockpile composite samples from the UST excavation in the northeast area; 15 confirmation samples and 5 soil stockpile composite samples from the UST excavation south of the building; and 11 confirmation samples and 2 soil stockpile composite samples collected in an exploratory excavation in the drive-through east of the south UST excavation. HydroCon (2014) also collected duplicate samples at most locations. The results of both sampling efforts are listed on Table 1.

GRPH and BTEX were either not detected or detected well below CULs in the confirmation and stockpile samples collected in the northeast area. One sample NSS-04 was also analyzed for polynuclear aromatic hydrocarbons (PAHs) using EPA Method 8270 with no results detected above the laboratory's method reporting limit (MRL). Based on these results, the stockpiled soil was returned to the excavation.

In the area south of the restaurant, 8 of the 15 soil samples collected from the excavation sidewalls and 2 of the 5 stockpile soil samples exhibited GRPH and BTEX concentrations in excess of the CULs. Results from samples collected in the western portions of the excavation

were generally below CULs. The excavation was backfilled using clean stockpiled soil and clean imported fill.

In the drive-through area, 7 of 11 confirmation samples and one of the stockpile samples contained GRPH and BTEX concentrations above CULs. Results from the northern part of the excavation were generally below CULs. The excavation was backfilled using clean stockpiled soil and clean imported fill.

3.5 HYDROCON SUBSURFACE INVESTIGATION (JUNE & JULY 2015)

HydroCon conducted two subsurface investigations (SIs) in 2015: an SI in June/July and an additional SI (ASI) in December. Analytical laboratory reports for the HydroCon SI and ASI are appended to the respective reports (HydroCon 2015, 2016a). The June/July SI was conducted to collect data sufficient to define the Site in accordance with WAC §173-340-350. The SI consisted of sampling soil from 17 direct-push borings and installing 6 groundwater monitoring wells. Soil sampling results are provided in Table 4 and 5 and Figure 3. Borehole groundwater results are provided in Table 6 and Figure 4. Monitoring well sampling results are provided in Tables 7 and 8 and Figure 5. The results of the SI are summarized in the following paragraphs.

3.5.1 Soil Conditions Revealed During the SI

DRPH was detected in 17 of the 73 samples collected at concentrations above the laboratory method reporting limit (MRL), ranging from 69 mg/kg to 6,700 mg/kg. Of the 17 samples with detected concentrations, 5 samples (HC10-07, HC11-05, HC11-07, HC12-05, and HC13-05) had concentrations above the MTCA Method A cleanup level. In addition, all 17 detections of DRPH were qualified ("x") by the laboratory as chromatographic patterns not resembling the fuel standard used for quantitation - except MW04-07 and MW05-08. The fuel standards used by the laboratory for GRPH, DRPH, and ORPH are from certified sources consisting of fresh gasoline, diesel fuel, and motor oil, respectively (Personal Communication, 2016). Detected chromatographic patterns that do not match with laboratory diesel fuel standards suggest that the mass resolving as DRPH in the DRPH analyses does not source from diesel fuel but from organic compounds sourcing from naturally-occurring plant material or from the abiotic or biotic degradation of GRPH (polar metabolites).

ORPH was detected above the laboratory MRL in three samples; the sample collected at HC08 (at 5' bgs) exceeded the MTCA Method A cleanup level with a concentration of 2,800 mg/kg.

GRPH was detected in 24 of the 73 samples collected at concentrations above the laboratory MRL (Table 1), ranging from 3.6 mg/kg to 14,000 mg/kg. Of the 24 samples with detected concentrations, 13 samples (HC02-07, HC03-08, HC10-07, HC11-05, HC11-07, HC12-05, HC12-07, HC13-05, HC13-11, MW02-07, MW03-05, MW03-07, and MW03-12) had concentrations above the MTCA Method A cleanup level.

One or more BTEX constituents were detected in 10 of the 73 samples collected at concentrations above the laboratory MRLs. The benzene concentrations detected in the samples HC10-07, HC11-05, HC11-07, HC12-05, HC12-07, HC13-05, HC13-11, MW02-07, MW03-05, MW03-07, and MW03-12 exceeded the MTCA Method A cleanup level of 0.03 mg/kg. None of the detected concentrations of toluene, ethylbenzene, or xylene exceeded their respective MTCA Method A cleanup level.

Based on the results of field screening and laboratory analysis, DRPH, GRPH, and/or BTEX constituents were observed above CULs in soil samples from the southeast corner of the Site. This impacted area appeared to be constrained to the south by concentrations in soil below CULs in boreholes HC15, HC16, and HC17 and to the west by boreholes HC14, MW01, and HC01. The area to the east was not constrained. An area north of the existing Site building at HC08 is also impacted with ORPH. Additional borings to define the eastern bounds of contamination were considered necessary to fully constrain the extent of impacted soil.

3.5.2 Groundwater Conditions Revealed During the SI

Similarly, groundwater sampling results from locations MW02, MW03, HC02, HC04, and HC10 through HC13 indicated that the southeast portion of the Site exhibits groundwater impacted with GRPH, DRPH, ORPH, benzene, and possibly lead. All DRPH and ORPH detections were qualified (“x”) by the laboratory as chromatographic patterns not resembling the fuel standard used for quantitation. Thus the DRPH and ORPH results are questionable as representative of actual DRPH or ORPH.

Impacts to the east of the property boundary were not constrained. Further investigation was considered necessary to determine the full extent of the groundwater plume.

3.6 HYDROCON ADDITIONAL SUBSURFACE INVESTIGATION (DECEMBER 2015)

The ASI was conducted to address data gaps in the nature and extent of contamination identified by the SI. The investigation (HydroCon 2016a) consisted of sampling soil from 11 direct-push borings, collecting borehole groundwater from 4 of the borings, collecting groundwater samples from monitoring wells, and collecting soil gas from 3 soil borings located outside and near the Site building. Soil sampling results are provided in Tables 4 and 5 and Figure 3. Borehole groundwater results are provided in Table 6 and Figure 4. Monitoring well sampling results are provided in Tables 7 and 8 and Figure 5. Soil gas results are provided in Table 9 and Figure 6. Geological cross sections illustrating the Site lithology and distribution of COCs in soil resulting from HydroCon’s SI and ASI are provided in Figures 7 through 9. The results of the ASI are summarized in the following paragraphs.

3.6.1 Soil Conditions Revealed During the ASI

Soil sampling results from borings HC18 through HC29 are summarized in Tables 4 and 5 and Figure 3. Borings HC18 through HC21 were located north of the site building to investigate the

extent of chemicals of concern (COCs) detected near HC08. None of the samples from these borings had concentrations of DRPH, ORPH, GRPH, or BTEX above laboratory method detection limits (MRLs) or CULs. Based on these results, the extent of impacts near HC08 have been defined.

Boring HC24 was located in the apparent downgradient direction from the main area of impact south of the building to evaluate the extent of impacts in this direction. None of the samples from this boring had concentrations of DRPH, ORPH, GRPH, BTEX, or EDC above MRLs or CULs. Based on these results, the limit of downgradient migration of contamination in soil has been defined.

Borings HC22, HC23, HC28, and HC29, were located south of the known area of impacts to further evaluate the extent of impacts in this direction. Samples from Boring HC22 did not exhibit concentrations of COCs above the MRL or CUL therefore defining the northern extent of impacts in this area. HC23 and HC29 were located in known impacted areas and exhibited concentrations of DRPH and/or GRPH above CULs. Samples from the borings were also analyzed for PCBs, PAHs, and CVOCs (Table 5); none were detected above MRLs or CULs. HC28 was located near the southeastern extent of impacts and exhibited a concentration of GRPH above CULs. These results helped define the extent of impacts in this area.

Borings HC25 through HC27 were located along a north-south transect on the western edge of Central Avenue North and to the east of the impacted area on the Property to evaluate the eastern extent of the impacts originating from the Property. None of these samples contained concentrations of DRPH, ORPH, GRPH or BTEX above MRLs or CULs, confirming that the eastern extent of impacts does not extend under Central Avenue.

3.6.2 Groundwater Conditions Revealed During the ASI

Four borehole groundwater samples were collected from boring HC24 through HC27. None of the samples from these borings exhibited concentrations of DRPH, ORPH, GRPH, BTEX above MRLs or CULs (Table 6, Figure 4). Water from boring HC24 was also analyzed for EDB, EDC, MTBE, and naphthalene and none of these constituents were detected above MRLs or CULs, confirming that the downgradient extent of impacts is defined. Results from HC25 through HC27 confirm that the eastern extent of impacts does not extend under Central Avenue North.

3.6.3 Soil Vapor Conditions Revealed During the ASI

Soil vapor samples SG01, SG02, and SG03 were located on the southern and eastern sides of the building: near the center of the south side, near the southeast corner of the building, and near the northeast corner of the building, respectively (Figure 6). The samples were submitted for analyses of soil gas constituents listed in Ecology's soil vapor intrusion assessment guidance (Ecology 2015b). Each of the samples exceeded one or more of Ecology's 2015 sub-slab screening levels (Table 9, Figure 6), indicating that soil gas abatement is a necessary component of remedial actions for the Site.

4 TERRESTRIAL ECOLOGICAL EVALUATION

The Terrestrial Ecological Evaluation (TEE) is required by WAC §173-340-7940 at locations where a release of a hazardous substance to soil has occurred. The regulation requires that one of the following actions be taken:

- Document a TEE exclusion using the criteria presented in WAC §173-340-7491;
- Conduct a simplified TEE in accordance with WAC §173-340-7492; or
- Conduct a Site-specific TEE in accordance with WAC §173-340-7493.

Results from the TEE indicate that the Site qualifies for an exclusion based on WAC §173-340-7491. The results of ranking for the simplified TEE under Table 749-1 of WAC qualifies the Site for TEE exclusion under the criteria set forth in WAC §173-340-7492. The completed Table 749-1 is provided in Appendix A. No further consideration of ecological impacts is required under MTCA.

5 CONCEPTUAL SITE MODEL

This section presents a conceptual understanding of the Site and identifies potential or suspected sources of hazardous substances, types and concentrations of hazardous substances, potentially contaminated media, and actual and potential exposure pathways and receptors.

5.1 SITE DEFINITION

Based on the findings from the investigations conducted by HydroCon and others between 2010 and the present, the Site is defined as petroleum-contaminated soil, soil gas, or groundwater exceeding the MTCA Method A CULs or screening levels (soil gas) in the southeastern portion of the Property and approximately 10 feet to the south of the Property in the City of Kent's E. Smith Street ROW as shown in Figure 10, titled "Site Boundary Definition".

5.2 CHEMICALS AND MEDIA OF CONCERN

Based on the findings of the investigations conducted on and adjacent to the Property, the primary COCs for the Site in soil and groundwater are DRPH; ORPH; GRPH; BTEX; and naphthalene.

A Tier I VIA conducted by HydroCon during their ASI in December 2015 revealed concentrations in soil gas of benzene; EDC; ethylbenzene; n-hexane; naphthalene; ortho- and meta-xylenes; C5 to C8 airborne aliphatic petroleum hydrocarbons (APH); C9 to C12 aliphatic APH; and C9 to C10 aromatic APH exceeding Ecology's sub-slab screening levels (Ecology 2015b). Based on these Tier I findings, HydroCon recommended a Tier II VIA (HydroCon, 2016b) involving sub-slab, ambient air, and indoor air sampling to further evaluate the vapor intrusion pathway in accordance with Ecology's guidance. The Tier II VIA has not been completed as of the date of this RI/FS. It is anticipated that the list of COCs in soil gas and indoor air (if appropriate) will be finalized after the completion of the Tier II VIA.

5.3 CONFIRMED AND SUSPECTED SOURCE AREAS

The historical investigations confirmed elevated concentrations of COCs present in soil and groundwater beneath the Property as a result of a release of petroleum hydrocarbons from the former USTs and fuel-dispensing pump islands that formerly occupied the Property (Figure 2).

5.4 DISTRIBUTION OF CONTAMINANTS IN SOIL

Petroleum-contaminated soil generally extends to the south and east of the existing restaurant building ranging between 5 and 15 feet bgs. An area surrounding location HC08 to the northeast of the existing building exhibits soil contamination with ORPH above CULs at a depth of 5 feet bgs.

5.5 DISTRIBUTION OF CONTAMINANTS IN GROUNDWATER

The area of petroleum-contaminated groundwater that resulted from the Property's historical use as a retail gasoline station generally coincides with the area of soil contamination except there is no groundwater contamination in the vicinity of soil boring HC08.

5.6 DISTRIBUTION OF CONTAMINANTS IN SOIL GAS

The Tier I VIA revealed that contaminants in soil gas adjacent to the east and southeast sides of the existing restaurant building foundation exceed Ecology's sub-slab screening levels. Because sub-slab soil gas and indoor air samples have not been collected, the delineation of contaminants in soil gas is not complete as of the date of this RI/FS. A Tier II VIA is planned to further evaluate sub-slab soil gas and indoor air contaminant concentrations.

5.7 CONTAMINANT FATE AND TRANSPORT

5.7.1 Transport Mechanisms Affecting Distribution of Petroleum Hydrocarbons

The environmental transport mechanisms of petroleum hydrocarbons are related to its separate phases in the subsurface. The four phases of petroleum contamination in the subsurface are vapor (in soil gas), residual (sorbed contamination on soil particles), aqueous phase (contaminants dissolved in groundwater), and light non-aqueous phase liquids (LNAPL). At steady state conditions, each phase is in equilibrium with the other phases in the subsurface, and the relative ratio of total subsurface contamination by petroleum hydrocarbons between the four phases is controlled by dissolution, volatilization, and sorption.

Petroleum hydrocarbons observed in soil and groundwater beneath the Site have been transported from source areas and distributed throughout the Site primarily by dispersive transport mechanisms within the saturated zone and by soil vapor transport. As with other chemicals, petroleum hydrocarbons tend to spread out as groundwater flows away from the source area. The extent of the hydrocarbon plume depends on the volume of the release, soil density, particle size, and seepage velocity.

5.7.2 Environmental Fate

The significant processes controlling the fate of petroleum hydrocarbons in the environment are dissolution, volatilization, sorption, and bioattenuation. Petroleum hydrocarbons are comprised of hundreds of organic compounds that exhibit a wide range of physical and chemical properties. These compounds range from low molecular weight, low-boiling point compounds with high vapor pressure (i.e. highly volatile) exhibiting moderate aqueous solubility to those that exhibit a high molecular weight, high-boiling point, low vapor pressure, and extremely low aqueous solubility. Gasoline represents the lower molecular weight compounds that exhibit a higher relative capacity for dissolution, volatilization, and bioattenuation. These compounds are therefore more mobile in the environment and less persistent over time. The moderate molecular weight compounds representative of diesel fuel exhibit a lower relative capacity for

dissolution, volatilization, and bioattenuation compared to gasoline. The highest molecular weight compounds representative of motor oil, paraffins, asphaltenes, and PAHs exhibit an even lower capacity for dissolution, volatilization, and bioattenuation, and are therefore less mobile and more persistent over time.

5.8 PRELIMINARY EXPOSURE ASSESSMENT

The following is a summary of the potential migration pathways identified for the Site and potential targets for COCs observed on the Property.

5.8.1 Soil-to-Groundwater Pathway

Analytical testing of groundwater samples indicates that contamination of groundwater via the soil leaching pathway appears to be complete.

5.8.2 Direct Contact Pathway

Direct contact with soil and groundwater exhibiting concentrations of petroleum hydrocarbons in excess of the CULs is limited to human receptors who come into close contact with the media via direct exposure, including dermal contact or ingestion of excavated soil or groundwater. The standard point of compliance for soil contamination beneath a site is approximately 15 feet bgs, which represents a reasonable estimate of the depth that could be accessed during normal site redevelopment activities (WAC §173-340-740[6][d]). Although petroleum-contaminated soil and groundwater are present within 15 feet of the ground surface, only a small area of the Property is unpaved, making direct contact exposure to soil and groundwater unlikely. Nevertheless, until such time as the contaminated soil and groundwater are removed or remediated, or an institutional control limiting direct contact is implemented, the direct contact pathway is a potentially viable exposure pathway.

5.8.3 Vapor Pathway

Volatile COCs have been identified in soil gas at concentrations exceeding Ecology's screening levels. Since soil gas concentrations exceed the screening levels, the vapor intrusion exposure pathway is considered to be potentially complete at the Site. A Tier II VIA is planned to assess the indoor air pathway.

5.8.4 Surface Water

Migration of contaminants via surface water infiltration and leaching to the subsurface is mitigated by the asphalt and concrete that covers the Property and adjacent ROWs. Also, since there are no ongoing fueling operations at the Property or surface water bodies currently on or adjacent to the Property, there is no potential for human contact with contaminated surface water or for contaminant migration through this medium. Therefore, this pathway is considered incomplete.

5.8.5 Groundwater/Drinking Water

Shallow groundwater in the vicinity of the Site is not developed as a significant drinking water resource and is not likely to be developed in the future due to presence of the City of Kent water system (see Section 2.5.4). HydroCon reviewed registered water wells on the Ecology website, which revealed that the City of Kent owns 17 water supply wells within a 1-mile radius of the Site, with well depths ranging from 23 to 598 feet. While adverse impacts to shallow groundwater in the immediate vicinity of the Property have been confirmed, the potential for adverse impacts to the municipal water supply or private wells from contaminants migrating from the Property is low.

6 FEASIBILITY STUDY INTRODUCTION

The purpose of the FS is to determine a cleanup action for the Site that achieves the remedial action objectives (RAOs) in the most cost-effective manner while complying with the selection criteria in the MTCA rule (WAC §173-340-350(8) and -360). The FS process involves developing, screening, and evaluating a range of cleanup action alternatives. Alternatives were excluded if they were deemed ineffective or not implementable, or exhibited costs that were disproportionate as defined in WAC §173-340-360(3)(e). Furthermore, alternatives were not advanced if they were judged to be incompatible with the current or likely future land uses at the Property. Based on the screening, the FS presented below evaluates plausible remedial alternatives from which to select a cleanup action for the Site in conformance with the MTCA regulation.

The RAOs developed for the Site were used to define the regulatory elements applicable for the screening evaluation and to select remedial alternatives. The regulatory elements include RAOs, Applicable or Relevant and Appropriate Requirements (ARARs), chemicals of concern (COCs), media of concern, and CULs (or standards).

6.1 REMEDIAL ACTION OBJECTIVES

RAOs are statements of the goals that a remedial alternative must achieve in order to be retained for further consideration as part of the FS. The purpose of establishing RAOs for a site is to provide remedial alternatives that protect human health and the environment (WAC §173-340-350). In addition, RAOs are designated in order to:

- Implement administrative principles for cleanup (WAC §173-340-130).
- Meet the requirements, procedures, and expectations for conducting an FS and developing cleanup action alternatives as discussed in WAC §173-340-350 through §173-340-370.
- Develop CULs (WAC §173-340-700 through §173-340-760) and remedial alternatives that are protective of human health and the environment.

In particular, RAOs must address the following threshold requirements from WAC §173-340:

- Protect human health and the environment.
- Comply with CULs.
- Comply with applicable state and federal laws.
- Provide for compliance monitoring.

The overall RAO for this Site is to reduce the existing human health and environmental risks to a level sufficient to achieve an unrestricted "No Further Action" (NFA) determination from Ecology.

6.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Under WAC §173-340-350 and §173-340-710, applicable requirements include regulatory cleanup standards, standards of control, and other environmental requirements, criteria, or limitations established under state or federal law that specifically address a contaminant, remedial action, location, or other circumstances at a site. MTCA defines relevant and appropriate requirements as:

> those cleanup action standards, standards of control, and other human health and environmental requirements, criteria or limitations established under state and federal law that, while not legally applicable to the hazardous substance, cleanup action, location, or other circumstances at a site, the department determines address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site. The criteria specified in WAC §173-340-710(3) shall be used to determine if a requirement is relevant and appropriate.

Remedial actions conducted under MTCA must comply with the substantive requirements of the ARARs but are exempt from their procedural requirements (WAC §173-340-710[9]). Specifically, this exemption applies to state and local permitting requirements under the Washington State Water Pollution Control Act, Solid Waste Management Act, Hazardous Waste Management Act, Clean Air Act, State Fisheries Code, and Shoreline Management Act.

ARARs were screened to assess their applicability to the Site. Table 10 summarizes the preliminary ARARs for the Site.

6.3 CHEMICALS AND MEDIA OF CONCERN

The COCs for the Site are those compounds that were detected at concentrations exceeding their respective CULs. The COCs and the media where the COCs were detected above the respective CULs are listed below:

- GRPH, DRPH, ORPH; BTEX, and naphthalene in soil and groundwater.
- Benzene, ethylbenzene, xylenes, EDC, n-hexane, naphthalene, and airborne petroleum hydrocarbons (APH) in soil gas and potentially indoor air.

6.4 CLEANUP STANDARDS

The selected cleanup alternative must comply with the MTCA cleanup regulations specified in WAC §173-340 and with applicable state and federal laws. The CULs selected for those portions of the Site located within the Property boundary and for the greater Site are consistent with the RAOs, which state that the overall objective is to reduce concentrations of COCs in soil,

groundwater, and indoor air beneath the Site to below their applicable CULs. In addition to mitigating risks to human health and the environment, achieving the RAOs will allow Ecology to issue Property- and/or Site-specific determinations of NFA. The associated media-specific CULs for the identified COCs are summarized in the following sections

6.4.1 Cleanup Levels

The proposed CULs for soil and groundwater beneath the Site are generally the MTCA Method A CULs for Unrestricted Land Use for COCs that have a Method A CUL. If there is no promulgated Method A CUL for a particular COC for a given chemical or medium, the proposed CUL is the MTCA Method B Standard Formula Value for carcinogenic or noncarcinogenic compounds, depending upon the carcinogenic properties of the compound.

The CULs for the media and COCs are presented in the tables below, including the source of the CUL.

Proposed CULs for Soil

Chemicals of Concern	Cleanup Level (milligrams per kilogram)	Source
GRPH[1]	30	MTCA Method A, Unrestricted; WAC §173-340-740(2)(b)(i)
DRPH	2,000	
ORPH	2,000	
benzene	0.03	
toluene	7	
ethylbenzene	6	
xylenes[2]	9	
naphthalene[3]	5	

[1]For all gasoline mixtures with benzene included
[2]For total xylenes: ortho-, meta-, and para-isomers
[3]Value is for total of naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene

Proposed CULs for Groundwater

Chemicals of Concern	Cleanup Level (micrograms per liter)	Source
GRPH[1]	800	MTCA Method A, Table Value; WAC §173-340-720(3)(b)(i)
DRPH	500	
ORPH	500	
benzene	5	
toluene	1,000	
ethylbenzene	700	
xylenes[2]	1,000	
naphthalene[3]	160	
1,3,5-trimethylbenzene	80	MTCA Method B, Non-Carcinogen, Standard Formula Value

[1]When benzene is present in groundwater
[2]For total xylenes: ortho-, meta-, and para-isomers
[3]Value is for total of naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene

Screening Levels for Sub-Slab Soil Gas

Chemicals of Concern	Cleanup Level[1] (micrograms per cubic meter)	Source
APH[2]	4,700	*Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action*, Review DRAFT, Publication No. 09-09-047; Appendix B, Method B, October 2009, Revised April 2015,
benzene	10.7	
toluene	76,200	
ethylbenzene	15,200	
xylenes[3]	1,520	
1,2 dichloroethane (EDC)	3.2	
1,2 dibromoethane (EDB)	0.139	
n-hexane	10,700	
methyl tertiary butyl ether	321	
naphthalene	2.45	
1,2,4 trimethylbenzene	107	

[1]The value is the screening level for sub slab measurements of soil gas.
[2]This is the most stringent of the three screening level values for air-phase petroleum hydrocarbon fractions.
[3]Value is for individual ortho- and meta-isomers. No value is published for para-isomer.

Proposed CULs for Indoor Air

Chemicals of Concern	Cleanup Level (micrograms per cubic meter)	Source
APH[1]	140	*Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action*, Review DRAFT, Publication No. 09-09-047; Appendix B, Method B, October 2009, Revised April 2015,
benzene	0.321	
toluene	2,290	
ethylbenzene	457	
xylenes[3]	45.7	
1,2 dichloroethane (EDC)	0.0962	
1,2 dibromoethane (EDB)	0.00417	
n-hexane	320	
methyl tertiary butyl ether (MTBE)	9.62	
naphthalene	0.0735	
1,2,4 trimethylbenzene	3.2	

[1]Value is for aliphatic petroleum hydrocarbon fraction (EC9-12).
[2]Value is for individual ortho- and meta- isomers. No value is published for para- isomer.

