Cleanup Action Plan

4 Corners Cleaners
2386 SE Kent-Kangley Road
Maple Valley, Washington 98038-6848

Prepared for:
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AEG Project #: 17-126
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EXECUTIVE SUMMARY

This document presents the Cleanup Action Plan (CAP) for the 4 Corners Cleaner, located at 23886 SE Kent-Kangley Road, Maple Valley, WA (Site). This CAP was prepared by Associated Environmental Group, LLC (AEG) and is intended to meet the requirements of the Model Toxics Control Act (MTCA) administered by the Washington State Department of Ecology (Ecology) under Chapter 173-340 of the Washington Administrative Code (WAC). This CAP describes the proposed cleanup action for the Site and sets forth the requirements that the cleanup must meet.

- The Site is located northwest of the intersection between SE Kent-Kangley Road and Highway 169 in Maple Valley, Washington, and operates as a retail shopping center. Current tenants in the "L" shaped building along the southern portion of the property include: 4 Corners Cleaners, Bellissimo Lashes and Nails, Papa Murphy's Pizza, Allstate Insurance, Serena Hair Design, a chiropractic office, Smoke & Vape shop, Four Corners Family Dentist, Bike Masters, and Maple Valley Bar and Grill. Gravity Coffee, MOD Pizza, and a Verizon Retailer occupy the square building located in the southeast portion of the property. North of the "L" shaped building, and the 4 Corners Cleaners tenant space, is Johnsons Home & Garden, Dog Spaw, Subway, Discovery Playtown, and Grocery Outlet. This CAP is in response to a release of PCE (tetrachloroethene), which was detected in Site soil and sub-slab vapor at concentrations exceeding MTCA Method A cleanup levels and Method B screening levels, respectively, in March 2017. The current 4 Corners Cleaners switched to a hydrocarbon dry cleaning machine in 2017, which triggered a Phase II Environmental Site Assessment (ESA) from the tenant's environmental insurance.
- **Cleanup Action Overview – Alternative 2 – In-Situ Treatment via Soil Vapor Extraction (SVE)**

  The cleanup action will consist of installing and operating an active SVE system to extract and remove adsorbed vapor-phase PCE and other volatile organic compounds (VOCs) from subsurface soil beneath the building. The extracted soil vapors from the SVE system will be treated using granular activated carbon (GAC). Groundwater at the Site is not currently impacted; therefore, compliance monitoring will be consistent with the operational air permit to evaluate the effectiveness of the GAC treatment units in removing VOCs from the SVE air emissions, and performance monitoring to evaluate the effectiveness of the cleanup action. The general scope of work is as follows:

  - Development of necessary work plans and permitting.
  - Drilling, soil disposal, and installation of SVE wells.
  - Trenching for process conveyance piping and electrical power supply to equipment compound location.

- Operation of vapor treatment under specific air discharge permits.
- Compliance monitoring of COCs in recovered soil vapors and indoor air sampling data to demonstrate reduction of COC concentrations and confirm the SVE system was successful in achieving MTCA cleanup standards for soil.
- Confirmatory sampling and well abandonment.

1.0 INTRODUCTION

1.1 *Purpose*

This document is the Cleanup Action Plan (CAP) for 4 Corners Cleaners located at 23886 SE Kent-Kangley Road, Maple Valley, WA (Site). The general location of the Site is shown in Figure 1, *Vicinity Map*. A CAP is required as part of the Site cleanup process under Chapter 173-340 WAC, Model Toxics Control Act (MTCA) Cleanup Regulations. The purpose of the CAP is to identify the proposed cleanup action for the Site and to provide an explanatory document for review. More specifically, this plan:

- Describes the Site.
- Summarizes current site conditions.
- Summarizes the cleanup action alternative considered in the remedy selection process.
- Describes the selected cleanup action for the Site and the rational for selecting this alternative.
- Identifies site-specific cleanup levels and points of compliance for each hazardous substance and medium of concern for the proposed cleanup action.
- Discusses compliance monitoring requirements.
- Presents the schedule for implementing the CAP.

1.2 *Previous Studies*

1.2.1 Phase II Environmental Site Assessment – AEG, March 2017

On March 13, 2017, AEG supervised the advancement of three borings (B-1 through B-3) to a maximum depth of 2 feet below ground surface (bgs) inside the current dry cleaning facility. One soil sample was collected from each boring. AEG returned to the Site on March 31, 2017 and collected soil vapor samples from 14 sub-slab vapor locations (SV-1 through SV-14). The soil vapor was sampled from directly beneath the slab. The soil and sub-sab vapor sample locations are illustrated on Figure 2, *Site Map*. Based on the analytical results, AEG concluded the following:

- *PCE* [tetrachloroethene] *was detected in Site soil exceeding the MTCA Method A cleanup levels of 0.05 mg/kg* [milligrams per kilogram] *in B1-22 at 1.8 feet bgs at 0.058 mg/kg and B3-23 at 1.9 feet bgs at 0.067 mg/kg and sub-slab vapor at concentrations exceeding Method B screening levels in all samples, except SV-13, which as below the Method B screening levels of 321 µg/m^3 at 180 µg/m^3. These exceedances suggest a release from dry cleaning operations has occurred at the Site.*

- *Other VOCs* [volatile organic compounds], *including dichlorodifluoromethane, chloroform, and 1,1,2-trichloroethane, were also detected in sub-slab vapor above their respective MTCA Method B screening levels. The source of these VOCs is unknown at this time.*

AEG recommended:

- *Further Site characterization, including the installation of at least three groundwater monitoring wells to assess the depth of potential impacts in soil and groundwater, and to identify groundwater gradient and potential for off-property migration of PCE.*
- *Additional soil borings in the parking areas and near the entrance roadway to assess the potential source of the dichlorodifluoromethane, which is a refrigerant and not usually associated with dry cleaning operations.*
- *A Tier II Vapor assessment be performed to determine the lateral extent of VOCs present in sub-slab soil vapor, and whether those vapors may be impacting indoor air. AEG recommends advancing a soil vapor probes outside the building perimeter, and concurrently collecting one indoor air sample and one background ambient air sample.*

Analytical results of the soil and sub-slab vapor samples are presented in Table 1, *Summary of Soil Analytical Results*, and Table 2, *Summary of Sub-Slab Vapor Analytical Results*, respectively.

1.2.2 Remedial Investigation – AEG, July 2018

In July 2018, AEG returned to the Site to define the extent of contamination in soil and to determine if contamination was present in groundwater. AEG advanced 10 borings (B-4 through B-13) to a maximum depth of 35 feet bgs using a limited-access sonic drill rig, operated by Cascade Drilling. Soil and groundwater (where encountered) samples were collected from the borings, and analyzed for PCE and its daughter products. Soil sample B11-18 at 18 feet bgs reported PCE at 0.053 milligrams per kilogram (mg/kg), which was the only soil sample collected during this event that was above the MTCA Method A cleanup level for PCE (0.05 mg/kg). Deeper sample results from the same boring at 21 and 24 feet bgs (0.034 mg/kg and 0.046 mg/kg respectively) were below the MTCA cleanup level. Groundwater was encountered in six of the 10 borings (not including B-11), and no contaminants were detected.

Analytical results of the soil and groundwater samples are presented in Table 1, *Summary of Soil Analytical Results*, and Table 3, *Summary of Groundwater Analytical Results*, respectively.

1.2.3 SVE Pilot Test – AEG, December 2018

On December 4, 2018, for the purpose of performing a Soil Vapor Extraction (SVE) pilot test, eight temporary wells (T-1 through T-8) were installed at the Site with specific spacing used to determine the effectiveness of SVE as a remedial option. The temporary wells were completed with 10 feet of slotted screen from 5 to 15 feet bgs. The wells were sealed with bentonite for the top 5 feet of the boring and were installed to measure the radius of influence (ROI) and vacuum during the pilot test. No soil samples were collected during the temporary well installations. On December 5, 2018, AEG performed a SVE pilot test over one day at the Site using the temporary wells, with T-1 as the extraction point and field monitoring in wells T-2 through T-8.

From the testing results:

- HVDPE technology appeared to be an effective technology for the soil vapors from the vadose zone at the Site. Soil vapors collected during the vapor extraction test indicate that soil ventilation effectively volatilized chlorinated VOCs (CVOCs) from the vadose zone and is a viable remedial option.
- The effective ROI for the vapor extraction test conducted at temporary well T-1 is estimated to be approximately 25 feet for an applied vacuum of 26 inches of water column (W.C.).
- Two exhaust airflow samples (AS-1 and AS-2) were collected on December 5, 2018 after 110 minutes of extraction and at 180 minutes of operation, respectively. The laboratory result for air samples collected during the testing indicated vapor concentrations of PCE at 61 micrograms per cubic meter ($\mu g/m^3$) and 163 $\mu g/m^3$. This is a 63 percent (%) difference (increase) in vapor-phase concentrations from the start to end of the testing period.
- The ability to move air through the soil media (185 darcy), and the vapor-phase CVOC concentrations demonstrate that SVE would be applicable at this Site for soil remediation.
- An effective SVE ROI of approximately 25 feet was calculated based on the theoretical calculations and by monitored wellhead pressure readings observed during the pilot test.
- The total pounds (lbs) of vapor-phase CVOCs removed was estimated at 0.00016 lbs over 180 minutes of extracting at vapor point T-1.

