SOUTHERN PROPERTY BOUNDARY AREA SUPPLEMENTAL SOIL QUALITY INVESTIGATION

Former York Naval Ordnance Plant
1425 Eden Road, Springettsbury Township
York, Pennsylvania

August 2017

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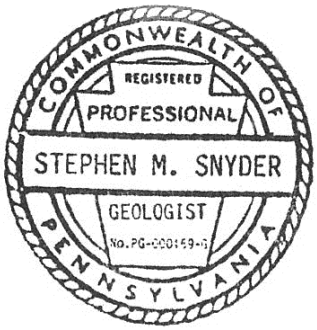

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Table of Contents

Table

Figures

Appendices

LIST OF ACRONYMS AND ABBREVIATIONS

%R	percent recoveries
µg/l	micrograms per liter
1,2-DCA	1,2-Dichloroethane
AMSL	above mean sea level
bgs	below ground surface
CCV	continuing calibration verification
COC	constituents of concern
DCA	1,1-Dichloroethane
DQO	data quality objective
Eichelbergers	Eichelbergers, Inc.
FSP	field sampling plan
fYNOP	former York Naval Ordnance Plant
GPS	global positioning system
GSC	Groundwater Sciences Corporation
Harley-Davidson	Harley-Davidson Motor Company Operations, Inc.
HASP	Health and Safety Plan
IS	internal standard
IDW	investigation-derived waste
LCL	lower control limit
LCS/LCSD	laboratory control sample / laboratory control sample duplicate
Langan	Langan Engineering and Environmental Services, Inc.
mg/kg	milligrams per kilogram
MIP	membrane interface probe
MSC	medium specific concentration
MS/MSD	matrix spike / matrix spike duplicate

PADEP	Pennsylvania Department of Environmental Protection
PCE	tetrachloroethene
PID	photoionization detector
ppm	part per million
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance / quality control
RAA	Remedial Alternatives Analysis
RRF	relative response factor
RSL	Regional Screening Level
SAIC	Science Applications International Corporation
SPBA	Southern Property Boundary Area
SRI	Supplemental Remedial Investigation
TCE	trichloroethene
UCL	upper control limit
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1 INTRODUCTION

This report presents the results of a supplemental soil quality investigation completed in the Southern Property Boundary Area (SPBA) at the former York Naval Ordnance Plant (fYNOP) located in York, Pennsylvania. The SPBA is an undeveloped area located in the southeast corner of the fYNOP Site that is bordered by residential properties to the east and south (**Figure 1**).

The purpose for the investigation was to address comment number 16 from the United States Environmental Protection Agency (USEPA) in a letter to Harley-Davidson Motor Company Operations, Inc. (Harley-Davidson) dated January 27, 2017 (USEPA, 2017a) on the Supplemental Remedial Investigation (SRI) Groundwater Report (Part 2) dated August 2016 (Groundwater Sciences Corporation [GSC], 2016) and the SRI Soil Report dated December 2009 (Science Applications International Corporation [SAIC], 2009). The Groundwater Report (Part 2) is in the process of being revised and finalized, and the Soil Report was approved by the USEPA and the Pennsylvania Department of Environmental Protection (PADEP) in 2010. USEPA comment number 16 in the January 27, 2017, letter stated the following:

> *"The Supplemental Remedial Investigations Soil Report, December 1, 2009, includes MIPs data from the SPBA (Table 3.4-2), and indicate TCE and PCE in some of the borings to a depth of 15 feet (still above the water table) with the highest detections at the deepest samples. There was apparently no follow up soil analytical work done, so there is no way to assess soil to groundwater or direct contact pathways. It appears there is at least an on-going source to groundwater based on groundwater data, so the lack of soil data represents a data gap. Further characterization should be conducted to quantify risks and to determine whether a soil remedy is needed either for direct contact or to address an ongoing source to groundwater."*

The fieldwork for the investigation was completed by GSC on March 27-30, 2017 following a work scope dated March 17, 2017 (GSC, 2017). The work scope was modified following submittal to increase the number of sample locations from four to five based on email comments from the USEPA on March 22, 2017 (USEPA, 2017b).

1.1 Background

Historical accounts indicate that liquid waste containing volatile organic compounds (VOCs) was used to control weeds and poured into active groundhog burrows as a method of extermination along the SPBA perimeter road. In addition, waste oils were reportedly used to reduce the dust on the perimeter road by the Navy.

1.1.1 Soil Quality

The following is a summary of the soil quality investigations completed in the SPBA:

- Backhoe Pits (1986) – Field screening did not detect any VOCs in the samples from three backhoe pit excavations located along the perimeter road. A sample of soil from the road surface at one of the locations had low detections of tetrachloroethene (PCE) and 1,1-Dichloroethane (DCA) at concentrations below the PADEP non-residential direct contact and soil to groundwater medium specific concentrations (MSCs).

- Active Soil Gas Sampling (1998) – Active soil gas samples were installed along the perimeter road and were field-evaluated using a photoionization detector (PID). The locations of the samples and the PID measurements are illustrated on **Figure 2**. No significantly elevated PID measurements were detected in the shallow soil gas samples, and therefore no indication of a specific location to search for an ongoing source to groundwater.

- Membrane Interface Probe (MIP) and Soil Vapor Sampling (2003) – The MIP/soil vapor samples were completed in the southeast corner of the property along the perimeter road, and the results are documented in the Draft Indoor Vapor Pathway Screening Assessment – Supplemental RI report dated March 2005 (Langan Engineering and Environmental Services, Inc. [Langan], 2005), and summarized in the SRI Soil Report dated December 2009 (SAIC, 2009). The MIP sample locations, depth intervals sampled and the gas chromatograph area count results for DCA, 1,2-Dichloroethane (1,2-DCA), PCE and trichloroethene (TCE) are illustrated on **Figure 3**. The highest MIP area counts were evident in borings SESB07 through SESB10 located in the southeast corner of the SPBA.

Although no MIP data was collected at SESB11, PCE was detected in soil vapor samples at that location, which increased in concentration with depth sampled.

1.1.2 Groundwater Quality

Previous investigations identified TCE and PCE as the primary constituents of concern (COCs) in groundwater in the SPBA. **Figure 4** shows locations of the monitoring wells in the SPBA and the analytical results of groundwater samples collected in 2015. The highest concentrations of PCE and TCE in groundwater were detected at wells located on the fYNOP Site (MW-64S, MW-64D, MW-161 and MW-162), which are coincident with some of the MIP locations that had the high area counts (SESB07, SESB08 and SESB09). As shown on the time versus groundwater concentration graphs for monitoring well couplet MW-64S/D (**Appendix A**), which include the most recent results from the October 2016 comprehensive groundwater sampling round, the PCE concentrations have been relatively consistent in these wells and the TCE concentrations have shown an overall declining trend since the wells were first sampled in late 1995.

1.1.3 Geology

Subsurface geologic conditions in the SPBA consist of residual soil overlying bedrock. The soil consists primarily of silt and clay, which was formed in place by weathering of the underlying bedrock. Bedrock consists of solution-prone (karst) carbonate bedrock (limestone and dolostone) and quarzitic sandstone and marble of the Vintage Formation (undivided). **Figure 1** shows the approximated location of the contact between the quartzite (denoted by the symbol Cah) and the carbonate rock (denoted by the symbol Cv). Structurally, this area occurs in a tight synclinal fold, with the older quartzite rocks wrapping around the west, north and east sides of the younger carbonate rocks. The synclinal fold plunges to the south.

1.1.4 Hydrogeology

The water table occurs in both the residual soil and bedrock and ranged in depth in the monitoring wells from approximately 30 to 60 feet below ground surface (bgs). The saturated thickness of the residual soil is variable, ranging from 0 to greater than 30 feet. The limestone and dolostone is a karstic carbonate aquifer with groundwater migrating through solution-enhanced discontinuities.

The hydraulic conductivity of the quarzitic sandstone is much lower than that of the carbonate rock. Groundwater in the quarzitic sandstone flows through discrete bedding plane partings, joints, and fractures, while the discontinuities in the carbonate aquifer have been enlarged by dissolution.

The lateral component of shallow groundwater flow is generally from north to south (**Figure 4**). However, the predominant direction of groundwater flow is vertical in response to a strong vertical gradient from the saturated residual soil downward into the underlying carbonate bedrock. Therefore, localized lateral flow within the shallow groundwater at and just below the water table is anticipated to be limited by the presence of this vertical downward gradient.

2 DATA QUALITY ASSESSMENT

A comprehensive quality assurance/quality control (QA/QC) program was followed during the supplemental soil investigation at the SPBA. The investigation consisted of the collection and analysis of soil samples at five locations (HD-SPBA-SB-006 through HD-SPBA-SB-010), which are herein after referred to as SB-006 through SB-010.

Soil samples and associated QA samples (i.e., equipment rinse blanks, field blanks, trip blanks, matrix spikes, and matrix spike duplicates) were analyzed for VOCs using approved methods specified in the Quality Assurance Project Plan (QAPP) (GSC, 2014).

GSC conducted a systematic review of 100 percent of the data for compliance with QC criteria using the Organic Data Review Checklist (Standard Validation) from SAIC Technical Procedure TP-DM-300-7 for data validation (300-7, Rev. 3, June 2009). The general criteria used to assess the analytical integrity of the data were based on an examination of the following:

1. Analytical holding times,
2. Method and project blanks,
3. Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) recoveries,
4. Matrix spike (MS) and matrix spike duplicate (MSD) recoveries and differences,
5. Analytical surrogate recoveries (organic methods),
6. Internal standard (IS) recoveries (organic methods),
7. Method calibrations (initial and continuing),
8. Sample reanalysis,
9. Secondary dilutions, and
10. Laboratory case narrative review and verification.

Data evaluation was accomplished by comparing the contents of the data packages and QA/QC results to requirements contained in the requested analytical methods. GSC evaluated QC data reported by the laboratory against required precision and accuracy limits established in Tables A-2 and A-3 of the QAPP (GSC, 2014).

Consistent with the data quality requirements as defined in the data quality objectives (DQOs), project data and associated QC data were evaluated on these categories and qualified according to the outcome of the review. During the review, laboratory-applied data qualifiers were evaluated, defined, and explained. During verification, individual sample results were qualified, as necessary, to designate usability of the data toward meeting project objectives. The qualifiers used are defined as follows:

U – The analyte was analyzed for, but was not detected above the reported sample quantitation limit. These results are qualitatively acceptable.

J – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample. Although estimated, these results are qualitatively acceptable.

UJ – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample. Although estimated, these results are qualitatively acceptable.

R – The analyte result was rejected due to serious deficiencies in the ability to analyze the sample and/or meet QC criteria. The presence or absence of the analyte cannot be verified.

Data qualifications were applied based on deviations from the measurement performance criteria identified in TP-DM-300-7.

A secondary stage of validation occurred after the initial validation for each discrete sampling event had been completed. Individual equipment rinse blanks, trip blanks, and field blanks were associated with the corresponding environmental samples. These field QC blanks were evaluated following the same criteria as method blanks, and the associated environmental samples were qualified accordingly.

The following sections summarize the laboratory chemical analysis program implemented as part of the soil sampling conducted in the SPBA. The project DQOs are summarized in the following

sections and include a discussion on precision, accuracy, bias, representativeness, comparability, and completeness, and sensitivity.

2.1 Precision

Precision was evaluated using the analysis of two types of QC samples: MS/MSD samples and LCS/LCSDs.

The first type of QC sample used to assess the data precision was the MS/MSD. MS/MSD percent recoveries (%R) were reviewed for the two samples that were project-sourced from SB-007 at a depth of 50-55 feet and from SB-009 at a depth of 45-45.5 feet. Except for two analytes with low recoveries and several analytes with high recoveries, percent recoveries were acceptable in these MS/MSDs. MS/MSD results are discussed further in Section 2.2.

The second type of QC sample used to assess the data precision was the LCS/LCSD sample. The soil samples from SB-006 required qualification for 1,1-dichloroethene, acrylonitrile, carbon disulfide, and trans-1,2-dichloroethene based on the LCS/LCSD results for these four VOCs. None of the other soil samples required qualification based on LCS/LCSD results.

A third type of QC sample, the field duplicate, can be used to evaluate precision in aqueous samples. However, due to the physical properties of soil aliquots, including the immiscibility of soil relative to aqueous samples, field duplicates were not collected.

In summary, no results were rejected due to unacceptable precision. Based on an evaluation of MS/MSD and LCS/LCSD results, the overall precision is acceptable. As a result, the laboratory DQO for precision was met.

2.2 Accuracy

Analytical accuracy was measured through the use of LCSs, ISs, surrogates, MS/MSDs, instrument performance checks, initial and continuing instrument calibration, serial dilutions, second column confirmation analysis, method and calibration blanks, and field QC blanks (i.e., trip blanks, field blanks, and equipment rinse blanks).

The first type of QC sample used to assess data accuracy was the LCS and/or LCSD sample. The LCS and/or LCSD percent recoveries were acceptable with the exception of low recoveries for the four VOCs noted in Section 2.1 that affected soil samples from soil boring SB-006. Consequently, results for those four analytes were qualified as estimated (UJ), although they were not detected in associated soil samples. High LCS/LCSD recoveries were reported for bromomethane, chloroethane, and carbon tetrachloride, although no qualification was necessary because those VOCs were not detected in the associated soil samples.

The second QC measure used to assess the accuracy of the data was the surrogate percent recovery for VOCs. Sample results were qualified as estimated (J/UJ) if the associated surrogate recovery was less than the lower control limit (LCL). Detected organic sample results were qualified as estimated (J) if the associated surrogate recovery was greater than the upper control limit (UCL). Non-detected organic sample results were qualified as rejected (R) if the associated surrogate recovery was less than 10 percent. All surrogate recoveries were within control limits.

ISs were added to calibration standards, environmental samples, and QC blanks in accordance with SW-846 Method 8260C for VOCs. All ISs for VOCs were within control limits in the data package that received full validation. This package contained soil sample results from SB-008 and SB-009.

MS/MSD analyses were another QC method used to assess data accuracy. Results from the native samples (SB-007, depth 50-55 feet and SB-009, depth 45-45.5 feet) were qualified (UJ) if the MS or MSD recoveries were outside the applicable recovery QC limits. This was the case for methyl isobutyl ketone and acrylonitrile where the MS recovery was less than the LCL, and for bromomethane, carbon tetrachloride and 1,1,1-trichloroethane where the MS or MSD recovery was greater than the UCL. No VOCs were detected in the native sample from SB-007.

Initial calibration of each instrument was completed in accordance with SW-846 Method 8260C requirements for all analyses. All initial calibration criteria were met. No data were qualified due to unacceptable initial calibrations.

Continuing calibration verification (CCV) of each instrument was completed in accordance with SW-846 Method 8260C requirements. Organic sample results were qualified as estimated (J/UJ) if the associated CCV was less than the LCL. Detected organic sample results were qualified as

estimated (J) and non-detected sample results were qualified as estimated (UJ) if the associated CCV was greater than the UCL. All of the 1,4-dioxane results in all data packages were rejected due to the relative response factor (RRF) being less than 0.01 for 1,4-dioxane.

Method blanks were analyzed with each batch of samples in accordance with SW-846 Method 8260C requirements. Methylene chloride was detected in method blanks from all analytical sample batches except for those from SB-006, at concentrations that might bias analytical results. Methylene chloride results in 45 samples were subsequently qualified as non-detect (U) due to method blank contamination.

Field QC blanks were collected to gauge the impacts from various components of field activities. Equipment rinse blanks and field blanks were used to evaluate potential cross-contamination of samples, to verify successful decontamination procedures, and to identify other potential sampling errors that can be introduced from sources other than the sample. Trip blanks were used to determine whether samples were contaminated during transit from the field to the laboratory, or during sample collection. Soil sample results associated with contaminants found in field QC blanks are considered non-detect (U) if they are at concentrations less than ten times the level in the associated blank for common laboratory contaminants (acetone and methylene chloride) and less than five times the level in the associated blank for other contaminants.

Acetone was detected in both equipment rinse blanks and in both field blanks that were collected, but was not detected in any associated soil sample. Associated sample detections less than ten times the blank results would otherwise be qualified as non-detect (U) for acetone.

Acetone was detected in one of five trip blanks but was not detected in any associated soil sample. Associated sample detections less than ten times the blank results would otherwise be qualified as non-detect (U) for acetone. Methylene chloride was detected in one of five trip blanks; however, it was also detected in the associated method blank. Therefore, detections of methylene chloride in the associated soil samples were qualified based on the method blanks results.

Overall analytical accuracy was measured through the use of calibration standards (initial and continuing), surrogates, instrument performance checks, MS/MSDs, LCSs, serial dilutions, method blanks and calibration standards. Supporting QC information cited above was qualitatively

evaluated with respect to the analytical accuracy DQO. All 54 data points for 1,4-dioxane were rejected due to unacceptable accuracy. Based on the evaluation of the initial and continuing calibration, surrogate, MS/MSD, LCS, serial dilution, and method blank results, the laboratory accuracy has been determined to be acceptable for all other analyses. The analytical DQO for accuracy has been met except as noted.

Based on an evaluation of the VOCs detected in the field QC blanks, overall field accuracy is acceptable. As a result, the field DQO for accuracy has been fulfilled.

2.3 Bias

Bias is the systematic or persistent distortion of a measurement process causing errors in one direction. Analytical bias was evaluated by analysis of LCS/LCSD and MS/MSD samples. The laboratory performed a LCS/LCSD or MS/MSD for each analytical batch, as appropriate.

Acceptance criteria for LCS/LCSD and MS/MSD measurements are expressed as a percent recovery and are specified in the analytical method and in the QAPP (GSC, 2014). Various blank samples (such as laboratory method blanks and field equipment rinse blanks) were used to assess contamination of samples that may bias results high. These results are discussed in Sections 2.1 and 2.2.

