Weston Solutions, Inc.
1400 Weston Way
West Chester, PA 19380
610-701-3000 ● Fax 610-701-3186
www.westonsolutions.com

November 3, 2016

U.S. Environmental Protection Agency Region III
Mr. Richard Rupert
On-Scene Coordinator
1650 Arch Street
Philadelphia, Pennsylvania 19103

Subject: Trip Report – Soil Vapor Sampling
Project: Hockessin Groundwater Site
EPA Contract No.: EP-S3-15-02
TDD No.: W501-16-07-005

Document Control No.: W0119.1A.01856

Dear Mr. Rupert:

Under Eastern Area Superfund Technical Assessment and Response Team (START) Contract No. EP-S3-15-02, Technical Direction Document (TDD) No. W501-16-07-005, U.S. Environmental Protection Agency (EPA) Region III tasked Weston Solutions Inc. (WESTON®)/Tetra Tech Inc. (Tetra Tech) to collect soil gas samples at the Hockessin Groundwater Site (the Site) located in Hockessin, New Castle County, Delaware. The objective of the sampling was to determine whether the presence of volatile organic compounds (VOCs) in the groundwater, specifically Tetrachloroethene (PCE), poses the potential to cause vapor intrusion into nearby residences and businesses.

START is submitting this draft trip report to summarize the soil gas sampling activities conducted by START in September and October 2016. Specifically, this report discusses the soil gas sampling implant installation, sampling activities, and the analytical results of the samples collected. Figures and analytical results tables are presented at the end of this report. In addition, boring logs and preliminary laboratory analytical data packages are included as attachments. Photographic documentation is also provided as an attachment.

If you have any questions regarding this report, please contact me at (610) 701-3191.

Very truly yours,

[redacted]

Enclosure

1.0 SOIL GAS IMPLANT INSTALLATION AND SAMPLING ACTIVITIES

This section discusses the sampling activities performed at the Site by WESTON in September and October 2016. All activities were conducted in accordance with the Final Field Sampling Plan for Soil Gas Sampling at the Hockessin Groundwater Site (WESTON, 2016), unless otherwise specified.

On September 19, 2016, WESTON, EPA, and Cascade Drilling L.P. (a subcontractor to WESTON) personnel mobilized to the Site. Over the following 3 weeks, 32 soil gas sampling implants were installed at locations distributed across the Site. One soil gas sample was collected from each soil gas implant. In addition, two ambient air samples were also collected, one from the Hockessin Volunteer Firefighter's parking lot and one from the southwestern portion of the Site near Evanson Road. The locations of the soil gas sampling implants and ambient air sample locations are depicted on Figure 1. All samples were analyzed by a Tier IV (WESTON-subcontracted) laboratory for volatile organic compounds (VOCs) in accordance with EPA Method Toxic Organics (TO)-15. In addition, all samples were analyzed for Helium using American Society for Testing and Materials International (ASTM) Method D1946 to determine whether there was short-circuiting in the connection from the summa canister to the soil gas sampling point. Table 1 summarizes the samples collected, identifies the coordinates of each sample location, the depth at which each sample was collected, and provides a summary of the PCE results for each sample.

All soil gas sampling points and samples were originally proposed to be installed and collected utilizing the Geoprobe® Post-Run Tubing (PRT) installation system. However, only one sample, SV-29, was collected using this procedure. Due to technical difficulties, the soil lithology encountered at the Site, the deeper than expected depth to groundwater (and thus deeper target depth for soil gas point installation), the PRT system proved to be a non-viable option for sample collection. Therefore, the decision was made by START and the EPA On-Scene Coordinator (OSC) to construct temporary soil gas implants instead of using the PRT system. Due to lack of a viable substrate for installation of the soil gas implant at location SV-18 and high water table at location SV-19, soil gas samples were not collected at either of these locations.

Each soil gas sampling implant was constructed with a 6-inch stainless-steel screen point connected to low-density polyethylene (LDPE)-lined tubing by either a barbed or compression fitting. The soil gas implant was first installed inside a 1-inch poly-vinyl chloride (PVC) pipe which was set inside an open borehole advanced to the target depth selected by the EPA OSC. Once at depth, approximately 1 to 2 feet of sand pack was installed to cover the soil gas sampling implant as the PVC pipe was slowly removed from the borehole. Bentonite was then placed in the borehole to ground surface while the PVC was simultaneously removed from the hole. At least 2 vertical feet of bentonite at each location was hydrated with water. Each soil gas sampling location was completed by coiling the tubing and capping to seal from moisture.

