Remedial Action

Volume II – Appendices

Groveland Wells Superfund Site – Operable Unit 2
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

REMEDIAL ACTION CONTRACT
No. EP-S1-06-03

FOR

US Environmental Protection Agency
Region 1

BY

Nobis Engineering, Inc.

Nobis Project No. 80037

September 2011

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Diane M. Baxter
Senior Project Manager

Lauren D. Soós
Project Engineer

APPENDIX A

TECHNICAL MEMORANDUM

Date: June 2, 2010

To: Derrick Golden, United States Environmental Protection Agency (USEPA), Region 1

From: Diane Baxter, Project Manager, Nobis Engineering, Inc.

Prepared by: Lauren Soós, Project Engineer, Nobis Engineering, Inc.

Subject: Baseline Investigation, Data Summary
Source Control Remedial Action, In-Situ Thermal Treatment
Groveland Wells Nos. 1 & 2 Superfund Site, Groveland, Massachusetts
Document Tracking Number MA-2725-2010-F

Introduction

Prior to implementation of the In-Situ Thermal Treatment (ISTT) system at the Groveland Wells Nos. 1 & 2 Superfund Site (the site), a Baseline Investigation was performed that consisted of sampling and analysis of soil, groundwater, and ambient air. The investigation was conducted to establish baseline concentrations of volatile organic compounds (VOCs) in the ISTT treatment area (Figure 1) and to provide information for the ISTT design and progress evaluation. The data have been used to confirm the current extent and concentrations of contaminants and to optimize the design of the ISTT system, and it will be used to determine the effectiveness of the Source Control Remedial Action.

This Technical Memorandum (Memo) summarizes the field and laboratory data collected as part of the Baseline Investigation. Tables, figures, and attachments are included at the end of this Memo. Data discussed in this memo are for the following activities:

- Soil Investigation – Potential Treatment Area D – July 2009
- Soil Investigation – Replacement Monitoring Well Installation – August 2009
- Soil Investigation – ISTT Subsurface Installation – March & April 2010
- Groundwater Investigation – Historical Monitoring Wells – June & July 2009
- Groundwater Investigation – Replacement Monitoring Wells – August 2009
- Ambient Air Monitoring – Baseline Conditions – January 2010

Purpose and Description of Field Activities

The baseline investigation field activities performed by Nobis between July 2009 and April 2010 are briefly described below. Refer to the *Quality Assurance Project Plan, Revision 1 (Nobis, July 2009) or Quality Assurance Project Plan, Revision 3 (Nobis, April 2010) for details of the sampling programs.*

Soil Investigations

Soil samples were collected from borehole locations within potential Treatment Area D, from boreholes for new stainless steel groundwater monitoring wells installed to replace historical PVC monitoring wells

abandoned in August 2009, and from boreholes for ISTT subsurface construction (mainly electrode installation). The Treatment Area D soil data provided information needed to further delineate the treatment area within the Valley Manufacturing building. Data collected during installation of replacement groundwater monitoring wells and ISTT subsurface components were used to verify and refine the limits of the treatment areas. The soil data will also be compared to post ISTT VOC concentrations to evaluate the overall effectiveness of the Remedial Action. Figure 2 describes the locations of the Treatment Area D borings and the replacement groundwater monitoring wells. The ISTT wellfield layout, showing the locations of the ISTT subsurface installations and final limits of the treatment areas, is included as Attachment A.

Treatment Area D soil samples were collected on July 29 and 30, 2009. Soil samples from the replacement groundwater monitoring wells and the ISTT subsurface installations were collected on July 30 through August 6, 2009 and March 2 and April 13, 2010, respectively. Soil samples were collected from various depths targeting the ISTT treatment zones, in accordance with procedures described in the *Quality Assurance Project Plan, Revision 1 (Nobis, July 2009)*. Soil samples were selected for laboratory analysis by a Nobis project scientist or engineer based on borehole geology, field observations (odor and color), and total VOC readings collected using a photo-ionization detector.

Groundwater Investigations

Baseline groundwater samples were collected from select historical groundwater monitoring wells and the replacement groundwater monitoring wells (Figure 2) in July and August of 2009, respectively. The purpose of the baseline groundwater monitoring was to determine the VOC concentrations in site groundwater prior to ISTT. The data were used to confirm and refine the extent of the groundwater treatment zone (Treatment Area A). The data will also be used, in combination with data collected during and after the ISTT operation, to evaluate the progress and overall effectiveness of the Remedial Action. Groundwater samples were collected using low-stress sampling procedures, in accordance with the *Quality Assurance Project Plan, Revision 1 (Nobis, July 2009)*.

Ambient Air Monitoring

Baseline ambient air samples were collected from upgradient (upwind) and downgradient (downwind) locations (Figure 3) at the site on January 22, 2010, during a period of no active construction on site. The purpose of the baseline ambient air sampling was to establish baseline conditions for comparison to the ambient air sampling events that will be conducted during ISTT operation. Ambient air sampling will be conducted during the ISTT operation to verify that there are no VOCs migrating outside of the treatment areas and discharging to the atmosphere. The ambient air sample locations were determined based on wind data (speed and direction) collected from the Bradford College Weather Station on January 22, 2010. The ambient air samples were collected in accordance with the *Quality Assurance Project Plan, Revision 1* (*Nobis, July 2009)*.

Baseline Investigation Results

The conclusions of the baseline investigations are briefly described below. Refer to the attached Tables for the comprehensive analytical results.

Geologic Conditions

Local geologic conditions were evaluated by the Nobis Site representative during baseline soil sampling. Boring logs, including well construction details, when applicable, were prepared for the Treatment Area D boreholes and the replacement groundwater monitoring well installations; the logs are included in Attachment B. A table was prepared (instead of individual boring logs) to describe the geologic units and lithology observed during the ISTT subsurface installations (Table 1). In general, the overburden soils consist of coarse-grained sand and silty sands, with a fine-grained unit (clay) at depths between 5 and 20 feet below the ground surface (bgs). Till (dense silty sand with gravel) is generally encountered around 30 feet bgs until bedrock, which is generally observed at approximately 40 feet bgs.

Baseline Soil Analysis Results

All baseline soil samples were analyzed for VOCs and a limited number of soil samples, approximately 10 percent, were also analyzed for total organic carbon (TOC). The laboratory results of the VOC and TOC analyses are presented for the Treatment Area D borings, replacement groundwater monitoring well borings, and ISTT subsurface installations in Tables 2, 3, and 4, respectively. As shown in Table 2, concentrations of VOCs in Treatment Area D soil samples were generally limited to trichloroethene (TCE) at AD-01 and AD-02. Other VOCs were detected, but at concentrations below the Cleanup Goals. The highest concentration of TCE, (1,800 micrograms per kilogram (ug/kg)), was observed at boring location AD-01, located in the northeast corner of potential Treatment Area D (Figure 2). As shown in the ISTT wellfield layout (Attachment A), Treatment Area D was extended both north and east of AD-01 to ensure complete treatment in the vicinity of this location.

As shown in Table 3, TCE was detected at concentrations above the Cleanup Goal in soil samples collected from Replacement Wells RW-01, RW-03, RW-05, and RW-08 (Figure 3). The highest concentration of TCE was observed at Replacement Well RW-05 at 11,000 ug/kg. In addition, cis-1,2-dichloroethene (cis-1,2-DCE), at 2,100 ug/kg, and tetrachloroethene (PCE), at 1,900 ug/kg, were detected at concentrations above the respective Cleanup Goals from soil samples collected at Replacement Well RW-05. Other VOCs were detected, but at concentrations below the Cleanup Goals.

As shown in Table 4, several soil samples collected from the ISTT subsurface installations had VOCs which were detected at concentrations above the Cleanup Goals for TCE, cis-1,2-DCE, PCE, and 1,1-dichloroethene (1,1-DCE). As expected, one or more of these VOCs were detected at concentrations above the Cleanup Goals within each of the ISTT treatment areas, Treatment Areas A, B, C, and D (Attachment A). The highest concentrations of TCE (20,000 ug/kg) and PCE (410 ug/kg) were observed at Electrode E-43. The highest concentrations of cis-1,2-DCE (940 ug/kg) and 1,1-DCE (63 ug/kg) were observed in Electrodes E-42 and E-46, respectively.

Baseline Groundwater Analysis Results

Groundwater samples collected from the historical and replacement groundwater monitoring wells were analyzed for VOCs. The laboratory results for the VOC analysis are presented for the historical and replacement groundwater monitoring well samples in Tables 5 and 6, respectively. TCE detections in the groundwater samples ranged from below the Interim Cleanup Goal of 5 microgram per liter (ug/L) to a concentration of 96,000 ug/L detected in historical groundwater monitoring well TW-42 (Figure 2). In

addition, cis-1,2-DCE and vinyl chloride were detected at concentrations ranging from below the Cleanup Goals of 70 and 2 ug/L to 340 and 12 ug/L, respectively.

Baseline Ambient Air Analysis Results

The ambient air samples were analyzed for VOCs. The analytical results of the baseline ambient air sampling are presented in Table 7. Several VOCs were detected at low concentrations (less than 1 part per billion per volume). None of the VOCs previously discussed, TCE, cis-1,2-DCE, PCE, and 1,1-DCE were detected at concentrations above the reporting limits.

Tables:

Table 1	Soil Investigation, ISTT Subsurface Installations, General Site Geologic Observations
Table 2	Soil Investigation, Potential Treatment Area D, Volatile Organic and Total Organic Carbon Analyses
Table 3	Soil Investigation, Replacement Monitoring Well Borings, Volatile Organic and Total Organic Carbon Analyses
Table 4	Soil Investigation, ISTT Subsurface Installations, Volatile Organic and Total Organic Carbon Analyses
Table 5	Groundwater Investigation, Historical Monitoring Wells, Volatile Organic Analysis
Table 6	Groundwater Investigation, Replacement Monitoring Wells, Volatile Organic Analysis
Table 7	Ambient Air Monitoring, Baseline Conditions, Volatile Organic Analysis

Figures:

Figure 1	In Situ Thermal Treatment Areas (Original Estimated Limits)
Figure 2	Treatment Area D Borehole and Replacement Groundwater Monitoring Well Locations
Figure 3	Ambient Air Sampling Locations

Attachments:

Attachment A	In Situ Thermal Treatment Wellfield Layout (Final)
Attachment B	Boring Logs and Well Construction Details – Treatment Area D and Replacement Groundwater Monitoring Wells

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TABLES

Table 1
Soil Investigation - ISTT Subsurface Installation
General Site Geologic Observations
GROVELAND WELLS SUPERFUND SITE - SOURCE CONTROL REMEDIAL ACTION

		Approximate Depth Intervals of General Site Geologic Units (in feet)[1]																	
Electrode Location[2]	Date[3]	Sand			Clay			Sand			Silty Sand			Till			Weathered Bedrock			Bedrock	End of Boring[4]
E-01	4/6/2010	0	to	5	5	to	8	8	to	26	26	to	29	29	to	34	34	to	35	35	39
E-02	3/30/2010	0	to	7	7	to	12	12	to	31		NO		31	to	36		NO		37	43
E-03	3/4/2010	0	to	30		NO			NO		30	to	35	35	to	41	41	to	42	42	45
E-10	3/22/2010	0	to	9.5	9.5	to	13	13	to	26	26	to	42.5		NO		42.5	to	43	43	45
E-11	3/2/2010	0	to	39		NO			NO			NO		39	to	45		NO		45	45
E-12	3/17/2010	0	to	14	14	to	22	22	to	26	26	to	27	27	to	37	37	to	38	38	45
E-18	3/23/2010	0	to	13	13	to	19	19	to	28	28	to	39	39	to	48		NO		49	49
E-21	3/4/2010	0	to	*NO*		-			-			-			-			-		-	10
E-23	3/8/2010	0	to	18.5		NO			NO		18.5	to	29	30	to	43	43	to	45	45	45
E-26	3/16/2010	0	to	20	20	to	22	22	to	25.5	25.5	to	37	37	to	38.5	38.5	to	39	39	45
E-27	4/13/2010	0	to	18	18	to	23	23	to	39.5		NO		39.5	to	49.5	49.5	to	*NO*	-	50
E-34	3/4/2010	0	to	*NO*		-			-			-			-			-		-	10
E-35	3/9/2010	0	to	*NO*		-			-			-			-			-		-	25
E-40	3/25/2010	0	to	9	9	to	*NO*		-			-			-			-		-	10
E-42	3/17/2010	0	to	16	16	to	18	18	to	20	20	to	21	21	to	39		NO		39	45
E-43	4/2/2010	0	to	14.5	14.5	to	29	29	to	33		NO		33	to	49		NO		49	49
E-44	3/29/2010	0	to	13	13	to	19	19	to	34		NO		34	to	48		NO		48	48
E-46	4/12/2010	0	to	15	15	to	22	22	to	31	31	to	44		NO			NO		44	45
E-47	3/29/2010	0	to	*NO*		-			-			-			-			-		-	10
E-48	3/25/2010	0	to	*NO*		-			-			-			-			-		-	10
E-49	3/25/2010	0	to	15	15	to	20	20	to	27	27	to	36.5		NO		36.5	to	37	37	45
E-53	4/7/2010	0	to	13	13	to	18	18	to	23	23	to	30	30	to	*40*		-		-	40
E-54	3/29/2010	0	to	9.5	9.5	to	*NO*		-			-			-			-		-	10
E-56	3/31/2010	0	to	9.5	9.5	to	15	15	to	22	22	to	*NO*		-			-		-	25
E-57	3/30/2010	0	to	9	9	to	12	12	to	*NO*		-			-			-		-	14
E-60	3/31/2010	0	to	*NO*		-			-			-			-			-		-	10
E-61	3/31/2010	0	to	10	10	to	*NO*		-			-			-			-		-	12
E-62	3/16/2010	0	to	*NO*		-			-			-			-			-		-	10
E-63	3/16/2010	0	to	*NO*		-			-			-			-			-		-	10
E-65	3/3/2010	0	to	*NO*		-			-			-			-			-		-	10
T-16	3/22/2010	0	to	*NO*		-			-			-			-			-		-	11

Notes:

(1) Depth intervals of general Site geologic units are based on field observations by the Nobis Site representative and communications with the driller.

(2) Electrodes were installed using RotoSonic drilling methods by Boart Longyear, a TerraTherm, Inc. Subcontractor. Nobis staff collected soil samples at select locations.

(3) This date represents the date when the borehole was sampled and does not represent the date when the electrode was installed.

(4) This depth is the final depth of the borehole and does not represent the depth of the electrode.

NO - Not Observed. The geologic unit or interface was not observed by the Nobis Site representative.

Italics - The end of the geologic unit was not observed due to termination of the borehole.

Table 2
Soil Investigation - Potential Treatment Area D - July 2009
Volatile Organic and Total Organic Carbon Analyses
GROVELAND WELLS SUPERFUND SITE - SOURCE CONTROL REMEDIAL ACTION

Sample Name			A2YW2	A2YW3	A2YW4	A2YT9	A2YW0	A2YW1	A2YW5	A2YW6	A2YW7	D00260	A2YX0/A2YX1	A2YW9	A2YW8
Sample Location			AD-01	AD-01	AD-01	AD-02	AD-02	AD-02	AD-03	AD-03	AD-03	AD-04	AD-04	AD-04	AD-04
Sample Depth (feet below ground surface)			9 to 10	13 to 14	19 to 20	7 to 8	9 to 10	13 to 14	11 to 12	13 to 14	19 to 20	4 to 6	8 to 9	13 to 14	17 to 18
Sample Date			29-Jul-09	29-Jul-09	29-Jul-09	29-Jul-09	29-Jul-09	29-Jul-09	29-Jul-09	29-Jul-09	29-Jul-09	29-Jul-09	30-Jul-09	30-Jul-09	30-Jul-09
Chemical Name	CRQL	CUG													
1,1,1-Trichloroethane	5	1388	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,1,2,2-Tetrachloroethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,1,2-Trichloroethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,1-Dichloroethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,1-Dichloroethene	5	45	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,2,3-Trichlorobenzene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,2,4-Trichlorobenzene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,2-Dibromo-3-chloropropane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,2-Dibromoethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,2-Dichlorobenzene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,2-Dichloroethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,2-Dichloropropane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,3-Dichlorobenzene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,4-Dichlorobenzene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
1,4-Dioxane	100	-	120 U	110 U	110 U	120 U	100 U	110 U	110 U	98 U	94 U	NA	99 U	110 U	110 U
2-Butanone	10	-	12 U	11 U	11 U	12 U	10 U	11 U	11 U	9.8 U	9.4 U	NA	9.9 U	11 U	11 U
2-Hexanone	10	-	12 U	11 U	11 U	12 U	10 U	11 U	11 U	9.8 U	9.4 U	NA	9.9 U	11 U	11 U
4-Methyl-2-pentanone	10	-	12 U	11 U	11 U	12 U	10 U	11 U	11 U	9.8 U	9.4 U	NA	9.9 U	11 U	11 U
Acetone	10	-	**93**	11 U	11 U	**38**	10 U	11 U	11 U	9.8 U	9.4 U	NA	9.9 U	11 U	11 U
Benzene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Bromochloromethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Bromodichloromethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Bromoform	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Bromomethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Carbon disulfide	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Carbon tetrachloride	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Chlorobenzene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Chloroethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Chloroform	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Chloromethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
cis-1,2-Dichloroethene	5	418	**10**	5.5 U	**6.1**	**6.1**	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
cis-1,3-Dichloropropene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Cyclohexane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Dibromochloromethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Dichlorodifluoromethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Ethylbenzene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Isopropylbenzene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
m,p-Xylene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Methyl acetate	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Methyl tert-butyl ether	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Methylcyclohexane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Methylene chloride	5	22	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
o-Xylene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Styrene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Tetrachloroethene	5	56	**2.7** J	5.5 U	5.7 U	**7.3**	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Toluene	5	22753	**1.4** J	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
trans-1,2-Dichloroethene	5	626	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
trans-1,3-Dichloropropene	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Trichloroethene	5	77	**1800** D	5.5 U	**11**	**210**	**1.5** J	**1.2** J	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Trichlorofluoromethane	5	-	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Vinyl chloride	5	11	5.8 U	5.5 U	5.7 U	5.9 U	5.2 U	5.6 U	5.3 U	4.9 U	4.7 U	NA	4.9 U	5.7 U	5.3 U
Total Organic Carbon	100	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1300**	**1400**	NA	NA

NOTES:

All values are in micrograms per kilograms (ug/kg), with the exception of Total Organic Carbon which is in milograms per kilograms (mg/kg). The data are unvalidated.

CUG - Cleanup Goals as defined in the Explanation of Significant Differences (2007)
CRQL - Contract Required Quantitation Limit
NA - Not Analyzed
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit Is Higher Than the CUG

LABORATORY QUALIFIERS:

D - Concentration is reported from a dilution of the sample.
E - Quantitation is estimated as it exceeds the calibration range of the analysis.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 3
Soil Investigation - Replacement Monitoring Well Installation - August 2009
Volatile Organic and Total Organic Carbon Analyses
GROVELAND WELLS SUPERFUND SITE - SOURCE CONTROL REMEDIAL ACTION

Sample Name			A2YY5	A2YY4	A2YZ7	A2YZ8	A2YY7	A2YY8/A2YY9	A2YZ0	A2YX7	A2YX9	A2YZ3	A2YZ4	A2YZ5
Sample Location			RW-01	RW-01	RW-02	RW-02	RW-03	RW-03	RW-03	RW-04	RW-04	RW-05	RW-05	RW-05
Sample Depth (feet below ground surface)			8 to 9	29 to 40	14 to 15	18 to 19	1 to 2	31 to 32	35 to 36	18 to 20	37 to 38	3 to 4	23 to 24	37 to 38
Sample Date			4-Aug-09	4-Aug-09	5-Aug-09	5-Aug-09	4-Aug-09	4-Aug-09	4-Aug-09	30-Jul-09	30-Jul-09	5-Aug-09	5-Aug-09	5-Aug-09
Chemical Name	CRQL	CUG												
1,1,1-Trichloroethane	5	1388	5.7 U	5 U	5.1 U	6.2 U	4.5 U	**1.4** J	**6.4**	5.9 U	4.7 U	4.8 U	**38**	**2.3** J
1,1,2,2-Tetrachloroethane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
1,1,2-Trichloroethane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	**57**	**9.5**	5.7 U
1,1-Dichloroethane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	**5.1** J	5.7 U
1,1-Dichloroethene	5	45	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	**1.2** J	5.9 U	4.7 U	**1.5** J	**15**	5.7 U
1,2,3-Trichlorobenzene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
1,2,4-Trichlorobenzene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
1,2-Dibromo-3-chloropropane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
1,2-Dibromoethane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
1,2-Dichlorobenzene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
1,2-Dichloroethane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
1,2-Dichloropropane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
1,3-Dichlorobenzene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
1,4-Dichlorobenzene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
1,4-Dioxane	100	-	110 U	100 U	100 U	120 U	90 U	120 U	100 U	120 U	94 U	96 U	120 U	110 U
2-Butanone	10	-	11 U	10 U	10 U	12 U	**98**	12 U	**2** J	12 U	9.4 U	9.6 U	12 U	11 U
2-Hexanone	10	-	11 U	10 U	10 U	12 U	9 U	12 U	10 U	12 U	9.4 U	9.6 U	12 U	11 U
4-Methyl-2-pentanone	10	-	11 U	10 U	10 U	12 U	9 U	12 U	10 U	12 U	9.4 U	9.6 U	12 U	11 U
Acetone	10	-	**23**	10 U	10 U	12 U	**360** E	12 U	**8.2** J	12 U	9.4 U	**62**	12 U	11 U
Benzene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Bromochloromethane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Bromodichloromethane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Bromoform	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Bromomethane	5	-	5.7 U	5 U	5.1 U	6.2 U	**13**	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Carbon disulfide	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Carbon tetrachloride	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Chlorobenzene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Chloroethane	5	-	5.7 U	5 U	5.1 U	6.2 U	**10**	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Chloroform	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Chloromethane	5	-	5.7 U	5 U	5.1 U	6.2 U	**11**	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
cis-1,2-Dichloroethene	5	418	**4.4** J	5 U	**2.4** J	**2.9** J	**4.9**	**14** U	**260** E	5.9 U	**1** J	**100**	**2100** D	**8.1**
cis-1,3-Dichloropropene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Cyclohexane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Dibromochloromethane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Dichlorodifluoromethane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Ethylbenzene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Isopropylbenzene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
m,p-Xylene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Methyl acetate	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Methyl tert-butyl ether	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Methylcyclohexane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Methylene chloride	5	22	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
o-Xylene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Styrene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Tetrachloroethene	5	56	5.7 U	5 U	**1.1** J	**3.4** J	**5**	6.1 U	**5.4**	5.9 U	4.7 U	**1900** D	**21**	5.7 U
Toluene	5	22753	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
trans-1,2-Dichloroethene	5	626	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	**3** J	5.9 U	4.7 U	4.8 U	**4.3** J	5.7 U
trans-1,3-Dichloropropene	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Trichloroethene	5	77	**82**	5 U	**3.1** BJ	**9** B	**940** D	**5650** D	**6900** D	5.9 U	**1.8** J	**11000** D	**7400** D	**8700** D
Trichlorofluoromethane	5	-	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Vinyl chloride	5	11	5.7 U	5 U	5.1 U	6.2 U	4.5 U	6.1 U	5.2 U	5.9 U	4.7 U	4.8 U	5.8 U	5.7 U
Total Organic Carbon	100	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1200**	NA

NOTES:
All values are in micrograms per kilograms (ug/kg), with the exception of Total Organic Carbon which is in milograms per kilograms (mg/kg). The data are unvalidated.
CUG - Cleanup Goals as defined in the Explanation of Significant Differences (2007)
CRQL - Contract Required Quantitation Limit
NA - Not Analyzed
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit Is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
E - Quantitation is estimated as it exceeds the calibration range of the analysis.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 3
Soil Investigation - Replacement Monitoring Well Installation - August 2009
Volatile Organic and Total Organic Carbon Analyses
GROVELAND WELLS SUPERFUND SITE - SOURCE CONTROL REMEDIAL ACTION

Sample Name			A2YY0		A2YY1		A2YY2		A2YY3		A2Z02		A2Z00		A2Z01		A2YZ1		A2YZ2		A2Z03		A2Z04	
Sample Location			RW-06		RW-06		RW-07		RW-07		RW-08		RW-08		RW-08		RW-09		RW-09		RW-10		RW-10	
Sample Depth (feet below ground surface)			6 to 7		18 to 19		18 to 19		29 to 30		9 to 10		14 to 15		46 to 47		14 to 15		39 to 40		8 to 9		38 to 39	
Sample Date			3-Aug-09		3-Aug-09		3-Aug-09		3-Aug-09		6-Aug-09		6-Aug-09		6-Aug-09		4-Aug-09		4-Aug-09		6-Aug-09		6-Aug-09	
Chemical Name	CRQL	CUG																						
1,1,1-Trichloroethane	5	1388	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,1,2,2-Tetrachloroethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,1,2-Trichloroethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,1-Dichloroethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,1-Dichloroethene	5	45	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,2,3-Trichlorobenzene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,2,4-Trichlorobenzene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,2-Dibromo-3-chloropropane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,2-Dibromoethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,2-Dichlorobenzene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,2-Dichloroethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,2-Dichloropropane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,3-Dichlorobenzene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	**1.7**	J	5.5	U	5.1	U
1,4-Dichlorobenzene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
1,4-Dioxane	100	-	100	U	120	U	120	U	90	U	97	U	110	U	110	U	94	U	100	U	110	U	100	U
2-Butanone	10	-	10	U	12	U	12	U	9	U	9.7	U	11	U	11	U	9.4	U	10	U	11	U	10	U
2-Hexanone	10	-	10	U	12	U	12	U	9	U	9.7	U	11	U	11	U	9.4	U	10	U	11	U	10	U
4-Methyl-2-pentanone	10	-	10	U	12	U	12	U	9	U	9.7	U	11	U	11	U	9.4	U	10	U	11	U	10	U
Acetone	10	-	**19**		12	U	12	U	9	U	**18**		**21**		11	U	9.4	U	10	U	11	U	10	U
Benzene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Bromochloromethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Bromodichloromethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Bromoform	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Bromomethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Carbon disulfide	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Carbon tetrachloride	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Chlorobenzene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Chloroethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Chloroform	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Chloromethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
cis-1,2-Dichloroethene	5	418	5.2	U	**41**		6.1	U	4.5	U	4.9	U	**14**		5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
cis-1,3-Dichloropropene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Cyclohexane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Dibromochloromethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Dichlorodifluoromethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Ethylbenzene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Isopropylbenzene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
m,p-Xylene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Methyl acetate	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Methyl tert-butyl ether	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Methylcyclohexane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Methylene chloride	5	22	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
o-Xylene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Styrene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Tetrachloroethene	5	56	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	**87**		5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Toluene	5	22753	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
trans-1,2-Dichloroethene	5	626	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
trans-1,3-Dichloropropene	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Trichloroethene	5	77	**2.9**	J	**52**		6.1	U	4.5	U	**1.5**	BJ	**220**	B	**2.7**	BJ	4.7	U	**8**		5.5	U	**4.4**	BJ
Trichlorofluoromethane	5	-	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Vinyl chloride	5	11	5.2	U	5.8	U	6.1	U	4.5	U	4.9	U	5.6	U	5.4	U	4.7	U	5.1	U	5.5	U	5.1	U
Total Organic Carbon	100	-	NA		NA		NA		NA		NA		NA		**580**		NA		NA		NA		NA	

NOTES:
All values are in micrograms per kilograms (ug/kg), with the exception of Total Organic Carbon which is in milograms per kilograms (mg/kg). The data are unvalidated.
CUG - Cleanup Goals as defined in the Explanation of Significant Differences (2007)
CRQL - Contract Required Quantitation Limit
NA - Not Analyzed
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit Is Higher Than the CUG.

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
E - Quantitation is estimated as it exceeds the calibration range of the analysis.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 4
Soil Investigation - ISTT Subsurface Installation - March and April 2010
Volatile Organic and Total Organic Carbon Analyses
GROVELAND WELLS SUPERFUND SITE - SOURCE CONTROL REMEDIAL ACTION

Sample Name			A2Z89	A2Z90	A2Z75	A2Z76	A2Z77	A2Z28	A2Z34	A2Z57	A2Z58	A2Z59[1]	A2Z22	A2Z23	A2Z24	A2Z49	A2Z50	A2Z60/61[2]	A2Z32	A2Z31	A2Z36	A2Z37	A2Z45	A2Z46[1]
Sample Location			E-01	E-01	E-02	E-02	E-02	E-03	E-03	E-10	E-10	E-10	E-11	E-11	E-11	E-12	E-12	E-18	E-21	E-21	E-23	E-23	E-26	E-26
Sample Depth (feet below ground surface)			0 to 1	32 to 33	7 to 8	10 to 11	27 to 28	9 to 10	40 to 41	9 to 10	11 to 12	13 to 14	35 to 36	39 to 40	44 to 45	14 to 15	19 to 20	18 to 19	6 to7	9 to 10	19 to 20	43 to 44	15 to 16	20 to 21
Sample Date			4/6/2010	4/6/2010	3/30/2010	3/30/2010	3/30/2010	3/4/2010	3/5/2010	3/22/2010	3/22/2010	3/22/2010	3/2/2010	3/2/2010	3/2/2010	3/17/2010	3/17/2010	3/23/2010	3/4/2010	3/4/2010	3/8/2010	3/8/2010	3/16/2010	3/16/2010
Chemical Name	CRQL	CUG																						
1,1,1-Trichloroethane	5	1388	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	**94 J**	**6.6**	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,1,2,2-Tetrachloroethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,1,2-Trichloroethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,1-Dichloroethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,1-Dichloroethene	5	45	5.9 U	5.7 U	7.2 U	*300 U*	6.1 U	7.7 U	3.9 U	*1200 U*	*350 U*	4.4 U	5.1 U	5.6 U	5.2 U	6 U	*380 U*	*350 U*	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,2,3-Trichlorobenzene	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	**92 JB**	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,2,4-Trichlorobenzene	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	**1.7 J**	5.1 U	5.6 U	5.2 U	6 U	**85 JB**	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,2-Dibromo-3-chloropropane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,2-Dibromoethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,2-Dichlorobenzene	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,2-Dichloroethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,2-Dichloropropane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,3-Dichlorobenzene	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,4-Dichlorobenzene	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
1,4-Dioxane	100	-	120 U	110 U	140 U	6100 U	120 U	150 U	77 U	25000 U	7000 U	89 U	100 U	110 U	100 U	120 U	7700 U	7000 U	130 U	100 U	110 U	140 U	100 U	150 U
2-Butanone	10	-	12 U	11 U	**12 J**	610 U	12 U	15 U	7.7 U	2500 U	700 U	**14**	10 U	11 U	10 U	12 U	770 U	700 U	13 U	**6.3 J**	11 U	14 U	10 U	15 U
2-Hexanone	10	-	12 U	11 U	14 U	610 U	12 U	15 U	7.7 U	2500 U	700 U	8.9 U	10 U	11 U	10 U	12 U	770 U	700 U	13 U	10 U	11 U	14 U	10 U	15 U
4-Methyl-2-pentanone	10	-	12 U	11 U	14 U	610 U	12 U	15 U	7.7 U	2500 U	700 U	8.9 U	10 U	11 U	10 U	12 U	770 U	700 U	13 U	10 U	11 U	14 U	10 U	15 U
Acetone	10	-	**18**	11 U	**29**	610 U	**9.6 J**	**18**	**3.4 J**	2500 U	700 U	**40**	10 U	**5.7 J**	**8.1 J**	**6.4 J**	**160 JB**	700 U	**15**	**22**	**5.6 J**	**13 J**	**10 J**	**8.85 J**
Benzene	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Bromochloromethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Bromodichloromethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Bromoform	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Bromomethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Carbon disulfide	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	**110 JB**	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Carbon tetrachloride	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Chlorobenzene	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Chloroethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Chloroform	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Chloromethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
cis-1,2-Dichloroethene	5	418	5.9 U	5.7 U	7.2 U	300 U	**11**	7.7 U	3.9 U	*1200 U*	**760**	**260 E**	5.1 U	5.6 U	5.2 U	6 U	**550**	350 U	6.5 U	5 U	5.3 U	7 U	5 U	**28.5**
cis-1,3-Dichloropropene	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Cyclohexane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Dibromochloromethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Dichlorodifluoromethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Ethylbenzene	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Isopropylbenzene	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	**170 J**	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	**125 J**	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
m,p-Xylene	5	-	**4 J**	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Methyl acetate	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	**3.1 J**	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Methyl tert-butyl ether	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Methylcyclohexane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Methylene chloride	5	22	5.9 U	5.7 U	7.2 U	*300 U*	6.1 U	7.7 U	3.9 U	*1200 U*	*350 U*	4.4 U	5.1 U	5.6 U	5.2 U	6 U	*380 U*	*350 U*	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
o-Xylene	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	**230 J**	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Styrene	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Tetrachloroethene	5	56	5.9 U	5.7 U	7.2 U	**72 J**	6.1 U	7.7 U	3.9 U	*1200 U*	**330 J**	**20.2**	5.1 U	5.6 U	5.2 U	6 U	*380 U*	**2600**	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Toluene	5	22753	**21**	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
trans-1,2-Dichloroethene	5	626	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	*1200 U*	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
trans-1,3-Dichloropropene	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Trichloroethene	5	77	5.9 U	**6**	7.2 U	**56 J**	**6.7**	7.7 U	**3.3 J**	*1200 U*	*350 U*	**355 E**	5.1 U	5.6 U	5.2 U	6 U	**1400**	**155 J**	**8.1**	**3.1 J**	5.3 U	**34**	**4.5 J**	**104**
Trichlorofluoromethane	5	-	5.9 U	5.7 U	7.2 U	300 U	6.1 U	7.7 U	3.9 U	1200 U	350 U	4.4 U	5.1 U	5.6 U	5.2 U	6 U	380 U	350 U	6.5 U	5 U	5.3 U	7 U	5 U	7.7 U
Vinyl chloride	5	11	5.9 U	5.7 U	*7.2 U*	*300 U*	*6.1 U*	*7.7 U*	3.9 U	*1200 U*	*350 U*	4.4 U	*5.1 U*	*5.6 U*	*5.2 U*	*6 U*	*380 U*	*350 U*	*6.5 U*	5 U	*5.3 U*	*7 U*	5 U	*7.7 U*
Total Organic Carbon	100	-	NA	NA	NA	NA	NA	NA	NA	NA	**1800**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**470**

NOTES:
All values are in micrograms per kilograms (ug/kg), with the exception of Total Organic Carbon which is in milograms per kilograms (mg/kg). The data are unvalidated.
CUG - Cleanup Goals as defined in the Explanation of Significant Differences (2007)
CRQL - Contract Required Quantitation Limit
NA - Not Analyzed
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit Is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
E - Quantitation is estimated as it exceeds the calibration range of the analysis.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 4
Soil Investigation - ISTT Subsurface Installation - March and April 2010
Volatile Organic and Total Organic Carbon Analyses
GROVELAND WELLS SUPERFUND SITE - SOURCE CONTROL REMEDIAL ACTION

