SOIL GAS SURVEY

BUILDING 25
WATERVLIET ARSENAL
WATERVLIET, NEW YORK

PREPARED FOR

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PREPARED BY

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EXECUTIVE SUMMARY

On December 14-15, 1994, **TARGET Environmental Services, Inc. (TARGET)** conducted a soil gas survey at **Building 25 - Watervliet Arsenal** in Watervliet, New York. A total of 48 soil gas samples and 1 duplicate were collected from depths of 3 to 4 feet. The samples were analyzed on site using a gas chromatograph equipped with a flame ionization detector (GC/FID) for petroleum hydrocarbons and an electron capture detector for halogenated hydrocarbons (GC/ECD). The objective of the survey was to determine the lateral extent of subsurface volatile organic contamination in the area of Building 25 at the arsenal.

Only one sample revealed petroleum hydrocarbons above the reporting limit. However, the GC/FID chromatogram signature of Sample WVA-B25-SG-41 was so weak that only a few peaks smaller than the small ethylbenzene and xylenes peaks were visible in the same distillation range. No fuel identification was possible with this limited peak pattern.

All the samples observed to have TCE in them were collected just east of Building 25, especially near the northeast end of the building. No significant petroleum contamination was observed at the site within the shallow subsurface. No other contamination was observed during this survey.

Introduction

Malcolm Pirnie, Inc. contracted **TARGET Environmental Services, Inc. (TARGET)** to perform a soil gas survey at **Building 25 - Watervliet Arsenal**, Watervliet, New York. The site is in the vicinity of the Industrial Waste Treatment Plant and Building 25 of the arsenal. Subsurface materials were reported to be channelized silt, sand and gravel deposits interbedded with peat to a depth of 24 feet. Groundwater was anticipated to be 10 feet below the surface. The objective of the survey was to determine the lateral extent of subsurface volatile organic contamination in the area of Building 25 at the arsenal.

The proposed survey grid was designed to include a grid of 50 sampling locations spaced approximately 50 feet apart. The proposed depth of sampling was 4 feet. The field phase of the survey was conducted on December 14-15, 1994.

Sample Collection and Analysis

Soil gas samples were collected at a total of 48 locations at the site, as shown in Figure 1. In addition, 1 duplicate sample was collected at Location WVA-B25-SG-34 and is indicated by a "D" following the sample number. Final sample depths varied somewhat between 3 and 4 feet below ground surface due to shallow subsurface refusal of the drive rod. However, most of the samples were collected at a depth of 4 feet. A detailed explanation of the sampling procedure is provided in Appendix A.

All of the soil gas samples collected during the field phase of the survey were subjected to dual analyses. One analysis was conducted according to EPA Method 8010 (modified) on a gas chromatograph equipped with an electron capture detector (ECD), and using direct injection. Specific analytes standardized for this analysis were:

1,1-dichloroethene (11DCE)
methylene chloride (CH_2Cl_2)
trans-1,2-dichloroethene (t12DCE)
1,1-dichloroethane (11DCA)
cis-1,2-dichloroethene (c12DCE)
chloroform ($CHCl_3$)
1,1,1-trichloroethane (111TCA)
carbon tetrachloride (CCl_4)
trichloroethene (TCE)
1,1,2-trichloroethane (112TCA)
tetrachloroethene (PCE)

The chlorinated hydrocarbons in this suite were chosen because of their common usage in industrial solvents, and/or their degradational relationship to commonly used compounds.

The second analysis was conducted according to EPA Method 8020 (modified) on a gas chromatograph equipped with a flame ionization detector (FID), and using direct injection. The analytes selected for standardization in this analysis were:

benzene
toluene
ethylbenzene
meta- and para- xylene
ortho- xylene

These compounds were chosen because of their utility in evaluating the presence of fuel products, or petroleum based solvents. An explanation of the laboratory procedures is provided in Appendix B.