6.4.2 Points of Compliance

The point of compliance is the location where the enforcement limits that are set in accordance with WAC §173-200-050 will be measured and cannot be exceeded (WAC §173-200-060 and Ecology, 2005). Once the CULs have been attained at the defined points of compliance, the impacts present beneath the Site will no longer be considered a risk to human health or the environment.

6.4.2.1 Points of Compliance for Soil

In accordance with Ecology 2005, the points of compliance for soil depend on the CULs proposed for cleanup and the exposure pathways. Since Method A CULs are proposed for the Site and are considered protective of all potential soil exposure pathways, the standard point of compliance applies to cleanup actions at this Site. The standard point of compliance is defined as “throughout the site from ground surface to fifteen feet below the ground surface”.

For sites where Method B or Method C CULs are proposed, the following points of compliance are defined based on the associated pathway:

Direct Contact: For soil CULs based on direct contact, the point of compliance is defined as throughout the site from the ground surface to fifteen feet below the ground surface.

Leaching (Protection of Groundwater): For soil CULs based on leaching, the point of compliance is defined as throughout the site. This means that the point of compliance extends throughout the soil profile and may extend below the water table.

Vapors: For soil CULs based on vapors, the point of compliance is defined as throughout the site from the ground surface to the uppermost groundwater saturated zone.

Protection of the Environment: For soil CULs based on protection of the environment, the standard point of compliance is defined as throughout the site from the ground surface to fifteen feet below the ground surface. For sites with institutional controls to prevent excavation of deeper soil, a conditional point of compliance may be set at the biologically active soil zone. This zone is assumed to extend to six feet. Ecology may approve a different depth based on site-specific information.

6.4.2.2 Point of Compliance for Groundwater

In accordance with WAC §173-340-720(8)(a)(b), the point of compliance for groundwater is defined as the uppermost level of the saturated zone extending vertically to the lowest depth that potentially could be impacted by the COCs throughout the Site.

Existing monitoring wells that are not removed as a result of the selected remedy; together with newly installed monitoring or remediation wells will be used to evaluate whether compliance at the Property has been achieved.

6.4.2.3 Point of Compliance for Soil Gas

Cleanup standards and points of compliance for soil gas have not been promulgated as of the date of this document, although soil gas screening levels have been published as draft guidance by Ecology (Ecology 2015b) and are included as ARARs for this document. The points of compliance for soil gas are identified in the referenced guidance for both sub-slab (soil gas encountered just beneath a building) and deeper soil gas (defined as equal to, or greater than, 15 feet bgs).

6.4.2.4 Point of Compliance for Ambient (Outdoor) and Indoor Air

The points of compliance for ambient air will be the standard point of compliance in accordance with WAC §173-340-750(6), which is ambient air throughout the Property, although ambient air is not currently considered a medium of concern for this Site. CULs and points of compliance for indoor air have not been promulgated as of the date of this document, although indoor air CULs have been published as draft guidance (Ecology 2015b) and are included as ARARs for this document. Because the results of the Tier I VIA revealed soil gas concentrations exceeding Ecology's sub-slab screening levels, indoor air is considered a potential medium of concern for this Site.

7 PILOT TESTING

No pilot testing of candidate remedial components has been performed at the bench or field scale as part of the RI/FS. Pilot testing of one or more of the recommended remedial components at the field scale is anticipated during the CAP or EDD phase of the cleanup process.

8 FEASIBILITY STUDY

The FS involves identifying and screening remedial components (technologies); assembling retained components into alternatives that address the RAOs, and performing a comparative, or focused analysis of the alternatives in relation to the MTCA evaluation criteria to identify the best remedy for the Site. The FS is documented in the following sections.

8.1 REMEDIAL COMPONENT SCREENING

Remedial components were evaluated with respect to the degree to which they comply with the cleanup requirements set forth in MTCA. According to MTCA, a cleanup action alternative (CAA) must satisfy all of the minimum threshold requirements for RAOs, as outlined in Section 6.1. WAC §173-340-360 (2)(b) also requires that the CAA incorporate the following:

- Permanent solutions to the maximum extent practicable.
- A reasonable restoration time frame.
- Public concerns on the proposed cleanup action alternative.

Using the above criteria, several remedial components (technologies) were evaluated to produce a short list for further evaluation. Table 11 presents the results of the screening matrix. The components that passed the screening process are summarized in the following table.

Summary of Remedial Component Screening

Component Group	Component(s) Retained
Institutional Controls and Passive Treatment	▪ Monitored Natural Attenuation ▪ Environmental Covenant
Insitu Physical	▪ Air Sparging ▪ Soil Vapor Extraction ▪ Dual-Phase Extraction
Source Removal	▪ Excavation (Without Shoring)
Exsitu Source Treatment	▪ Thermal Desorption
Insitu Chemical Oxidation	▪ Hydrogen Peroxide
Insitu Bioremediation	▪ Aerobic

The following sections provide a brief description of the remedial components that were retained for possible inclusion in the CAAs developed for the Site.

8.1.1 Institutional Controls and Passive Treatment

Institutional controls are administrative measures to prevent human or ecological exposure to contaminants as opposed to reducing risks through active remediation.

8.1.1.1 Institutional Controls - Environmental Covenant

Institutional controls could take the form of environmental covenants (e.g. deed restrictions) prohibiting activities that could result in exposure to subsurface contamination. Fences or signs that limit or discourage access to areas of concern are also institutional controls. Institutional controls are often used in combination with active or passive remediation technologies and can be applied to soil and/or groundwater media.

8.1.1.2 Passive Treatment – Monitored Natural Attenuation

Monitored Natural Attenuation (MNA) refers to intrinsic environmental factors in play that reduce contaminant concentrations in the absence of human effort through natural processes, such as biodegradation, adsorption, and dispersion.

MNA includes the process of monitoring and documenting the effectiveness of an otherwise passive component. MNA is often the default component for that portion of a site that cannot be cost-effectively remediated by active means. It is also used as a polishing process after an active remedial component has reduced contaminant concentrations but is unable to achieve CULs. Monitoring is required to evaluate the effectiveness of natural attenuation and to document the achievement of CULs. MNA may be appropriate in combination with other on-Property and, if necessary, off-Property remedial components.

8.1.2 Insitu Physical

Retained components under the insitu physical treatment group include soil vapor extraction (SVE), air sparging (AS), and dual-phase extraction (DPE).

8.1.2.1 Soil Vapor Extraction

SVE is a proven technology for the remediation of volatile and nonvolatile petroleum hydrocarbons in unsaturated zone soils. This technology is implemented by installing vertical and/or horizontal wells within the zone of contamination. Vacuum is applied to recover contaminants in the vapor phase for subsequent treatment and disposal. This technology is not used for the recovery or treatment of contaminated groundwater. It is typically used to recover volatile organic compounds directly from unsaturated zone soils and to provide additional oxygen needed to support the insitu aerobic bioremediation of nonvolatile petroleum hydrocarbons like DRPH and ORPH in unsaturated zone soils. Treatment of recovered soil vapor is often required prior to release to the atmosphere.

8.1.2.2 Air Sparging

AS creates a mass transfer of volatile COCs from the dissolved phase to the vapor phase through the injection of air into the contaminated groundwater. Vapor-phase contaminant recovery is more efficient than aqueous-phase extraction. The addition of air to the saturated zone also enhances aerobic biodegradation of the COCs in the saturated zone. Bioremediation of dissolved-phase petroleum hydrocarbons in the groundwater medium is most effective and sustainable under aerobic (i.e., in the presence of oxygen) conditions. Therefore, SVE is often coupled with AS to extract vapor-phase compounds transferred from the aqueous phase. AS is effective in decreasing dissolved-phase COCs and increasing microbial activity in the subsurface. Relatively permeable subsurface geology and soils are necessary for this technology to be effective.

8.1.2.3 Dual-Phase Extraction

DPE, also known as bioslurping, involves the simultaneous recovery of contaminated soil vapor and groundwater media for aboveground treatment. This technology is effective by recovering the volatile compounds in both the vapor and aqueous phases and providing oxygen to the subsurface to enhance further in situ aerobic biological degradation of the compounds not recovered by physical removal. Vacuum is applied to the unsaturated zone to recover contaminated vapor while groundwater is pumped simultaneously. Both media are recovered for separate aboveground pretreatment prior to subsequent disposal or reuse.

8.1.3 Source Removal

Excavation without shoring was retained as a source removal component. ORPH in soil contamination exceeding CULs would be removed by excavation from a small area at a shallow depth (i.e. 5 feet bgs) at location HC08.

8.1.4 Exsitu Source Treatment

Thermal desorption is the only retained exsitu source treatment component. Thermal desorption was retained as the generator-preferred disposal method for contaminated soil generated during remediation.

8.1.4.1 Thermal Desorption

Petroleum hydrocarbon-contaminated soil generated by exsitu removal (e.g. excavation or drill cuttings) may be treated in a heated reactor at a temperature high enough to evolve (desorb) volatile contaminants from soil. Volatilized contaminants are treated in the vapor phase. Treated soils, absent the contaminants, are typically recycled by the treatment facility as clean fill.

8.1.5 Insitu Chemical Oxidation

The use of hydrogen peroxide was the one component retained under the category of in situ chemical oxidation.

8.1.5.1 Hydrogen Peroxide

Hydrogen peroxide is a strong chemical oxidant that in higher relative concentrations is able to react with certain organic contaminants to produce less toxic byproducts. However, hydrogen peroxide's oxidizing strength is not sufficient even at higher concentrations to effectively treat the target COCs in an insitu application. Therefore, it is not retained for use in direct oxidation of target COCs.

Hydrogen peroxide, when dissolved in water produces oxygen gas, which can be an effective way to increase the dissolved oxygen (DO) content in groundwater to support aerobic biodegradation of the target COCs. It is for this application that hydrogen peroxide is retained as a potential insitu treatment agent.

8.1.6 Insitu Bioremediation

Aerobic bioremediation was the one component retained under the category of insitu bioremediation.

8.1.6.1 Aerobic Bioremediation

Bioremediation of dissolved-phase COCs in the groundwater is most effective and sustainable under aerobic conditions. The rate and effectiveness of intrinsic aerobic bioremediation of COCs are generally limited by the lack of sufficient dissolved oxygen (DO) available to native microbes. Recent groundwater monitoring conducted at the Property (HydroCon 2016c) revealed that groundwater dissolved oxygen concentrations are low (typically below 1 milligram per liter) indicating that an oxygen-limited environment prevails constraining the rate of aerobic biodegradation of the COCs.

Increasing the availability and concentration of DO in the impacted groundwater by artificial methods promotes a higher rate of aerobic bioremediation. Several proven methods are known to increase the DO concentration in the saturated zone, including injecting chemical reactants that produce elemental oxygen (hydrogen or magnesium peroxide), as well as sparging compressed air, oxygen gas, or ozone directly into the water-bearing zone. Limitations to the technology include subsurface heterogeneities and low groundwater transmissivity, conditions that translate to poor distribution and migration of the DO.

8.2 CANDIDATE CLEANUP ACTION ALTERNATIVES

Two CAAs are considered viable based on the short list of remedial components retained from the component screening step (Table 11). The two alternatives are described below.

8.2.1 Cleanup Action Alternative 1 – Air Sparging with Soil Vapor Extraction

Figure 11 provides a conceptual site plan showing the major features of this alternative. CAA 1 involves air sparging (AS) of the saturated zone within the Site boundary while simultaneously conducting soil vapor extraction (SVE). A small excavation (5-foot diameter to 6 feet bgs) would be completed around boring location HC-08 to remove the elevated ORPH in soil. The excavation would be backfilled with clean structural fill. Vertical air sparge wells would be installed in a triangular grid pattern to sparge air into the groundwater at a depth of approximately 15 to 20 feet below ground surface in an area defined by the Site boundary. Because of the shallow depth to groundwater, SVE would be accomplished by installing shallow trenches filled with gravel over the area subjected to AS. Slotted pipe for vapor recovery would be installed in the trenches. Trenches would be located to ensure that sufficient vacuum is induced to capture contaminated soil vapor from under the existing building and from the AS of contaminated groundwater. Pipe for SVE and AS would be installed in a buried pipe trench routed to a remediation compound located in the existing landscaped area in the northeast corner of the Property as shown on Figure 11. It is anticipated that recovered soil vapor would require treatment before atmospheric discharge.

8.2.2 Cleanup Action Alternative 2 – Dual Phase Extraction

Figure 12 provides a conceptual site plan showing the major features of this alternative. CAA 2 involves DPE within the Site boundary. This would be implemented by installing trenches as shown on Figure 12 to a depth of approximately 10 feet bgs. Slotted pipe would be installed in the base of trench and backfilled with crushed rock or pea gravel. Pipes from the trenches would be routed to a manhole equipped with submersible pumps. Pumps would convey contaminated groundwater by buried pipeline to a remediation compound for further pretreatment and ultimate discharge to the City of Kent's publicly-owned treatment works (POTW) for additional treatment. Slotted pipe would also be installed in the trenches at a shallow depth to conduct SVE over the area being subjected to groundwater recovery. In a manner similar to CAA 1, trenches would be located to ensure that sufficient vacuum is induced to capture contaminated soil vapor from under the existing building. Pipe for SVE and groundwater recovery would be installed in a buried pipe trench routed to the remediation compound as shown on Figure 12. Under this alternative, recovered groundwater would be subjected to treatment by phase-separation, solids removal and air stripping or liquid phase granular activated carbon, or a combination of both air stripping and liquid phase carbon prior to discharge to the POTW under a pretreatment permit with the City of Kent. A small excavation (5-foot diameter to 6 feet bgs) would be performed around boring location HC-08 to remove the elevated ORPH in soil. The excavation would be backfilled with clean structural fill.

8.3 ALTERNATIVE EVALUATION PROCESS

This section describes the evaluation criteria used to evaluate the developed cleanup alternatives. Remedial components were identified per the requirements set forth in MTCA under WAC §173-340-350(8)(b) and screened using the requirements for selecting cleanup

actions set forth in the MTCA rule under WAC §173-340-360(2)(a)(b). The criteria used to evaluate and compare candidate CAAs when conducting the disproportionate cost analysis were derived from WAC §173-340-360(3)(f) and include the following:

8.3.1 Protectiveness

The overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, the time required to reduce risk at the facility and attain cleanup standards, the Site risks resulting from implementing the alternative, and improvement of overall environmental quality of the Site.

8.3.2 Permanence

The degree to which the alternative permanently reduces the toxicity, mobility, or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated during the treatment process.

8.3.3 Cost

The cost to implement the alternative, including the cost of construction, the net present value of long-term costs, and Ecology oversight costs. Long-term costs that were considered include those associated with O&M, monitoring, equipment replacement, reporting, and maintaining institutional controls.

8.3.4 Effectiveness over the Long Term

The degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time over which hazardous substances are expected to remain on the Site, and the magnitude of residual risk associated with the contaminated soil and/or groundwater components. The following types of cleanup action components, presented in descending order, may be used as a guide when assessing the relative degree of long-term effectiveness of the chosen alternative:

- Reuse or recycling.
- Destruction or detoxification.
- Immobilization or solidification.
- On-Property or off-Property disposal in an engineered, lined, and monitored facility.
- On-Property isolation or containment with attendant engineering controls.
- Institutional controls and monitoring.

8.3.5 Management of Short-Term Risks

The risk to human health and the environment associated with the alternative during its construction and implementation, and the effectiveness of measures that will be taken to manage such risks.

8.3.6 Technical and Administrative Implementability

The ability to implement the alternative; includes consideration of the technical feasibility of the alternative, administrative and regulatory requirements, permitting, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with the future development plans for the Property.

8.3.7 Consideration of Public Concerns

The consideration of community concerns regarding the alternative and, if there are concerns, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, federal and state agencies, or any other organization that may have an interest in or knowledge of the Site.

8.4 FOCUSED EVALUATION OF CLEANUP ALTERNATIVES

The focused evaluation of CAAs provides a more detailed description of the effectiveness, implementability, and cost for each alternative. A detailed description of the two alternatives developed from the retained remedial components is provided below.

8.4.1 Cleanup Action Alternative 1 –Air Sparging with Soil Vapor Extraction

CAA 1 involves air sparging of the groundwater in the areas exhibiting COC concentrations above cleanup goals simultaneously with SVE and excavating and backfilling the area of shallow soil contamination around boring HC-08. The conceptual site plan for this alternative is shown in Figure 11. This alternative would be effective in achieving the cleanup goals for the media of concern because it relies on proven technologies to remediate COCs in the affected media. It would also be effective in controlling the vapor intrusion to indoor pathway by preventing the further migration of contaminated soil gas and capturing the soil gas for permanent destruction by catalytic oxidation.

If this is the selected alternative, a field scale pilot test would be recommended to determine the effective spacing for AS wells and SVE trenches to ensure adequate treatment of the contaminated zones and capture of soil vapors. Because it is anticipated that the AS process would increase the COC concentrations in the soil gas above those measured during the Tier I VIA, it is of utmost importance that the system adequately capture soil gas under and surrounding the building to protect restaurant workers and visitors from exposure to contaminants in indoor air. As such, fail-safe measures and alarm systems would be incorporated into the design of the remedial system.

For the purpose of estimating the cost to install and operate this alternative, the AS well installation was assumed to be in a triangular grid pattern at a spacing of 12 feet over the area identified as the Site boundary. AS wells would be installed to a depth of approximately 20 feet bgs. Clean compressed air would be conveyed by buried pipeline in a utility trench from an AS blower located in the remediation compound. SVE would be implemented by excavating one or more shallow trenches to a depth of approximately 4 to 5 feet bgs. A four-inch diameter slotted polyvinyl chloride pipe would be installed in the trench at a depth of approximately 3.5 feet bgs and backfilled with crushed rock or pea gravel. The top of the trench would be sealed with polyethylene sheeting to minimize the collection of atmospheric air and to maximize the horizontal distance for the vacuum induced by the SVE blower. The SVE blower would be located in the remediation compound. Recovered soil gas would be subjected to moisture separation and then be routed initially through a catalytic oxidizer or vapor-phase carbon contactor depending on the contaminant concentrations. A Notice of Construction for approval to discharge treated vapor would be required from the Puget Sound Clean Air Agency (PSCAA) prior to system installation.

During the operation of the remediation system, recovered vapors from the system would be monitored monthly to assess the effectiveness and progress of the system. Groundwater quality would be monitored on a quarterly basis throughout the operational time frame and for at least four quarters following the operation of the system to confirm compliance with CULs. Confirmation soil and groundwater samples would be used to demonstrate that the RAOs were attained at the presumed conclusion of remediation. A compliance monitoring plan would be finalized in a CAP.

The life cycle for this alternative was assumed to be 3 years for the purpose of estimating the present worth cost. The life cycle estimate should not be construed as a guaranteed remediation time frame. The present worth cost for CAA 1, assuming a real discount rate of 0.3 percent and a life cycle of 3 years, is approximately $941,000 (Tables 12 and 12a).

8.4.2 Cleanup Action Alternative 2- Dual-Phase Extraction

CAA 2 involves DPE, which would be implemented by installing trenches in the saturated zone to extract contaminated groundwater while simultaneously conducting SVE. Contaminated soils around boring HC-08 would also be excavated and backfilled. The pipe trenches would be installed in the approximate locations shown in Figure 12. The pumping of groundwater for aboveground treatment would provide two primary benefits for remediation: 1) dissolved-phase contaminants would be removed by extraction thus reducing overall contaminant mass requiring treatment; and 2) pumping groundwater creates a drawdown that enhances the rate of remediation by SVE and aerobic bioremediation.

This alternative would require aboveground treatment of both groundwater and soil gas. Although no aquifer pump tests have been conducted to determine the hydraulic conductivity and transmissivity of the shallow aquifer, the texture of the shallow soils is in the fine- to

medium-sand category, which suggests a high relative hydraulic conductivity and transmissivity. This further suggests that the aquifer would exhibit a high yield during pumping with little or no drawdown.

Because of an anticipated high yield from the aquifer, it is assumed that the groundwater extraction rate could sustain a pumping rate of 10 to 20 gallons per minute or more for the purpose of estimating the remedial costs. Recovered soil vapor would be treated in a manner similar to that described for CAA 1.

During the operation of the remediation system, recovered vapors from the system would be monitored monthly to assess the effectiveness and progress of the system. Groundwater quality would be monitored on a quarterly basis throughout the operational time frame and for at least four quarters following the operation of the system to confirm compliance with CULs. Confirmation soil and groundwater samples would be used to demonstrate that the RAOs were attained at the presumed conclusion of remediation. A compliance monitoring plan would be finalized in a CAP.

The life cycle for this alternative was assumed to be 3 years for the purpose of estimating the present worth cost. The life cycle estimate should not be construed as a guaranteed remediation time frame. The present worth cost for CAA 2, assuming a real discount rate of 0.3 percent and a life cycle of 3 years, is approximately $1,006,000 (Tables 13 and 13a).

8.5 COMPARISON OF ALTERNATIVES

A summary of the comparative evaluation of the cleanup action alternatives using the MTCA evaluation criteria (WAC §173-340-360[3][f]) is presented in Table 14 and discussed in the following subsections.

8.5.1 Protectiveness

Both alternatives provide a high level of protectiveness for human health and the environment because they rely on remedial components proven to be effective in treating the COCs in the media of concern. CAA-2 exhibits a slightly higher degree of protectiveness than CAA-1 due to the removal of contaminated groundwater and permanent treatment and disposal of the contaminated soil gas and groundwater.

8.5.2 Permanence

Both alternatives score high for this criterion because they involve a permanent reduction in the toxicity, mobility, and volume of contaminants through removal, insitu treatment, and permanent destruction.

8.5.3 Effectiveness Over the Long Term

Since both alternatives employ proven technologies for the remediation of the identified COCs they both score highly for long-term effectiveness.

8.5.4 Management of Short-Term Risks

Both alternatives present significant short-term risks associated with the use of heavy equipment and excavation of trenches. The short-term risks are slightly higher for CAA-1 because it involves additional drilling hazards for air sparging well installation not associated with CAA-2.

8.5.5 Technical and Administrative Implementability

CAA-1 has fewer obstacles to implementation and operation compared to CAA-2. Although CAA-1 includes drilling air sparge wells, because of the sandy soil type the air sparge wells could possibly be installed as a well point rather than by auger drilling. Also, the trenches for CAA-1 are shallow and would not involve dewatering and backfill in the saturated zone, as necessary under CAA-2. Both alternatives involve permitting, and control and monitoring of treated soil vapor emissions; however, CAA-1 would not require extraction and treatment of contaminated groundwater and the associated pretreatment permitting with the City of Kent POTW.

8.5.6 Consideration of Public Concerns

Because this remedy would be implemented as a Potentially Liable Party (PLP) independent cleanup action under the MTCA Voluntary Cleanup Program there is no mandate to solicit or respond to public comment on the RI/FS.

8.5.7 Disproportionate Cost Analysis

According to the MTCA regulations, costs are disproportionate if the incremental costs of the 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. The following is a description of the factors that were used to estimate the cost of the two alternatives discussed above.

- **Capital Costs.** Direct capital costs include expenditures for equipment, labor, and material necessary to install a cleanup action. Indirect capital costs are those costs incurred for engineering, project management, financial, or other services not directly involved with installation of remedial alternatives but necessary for completion of this activity.
- **Operation and Maintenance Costs.** These costs are post-construction costs necessary to provide effective implementation of the alternative. Such costs may include, but are not limited to the following: operating labor; maintenance materials and labor; disposal of residues; and administrative, insurance, and licensing costs.