Sample Name			A2Z47	A2Z99	A2ZA0	A2Z29	A2Z30	A2Z38/39[2]	A2Z64	A2Z51	A2Z52	A2Z84	A2Z85	A2Z86/87[2]	A2Z73	A2Z74	A2Z96	A2Z97	A2Z98	A2Z69	A2Z65[1]	A2Z66[1]	A2Z67	A2Z91
Sample Location			E-26	E-27	E-27	E-34	E-34	E-35	E-40	E-42	E-42	E-43	E-43	E-43	E-44	E-44	E-46	E-46	E-46	E-47	E-48	E-49	E-49	E-53
Sample Depth (feet below ground surface)			25 to 26	16 to 17	29 to 30	7 to 8	9 to 10	10 to 11	9 to 10	9 to 10	28 to 29	4 to 5	18 to 19	29 to 30	11 to 12	12 to 13	4 to 5	15 to 16	25 to 26	3 to 4	0 to 1	6 to 7	18 to 19	0 to 1
Sample Date			3/16/2010	4/13/2010	4/13/2010	3/4/2010	3/4/2010	3/9/2010	3/25/2010	3/17/2010	3/17/2010	4/2/2010	4/2/2010	4/2/2010	3/29/2010	3/29/2010	4/12/2010	4/12/2010	4/12/2010	3/29/2010	3/25/2010	3/25/2010	3/25/2010	4/7/2010
Chemical Name	CRQL	CUG																						
1,1,1-Trichloroethane	5	1388	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,1,2,2-Tetrachloroethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,1,2-Trichloroethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	**58 J**	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,1-Dichloroethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,1-Dichloroethene	5	45	4.7 U	*350 U*	4.6 U	5.3 U	5.4 U	5.1 U	5 U	*240 U*	5.3 U	*320 U*	*380 U*	*260 U*	*310 U*	*260 U*	**63 J**	5.9 U	*250 U*	6.3 U	4.7 U	6.2 U	6 U	*300 U*
1,2,3-Trichlorobenzene	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,2,4-Trichlorobenzene	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	**74 JB**	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,2-Dibromo-3-chloropropane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,2-Dibromoethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,2-Dichlorobenzene	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,2-Dichloroethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,2-Dichloropropane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,3-Dichlorobenzene	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,4-Dichlorobenzene	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
1,4-Dioxane	100	-	94 U	6900 U	92 U	110 U	110 U	100 U	100 U	4800 U	110 U	6400 U	7500 U	5200 U	6200 U	5200 U	5700 U	120 U	5000 U	130 U	95 U	120 U	120 U	5900 U
2-Butanone	10	-	9.4 U	690 U	9.2 U	**46**	11 U	10 U	10 U	480 U	11 U	640 U	750 U	520 U	620 U	520 U	570 U	12 U	500 U	13 U	**44**	**8.5 J**	12 U	590 U
2-Hexanone	10	-	9.4 U	690 U	9.2 U	11 U	11 U	10 U	10 U	480 U	11 U	640 U	750 U	520 U	620 U	520 U	570 U	12 U	500 U	13 U	9.5 U	12 U	12 U	590 U
4-Methyl-2-pentanone	10	-	9.4 U	690 U	9.2 U	11 U	11 U	**6.6 J**	10 U	480 U	11 U	640 U	750 U	520 U	620 U	520 U	570 U	12 U	500 U	13 U	9.5 U	12 U	12 U	590 U
Acetone	10	-	9.4 U	690 U	**4.8 JB**	**21**	**11 J**	**7.6 J**	**39**	480 U	**6.1 J**	640 U	750 U	520 U	620 U	520 U	570 U	**13 B**	500 U	**34**	**64**	**55**	**12 J**	590 U
Benzene	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	**7.9 J**	6.2 U	6 U	300 U
Bromochloromethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Bromodichloromethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Bromoform	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Bromomethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Carbon disulfide	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	**80 JB**	5.9 U	250 U	6.3 U	**6.45 J**	6.2 U	6 U	300 U
Carbon tetrachloride	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Chlorobenzene	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Chloroethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Chloroform	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	**250 J**	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Chloromethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
cis-1,2-Dichloroethene	5	418	**93**	**230 J**	**5.6**	5.3 U	5.4 U	5.1 U	5 U	**940**	**8**	**480**	**400**	**690**	**81 J**	260 U	**150 J**	**30**	250 U	6.3 U	**4.4 J**	**14**	**32**	300 U
cis-1,3-Dichloropropene	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Cyclohexane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Dibromochloromethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Dichlorodifluoromethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Ethylbenzene	5	-	4.7 U	350 U	4.6 U	**3.8 J**	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	**7.7**	6.2 U	6 U	**71 J**
Isopropylbenzene	5	-	4.7 U	**68 J**	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
m,p-Xylene	5	-	4.7 U	350 U	4.6 U	**12**	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	**23.5**	6.2 U	6 U	**250 J**
Methyl acetate	5	-	4.7 U	**68 J**	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	**94 J**	**68.5 J**	310 U	260 U	**74 J**	5.9 U	**350**	6.3 U	4.7 U	**9.3**	6 U	300 U
Methyl tert-butyl ether	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Methylcyclohexane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Methylene chloride	5	22	4.7 U	*350 U*	4.6 U	5.3 U	5.4 U	5.1 U	5 U	*240 U*	5.3 U	*320 U*	*380 U*	*260 U*	*310 U*	*260 U*	*290 U*	5.9 U	*250 U*	6.3 U	4.7 U	6.2 U	6 U	*300 U*
o-Xylene	5	-	4.7 U	350 U	4.6 U	**2.5 J**	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	**5.2**	6.2 U	6 U	300 U
Styrene	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Tetrachloroethene	5	56	4.7 U	*350 U*	**1.7 J**	5.3 U	5.4 U	5.1 U	5 U	**110 J**	5.3 U	**410**	*380 U*	*260 U*	*310 U*	*260 U*	**300**	5.9 U	**80 J**	6.3 U	4.7 U	6.2 U	6 U	*300 U*
Toluene	5	22753	4.7 U	350 U	4.6 U	**10**	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	**0.17 JB**	**33**	6.2 U	6 U	**520**
trans-1,2-Dichloroethene	5	626	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
trans-1,3-Dichloropropene	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Trichloroethene	5	77	**38**	**1900**	**160**	5.3 U	5.4 U	5.1 U	**2.1 J**	**4600**	**11**	**20000 D**	**1700**	**3550**	**410**	**140 J**	**2800**	**9.8**	**360**	**47**	**11.9**	**160**	**62**	**540**
Trichlorofluoromethane	5	-	4.7 U	350 U	4.6 U	5.3 U	5.4 U	5.1 U	5 U	240 U	5.3 U	320 U	380 U	260 U	310 U	260 U	290 U	5.9 U	250 U	6.3 U	4.7 U	6.2 U	6 U	300 U
Vinyl chloride	5	11	4.7 U	*350 U*	4.6 U	*5.3 U*	*5.4 U*	*5.1 U*	5 U	*240 U*	*5.3 U*	*320 U*	*380 U*	*260 U*	*310 U*	*260 U*	*290 U*	**5.2 J**	*250 U*	*6.3 U*	4.7 U	*6.2 U*	**2.3 J**	*300 U*
Total Organic Carbon	100	-	NA	NA	NA	NA	NA	**250**	**1200**	NA	NA	NA	NA	NA	NA	NA	**4600**	NA	NA	NA	NA	NA	NA	NA

NOTES:
All values are in micrograms per kilograms (ug/kg), with the exception of Total Organic Carbon which is in milograms per kilograms (mg/kg). The data are unvalidated.
CUG - Cleanup Goals as defined in the Explanation of Significant Differences (2007)
CRQL - Contract Required Quantitation Limit
NA - Not Analyzed
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit Is Higher Than the CUG.

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
E - Quantitation is estimated as it exceeds the calibration range of the analysis.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 4
Soil Investigation - ISTT Subsurface Installation - March and April 2010
Volatile Organic and Total Organic Carbon Analyses
GROVELAND WELLS SUPERFUND SITE - SOURCE CONTROL REMEDIAL ACTION

Sample Name			A2Z92	A2Z70	A2Z71	A2Z80	A2Z78	A2Z81	A2Z82	A2Z83	A2Z41	A2Z42	A2Z44	A2Z25	A2Z26	A2Z55	A2Z56
Sample Location			E-53	E-54	E-54	E-56	E-57	E-60	E-61	E-61	E-62	E-62	E-63	E-65	E-65	T-16	T-16
Sample Depth (feet below ground surface)			12 to 13	1 to 2	9 to 10	5 to 6	11 to 12	1 to 2	5 to 6	10 to 11	5 to 6	8 to 9	3 to 4	5 to 7	9 to 10	8 to 9	10 to 11
Sample Date			4/7/2010	3/29/2010	3/29/2010	3/31/2010	3/30/2010	3/31/2010	3/31/2010	3/31/2010	3/16/2010	3/16/2010	3/16/2010	3/3/2010	3/3/2010	3/22/2010	3/22/2010
Chemical Name	CROL	CUG															
1,1,1-Trichloroethane	5	1388	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
1,1,2,2-Tetrachloroethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
1,1,2-Trichloroethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
1,1-Dichloroethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
1,1-Dichloroethene	5	45	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	*250 U*	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
1,2,3-Trichlorobenzene	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	**0.95 JB**	6.1 U	5.8 U	5.5 U	5.6 U
1,2,4-Trichlorobenzene	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	**0.48 JB**	6.1 U	5.8 U	5.5 U	5.6 U
1,2-Dibromo-3-chloropropane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
1,2-Dibromoethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
1,2-Dichlorobenzene	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
1,2-Dichloroethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
1,2-Dichloropropane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
1,3-Dichlorobenzene	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
1,4-Dichlorobenzene	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
1,4-Dioxane	100	-	100 U	150 U	110 U	120 U	110 U	120 U	5000 U	100 U	110 U	92 U	98 U	120 U	120 U	110 U	110 U
2-Butanone	10	-	**16**	**9.7 J**	11 U	12 U	11 U	12 U	500 U	10 U	11 U	9.2 U	9.8 U	**8.1 J**	**50**	11 U	11 U
2-Hexanone	10	-	10 U	15 U	11 U	12 U	11 U	12 U	500 U	10 U	11 U	9.2 U	9.8 U	12 U	12 U	11 U	11 U
4-Methyl-2-pentanone	10	-	10 U	15 U	11 U	12 U	11 U	12 U	500 U	10 U	11 U	9.2 U	9.8 U	12 U	12 U	11 U	11 U
Acetone	10	-	**150**	**75**	**20**	**23**	**5.6 J**	**39**	500 U	**9.6 J**	**34**	**18**	**32**	**8.6 J**	**20**	**22**	**13**
Benzene	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Bromochloromethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Bromodichloromethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Bromoform	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Bromomethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Carbon disulfide	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	**0.36 J**	**0.39 J**
Carbon tetrachloride	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Chlorobenzene	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Chloroethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Chloroform	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Chloromethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
cis-1,2-Dichloroethene	5	418	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	**0.34 J**	4.6 U	**0.19 J**	6.1 U	5.8 U	**1.5 J**	5.6 U
cis-1,3-Dichloropropene	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Cyclohexane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Dibromochloromethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Dichlorodifluoromethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Ethylbenzene	5	-	5.2 U	7.4 U	5.4 U	**2.5 J**	5.3 U	5.8 U	**100 J**	5.1 U	5.6 U	4.6 U	4.9 U	**0.8 J**	**6**	5.5 U	5.6 U
Isopropylbenzene	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
m,p-Xylene	5	-	5.2 U	7.4 U	5.4 U	**6.6**	5.3 U	5.8 U	**290**	5.1 U	5.6 U	4.6 U	4.9 U	**2.6 J**	**21**	5.5 U	5.6 U
Methyl acetate	5	-	**5.7**	7.4 U	5.4 U	6 U	5.3 U	**2.8 J**	**120 J**	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Methyl tert-butyl ether	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Methylcyclohexane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Methylene chloride	5	22	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	*250 U*	5.1 U	5.6 U	4.6 U	4.9 U	**0.39 J**	**0.37 J**	5.5 U	5.6 U
o-Xylene	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	**51 J**	5.1 U	5.6 U	4.6 U	4.9 U	**0.51 J**	**3.9 J**	5.5 U	5.6 U
Styrene	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Tetrachloroethene	5	56	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	*250 U*	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	**3.7 J**	**0.4 J**
Toluene	5	22753	5.2 U	**1.4 JB**	**0.27 JB**	**21**	5.3 U	5.8 U	**820**	5.1 U	**0.14 JB**	4.6 U	**0.17 JB**	**6.3**	**35**	**0.22 JB**	**0.19 JB**
trans-1,2-Dichloroethene	5	626	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
trans-1,3-Dichloropropene	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Trichloroethene	5	77	**5.7**	**26**	5.4 U	**5.1 J**	5.3 U	**6.4**	*250 U*	5.1 U	**18**	4.6 U	**4.3 J**	**0.27 J**	**0.26 J**	**150**	**14**
Trichlorofluoromethane	5	-	5.2 U	7.4 U	5.4 U	6 U	5.3 U	5.8 U	250 U	5.1 U	5.6 U	4.6 U	4.9 U	6.1 U	5.8 U	5.5 U	5.6 U
Vinyl chloride	5	11	5.2 U	*7.4 U*	*5.4 U*	*6 U*	*5.3 U*	5.8 U	*250 U*	5.1 U	*5.6 U*	4.6 U	4.9 U	*6.1 U*	*5.8 U*	*5.5 U*	*5.6 U*
Total Organic Carbon	100	-	NA	**13000 E**	NA	NA	**560**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:
All values are in micrograms per kilograms (ug/kg), with the exception of Total Organic Carbon which is in milograms per kilograms (mg/kg). The data are unvalidated.
CUG - Cleanup Goals as defined in the Explanation of Significant Differences (2007)
CRQL - Contract Required Quantitation Limit
NA - Not Analyzed
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit Is Higher Than the CUG.

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
E - Quantitation is estimated as it exceeds the calibration range of the analysis.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 5
Groundwater Investigation - Historical Monitoring Wells - June and July 2009
Volatile Organic Analysis
GROVELAND WELLS SUPERFUND SITE - SOURCE CONTROL REMEDIAL ACTION

Sample Name			A2YS4	A2YS1	A2YS2	A2YS3	A2YS6	A2YS5	A2YS7	A2YT2	A2YS8/A2YS9	A2YT3	A2YT4	A2YT7	A2YT5	A2YT6	A2YT8	A2YT0
Sample Location			TW-9	TW-11A	TW-15	TW-18	TW-19	TW-23	TW-26	TW-30	TW-31	TW-33	TW-40	TW-42	TW-43	TW-44D	TW-47	TW-48
Sample Date			30-Jun-09	30-Jun-09	29-Jun-09	30-Jun-09	30-Jun-09	30-Jun-09	30-Jun-09	1-Jul-09	30-Jun-09	1-Jul-09	1-Jul-09	1-Jul-09	1-Jul-09	1-Jul-09	1-Jul-09	29-Jun-09
CHEMICAL_NAME	CRQL	CUG																
1,1,1-Trichloroethane	0.5	200	**3.1** J	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	*1000* U	100 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
1,1,2-Trichloro-1,2,2-trifluoroethane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
1,1,2-Trichloroethane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
1,1-Dichloroethane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
1,1-Dichloroethene	0.5	7	*25* U	**0.81** JB	5 U	5 U	5 U	*25* U	5 U	5 U	5 U	5 U	5 U	*1000* U	*100* U	**0.88** J	5 U	**1** JB
1,2,3-Trichlorobenzene	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
1,2,4-Trichlorobenzene	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
1,2-Dibromo-3-chloropropane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
1,2-Dibromoethane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
1,2-Dichlorobenzene	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
1,2-Dichloroethane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
1,2-Dichloropropane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
1,3-Dichlorobenzene	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
1,4-Dichlorobenzene	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
1,4-Dioxane	20	-	500 U	100 U	100 U	100 U	100 U	500 U	100 U	100 U	100 U	100 U	100 U	20000 U	2000 U	100 U	100 U	100 U
2-Butanone	5	-	50 U	10 U	10 U	10 U	10 U	50 U	10 U	10 U	10 U	10 U	10 U	2000 U	200 U	10 U	10 U	10 U
2-Hexanone	5	-	50 U	10 U	10 U	10 U	10 U	50 U	10 U	10 U	10 U	10 U	10 U	2000 U	200 U	10 U	10 U	10 U
4-Methyl-2-pentanone	5	-	50 U	10 U	10 U	10 U	10 U	50 U	10 U	10 U	10 U	10 U	10 U	2000 U	200 U	10 U	10 U	10 U
Acetone	5	-	50 U	10 U	10 U	10 U	10 U	50 U	10 U	10 U	10 U	10 U	10 U	2000 U	200 U	10 U	10 U	10 U
Benzene	0.5	-	25 U	5 U	**0.55** J	5 U	5 U	25 U	**0.53** J	5 U	**0.51** J	5 U	5 U	**100** J	100 U	**0.53** J	5 U	5 U
Bromochloromethane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Bromodichloromethane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Bromoform	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Bromomethane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Carbon Disulfide	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Carbon tetrachloride	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Chlorobenzene	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Chloroethane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Chloroform	0.5	-	25 U	5 U	**0.56** JB	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	**110** J B	100 U	5 U	5 U	5 U
Chloromethane	0.5	-	25 U	5 U	**0.64** J	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	0.5	70	**340**	5 U	**17**	**1.6** J	**20**	**160**	**8.1**	5 U	5 U	5 U	5 U	*1000* U	**170**	**200** D	**1.3** J	**120**
cis-1,3-Dichloropropene	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Cyclohexane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Dibromochloromethane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Dichlorodifluoromethane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Ethylbenzene	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	**0.57** J	5 U	1000 U	100 U	5 U	5 U	5 U
Isopropylbenzene	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
m,p-Xylene	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	**0.56** J	5 U	1000 U	100 U	5 U	5 U	5 U
Methyl acetate	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Methyl tert-butyl ether	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Methylcyclohexane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Methylene chloride	0.5	5	*25* U	5 U	5 U	5 U	5 U	*25* U	5 U	5 U	5 U	5 U	5 U	*1000* U	*100* U	5 U	5 U	5 U
o-Xylene	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Styrene	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Tetrachloroethene	0.5	5	**4.8** J	5 U	**0.59** J	5 U	5 U	*25* U	5 U	5 U	5 U	5 U	5 U	*1000* U	*100* U	**2.3** J	5 U	5 U
Toluene	0.5	1000	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	**0.91** J	5 U	1000 U	100 U	5 U	**0.52** J	5 U
trans-1,2-Dichloroethene	0.5	100	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	*1000* U	100 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Trichloroethene	0.5	5	**380** B	**4.5** JB	**43** B	**9.6** B	**78** B	**300** B	**38** B	**1** JB	**8.7** B	**2** JB	5 U	**96000** DB	**18000** DB	**1200** DB	**8.3** B	**150** B
Trichlorofluoromethane	0.5	-	25 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	1000 U	100 U	5 U	5 U	5 U
Vinyl chloride	0.5	2	**12**	2 U	2 U	2 U	2 U	*10* U	2 U	2 U	2 U	2 U	2 U	*400* U	*40* U	2 U	2 U	**3.2**

NOTES:
All values are in micrograms per kilograms (ug/kg), with the exception of Total Organic Carbon which is in milograms per kilograms (mg/kg). The data are unvalidated.
CUG - Interim Cleanup Goals as defined in the Records of Decisions (1988 and 1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit Is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
E - Quantitation is estimated as it exceeds the calibration range of the analysis.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 6
Groundwater Investigation - Replacement Monitoring Wells - August 2009
Volatile Organic Analysis
GROVELAND WELLS SUPERFUND SITE - SOURCE CONTROL REMEDIAL ACTION

Sample Name			A2Z08	A2Z09	A2Z10	A2Z11	A2Z12/A2Z13	A2Z14	A2Z15	A2Z16	A2Z17	A2Z18	A2Z19	A2Z20
Sample Location			RW-01	RW-02	RW-03	RW-04	RW-05	RW-06	RW-07	RW-07B	RW-08	RW-09	RW-10	RW-10B
Sample Date			25-Aug-09	25-Aug-09	26-Aug-09	24-Aug-09	26-Aug-09	25-Aug-09	25-Aug-09	26-Aug-09	25-Aug-09	26-Aug-09	26-Aug-09	26-Aug-09
CHEMICAL_NAME	CRQL	CUG												
1,1,1-Trichloroethane	0.5	200	5 U	5 U	**4.9** J	5 U	**6.1**	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloro-1,2,2-trifluoroethane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	0.5	-	5 U	5 U	5 U	5 U	**2.5** J	5 U	5 U	5 U	5 U	5 U	**1.2** J	5 U
1,1-Dichloroethene	0.5	7	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,3-Trichlorobenzene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-Trichlorobenzene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dibromo-3-chloropropane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dibromoethane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichlorobenzene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-Dichlorobenzene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-Dioxane	20	-	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Butanone	5	-	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	5	-	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	5	-	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	5	-	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromochloromethane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	0.5	-	5 U	5 U	5 U	5 U	**1.8** J	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	0.5	70	5 U	**3.1** J	**260** DJ	**57**	**325** D J	5 U	**37**	**4.5** J	5 U	**2.8** J	**180** D	5 U
cis-1,3-Dichloropropene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cyclohexane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dichlorodifluoromethane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Isopropylbenzene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
m,p-Xylene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methyl acetate	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methyl tert-butyl ether	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylcyclohexane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylene chloride	0.5	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
o-Xylene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Styrene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	0.5	5	5 U	5 U	**3.2** J	**1.1** J	**4.5** J	5 U	5 U	5 U	5 U	5 U	**1.8** J	5 U
Toluene	0.5	1000	5 U	5 U	**5** U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	0.5	100	5 U	5 U	**2.6** J	5 U	**1.8** J	5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	0.5	5	5 U	**15**	**11000** D	**290** D	**11000** D	5 U	**83**	**52**	**4** J	**10**	**390** D	**1.4** J
Trichlorofluoromethane	0.5	-	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl chloride	0.5	2	2 U	2 U	**4.8**	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U

NOTES:
All values are in micrograms per kilograms (ug/kg), with the exception of Total Organic Carbon which is in milograms per kilograms (mg/kg). The data are unvalidated.
CUG - Interim Cleanup Goals as defined in the Records of Decisions (1988 and 1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit Is Higher Than the CUG

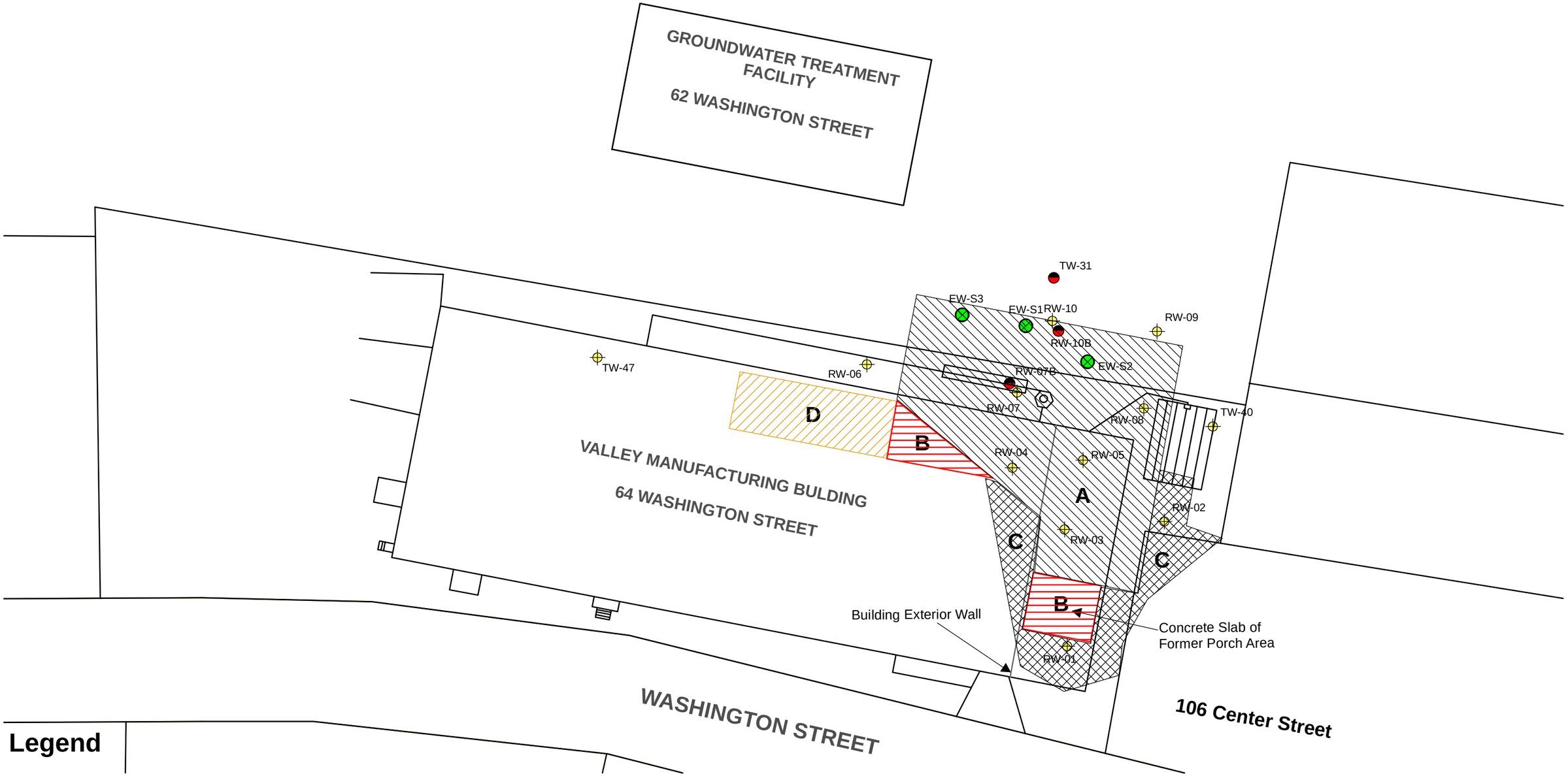
LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
E - Quantitation is estimated as it exceeds the calibration range of the analysis.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 7
Ambient Air Monitoring - Baseline Conditions - January 2010
Volatile Organic Analysis
GROVELAND WELLS SUPERFUND SITE - SOURCE CONTROL REMEDIAL ACTION

Sample Name			EP0017		EP0018	
Sample Location			USW		DNE	
Sample Description			Upgradient		Downgradient	
Sample Date			22-Jan-10		22-Jan-10	
Chemical Name	CRQL	CUG				
1,1,1-Trichloroethane	0.5	-	0.16	U	0.15	U
1,1,2,2-Tetrachloroethane	-	-	0.16	U	0.15	U
1,1,2-Trichloro-1,2,2-trifluoroethane	-	-	0.16	U	0.15	U
1,1,2-Trichloroethane	-	-	0.16	U	0.15	U
1,1-Dichloroethane	0.5	-	0.16	U	0.15	U
1,1-Dichloroethene	0.5	-	0.16	U	0.15	U
1,2,4-Trichlorobenzene	-	-	0.16	U	0.15	U
1,2,4-Trimethylbenzene	-	-	0.16	U	0.15	U
1,2-Dibromoethane	-	-	0.16	U	0.15	U
1,2-Dichlorobenzene	-	-	0.16	U	0.15	U
1,2-Dichloroethane	0.5	-	0.16	U	0.15	U
1,2-Dichloropropane	-	-	0.16	U	0.15	U
1,3,5-Trimethylbenzene	-	-	0.16	U	0.15	U
1,3-Butadiene	-	-	0.32	U	0.30	U
1,3-Dichlorobenzene	-	-	0.16	U	0.15	U
1,4-Dichlorobenzene	-	-	0.16	U	0.15	U
2-Butanone (Methyl ethyl ketone)	-	-	0.16	U	0.15	U
2-Hexanone	-	-	0.16	U	0.15	U
4-Ethyltoluene	-		0.16	U	0.15	U
4-Methyl-2-pentanone (Methyl iso ketone)	-	-	0.16	U	0.15	U
Acetone	2.0	-	0.16	U	0.15	U
Acrylonitrile	-	-	0.16	U	0.15	U
Allyl Chloride	-	-	0.16	U	0.15	U
Benzene	0.5	-	**0.42**		**0.47**	
Benzylchloride	-		0.16	U	0.15	U
Bromodichloromethane	-	-	0.16	U	0.15	U
Bromoform	-	-	0.16	U	0.15	U
Bromomethane (Methylbromide)	-	-	0.16	U	0.15	U
Carbon tetrachloride	-	-	0.16	U	0.15	U
Chlorobenzene	0.5	-	0.16	U	0.15	U
Chloroethane	0.5	-	0.16	U	0.15	U
Chloroform	-	-	0.16	U	0.15	U
Chloromethane (Methylchloride)	-	-	**0.48**		**0.52**	
cis-1,2-Dichloroethene	0.5	-	0.16	U	0.15	U
cis-1,3-Dichloropropene	-	-	0.16	U	0.15	U
Cyclohexane	-	-	0.16	U	0.15	U
Dibromochloromethane	-	-	0.16	U	0.15	U
Dichlorodifluoromethane	-	-	**0.47**		**0.49**	
Dichlorotetrafluoroethane	-	-	0.16	U	0.15	U
Ethanol	2.0	-	0.16	U	0.15	U
Ethylbenzene	-	-	0.16	U	0.15	U
Heptane	-	-	0.16	U	0.15	U
Hexachloro-1,3-butadiene	-	-	0.16	U	0.15	U
Hexane	-	-	**0.32**		**0.32**	
m,p-Xylene	-	-	0.32	U	**0.36**	
Methyl tert-butyl ether	-	-	0.16	U	0.15	U
Methylene chloride	1.0	-	**0.17**		0.15	U
o-Xylene	-	-	0.16	U	0.15	U
Styrene	-	-	0.16	U	0.15	U
Tetrachloroethene	0.5	-	0.16	U	0.15	U
Tetrahydrofuran	-	-	0.16	U	0.15	U
Toluene	0.5	-	**0.80**		**0.91**	
trans-1,2-Dichloroethene	2.0	-	0.16	U	0.15	U
trans-1,3-Dichloropropene	-	-	0.16	U	0.15	U
Trichloroethene	0.5	-	0.16	U	0.15	U
Trichlorofluoromethane	-	-	**0.25**		**0.25**	
Trichlorotrifluoroethane	-	-	0.16	U	0.15	U
Vinyl bromide	-	-	0.16	U	0.15	U
Vinyl chloride	0.5	-	0.16	U	0.15	U

NOTES:
All values are in parts per billion per volume (ppbv). The data are unvalidated.
CRQL - Contract Required Quantitation Limit
NA - Not Analyzed
Bold - Detected Concentration
U - Not Detected Above the Sample-Specific Detection Limit

FIGURES



Legend

- A — 0-45' BGS - Vadose and Saturated Treatment Zone
- B — 0-25' BGS - Shallow and Deep Vadose Treatment Zone
- C — 0-10' BGS - Shallow Vadose Treatment Zone
- D — Potential Shallow Treatment Zone
- Existing Extraction Well

NOTES:
1. Treatment zone areas are based on figures prepared by the US Army Corps of Engineers (USACE, 2008).

2. The limits of the treatment areas should be considered approximate, and are given for illustrative purposes only.

APPROXIMATE SCALE

0 25 50 100 Feet

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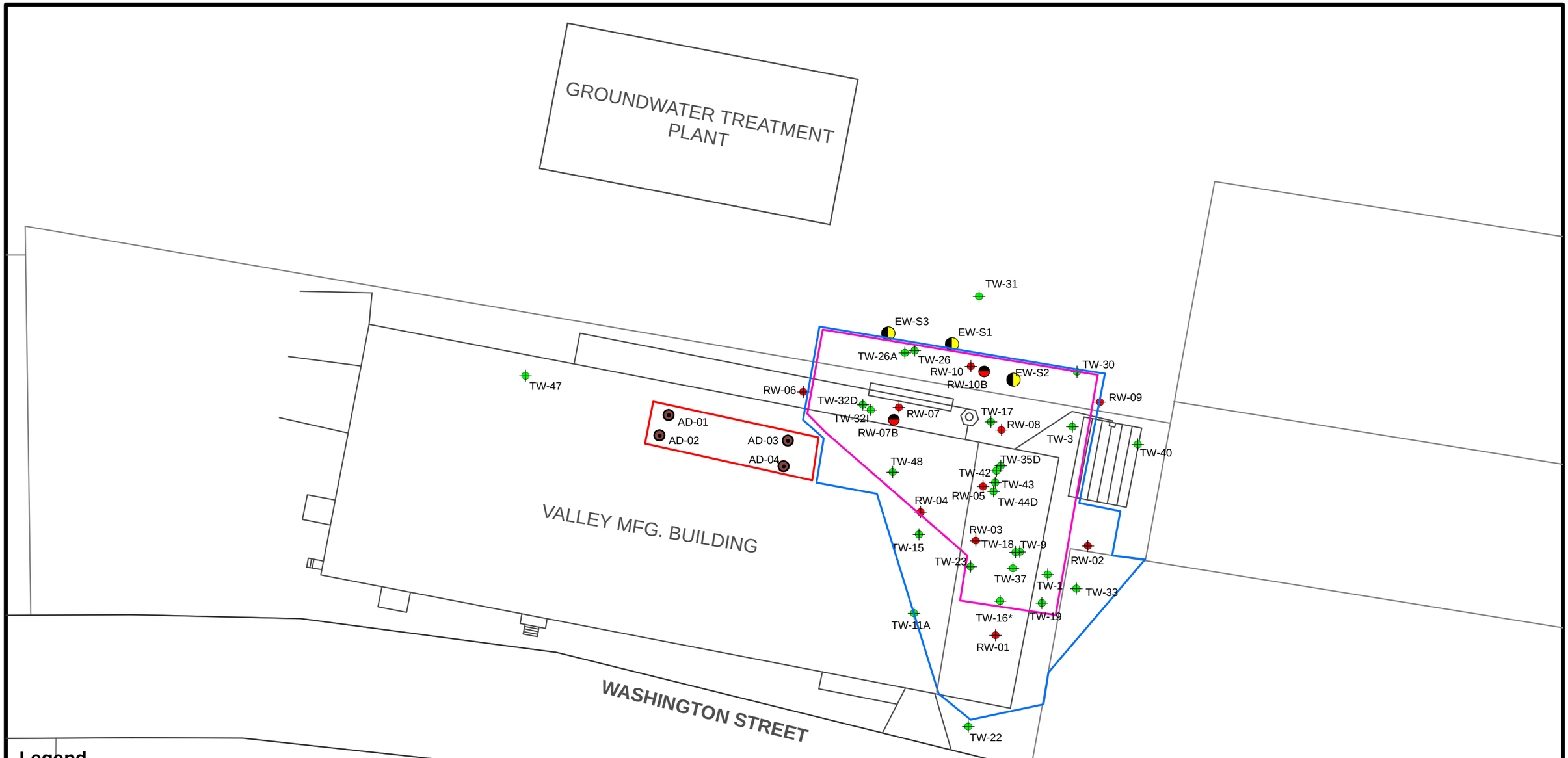
FIGURE 1

THERMAL TREATMENT AREA
GROVELAND WELLS Nos. 1&2
SUPERFUND SITE
GROVELAND, MASSACHUSETTS

PREPARED BY: ANR	CHECKED BY: DB
PROJECT NO. 80037	DATE: 09/14/09 Rev 00

J:\80000 EPA RAC2 Region 1\80000 Task Orders\80037 Groveland Wells RA\Technical Data\GIS\Nobis Maps\QAPP Maps\Figure 6-1 ERH Treatment Area.mxd



Legend

- Existing Monitoring Well (all monitoring wells within treatment area to be abandoned piror to treatment)
- Proposed Overburden Monitoring Well
- Proposed Bedrock Monitoring Well
- Existing Extraction Well
- Proposed Area D Soil Boring

TW-16* Well Damaged/Not Available for Sampling

- Approximate Limit of Soil and Groundwater Thermal Treatment
- Approximate Limit of Entire Thermal Treatment Area
- Estimated Limits of Area D

0 25 50 100 Feet

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Lowell, MA 01851
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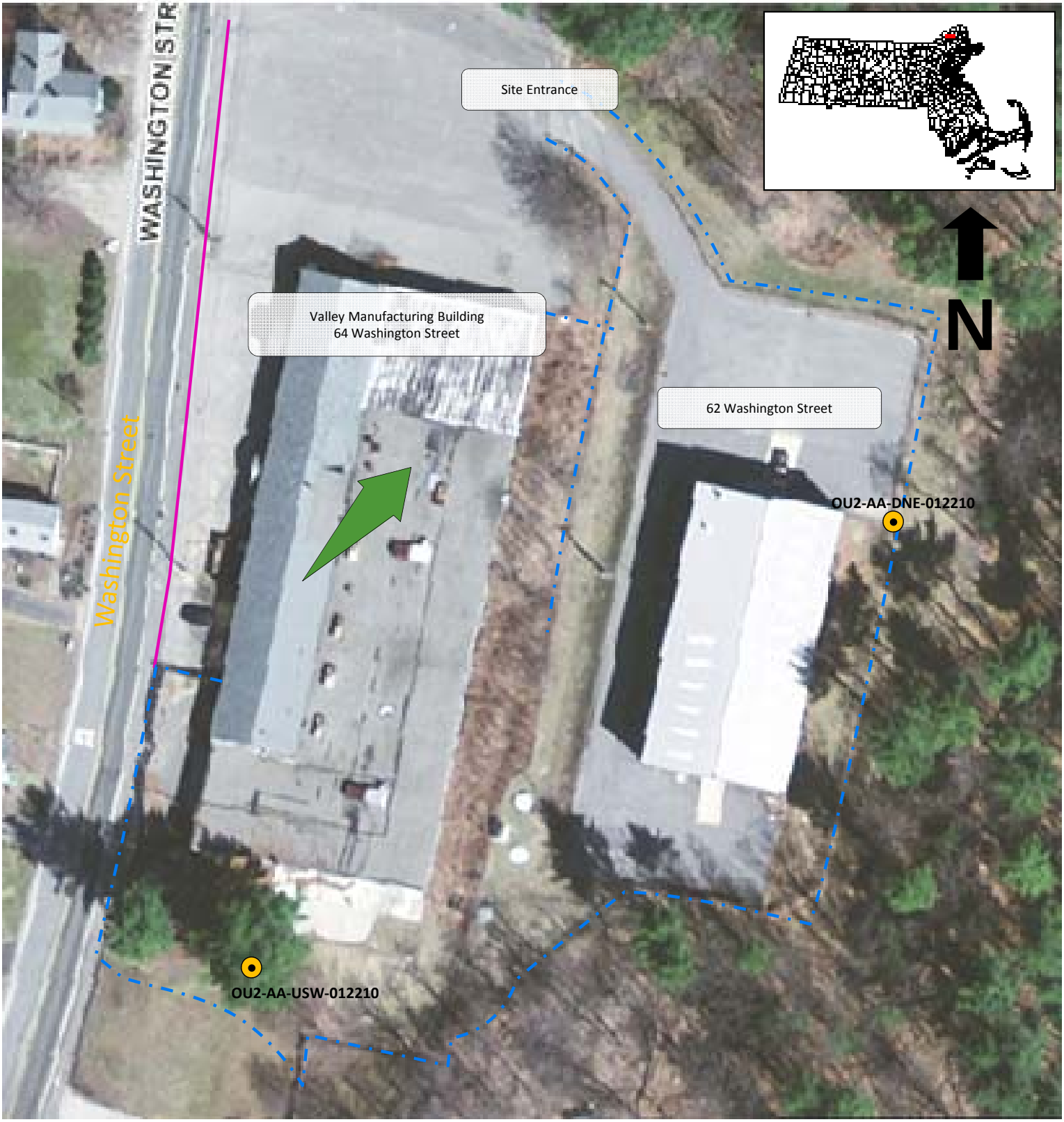
FIGURE 2

PROPOSED REMEDIAL ACTION
MONITORING WELL LOCATIONS
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

PREPARED BY: ANR	CHECKED BY: DB
PROJECT NO. 80037	DATE: 04/27/09 Rev 00

J:\80000 EPA RAC2 Region 1\80000 Task Orders\80037 Groveland Wells RA\Technical Data\GIS\Nobis Maps\QAPP Maps\Figure 6-2 Proposed MW Locations.mxd



Property Limit

Chain Link Fencing

Ambient Air Sample Location

General Wind Direction, based on data collected from the Bradford College Weather Station.

