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DATE: May 14, 2010

TO: Terrence Johnson, U.S. EPA/ERT Work Assignment Manager

THROUGH: Richard Leuser, SERAS Deputy Program Manager
Dan Patel, SERAS Task Leader

FROM: David Edgerton, SERAS Groundwater Modeler

SUBJECT: BASELINE SOIL GAS AND SOIL INVESTIGATIONS AT THE CIRCUITRON SITE, EAST FARMINGDALE, LONG ISLAND, NEW YORK
WA#0-022 TECHNICAL MEMORANDUM

1.0 INTRODUCTION

This technical memorandum, prepared by personnel from the Scientific, Engineering, Response and Analytical Services (SERAS) contract, presents results of baseline soil gas and soil sampling performed during four events (between August 2007 and May 2008) at the Circuitron Site (site). The site is located in East Farmingdale, Long Island, New York (NY).

Site activities were previously completed by Lockheed Martin personnel from the Response Engineering and Analytical Contract (REAC) in consultation with the Environmental Protection Agency (EPA) Environmental Response Team (ERT) Work Assignment Manager (WAM). The site is a known source of chlorinated volatile organic compound (VOC) contamination, with 1,1,1-trichloroethane (TCA) and tetrachloroethene (PCE) being the primary contaminants of concern.

2.0 PURPOSE

EPA Region 2 selected a pilot source treatment system (PSTS) comprised of a groundwater circulation well (GCW) that works in tandem with in-well vapor stripping (IVS) and soil vapor extraction (SVE) systems to treat contaminated soils associated with storm drains SD3 and SD2, located in the southwest corner of the site (Figure 1).

The performance metrics for determining the effectiveness of the PSTS is soil VOC concentrations with a cleanup goal of 1,000 micrograms per kilogram (μg/kg) for TCA and 1,500 μg/kg for PCE. However, because collection and analysis of soil gas and groundwater samples are much less expensive, the data from these surrogate matrices (soil gas and groundwater) will be used to monitor the progress of the PSTS while it is still in operation.

The primary purpose of this investigation was to prepare the site for the implementation of the PSTS by:

- Establishing baseline soil surrogate (groundwater and soil gas) concentrations.
- Installing temporary vapor well points to establish baseline VOC soil gas concentrations for comparison with subsequent sampling events to gage the effectiveness of the PSTS.

Previously, temporary monitor well points were installed to establish baseline VOC concentrations in groundwater to be used for comparison with subsequent sampling events to gage the effectiveness of the remedy (i.e., PSTS).

Analytical results for groundwater and soil gas samples will be used as a surrogates for soil metrics to assess the progress of the PSTS by estimating the decrease in TCA and/or PCE concentrations in source zone soils. Post-treatment performance soils sample will be collected after data from the surrogate matrices (soil gas and groundwater) suggest that the soil cleanup goals have been reached.

The investigation also had a secondary purpose of augmenting previous source zone investigations by:

- Collecting and analyzing split-spoon soil samples to confirm TCA concentrations that range up to 21,900,000 µg/kg and along with historical analytical results for soils associated with storm drains SD3 and SD2 (REAC, 2006b).
- Better defining the extents of the source zone at storm drain SD3.

3.0 BACKGROUND

The site is located at 82 Milbar Boulevard, East Farmingdale, NY. A detailed history of the site is documented in:

- EPA Superfund Record of Decision (ROD): Circuitron Corporation, EPA ID: NYD981184229 Operable Unit 1 (OU1), East Farmingdale, New York (NY) 3/29/91
- EPA Superfund Record of Decision (ROD): Circuitron Corporation, EPA ID: NYD981184229 Operable Unit 2 (OU2), East Farmingdale, New York (NY) 9/30/94

4.0 METHODOLOGY

The following methodologies were used to establish baseline soil gas and soil TCA and PCE concentrations, better define the source zone associated with storm drain SD3, and complete the PSTS monitoring network.

Utility Mark-Outs

Prior to initiating subsurface investigations, a utility markout provider (New York 1-Call) was retained by REAC for marking out underground utilities near locations where soil vapor well points and hollow-stem auger (HSA) borings were planned.

Drilling and Installation of Soil Vapor Well Points

REAC personnel constructed 15 soil vapor well points as part of the PSTS performance monitoring network in two events: August 2007 and May 2008 (Figure 1). Soil vapor well points were installed around the periphery of storm drain SD3, both within and outside the source zone, and constructed as follows:

- A Geoprobe® DPT post-run tubing (PRT) system was used to set 21-inch long sparge implants (#AT9637) that were connected to ¼-inch Teflon™ tubing, which extended to ground surface.
- Soil vapor well points were constructed to depths of either 12 or 22 feet below grade and designated by the suffixes "S" for shallow and "D" for deep (Table 1).
- Soil vapor well points were installed at distances up to 45 feet from storm drain SD3 in either the north, southeast or southwest directions and identified as (Figure 1):
    - SV-000D is located: next to GCW.
    - SV-N07D, SV-N30S/D and SV-N45S/D are located: 7, 30 and 45 feet north of storm drain SD3, respectively.
    - SV-SE07D, SV-SE15S/D and SV-SE45S/D are located: 7, 15 and 45 feet southeast of storm drain SD3, respectively.
    - SV-SW15S/D and SV-SW30S/D are located: 15 and 30 feet southwest of storm drain SD3, respectively.
- Either a 4- or 8-inch diameter flush mount cover protects the soil vapor wellhead.

Aquifer Characterization of Bulk Density and Total Organic Carbon (TOC)

Characterization of subsurface soils (i.e., aquifer material) was required to estimate the soil-water distribution coefficient (K_d) and retardation factor (R_f) of both TCA and PCE in the source zone (Table 2).

Under this task, REAC collected three subsurface soil samples from the unsaturated zone using DPT. The soil samples were analyzed for bulk density (ASTM Method D2937) at the REAC Engineering and Evaluation Unit (EEU) in Edison, NJ and total TOC (EPA Method SW 9060M) at AccuTest Laboratories (Dayton, New Jersey).

Collection of Split-Spoon Soil Cores

Miller Environmental Group (MEG) was subcontracted to assist in collecting soil samples from the source zone using HSAs. MEG completed six soil borings totaling 600 feet (Figure 1).

The six soil borings (SD2-1, SD3, SD3-1, SD3-2, SD3-3 and SD3-4) were completed to depths ranging from 56 to 151 feet using a Guspech AR1000 drilling rig (Table 3). Soil cores were collected at five-foot intervals, using a split-spoon sampling tool that was inserted through the HSAs and driven two feet below the auger bit. The split-spoons were driven into undisturbed soils using a three-hundred pound hammer. Ninety-two soil samples were collected to better define the horizontal and vertical extents of the source zone associated storm drain SD3.

Split-spoon soil cores were screened for VOCs using a field portable photoionization detector (PID) and sent to the REAC Laboratory in Edison, New Jersey (NJ) for analysis. Detailed soil profiles helped to establish:

- Baseline concentrations for TCA and PCE in soils from both the unsaturated and saturated zones.

- Vertical and horizontal extents of the source zone associated with storm drain SD3.

- Ranges of TCA or PCE concentrations in the source zone associated with storm drain SD3.

Upon completion, each boring was backfilled to ground surface using soil cuttings generated from the same borehole. All HSA and split-spoon equipment was cleaned and decontaminated prior to use at each location. Soil boring logs are attached as Appendix A.