2.4 Representativeness

Representativeness was satisfied by verifying that the QAPP (GSC, 2014) was properly followed, that proper sampling techniques were used, that proper analytical procedures were followed, and that analytical holding times of the samples were not exceeded. No samples were analyzed outside the VOC method required holding time and no results were qualified as estimated (J/UJ) due to missed holding times. Holding times exceeding more than two times the method required holding time are rejected (R) for non-detects and estimated (J) for detects. No sample results were rejected due to missed holding times. Based on an evaluation of sample precision and accuracy, the samples collected during soil sampling in the SPBA are considered to be representative of the environmental conditions.

2.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another data set measuring the same property. Comparability is achieved through the use of established and approved sample collection techniques and analytical methods, consistency in the basis of analysis (wet weight vs. dry weight, volume vs. mass, etc.), consistency in reporting units, and analysis of standard reference materials.

Data comparability is achieved by using standard units of measure. The use of EPA-approved methods to collect and analyze samples, along with instruments calibrated against Standard Analytical Reference Materials, which are National Institute for Standards and Technology-traceable standards, also aids comparability.

Based on the precision and accuracy assessment presented above and the use of EPA-approved methods, the data collected during soil sampling in the SPBA are considered to be comparable to data collected using similar EPA-approved methods.

2.6 Completeness

Completeness measures the quantity of valid data generated from the laboratory analysis and sampling processes. For data to be valid, all acceptance criteria must be fulfilled, including accuracy and precision, as well as other criteria specified by the analytical methods used for analytical data to be usable, each data point must be validated satisfactorily. Results of the soil sampling in the SPBA that have been qualified for completeness reasons have limited impact on the data quality. The DQOs were set at 90 percent for the field sampling and laboratory completeness. Based on the evaluation of the field and laboratory QC results, the data exceeded 90 percent completeness and were used in assessing results and providing recommendations.

Results that have been qualified “U”, “UJ” or “J” for various reasons encountered minor analytical problems, with limited impact on the data quality. Results for 1,4-dioxane in all of the soil samples were rejected (qualified “R”) due to the RRF in the initial and continuing calibrations being less than 0.01.

2.7 Sensitivity

Sensitivity requirements were provided as minimum required reporting limits in the QAPP (GSC, 2014). All reporting limit criteria were met and none of the samples required dilution due to matrix interferences or elevated target compounds. Reporting limits have been determined to be acceptable for all analyses. The analytical DQO for sensitivity has been met.

3 INVESTIGATION ACTIVITIES

In late March 2017, the investigation fieldwork was completed, which consisted of the collection of soil samples from five soil borings located along the perimeter road (SB-006 through SB-010). As shown on **Figure 5,** SB-006, SB-007 and SB-008 are located adjacent to the southernmost fYNOP property boundary in the SPBA, and SB-009 and SB-010 are located adjacent to the easternmost fYNOP property boundary directly north-northeast of SB-006, SB-007 and SB-008. The investigation was completed following the Health and Safety Plan (HASP) for Site Investigation and Remedial Activities (GSC, 2012). A description of the investigation is provided in the following subsections.

3.1 Utility Pre-Clearance

Utility clearance notification was completed by Eichelbergers, Inc. (Eichelbergers) through the Pennsylvania One Call System on March 20, 2017. The soil boring locations were marked with paint on the ground surface by GSC on March 23, 2017, and the locations were reviewed and approved by Harley-Davidson, in accordance with the Harley-Davidson "Subsurface Protocol and Utility Clearance, Work Instruction (WI) YS2.03.300". In addition, the borings were manually-cleared using a clean stainless steel bucket auger for unmarked underground utilities to a depth of approximately five feet bgs prior to drilling.

3.2 Soil Boring Installations and Sampling

The soil borings were completed by Eichelbergers under the oversight of GSC on March 27-30, 2017. Continuous soil sampling was performed using a clean stainless steel bucket auger from the ground surface to a depth of five feet bgs, and using the direct push drill rig with a dual-tube sampling system from five feet bgs to the total depth of the borings. Down-hole tools used for the sampling were decontaminated following the procedures in the QAPP (GSC, 2014).

Soil samples were logged in the field by a GSC scientist for texture, color, moisture content, etc., and were inspected for signs of contamination (odors and discoloration) and screened with a PID for total VOCs.

A total of 54 discrete soil samples were collected from the borings using a Terra Core™ disposable soil sampling tool. One sample was collected from each of the borings between a depth of 0-2 feet bgs to assess the direct contact pathway for surface soil. Samples were also collected at 5-foot depth intervals starting at a depth of 5 feet bgs to the bottom of the borings (i.e., 5-10 feet bgs, 10-15 feet bgs, etc.) to assess the soil to groundwater pathway for subsurface soil. Samples for submittal to the laboratory for analysis were selected from a 0.5-foot long depth interval within each of the target sample depth intervals based on the field screening results. Detailed information on the soil samples is provided in Section 4 of this report (e.g., number of samples per boring, sample intervals/depths, etc.).

QC samples were collected in accordance with the QAPP (GSC, 2014) as discussed in Section 2 of this report, which consisted of the following:

- Two equipment rinse blanks
- Two field blanks
- Six trip blanks
- Two MS/MSD samples (i.e., SB-007 at a depth of 50-55 feet bgs and from SB-009 at a depth of 45-45.5 feet bgs)

3.3 Laboratory Analyses

The samples were stored in coolers on ice, and shipped by GSC to TestAmerica Laboratories, Inc. of Pittsburgh, Pennsylvania (TestAmerica Pittsburgh) via Federal Express overnight delivery for analysis of VOCs in accordance with SW-846 Method 8260C.

3.4 Soil Boring Gauging and Abandonment

The open boreholes were gauged for total depth and the presence of groundwater following the completion of the sampling and the removal of the sampling tools from the subsurface. The open boreholes were then filled with bentonite hole plug to a depth of approximately 5 feet bgs. Discarded soil from the sampling of the borings was used to fill in the remainder of the open boreholes and ruts in the ground surface from the drill rig.

3.5 Investigation-Derived Waste Management

Investigation-derived waste (IDW) produced by drilling and sampling activities was handled in accordance with subsection 4.2.5 of the field sampling plan (FSP).

4 INVESTIGATION FINDINGS

The results of the supplemental soil investigation are described in the following subsections.

4.1 Soil Boring Locations

The geographic coordinates of each of the soil borings were determined in the field by GSC using a handheld Trimble GeoXT global positioning system (GPS), which had an accuracy of +/- 2 feet. The locations of the borings are illustrated on **Figure 5**, and the GPS coordinates (northings and eastings) are included on the logs in **Appendix B**.

Ground surface elevations at each of the borings were estimated by GSC based on a comparison of the boring locations to available topographic information shown on **Figure 2**. The elevations at borings SB-006 through SB-009 ranged from approximately 413 to 418 feet above mean sea level (AMSL). The ground surface elevation at SB-010 (432 feet AMSL), which was located up a relatively steep slope to the north-northeast of the other borings along the eastern perimeter road, was up to 19 feet higher than the other borings.

As shown on **Figure 5**, borings SB-006, SB-007 and SB-008 are mapped as being underlain by carbonate bedrock (limestone and dolostone), and SB-009 and SB-010 are mapped as being underlain by quarzitic sandstone bedrock.

4.2 Description of Soil Borings

The soil borings ranged in total depth from approximately 44 feet bgs at SB-006 to 68 feet bgs at SB-009. Due to differences in the total depth of the borings and their ground surface elevations, the elevations of the bottom of the borings varied by up to 27 feet from a low of approximately 350 feet AMSL at SB-009 to a high of 377 feet AMSL at SB-010.

Sampling at soil borings SB-006 and SB-007 was discontinued after intercepting water-saturated soil that generally coincided with the depth to groundwater measured in nearby monitoring wells (see detailed description below). Sampling at SB-008, SB-009 and SB-010 was discontinued when refusal was encountered in soil by the direct-push drill rig. Bedrock was not penetrated or characterized during the investigation.

Unconsolidated material encountered in the borings was described as soil consisting of predominately fine-grained silty clay with lesser amounts of coarse-grained sand and gravel. Quartzite cobbles and thin sand and gravel layers were observed in the borings; however, they were uncommon and only comprised a minor component of the soil.

As shown on logs in **Appendix B**, water-saturated soil were observed during sampling at each of the borings. Notable observations include the following:

- The approximate elevation of water-saturated soil at SB-006 (370.50 feet AMSL) appeared to be lower than the groundwater elevation at MW-162 (372.43 feet AMSL). MW-162 is located approximately 20 feet to the south of SB-006, and has a screen length of 10 feet that extends from 370.40-360.40 feet AMSL (**Figure 5**).
- Water-saturated soil was encountered at SB-008 at elevations of approximately 372 feet AMSL and approximately 366 feet AMSL, which are lower than the bottom of monitoring well MW-64S (dry to the bottom of its screened interval at 371.00 feet AMSL), and higher than the groundwater elevations measured at MW-161 (355.17 feet AMSL) and MW-64D (355.43 feet AMSL).
- Standing water was measured in each of the borings following the completion of the sampling and the removal of the sampling tools from the subsurface (see descriptions on the logs in **Appendix B**). Approximately 54.5 feet of standing water were measured in the bottom of the open borehole for SB-009 prior to its abandonment on March 30, 2017 (i.e., the water level elevation was approximately 404.50 feet AMSL). This observation indicates artesian conditions exist at this location because there was no surface water infiltration into the borehole and water-saturated soil was not encountered in the boring above an elevation of 368 feet AMSL.

4.3 Field Screening Results

Soil sample field screening results are provided on the soil boring logs in **Appendix B**. No indications of apparent contamination were noted based on the field inspection of the soil samples (odors or staining). No elevated PID head space soil screening measurements above one part per million (ppm) were detected in the samples from SB-007, SB-008 and SB-010, and the screening indicated low total VOC measurements in the following samples from SB-006 and SB-009:

- SB-006 – 26.6 ppm at 0.5-1 feet bgs, 3.3 ppm at 1-1.5 feet bgs and 3.8 ppm at 1.5-2 feet bgs. No elevated PID measurements were detected below a depth of 2 feet bgs.
- SB-009 – 2.1 ppm at 53.5-54 feet bgs and 1.1 to 2.8 ppm at 56-60 feet bgs. No other elevated PID measurements were detected in the soil at SB-009.

4.4 Laboratory Analysis Results

Copies of the laboratory analytical reports for the soil samples are included in **Appendix C**. A tabulated summary of the VOC analytical results for the soil samples and regulatory standards are presented on **Table 1**. The PADEP non-residential direct contact and soil to groundwater MSCs were used for the comparison to the soil sample results. USEPA's health-based Regional Screening Levels (RSLs) for industrial soil are provided on **Table 1** for reference purposes.

The analytical results indicate detections of VOCs in soil samples from each of the borings, which consisted of PCE (0.0011J to 0.071 milligrams per kilogram [mg/kg]), TCE (0.0013J to 0.240 mg/kg) and trace concentrations of methylene chloride (0.00069J to 0.0028J mg/kg). However, the detected concentrations were relatively low and do not exceed the PADEP MSCs.

Soil sample analytical results for PCE and TCE, which are the primary COCs in SPBA groundwater, are posted next to the boring locations on **Figure 5**. PCE and TCE were not detected in samples from any of the borings at depths of 20 feet bgs or less. At SB-006, only estimated "J" values of PCE were detected (no TCE), and SB-007 showed no detections of PCE and TCE.

The highest detected PCE and TCE concentrations were detected in the three easternmost borings (SB-008, SB-009 and SB-010). The highest PCE concentration was 0.071 mg/kg at a depth of 45-45.5 feet bgs at SB-010, and the highest TCE concentration was 0.240 mg/kg at a depth of 53.5-54 feet bgs at SB-009. All of the PCE and TCE detections were less than the PADEP soil to groundwater MSCs of 0.500 mg/kg for both of these compounds (**Table 1**).

5 SUMMARY AND CONCLUSIONS

The supplemental investigation consisted of soil sampling at five borings located in the southeast corner of the SPBA and laboratory analysis of 54 soil samples from the borings for VOCs to further evaluate whether there is soil contamination that is an ongoing source to the known VOC impacts in groundwater.

Consistent with previous investigations at the SPBA, soil in the borings consisted of predominately fine-grained silty clay with lesser amounts of coarse-grained sand and gravel. Water saturated soil was observed at depth in the borings. Approximately 54.5 feet of standing water was measured in the bottom of the open borehole at SB-009 prior to its abandonment on March 30, 2017, which indicates artesian conditions exist at this location.

Soil contamination was not apparent in the borings based on the field inspection of soil samples (odors or staining), and low PID head space soil screening measurements were limited to SB-006 (26.6 ppm or less from 0-2 feet bgs) and SB-009 (2.8 ppm or less from 53.5-60 feet bgs).

A comprehensive QA/QC review of the soil sample analytical data was performed and individual sample results were qualified, as necessary. The soil sample analytical results indicated trace concentrations of methylene chloride, and detections of PCE and TCE at depths equal to or greater than 20 feet bgs in four of the five borings, at relatively low concentrations that do not exceed the PADEP MSCs.

Based on the sampling and analysis results of this investigation, both the soil direct contact and soil to groundwater pathways are incomplete. In addition, the investigation did not identify significant VOC impacts in residual soil, and further eliminated areas of potential continuing sources of the PCE and TCE in groundwater at the SPBA. The results of this investigation will be incorporated into the Part 2 Remedial Alternatives Analysis (RAA) and the SRI Groundwater Report (Part 2).

6 REFERENCES

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Table

Table 1
Soils Data Summary - South Property Boundry Area (SPBA)
Former York Naval Ordnance Plant - York, PA

Location/ID Depth (ft.) Sample Date Parameter	MSC Soil to GW Used Aquifer (mg/kg)	MSC Direct Contact 0 - 2 ft (mg/kg)	MSC Direct Contact 2 - 15 ft (mg/kg)	EPA RSL Industrial Soil (mg/kg)	HD-SPBA-SB-006 0 - 1 3/27/17	HD-SPBA-SB-006 5 - 5.5 3/27/17	HD-SPBA-SB-006 10 - 10.5 3/27/17	HD-SPBA-SB-006 15 - 15.5 3/27/17	HD-SPBA-SB-006 20 - 20.5 3/27/17	HD-SPBA-SB-006 25 - 25.5 3/27/17	HD-SPBA-SB-006 30 - 30.5 3/27/17	HD-SPBA-SB-006 35 - 35.5 3/27/17
Volatile Organic Compound												
1,1,1,2-Tetrachloroethane	18	300	340	8.8	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
1,1,1-Trichloroethane	20	10000	10000	36000	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
1,1,2,2-Tetrachloroethane	0.43	38	44	2.7	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
1,1,2-Trichloroethane	0.5	16	18	5	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
1,1-Dichloroethane	16	1400	1600	16	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
1,1-Dichloroethene	0.7	10000	10000	1000	0.0058 UJ	0.0052 UJ	0.0046 UJ	0.0041 UJ	0.0049 UJ	0.0045 UJ	0.0036 UJ	0.0039 UJ
1,2-Dibromoethane	0.005	3.7	4.3	0.16	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
1,2-Dichloroethane	0.5	86	98	2	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
1,2-Dichloropropane	0.5	220	260	4.4	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
1,4-Dioxane	3.2	3200	190000	24	1.2 R	1 R	0.91 R	0.81 R	0.98 R	0.9 R	0.72 R	0.78 R
2-Butanone	400	1200	1400	190000	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
2-Hexanone	26	79	91	1300	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
4-Methyl-2-Pentanone	930	1.6	1.8	140000	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Acetone	10000	10000	10000	670000	0.023 U	0.021 U	0.018 U	0.016 U	0.02 U	0.018 U	0.014 U	0.016 U
Acrylonitrile	0.37	33	38	1.1	0.058 U	0.052 U	0.046 U	0.041 U	0.049 U	0.045 U	0.036 U	0.039 U
Benzene	0.5	290	330	5.1	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Bromochloromethane	9	3200	3600	630	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Bromodichloromethane	8	60	69	1.3	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Bromoform	8	2000	2300	86	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Bromomethane	1	400	460	30	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Carbon Disulfide	620	10000	10000	3500	0.0058 UJ	0.0052 UJ	0.0046 UJ	0.0041 UJ	0.0049 UJ	0.0045 UJ	0.0036 UJ	0.0039 UJ
Carbon Tetrachloride	0.5	370	430	2.9	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Chlorobenzene	10	4000	4600	1300	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Chlorodibromomethane	8	82	95	39	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Chloroethane	120	10000	10000	57000	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Chloroform	8	97	110	1.4	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Chloromethane	3	1600	1800	460	0.0058 UJ	0.0052 UJ	0.0046 UJ	0.0041 UJ	0.0049 UJ	0.0045 UJ	0.0036 UJ	0.0039 UJ
cis-1,2-Dichloroethene	7	6400	10000	2300	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
cis-1,3-Dichloropropene	3.4	560	640	8.2	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Ethylbenzene	70	640	730	25	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Methyl tert-butyl ether	2	3200	3600	210	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Methylene chloride	0.5	10000	10000	1000	0.0023 J	0.0028 J	0.0046 UJ	0.0041 UJ	0.0018 J	0.0019 J	0.0012 J	0.00069 J
Styrene	24	10000	10000	35000	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Tetrachloroethene	0.5	3200	3600	100	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0012 J	0.0045 U	0.0011 J	0.0014 J
Toluene	100	10000	10000	47000	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
trans-1,2-Dichloroethene	10	4800	5500	23000	0.0058 UJ	0.0052 UJ	0.0046 UJ	0.0041 UJ	0.0049 UJ	0.0045 UJ	0.0036 UJ	0.0039 UJ
trans-1,3-Dichloropropene	3.4	560	640	8.2	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Trichloroethene	0.5	160	180	6	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Vinyl Chloride	0.2	61	280	1.7	0.0058 U	0.0052 U	0.0046 U	0.0041 U	0.0049 U	0.0045 U	0.0036 U	0.0039 U
Xylenes (Total)	1000	8000	9100	2500	0.012 U	0.01 U	0.0091 U	0.0081 U	0.0098 U	0.009 U	0.0072 U	0.0078 U