Notes:

All locations are approximate.

Aerial photograph used with permission from MASS GIS – USGS 2008 30 cm Color Ortho.

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PROJECT:

Groveland Wells Superfund Site

TITLE:

Ambient Air Monitoring Locations

DATE: 22 January 2010	CHECKED BY: LDS	SCALE: AS SHOWN	FIGURE NO.: 3
DESIGN BY: LDS	REVIEWED BY: DB	JOB NO.: 80037.03	
DRAWN BY: LDS	DOCUMENT NO:	FILE NO.:	

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1
7
S

PROPOSED CHAINLINK FENCE W/ WOOD POSTS

TT VAPOR COVER W/ BERM

THERMAL TREATMENT AREA

TT VAPOR COVER W/ BERM

NO DRILL ZONE

GATE

OIL WATER/ SEPARATOR

2' NO DRILL ZONE AROUND COLUMNS

2' NO DRILL ZONE AROUND COLUMNS

NO DRILL ZONE

5' STOCKADE FENCE

STATE PLANE NAD 27

EXISTING STOCKADE FENCE

GATE

PROPOSED CHAINLINK FENCE W/ WOOD POSTS

64 WASHINGTON STREET
(VALLEY MANUFACTURED PRODUCTS/
GROVELAND RESOURCES CORPORATION)

THERMAL TREATMENT AREA

NO DRILL ZONE

TRUCK WELL

6' CHAINLINK FENCE

6' STOCKADE FENCE

NO DRILL ZONE

EXISTING 7' C.L.F. W/ BARBED WIRE

GATE

GATE

GATE

TT VAPOR COVER W/ BERM

APPROX. SCALE
0 10 20 30 FEET

—D— EXISTING DRAINAGE
—OHS— EXISTING OVER HEAD SERVICE
—GAS— EXISTING GAS
—E— EXISTING ELECTRIC
—x— PROPOSED FENCE
NO DRILL ZONE
THERMAL INFLUENCE AREA
THERMAL TREATMENT AREA
VAPOR COVER
—74— PROPOSED CONTOUR
E-XX ET-DSP ELECTRODE W/ONE 8" DIA ELECTRODE (9)
E-XX ET-DSP ELECTRODE W/TWO 8" DIA ELECTRODE (3)
E-XX ET-DSP ELECTRODE W/THREE 8" DIA ELECTRODE (28)
E-XX ET-DSP ELECTRODE W/ ONE 6" DIA ELECTRODE (13)
E-XX ET-DSP ELECTRODE W/ TWO 6" DIA ELECTRODE (2)
E-XX ET-DSP ELECTRODE W/ THREE 6" DIA ELECTRODE (9)
X-XX CO-LOCATED MPE & VEW WELLS – 4" DIA & 2" DIA ZONE A (15)
X-XX VEW WELLS ONLY – 2" DIA ZONES B, C & D (14)
T-XX TEMPERATURE SENSOR WELL (16)
TPV-XX TEMPERATURE, PRESSURE AND VACUUM SENSOR WELL (12)
A THERMAL TREATMENT AREA

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REVISIONS

REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
2	3/25/10	PT	RS	JG	REVISED ELECTRODE E-45	
1	2/22/10	PT	RS	JG	ADDED ELECTRODES PER CLIENT REQUEST	
0	2/15/10	SF	RS	JG	RELEASED FOR CONSTRUCTION	

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE
WELLFIELD LAYOUT

SIZE	FILE NO.	DWG NO.	REV
D	C103	C103	2
SCALE	DNS	SHEET 1 OF 1	

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Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **AD-01**
Boring Location: N: 635774 E: 722927

Checked by: Adam Roy
Date Start: July 29, 2009
Date Finish: July 29, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	76.78 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Remarks
	S-1	18	0-2		0.6		76.38	4 inches of concrete slab.	
1								Poorly graded sand (SP), moist, 60% fine sand, 5% silt, 35% medium sand, brown. (FILL)	
					1.8				
2							74.78		
	S-2	24	2-4		1.5			Poorly graded sand (SP), moist, 30% fine sand, 40% medium sand, 15% coarse sand, 5% silt, 10% fine gravel, brown/dark brown. (FILL)	
3									
					1.6				
4							72.78		
	S-3	12	4-6		0.1			Similar to S-2. (FILL)	
5									
					0.1				
6							70.78		
	S-4	24	6-8		1.3			Poorly graded sand (SP), moist, 20% fine sand, 40% medium sand, 20% coarse sand, 15% gravel, 5% silt, brown. (FILL)	
7									
					5				
8							68.78		
	S-5	24	8-10		3.6			Poorly graded sand (SP), moist, 30% fine sand, 40% medium sand, 10% silt, 10% coarse, 10% gravel, trace brick and organics observed, brown/yellow. (FILL)	
9									
					5.2				
10							66.78		
	S-6	24	10-12		5.1			Poorly graded sand (SP), moist, 40% fine sand , 30% medium sand, 15% coarse sand, 5% silt, 10% gravel, brown/yellow to brown. (OUTWASH SANDS)	
11									
					9.2				
12							64.78		
	S-7	24	12-14		3.6			Poorly graded sand (SP), moist to wet, 20% fine sand, 60% medium sand, 10% gravel, 10% coarse sand. (OUTWASH SAND)	
13									
					3.2				
14							62.78		
	S-8	24	14-16		1.6			S-8A: 13 inches of Poorly graded sand (SP), wet, 10% fine sand, 50% medium sand, 20% coarse sand, 15% gravel, 5% silt, brown. (OUTWASH SAND)	
15							61.78		
					1.9			S-8B:11 inches of Poorly graded sand with clay/silt layer, 50% fine sand, and 50% fines. Olive brown.	
16							60.78		
	S-9	22	16-18		1.6			Clay (CH), with fine sand, wet, 10% fine sand, 90% fines, olive brown.	
17									
					3				
18							58.78		
	S-10	24	18-20		3.4			Similar to S-9.	
19									
					2.1				
20							56.78		
	S-11	24	20-22		2.9			Similar to S-9.	
21								Boring terminated at 22 feet. Reached target depth.	
					0.7				
22							54.78		

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **AD-02**
Boring Location: N: 635781 E: 722912

Checked by: Adam Roy
Date Start: July 29, 2009
Date Finish: July 29, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	77 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Remarks
	S-1	24	0-2		1.4		76.5	6 inches of concrete slab followed by Poorly graded sand (SP), brown, moist, 40% medium sand, 50% fine sand, 5% coarse sand, 5% silt, brown/yellow. (FILL)	
1									
					1.4				
2							75.0		
	S-2	24	2-4		6.1			Poorly graded sand (SP), 40% fine sand, 40% medium sand, 10% coarse sand, 10% coarse to fine gravel, yellowish brown. (FILL)	
3									
					4				
4							73.0		
	S-3	20	4-6		3.7			Poorly graded sand (SP), moist, 40% fine sand, 40% medium sand, 5% coarse sand, 5% silt, 10% fine gravel, brown. (FILL)	
5									
					1.7				
6							71.0		
	S-4	20	6-8		16.2			Poorly graded sand (SP), moist, 30% fine sand, 50% medium sand, 5% coarse sand, 8% silt, 7% gravel, coarse to fine , brown to dark brown. (FILL)	
7									
					3.1				
8							69.0		
	S-5	20	8-10		5.7			Poorly graded sand (SP), moist, 45% fine sand, 40% medium sand, 10% coarse sand, 5% silt, brown to light brown. (FILL)	
9									
					2.4				
10							67.0		
	S-6	20	10-12		2.3			Poorly graded sand (SP), moist, 30% fine sand, 40% medium sand, 20% gravel, 5% silt, 5% coarse sand, brown/slightly oxidized. (OUTWASH SANDS)	
11									
					2				
12							65.0		
	S-7	20	12-14		29.4			Poorly graded sand (SP) with gravel, 20% fine sand, 40% medium sand, 20% coarse sand, 20% gravel, moist, brown.(OUTWASH SANDS)	
13									
					14.2				
14							63.0		
	S-8	24	14-16		2.1			S-8A: 12 inches similar to S-7.	
15							62.0		
					1.6			S-8 B:Clayey silt (CL-ML)with fine sand, 70% fines, 30% fine sand.	
16							61.0		
	S-9	24	16-18		0.8			S-9: Similar to S-8B, Clay (CL) with silt and fine sand, wet, olive brown.	
17									
					1				
18							59.0		
	S-10	24	18-20		1.1			Similar to S-9. S-11A: Similar to S-9.	
19									
					0.7				
20									
	S-11	24	20-22		0.8				
21							56.0		
					1			S-11B: Poorly graded sand with silt (SP-SM), moist to wet, 10% fine sand, 40% medium sand, 20% coarse sand, 20% gravel, 10% silt.	
22							55.0		

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **AD-02**
Boring Location: N: 635781 E: 722912

Checked by: Adam Roy
Date Start: July 29, 2009
Date Finish: July 29, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	77 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
▽					

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	STRATUM Log	Elev./ Desc.	SAMPLE DESCRIPTION (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	REMARKS
									Boring terminated at 22 feet. Reached target depth.	
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **AD-03**
Boring Location: N: 635712 E: 722911

Checked by: Adam Roy
Date Start: July 29, 2009
Date Finish: July 29, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	77 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Remarks
1	S-1	13	0-2		2.3			Poorly graded sand (SP), moist, 70% fine sand, 20% medium sand, 10% silt, brown/yellow. (FILL)	
2					3.3		75.0		
3	S-2	23	2-4		1.3			Poorly graded sand (SP), moist, 80% fine sand, 5% silt, 10% medium sand, 5% coarse gravel, brown. (FILL)	
4					1		73.0		
5	S-3	24	4-6		1.2			Similar to S-2. 70% fine sand, 20% medium sand, 5% silt, 5% gravel. (FILL)	
6					2.2		71.0		
7	S-4	22	6-8		1.3			Similar to S-3. (FILL)	
8					1		69.0		
9	S-5	24	8-10		2			Similar to S-3, moist, yellowish brown. (FILL)	
10					1.4		67.0		
11	S-6	24	10-12		1.7			Similar to S-3, moist to wet, 50% fine sand, 40% medium sand, 5% silt, 5% coarse sand and gravel, yellowish brown to light reddish brown. (OUTWASH SANDS)	
12					2.5		65.0		
13	S-7	24	12-14		3.9			Poorly graded sand (SP), wet, 30% fine sand, 40% medium sand, 20% coarse sand, 10% gravel, brown. (OUTWASH SANDS)	
14					4.1		63.0		
15	S-8	24	14-16		4.4			Poorly graded sand with silt to Silty sand (SP-SM), wet, 60% fine sand, 20% medium sand, 20% fines, varved silt layers at the bottom.	
16					3.9		61.0		
17	S-9	24	16-18		1.5			Silty sand (SM) to clay at the bottom, wet.	
18					1.9		59.0		
19	S-10	20	18-20		2.4		58.0	12 inches of clay	
20					6.1		57.0	Poorly graded sand	
21	S-11	20	20-22		4.5			Sand and clay. Boring terminated at 22 feet. Reached target depth.	
22					3.1		55.0		

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **AD-04**
Boring Location: N: 635718 E: 722899

Checked by: Adam Roy
Date Start: July 30, 2009
Date Finish: July 30, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	76.94 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Remarks
	S-1	10	0-2		2.5		76.54	4 inches of concrete slab.	
1								poorly graded sand (SP), moist, 70% fine sand, 20% medium sand, 5% silt, 5% gravel, tan/yellowish brown. (FILL)	
					2.7				
2							74.94		
	S-2	24	2-4		2.8			Poorly graded sand (SP), moist, 70% fine sand, 20% medium sand, 5% silt, 5% gravel tan/yellowish brown. (FILL)	
3									
					2.4				
4							72.94		
	S-3	17	4-6		2.8			Similar to S-2. (FILL)	
5									
					3.9				
6							70.94		
	S-4	24	6-8		3.4			Similar to S-2, wood observed in the sample. (FILL)	
7									
					6.1				
8							68.94		
	S-5	22	8-10		3.9			Poorly graded sand (SP), moist, 60% fine sand, 30% medium sand, 5% coarse sand, 5% silt, reddish brown/yellow. (FILL)	
9									
					3.2				
10							66.94		
	S-6	23	10-12		2.4			Poorly graded sand (SP), moist with gravel,30% fines and 40% medium sand, 5% silt, 25% coarse gravel. (OUTWASH SANDS)	
11									
					2.5				
12							64.94		
	S-7	20	12-14		1.9			S-7A: Similar to S-6.	
13									
					2.5			S-7B: Poorly graded sand (SP), wet, 25% fines and 60% coarse to medium sand, 10% gravel. (OUTWASH SANDS)	
14							62.94		
	S-8	21	14-16		2.8			S-8: Poorly graded sand with Silt (SP-SM), wet, 25% silt and clay, 50% fine sand, 25% medium sand, stratified layers observed. (OUTWASH SANDS)	
15									
					2.1				
16							60.94		
	S-9	20	16-18		2.6			Poorly graded sand (SP), wet, 20% fine sand, 60% medium sand, 10% gravel, 10%coarse sand. (OUTWASH SAND)	
17									
					1.5				
18							58.94		
	S-10	20	18-20		1.7			Sandy silt with clay (SM-ML), 70% fines, 20% fine sand, 10% silt, olive /reddish brown/gray. (OUTWASH SAND)	
19									
					1.9				
20							56.94		
	S-11	24	20-22		1.5			Poorly graded sand with silt and trace clay (SP-SM), 60% fines sand, 10% silt and clay, 30% medium sand, varved silt/clay layers observed. (OUTWASH SAND)	
21								Boring terminated at 22 feet. Reached	
					1.7				
22							54.94		

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-1**
Boring Location: N: 635648 E: 722820

Checked by: Adam Roy
Date Start: August 4, 2009
Date Finish: August 4, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	76.77 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

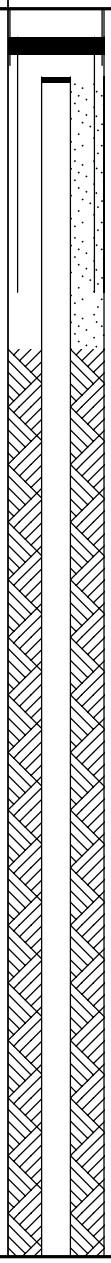
	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)
-3								
-2								
-1								
0								
1	S-1	44	0-5		0.4			Poorly graded sand (SP), loose, dry, 10% coarse sand, 30% medium sand, 50% fine sand, 10% gravel, medium brown. (FILL)
2					0.3			
3					0.8			
4					0.4			
5					1.4		71.77	
6	S-2	36	5-10		0.3			Silty sand (SM), moist, slightly cohesive, 20% medium sand, 50% fine sand, 30% silt, dark to medium brown. (OUTWASH SAND)
7					0.7			
8					1.4			
9					5.1			
10					0.8		66.77	
11	S-3	55	10-15					12 inches of clay with sand (CL), very cohesive, Very hard, moist, 80% clay with silt, 20% fine sand, olive brown.
12					1.7			33 inches of Clay (CL), very cohesive, hard, moist, 95% clay/silt, 5% fine sand, olive gray/brown.
13					0.9			
14					0.1			
15					0.5		61.77	
16	S-4	40	15-20		2.7			8 inches of Silty sand (SM), slightly cohesive, moist, 10% coarse sand, 30% medium sand, 40% fine sand, 20% silt, orange brown.
17					1.2			
18					2.4			32 inches of Poorly graded sand with gravel (SP), 10% coarse sand, 20% medium sand, 40% fine sand, 30% gravel, orange brown.

WELL DETAIL



Protective Casing

filter sand

Cement Grout in Stainless steel riser.

REMARKS

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-1**
Boring Location: N: 635648 E: 722820

Checked by: Adam Roy
Date Start: August 4, 2009
Date Finish: August 4, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	76.77 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
					2.6					
19										
					3.1					
20							56.77			
	S-5	38	20-25					28 inches of Poorly graded sand (SP), moist, 20% coarse sand, 30% medium sand, 50% fine sand, orange brown.		
21										
					1.1			10 inches of Silty sand with gravel (SM), moist to wet, very dense, 10% coarse sand, 15% medium sand, 30% fine sand, 40% silt, 5% gravel, olive brown. (TILL)		
22										
					3					
23										
					1.5					
24							52.77			
					0.7					
25							51.77			
	S-6	59	25-30					Similar to S-5B		
26										
					4.4					
27										
					6.6					
28										
					1.8					
29										
					2					
30							46.77			
	S-7	60	30-35		2.2			Similar to S-5B		
31									filter sand	
					1.4					
32										
					4.1					
33										
					3.4					
34										
					5.2					
35							41.77			
	S-8	60	35-40		2.9			Silty sand with gravel (SM), wet, very dense, 10% coarse sand, 15% medium sand, 25% fine sand, 30% silt, 20% gravel, olive brown.		
36										
					2.6					
37										
					6.2				Filter sand in 2inch Stainless steel slotted pipe	
38										
					5					
39										
					9.8					
40							36.77			

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-1**
Boring Location: N: 635648 E: 722820

Checked by: Adam Roy
Date Start: August 4, 2009
Date Finish: August 4, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	76.77 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	STRATUM Log	Elev./ Desc.	SAMPLE DESCRIPTION (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	WELL DETAIL	REMARKS
	S-9	12	40-41								
41								35.77			
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-10**
Boring Location: N: 635654 E: 722951

Checked by: Adam Roy
Date Start: August 6, 2009
Date Finish: August 7, 2009

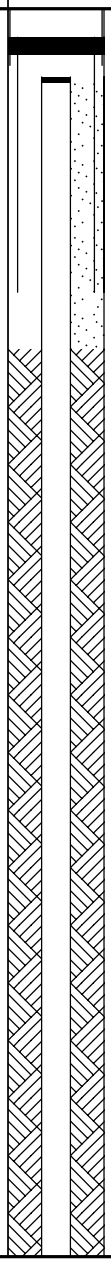
Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	72.25 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	10:30	39.54		41.23	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)
-3								
-2								
-1								
0								
1	S-1	26	0-5					Excavted 2 feet down for utility clearance. - Silty sand (SM), loose, moist, 15% coarse sand, 20% - medium sand, 40% fine sand, 15% silt, 10% gravel, - medium brown. -
2								
3					3.9			
4					7.9			
5					12.2		67.25	
6	S-2	51	5-10		4.8			25 inches similar to S-1. -
7					4.1			25 inches of Silt (ML), moist, very cohesive, dense, 90% - fines (silt/clay), 10% fine sand, olive brown. -
8					11.3			
9					27.6			
10					8.7		62.25	
11	S-3	45	10-15		1.8			Poorly graded sand with gravel (SP), loose, moist, 40% - coarse sand, 20% medium, 10% fine sand, 25% gravel, - 5% silt, brown. -
12					6.7			
13					9.2			
14					7.7			
15					12.2		57.25	
16	S-4	40	15-20		4			4 inches sandy silt, moist, cohesive, 60% silt,35% fine sand, 5% gravel, light brown.
17					0.9			36 inches of poorly graded sand with gravel (SP), loose, moist, 20% coarse sand, 30% medium sand, 40% fine sand, 5% silt, 5% gravel, light brown.
18					8.8			



WELL DETAIL

REMARKS

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-10**
Boring Location: N: 635654 E: 722951

Checked by: Adam Roy
Date Start: August 6, 2009
Date Finish: August 7, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	72.25 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	10:30	39.54		41.23	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
					4.3					
19										
					15.8					
20							52.25			
	S-5	45	20-25		6.6			35 inches similar to S-4.		
21								35 -45 inches of uniform sand (SP), moderately cohesive, moist, fine sand, light brown.		
					14.4					
22										
					7.7					
23										
					6.3					
24										
					13.2					
25							47.25			
	S-6	57	25-30		0.5			Silty sand (SM), moist, moderately cohesive, stratified layers of fine sand and silt, medium brown.		
26										
					0.6					
27										
					5.9					
28										
					6.7				filter sand	
29										
					3.2					
30							42.25			
	S-7	47	30-35		3.9			Silty sand (SM), saturated, moderately cohesive, 20% medium sand, 50% fine sand, 30% silt, medium brown.		
31										
					10.1					
32										
					6.9					
33										
					7.1					
34										
					6.1				Filter sand in 2 inch stainless steel slotted pipe	
35							37.25			
	S-8	36	35-39		16.1			32 inches of silty sand (SM), moist to wet, dense, very cohesive, 10% coarse sand, 20% medium sand, 30% fine sand, 25% silt, 1% gravel, medium brown to olive brown (TILL)		
36										
					0.8					
37										
					19.4			32-47 - weathered bedrock at 39 feet.		
38							34.25			
					8.2					
39										
					23.8					
40							32.25			

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-10B**
Boring Location:

Checked by: Adam Roy
Date Start: August 5, 2009
Date Finish: August 14, 2009

Contractor: Boart Longyear
Driller: John
Nobis Rep.: AR

Rig Type / Model: Mini Sonic 1414
Hammer Type: XX
Hammer Hoist: None

Ground Surface Elev.: 72.6 ft.
Top-of-Riser Elev.:
Datum: NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	Ground Water	STRATUM Log	Elev./ Desc.	SAMPLE DESCRIPTION (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	WELL DETAIL	REMARKS
-3								Refer to RW-10 for soil description.	Protective Casing	
-2										
-1										
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-10B**
Boring Location:

Checked by: Adam Roy
Date Start: August 5, 2009
Date Finish: August 14, 2009

Contractor: Boart Longyear
Driller: John
Nobis Rep.: AR

Rig Type / Model: Mini Sonic 1414
Hammer Type: XX
Hammer Hoist: None

Ground Surface Elev.: 72.6 ft.
Top-of-Riser Elev.:
Datum: NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	Ground Water	STRATUM Log	Elev./ Desc.	SAMPLE DESCRIPTION (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	WELL DETAIL	REMARKS
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40							32.6		7 inch casing to 55 feet.	

SAMPLE IDENTIFICATION

G - Geoprobe
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U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-10B**
Boring Location:
Checked by: Adam Roy
Date Start: August 5, 2009
Date Finish: August 14, 2009

Contractor: Boart Longyear
Driller: John
Nobis Rep.: AR

Rig Type / Model: Mini Sonic 1414
Hammer Type: XX
Hammer Hoist: None

Ground Surface Elev.: 72.6 ft.
Top-of-Riser Elev.:
Datum: NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	Ground Water	STRATUM Log	Elev./ Desc.	SAMPLE DESCRIPTION (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	WELL DETAIL	REMARKS
41								Weathered bedrock.		
42										
43										
44										
45										
46										
47										
48										
49										
50										
51										
52							20.6			
53										
54									4 inch riser with filter sand	
55							17.6	Difficulty extracting sample for R-1. Sample was completely crushed bedrock.		
56										
57										
58										
59										
60										
61										
62										

SAMPLE IDENTIFICATION

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REMARKS:

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Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-10B**
Boring Location:
Checked by: Adam Roy
Date Start: August 5, 2009
Date Finish: August 14, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	72.6 ft.
Driller:	John	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	AR	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	Ground Water	Stratum Log	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
63										
64										
65							7.6	Fresh, hard, dark gray, Schist. Discontinuties are difficult to note due to drilling method. Iron staining noted.	4 inch screen with filter sand	
66										
67										
68										
69										
70										
71										
72										
73										
74										
75							-2.4	Drilling is hard at 80 feet. Similar to previous interval. No iron staining noted.		
76										
77										
78										
79										
80										
81										
82										
83										
84										

SAMPLE IDENTIFICATION

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REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-10B**
Boring Location:
Checked by: Adam Roy
Date Start: August 5, 2009
Date Finish: August 14, 2009

Contractor: Boart Longyear
Driller: John
Nobis Rep.: AR

Rig Type / Model: Mini Sonic 1414
Hammer Type: XX
Hammer Hoist: None

Ground Surface Elev.: 72.6 ft.
Top-of-Riser Elev.:
Datum: NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	Ground Water	STRATUM Log	Elev./ Desc.	SAMPLE DESCRIPTION (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	WELL DETAIL	REMARKS
85							-12.4	Similar to previous description	Cement grout to 105 feet.	
86										
87										
88										
89										
90										
91										
92										
93										
94										
95							-22.4	Similar to previous description. Bottom of exploration at 105 feet.		
96										
97										
98										
99										
100										
101										
102										
103										
104										
105							-32.4			
106										

SAMPLE IDENTIFICATION
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REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-2**
Boring Location: N: 635609 E: 722870

Checked by: Adam Roy
Date Start: August 5, 2009
Date Finish: August 6, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	75.54 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

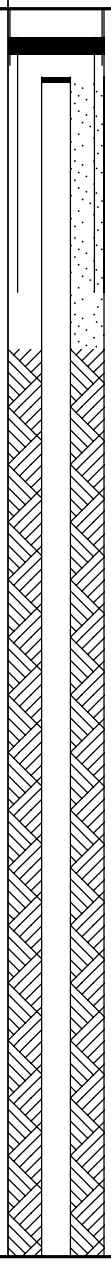
	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	09:30	34.81		53.5	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)
-3								
-2								
-1								
0								
1	S-1	45	0-5		4.4			Silty sand (SM), moist, slightly cohesive, 10% coarse sand, 25% medium sand, 40% fine sand, 15% silt, 10% gravel, dark brown. (FILL)
2					4.2			
3					7.4			
4					9.1			
5					13.3		70.54	
6	S-2	41	5-10		5			15 inches similar to S-1.
7					5.3			26 inches of poorly graded sand, moist, loose, 20% coarse sand, 30% medium sand, 50% fine sand, orange brown to brown. (FILL)
8					4.9			
9					4.5			
10					8.2		65.54	
11	S-3	47	10-15		2.9			8 inches similar to S-2.
12					4.1			20 inches of Poorly graded sand (SP) with gravel, loose, moist to wet, 30% coarse sand, 20% medium sand, 20% fine sand, 30% gravel, medium brown.
13					5.9			19 inches of Silt (ML), hard, moist, 90% fines, 10% fine sand, olive gray to gray.
14					37.5			
15					89.9		60.54	
16	S-4	35	15-20		7.7			Similar to S-3.
17					5.6			
18					53.6			

WELL DETAIL



REMARKS

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-2**
Boring Location: N: 635609 E: 722870

Checked by: Adam Roy
Date Start: August 5, 2009
Date Finish: August 6, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	75.54 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	09:30	34.81		53.5	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
					40.9					
19										
					20.4					
20							55.54			
	S-5	48	20-25		18			Poorly graded sand with gravel (SP), loose, moist to wet, 30% coarse sand, 20% medium sand, 20% fine sand, 20% gravel. 10% silt, medium brown.	Cement Grout in 2 inch stainless steel riser.	
21										
					14.2					
22										
					6.2					
23										
					6.1					
24										
					13.2					
25							50.54			
	S-6	41	25-30		4.9			Poorly graded sand (SP), loose, moist, 20% coarse sand, 30% medium sand, 50% fine sand, medium brown.		
26										
					5.5					
27										
					9.6					
28										
					13.6					
29										
					12.6					
30							45.54			
	S-7	60	30-35		1.5			13 inches of collapsed soil.		
31										
					4.3			28 inches of poorly graded sand (SP), loose, saturated, 20% coarse sand, 20% medium sand, 60% fine sand, orange brown.		
32										
					5.5					
33										
					5.7					
34										
					9.2					
35							40.54			
	S-8	60	35-40		0.7			Silty sand (SM), moist, very cohesive, dense,10% coarse sand, 20% medium sand, 20% fine sand, 20% gravel, 30% silt, olive brown to brown. (TILL)		
36										
					1.5					
37										
					1.4					
38										
					1.4					
39										
					1.2					
40							35.54			

SAMPLE IDENTIFICATION

G - Geoprobe
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U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-2**
Boring Location: N: 635609 E: 722870

Checked by: Adam Roy
Date Start: August 5, 2009
Date Finish: August 6, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	75.54 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	09:30	34.81		53.5	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
	S-9	60	40-45		0.5			Similar to above.	filter sand	
41										
					0.3					
42										
					0.3					
43										
					0.4					
44										
					0.4					
45							30.54			
	S-10	60	45-50		0.7			Similar to above (TILL), very cohesive, extremely dense.		
46										
					1.1				Filter sand in 2 inch stainless steel slotted pipe	
47										
					1.2					
48										
					0.3					
49										
					0.7					
50							25.54			
	S-11	21	50-52		0.4			Weathered bedrock.		
51										
52							23.54			
53										
54										
55										
56										
57										
58										
59										
60										
61										
62										

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-3**
Boring Location: N: 635649 E: 722867

Checked by: Adam Roy
Date Start: August 4, 2009
Date Finish: August 5, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	76.96 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

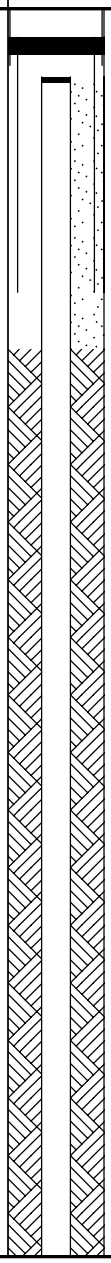
	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	09:35	34.93		42.51	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)
-3								
-2								
-1								
0								
1	S-1	41	0-5		26.5			3 inches of concrete.
2					41.7			15 inches of poorly graded sand (SP), loose, dry, 10% coarse sand, 30% medium sand, 50% fine sand, 5%silt, 5% gravel, light brown. strong odor.
3					31.1			6 inches of silty sand with gravel (SM), slightly cohesive, moist, 5% coarse sand, 20% medium sand, 35% fine sand, 20% gravel, dark brown, strong odor.
4					11.7			
5					27.8		71.96	17 inches of Poorly graded sand (SP), loose, moist, 10% coarse sand, 30% medium sand, 50% fine sand, 5% silt, 5% gravel, light brown, strong odor. (FILL)
6	S-2	49	5-10		104			18 inches similar to above.
7					110			22 inches of poorly graded sand with gravel (SP), loose, moist, 10% coarse sand, 30% medium sand, 40% fine sand, 15% gravel, 5% silt, brown, strong odor.
8					59			
9					43.4			2 inches of silt with sand (ML), moist, cohesive, 10% medium sand, 20% fine sand, 65% silt, 5% gravel, dark brwon, strong odor.
10					20.5		66.96	7 inches of poorly graded sand (SP), loose, moist, 10% coarse sand, 30% medium sand, 50% fine sand, 5% silt, 5% gravel, light brown to orange brown, slight odor.
11	S-3	51	10-15		4.9			Poorly graded sand (SP), slightly cohesive, moist, 10% coarse sand, 25% medium sand, 50% fine sand, 10% gravel, 5% silt, brown, some iron staining.
12					3.9			
13					7.4			
14					10			
15					14.8		61.96	
16	S-4	59	15-20		1.8			Silt (ML), saturated, very cohesive, hard, 5% fine sand, 5% gravel, 90% fines (silt/clay), olive brown to gray, slightly odor towards
17					1.8			
18					0.4			

WELL DETAIL



REMARKS

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-3**
Boring Location: N: 635649 E: 722867

Checked by: Adam Roy
Date Start: August 4, 2009
Date Finish: August 5, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	76.96 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	09:35	34.93		42.51	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
					14.6					
19										
					12.3					
20							56.96			
	S-5	58	20-25		20.8			Similar to S-5, odor increase as depth increase. -		
21										
					85.9					
22										
					93.2					
23							53.96			
					164					
24							52.96			
					294					
25							51.96			
	S-6	48	25-30		480			12 inches similar to S-5. strong odor. -		
26								26 inches of poorly graded sand with gravel (SP), - saturated, loose, 30% coarse, 20% medium sand, 20% - fine sand, 30% gravel. strong odor, slightly sheen in - sleeve. gray. -		
					446					
27										
					852					
28										
					804					
29									filter sand	
					988					
30							46.96			
	S-7	52	30-35		5605			12 inches of washed sample. -		
31								25 inches of poorly graded sand with gravel (SP), - saturated, loose, 30% coarse sand, 20% medium sand, - 20% fine sand, 30% gravel, strong odor, staining, sheen - in water in sleeve, gray. -		
					9999					
32										
					9999					
33										
					9999					
34										
					9999					
35							41.96			
	S-8	48	35-40		9999			Silty sand with gravel (SM), cohesive, wet, 10% coarse sand, 10% medium sand, 20% fine sand, 30% silt, 30% gravel, strong odor, brown.	Filter sand in 2 inch stainless steel slotted pipe	
36										
					9999					
37										
					29.7					
38							38.96			
					30.4			Silty sand with gravel (SM), moist to wet, very cohesive, 10% coarse sand, 10% medium sand, 30% fine sand. 40% silt, 10% gravel, brown to olive brown. (TILL).		
39										
					26.7					
40							36.96			