The tabulated results of the laboratory analyses of the soil gas samples are reported in micrograms per liter-vapor (µg/l-v) in Tables 1 and 2. Although "micrograms per liter" is equivalent to "parts per billion (v/v)" in water analyses, they are not equivalent in gas analyses, due to the difference in the mass of equal volumes of water and gas matrices. The xylenes concentrations reported in Table 1 are the sum of the m- and p-xylene and the o-xylene concentrations for each sample. With **TARGET**'s analytical run conditions, 1,1-dichloroethene

(11DCE)/trichlorotrifluoroethane (TCTFA) and carbon tetrachloride (CCl_4)/1,2-dichloroethane (12DCA) occur as co-eluting pairs and are reported in Table 2 in concentrations of 11DCE and CCl_4, respectively.

Quality Assurance/Quality Control (QA/QC) Evaluation

Field QA/QC Samples

Field control samples (blanks) were collected at the beginning and end of each day's field activities and after every tenth soil gas sample. These QA/QC blanks were obtained by filtering ambient air through a dust and organic vapor filter cartridge and encapsulating as described in the "Field Procedures" in Appendix A. In addition, a duplicate soil gas sample was collected from Sample Location WVA-B25-SG-34 and is indicated by a "D" following the sample number. The laboratory results of these QA/QC samples are reported in Tables 1 and 2. Concentrations of all analytes were below the reporting limit in all field control blanks, indicating that the QA/QC measures employed were sufficient to prevent cross-contamination of the samples during collection. The duplicate soil gas sample results were within acceptable limits.

Laboratory QA/QC Samples

To document analytical repeatability, a duplicate analysis was performed on the twentieth field sample. A laboratory blank of nitrogen gas was also analyzed after twentieth field sample. The results of these analyses are reported in Tables 1 and 2. The duplicate analysis was within acceptable limits. Concentrations of all analytes were below the reporting limit in the laboratory blank.

Results

The analytical results revealed only a few "positive" analyte detections which were insufficient to allow meaningful contouring of the data. Therefore, none of the data sets were mapped or contoured and only a "Sample Locations" map is provided in this report. An explanation of the terminology used in this report is provided in Appendix C.

Total FID Volatiles were observed at a concentration of 40 µg/l in Sample WVA-B25-SG-41. Ethylbenzene and xylenes were also present in this sample at concentrations of 4.9 and 33 µg/l, respectively. No other samples revealed any petroleum hydrocarbons. TCE was the only chlorinated contaminant observed above the reporting limit. It occurred in Samples WVA-B25-SG-12, -15, -16 and -24 at concentrations ranging from 1.4 to 7.0 µg/l. No other samples revealed any halogenated compounds.