- **Monitoring Costs.** These costs are incurred from monitoring activities associated with remedial activities. Cost items may include sampling labor, laboratory, analyses, and report preparation.
- **Present Worth Analysis.** Present worth analysis provides a method of evaluating and comparing costs that occur over different time periods by discounting all future expenditures to the present year. The present worth cost (or value) represents the amount of money, which if invested in year 0 and disbursed as needed, would be sufficient to cover all costs associated with a remedial alternative. The assumptions necessary to derive a present worth cost are inflation rate, discount rate, and period of performance. A discount rate, which is similar to an interest rate, is used to account for the time value of money. U.S Environmental Protection Agency (U.S. EPA) policy on the use of discount rates for RI/FS cost analyses is stated in the preamble to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) published at the Federal Register (55 FR 8722) and in Office of Solid Waste and Emergency Response Directive 9355.3-20 titled Revisions to the Executive Office of the President, Office of Management and Budget (OMB) Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis (U.S. EPA 1993). Based on the NCP and this directive, a discount rate of 7 percent is recommended when developing present value cost estimates for remedial action alternatives during the FS. This specified rate of 7 percent represents a "real" discount rate in that it approximates the marginal pretax rate of return on an average investment in the private sector in recent years and has been adjusted to eliminate the effect of expected inflation. For this FS Report, a more conservative real discount rate of 0.3% for a three-year life cycle was used based on the November 2015 revisions to Appendix C of the OMB Circular A-94. The real discount rates used to estimate the present worth of annual operating costs are based on the estimated restoration time frame (life cycle) for each alternative and are extrapolated from the referenced circular, which is published annually by the OMB in December.

Because it is assumed that all capital costs are incurred in year 0, the present worth analysis is performed only on annual O&M costs. The total present worth for a given alternative is equal to the sum of the capital costs and the present worth of annual O&M costs over the anticipated life cycle of the alternative.

Charts 1 and 2 plot the relative cost and ranking scores for the two alternatives and the cost-to-benefit ratios as graphical tools to evaluate the relative cost and benefits afforded by each alternative, respectively. The charts illustrate that CAA 1 ranks (scores) higher than CAA 2 using the weighted evaluation criteria. The cost to benefit ratio also favors CAA 1.

8.6 RECOMMENDED CLEANUP ACTION ALTERNATIVE

After performing the comparative analysis and ranking of alternatives in accordance with the MTCA evaluation criteria, CAA 1 is the recommended alternative. CAA 1 meets the threshold requirements for cleanup actions set forth in WAC §173-340-360(3) and WAC §173-340-370.

CAA 1 is protective of human health and the environment, is more easily implemented than the competing alternative, and it provides a permanent solution for reducing concentrations of COCs at the Property. In addition, the cost to implement CAA 1 is lower than CAA 2 in achieving a corresponding benefit.

Details concerning the implementation of the recommended cleanup action alternative and the decision process used to evaluate whether modifications to the selected approach are warranted will be provided in the CAP.

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10 LIMITATIONS

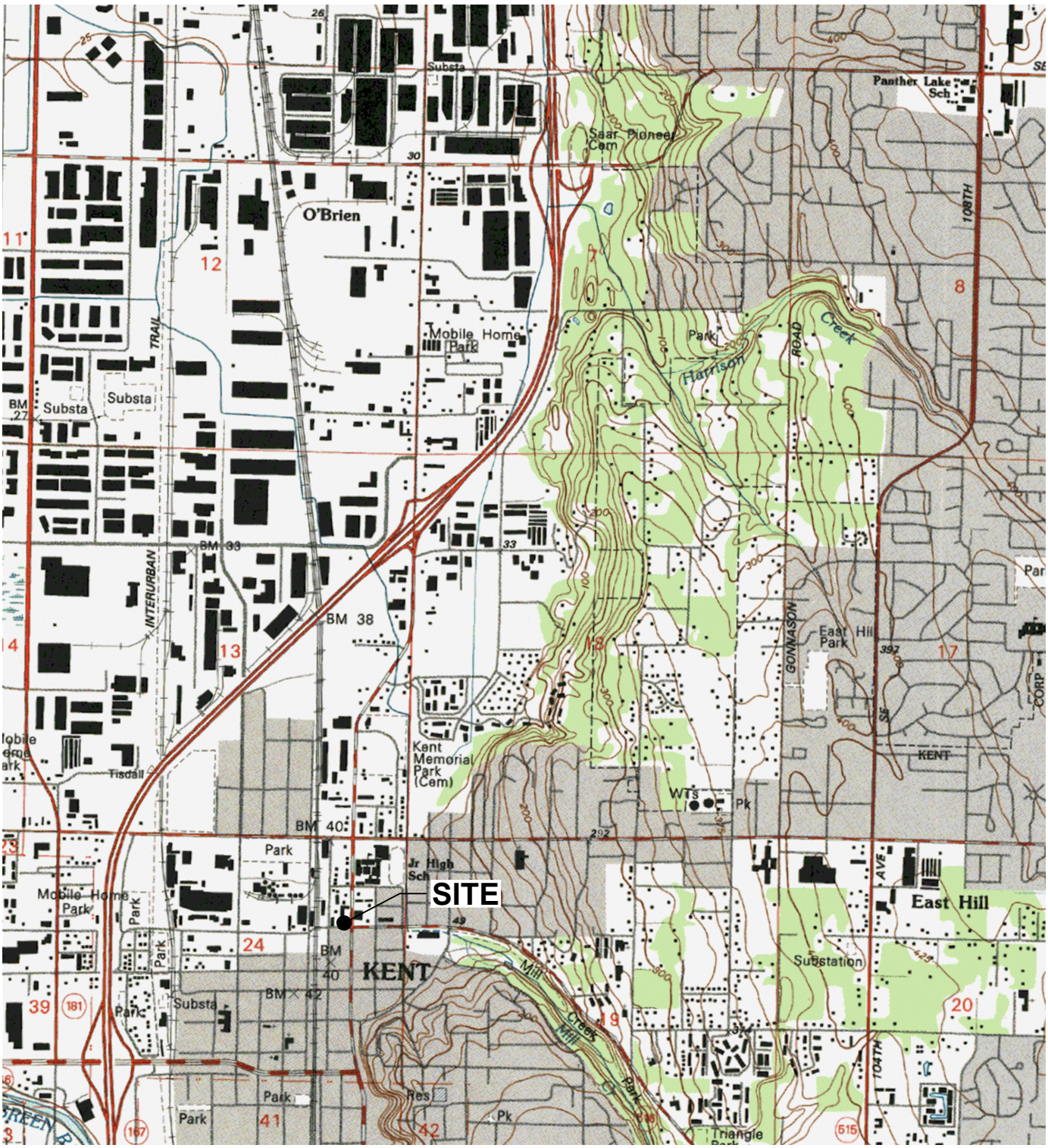
HydroCon's services were performed in a manner consistent with generally accepted practices of the profession undertaken in similar studies in the same geographical area during the same time period. HydroCon makes no warranties, either expressed or implied, regarding the findings, conclusions or recommendations. Please note that HydroCon does not warrant the work of laboratories, regulatory agencies, or other third parties supplying information used in the preparation of the report.

Findings and conclusions resulting from these services are based upon information derived from the on-Site activities and other services performed under this scope of work; such information is subject to change over time. Certain indicators of the presence of hazardous substances, petroleum products, or other constituents may have been latent, inaccessible, unobservable, non-detectable or not present during these services, and we cannot represent that the Site contains no hazardous substances, toxic materials, petroleum products, or other latent conditions beyond those identified during this monitoring. Subsurface conditions may vary from those encountered at specific sampling locations or during other surveys, tests, assessments, investigations, or exploratory services; the data, interpretations and findings are based solely upon data obtained at the time and within the scope of these services.

This report is intended for the use of TOC Holdings Co. This report may not be used or relied upon by any other party without the written consent of HydroCon. The scope of services performed in execution of this evaluation may not be appropriate to satisfy the needs of other users, and use or re-use of this document or the findings, conclusions, or recommendations is at the risk of said user.

The conclusions presented in this report are, in part, based upon subsurface sampling performed at selected locations and depths. There may be conditions between borings or samples that differ significantly from those presented in this report and which cannot be predicted by this study.

FIGURES



NOTE(S):

USGS, RENTON QUADRANGLE
WASHINGTON-KING CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

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SCALE IN FEET
1" = 2000'

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HydroCon

DATE: 2-11-16
DWN: JJT
CHK: NV
APPROVED: CH
PRJ. MGR: RH
PROJECT NO: 01-323

FIGURE 1
SITE LOCATION MAP

TOC HOLDING CO. FACILITY NO. 01-323
301 N CENTRAL AVE
KENT, WA.

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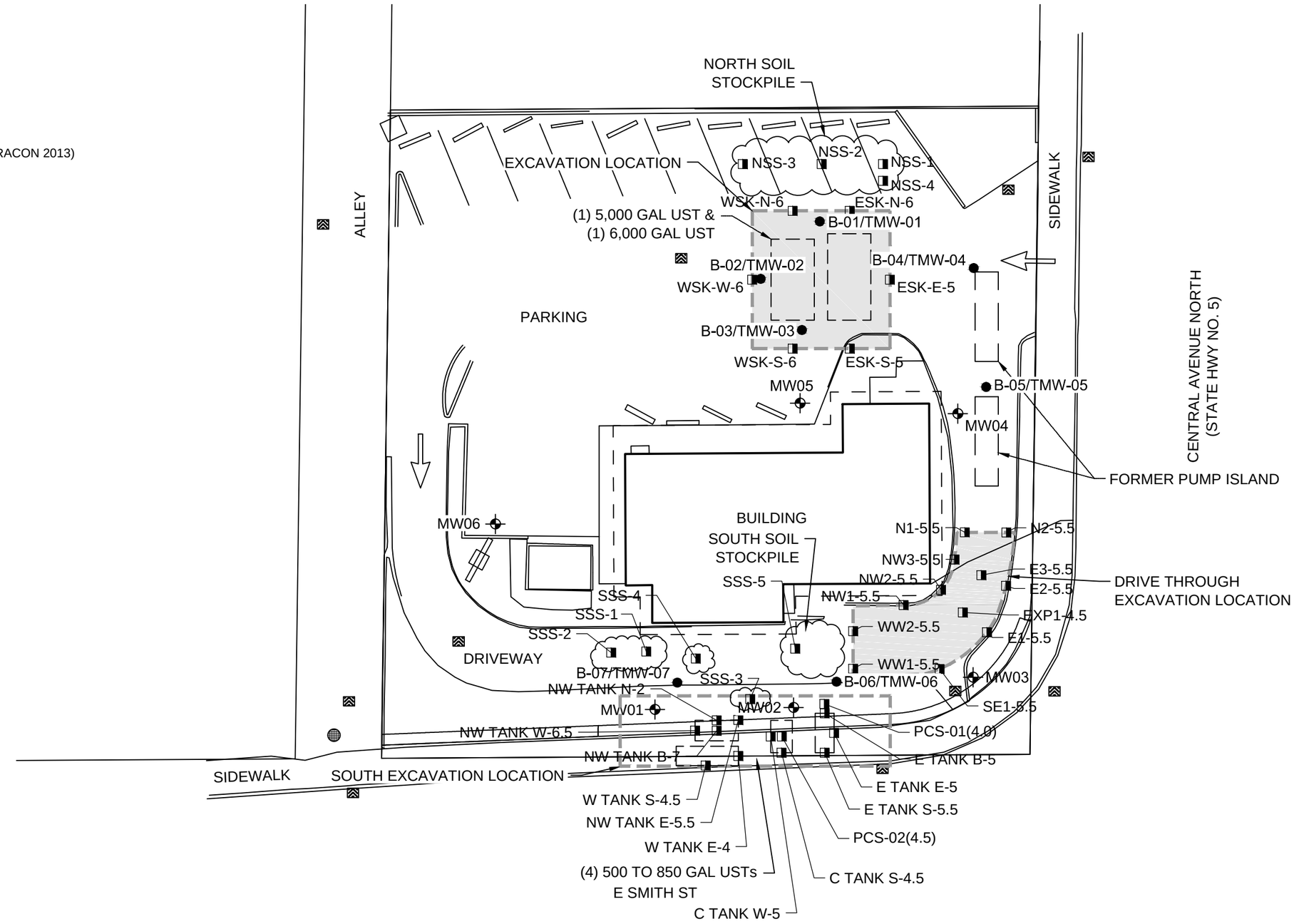
LEGEND

- BUILDING
- MW01 — MONITORING WELL
- CATCH BASIN
- BORING LOCATIONS (TERRACON 2013)
- EXCAVATION LOCATIONS



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SCALE IN FEET
1" = 20'

HydroCon

510 Allen St. Suite B Kelso, Wa 98626, Ph(360)-703-6086

DATE: 2-11-16
DWN: JJT
CHK: NV
APPROVED: CH
PRJ. MGR: CH
PROJECT NO: 01-323

FIGURE 2
SITE FEATURES AND UTILITIES
2013 - 2014 SAMPLE LOCATIONS
TOC HOLDING CO. FACILITY NO. 01-323
301 N CENTRAL AVE
KENT, WA.

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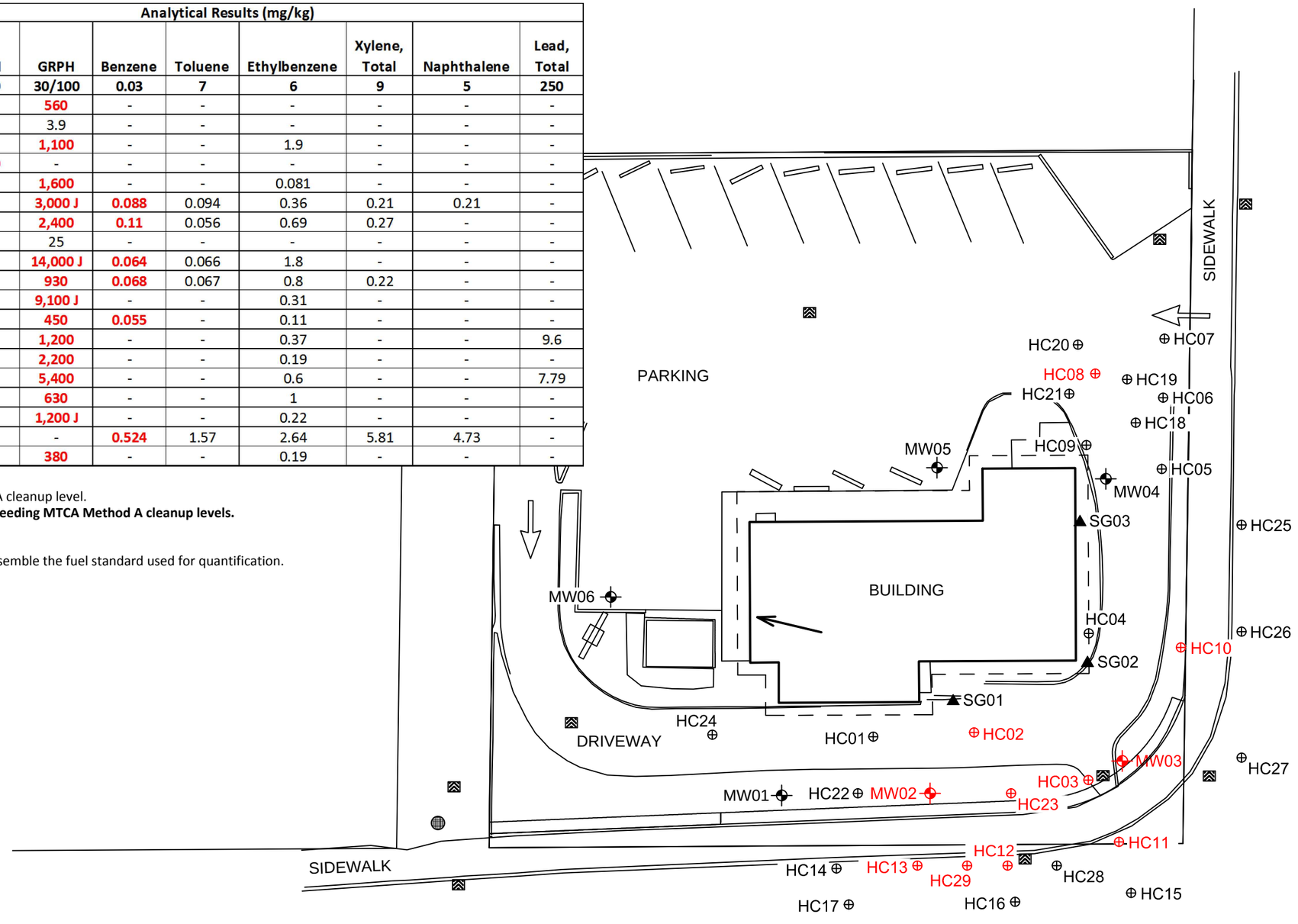
Field ID	Date Sampled	Analytical Results (mg/kg)								
		DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene, Total	Naphthalene	Lead, Total
WA Method A		2,000	2,000	30/100	0.03	7	6	9	5	250
HC02-07	6/29/2015	400 x	-	**560**	-	-	-	-	-	-
HC02-15	6/29/2015	-	-	3.9	-	-	-	-	-	-
HC03-08	6/29/2015	1,200 x	-	**1,100**	-	-	1.9	-	-	-
HC08-05	6/29/2015	250 x	**2,800**	-	-	-	-	-	-	-
HC10-07	7/7/2015	**4,600 x**	-	**1,600**	-	-	0.081	-	-	-
HC11-05	7/21/2015	**2,200 x**	-	**3,000 J**	**0.088**	0.094	0.36	0.21	0.21	-
HC11-07	7/21/2015	**3,500 x**	-	**2,400**	**0.11**	0.056	0.69	0.27	-	-
HC11-10	7/21/2015	-	-	25	-	-	-	-	-	-
HC12-05	7/21/2015	**6,700 x**	-	**14,000 J**	**0.064**	0.066	1.8	-	-	-
HC12-07	7/21/2015	1,700 x	-	**930**	**0.068**	0.067	0.8	0.22	-	-
HC13-05	7/21/2015	**5,700 x**	-	**9,100 J**	-	-	0.31	-	-	-
HC13-11	7/21/2015	-	-	**450**	**0.055**	-	0.11	-	-	-
HC23-12	12/28/2015	550 x	-	**1,200**	-	-	0.37	-	-	9.6
HC23-15	12/28/2015	670 x	-	**2,200**	-	-	0.19	-	-	-
HC29-05	12/29/2015	**4,300 x**	-	**5,400**	-	-	0.6	-	-	7.79
MW02-07	6/30/2015	400 x	-	**630**	-	-	1	-	-	-
MW03-05	6/30/2015	1,500 x	-	**1,200 J**	-	-	0.22	-	-	-
MW03-07	6/30/2015	-	-	-	**0.524**	1.57	2.64	5.81	4.73	-
MW03-12	6/30/2015	640 x	-	**380**	-	-	0.19	-	-	-

Notes:
Red denotes concentration exceeds MTCA Method A cleanup level.
Results shown only for samples with detections exceeding MTCA Method A cleanup levels.
See Table 1 for complete results.
Lab Qualifiers:
x - The sample chromatographic pattern does not resemble the fuel standard used for quantification.



LEGEND

- BUILDING
- MW01 — MONITORING WELL
- HC01 — BORING LOCATIONS (HYDROCON 2015)
- CATCH BASIN
- APPROXIMATE GROUNDWATER FLOW DIRECTION

*RED INDICATES IMPACTED SOIL

N E S W

0 20 40
SCALE IN FEET
1" = 20'

HydroCon
510 Allen St. Suite B Kelso, Wa 98626, Ph(360)-703-6086

DATE: 9-28-15
DWN: JJT
CHK: NV
APPROVED: CH
PRJ. MGR: CH
PROJECT NO: 01-323

FIGURE 3
SOIL ANALYTICAL RESULTS
FOR JULY 2015
TOC HOLDING CO. FACILITY NO. 01-323
301 N CENTRAL AVE
KENT, WA.

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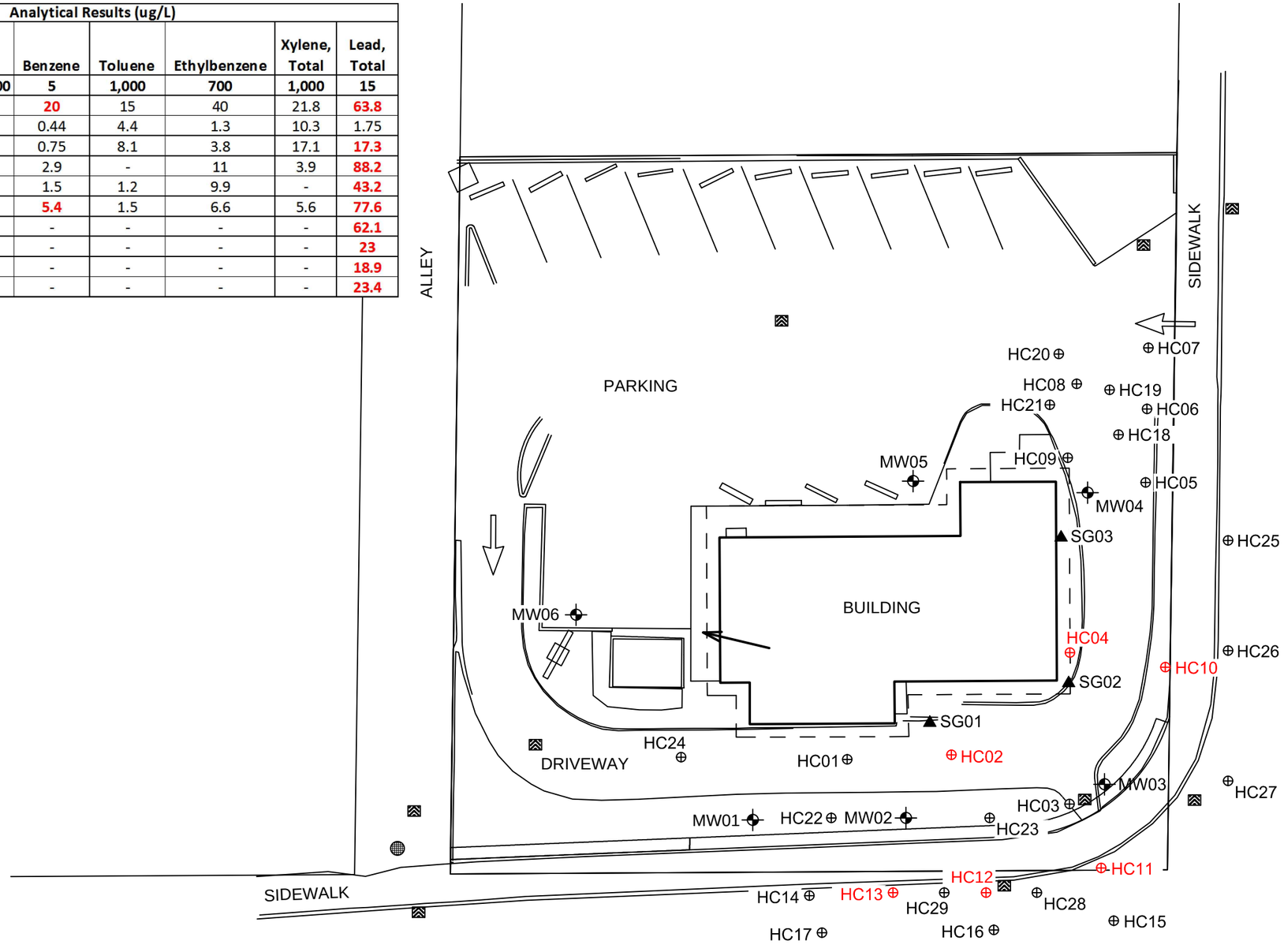
Field ID	Date Sampled	Analytical Results (ug/L)							
		DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene, Total	Lead, Total
WA Method A		500	500	800/1,000	5	1,000	700	1,000	15
HC02	7/7/2015	19,000 x	510 x	6,900	20	15	40	21.8	63.8
HC04	7/7/2015	740 x	-	1,200	0.44	4.4	1.3	10.3	1.75
HC10	7/7/2015	1,800 x	-	1,900	0.75	8.1	3.8	17.1	17.3
HC11	7/7/2015	7,500 x	290 x	5,000	2.9	-	11	3.9	88.2
HC12	7/7/2015	1,900 x	-	5,100	1.5	1.2	9.9	-	43.2
HC13	7/7/2015	13,000 x	1,100 x	5,800	5.4	1.5	6.6	5.6	77.6
HC14	7/7/2015	170 x	-	-	-	-	-	-	62.1
HC15	7/7/2015	150 x	-	290	-	-	-	-	23
HC16	7/7/2015	180 x	-	190	-	-	-	-	18.9
HC17	7/7/2015	100 x	-	-	-	-	-	-	23.4



LEGEND

- BUILDING
- MW01 — MONITORING WELL
- HC01 — BORING LOCATIONS (HYDROCON 2015)
- SG01 — SOIL GAS LOCATIONS (HYDROCON 2015)
- CATCH BASIN
- APPROXIMATE GROUNDWATER FLOW DIRECTION

*RED INDICATES IMPACTED SOIL OR GROUNDWATER

N W E S

0 20 40

SCALE IN FEET
1" = 20'

Hydro Con
510 Allen St. Suite B Kelso, Wa 98626, Ph(360)-703-6086

DATE: 2-11-16
DWN: JJT
CHK: MS
APPROVED: MS
PRJ. MGR: CH
PROJECT NO: 01-323

FIGURE 4
2015 BOREHOLE GROUNDWATER ANALYTICAL RESULTS
TOC HOLDING CO. FACILITY NO. 01-323
301 N CENTRAL AVE
KENT, WA.