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-3**
Boring Location: N: 635649 E: 722867

Checked by: Adam Roy
Date Start: August 4, 2009
Date Finish: August 5, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	76.96 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	09:35	34.93		42.51	

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	STRATUM Log	Elev./ Desc.	SAMPLE DESCRIPTION (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	WELL DETAIL	REMARKS
	S-9	16	40-41.5		43.7			36.46	6 inches of TILL		
41								35.96	6 inches of bedrock.		
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											

SAMPLE IDENTIFICATION
G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-4**
Boring Location: N: 635670 E: 722892

Checked by: Adam Roy
Date Start: July 30, 2009
Date Finish: July 31, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	77.02 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

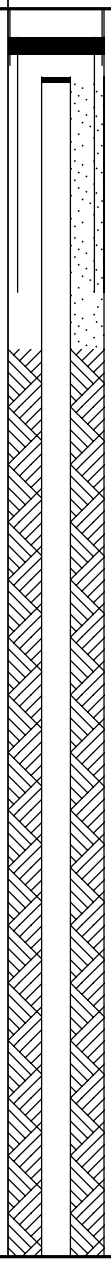
	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	13:00	36.59		42.4	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Remarks
-3									
-2									
-1									
0									
1	S-1	12	0-2					6 inches of concrete slab followed by poorly graded sand.	
2					5.2		75.02		
3	S-2	19	2-4		3			Poorly graded sand with silt (SP-SM), moist, 10% silt, 80% fine sand, 5% medium sand, 5% gravel, brown. (FILL)	
4					1.2		73.02		
5	S-3	19	4-6		2.3			Similar to S-1. Coarse gravel observed, brown.	
6					3.4		71.02		
7	S-4	18	6-8		2.1			Similar to S-1, brown/dark brown.	
8					5.2		69.02		
9	S-5	16	8-10		4.1			Poorly graded sand with little silt (SP), moist, 5% silt, 75% fine sand, 20% medium sand, trace gravel, brown/reddish brown.	
10					1		67.02		
11	S-6	20	10-12		0.7			Poorly graded sand (SP), moist to wet, 30% fine sand, 50% medium sand, 10% coarse sand, 5% silt, 5% gravel, reddish brown.	
12					4.3		65.02		
13	S-7	18	12-14		1.8			Poorly graded sand (SP), wet, 50% fine sand, 40% medium sand, 5% silt, 5% coarse sand, brown.	
14					5.6		63.02		
15	S-8	18	14-16		0.7			Poorly graded sand with gravel (SP), wet, 10% fine sand, 60% coarse to medium sand, 10% silt, 20% coarse to fine gravel, reddish brown followed by	
16					1		61.02	Silty sand (SM), 25% silt, 75% fine sand, brown.	
17	S-9	20	16-18		0.3			Similar to S-7 followed by Clayey silt with fine sand.	
18					0.7		59.02		

WELL DETAIL



SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-4**
Boring Location: N: 635670 E: 722892

Checked by: Adam Roy
Date Start: July 30, 2009
Date Finish: July 31, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	77.02 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
∓ 08/24/09	13:00	36.59		42.4	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
19	S-10	16	18-20		2.1			Clay (CL), stratified layers of fine sand, silt and clay, 90% - fines, 10% fine sand, trace fine gravel. -		
20					0.2		57.02			
21	S-11	20	20-22		1			14 inches of clay similar to S-9 followed by poorly graded - sand with silt and gravel -		
22					2.1		55.02			
23	S-12	13	22-24		0.8			Silty sand with gravel (SM), wet, 15% fine sand, 25% silt, - 40% coarse to fine sand, 20% gravel. -		
24					0.6		53.02			
25	S-13	18	24-26		4.3			Poorly graded sand with gravel (SP), wet, 70% coarse to - medium sand, 20% gravel, 10% fine sand and silt. -		
26					0.8		51.02			
27	S-14	15	26-28		2.5			Poorly graded sand with gravel (SP), wet, 70% coarse to - medium sand, 25% gravel, 5% fine sand, last 2 inches of - stratified layers of reddish brown, silty sand observed. -		
28					3.8		49.02			
29	S-15	6	28-30		1.7			Poorly graded sand with gravel (SP), wet, slightly - oxidized, 60% coarse sand, 40% medium sand, brown. -	Cement Grout in 2 inch stainless steel riser.	
30					2.8		47.02			
31	S-16	6	30-32		6.2			Silty sand (SM), 30% silt, 70% fine sand, gray with - brown. -		
32					4.7		45.02			
33	S-17	20	32-34		2.1			No representative sample. -		
34					1.1		43.02		filter sand	
35	S-18	20	34-36		0.2			Poorly graded sand with silt (SP-SM), 40% coarse sand, - 30% medium sand, 10% silt, 15% fine sand, 5% gravel, - brown to reddish brown. -		
36					0.6		41.02			
37	S-18	18	36-38		3.6	∓		12 inches similar to above. - 12 inches of silty sand with gravel, non stratified, olive - brown. (TILL) -		
38					3.4		39.02			
39	S-19	16	38-40		1.8			39-39.5 Till. - Bottom of exploration at 39.5 feet. -		
40							37.52		Filter sand in	

SAMPLE IDENTIFICATION

G - Geoprobe
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R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-4**
Boring Location: N: 635670 E: 722892

Checked by: Adam Roy
Date Start: July 30, 2009
Date Finish: July 31, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	77.02 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
∇ 08/24/09	13:00	36.59		42.4	

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	STRATUM Log	Elev./ Desc.	SAMPLE DESCRIPTION (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	WELL DETAIL	REMARKS
41										2 inch stainless steel slotted pipe	
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-5**
Boring Location: N: 635642 E: 722895

Checked by: Adam Roy
Date Start: August 5, 2009
Date Finish: August 5, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	76.87 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

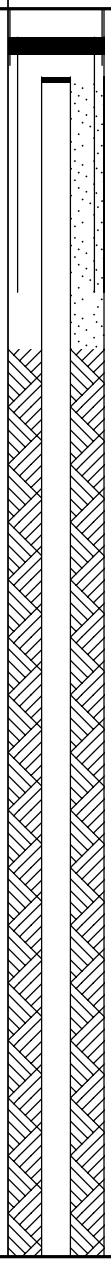
	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	09:40	36.35		47.7	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)
-3								
-2								
-1								
0								
1	S-1	36	0-5		21			3 inches concrete. - 3-16 inches: Poorly graded sand (SP), loose, dry, 10% - coarse sand, 30% medium sand, 60% fine sand, light - brown. (FILL) -
2					59			
3					322			16-36 inches: Poorly graded sand with gravel (SP), moist, - loose, 10% coarse sand, 20% medium sand, 40% fine - sand, 10% silt, 20% gravel, dark brown, slight odor. -
4					197			
5					66.2		71.87	
6	S-2	44	5-10		59.7			0-27 inches of poorly graded sand (SP), 20% coarse - sand, 30% medium sand, 50% fine sand, loose, moist, - slight odor, light brown. -
7					178			
8					74.5			27-39 inches : Poorly graded sand with silt and gravel - (SP-SM), loose, moist, 10% coarse sand, 10% medium - sand, 40% fine sand, 30% gravel, 10% silt, dark brown, - strong odor. -
9					205			
10					89.1		66.87	39-44 inches: Silty sand (SM), moist, slightly cohesive, - 5% coarse sand, 30% medium sand, 45% fine sand, - 20% silt, dark brown, very strong odor. -
11	S-3	52	10-15		7.2			Poorly graded sand, moist to wet, slightly cohesive, 15% - coarse sand, 30% medium sand, 50% fine sand, 5% silt, - slightly odor, brown to light brown. -
12					12.8			
13					18.9			
14					5			
15					12.6		61.87	
16	S-4	57	15-20		419			8 inches similar to S-3.
17					344			8-57 inches: Clay (CL), very cohesive, dense, wet to saturated, 90% fines (Clay/Silt), 10% fine sand, strong odor, sheen noted in water, olive brown.
18					72			

WELL DETAIL



REMARKS

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-5**
Boring Location: N: 635642 E: 722895

Checked by: Adam Roy
Date Start: August 5, 2009
Date Finish: August 5, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	76.87 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
⊥ 08/24/09	09:40	36.35		47.7	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
					89				Cement Grout in 2 inch stainless steel riser.	
19										
					140					
20							56.87			
	S-5	54	20-25		99.3			0-42 inches similar to S-4.		
21								42-54 inches: Poorly graded sand with gravel (SP), loose, wet, 40% coarse sand, 20% medium sand, 10% fine sand, 30% gravel, dark brown, strong odor.		
					125					
22										
					802					
23										
					620					
24							52.87			
					565					
25							51.87			
	S-6	42	25-30		8.7			0-37 inches: Similar to S-5.		
26								37-42: Poorly graded sand (SP), wet, loose, 20% coarse sand, 30% medium sand, 40% fine sand, 5% gravel, 5% silt, medium brown, iron staining throughout.		
					31.3					
27										
					32					
28										
					19.8					
29										
					3.4					
30							46.87			
	S-7	42	30-35		126			0-16: washed sample.		
31								16-42: Poorly graded sand (SP), wet, slightly cohesive, 5% coarse sand, 30% medium sand, 60% fine sand, 5% silt, brown.		
					22					
32										
					10.2					
33										
					0.8					
34										
35							41.87			
	S-8	36	35-40		66.4			Similar to S-7.	filter sand	
36										
					1532	⊥				
37										
					1032					
38										
					650					
39										
					3.5					
40							36.87			

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-5**
Boring Location: N: 635642 E: 722895

Checked by: Adam Roy
Date Start: August 5, 2009
Date Finish: August 5, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	76.87 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	09:40	36.35		47.7	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Log	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
	S-9	48	40-45		0.7				0-27 inches: similar to S-8.		
41											
					10.5				27-48 inches: Poorly graded sand with gravel, 30% coarse sand, 20% medium sand, 10% fine sand, 40% gravel, iron staining throug out, medium brown.	Filter sand in 2 inch stainless steel slotted pipe	
42											
					4.6						
43											
					10.1						
44											
					1.7						
45								31.87			
	S-10	14	45-48		3.2				Silty sand (SM), very cohesive, moist to wet, 10% coarse sand, 20% medium sand, 40% fine sand, 20% silt, 10% gravel, brown to olive brown.		
46											
					0.6				Bedrock at 48 feet.		
47									Boring terminated at 48 feet in bedrock.		
48								28.87			
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-6**
Boring Location: N: 635729 E: 722934

Checked by: Adam Roy
Date Start: August 3, 2009
Date Finish: August 3, 2009

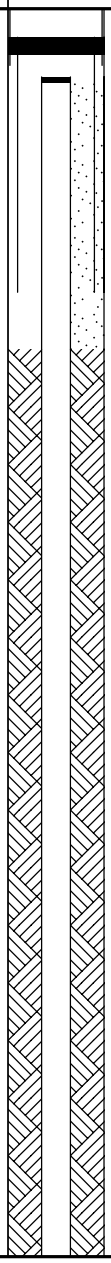
Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	74.76 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	09:50	27.01		38.51	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Remarks
-3									
-2									
-1									
0									
1	S-1	28	0-5		1.3			Poorly graded sand (SP), moist, slightly cohesive, 10% coarse sand, 30% medium sand, 50% fine sand, 5% gravel, 5% silt, brown. (FILL)	
2					0.2				
3					0.3				
4					0.1				
5					0.1		69.76		
6	S-2	30	5-10		19.3			6 inches similar to S-1.	
7					11.2			4 inches of poorly graded sand (SP) with concrete, loose, moist, 5% coarse sand, 40% medium sand, 40% fine sand, 15% concrete, brown.	
8					3.6			4 inches of silty sand with gravel (SM), moist, loose, 10% coarse sand, 20% medium sand, 20% fine sand, 10% gravel, 40% silt, dark brown.	
9					2.5				
10					5.4		64.76	16 inches of poorly graded sand (SP), moist, loose, 10% coarse sand, 40% medium sand, 40% fine sand, 10% gravel, brown/iron staining.	
11	S-3	39	10-15		9.5			Silty sand (SM), moist, slightly cohesive to moderately cohesive, 15% medium sand, 50% fine sand, 35% silt, medium brown, iron staining observed.	1
12					8.1				
13					2.1				
14					2.4				
15					6.3		59.76		
16	S-4	56	15-20		0.2			Clay (CL), moist to wet, hard, 5% medium sand, 5% fine sand, 20% silt, 70% clay, brown to gray-brown.	
17					4.1				
18					2.1				



SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

1) Water Observed at 11 feet. Possibly perched on the clay layer.

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-6**
Boring Location: N: 635729 E: 722934

Checked by: Adam Roy
Date Start: August 3, 2009
Date Finish: August 3, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	74.76 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	09:50	27.01		38.51	

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Log	Elev./ Desc.	SAMPLE DESCRIPTION (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	WELL DETAIL	REMARKS
					10.8						
19											
					0.8						
20								54.76			
	S-5	46	20-25		0.1				24 inches similar to S-4. -		
21											
					0.3				32 inches of poorly graded sand (SP), loose, saturated, - 10% coarse sand, 30% medium sand, 40% fine sand, - 10% gravel, 10% silt, medium brown to olive brown. -		
22								52.76			
					1.6						
23											
					1.9						
24											
					1.7						
25								49.76			
	S-6	48	25-30		2.2				34 inches of poorly graded sand (SP), loose, saturated, - 20% coarse sand, 30% medium sand, 30% fine sand, - 15% gravel, 5% silt, brown. -	filter sand	
26											
					1.3						
27									14 inches of Clay (CL), moist, dense, 10% fine sand, - 90% fines, gray brown to gray. -		
					0.9						
28											
					3.2						
29											
					9.1						
30								44.76			
	S-7	50	30-35		0.4				26 inches of poorly graded sand (SP), loose, saturated, - 30% coarse sand, 30% medium sand, 20% fine sand, - 20% gravel. -		
31											
					7.3						
32									6 inches of silty sand with gravel (SM), moist to wet, very - dense, 10% coarse sand, 15% medium sand, 25% fine - sand, 20% gravel, 20% silt, brown to gray. -	Filter sand in 2 inch stainless steel slotted pipe	
					1.2						
33											
					7.9				4 inches of fragmented cobble. -		
34											
					8.4				14 inches Similar to S-7 A. -		
35								39.76			
	S-8	18	35-36.5		1.9				Similar to S-7B. - Hit bedrock surface at 36.5 feet. -		
36											
					3.1			38.26			
37											
38											
39											
40											

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-7**
Boring Location: N: 635669 E: 722923

Checked by: Adam Roy
Date Start: August 3, 2009
Date Finish: August 4, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	74.9 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

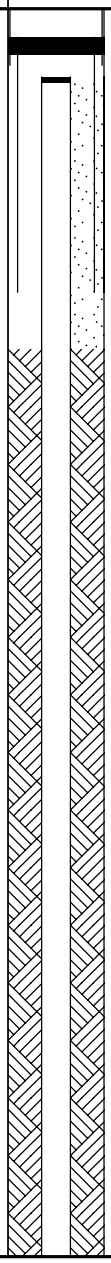
	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	10:05	37.44		47.97	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)
-3								
-2								
-1								
0								
1	S-1	29	0-5		0.6			Silty Sand (SM), moist, slightly cohesive, 20% medium sand, 40% fine sand, 10% gravel, 30% silt, dark brown to brown.
2					0.3			
3								
4					0.4			
5							69.9	
6	S-2	45	5-10		0.6			Poorly graded sand (SP), moist, slightly cohesive, 10% coarse sand, 30% medium sand, 50% fine sand, 5% gravel, 5% silt, brown with iron staining.
7					0.7			Bottom 4 inches of concrete.
8					0.8			
9					7.8			
10							64.9	
11	S-3	55	10-15		2.2			26 inches of poorly graded sand (SP), moist, slightly cohesive, 5% coarse sand, 30% medium sand, 60% fine sand, 5% silt, brown to olive brown.
12					2.2			29 inches of clay (CL), moist, very cohesive, hard, 100% fines, olive brown.
13					4			
14					2.2			
15					4.3		59.9	
16	S-4	51	15-20		0.8			Similar to bottom of S-3, saturated, 5% gravel.
17					0.8			
18					0.8			

WELL DETAIL



REMARKS

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-7**
Boring Location: N: 635669 E: 722923

Checked by: Adam Roy
Date Start: August 3, 2009
Date Finish: August 4, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	74.9 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	10:05	37.44		47.97	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
					0.8				Grout in 2 inch stainless steel riser.	
19										
					6.1					
20							54.9			
	S-5	45	20-25		0.7			Silty sand (SM), cohesive, saturated, 5% coarse sand, 20% medium sand, 30% fine sand, 5% gravel, 40% silt, brown.		
21										
					0.9			33 inches of poorly graded sand (SP), saturated, slightly cohesive, 10% coarse sand, 30% medium sand, 40% fine sand, 15% gravel, 5% silt, medium brown, iron staining througout.		
22										
					0.5					
23										
					12					
24										
					5.4					
25							49.9			
	S-6	52	25-30		8.2			Poorly graded sand (SP), saturated, slightly cohesive, 15% coarse sand, 30% medium sand, 40% fine sand, 15% gravel, medium brown, iron staining.		
26										
					13.4					
27										
					13.1					
28										
					20					
29										
					1.3					
30							44.9			
	S-7	49	30-35					Poorly graded sand (SP), wet to saturated, loose, 40% coarse sand, 30% medium sand, 20% fine sand, 10% gravel, brown to gray brown, iron staining throughout.		
31										
					2.3					
32										
					9.1					
33										
					4.3					
34										
					8.8				filter sand	
35							39.9			
	S-8	46	35-40		1.5			Silty sand (SM), cohesive, saturated, 20% medium sand, 60% fine sand, 20% silt, brown with iron staining.		
36										
					9.9			34 inches of silty sand with gravel (SM), cohesive/dense, saturated, 5% coarse sand, 20% medium sand, 30% fine sand, 30% silt, 15% gravel, olive/gray.		
37										
					5.2					
38										
					5.7					
39										
					9					
40							34.9			

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
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R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-7**
Boring Location: N: 635669 E: 722923

Checked by: Adam Roy
Date Start: August 3, 2009
Date Finish: August 4, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	74.9 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	10:05	37.44		47.97	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Log	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
	S-9	60	40-45		1.1				Similar to S-8. Bedrock at 45 feet.	Filter sand in 2 inch stainless steel slotted pipe	
41											
					0.2						
42											
					0.9						
43											
44											
45								29.9			
	S-10	12	45-46						Advance boring to 46 feet (1 foot into bedrock.)		
46								28.9	Boring terminated at 46 feet in bedrock.		
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-7B**
Boring Location:
Checked by: Adam Roy
Date Start: August 3, 2009
Date Finish: August 11, 2009

Contractor: Boart Longyear
Driller: John
Nobis Rep.: AR

Rig Type / Model: Mini Sonic 1414
Hammer Type: XX
Hammer Hoist: None

Ground Surface Elev.: 74.9 ft.
Top-of-Riser Elev.:
Datum: NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	Ground Water	Stratum Log	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
-3									Protective casing	
-2										
-1									7 inch casing to 50.5 feet.	
0										
	S-1	29	0-5					Refer to RW-7 for soil description		
1										
2										
3										
4										
5										
	S-2	45	5-10							
6										
7										
8										
9										
10										
	S-3	55	10-15							
11										
12										
13										
14										
15										
	S-4	51	15-20							
16										
17										
18										

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-7B**
Boring Location:
Checked by: Adam Roy
Date Start: August 3, 2009
Date Finish: August 11, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	74.9 ft.
Driller:	John	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	AR	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	Ground Water	STRATUM Log	Elev./ Desc.	SAMPLE DESCRIPTION (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	WELL DETAIL	REMARKS
19										
20										
	S-5	45	20-25							
21										
22										
23										
24										
25										
	S-6	52	25-30							
26										
27										
28										
29										
30										
	S-7	49	30-35							
31										
32										
33										
34										
35										
	S-8	46	35-40							
36										
37										
38										
39										
40									4 inch riser	

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-7B**
Boring Location:
Checked by: Adam Roy
Date Start: August 3, 2009
Date Finish: August 11, 2009

Contractor: Boart Longyear
Driller: John
Nobis Rep.: AR

Rig Type / Model: Mini Sonic 1414
Hammer Type: XX
Hammer Hoist: None

Ground Surface Elev.: 74.9 ft.
Top-of-Riser Elev.:
Datum: NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	Ground Water	Stratum Log	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
	S-9	60	40-45						with grout	
41										
42							32.9	Weathered Bedrock		
43										
44										
45										
	S-10	12	45-46							
46										
47										
48										
49										
50										
51							24.4	Advanced 7 inch casing to 50.5 feet. Fresh, hard, dark gray/Schist, joints are difficult to dicsern due to drilling method. Joints appear to be high angled, fresh, moderately spaced, trace iron staining noted in some joints.		
52										
53										
54										
55										
56										
57										
58										
59										
60										
61							14.4	Rock is similar to previous interval. Joints are similar to previous sample.		
62										

SAMPLE IDENTIFICATION

G - Geoprobe
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U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-7B**
Boring Location:
Checked by: Adam Roy
Date Start: August 3, 2009
Date Finish: August 11, 2009

Contractor: Boart Longyear
Driller: John
Nobis Rep.: AR

Rig Type / Model: Mini Sonic 1414
Hammer Type: XX
Hammer Hoist: None

Ground Surface Elev.: 74.9 ft.
Top-of-Riser Elev.:
Datum: NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	Ground Water	STRATUM Log	Elev./ Desc.	SAMPLE DESCRIPTION (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	WELL DETAIL	REMARKS
63										
64										
65										
66										
67										
68										
69										
70							4.9	Poor recovery. Rock is similar to previous intervals. Driller removed approximately 6 feet of drill cuttings.		
71										
72										
73										
74										
75										
76										
77										
78										
79										
80							-5.1	Rock is similar to previous. Driller indicated rock was hard from 80-85. 85-90 was softer.	4 inch riser with filter sand	
81										
82										
83										
84										

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-7B**
Boring Location:
Checked by: Adam Roy
Date Start: August 3, 2009
Date Finish: August 11, 2009

Contractor: Boart Longyear
Driller: John
Nobis Rep.: AR

Rig Type / Model: Mini Sonic 1414
Hammer Type: XX
Hammer Hoist: None

Ground Surface Elev.: 74.9 ft.
Top-of-Riser Elev.:
Datum: NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	Ground Water	Stratum Log	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
85										
86										
87										
88										
89										
90							-15.1	Rock is similar to previous. Driller indicated 90-95 was soft and 95 to 100 was hard. Advanced boring to 101.5 feet.	4 inch screen with filter sand	
91										
92										
93										
94										
95										
96										
97										
98										
99										
100							-25.1	Boring terminated at 101.5 feet in bedrock.		
101									filter sand	
102							-26.6			
103										
104										
105										
106										

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:24 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-8**
Boring Location: N: 635617 E: 722916

Checked by: Adam Roy
Date Start: August 6, 2009
Date Finish: August 6, 2009

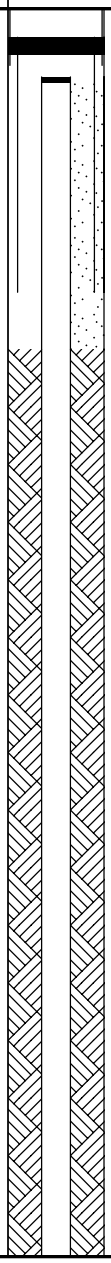
Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	74.31 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	10:15	34.61		52.0	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)
-3								
-2								
-1								
0								
1	S-1	29	0-5		2.5			Silty sand (SM), moist, slightly cohesive, 15% coarse sand, 25% medium sand, 40% fine sand, 15% silt, 5% gravel, dark brown.
2					2.9			
3								
4					2.1			
5					11.8		69.31	
6	S-2	45	5-10		3.4			5 inches similar to S-1.
7					9.1			33 inches of poorly graded sand (SP), moist, loose, 10% coarse sand, 30% medium sand, 50% fine sand, 5% silt, 5% gravel, medium brown to orange brown.
8					11			
9					8			17 inches of poorly graded sand (SP) with gravel, moist, loose, 15% coarse sand, 25% medium sand, 40% fine sand, 15% gravel, 5% silt, brown.
10					18.7		64.31	
11	S-3	46	10-15		6			16 inches similar to S-2, wet.
12					59.1		62.91	30 inches of Silt (ML), wet, very cohesive, hard, 80% fines (silt/clay), 5% fine sand, 5% medium sand, 5% gravel, gray/brown.
13					4.3			
14					76.9			
15					78.3		59.31	
16	S-4	47	15-20		3.7			26 inches of poorly graded sand with gravel (SP), wet to saturated, loose, 30% coarse sand, 20% medium sand, 5% fine sand, 40% gravel, 5% silt, brown.
17					4.4			
18					2.6			21 inches of poorly graded sand (SP), moist to wet, 20% coarse sand, 30% medium sand, 40% fine sand, 10% gravel, brown.



WELL DETAIL

REMARKS

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:25 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-8**
Boring Location: N: 635617 E: 722916

Checked by: Adam Roy
Date Start: August 6, 2009
Date Finish: August 6, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	74.31 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	10:15	34.61		52.0	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
					5.1					
19										
					5.7					
20							54.31		Cement Grout in 2 inch stainless steel riser.	
	S-5	42	20-25					Poorly graded sand with gravel (SP), loose, moist, 40% coarse sand, 30% medium sand, 10% fine sand, 15% gravel, 5% silt, brown to orange brown.		
21										
					2.2					
22										
					2.5					
23										
					6.4					
24										
					6.8					
25							49.31			
	S-6	42	25-30					23 inches of washed sample.		
26								Poorly graded sand (SP), loose, moist, 10% coarse sand, 30% medium sand, 40% fine sand, 5% gravel, 5% silt.		
					1.5					
27										
					4.1					
28										
					5.2					
29										
					1.2					
30							44.31			
	S-7	36	30-35					27 inches of washed sample.		
31								9 inches of poorly graded sand (SP), loose, moist to wet, 10% coarse sand, 30% medium sand, 45% fine sand, 10% gravel, 5% silt, light brown.		
					2.8					
32										
					10.4					
33										
					5.9					
34										
					6					
35							39.31			
	S-8	55	35-40		3.6			18 inches of silty sand (SM), saturated, moderately cohesive, 20% medium sand, 50% fine sand, 30% silt, brown.		
36										
					4.6			42 inches of silty sand (SM), moist, very cohesive, 10% coarse sand, 20% medium sand, 30% fine sand, 30% silt, 10% gravel, olive brown. (TILL)		
37										
					2.4					
38										
					6.4				filter sand	
39										
					0.4					
40							34.31			

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:25 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-8**
Boring Location: N: 635617 E: 722916

Checked by: Adam Roy
Date Start: August 6, 2009
Date Finish: August 6, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	74.31 ft.
Driller:	Dale Duscher	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	10:15	34.61		52.0	

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Log	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
	S-9	60	40-45		1.3				Similar to Above,		
41											
					3.8						
42											
					3.7						
43											
					3.7						
44											
					3.7						
45								29.31			
	S-10	60	45-50		13.2				Similar to above with bedrock at 50 feet.	Filter sand in 2 inch stainless steel slotted pipe	
46											
					7.8						
47											
					12.2						
48											
					1						
49											
50								24.31			
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:25 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-9**
Boring Location: N: 635612 E: 722947

Checked by: Adam Roy
Date Start: August 4, 2009
Date Finish: August 5, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	72.66 ft.
Driller:	John	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	10:20	33.67	42.67		

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
-3										
-2										
-1										
0									filter sand	
1	S-1	54	0-5		4.7			4 inches of dark brown topsoil.		
2					5			50 inches of poorly graded sand with silt (SP-SM), moist, 20% silt, 60% fine sand, 10% coarse to medium sand, 10% fine gravel at bottom 12 inches, brown/dark brown.		
3					10.4					
4					3.9					
5					12.5		67.66			
6	S-2	50	5-10		5.5			Poorly graded sand with gravel, moist, 20% fine sand, 50% coarse to medium sand, 25% gravel, 5% silt, brown/reddish brown.		
7					1.4					
8					6.5					
9					4.1					
10					6.9		62.66			
11	S-3	55	10-15		39.4			S-3 A: Poorly graded sand (SP) with gravel, moist, 30% fine sand, 40% coarse to medium sand, 30% gravel, 6 inch cobble observed, brown.		
12					16.1			S-3B: Poorly graded sand (SP), moist, 40% fine sand, 40% medium sand, 10% coarse sand, 10% fine gravel, reddish brown, slightly oxidized.		
13					6.3					
14					4.2					
15					2.8		57.66			
16	S-4	50	15-20		10.2			Poorly graded sand with gravel (SP), brown, moist, 15% fine sand, 40% medium sand, 20% coarse sand, 25% gravel, brown/reddish brown at some parts.	Cement Grout in 2 inch stainless steel riser.	
17					0.7					
18					0.4					

SAMPLE IDENTIFICATION

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S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

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Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2 -
Groveland, MA -

Nobis File No:. 80037.00

Boring No:. **RW-9**
Boring Location: N: 635612 E: 722947

Checked by: Adam Roy
Date Start: August 4, 2009
Date Finish: August 5, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	72.66 ft.
Driller:	John	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
08/24/09	10:20	33.67	42.67		

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	Stratum Elev./ Desc.	Sample Description (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	Well Detail	Remarks
19					0.3					
20					0.8		52.66			
21	S-5	52	20-25		3.4			Poorly graded sand (SP) with trace silt, very moist to wet, 10% fine sand, 80% coarse to medium sand, 10% gravel, slightly oxidized, reddish brown layers observed between 22 and 24 feet.		
22					0.2					
23					0.1					
24					0.2					
25					0.2		47.66			
26	S-6	54	25-30		2.4			Poorly graded sand (SP), wet, 10% fine sand, 70% coarse to medium sand, 20% gravel (sub angular to subrounded), brown/reddish brown.		
27					0.2					
28					0.1					
29					0.2				filter sand	
30					2.4		42.66			
31	S-7	55	30-35		0.2			S-7A: 18 inches similar to S-6.		
32					0.1			S-7B: 18 inches of silt to sandy silt (ML- (SM-ML), 90% fines, 10% fine sand, wet, thinly stratfied, olive brown with trace gray.		
33					0			S-7C: 19 inches of poorly graded sand with silt (SP-SM), wet, 80% fine sand, 10% medium sand, 10% silt, stratified layers of silt observed at 34 feet.		
34					0.1					
35					3.4		37.66		Filter sand in 2 inch stainless steel slotted pipe	
36	S-8	50	35-40		0.2			S-8A: 18 inches similar to S-7C.		
37					1.9			S-8B: Silty sand with gravel (SM), wet, non stratified, 30% fines (Silt and Clay), 20% fine sand, 30% coarse to medium sand, 20% gravel, olive brown, slightly oxidized. (TILL)		
38					225					
39					157		33.66			
40					206		32.66	S-9: Silty sand with crushed weathered rock at the bottom.		

SAMPLE IDENTIFICATION

G - Geoprobe
S - Split Spoon
U - Undisturbed Sample
R - Core Run

REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:25 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

Nobis Engineering, Inc.

PROJECT

Groveland Wells Nos. 1 and 2
Groveland, MA

Nobis File No:. 80037.00

Boring No:. **RW-9**
Boring Location: N: 635612 E: 722947

Checked by: Adam Roy
Date Start: August 4, 2009
Date Finish: August 5, 2009

Contractor:	Boart Longyear	Rig Type / Model:	Mini Sonic 1414	Ground Surface Elev.:	72.66 ft.
Driller:	John	Hammer Type:	XX	Top-of-Riser Elev.:	
Nobis Rep.:	S Combs	Hammer Hoist:	None	Datum:	NAD 27

	Drilling Method	Sampler
Type	Casing	None
Size	4 inch	None
Advancement	Drive and wash	None

Groundwater Observations

Date	Time	Depth Below Riser (ft.)	Depth of Casing (ft.)	Depth to Bottom of Well (ft.)	Stabilization Time
∇ 08/24/09	10:20	33.67	42.67		

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft)	Blows/ 6 in.	PID (ppmv)	Ground Water	STRATUM Log	Elev./ Desc.	SAMPLE DESCRIPTION (Soil: ASTM D2488 Visual Manual Procedure As Modified by Nobis)	WELL DETAIL	REMARKS
									Bottom of exploration at 40 feet.		
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											

SAMPLE IDENTIFICATION

G - Geoprobe
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REMARKS:

BOREHOLE LOG - NOBIS ENGINEERING.GDT - 10/13/09 12:25 - R:\80000 TASK ORDERS\80037 GROVELAND WELLS RA\BASELINE INVESTIGATION -ANALYTICAL AND FIELD DATA\BORING LOGS\GROVELAND.GPJ

TECHNICAL MEMORANDUM

Date: August 2011

To: Derrick Golden, United States Environmental Protection Agency (USEPA), Region 1

From: Diane Baxter, Project Manager, Nobis Engineering, Inc.

Prepared by: Lauren Soós, Project Engineer, Nobis Engineering, Inc.
Paul Yingling, Staff Engineer, Nobis Engineering, Inc.

Subject: In Situ Thermal Treatment Operations Data Summary
Source Control Remedial Action
Groveland Wells Nos. 1 & 2 Superfund Site, Groveland, Massachusetts

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INTRODUCTION

During implementation of the In-Situ Thermal Treatment (ISTT) system at the Groveland Wells Nos. 1 & 2 Superfund Site (Site), routine sampling of Site groundwater, process water, process air, and ambient air was performed. Samples were collected to monitor progress and effectiveness of the ISTT system, design ISTT system optimizations, and support ISTT shutdown decisions.

This Technical Memorandum (Memo) summarizes the laboratory and field screening data collected during the ISTT operations. Tables, figures, and attachments are included at the end of this Memo. Data discussed in this Memo are for the following activities:

- Groundwater Monitoring;
- Process Water Sampling;
- Vapor Extraction Well Sampling;
- Process Air Sampling; and
- Ambient Air Monitoring.

PURPOSE AND DESCRIPTION OF FIELD ACTIVITIES

The ISTT operations field activities performed by Nobis and its subcontractor, TerraTherm, Inc. (TerraTherm), between August 2010 and February 2011 are briefly described below. Refer to the *Quality Assurance Project Plan (QAPP), Revision 3 (Nobis, April 2010)* and *Field Sampling Plan (FSP) (TerraTherm, January 2010)* for details of the sampling programs.

Groundwater Monitoring

During ISTT operations, groundwater samples were collected from the 12 replacement monitoring wells (RW-01 through RW-10, RW-07B, and RW-10B) located in the ISTT Areas, as well as 2 existing wells (TW-31 and EW-S3) located near the ISTT Areas. In some instances, groundwater samples were collected from ISTT multi-phase extraction wells instead of from the groundwater monitoring wells when groundwater was not available at these locations because

the water table was depressed below the elevation of the well screen. The locations of the groundwater monitoring and multi-phase extraction wells sampled during ISTT operations are shown on Figure 1.

Groundwater samples collected from within the ISTT area were used to monitor the progress and effectiveness of the ISTT. Groundwater samples collected from outside the ISTT area were used to monitor potential contaminant migration from the Source Area. Groundwater samples were generally collected bi-weekly and analyzed for volatile organic compounds (VOCs) using EPA SOW SOM01.2 (low/medium concentration), in accordance with the *QAPP (Nobis, April 2010)* and *FSP (TerraTherm, January 2010)*.