Interpretation

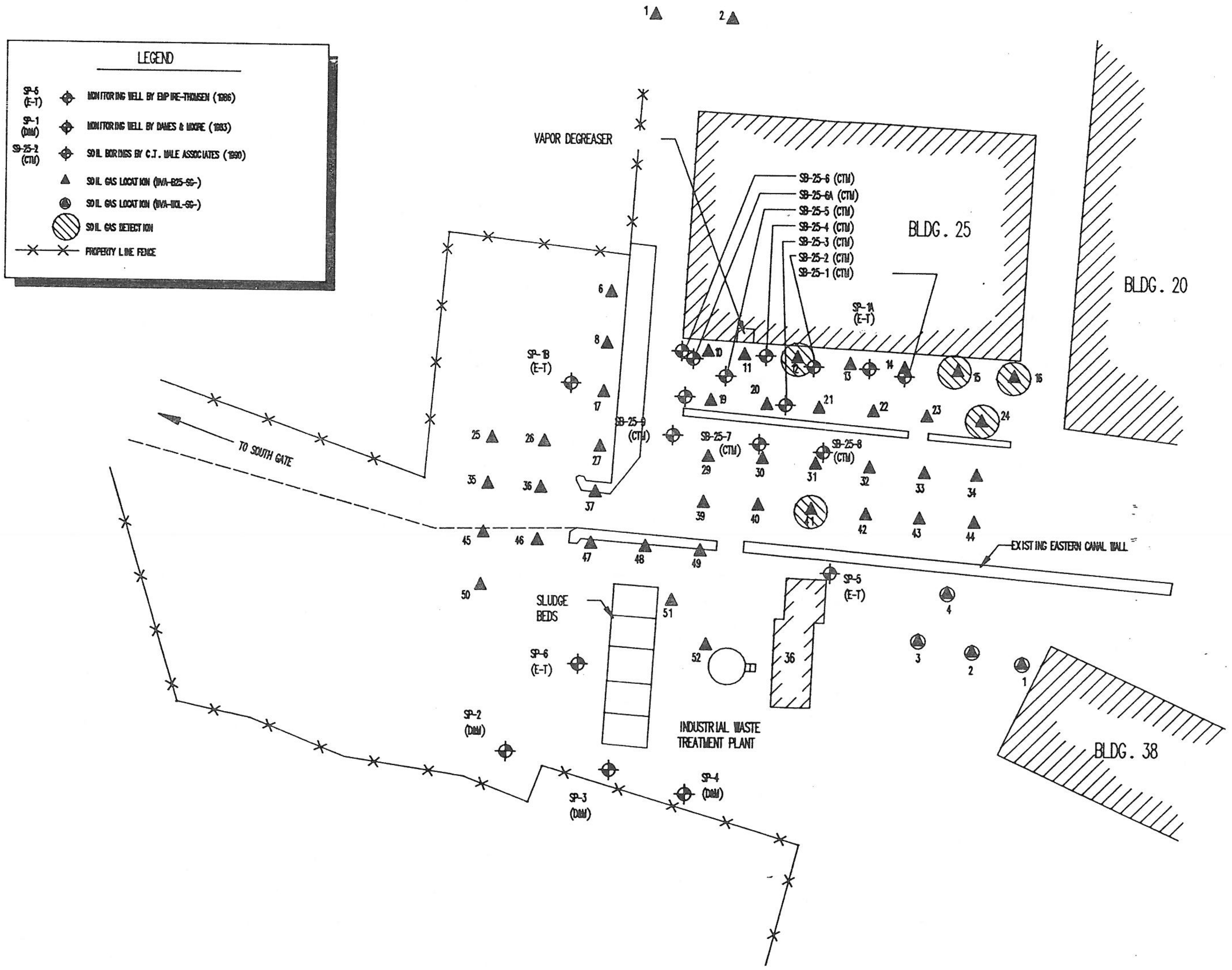
The GC/FID chromatogram signature of Sample WVA-B25-SG-41 was so weak that only a few peaks smaller than the small ethylbenzene and xylenes peaks were visible in the same distillation range. This sample was collected just west of the eastern canal wall, approximately 160 feet east of the middle of the building. No fuel identification was possible with this limited peak pattern.

All the samples observed to have TCE in them were collected just east of Building 25, especially near the northeast end of the building.

Conclusions

- The concentrations of petroleum hydrocarbons observed in Sample WVA-B25-SG-41 do not indicate a significant petroleum contamination problem within the shallow subsurface of the site.

- Concentrations of TCE ranging from 1.4 to 7.0 µg/l were observed at four sample locations just east of Building 25.



GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)

FIGURE 1. Sample Locations

WATERVLIET ARSENAL
WATERVLIET, NEW YORK

TARGET ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

TABLE 1

ANALYTE CONCENTRATIONS VIA GC/FID (µg/l)

SAMPLE	ANALYSIS DATE	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES	TOTAL FID VOLATILES*
REPORTING LIMIT		1.0	1.0	1.0	1.0	10
WOL-SG-1	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WOL-SG-2	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WOL-SG-3	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WOL-SG-4	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-1	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-2	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-6	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-8	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-10	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-11	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-12	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-13	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-14	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-15	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-16	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-17	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-19	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-20	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-21	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-22	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-23	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-24	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-25	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-26	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-27	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-29	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-30	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-31	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-32	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-33	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-34	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-34D	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-35	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-36	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-37	12/14/94	<1.0	<1.0	<1.0	<1.0	<10

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* *CALCULATED USING THE SUM OF THE AREAS OF ALL INTEGRATED CHROMATOGRAM PEAKS AND THE INSTRUMENT RESPONSE FACTOR FOR TOLUENE*