U = Not detected. J = Organics; estimated. UJ = Not detected above the reported approximate sample quantitation limit. R = Data rejected.
Samples analyzed by TestAmerica Laboratories, Inc. of Pittsburgh, Pennsylvania

Table 1
Soils Data Summary - South Property Boundry Area (SPBA)
Former York Naval Ordnance Plant - York, PA

Location/ID Depth (ft.) Sample Date Parameter	MSC Soil to GW Used Aquifer (mg/kg)	MSC Direct Contact 0 - 2 ft (mg/kg)	MSC Direct Contact 2 - 15 ft (mg/kg)	EPA RSL Industrial Soil (mg/kg)	HD-SPBA-SB-006 40 - 40.5 3/27/17	HD-SPBA-SB-007 0.5 - 1 3/28/17	HD-SPBA-SB-007 5 - 5.5 3/28/17	HD-SPBA-SB-007 10 - 10.5 3/28/17	HD-SPBA-SB-007 15 - 15.5 3/28/17	HD-SPBA-SB-007 20 - 20.5 3/28/17	HD-SPBA-SB-007 25 - 25.5 3/28/17	HD-SPBA-SB-007 30 - 30.5 3/28/17
Volatile Organic Compound												
1,1,1,2-Tetrachloroethane	18	300	340	8.8	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
1,1,1-Trichloroethane	20	10000	10000	36000	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
1,1,2,2-Tetrachloroethane	0.43	38	44	2.7	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
1,1,2-Trichloroethane	0.5	16	18	5	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
1,1-Dichloroethane	16	1400	1600	16	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
1,1-Dichloroethene	0.7	10000	10000	1000	0.0043 UJ	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
1,2-Dibromoethane	0.005	3.7	4.3	0.16	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
1,2-Dichloroethane	0.5	86	98	2	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
1,2-Dichloropropane	0.5	220	260	4.4	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
1,4-Dioxane	3.2	3200	190000	24	0.87 R	1 R	0.94 R	0.97 R	0.81 R	0.88 R	0.9 R	0.82 R
2-Butanone	400	1200	1400	190000	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
2-Hexanone	26	79	91	1300	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
4-Methyl-2-Pentanone	930	1.6	1.8	140000	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Acetone	10000	10000	10000	670000	0.019	0.02 U	0.019 U	0.019 U	0.016 U	0.018 U	0.018 U	0.016 U
Acrylonitrile	0.37	33	38	1.1	0.043 U	0.051 U	0.047 U	0.048 U	0.041 U	0.044 U	0.045 U	0.041 U
Benzene	0.5	290	330	5.1	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Bromochloromethane	9	3200	3600	630	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Bromodichloromethane	8	60	69	1.3	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Bromoform	8	2000	2300	86	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Bromomethane	1	400	460	30	0.0043 U	0.0051 UJ	0.0047 UJ	0.0048 UJ	0.0041 UJ	0.0044 UJ	0.0045 UJ	0.0041 UJ
Carbon Disulfide	620	10000	10000	3500	0.0043 UJ	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Carbon Tetrachloride	0.5	370	430	2.9	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Chlorobenzene	10	4000	4600	1300	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Chlorodibromomethane	8	82	95	39	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Chloroethane	120	10000	10000	57000	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Chloroform	8	97	110	1.4	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Chloromethane	3	1600	1800	460	0.0043 UJ	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
cis-1,2-Dichloroethene	7	6400	10000	2300	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
cis-1,3-Dichloropropene	3.4	560	640	8.2	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Ethylbenzene	70	640	730	25	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Methyl tert-butyl ether	2	3200	3600	210	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Methylene chloride	0.5	10000	10000	1000	0.0013 J	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Styrene	24	10000	10000	35000	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Tetrachloroethene	0.5	3200	3600	100	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Toluene	100	10000	10000	47000	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
trans-1,2-Dichloroethene	10	4800	5500	23000	0.0043 UJ	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
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Trichloroethene	0.5	160	180	6	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Vinyl Chloride	0.2	61	280	1.7	0.0043 U	0.0051 U	0.0047 U	0.0048 U	0.0041 U	0.0044 U	0.0045 U	0.0041 U
Xylenes (Total)	1000	8000	9100	2500	0.0087 U	0.01 U	0.0094 U	0.0097 U	0.0081 U	0.0088 U	0.009 U	0.0082 U

U = Not detected. J = Organics; estimated. UJ = Not detected above the reported approximate sample quantitation limit. R = Data rejected.
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Volatile Organic Compound												
1,1,1,2-Tetrachloroethane	18	300	340	8.8	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
1,1,1-Trichloroethane	20	10000	10000	36000	0.0051 U	0.0049 U	0.0043 UJ	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
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1,1,2-Trichloroethane	0.5	16	18	5	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
1,1-Dichloroethane	16	1400	1600	16	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
1,1-Dichloroethene	0.7	10000	10000	1000	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
1,2-Dibromoethane	0.005	3.7	4.3	0.16	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
1,2-Dichloroethane	0.5	86	98	2	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
1,2-Dichloropropane	0.5	220	260	4.4	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
1,4-Dioxane	3.2	3200	190000	24	1 R	0.97 R	0.87 R	0.95 R	0.85 R	0.87 R	1 R	0.79 R
2-Butanone	400	1200	1400	190000	0.0051 U	0.0049 U	0.0043 UJ	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
2-Hexanone	26	79	91	1300	0.0051 U	0.0049 U	0.0043 UJ	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
4-Methyl-2-Pentanone	930	1.6	1.8	140000	0.0051 U	0.0049 U	0.0043 UJ	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Acetone	10000	10000	10000	670000	0.021 U	0.019 U	0.017 UJ	0.019 U	0.017 U	0.017 U	0.021 U	0.016 U
Acrylonitrile	0.37	33	38	1.1	0.051 U	0.049 U	0.043 UJ	0.047 U	0.043 U	0.044 U	0.052 U	0.04 U
Benzene	0.5	290	330	5.1	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Bromochloromethane	9	3200	3600	630	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Bromodichloromethane	8	60	69	1.3	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Bromoform	8	2000	2300	86	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Bromomethane	1	400	460	30	0.0051 UJ	0.0049 UJ	0.0043 UJ	0.0047 UJ	0.0043 UJ	0.0044 UJ	0.0052 UJ	0.004 UJ
Carbon Disulfide	620	10000	10000	3500	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Carbon Tetrachloride	0.5	370	430	2.9	0.0051 U	0.0049 U	0.0043 UJ	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Chlorobenzene	10	4000	4600	1300	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Chlorodibromomethane	8	82	95	39	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Chloroethane	120	10000	10000	57000	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Chloroform	8	97	110	1.4	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Chloromethane	3	1600	1800	460	0.0051 U	0.0049 U	0.0043 U	0.0047 UJ	0.0043 UJ	0.0044 UJ	0.0052 UJ	0.004 UJ
cis-1,2-Dichloroethene	7	6400	10000	2300	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
cis-1,3-Dichloropropene	3.4	560	640	8.2	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Ethylbenzene	70	640	730	25	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Methyl tert-butyl ether	2	3200	3600	210	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Methylene chloride	0.5	10000	10000	1000	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Styrene	24	10000	10000	35000	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Tetrachloroethene	0.5	3200	3600	100	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Toluene	100	10000	10000	47000	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
trans-1,2-Dichloroethene	10	4800	5500	23000	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
trans-1,3-Dichloropropene	3.4	560	640	8.2	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Trichloroethene	0.5	160	180	6	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Vinyl Chloride	0.2	61	280	1.7	0.0051 U	0.0049 U	0.0043 U	0.0047 U	0.0043 U	0.0044 U	0.0052 U	0.004 U
Xylenes (Total)	1000	8000	9100	2500	0.01 U	0.0097 U	0.0087 U	0.0095 U	0.0085 U	0.0087 U	0.01 U	0.0079 U

U = Not detected. J = Organics; estimated. UJ = Not detected above the reported approximate sample quantitation limit. R = Data rejected.
Samples analyzed by TestAmerica Laboratories, Inc. of Pittsburgh, Pennsylvania

Table 1
Soils Data Summary - South Property Boundry Area (SPBA)
Former York Naval Ordnance Plant - York, PA

Location/ID Depth (ft.) Sample Date Parameter	MSC Soil to GW Used Aquifer (mg/kg)	MSC Direct Contact 0 - 2 ft (mg/kg)	MSC Direct Contact 2 - 15 ft (mg/kg)	EPA RSL Industrial Soil (mg/kg)	HD-SPBA-SB-008 25 - 25.5 3/29/17	HD-SPBA-SB-008 30 - 30.5 3/29/17	HD-SPBA-SB-008 35 - 35.5 3/29/17	HD-SPBA-SB-008 40 - 40.5 3/29/17	HD-SPBA-SB-008 45 - 45.5 3/29/17	HD-SPBA-SB-009 0.5 - 1 3/29/17	HD-SPBA-SB-009 5 - 5.5 3/29/17	HD-SPBA-SB-009 10 - 10.5 3/29/17
Volatile Organic Compound												
1,1,1,2-Tetrachloroethane	18	300	340	8.8	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
1,1,1-Trichloroethane	20	10000	10000	36000	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
1,1,2,2-Tetrachloroethane	0.43	38	44	2.7	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
1,1,2-Trichloroethane	0.5	16	18	5	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
1,1-Dichloroethane	16	1400	1600	16	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
1,1-Dichloroethene	0.7	10000	10000	1000	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
1,2-Dibromoethane	0.005	3.7	4.3	0.16	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
1,2-Dichloroethane	0.5	86	98	2	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
1,2-Dichloropropane	0.5	220	260	4.4	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
1,4-Dioxane	3.2	3200	190000	24	1.1 R	0.83 R	1.1 R	1 R	0.96 R	1 R	1 R	0.99 R
2-Butanone	400	1200	1400	190000	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
2-Hexanone	26	79	91	1300	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
4-Methyl-2-Pentanone	930	1.6	1.8	140000	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Acetone	10000	10000	10000	670000	0.021 U	0.017 U	0.021 U	0.021 U	0.019 U	0.021 U	0.02 U	0.02 U
Acrylonitrile	0.37	33	38	1.1	0.053 U	0.042 U	0.053 U	0.052 U	0.048 U	0.051 U	0.05 U	0.049 U
Benzene	0.5	290	330	5.1	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Bromochloromethane	9	3200	3600	630	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Bromodichloromethane	8	60	69	1.3	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Bromoform	8	2000	2300	86	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Bromomethane	1	400	460	30	0.0053 UJ	0.0042 UJ	0.0053 UJ	0.0052 UJ	0.0048 UJ	0.0051 UJ	0.005 UJ	0.0049 UJ
Carbon Disulfide	620	10000	10000	3500	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Carbon Tetrachloride	0.5	370	430	2.9	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Chlorobenzene	10	4000	4600	1300	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Chlorodibromomethane	8	82	95	39	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Chloroethane	120	10000	10000	57000	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Chloroform	8	97	110	1.4	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Chloromethane	3	1600	1800	460	0.0053 UJ	0.0042 UJ	0.0053 UJ	0.0052 UJ	0.0048 UJ	0.0051 UJ	0.005 UJ	0.0049 UJ
cis-1,2-Dichloroethene	7	6400	10000	2300	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
cis-1,3-Dichloropropene	3.4	560	640	8.2	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Ethylbenzene	70	640	730	25	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Methyl tert-butyl ether	2	3200	3600	210	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Methylene chloride	0.5	10000	10000	1000	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0053 U	0.005 U	0.0049 U
Styrene	24	10000	10000	35000	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Tetrachloroethene	0.5	3200	3600	100	0.0053 U	0.0042 U	0.0013 J	0.0035 J	0.013	0.0051 U	0.005 U	0.0049 U
Toluene	100	10000	10000	47000	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
trans-1,2-Dichloroethene	10	4800	5500	23000	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
trans-1,3-Dichloropropene	3.4	560	640	8.2	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Trichloroethene	0.5	160	180	6	0.0053 U	0.0013 J	0.0023 J	0.0074	0.04	0.0051 U	0.005 U	0.0049 U
Vinyl Chloride	0.2	61	280	1.7	0.0053 U	0.0042 U	0.0053 U	0.0052 U	0.0048 U	0.0051 U	0.005 U	0.0049 U
Xylenes (Total)	1000	8000	9100	2500	0.011 U	0.0083 U	0.011 U	0.01 U	0.0096 U	0.01 U	0.01 U	0.0099 U

U = Not detected. J = Organics; estimated. UJ = Not detected above the reported approximate sample quantitation limit. R = Data rejected.
Samples analyzed by TestAmerica Laboratories, Inc. of Pittsburgh, Pennsylvania

Table 1
Soils Data Summary - South Property Boundry Area (SPBA)
Former York Naval Ordnance Plant - York, PA

Location/ID Depth (ft.) Sample Date Parameter	MSC Soil to GW Used Aquifer (mg/kg)	MSC Direct Contact 0 - 2 ft (mg/kg)	MSC Direct Contact 2 - 15 ft (mg/kg)	EPA RSL Industrial Soil (mg/kg)	HD-SPBA-SB-009 15 - 15.5 3/29/17	HD-SPBA-SB-009 20 - 20.5 3/29/17	HD-SPBA-SB-009 25 - 25.5 3/29/17	HD-SPBA-SB-009 30 - 30.5 3/30/17	HD-SPBA-SB-009 35 - 35.5 3/30/17	HD-SPBA-SB-009 40 - 40.5 3/30/17	HD-SPBA-SB-009 45 - 45.5 3/30/17	HD-SPBA-SB-009 53.5 - 54 3/30/17
Volatile Organic Compound												
1,1,1,2-Tetrachloroethane	18	300	340	8.8	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
1,1,1-Trichloroethane	20	10000	10000	36000	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 UJ	0.0049 U
1,1,2,2-Tetrachloroethane	0.43	38	44	2.7	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 UJ	0.0049 U
1,1,2-Trichloroethane	0.5	16	18	5	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
1,1-Dichloroethane	16	1400	1600	16	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
1,1-Dichloroethene	0.7	10000	10000	1000	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
1,2-Dibromoethane	0.005	3.7	4.3	0.16	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
1,2-Dichloroethane	0.5	86	98	2	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
1,2-Dichloropropane	0.5	220	260	4.4	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
1,4-Dioxane	3.2	3200	190000	24	0.81 R	0.86 R	0.9 R	1 R	0.91 R	0.93 R	1 R	0.98 R
2-Butanone	400	1200	1400	190000	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 UJ	0.0049 U
2-Hexanone	26	79	91	1300	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 UJ	0.0049 U
4-Methyl-2-Pentanone	930	1.6	1.8	140000	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 UJ	0.0049 U
Acetone	10000	10000	10000	670000	0.016 U	0.017 U	0.018 U	0.02 U	0.018 U	0.019 U	0.02 UJ	0.02 U
Acrylonitrile	0.37	33	38	1.1	0.041 U	0.043 U	0.045 U	0.051 U	0.046 U	0.046 U	0.051 UJ	0.049 U
Benzene	0.5	290	330	5.1	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Bromochloromethane	9	3200	3600	630	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Bromodichloromethane	8	60	69	1.3	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Bromoform	8	2000	2300	86	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Bromomethane	1	400	460	30	0.0041 UJ	0.0043 UJ	0.0045 UJ	0.0051 UJ	0.0046 UJ	0.0046 UJ	0.0051 UJ	0.0049 UJ
Carbon Disulfide	620	10000	10000	3500	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Carbon Tetrachloride	0.5	370	430	2.9	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 UJ	0.0049 U
Chlorobenzene	10	4000	4600	1300	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Chlorodibromomethane	8	82	95	39	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Chloroethane	120	10000	10000	57000	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 UJ	0.0049 U
Chloroform	8	97	110	1.4	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Chloromethane	3	1600	1800	460	0.0041 UJ	0.0043 UJ	0.0045 UJ	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
cis-1,2-Dichloroethene	7	6400	10000	2300	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
cis-1,3-Dichloropropene	3.4	560	640	8.2	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Ethylbenzene	70	640	730	25	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Methyl tert-butyl ether	2	3200	3600	210	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Methylene chloride	0.5	10000	10000	1000	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Styrene	24	10000	10000	35000	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Tetrachloroethene	0.5	3200	3600	100	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.006
Toluene	100	10000	10000	47000	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
trans-1,2-Dichloroethene	10	4800	5500	23000	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
trans-1,3-Dichloropropene	3.4	560	640	8.2	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Trichloroethene	0.5	160	180	6	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.24
Vinyl Chloride	0.2	61	280	1.7	0.0041 U	0.0043 U	0.0045 U	0.0051 U	0.0046 U	0.0046 U	0.0051 U	0.0049 U
Xylenes (Total)	1000	8000	9100	2500	0.0081 U	0.0086 U	0.009 U	0.01 U	0.0091 U	0.0093 U	0.01 U	0.0098 U

U = Not detected. J = Organics; estimated. UJ = Not detected above the reported approximate sample quantitation limit. R = Data rejected.
Samples analyzed by TestAmerica Laboratories, Inc. of Pittsburgh, Pennsylvania

Table 1
Soils Data Summary - South Property Boundry Area (SPBA)
Former York Naval Ordnance Plant - York, PA