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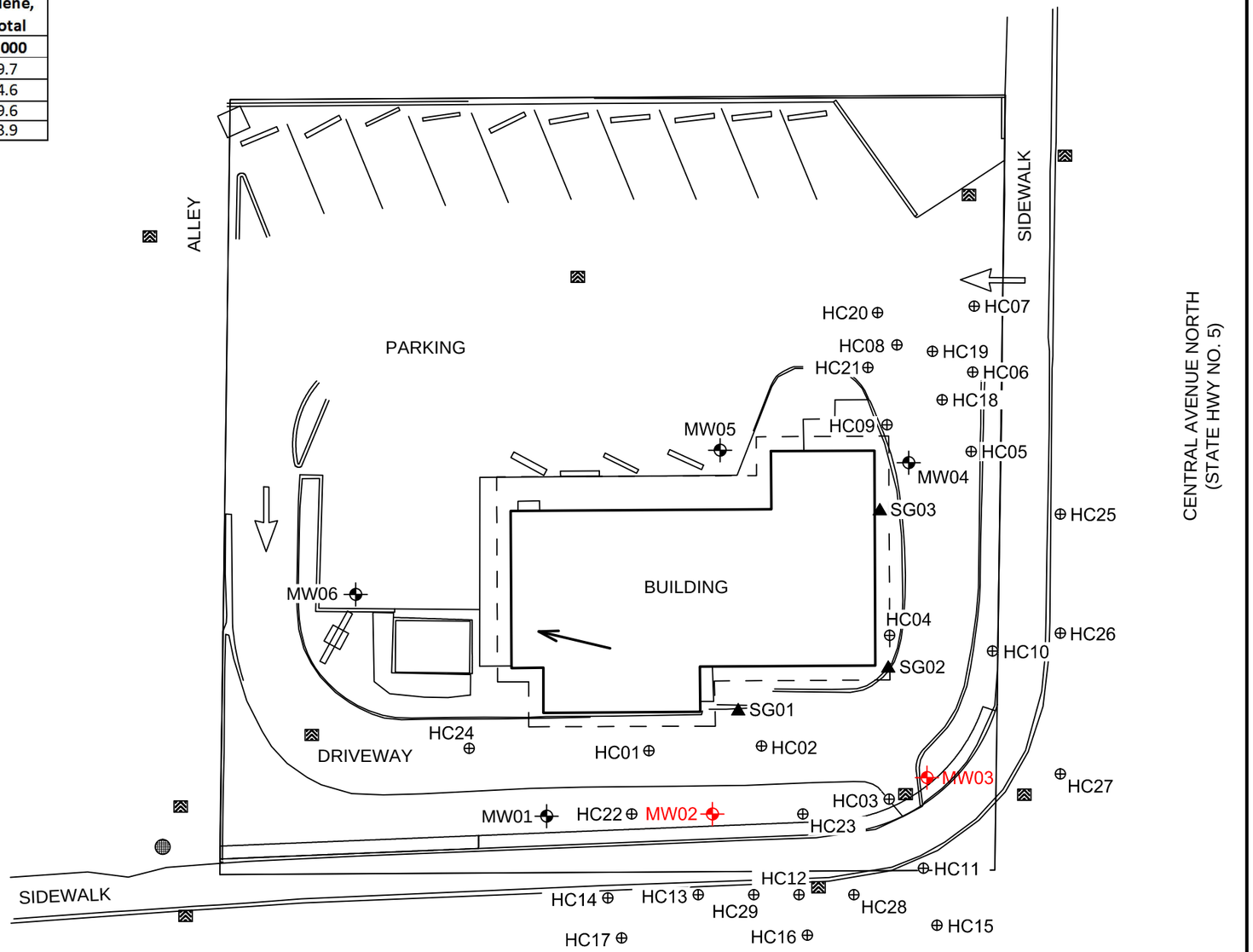
Well ID	Date Sampled	Analytical Results (ug/L)						
		DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene, Total
WA Method A		500	500	500/1,000	5	1,000	700	1,000
MW02	7/29/2015	4,600 x	<250	4,100	8.1	4.8	36	9.7
MW03	7/29/2015	4,400 x	<250	3,900	0.76	1.4	26	4.6
MW02	10/21/2015	4,300 x	<280	4,300 J	4	4.6	32	9.6
MW03	10/21/2015	2,400 x	<280	3,300	0.59	1.3	19	3.9

Notes:
Red denotes concentration exceeds MTCA Cleanup Level for Groundwater.
Lab Qualifiers:
x - The sample chromatographic pattern does not resemble the fuel standard used for quantification.
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.



LEGEND

- BUILDING
- MW01 — MONITORING WELL
- HC01 — BORING LOCATIONS (HYDROCON 2015)
- CATCH BASIN
- APPROXIMATE GROUNDWATER FLOW DIRECTION

*RED INDICATES IMPACTED GROUNDWATER

N W E S

0 20 40
SCALE IN FEET
1" = 20'

Hydro Con
510 Allen St. Suite B Kelso, Wa 98626, Ph(360)-703-6086

DATE: 2-11-16
DWN: JJT
CHK: NV
APPROVED: CH
PRJ. MGR: CH
PROJECT NO: 01-323

FIGURE 5
GROUNDWATER ANALYTICAL RESULTS
FOR JULY - DECEMBER 2015
TOC HOLDING CO. FACILITY NO. 01-323
301 N CENTRAL AVE
KENT, WA.

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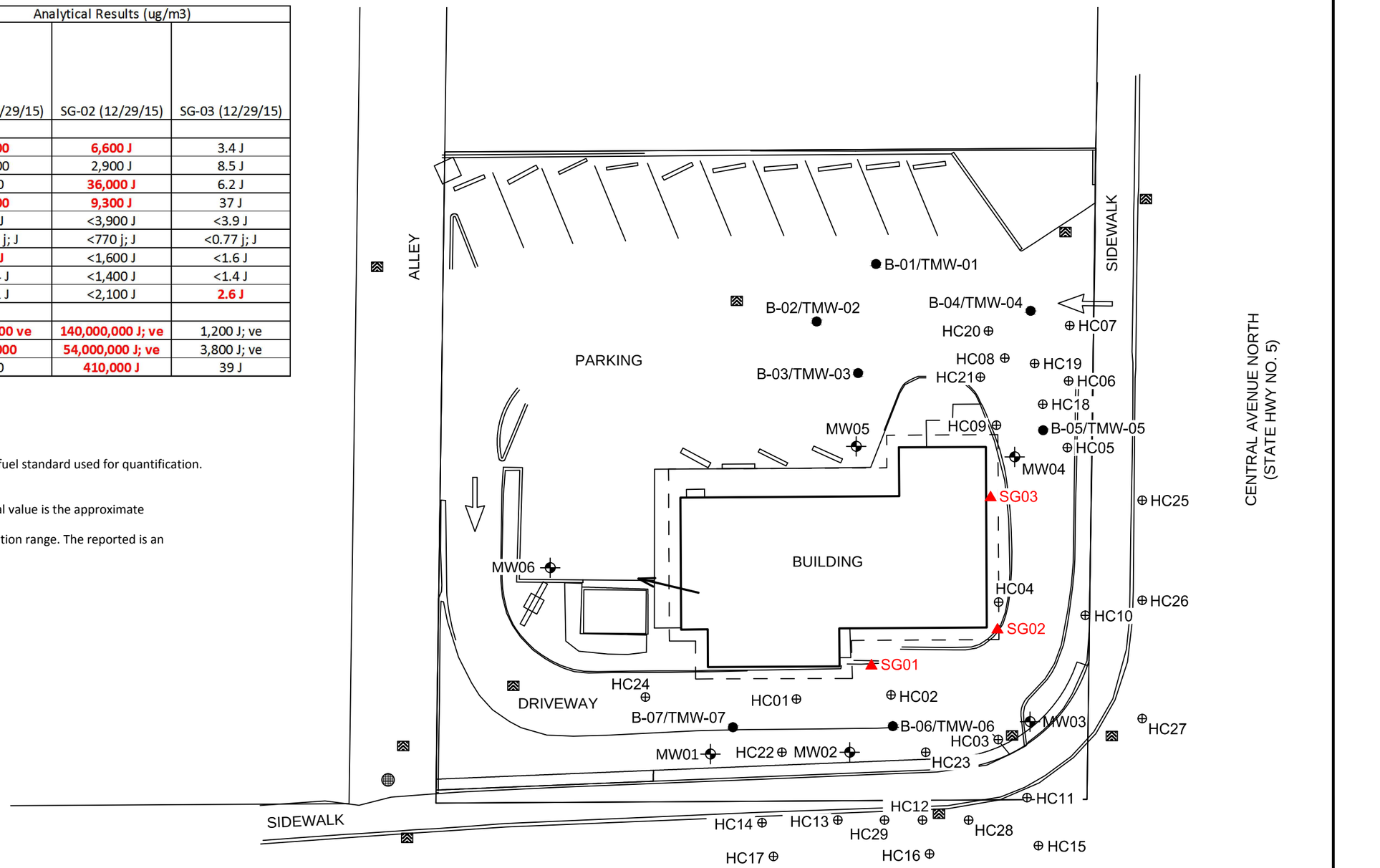
	Ecology's Lowest Sub-Slab Soil Gas Screening Level	Analytical Results (ug/m3)		
		SG-01 (12/29/15)	SG-02 (12/29/15)	SG-03 (12/29/15)
Volatiles-TO15				
Benzene	**10.7**	**6,600**	**6,600 J**	3.4 J
Toluene	**76,200**	9,200	2,900 J	8.5 J
Ethylbenzene	**15,200**	860	**36,000 J**	6.2 J
Xylene Total	**1,520**	**6,500**	**9,300 J**	37 J
1,2,4-trimethylbenzene	**107**	85 J	<3,900 J	<3.9 J
EDB	**0.139**	<0.77 j; J	<770 j; J	<0.77 j; J
EDC	**3.21**	**63 J**	<1,600 J	<1.6 J
MTBE	**321**	<1.4 J	<1,400 J	<1.4 J
Naphthalene	**2.45**	<2.1 J	<2,100 J	**2.6 J**
Volatiles-APH				
APH EC5-8 aliphatics	**90,000**	**2,300,000 ve**	**140,000,000 J; ve**	1,200 J; ve
APH EC9-12 aliphatics	**4,700**	**200,000**	**54,000,000 J; ve**	3,800 J; ve
APH EC9-10 aromatics	**6,000**	830	**410,000 J**	39 J

Notes:
Red denotes concentration exceeds sub-slab screening level.
See Table 1 for complete results.
Lab Qualifiers:
x - The sample chromatographic pattern does not resemble the fuel standard used for quantification.
ec - Method reporting limit exceeds Clean Up Level shown.
j - Estimated value; result is less than normal reporting limits.
J - The analyte was positively identified; the associated numerical value is the approximate concentration.
ve - The analytle response exceeded the valid instrument calibration range. The reported is an estimate.



LEGEND

- BUILDING
- MW01 — MONITORING WELL
- HC01 — BORING LOCATIONS (HYDROCON 2015)
- SG01 — SOIL GAS LOCATIONS (HYDROCON 2015)
- CATCH BASIN
- APPROXIMATE GROUNDWATER FLOW DIRECTION

*RED INDICATES IMPACTED SOIL OR GROUNDWATER

N W E S

0 20 40
SCALE IN FEET
1" = 20'

Hydro Con
510 Allen St. Suite B Kelso, Wa 98626, Ph(360)-703-6086

DATE: 3-16-16
DWN: JJT
CHK: NV
APPROVED: CH
PRJ. MGR: CH
PROJECT NO: 01-323

FIGURE 6
2015 TIER I SOIL GAS RESULTS

TOC HOLDING CO. FACILITY NO. 01-323
301 N CENTRAL AVE
KENT, WA.

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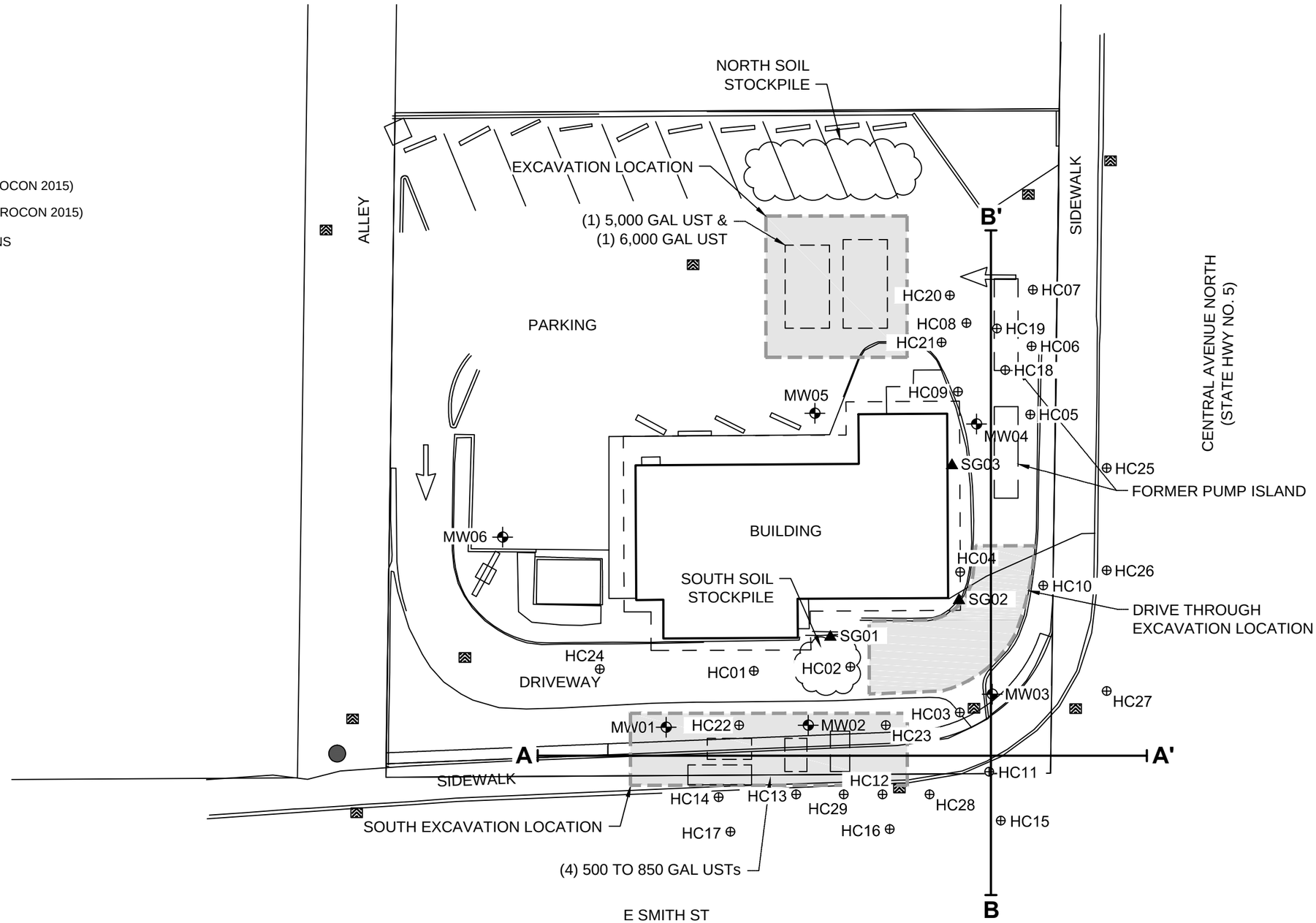
LEGEND

- BUILDING
- MW01 — MONITORING WELL
- CATCH BASIN
- EXCAVATION LOCATIONS
- HC01 — BORING LOCATIONS (HYDROCON 2015)
- SG01 — SOIL GAS LOCATIONS (HYDROCON 2015)
- A — A' — CROSS SECTION LOCATIONS



N W E S

0 20 40

SCALE IN FEET
1" = 20'

Hydro Con
510 Allen St. Suite B Kelso, Wa 98626, Ph(360)-703-6086

DATE: 3-8-16
DWN: JJT
CHK: NV
APPROVED: CH
PRJ. MGR: CH
PROJECT NO: 01-323

FIGURE 7
CROSS SECTION LOCATIONS

TOC HOLDING CO. FACILITY NO. 01-323
301 N CENTRAL AVE
KENT, WA.

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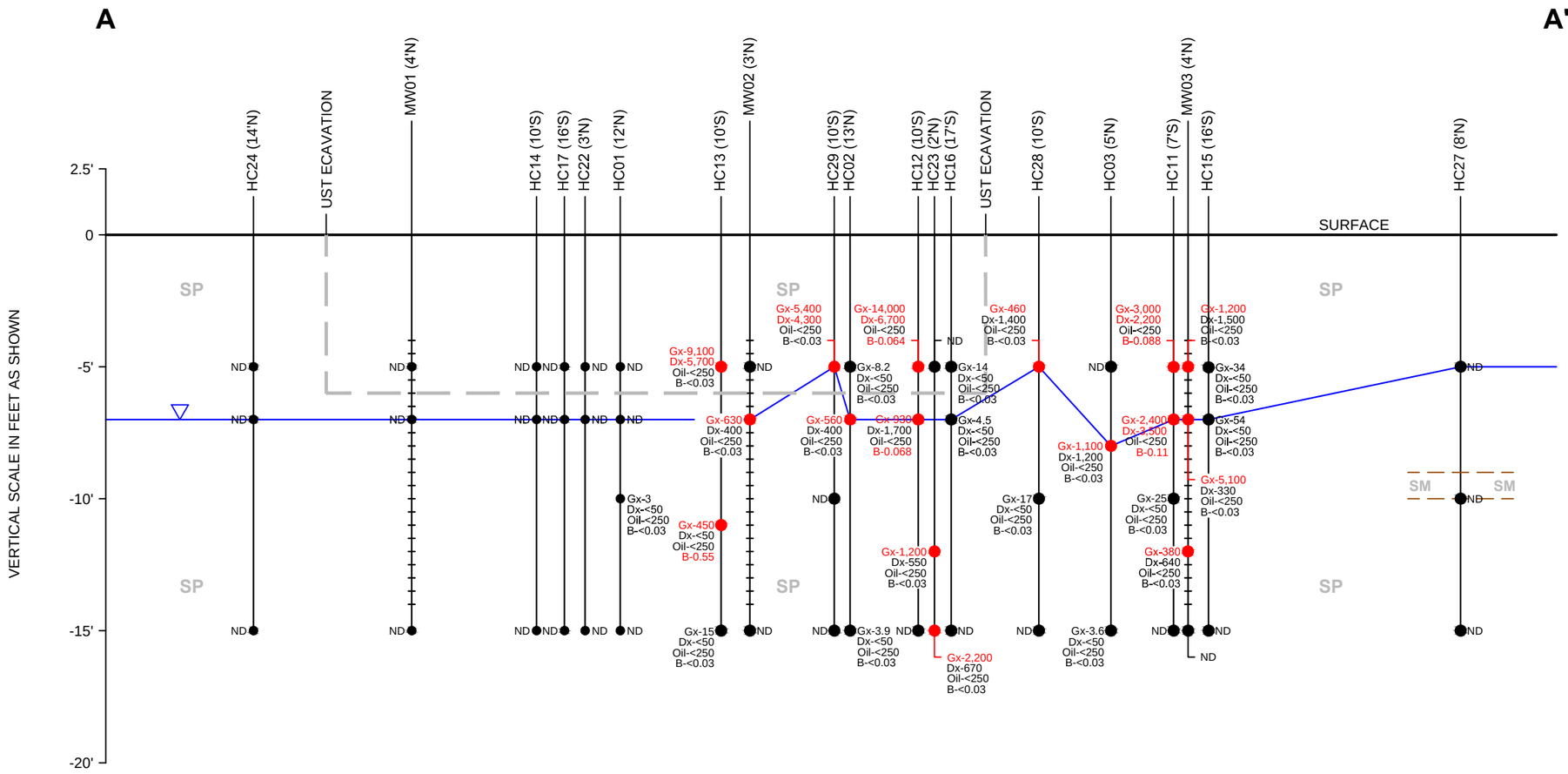


LEGEND

- WATER LEVEL DURING DRILLING
- SAMPLE LOCATION
- RED INDICATES SAMPLE EXCEEDS THE MTCA METHOD A CLEANUP LEVEL FOR SOIL
- WELL SCREEN INTERVAL

Gx = GASOLINE RANGE HYDROCARBONS

Dx = DIESEL RANGE HYDROCARBONS

B = BENZENE

Oil = OIL RANGE HYDROCARBONS

ND = ALL VALUES FOR Gx, Dx, Oil AND B WERE NOT DETECTED

N E S W

0 10 20

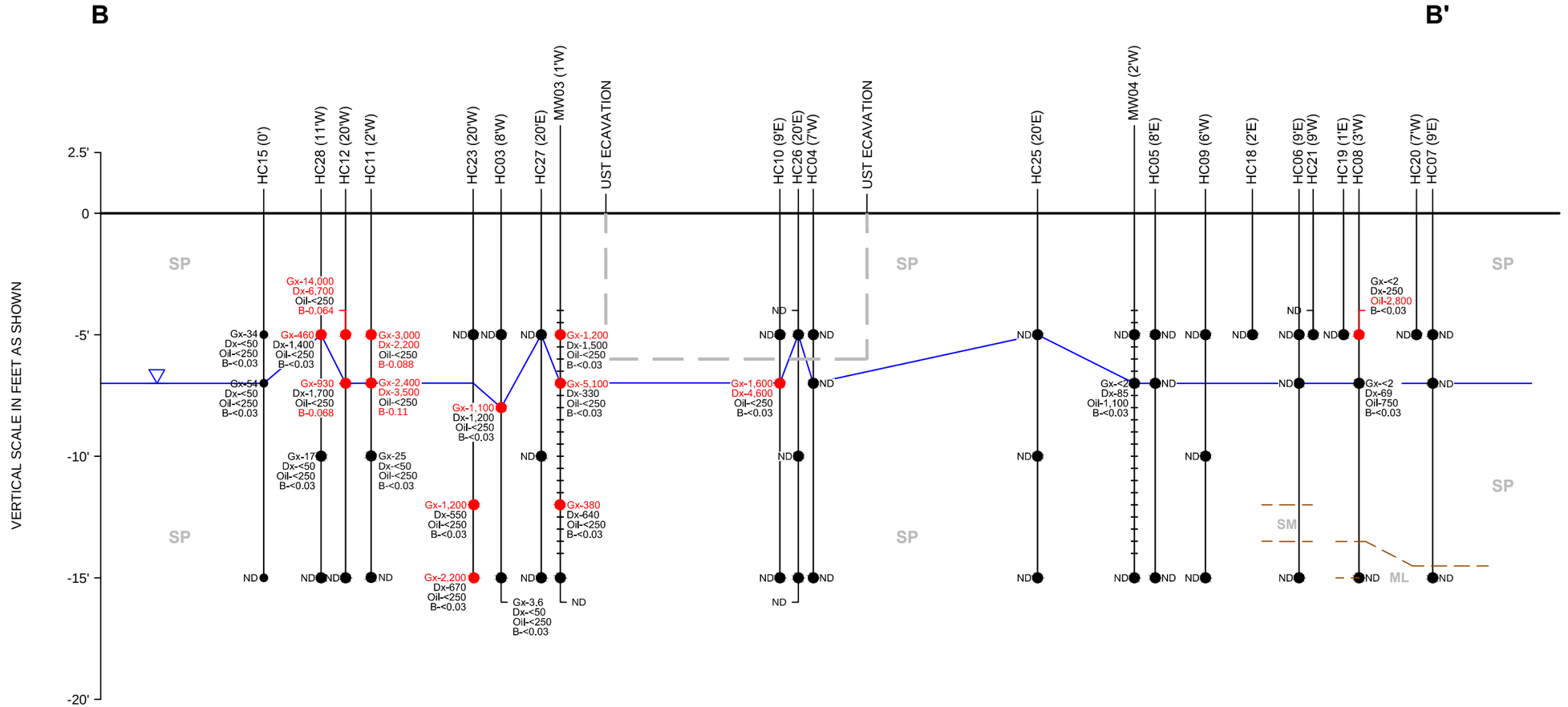
SCALE IN FEET
1" = 10'

Hydro Con
510 Allen St. Suite B Kelso, Wa 98626, Ph(360)-703-6086

DATE: 3-8-16
DWN: JJT
CHK: RH
APPROVED: CH
PRJ. MGR: CH
PROJECT NO: 01-323

FIGURE 8
CROSS SECTION A-A'

TOC HOLDING CO. FACILITY NO. 01-323
301 N CENTRAL AVE
KENT, WA.