TABLE 1

ANALYTE CONCENTRATIONS VIA GC/FID (µg/l)

SAMPLE	ANALYSIS DATE	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES	TOTAL FID VOLATILES*
REPORTING LIMIT		1.0	1.0	1.0	1.0	10
WVA-B25-SG-39	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-40	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-41	12/14/94	<1.0	<1.0	4.9	33	40
WVA-B25-SG-42	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-43	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-44	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-45	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-46	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-47	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-48	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-49	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-50	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-51	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-52	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
FIELD CONTROL SAMPLES						
WVA-B25-SG-101	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-102	12/14/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-103	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-104	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-105	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-106	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
LABORATORY DUPLICATE ANALYSIS						
WVA-B25-SG-15	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
WVA-B25-SG-15R	12/15/94	<1.0	<1.0	<1.0	<1.0	<10
LABORATORY BLANKS						
WVA-B25-SG-15B	12/15/94	<1.0	<1.0	<1.0	<1.0	<10

** CALCULATED USING THE SUM OF THE AREAS OF ALL INTEGRATED CHROMATOGRAM PEAKS AND THE INSTRUMENT RESPONSE FACTOR FOR TOLUENE*

TABLE 2

ANALYTE CONCENTRATIONS VIA GC/ECD (μg/l)

SAMPLE	ANALYSIS DATE	11DCE*	CH2Cl2	t12DCE	11DCA	c12DCE	CHCl3	111TCA	CCl4*	TCE	112TCA	PCE
REPORTING LIMIT		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
WOL-SG-1	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WOL-SG-2	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WOL-SG-3	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WOL-SG-4	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-1	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-2	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-6	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-8	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-10	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-11	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-12	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.1	<1.0	<1.0
WVA-B25-SG-13	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-14	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-15	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.0	<1.0	<1.0
WVA-B25-SG-16	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.7	<1.0	<1.0
WVA-B25-SG-17	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-19	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-20	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-21	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-22	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-23	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-24	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.4	<1.0	<1.0
WVA-B25-SG-25	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-26	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-27	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-29	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-30	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-31	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-32	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-33	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-34	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-34D	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-35	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-36	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-37	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

TABLE 2

ANALYTE CONCENTRATIONS VIA GC/ECD (μg/l)

SAMPLE	ANALYSIS DATE	11DCE*	CH2Cl2	t12DCE	11DCA	c12DCE	CHCl3	111TCA	CCl4*	TCE	112TCA	PCE
REPORTING LIMIT		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
WVA-B25-SG-39	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-40	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-41	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-42	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-43	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-44	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-45	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-46	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-47	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-48	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-49	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-50	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-51	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-52	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
FIELD CONTROL SAMPLES												
WVA-B25-SG-101	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-102	12/14/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-103	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-104	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-105	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
WVA-B25-SG-106	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
LABORATORY DUPLICATE ANALYSIS												
WVA-B25-SG-15	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.0	<1.0	<1.0
WVA-B25-SG-15R	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	6.9	<1.0	<1.0
LABORATORY BLANKS												
WVA-B25-SG-15B	12/15/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

11DCE = 1,1-dichloroethene
11DCA = 1,1-dichloroethane
111TCA = 1,1,1-trichloroethane
112TCA = 1,1,2-trichloroethane
CH2Cl2 = methylene chloride
c12DCE = cis-1,2-dichloroethene
CCl4 = carbon tetrachloride
PCE = tetrachloroethene
t12DCE = trans-1,2-dichloroethene
CHCl3 = chloroform
TCE = trichloroethene

* *11DCE/TCTFA and CCl4/12DCA are co-eluting pairs and are reported in concentrations of 11DCE and CCl4, respectively.*

FIELD PROCEDURES

To collect the samples a 1/2 inch hole was produced to a depth of approximately 4 feet by using a drive rod. Where pavement was present, a rotary hammer was employed for penetration prior to using the drive rod. The entire sampling system was purged with ambient air drawn through an organic vapor filter cartridge, and a stainless steel probe was inserted to the full depth of the hole and sealed off from the atmosphere. A sample of in-situ soil gas was then withdrawn through the probe and used to purge atmospheric air from the sampling system. A second sample of soil gas was withdrawn through the probe and encapsulated in a pre-evacuated glass vial at two atmospheres of pressure (15 psig). The self-sealing vial was detached from the sampling system, packaged, labeled, and stored for laboratory analysis.