Location/ID Depth (ft.) Sample Date Parameter	MSC Soil to GW Used Aquifer (mg/kg)	MSC Direct Contact 0 - 2 ft (mg/kg)	MSC Direct Contact 2 - 15 ft (mg/kg)	EPA RSL Industrial Soil (mg/kg)	HD-SPBA-SB-009 58.5 - 59 3/30/17	HD-SPBA-SB-009 61 - 61.5 3/30/17	HD-SPBA-SB-009 65 - 68 3/30/17	HD-SPBA-SB-010 0.5 - 1 3/30/17	HD-SPBA-SB-010 5 - 5.5 3/30/17	HD-SPBA-SB-010 10 - 10.5 3/30/17	HD-SPBA-SB-010 15 - 15.5 3/30/17	HD-SPBA-SB-010 20 - 20.5 3/30/17
Volatile Organic Compound												
1,1,1,2-Tetrachloroethane	18	300	340	8.8	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
1,1,1-Trichloroethane	20	10000	10000	36000	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
1,1,2,2-Tetrachloroethane	0.43	38	44	2.7	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
1,1,2-Trichloroethane	0.5	16	18	5	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
1,1-Dichloroethane	16	1400	1600	16	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
1,1-Dichloroethene	0.7	10000	10000	1000	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
1,2-Dibromoethane	0.005	3.7	4.3	0.16	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
1,2-Dichloroethane	0.5	86	98	2	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
1,2-Dichloropropane	0.5	220	260	4.4	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
1,4-Dioxane	3.2	3200	190000	24	0.95 R	0.94 R	0.9 R	1 R	1 R	1 R	0.92 R	0.9 R
2-Butanone	400	1200	1400	190000	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
2-Hexanone	26	79	91	1300	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
4-Methyl-2-Pentanone	930	1.6	1.8	140000	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Acetone	10000	10000	10000	670000	0.019 U	0.019 U	0.018 U	0.021 U	0.021 U	0.02 U	0.018 U	0.018 U
Acrylonitrile	0.37	33	38	1.1	0.047 U	0.047 U	0.045 U	0.052 U	0.051 U	0.05 U	0.046 U	0.045 U
Benzene	0.5	290	330	5.1	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Bromochloromethane	9	3200	3600	630	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Bromodichloromethane	8	60	69	1.3	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Bromoform	8	2000	2300	86	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Bromomethane	1	400	460	30	0.0047 UJ	0.0047 UJ	0.0045 UJ	0.0052 UJ	0.0051 UJ	0.005 UJ	0.0046 UJ	0.0045 UJ
Carbon Disulfide	620	10000	10000	3500	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Carbon Tetrachloride	0.5	370	430	2.9	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Chlorobenzene	10	4000	4600	1300	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Chlorodibromomethane	8	82	95	39	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Chloroethane	120	10000	10000	57000	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Chloroform	8	97	110	1.4	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Chloromethane	3	1600	1800	460	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
cis-1,2-Dichloroethene	7	6400	10000	2300	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
cis-1,3-Dichloropropene	3.4	560	640	8.2	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Ethylbenzene	70	640	730	25	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Methyl tert-butyl ether	2	3200	3600	210	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Methylene chloride	0.5	10000	10000	1000	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Styrene	24	10000	10000	35000	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Tetrachloroethene	0.5	3200	3600	100	0.0025 J	0.0056	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Toluene	100	10000	10000	47000	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
trans-1,2-Dichloroethene	10	4800	5500	23000	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
trans-1,3-Dichloropropene	3.4	560	640	8.2	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Trichloroethene	0.5	160	180	6	0.072	0.15	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Vinyl Chloride	0.2	61	280	1.7	0.0047 U	0.0047 U	0.0045 U	0.0052 U	0.0051 U	0.005 U	0.0046 U	0.0045 U
Xylenes (Total)	1000	8000	9100	2500	0.0095 U	0.0094 U	0.009 U	0.01 U	0.01 U	0.01 U	0.0092 U	0.009 U

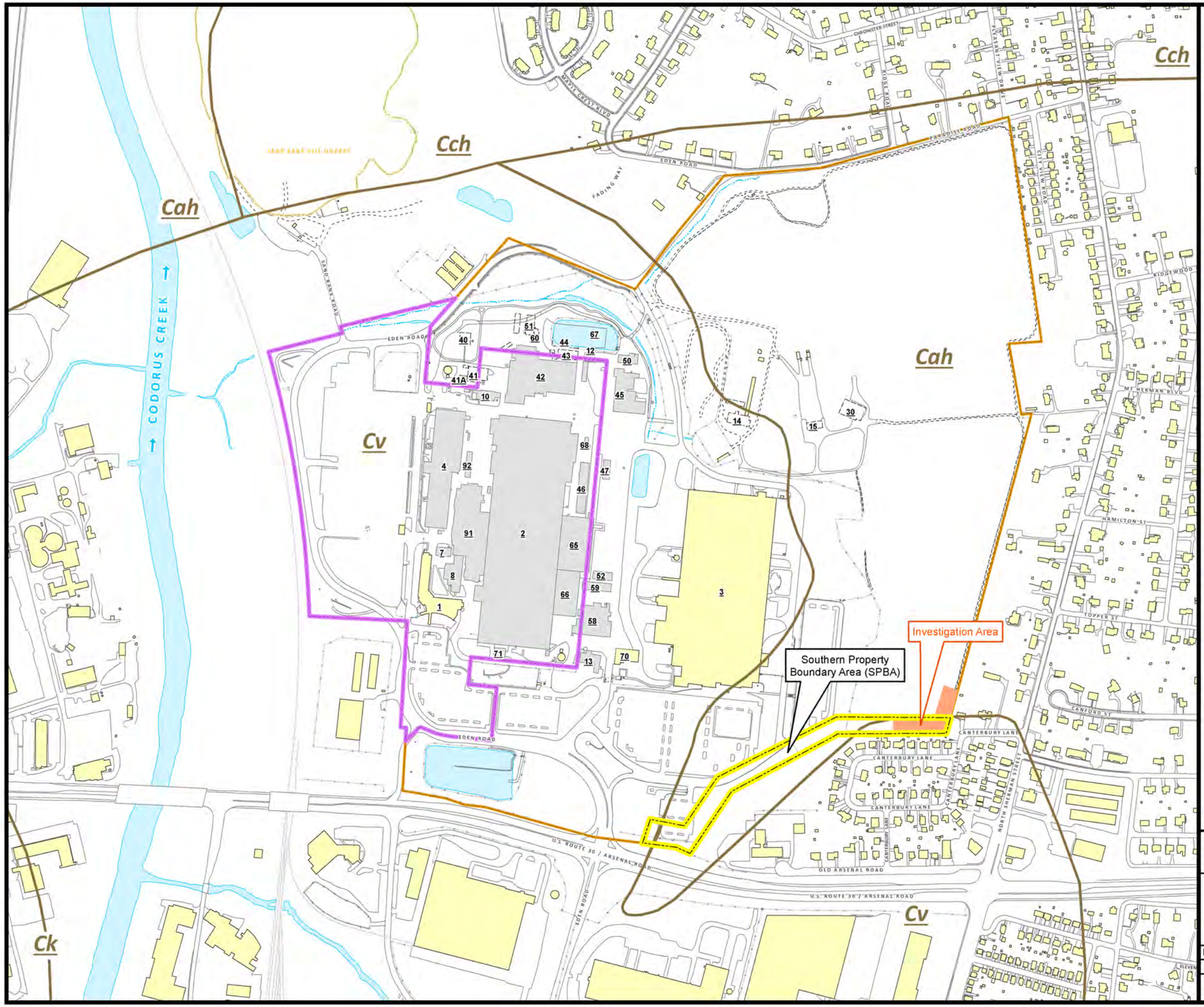
U = Not detected. J = Organics; estimated. UJ = Not detected above the reported approximate sample quantitation limit. R = Data rejected.
Samples analyzed by TestAmerica Laboratories, Inc. of Pittsburgh, Pennsylvania

Table 1
Soils Data Summary - South Property Boundry Area (SPBA)
Former York Naval Ordnance Plant - York, PA

Location/ID Depth (ft.) Sample Date Parameter	MSC Soil to GW Used Aquifer (mg/kg)	MSC Direct Contact 0 - 2 ft (mg/kg)	MSC Direct Contact 2 - 15 ft (mg/kg)	EPA RSL Industrial Soil (mg/kg)	HD-SPBA-SB-01 25 - 25.5 3/30/17	HD-SPBA-SB-010 31.6 - 32.2 3/30/17	HD-SPBA-SB-010 35 - 35.5 3/30/17	HD-SPBA-SB-010 40 - 40.5 3/30/17	HD-SPBA-SB-010 45 - 45.5 3/30/17	HD-SPBA-SB-010 50 - 50.5 3/30/17
Volatile Organic Compound										
1,1,1,2-Tetrachloroethane	18	300	340	8.8	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
1,1,1-Trichloroethane	20	10000	10000	36000	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
1,1,2,2-Tetrachloroethane	0.43	38	44	2.7	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
1,1,2-Trichloroethane	0.5	16	18	5	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
1,1-Dichloroethane	16	1400	1600	16	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
1,1-Dichloroethene	0.7	10000	10000	1000	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
1,2-Dibromoethane	0.005	3.7	4.3	0.16	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
1,2-Dichloroethane	0.5	86	98	2	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
1,2-Dichloropropane	0.5	220	260	4.4	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
1,4-Dioxane	3.2	3200	190000	24	1 R	0.88 R	0.89 R	0.85 R	0.92 R	0.9 R
2-Butanone	400	1200	1400	190000	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
2-Hexanone	26	79	91	1300	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
4-Methyl-2-Pentanone	930	1.6	1.8	140000	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Acetone	10000	10000	10000	670000	0.02 U	0.018 U	0.018 U	0.017 U	0.018 U	0.018 U
Acrylonitrile	0.37	33	38	1.1	0.05 U	0.044 U	0.045 U	0.043 U	0.046 U	0.045 U
Benzene	0.5	290	330	5.1	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Bromochloromethane	9	3200	3600	630	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Bromodichloromethane	8	60	69	1.3	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Bromoform	8	2000	2300	86	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Bromomethane	1	400	460	30	0.005 UJ	0.0044 UJ	0.0045 UJ	0.0043 UJ	0.0046 UJ	0.0045 UJ
Carbon Disulfide	620	10000	10000	3500	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Carbon Tetrachloride	0.5	370	430	2.9	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Chlorobenzene	10	4000	4600	1300	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Chlorodibromomethane	8	82	95	39	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Chloroethane	120	10000	10000	57000	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Chloroform	8	97	110	1.4	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Chloromethane	3	1600	1800	460	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
cis-1,2-Dichloroethene	7	6400	10000	2300	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
cis-1,3-Dichloropropene	3.4	560	640	8.2	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Ethylbenzene	70	640	730	25	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Methyl tert-butyl ether	2	3200	3600	210	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Methylene chloride	0.5	10000	10000	1000	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Styrene	24	10000	10000	35000	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Tetrachloroethene	0.5	3200	3600	100	0.005 U	0.0044 U	0.0045 U	0.011	0.071	0.039
Toluene	100	10000	10000	47000	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
trans-1,2-Dichloroethene	10	4800	5500	23000	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
trans-1,3-Dichloropropene	3.4	560	640	8.2	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Trichloroethene	0.5	160	180	6	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046	0.0021 J
Vinyl Chloride	0.2	61	280	1.7	0.005 U	0.0044 U	0.0045 U	0.0043 U	0.0046 U	0.0045 U
Xylenes (Total)	1000	8000	9100	2500	0.01 U	0.0088 U	0.0089 U	0.0085 U	0.0092 U	0.009 U

U = Not detected. J = Organics; estimated. UJ = Not detected above the reported approximate sample quantitation limit. R = Data rejected.
Samples analyzed by TestAmerica Laboratories, Inc. of Pittsburgh, Pennsylvania

Figures



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LEGEND

- Southern Property Boundary Area (SPBA)
- Investigation Area
- Cah — Antietam & Harpers Formation, undiv.
- Cv — Vintage Formation
- Ck — Kinzers Formation
- Cl — Ledger Formation
- West Campus Property Boundary
- Harley-Davidson Property Boundary (East Campus)
- Railroad
- Road (Paved)
- Road Curb
- Road (Unpaved)
- Walkway
- Fenceline
- Existing Water Feature
- Existing Building
- Demolished
- Demolished/Slab Removed

Scale (feet)
0 125 250 500

Figure 1

Former York Naval Ordnance Plant
1425 Eden Road, York, PA 17402

Southern Property Boundary Area (SPBA)
Location Map

DRAWN BY: JPB	CHECKED AND APPROVED BY: SS/CO	DATE: 6/15/2017

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GROUNDWATER SCIENCES CORPORATION

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LEGEND

- 1998 Active Soil Gas Sample (PID Results in PPM)
- Abandoned Well
- Monitoring Well
- Cah — Antietam & Harpers Formation, undiv.
- Cv — Vintage Formation
- Harley-Davidson Property Boundary (East Campus)
- Road (Paved)
- Road Curb
- Road (Unpaved)
- Walkway
- Fenceline
- Existing Building
- Surface Contour (2' Intervals)

NOTES:
PID = Photoionization detector
PPM = Parts per million
RI = Remedial Investigation

Scale (feet)
0 25 50 100

Figure 2

Former York Naval Ordnance Plant
1425 Eden Road, York, PA 17402

Active Soil Gas Results (1998)

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Location	Depth	1,1 DCA	1,2 DCA	TCE	PCE	Date
SESB011	5-10	NA	NA	NA	NA	NA
SESB011	10-15	NA	NA	NA	NA	NA

Location	Depth	1,1 DCA	1,2 DCA	TCE	PCE	Date
SESB010	0-5	0	0	0	819.2	12/4/2003
SESB010	5-10	0	0	15.6	1197.5	12/4/2003
SESB010	10-15	0	0	191.3	2377.9	12/4/2003

Location	Depth	1,1 DCA	1,2 DCA	TCE	PCE	Date
SESB009	0-5	0	0	1571.8	562.5	12/4/2003
SESB009	5-10	0	0	1691.8	349.6	12/4/2003
SESB009	10-15	11.1	0	136	241	12/4/2003

Location	Depth	1,1 DCA	1,2 DCA	TCE	PCE	Date
SESB008	0-5	0	0	0	482.9	12/4/2003
SESB008	5-10	0	0	0	1123.3	12/4/2003
SESB008	10-15	0	0	0	2897	12/4/2003

Location	Depth	1,1 DCA	1,2 DCA	TCE	PCE	Date
SESB007	0-5	0	24.4	0	0	12/4/2003
SESB007	5-10	0	0	0	0	12/4/2003
SESB007	10-15	0	0	0	1470.3	12/4/2003

Location	Depth	1,1 DCA	1,2 DCA	TCE	PCE	Date
SESB006	0-5	0	0	0	0	12/4/2003
SESB006	5-10	0	0	0	0	12/4/2003
SESB006	10-15	0	0	0	0	12/4/2003

Location	Depth	1,1 DCA	1,2 DCA	TCE	PCE	Date
SESB005	0-5	0	0	0	0	12/4/2003
SESB005	5-10	0	0	0	0	12/4/2003
SESB005	10-15	0	0	0	0	12/4/2003

Location	Depth	1,1 DCA	1,2 DCA	TCE	PCE	Date
SESB004	0-5	0	0	79.6	0	12/3/2003
SESB004	5-10	24.8	0	0	29.1	12/3/2003
SESB004	10-15	0	0	0	0	12/4/2003

Location	Depth	1,1 DCA	1,2 DCA	TCE	PCE	Date
SESB003	0-5	119.9	0	51.8	72.9	12/3/2003
SESB003	5-10	52.8	0	111	0	12/3/2003
SESB003	10-15	22.4	30	0	0	12/3/2003

Location	Depth	1,1 DCA	1,2 DCA	TCE	PCE	Date
SESB002	0-4.5	0	0	74.7	156.9	12/3/2003
SESB002	6-7	123	0	40.5	45.4	12/3/2003
SESB002	10-11	209.3	215.9	0	0	12/3/2003

Location	Depth	1,1 DCA	1,2 DCA	TCE	PCE	Date
SESB001	0-5	504.2	716.2	0	413.3	12/3/2003
SESB001	5-7	24.7	11.8	37.7	0	12/3/2003

MW-92
MW-22
Cah
SESB11
SESB10
SESB09
MW-64S
MW-64D
MW-141A
SESB08
MW-161
MW-162
SESB07
SESB06
MW-163
SESB05
SESB03
MW-41S
MW-41D
SESB02
MW-164
SESB01
MW-44
MW-165
CW-10
Cah
Cv
MW-168
CANTERBURY LANE
MW-167
MW-166
CANTERBURY LANE
MW-171
CANTERBURY LANE
MW-170
MW-169

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S

LEGEND

- 2003 MIP Stations and Area Counts
- Abandoned Well
- Monitoring Well
- Cah — Antietam & Harpers Formation, undiv.
- Cv — Vintage Formation
- Harley-Davidson Property Boundary
- Road (Paved)
- Road Curb
- Road (Unpaved)
- Walkway
- Fenceline
- Existing Building

NOTES:
1) Membrane Interface Probe (MIP) area counts for each constituent are unitless and provide qualitative indications of constituents relative to calibration standards analyzed daily using the field gas chromatograph.
2) Sample depth in feet below ground surface.
1,1 DCA = 1,1-Dichloroethane
1,2 DCA = 1,2-Dichloroethane
PCE = Tetrachloroethene
TCE = Trichloroethene
NA = No MIP data collected

Scale (feet)
0 25 50 100

Figure 3

Former York Naval Ordnance Plant
1425 Eden Road, York, PA 17402

Membrane Interface Probe Results (2003)