Sample Collection and Analyses

Fifteen soil gas samples including duplicates were collected and analyzed to establish baseline TCA and PCE concentrations on December 11, 2007. Soil gas samples were collected into 1-Liter Tedlar® bags, through the soil vapor well ports, and analyzed for VOCs using an Agilent 6890 ChemStation® gas chromatograph and 5973N mass spectrometer (GC/MS) that operates from the REAC Trace Atmospheric Gas Analyzer (TAGA) Mobile Laboratory. Samples were analyzed using EPA Method TO-15 SIM. The Final Analytical Report for the baseline soil gas investigation is attached as Appendix B, with results summarized in Table 1.

Ninety-two (92) soil samples including duplicates, matrix spike and matrix spike duplicates (MS/MSDs) were collected during three separate events between August 2007 and February 2008. Soil samples were packed in coolers (cooled to 4°C) and transported under chain-of-custody to the REAC Laboratory for analyses. Soil samples were analyzed by EPA Method 846 8260 for VOCs. The complete data package for baseline soils is attached as Appendix C, with analytical results summarized in Table 3.

Surveying

Horizontal locations of soil vapor well points and soil borings were recorded using Global Positioning System (GPS) technology.

5.0 RESULTS

The baseline investigation:

1. Established baseline soil gas and soil concentrations for TCA and PCE, prior to implementation of the PSTS.

2. Used soil gas concentrations to estimate the TCA and PCE concentrations in source zone soils. Soil gas analysis will be used as a surrogate metric to estimate TCA and PCE concentrations in source zone soils, while the PSTS is operating.

3. Determined the extents of TCA and PCE contamination in source zone soils.

4. Established baseline TCA and PCE concentrations in soils prior to implementation of the PSTS. Soil analysis will be used as a performance metric to assess the source reduction effectiveness of the PSTS.

Soil Gas Investigation

Fifteen soil vapor well points were installed around the periphery of storm drain SD3 (Figure 1). Analytical results indicate (Table 1):

- TCA soil gas concentrations range from 490 to 190,596 $\mu g/m^3$, while PCE soil gas concentrations range from 17 to 10,363 $\mu g/m^3$.

- The highest TCA soil gas concentrations are associated with storm drain SD3 and highest PCE concentrations are associated with storm drain SD2.

- The highest TCA soil gas concentrations (189,019 and 190,596 $\mu g/m^3$) are found in duplicate samples collected from SV-SW15D.

- The highest PCE soil gas concentrations are found in SV-N30D (10,363 $\mu g/m^3$) and SV-SW15D (2,765 and 2,719 $\mu g/m^3$).

Equilibrium soil gas concentrations are used as a surrogate metric to estimate soil concentrations (C'_s) in the unsaturated zone by the soil-soil gas partition relationship:

$$C'_s = \frac{C_{sg}\,(K_d\,\rho_b + \eta_w + H_d\eta_a)}{\rho_b H_d}$$

where C_{sg} = soil gas concentration of either TCA or PCE, K_d = water-soil distribution coefficient, ρ_b = dry bulk density of site soils, η_w = water filled porosity, assuming 0.04, η_a = air filled porosity assuming 0.2, and H_d = the dimensionless Henry's Law Constant (Table 2). Using the above relationship, soil concentration estimates for:

- TCA in the source zone range from 738 to 286,832 µg/kg, with a geometric mean of 11,989 µg/kg.

- PCE in the source zone range from 48 to 28,466 µg/kg, with a geometric mean of 1,544 µg/kg.

Bulk Density and TOC of the Aquifer Material

Samples of aquifer material were collected from three soil borings and analyzed for bulk density and TOC (Table 2). The bulk density of the aquifer material averages 2.02 kilograms per liter (kg/L). TOC concentrations were variable among the three samples, ranging from less than (<) 1,100 to 8,050 milligrams per kilogram (mg/kg).

The K_d and R_f are determined for TCA and PCE assuming soil sorption coefficients of 152 and 272 milliliters per gram (mL/g), respectively (Table 2):

- K_d for TCA ranges from <0.15 to 1.22 mL/g, and <0.27 to 2.19 mL/g for PCE
- R_f for TCA ranges from <2.3 to 11.4 mL/g, and <3.3 to 19.6 mL/g for PCE

Hollow Stem Auger Borings and Split-Spoon Soil Samples

The vertical extent of TCA contamination beneath storm drain SD3 was not clearly defined by prior investigations (REAC, 2005 and 2006). For this reason, the primary focus of the baseline investigation was to collect deep soil samples from the saturated zone to find the bottom of the contamination.

Two-foot split-spoon soil cores were collected every five feet, logged in the field for lithologic characteristics, moisture conditions, visual indicators of contamination, odors and PID readings. Discrete samples were collected from each soil core. Sample selection was based on visual observations of the soil core (i.e., hydrocarbon staining), and PID field screening results. A total of 92 soil samples were collected from six soil borings, during three sampling events. All six soil borings were located in the SD3 source zone (Figure 1).

Baseline soil samples were analyzed only for VOCs. Analytical results from soils for this event are summarized in Table 3, with the complete data package attached as Appendix C.

6.0 CONCLUSIONS

The baseline investigation supports the following conclusions.

- The baseline TCA concentration in soils ranged from 4 to 1,010,000 µg/kg in the source zone.
- The baseline soil gas TCA concentration ranged from 490 to 190,596 $\mu g/m^3$.
- Using the soil gas TCA concentration as a surrogate metrics the baseline geometric mean TCA concentration in the source zone soils was estimated to be 11,989 µg/kg.
- The baseline PCE concentration in soils ranged from 6 to 91,400 µg/kg in the unsaturated zone. The highest, PCE concentration (91,400 µg/kg) occurs beneath storm drain SD3 at a depth of 16 feet.
- Baseline sampling confirms, PCE concentrations rapidly decrease with depth, and underlying soils meet the ROD (OU1) cleanup goal (1,500 µg/kg) before reaching the water table.

REFERENCES

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U.S. Army Corp of Engineers (ACE). 2002. Engineering and Design: Soil Vapor Extraction and Bioventing, Engineer Manual (EM) 1110-1-4001, p424.

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U.S. Environmental Protection Agency (EPA). 1994. EPA Superfund Record of Decision (ROD): Circuitron Corporation, EPA ID: NYD981184229 Operable Unit 2 (OU2), East Farmingdale, New York (NY) 9/30/94

U.S. Environmental Protection Agency (EPA). 1991. EPA Superfund Record of Decision (ROD): Circuitron Corporation, EPA ID: NYD981184229 Operable Unit 1 (OU1), East Farmingdale, New York (NY) 3/29/91

cc: Central File - WA # 0-022
Electronic File - I:/Archive/SERAS/WA#022/D/TR/012510
SERAS Program Manager (cover page only)

TABLES

Table 1
Summary of Baseline Soil Gas Analysis (December 2007)
Circuitron Site
East Farmingdale, Long Island, New York