Prior to sample port installation, soil cores were collected and logged at each location with a Geoprobe® using 2-inch diameter, 5-foot long macrocore samplers with acetate sleeves to identify favorable soil conditions for soil gas collection and select the depth at which each soil gas sampling point would be set. In addition, soil was continuously screened using a Photoionization Detector (PID) capable of detecting in the parts per billion (ppb) range for evidence of VOC impacts. Installation depths were selected at the discretion of the EPA OSC and biased to the highest permeability substrate that might contain vapors or within lithology that indicated visual or PID impacts. At locations where the maximum borehole depth was deeper than the target sampling depth, the borehole was filled with bentonite to approximately 1 foot below the target sample depth. Approximately 1 foot of sand pack was then placed in the borehole to form a base for the implant to be installed at the target sample depth. Soil logs from each boring location, including the depth and lithology at which each implant was installed, are presented as an attachment. At several locations (borings SV-19, SV-24, SV-28, and SV-30) two boreholes were advanced. At locations SV-24, SV-28, and

SV-30 two boreholes were advanced because of the change from the PRT installation system to the implant install system. At location SV-19, two boreholes were advanced because a shallow water table was encountered and multiple attempts were made on different days to install an implant properly. Geoprobe® rods and associated tools were decontaminated between each sampling location using an Alconox wash and rinsed with water.

Once the soil gas sampling implants were installed, a helium leak tracer test was performed at each location to ensure that ambient air was not short-circuiting the implant. The helium leak test was performed by covering the surface of the implant with a shroud containing three ports. The sample tube connecting the well to a lung-box Tedlar® bag sampler was passed through the bottom port. The top port was used to introduce a steady flow of helium into the shroud and a detector was attached to the middle port to monitor the helium concentration within the shroud. When the shroud helium concentration stabilized at or near 100 percent (%), a sample was collected into a 1-liter (L) Tedlar bag using an SKC PCXR8 or equivalent sampling pump and a vacuum chamber for approximately 1 minute. After collecting the sample, the helium cylinder was shut off, the detector was removed, and the reading was allowed to return to zero. To verify the integrity of the soil gas well, the Tedlar bag sample was removed from the lung-box, the tubing was sealed, and the Tedlar bag sample was screened with the helium monitor to measure the helium concentration. The leak test was considering "passing" if the helium concentration in the Tedlar bag sample was less than 5%. All sampling implants passed the leak test prior to sampling. After the helium test, the soil gas probe was purged by removing at least 3 Ls of air from each location using a personnel air sampling pump or dedicated, disposable, plastic syringe to draw air from the sampling point. The sample tube from the soil gas well was then attached to a Summa canister, and the helium was re-established to 100% in preparation for sampling.

After the soil gas sampling implants passed the helium leak test, soil gas samples were collected from each implant. Soil gas sampling was conducted in accordance with EPA Environmental Response Team (ERT) Standard Operating Procedure (SOP) 1704 for Summa canisters (EPA ERT, 1995). All samples were collected by connecting a batch-certified 1-L stainless-steel Summa canister fitted with batch-certified 5-minute flow controller to each soil gas implant. In addition to sampling, at the majority of the locations a PID measurement was collected from each sampling point and a Draeger tube sample for PCE was collected. The PID measurements and Draeger tube results from each location are summarized on Table 2. At most locations a color change was indicated on the Draeger tube; however, it was not enough of a change to visually indicate a concentration of PCE because the low end of the detection range on the tubes was 2 parts per million (ppm). Therefore, the Draeger tube results may indicate the presence of PCE but were not effective in determining the PCE concentration.

Sampling activities were documented in the Site logbook in accordance with WESTON SOP No. 101 Logbook Documentation (WESTON, 2015a). All samples collected during the September and October 2016 sampling event were handled and packaged *Contract Laboratory Program Guidance for Field Samplers* (EPA, 2014). Samples were placed in original shipping containers following collection and delivered to the laboratory within one week of collection. All shipping containers were properly labeled with EPA chain-of-custody seals and delivered with signed chain-of-custody forms and appropriate hazard warnings for laboratory personnel.

Field Quality Assurance/Quality Control (QA/QC) measures consisted of the collection of two field ambient air samples and two lot blank samples. QA/QC measures were conducted in accordance with the WESTON *EPA Region III START 5 Program-Wide Uniform Federal Policy-Quality Assurance Project Plan* (UFP QAPP) (WESTON, 2015b).