LEGEND

- WATER LEVEL DURING DRILLING
- SAMPLE LOCATION
- RED INDICATES SAMPLE EXCEEDS THE MTCA METHOD A CLEANUP LEVEL FOR SOIL
- WELL SCREEN INTERVAL

Gx = GASOLINE RANGE HYDROCARBONS

Dx = DIESEL RANGE HYDROCARBONS

B = BENZENE

Oil = OIL RANGE HYDROCARBONS

ND = ALL VALUES FOR Gx, Dx, Oil AND B WERE NOT DETECTED

N W E S

0 10 20

SCALE IN FEET
1" = 10'

HydroCon
510 Allen St. Suite B Kelso, Wa 98626, Ph(360)-703-6086

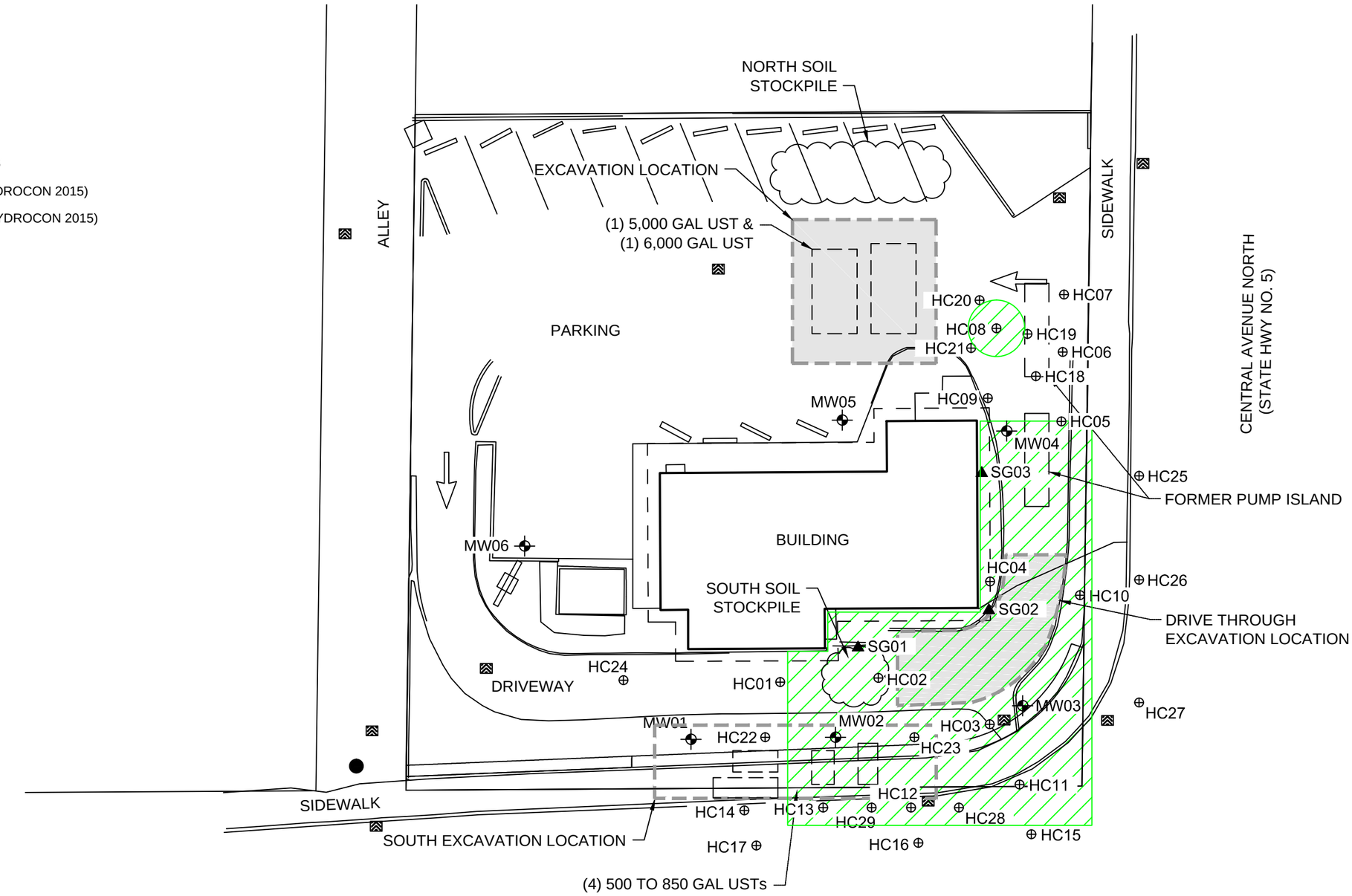
DATE: 3-19-16
DWN: JJT
CHK: RH
APPROVED: CH
PRJ. MGR: CH
PROJECT NO: 01-323

FIGURE 9
CROSS SECTION B-B'

TOC HOLDING CO. FACILITY NO. 01-323
301 N CENTRAL AVE
KENT, WA.

LEGEND

- BUILDING
- MW01 — MONITORING WELL
- CATCH BASIN
- EXCAVATION LOCATIONS
- HC01 — BORING LOCATIONS (HYDROCON 2015)
- SG01 — SOIL GAS LOCATIONS (HYDROCON 2015)
- SITE BOUNDARY



N W E S

0 20 40

SCALE IN FEET
1" = 20'

Hydro Con
510 Allen St. Suite B Kelso, Wa 98626, Ph(360)-703-6086

DATE: 2-11-16
DWN: JJT
CHK: NV
APPROVED: CH
PRJ. MGR: CH
PROJECT NO: 01-323

FIGURE 10
SITE BOUNDARY DEFINITION

TOC HOLDING CO. FACILITY NO. 01-323
301 N CENTRAL AVE
KENT, WA.

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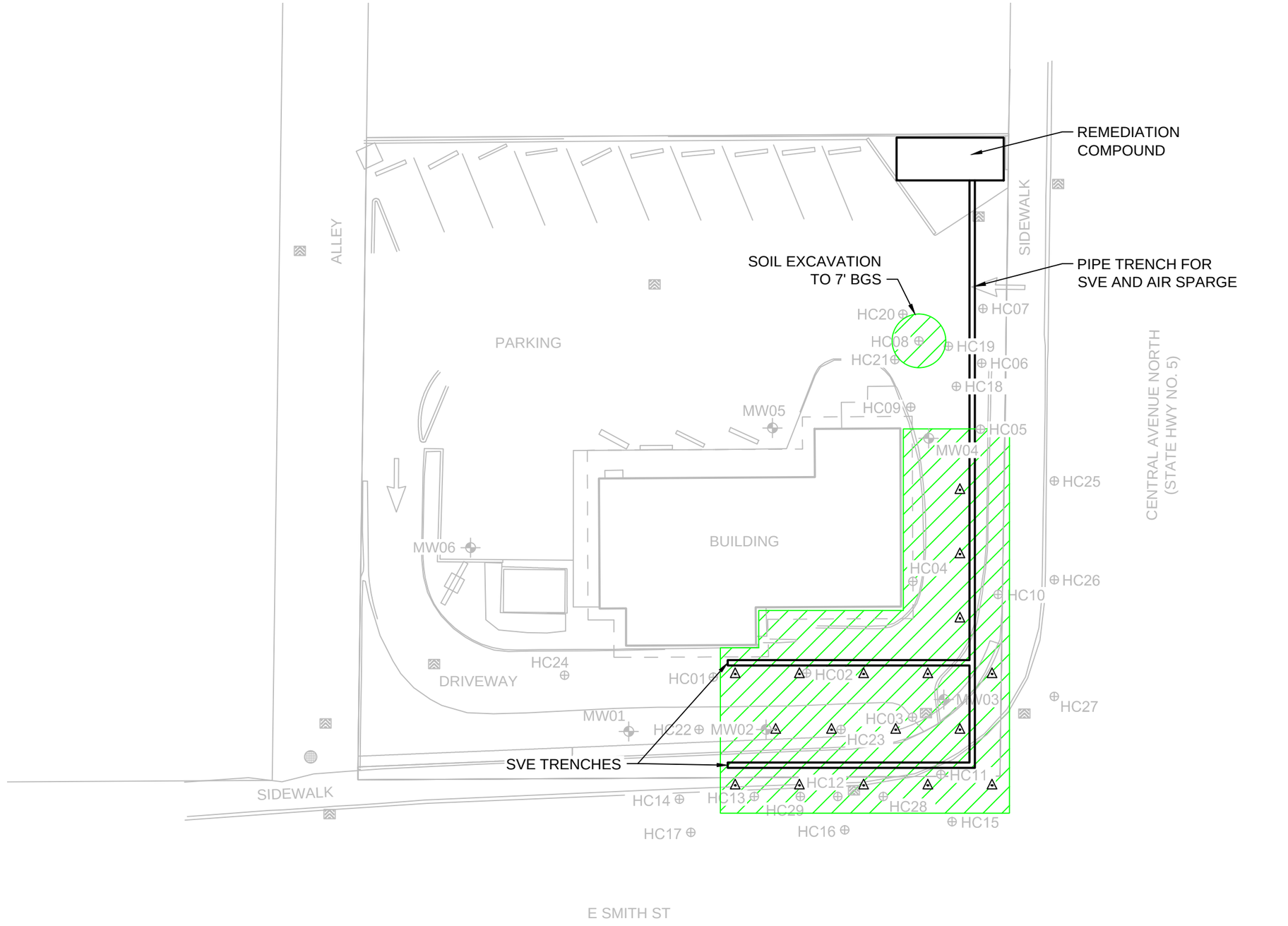
LEGEND

- BUILDING
- MW01 — MONITORING WELL
- CATCH BASIN
- PROPOSED SVE TRENCHES
- HC01 — BORING LOCATIONS (HYDROCON 2015)
- SG01 — SOIL GAS LOCATIONS (HYDROCON 2015)
- SITE BOUNDARY
- PROPOSED AIRSPARGE LOCATIONS



N / W / E / S

0 20 40

SCALE IN FEET
1" = 20'

HydroCon
510 Allen St. Suite B Kelso, Wa 98626, Ph(360)-703-6086

DATE: 2-11-16
DWN: JJT
CHK: MS
APPROVED: MS
PRJ. MGR: CH
PROJECT NO: 01-323

FIGURE 11
CONCEPTUAL SITE LAYOUT
CLEANUP ACTION ALTERNATIVE 1
AIR SPARGE WITH SVE
TOC HOLDING CO. FACILITY NO. 01-323

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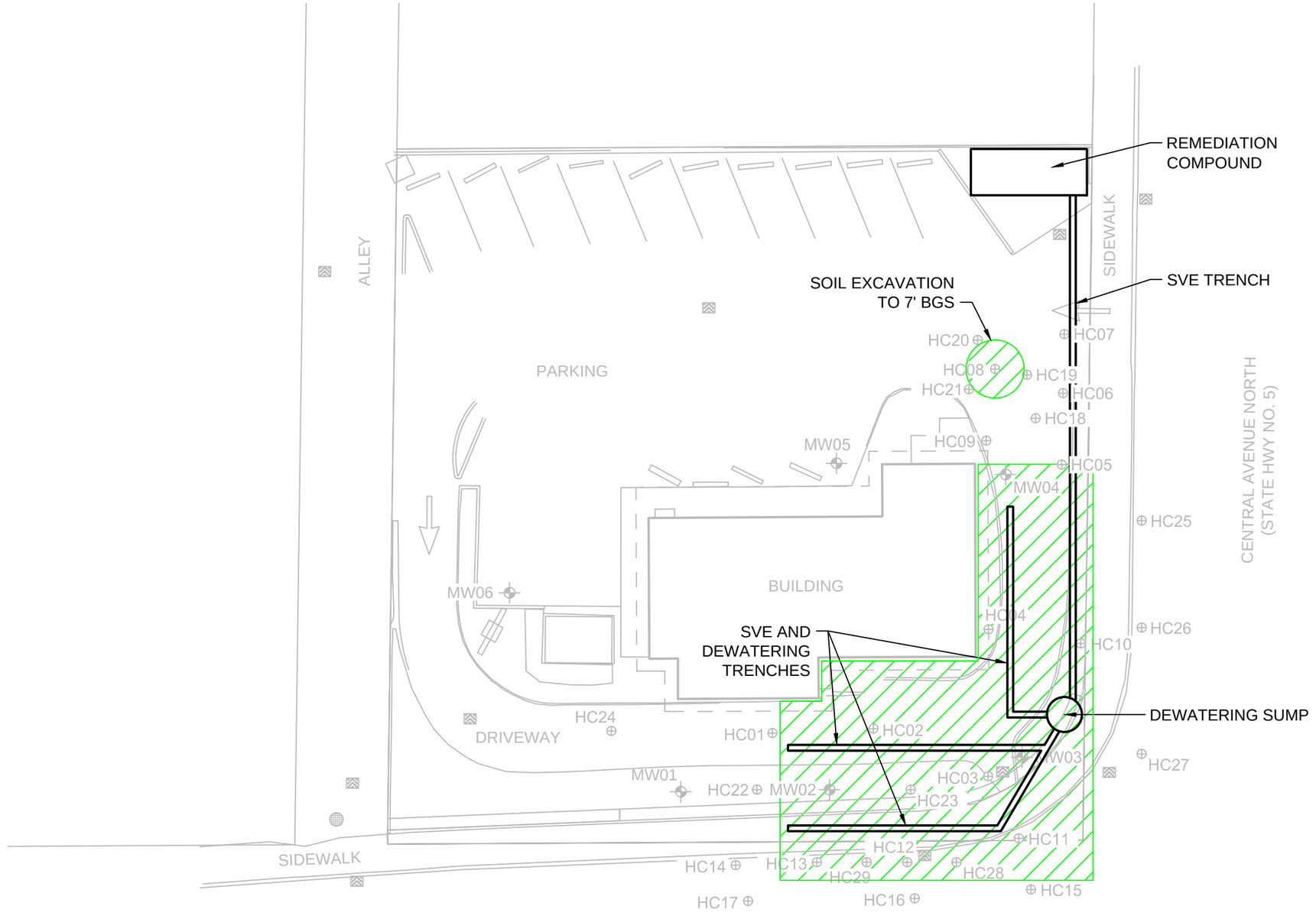
LEGEND

- BUILDING
- MW01 — MONITORING WELL
- CATCH BASIN
- PROPOSED SVE AND DEWATERING TRENCHES
- HC01 — BORING LOCATIONS (HYDROCON 2015)
- SG01 — SOIL GAS LOCATIONS (HYDROCON 2015)
- SITE BOUNDARY



N
W E
S

0 20 40
SCALE IN FEET
1" = 20'

Hydro Con
510 Allen St. Suite B Kelso, Wa 98626, Ph(360)-703-6086

DATE: 2-11-16
DWN: JJT
CHK: MS
APPROVED: MS
PRJ. MGR: CH
PROJECT NO: 01-323

FIGURE 12
CONCEPTUAL SITE LAYOUT
CLEANUP ACTION ALTERNATIVE 2
DUAL-PHASE EXTRACTION
TOC HOLDING CO. FACILITY NO. 01-323

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TABLES

Table 1
Summary of 2013-2014 Soil Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	Fuels		Volatiles									Metal
	DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene, Total	EDB	EDC	MTBE	Naphthalene	Lead, Total
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
WA Method A Cleanup for Unrestricted Land Use	**2,000**	**2,000**		**0.03**	**7**	**6**	**9**	**0.005**		**0.1**	**5**	**250**
Benzene (Non Detect)			**100**									
Benzene (Detect)			**30**									
WA Method B Soil Non Cancer				**320**	**6,400**	**8,000**	**16,000**	**720**	**480**		**1,600**	
Field ID	**Date**											
Terracon 2013 Limited Site Investigation												
B-01 S-01	10/23/2013	<5.4	9.1 J	<0.14	0.0012 J	<0.0068	<0.0014	<0.0041	-	<0.0014	-	<0.0068	87
B-01 S-02	10/23/2013	<5.2	<13	0.05 J	0.00044 J	<0.0065	<0.0013	<0.0039	-	<0.0013	-	<0.0065	1.8
B-02 S-01	10/23/2013	<4.4	<11	<0.11	<0.0011	<0.0056	<0.0011	<0.0033	-	<0.0011	-	<0.0056	12
B-02 S-02	10/23/2013	<5.2	5.8 J	0.35 J	0.0042	0.0018 J	<0.0013	0.001 J	-	0.0008 J	-	<0.0066	4.7
B-03 S-01	10/23/2013	6.7	6.8 J	2.4	<0.0013	<0.0064	0.0017	<0.0039	-	<0.0013	-	0.0024	10
B-03 S-02	10/23/2013	<5.2	<13	0.78	0.00057 J	<0.0065	<0.0013	<0.0039	-	<0.0013	-	<0.0065	16
B-04 S-01	10/23/2013	<4.8	5.4 J	0.04 J	0.0011 J	<0.006	<0.0012	<0.0036	-	<0.0012	-	<0.006	2.1
B-04 S-02	10/23/2013	<5.6	<14	0.049	0.00099 J	<0.007	<0.0014	<0.0042	-	<0.0014	-	<0.007	3.3
B-05 S-01	10/23/2013	<5.2	4.5 J	<0.13	0.0012 J	<0.0066	<0.0013	<0.0039	-	<0.0013	-	<0.0066	1.4
B-05 S-02	10/23/2013	<5.6	<14	<0.15	0.0014 J	<0.0072	<0.0014	<0.0043	-	<0.0014	-	<0.0072	1.8
B-06 S-01	10/23/2013	150	8.7 J	**1,200**	<0.23	<1.2	0.57	<0.7	-	<0.23	-	1.8	3.3
B-06 S-02	10/23/2013	240	5.5 J	**3,400**	<0.34	0.13 J	**8.6**	0.29 J	-	<0.34	-	**5.2**	2
B-07 S-01	10/23/2013	<4.9	6.4 J	0.12 J	0.00038 J	<0.0063	<0.0012	<0.0038	-	<0.0012	-	<0.0063	1.8
B-07 S-02	10/23/2013	<5	23	1.4	0.0012 J	<0.0063	<0.0013	<0.0038	-	<0.0013	-	<0.0063	1.3
Terracon 2014 UST Decommissioning and Soil Interim Action Report and HydroCon 2014 Oversight Technical Memorandum													
C Tank S-4.5	6/4/2014	1,500 jl x	<250	**3,600 J**	<0.03	<0.05	0.89	<0.15	-	-	-	-	-
C Tank S-4.5	6/4/2014	<1,300	66	**4,000**	**0.12**	<0.14	**8.5**	**17**	-	-	-	-	-
C Tank W-5	6/3/2014	<50	<250	5	<0.03	<0.05	0.26	<0.15	-	-	-	-	-
C Tank W-5	6/4/2014	**2,300 jl x**	<250	**5,300 J**	<0.03	<0.05	0.32	<0.15	-	-	-	-	-
C Tank W-5	6/4/2014	<780	<61	**2,400**	**0.066**	<0.14	4.4	7.4	-	-	-	-	-
E Tank B-5	6/3/2014	590	<250	**1,400**	<0.03	<0.05	0.099	<0.15	-	-	-	-	-
E Tank B-5	6/3/2014	590	<250	**1,400**	<0.03	<0.05	0.099	<0.15	-	-	-	-	-
E Tank E-5	6/3/2014	160	<250	**220**	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
E Tank E-5	6/3/2014	160	<250	**220**	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
E Tank N-4	6/5/2014	<1,300	<67	**8,300**	**0.43**	0.52	**22**	**23.6**	-	-	-	-	-
E Tank NE-4	6/5/2014	<680	<65	**940**	**0.081**	<0.15	2.2	2.85	-	-	-	-	-
E Tank S-5	6/3/2014	770	<250	**2,400 J**	<0.03	<0.05	0.17	<0.15	-	-	-	-	-
E Tank S-5	6/3/2014	<760	<64	**760**	<0.027	<0.14	1.2	1.4	-	-	-	-	-
E1-5.5	6/11/2014	**8,500**	<250	**1,700**	<0.03	<0.05	0.94	<0.15	-	-	-	-	-

Table 1
Summary of 2013-2014 Soil Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	Fuels		Volatiles									Metal
	DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene, Total	EDB	EDC	MTBE	Naphthalene	Lead, Total
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
WA Method A Cleanup for Unrestricted Land Use	**2,000**	**2,000**		**0.03**	**7**	**6**	**9**	**0.005**		**0.1**	**5**	**250**
Benzene (Non Detect)			**100**									
Benzene (Detect)			**30**									
WA Method B Soil Non Cancer				**320**	**6,400**	**8,000**	**16,000**	**720**	**480**		**1,600**	
Field ID	**Date**											
E1-5.5	6/11/2014	<2,200	<63	**2,900**	**0.18**	0.26	**10**	**12.25**	-	-	-	-	-
E2-5.5	6/11/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
E2-5.5	6/11/2014	<33	<65	<10	<0.02	<0.1	<0.1	<0.2	-	-	-	-	-
E3-5.5	6/11/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
E3-5.5	6/11/2014	<33	<66	<5.7	<0.02	<0.057	<0.057	<0.114	-	-	-	-	-
E5K E-5	5/28/2014	<29	<57	<6.2	<0.02	<0.062	<0.062	<0.182	-	-	-	-	-
E5K N-6	5/28/2014	<29	<59	<6.2	<0.02	<0.062	<0.062	<0.182	-	-	-	-	-
E5K S-5	5/28/2014	<27	85	<5.6	<0.02	<0.056	<0.056	<0.166	-	-	-	-	-
E5K-E-5	5/28/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
E5K-N-5	5/28/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
E5K-S-5	5/28/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
EXP1-4.5	6/11/2014	**3,900 x**	<250	**3,400**	<0.03	<0.05	0.25	<0.15	-	-	-	-	-
EXP1-4.5	6/11/2014	<840	<65	**2,700**	**0.084**	<0.28	4.9	8.28	-	-	-	-	-
N1-5.5	6/11/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
N1-5.5	6/11/2014	<29	<58	<4.1	<0.02	<0.041	<0.041	<0.082	-	-	-	-	-
N2-5.5	6/11/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
N2-5.5	6/11/2014	<29	<58	<3.9	<0.02	<0.039	<0.039	<0.078	-	-	-	-	-
NSS-01	5/29/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
NSS-01	5/28/2014	<27	<54	<5.3	<0.02	<0.053	<0.053	<0.163	-	-	-	-	-
NSS-02	5/29/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
NSS-02	5/28/2014	<28	<55	<5.9	<0.02	<0.059	<0.059	<0.179	-	-	-	-	-
NSS-03	5/29/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
NSS-03	5/28/2014	<27	<55	<5.7	<0.02	<0.057	<0.057	<0.167	-	-	-	-	-
NSS-04	5/29/2014	<50	<250	5.7	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
NSS-04	5/28/2014	<40	290	7.9	<0.02	<0.066	<0.066	<0.196	-	-	-	-	19
NW Tank B-7	6/4/2014	440 jl x	<250	**1,400**	<0.03	<0.05	1.6	0.255	-	-	-	-	-
NW Tank B-7	6/4/2014	<470	68	**2,500**	**0.12**	<0.14	**7.2**	8.2	-	-	-	-	-
NW Tank E-5.5	6/4/2014	<50	<250	15	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
NW Tank E-5.5	6/4/2014	<30	<61	10	<0.02	<0.063	<0.063	<0.126	-	-	-	-	-
NW Tank N-2	6/2/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-