DRAWN BY: JPB | **CHECKED AND APPROVED BY:** SS/CO | **DATE:** 6/15/2017

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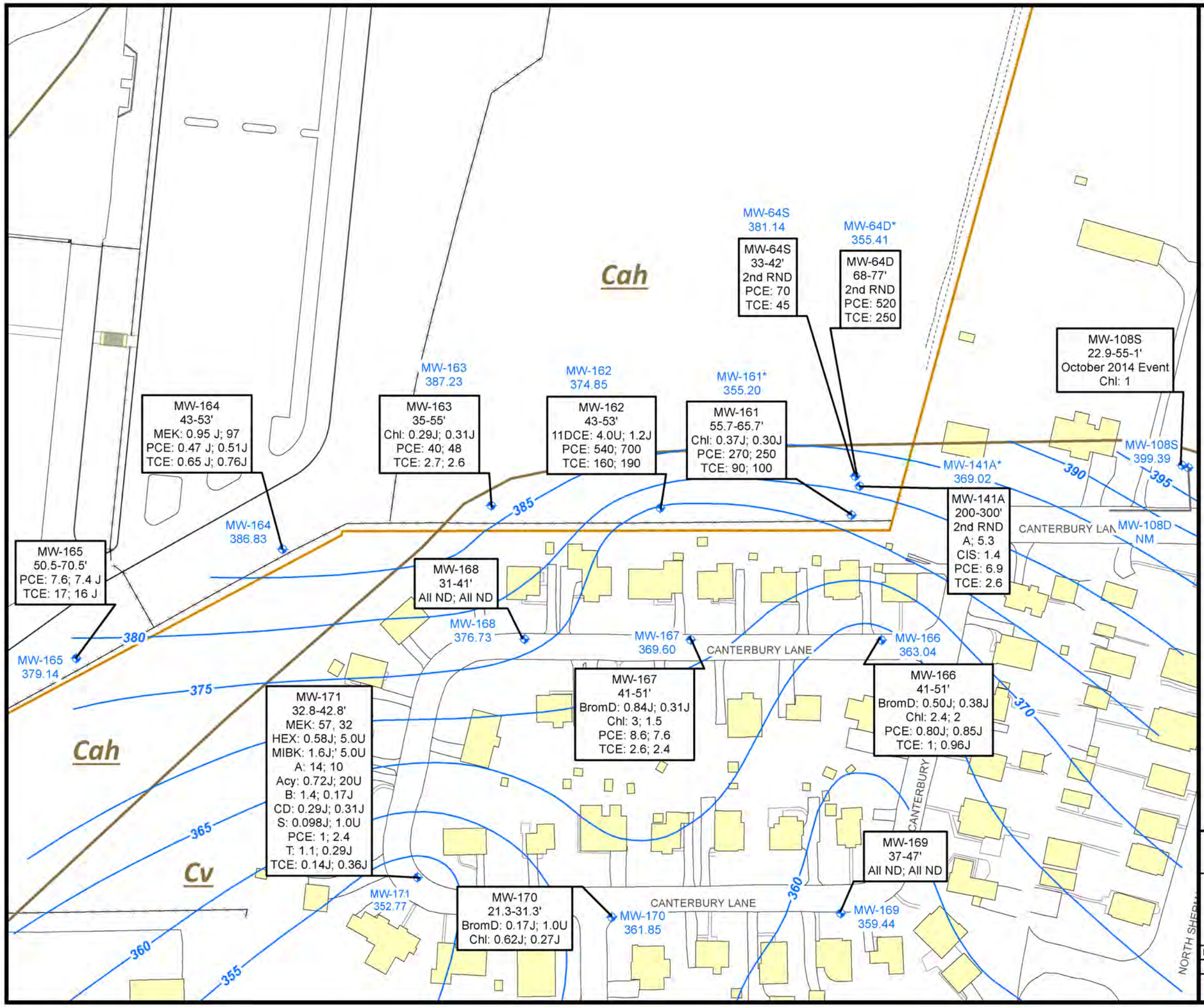

NOTES:
FBGS = Feet Below Ground Surface
Chemistry results in µg/L.
NM = Not measured.
ND = Not detected.
J = Estimated concentration.
U = Not detected above reported value.
Water levels measured 4/14/2015.
Contours are in Feet Above Mean Sea Level.
Water levels for deeper wells marked with * not used in contouring.

Scale (feet)
0 25 50 100

Figure 4

Former York Naval Ordnance Plant
1425 Eden Road, York, PA 17402

Groundwater Quality Results (2015)

DRAWN BY: JPB	CHECKED AND APPROVED BY: SS/CO	DATE: 6/7/2017

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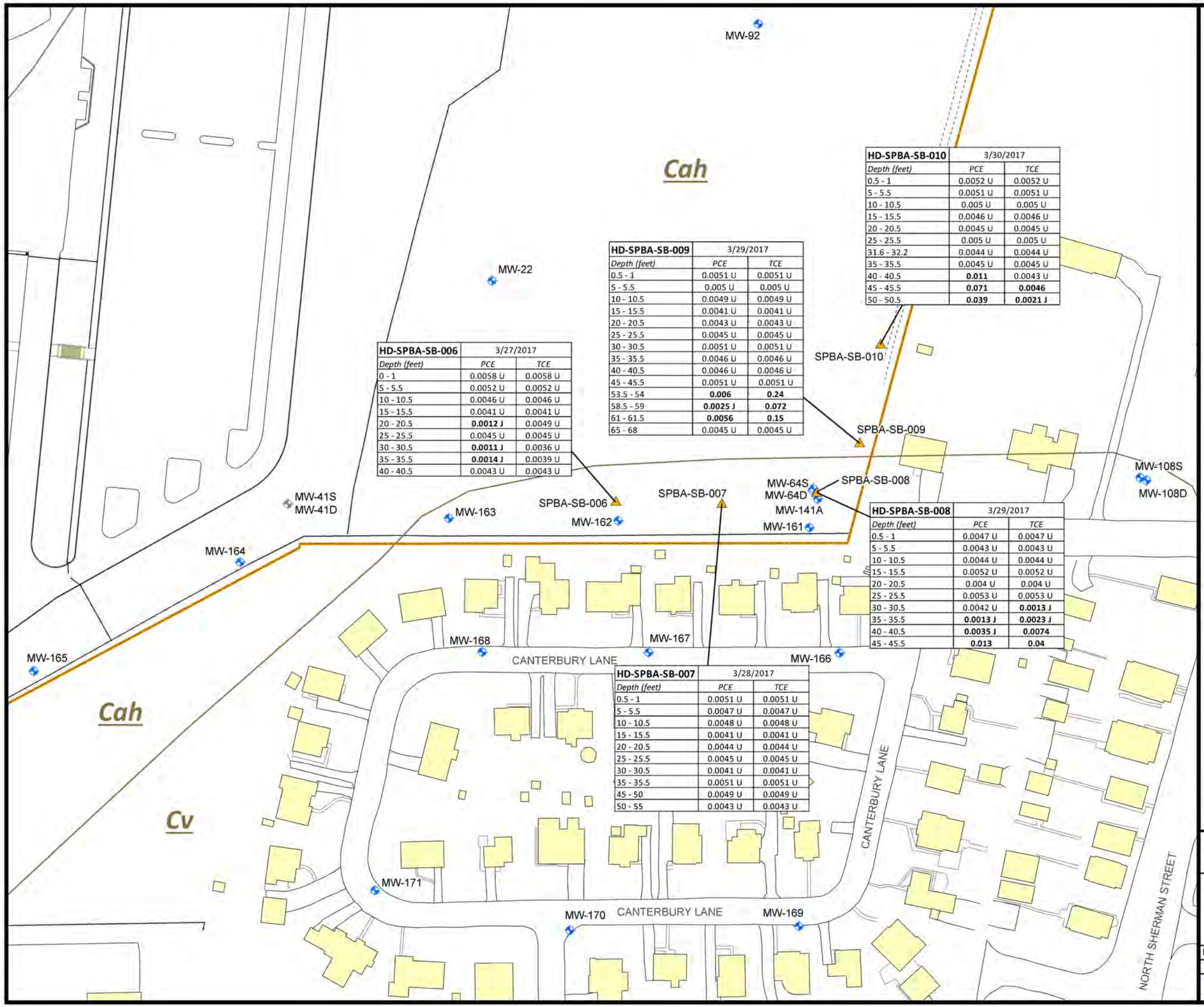
GROUNDWATER SCIENCES CORPORATION



HD-SPBA-SB-006	3/27/2017	
Depth (feet)	PCE	TCE
0 - 1	0.0058 U	0.0058 U
5 - 5.5	0.0052 U	0.0052 U
10 - 10.5	0.0046 U	0.0046 U
15 - 15.5	0.0041 U	0.0041 U
20 - 20.5	**0.0012 J**	0.0049 U
25 - 25.5	0.0045 U	0.0045 U
30 - 30.5	**0.0011 J**	0.0036 U
35 - 35.5	**0.0014 J**	0.0039 U
40 - 40.5	0.0043 U	0.0043 U

HD-SPBA-SB-009	3/29/2017	
Depth (feet)	PCE	TCE
0.5 - 1	0.0051 U	0.0051 U
5 - 5.5	0.005 U	0.005 U
10 - 10.5	0.0049 U	0.0049 U
15 - 15.5	0.0041 U	0.0041 U
20 - 20.5	0.0043 U	0.0043 U
25 - 25.5	0.0045 U	0.0045 U
30 - 30.5	0.0051 U	0.0051 U
35 - 35.5	0.0046 U	0.0046 U
40 - 40.5	0.0046 U	0.0046 U
45 - 45.5	0.0051 U	0.0051 U
53.5 - 54	**0.006**	**0.24**
58.5 - 59	**0.0025 J**	**0.072**
61 - 61.5	**0.0056**	**0.15**
65 - 68	0.0045 U	0.0045 U

HD-SPBA-SB-010	3/30/2017	
Depth (feet)	PCE	TCE
0.5 - 1	0.0052 U	0.0052 U
5 - 5.5	0.0051 U	0.0051 U
10 - 10.5	0.005 U	0.005 U
15 - 15.5	0.0046 U	0.0046 U
20 - 20.5	0.0045 U	0.0045 U
25 - 25.5	0.005 U	0.005 U
31.6 - 32.2	0.0044 U	0.0044 U
35 - 35.5	0.0045 U	0.0045 U
40 - 40.5	**0.011**	0.0043 U
45 - 45.5	**0.071**	**0.0046**
50 - 50.5	**0.039**	**0.0021 J**

HD-SPBA-SB-008	3/29/2017	
Depth (feet)	PCE	TCE
0.5 - 1	0.0047 U	0.0047 U
5 - 5.5	0.0043 U	0.0043 U
10 - 10.5	0.0044 U	0.0044 U
15 - 15.5	0.0052 U	0.0052 U
20 - 20.5	0.004 U	0.004 U
25 - 25.5	0.0053 U	0.0053 U
30 - 30.5	0.0042 U	**0.0013 J**
35 - 35.5	**0.0013 J**	**0.0023 J**
40 - 40.5	**0.0035 J**	**0.0074**
45 - 45.5	**0.013**	**0.04**

HD-SPBA-SB-007	3/28/2017	
Depth (feet)	PCE	TCE
0.5 - 1	0.0051 U	0.0051 U
5 - 5.5	0.0047 U	0.0047 U
10 - 10.5	0.0048 U	0.0048 U
15 - 15.5	0.0041 U	0.0041 U
20 - 20.5	0.0044 U	0.0044 U
25 - 25.5	0.0045 U	0.0045 U
30 - 30.5	0.0041 U	0.0041 U
35 - 35.5	0.0051 U	0.0051 U
45 - 50	0.0049 U	0.0049 U
50 - 55	0.0043 U	0.0043 U

N
W E
S

LEGEND

- 2017 Soil Boring Location
- Abandoned Well
- Monitoring Well
- Cah — Antietam & Harpers Formation, undiv.
- Cv — Vintage Formation
- Harley-Davidson Property Boundary
- Road (Paved)
- Road Curb
- Road (Unpaved)
- Walkway
- Fenceline
- Existing Building

NOTES:
Analytical results in milligrams per kilogram (mg/kg).
U = Not detected above reported value
J = Estimated concentration
Bold font indicates analyte was detected.
PCE = Tetrachloroethene
TCE = Trichloroethene
Depth = Sample depth in feet below ground surface
The PADEP non-residential soil to groundwater medium specific concentration (MSC) for PCE and TCE is 0.500mg/kg.

Scale (feet)
0 25 50 100

Figure 5

Former York Naval Ordnance Plant
1425 Eden Road, York, PA 17402

PCE and TCE Soil Quality Results (2017)