2.0 RESULTS

Preliminary PCE analytical results are summarized in Table 1. Validation through the Office of Analytical Services and Quality Assurance (OASQA) is on-going and any changes and/or qualifications to the preliminary results will be discussed in a revision to this trip report. The preliminary PCE analytical results and sampling locations are presented on Figure 2.

PCE was detected at concentrations ranging from an estimated concentration of 0.27 J parts per billion per volume per volume (ppb v/v) to 47 ppb v/v in 15 of the 32 soil gas samples collected (samples SV-02, SV-03, SV-11, SV-14, SV-24, SV-29, SV-30, and SV-33). Results indicated with a "J" qualifier are considered estimated concentrations. The highest concentration of 47 ppb v/v was indicated at location SV-24. PCE was not detected in soil gas samples SV-00 (background sample), SV-04, SV-05, SV-06, SV-09, SV-10, SV-15, SV-17, SV-21, SV-22, SV-23, SV-25, SV-26, SV-27, SV-28, SV-31, SV-32, and ambient air samples AS-01 and AS-02.

3.0 REFERENCES

U.S. Environmental Protection Agency (EPA). 2014. *Contract Laboratory Program Guidance for Field Samplers*. 540-R-014-013. October.

U.S. Environmental Protection Agency Environmental Response Team (EPA ERT). 1995. SOP No. 1704. Summa Canister Sampling. July.

Weston Solutions, Inc. (WESTON). 2015a. Logbook Documentation. SOP No. 101. December.

WESTON (Weston Solutions, Inc.). 2015b. *EPA Region III Superfund Technical Assessment and Response Team 5 (START-5 Contract) Program-Wide Uniform Federal Policy Quality Assurance Project Plan (QAPP)*. September.

WESTON (Weston Solutions, Inc.). 2016. Final Field Sampling Plan for Soil Gas Sampling at the Hockessin Groundwater Site. September.

FIGURES

Legend

- Sample Locations
- Hockessin Groundwater Site
- Buildings

Imagery: ESRI, Bing Mapping Service

N

Coordinate System: WGS84 UTM Zone 18N Feet

0 275 550
Feet

Hockessin Groundwater Site
Hockessin, New Castle County, Delaware

Figure 1
Soil Gas Sampling Locations

TDD#: W501-16-07-005
Contract: EP-S3-15-02
Prepared: 10/31/2016

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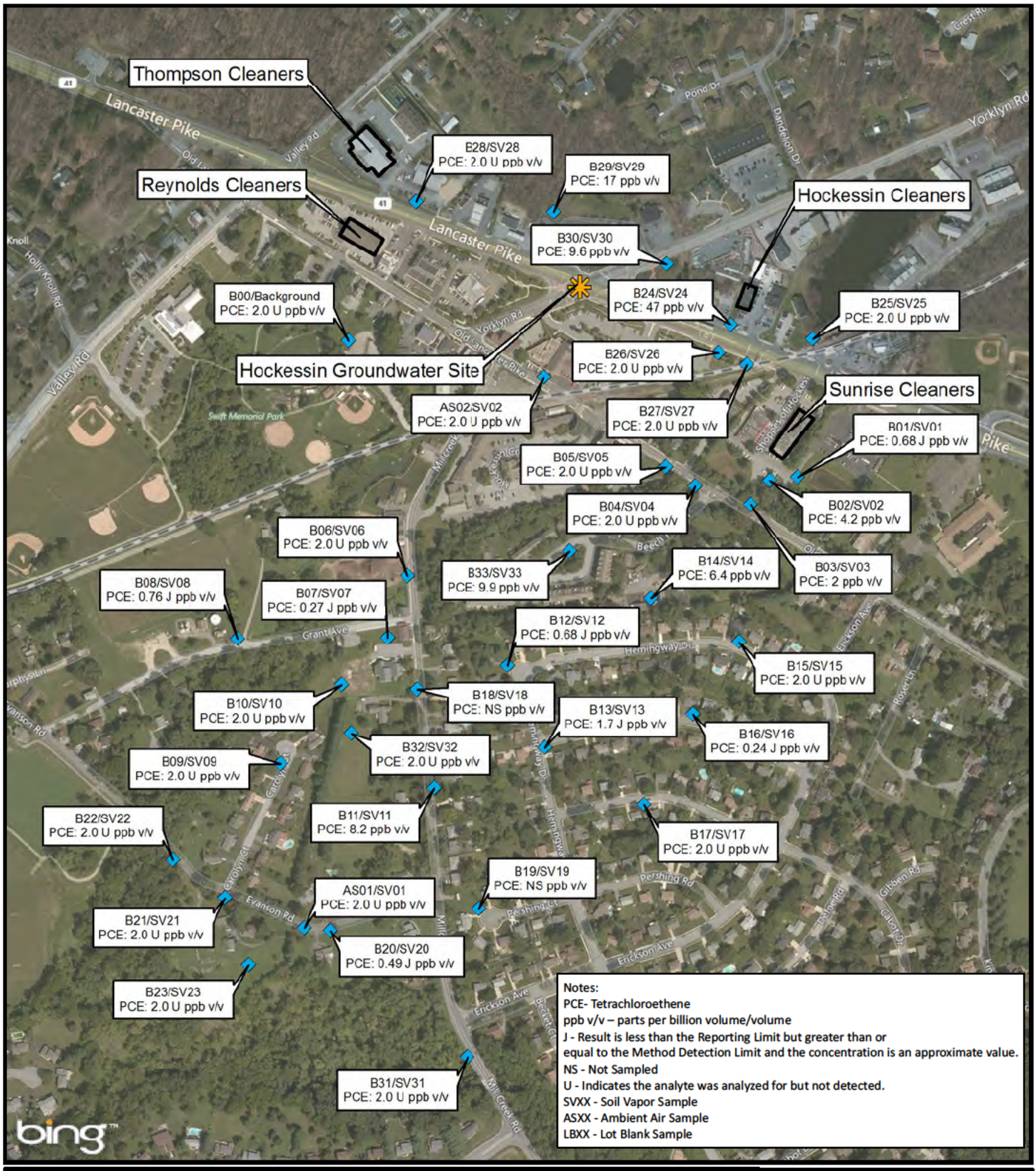