A summary report of the SVE pilot testing was prepared and submitted with the *Remedial Investigation and Feasibility Study Report,* dated March 14, 2019.

2.0 SITE DESCIPTION

2.1 *Site Description*

The Site is located northwest of the intersection between SE Kent-Kangley Road and Highway 169 in Maple Valley, King County, Washington. The Site is positioned on an approximately 9.57-acre parcel with five retail buildings totaling 254,663 square feet. An "L" shaped building on the southwest portion of the parcel includes the 4 Corners Cleaners tenant space. The remainder of the parcel not covered by buildings is improved with asphalt-paved parking and driveways, and landscaped areas. The immediate vicinity of the Site is primarily commercial businesses. Figure 1, *Site Location Map*, presents the general layout of the Site vicinity. The Site's current layout can be seen in Figure 2, *Site Map*.

Current tenants in the "L" shaped building along the southern portion of the property include: 4 Corners Cleaners, Bellissimo Lashes and Nails, Papa Murphy's Pizza, Allstate Insurance, Serena Hair Design, a chiropractic office, Smoke & Vape shop, Four Corners Family Dentist, Bike Masters, and Maple Valley Bar and Grill. Gravity Coffee, MOD Pizza, and a Verizon Retailer occupy the square building located in the southeast portion of the property. North of the "L" shaped building, and the 4 Corners Cleaners tenant space, is Johnsons Home & Garden, Dog Spaw, Subway, Discovery Playtown, and Grocery Outlet.

2.2 *Human Health and Environmental Concerns*

As defined in WAC 173-340-200, an exposure pathway describes the mechanism by which a hazardous substance takes or could take a pathway from a source or contaminated medium to an exposed receptor. Potential soil exposure pathways at the Site include contact with hazardous substances in soil by visitors, residents, and workers, and groundwater leaching pathway. Potential groundwater exposure pathways at the Site include contact with hazardous substances dissolved in groundwater by visitors, residents, and workers, and consumption of hazardous substances in groundwater. Potential air exposure pathways at the Site include inhalation of hazardous substances in air by visitors, residents, and workers.

Exclusion from further terrestrial ecological evaluation is appropriate for this Site for the following reasons:

- Barriers to Exposure: WAC 173-340-7491(1)(b): All contaminated soil, is or will be, covered by physical barriers (such as buildings or paved roads) that prevent exposure to plants and wildlife, and institutional controls are used to manage remaining contamination.
- Undeveloped Land: WAC 173-340-7491(1)(c): There is less than 1.5 acres of contiguous undeveloped land on or within 500 feet of any area of the Site.

2.3 *Cleanup Standards*

Cleanup standards include levels and points of compliance as described in WAC 173-340-700 through WAC 173-340-760.

2.3.1 Contaminants of Concern

Contaminants of Concern (COCs) at the Site consist of PCE and its breakdown products, including trichloroethene (TCE), cis-1,2-dichloroethene (DCE), trans-1,2-DCE, and vinyl chloride. Soil and soil vapor are the media affected. Soil impacts at the Site are likely the result of use and storage of PCE formerly used in the dry cleaner machine and dry cleaning process.

2.3.2 Cleanup Levels

MTCA Method A cleanup levels for the soil exposure pathways are appropriate for this Site. MTCA Method B cleanup levels are appropriate for the air exposure pathway, and for constituents where MTCA Method A cleanup levels are not promulgated. These cleanup levels are based on the most stringent values for each exposure pathway and are considered appropriate for the Site COCs. Proposed MTCA cleanup levels for the Site COCs that have been measured in soil at the Site include:

Constituent	Soil	Groundwater	Indoor Air
• PCE	0.05 mg/kg	5 µg/L	9.62 µg/m^3*
• TCE	0.03 mg/kg	5 µg/L	0.37 µg/m^3*
• cis-1,2- DCE	160 mg/kg*	16 µg/L*	NL
• trans-1,2- DCE	1,600 mg/kg*	160 µg/L*	NL
• Vinyl Chloride	0.67 mg/kg*	0.2 µg/L	0.28 µg/m^3*

mg/kg = milligrams per kilogram
µg/m^3 = micrograms per cubic meter
NL = Not Listed; no cleanup/screening levels have been promulgated for these constituents
* Method B cleanup level (Method A cleanup level not established)

3.0 DESCRIPTION OF SELECTED REMEDY

The Remedial Investigation and Feasibility Study drafted by AEG (dated February 7, 2019) presents a detailed overview of the cleanup alternatives screened and evaluated for consideration for this Site. Please refer to that document for information on those alternatives. This CAP and the information presented below is limited to an overview of the preferred remedy.

3.1 *Site Description*

The boundaries of the Site that the CAP applies to are illustrated in Figure 3, *PCE in Soil Plume Map*, which illustrate the extents of soil contamination at the Site, in plan view. Cross sections are illustrated in Figure 5, *Geologic Cross Section A-A',* and Figure 6, *Geologic Cross Section B-B'.*

3.2 *Description of the Cleanup Action*

Impacts to soil will be remediated through volatilization of sorbed PCE from soil directly beneath the building concrete slab by four SVE wells (Figure 7, *Proposed Soil Vapor Extraction Well Locations Map*). The system will consist of vertical SVE wells connected by underground conveyance piping that is connected to a vacuum blower, air treatment system with controls for unattended operation (Figure 8, *Process Flow Schematic,* and Figure 9, *Typical SVE Well Construction*). The removal of soil vapors will provide treatment throughout the impacted portion of the vadose zone beneath the concrete slab.

Extracted vapors from the SVE system will be captured and treated to remove vapor-phase contaminants prior to atmospheric discharge under applicable permits. The effectiveness of the corrective action will be evaluated through regular monitoring and measurement of contaminant mass removed during operation of the SVE system. Continued ongoing sampling of the groundwater monitoring well network at the Site will provide groundwater data for comparison to MTCA cleanup levels.

Specific tasks to be performed include the following:

- Development of necessary work plans and permitting.
- Complete the design of the remediation option based on the pilot testing and provide bid documents to subcontractors for installation.
- Complete and submit permit applications for the local construction permits, Puget Sound Clean Air Agency (PSCAA) air discharge permit, and apply for a notice of intent to construct permits with local/state agencies.
- Installation of four vertical SVE wells (SVE-1 through SVE-4).

- Trenching for process conveyance piping and electrical power supply to equipment compound location. The piping will connect the newly installed SVE wells to the SVE equipment.
- Purchasing equipment for vacuum process including: regenerative blower, condensate pumps, air/water separating vessel, monitoring controller, gauges, safety interface, carbon vessels, and telemetry unit Figure 8, *Process Flow Schematic*.
- Operating the SVE system for approximately 18-24 months.
- Monitoring of granulated activated carbon (GAC) vapor treatment under specific air discharge limitations.
- Performing monthly operations and maintenance (O&M) to provide long-term performance. For the area surrounding the Site, noise abatement must be provided for 24-hour operation.
- Continued regular discharge permit compliance monitoring of COCs in soil vapors extracted to demonstrate and document the reduction of COC concentrations and confirm the SVE system was successful operating below the PSCAA limit of 500 pounds (lbs) per year of PCE and 1,000 lbs of total toxic air pollutants discharge criteria.
- Conduct system performance monitoring including sub-slab pressure measurements within the building via permanent vapor monitoring points. The "negative pressure" or vacuum measured will be compared to the EPA 2008 guidelines to meet or exceed a pressure reduction goal of 0.02 inches of water column (W.C.) as measured beneath the concrete floor slab.
- Performance and confirmational indoor air sampling inside the building to evaluate system performance, and to determine if the SVE system was successful in achieving MTCA cleanup standards for indoor air quality following system shutdown.
- Confirmation soil sampling of previously documented areas of PCE-contaminated soil to confirm the SVE system was successful in achieving MTCA cleanup standards for soil.
- Removal of the system and repair of any Site improvements affected by the system installation, operation, and removal.