Process Water Sampling

Process water from the ISTT system is a combined waste stream consisting of hot groundwater and vapor condensate recovered from the ISTT Areas. The process water receives limited treatment (cooling, phase separation, and filtration) in the ISTT vapor and liquid extraction system prior to discharge to the Operable Unit 1 Groundwater Treatment Facility (GWTF). Process water samples were collected weekly throughout ISTT operations for VOC analysis using EPA SOW SOM01.2. In addition, one process water sample per month was analyzed for metals using EPA SOW ILM05.4. The process water samples were collected from the effluent of the ISTT liquid extraction system in order to characterize the quality of the influent to the GWTF to help identify any spikes in concentrations that could adversely affect the GWTF processes. Process water samples were collected and analyzed in accordance with the *QAPP (Nobis, April 2010)* and *FSP (TerraTherm, January 2010)*.

Vapor Extraction Well Sampling

Vapor extraction well (VEW) samples were collected regularly throughout ISTT operations from various locations (mainly shallow VEWs) within the ISTT Areas to evaluate the treatment progress. Vapor samples were generally collected weekly for total VOC screening using a photoionization detector (PID) and monthly for VOC analysis by EPA Method TO-15 by the EPA Office of Environmental Management and Evaluation (OEME) Mobile Laboratory. During the monthly events, split samples were collected for VOC field screening and mobile lab VOC analysis to allow comparison of the data. Additionally, in late January 2011, several samples were collected for VOC analysis by the OEME fixed laboratory to support shutdown decisions. During each sampling event, vapor samples were collected from a minimum of 16 locations in the ISTT Areas. VEW samples were collected and analyzed in accordance with methods identified in the *QAPP (Nobis, April 2010)* and *FSP (TerraTherm, January 2010)*.

Process Air Sampling

Process air samples were collected throughout ISTT operations to monitor the performance of the vapor treatment system and the progress of treatment, to characterize the VOCs removed by the ISTT system, and to estimate the VOC mass removed. Samples were collected daily from influent, midfluent, and effluent points of the granular activated carbon (GAC) vapor treatment system for PID screening of total VOCs, and weekly from the influent and effluent points of the GAC system to be analyzed for VOCs using EPA Method TO-15 at the EPA OEME fixed laboratory. On occasion, a process air sample was also collected for laboratory analysis from the midfluent point to further evaluate the performance of GAC. The process air samples were collected and analyzed in accordance with the *QAPP (Nobis, April 2010)* and *FSP (TerraTherm, January 2010)*.

Ambient Air Monitoring

Ambient air monitoring was conducted at locations upgradient (upwind) and downgradient (downwind) of the ISTT operations. The general locations of the ambient air monitoring points are shown on Figure 2. Ambient air samples were collected bi-weekly throughout ISTT operations. The purpose of ambient air monitoring was to verify that there were no VOCs migrating outside of the ISTT Areas and discharging to the atmosphere. The ambient air samples were collected in accordance with the *QAPP* (*Nobis, April 2010)*.

RESULTS

The results of the ISTT operations data are briefly summarized below. Refer to the attached Tables for the comprehensive analytical results.

Groundwater Monitoring

The results of the groundwater monitoring events conducted during ISTT operations are provided in Table 1A through 1K. Three VOCs, Trichloroethene (TCE), cis-1,2-Dichloroethene (cis-1,2-DCE), and methylene chloride were detected in Site groundwater at concentrations above the Site Cleanup Goals (CUGs) during ISTT operations. TCE was detected in groundwater samples at concentrations ranging from 29,000 micrograms per liter (µg/L) (detected in groundwater monitoring well RW-05 during the September 1, 2010 monitoring event) to below the CUG of 5 µg/L in several wells in January 2011. Cis-1,2-DCE was detected at concentrations ranging from 250 µg/L (detected in groundwater monitoring well RW-05 during the August 16, 2010 monitoring event) to below the quantitation limit of 5 µg/L in several wells (and well below the CUG of 70 µg/L) in several wells in January 2011. Methylene chloride was detected at concentrations ranging from below the CUG of 5 µg/L in many wells throughout operations to 130 µg/L (at MPE-15 during the September 30, 2010 monitoring event).

The concentrations of TCE and cis-1,2-DCE detected in Site groundwater decreased significantly from the start to the conclusion of ISTT operations (Tables 1A and 1K). Methylene chloride concentrations started out relatively low (Tables 1A through 1C), increased to peak concentrations in late September and October (Table 1D and 1E), changed sporadically in November and December (Tables 1F through 1I) and remained at non-detect levels in January 2011 (Tables 1J and 1K).

Process Water Sampling

The organic and inorganic analytical results of the process water sampling conducted during ISTT operations are presented in Tables 2 and 3, respectively. TCE concentrations in process water exhibited a decreasing trend over the ISTT operation period, with concentrations ranging from 1,900 µg/L in August 11, 2010 to below the CUG at the conclusion of ISTT operations (in February 24, 2010). In contrast, acetone concentrations were observed to be generally increasing, from concentrations below the Quantitation Limit (in August 11, 2010) to 4000 µg/L (in February 24, 2011) at the conclusion of ISTT operations. As stated previously, the increase in concentrations of acetone and 2-butanone are believed to result from heat-related breakdown of naturally occurring humic acid in Site soil.

Metals concentrations (Table 3) were evaluated in comparison to starting concentrations rather than to a particular benchmark. In general, the concentrations of most metals in process water did not exhibit any clear pattern over the ISTT operation period. Three exceptions were arsenic,

which had a starting concentration of 10 U µg/L and ending concentration of 21.7 µg/L, and lead and manganese, which both had ending concentrations lower than the starting concentrations (Table 3). The GWTF effluent (under Task Order 12) was monitored throughout the ISTT operations period to ensure that ISTT process water being discharged to the GWTF did not interfere with effective treatment. No problems with excessive metals discharge were identified.

Vapor Extraction Well Sampling

The screening and analytical results of the vapor extraction well sampling conducted during ISTT operations are presented in Table 4, the results are also presented in graphical form in the *Data Trend Report, Figures F-19 through F-27 (Nobis, August 2011)*. Concentrations of VOCs in process vapor varied significantly during ISTT operations, with multiple peaks occurring at most locations, and peaks occurring at different times in various locations. However, in general, the concentrations were low at the start of operations, increased in response to heating of the subsurface, and decreased towards the conclusion of treatment.

Process Air Sampling

The results of the process air sampling events are summarized in Tables 5 (PID data) and 6 (laboratory data). The concentrations of total VOCs measured using a PID at the GAC influent were relatively low (less than 30 ppmv), but showed occasional peaks, most notably in October 2010. Due to the low influent concentrations and the sensitivity of the PID, the ISTT vapor extraction system destruction removal efficiency at the Site could not be maintained above 95 percent at all times (Table 5).

Several VOCs were detected in the process air samples analyzed by the OEME fixed laboratory. TCE was typically present at the highest concentrations, when compared to other VOC. TCE was detected in the GAC influent samples at concentrations as high as 3900 ppbv in September 2010, but dropped to 480 ppbv and lower by February 2011. Cis-1,2-Dichloroethene was detected in the GAC influent at a maximum concentration of 1900 ppbv in August 2010 and dropped to between 160 and 510 ppbv in February 2011.

Ambient Air Monitoring

The results of the ambient air sampling are presented on Table 5. Seven VOCs were detected, all at low concentrations (generally less than 1 part per billion per volume). None of the VOCs was detected at concentrations exceeding the Massachusetts Department of Environmental Protection (DEP) Threshold Effects Limits (24-hour average concentrations). TCE was the only VOC detected at concentrations exceeding the Massachusetts DEP Allowable Ambient Air Limits (AALs) (allowable annual average concentrations). TCE concentrations detected in both upwind and downwind samples slightly exceeded the AALs during the first two months of ISTT operation only. In most of these cases the concentration detected downwind was slightly higher than the upwind concentration; however, during the September 27, 2010 sampling event, the maximum TCE concentration (1.32 ppbv) was detected in the upwind sample. This was also the maximum concentration detected throughout the monitoring period. The ambient air concentrations detected in upwind and downwind samples after the second month of ISTT operation were comparable to concentrations detected during the baseline sampling event in January 2010, prior to the start of remedial construction. The TCE concentrations detected during the baseline event were 0.16 U and 0.15 U ppbv in the upwind and downwind samples, respectively.

In Situ Thermal Treatment Data Summary

TABLES:

Table 1 Analytical Results of Groundwater Monitoring
Table 2 Analytical Results of Process Water Sampling – Organic Analysis
Table 3 Analytical Results of Process Water Sampling – Inorganic Analyses
Table 4 Field Data and Analytical Results of Shallow Soil Vapor Extraction Wells
Table 5 Field Data and Calculated Destruction and Removal Efficiency of Process Air
Table 6 Analytical Results of Process Air Sampling
Table 7 Analytical Results of Ambient Air Monitoring

FIGURES:

Figure 1 Groundwater Monitoring Locations
Figure 2 Ambient Air Monitoring Locations

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Table 1-A
Analytical Results of Groundwater Monitoring 8/16/2010
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

		Sample Date	A2ZA7	A2ZA8	A2ZA9	A2ZB0	A2ZB1	A2ZB2	A2ZB3	A2ZB4/A2ZB5	A2ZB6	A2ZB7	A2ZB8	A2ZB9	A2ZC0	A2ZC2
		Sample Location	EW-S3	MPE-01	MPE-03	MPE-14	MPE-21	RW-01	RW-02	RW-05	RW-07	RW-7B	RW-08	RW-09	RW-10B	TW-31
		Sample Date	8/16/2010	8/16/2010	8/16/2010	8/16/2010	8/16/2010	8/16/2010	8/16/2010	8/16/2010	8/16/2010	8/16/2010	8/16/2010	8/9/2010	8/16/2010	8/16/2010
Chemical	CRQL	CUG														
1,1,1-TRICHLOROETHANE	5	200	5 U	**0.68 J**	5 U	5 U	**0.93 J**	5 U	5 U	**11.5 J**	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHAN	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	5 U	**0.35 J**	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	5 U	5 U	5 U	5 U	10 U	5 U	5 U	*100 U*	5 U	5 U	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	100 U	100 U	100 U	100 U	200 U	100 U	100 U	2000 U	100 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	10 U	10 U	10 U	10 U	20 U	10 U	10 U	200 U	10 U	10 U	10 U	10 U	10 U	10 U
2-HEXANONE	10	--	10 U	10 U	10 U	10 U	20 U	10 U	10 U	200 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10	--	10 U	10 U	10 U	10 U	20 U	10 U	10 U	200 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10	--	10 U	10 U	10 U	10 U	**15 J**	10 U	10 U	200 U	10 U	10 U	10 U	10 U	10 U	10 U
BENZENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	**0.64 J**	100 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	**1.8 JB**	5 U	**1.6 JB**	**1.6 JB**	10 U	**1.5 JB**	5 U	**41 JB**	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5	70	**5.5**	**40**	**10**	**9.5**	**32**	5 U	5 U	**250**	**14**	5 U	5 U	5 U	5 U	**0.87 J**
CIS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	**0.42 JB**	**0.44 JB**	**0.53 JB**	**0.52 JB**	**0.96 JB**	**0.47 JB**	**0.4 JB**	**12 JB**	5 U	**0.49 JB**	**0.49 JB**	**0.74 JB**	**0.75 JB**	**0.86 JB**
DIBROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL TERT-BUTYL ETHER	5	--	5 U	**0.8 J**	**0.72 J**	5 U	**4.5 J**	5 U	5 U	100 U	**0.62 J**	5 U	5 U	5 U	5 U	5 U
METHYLCYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	5	**0.75 JB**	**0.43 JB**	**0.82 JB**	**0.8 JB**	**1.1 JB**	**0.83 JB**	**0.82 JB**	**14 JB**	**0.9 JB**	**0.8 JB**	**0.8 JB**	**0.66 JB**	**0.7 JB**	**0.7 JB**
O-XYLENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	5 U	**0.76 J**	**0.24 J**	5 U	**0.55 J**	5 U	5 U	*100 U*	5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE	5	1000	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,2-DICHLOROETHENE	5	100	5 U	**0.28 J**	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	5	**47**	**1400 D**	**24**	**17**	**2600 D**	**0.27 J**	**0.21 J**	**27000 D**	**24**	**3 J**	**0.52 J**	**1.3 J**	**0.82 J**	**7.8**
TRICHLOROFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	10 U	5 U	5 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	*5 U*	*5 U*	*5 U*	*5 U*	*10 U*	*5 U*	*5 U*	*100 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 1-B
Analytical Results of Groundwater Monitoring 9/1/2010
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

	Sample Date		A2ZE0	A2ZE1	A2ZD3	A2ZE4	A2ZC8	A2ZE2	A2ZD5	A2ZD8	A2ZC9	A2ZD0	A2ZD1	A2ZD4	A2ZC7	A2ZD2	A2ZD6
	Sample Location		EW-S3	MPE-03	MPE-14	RW-01	RW-02	RW-03	RW-05	RW-05	RW-07	RW-7B	RW-08	RW-09	RW-10	RW-10B	TW-31
	Sample Date		9/1/2010	9/1/2010	9/1/2010	9/1/2010	9/1/2010	9/1/2010	9/1/2010	9/1/2010	9/1/2010	9/1/2010	9/1/2010	9/1/2010	9/1/2010	9/1/2010	9/1/2010
Chemical	CRQL	CUG															
1,1,1-TRICHLOROETHANE	5	200	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	5 U	5 U	5 U	5 U	5 U	5 U	*100 U*	*100 U*	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	**0.45 J**	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	100 U	100 U	100 U	100 U	100 U	100 U	2000 U	2000 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	200 U	200 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-HEXANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	200 U	200 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	200 U	200 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10	--	10 U	**9.6 J**	**6.7 J**	10 U	10 U	**3.2 J**	200 U	200 U	**2.4 J**	10 U	10 U	10 U	**6.4 J**	10 U	10 U
BENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5	70	**1.5 J**	**3.5 J**	**6.4**	5 U	**1.5 J**	**2.9 J**	**72 J**	**70 J**	**14**	5 U	5 U	5 U	**50**	5 U	5 U
CIS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DIBROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	5 U	5 U	5 U	5 U	0.6 J	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL TERT-BUTYL ETHER	5	--	5 U	**1.1 J**	5 U	5 U	**1.5 J**	5 U	100 U	100 U	**2.5 J**	5 U	5 U	5 U	**2.7 J**	5 U	5 U
METHYLCYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	**220**	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	5	5 U	5 U	**0.58 J**	5 U	5 U	5 U	*100 U*	*100 U*	5 U	5 U	5 U	5 U	5 U	5 U	5 U
O-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	5 U	5 U	**0.41 J**	5 U	5 U	5 U	*100 U*	*100 U*	**0.76 J**	5 U	5 U	5 U	**0.84 J**	5 U	5 U
TOLUENE	5	1000	**0.48 JB**	5 U	**0.61 JB**	**0.43 JB**	**0.73 JB**	**0.47 JB**	**10 JB**	**9.3 JB**	**0.57 JB**	5 U	5 U	**0.62 JB**	**0.46 JB**	**0.47 JB**	**0.62 JB**
TRANS-1,2-DICHLOROETHENE	5	100	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	5	**4.1 J**	**15**	**28**	**2.8 J**	**8**	**80**	**27000 D**	**29000 D**	**52**	**2.8 J**	**2.1 J**	5 U	**770 D**	5 U	**9**
TRICHLOROFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	100 U	100 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*100 U*	*100 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 1-C
Analytical Results of Groundwater Monitoring 9/15/2010
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

		Sample Date	A2ZF2	A2ZF3	A2ZF4	A2ZF5	A2ZF6	A2ZF7	A2ZF8	A2ZG0	A2ZG1	A2ZG2/A2ZG3	A2ZG4	A2ZG5	A2ZG6	A2ZG8
		Sample Location	EW-S3	MPE-01	MPE-03	MPE-04	MPE-07	MPE-14	MPE-21	RW-01	RW-02	RW-05	RW-7B	RW-08	RW-10B	TW-31
		Sample Date	9/15/2010	9/15/2010	9/15/2010	9/15/2010	9/15/2010	9/15/2010	9/15/2010	9/15/2010	9/15/2010	9/15/2010	9/15/2010	9/15/2010	9/15/2010	9/15/2010
Chemical	CRQL	CUG														
1,1,1-TRICHLOROETHANE	5	200	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	5 U	5 U	5 U	5 U	5 U	5 U	*50 U*	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROBENZENE	5	--	5 U	5 U	**3.2 JB**	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	5 U	5 U	**2.5 JB**	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	100 U	100 U	100 U	100 U	100 U	100 U	1000 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	100 U	**800 D**	10 U	10 U	10 U	10 U	10 U	10 U
2-HEXANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	100 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	100 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10	--	**69**	**80**	**57**	10 U	**64**	**47**	**370**	**260**	10 U	**49.5**	10 U	10 U	10 U	10 U
BENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5	70	5 U	**7.1**	5 U	5 U	5 U	**6.4**	50 U	5 U	5 U	**5.8**	5 U	5 U	5 U	5 U
CIS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DIBROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL TERT-BUTYL ETHER	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLCYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	5	5 U	5 U	5 U	5 U	5 U	5 U	*50 U*	**2.5 J**	5 U	5 U	5 U	5 U	5 U	5 U
O-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	5 U	5 U	5 U	5 U	5 U	5 U	*50 U*	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE	5	1000	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,2-DICHLOROETHENE	5	100	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	5	**12**	**150**	**13**	**28**	**5.8**	**28**	**3300 D**	5 U	**2.6 J**	**425 D**	5 U	**10**	5 U	**6.5**
TRICHLOROFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*50 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 1-D
Analytical Results of Groundwater Monitoring 9/30/2010
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

	Sample Date		A2ZH8	A2ZH9	A2ZJ0	A2ZJ4	A2ZH5	A2ZH4	A2ZJ3	A2ZJ5	A2ZH6/A2ZH7	A2ZJ8	A2ZJ2	A2ZH2	A2ZH3	A2ZJ6
	Sample Location		MPE-01	MPE-02	MPE-03	MPE-05	MPE-07	MPE-09	MPE-14	MPE-15	MPE-17	MPE-18	MPE-21	RW-01	RW-02	TW-31
	Sample Date		9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010
Chemical	CRQL	CUG														
1,1,1-TRICHLOROETHANE	5	200	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	5 U	5 U	5 U	5 U	5 U	*50 U*	5 U	*130 U*	*20 U*	5 U	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	100 U	100 U	100 U	100 U	100 U	1000 U	100 U	2500 U	400 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	**17**	10 U	10 U	**36**	**22**	100 U	**12**	250 U	40 U	**14**	**43**	10 U	10 U	10 U
2-HEXANONE	10	--	10 U	10 U	10 U	10 U	10 U	100 U	10 U	250 U	40 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10	--	10 U	10 U	10 U	10 U	10 U	100 U	10 U	250 U	40 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10	--	**150**	**34**	**16**	**230**	**200**	**240**	**98**	**250 J**	**420**	**100**	**290**	10 U	10 U	10 U
BENZENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
BROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5	70	**10**	**4.4 J**	5 U	5 U	**4.3 J**	50 U	**19**	*130 U*	20 U	5 U	5 U	5 U	5 U	5 U
CIS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
DIBROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
METHYL TERT-BUTYL ETHER	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
METHYLCYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	5	**4.2 JB**	**3.4 JB**	**16 B**	**29 B**	**13 B**	*50 U*	5 U	**130 B**	*20 U*	**23 B**	**15 B**	**17 B**	**15 B**	**20 B**
O-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	5 U	5 U	5 U	5 U	5 U	*50 U*	5 U	*130 U*	*20 U*	5 U	5 U	5 U	5 U	5 U
TOLUENE	5	1000	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,2-DICHLOROETHENE	5	100	5 U	5 U	5 U	5 U	5 U	50 U	5 U	*130 U*	20 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	5	**350 D**	**340 D**	**15**	**93**	**34**	**4200 D**	**170 D**	**8500 D**	**1550 D**	5 U	**83**	5 U	5 U	**5.3**
TRICHLOROFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	50 U	5 U	130 U	20 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*50 U*	*5 U*	*130 U*	*20 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 1-E
Analytical Results of Groundwater Monitoring 10/27/2010
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

		Sample Date	A2ZK3	A2ZK4	A2ZK5	A2ZK6	A2ZK7	A2ZK8	A2ZK9	A2ZL0	A2ZL1/A2ZL2	A2ZL3	A2ZL4	A2ZL5	A2ZL6	A2ZL8
		Sample Location	MPE-01	MPE-02	MPE-03	MPE-05	MPE-07	MPE-09	MPE-14	MPE-15	MPE-17	MPE-18	MPE-21	RW-01	RW-02	TW-31
		Sample Date	10/27/2010	10/27/2010	10/27/2010	10/27/2010	10/27/2010	10/27/2010	10/27/2010	10/27/2010	10/27/2010	10/27/2010	10/27/2010	10/27/2010	10/27/2010	10/27/2010
Chemical	CRQL	CUG														
1,1,1-TRICHLOROETHANE	5	200	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	**59**	**16**	**29**	**27**	10 U	**30**	**21**	10 U	**26**	**16**	**35**	10 U	10 U	10 U
2-HEXANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10	--	**750 DB**	**150 B**	**360 B**	**330 B**	**64 B**	**320**	**250**	**60 B**	**275**	**160 B**	**370 B**	**9.1 JB**	**7.3 JB**	10 U
BENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5	70	5 U	**4.4 J**	**3.7 J**	**3.7 J**	5 U	**4.2 J**	**8.8**	5 U	**4.6 J**	**3 J**	**6.6**	5 U	5 U	5 U
CIS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DIBROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL TERT-BUTYL ETHER	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLCYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	5	**12 B**	**4.7 JB**	**4.5 JB**	**5 B**	**35 B**	**4.2 JB**	**4.8 JB**	**25 B**	**4 JB**	**18 B**	**4.9 JB**	**26 B**	**25 B**	**26 B**
O-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE	5	1000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,2-DICHLOROETHENE	5	100	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	5	**59**	**120**	**28**	**90**	5 U	**470 D**	**61**	5 U	**27**	**16**	**29**	5 U	5 U	**24**
TRICHLOROFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 1-F
Analytical Results of Groundwater Monitoring 11/10/2010
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

		Sample Name	A2ZM6	A2ZM7	A2ZM8	A2ZM9	A2ZN0	A2ZN1	A2ZN2	A2ZN3	A2ZN4/A2ZN5	A2ZN6	A2ZN7	A2ZN9	A2ZP0	A2ZP2
		Sample Location	MPE-01	MPE-02	MPE-03	MPE-05	MPE-07	MPE-09	MPE-14	MPE-15	MPE-17	MPE-18	MPE-21	RW-01	RW-02	TW-31
		Sample Date	11/10/2010	11/10/2010	11/10/2010	11/10/2010	11/10/2010	10/10/2010	11/10/2010	11/10/2010	11/10/2010	11/10/2010	11/10/2010	11/10/2010	11/10/2010	11/10/2010
Chemical	CRQL	CUG														
1,1,1-TRICHLOROETHANE	5	200	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**0.91 J**	5 U	5 U	5 U
1,2,3-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**0.6 J**	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**0.76 J**	5 U	5 U	**0.54 J**	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**0.54 J**	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	**10**	10 U	**25**	**36**	**38**	**48**	10 U	**38**	**46**	**61**	**23**	10 U	10 U	10 U
2-HEXANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10	--	**55**	**150**	**260**	**370**	**340**	**440 D**	**240**	**280**	**425 D**	**340**	**190**	10 U	10 U	10 U
BENZENE	5	--	5 U	**0.61 J**	5 U	5 U	5 U	**0.77 J**	5 U	**1.6 J**	5 U	5 U	5 U	5 U	**1.2 J**	5 U
BROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5	70	**2 J**	**6**	**3.3 J**	**15**	5 U	**8.3**	**14**	**5.4**	**4 J**	5 U	**2.5 J**	5 U	5 U	5 U
CIS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DIBROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL TERT-BUTYL ETHER	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLCYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
O-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	5 U	**0.93 J**	5 U	**0.61 J**	5 U	**0.91 J**	**2.6 J**	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE	5	1000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**0.62 J**	5 U	5 U	5 U	5 U
TRANS-1,2-DICHLOROETHENE	5	100	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	5	**29**	**90**	**15**	**380 D**	5 U	**100**	**110**	**80**	**19.5**	5 U	**11**	5 U	**0.82 J**	**19**
TRICHLOROFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.

Table 1-G
Analytical Results of Groundwater Monitoring 11/23/2010
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

		Sample Name	A2ZP5	A2ZP7	A2ZP6	A2ZP8	A2ZQ9	A2ZQ5	A2ZQ8	A2ZQ7	A2ZQ1/A2ZQ2	A2ZQ6	A2ZQ4	A2ZQ0	A2ZP9	A2ZQ3
		Sample Location	MPE-01	MPE-02	MPE-03	MPE-05	MPE-07	MPE-09	MPE-14	MPE-15	MPE-17	MPE-18	MPE-21	RW-01	RW-02	TW-31
		Sample Date	11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/23/2010
Chemical	CRQL	CUG														
1,1,1-TRICHLOROETHANE	5	200	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHAN	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	*50 U*	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**0.75 J**	5 U
1,2,3-TRICHLOROBENZENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	1000 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	100 U	**23**	**20**	**71**	**6.7 J**	**57**	**26**	**51**	**65.5**	**500 D**	**48**	10 U	10 U	10 U
2-HEXANONE	10	--	100 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10	--	100 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10	--	**1200**	**210**	**210**	**290 D**	**71**	**390 D**	**230**	**320**	**490 D**	**2300 D**	**390 D**	10 U	**4.9 J**	10 U
BENZENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**0.46 J**	5 U	5 U	5 U
BROMOCHLOROMETHANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5	70	50 U	**5.7**	**3.6 J**	**0.85 J**	5 U	**5.2**	**10**	5 U	**5.7**	5 U	**1.2 J**	5 U	5 U	**1.2 J**
CIS-1,3-DICHLOROPROPENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DIBROMOCHLOROMETHANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**12**	5 U	5 U	5 U	5 U
METHYL TERT-BUTYL ETHER	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLCYCLOHEXANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	5	*50 U*	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
O-XYLENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	*50 U*	5 U	5 U	5 U	5 U	**2.6 J**	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE	5	1000	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,2-DICHLOROETHENE	5	100	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	5	*50 U*	**97**	**16**	**13**	5 U	**51**	**56**	**1.1 J**	**37.5**	5 U	**7.7**	5 U	5 U	**17**
TRICHLOROFLUOROMETHANE	5	--	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	*50 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.

Table 1-H
Analytical Results of Groundwater Monitoring 12/8/2010
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

	Sample Date		A2ZX1	A2ZX2	A2ZX3	A2ZX4	A2ZX5	A2ZX6	A2ZX7	A2ZX0/A2ZY2	A2ZX9	A2ZY4	A2ZY5	A2ZY7
	Sample Location		MPE-02	MPE-03	MPE-05	MPE-07	MPE-09	MPE-14	MPE-15	MPE-17	MPE-21	RW-01	RW-02	TW-31
	Sample Date		12/8/2010	12/8/2010	12/8/2010	12/8/2010	12/8/2010	12/8/2010	12/8/2010	12/8/2010	12/8/2010	12/8/2010	12/8/2010	12/8/2010
Chemical	CRQL	CUG												
1,1,1-TRICHLOROETHANE	5	200	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	10 U	10 U	10 U	10 U	**22**	**15**	**66**	**44.5**	**33**	10 U	10 U	10 U
2-HEXANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10	--	**140**	**190**	**120**	**150**	**230**	**130**	**460 D**	**465**	**380**	10 U	10 U	10 U
BENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5	70	**3.8 J**	5 U	5 U	5 U	**2.8 J**	**9**	**4.1 J**	**12.5**	**3.4 J**	5 U	5 U	5 U
CIS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DIBROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL TERT-BUTYL ETHER	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLCYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	5	**2.9 J**	**3 J**	**2.6 J**	5 U	**10 B**	**12 B**	**6.5 B**	**3.5 J**	**6.3 B**	**12 B**	**8.1 B**	**6.6 B**
O-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE	5	1000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,2-DICHLOROETHENE	5	100	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	5	**48**	**3.8 J**	5 U	5 U	**14**	**49**	**10**	**19.5**	**7.7**	5 U	5 U	**8.5**
TRICHLOROFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 1-I
Analytical Results of Groundwater Monitoring 12/22/2010
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

	Sample Date		A2ZZ9	A3000	A3009	A3010	A3001	A3002	A3003/A3004	A3011	A3012	A3008	A3006	A2ZZ8
	Sample Location		MPE-02	MPE-05	MPE-07	MPE-09	MPE-14	MPE-15	MPE-17	MPE-18	MPE-21	RW-01	RW-02	TW-31
	Sample Date		12/22/2010	12/22/2010	12/22/2010	12/22/2010	12/22/2010	12/22/2010	12/22/2010	12/22/2010	12/22/2010	12/22/2010	12/22/2010	12/22/2010
Chemical	CRQL	CUG												
1,1,1-TRICHLOROETHANE	5	200	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	10 U	10 U	10 U	**51**	10 U	10 U	**51**	**68**	**48**	10 U	10 U	10 U
2-HEXANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10	--	**160**	**93**	**110**	**310**	**190**	**330**	**485 D**	**570 D**	**290**	10 U	10 U	10 U
BENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5	70	5 U	5 U	5 U	**3.1 J**	**4.8 J**	5 U	**11**	5 U	**19**	5 U	5 U	5 U
CIS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DIBROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL TERT-BUTYL ETHER	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLCYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	5	**3.4 J**	**8.8**	**5.3**	**5.9 B**	**7.7**	**7.7**	**7 B**	**5.4 B**	**4.7 JB**	**5.3**	**3 J**	**3.2 J**
O-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE	5	1000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,2-DICHLOROETHENE	5	100	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	5	**24**	5 U	5 U	**12 B**	**34**	5 U	**11**	5 U	**37 B**	5 U	5 U	**4.7 J**
TRICHLOROFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 1-J
Analytical Results of Groundwater Monitoring 1/5/2011
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

		Sample Date	A3019	A3020	A3021	A3022	A3023	A3024	A3025	A3026	A3027	A3028	A3029	A3030	A3031
		Sample Location	MPE-02	MPE-03	MPE-05	MPE-07	MPE-09	MPE-14	MPE-15	MPE-17	MPE-18	MPE-21	RW-01	RW-02	TW-31
		Sample Date	1/5/2011	1/5/2011	1/5/2011	1/5/2011	1/5/2011	1/5/2011	1/5/2011	1/5/2011	1/5/2011	1/5/2011	1/5/2011	1/5/2011	1/5/2011
Chemical	CRQL	CUG													
1,1,1-TRICHLOROETHANE	5	200	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	**22**	**12**	10 U	**12**	**57**	**27**	**95**	**91**	**340**	**74**	**7.4 J**	10 U	10 U
2-HEXANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10	--	**160 B**	**120 B**	**110 B**	**91 B**	**330 B**	**230**	**680 BD**	**500 BD**	**1600 BD**	**440 BD**	**24 B**	**8.6 JB**	**10 B**
BENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	**0.48 J**	5 U	5 U	5 U	5 U	5 U	5 U
BROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5	70	**1.8 J**	5 U	5 U	5 U	**1.2 J**	**2 J**	**0.57 J**	**19**	5 U	**13**	5 U	5 U	5 U
CIS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	**1.6 JB**	**1.4 JB**	**1.3 JB**	**1.4 JB**	**1.3 JB**	5 U	**1.1 JB**	**1.3 JB**	**1.2 JB**	**1.2 JB**	**1.3 JB**	**0.89 JB**	**1.2 JB**
DIBROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	5 U	5 U	5 U	5 U	5 U	**1.7 J**	5 U	**8.3**	**8.8**	5 U	5 U	5 U	5 U
METHYL TERT-BUTYL ETHER	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLCYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
O-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE	5	1000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,2-DICHLOROETHENE	5	100	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	5	**26**	5 U	5 U	5 U	**2.9 J**	**9.9**	5 U	**18**	5 U	**14**	5 U	5 U	**4.8 J**
TRICHLOROFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 1-K - Page 1
Analytical Results of Groundwater Monitoring 1/25/2011
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

		Sample Name	A3046	A3047	A3077	A3048	A3049	A3050	A3074	A3052	A3053/A3054	A3055	A3056	A3062	A3058	A3059
		Sample Location	MPE-02	MPE-03	MPE-05	MPE-08	MPE-09	MPE-14	MPE-15	MPE-17	MPE-18	MPE-21	MPE-22	RW-01	RW-02	RW-03
		Sample Date	1/25/2011	1/25/2011	1/28/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011
Chemical	CRQL	CUG														
1,1,1-TRICHLOROETHANE	5	200	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	**14**	**16**	**10**	**170**	**68**	**27**	**170**	**290**	**120**	**120**	**8.8 J**	10 U	10 U	**230**
2-HEXANONE	10	--	10 U	10 U	10 U	**4.6 J**	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10	--	10 U	10 U	10 U	**2.5 J**	10 U	10 U	2.8 J	10 U	10 U	10 U	10 U	10 U	10 U	**3.4 J**
ACETONE	10	--	**170 B**	**160 B**	**120 B**	**1300 BD**	**360 BD**	**240 B**	**980 BD**	**1800 BD**	**1050 BD**	**1100 BD**	**58 B**	**3.5 J**	**9.5 JB**	**1700 BD**
BENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	**0.34 J**	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5	70	5 U	**0.57 J**	5 U	**7.6**	**2 J**	5 U	**8.4**	**13**	5 U	**2.8 J**	**1.6 J**	5 U	5 U	**88**
CIS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	**1.6 JB**	**1.6 JB**	**1.4 JB**	**1.4 JB**	**1.4 JB**	**1.3 JB**	5 U	**1.4 JB**	**1.4 JB**	**1.6 JB**	**1.4 JB**	5 U	**1.5 JB**	**1.6 JB**
DIBROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	5 U	5 U	5 U	**1.8 J**	**2.6 J**	5 U	**5.9**	**4 J**	**10.1**	**3.2 J**	5 U	5 U	5 U	**26**
METHYL TERT-BUTYL ETHER	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLCYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
O-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	**1.7 J**	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE	5	1000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,2-DICHLOROETHENE	5	100	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	5	5 U	5 U	5 U	**20**	**7.2**	5 U	**26**	**19**	5 U	**4.4 J**	**7.7**	5 U	5 U	**180**
TRICHLOROFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
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B - Analyte detected in laboratory blanks.