Legend

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Imagery: ESRI, Bing Mapping Service

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Coordinate System: WGS84 UTM Zone 18N Feet

0 275 550
Feet

Hockessin Groundwater Site
Hockessin, New Castle County, Delaware

Figure 2
Soil Vapor Sample and Preliminary Results Map

TDD#: W501-16-07-005
Contract: EP-S3-15-02
Prepared: 11/3/2016

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TABLES

Preliminary PCE Data
Soil Vapor Samples
Hockessin Groundwater Site
October 2016

GPS Coordinates*		Sample Identification		Sample Depth (feet)	Preliminary PCE Result (ppb v/v)
Point X	Point Y	CLP Sample #	Sample Location		
1444066	14450315.17	C0AB8	SV00 (background)	12.6	2.0 U
1445775	14449794.97	C0AA0	S-01	15	0.68 J
1445670	14449783.72	C0AA1	SV02	16	4.2
1445597	14449692.4	C0AA2	SV03	17.5	2.0
1445387	14449761.84	C0AD3	SV04	15	2.0 U
1445275	14449832.96	C0AA4	SV05	15	2.0 U
1444290	14449421.16	C0AA5	SV06	12	2.0 U
1444215	14449186.88	C0AA6	SV07	15	0.27 J
1443645	14449182.54	C0AA7	SV08	11.5	0.76 J
1443807	14448707.56	C0AA8	SV09	15	2.0 U
1444040	14449007.77	C0AA9	SV10	15	2.0 U
1444392	14448614.18	C0AB0	SV11	15	8.2
1444674	14449080.52	C0AB1	SV12	15.5	0.68 J
1444817	14448766.96	C0AB2	SV13	16.5	1.7 J
1445219	14449335.95	C0AB3	SV14	22.5	6.4
1445553	14449170.99	C0AB4	SV15	15	2.0 U
1445378	14448895.94	C0AB5	SV16	4.5	0.24 J
1445193	14448552.07	C0AB6	SV17	16.5	2.0 U
1444327	14448989.54	NS	SV18	NS	NS
1444564	14448153.1	NS	SV19	NS	NS
1443996	14448069.41	C0AB9	SV20	10	0.49 J
1443597	14448197.34	C0AC0	SV21	12.5	2.0 U
1443399	14448339.94	C0AC1	SV22	9.7	2.0 U
1443686	14447940.95	C0AC2	SV23	5	2.0 U
1445522	14450375.61	C0AC3	SV24	24.5	47
1445833	14450320.41	C0AC4	SV25	4	2.0 U
1445476	14450267.43	C0AC5	SV26	13	2.0 U
1445583	14450224.12	C0AC6	SV27	17.5	2.0 U
1444322	14450841.83	C0AC7	SV28	15	2.0 U
1444848	14450803.37	C0AC8	SV29	25	17
1445279	14450605.61	C0AD5	SV30	16	9.6
1444519	14447591.23	C0AD4	SV31	5	2.0 U
1444076	14448821.46	C0AD0	SV32	12.3	2.0 U
1444909	14449514.15	C0AC9	SV33	15	9.9
1443898	14448079.56	C0AD6	AS01 (Ambient Air)	N/A	2.0 U
1444811	14450176.15	C0AD1	AS02 (Ambient Air)	N/A	2.0 U
NA	NA	C0AD2	LB01 (Summa Lot Blank)	N/A	2.0 U
NA	NA	C0AD7	LB02 (Summa Lot Blank)	N/A	2.0 U