Performance monitoring of COCs and pressure beneath the concrete slab would be used to predict the duration of the operation and effectiveness. Differential pressure readings beneath the concrete slab would indicate a negative pressure has developed underneath the slab provided by the extraction points. Provisions in the PSCAA regulations would require that VOC discharges not exceed the allowable thresholds for toxic air pollutants. The operation of the SVE system would initially have vapor treatment prior to discharge to the atmosphere and must be monitored and

compared to the applicable PSCAA discharge limitations. Compliance air sampling would be required, and overall removal efficiency records would maintained and provided to PSCAA if requested during Site inspections.

3.3 *Cleanup Standards and Point of Compliance*

As defined in section *2.3.2 Cleanup Levels*, MTCA Method A and B cleanup levels are appropriate for soil and soil vapor/air at this Site. It is assumed that standard points of compliance will be used.

- Soil – Direct Contact: For soil cleanup levels based on human exposure via direct contact, the point of compliance is throughout the Site from the ground surface to 15 feet bgs.
- Soil – Leaching: For soil cleanup levels based on protection of groundwater, the point of compliance is throughout the Site.
- Groundwater: For groundwater, the point of compliance is throughout the Site from the uppermost level of the saturated zone extending vertically to the lowest most depth that could potentially be affected by the Site.
- Indoor Air/Soil Gas: The point of compliance is ambient and indoor air throughout the Site.

3.4 *Applicable, Relevant, and Appropriate Requirements (ARARs)*

All cleanup actions conducted under MTCA shall comply with applicable state and federal laws [WAC 173-340-710(1)]. MTCA defines applicable state and federal laws to include legally applicable requirements and those requirements that are relevant and appropriate. Collectively, these requirements are referred to as ARARs. The primary ARAR is the MTCA regulation (WAC 173-340), especially with regard to the development of cleanup levels and procedures for development and implementation of a cleanup under MTCA. ARARs for the Site cleanup also include the following:

- Federal Safe Drinking Water Act Maximum Contaminant Levels (MCLs; 40 CFR Part 141).
- Washington Clean Air Act (Chapter 70.94 RCW).
- Puget Sound Clean Air Agency (PSCAA), Regulation I.
- Washington Solid and Hazardous Waste Management (RCW 70.105); Chapter 173-303 WAC; 40 CFR 241, 257; Chapter 173-350 and 173-351 WAC) and Land Disposal Restrictions (40 CFR 268; WAC 173-303-340).

- Washington Industrial Safety and Health Act (RCW 49.17) and other Federal Occupational Safety and Health Act (29 CFR 1910, 1926).

3.5 *Restoration Timeframe*

Estimated time for Site restoration using Selected SVE and Monitoring is approximately 2 to 3 years.

3.6 *Compliance Monitoring*

MTCA identifies three types of compliance monitoring to be performed during and/or after a remedial action, protection, performance, and confirmational monitoring. According to MTCA:

Protection monitoring confirms:

> *"…that human health and the environment are adequately protected during construction and the operation and maintenance period of an interim action or cleanup action…"*

Performance monitoring confirms:

> "*…that the interim action or cleanup action has attained cleanup standards and, if appropriate, remediation levels…*"

Confirmational monitoring confirms:

> "*…the long-term effectiveness of the interim action or cleanup action once cleanup standards and, if appropriate, remediation levels or other performance standards have been attained.*"

During and following the remedial actions being taken at the Site, all three types of compliance monitoring will occur. Following each monitoring event, a report documenting the O&M activities, summary of analytical results of the vapor sampling activities, and any other activities pertinent to the cleanup at the Site will be prepared by AEG. All reports generated by AEG will be reviewed by a Washington State licensed hydrogeologist. All data generated will be submitted to the Environmental Information Management (EIM) database in accordance with WAC 173-340-840(5).

3.6.1 Performance Monitoring

Following the initial equipment startup period, performance monitoring will be conducted to assess remedial progress and permit compliance. The SVE system will be monitored and physically inspected no less than once per month, or more frequently if required to respond to system alarms.

During each monthly system monitoring visit, O&M of the extraction and treatment components will be monitored and adjusted as necessary to optimize performance. The sub slab pressure will be monitored and recorded using differential pressure gauges (Magnehelic ® style gauges). The SVE system while operating may accumulate soil moisture and must be removed from the system and stored in a 55-gallon drum for proper disposal.

All monitoring parameters and O&M notes will be recorded on field sheets or in a dedicated field notebook. Copies of records pertinent to the air operating permit and the water discharge permit will be kept on Site within the treatment system building. Remedial progress will be evaluated on a monthly basis and will be documented in quarterly status reports, which will be provided to Ecology, the insurance company, and the property owner.

The laboratory sample results of the extracted soil vapors collected before and after GAC treatment will be used for the Performance Monitoring and for the comparison to the PSCAA discharge air quality criteria. It is anticipated that sampling will occur monthly for the first year, and quarterly for the duration of the system operation. The first compliance sampling event would occur immediately following the SVE system startup.

Extracted soil vapor sample analyses would include:

- PCE and daughter products using Method EPA 8260C.

In addition, system operating parameters of temperature and airflow rate will be collected to evaluate equipment performance and to reduce GAC media damage from excess heat in the air stream.

The pilot testing PCE removal rate was based on the soil vapor data from wells within the downgradient portion of the plume shown on Figure 3, *PCE in Soil Plume Map*. The pilot testing provided the estimated theoretical 25-foot ROI of the vacuum energy response to the actual soil media beneath the Site. This ROI was used for the placement of the four SVE wells as shown on Figure 7, *Proposed Soil Vapor Extraction Well Locations Map*. The proposed SVE wells are to be installed in areas that would encompass the plume boundary as shown and a majority of the sub-slab fill material beneath the concrete floor. The performance milestones to judge the system effectiveness will be calculated via an evaluation of the performance monitoring data to the initial baseline data. System adjustments will be based on this data along with compliance sampling data to optimize the system performance.

The current dry cleaning process was converted to use hydrocarbon solutions and not PCE. Therefore, indoor air vapor sampling will be used to assess the VOC concentrations inside the work area as compared to the MTCA Method B Indoor Air Cleanup Levels. Baseline indoor air

vapor samples and system performance sample data will be collected after the SVE is fully operational to be able to calculate a more accurate removal rate throughout the plume. To provide closure criteria, a review of the system compliance data, and a reduction in VOC concentrations, sub-slab vapor samples will be collected and compared to the MTCA Method B Sub-Slab Screening Levels

3.6.2 Confirmational Monitoring

Once the SVE system data indicates PCE vapors are no longer being removed, sampling of the indoor air, sub-slab vapor, and soil will be performed following SVE system shutdown to determine whether MTCA cleanup standards have been achieved. If confirmation indoor air, sub-slab vapor, and soil sampling following SVE system shutdown indicates residual concentrations of Site COCs are still present above MTCA Method B cleanup levels, AEG will evaluate other options for ensuring a complete cleanup, which may include modification of the SVE system to focus energy on any remaining residual areas.

Soil sample analyses would include:

- PCE and daughter products using Method EPA 8260C/5035.

Indoor air and sub-slab vapor sample analyses would include:

- PCE and daughter products using Method TO-15.

3.6.3 Protection Monitoring and Reporting

Concurrent with the Performance Monitoring and the Confirmational Monitoring, Protection Monitoring will occur. This monitoring will confirm that contamination, if present, is not leaving the property or impacting any potentially sensitive exposure pathways. For this Site, Protection Monitoring is synonymous with Performance and Confirmational Monitoring, and no additional actions will be needed.

3.7 *Schedule for Implementation*

Upon approval of the CAP, the SVE system would be installed following the installation of the vertical SVE wells. The on-Site SVE system installation (conveyance piping, electrical and equipment placement) is expected to take 7 to 10 days after the equipment is permitted for operation and delivered from the manufacturer. The system would be started and optimized for removal, followed by the initiation of compliance monitoring.

4.0 LIMITATIONS

This report summarizes the findings of the services authorized under our agreement with Mr. Chang Kim. It has been prepared using generally accepted professional practices, related to the nature of the work accomplished. This report was prepared for the exclusive use of Mr. Kim and his designated representatives for the specific application to the project purpose.

Recommendations, opinions, site history, and proposed actions contained in this report apply to conditions and information available at the time this report was completed. Since conditions and regulations beyond our control can change at any time after completion of this report, or our proposed work, we are not responsible for any impacts of any changes in conditions, standards, practices, and/or regulations subsequent to our performance of services. We cannot warrant or validate the accuracy of information supplied by others, in whole or part.