Location	1,1,1-Trichloroethane (TCA)			Tetrachloroethene (PCE)		
	C_{sg} (ppbv)	C_{sg} ($\mu g/m^3$)	C'_{TCA} ($\mu g/kg$)	C_{sg} (ppbv)	C_{sg} ($\mu g/m^3$)	C'_{PCE} ($\mu g/kg$)
SV-N00D	ns	ns	ns	ns	ns	ns
SV-N07D	ns	ns	ns	ns	ns	ns
SV-SE07D	ns	ns	ns	ns	ns	ns
SV-N30D	5,396	30,982	46,626	1,452	10,363	28,466
SV-N30S	103	589	886	34	246	676
SV-N45D	598	3,435	5,170	246	1,756	4,824
SV-N45S	92	527	793	39	281	771
SV-SE15D	4,327	24,846	37,392	118	840	2,308
SV-SE15Ddup	4,202	24,129	36,312	114	812	2,229
SV-SE1515S	1,389	7,974	12,000	32	231	633
SV-SE45D	342	1,964	2,956	33	237	652
SV-SE45S	141	810	1,219	12	84	232
SV-SW30D	3,490	20,042	30,162	114	813	2,233
SV-SW30S	85	490	738	2	17	48
SV-SW15D	32,918	189,019	284,459	387	2,765	7,596
SV-SW15Ddup	33,193	190,596	286,832	381	2,719	7,467
SV-SW15S	8,126	46,659	70,218	104	743	2,040
Geometric Mean	**1,387**	**7,966**	**11,989**	**79**	**562**	**1,544**

ns = not sampled (soil vapor well points were installed in May 2008)

ppbv = parts per billion by volume

$\mu g/m^3$ = micrograms per meter cubed

C_{sg} = concentration of soil gas sample

$C'_{TCA, PCE}$ = estimated concentration in source soils (unsaturated zone)

TABLE 2
Summary of TOC and Bulk Density for Soil Samples
Circuitron Chlorinated Solvent Pilot Study Site
East Farmingdale, Long Island, New York

Location	Depth (ft-bgs)	TOC (mg/kg)	f_{OC}	Henry's Law Constant (H_d) dimensionless		Bulk Density (g/mL)	Soil Sorption Coefficient (K_{oc})		Distribution Coefficient (K_d)[1]		Total Porosity [-]	Retardation Factor (R_f)[2]	
				TCA H_d [-]	PCE H_d ([-]		TCA K_{oc} (mL/g)	PCE K_{oc} (mL/g)	TCA K_d (mL/g)	PCE K_d (mL/g)		TCA R_f [-]	PCE R_f [-]
SD3-12	12	<1,100	<0.001	0.711	0.699	2.02	152	272	0.15	0.27	0.24	<2.3	<3.3
SD3-20	20	8,050	0.008	0.711	0.699	2.02	152	272	1.22	2.19	0.24	11.4	19.6
SD3-32	32	6,040	0.006	0.711	0.699	2.02	152	272	0.92	1.64	0.24	8.8	15.0
AVERAGE		7,045	0.007	0.711	0.699	2.02	152	272	1.07	1.92	0.24	10.1	17.3

Notes:

ft-bgs = feet below ground surface; mg/kg = milligrams per kilogram; % = percent, g/mL = grams per milliliter, mL/g = milliliters per gram;
[-] = dimensionless, TOC = Total Organic Carbon, f_{OC} = fraction organic carbon

1. $K_d = K_{oc} \times f_{oc}$ (Dominco and Schwartz 1990)
2. $R_f = 1 + (\rho_b \times K_d)/\eta$, where η = porosity (USGS, 2004)

TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR BASELINE SOIL SAMPLES
CIRCUITRON, EAST FARMINGDALE, NEW YORK

Boring	Easting (feet)	Northing (feet)	Elevation[1] (feet amsl)	Depth (feet)	PCE (µg/kg)		TCA (µg/kg)	
SD2-1	1145202.23	212928.51	87.54	11	50	U	8,830	
				13	6,190		20,300	
				14	2,560		12,065	
				16	5.7	J	4.1	J
				18	16		8.9	
				20	1,490		5,420	
				26	6.2		14.6	
				31	6	U	6	U
				36	12		7.6	
				41	6	U	6	U
				46	6	U	6	U
				51	6	U	6	U
				56	6	U	3.0	J
				61	6	U	1.5	J
				66	2.4	J	7.7	
				71	3.8	J	19	
				76	6	U	8.7	
				81	6	U	3.0	J
SD3	1145199.07	212891.54	87.54	38	250	U	215,000	
				46	250	U	13,300	
				50	250	U	60,800	
				54	250	U	18,550	
SD3-1	1145202.93	212881.37	87.54	15	250	U	30,950	
				21	6	U	5,040	
				27	250	U	153,000	
				31	250	U	54,000	
				36	50	U	1,270	
				41	250	U	117,000	
				46	250	U	4,890	
				51	6	U	21	
				56	6	U	6	
				61	6	U	10	
				66	250	U	2,860	
				71	250	U	22,800	
				76	250	U	17,200	
				81	250	U	9,335	
SD3-2	1145201.54	212884.42	87.54	14	250	U	505,000	
				16	91,400		1,010,000	
				21	250	U	96,500	
				26	250	U	68,600	
				31	250	U	122,000	
				36	250	U	85,850	
				41	250	U	405,000	
				46	13		101	
				51	6	U	5.7	
				56	6	U	30	
				61	6	U	9.8	
				66	30	U	100	
				71	22		766	
				76	250	U	55,400	
				81	250	U	122,500	

TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR BASELINE SOIL SAMPLES
CIRCUITRON, EAST FARMINGDALE, NEW YORK

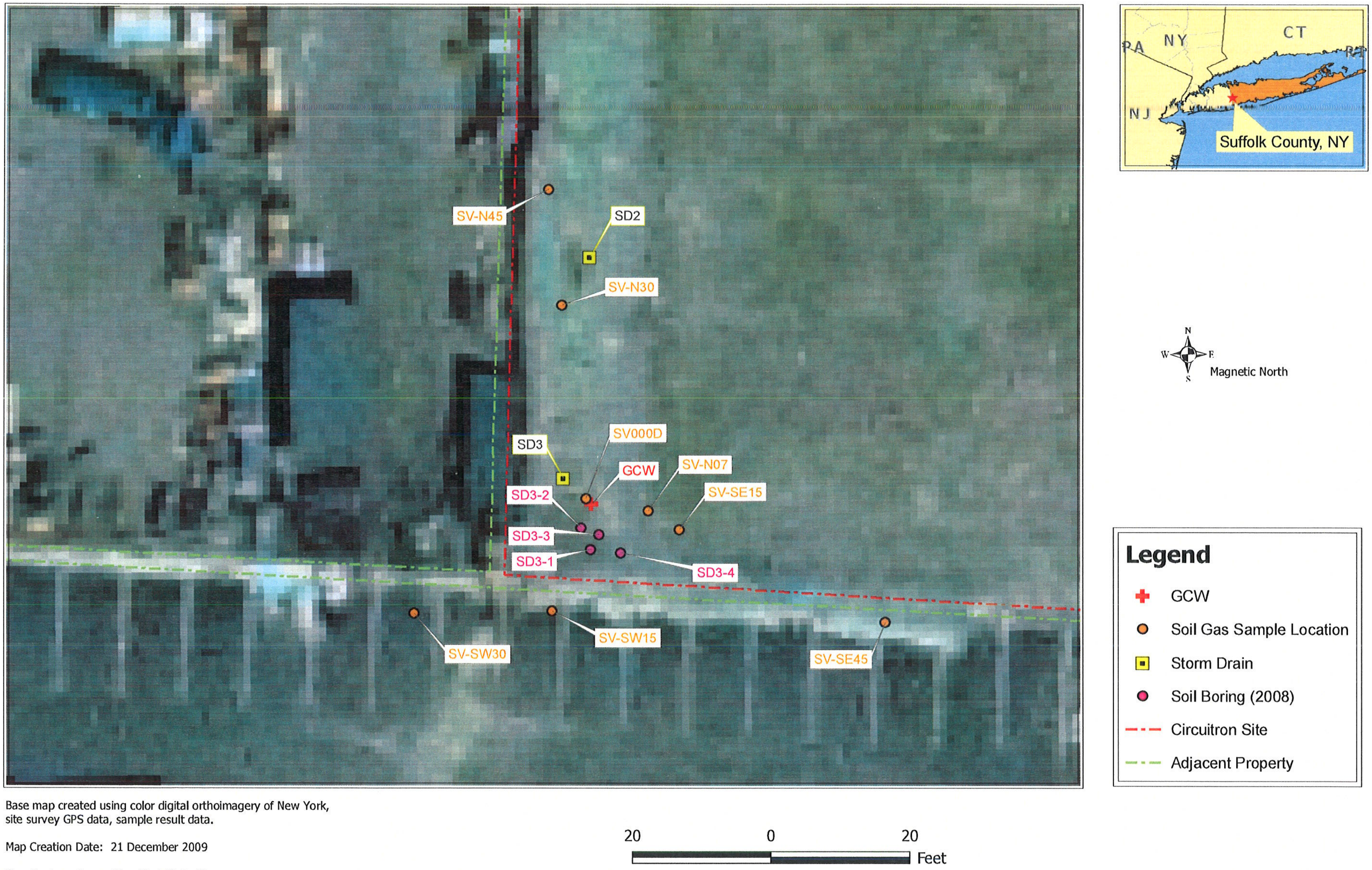
Boring	Easting (feet)	Northing (feet)	Elevation^1 (feet amsl)	Depth (feet)	PCE (µg/kg)		TCA (µg/kg)	
SD3-3	1145204.14	212883.48	87.54	86	10		1,670	
				91	1.6	J	143	
				96	14		523	
				101	6	U	70	
				106	6	U	10.9	
				111	6	U	10.1	
				116	6	U	14.9	
				121	6	U	14.0	
				126	6	U	7.3	
				131	6	U	2.8	J
				136	6	U	1.7	J
				141	6	U	2.7	J
				146	6	U	3.9	J
				151	6	U	1.9	J
SD3-4	1145207.22	212880.85	87.54	15	6	U	8.4	
				21	3.8	J	163	
				26	6	U	105	
				32	2.6	J	1,620	
				36	6	U	30.8	
				41	6	U	3.3	J
				45	3.1	J	756	
				51	6	U	6.1	
				56	6	U	18.9	
				61	6	U	15.6	
				66	6	U	6.77	
				71	6	U	141	
				75	6	U	111	
				80	6	U	150	
				86	6	U	137	
				91	6	U	41	
				96	6	U	72	
				101	6	U	91	
				106	6	U	12.8	
				111	6	U	6	U
				116	6	U	6	U
				121	6	U	6	U
				126	6	U	6	U
				131	6	U	6	U
				136	6	U	3.6	J
				141	6	U	6	U
				146	6	U	6	U
				151	6	U	6	U

amsl = above mean sea level; TCA = 1,1,1-Trichloroethane, µg/kg = micrograms per kilograms

J = estimated value below method detection limit; ND = not detected

1. Approximate elevations generated from a digital elevation model of the site and vicinity.

FIGURE



Base map created using color digital orthoimagery of New York,
site survey GPS data, sample result data.

Map Creation Date: 21 December 2009

Coordinate system: New York State Plane
FIPS: 3104
Datum: NAD83
Units: Feet

Data: g:\arcviewprojects\SERAS01\00-022
MXD file: g:\arcinfoprojects\SERAS01\SER00022_CircuitronSite\BaseLineSamples\022_Baseline_Sample_Location_f1rev001
Revision Number: 001

U.S EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-022

Figure 1
Sample Locations
Circuitron Chlorinated Cleanup Pilot Site
East Farmingdale, Long Island, NY

APPENDIX A

Soil Borings Logs

Circuitron Chlorinated Solvent Site
East Farmingdale, Long Island, New York

August 2007 to February 2008

Lockheed Martin / REAC
2890 Woodbridge Avenue
Edison, NJ 08837

Boring ID: SD3-1
Page: 1 of 2
WA#: 0-132

Circuitron Superfund Site
Farmingdale, New York

Drilling Co.: Miller Drilling
Date Start: 9/2/07
Date End: 9/2/07
Site: Circuitron

Depth: 82
Casing: none
Screen: none
North: 212,881.37

Method: Hollow Stem Auger
Boring: 6 3/4-inch ID
East: 1,145,202.93
Elev: (feet)

Depth	Sample Interval	Lithology	Recovery	Time	Description
0					
5		No Samples Collected	Drywell Vault		
10					
15	15				
			0.90	0845	
	17				15 to 72 feet: Tan to buff colored, medium to coarse sand, gravels and cobbles
20	20				
			1.16	0900	
	22				
25	25				
			0.90	0905	water table at 26 feet
	27				
30	30		0.70	0919	
	32				Sand, gravel and cobbles are moderately sorted. Pebbles and coarse sand are subangular to subrounded.
35	35				
			1.17	0924	
	37				
40	40		1.47	0945	
	42				
45	45				
			1.75	1000	Pebbles and coarse sand are subrounded to rounded.
	47				
50					

Lockheed Martin / REAC
2890 Woodbridge Avenue
Edison, NY 08837

Boring ID: SD3-1
Page: 2 of 2
WA#: 0-132

Circuitron Superfund Site
Farmingdale, New York

Depth	Sample Interval	Lithology	Recovery	Time	Description
50					
		▨	1.80	1005	
	52	▨			
55	55	▨			
		▨	1.92	1014	
	57	▨			
60	60	▨			
		▨	2.00	1027	
	62	▨			
65	65	▨			
		▨	1.70	1040	
	67	▨			
70	70	▨			
		▨	1.45	1050	
	72	░			72 Approximate Contact Gradational
75	75	░			
		░	2.00	1055	
	77	░			72 to 82 feet: Buff colored, medium sand that is well sorted.
80	80	░			
		░	1.25	1105	
	82				TD 82 feet
85					
90					
95					
100					

Lockheed Martin / REAC **2890 Woodbridge Avenue** **Edison, NY 08837**	**Colville Pole and Post Site** **Colville, WA**	**Boring ID:** MW09 **Page:** 1 of 1 **WA#:** 0-141

Drilling Co.: Environmental West Drilling
Date Start: 11/28/06 **End:** 11/28/06
Site: Colville Pole & Post
Total Depth: 15.0
Casing: 10.0
Screen: 5.0
Method: 8 1/4" HSA
Diameter: 4" PVC
North: 589,784.0 **East:** 2,335,829.9 **Elev:** 1,540.1 (feet)