DRAWN BY: JPB | CHECKED AND APPROVED BY: SS/CO | DATE: 7/25/2017

Q:\10000\10012\Projects\2017_SPBA\Rpt0617\Fig05_SPBA_SBs.mxd

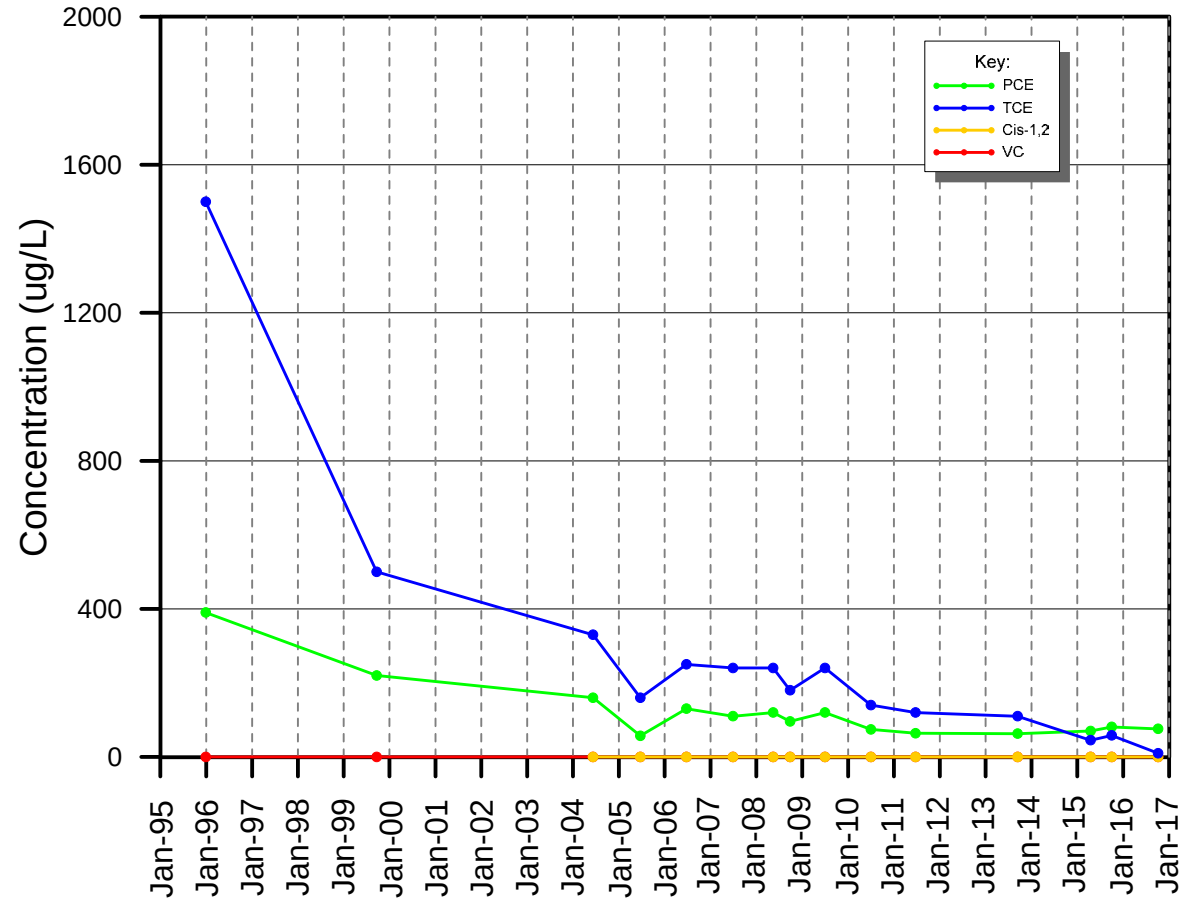
GROUNDWATER SCIENCES CORPORATION

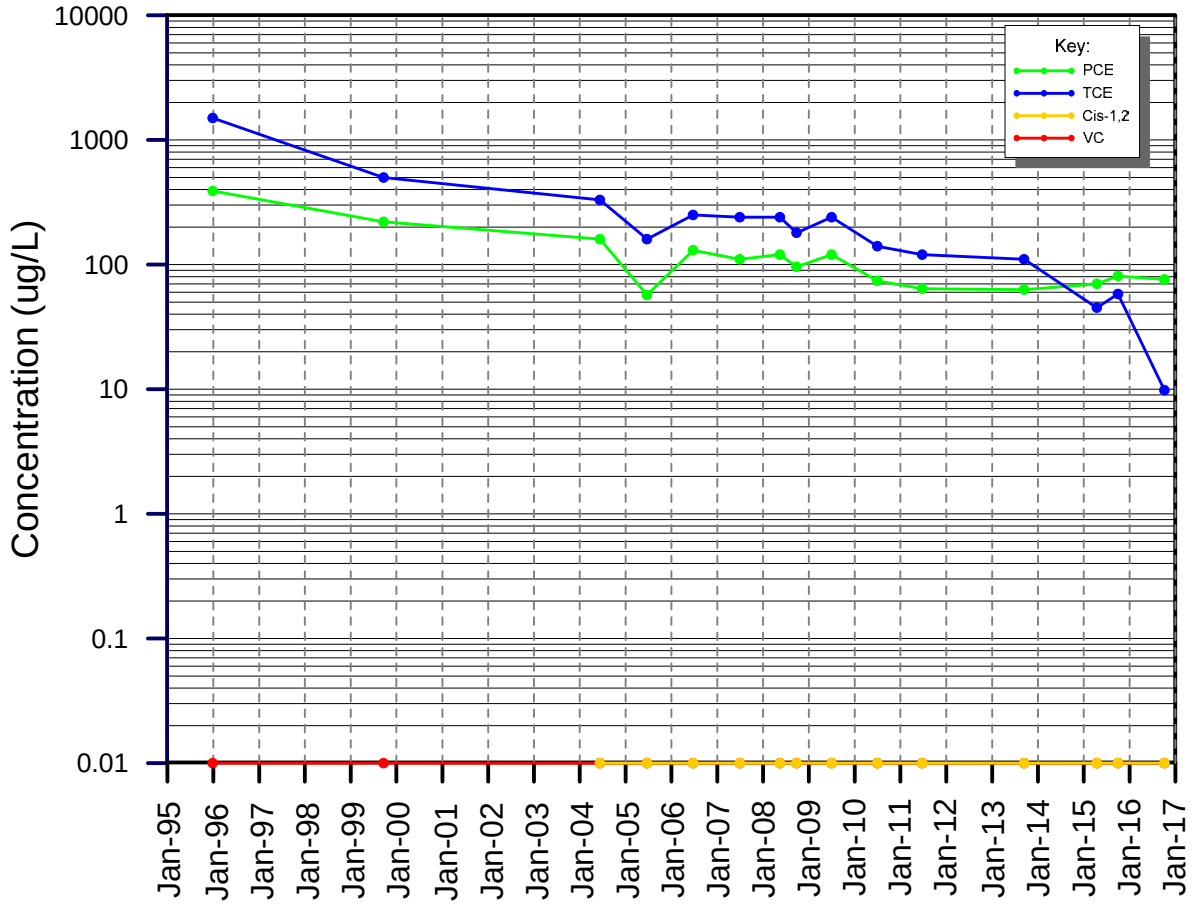
Appendix A

Groundwater Chemistry Graphs

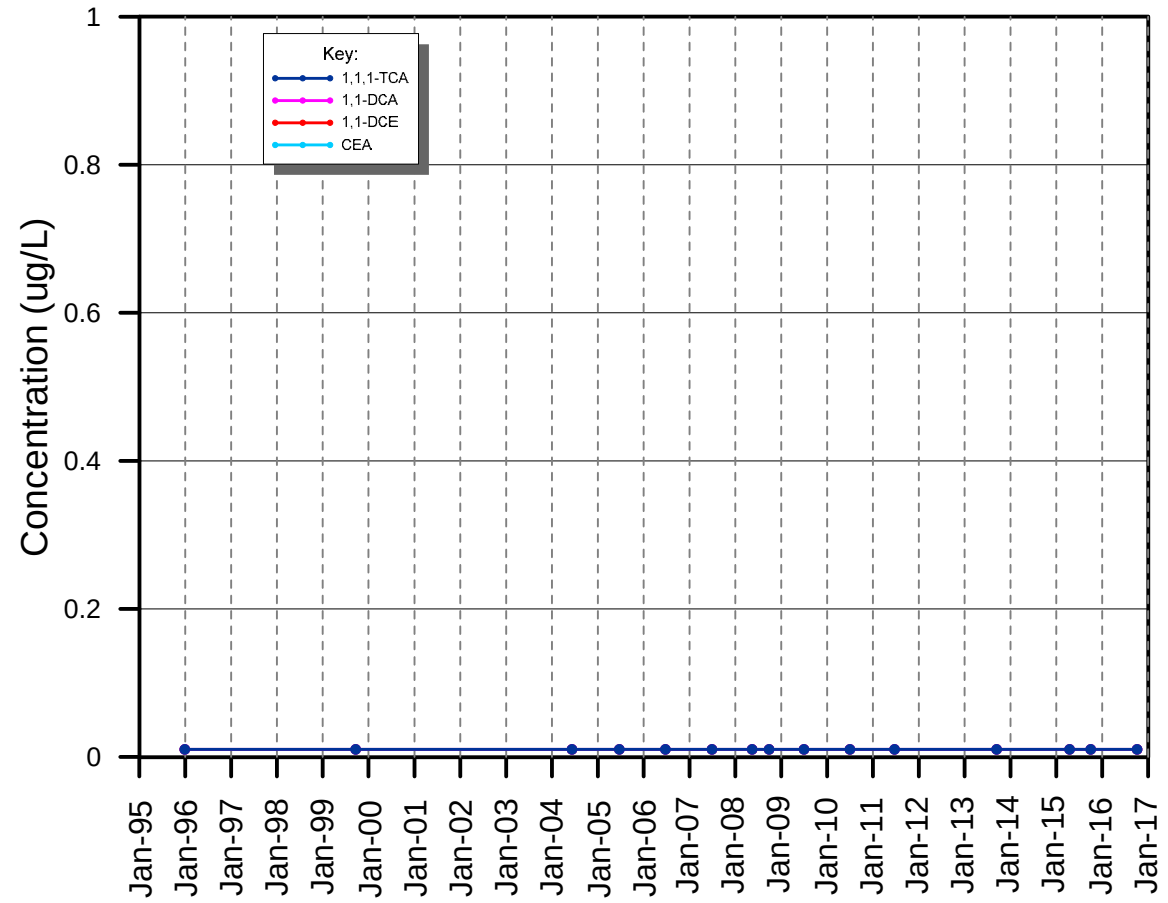
Undetected laboratory results are represented on the graphs as a concentration of 0.01 micrograms per liter (µg/l), regardless of method detection limit or laboratory reporting limit. "J" qualified (estimated) results are plotted on the graphs as actual values.

MW-64S


Key:
PCE
TCE
Cis-1,2
VC
Concentration (ug/L)
2000
1600
1200
800
400
0
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17


Key:
PCE
TCE
Cis-1,2
VC
Concentration (ug/L)
10000
1000
100
10
1
0.1
0.01
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17

MW-64S


Key:
1,1,1-TCA
1,1-DCA
1,1-DCE
CEA
Concentration (ug/L)
1
0.8
0.6
0.4
0.2
0
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
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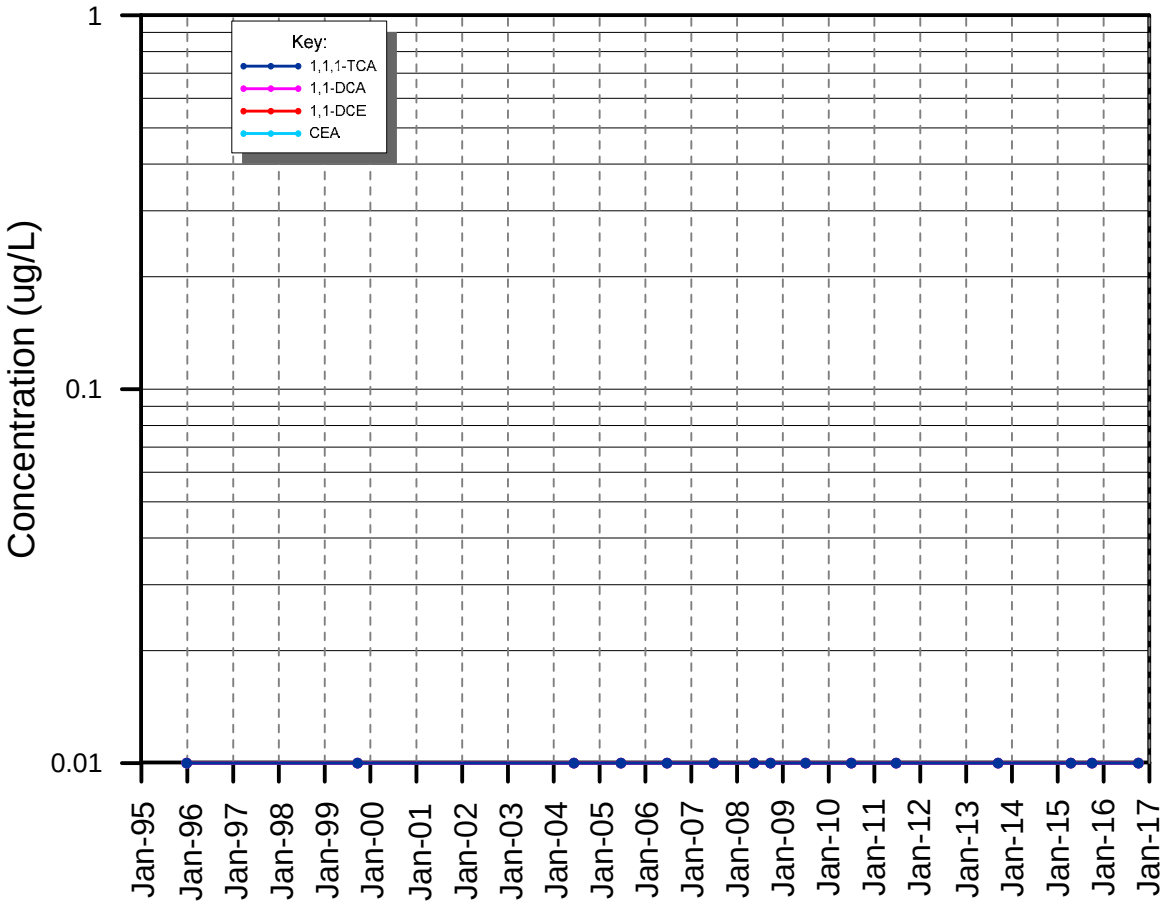
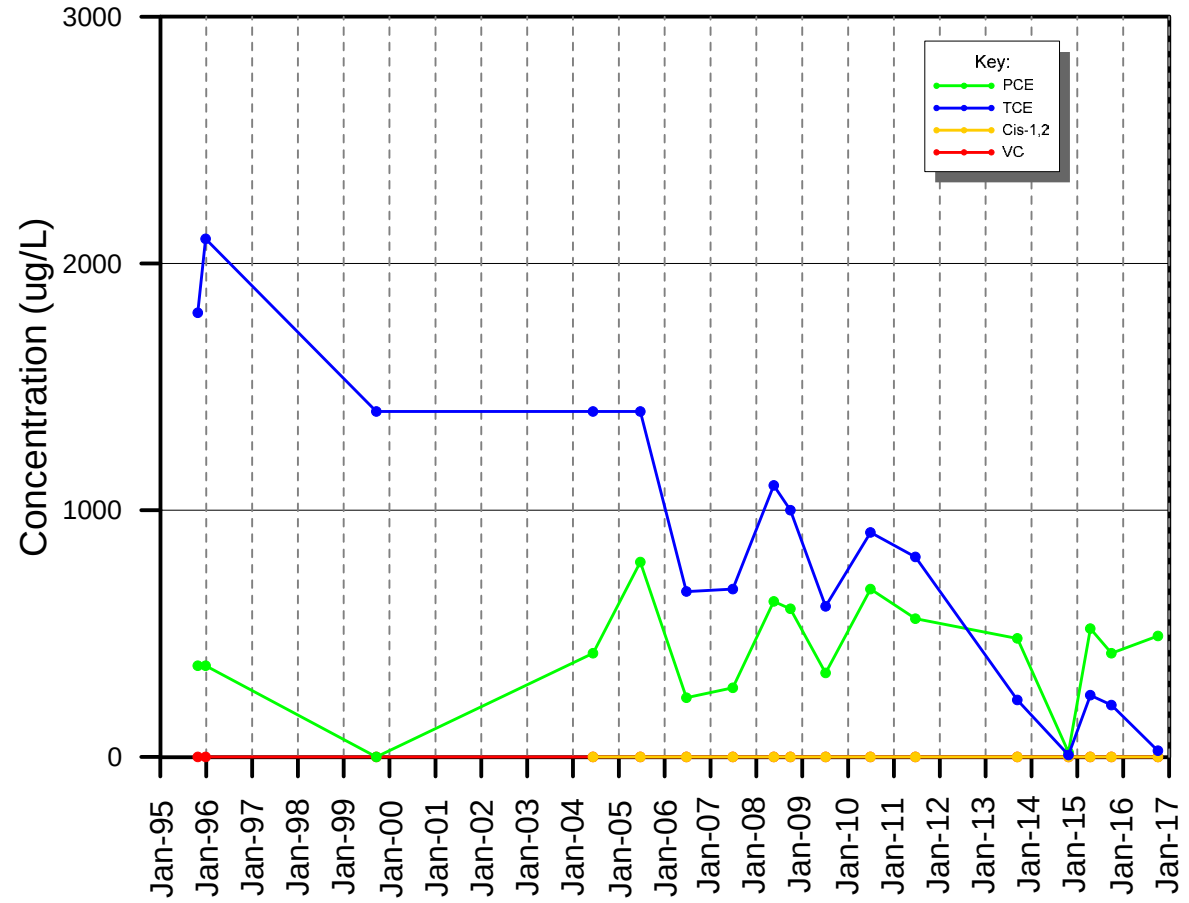
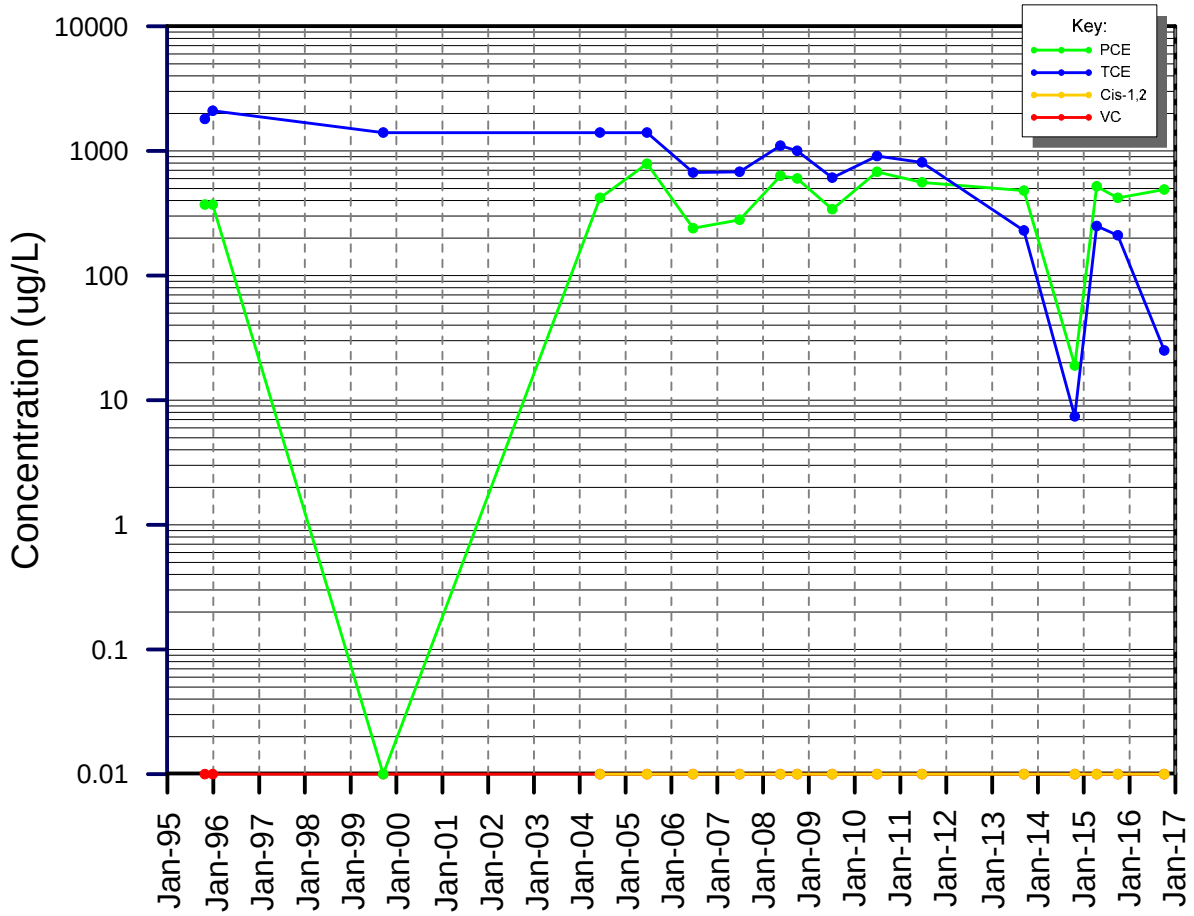
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17


Key:
1,1,1-TCA
1,1-DCA
1,1-DCE
CEA
Concentration (ug/L)
1
0.1
0.01
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17

MW-64D


Key:
PCE
TCE
Cis-1,2
VC
Concentration (ug/L)
3000
2000
1000
0
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17