5.0 REFERENCES

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FIGURES

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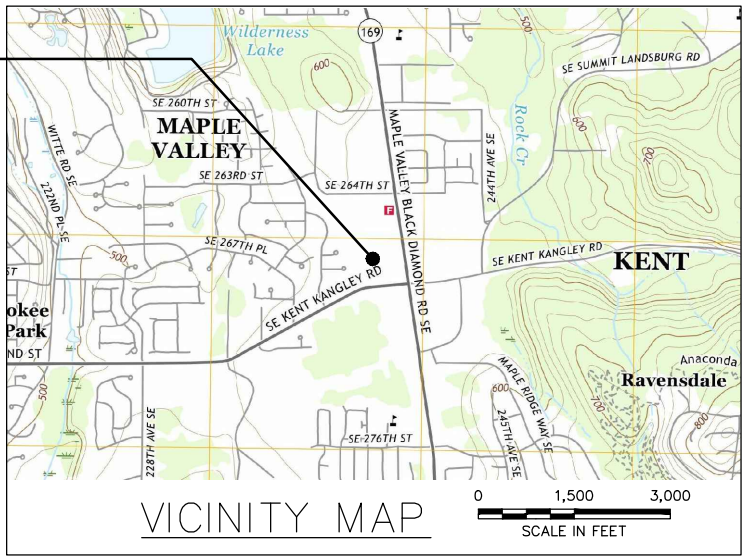
FILENAME	DRAWN BY		CHECKED BY		APPROVED BY		PROJECT NUMBER
17-126_17Q1.DWG	ICD	3/22/2017	CS	3/22/2017	CS	3/22/2017	17-126

N
W E
S

PROJECT LOCATION

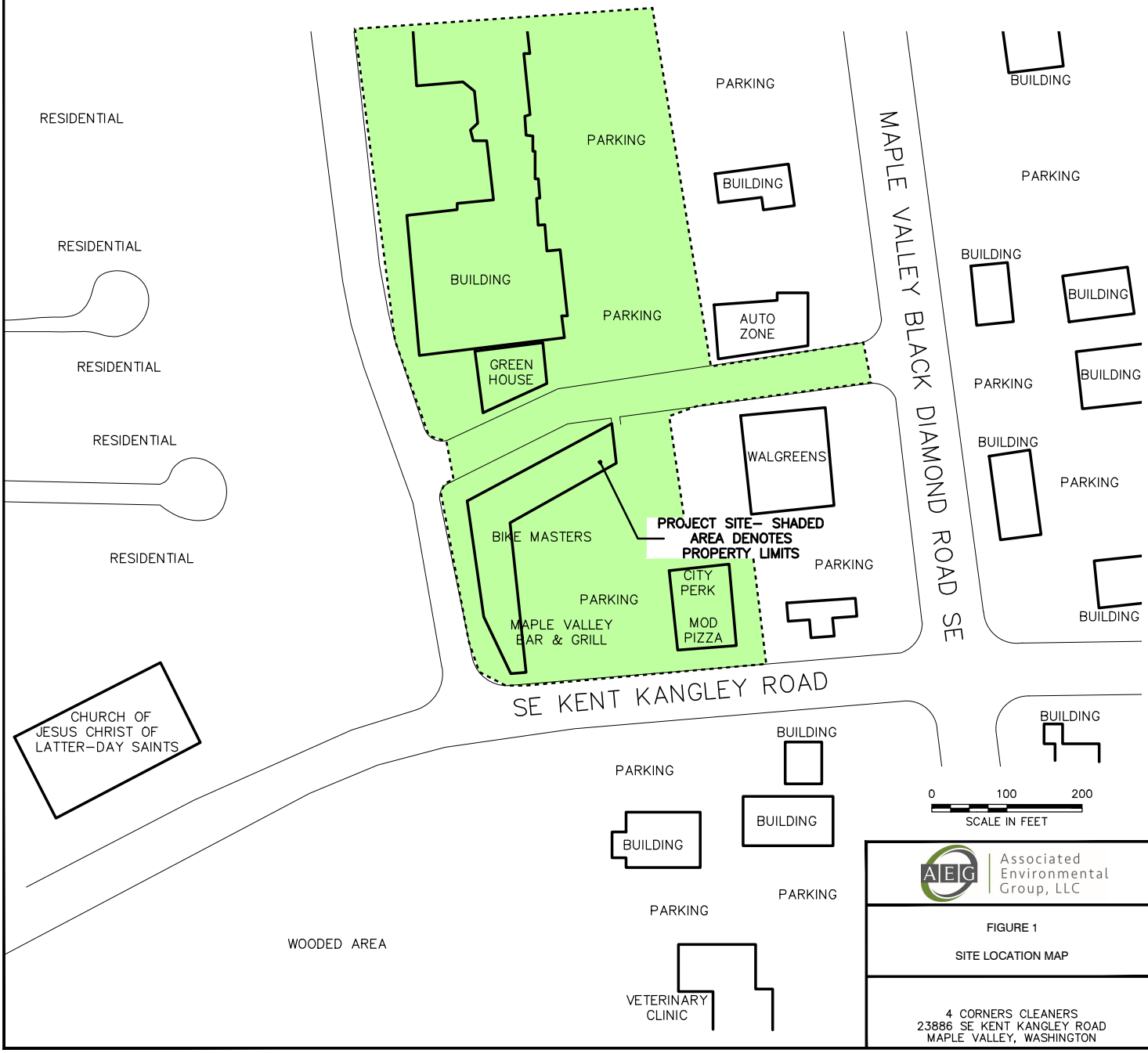


NOTES

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT.

REFERENCE

DRAWING CREATED FROM AERIAL PHOTOGRAPH AND NOTES PROVIDED BY AEG, LLC.
VICINITY IMAGE SOURCE: U.S. GEOLOGICAL SURVEY–2017, 7.5 MINUTE QUADRANGLE MAP
BLACK DIAMOND, WASHINGTON



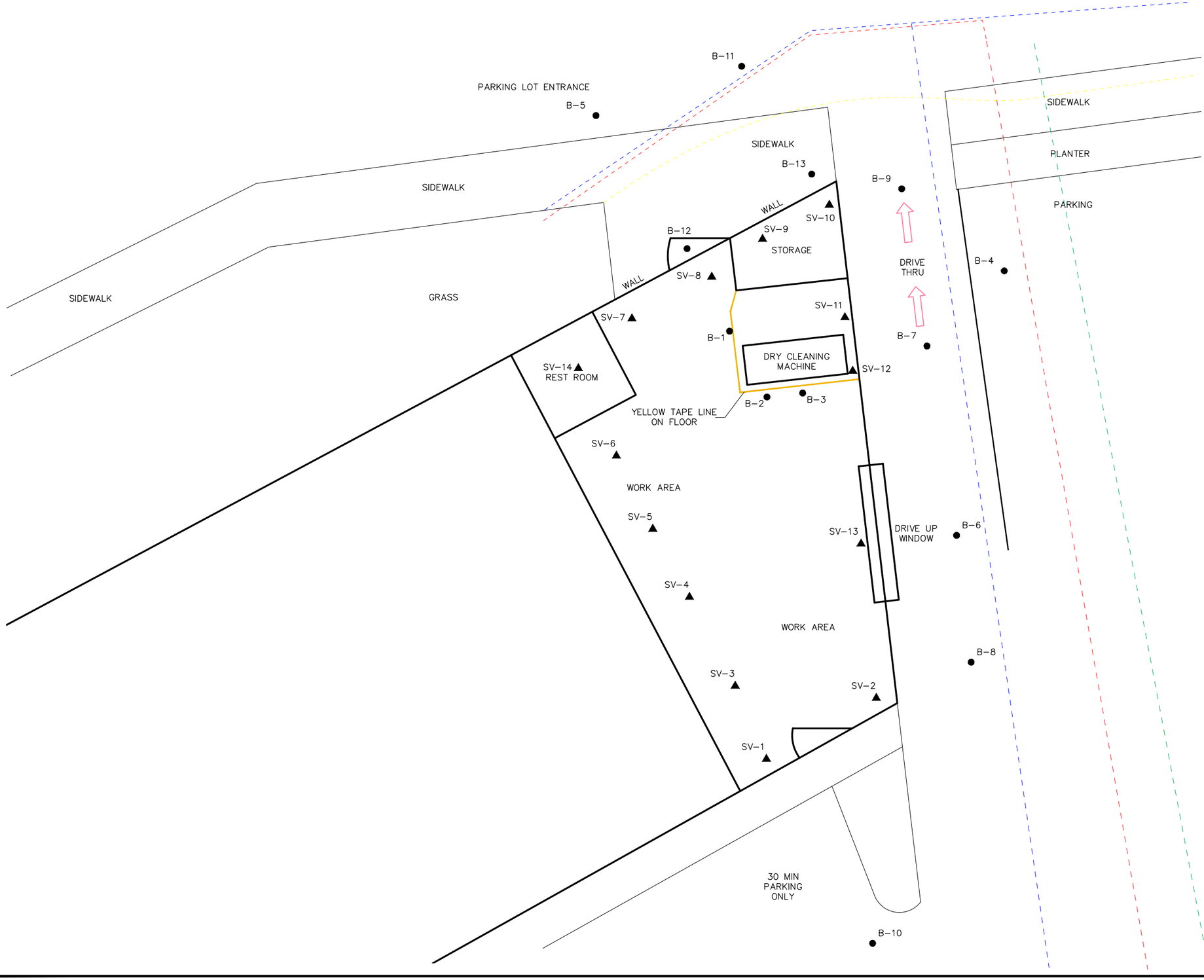
Associated Environmental Group, LLC

FIGURE 1

SITE LOCATION MAP

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

PROJECT NUMBER	17-126
APPROVED BY	BD 9/27/2018
CHECKED BY	BD 9/27/2018
DRAWN BY	ICD 9/27/2018
FILENAME	17-126_1803.DWG



LEGEND

- B-1 ● SOIL BORING LOCATION
- SV-1 ▲ SOIL VAPOR LOCATION
- APPROX. LOCATION OF GAS LINE
- APPROX. LOCATION OF ELECTRIC LINE
- APPROX. LOCATION OF WATER LINE
- APPROX. LOCATION OF SEWER/STORMWATER

NOTES

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REFERENCE

DRAWING CREATED FROM AERIAL PHOTOGRAPH AND NOTES PROVIDED BY AEG, LLC.