Interval	Time	Counts	Recovery (feet)	Odor	Remarks
0					
1	▒	NS	NS	NS	**0-1.0 Fill:** Black organic clay (oc) and silt (sc) w/ root and wood fragments. Reworked top soil.
2	▒	6-6-7-13	9	None	**1.0-3.5 Fill:** Black organic clay (oc), silt (sc) with small cobbles (cgl). Cobbles are rounded to subrounded.
3	▒				
4	░	16-17-18-18	13	None	**3.5-6.0 Clayey-silt:** Brown, slightly organic clayey silt (sc-oh <<oc) with trace pebbles and root fragments. Possibly an older fill layer.
5	░				
6	░	3-5-7-9	11	Deisel Odor	
7	▥				**6.0-7.0 Loam:** Black organic clay (oc) and root mat. Possibly orginal wetland surface.
8	░	9-9-11-10	20	None	**7.0-8.0 Silt**: Gray silt (sc) and fine sand (sm), with minor clay (<<oh). Material is moderately sorted and saturated.
9	▒				**8.0-13.0 Coarse Sand:** Gray coarse sand (sm) and gravels (sg), with minor silt. Pebbles are rounded to well rounded. Material is poorly sorted and saturated.
10	▒	10-11-17-9	20	None	
11	▒				
12	▒	1-1-1-1	20	None	
13	▒				
14	▤	5-7-7-9	22	None	**13.0-15.0 Clay:** Blue-gray clay (oh), very well sorted, very soft and wet.
15	▤				

Lockheed Martin / REAC **2890 Woodbridge Avenue** **Edison, NJ 08837**	**Boring ID:** SD3-2 **Page:** 1 of 2 **WA#:** 0-132

Circuitron Superfund Site
Farmingdale, New York

Drilling Co.: Miller Drilling **Depth:** 82 **Method:** Hollow Stem Auger
Date Start: 9/2/07 **Casing:** none **Boring:** 6 3/4-inch ID
Date End: 9/2/07 **Screen:** none
Site: Circuitron **North:** 212,884.42 **East:** 1,145,201.54 **Elev:** (feet)

Depth	Sample Interval	Lithology	Recovery	Time	Description
0					
5		No Samples Collected			
10					
	13				
15		▨	1.25	1255	13 to 16.5 feet: Black organic sludge
		▨	1.50	1303	Contact at 16.5 feet Sharp
	17	░			
20	20	░			16.5 to 68 feet: Tan to buff colored, medium to coarse sand, gravels and cobbles.
		░	1.17	1321	
	22	░			
25	25	░			
		░	0.25	1330	water table at 26 feet
	27	░			
30	30	░			
		░	0.50	1343	
	32	░			
35	35	░			
		░	1.20	1348	Sand, gravel and cobbles are moderately sorted. Pebbles and coarse sand are subangular to subrounded.
	37	░			
40	40	░	1.10	1359	
	42	░			
45	45	░			
		░	1.25	1408	
	47	░			
50		░			

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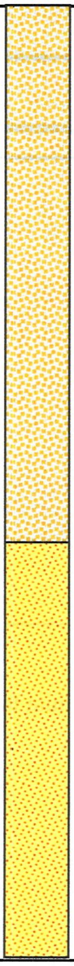
Circuitron Superfund Site
Farmingdale, New York



Depth	Sample Interval	Lithology	Recovery	Time	Description
50					
			1.50	1415	cont'd
	52				
55	55				
			1.50	1422	Sand, gravel and cobbles are moderately sorted. Pebbles and coarse sand are subangular to subrounded.
	57				
60	60				
			1.75	1433	
	62				
65	65				
			1.50	1440	
	67				68 Approximate Contact Gradational
70	70				
			1.85	1447	
	72				
75	75				68 to 82 feet: Buff colored, medium sand that is well sorted.
			0.70	1455	
	77				
80	80				
			0.70	1505	
	82				TD 82 feet
85					
90					
95					
100					

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Edison, NJ 08837

Boring ID: SD3-3
Page: 1 of 2
WA#: 0-132

Circuitron Superfund Site
Farmingdale, New York

Drilling Co.: Miller Drilling	**Depth:** 82	**Method:** Hollow Stem Auger
Date Start: 9/2/07	**Casing:** none	**Boring:** 6 3/4-inch ID
Date End: 9/2/07	**Screen:** none	
Site: Circuitron	**North:** 212,883.48	**East:** 1,145,204.14 **Elev:** (feet)

Depth	Sample Interval	Lithology	Recovery	Time	Description
0					
5		No Samples Collected			
10	11				
			0.25	0833	11 to 13.5 feet: Black organic sludge
			1.93	0845	Contact at 11 feet Sharp
15			1.47	0849	13.5 to 64 feet: Tan to buff colored, medium to coarse sand, gravels and cobbles.
			1.17	0855	
20			0.25	0902	
	21				13 to 16.0: Visible degraded black hydrocarbons(?)
25	25				
			0.90	0912	water table at 26 feet
	27				
30	30				
			1.45	0919	
	32				
35	35				
			2.00	0927	
	37				Sand, gravel and cobbles are moderately sorted. Pebbles and coarse sand are subangular to subrounded.
40	40				
			0.95	0937	
	42				
45	45				
			2.00	0945	
	47				
50					

Lockheed Martin / REAC
2890 Woodbridge Avenue
Edison, NY 08837

Boring ID: SD3-3
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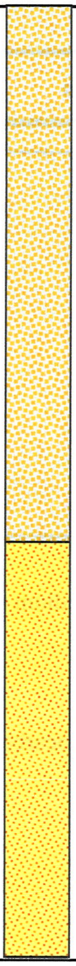
WA#: 0-132

Circuitron Superfund Site
Farmingdale, New York



Depth	Sample Interval	Lithology	Recovery	Time	Description
50					
			2.00	0953	cont'd
	52				
55	55				
			2.00	0956	Sand, gravel and cobbles are moderately sorted. Pebbles and coarse sand are subangular to subrounded.
	57				
60	60				
			1.33	1011	
	62				
65	65				64 feet Approximate Contact Gradational
			1.17	1024	
	67				
70	70				
			1.10	1035	
	72				<u>64 to 82 feet:</u> Buff colored, medium sand that is well sorted.
75	75				
			2.00	1052	
	77				
80	80				
			0.90	1103	
	82				TD 82 feet
85					
90					
95					
100					

APPENDIX B

GC/MS Analytical Report
Circuitron Chlorinated Solvent Site
East Farmingdale, Long Island, New York

December 2007

GC/MS ANALYTICAL REPORT
CIRCUITRON SITE
LONG ISLAND, NEW YORK
DECEMBER 2007

U.S. EPA Work Assignment No.: 0-132
LOCKHEED MARTIN Work Order No.: EAC00132
U.S. EPA Contract No.: EP-C-04-032

Submitted to:
Terrence G. Johnson
U.S. EPA/ERT

Prepared by:
Lockheed Martin/REAC

DnPatel
Dan Patel
REAC Task Leader

12/24/07
Date

Killeen for
Dennis A. Miller
REAC Program Manager

12-21-07
Date

Analyzed and Prepared by:
Scott J. Thompson

CONTENTS

LIST OF TABLES

APPENDICES

1.0 INTRODUCTION

The Environmental Protection Agency/Environmental Response Team (EPA/ERT) issued Work Assignment # 0-132 to Lockheed Martin under the Response Engineering and Analytical Contract (REAC) to provide analytical services at the Circuitron Site on Long Island, New York.

An Agilent® 6890 gas chromatograph and 5973N mass spectrometer (GC/MS) were used to perform Volatile Organic Compound (VOC) analysis of soil gas samples collected in one-Liter (L) Tedlar® bags. Eight compounds made up the target compound list (TCL) comprised of vinyl chloride, 1,1-dichloroethene, trans-1,2-dichloroethene, 1,1-dichloroethane, cis-1,2-dichlorothene, 1,1,1-trichloroethane, trichloroethene, and tetrachloroethene.