Table 1
Summary of 2013-2014 Soil Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	Fuels		Volatiles									Metal
	DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene, Total	EDB	EDC	MTBE	Naphthalene	Lead, Total
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
WA Method A Cleanup for Unrestricted Land Use	**2,000**	**2,000**		**0.03**	**7**	**6**	**9**	**0.005**		**0.1**	**5**	**250**
Benzene (Non Detect)			**100**									
Benzene (Detect)			**30**									
WA Method B Soil Non Cancer				**320**	**6,400**	**8,000**	**16,000**	**720**	**480**		**1,600**	
Field ID	**Date**											
NW Tank N-7	6/2/2014	<33	<66	<8.1	<0.02	<0.081	<0.081	<0.162	-	-	-	-	-
NW Tank W-6.5	6/2/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
NW Tank W-6.5	6/2/2014	<32	<63	<8.6	<0.02	<0.086	<0.086	<0.172	-	-	-	-	-
NW1-5.5	6/10/2014	**3,300 jl x**	<250	**4,500 J**	<0.03	<0.05	0.53	<0.15	-	-	-	-	-
NW1-5.5	6/10/2014	<2,500	<63	**6,100**	**0.34**	0.48	**9.8**	**11**	-	-	-	-	-
NW2-5.5	6/11/2014	410 x	<250	**800**	<0.03	<0.05	0.1	<0.15	-	-	-	-	-
NW2-5.5	6/11/2014	<550	<64	**1,300**	**0.087**	<0.25	2.4	3.05	-	-	-	-	-
NW3-5.5	6/11/2014	<50	<250	15	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
NW3-5.5	6/11/2014	100	<66	<10	<0.021	<0.1	<0.1	<0.2	-	-	-	-	-
PCS-01	6/3/2014	**3,900**	<250	**3,200 J**	<0.03	<0.05	0.3	<0.15	-	-	-	-	-
PCS-02	6/3/2014	1,400	<250	**4,000**	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
PCS-02	6/3/2014	<1,300	120	**3,300**	**0.057**	<0.12	4.4	**13.2**	-	-	-	-	-
SE1-5.5	6/10/2014	420 jl x	<250	**1,200**	<0.03	<0.05	0.59	0.15	-	-	-	-	-
SE1-5.5	6/10/2014	<46	<70	**2,900**	**0.12**	0.13	4.9	4.7	-	-	-	-	-
SSS-01	6/2/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
SSS-01	6/2/2014	28	96	<5.6	<0.02	<0.056	<0.056	<0.112	-	-	-	-	-
SSS-02	6/2/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
SSS-02	6/2/2014	<27	75	<6.9	<0.02	<0.069	<0.069	<0.138	-	-	-	-	-
SSS-03	6/2/2014	<50	<250	**160 J**	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
SSS-03	6/2/2014	<50	97	**130**	<0.02	<0.065	0.093	0.225	-	-	-	-	-
SSS-04	6/4/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
SSS-04	6/4/2014	<28	120	<5.3	<0.02	<0.053	<0.053	<0.106	-	-	-	-	-
SSS-05	6/10/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
SSS-05	6/10/2014	<27	290	<3.5	<0.02	<0.035	<0.035	<0.035	-	-	-	-	-
W Tank E-4	6/4/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
W Tank E-4	6/4/2014	<30	<61	<6.7	<0.02	<0.067	<0.067	<0.134	-	-	-	-	-
W Tank S-4.5	6/4/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
W Tank S-4.5	6/4/2014	<32	<64	<6.6	<0.02	<0.066	<0.066	<0.132	-	-	-	-	-
W Tank W-4.5	6/2/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
W Tank W-4.5	6/2/2014	<32	<65	<7.6	<0.02	<0.076	<0.076	<0.152	-	-	-	-	-

Table 1
Summary of 2013-2014 Soil Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	Fuels		Volatiles									Metal
	DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene, Total	EDB	EDC	MTBE	Naphthalene	Lead, Total
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
WA Method A Cleanup for Unrestricted Land Use	**2,000**	**2,000**		**0.03**	**7**	**6**	**9**	**0.005**		**0.1**	**5**	**250**
Benzene (Non Detect)			**100**									
Benzene (Detect)			**30**									
WA Method B Soil Non Cancer				**320**	**6,400**	**8,000**	**16,000**	**720**	**480**		**1,600**	
Field ID	**Date**											
W5K-N-6	5/28/2014	<31	<63	<7.2	<0.02	<0.072	<0.072	<0.212	-	-	-	-	-
W5K-N-6	5/28/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
W5K-S-6	5/28/2014	<29	<57	<6.3	<0.02	<0.063	<0.063	<0.193	-	-	-	-	-
W5K-S-6	5/28/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
W5K-W-6	5/28/2014	<29	<58	<5.5	<0.02	<0.055	<0.055	<0.165	-	-	-	-	-
W5K-W-6	5/28/2014	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
WW1-5.5	6/10/2014	1,900 jl x	<250	**1,500**	<0.03	<0.05	0.17	<0.15	-	-	-	-	-
WW1-5.5	6/10/2014	<1,500	<65	**2,000**	**0.063**	<0.1	4.6	5.7	-	-	-	-	-
WW2-5.5	6/10/2014	1,500 jl x	<250	**2,000 J**	<0.03	<0.05	0.23	<0.15	-	-	-	-	-
WW2-5.5	6/10/2014	<900	<64	**3,300**	**0.43**	0.36	**9.1**	**10**	-	-	-	-	-

Notes

Red denotes concentration exceeds MTCA cleanup level.
Samples analyzed by Friedman & Bruya, Inc., of Seattle, WA;
Environmental Science Corporation of Mt Juliet, TN; or OnSite Environmental, of Redmond, WA.
MTCA Method A Cleanup Levels, Table 740-1 of Section 900 of Chapter 173-340 of the
Washington Administrative Code, revised November 2007.
MTCA Method B Noncancer Direct Cleanup Levels, CLARC Master Table
GRPH analyzed by Method NWTPH-Gx.
DRPH and ORPH analyzed by Method NWTPH-Dx.
Volatiles analyzed by EPA 8260B, 8260C or 8021B.
Metals analyzed by EPA Method 6010B, 6010C or 200.8.

J - Estimated value below the lowest calibration point. Confidence correlates with concentration.
jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits.
The reported concentration should be considered an estimate.
q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria and
is not within established control limits.
x - The sample chromatographic pattern does not resemble the fuel standard used for quantification.

- = not measured/not analyzed
< = not detected at a concentration exceeding
the laboratory reporting limit
mg/kg = milligrams per kilogram
DRPH = Diesel Range Petroleum Hydrocarbons
EDB = 1,2-dibromoethane (ethylene dibromide)
EDC = 1,2-dichloroethylene (ethylene dichloride)
EPA = U.S. Environmental Protection Agency
GRPH = Gasoline Range Petroleum Hydrocarbons
MTBE = methyl tertiary-butyl ether
MTCA = Washington State Model Toxics Control Act
NWTPH = Northwest Total Petroleum Hydrocarbon
ORPH = Oil Range Petroleum Hydrocarbons

Table 2
Summary of 2013-2014 Soil Additional Volatiles Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

		Volatiles								
		1,2,3-trimethylbenzene	Acetone	Isopropylbenzene	Methyl Ethyl Ketone	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene	tert-butylbenzene
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
WA Method A Cleanup for Unrestricted Land Use										
Benzene (Non Detect)										
Benzene (Detect)										
WA Method B Soil Non Cancer			72,000	8,000	48,000	4,000	8,000		8,000	8,000
Field ID	**Date**									
Terracon 2013 Limited Site Investigation										
B-01 S-01	10/23/2013	<0.0014	0.041 J	<0.0014	<0.014	<0.0014	<0.0014	<0.0014	<0.0014	<0.0014
B-01 S-02	10/23/2013	<0.0013	0.018 J	<0.0013	<0.013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013
B-02 S-01	10/23/2013	<0.0011	<0.056	<0.0011	<0.011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
B-02 S-02	10/23/2013	0.0059	0.089 J	<0.0013	0.013	<0.0013	<0.0013	<0.0013	0.00059 J	<0.0013
B-03 S-01	10/23/2013	<0.0013	0.03 J	<0.0013	<0.013	<0.0013	0.00054 J	<0.0013	<0.0013	<0.0013
B-03 S-02	10/23/2013	<0.0013	0.03 J	<0.0013	<0.013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013
B-04 S-01	10/23/2013	<0.0012	0.018 J	<0.0012	<0.012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
B-04 S-02	10/23/2013	<0.0014	0.024 J	<0.0014	<0.014	<0.0014	<0.0014	<0.0014	<0.0014	<0.0014
B-05 S-01	10/23/2013	<0.0013	0.035 J	<0.0013	<0.013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013
B-05 S-02	10/23/2013	<0.0014	0.067 J	<0.0014	0.0077 J	<0.0014	<0.0014	<0.0014	<0.0014	<0.0014
B-06 S-01	10/23/2013	8.9	<12	1.8	<2.3	0.98	2.4	0.15 J	0.86	0.057 J
B-06 S-02	10/23/2013	18	<13	4	<3.4	2	5.4	0.64	1.6	0.11 J
B-07 S-01	10/23/2013	0.00068 J	0.018 J	<0.0012	<0.012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
B-07 S-02	10/23/2013	<0.0013	0.044 J	0.00068 J	<0.013	<0.0013	<0.0013	<0.0013	0.00067 J	<0.0013

Notes

Red denotes concentration exceeds MTCA cleanup level.
Samples analyzed by Friedman & Bruya, Inc., of Seattle, WA;
Environmental Science Corporation of Mt Juliet, TN;
or OnSite Environmental, of Redmond, WA.
MTCA Method A Cleanup Levels, Table 740-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code revised November 2007.
MTCA Method B Noncancer Direct Cleanup Levels, CLARC Master Table
Volatiles analyzed by EPA 8260B, 8260C or 8021B.

J - Estimated value below the lowest calibration point. Confidence correlates with concentration.

< = not detected at a concentration exceeding the laboratory reporting limit
mg/kg = milligrams per kilogram
EPA = U.S. Environmental Protection Agency
MTCA = Washington State Model Toxics Control Act

Table 3
Summary of 2013-2014 Borehole Groundwater Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	Fuels		Volatiles						Metals	
	DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene Total	Naphthalene	Lead, Total	Lead, Dissolved
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WA Method A Cleanup for Groundwater	**500**	**500**		**5**	**1,000**	**700**	**1,000**	**160**	**15**	**15**
Benzene (Non Detect)			**1,000**							
Benzene (Detect)			**800**							
Field ID	**Date**									
Terracon 2013 Limited Site Investigation										
TMW-01	10/23/2013	310	160 J	52 J	<1	<5	<1	<3	<5	<5	-
TMW-02	10/23/2013	120	260	<100	<1	<5	<1	<3	<5	<5	-
TMW-03	10/23/2013	120	440	<100	<1	<5	<1	<3	<5	<5	-
TMW-04	10/23/2013	100	130 J	<100	<1	<5	1.8	<3	<5	<5	-
TMW-05	10/23/2013	59 J	140 J	<100	<1	<5	<1	<3	<5	<5	-
TMW-06	10/23/2013	**910**	300	**6,600**	**6 J**	<50	360	23	**240**	<5	-
TMW-07	10/23/2013	470	150 J	<100	<1	<5	<1	<3	<5	<5	-

Notes
Red denotes concentration in excess of MTCA Cleanup Level for Groundwater.
Samples analyzed by Friedman & Bruya, Inc., of Seattle, Washington or Environmental Science Corporation of Mt. Juliet, Tennessee.
GRPH analyzed by Method NWTPH-Gx.
DRPH and ORPH analyzed by Method NWTPH-Dx.
Volatiles analyzed by EPA 8260B or 8260C.
Metals analyzed by EPA Method 6010B or 200.8.

J - Estimated value below the lowest calibration point. Confidence correlates with concentration.
x - The sample chromatographic pattern does not resemble the fuel standard used for quantification.

< = not detected at a concentration exceeding the laboratory reporting limit
µg/L = micrograms per liter
EPA = U.S. Environmental Protection Agency
MTCA = Washington State Model Toxics Control Act
NWTPH = Northwest Total Petroleum Hydrocarbon

Table 3 (continued)
Summary of 2013-2014 Borehole Groundwater Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

		Volatiles								
		1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2,3-trimethylbenzene	1,3-dichlorobenzene	Isopropylbenzene	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WA Method A Cleanup for Groundwater										
Benzene (Non Detect)										
Benzene (Detect)										
Field ID	**Date**									
Terracon 2013 Limited Site Investigation										
TMW-01	10/23/2013	<1	<1	<1	<1	<1	<1	<1	<1	<1
TMW-02	10/23/2013	<1	<1	<1	<1	<1	<1	<1	<1	<1
TMW-03	10/23/2013	<1	<1	<1	<1	<1	<1	<1	<1	<1
TMW-04	10/23/2013	<1	<1	<1	<1	<1	<1	0.6 J	<1	<1
TMW-05	10/23/2013	<1	<1	<1	<1	<1	<1	<1	<1	<1
TMW-06	10/23/2013	2.5	2.6	540	3 J	110	14	110	6	17
TMW-07	10/23/2013	<1	<1	0.47 J	<1	<1	<1	<1	<1	<1

Notes
Red denotes concentration in excess of MTCA Cleanup Level for Groundwater.
Samples analyzed by Friedman & Bruya, Inc., of Seattle, Washington or Environmental Science Corporation of Mt. Juliet, Tennessee.
GRPH analyzed by Method NWTPH-Gx.
DRPH and ORPH analyzed by Method NWTPH-Dx.
Volatiles analyzed by EPA 8260B or 8260C.
Metals analyzed by EPA Method 6010B or 200.8.

J - Estimated value below the lowest calibration point. Confidence correlates with concentration.
x - The sample chromatographic pattern does not resemble the fuel standard used for quantification.

< = not detected at a concentration exceeding the laboratory reporting limit
µg/L = micrograms per liter
EPA = U.S. Environmental Protection Agency
MTCA = Washington State Model Toxics Control Act
NWTPH = Northwest Total Petroleum Hydrocarbon

Table 4
Summary of 2015 Soil Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	Fuels		Volatiles									Metal
	DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene, Total	Naphthalene	EDB	EDC	MTBE	Lead, Total
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
WA Method A Cleanup for Unrestricted Land Use	**2,000**	**2,000**	**30|100**	**0.03**	**7**	**6**	**9**	**5**	**0.005**		**0.1**	**250**
Benzene (Non Detect)			**100**									
Benzene (Detect)			**30**									

Field ID	Date												
HydroCon Subsurface Investigation 2015													
HC01-05	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC01-07	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC01-10	6/29/2015	<50	<250	3	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC01-15	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC02-05	6/29/2015	<50	<250	8.2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC02-07	6/29/2015	400 x	<250	**560**	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC02-15	6/29/2015	<50	<250	3.9	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC03-05	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC03-08	6/29/2015	1,200 x	<250	**1,100**	<0.03	<0.05	1.9	<0.15	-	-	-	-	-
HC03-15	6/29/2015	<50	<250	3.6	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC04-05	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC04-07	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC04-15	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC05-05	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC05-07	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	0.241	-	-	-	-	-
HC05-15	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC06-05	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC06-07	6/29/2015	<50	<250	<2	<0.03	<0.05	0.069	0.47	-	-	-	-	-
HC06-15	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC07-05	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC07-07	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	0.19	-	-	-	-	-
HC07-15	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC08-05	6/29/2015	250 x	**2,800**	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC08-07	6/29/2015	69 x	760	<2	<0.03	<0.05	<0.05	0.222	-	-	-	-	-
HC08-15	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC09-05	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC09-07	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC09-15	6/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC10-05	7/7/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC10-07	7/7/2015	**4,600 x**	<250	**1,600**	<0.03	<0.05	0.081	<0.15	-	-	-	-	-
HC10-15	7/7/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC11-05	7/21/2015	**2,200 x**	<250	**3,000 J**	**0.088**	0.094	0.36	0.21	0.21	<0.05	<0.05	<0.05	-
HC11-07	7/21/2015	**3,500 x**	<250	**2,400**	**0.11**	0.056	0.69	0.27	<0.05	<0.05	<0.05	<0.05	-
HC11-10	7/21/2015	<50	<250	25	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC11-15	7/21/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC12-05	7/21/2015	**6,700 x**	<250	**14,000 J**	**0.064**	0.066	1.8	<0.15	<0.05	<0.05	<0.05	<0.05	-
HC12-07	7/21/2015	1,700 x	<250	**930**	**0.068**	0.067	0.8	0.22	-	-	-	-	-
HC12-15	7/21/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-

Table 4
Summary of 2015 Soil Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	Fuels		Volatiles									Metal
	DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene, Total	Naphthalene	EDB	EDC	MTBE	Lead, Total
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
WA Method A Cleanup for Unrestricted Land Use	**2,000**	**2,000**	**30|100**	**0.03**	**7**	**6**	**9**	**5**	**0.005**		**0.1**	**250**
Benzene (Non Detect)			**100**									
Benzene (Detect)			**30**									
Field ID	**Date**											
HC13-05	7/21/2015	**5,700 x**	<250	**9,100 J**	<0.03	<0.05	0.31	<0.15	<0.05	<0.05	<0.05	<0.05	-
HC13-11	7/21/2015	<50	<250	**450**	**0.055**	<0.05	0.11	<0.15	-	-	-	-	-
HC13-15	7/21/2015	<50	<250	15	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC14-05	7/21/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC14-07	7/21/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC14-15	7/21/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC15-05	7/21/2015	<50	<250	34	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC15-07	7/21/2015	<50	<250	54	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC15-15	7/21/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC16-05	7/21/2015	<50	<250	14	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC16-07	7/21/2015	<50	<250	4.5	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC16-15	7/21/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC17-05	7/21/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC17-07	7/21/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC17-15	7/21/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW01-05	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW01-07	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW01-07	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW01-15	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW01-15	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW02-05	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW02-05	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW02-07	6/30/2015	400 x	<250	**630**	<0.03	<0.05	1	<0.15	-	-	-	-	-
MW02-07	6/30/2015	400 x	<250	**630**	<0.03	<0.05	1	<0.15	-	-	-	-	-
MW02-15	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW02-15	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW03-05	6/30/2015	1,500 x	<250	**1,200 J**	<0.03	<0.05	0.22	<0.15	-	-	-	-	-

Table 4
Summary of 2015 Soil Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	Fuels		Volatiles									Metal
	DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene, Total	Naphthalene	EDB	EDC	MTBE	Lead, Total
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
WA Method A Cleanup for Unrestricted Land Use	**2,000**	**2,000**	**30|100**	**0.03**	**7**	**6**	**9**	**5**	**0.005**		**0.1**	**250**
Benzene (Non Detect)			**100**									
Benzene (Detect)			**30**									
Field ID	**Date**											
MW03-05	6/30/2015	1,500 x	<250	**1,200 J**	<0.03	<0.05	0.22	<0.15	-	-	-	-	-
MW03-07	7/22/2015	-	-	-	**0.524**	1.57	2.64	5.81	4.73	-	-	<0.214 ec	-
MW03-12	6/30/2015	640 x	<250	**380**	<0.03	<0.05	0.19	<0.15	-	-	-	-	-
MW03-12	6/30/2015	640 x	<250	**380**	<0.03	<0.05	0.19	<0.15	-	-	-	-	-
MW03-15	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW03-15	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW04-05	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW04-07	6/30/2015	85 x	1,100	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW04-15	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW05-05	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW05-08	6/30/2015	350	<250	18	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW05-15	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW06-05	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW06-06	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
MW06-15	6/30/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HydroCon Additional Subsurface Investigation 2015													
HC18-05	12/28/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC19-05	12/28/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC20-05	12/28/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC21-05	12/28/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC22-05	12/28/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC22-07	12/28/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC22-15	12/28/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC23-05	12/28/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC23-12	12/28/2015	550 x	<250	**1,200**	<0.03	<0.05	0.37	<0.15	-	-	-	-	9.6
HC23-15	12/28/2015	670 x	<250	**2,200**	<0.03	<0.05	0.19	<0.15	-	-	-	-	-
HC24-05	12/28/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC24-07	12/28/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	<0.05	-	-
HC24-15	12/28/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC25-05	12/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC25-10	12/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC25-15	12/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC26-05	12/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC26-10	12/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC26-15	12/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC27-05	12/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC27-10	12/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC27-15	12/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC28-05	12/29/2015	1,400	<250	**460**	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-

Table 4
Summary of 2015 Soil Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	Fuels		Volatiles									Metal
	DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene, Total	Naphthalene	EDB	EDC	MTBE	Lead, Total
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
WA Method A Cleanup for Unrestricted Land Use	**2,000**	**2,000**	**30|100**	**0.03**	**7**	**6**	**9**	**5**	**0.005**		**0.1**	**250**
Benzene (Non Detect)			**100**									
Benzene (Detect)			**30**									
Field ID **Date**												
HC28-10 12/29/2015	<50	<250	17	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC28-15 12/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC29-05 12/29/2015	**4,300 x**	<250	**5,400**	<0.03	<0.05	0.6	<0.15	-	-	<0.05	<0.05	7.79
HC29-10 12/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-
HC29-15 12/29/2015	<50	<250	<2	<0.03	<0.05	<0.05	<0.15	-	-	-	-	-

Notes

Red denotes concentration exceeds MTCA Method A cleanup level.
MTCA Method A Cleanup Levels, Table 740-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, revised November 2007.
GRPH analyzed by Method NWTPH-Gx.
DRPH and ORPH analyzed by Method NWTPH-Dx.
Volatiles analyzed by EPA 8260B, 8260C or 8021B.
Metals analyzed by EPA Method 6010B, 6010C or 200.8.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

- = not measured/not analyzed
< = not detected at a concentration exceeding the laboratory reporting limit
mg/kg = milligrams per kilogram
DRPH = Diesel Range Petroleum Hydrocarbons
EDB = 1,2-dibromoethane (ethylene dibromide)
EDC = 1,2-dichloroethylene (ethylene dichloride)
EPA = U.S. Environmental Protection Agency
GRPH = Gasoline Range Petroleum Hydrocarbons
MTBE = methyl tertiary-butyl ether
MTCA = Washington State Model Toxics Control Act
NWVPH = Northwest Volatile Petroleum Hydrocarbons
ORPH = Oil Range Petroleum Hydrocarbons

Table 5
Summary of Soil PCB/PAH/HVOC Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	Units	WA Method A Cleanup for Unrestricted Land Use	Method B Non cancer	Method B Cancer	Protective of Groundwater Vadose @ 25 degrees C	Protective of Groundwater Vadose @ 13 degrees C	Protective of Groundwater Saturated	7/21/2015 HC11-07	7/21/2015 HC12-05	12/28/2015 HC23-12	12/29/2015 HC29-05
PCBs											
PCB Mixtures (total PCBs)	mg/kg	1	--	0.5	--	--	--				
Aroclor 1016	mg/kg	--	5.6	14.3	--	--	--	-	-	<0.02	<0.02
Aroclor 1221	mg/kg	--	--	--	--	--	--	-	-	<0.02	<0.02
Aroclor 1232	mg/kg	--	--	--	--	--	--	-	-	<0.02	<0.02
Aroclor 1242	mg/kg	--	--	--	--	--	--	-	-	<0.02	<0.02
Aroclor 1248	mg/kg	--	--	--	--	--	--	-	-	<0.02	<0.02
Aroclor 1254	mg/kg	--	1.6	0.5	--	--	--	-	-	<0.02	<0.02
Aroclor 1260	mg/kg	--	--	0.5	--	--	--	-	-	<0.02	<0.02
Aroclor 1268	mg/kg	--	--	--	--	--	--	-	-	<0.02	<0.02
Aroclor 1262	mg/kg	--	--	--	--	--	--	-	-	<0.02	<0.02
PAHs											
Acenaphthene	mg/kg	--	4,800	--	--	97.9	4.98	-	-	-	0.037
Acenaphthylene	mg/kg	--	--	--	--	--	--	-	-	-	<0.01
Anthracene	mg/kg	--	24,000	--	2,275	--	114	-	-	-	0.039
Benz(a)anthracene	mg/kg	--	--	1.37	0.858	--	0.0429	<0.01 ht	0.027 ht	<0.01	**0.045**
Benzo(a) pyrene	mg/kg	0.1	--	0.137	2.33	--	0.116	<0.01 ht	0.018 ht	0.019	0.037
Benzo(b)fluoranthene	mg/kg	--	--	1.37	2.95	2.95	0.147	<0.01 ht	0.022 ht	0.024	0.05
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	--	-	-	-	0.014
Benzo(k)fluoranthene	mg/kg	--	--	13.7	269.5	--	1.47	<0.01 ht	<0.01 ht	<0.01	0.016
Chrysene	mg/kg	--	--	137	95.5	95.5	4.77	<0.01 ht	0.035 ht	0.014	0.054
Dibenz(a,h)anthracene	mg/kg	--	--	0.137	0.429	--	0.0214	<0.01 ht	<0.01 ht	<0.01	<0.01
Fluoranthene	mg/kg	--	3,200	--	631	--	31.6	-	-	-	0.16
Fluorene	mg/kg	--	3,200	--	101	101	5.12	-	-	-	0.078
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	1.37	8.32	--	0.416	<0.01 ht	0.01 ht	0.015	0.018
Naphthalene	mg/kg	5	1,600	--	4.46	4.45	0.236	-	-	-	<0.01
Phenanthrene	mg/kg	--	--	--	--	--	--	-	-	-	0.24
Pyrene	mg/kg	--	2,400	--	655	655	32.8	-	-	-	0.17
Volatiles-HVOCs											
1,1,1-trichloroethane	mg/kg	2	160,000	--	1.58	1.49	0.0843	-	-	<0.05	<0.05
1,1-dichloroethane	mg/kg	--	16,000	175	0.042	0.041	0.0026	-	-	<0.05	<0.05
1,1-dichloroethene	mg/kg	--	4,000	--	0.05	0.0457	0.00246	-	-	<0.05	<0.05
Chloroethane	mg/kg	--	--	--	--	--	--	-	-	<0.5	<0.5
cis-1,2-dichloroethene	mg/kg	--	160		0.08	0.078	0.00515	-	-	<0.05	<0.05
Dichloromethane	mg/kg	0.02	480	500	0.022	0.022	0.00148	-	-	<0.5	<0.5
Diisopropyl ether	mg/kg	--	--	--	--	--	--	-	-	-	<0.05
ETBE	mg/kg	--	--	--	--	--	--	-	-	<0.05	<0.05
Ethanol	mg/kg	--	--	--	--	--	--	-	-	<50	<50
TAME	mg/kg	--	--	--	--	--	--	-	-	<0.05	<0.05
tert-Butyl alcohol	mg/kg	--	--	--	--	--	--	-	-	<2.5	<2.5

Table 5
Summary of Soil PCB/PAH/HVOC Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	Units	WA Method A Cleanup for Unrestricted Land Use	Method B Non cancer	Method B Cancer	Protective of Groundwater Vadose @ 25 degrees C	Protective of Groundwater Vadose @ 13 degrees C	Protective of Groundwater Saturated	7/21/2015 HC11-07	7/21/2015 HC12-05	12/28/2015 HC23-12	12/29/2015 HC29-05
Trichloroethene	**mg/kg**	**0.03**	**40**	**12**	**0.0264**	**0.0252**	**0.00152**	-	-	<0.02	<0.02
Tetrachloroethene	**mg/kg**	**0.05**	**480**	**476**	**0.053**	**0.05**	**0.00276**	-	-	<0.025	<0.025
trans-1,2-dichloroethene	**mg/kg**	**--**	**1,600**		**0.543**	**0.518**	**0.0325**	-	-	<0.05	<0.05
Vinyl chloride	**mg/kg**	**--**	**240**	**0.67**	**0.00183**	**0.00167**	**0.0000885**	-	-	<0.05	<0.05

Notes

Red denotes concentration exceeds MTCA Method A (or Method B cleanup level) if no Method A cleanup level is established.