0 5 10
SCALE IN FEET

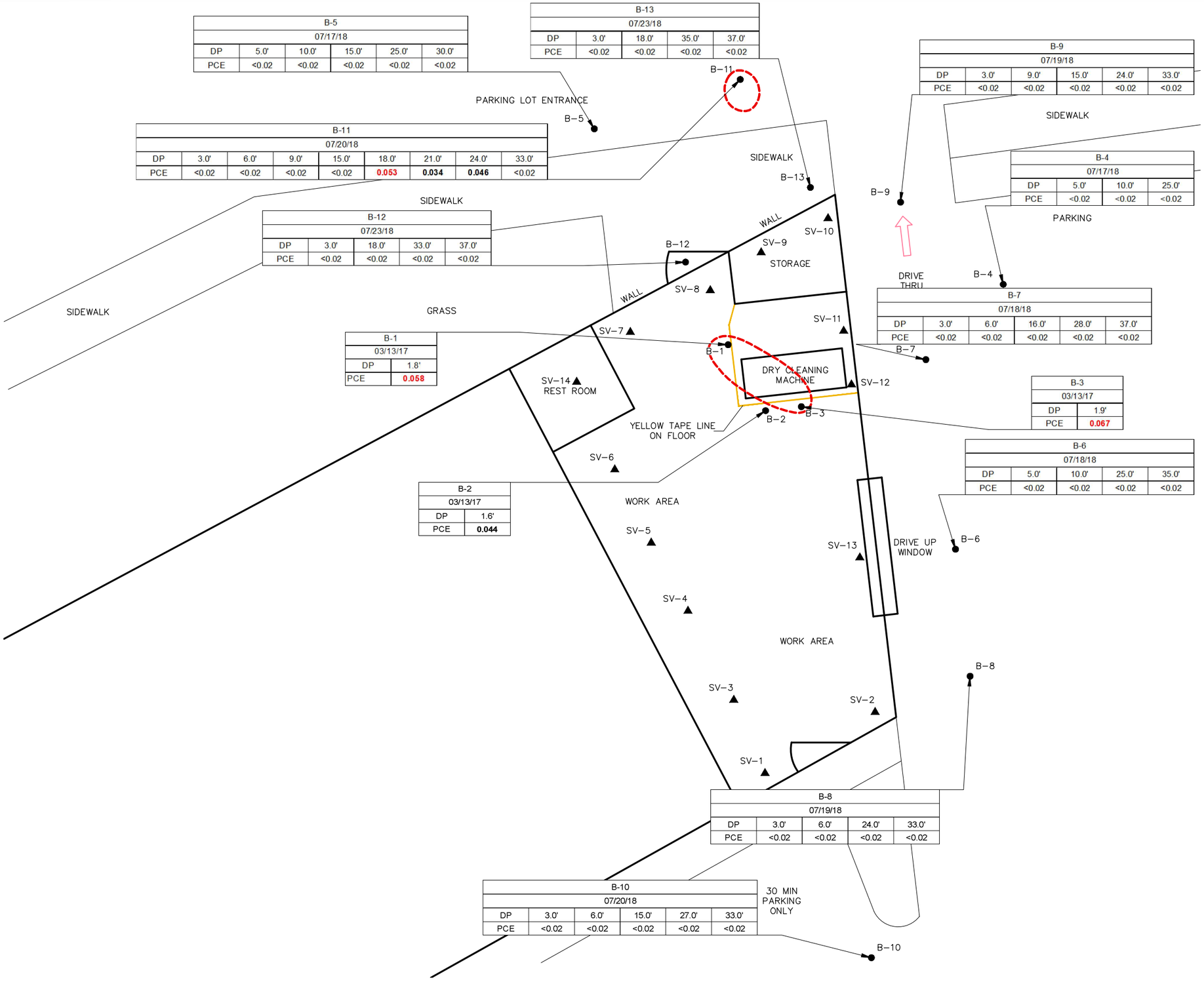
Associated Environmental Group, LLC

FIGURE 2

SITE MAP

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

PROJECT NUMBER	17-126
APPROVED BY	BD 1/11/2019
CHECKED BY	BD 1/11/2019
DRAWN BY	ICD 1/11/2019
FILENAME	17-126_1803_1.DWG



LEGEND

B-1	●	SOIL BORING LOCATION
SV-1	▲	SOIL VAPOR LOCATION
PCE		TETRACHLOROETHENE (mg/kg)
		SOIL PCE PLUME (INDICATING EXCEEDANCE OF MTCA CUL 0.05 mg/kg)
<		NOT DETECTED ABOVE LIMIT NOTED
mg/kg		MILLIGRAMS PER KILOGRAM
DP		DEPTH IN FEET

BOLD VALUE INDICATES THE DETECTED CONCENTRATION IS BELOW ECOLOGY MTCA METHOD A CLEANUP LEVELS

RED BOLD VALUE INDICATES THE DETECTED CONCENTRATION EXCEEDS ECOLOGY MTCA METHOD A CLEANUP LEVELS

NOTES

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT.

REFERENCE

DRAWING CREATED FROM AERIAL PHOTOGRAPH AND NOTES PROVIDED BY AEG, LLC.