On-site analyses occurred on 11 December 2007 on the 17 soil gas samples collected by REAC personnel. Analysis was performed in accordance with the REAC DRAFT Standard Operating Procedure, *Field Analysis of VOCs in Gaseous Phase Samples by GC/MS Loop Injection.* All analytical data were verified per Screening Data (SD) requirements. Table 1 details the samples by chain of custody number, number of samples, date sampled and received, matrix, and analysis. Copies of the chain of custody records are included in Appendix A.

2.0 PROCEDURES

A Tedlar® bag was attached to the sample introduction port of the heated dual loop injection apparatus. One of the loops was filled with sample and the other with internal standard. The contents of both loops were simultaneously injected onto the head of the column for subsequent analysis by GC/MS. When required, all sample dilutions were done in a glass syringe. The Agilent Chemstation® data system was used to evaluate and process the data. Table 2 lists the operating conditions of the dual loop injection apparatus and the GC/MS system.

2.1 Soil Gas Analysis

An aliquant of sample was directly introduced into the first loop of the injection apparatus from a Tedlar® bag using the sample introduction port. The second loop was filled from a SUMMA® canister containing the internal standard. The loops were switched in line with the carrier gas to inject the sample and internal standard into the GC/MS system.

The GC oven was temperature programmed to focus the sample on the head of the column and to achieve quick separation of the VOCs in the sample, which were then detected by the MS detector. Comparing their retention times and mass spectra to those of a 500 parts per billion by volume (ppbv) reference standard, permits identification of the VOCs in the sample.

2.2 Tuning and Calibration Standards

All certified standards were obtained from commercial vendors with certificates of analysis. The standards' cylinder numbers, concentrations, and compound quantitation ions used are presented in Table 3. Vendor certificate of analysis of the p-bromofluorobenzene (BFB) tuning, primary and secondary VOC standards, and internal standard are presented in Appendix B.

Mass spectrometer tuning was performed and checked at the beginning of the day. Five milliliters (mL) of BFB at one part per million by volume (ppmv) was analyzed to validate the mass spectrometer tuning parameters.

The primary calibration standard was based on a nominal value of 20 ppmv for all target compounds. The secondary calibration standard was based on a nominal value of 500 ppbv for all target compounds. The primary and secondary standards both contained 15 compounds in a balance of nitrogen.

Six initial calibration levels of varying concentrations were prepared and analyzed at the beginning of the day to establish the initial calibration curve. The calibration curve levels consisted of 1 ppbv, 5 ppbv, 50 ppbv, 500 ppbv, 1 ppmv, and 10 ppmv concentrations.

The internal standard mix consisted of bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d_5 each at approximately one ppmv. Fifty microliters (µL) of internal standard, equivalent to 10ppbv, was added to all standards, blanks, and samples.

2.3 Compound Identification and Quantitation

VOCs in the samples were identified and quantitated using the ChemStation® software. This software uses mass spectra reference libraries and extracted ion chromatograms matched with retention time windows to identify and quantify target compounds. The report format prints the internal standards, identified compounds, calculated concentrations, mass spectra (both raw and background subtracted), quantitation, and qualifier ion chromatograms.

The limit of quantitation (LOQ) for each compound was calculated using the following equation:

$$LOQ\ (ppbv) = Lowest\ Calibration\ Standard\ (ppbv) \times Dilution\ Factor$$

Documented in the injection logbook, the dilution factor (DF) was calculated using the following equation:

$$Dilution\ Factor = \frac{Total\ Sample\ Volume\ (mL)}{Initial\ Sample\ Volume\ (mL)}$$

The target compound results were calculated using the following equation:

$$Concentration\ (ppbv) = Analytical\ Concentration\ of\ Compound\ (ppbv) \times DF$$

2.4 Quality Assurance/Quality Control

The following Quality Assurance/Quality Control (QA/QC) procedures were performed for this work assignment:

- The GC/MS system was tuned with perfluorotributylamine (PFTBA) to meet ion abundance criteria for BFB as listed on the BFB tune reports. All BFB results are included in Appendix C.
- Six initial calibration levels of varying concentrations were prepared and analyzed using the GC/MS operating parameters listed in Table 2. An initial calibration curve with a minimum of six calibration levels for each target compound was constructed before any samples were analyzed. The Response Factor Report for the initial calibration curve of target compounds was evaluated for acceptance criteria of less than 30 percent relative standard deviation (%RSD) for all target compounds. The Response Factor Report is presented in Appendix C.
- Method (Instrument) blanks were analyzed after the initial calibration and before samples were analyzed to assess possible laboratory contamination and/or carryover. Method blanks were analyzed when necessary to minimize carryover from samples or standards with high levels of target compounds. The method blank quantitation report is presented

in Appendix D.

- Lot (Tedlar® Bag) blanks were analyzed after the method blank and before samples were analyzed to assess possible contaminants in the lot of Tedlar® bag being used to collect the samples. The lot blank quantitation report is presented in Appendix D.

- A 500 ppbv Laboratory Control Standard (LCS) was run at the beginning and the end of the day to assess the total performance of the GC/MS system. The percent difference (% Dif) between the 500 ppbv LCS and the quantitative result must be less than ±30% difference for all target compounds to be acceptable. LCS quantitation and comparison reports are presented in Appendix E.

- Internal Standard areas from all analyses were evaluated and acceptance criteria verified. Acceptance criteria for internal standard areas were areas within ±40% of the internal standard area in the associated 500 ppbv initial calibration level. The Internal Standard QA-QC Report is presented in Appendix E.

- The lowest initial calibration level used for each target compound was used for the LOQ.

- Sample replicates were analyzed and reported in Appendix E.

- The following is a list of the QA/QC flags used in qualifying the analytical results.

  A - Assumed Volume.
  B - Concentration less than five times the reported blank result. Result is considered not detected.
  D - Result is from an analysis at a secondary dilution factor.
  E - Exceeds the calibration range. Result is considered estimated.
  J - Detected below the limit of quantitation. Result is considered estimated.
  U - None detected at or above the limit of quantitation.
  R - Result is unusable.

All applicable data qualifiers were inserted into the results tables.

3.0 RESULTS

All results are reported in ppbv and to two significant figures. Method Blank, Lot Blank and soil gas sample results are presented in Table 4. Results for LCS and sample replicates are presented in Table 5.

The chain of custody record is found in Appendix A. The certificates of analysis for the BFB tuning standard, primary and secondary VOC standards, and internal standard are found in Appendix B. The Mass Spectrometer Tuning Report and calibration package for the day of analysis are included in Appendix C. This calibration package includes copies of the GC/MS injection logbook # REAC-IV-L-0054, BFB Tune Report, Initial Calibration Response Factor Report, Initial Calibration Quantitation Reports and Second Source Verification Quantitation Report.

Quantitation reports for all blanks and samples are included in Appendix D. All blank and sample quantitation reports list the retention times, quantitation ions, peak area responses, and concentration of target compounds in ppbv. Calculated concentrations are generated using the average relative response factor from the initial calibration curve for each target compound.

LCS Quantitation Reports, LCS Comparison Reports and Internal Standard QA-QC Report are included in Appendix E.

4.0 DISCUSSION OF RESULTS

On 11 December 2007, 17 samples were collected and analyzed on-site by REAC personnel with preliminary results being reported to the REAC Task Leader.