-- means no standard promulgated

Samples analyzed by Friedman & Bruya, Inc., of Seattle, Washington.

MTCA Method A Cleanup Levels, Table 740-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, revised November 2007.

Method B Soil Cleanup Levels Protective of Groundwater from CLARC Master Tables; Updated August 2015

Volatiles analyzed by EPA 8260B, 8260C or 8021B.

PCBs analyzed by SW8082.

PAHs analyzed by SW 8270SIM or SW8270D.

ht - The analysis was performed outside the method or client-specified holding time requirement.

- = not measured/not analyzed

< = not detected at a concentration exceeding the laboratory MRL shown

mg/kg = milligrams per kilogram

ETBE - Ethyl tert-butyl ether

TAME - tert-Amyl methyl ether

PCB - Polychlorinated Biphenyl

PAH - Polynuclear Aromatic Hydrocarbon

HVOC - Halogenated volatile organic compound

Table 6
Summary of 2015 Borehole Water Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

		Fuels		Volatiles									Metal
		DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene, Total	EDB	EDC	MTBE	Naphthalene	Lead, Total
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WA Method A Cleanup for Groundwater		**500**	**500**		**5**	**1,000**	**700**	**1,000**	**0.01**	**5**	**20**	**160**	**15**
Benzene (Non Detect)				**1,000**									
Benzene (Detect)				**800**									
Field ID	**Date**												
Temporary Borehole Wells													
HC01	7/7/2015	350 x	<250	460	0.71	6.8	1.8	14.1	-	-	-	-	1.21
HC02	7/7/2015	**19,000 x**	**510 x**	**6,900**	**20**	15	40	21.8	-	-	-	-	**63.8**
HC04	7/7/2015	**740 x**	<250	**1,200**	0.44	4.4	1.3	10.3	-	-	-	-	1.75
HC05	7/7/2015	90 x	<250	100	0.49	5.6	1.5	10.5	-	-	-	-	14.9
HC07	7/7/2015	140 x	<250	130	0.85	9	2.2	17.2	-	-	-	-	**16.1**
HC08	7/7/2015	110 x	<250	<100	0.52	5.2	1.2	9.1	-	-	-	-	3.92
HC10	7/7/2015	**1,800 x**	<250	**1,900**	0.75	8.1	3.8	17.1	-	-	-	-	**17.3**
HC11	7/21/2015	**7,500 x**	290 x	**5,000**	2.9	<1	11	3.9	-	-	-	-	**88.2**
HC12	7/21/2015	**1,900 x**	<250	**5,100**	1.5	1.2	9.9	<3	-	-	-	-	**43.2**
HC13	7/21/2015	**13,000 x**	**1,100 x**	**5,800**	**5.4**	1.5	6.6	5.6	-	-	-	-	**77.6**
HC14	7/21/2015	170 x	<250	<100	<0.35	<1	<1	<3	-	-	-	-	**62.1**
HC15	7/21/2015	150 x	<250	290	<0.35	<1	<1	<3	-	-	-	-	**23**
HC16	7/21/2015	180 x	<250	190	<0.35	<1	<1	<3	-	-	-	-	**18.9**
HC17	7/22/2015	100 x	<250	<100	<0.35	<1	<1	<3	-	-	-	-	**23.4**
HC24	12/28/2015	69 x	<250	<100	<0.35	<1	<1	<3	<1 ec	<1	<1	<1	-
HC25	12/29/2015	<50	<250	<100	<0.35	1.9	<1	<3	-	-	-	-	-
HC26	12/29/2015	<60	<280	<100	<0.35	<1	<1	<3	-	-	-	-	-
HC27	12/29/2015	<60	310	<100	<0.35	<1	<1	<3	-	-	-	-	-

Red denotes concentration in excess of MTCA Cleanup Level for Groundwater.
Samples analyzed by Friedman & Bruya, Inc., of Seattle, Washington
MTCA Method A Cleanup Levels, Table 720-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, revised November 2007.
GRPH analyzed by Method NWTPH-Gx.
DRPH and ORPH analyzed by Method NWTPH-Dx.
Volatiles analyzed by EPA 8260B, 8260C or 8021B.
Metals analyzed by EPA Method 6010B, 6010C or 200.8.

ec - Method reporting limit exceeds Clean Up Level shown.
x - The sample chromatographic pattern does not resemble the fuel standard used for quantification.

- = not measured/not analyzed
< = not detected at a concentration exceeding the laboratory reporting limit
µg/L = micrograms per liter
DRPH = Diesel Range Petroleum Hydrocarbon
EDB = 1,2-dibromoethane (ethylene dibromide)
EDC = 1,2-dichloroethane (ethylene dichloride)
EPA = U.S. Environmental Protection Agency
GRPH = Gasoline Range Petroleum Hydrocarbon
MTBE = methyl tertiary-butyl ether
MTCA = Washington State Model Toxics Control Act
NWTPH = Northwest Total Petroleum Hydrocarbon
ORPH = Oil Range Petroleum Hydrocarbon

Table 7
Summary of 2015 Installation Groundwater Monitoring Wells Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	Fuels		Volatiles									Metal	
	DRPH	ORPH	GRPH	Benzene	Toluene	Ethylbenzene	Xylene Total	EDB	EDC	MTBE	Naphthalene	Lead	Lead (filtered)
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WA Method A Cleanup for Groundwater	**500**	**500**		**5**	**1,000**	**700**	**1,000**	**0.01**	**5**	**20**	**160**	**15**	**15**
Benzene (Non Detect)			**1,000**										
Benzene (Detect)			**800**										
Field ID	**Date**												
MW01	7/9/2015	67 x	<250	<100	<0.35	<1	<1	<3	<1 ec	<1	<1	<1	-	<1
	10/21/2015	110 x	<280	<100	<0.35	<1	<1	<3	<1 ec	<1	<1	<1	<1	<1
MW02	7/9/2015	**4,600 x**	<250	**4,100**	**8.1**	4.8	36	9.7	<1 ec	<1	<1	46	-	1.68
	10/21/2015	**4,300 x**	<280	**4,300 J**	4	4.6	32	9.6	<1 ec	<1	<1	41	1.27	<1
MW03	7/9/2015	**4,400 x**	<250	**3,900**	0.76	1.4	26	4.6	<1 ec	<1	<1	29	-	<1
	10/21/2015	**2,400 x**	<280	**3,300**	0.59	1.3	19	3.9	<1 ec	<1	<1	24	<1	<1
MW04	7/9/2015	<50	<250	<100	<0.35	<1	<1	<3	<1 ec	<1	<1	<1	-	<1
	10/22/2015	<55	<280	<100	<0.35	<1	<1	<3	<1 ec	<1	<1	<1	<10	<1
MW05	7/9/2015	100 x	<250	<100	<0.35	<1	<1	<3	<1 ec	<1	<1	<1	-	<1
	10/21/2015	<50	<250	<100	<0.35	<1	<1	<3	<1 ec	<1	<1	<1	<1	<1
MW06	7/10/2015	<50	<250	<100	<0.35	<1	<1	<3	<1 ec	<1	<1	<1	-	<1
	10/21/2015	<55	<280	<100	<0.35	<1	<1	<3	<1 ec	<1	<1	<1	<1	<1

Notes

Red denotes concentration in excess of MTCA Cleanup Level for Groundwater.
Samples analyzed by Friedman & Bruya, Inc., of Seattle, Washington
MTCA Method A Cleanup Levels, Table 720-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, revised November 2007.
GRPH analyzed by Method NWTPH-Gx.
DRPH and ORPH analyzed by Method NWTPH-Dx.
Volatiles analyzed by EPA 8260B, 8260C or 8021B.
Metals analyzed by EPA Method 6010B, 6010C or 200.8.

ec - Method reporting limit exceeds Clean Up Level shown.
x - The sample chromatographic pattern does not resemble the fuel standard used for quantification.
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

- = not measured/not analyzed
< = not detected at a concentration exceeding the laboratory reporting limit
µg/L = micrograms per liter
DRPH = Diesel Range Petroleum Hydrocarbon
EDB = 1,2-dibromoethane (ethylene dibromide)
EDC = 1,2-dichloroethane (ethylene dichloride)
EPA = U.S. Environmental Protection Agency
GRPH = Gasoline Range Petroleum Hydrocarbon
MTBE = methyl tertiary-butyl ether
MTCA = Washington State Model Toxics Control Act
NWTPH = Northwest Total Petroleum Hydrocarbon
ORPH = Oil Range Petroleum Hydrocarbon

Table 8
Summary of Groundwater PAH Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	unit	WA Method A Cleanup for Groundwater	7/9/2015 MW02
PAHs			
Benz(a)anthracene	**µg/L**		<0.1 ht
Benzo(a) pyrene	**µg/L**	**0.1**	<0.1 ht
Benzo(b)fluoranthene	**µg/L**		<0.1 ht
Benzo(k)fluoranthene	**µg/L**		<0.1 ht
Chrysene	**µg/L**		<0.1 ht
Dibenz(a,h)anthracene	**µg/L**		<0.1 ht
Indeno(1,2,3-c,d)pyrene	**µg/L**		<0.1 ht

Notes
Samples analyzed by Friedman & Bruya, Inc., of Seattle, Washington.
MTCA Method A Cleanup Levels, Table 720-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, revised November 2007.
< = not detected at a concentration exceeding the laboratory reporting limit
µg/L = micrograms per liter
MTCA = Washington State Model Toxics Control Act
SemiVols analyzed by SW8270D SIM.

ht - Sample extracted outside holding time. Results should be considered an estimate.

Table 9
Summary of Tier I Soil Gas Analytical Results
TOC Holding Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

	unit	2015 Sub-Slab Screening Level Method B (Noncancer)	2015 Sub-Slab Screening Level Method B (Cancer)	12/29/2015		
				SG-01	SG-02	SG-03
Volatiles-TO15						
Benzene	µg/m^3	457	10.7	6,600	6,600 J	3.4 J
Toluene	µg/m^3	76,200		9,200	2,900 J	8.5 J
Ethylbenzene	µg/m^3	15,200		860	36,000 J	6.2 J
m,p-Xylene	µg/m^3	1,520		4,800	7,600	27
o-Xylene	µg/m^3	1,520		1,700	<1,700 ec	10
1,2,4-trimethylbenzene	µg/m^3	107		85 J	<3,900 ec; J	<3.9; J
EDB	µg/m^3	137	0.139	<0.77 ec; j; J	<770 ec; j; J	<0.77 ec; j; J
EDC	µg/m^3	107	3.21	63 J	<1,600 ec; J	<1.6; J
Hexane	µg/m^3	10,700		110,000 ve	820,000 ve	170
MTBE	µg/m^3	45,700	321	<1.4 J	<1,400 ec; J	<1.4 J
Naphthalene	µg/m^3	45.7	2.45	<2.1; J	<2,100 ec; J	2.6 J
Volatiles-APH						
APH EC5-8 aliphatics	µg/m^3	90,000		2,300,000 ve	140,000,000 J; ve	1,200 J; ve
APH EC9-10 aromatics	µg/m^3	4,700		830	410,000 J	39 J
APH EC9-12 aliphatics	µg/m^3	6,000		200,000	54,000,000 J; ve	3,800 J; ve

Notes

Red denotes concentration exceeds MTCA cleanup level.

Samples analyzed by Friedman & Bruya, Inc., of Seattle, Washington.

Washington State Department of Ecology (Ecology). 2009. Guidance for Evaluating Soil Vapor Intrusion in the Washington State – Investigation and Remedial Action; Publication No. 09-09-047. Toxics Cleanup Program. October. Table B-1 Updated April 2015.

If there are two cleanup levels for an analyte, the lower of the two is the required mininum detection limit for the analytical method requested.

< = not detected at a concentration exceeding the laboratory reporting limit

µg/m^3 = micrograms per cubic meter

Volatiles analyzed by APH or TO15.

EDB = 1,2-dibromoethane (ethylene dibromide)

EDC = 1,2-dichloroethane (ethylene dichloride)

MTBE = methyl tertiary-butyl ether

ec - Method reporting limit exceeds cleanup level shown.

j - Estimated value; result is less than normal reporting limits.

J - The analyte was positively identified; the associated numerical value is the approximate concentration

ve - The analytle response exceeded the valid instrument calibration range. The reported is an estimate.

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Table 10
Preliminary ARARs for the Site

Preliminary ARAR	Citation or Source
MTCA	Chapter 70.105 of the Revised Code of Washington (RCW)
MTCA Cleanup Regulation	WAC 173-340
Ecology, Toxics Cleanup Program – Guidance To Be Considered	*Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action*, Review DRAFT, October 2009, Updated April 2015, Publication No. 09-09-047
State Environmental Policy Act	RCW 43.21C
Washington State Shoreline Management Act	RCW 90.58; WAC 173-18, 173-22, and 173-27
The Clean Water Act	33 United States Code [USC] 1251 et seq.
Comprehensive Environmental Response, Compensation, and Liability Act of 1980	42 USC 9601 et seq. and Part 300 of Title 40 of the Code of Federal Regulations [40 CFR 300]
The Fish and Wildlife Coordination Act	16 USC 661-667e; the Act of March 10, 1934; Ch. 55; 48 Stat. 401
Endangered Species Act	16 USC 1531 et seq.; 50 CFR 17, 225, and 402
Native American Graves Protection and Repatriation Act	25 USC 3001 through 3013; 43 CFR 10 and Washington's Indian Graves and Records Law (RCW 27.44)
Archaeological Resources Protection Act	16 USC 470aa et seq.; 43 CFR 7
Washington Dangerous Waste Regulations	WAC 173-303
Solid Waste Management Act	RCW 70.95; WAC 173-304 and 173-351
Occupational Safety and Health Administration Regulations	29 CFR 1910, 1926
Washington Department of Labor and Industries Regulations	WAC 296
Water Quality Standards for Surface Waters of the State of Washington	RCW 90.48 and 90.54; WAC 173-201A
Water Quality Standards for Ground Water	WAC 173-200
Department of Transportation Hazardous Materials Regulations	40 CFR 100 through 185
Washington State Water Well Construction Act	RCW 18.104; WAC 173-160
City of Seattle regulations, codes, and standards	All applicable or relevant and appropriate regulations, codes, and standards
King County regulations, codes, and standards	All applicable or relevant and appropriate regulations, codes, and standards

ARAR = applicable or relevant and appropriate requirement
CFR = Code of Federal Regulations
MTCA = Model Toxics Control Act
RCW = Revised Code of Washington
USC = United States Code
WAC = Washington Administrative Code

Table 11
Remedial Component Screening Matrix
TOC Holdings Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

Component Group	Component Options	Retained for Inclusion in Cleanup Action Alternatives?	Rationale for Inclusion or Exclusion
Institutional Controls and Passive Treatment			
	No Further Action	No	Not retained because the current Site conditions pose unacceptable risks that require remediation.
	Monitored Natural Attenuation	Yes	Retained as a component of all cleanup action alternatives. Not retained for use as a sole administrative or engineering control.
	Low Permeability Containment Cap	No	Not retained because the existence of a cap is not compatible with prospective future land uses.
	Environmental Covenant	Yes	Retained as a component of all cleanup alternatives. Not retained for use as the sole administrative or engineering control.
	Passive Treatment Wall (Activated Carbon/PRB)	No	Technology is temporarily effective for controlling the migration of COCs in groundwater but does not address soil contamination.
In Situ Physical Treatment			
	Soil Vapor Extraction	Yes	Retained because SVE is a demonstrated technology for remediation of COCs in soil and Site conditions are favorable for effective use of this technology.
	Air Sparging	Yes	Retained because AS is a demonstrated technology for remediation of COCs in soil and Site conditions are favorable for effective use of this technology.
	Surfactant Washing	No	Not retained as this technology is mediated in the saturated zone and is not effective in treating unsaturated zone soil contamination.
	Cosolvent Washing	No	Not retained as this technology is mediated in the saturated zone and is not effective in treating unsaturated zone soil contamination.
	Pump and Treat	No	Not effective unless implemented in combination with other technologies such as DPE or MPE. Also not effective for treating unsaturated zone soil contamination.
	Dual- or Multi-Phase Extraction (DPE, MPE)	Yes	Dual-phase extraction is retained because technology is demonstrated to be effective for remediation of COCs in soil and groundwater and Site conditions are somewhat favorable for use of this technology.
In Situ Thermal			
	Resistive Thermal with SVE	No	Insitu thermal remedial components are not retained because they are more costly to implement and will not effectively treat all of the COCs in soil and groundwater.
	Conductive Thermal with SVE	No	
	Radio Frequency/Electromagnetic Thermal with SVE	No	
	Steam Injection with SVE and Groundwater Extraction	No	
	Hot Air Injection with SVE	No	
	Hot Water Injection with SVE and Groundwater Extraction	No	
Source Removal			
	Excavation with or without Shoring	Yes	Excavation without shoring is retained for removal of elevated DRPH at location HC08 at a depth of 5 feet below ground surface.
	Secant Pile Wall - Impervious Wall	No	Large scale source removal is not feasible or compatible with the current and future planned land use.
	Sheet Pile Wall - Impervious Wall	No	
	Soldier Pile Wall - Non-Impervious Wall	No	
Ex Situ Source Treatment			
	Surfactant Washing	No	Not retained because these components are not cost competitive with other technologies at this scale and would result in another waste stream requiring disposal.
	Cosolvent Washing	No	
	Chemical Oxidation	No	
	Thermal Desorption	Yes	Retained for treatment/disposal of TPH-contaminated soil recovered as part of the installation of remedial infrastructure- This technology is cost-competitive and provides more permanence than other component technologies in this category.
	Land Disposal	No	Not an approved disposal option for the generator

Table 11
Remedial Component Screening Matrix
TOC Holdings Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington

Component Group	Component Options	Retained for Inclusion in Cleanup Action Alternatives?	Rationale for Inclusion or Exclusion
In Situ Chemical Oxidation			
	Heated Sodium Persulfate	No	Not retained because of poor effectiveness in treating DRPH; current land use precludes use of strong chemical oxidizers
	Hydrogen Peroxide	Yes	Insufficient oxidation potential for rapid chemical oxidation of high concentrations of COCs in soil and groundwater. Retained as a potential polishing technology to support aerobic bioremediation of residual hydrocarbons as the cleanup approaches cleanup goals.
	Ozonation	No	Would be implemented by gas injection. Current land use precludes use of strong chemical oxidizers
	Permanganate	No	Not retained because of poor effectiveness in treating COCs.
	Fenton's Reagent	No	Difficult process to control and costly to implement compared to other technologies.
Containment/Immobilization			
	Bituminization	No	Not retained because these technologies reduce the mobility of hazardous substances but not their toxicity or volume. The technologies are typically implemented ex situ.
	Emulsified Asphalt	No	
	Modified Sulfur Cement	No	
	Polyethylene Extrusion	No	Not retained because this technology is not well developed.
	Pozzolan/Portland Cement	No	Not retained because the technology reduces the mobility of hazardous substances but not the toxicity or volume. The technology is typically implemented ex situ.
	Vitrification/Molten Glass	No	Not retained because it is not cost competitive with our technologies in this group and is difficult to implement. This technology also presents an increased short-term risk of injury during installation and operation.
	Slurry Wall Containment	No	Not retained because these technologies reduce the mobility of hazardous substances but not their toxicity or volume. The technologies are typically implemented ex situ.
	Sheet Pile Wall Containment	No	
	Pump and Treat for Hydraulic Containment	No	Not retained as this component will not address soil contamination.
Phytoremediation			
	Hydraulic Control	No	Not retained because they are not compatible with current or future land use at the Site
	Phyto-Degradation	No	
	Phyto-Volatilization	No	
	Phyto-Accumulation	No	
	Phyto-Stabilization	No	
	Enhanced Rhizosphere Biodegradation	No	
In Situ Bioremediation			
	Aerobic Bioremediation	Yes	Retained in conjunction with SVE and potentially hydrogen peroxide.
	Anaerobic Bioremediation	No	Not retained because of poor effectiveness in treating COCs.