Prior to the day's field activities all sampling equipment, slide hammer rods and probes were decontaminated by washing with soapy water and rinsing thoroughly. Internal surfaces were flushed dry using pre-purified nitrogen or filtered ambient air, and external surfaces were wiped clean using clean paper towels.

LABORATORY PROCEDURES

The analytical equipment was calibrated using a 3-point instrument-response curve and injection of known concentrations of the target analytes. Retention times of the standards were used to identify the peaks in the chromatograms of the field samples, and their response factors were used to calculate the analyte concentrations.

Total FID Volatiles values were generated by summing the areas of all integrated chromatogram peaks and calculated using the instrument response factor for toluene. Injection peaks, which also contain the light hydrocarbon methane, were excluded to avoid the skewing of Total FID Volatiles values due to injection disturbances and biogenic methane. For samples with low hydrocarbon concentrations, the calculated Total FID Volatiles concentration is occasionally lower than the sum of the individual analytes. This is because the response factor used for the Total FID Volatiles calculation is a constant, whereas the individual analyte response factors are compound specific. It is important to understand that the Total FID Volatiles levels reported are relative, not absolute, values.

DETECTABILITY & TERMINOLOGY

Detectability

The soil gas survey data presented in this report are the result of precise sampling and measurement of contaminant concentrations in the vadose zone. Analyte detection at a particular location is representative of vapor, dissolved, and/or liquid phase contamination at that location. The presence of detectable levels of target analytes in the vadose zone is dependent upon several factors, including the presence of vapor-phase hydrocarbons or dissolved or liquid concentrations adequate to facilitate volatilization into the unsaturated zone.

Terminology

In order to prevent misunderstanding of certain terms used in **TARGET**'s reports, the following clarifications are offered:

Analyte refers to any of the hydrocarbons standardized for quantification in the chromatographic analysis.

Anomaly refers to an area where hydrocarbons were measured in excess of what would normally be considered "natural" or "background" levels.

Elevated and **significant** are used to describe concentrations of analytes which indicate the existence of a potential problem in the soil or ground water.

Feature is used in reference to a discernible pattern in the contoured data. It denotes a contour form rather than a definite or separate chemical occurrence.

Indicates is used when evidence dictates a unique conclusion. **Suggests** is used when several explanations of certain evidence are possible, but one in particular seems more likely. As a result, "indicates" carries a higher degree of confidence in a conclusion than does "suggests."

Occurrence is used to indicate an area where chemical compounds are present in sufficient concentrations to be detected by the analysis of soil vapors. The term is not indicative of any specific mode of occurrence (vapor, dissolved, etc.), and does not necessarily indicate or suggest the presence of "free product" or "phase-separated hydrocarbons."

Reporting Limit refers to the minimum concentration reported for each analyte.

Vadose zone represents the unsaturated zone between the ground water table and the ground surface.

The terms "low", "moderate" and "high" levels, when applied to Total FID Volatile petroleum hydrocarbons, are relative terms based on **TARGET**'s analysis of thousands of soil gas samples from hundreds of sites. Less than 100 µg/l can be considered very low. Levels between 0 and 1000 µg/l can be considered typical "background" levels often observed at fuel handling facilities. "Moderate" levels include concentrations in the range of 25,000 to 50,000 µg/l. Levels greater than 100,000 µg/l are deemed "high", while those greater than 750,000 µg/l are considered to be very high.

The same terms when applied to chlorinated hydrocarbons refer to much lower levels. This is partially due to the fact that individual analytes rather than chlorinated "totals" are being discussed, and partially due to the generally more serious nature of contamination by these compounds. Concentrations less than 1-2 µg/l are considered relatively low and those around 10-20 µg/l are considered moderate. High values include levels greater than 100 µg/l, while concentrations over 1000 µg/l are considered extremely high.