Key:
PCE
TCE
Cis-1,2
VC
Concentration (ug/L)
10000
1000
100
10
1
0.1
0.01
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
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Jan-07
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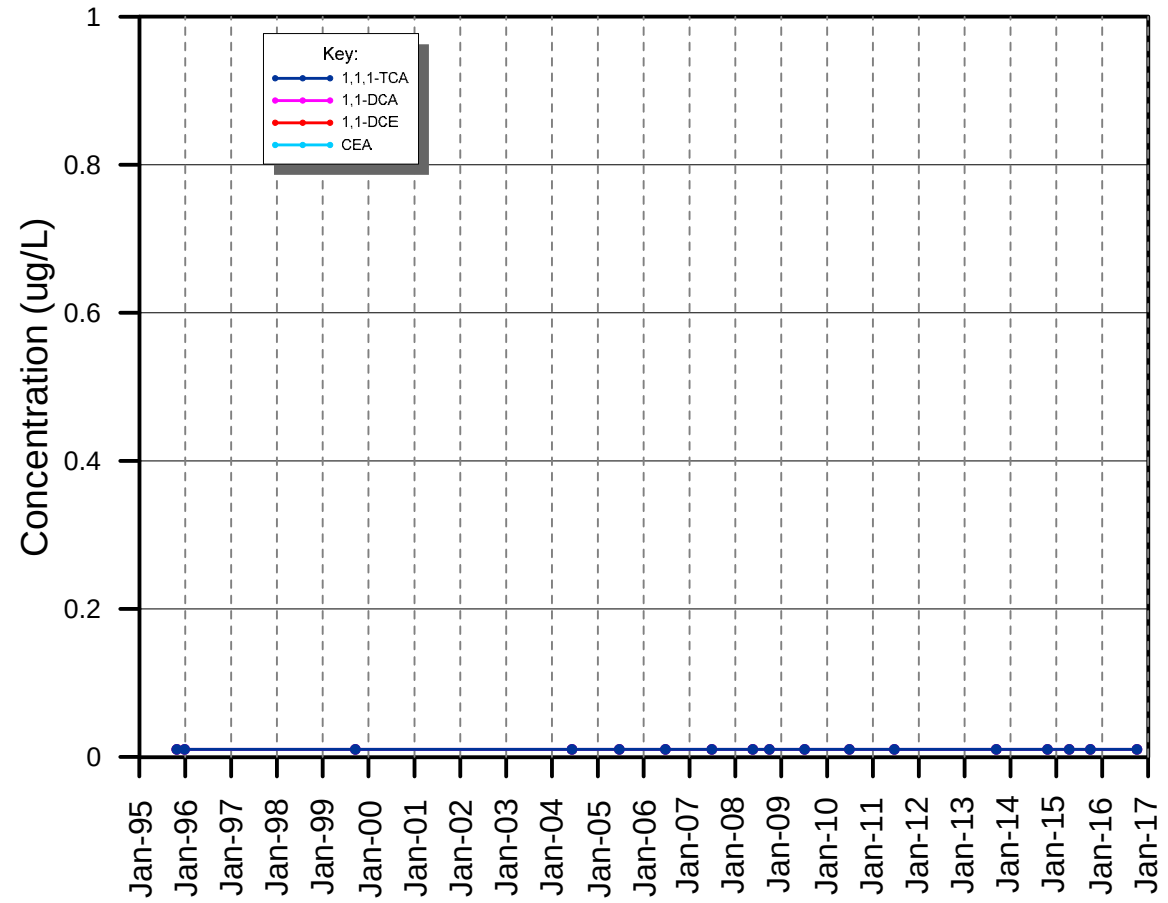
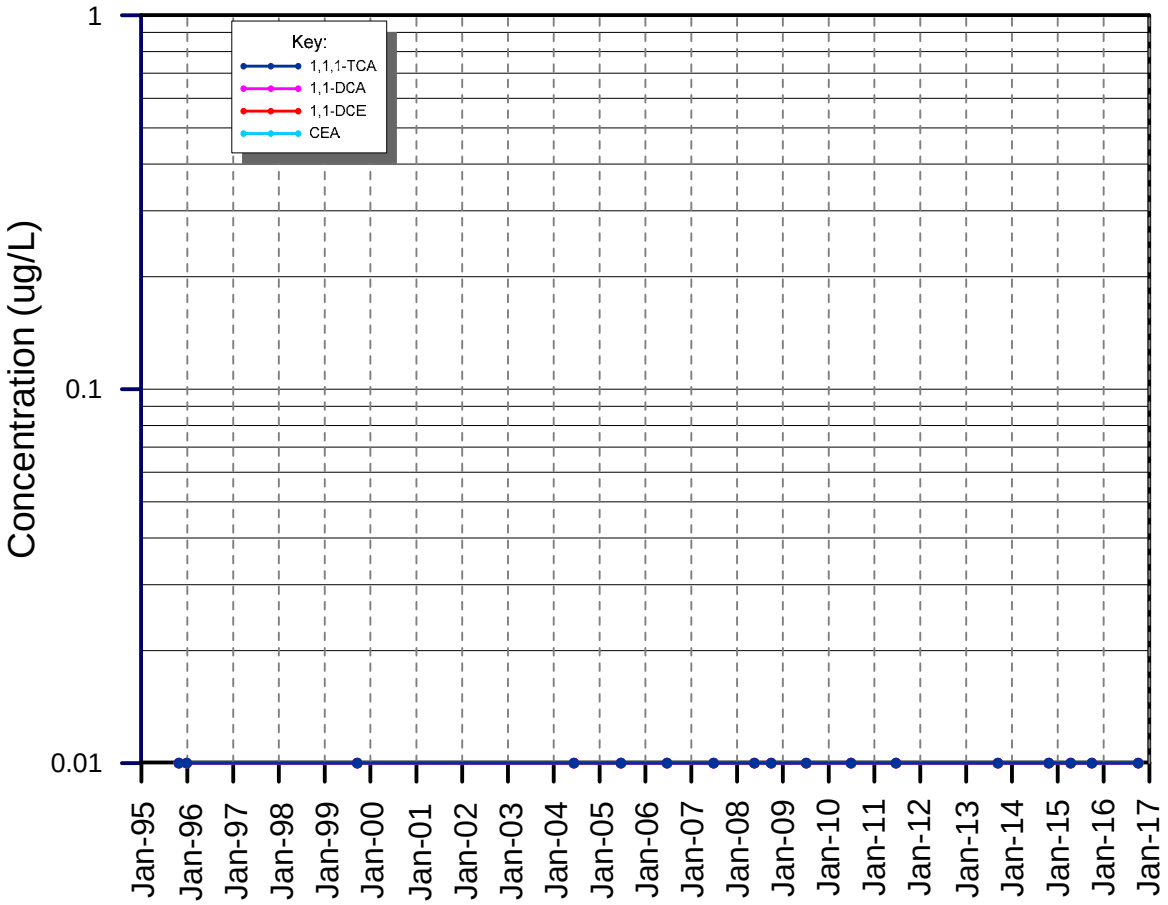
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17

MW-64D


Key:
1,1,1-TCA
1,1-DCA
1,1-DCE
CEA
Concentration (ug/L)
1
0.8
0.6
0.4
0.2
0
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17


Key:
1,1,1-TCA
1,1-DCA
1,1-DCE
CEA
Concentration (ug/L)
1
0.1
0.01
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
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Jan-16
Jan-17

Appendix B

Soil Boring Logs

GROUNDWATER SCIENCES CORPORATION

GEOLOGIC LOG: HD-SPBA-SB-006

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	***Harley-Davidson***	DRILLING CO.:	***Eichelbergers, Inc.***
SITE LOCATION:	***Former York Naval Ordnance Plant, York, PA***	DRILLER:	***Paul Wirrick***
JOB NO.:	***10012.31***	RIG TYPE:	***Geoprobe Direct Push 7822DT***
LOGGED BY:	***K. Fleming***	DRILLING METHOD:	***Geoprobe Dual-Tube Sampling***
DATES DRILLED:	***3/27/17***	DEVELOPMENT DATE:	***NA***
		LOCATION:	***South Property Boundary Area***
NOTES: Hand auger utility clearance to 5'. 3" dia dual-tube direct push macrocore advanced to 43.78' below ground suface (bgs). SAMP = Sample submitted for labratory analysis of VOCS		SURFACE ELEVATION	Approximately 414 feet AMSL
		EASTING	2260010.01417999
		NORTHING	239017.196101999

DEPTH FEET	BLOW COUNTS	PID (ppm)	RECOV.	SAMP.	SOIL DESCRIPTION	GRAPHIC	DEPTH FEET	WELL CONSTRUCTION	WELL CONSTRUCTION DETAILS
0		26.6	60"/60"	0'-1'	Very dark brown 10YR 2/2, Topsoil and organics. Moist.		0		Well Not Constructed
2		3.3 3.8 0.1 0.1 0.0 0.0			10YR 5/4 yellowish brown fine SAND and SILT, little Clay, trace fine Gravel. Moist.		2		Borehole backfilled with drill cuttings (0'-2')
4		0.0 0.0 0.0 0.0			10YR 5/4 yellowish brown fine to medium SAND and SILT, little fine Gravel, trace Clay. Dense. Moist.		4		
6		0.0	45/60"	5'-5.5'	Brownish yellow 10YR 6/6 fine to medium SAND and SILT, little Gravel, trace Clay. Moist.		6		
8		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0					8		
10		0.0	60/60"	10'-10.5'	Brownish yellow 10YR 6/6 Silty CLAY, trace fine Sand, trace fine Gravel. Dense. Moist.		10		
12		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0					12		
14		0.0 0.0 0.0					14		
16		0.0	60/60"	15'-15.5'	Yellowish brown 10YR 5/4 fine to medium SAND and SILT, little Clay, little fine to medium Gravel, Dense. Moist.		16		Borehole backfilled with bentonite hole plug (2'-43.78')
18		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0					18		
20		0.0	60/60"	20'-20.5'	Yellowish brown 10YR 5/4 fine to coarse SAND and fine to medium GRAVEL, little Silt, trace Clay. Moist.		20		
22		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			Yellowish brown 10YR 5/4 CLAYEY SILT, some fine to medium Gravel, trace fine to medium Sand, trace coarse quartz Gravel. Very dense. Moist.		22		
24		0.0 0.0 0.0					24		
26		0.0	60/60"	25'-25.5'	Pale Brown 6/3 to Light gray 5Y 7/2 fine to medium SAND and SILT, some fine to medium quartz Gravel, red mottling on and around gravel, trace coarse Gravel. Moist.		26		
28		0.0 0.0 0.0 0.0 0.0					28		

GROUNDWATER SCIENCES CORPORATION

GEOLOGIC LOG: HD-SPBA-SB-006

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	***Harley-Davidson***	DRILLING CO.:	***Eichelbergers, Inc.***
SITE LOCATION:	***Former York Naval Ordnance Plant, York, PA***	DRILLER:	***Paul Wirrick***
JOB NO.:	***10012.31***	RIG TYPE:	***Geoprobe Direct Push 7822DT***
LOGGED BY:	***K. Fleming***	DRILLING METHOD:	***Geoprobe Dual-Tube Sampling***
DATES DRILLED:	***3/27/17***	DEVELOPMENT DATE:	***NA***
		LOCATION:	***South Property Boundary Area***
NOTES: Hand auger utility clearance to 5'. 3" dia dual-tube direct push macrocore advanced to 43.78' below ground suface (bgs). SAMP = Sample submitted for labratory analysis of VOCS		SURFACE ELEVATION	Approximately 414 feet AMSL
		EASTING	2260010.01417999
		NORTHING	239017.196101999

DEPTH FEET	BLOW COUNTS	PID (ppm)	RECOV.	SAMP.	SOIL DESCRIPTION	GRAPHIC	DEPTH FEET	WELL CONSTRUCTION	WELL CONSTRUCTION DETAILS
28		0.0					28		
		0.0			Pale Brown 6/3 to Light gray 5Y 7/2 SILTY CLAY, trace fine Sand, trace fine to coarse Gravel. Moist.				
30		0.0	60/60"	30'-30.5'			30		
		0.0			Pale Brown 6/3 to Light gray 5Y 7/2 fine SAND and SILT, little fine to coarse Gravel, trace Clay. Dense. Moist.				
32		0.0					32		
		0.0							
34		0.0					34		
		0.0			Yellowish brown 10YR 5/4 fine to medium SAND, some Silt, trace Clay, trace fine Gravel. Moist.				
		0.0	60/60"	35'-35.5'					
36		0.0			Yellowish brown 10YR 5/4 SILTY CLAY, some fine Gravel, trace fine Sand. Moist.		36		
		0.0							
38		0.0			Yellowish brown 10YR 5/4 fine to medium SAND and fine to medium GRAVEL, little Silt, trace Clay. Moist.		38		
		0.0							
40		0.0	42/60"	40'-40.5'			40		Depth to water measured in borehole following sampling was 43.65' on 3/30/17.
		0.0			Yellowish brown 10YR 5/4 CLAYEY SILT, some fine to medium Gravel, trace fine SAND. Water saturated 43.5'-43.78'.				
42		0.0					42		

GROUNDWATER SCIENCES CORPORATION

GEOLOGIC LOG: HD-SPBA-SB-007

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	***Harley-Davidson***	DRILLING CO.:	***Eichelbergers, Inc.***
SITE LOCATION:	***Former York Naval Ordnance Plant, York, PA***	DRILLER:	***Paul Wirrick***
JOB NO.:	***10012.31***	RIG TYPE:	***Geoprobe Direct Push 7822DT***
LOGGED BY:	***K. Fleming***	DRILLING METHOD:	***Geoprobe Dual-Tube Sampling***
DATES DRILLED:	***3/28/17***	DEVELOPMENT DATE:	***NA***
		LOCATION:	***South Property Boundary Area***
NOTES: Hand auger utility clearance to 5'. 3" dia dual-tube direct push macrocore advanced to 55.15' below ground suface (bgs). SAMP = Sample submitted for labratory analysis of VOCS		SURFACE ELEVATION	Approximately 413 feet AMSL
		EASTING	2260118.75703
		NORTHING	239014.925519

DEPTH FEET	BLOW COUNTS	PID (ppm)	RECOV.	SAMP.	SOIL DESCRIPTION	GRAPHIC	DEPTH FEET	WELL CONSTRUCTION	WELL CONSTRUCTION DETAILS
0		0.0	60"/60"		Very dark brown 10YR 2/2 Topsoil and organics. Moist.		0		Well Not Constructed
		0.3		0.5'-1.0'					
2		0.0			Yellowish brown 10YR 5/4 fine to medium SAND and SILT, some Clay, trace fine Gravel. Moist.		2		Borehole backfilled with drill cuttings (0'-2')
		0.0							
		0.0							
		0.0							
4		0.0					4		
		0.0							
		0.0	58/60"	5'-5.5'	Yellowish brown 10YR 5/4 fine to medium SAND and SILT, some fine to coarse quartz Gravel, trace Clay. Moist.				
6		0.0					6		
		0.0							
		0.0							
		0.0							
8		0.0					8		
		0.0			Brownish yellow 10YR 6/6 CLAYEY SILT, trace fine to medium Sand, trace fine Gravel. Dense. Moist.				
		0.0							
10		0.0	60/60"	10'-10.5'	Brownish yellow 10YR 6/6 CLAYEY SILT, little fine to coarse Sand, trace fine to medium Gravel. Dense. Moist.		10		
		0.0							
		0.0							
		0.0							
12		0.0					12		
		0.0							
		0.0							
		0.0							
14		0.0					14		
		0.0							
		0.0							
		0.0	60/60"	15'-15.5'					Borehole backfilled with bentonite hole plug (2'-55.15)
16		0.0			Pale Brown 6/3 to Light gray 5Y 7/2 fine to coarse SAND, some Silt, trace Clay, trace fine to medium Gravel.		16		
		0.0							
		0.0							
		0.0							
18		0.0					18		
		0.0							
		0.0							
		0.0							
20		0.0	60/60"	20'-20.5'	Pale Brown 6/3 to Light gray 5Y 7/2 fine to coarse SAND and SILT, some fine to coarse Gravel, trace Clay, Dense. Moist.		20		
		0.0							
		0.0							
		0.0							
22		0.0					22		
		0.0							
		0.0							
		0.0							
24		0.0					24		
		0.0							
		0.0	60/60"	25'-25.5'					
26		0.0			Pale Brown 6/3 to Browinsh Yellow 10YR 6/6 to coarse SAND and SILT, little fine to coarse Gravel, trace Clay, trace coarse Sand, Dense. Moist.		26		
		0.0							
		0.0							
		0.0							
28		0.0					28		

GROUNDWATER SCIENCES CORPORATION

GEOLOGIC LOG: HD-SPBA-SB-007

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	***Harley-Davidson***	DRILLING CO.:	***Eichelbergers, Inc.***
SITE LOCATION:	***Former York Naval Ordnance Plant, York, PA***	DRILLER:	***Paul Wirrick***
JOB NO.:	***10012.31***	RIG TYPE:	***Geoprobe Direct Push 7822DT***
LOGGED BY:	***K. Fleming***	DRILLING METHOD:	***Geoprobe Dual-Tube Sampling***
DATES DRILLED:	***3/28/17***	DEVELOPMENT DATE:	***NA***
		LOCATION:	***South Property Boundary Area***
NOTES: Hand auger utility clearance to 5'. 3" dia dual-tube direct push macrocore advanced to 55.15' below ground suface (bgs). SAMP = Sample submitted for labratory analysis of VOCS		SURFACE ELEVATION	Approximately 413 feet AMSL
		EASTING	2260118.75703
		NORTHING	239014.925519

DEPTH FEET	BLOW COUNTS	PID (ppm)	RECOV.	SAMP.	SOIL DESCRIPTION	GRAPHIC	DEPTH FEET	WELL CONSTRUCTION	WELL CONSTRUCTION DETAILS
28		0.0 0.0 0.0 0.0					28		
30		0.0	60/60"	30'-30.5'	Brownish yellow 10YR 6/6 fine to medium SAND and SILT, some medium to coarse Gravel, little Clay. Red mottling on gravel. Dense. Moist.		30		
32		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0					32		
34							34		
36		0.0	55/60"	35'-35.5'	Brownish yellow 10YR 6/6 fine to medium SAND and SILT, some Clay, trace coarse Gravel. Dense. Moist.		36		
38		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0					38		
40		0.0	0/60"	No Recovery	No Recovery.		40		Depth to water measured in borehole following sampling was 54.82' on 3/30/17.
42		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0					42		
44							44		
46		0.0	60/60"	40'-40.5'	Brownish yellow 10YR 6/6 fine to medium SAND and SILT, some Clay, trace coarse Gravel. Dense. Moist.		46		
48		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0					48		
50		0.0	30/60"	50'-55'	Brownish yellow 10YR 6/6 CLAYEY SILT, some medium to coarse Sand and fine Gravel, trace fine Sand. Water Saturated 55'-55.15'.		50		
52		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0					52		
54							54		

GROUNDWATER SCIENCES CORPORATION

GEOLOGIC LOG: HD-SPBA-SB-008

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	***Harley-Davidson***	DRILLING CO.:	***Eichelbergers, Inc.***
SITE LOCATION:	***Former York Naval Ordnance Plant, York, PA***	DRILLER:	***Paul Wirrick***
JOB NO.:	***10012.31***	RIG TYPE:	***Geoprobe Direct Push 7822DT***
LOGGED BY:	***K. Fleming***	DRILLING METHOD:	***Geoprobe Dual-Tube Sampling***
DATES DRILLED:	***3/29/17***	DEVELOPMENT DATE:	***NA***
		LOCATION:	***South Property Boundary Area***
NOTES: Hand auger utility clearance to 5'. 3" dia dual-tube direct push macrocore advanced to refusal at 50' below ground suface (bgs). SAMP = Sample submitted for labratory analysis of VOCS		SURFACE ELEVATION	Approximately 416 feet AMSL
		EASTING	2260216.15389
		NORTHING	239026.213729999