Notes:
AS - Ambient Air Sample
CLP - Contract Laboratory Program
GPS - Global Positioning System
J - Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
LB - Lot Blank Sample
NA - Not Applicable
NS - Not Sampled
PCE - Tetrachloroethylene
ppb v/v- parts per billion volume/volume
SV- Soil Vapor Sample
U - Indicates the analyte was analyzed for but not detected.
*WGS1984 UTM ZONE 18N, U.S Survey Feet

PID and Draeger Tube
Screening Results
Hockessin Groundwater Site
October 2016

GPS Coordinates*		Sample Identification			Screening Results	
Point X	Point Y	CLP Sample #	Sample Location	Sample Depth (feet)	PID Reading (ppb)	Draeger Tube color change (Y/N)
1444065.831	14450315.17	C0AB8	SV00 (background)	12.6	NC	NC
1445775.095	14449794 97	C0AA0	SV01	15	400	Y
1445669.687	14449783.72	C0AA1	SV02	16	9,500	Y
1445597.224	14449692.4	C0AA2	SV03	17.5	1,711	Y
1445387.111	14449761 84	C0AD3	SV04	15	900	Y
1445275.375	14449832 96	C0AA4	SV05	15	6,830	Y
1444289.924	14449421.16	C0AA5	SV06	12	46	Y
1444214.842	14449186 88	C0AA6	SV07	15	138	Y
1443644.888	14449182 54	C0AA7	SV08	11.5	140	Y
1443807.062	14448707 56	C0AA8	SV09	15	900	Y
1444040.021	14449007.77	C0AA9	SV10	15	686	Y
1444391.779	14448614.18	C0AB0	SV11	15	45	Y
1444674.011	14449080 52	C0AB1	SV12	15.5	1,850	Y
1444816.512	14448766 96	C0AB2	SV13	16.5	1,595	Y
1445218.787	14449335 95	C0AB3	SV14	22.5	350	Y
1445552.739	14449170 99	C0AB4	SV15	15	40	Y
1445377.797	14448895 94	C0AB5	SV16	4.5	420	Y
1445192.882	14448552 07	C0AB6	SV17	16.5	578	Y
1444326.815	14448989 54	NS	SV18	NS	NA	NA
1444563.827	14448153.1	NS	SV19	NS	NA	NA
1443996 21	14448069.41	C0AB9	SV20	10	191	Y
1443597.207	14448197 34	C0AC0	SV21	12.5	3,000	Y
1443398.873	14448339 94	C0AC1	SV22	9.7	234	Y
1443686.464	14447940 95	C0AC2	SV23	5	NC	NC
1445521.778	14450375.61	C0AC3	SV24	24.5	3,000	Y
1445832.591	14450320.41	C0AC4	SV25	4	NC	NC
1445475.583	14450267.43	C0AC5	SV26	13	5,933	Y
1445582.693	14450224.12	C0AC6	SV27	17.5	1,200	Y
1444321.995	14450841 83	C0AC7	SV28	15	720	Y
1444848.202	14450803 37	C0AC8	SV29	25	NC	NC
1445279.052	14450605.61	C0AD5	SV30	16	500	Y
1444518.793	14447591 23	C0AD4	SV31	5	1,350	Y
1444076.224	14448821.46	C0AD0	SV32	12.3	NC	Y
1444909.238	14449514.15	C0AC9	SV33	15	865	Y
1443897.725	14448079 56	C0AD6	AS-01	N/A	NA	NA
1444811.419	14450176.15	C0AD1	AS-02	N/A	NA	NA
NA	NA	C0AD2	LB-01	N/A	NA	NA
NA	NA	C0AD7	LB-02	N/A	NA	NA

Notes:
AS - Ambient Air Sample
CLP -Contract Laboratory Program
GPS - Global Positioning System
LB - Lot Blank Sample
NA - Not Applicable
NC - Not Collected. Screening measurement not collected.
NS - Not Sampled
PID - Photoionization detector
ppb - parts per billion
SV - Soil Vapor Sample
*WGS1984 UTM ZONE 18N, U.S Survey Feet