The BFB and six-point initial calibration curve were reviewed and found to be acceptable. The limit of quantitation for all targeted compounds on 11 December 2007 was 1ppbv. The secondary standard used to verify the initial calibration curve was analyzed and found to be acceptable with all target compounds being reported less than thirty percent deviation (< 30%).

The method blank and lot (Tedlar® Bag) blank were reviewed and found to be acceptable with zero target compounds. Laboratory control standards were analyzed at the beginning and end of the day with reported results within acceptable limits of plus or minus thirty percent difference (±30%).

Of the 17 samples collected on 11 December 2007, sample locations SV-SW15D, SV-SW15S and PRE-CARB-001 have the highest reportable results for 1,1,1-trichloroethane at 33,000 ppbv, 8,100 ppbv and 27,000 ppbv, respectively. Sample locations SV-SW15D, SV-N30D, and PRE-CARB-001 have the highest reportable results for tetrachloroethene at 390 ppbv, 1,500 ppbv, and 640 ppbv respectively.

Sample location MID-CARB-001 was used as the sample replicate on 11 December 2007 with the results reported in Table 5. The relative percent difference (RPD) between the sample replicates for 1,1,1-trichloroethane and tetrachloroethene were 2.2% and 4.3%, respectively.

TABLES

TABLE 1
Summary of Chain of Custody Records
Circuitron Site
Long Island, New York
December 2007

COC #	Number of Samples	Date Sampled	Date Received	Matrix	Analysis
04492	17	11 December 2007	11 December 2007	AIR Soil Gas	VOCs by GC-MS w/ loop Injection

TABLE 2

Instrument Conditions for the Analysis of Volatile Organic Compounds in Soil Gas Samples

Circuitron Site
Long Island, New York
December 2007

AGILENT® 6890 GC Method

Sample Loop	
Loop Volume	5mL
Loop Temperature	60 °C
Internal Standard Loop	
Loop Volume	50µL (10ppbv)
Loop Temperature	60 °C
GC Inlet	
Gas Type	Helium
Mode	Split
Temperature	190 °C
Initial Pressure	23.08 psi
Split Ratio	20:1
Split Flow	30.0 mL/min
Total Flow	33.7 mL/min
GC Oven	
Column	Rtx-Volatiles, 20 m x 0.18 mm ID x 2.0 μm df
Mode	Constant Flow
Flow rate	1.5 mL/min
Cryo (CO_2)	On
Quick Cryo Cooling	On
Initial Temperature	-10 °C
Initial Temperature Hold Time	0.50 min
Ramp Program	40 °C/min
Final Temperature	160 °C
Final Temperature Hold Time	1 min
Total Run Time	5.75 min

AGILENT® 5973N MS Method

MS Temperatures	
MS Quadrupole	150 °C
MS Ion Source	230 °C
MS Transfer Line	220 °C
MS Tune File	BFB.u
MS Acquisition Mode	SIM
Solvent Delay	1.00 min
EM Offset / Voltage	106 / 2000

TABLE 2 (continued)
Instrument Conditions for the Analysis of Volatile Organic Compounds in Soil Gas Samples
Circuitron Site
Long Island, New York
December 2007

SIMS Parameters:

Group 1 Start Time	1.00 min
Ions/Dwell in Group 1	(62/85) (64/85)
Group 2 Starts Time	2.00 min
Ions/Dwell in Group 2	(61/85) (63/85) (96/85)
Group 3 Starts Time	2.50 min
Ions/Dwell in Group 3	(41/85) (43/85) (57/85) (61/85) (63/85) (65/85) (73/85) (83/85) (96/85) (98/85)
Group 4 Starts Time	3.00 min
Ions/Dwell in Group 4	(49/85) (61/85) (93/85) (96/85) (98/85) (130/85)
Group 5 Starts Time	3.22 min
Ions/Dwell in Group 5	(50/85) (61/85) (63/85) (77/85) (78/85) (88/85) (97/85) (99/85) (114/85)
Group 6 Starts Time	3.55 min
Ions/Dwell in Group 6	(95/85) (130/85) (132/85)
Group 7 Starts Time	3.75 min
Ions/Dwell in Group 7	(91/85) (92/85)
Group 8 Starts Time	4.20 min
Ions/Dwell in Group 8	(131/85) (164/85) (166/85)
Group 9 Starts Time	4.50 min
Ions/Dwell in Group 10	(82/85) (91/85) (106/85) (117/85) (119/85)

TABLE 3
Concentrations and Quantitation Ions for BFB Tuning Standard, Primary and Secondary Volatile Organic Compound Standards and Internal Standard
Circuitron Site
Long Island, New York
December 2007

Scott Specialty Gases, Inc.

Cylinder Number:	ALM057539
Certification Date:	01 March 2006
Expiration Date:	29 February 2008

BFB Compound	Quantitation Ion	Concentration
4-Bromofluorobenzene	N/A	1.02 ppm

Spectra Gases, Inc. Special Certified Blend

Cylinder Number:	CC-256138
Certification Date:	01 October 2007
Expiration Date:	01 October 2008

Volatile Organic Compound	Quantitation Ion	Concentration
Vinyl chloride	62	20.7 ppm
1,1-Dichloroethene	61	20.4 ppm
trans-1,2-Dichloroethene	61	21.1 ppm
1,1-Dichloroethane	63	20.4 ppm
Methyl Tert Butyl Ether	73	20.5 ppm
cis-1,2-Dichloroethene	61	20.4 ppm
1,1,1-Trichloroethane	97	20.4 ppm
Benzene	78	20.2 ppm
Trichloroethene	130	20.6 ppm
Toluene	97	20.4 ppm
Tetrachloroethene	166	20.1 ppm
Ethylbenzene	91	20.0 ppm
p-Xylene	91	19.7 ppm
m-Xylene	91	19.7 ppm
o-Xylene	91	19.7 ppm

TABLE 3 (continued)
Concentrations and Quantitation Ions for BFB Tuning Standard, Primary and Secondary Volatile Organic Compound Standards and Internal Standard
Circuitron Site
Long Island, New York
December 2007

Spectra Gases, Inc. Special Certified Blend

Cylinder Number:	CC-256175
Certification Date:	20 March 2007
Expiration Date:	20 March 2008

Volatile Organic Compound	Quantitation Ion	Concentration
Vinyl chloride	62	500 ppb
1,1-Dichloroethene	61	539 ppb
trans-1,2-Dichloroethene	61	534 ppb
1,1-Dichloroethane	63	531 ppb
Methyl Tert Butyl Ether	73	534 ppb
cis-1,2-Dichloroethene	61	520 ppb
1,1,1-Trichloroethane	97	529 ppb
Benzene	78	530 ppb
Trichloroethene	130	546 ppb
Toluene	97	536 ppb
Tetrachloroethene	166	521 ppb
Ethylbenzene	91	516 ppb
p-Xylene	91	514 ppb
m-Xylene	91	514 ppb
o-Xylene	91	516 ppb

Spectra Gases, Inc.