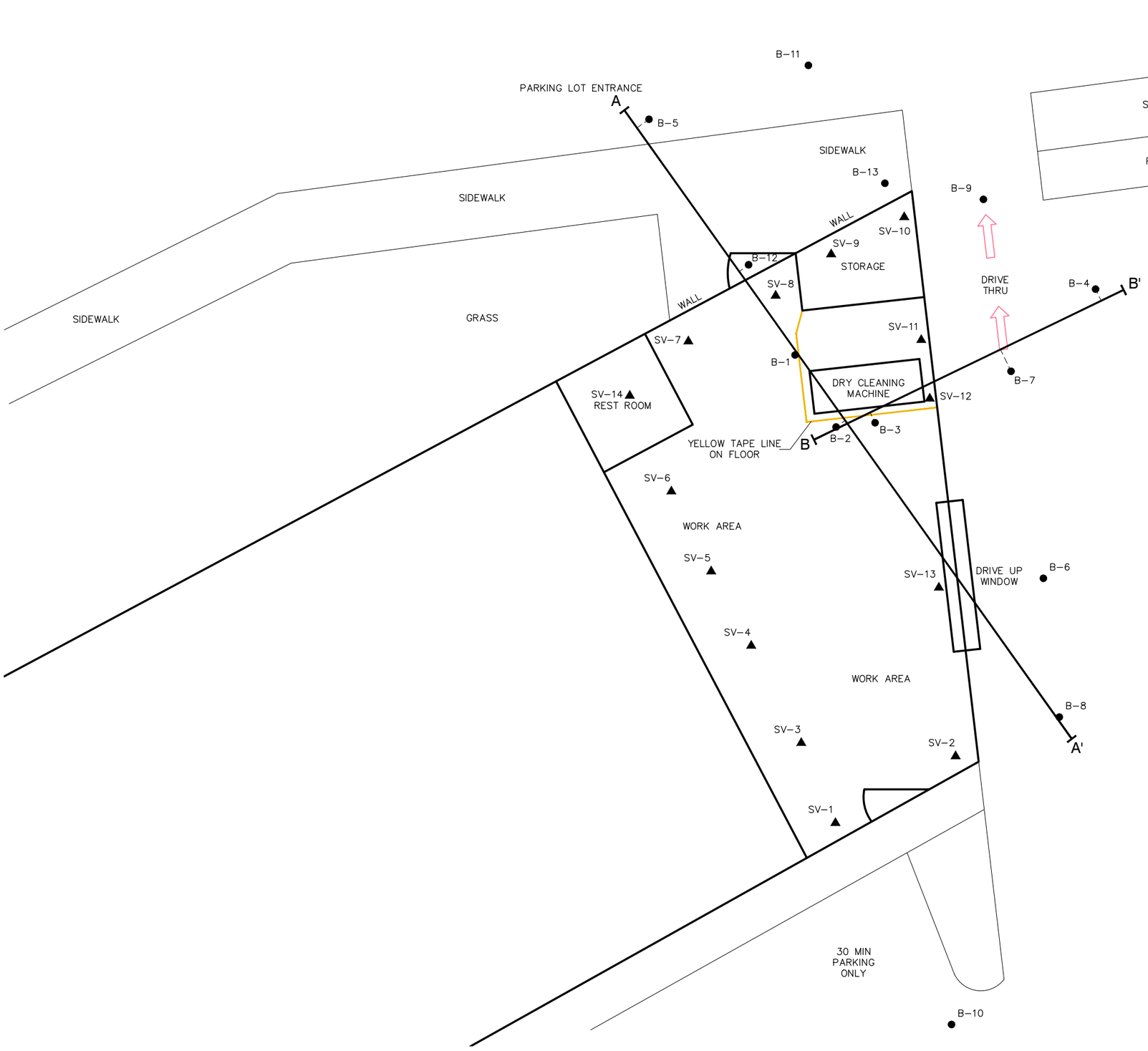
Associated Environmental Group, LLC

FIGURE 3

PCE IN SOIL PLUME MAP

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

PROJECT NUMBER	17-126
APPROVED BY	BD 1/11/2019
CHECKED BY	BD 1/11/2019
DRAWN BY	ICD 1/11/2019
FILENAME	17-126_XSECTIONS.DWG



LEGEND

B-1 ●	SOIL BORING LOCATION
SV-1 ▲	SOIL VAPOR LOCATION
A A'	LINE OF LITHOLOGIC CROSS SECTION AND PROJECTION LINE OR BORING/WELL

NOTES

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT.

REFERENCE

DRAWING CREATED FROM AERIAL PHOTOGRAPH AND NOTES PROVIDED BY AEG, LLC.

0 5 10
SCALE IN FEET

Associated Environmental Group, LLC

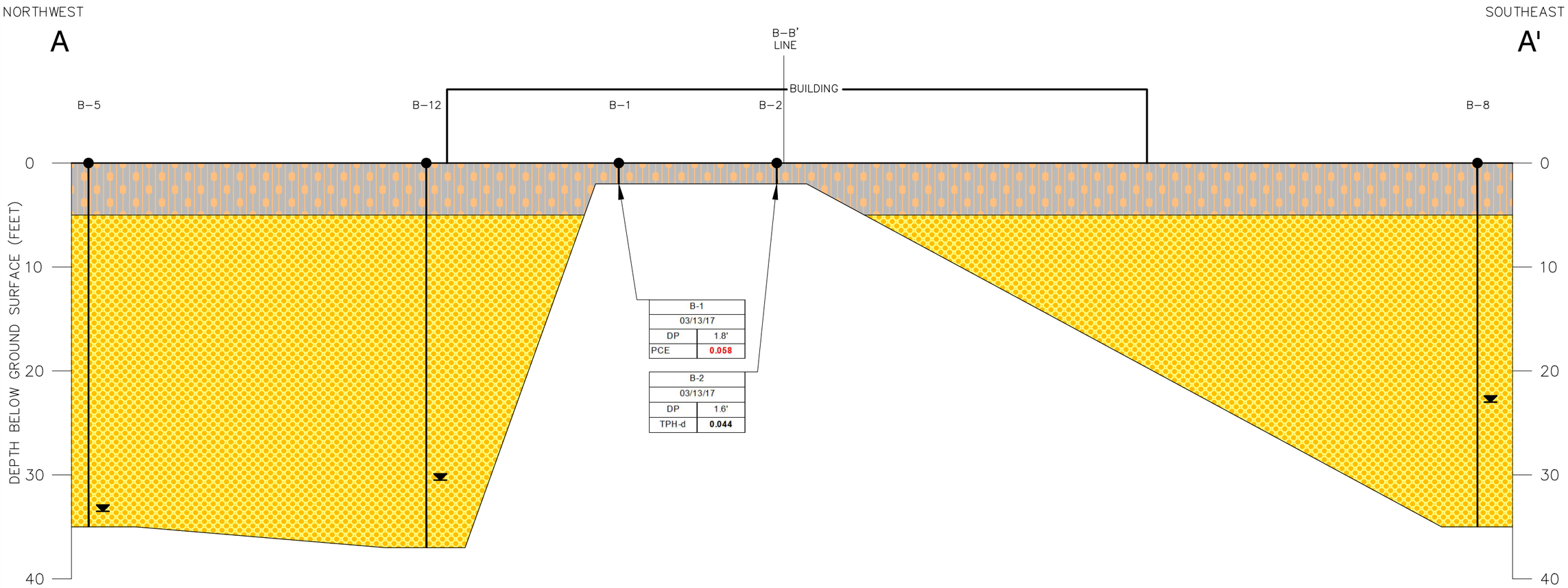
FIGURE 4

SITE MAP WITH GEOLOGIC CROSS SECTIONS A-A' AND B-B'

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

PROJECT NUMBER	APPROVED BY	CHECKED BY	DRAWN BY
17-126	BD 1/11/2019	BD 1/11/2019	ICD 1/11/2019

FILENAME: 17-126_XSECTIONS.DWG



LEGEND

B–2 – SOIL BORING

– GROUNDWATER LEVEL AT TIME OF DRILLING

– MAXIMUM DEPTH EXPLORED

– SOIL CONTACT

SANDY GRAVEL

GRAVELLY SILT

PCE	TETRACHLOROETHENE (mg/kg)
<	NOT DETECTED ABOVE LIMIT NOTED
mg/kg	MILLIGRAMS PER KILOGRAM
DP	DEPTH IN FEET

BOLD VALUE INDICATES THE DETECTED CONCENTRATION IS BELOW ECOLOGY MTCA METHOD A CLEANUP LEVELS

RED BOLD VALUE INDICATES THE DETECTED CONCENTRATION EXCEEDS ECOLOGY MTCA METHOD A CLEANUP LEVELS

0 2.5 5
HORIZONTAL SCALE

0 5 10
VERTICAL SCALE

AEG Associated Environmental Group, LLC

FIGURE 5

GEOLOGIC CROSS SECTION A-A'

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

FILENAME	DRAWN BY	CHECKED BY	APPROVED BY	PROJECT NUMBER
17-126_XSECTIONS.DWG	ICD 1/11/2019	BD 1/11/2019	BD 1/11/2019	17-126

SOUTHWEST

B

A–A' LINE

BUILDING

B–2 B–3 B–7 B–4

NORTHEAST

B'

DEPTH BELOW GROUND SURFACE (FEET)

0 10 20 30 40

B-2	
03/13/17	
DP	1.6'
PCE	**0.044**

B-3	
03/13/17	
DP	1.9'
PCE	**0.067**

HORIZONTAL SCALE 0 2.5 5

VERTICAL SCALE 0 5 10

LEGEND

B–2 – SOIL BORING

– GROUNDWATER LEVEL AT TIME OF DRILLING

– MAXIMUM DEPTH EXPLORED

– SOIL CONTACT

SANDY GRAVEL

GRAVELLY SILT

PCE	TETRACHLOROETHENE (mg/kg)
<	NOT DETECTED ABOVE LIMIT NOTED
mg/kg	MILLIGRAMS PER KILOGRAM
DP	DEPTH IN FEET

BOLD VALUE INDICATES THE DETECTED CONCENTRATION IS BELOW ECOLOGY MTCA METHOD A CLEANUP LEVELS

RED BOLD VALUE INDICATES THE DETECTED CONCENTRATION EXCEEDS ECOLOGY MTCA METHOD A CLEANUP LEVELS

AEG Associated Environmental Group, LLC

FIGURE 6

GEOLOGIC CROSS SECTION B-B'

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

PROJECT NUMBER	17-126
APPROVED BY	BD 1/21/2019
CHECKED BY	BD 1/21/2019
DRAWN BY	ICD 1/21/2019
FILENAME	17-126_1803_1.DWG

POWER WILL BE PROVIDED FROM THE ELECTRICAL ROOM FOR THE WHOLE BUILDING IS 170 FEET TO THE WEST

SVE EQUIPMENT

PARKING LOT ENTRANCE

SIDEWALK

SIDEWALK

SIDEWALK

PLANTER

PARKING

EXTENT OF PCE SOIL

GRASS

WALL

STORAGE

DRIVE THRU

DRY CLEANING MACHINE

REST ROOM

YELLOW TAPE LINE ON FLOOR

WORK AREA

DRIVE UP WINDOW

WORK AREA

30 MIN PARKING ONLY

B-1 B-2 B-3 B-4 B-5 B-6 B-7 B-8 B-9 B-10 B-11 B-12 B-13

SV-1 SV-2 SV-3 SV-4 SV-5 SV-6 SV-7 SV-8 SV-9 SV-10 SV-11 SV-12 SV-13 SV-14

SVE 1 SVE 2 SVE 3 SVE 4 SVE 5

VM-1 VM-2 VM-3

SVE WELL TRENCHES 18 INCHES DEPTH WITH CDF FILL AND FINISHED WITH ASPHALT OR CONCRETE

THEORETICAL RADIUS OF VACUUM INFLUENCE

THEORETICAL RADIUS OF INFLUENCE

NO I

N W E S

LEGEND

B-1 ●	SOIL BORING LOCATION
SV-1 ▲	SOIL VAPOR LOCATION
SV-1 ⊙	SOIL VAPOR WELL LOCATION
-------	SOIL PCE PLUME (INDICATING EXCEEDANCE OF MTCA CUL 0.05 mg/kg)
VM-1 ○	VAPOR MONITORING POINT

NOTES

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT.