Table 1-K - Page 2
Analytical Results of Groundwater Monitoring 1/25/2011
In Situ Thermal Treatment
Groveland Wells Superfund Site

		Sample Name	A3060	A3061	A3063	A3064	A3065	A3066	A3067	A3068	A3069	A3070
		Sample Location	RW-04	RW-05	RW-05	RW-06	RW-07	RW-7B	RW-08	RW-09	RW-10B	TW-31
		Sample Date	1/25/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011	1/25/2011
Chemical	CRQL	CUG										
1,1,1-TRICHLOROETHANE	5	200	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	**12**	**11**	**10**	10 U	**340**	**4.9 J**	**2.8 J**	**7.1 J**	**2 J**	10 U
2-HEXANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10	--	10 U	**1.4 J**	**0.87 J**	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10	--	**75 B**	**75**	**78**	10 U	**54**	**8.2 J**	**7.3 J**	**49**	**4.5 J**	10 U
BENZENE	5	--	5 U	5 U	5 U	5 U	**410 D**	5 U	5 U	5 U	5 U	5 U
BROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5	70	**2.3 J**	**4.2 J**	**4.6 J**	**0.66 J**	5 U	5 U	5 U	**1.1 J**	5 U	5 U
CIS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	**1.3 JB**	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DIBROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	5 U	5 U	5 U	5 U	**0.8 J**	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	5 U	5 U	5 U	5 U	**0.66 J**	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	5 U	**0.94 J**	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL TERT-BUTYL ETHER	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLCYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
O-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	5 U	5 U	5 U	5 U	**2 J**	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	5 U	5 U	5 U	5 U	**1.7 J**	5 U	5 U	5 U	5 U	5 U
TOLUENE	5	1000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,2-DICHLOROETHENE	5	100	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	5	**2.6 J**	**15**	**14**	**1 J**	**1.1 J**	5 U	**1.5 J**	**12**	5 U	**1.2 J**
TRICHLOROFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*	*5 U*

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals - based on current federal and st
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 2
Analytical Results of Process Water Sampling - Organic Analysis
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

	Sample Name		A2ZA2	A2ZC3	A2ZC6	A2ZE5	A2ZE6	A2ZG9	A2ZH1	A2ZJ7	A2ZK1	A2ZL9	A2ZM0	A2ZM3	A2ZN8	A2ZP4
	Sample Location		PW01	PW01	PW01	PW01	PW01	PW01	PW01	PW01	PW01	PW01	PW02	PW01	PW01	PW01
	Sample Date		8/11/2010	8/17/2010	8/25/2010	9/1/2010	9/8/2010	9/16/2010	9/22/2010	9/30/2010	10/6/2010	10/27/2010	10/27/2010	11/3/2010	11/10/2010	11/17/2010
Chemical Name	CRQL	CUGs														
1,1,1-TRICHLOROETHANE	5	200	0.82 J	0.68 J	10 U	0.37 J	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHA	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	0.69 JB
1,2,3-TRICHLOROBENZENE	5	--	10 U	10 U	10 U	1.1 JB	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	10 U	10 U	10 U	3 JB	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	10 U	10 U	10 U	**9.3**	25 U	**23**	10 J	**15**	**7.8**	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	10 U	10 U	10 U	**5.4**	25 U	**15 J**	**7.6 J**	**8.9 J**	4.2 J	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	200 U	200 U	200 U	100 U	500 U	400 U	200 U	200 U	100 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	20 U	20 U	20 U	10 U	50 U	40 U	20 U	**64**	**74**	**82**	**100**	**130**	**140**	**240**
2-HEXANONE	10	--	20 U	20 U	20 U	10 U	50 U	40 U	20 U	20 U	10 U	10 U	10 U	10 U	10 U	4.2 J
4-METHYL-2-PENTANONE	10	--	20 U	20 U	20 U	10 U	50 U	40 U	20 U	20 U	10 U	10 U	10 U	10 U	10 U	1.2 J
ACETONE	10	--	20 U	20 U	20 U	**37**	**170**	**280**	**300**	**430**	**790 D**	**760 D**	**800 D**	**1100 D**	**940 D**	**1200 D**
BENZENE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOCHLOROMETHANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	10 U	10 U	10 U	0.68 J	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	10 U	10 U	10 U	1.3 J	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	10 U	10 U	3.5 JB	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	0.97 J	1.8 J	3.1 J
CHLOROMETHANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	0.98 J
CIS-1,2-DICHLOROETHENE	5	70	**36**	**23**	**14**	**9.6**	25 U	20 U	10 U	10 U	4.4 J	5 U	5 U	5 U	5 U	4.1 J
CIS-1,3-DICHLOROPROPENE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	10 U	1.3 JB	10 U	0.72 JB	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	1.5 JB
DIBROMOCHLOROMETHANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	10 U	10 U	10 U	0.28 J	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	10 U	10 U	10 U	0.87 J	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	**9.6**
METHYL TERT-BUTYL ETHER	5	--	10 U	10 U	1.1 J	0.72 J	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLCYCLOHEXANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	**5**	1.5 JB	1.7 JB	10 U	5 U	25 U	20 U	**10 B**	10 U	**6.4**	4.4 JB	**14 B**	5 U	5 U	0.54 J
O-XYLENE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	0.7 J	0.5 J	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE	5	1000	10 U	10 U	10 U	0.44 J	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,2-DICHLOROETHENE	5	100	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	**5**	**1900 D**	**1900 D**	**1500 D**	**1400 D**	**1500 D**	**1400 D**	**740 D**	**710 D**	**250 D**	**49**	**10**	3.4 J	**20**	**28**
TRICHLOROFLUOROMETHANE	5	--	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	10 U	10 U	10 U	5 U	25 U	20 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentration Exceeds the CUG
Italics - Reporting Limit is Higher than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
E - Quantitation is estimated as it exceeds the calibration range of the analysis.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 2
Analytical Results of Process Water Sampling - Organic Analysis
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

	Sample Name		A2ZR0	A2ZR4	A2ZY3	A2ZZ4	A3013	A3017	A3032	A3041	A3044	A3078	A3088	A3090
	Sample Location		PW01	PW01	PW01	PW01	PW01	PW01	PW01	PW01	PW01	PW01	PW01	PW01
	Sample Date		11/23/2010	12/1/2010	12/8/2010	12/14/2010	12/22/2010	12/29/2010	1/5/2011	1/12/2011	1/19/2011	2/3/2011	2/16/2011	2/24/2011
Chemical Name	CRQL	CUGs												
1,1,1-TRICHLOROETHANE	5	200	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHA	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5	7	0.8 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	100	--	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-BUTANONE	10	--	**230**	**140**	**220**	**230**	**170**	**200**	**140**	**390**	**270**	**540 D**	**220**	**500 D**
2-HEXANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	8.2 J	**11**	10 U	**10**
4-METHYL-2-PENTANONE	10	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5.6 J	3.1 J	4.7 J	2.6 J	3.8 J
ACETONE	10	--	**1700 D**	**990 D**	**1500 D**	**2000 D**	**1600 D**	**1500 D**	**940 BD**	**1700 D**	**1300 D**	**3000 BE**	**1800 D**	**4000 D**
BENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	4.1 J	**7.7**	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOMETHANE	5	--	5 U	5 U	5 U	5 U	3 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.8 J	0.67 J	5 U	5 U	5 U
CARBON TETRACHLORIDE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5	--	2.5 J	5 U	5 U	5 U	5 U	**11**	**14**	5 U	5 U	1 J	5 U	5 U
CHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	2.6 J	3.8 J	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5	70	5 U	5 U	5 U	1.8 J	5 U	5 U	1.5 J	2.4 J	1.5 J	3.2 J	5 U	1.1 J
CIS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	1.5 JB	5 U	5 U	1.2 JB	5 U	5 U
DIBROMOCHLOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	3.5 J	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ISOPROPYLBENZENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
M,P-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL ACETATE	5	--	5 U	**7.3**	**13**	**14**	5 U	**6.9**	3.1 J	**8.2**	**6**	**7.7**	4.8 J	**8.3**
METHYL TERT-BUTYL ETHER	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLCYCLOHEXANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	5	**5**	5 U	4.4 JB	5 U	3.3 JB	3 JB	5 U	5 U	5 U	5 U	5 U	3.8 JB	2.6 JB
O-XYLENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE	5	1000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,2-DICHLOROETHENE	5	100	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5	**5**	**19**	5 U	3.7 J	**5.7**	2.5 J	**5.4**	4.7 J	**5.9**	4.2 J	**5.2**	1.2 J	1.6 J
TRICHLOROFLUOROMETHANE	5	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5	2	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U

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CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
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Table 3
Analytical Results of Process Water Sampling - Inorganic Analysis
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

		Sample Name	MA2ZA2/MA2ZA3	MA2ZE6/MA2ZE7	MA2ZK0/MA2ZK1	MA2ZM3/MA2ZM5	MA2ZY3/MA2ZY9	MA3041/MA3042	MA3078/MA3082
		Sample Location	PW01	PW01	PW01	PW01	PW01	PW01	PW01
		Sample Date	8/11/2010	9/8/2010	10/6/2010	11/3/2010	12/8/2010	1/12/2011	2/3/2011
Chemical Name	CRQL	CUGs							
ALUMINUM	200		NA	NA	NA	NA	133 J	NA	NA
ANTIMONY	60		60 U	60 U	60 U	60 U	2.7 J	60 U	7.2 J
ARSENIC	10		10 U	2.5 J	5.6 J	5.2 J	6.6 J	**15.4**	**21.7**
BARIUM	200		66 J	57.2 J	55.2 J	40.1 J	36.8 J	62.7 J	117 J
BERYLLIUM	5		5 U	0.29 J	5 U	5 U	1.1 J	5 U	0.13 J
CADMIUM	5		0.26 J	0.96 J	0.46 J	0.21 J	5 U	5 U	0.29 J
CALCIUM	5000		NA	NA	NA	NA	**24650**	NA	NA
CHROMIUM	10		1.6 J	1.5 J	0.72 J	10 U	10 U	2.7 J	**33.2**
COBALT	50		NA	NA	NA	NA	50 U	NA	NA
COPPER	25		NA	NA	NA	NA	14.9 J	NA	NA
IRON	100		**1189**	**2061**	**1747**	**378**	**1545**	**2070**	**4750**
LEAD	10		**43.8**	**15.6**	**10.4**	3.4 J	10 U	4.9 J	1.8 J
MAGNESIUM	5000		NA	NA	NA	NA	4685 J	NA	NA
MANGANESE	15		**207**	**379**	**438**	**509**	**722**	**1575**	**3785**
MERCURY	0.2		0.2 U	**0.49**	**0.23** J	0.2 U	0.08 J	0.2 U	0.2 U
NICKEL	40		10 J	25 J	3 J	7.8 J	8.3 J	20.2 J	35.4 J
POTASSIUM	5000		NA	NA	NA	NA	**7275**	NA	NA
SELENIUM	35		35 U	35 U	35 U	35 U	35 U	8.8 J	9.7 J
SILVER	10		10 U	10 U	10 U	10 U	3.5 J	10 U	10 U
SODIUM	5000		NA	NA	NA	NA	**133500**	NA	NA
THALLIUM	25		NA	NA	NA	NA	25 U	NA	NA
VANADIUM	50		50 U	50 U	1.2 J	1.2 J	14.8 J	50 U	3 J
ZINC	60		**207**	**185**	45.1 J	57.55	13.7 J	36 J	39.8 J

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CUG - Interim Cleanup Goals based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentration Exceeds the CUG
Italics - Reporting Limit is Higher than the CUG

LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.

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Well ID	ISTT Area	Date	Total VOC (ppm)[1]	Trichloroethylene (ppbv)[2]	Tetrachloroethylene (ppbv)[2]	1,1,1-Trichloroethane (ppbv)[2]	cis 1,2-Dichloroethene (ppbv)[2]	1,1-Dichloroethene (ppbv)[2]	Trans 1,2-Dichloroethene (ppbv)[2]
VEW-01	A	8/9/2010	5.1	NA	NA	NA	NA	NA	NA
		8/17/2010	5	1.3	ND (0.8)	ND (3)	0	ND (30)	ND (25)
		8/25/2010	6.4	NA	NA	NA	NA	NA	NA
		9/1/2010	6	9.1	1.2	ND (3)	41	ND (25)	ND (50)
		9/8/2010	7.3	NA	NA	NA	NA	NA	NA
		9/15/2010	6.5	NA	NA	NA	NA	NA	NA
		9/22/2010	8.7	NA	NA	NA	NA	NA	NA
		9/29/2010	11	NA	NA	NA	NA	NA	NA
		11/17/2010	6.1	NA	NA	NA	NA	NA	NA
		11/23/2010	25	52	30	ND(5)	309	90	44
		12/1/2010	7.3	NA	NA	NA	NA	NA	NA
		12/7/2010	10.6	NA	NA	NA	NA	NA	NA
		12/14/2010	3.1	12	ND(1)	ND(5)	90	NA	ND(50)
		12/22/2010	9.8	NA	NA	NA	NA	NA	NA
		1/5/2011	4.2	NA	NA	NA	NA	NA	NA
		1/13/2011	0	NA	NA	NA	NA	NA	NA
		1/19/2011	1	NA	NA	NA	NA	NA	NA
VEW-02	A	8/9/2010	4.5	NA	NA	NA	NA	NA	NA
		8/17/2010	8	85	331	ND (3)	57	ND (30)	ND (25)
		8/25/2010	6.5	NA	NA	NA	NA	NA	NA
		9/1/2010	5	272	13	ND (3)	110	ND(25)	ND (50)
		9/8/2010	5.2	NA	NA	NA	NA	NA	NA
		9/15/2010	2.9	NA	NA	NA	NA	NA	NA
		9/22/2010	7.8	NA	NA	NA	NA	NA	NA
		9/29/2010	7.4	NA	NA	NA	NA	NA	NA
		10/8/2010	5.2	NA	NA	NA	NA	NA	NA
		10/21/2010	20.7	NA	NA	NA	NA	NA	NA
		10/27/2010	15.8	NA	NA	NA	NA	NA	NA
		11/3/2010	8.1	201	10	ND (5)	331	11	ND (20)
		11/10/2010	6.8	NA	NA	NA	NA	NA	NA
		11/17/2010	5.3	NA	NA	NA	NA	NA	NA
		11/23/2010	13	225	18	ND(5)	670	65	81
		12/1/2010	10.1	NA	NA	NA	NA	NA	NA
		12/7/2010	18.8	NA	NA	NA	NA	NA	NA
		12/14/2010	2.8	142	21	ND(5)	257	NA	450
		12/22/2010	5.2	NA	NA	NA	NA	NA	NA
		1/5/2011	6.4	NA	NA	NA	NA	NA	NA
		1/13/2011	5	NA	NA	NA	NA	NA	NA
		1/19/2011	0	NA	NA	NA	NA	NA	NA
		2/7/2011	2	468	20	ND (5)	1660	NA	NA
VEW-03	A	8/9/2010	1.1	NA	NA	NA	NA	NA	NA
		8/17/2010	8	7.3	26	ND (3)	0	ND (30)	ND (25)
		8/25/2010	2.1	NA	NA	NA	NA	NA	NA
		9/1/2010	7	85	37	ND (3)	0	ND(25)	ND (50)
		9/8/2010	7.1	NA	NA	NA	NA	NA	NA
		9/15/2010	8.2	NA	NA	NA	NA	NA	NA
		9/22/2010	22	NA	NA	NA	NA	NA	NA
		9/29/2010	74	NA	NA	NA	NA	NA	NA
		10/8/2010	40	NA	NA	NA	NA	NA	NA
		11/17/2010	34	NA	NA	NA	NA	NA	NA

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Well ID	ISTT Area	Date	Total VOC (ppm)(1)	Trichloroethylene (ppbv)(2)	Tetrachloroethylene (ppbv)(2)	1,1,1-Trichloroethane (ppbv)(2)	cis 1,2-Dichloroethene (ppbv)(2)	1,1-Dichloroethene (ppbv)(2)	Trans 1,2-Dichloroethene (ppbv)(2)
		11/23/2010	8.7	48	12	ND(5)	74	125	110
		12/1/2010	9.9	NA	NA	NA	NA	NA	NA
		12/7/2010	23	NA	NA	NA	NA	NA	NA
		12/14/2010	NA	1.4	ND(1)	ND(5)	0	NA	ND(50)
		12/22/2010	12.5	NA	NA	NA	NA	NA	NA
VEW-03	A	1/5/2011	10.3	NA	NA	NA	NA	NA	NA
		1/13/2011	7	NA	NA	NA	NA	NA	NA
		1/19/2011	8	NA	NA	NA	NA	NA	NA
		2/7/2011	8	585	30	ND (5)	2020	NA	NA
		8/9/2010	4.1	NA	NA	NA	NA	NA	NA
		8/17/2010	6	61	77	ND (3)	69	ND (30)	ND (25)
		8/25/2010	5.2	NA	NA	NA	NA	NA	NA
		9/1/2010	6	220	74	ND (3)	49	ND (25)	ND (50)
		9/8/2010	8.7	NA	NA	NA	NA	NA	NA
		9/15/2010	6.3	NA	NA	NA	NA	NA	NA
		9/29/2010	13	NA	NA	NA	NA	NA	NA
		11/17/2010	NR	NA	NA	NA	NA	NA	NA
VEW-04	A	11/23/2010	51	520	149	ND(5)	1485	277	82
		12/1/2010	17	NA	NA	NA	NA	NA	NA
		12/7/2010	32.8	NA	NA	NA	NA	NA	NA
		12/14/2010	9.9	284	34	ND(5)	640	NA	121
		12/22/2010	13.1	NA	NA	NA	NA	NA	NA
		1/5/2011	15.4	NA	NA	NA	NA	NA	NA
		1/13/2011	20	NA	NA	NA	NA	NA	NA
		1/19/2011	58	NA	NA	NA	NA	NA	NA
		1/28/2011	165	NA	NA	NA	NA	NA	NA
		2/7/2011	40	919	24	ND (5)	3600	NA	NA
		8/9/2010	7.9	NA	NA	NA	NA	NA	NA
		9/29/2010	75	NA	NA	NA	NA	NA	NA
		10/8/2010	52.5	NA	NA	NA	NA	NA	NA
		10/21/2010	70.3	NA	NA	NA	NA	NA	NA
		10/27/2010	65.1	NA	NA	NA	NA	NA	NA
		11/3/2010	7.6	550	15	ND (5)	1600	157	70
		11/10/2010	23.9	NA	NA	NA	NA	NA	NA
		11/17/2010	29	NA	NA	NA	NA	NA	NA
		11/23/2010	77	710	44	ND(5)	2700	870	165
VEW-05	A	12/1/2010	35.2	NA	NA	NA	NA	NA	NA
		12/7/2010	50.8	NA	NA	NA	NA	NA	NA
		12/14/2010	27	540	16	ND(5)	1160	NA	178
		12/22/2010	24.2	NA	NA	NA	NA	NA	NA
		1/5/2011	49.8	NA	NA	NA	NA	NA	NA
		1/13/2011	218	NA	NA	NA	NA	NA	NA
		1/18/2011	0	NA	NA	NA	NA	NA	NA
		1/19/2011	22	NA	NA	NA	NA	NA	NA
		1/28/2011	31	NA	NA	NA	NA	NA	NA
		2/7/2011	4	1504	21	ND (5)	2700	NA	NA
		8/9/2010	2.9	NA	NA	NA	NA	NA	NA
		9/29/2010	32	NA	NA	NA	NA	NA	NA
		10/8/2010	12.1	NA	NA	NA	NA	NA	NA
		10/21/2010	21.2	NA	NA	NA	NA	NA	NA

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Well ID	ISTT Area	Date	Total VOC (ppm)[1]	Trichloroethylene (ppbv)[2]	Tetrachloroethylene (ppbv)[2]	1,1,1-Trichloroethane (ppbv)[2]	cis 1,2-Dichloroethene (ppbv)[2]	1,1-Dichloroethene (ppbv)[2]	Trans 1,2-Dichloroethene (ppbv)[2]
VEW-06	A	10/27/2010	18.2	NA	NA	NA	NA	NA	NA
		11/3/2010	2.9	16	ND (1)	ND (5)	370	67	43
		11/10/2010	7.3	NA	NA	NA	NA	NA	NA
		11/17/2010	2.2	NA	NA	NA	NA	NA	NA
		1/5/2011	9.1	NA	NA	NA	NA	NA	NA
		1/13/2011	88	NA	NA	NA	NA	NA	NA
VEW-06	A	1/18/2011	0.2	NA	NA	NA	NA	NA	NA
		1/19/2011	2	NA	NA	NA	NA	NA	NA
VEW-07	A	8/9/2010	3.5	NA	NA	NA	NA	NA	NA
		9/29/2010	16	NA	NA	NA	NA	NA	NA
		11/17/2010	0	NA	NA	NA	NA	NA	NA
		11/23/2010	20	12	3.3	ND(5)	0	36	73
		12/12/2010	2.4	NA	NA	NA	NA	NA	NA
		12/7/2010	7.7	NA	NA	NA	NA	NA	NA
		12/14/2010	3.5	35	ND(1)	ND(5)	160	NA	24
		12/22/2010	9.6	NA	NA	NA	NA	NA	NA
		1/5/2011	21.6	NA	NA	NA	NA	NA	NA
		1/13/2011	4	NA	NA	NA	NA	NA	NA
		1/19/2011	0	NA	NA	NA	NA	NA	NA
VEW-08	A	8/9/2010	10.8	NA	NA	NA	NA	NA	NA
		9/29/2010	11	NA	NA	NA	NA	NA	NA
		11/17/2010	2.2	NA	NA	NA	NA	NA	NA
		1/5/2011	8.4	NA	NA	NA	NA	NA	NA
		1/13/2011	3	NA	NA	NA	NA	NA	NA
		1/19/2011	7	NA	NA	NA	NA	NA	NA
VEW-09	A	8/9/2010	14.2	NA	NA	NA	NA	NA	NA
		8/17/2010	0	2344	223	ND (3)	890	ND (30)	ND (25)
		8/25/2010	4.5	NA	NA	NA	NA	NA	NA
		9/1/2010	22	4160	330	ND (3)	704	ND (25)	ND (50)
		9/8/2010	73	NA	NA	NA	NA	NA	NA
		9/15/2010	66.1	NA	NA	NA	NA	NA	NA
		9/22/2010	81	NA	NA	NA	NA	NA	NA
		9/29/2010	151	NA	NA	NA	NA	NA	NA
		10/8/2010	28.9	NA	NA	NA	NA	NA	NA
		10/21/2010	137.1	NA	NA	NA	NA	NA	NA
		10/27/2010	55.8	NA	NA	NA	NA	NA	NA
		11/3/2010	38.7	1370	105	ND (5)	2560	217	310
		11/10/2010	24.8	NA	NA	NA	NA	NA	NA
		11/17/2010	33	NA	NA	NA	NA	NA	NA
		11/23/2010	105	1115	60	ND(5)	3780	1200	544
		12/1/2010	25	NA	NA	NA	NA	NA	NA
		12/7/2010	59	NA	NA	NA	NA	NA	NA
		12/14/2010	24	816	29	ND(5)	1340	NA	283
		12/22/2010	12.4	NA	NA	NA	NA	NA	NA
		1/5/2011	47.8	NA	NA	NA	NA	NA	NA
		1/13/2011	24	NA	NA	NA	NA	NA	NA
		1/19/2011	32	NA	NA	NA	NA	NA	NA
		1/28/2011	84	NA	NA	NA	NA	NA	NA
		2/7/2011	14	2440	37	ND (5)	4500	NA	NA
		8/9/2010	2.3	NA	NA	NA	NA	NA	NA

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Well ID	ISTT Area	Date	Total VOC (ppm)[1]	Trichloroethylene (ppbv)[2]	Tetrachloroethylene (ppbv)[2]	1,1,1-Trichloroethane (ppbv)[2]	cis 1,2-Dichloroethene (ppbv)[2]	1,1-Dichloroethene (ppbv)[2]	Trans 1,2-Dichloroethene (ppbv)[2]
VEW-10	D	9/29/2010	5.8	NA	NA	NA	NA	NA	NA
		11/17/2010	0.8	NA	NA	NA	NA	NA	NA
		12/22/2010	8.5	NA	NA	NA	NA	NA	NA
		12/29/2010	4.3	NA	NA	NA	NA	NA	NA
		1/19/2011	3	NA	NA	NA	NA	NA	NA
		1/28/2011	2	NA	NA	NA	NA	NA	NA
VEW-11	D	8/9/2010	5.4	NA	NA	NA	NA	NA	NA
		9/29/2010	6.4	NA	NA	NA	NA	NA	NA
		11/17/2010	1.2	NA	NA	NA	NA	NA	NA
VEW-11	D	12/22/2010	4.1	NA	NA	NA	NA	NA	NA
		12/29/2010	4	NA	NA	NA	NA	NA	NA
		1/19/2011	2	NA	NA	NA	NA	NA	NA
		1/28/2011	5	NA	NA	NA	NA	NA	NA
VEW-12	D	8/9/2010	4.6	NA	NA	NA	NA	NA	NA
		9/29/2010	13	NA	NA	NA	NA	NA	NA
		11/17/2010	29	NA	NA	NA	NA	NA	NA
		11/23/2010	13	32	1.6	ND(5)	970	364	165
		12/1/2010	10.3	NA	NA	NA	NA	NA	NA
		12/7/2010	19.5	NA	NA	NA	NA	NA	NA
		12/14/2010	2.7	68	1.6	ND(5)	552	NA	121
		12/22/2010	8.5	NA	NA	NA	NA	NA	NA
		12/29/2010	4	NA	NA	NA	NA	NA	NA
		1/19/2011	6	NA	NA	NA	NA	NA	NA
		1/28/2011	25	NA	NA	NA	NA	NA	NA
VEW-13	A	8/9/2010	3.1	NA	NA	NA	NA	NA	NA
		9/29/2010	29	NA	NA	NA	NA	NA	NA
		10/8/2010	47.4	NA	NA	NA	NA	NA	NA
		10/21/2010	94	NA	NA	NA	NA	NA	NA
		10/27/2010	25.7	NA	NA	NA	NA	NA	NA
		11/3/2010	3.4	54	ND (1)	ND (5)	1528	187	188
		11/10/2010	17.8	NA	NA	NA	NA	NA	NA
		11/17/2010	12	NA	NA	NA	NA	NA	NA
		11/23/2010	30	225	6.7	ND(5)	22	197	211
		12/1/2010	19.5	NA	NA	NA	NA	NA	NA
		12/7/2010	28.4	NA	NA	NA	NA	NA	NA
		12/14/2010	18	140	6.4	ND(5)	617	NA	194
		12/22/2010	13.9	NA	NA	NA	NA	NA	NA
		12/29/2010	9.4	NA	NA	NA	NA	NA	NA
		1/5/2011	38	NA	NA	NA	NA	NA	NA
		1/19/2011	8	NA	NA	NA	NA	NA	NA
		1/28/2011[3]	26	1.6	ND (0.35)	ND (0.35)	1.2	ND (0.35)	ND (0.35)
VEW-14	A	8/9/2010	1.3	NA	NA	NA	NA	NA	NA
		9/29/2010	93	NA	NA	NA	NA	NA	NA
		10/8/2010	47	NA	NA	NA	NA	NA	NA
		10/21/2010	36.1	NA	NA	NA	NA	NA	NA
		10/27/2010	23.3	NA	NA	NA	NA	NA	NA
		11/3/2010	1.2	38	2	ND (5)	255	30	21
		11/10/2010	8	NA	NA	NA	NA	NA	NA
		11/17/2010	4.7	NA	NA	NA	NA	NA	NA

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		12/22/2010	18.8	NA	NA	NA	NA	NA	NA
		12/29/2010	1.4	NA	NA	NA	NA	NA	NA
		1/5/2011	6.6	NA	NA	NA	NA	NA	NA
		1/19/2011	1	NA	NA	NA	NA	NA	NA
		1/28/2011	5	NA	NA	NA	NA	NA	NA
		8/9/2010	6.2	NA	NA	NA	NA	NA	NA
		8/17/2010	10	1910	84	ND (3)	533	ND (30)	ND (25)
		8/25/2010	6.8	NA	NA	NA	NA	NA	NA
VEW-15	A	9/1/2010	26	4930	139	ND (3)	704	ND (25)	ND (50)
		9/8/2010	42	NA	NA	NA	NA	NA	NA
		9/15/2010	60.2	NA	NA	NA	NA	NA	NA
		9/22/2010	107	NA	NA	NA	NA	NA	NA
		9/29/2010	268	NA	NA	NA	NA	NA	NA
		10/8/2010	164.3	NA	NA	NA	NA	NA	NA
		10/21/2010	265.8	NA	NA	NA	NA	NA	NA
		10/27/2010	164.3	NA	NA	NA	NA	NA	NA
		11/3/2010	23.4	2690	75	ND (5)	2920	170	ND (600)
		11/10/2010	57	NA	NA	NA	NA	NA	NA
		11/17/2010	102	NA	NA	NA	NA	NA	NA
		11/23/2010	128	3160	107	ND(5)	5400	700	826
VEW-15	A	12/1/2010	69.3	NA	NA	NA	NA	NA	NA
		12/7/2010	64.8	NA	NA	NA	NA	NA	NA
		12/14/2010	43	5400	96	ND(5)	3780	NA	848
		12/22/2010	20.8	NA	NA	NA	NA	NA	NA
		1/5/2011	179.4	NA	NA	NA	NA	NA	NA
		1/12/2011	NA	1.4	ND(0.15)	ND(0.15	0	ND(0.15)	ND(0.15)
		1/18/2011	3.6	NA	NA	NA	NA	NA	NA
		1/19/2011	9	NA	NA	NA	NA	NA	NA
		2/7/2011	4	885	19	ND (5)	562	NA	NA
		8/9/2010	4	NA	NA	NA	NA	NA	NA
		8/17/2010	6	16	ND (0.8)	ND (3)	0	ND (30)	ND (25)
		8/25/2010	5.9	NA	NA	NA	NA	NA	NA
		9/1/2010	5	133	1.2	ND (3)	26	ND (25)	ND (50)
		9/8/2010	8.1	NA	NA	NA	NA	NA	NA
		9/15/2010	3.4	NA	NA	NA	NA	NA	NA
		9/22/2010	12	NA	NA	NA	NA	NA	NA
VEW-16	C	9/29/2010	15	NA	NA	NA	NA	NA	NA
		11/17/2010	2.5	NA	NA	NA	NA	NA	NA
		1/5/2011	23.1	NA	NA	NA	NA	NA	NA
		1/13/2011	6	NA	NA	NA	NA	NA	NA
		1/19/2011	3	NA	NA	NA	NA	NA	NA
		1/28/2011	30	NA	NA	NA	NA	NA	NA
		2/7/2011	2	986	10	ND (5)	1010	NA	NA
		8/9/2010	15.9	NA	NA	NA	NA	NA	NA
		8/17/2010	16	1354	74	ND (3)	305	ND (30)	ND (25)
		8/25/2010	8.4	NA	NA	NA	NA	NA	NA
		9/1/2010	101	12130	347	ND (3)	2060	270	ND (50)
		9/8/2010	164	NA	NA	NA	NA	NA	NA
		9/15/2010	74.7	NA	NA	NA	NA	NA	NA
		9/22/2010	129	NA	NA	NA	NA	NA	NA

Table 4
Field Data and Analytical Results of Shallow Soil Vapor Extraction Wells
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

Well ID	ISTT Area	Date	Total VOC (ppm)[1]	Trichloroethylene (ppbv)[2]	Tetrachloroethylene (ppbv)[2]	1,1,1-Trichloroethane (ppbv)[2]	cis 1,2-Dichloroethene (ppbv)[2]	1,1-Dichloroethene (ppbv)[2]	Trans 1,2-Dichloroethene (ppbv)[2]
VEW-17	A	9/29/2010	185	NA	NA	NA	NA	NA	NA
		10/8/2010	105.8	NA	NA	NA	NA	NA	NA
		10/21/2010	146.9	NA	NA	NA	NA	NA	NA
		10/27/2010	70.7	NA	NA	NA	NA	NA	NA
		11/3/2010	50.2	3990	132	ND (5)	3500	200	ND (600)
		11/10/2010	37	NA	NA	NA	NA	NA	NA
		11/17/2010	45	NA	NA	NA	NA	NA	NA
		11/23/2010	71	778	21	ND(5)	855	125	138
		12/1/2010	36.9	NA	NA	NA	NA	NA	NA
		12/7/2010	54.4	NA	NA	NA	NA	NA	NA
		12/14/2010	39	5820	88	ND(5)	2160	NA	476
		12/22/2010	38.3	NA	NA	NA	NA	NA	NA
		1/5/2011	49.9	NA	NA	NA	NA	NA	NA
		1/13/2011	25	NA	NA	NA	NA	NA	NA
VEW-18	A	8/9/2010	10.3	NA	NA	NA	NA	NA	NA
		8/17/2010	8	2430	64	ND (3)	401	ND (30)	ND (25)
VEW-18	A	8/25/2010	5.8	NA	NA	NA	NA	NA	NA
		9/1/2010	51	14670	200	ND (3)	1470	ND (1000)	ND (1000)
		9/8/2010	95	NA	NA	NA	NA	NA	NA
		9/15/2010	35.6	NA	NA	NA	NA	NA	NA
		9/22/2010	22	NA	NA	NA	NA	NA	NA
		9/29/2010	13	NA	NA	NA	NA	NA	NA
		11/17/2010	6.5	NA	NA	NA	NA	NA	NA
		11/23/2010	13	43	ND(1)	ND(5)	0	35	ND(50)
		12/1/2010	13.3	NA	NA	NA	NA	NA	NA
		12/7/2010	7.9	NA	NA	NA	NA	NA	NA
		12/14/2010	11	653	12	ND(5)	1260	NA	ND(200)
		12/22/2010	6.8	NA	NA	NA	NA	NA	NA
		1/5/2011	11.9	NA	NA	NA	NA	NA	NA
		1/13/2011	5	NA	NA	NA	NA	NA	NA
		1/19/2011	3	NA	NA	NA	NA	NA	NA
VEW-19	C	8/9/2010	1.6	NA	NA	NA	NA	NA	NA
		8/17/2010	5	114	ND (0.8)	ND (3)	22	ND (30)	ND (25)
		8/25/2010	4.8	NA	NA	NA	NA	NA	NA
		9/1/2010	6	544	2.4	ND (3)	65	ND (25)	ND (50)
		9/8/2010	28	NA	NA	NA	NA	NA	NA
		9/15/2010	7.4	NA	NA	NA	NA	NA	NA
		9/22/2010	11	NA	NA	NA	NA	NA	NA
		9/29/2010	17	NA	NA	NA	NA	NA	NA
		10/8/2010	34.4	NA	NA	NA	NA	NA	NA
		10/21/2010	50.7	NA	NA	NA	NA	NA	NA
		10/27/2010	16.9	NA	NA	NA	NA	NA	NA
		11/3/2010	14.4	787	5	ND (5)	594	73	ND (20)
		11/17/2010	3.1	NA	NA	NA	NA	NA	NA
		12/1/2010	21.5	NA	NA	NA	NA	NA	NA
		1/5/2011	36.4	NA	NA	NA	NA	NA	NA
		1/13/2011	11	NA	NA	NA	NA	NA	NA
		1/19/2011	9	NA	NA	NA	NA	NA	NA
		1/28/2011	42	NA	NA	NA	NA	NA	NA
		2/7/2011	18	8350	50	ND (5)	3600	NA	NA

Table 4
Field Data and Analytical Results of Shallow Soil Vapor Extraction Wells
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