Cylinder Number:	CC-172915
Certification Date:	04 December 2007
Expiration Date:	04 December 2008

Internal Standard	Quantitation Ion	Concentration
Bromochloromethane	49	1.03
1,4-Difluorobenzene	114	1.06
Chlorobenzene-d_5	117	1.07

TABLE 4
Results of Volatile Organic Compounds in Soil Gas Samples for 11 December 2007
Circuitron Site
Long Island, New York
December 2007

RESULT SHEET BELOW				
Data File	CIR009	CIR010	CIR013	CIR014
Sample Number	20071211MB-1	20071211LB-1	03923	03927
Sample Location	METHOD BLANK	LOT BLANK	SV-SE45D	SV-SE45S
Sample Volume (ml)	5	5	5	5
Limit of Quantitation (ppbv)	1	1	1	1
Date Sampled	11 Dec 2007	11 Dec 2007	11 Dec 2007	11 Dec 2007
Date Analyzed	11 Dec 2007	11 Dec 2007	11 Dec 2007	11 Dec 2007
Vinyl Chloride	U	U	U	U
1.1-Dichloroethene	U	U	U	U
trans-1.2-Dichloroethene	U	U	U	U
1.1-Dichloroethane	U	U	11	1.3
cis-1.2-Dichloroethene	U	U	U	U
1.1.1-Trichloroethane	U	U	340	140
Trichloroethene	U	U	8.1	2.8
Tetrachloroethene	U	U	33	12

RESULT SHEET BELOW				
Data File	CIR015	CIR016	CIR017	CIR018
Sample Number	03928	03926	03929	03924
Sample Location	SV-SW30D	SV-SW30S	SV-SW15D	SV-SW15D DUP
Sample Volume (ml)	5	5	0.5	0.5
Limit of Quantitation (ppbv)	1	1	10	10
Date Sampled	11 Dec 2007	11 Dec 2007	11 Dec 2007	11 Dec 2007
Date Analyzed	11 Dec 2007	11 Dec 2007	11 Dec 2007	11 Dec 2007
Vinyl Chloride	U	U	U	U
1.1-Dichloroethene	5.7	U	31	33
trans-1.2-Dichloroethene	U	U	U	U
1.1-Dichloroethane	U	U	43	41
cis-1.2-Dichloroethene	U	U	U	U
1.1.1-Trichloroethane	3500	85	33000	33000
Trichloroethene	3.4	U	13	15
Tetrachloroethene	110	2.4	390	380

Results are in parts per billion by volume (ppbv)
U = None Detected at or above the limit of quantitation
J = Result is considered estimated

TABLE 4 (continued)
Results of Volatile Organic Compounds in Soil Gas Samples for 11 December 2007
Circuitron Site
Long Island, New York
December 2007

RESULT SHEET BELOW

Data File	CIR019	CIR020	CIR021	CIR022
Sample Number	03925	03931	03932	03930
Sample Location	SV-SW15S	SV-SE15D	SV-SE15D-DUP	SV-SE15S
Sample Volume (ml)	0.5	0.5	0.5	0.5
Limit of Quantitation (ppbv)	10	10	10	10
Date Sampled	11 Dec 2007	11 Dec 2007	11 Dec 2007	11 Dec 2007
Date Analyzed	11 Dec 2007	11 Dec 2007	11 Dec 2007	11 Dec 2007
Vinyl Chloride	U	U	U	U
1,1-Dichloroethene	12	6.5 J	6.9 J	3.2 J
trans-1,2-Dichloroethene	U	U	U	U
1,1-Dichloroethane	13	8.8 J	10	U
cis-1,2-Dichloroethene	U	U	U	U
1,1,1-Trichloroethane	8100	4300	4200	1400
Trichloroethene	U	7.0 J	6.9 J	U
Tetrachloroethene	100	120	110	32

RESULT SHEET BELOW

Data File	CIR024	CIR025	CIR026	CIR027
Sample Number	03933	03934	03935	03936
Sample Location	SV-N30S	SV-N30D	SV-N45S	SV-N45D
Sample Volume (ml)	5	5	5	5
Limit of Quantitation (ppbv)	1	1	1	1
Date Sampled	11 Dec 2007	11 Dec 2007	11 Dec 2007	11 Dec 2007
Date Analyzed	11 Dec 2007	11 Dec 2007	11 Dec 2007	11 Dec 2007
Vinyl Chloride	U	U	U	U
1,1-Dichloroethene	U	1.3	U	U
trans-1,2-Dichloroethene	U	0.66 J	U	U
1,1-Dichloroethane	U	23	U	U
cis-1,2-Dichloroethene	U	U	U	U
1,1,1-Trichloroethane	100	5400	92	600
Trichloroethene	0.86 J	33	1.0	6.8
Tetrachloroethene	34	1500	39	250

Results are in parts per billion by volume (ppbv)
U = None Detected at or above the limit of quantitation
J = Result is considered estimated

TABLE 4 (continued)
Results of Volatile Organic Compounds in Soil Gas Samples for 11 December 2007
Circuitron Site
Long Island, New York
December 2007

RESULT SHEET BELOW

Data File	CIR029	CIR031	CIR032	
Sample Number	03938	03939	03940	
Sample Location	PRE-CARB-001	MID-CARB-001	POST-CARB-001	
Sample Volume (ml)	0.5	5	5	
Limit of Quantitation (ppbv)	10	1	1	
Date Sampled	11 Dec 2007	11 Dec 2007	11 Dec 2007	
Date Analyzed	11 Dec 2007	11 Dec 2007	11 Dec 2007	
Vinyl Chloride	U	U	U	
1,1-Dichloroethene	15	U	U	
trans-1,2-Dichloroethene	U	U	U	
1,1-Dichloroethane	38	U	U	
cis-1,2-Dichloroethene	U	U	U	
1,1,1-Trichloroethane	27000	93	U	
Trichloroethene	17	U	U	
Tetrachloroethene	640	2.5	U	

Results are in parts per billion by volume (ppbv)
U = None Detected at or above the limit of quantitation
J = Result is considered estimated

TABLE 5
Results of Laboratory Control Standards and Sample Replicate for Volatile Organic Compounds for 11 December 2007
Circuitron Site
Long Island, New York
December 2007

Data File	CIR011		CIR034	
Sample Number	20071211LCS-1		20071211LCS-2	
Sample Location	LCS		LCS	
Sample Volume (ml)	5		5	
Limit of Quantitation (ppbv)	1		1	
Date Sampled	11 Dec 2007		11 Dec 2007	
Date Analyzed	11 Dec 2007	%Dif	11 Dec 2007	%Dif
Vinyl Chloride	510	2.0	500	0.0
1,1-Dichloroethene	520	4.0	500	0.0
trans-1,2-Dichloroethene	540	8.0	510	2.0
1,1-Dichloroethane	530	3.0	510	2.0
cis-1,2-Dichloroethene	530	3.0	540	8.0
1,1,1-Trichloroethane	520	2.0	510	2.0
Trichloroethene	530	3.0	510	2.0
Tetrachloroethene	490	2.0	480	4.0

Data File	CIR031	CIR033	
Sample Number	03939	03939	
Sample Location	MID-CARB-001	MID-CARB-001-DUP	
Sample Volume (ml)	5	5	
Limit of Quantitation (ppbv)	1	1	
Date Sampled	11 Dec 2007	11 Dec 2007	
Date Analyzed	11 Dec 2007	11 Dec 2007	% RPD
Vinyl Chloride	U	U	
1,1-Dichloroethene	U	U	
trans-1,2-Dichloroethene	U	U	
1,1-Dichloroethane	U	U	
cis-1,2-Dichloroethene	U	U	
1,1,1-Trichloroethane	93	91	2.2
Trichloroethene	U	U	
Tetrachloroethene	2.4	2.3	4.3

Results are in parts per billion by volume (ppbv)
% Dif = Percent Difference
% RPD = Relative Percent Difference