REFERENCE

DRAWING CREATED FROM AERIAL PHOTOGRAPH AND NOTES PROVIDED BY AEG, LLC.

0 5 10
SCALE IN FEET

Associated Environmental Group, LLC

FIGURE 7
PROPOSED SOIL VAPOR EXTRACTION WELL LOCATIONS MAP

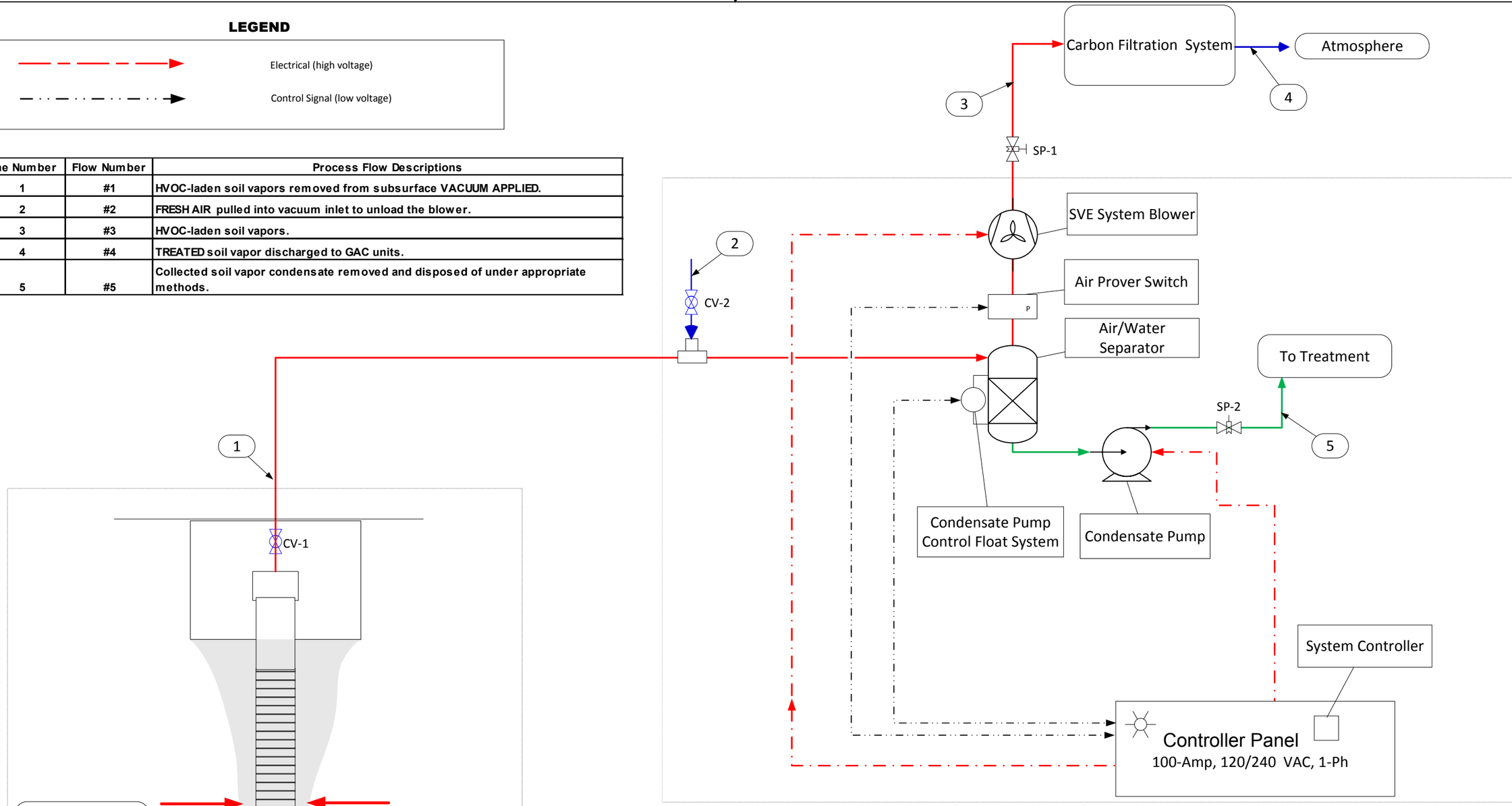
4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

LEGEND

Electrical (high voltage)

Control Signal (low voltage)

Line Number	Flow Number	Process Flow Descriptions
1	#1	HVOC-laden soil vapors removed from subsurface VACUUM APPLIED.
2	#2	FRESH AIR pulled into vacuum inlet to unload the blower.
3	#3	HVOC-laden soil vapors.
4	#4	TREATED soil vapor discharged to GAC units.
5	#5	Collected soil vapor condensate removed and disposed of under appropriate methods.



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SVE PROCESS FLOW SCHEMATIC

Figure 8

Associated Environmental Group, LLC	SIZE	FSCM NO	DWG NO: 17-126-18Q3_FIG8_PID.vsd / REV
23889 SE KENT KANGLEY ROAD, MAPLE VALLEY, WA	SCALE: None	4 CORNERS CLEANERS	SHEET: 1 OF 1