DEPTH FEET	BLOW COUNTS	PID (ppm)	RECOV.	SAMP.	SOIL DESCRIPTION	GRAPHIC	DEPTH FEET	WELL CONSTRUCTION	WELL CONSTRUCTION DETAILS
0		0.0	60"/60"	0.5'-1.0'	Very dark brown 10YR 2/2 Topsoil and organics. Moist.		0		Well Not Constructed
2		0.0			Yellowish brown 10YR 5/4 fine to medium SAND, little Silt, trace coarse Sand. Moist.		2		Borehole backfilled with drill cuttings (0'-2')
4		0.0					4		
6		0.0	50/60"	5'-5.5'	Yellowish brown 10YR 5/4 fine to medium SAND and SILT, some medium to coarse Gravel (2-3"), trace Clay. Moist.		6		
8		0.0					8		
10		0.0	55/60"	10'-10.5'	Pale Brown 6/3 to Light gray 5Y 7/2 fine SAND and SILT, some medium to coarse Gravel (2-3"), little Clay. Moist. Red mottling on last 8".		10		
12		0.0					12		
14		0.0					14		
16		0.0	60/60"	15'-15.5'	Yellowish Red 5YR 5/8 to Yellowish brown 10YR 5/4 SILTY CLAY, little fine to medium Sand, trace fine Gravel. Moist.		16		Borehole backfilled with bentonite hole plug (2'-50')
18		0.0					18		
20		0.0	60/60"	20'-20.5'			20		
22		0.0			Yellowish brown 10YR 5/4 fine to coarse SAND and SILT.		22		
24		0.0			Yellowish brown 10YR 5/4 fine SAND and SILT, little Clay, little fine to coarse Gravel. Moist.		24		
26		0.0	60/60"	25'-25.5'	Brownish yellow 10YR 6/6, to Yellowish brown 10YR 5/4 SILTY CLAY, little fine to coarse Gravel, trace fine to medium Sand. Moist.		26		
28		0.0					28		

GROUNDWATER SCIENCES CORPORATION

GEOLOGIC LOG: **HD-SPBA-SB-008**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	***Harley-Davidson***	DRILLING CO.:	***Eichelbergers, Inc.***
SITE LOCATION:	***Former York Naval Ordnance Plant, York, PA***	DRILLER:	***Paul Wirrick***
JOB NO.:	***10012.31***	RIG TYPE:	***Geoprobe Direct Push 7822DT***
LOGGED BY:	***K. Fleming***	DRILLING METHOD:	***Geoprobe Dual-Tube Sampling***
DATES DRILLED:	***3/29/17***	DEVELOPMENT DATE:	***NA***
		LOCATION:	***South Property Boundary Area***
NOTES: Hand auger utility clearance to 5'. 3" dia dual-tube direct push macrocore advanced to refusal at 50' below ground suface (bgs). SAMP = Sample submitted for labratory analysis of VOCS		SURFACE ELEVATION	Approximately 416 feet AMSL
		EASTING	2260216.15389
		NORTHING	239026.213729999

DEPTH FEET	BLOW COUNTS	PID (ppm)	RECOV.	SAMP.	SOIL DESCRIPTION	GRAPHIC	DEPTH FEET	WELL CONSTRUCTION	WELL CONSTRUCTION DETAILS
28		0.0 0.0 0.0 0.0					28		
30		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	60/60"	30'-30.5'	Brownish yellow 10YR 6/6, to Yellowish brown 10YR 5/4 SILTY CLAY, some fine to coarse Gravel, trace medium to coarse Sand. Dense. Moist. Water Saturanted 43.6'-43.8'.		30		
32							32		
34							34		
36		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	60/60"	35'-35.5'			36		
38							38		
40		0.0 0.0 0.0 0.0 0.0 0.1 0.0 0.0 0.0 0.0	60/60"	40'-45.5'			40		Depth to water measured in borehole following sampling was 47.75' on 3/30/17.
42							42		
44							44		
46		0.1 0.0 0.0 0.0 0.1 0.1 0.0 0.0 0.0 0.0	60/60"	45'-45.5'	Brownish yellow 10YR 6/6 to Dark yellowish brown 10YR 4/6 SILTY CLAY, some fine to coarse Gravel, weathered bedrock and water saturation from 49.9'-50'. Geoprobe refusal 50'.		46		
48							48		
50							50		

GROUNDWATER SCIENCES CORPORATION

GEOLOGIC LOG: HD-SPBA-SB-009

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	***Harley-Davidson***	DRILLING CO.:	***Eichelbergers, Inc.***
SITE LOCATION:	***Former York Naval Ordnance Plant, York, PA***	DRILLER:	***Paul Wirrick***
JOB NO.:	***10012.31***	RIG TYPE:	***Geoprobe Direct Push 7822DT***
LOGGED BY:	***K. Fleming***	DRILLING METHOD:	***Geoprobe Dual-Tube Sampling***
DATES DRILLED:	***3/29/17-3/30/17***	DEVELOPMENT DATE:	***NA***
		LOCATION:	***South Property Boundary Area***
NOTES: Hand auger utility clearance to 5'. 3" dia dual-tube direct push macrocore advanced to refusal at 68' below ground suface (bgs). SAMP = Sample submitted for labratory analysis of VOCS		SURFACE ELEVATION	Approximately 418 feet AMSL
		EASTING	2260260.27241
		NORTHING	239077.461772

DEPTH FEET	BLOW COUNTS	PID (ppm)	RECOV.	SAMP.	SOIL DESCRIPTION	GRAPHIC	DEPTH FEET	WELL CONSTRUCTION	WELL CONSTRUCTION DETAILS
0		0.0	60"/60"	0.5'-1.0'	Very Dark Brown 10YR 2/2, Topsoil and organics. Moist.		0		Well Not Constructed
2		0.0			Yellowish Red 5YR 5/8 fine to medium SAND and SILT, trace fine Gravel. Moist.		2		Borehole backfilled with drill cuttings (0'-2')
4		0.0					4		
6		0.0	50/60"	5'-5.5'	Yellowish Red 5YR 5/8 fine to medium SAND and SILT, little coarse Sand, little medium to coarse Gravel. Moist.		6		
8		0.0					8		
10		0.0	60/60"	10'-10.5'	Brownish Yellow 10YR 6/6 fine to medium SAND and coarse quartz GRAVEL, little Silt, trace Clay. Moist.		10		
12		0.0			Brownish Yellow 10YR 6/6 CLAYEY SILT, some medium to coarse quartz Gravel, trace fine to medium Sand. Moist.		12		
14		0.0					14		
16		0.0	60/60"	15'-15.5'	Yellowish Brown 10YR 5/4 fine to coarse SAND and SILT, little fine to medium Gravel, trace Clay, Moist.		16		Borehole backfilled with bentonite hole plug (2'-68')
18		0.0					18		
20		0.0	60/60"	20'-20.5'			20		
22		0.0			Pale Brown 6/3 to Light Gray 5Y 7/2 CLAYEY SILT, some fine Sand, trace medium to coarse Gravel. Moist.		22		
24		0.0					24		
26		0.0	60/60"	25'-25.5'			26		
28		0.0					28		

GROUNDWATER SCIENCES CORPORATION

GEOLOGIC LOG: HD-SPBA-SB-009

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	***Harley-Davidson***	DRILLING CO.:	***Eichelbergers, Inc.***
SITE LOCATION:	***Former York Naval Ordnance Plant, York, PA***	DRILLER:	***Paul Wirrick***
JOB NO.:	***10012.31***	RIG TYPE:	***Geoprobe Direct Push 7822DT***
LOGGED BY:	***K. Fleming***	DRILLING METHOD:	***Geoprobe Dual-Tube Sampling***
DATES DRILLED:	***3/29/17-3/30/17***	DEVELOPMENT DATE:	***NA***
		LOCATION:	***South Property Boundary Area***
NOTES: Hand auger utility clearance to 5'. 3" dia dual-tube direct push macrocore advanced to refusal at 68' below ground suface (bgs). SAMP = Sample submitted for labratory analysis of VOCS		SURFACE ELEVATION	Approximately 418 feet AMSL
		EASTING	2260260.27241
		NORTHING	239077.461772

DEPTH FEET	BLOW COUNTS	PID (ppm)	RECOV.	SAMP.	SOIL DESCRIPTION	GRAPHIC	DEPTH FEET	WELL CONSTRUCTION	WELL CONSTRUCTION DETAILS
28		0.0					28		
		0.0							
		0.0							
		0.0							
30		0.0	60/60"	30'-30.5'	Yellowish Brown 10YR 5/4 SILTY CLAY, little fine to medium quartz Gravel, trace fine Sand. Moist.		30		
		0.0							
		0.0							
		0.0							
32		0.0					32		
		0.0			Yellowish Brown 10YR 5/4 SILTY CLAY, some medium to coarse quartz Gravel, trace fine Gravel, trace coarse Sand. Moist.				
		0.0							
		0.0							
34		0.0					34		
		0.0							
		0.0							
36		0.0	60/60"	35'-35.5'	Yellowish Red 5YR 5/8 to Yellowish Brown 10YR 5/4 SILTY CLAY, some fine to coarse Gravel, trace fine to medium Sand. Dense. Moist. Water saturated 50'-50.1'.		36		
		0.0							
		0.0							
		0.0							
38		0.0					38		
		0.0							
		0.0							
		0.0							
40		0.0	60/60"	40'-45.5'			40		Depth to water measured in borehole following sampling was 13.5' on 3/30/17.
		0.0							
		0.0							
		0.0							
42		0.0					42		
		0.0							
		0.0							
		0.0							
44		0.0					44		
		0.0							
		0.0							
		0.1	60/60"	45'-45.5'					
46		0.0					46		
		0.0							
		0.0							
		0.0							
48		0.0					48		
		0.0							
		0.0							
		0.0							
50		0.0					50		
		0.0	60/60"	53.5'-54'					
		0.1							
		0.1							
52		0.2					52		
		0.0							
		0.0							
		0.3			Yellowish Brown 10YR 5/4 CLAY, trace Silt, trace fine to medium Sand, trace coarse Gravel. Moist.				
54		2.1					54		
		0.1							
		0.0							
		0.2	60/60"	58.5'-59'	Yellowish Brown 10YR 5/4 SILTY CLAY, some fine to coarse Gravel, trace fine to				
		0.9							
56		1.2					56		

GROUNDWATER SCIENCES CORPORATION

GEOLOGIC LOG: HD-SPBA-SB-009

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	***Harley-Davidson***	DRILLING CO.:	***Eichelbergers, Inc.***
SITE LOCATION:	***Former York Naval Ordnance Plant, York, PA***	DRILLER:	***Paul Wirrick***
JOB NO.:	***10012.31***	RIG TYPE:	***Geoprobe Direct Push 7822DT***
LOGGED BY:	***K. Fleming***	DRILLING METHOD:	***Geoprobe Dual-Tube Sampling***
DATES DRILLED:	***3/29/17-3/30/17***	DEVELOPMENT DATE:	***NA***
		LOCATION:	***South Property Boundary Area***
NOTES: Hand auger utility clearance to 5'. 3" dia dual-tube direct push macrocore advanced to refusal at 68' below ground suface (bgs). SAMP = Sample submitted for labratory analysis of VOCS		SURFACE ELEVATION	Approximately 418 feet AMSL
		EASTING	2260260.27241
		NORTHING	239077.461772

DEPTH FEET	BLOW COUNTS	PID (ppm)	RECOV.	SAMP.	SOIL DESCRIPTION	GRAPHIC	DEPTH FEET	WELL CONSTRUCTION	WELL CONSTRUCTION DETAILS
58		1.1 1.1 1.1 1.2 2.8 2.2 1.9			medium Sand. Dense. Moist. Water saturated gravel from 57'-57.1' and 58.2'-58.4'.		58		
60		0.9 0.0 0.3 0.3 0.0 0.0 0.1 0.1 0.0 0.0	60/60"	61'-61.5'	Yellowish Brown 10YR 5/4 SILTY CLAY, some fine to coarse Gravel, trace fine to medium Sand. Dense. Moist. Water saturated from 64.8'-65'.		60 62 64		
62									
64									
66		0.1 0.0 0.0 0.0 0.0 0.0	18/60"	65'/68'	Yellowish Brown 10YR 5/4 SILTY CLAY, some fine to coarse Gravel, trace fine to medium Sand. Dense. Moist. Weathered bedrock and water saturated at 66.5'-68'. Geoprobe refusal 68'.		66 68		
68									

GROUNDWATER SCIENCES CORPORATION

GEOLOGIC LOG: HD-SPBA-SB-010

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	***Harley-Davidson***	DRILLING CO.:	***Eichelbergers, Inc.***
SITE LOCATION:	***Former York Naval Ordnance Plant, York, PA***	DRILLER:	***Paul Wirrick***
JOB NO.:	***10012.31***	RIG TYPE:	***Geoprobe Direct Push 7822DT***
LOGGED BY:	***K. Fleming***	DRILLING METHOD:	***Geoprobe Dual-Tube Sampling***
DATES DRILLED:	***3/30/17***	DEVELOPMENT DATE:	***NA***
		LOCATION:	***South Property Boundary Area***
NOTES: Hand auger utility clearance to 5'. 3" dia dual-tube direct push macrocore advanced to refusal at 55.25' below ground suface (bgs). SAMP = Sample submitted for labratory analysis of VOCS		SURFACE ELEVATION	Approximately 432 feet AMSL
		EASTING	2260282.02443
		NORTHING	239178.802358999

DEPTH FEET	BLOW COUNTS	PID (ppm)	RECOV.	SAMP.	SOIL DESCRIPTION	GRAPHIC	DEPTH FEET	WELL CONSTRUCTION	WELL CONSTRUCTION DETAILS
0		0.0	60"/60"	0.5'-1.0'	Very Dark Brown 10YR 2/2, Topsoil and organics. Moist.		0		Well Not Constructed
2		0.0			Brownish Yellow 10YR 6/6 fine to medium SAND and GRAVEL, some Silt, trace Organics. Moist.		2		Borehole backfilled with drill cuttings (0'-2')
4		0.0					4		
6		0.0	60/60"	5'-5.5'	Brownish Yellow 10YR 6/6 fine to medium SAND and SILT, some medium to coarse Gravel, trace Clay. Moist.		6		
8		0.0					8		
10		0.0	60/60"	10'-10.5'			10		
12		0.0			Yellowish Brown 10YR 5/4 SILTY CLAY, little medium to coarse Gravel, trace fine to medium Sand. Moist.		12		
14		0.0					14		
16		0.0	60/60"	15'-15.5'	Yellowish Brown 10YR 5/4 fine SAND and SILT, some medium to coarse Gravel, little Clay. Moist.		16		Borehole backfilled with bentonite hole plug (2'-55.25')
18		0.0					18		
20		0.0	60/60"	20'-20.5'	Yellowish Brown 10YR 5/4 SILTY CLAY, little fine to coarse GRAVEL, trace fine to medium Sand. Moist.		20		
22		0.0					22		
24		0.0					24		
26		0.0	60/60"	25'-25.5'	Brownish Yellow 10YR 6/6 to Yellowish Brown 10YR 5/4 fine to medium SAND and SILT, little fine to medium Gravel,		26		
28		0.0					28		

GROUNDWATER SCIENCES CORPORATION

GEOLOGIC LOG: HD-SPBA-SB-010

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	***Harley-Davidson***	DRILLING CO.:	***Eichelbergers, Inc.***
SITE LOCATION:	***Former York Naval Ordnance Plant, York, PA***	DRILLER:	***Paul Wirrick***
JOB NO.:	***10012.31***	RIG TYPE:	***Geoprobe Direct Push 7822DT***
LOGGED BY:	***K. Fleming***	DRILLING METHOD:	***Geoprobe Dual-Tube Sampling***
DATES DRILLED:	***3/30/17***	DEVELOPMENT DATE:	***NA***
		LOCATION:	***South Property Boundary Area***
NOTES: Hand auger utility clearance to 5'. 3" dia dual-tube direct push macrocore advanced to refusal at 55.25' below ground suface (bgs). SAMP = Sample submitted for labratory analysis of VOCS		SURFACE ELEVATION	Approximately 432 feet AMSL
		EASTING	2260282.02443
		NORTHING	239178.802358999

DEPTH FEET	BLOW COUNTS	PID (ppm)	RECOV.	SAMP.	SOIL DESCRIPTION	GRAPHIC	DEPTH FEET	WELL CONSTRUCTION	WELL CONSTRUCTION DETAILS
28		0.0			trace Clay. Moist.		28		
		0.0							
		0.0							
		0.0			Yellowish Brown 10YR 5/4 SILTY CLAY, some fine to coarse Gravel, trace fine to medium Sand. Last 3" wet.				
30		0.0	60/60"	31.6-32.2			30		
		0.0							
		0.0							
		0.0			Yellowish Brown 10YR 5/4 SILTY CLAY, some fine to coarse Gravel, trace fine to medium Sand. Water saturated 31.4'-31.6'.				
32		0.0					32		
		0.0							
		0.0							
		0.0			Yellowish Brown 10YR 5/4 SILTY CLAY, some fine to coarse Gravel, trace fine to medium Sand. Moist.				
34		0.0					34		
		0.0							
		0.0							
36		0.0	60/60"	35'-35.5'			36		
		0.0							
		0.0							
		0.0							
		0.0							
38		0.0					38		
		0.0							
		0.0							
		0.0							
		0.0							
40		0.0	60/60"	40'-45.5'	Dark Reddish Brown 5YR 3/4 CLAYEY SILT, trace fine to medium Sand. Moist.		40		Depth to water measured in borehole following sampling was 55.15' on 3/30/17.
		0.0							
		0.0							
		0.0			Yellowish Brown 10YR 5/4 SILTY CLAY, trace fine to medium Gravel. Moist.				
42		0.0					42		
		0.0							
		0.0							
		0.0			Yellowish Brown 10YR 5/4 SILTY CLAY, trace fine to medium Sand. Water saturated 43'-43.2'.				
44		0.0					44		
		0.0							
		0.0							
		0.1	60/60"	45'-45.5'					
		0.0			Yellowish Brown 10YR 5/4 SILTY CLAY, some fine to coarse quartz Gravel, trace fine to coarse Sand. Dense. Hard. Moist except water saturated 54.8'-55.25'. Geoprobe refusal 55.25'.				
46		0.0					46		
		0.0							
		0.0							
		0.0							
		0.0							
48		0.0					48		
		0.0							
		0.0							
		0.0							
		0.0							
50		0.0	60/60"	50'-50.5'			50		
		0.0							
		0.0							
		0.0							
52		0.0					52		
		0.0							
		0.0							
		0.0							
		0.0							
54		0.0					54		
		0.0							
		0.0							
		0.0	60/60"						

Appendix C

Soil Sample Analytical Reports