NOTES:
COC = chemical of concern
SVE = soil vapor extraction
DPE = dual-phase extraction
MPE = multi-phase extraction

Table 12
Feasibility Level Cost Estimate
Cleanup Action Alternative 1
Air Sparge with SVE
TOC Holdings Co. Facility No. 01-323
301 Central Avenue North; Kent, WA

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Direct Capital					
Site controls (6' temporary chain-link fencing)	200	lf	$ 5.71	$ 1,142	
Sawcut asphalt for trenching	650	lf	$ 1.79	$ 1,164	
Excavation and Trenching	90	bcy	$ 12.52	$ 1,127	
Handling Soil	190	ton	$ 21	$ 3,990	
T&D of PCS for thermal desorption	190	ton	$ 70	$ 13,300	
Backfill and compact trenches	130	lcy	$ 46.35	$ 6,026	
Drill and Install Air Sparge wells (12' Δ spacing)	17	ea	$ 2,500	$ 42,500	
Install air sparge supply line (assume 1" Ø galvanized steel)	300	lf	$ 20.64	$ 6,192	
3-inch SVE Schedule 80 PVC piping	300	lf	$ 40	$ 12,000	
4-inch SVE; Schedule 80 PVC piping installed	60	lf	$ 45	$ 2,700	
Fittings (35% of pipe cost)	1	ea	$ 1,863	$ 1,863	
Remediation Slab; Equipment; and Enclosure	1	ea	$ 175,000	$ 175,000	
Subtotal Direct Capital					$ 267,000
Indirect Capital (as percentages of Direct Capital)					
Design, Permitting, and Work Plans (15%)				$ 40,050	
Mobilization (1%)				$ 2,670	
Professional Labor for Construction Oversight (12%)				$ 32,040	
Field Equipment and Supplies (1%)				$ 2,670	
Laboratory Testing (Field Verification and Waste Profiling) (5%)				$ 13,350	
Site Restoration and Demobilization (5%)				$ 13,350	
Regulatory Reporting (10%)				$ 26,700	
Subtotal Indirect Capital					$ 130,800
Total Capital					$ 397,800

OPERATING AND MAINTENANCE (O&M) COST ITEM	ANNUAL COST[1]	PRESENT WORTH COST OF ANNUAL O&M		
		Discount Rate =	0.3%	n = 3 years
Quarterly Groundwater Monitoring and System O&M w/Reporting	$ 182,100		$ 543,039	
Present Worth Cost of Annual O&M				$ 543,000
TOTAL PRESENT WORTH COST (Sum of Total Capital and Present Worth Cost of Annual O&M)				$ 941,000

NOTES:
[1]Annual cost is year 2016 cost

bcy = bank cubic yards
ea = each
lcy = loose cubic yards
lf = linear feet
ls = lump sum
PCS = petroleum-contaminated soils
T&D = transportation and disposal

Table 12a
Cost Estimate for
Annual Operation, Maintenance, and Monitoring **CAA 1**
TOC Holdings Co. Facility No. 01-323
301 Central Avenue North
Kent, WA

Annual Groundwater Monitoring and Operation and Maintenance				
Subtask A Annual Groundwater Monitoring and Reporting		**Units**	**Per**	**Cost**
Labor				
Program Manager/Principal Scientist		12 hours	$150 per hour	$1,800
Sr. Project Manager/Senior Engineer/Hydrologist		24 hours	$140 per hour	$3,360
Site Manager/Associate `		0 hours	$120 per hour	$0
Project Engineer/Geologist/Scientist		160 hours	$110 per hour	$17,600
Staff Engineer/Geologist/Scientist		160 hours	$105 per hour	$16,800
CADD/GIS/Drafting		32 hours	$100 per hour	$3,200
Technician		0 hours	$90 per hour	$0
Technical Editor		32 hours	$80 per hour	$2,560
Project/Contract Coordinator		32 hours	$75 per hour	$2,400
Clerical/Administrative		32 hours	$70 per hour	$2,240
			Subtask A Labor Subtotal	**$49,960**
			Project Management (18%)	**$8,993**
			Subtask A Total	**$58,953**
Subtask B Annual Remedial System O&M		**Units**	**Per**	**Cost**
Labor				
Program Manager/Principal Scientist		12 hours	$150 per hour	$1,800
Sr. Project Manager/Senior Engineer/Hydrologist		24 hours	$140 per hour	$3,360
Site Manager/Associate `		0 hours	$120 per hour	$0
Project Engineer/Geologist/Scientist		208 hours	$110 per hour	$22,880
Staff Engineer/Geologist/Scientist		160 hours	$105 per hour	$16,800
CADD/GIS/Drafting		32 hours	$100 per hour	$3,200
Technician		0 hours	$90 per hour	$0
Technical Editor		32 hours	$80 per hour	$2,560
Project/Contract Coordinator		32 hours	$75 per hour	$2,400
Clerical/Administrative		32 hours	$70 per hour	$2,240
			Subtask B Labor Subtotal	**$55,240**
			Project Management (18%)	**$9,943**
			Subtask B Total	**$65,183**
Other Direct Costs		**Units**	**Per**	**Cost**
ODCs				
Field and System Supplies	Misc. Supplies for Optimization	1	$1,500 each	$1,500
Permits	King County Discharge	1	$5,000 each	$5,000
Power	Assume 30 HP; 24/7 @ $0.13/kwH	1	$25,521 each	$25,521
			ODCs Subtotal	**$32,021**
Subcontractors				
Private Utility Locate		1	$400 each	$400
			Subcontractors	**$400**
Field Equipment				
4-Gas Meter		12	$125 per day	$1,500
DO Meter		6	$40 per day	$240
Down-Well Tubing		240	$0.50 per foot	$120
Field Vehicle		20	$95 per day	$1,900
Low-Flow GW Sampling Kit		6	$290 per day	$1,740
O&M Kit		12	$100 per day	$1,200
Oil/Water Interface Probe		6	$75 per day	$450
Peristaltic Pump		6	$50 per day	$300
PID		12	$150 per day	$1,800
PPE/H&S Equipment		20	$55 per day	$1,100
Turbidity Meter		6	$30 per day	$180
Water Quality Meter		6	$125 per day	$750
			Field Equipment Subtotal	**$11,280**
			Total ODCs	**$43,701**

Table 12a
Cost Estimate for
Annual Operation, Maintenance, and Monitoring **CAA 1**
TOC Holdings Co. Facility No. 01-323
301 Central Avenue North
Kent, WA

		Units	Per	Cost
Direct-Billed Subcontractor and Laboratory Expenses				
Direct-Billed Subcontractor Expenses				
Waste Disposal	VPGAC or LPGAC	1	$7,500 each	$7,500
			Direct-Billed Subcontractor Subtotal	**$7,500**
Direct-Billed Laboratory				
Groundwater				
DRPH and ORPH by Method NWTPH-Dx (with silica gel)		24	$68 per sample	$1,632
GRPH, BTEX, and Oxygenates by Method NWTPH-Gx/8260C		24	$109 per sample	$2,616
Individual Metals by Method 200.8		6	$14 per sample	$84
Vapor				
GRPH and BTEX by Method NWTPH-Gx/8021B		24	$100 per sample	$2,400
			Direct-Billed Laboratory Subtotal	**$6,732**
			Direct-Billed Subcontractors and Laboratory Total	**$14,232**
			LABOR & ODC SUBTOTAL	**$167,837**
			DIRECT-BILLED SUBTOTAL	**$14,232**
			TOTAL	**$182,069**

Table 13
Feasibility Level Cost Estimate
Cleanup Action Alternative 2
Dual-Phase Extraction
TOC Holdings Co. Facility No. 01-323
301 Central Avenue North; Kent, WA

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Direct Capital					
Site controls (6' temporary chain-link fencing)	200	lf	$ 5.71	$ 1,142	
Sawcut asphalt for trenching	750	lf	$ 1.79	$ 1,343	
Excavation and Trenching	220	bcy	$ 12.52	$ 2,755	
Handling Soil	429	ton	$ 21	$ 9,012	
T&D of PCS for thermal desorption	429	ton	$ 70	$ 30,040	
Backfill and compact trenches	286	lcy	$ 46.35	$ 13,261	
2-inch Schedule 80 PVC water pipe	300	lf	$ 35.00	$ 10,500	
3-inch SVE Schedule 80 PVC piping	300	lf	$ 40.00	$ 12,000	
4-inch SVE; Schedule 80 PVC piping installed	60	lf	$ 45.00	$ 2,700	
Fittings (35% of pipe cost)	1	ea	$ 2,153	$ 2,153	
Remediation Slab; Equipment; and Enclosure	1	ea	$ 200,000	$ 200,000	
Subtotal Direct Capital					$ 284,900
Indirect Capital (as percentages of Direct Capital)					
Design, Permitting, and Work Plans (15%)				$ 42,735	
Mobilization (1%)				$ 2,849	
Professional Labor for Construction Oversight (12%)				$ 34,188	
Field Equipment and Supplies (1%)				$ 2,849	
Laboratory Testing (Field Verification and Waste Profiling) (5%)				$ 14,245	
Site Restoration and Demobilization (5%)				$ 14,245	
Regulatory Reporting (10%)				$ 28,490	
Subtotal Indirect Capital					$ 139,600
Total Capital					$ 424,500

OPERATING AND MAINTENANCE (O&M) COST ITEM	ANNUAL COST[1]	PRESENT WORTH COST OF ANNUAL O&M		
		Discount Rate =	0.3%	n = 3 years
Quarterly Groundwater Monitoring and System O&M w/Reporting	$ 194,986		$ 581,466	
Present Worth Cost of Annual O&M				$ 581,500
TOTAL PRESENT WORTH COST (Sum of Total Capital and Present Worth Cost of Annual O&M)				$ 1,006,000

NOTES:
[1]Annual cost is year 2016 cost

bcy = bank cubic yards
ea = each
lcy = loose cubic yards
lf = linear feet
ls = lump sum
PCS = petroleum-contaminated soils
T&D = transportation and disposal

Table 13a
Cost Estimate for
Annual Operation, Maintenance, and Monitoring **CAA 2**
TOC Holdings Co. Facility No. 01-323
301 Central Avenue North
Kent, WA

Annual Groundwater Monitoring and Operation and Maintenance				
Subtask A Annual Groundwater Monitoring and Reporting		**Units**	**Per**	**Cost**
Labor				
Program Manager/Principal Scientist		12 hours	$150 per hour	$1,800
Sr. Project Manager/Senior Engineer/Hydrologist		24 hours	$140 per hour	$3,360
Site Manager/Associate		0 hours	$120 per hour	$0
Project Engineer/Geologist/Scientist		160 hours	$110 per hour	$17,600
Staff Engineer/Geologist/Scientist		160 hours	$105 per hour	$16,800
CADD/GIS/Drafting		32 hours	$100 per hour	$3,200
Technician		0 hours	$90 per hour	$0
Technical Editor		32 hours	$80 per hour	$2,560
Project/Contract Coordinator		32 hours	$75 per hour	$2,400
Clerical/Administrative		32 hours	$70 per hour	$2,240
			Subtask A Labor Subtotal	**$49,960**
			Project Management (18%)	**$8,993**
			Subtask A Total	**$58,953**
Subtask B Annual Remedial System O&M		**Units**	**Per**	**Cost**
Labor				
Program Manager/Principal Scientist		12 hours	$150 per hour	$1,800
Sr. Project Manager/Senior Engineer/Hydrologist		24 hours	$140 per hour	$3,360
Site Manager/Associate		0 hours	$120 per hour	$0
Project Engineer/Geologist/Scientist		208 hours	$110 per hour	$22,880
Staff Engineer/Geologist/Scientist		160 hours	$105 per hour	$16,800
CADD/GIS/Drafting		32 hours	$100 per hour	$3,200
Technician		0 hours	$90 per hour	$0
Technical Editor		32 hours	$80 per hour	$2,560
Project/Contract Coordinator		32 hours	$75 per hour	$2,400
Clerical/Administrative		32 hours	$70 per hour	$2,240
			Subtask B Labor Subtotal	**$55,240**
			Project Management (18%)	**$9,943**
			Subtask B Total	**$65,183**
Other Direct Costs		**Units**	**Per**	**Cost**
ODCs				
Field and System Suppl	Misc. Supplies for Optimization	1	$1,500 each	$1,500
Permits	King County Discharge	1	$5,000 each	$5,000
Power	Assume 35 HP; 24/7 @ $0.13/kwH	1	$29,774 each	$29,774
			ODCs Subtotal	**$36,274**
Subcontractors				
Private Utility Locate		1	$400 each	$400
			Subcontractors	**$400**
Field Equipment				
4-Gas Meter		12	$125 per day	$1,500
DO Meter		6	$40 per day	$240
Down-Well Tubing		240	$0.50 per foot	$120
Field Vehicle		20	$95 per day	$1,900
Low-Flow GW Sampling Kit		6	$290 per day	$1,740
O&M Kit		12	$100 per day	$1,200
Oil/Water Interface Probe		6	$75 per day	$450
Peristaltic Pump		6	$50 per day	$300
PID		12	$150 per day	$1,800
PPE/H&S Equipment		20	$55 per day	$1,100
Turbidity Meter		6	$30 per day	$180
Water Quality Meter		6	$125 per day	$750
			Field Equipment Subtotal	**$11,280**
			Total ODCs	**$47,954**

Table 13a
Cost Estimate for
Annual Operation, Maintenance, and Monitoring **CAA 2**
TOC Holdings Co. Facility No. 01-323
301 Central Avenue North
Kent, WA

		Units	Per	Cost
Direct-Billed Subcontractor and Laboratory Expenses				
Direct-Billed Subcontractor Expenses				
Waste Disposal	VPGAC or LPGAC	1	$7,500 each	$7,500
			Direct-Billed Subcontractor Subtotal	**$7,500**
Direct-Billed Laboratory				
Groundwater				
DRPH and ORPH by Method NWTPH-Dx (with silica gel)		72	$68 per sample	$4,896
GRPH, BTEX, and Oxygenates by Method NWTPH-Gx/8260C		72	$109 per sample	$7,848
Individual Metals by Method 200.8		18	$14 per sample	$252
Vapor				
GRPH and BTEX by Method NWTPH-Gx/8021B		24	$100 per sample	$2,400
			Direct-Billed Laboratory Subtotal	**$15,396**
			Direct-Billed Subcontractors and Laboratory Total	**$22,896**
			LABOR & ODC SUBTOTAL	**$172,090**
			DIRECT-BILLED SUBTOTAL	**$22,896**
			TOTAL	**$194,986**

Table 14
Cleanup Action Alternatives Summary
TOC Holdings Co. Facility No. 01-323
301 Central Avenue North; Kent, WA

Cleanup Action Alternatives		Summary Description	Washington State Department of Ecology Evaluation Criteria/Relative Ranking (1 = Low 10 = High)						Ranking Score[1]	Estimated Present Worth Cost ($1,000)
			Protectiveness	Permanence	Effectiveness over the Long Term	Management of Short-Term Risks	Technical and Administrative Implementability	Consideration of Public Concerns		
TOC Facility No. 01-323	**Cleanup Action Alternative 1 - Air Sparge with Soil Vapor Extraction**	Install approximately 17 air sparging wells at a spacing of 12 feet in a triangular pattern to a depth of approximately 20 feet bgs covering an area of approximately 3,200 square feet to remediate saturated zone contamination by phase transfer and aerobic bioremediation. Install soil vapor extraction trenches to recover contaminated soil gas for treatment and atmospheric discharge. Estimated life cycle of 3 years.	7	8	8	3	8	N/A	**34**	$ 941,000
	Cleanup Action Alternative 2 - Dual-Phase Extraction	Install pipe drains in trenches approximately 10 feet bgs to extract contaminated groundwater for exsitu pretreatment and disposal at the POTW. In the same trenches, install soil vapor extraction to recover contaminated soil gas for treatment and atmospheric discharge. Estimated life cycle of 3 years.	8	8	8	4	4	N/A	**32**	$ 1,006,000

Note:
[1] Ranking score is the sum of the individual criterion ranking scores

CHARTS

CHART 1

Cost and Relative Ranking of
Cleanup Action Alternatives

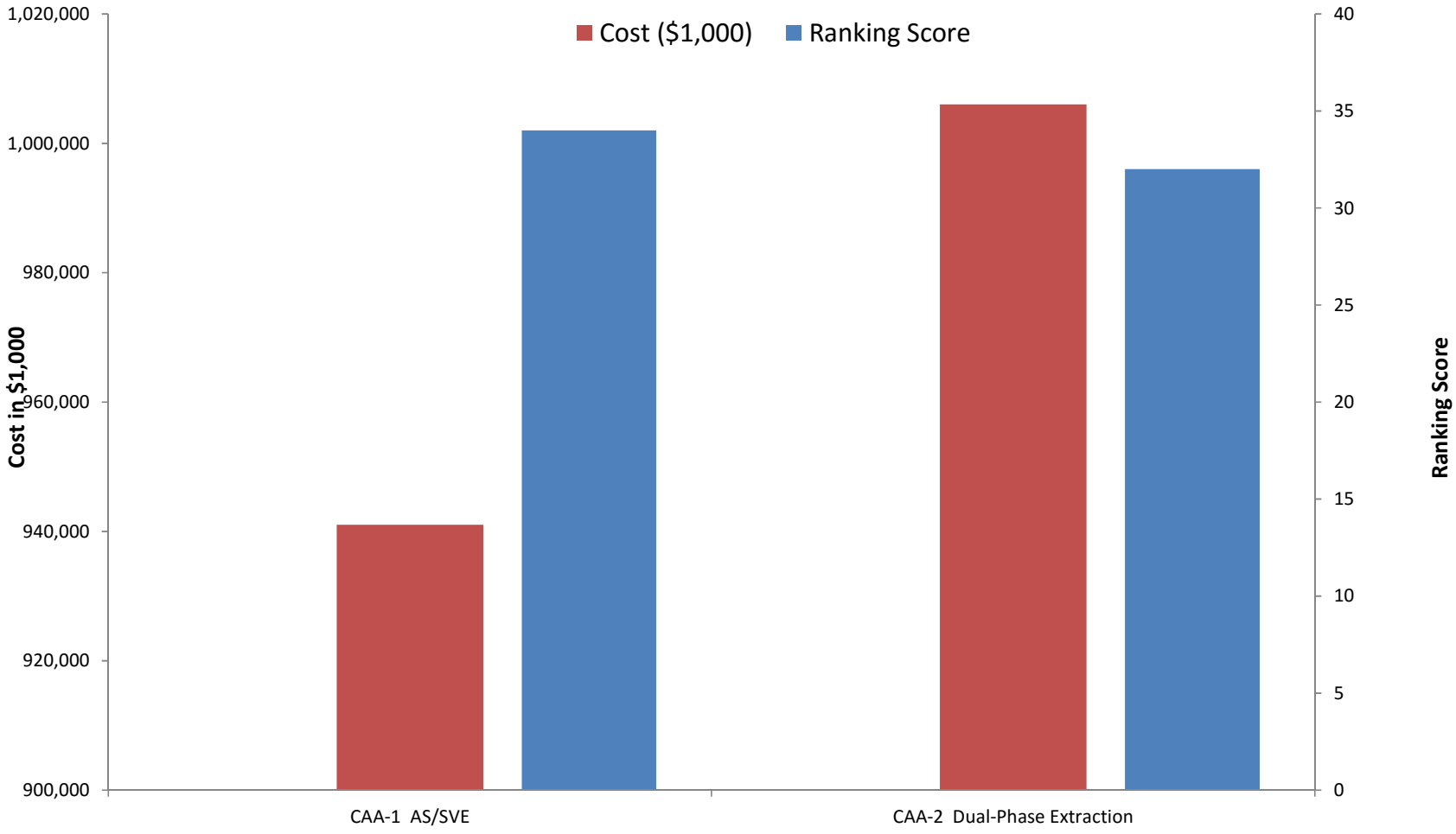
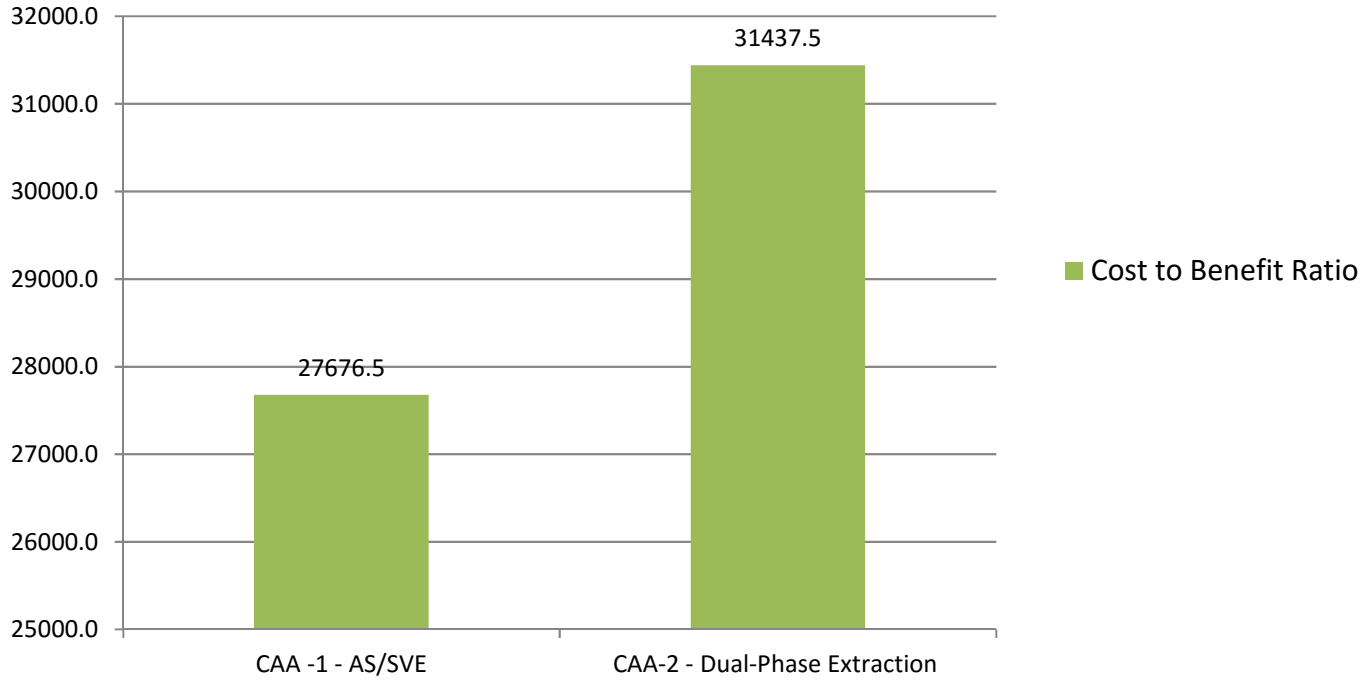


CHART 2

Cost:Benefit Ratio

Cleanup Action Alternatives



APPENDIX A

Simplified Terrestrial Ecological Evaluation (TEE)

WAC Table 749-1

Table 749-1

Simplified Terrestrial Ecological Evaluation-Exposure Analysis Procedure

Estimate the area of contiguous (connected) undeveloped land on the site or within 500 feet of any area of the site to the nearest 1/2 acre (1/4 acre if the area is less than 0.5 acre).	
1) From the table below, find the number of points corresponding to the area and enter this number in the field to the right.	
Area (acres) / Points 0.25 or less / 4 0.5 / 5 1.0 / 6 1.5 / 7 2.0 / 8 2.5 / 9 3.0 / 10 3.5 / 11 4.0 or more / 12	5
2) Is this an industrial or commercial property? If yes, enter a score of 3. If no, enter a score of 1	3
3)[a] Enter a score in the box to the right for the habitat quality of the site, using the following rating system[b]. High=1, Intermediate=2, Low=3	3
4) Is the undeveloped land likely to attract wildlife? If yes, enter a score of 1 in the box to the right. If no, enter a score of 2.[c]	2
5) Are there any of the following soil contaminants present: Chlorinated dioxins/furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, pentachlorobenzene? If yes, enter a score of 1 in the box to the right. If no, enter a score of 4.	4
6) Add the numbers in the boxes on lines 2-5 and enter this number in the box to the right. If this number is larger than the number in the box on line 1, the simplified evaluation may be ended.	12

Notes for Table 749-1

[a] It is expected that this habitat evaluation will be undertaken by an experienced field biologist. If this is not the case, enter a conservative score of (1) for questions 3 and 4.

[b] **Habitat rating system.** Rate the quality of the habitat as high, intermediate or low based on your professional judgment as a field biologist. The following are suggested factors to consider in making this evaluation:

> **Low:** Early successional vegetative stands; vegetation predominantly noxious, nonnative, exotic plant species or weeds. Areas severely disturbed by human activity, including intensively cultivated croplands. Areas isolated from other habitat used by wildlife.

High: Area is ecologically significant for one or more of the following reasons: Late-successional native plant communities present; relatively high species diversity; used by an uncommon or rare species; priority habitat (as defined by the Washington Department of fish and Wildlife); part of a larger area of habitat where size or fragmentation may be important for the retention of some species.

Intermediate: Area does not rate as either high or low.

[c] Indicate "yes" if the area attracts wildlife or is likely to do so. Examples: Birds frequently visit the area to feed; evidence of high use b mammals (tracks, scat, etc.); habitat "island" in an industrial area; unusual features of an area that make it important for feeding animals; heavy use during seasonal migrations.

[Area Calculation Aid] [Aerial Photo with Area Designations] [TEE Table 749-1] [Index of Tables]

[Exclusions Main] [TEE Definitions] [Simplified or Site-Specific?] [Simplified Ecological Evaluation] [Site-Specific Ecological Evaluation] [WAC 173-340-7493]

[TEE Home]