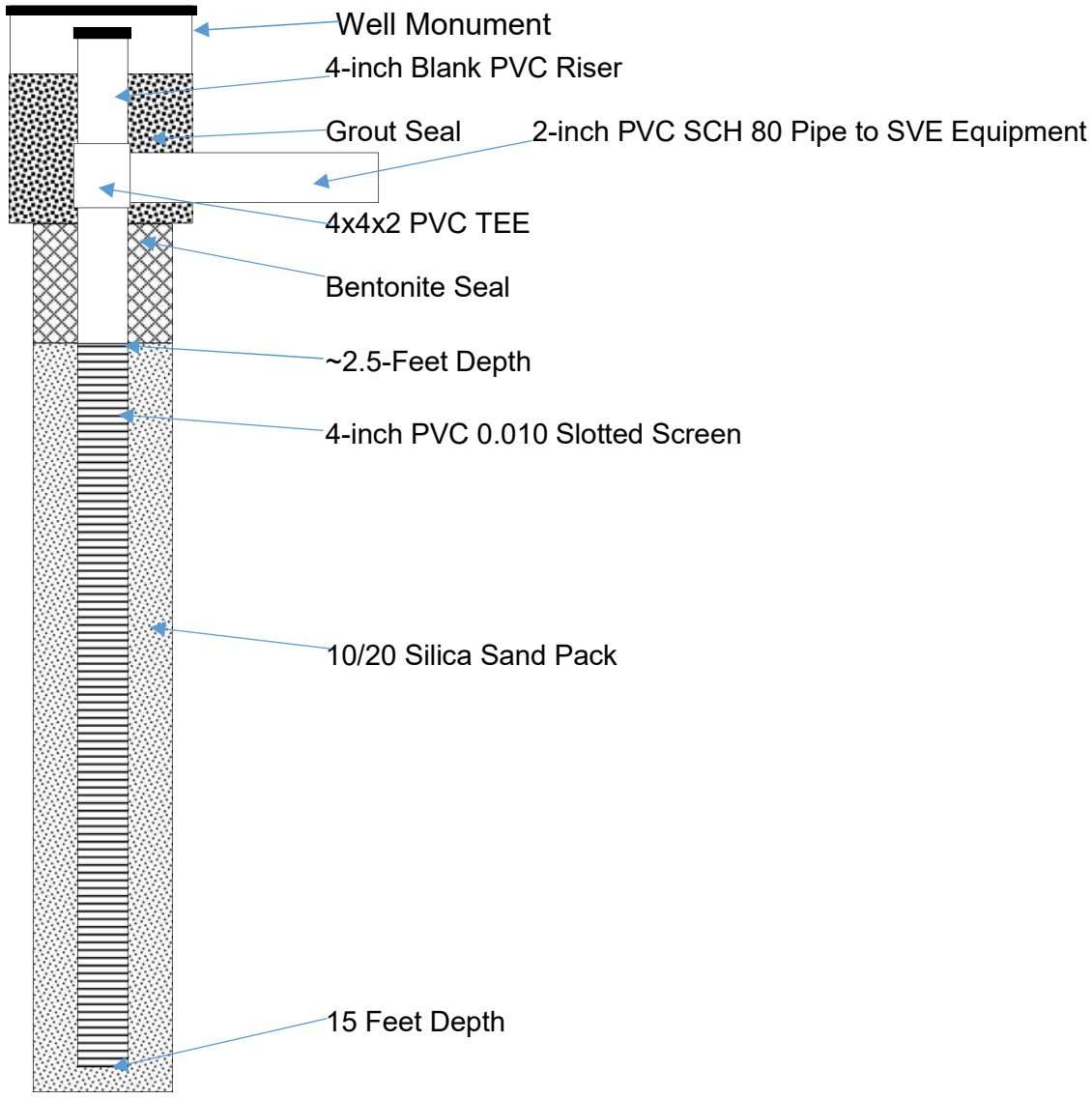

FIGURE 9 - TYPICAL SVE WELL CONSTRUCTION (NTS)

Soils encountered at the Site during subsurface investigations generally consisted of silt with gravel to approximately 5 feet bgs, underlain by dense, sandy gravel with fine- to coarse-sized gravels, and cobbles to about 35 feet bgs. Groundwater at Site was encountered at various depths from 25 to 33 feet bgs and is not being considered for remediation.

AEG will install the SVE wells using Sonic Drilling equipment due to the type of soil beneath the Site and the SVE wells will be completed to 15 feet bgs. The extraction point inside the building will be installed by hand methods to the extent possible and the piping routed to the outside through the wall.

TABLES

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Table 1 - Summary of Soil Analytical Results

4 Corners Dry Cleaning

Maple Valley, Washington

Sample Number	Depth Collected (feet)	Date Collected	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride
B1-22	1.8	3/13/2017	**0.058**	<0.02	<0.05	<0.05	<0.02
B2-20	1.6	3/13/2017	**0.044**	<0.02	<0.05	<0.05	<0.02
B3-23	1.9	3/13/2017	**0.067**	<0.02	<0.05	<0.05	<0.02
B4-5	5.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B4-10	10.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B4-25	25.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B5-5	5.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B5-10	10.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B5-15	15.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B5-25	25.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B5-30	30.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B6-5	5.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B6-10	10.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B6-25	25.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B6-35	35.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B7-3	3.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B7-6	6.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B7-16	16.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B7-28	28.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B7-37	37.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B8-3	3.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B8-6	6.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B8-24	24.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B8-33	33.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B9-3	3.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B9-9	9.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B9-15	15.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B9-24	24.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B9-33	33.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B10-3	3.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B10-6	6.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B10-15	15.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B10-27	27.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B10-33	33.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B11-3	3.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B11-6	6.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B11-9	9.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B11-15	15.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B11-18	18.0	7/20/2018	**0.053**	<0.02	<0.05	<0.05	<0.02
B11-21	21.0	7/20/2018	**0.034**	<0.02	<0.05	<0.05	<0.02
B11-24	24.0	7/20/2018	**0.046**	<0.02	<0.05	<0.05	<0.02
B11-33	33.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02

Table 1 - Summary of Soil Analytical Results

4 Corners Dry Cleaning

Maple Valley, Washington

Sample Number	Depth Collected (feet)	Date Collected	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride
B12-3	3.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B12-18	18.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B12-33	33.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B12-37	37.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B13-3	3.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B13-18	18.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B13-35	35.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B13-37	37.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
PQL			0.02	0.02	0.05	0.05	0.02
MTCA Method A Cleanup Levels			0.05	0.03	160*	1,600*	0.67*

Notes:

All values are presented in milligrams per kilogram (mg/kg)

< = Not detected at the listed laboratory detection limits

PQL = Practical Quantification Limit (laboratory detection limit)

*Method B cleanup level for direct contact; no Method A cleanup has been established.

Red Bold indicates the detected concentration exceeds Ecology MTCA Method A cleanup level

Bold indicates the detected concentration is below Ecology MTCA Method A cleanup levels

PCE = Tetrachloroethene

TCE = Trichloroethene

DCE = Dichloroethene

Table 2 - Summary of Groundwater Analytical Results

4 Corners Cleaners

Maple Valley, Washington

Sample Number	Date Collected	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride
B4-W	7/17/2018	<1.0	<1.0	<1.0	<1.0	<0.2
B5-W	7/17/2018	<1.0	<1.0	<1.0	<1.0	<0.2
B6-W	7/18/2018	<1.0	<1.0	<1.0	<1.0	<0.2
B7-W	7/18/2018	<1.0	<1.0	<1.0	<1.0	<0.2
B8-W	7/19/2018	<1.0	<1.0	<1.0	<1.0	<0.2
B9-W	7/19/2018	<1.0	<1.0	<1.0	<1.0	<0.2
PQL		1.0	1.0	1.0	1.0	0.2
MTCA Method A Cleanup Levels		5.0	5.0	160*	16*	0.2

Notes:

All values present are micrograms per liter (µg/L)

-- = Not analyzed for constituent

< = Not detected at the listed laboratory detection limits

PQL = Practical Quantification Limit (laboratory detection limit)

Red Bold indicates the detected concentration exceeds Ecology MTCA Method A cleanup level

Bold indicates the detected concentration is below Ecology MTCA Method A cleanup levels

PCE = Tetrachloroethene

TCE = Trichloroethene

DCE = Dichloroethene

* MTCA Method B cleanup level; Method A cleanup level not established

Table 3 - Summary of Sub-Slab Vapor Analytical Results
4 Corners Cleaners
Maple Valley, Washington

Sample Number	Depth Collected (feet)	Date Collected	PCE and Daughter Products					Other Detected Volatile Organic Compounds		
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	Chloroform	Dichloro-difluoromethane	1,1,2-Trichloroethane
SV-1	SUB-SLAB	3/31/2017	**1,600**	<10	<10	<10	<10	<10	<10	<10
SV-2	SUB-SLAB	3/31/2017	**1,800**	<10	<10	<10	<10	<10	**8,600**	<10
SV-3	SUB-SLAB	3/31/2017	**1,500**	<10	<10	<10	<10	<10	**12,000**	<10
SV-4	SUB-SLAB	3/31/2017	**790**	<10	<10	<10	<10	<10	**15,000**	<10
SV-5	SUB-SLAB	3/31/2017	**940**	<10	<10	<10	<10	<10	**8,200**	<10
SV-6	SUB-SLAB	3/31/2017	**850**	<10	<10	<10	<10	<10	**7,200**	<10
SV-7	SUB-SLAB	3/31/2017	**1,700**	<10	<10	<10	<10	<10	**870**	<10
SV-8	SUB-SLAB	3/31/2017	**1,100**	<10	<10	<10	<10	<10	**290**	<10
SV-9	SUB-SLAB	3/31/2017	**2,800**	<10	<10	<10	<10	**310**	**2,500**	<10
SV-10	SUB-SLAB	3/31/2017	**2,100**	<10	<10	<10	<10	**31,000**	**3,100**	**380**
SV-11	SUB-SLAB	3/31/2017	**6,300**	<10	<10	<10	<10	<10	**2,800**	<10
SV-12	SUB-SLAB	3/31/2017	**2,600**	<10	<10	<10	<10	<10	**3,400**	<10
SV-13	SUB-SLAB	3/31/2017	**180**	<10	<10	<10	<10	<10	**9,000**	<10
SV-14	SUB-SLAB	3/31/2017	**2,600**	<10	<10	<10	<10	<10	**610**	<10
PQL			10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
MTCA Method B Sub-Slab Screening Levels			321	12.3	NL	NL	9.33	3.62	1,520	5.21

Notes:
All values are presented in micrograms per cubic meter (µg/m³)
< = Not detected at the listed laboratory detection limits
PQL = Practical Quantification Limit (laboratory detection limit)
PCE = Tetrachloroethene
TCE = Trichloroethene
DCE = Dichloroethene
NL = Not Listed; no sub-slab screening levels have been established for this constituent/
Red Bold indicates the detected concentration exceeds Ecology MTCA Method B sub-slab screening level
Bold indicates the detected concentration is below Ecology MTCA Method B sub-slab screening levels