Well ID	ISTT Area	Date	Total VOC (ppm)[1]	Trichloroethylene (ppbv)[2]	Tetrachloroethylene (ppbv)[2]	1,1,1-Trichloroethane (ppbv)[2]	cis 1,2-Dichloroethene (ppbv)[2]	1,1-Dichloroethene (ppbv)[2]	Trans 1,2-Dichloroethene (ppbv)[2]
VEW-20	C	8/9/2010	4.5	NA	NA	NA	NA	NA	NA
		9/29/2010	42	NA	NA	NA	NA	NA	NA
		10/8/2010	60.7	NA	NA	NA	NA	NA	NA
		10/21/2010	50.6	NA	NA	NA	NA	NA	NA
		10/27/2010	20.2	NA	NA	NA	NA	NA	NA
		11/3/2010	2.7	56	6	ND (5)	934	120	69
		11/10/2010	23.9	NA	NA	NA	NA	NA	NA
		11/17/2010	11	NA	NA	NA	NA	NA	NA
		11/23/2010	47	130	18	ND(5)	2450	411	128
		12/1/2010	15.2	NA	NA	NA	NA	NA	NA
		12/7/2010	12.3	NA	NA	NA	NA	NA	NA
		12/14/2010	7.9	210	44	ND(5)	874	NA	ND(200)
		12/22/2010	9.9	NA	NA	NA	NA	NA	NA
		12/29/2010	3.6	NA	NA	NA	NA	NA	NA
		1/5/2011	32.9	NA	NA	NA	NA	NA	NA
		1/28/2011[3]	41	1.9	1.6	ND (0.22)	4.6	ND (0.22)	ND (0.22)
VEW-21	A	8/9/2010	11.1	NA	NA	NA	NA	NA	NA
		8/17/2010	5	868	21	ND (3)	125	ND (30)	ND (25)
		8/25/2010	3.8	NA	NA	NA	NA	NA	NA
VEW-21	A	9/1/2010	42	9200	306	ND (3)	2200	ND (25)	ND (50)
		9/8/2010	93	NA	NA	NA	NA	NA	NA
		9/15/2010	88.8	NA	NA	NA	NA	NA	NA
		9/22/2010	139	NA	NA	NA	NA	NA	NA
		9/29/2010	177	NA	NA	NA	NA	NA	NA
		10/8/2010	108.2	NA	NA	NA	NA	NA	NA
		10/21/2010	68.7	NA	NA	NA	NA	NA	NA
		10/27/2010	41.1	NA	NA	NA	NA	NA	NA
		11/3/2010	21.9	1055	30	ND(5)	1935	183	245
		11/10/2010	41.4	NA	NA	NA	NA	NA	NA
		11/17/2010	25	NA	NA	NA	NA	NA	NA
		11/23/2010	60	1397	32	ND(5)	2700	500	266
		12/1/2010	31.4	NA	NA	NA	NA	NA	NA
		12/7/2010	25	NA	NA	NA	NA	NA	NA
		12/14/2010	23	1350	24	ND(5)	1260	NA	275
		12/22/2010	14.7	NA	NA	NA	NA	NA	NA
		1/5/2011	37.9	NA	NA	NA	NA	NA	NA
		1/13/2011	20	NA	NA	NA	NA	NA	NA
		1/19/2011	9	NA	NA	NA	NA	NA	NA
		1/28/2011	65	NA	NA	NA	NA	NA	NA
		2/7/2011	22	4510	72	ND (5)	2920	NA	NA
VEW-22	A	8/9/2010	8.4	NA	NA	NA	NA	NA	NA
		9/29/2010	20	NA	NA	NA	NA	NA	NA
		10/21/2010	25	NA	NA	NA	NA	NA	NA
		10/27/2010	11.6	NA	NA	NA	NA	NA	NA
		11/3/2010	2.6	415	9	ND (5)	610	81	40
		12/1/2010	3.5	NA	NA	NA	NA	NA	NA
		11/17/2010	4.1	NA	NA	NA	NA	NA	NA
		1/5/2011	9.5	NA	NA	NA	NA	NA	NA
		1/13/2011	3	NA	NA	NA	NA	NA	NA
		1/19/2011	2	NA	NA	NA	NA	NA	NA

Table 4
Field Data and Analytical Results of Shallow Soil Vapor Extraction Wells
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

Well ID	ISTT Area	Date	Total VOC (ppm)[1]	Trichloroethylene (ppbv)[2]	Tetrachloroethylene (ppbv)[2]	1,1,1-Trichloroethane (ppbv)[2]	cis 1,2-Dichloroethene (ppbv)[2]	1,1-Dichloroethene (ppbv)[2]	Trans 1,2-Dichloroethene (ppbv)[2]
VEW-23	C	8/9/2010	0.6	NA	NA	NA	NA	NA	NA
		8/17/2010	7	232	ND (0.8)	ND (3)	62	ND (30)	ND (25)
		8/25/2010	7.3	NA	NA	NA	NA	NA	NA
		9/1/2010	15	2520	12	ND (3)	704	115	ND (50)
		9/8/2010	58	NA	NA	NA	NA	NA	NA
		9/15/2010	7.1	NA	NA	NA	NA	NA	NA
		9/22/2010	6.2	NA	NA	NA	NA	NA	NA
		9/29/2010	19	NA	NA	NA	NA	NA	NA
		11/17/2010	5.7	NA	NA	NA	NA	NA	NA
		11/23/2010	87	3656	17	ND(5)	4050	446	964
		12/1/2010	48.3	NA	NA	NA	NA	NA	NA
		12/7/2010	38.7	NA	NA	NA	NA	NA	NA
		12/14/2010	20	NA	NA	NA	NA	NA	NA
		12/22/2010	15.4	NA	NA	NA	NA	NA	NA
		1/5/2011	15.6	NA	NA	NA	NA	NA	NA
		1/13/2011	10	NA	NA	NA	NA	NA	NA
		1/19/2011	5	NA	NA	NA	NA	NA	NA
		1/28/2011	49	NA	NA	NA	NA	NA	NA
		2/7/2011	1	384	2	ND (5)	338	NA	NA
VEW-24	B	8/9/2010	4.6	NA	NA	NA	NA	NA	NA
		8/17/2010	5	86	1.2	ND (3)	20	ND (30)	ND (25)
		8/25/2010	5.4	NA	NA	NA	NA	NA	NA
VEW-24	B	9/1/2010	15	296	3.6	ND (3)	23	ND (25)	ND (50)
		9/8/2010	43	NA	NA	NA	NA	NA	NA
		9/15/2010	63.7	NA	NA	NA	NA	NA	NA
		9/22/2010	57	NA	NA	NA	NA	NA	NA
		9/29/2010	176	NA	NA	NA	NA	NA	NA
		10/8/2010	47.3	NA	NA	NA	NA	NA	NA
		10/21/2010	24.8	NA	NA	NA	NA	NA	NA
		10/27/2010	14.3	NA	NA	NA	NA	NA	NA
		11/23/2010	5	250	3	ND (5)	560	87	ND (20)
		11/10/2010	11.2	NA	NA	NA	NA	NA	NA
		11/17/2010	4.3	NA	NA	NA	NA	NA	NA
		1/5/2011	16.2	NA	NA	NA	NA	NA	NA
		1/13/2011	5	NA	NA	NA	NA	NA	NA
		1/19/2011	3	NA	NA	NA	NA	NA	NA
VEW-25	B	8/9/2010	1.9	NA	NA	NA	NA	NA	NA
		9/29/2010	8.5	NA	NA	NA	NA	NA	NA
		11/17/2010	7.5	NA	NA	NA	NA	NA	NA
		11/23/2010	36	1917	16	ND(5)	1552	196	119
		12/1/2010	11.9	NA	NA	NA	NA	NA	NA
		12/7/2010	19.3	NA	NA	NA	NA	NA	NA
		12/14/2010	6.3	NA	NA	NA	NA	NA	NA
		12/22/2010	6.9	NA	NA	NA	NA	NA	NA
		1/13/2011	6	NA	NA	NA	NA	NA	NA
		1/19/2011	6	NA	NA	NA	NA	NA	NA
		2/7/2011	15	4510	16	ND (5)	1350	NA	NA
		8/9/2010	7.1	NA	NA	NA	NA	NA	NA
		8/17/2010	5	32	28	ND (3)	0	ND (30)	ND (25)
		8/25/2010	4.4	NA	NA	NA	NA	NA	NA

Table 4
Field Data and Analytical Results of Shallow Soil Vapor Extraction Wells
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

Well ID	ISTT Area	Date	Total VOC (ppm)[1]	Trichloroethylene (ppbv)[2]	Tetrachloroethylene (ppbv)[2]	1,1,1-Trichloroethane (ppbv)[2]	cis 1,2-Dichloroethene (ppbv)[2]	1,1-Dichloroethene (ppbv)[2]	Trans 1,2-Dichloroethene (ppbv)[2]
VEW-26	C	9/1/2010	5	117	1	ND (3)	0	ND (25)	ND (50)
		9/8/2010	4.2	NA	NA	NA	NA	NA	NA
		9/15/2010	6.9	NA	NA	NA	NA	NA	NA
		9/22/2010	9.6	NA	NA	NA	NA	NA	NA
		9/29/2010	18	NA	NA	NA	NA	NA	NA
		11/17/2010	2.8	NA	NA	NA	NA	NA	NA
		1/5/2011	11.1	NA	NA	NA	NA	NA	NA
		1/13/2011	4	NA	NA	NA	NA	NA	NA
		1/19/2011	2	NA	NA	NA	NA	NA	NA
		1/28/2011	12	NA	NA	NA	NA	NA	NA
		2/7/2011	1	342	4	ND (5)	472	NA	NA
VEW-27	C	8/9/2010	8.1	NA	NA	NA	NA	NA	NA
		8/17/2010	7	34	ND (0.8)	ND (3)	0	ND (30)	ND (25)
		8/25/2010	4.5	NA	NA	NA	NA	NA	NA
		9/1/2010	2	--	--	ND (3)	--	--	ND (50)
		9/8/2010	5.6	NA	NA	NA	NA	NA	NA
		9/15/2010	4.2	NA	NA	NA	NA	NA	NA
		9/22/2010	8.5	NA	NA	NA	NA	NA	NA
		9/29/2010	5.3	NA	NA	NA	NA	NA	NA
		10/8/2010	9.8	NA	NA	NA	NA	NA	NA
		10/21/2010	13.3	NA	NA	NA	NA	NA	NA
		10/27/2010	8.9	NA	NA	NA	NA	NA	NA
		11/3/2010	1.3	48	ND (1)	ND (5)	115	22	ND (20)
		11/10/2010	7.8	NA	NA	NA	NA	NA	NA
		11/17/2010	0	NA	NA	NA	NA	NA	NA
VEW-27	C	11/23/2010	2.8	98	ND(1)	ND(5)	135	71	24
		12/1/2010	5.6	NA	NA	NA	NA	NA	NA
		12/7/2010	6.8	NA	NA	NA	NA	NA	NA
		12/14/2010	2.3	NA	NA	NA	NA	NA	NA
		12/22/2010	5.5	NA	NA	NA	NA	NA	NA
		1/5/2011	11.7	NA	NA	NA	NA	NA	NA
		1/13/2011	3	NA	NA	NA	NA	NA	NA
		1/19/2011	3	NA	NA	NA	NA	NA	NA
		1/28/2011	6	NA	NA	NA	NA	NA	NA
VEW-28	D	8/9/2010	10.7	NA	NA	NA	NA	NA	NA
		8/17/2010	6	1	1.2	ND (3)	0	ND (30)	ND (25)
		8/25/2010	3.3	NA	NA	NA	NA	NA	NA
		9/1/2010	6	6.8	5.2	ND (3)	0	ND (25)	ND (50)
		9/8/2010	5.3	NA	NA	NA	NA	NA	NA
		9/15/2010	3.8	NA	NA	NA	NA	NA	NA
		9/22/2010	11	NA	NA	NA	NA	NA	NA
		9/29/2010	9.9	NA	NA	NA	NA	NA	NA
		11/17/2010	0	NA	NA	NA	NA	NA	NA
		11/23/2010	5.3	40	ND(1)	ND(5)	202	ND(35)	51
		12/1/2010	0.8	NA	NA	NA	NA	NA	NA
		12/7/2010	2.2	NA	NA	NA	NA	NA	NA
		12/14/2010	0.7	5	ND(1)	ND(5)	0	NA	ND(25)
		12/22/2010	3.8	NA	NA	NA	NA	NA	NA
		1/5/2011	4.1	NA	NA	NA	NA	NA	NA
		1/13/2011	2	NA	NA	NA	NA	NA	NA

Table 4
Field Data and Analytical Results of Shallow Soil Vapor Extraction Wells
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

Well ID	ISTT Area	Date	Total VOC (ppm)(1)	Trichloroethylene (ppbv)(2)	Tetrachloroethylene (ppbv)(2)	1,1,1-Trichloroethane (ppbv)(2)	cis 1,2-Dichloroethene (ppbv)(2)	1,1-Dichloroethene (ppbv)(2)	Trans 1,2-Dichloroethene (ppbv)(2)
		1/19/2011	0	NA	NA	NA	NA	NA	NA
VEW-29	D	8/9/2010	10.3	NA	NA	NA	NA	NA	NA
		9/29/2010	29	NA	NA	NA	NA	NA	NA
		10/8/2010	26.2	NA	NA	NA	NA	NA	NA
		10/21/2010	24.9	NA	NA	NA	NA	NA	NA
		10/27/2010	6.5	NA	NA	NA	NA	NA	NA
		11/3/2010	5.3	86	ND(1)	ND(5)	306	63	251
		11/10/2010	6.7	NA	NA	NA	NA	NA	NA
		11/17/2010	0	NA	NA	NA	NA	NA	NA
		11/23/2010	12	284	7	ND(5)	1010	253	155
		12/1/2010	15.3	NA	NA	NA	NA	NA	NA
		12/7/2010	15.1	NA	NA	NA	NA	NA	NA
		12/14/2010	4.2	135	1.2	ND(5)	463	NA	ND(50)
		12/22/2010	5	NA	NA	NA	NA	NA	NA
		12/29/2010	4.5	NA	NA	NA	NA	NA	NA
		1/5/2011	47.7	NA	NA	NA	NA	NA	NA
		1/18/2011	0.6	NA	NA	NA	NA	NA	NA
		1/19/2011	71	NA	NA	NA	NA	NA	NA
		1/28/2011(3)	9	0.36	ND (0.25)	ND (0.25)	0	ND (0.25)	ND (0.25)
Area D Manifold	D	1/28/2011(3)	NA	1400	5	ND (0.24)	500	ND (0.24)	5.3

Notes:
VOC - volatile organic compounds
ppm - parts per million
ND - Not Detected, detection limit shown in parenthesis
NA - Not Analyzed
ppbv - parts per billion by volume
(1) Total VOC readings collected weekly by TerraTherm operators using a Photoionization Detector with a 11.7 ev lamp.
(2) Vapor samples analyzed by OEME's mobile laboratory for the compounds shown, unless otherwise noted (note 3).
(3) Vapor sample analyzed by OEME's fixed laboratory for compounds shown.

Table 5
Field Data and Calculated Destruction and Removal Efficiency of Process Air
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

Date	Total VOC Readings (ppm)[1]			Destruction and Removal Efficiency[2]
	GAC Influent	GAC Midfluent	GAC Effluent	
8/9/2010	19	0	0	100%
8/10/2010	7	0	0	100%
8/11/2010	15	0	0	100%
8/12/2010	13	0	0	100%
8/13/2010	13	0	0	100%
8/14/2010	8	0	0	100%
8/15/2010	5	0	0	100%
8/16/2010	9	0	0	100%
8/17/2010	16	0	0	100%
8/18/2010	12	0	0	100%
8/19/2010	15	0	0	100%
8/20/2010	8	0	0	100%
8/21/2010	9	0	0	100%
8/22/2010	10	0	0	100%
8/23/2010	11	0	0	100%
8/24/2010	20	0	0	100%
8/25/2010	18	0	0	100%
8/26/2010	9	0	0	100%
8/27/2010	11	0	0	100%
8/28/2010	9	0	0	100%
8/29/2010	3	0	0	100%
8/30/2010	9	0	0	100%
8/31/2010	7	0	0	100%
9/1/2010	13	1	1	92%
9/2/2010	9	0	1	89%
9/3/2010	10	0	0	100%
9/4/2010	26	0	0	100%
9/5/2010	7	0	0	100%
9/6/2010	9	1	0	100%
9/7/2010	29	1	0	100%
9/8/2010	18	0	0	100%
9/9/2010	14	0	0	100%
9/10/2010	11	0	0	100%
9/11/2010	13	0	0	100%
9/12/2010	12	0	0	100%
9/13/2010	14	1	0	100%
9/14/2010	19	1	0	100%
9/15/2010	17	1	0	100%
9/16/2010	18	1	0	100%
9/17/2010	25	11	1	96%
9/18/2010	24	1	0	100%
9/19/2010	31	0	0	100%
9/20/2010	46	2	0	100%
9/21/2010	74	0	0	100%
9/22/2010	153	4	0	100%
9/23/2010	81	9	0	100%
9/24/2010	37	10	0	100%
9/25/2010	29	14	1	97%
9/26/2010	18	8	1	94%
9/27/2010	28	9	0	100%
9/28/2010	23	16	1	96%
9/29/2010	24	9	2	92%
9/30/2010	23	9	1	96%
10/1/2010	74	33	3	96%
10/2/2010	40	18	0	100%
10/3/2010	31	15	0	100%
10/4/2010	43	30	1	98%
10/5/2010	10	6	0	100%
10/6/2010	14	10	2	86%

Table 5
Field Data and Calculated Destruction and Removal Efficiency of Process Air
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

Date	Total VOC Readings (ppm)[1]			Destruction and Removal Efficiency[2]
	GAC Influent	GAC Midfluent	GAC Effluent	
10/7/2010	16	11	0	100%
10/8/2010	21	17	0	100%
10/9/2010	15	1	0	100%
10/10/2010	8	3	0	100%
10/11/2010	12	3	0	100%
10/12/2010	32	0	0	100%
10/13/2010	52	0	0	100%
10/14/2010	103	5	1	99%
10/15/2010	100	7	1	99%
10/16/2010	85	6	0	100%
10/17/2010	49	4	1	98%
10/18/2010	51	4	1	98%
10/19/2010	50	0	1	98%
10/20/2010	48.5	0	0	100%
10/21/2010	47	5	0	100%
10/22/2010	49	4	2	96%
10/23/2010	37	3	2	95%
10/24/2010	28	3	1	96%
10/25/2010	17	2	1	94%
10/26/2010	20	5	1	95%
10/27/2010	14	4	1	93%
10/28/2010	13	3	1	92%
10/29/2010	17	3	1	94%
10/30/2010	19	3	1	95%
10/31/2010	4	0	0	100%
11/1/2010	2	0	0	100%
11/2/2010	4	1	0	100%
11/3/2010	6	1	1	83%
11/4/2010	11	2	2	82%
11/5/2010	21	5	2	90%
11/6/2010	14	3	2	86%
11/7/2010	5	2	1	80%
11/8/2010	9	2	1	89%
11/9/2010	9	2	1	89%
11/10/2010	8	2	0	100%
11/11/2010	10	2	1	90%
11/12/2010	8	2	1	88%
11/13/2010	7	2	1	86%
11/14/2010	6	1	0	100%
11/15/2010	6	1	1	83%
11/16/2010	10	2	0	100%
11/17/2010	45	10	4	91%
11/18/2010	12	4	2	83%
11/19/2010	18	5	3	83%
11/20/2010	22	8	3	86%
11/21/2010	9	2	1	89%
11/22/2010	17	6	1	94%
11/23/2010	19	6	3	84%
11/24/2010	13	6	2	85%
11/25/2010	15	5	2	87%
11/26/2010	25	10	3	88%
11/27/2010	14	1	0	100%
11/28/2010	14	1	0	100%
11/29/2010	16	7	2	88%
11/30/2010	21	7	3	86%
12/1/2010	19	5	3	84%
12/2/2010	19	5	4	79%
12/3/2010	24	6	3	88%
12/4/2010	40	9	6	85%

Table 5
Field Data and Calculated Destruction and Removal Efficiency of Process Air
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

Date	Total VOC Readings (ppm)[1]			Destruction and Removal Efficiency[2]
	GAC Influent	GAC Midfluent	GAC Effluent	
12/5/2010	27	8	7	74%
12/6/2010	26	9	6	77%
12/7/2010	20	8	7	65%
12/8/2010	18	6	3	83%
12/9/2010	10	6	3	70%
12/10/2010	17	8	1	94%
12/11/2010	22	6	4	82%
12/12/2010	16	5	4	75%
12/13/2010	14	7	4	71%
12/14/2010	10	2	1	90%
12/15/2010	19	3	4	79%
12/16/2010	18	2	3	83%
12/17/2010	12	1	2	83%
12/18/2010	6	1	2	67%
12/19/2010	10	1	3	70%
12/20/2010	5	1	1	80%
12/21/2010	6	1	1	83%
12/22/2010	7	2	1	86%
12/23/2010	10	3	1	90%
12/24/2010	10	3	1	90%
12/25/2010	9	3	1	89%
12/26/2010	8	2	1	88%
12/27/2010	7	2	1	86%
12/28/2010	6	2	1	83%
12/29/2010	6	2	2	67%
12/30/2010	11	1	2	82%
12/31/2010	8	2	1	88%
1/1/2011	10	1	2	80%
1/2/2011	9	1	1	89%
1/3/2011	5	0	1	80%
1/4/2011	13	0	2	85%
1/5/2011	14	0	3	79%
1/6/2011	6	1	1	83%
1/7/2011	9	1	2	83%
1/8/2011	12	5	2	83%
1/9/2011	8	4	2	75%
1/10/2011	9	2	1	89%
1/11/2011	9	3	2	78%
1/12/2011	13	3	1.5	88%
1/13/2011	17	3	1	94%
1/14/2011	19	1	1	95%
1/15/2011	32	1	1	97%
1/16/2011	23	2	2	91%
1/17/2011	8	2	1	88%
1/18/2011	21	4	2	90%
1/19/2011	17	3	2	88%
1/20/2011	12	2	2	83%
1/21/2011	21	1.5	1.5	93%
1/22/2011	18	2	2	89%
1/23/2011	26	3	2	92%
1/24/2011	26	3	2	92%
1/27/2011	28	2	1	96%
1/28/2011	22	2	1	95%
1/29/2011	28	1	1	96%
1/30/2011	21	2	1	95%
1/31/2011	18	2	1	94%
2/1/2011	16	2	1	94%
2/2/2011	32	6	2	94%
2/3/2011	10	3	2	80%

Table 5
Field Data and Calculated Destruction and Removal Efficiency of Process Air
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

Date	Total VOC Readings (ppm)[1]			Destruction and Removal Efficiency[2]
	GAC Influent	GAC Midfluent	GAC Effluent	
2/4/2011	8	4	1	88%
2/5/2011	6	2	1	83%
2/6/2011	18	4	1	94%
2/7/2011	10	1	1	90%
2/8/2011	8	2	1	88%
2/9/2011	9	2	1	89%
2/10/2011	8	2	1	88%
2/11/2011	15	3	1	93%
2/12/2011	8	3	2	75%
2/13/2011	8	3	3	63%
2/14/2011	15	2	2	87%
2/15/2011	14	3	2	86%
2/16/2011	6	2	2	67%
2/17/2011	10	5	3	70%
2/18/2011	7	2	2	71%
2/19/2011	7	2	1	86%
2/20/2011	7	0	0	100%
2/21/2011	6	1	0	100%
2/22/2011	6	2	1	83%
2/23/2011	3	1	0	100%

Notes:
VOC - Volatile Organic Compounds
ppm - Parts Per Million
(1) Total VOC readings collected daily by TerraTherm operators using a Photoionization Detector with a 11.7 ev lamp.
(2) The destruction and removal efficiency calculated using GAC influent and effluent field data.

Table 6
Analytical Results of Process Air Sampling
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

			Sample Date	August 9, 2010		August 18, 2010		August 24, 2010		August 31, 2010		September 8, 2010		September 15, 2010	
			Sample Name	EP0022	EP0021	EP0024	EP0023	EP0026	EP0025	EP0030	EP0029	EP0034	EP0033	EP0036	EP0035
			Sample Location	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT
Chemical Name	CRQL	MassDEP TELs	MassDEP AALs												
1,1,1-TRICHLOROETHANE	0.50	190	190	**29**	0.12 U	**3.3**	0.26 U	4.3 U	0.15 U	**2.88**	0.22 U	**4.29**	0.18 U	**2.11**	0.2 U
1,1,2,2-TETRACHLOROETHANE	0.50	2.72	0.003	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
1,1,2-TRICHLOROETHANE	0.50	2.72	0.01	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	**1.5**	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
1,1-DICHLOROETHANE	0.50	--	--	**8.5**	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
1,1-DICHLOROETHENE	0.50	0.27	0.01	**6.2**	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	**1.9**	0.22 U	**4.41**	0.18 U	**3.33**	0.2 U
1,2,4-TRICHLOROBENZENE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
1,2,4-TRIMETHYLBENZENE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
1,2-DIBROMOETHANE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
1,2-DICHLOROBENZENE	0.50	13.6	13.6	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
1,2-DICHLOROETHANE	0.50	2.72	0.01	**39**	0.12 U	**15**	0.26 U	**10.3**	0.15 U	**0.91**	0.22 U	**4.16**	0.18 U	**5.46**	0.2 U
1,2-DICHLOROPROPANE	0.50	0.19	0.01	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
1,3,5-TRIMETHYLBENZENE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
1,3-BUTADINE	0.50	0.54	0.002	2.2 U	0.24 U	4.8 U	0.52 U	8.6 U	0.3 U	**0.6**	0.44 U	**17.5**	0.36 U	3.4 U	0.4 U
1,3-DICHLOROBENZENE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
1,4-DICHLOROBENZENE	0.50	20.4	0.03	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
2-BUTANONE	0.50	67.8	3.39	1.1 U	**0.35**	**16**	0.26 U	**30.5**	**12.9**	**44**	**0.44**	**140**	**0.18**	**120**	0.2 U
2-HEXANONE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	**3.8**	0.22 U	**11.7**	0.18 U	**12.4**	0.2 U
4-ETHYLTOLUENE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
4-METHYL-2-PENTANONE	0.50	13.6	13.6	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	**2.5**	0.22 U	**9.48**	0.18 U	**6.48**	0.2 U
ACRYLONITRILE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	**3.44**	0.18 U	**4.91**	0.2 U
ALLYL CHLORIDE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
BENZENE	0.50	0.54	0.4	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	**0.39**	**33.3**	**0.22**	1.7 U	**0.31**
BENZYL CHLORIDE	0.50	2.72	0.18	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
BROMODICHLOROMETHANE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
BROMOFORM	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
BROMOMETHANE	0.50	1.36	0.68	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
CARBON TETRACHLORIDE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
CHLOROBENZENE	0.50	20.4	1.36	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
CHLOROETHANE	0.50	272	136	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	**0.64**	**2.94**	**0.77**	1.7 U	**6.4**
CHLOROFORM	0.50	27.2	0.01	**3**	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	**3.3**	0.22 U	**5.47**	0.18 U	**3.68**	0.2 U
CHLOROMETHANE	0.50	--	--	1.1 U	0.12 U	2.4 U	**1.1**	4.3 U	**3.64**	**11**	**20**	**28.3**	**51**	**17.1**	**23**
CIS-1,2-DICHLOROETHENE	0.50	--	--	**1900**	0.12 U	**110**	0.26 U	**130**	0.15 U	**140**	0.22 U	**220**	0.18 U	**190**	0.2 U
CIS-1,3-DICHLOROPROPENE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
CYCLOHEXANE	0.50	81.6	81.6	**3**	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
DIBROMOCHLOROMETHANE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
DICHLORODIFLUOROMETHANE	0.50	--	--	1.1 U	0.12 U	2.4 U	**0.5**	4.3 U	**0.72**	0.44 U	**0.85**	1.2 U	**0.57**	1.7 U	**0.57**
DICHLOROTETRAFLUOROETHANE	0.50	--	--	1.1 U	0.12 U	2.4 U	**0.67**	4.3 U	**0.15**	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
ETHYLBENZENE	0.50	69.1	69.1	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	**0.42**	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
HEXACHLOROBUTADIENE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
HEXANE	0.50	--	--	**4.4**	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
METHYL TERT-BUTYL ETHER	0.50	--	--	**3.6**	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	**0.67**	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
METHYLENE CHLORIDE	1.00	2.72	0.07	1.1 U	**0.14**	2.4 U	0.26 U	4.3 U	0.15 U	**2.7**	**0.35**	**5.45**	**0.77**	**3.24**	**1.9**
N-HEPTANE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
O-XYLENE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	**0.2**	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
STYRENE	0.50	47	0.47	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	**0.19**	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
TETRACHLOROETHENE	0.50	136	0.003	**74**	0.12 U	**21**	0.26 U	**14.8**	0.15 U	**25**	0.22 U	**29**	0.18 U	**27**	0.2 U
TETRAHYDROFURAN	0.50	54	27	1.1 U	0.12 U	2.4 U	0.26 U	**44.6**	**48**	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
TOLUENE	0.50	21.23	5.31	**61**	0.12 U	**36**	0.26 U	**26.2**	**1.48**	**3.8**	0.22 U	**23.8**	0.18 U	**20.7**	0.2 U
TRANS-1,2-DICHLOROETHENE	2.00	--	--	**16**	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	**3.7**	0.22 U	**7.33**	0.18 U	**4.56**	0.2 U
TRANS-1,3-DICHLOROPROPENE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
TRICHLOROETHENE	0.50	6.8	0.11	**3400**	0.12 U	**420**	0.26 U	**800**	**0.18**	**1200**	0.22 U	**3300**	0.18 U	**3900**	0.2 U
TRICHLOROFLUOROMETHANE	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
VINYL BROMIDE (BROMOETHENE)	0.50	--	--	1.1 U	0.12 U	2.4 U	0.26 U	4.3 U	0.15 U	0.44 U	0.22 U	1.2 U	0.18 U	1.7 U	0.2 U
VINYL CHLORIDE	0.50	1.4	0.15	**66**	0.12 U	2.4 U	**4.4**	4.3 U	**1.24**	**2.2**	**3.5**	**8.58**	**2.6**	**4.16**	**7.4**
XYLENE (TOTAL)	0.50	2.72	2.72	2.2 U	0.24 U	4.8 U	0.52 U	8.6 U	**1.66**	0.88 U	0.44 U	2.4 U	0.36 U	3.4 U	0.4 U

NOTES:
All values are in parts per billion by volume (ppbv).
The data are unvalidated.
MassDEP TELs - Massachusetts Department of Environmental Protection Threshold Effects Exposure Limits (24-hour average)
MassDEP AALs - Massachusetts Department of Environmental Protection Allowable Ambient Limits (annual average)
Bold - Detected Concentration
CRQL - Contract Required Quantification Limit
Shading
Gray - Detected Concentrations Exceed the MassDEP AALs.
Black - Detected Concentrations Exceed the MassDEP AALs and MassDEP TELs.

LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.
L - Estimated value is below the calibration range.

Table 6
Analytical Results of Process Air Sampling
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

			Sample Date	September 23, 2010		September 28, 2010		October 4, 2010			October 26, 2010		November 3, 2010		November 16, 2010		November 23, 2010	
			Sample Name	EP0038	EP0037	EP0044	EP0045	EP0041	EP0042	EP0043	EP0049	EP0048	EP0051	EP0050	EP0052	EP0053	EP0056	EP0
			Sample Location	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-MIDFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EF
Chemical Name	CRQL	MassDEP TELs	MassDEP AALs															
1,1,1-TRICHLOROETHANE	0.50	190	190	**4.2**	0.2 U	24 U	0.21 U	7.2 U	**5.6**	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
1,1,2,2-TETRACHLOROETHANE	0.50	2.72	0.003	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
1,1,2-TRICHLOROETHANE	0.50	2.72	0.01	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
1,1-DICHLOROETHANE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	**0.33**
1,1-DICHLOROETHENE	0.50	0.27	0.01	**5.7**	0.2 U	24 U	0.21 U	7.2 U	**8.3**	0.2 U	8.7 U	**1.5**	7.3 U	**2**	3.2 U	**4.1**	5 U	**5.3**
1,2,4-TRICHLOROBENZENE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
1,2,4-TRIMETHYLBENZENE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	**0.32**	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	**5.2**	0.19
1,2-DIBROMOETHANE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
1,2-DICHLOROBENZENE	0.50	13.6	13.6	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
1,2-DICHLOROETHANE	0.50	2.72	0.01	**9.2**	0.2 U	24 U	0.21 U	**8.8**	**10**	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	**0.38**
1,2-DICHLOROPROPANE	0.50	0.19	0.01	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
1,3,5-TRIMETHYLBENZENE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
1,3-BUTADINE	0.50	0.54	0.002	4.9 U	0.4 U	48 U	0.42 U	14 U	**8.2**	**1.65**	17 U	**3.2**	15 U	**1.7**	6.4 U	**2.2**	10 U	**3.81**
1,3-DICHLOROBENZENE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
1,4-DICHLOROBENZENE	0.50	20.4	0.03	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
2-BUTANONE	0.50	67.8	3.39	**140**	**0.52**	**110**	**0.38**	**190**	**330**	**0.33**	**190**	0.21 U	**87**	**6.4**	**220**	1 U	**280**	**1.63**
2-HEXANONE	0.50	--	--	**15**	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	**0.21**	3.2 U	1 U	5 U	**0.24**
4-ETHYLTOLUENE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
4-METHYL-2-PENTANONE	0.50	13.6	13.6	**11**	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
ACRYLONITRILE	0.50	--	--	2.4 U	0.2 U	24 U	**1.1**	7.2 U	**6.7**	**4.52**	8.7 U	**4.1**	7.3 U	**1.2**	3.2 U	**1.8**	5 U	**3.02**
ALLYL CHLORIDE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
BENZENE	0.50	0.54	0.4	2.4 U	0.2 U	24 U	0.21 U	7.2 U	**21**	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	**7.1**	0.19
BENZYL CHLORIDE	0.50	2.72	0.18	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
BROMODICHLOROMETHANE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
BROMOFORM	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
BROMOMETHANE	0.50	1.36	0.68	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
CARBON TETRACHLORIDE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
CHLOROBENZENE	0.50	20.4	1.36	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
CHLOROETHANE	0.50	272	136	2.4 U	**16**	24 U	**9.2**	7.2 U	3.5 U	**3.35**	8.7 U	**3.4**	7.3 U	**6**	3.2 U	**1.5**	5 U	**1.76**
CHLOROFORM	0.50	27.2	0.01	**4.7**	0.2 U	24 U	0.21 U	**6.7**	**10**	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	**1.03**
CHLOROMETHANE	0.50	--	--	**20**	**23**	24 U	**26**	**24**	**30**	**31**	**14**	**14**	**15**	**26**	**11**	**16**	**12**	**25**
CIS-1,2-DICHLOROETHENE	0.50	--	--	**250**	**0.3**	**190**	**0.3**	**280**	**680**	**0.28**	**95**	**3.5**	**140**	**25**	**79**	**71**	**130**	**89**
CIS-1,3-DICHLOROPROPENE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
CYCLOHEXANE	0.50	81.6	81.6	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
DIBROMOCHLOROMETHANE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
DICHLORODIFLUOROMETHANE	0.50	--	--	2.4 U	**0.6**	24 U	**0.7**	7.2 U	3.5 U	**0.44**	8.7 U	**0.6**	7.3 U	**0.42**	3.2 U	1 U	5 U	**0.77**
DICHLOROTETRAFLUOROETHANE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
ETHYLBENZENE	0.50	69.1	69.1	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	**0.34**	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
HEXACHLOROBUTADIENE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
HEXANE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
METHYL TERT-BUTYL ETHER	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
METHYLENE CHLORIDE	1.00	2.72	0.07	**3.8**	**4.65**	24 U	**6**	7.2 U	**4.9**	**3.75**	8.7 U	**3.6**	7.3 U	**2.5**	3.2 U	**2.1**	5 UJ	**5.46**
N-HEPTANE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
O-XYLENE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	**0.27**	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
STYRENE	0.50	47	0.47	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
TETRACHLOROETHENE	0.50	136	0.003	**37**	0.2 U	**27**	0.21 U	**22**	3.5 U	0.2 U	**9.6**	0.21 U	**8.1**	**0.18 L**	**7.1**	1 U	**15**	0.19
TETRAHYDROFURAN	0.50	54	27	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	**0.45**
TOLUENE	0.50	21.23	5.31	**44**	**0.34**	24 U	0.21 U	**28**	3.5 U	**0.22**	8.7 U	0.21 U	**9.8**	**0.47**	**6.4**	1 U	**7.2**	**0.32**
TRANS-1,2-DICHLOROETHENE	2.00	--	--	**6.5**	0.2 U	24 U	0.21 U	**6.1**	**13**	0.2 U	8.7 U	0.21 U	7.3 U	**0.88**	**2.8 L**	**2.3**	**4.5**	**3.19**
TRANS-1,3-DICHLOROPROPENE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
TRICHLOROETHENE	0.50	6.8	0.11	**22000**	**3.12**	**2000**	**3.9**	**1100**	**5400**	**2.39**	**340**	0.21 U	**340**	**4.6**	**240**	1 U	**430**	**0.45**
TRICHLOROFLUOROMETHANE	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	**0.43**	7.3 U	**0.3**	3.2 U	1 U	5 U	**0.32**
VINYL BROMIDE (BROMOETHENE)	0.50	--	--	2.4 U	0.2 U	24 U	0.21 U	7.2 U	3.5 U	0.2 U	8.7 U	0.21 U	7.3 U	0.2 U	3.2 U	1 U	5 U	0.19
VINYL CHLORIDE	0.50	1.4	0.15	**6.16**	**6.75**	24 U	**6.1**	**6.8**	**6.1**	**5.53**	8.7 U	**7.2**	7.3 U	**2.8**	3.2 U	**1.8**	5 U	**2.69**
XYLENE (TOTAL)	0.50	2.72	2.72	4.9 U	0.4 U	48 U	0.42 U	14 U	7 U	**0.36**	17 U	0.42 U	15 U	0.4 U	6.4 U	2 U	10 U	0.38

NOTES:
All values are in parts per billion by volume (ppbv).
The data are unvalidated.
MassDEP TELs - Massachusetts Department of Environmental Protection Threshold Effects Exposure Limits (24
MassDEP AALs - Massachusetts Department of Environmental Protection Allowable Ambient Limits (annual aver
Bold - Detected Concentration
CRQL - Contract Required Quantification Limit
Shading
Gray - Detected Concentrations Exceed the MassDEP AALs.
Black - Detected Concentrations Exceed the MassDEP AALs and MassDEP TELs.

LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.
L - Estimated value is below the calibration range.

Table 6
Analytical Results of Process Air Sampling
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

			Sample Date	
			Sample Name	057
			Sample Location	FLUENT
Chemical Name	CRQL	MassDEP TELs	MassDEP AALs	
1,1,1-TRICHLOROETHANE	0.50	190	190	U
1,1,2,2-TETRACHLOROETHANE	0.50	2.72	0.003	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0.50	--	--	U
1,1,2-TRICHLOROETHANE	0.50	2.72	0.01	U
1,1-DICHLOROETHANE	0.50	--	--	
1,1-DICHLOROETHENE	0.50	0.27	0.01	
1,2,4-TRICHLOROBENZENE	0.50	--	--	U
1,2,4-TRIMETHYLBENZENE	0.50	--	--	U
1,2-DIBROMOETHANE	0.50	--	--	U
1,2-DICHLOROBENZENE	0.50	13.6	13.6	U
1,2-DICHLOROETHANE	0.50	2.72	0.01	
1,2-DICHLOROPROPANE	0.50	0.19	0.01	U
1,3,5-TRIMETHYLBENZENE	0.50	--	--	U
1,3-BUTADINE	0.50	0.54	0.002	
1,3-DICHLOROBENZENE	0.50	--	--	U
1,4-DICHLOROBENZENE	0.50	20.4	0.03	U
2-BUTANONE	0.50	67.8	3.39	
2-HEXANONE	0.50	--	--	
4-ETHYLTOLUENE	0.50	--	--	U
4-METHYL-2-PENTANONE	0.50	13.6	13.6	U
ACRYLONITRILE	0.50	--	--	
ALLYL CHLORIDE	0.50	--	--	U
BENZENE	0.50	0.54	0.4	U
BENZYL CHLORIDE	0.50	2.72	0.18	U
BROMODICHLOROMETHANE	0.50	--	--	U
BROMOFORM	0.50	--	--	U
BROMOMETHANE	0.50	1.36	0.68	U
CARBON TETRACHLORIDE	0.50	--	--	U
CHLOROBENZENE	0.50	20.4	1.36	U
CHLOROETHANE	0.50	272	136	
CHLOROFORM	0.50	27.2	0.01	
CHLOROMETHANE	0.50	--	--	
CIS-1,2-DICHLOROETHENE	0.50	--	--	
CIS-1,3-DICHLOROPROPENE	0.50	--	--	U
CYCLOHEXANE	0.50	81.6	81.6	U
DIBROMOCHLOROMETHANE	0.50	--	--	U
DICHLORODIFLUOROMETHANE	0.50	--	--	
DICHLOROTETRAFLUOROETHANE	0.50	--	--	U
ETHYLBENZENE	0.50	69.1	69.1	U
HEXACHLOROBUTADIENE	0.50	--	--	U
HEXANE	0.50	--	--	U
METHYL TERT-BUTYL ETHER	0.50	--	--	U
METHYLENE CHLORIDE	1.00	2.72	0.07	**J**
N-HEPTANE	0.50	--	--	U
O-XYLENE	0.50	--	--	U
STYRENE	0.50	47	0.47	U
TETRACHLOROETHENE	0.50	136	0.003	U
TETRAHYDROFURAN	0.50	54	27	
TOLUENE	0.50	21.23	5.31	
TRANS-1,2-DICHLOROETHENE	2.00	--	--	
TRANS-1,3-DICHLOROPROPENE	0.50	--	--	U
TRICHLOROETHENE	0.50	6.8	0.11	
TRICHLOROFLUOROMETHANE	0.50	--	--	
VINYL BROMIDE (BROMOETHENE)	0.50	--	--	U
VINYL CHLORIDE	0.50	1.4	0.15	
XYLENE (TOTAL)	0.50	2.72	2.72	U

NOTES:
All values are in parts per billion by volume (ppbv).
The data are unvalidated.
MassDEP TELs - Massachusetts Department of Environmental Protection Threshold Effects Exposure Limits (24·
MassDEP AALs - Massachusetts Department of Environmental Protection Allowable Ambient Limits (annual aver
Bold - Detected Concentration
CRQL - Contract Required Quantification Limit
Shading
Gray - Detected Concentrations Exceed the MassDEP AALs.
Black - Detected Concentrations Exceed the MassDEP AALs and MassDEP TELs.

Table 6
Analytical Results of Process Air Sampling
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

			Sample Date	December 1, 2010		December 9, 2010		December 14, 2010		December 21, 2010		December 29, 2010		January 5, 2011		January 12, 2011	
			Sample Name	EP0061	EP0060	EP0063	EP0062	EP0067	EP0066	EP0068	EP0069	EP0070	EP0071	EP0075	EP0074	EP0077	EP0076
			Sample Location	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT
Chemical Name	CRQL	MassDEP TELs	MassDEP AALs														
1,1,1-TRICHLOROETHANE	0.50	190	190	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
1,1,2,2-TETRACHLOROETHANE	0.50	2.72	0.003	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
1,1,2-TRICHLOROETHANE	0.50	2.72	0.01	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
1,1-DICHLOROETHANE	0.50	--	--	1.5 U	**0.39**	1.8 U	**0.3 L**	6.2 U	0.33 L	7 U	**0.44**	6.6 U	**0.24**	7 U	**0.21**	8.4 U	0.31 U
1,1-DICHLOROETHENE	0.50	0.27	0.01	**2.47**	**5.26**	**3.1**	**4.02**	6.2 U	**3.8**	7 U	**4.3**	6.6 U	**2.2**	7 U	**1.83**	**17**	**1.8**
1,2,4-TRICHLOROBENZENE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
1,2,4-TRIMETHYLBENZENE	0.50	--	--	**14.4**	0.22 U	**9.84**	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
1,2-DIBROMOETHANE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
1,2-DICHLOROBENZENE	0.50	13.6	13.6	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
1,2-DICHLOROETHANE	0.50	2.72	0.01	1.5 U	**0.56**	1.8 U	**0.49**	6.2 U	**0.56**	7 U	**0.54**	6.6 U	**0.36**	7 U	**0.45**	8.4 U	**0.66**
1,2-DICHLOROPROPANE	0.50	0.19	0.01	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
1,3,5-TRIMETHYLBENZENE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
1,3-BUTADINE	0.50	0.54	0.002	3 U	**5.14**	3.6 U	**5.54**	12 U	**6.6**	14 U	**7.5**	13 U	**2.61**	14 U	**1.22**	17 U	**1.2**
1,3-DICHLOROBENZENE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
1,4-DICHLOROBENZENE	0.50	20.4	0.03	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
2-BUTANONE	0.50	67.8	3.39	**200** B	**2.33**	**410** B	**1.98 B**	**120**	**3.02**	**65**	**3.2**	**98.5**	**2.7**	**100**	**4.06**	**680**	**3.5**
2-HEXANONE	0.50	--	--	**18.1**	0.22 U	**17.5**	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
4-ETHYLTOLUENE	0.50	--	--	1.5 U	0.22 U	**4.45**	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
4-METHYL-2-PENTANONE	0.50	13.6	13.6	**11.6**	0.22 U	**15.4**	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
ACRYLONITRILE	0.50	--	--	**1.92**	**3.8**	**6.33**	**3.25**	6.2 U	**3.6**	7 U	**4.6**	6.6 U	**2.83 J**	7 U	**0.42**	8.4 U	**1.1**
ALLYL CHLORIDE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
BENZENE	0.50	0.54	0.4	1.5 U	0.22 U	1.8 U	0.34 U	**11**	0.34 U	**33**	0.25 U	**7.66**	0.18 U	**52.4**	0.22 U	8.4 U	0.31 U
BENZYL CHLORIDE	0.50	2.72	0.18	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
BROMODICHLOROMETHANE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
BROMOFORM	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
BROMOMETHANE	0.50	1.36	0.68	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
CARBON TETRACHLORIDE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
CHLOROBENZENE	0.50	20.4	1.36	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
CHLOROETHANE	0.50	272	136	1.5 U	**2.43**	1.8 U	**1.62**	6.2 U	**4.2**	7 U	**1.7**	6.6 U	**1.66**	7 U	**5.95**	8.4 U	**9.5**
CHLOROFORM	0.50	27.2	0.01	**2.27**	**1.23**	**3.92**	**0.96**	6.2 U	**1**	7 U	**1.2**	6.6 U	**0.76**	7 U	**0.86**	8.4 U	**1**
CHLOROMETHANE	0.50	--	--	**11.8**	**21**	**12.6**	**32.7**	**16**	**11**	**15**	**22**	**19.9**	**16**	**22**	**38**	**44**	**59**
CIS-1,2-DICHLOROETHENE	0.50	--	--	**116**	**110**	**140**	**94**	**120**	**87**	**91**	**110**	**85.8**	**99**	**150**	**97**	**350**	**140**
CIS-1,3-DICHLOROPROPENE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
CYCLOHEXANE	0.50	81.6	81.6	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
DIBROMOCHLOROMETHANE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
DICHLORODIFLUOROMETHANE	0.50	--	--	**1.9**	**0.7**	**2.1**	**1.3**	**6.3**	**1**	7 U	**0.66**	6.6 U	**0.66**	7 U	**0.54**	84 U	**0.47**
DICHLOROTETRAFLUOROETHANE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	13 U	0.36 U	14 U	0.44 U	17 U	0.62 U
ETHYLBENZENE	0.50	69.1	69.1	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
HEXACHLOROBUTADIENE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
HEXANE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
METHYL TERT-BUTYL ETHER	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
METHYLENE CHLORIDE	1.00	2.72	0.07	1.5 UJ	**7.95 J**	**5.45 J**	**5.64 J**	6.2 UJ	**4.9 J**	14 UJ	0.5 UJ	6.6 UJ	0.18 UJ	7 U	0.22 U	8.4 UJ	0.31 UJ
N-HEPTANE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
O-XYLENE	0.50	--	--	**1.63**	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
STYRENE	0.50	47	0.47	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
TETRACHLOROETHENE	0.50	136	0.003	**8.17**	0.22 U	**8.24**	0.34 U	**6.1**	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	**24**	0.31 U
TETRAHYDROFURAN	0.50	54	27	1.5 U	**0.67**	1.8 U	0.34 U	6.2 U	0.34 U	7 U	**0.42**	6.6 U	**0.33**	7 U	**0.35**	8.4 U	0.31 U
TOLUENE	0.50	21.23	5.31	**6.53**	**0.41**	**7**	0.34 U	**6.5**	0.34 U	**8.1**	0.25 U	6.6 U	0.18 U	**13.6**	0.22 U	**31**	0.31 U
TRANS-1,2-DICHLOROETHENE	2.00	--	--	**4.28**	**3.7**	**5.4**	**3**	6.2 U	**3.4**	7 U	**4.2**	6.6 U	**2.77**	7 U	**2.73**	**25**	**3**
TRANS-1,3-DICHLOROPROPENE	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
TRICHLOROETHENE	0.50	6.8	0.11	**470**	**0.46**	**580**	**0.86**	**420**	**1.04**	**200**	**2**	**200**	**2.73**	**330**	**2.76**	**1400**	**4**
TRICHLOROFLUOROMETHANE	0.50	--	--	1.5 U	**0.35**	1.8 U	0.34 U	6.2 U	**0.43**	7 U	**0.33**	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
VINYL BROMIDE (BROMOETHENE)	0.50	--	--	1.5 U	0.22 U	1.8 U	0.34 U	6.2 U	0.34 U	7 U	0.25 U	6.6 U	0.18 U	7 U	0.22 U	8.4 U	0.31 U
VINYL CHLORIDE	0.50	1.4	0.15	**2.07**	**2.99**	**1.89**	**2.66**	6.2 U	**1.9**	7 U	**5.1**	6.6 U	**1.42**	7 U	**11.2**	**11**	**11**
XYLENE (TOTAL)	0.50	2.72	2.72	3 U	0.44 U	3.6 U	0.68 U	12 U	0.68 U	14 U	0.5 U	13 U	0.36 U	14 U	0.44 U	17 U	0.62 U

NOTES:

All values are in parts per billion by volume (ppbv).
The data are unvalidated.
MassDEP TELs - Massachusetts Department of Environmental Protection Threshold Effects Exposure Limits (24
MassDEP AALs - Massachusetts Department of Environmental Protection Allowable Ambient Limits (annual aver
Bold - Detected Concentration
CRQL - Contract Required Quantification Limit
Shading
Gray - Detected Concentrations Exceed the MassDEP AALs.
Black - Detected Concentrations Exceed the MassDEP AALs and MassDEP TELs.

LABORATORY QUALIFIERS:

J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.
L - Estimated value is below the calibration range.

Table 6
Analytical Results of Process Air Sampling
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

			Sample Date	January 19, 2011		January 28, 2011		February 3, 2011		February 9, 2011		February 16, 2011		February 24, 2011	
			Sample Name	EP0081	EP0082	EP0084	EP0083	EP0092	EP0091	EP0093	EP0094	EP0096	EP0095	EP0101	EP0100
			Sample Location	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT	GAC-INFLUENT	GAC-EFFLUENT
Chemical Name	CRQL	MassDEP TELs	MassDEP AALs												
1,1,1-TRICHLOROETHANE	0.50	190	190	3.7 U	**0.19**	4.5 U	**0.16**	4.2 U	0.18 U	4.6 U	**0.31**	6.6 U	2.1 U	3.9 U	2.6 U
1,1,2,2-TETRACHLOROETHANE	0.50	2.72	0.003	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
1,1,2-TRICHLOROETHANE	0.50	2.72	0.01	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
1,1-DICHLOROETHANE	0.50	--	--	3.7 U	**0.32**	4.5 U	**0.24**	4.2 U	**0.33**	4.6 U	**0.53**	6.6 U	2.1 U	3.9 U	2.6 U
1,1-DICHLOROETHENE	0.50	0.27	0.01	**9.7**	**2.3**	**23** J	**1.6** J	**14**	**2.3**	**12**	**3.3**	**9.5**	**8.2**	**4.3**	**16**
1,2,4-TRICHLOROBENZENE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
1,2,4-TRIMETHYLBENZENE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
1,2-DIBROMOETHANE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
1,2-DICHLOROBENZENE	0.50	13.6	13.6	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
1,2-DICHLOROETHANE	0.50	2.72	0.01	3.7 U	**1.04**	**6.1**	**0.93**	4.2 U	**1.06**	4.6 U	**1.8**	6.6 U	2.1 U	3.9 U	**3.5**
1,2-DICHLOROPROPANE	0.50	0.19	0.01	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
1,3,5-TRIMETHYLBENZENE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
1,3-BUTADINE	0.50	0.54	0.002	**8.3**	**1.6**	**7.1**	**1.3**	**4.3**	**2.2**	9.2 U	**7.6**	**25**	4.2 U	7.9 U	**5**
1,3-DICHLOROBENZENE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
1,4-DICHLOROBENZENE	0.50	20.4	0.03	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
2-BUTANONE	0.50	67.8	3.39	**280**	**5.6**	**160**	**3.7**	**39**	**4.7**	**63**	**6.3**	6.6 U	**280**	**280**	**13**
2-HEXANONE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	**10**	3.9 U	2.6 U
4-ETHYLTOLUENE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
4-METHYL-2-PENTANONE	0.50	13.6	13.6	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	**16**	3.9 U	2.6 U
ACRYLONITRILE	0.50	--	--	3.7 U	**0.52**	**10 J**	**3.5 J**	4.2 U	**5.5 J**	4.6 U	**1.8 J**	**7.2 J**	2.1 UJ	3.9 UJ	**20 J**
ALLYL CHLORIDE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 UJ	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
BENZENE	0.50	0.54	0.4	**35**	0.17 U	**57**	0.15 U	4.2 U	0.18 U	**15**	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
BENZYL CHLORIDE	0.50	2.72	0.18	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
BROMODICHLOROMETHANE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
BROMOFORM	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
BROMOMETHANE	0.50	1.36	0.68	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
CARBON TETRACHLORIDE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
CHLOROBENZENE	0.50	20.4	1.36	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
CHLOROETHANE	0.50	272	136	3.7 U	**8.6**	4.5 U	**7.6**	4.2 U	**6.5**	4.6 U	**3.9**	6.6 U	2.1 U	3.9 U	2.6 U
CHLOROFORM	0.50	27.2	0.01	**3.8**	**1.7**	**4.2**	**1.6**	4.2 U	**2**	4.6 U	**3.1**	**8.3**	2.1 U	3.9 U	**7.5**
CHLOROMETHANE	0.50	--	--	**25**	**59**	**38**	**69**	**35**	**50**	**25**	**28**	**11**	**13**	**7.2**	**16**
CIS-1,2-DICHLOROETHENE	0.50	--	--	**190**	**130**	**430**	**110**	**230**	**160**	**160**	**210**	**510**	**170**	**120**	**340**
CIS-1,3-DICHLOROPROPENE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
CYCLOHEXANE	0.50	81.6	81.6	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
DIBROMOCHLOROMETHANE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
DICHLORODIFLUOROMETHANE	0.50	--	--	3.7 U	**0.79**	4.5 U	**0.43 J**	4.2 U	**0.62**	4.6 U	**0.47**	6.6 U	2.1 U	3.9 U	2.6 U
DICHLOROTETRAFLUOROETHANE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 UJ	6.6 U	2.1 U	3.9 U	2.6 U
ETHYLBENZENE	0.50	69.1	69.1	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
HEXACHLOROBUTADIENE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
HEXANE	0.50	--	--	3.7 U	0.17 U	**8.6**	0.15 U	**7.3**	0.18 U	**6.9**	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
METHYL TERT-BUTYL ETHER	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
METHYLENE CHLORIDE	1.00	2.72	0.07	3.7 U	0.17 U	4.5 UJ	**8.4** J	**16** J	0.18 UJ	4.6 UJ	0.22 U	6.6 UJ	2.1 UJ	3.9 UJ	2.6 UJ
N-HEPTANE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
O-XYLENE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
STYRENE	0.50	47	0.47	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
TETRACHLOROETHENE	0.50	136	0.003	**9.1**	0.17 U	**14**	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
TETRAHYDROFURAN	0.50	54	27	3.7 U	**0.61**	4.5 U	**0.55**	4.2 U	0.18 U	4.6 U	**1.1**	6.6 U	2.1 U	3.9 U	2.6 U
TOLUENE	0.50	21.23	5.31	**8.4**	**0.8**	**18**	**0.23**	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	**2.7**	**4.2**	2.6 U
TRANS-1,2-DICHLOROETHENE	2.00	--	--	**15**	**4.1**	**39**	**3.1**	**22**	**4.7**	**17**	**6.6**	**11**	**16**	**8.1**	**10**
TRANS-1,3-DICHLOROPROPENE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
TRICHLOROETHENE	0.50	6.8	0.11	**680**	**6.4**	**1200**	**9.4**	**420**	**11**	**260**	**24**	**480**	**260**	**260**	**130**
TRICHLOROFLUOROMETHANE	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	**0.28**	6.6 U	2.1 U	3.9 U	2.6 U
VINYL BROMIDE (BROMOETHENE)	0.50	--	--	3.7 U	0.17 U	4.5 U	0.15 U	4.2 U	0.18 U	4.6 U	0.22 U	6.6 U	2.1 U	3.9 U	2.6 U
VINYL CHLORIDE	0.50	1.4	0.15	**8.1**	**38**	**13**	**13**	**8.1**	**15**	**7.8**	**12**	6.6 U	**3.3**	3.9 U	2.6 U
XYLENE (TOTAL)	0.50	2.72	2.72	7.4 U	0.34 U	9 U	0.3 U	8.4 U	0.36 U	9.2 U	0.44 U	13 U	4.2 U	7.8 U	5.3 U

NOTES:
All values are in parts per billion by volume (ppbv).
The data are unvalidated.
MassDEP TELs - Massachusetts Department of Environmental Protection Threshold Effects Exposure Limits (24
MassDEP AALs - Massachusetts Department of Environmental Protection Allowable Ambient Limits (annual aver
Bold - Detected Concentration
CRQL - Contract Required Quantification Limit
Shading
Gray - Detected Concentrations Exceed the MassDEP AALs.
Black - Detected Concentrations Exceed the MassDEP AALs and MassDEP TELs.

LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.
L - Estimated value is below the calibration range.

Table 7
Analytical Results of Ambient Air Monitoring
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

			Sample Date	August 10, 2010		August 26, 2010		September 8, 2010		September 27, 2010		October 29, 2010	
			Sample Name	EP0020/EP0019	EP0018	EP0028	EP0027	EP0032	EP0031	EP0040	EP0039	EP0047	EP0046
			Sample Description	UPGRADIENT	DOWNGRADIENT	UPGRADIENT	DOWNGRADIENT	UPGRADIENT	DOWNGRADIENT	UPGRADIENT	DOWNGRADIENT	UPGRADIENT	DOWNGRADIENT
			Sample Location	Upwind, SW of Site	Downwind, NE of Site	Upwind, SW of Site	Downwind, NE of Site	Upwind, SW of Site	Downwind, NE of Site	Upwind, N of Site	Downwind, S of Site	Upwind, SW of Site	Downwind, NE of Site
Chemical Name	CRQL	MassDEP TELs	MassDEP AALs										
1,1,1-TRICHLOROETHANE	0.50	190	190	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,1,2,2-TETRACHLOROETHANE	0.50	2.72	0.003	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,1,2-TRICHLOROETHANE	0.50	2.72	0.01	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,1-DICHLOROETHANE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,1-DICHLOROETHENE	0.50	0.27	0.01	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,2,4-TRICHLOROBENZENE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,2,4-TRIMETHYLBENZENE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,2-DIBROMOETHANE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,2-DICHLOROBENZENE	0.50	13.6	13.6	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,2-DICHLOROETHANE	0.50	2.72	0.01	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,2-DICHLOROPROPANE	0.50	0.19	0.01	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,3,5-TRIMETHYLBENZENE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,3-BUTADINE	0.50	0.54	0.002	0.2 U	0.2 U	0.22 U	0.26 U	0.22 U	0.22 U	0.46 U	0.44 U	0.46 U	0.4 U
1,3-DICHLOROBENZENE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
1,4-DICHLOROBENZENE	0.50	20.4	0.03	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
2-BUTANONE	0.50	67.8	3.39	**0.34**	**0.41**	0.11 U	**0.198**	**0.33**	**0.35**	**0.27**	0.22 U	0.23 U	0.2 U
2-HEXANONE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
4-ETHYLTOLUENE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
4-METHYL-2-PENTANONE	0.50	13.6	13.6	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
ACRYLONITRILE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
ALLYL CHLORIDE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
BENZENE	0.50	0.54	0.4	0.1 U	0.1 U	0.11 U	0.13 U	**0.21**	**0.21**	0.23 U	0.22 U	0.23 U	0.2 U
BENZYL CHLORIDE	0.50	2.72	0.18	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
BROMODICHLOROMETHANE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
BROMOFORM	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
BROMOMETHANE	0.50	1.36	0.68	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
CARBON TETRACHLORIDE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
CHLOROBENZENE	0.50	20.4	1.36	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
CHLOROETHANE	0.50	272	136	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
CHLOROFORM	0.50	27.2	0.01	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
CHLOROMETHANE	0.50	--	--	**0.54**	**0.58**	**0.55**	**0.58**	**0.48**	**0.49**	**0.45**	**0.41**	**0.33**	**0.36**
CIS-1,2-DICHLOROETHENE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
CIS-1,3-DICHLOROPROPENE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
CYCLOHEXANE	0.50	81.6	81.6	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
DIBROMOCHLOROMETHANE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
DICHLORODIFLUOROMETHANE	0.50	--	--	**0.52**	**0.55**	**0.54**	**0.55**	**0.54**	**0.59**	**0.54**	**0.48**	**0.45**	**0.58**
DICHLOROTETRAFLUOROETHANE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
ETHYLBENZENE	0.50	69.1	69.1	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
HEXACHLOROBUTADIENE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
HEXANE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
METHYL TERT-BUTYL ETHER	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
METHYLENE CHLORIDE	1.00	2.72	0.07	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
N-HEPTANE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
O-XYLENE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
STYRENE	0.50	47	0.47	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
TETRACHLOROETHENE	0.50	136	0.003	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
TETRAHYDROFURAN	0.50	54	27	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
TOLUENE	0.50	21.23	5.31	**0.21**	**0.21**	**0.24**	**0.27**	**0.19**	**0.18**	0.23 U	0.22 U	**0.29**	**0.29**
TRANS-1,2-DICHLOROETHENE	2.00	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
TRANS-1,3-DICHLOROPROPENE	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
TRICHLOROETHENE	0.50	6.8	**0.11**	**0.33**	**0.42**	**0.12**	**0.16**	**0.12**	**0.45**	**1.32**	**0.46**	0.23 U	0.2 U
TRICHLOROFLUOROMETHANE	0.50	--	--	**0.26**	**0.27**	**0.27**	**0.28**	**0.26**	**0.28**	**0.27**	**0.23**	0.23 U	**0.23**
VINYL BROMIDE (BROMOETHENE)	0.50	--	--	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
VINYL CHLORIDE	0.50	1.4	0.15	0.1 U	0.1 U	0.11 U	0.13 U	0.11 U	0.11 U	0.23 U	0.22 U	0.23 U	0.2 U
XYLENE (TOTAL)	0.50	2.72	2.72	0.2 U	0.2 U	0.22 U	0.26 U	0.22 U	0.22 U	0.46 U	0.44 U	0.46 U	0.4 U

NOTES:
All values are in parts per billion by volume (ppbv).
The data are unvalidated.
MassDEP TELs - Massachusetts Department of Environmental Protection Threshold Effects Exposure Limits (24-hour average)
MassDEP AALs - Massachusetts Department of Environmental Protection Allowable Ambient Limits (annual average)
Bold - Detected Concentration
CRQL - Contract Required Quantification Limit
Shading
Gray - Detected Concentration Exceeds the MassDEP AALs.

LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.

Table 7
Analytical Results of Ambient Air Monitoring
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

			Sample Date	November 17, 2010		December 1, 2010		December 14, 2010		January 5, 2011		January 19, 2011	
			Sample Name	EP0055	EP0054	EP0059	EP0058	EP0065	EP0064	EP0073	EP0072	EP0079	EP0080
			Sample Description	DOWNGRADIENT	UPGRADIENT	UPGRADIENT	DOWNGRADIENT	UPGRADIENT	DOWNGRADIENT	UPGRADIENT	DOWNGRADIENT	UPGRADIENT	DOWNGRADIENT
			Sample Location	Downwind, NE of Site	Upwind, SW of Site	Upwind, SE of Site	Downwind, NW of Site	Upwind, SE of Site	Downwind, NE of Site	Upwind, W of Site	Downwind, NE of Site	Upwind, SW of Site	Downwind, NE of Site
Chemical Name	CRQL	MassDEP TELs	MassDEP AALs										
1,1,1-TRICHLOROETHANE	0.50	190	190	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,1,2,2-TETRACHLOROETHANE	0.50	2.72	0.003	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,1,2-TRICHLOROETHANE	0.50	2.72	0.01	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,1-DICHLOROETHANE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,1-DICHLOROETHENE	0.50	0.27	0.01	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,2,4-TRICHLOROBENZENE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,2,4-TRIMETHYLBENZENE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,2-DIBROMOETHANE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,2-DICHLOROBENZENE	0.50	13.6	13.6	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,2-DICHLOROETHANE	0.50	2.72	0.01	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,2-DICHLOROPROPANE	0.50	0.19	0.01	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,3,5-TRIMETHYLBENZENE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,3-BUTADINE	0.50	0.54	0.002	0.4 U	0.36 U	0.44 U	0.35 U	0.371 U	0.4 U	0.28 U	0.26 U	0.36 U	0.26 U
1,3-DICHLOROBENZENE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
1,4-DICHLOROBENZENE	0.50	20.4	0.03	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
2-BUTANONE	0.50	67.8	3.39	**0.27**	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	**0.22**	**0.26**
2-HEXANONE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
4-ETHYLTOLUENE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
4-METHYL-2-PENTANONE	0.50	13.6	13.6	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
ACRYLONITRILE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
ALLYL CHLORIDE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
BENZENE	0.50	0.54	0.4	0.2 U	0.18 U	0.22 U	0.17 U	**0.21**	**0.21**	**0.15**	**0.14**	**0.27**	**0.22**
BENZYL CHLORIDE	0.50	2.72	0.18	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
BROMODICHLOROMETHANE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
BROMOFORM	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 UJ	0.13 U
BROMOMETHANE	0.50	1.36	0.68	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
CARBON TETRACHLORIDE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
CHLOROBENZENE	0.50	20.4	1.36	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
CHLOROETHANE	0.50	272	136	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
CHLOROFORM	0.50	27.2	0.01	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
CHLOROMETHANE	0.50	--	--	**0.37**	**0.3**	**0.47**	**0.49**	**0.48**	**0.54**	**0.36**	**0.47**	**0.46**	**0.52**
CIS-1,2-DICHLOROETHENE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
CIS-1,3-DICHLOROPROPENE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
CYCLOHEXANE	0.50	81.6	81.6	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
DIBROMOCHLOROMETHANE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
DICHLORODIFLUOROMETHANE	0.50	--	--	**0.51**	**0.36**	**0.67**	**0.79**	**0.88**	**1**	**0.32**	**0.37**	**0.46**	**0.52**
DICHLOROTETRAFLUOROETHANE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.28 U	0.26 U	0.18 U	0.13 U
ETHYLBENZENE	0.50	69.1	69.1	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
HEXACHLOROBUTADIENE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
HEXANE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
METHYL TERT-BUTYL ETHER	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
METHYLENE CHLORIDE	1.00	2.72	0.07	0.2 U	0.18 U	0.22 UJ	0.17 UJ	0.186 UJ	0.2 UJ	0.14 U	0.13 U	0.18 UJ	0.13 U
N-HEPTANE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
O-XYLENE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
STYRENE	0.50	47	0.47	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
TETRACHLOROETHENE	0.50	136	0.003	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
TETRAHYDROFURAN	0.50	54	27	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
TOLUENE	0.50	21.23	5.31	0.2 U	0.18 U	0.22 U	0.17 U	**0.25**	**0.26**	**0.15**	0.13 U	**0.36**	**0.23**
TRANS-1,2-DICHLOROETHENE	2.00	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
TRANS-1,3-DICHLOROPROPENE	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
TRICHLOROETHENE	0.50	6.8	**0.11**	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
TRICHLOROFLUOROMETHANE	0.50	--	--	**0.21**	0.18 U	**0.26**	**0.26**	**0.28**	**0.31**	**0.17**	**0.2**	**0.22**	**0.22**
VINYL BROMIDE (BROMOETHENE)	0.50	--	--	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
VINYL CHLORIDE	0.50	1.4	0.15	0.2 U	0.18 U	0.22 U	0.17 U	0.186 U	0.2 U	0.14 U	0.13 U	0.18 U	0.13 U
XYLENE (TOTAL)	0.50	2.72	2.72	0.4 U	0.36 U	0.44 U	0.35 U	0.371 U	0.4 U	0.28 U	0.26 U	0.36 U	0.26 U

NOTES:
All values are in parts per billion by volume (ppbv).
The data are unvalidated.
MassDEP TELs - Massachusetts Department of Environmental Protection Threshold Effects Exposure Limits (2-
MassDEP AALs - Massachusetts Department of Environmental Protection Allowable Ambient Limits (annual ave
Bold - Detected Concentration
CRQL - Contract Required Quantification Limit
Shading
Gray - Detected Concentration Exceeds the MassDEP AALs.

LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.

Table 7
Analytical Results of Ambient Air Monitoring
In Situ Thermal Treatment Operations
Groveland Wells Superfund Site

			Sample Date	February 3, 2011		February 18, 2011	
			Sample Name	EP0090	EP0089	EP0099	EP0098
			Sample Description	UPGRADIENT	DOWNGRADIENT	UPGRADIENT	DOWNGRADIENT
			Sample Location	Upwind, N of Site	Downwind, S of Site	Upwind, N of Site	Downwind, S of Site
Chemical Name	CRQL	MassDEP TELs	MassDEP AALs				
1,1,1-TRICHLOROETHANE	0.50	190	190	0.14 U	0.15 U	0.26 U	0.23 U
1,1,2,2-TETRACHLOROETHANE	0.50	2.72	0.003	0.14 U	0.15 U	0.26 U	0.23 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
1,1,2-TRICHLOROETHANE	0.50	2.72	0.01	0.14 U	0.15 U	0.26 U	0.23 U
1,1-DICHLOROETHANE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
1,1-DICHLOROETHENE	0.50	0.27	0.01	0.14 U	0.15 U	0.26 U	0.23 U
1,2,4-TRICHLOROBENZENE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
1,2,4-TRIMETHYLBENZENE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
1,2-DIBROMOETHANE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
1,2-DICHLOROBENZENE	0.50	13.6	13.6	0.14 U	0.15 U	0.26 U	0.23 U
1,2-DICHLOROETHANE	0.50	2.72	0.01	0.14 U	0.15 U	0.26 U	0.23 U
1,2-DICHLOROPROPANE	0.50	0.19	0.01	0.14 U	0.15 U	0.26 U	0.23 U
1,3,5-TRIMETHYLBENZENE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
1,3-BUTADINE	0.50	0.54	0.002	0.28 U	0.3 U	0.52 U	0.46 U
1,3-DICHLOROBENZENE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
1,4-DICHLOROBENZENE	0.50	20.4	0.03	0.14 U	0.15 U	0.26 U	0.23 U
2-BUTANONE	0.50	67.8	3.39	**0.21**	**0.18**	**0.5**	**1.57**
2-HEXANONE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
4-ETHYLTOLUENE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
4-METHYL-2-PENTANONE	0.50	13.6	13.6	0.14 U	0.15 U	0.26 U	0.23 U
ACRYLONITRILE	0.50	--	--	0.14 UJ	0.15 UJ	0.26 UJ	0.23 UJ
ALLYL CHLORIDE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
BENZENE	0.50	0.54	0.4	**0.17**	**0.16**	**0.33**	**0.3**
BENZYL CHLORIDE	0.50	2.72	0.18	0.14 U	0.15 U	0.26 U	0.23 U
BROMODICHLOROMETHANE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
BROMOFORM	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
BROMOMETHANE	0.50	1.36	0.68	0.14 U	0.15 U	0.26 U	0.23 U
CARBON TETRACHLORIDE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
CHLOROBENZENE	0.50	20.4	1.36	0.14 U	0.15 U	0.26 U	0.23 U
CHLOROETHANE	0.50	272	136	0.14 U	0.15 U	0.26 U	0.23 U
CHLOROFORM	0.50	27.2	0.01	0.14 U	0.15 U	0.26 U	0.23 U
CHLOROMETHANE	0.50	--	--	**0.36**	**0.37**	**0.58**	**0.55**
CIS-1,2-DICHLOROETHENE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
CIS-1,3-DICHLOROPROPENE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
CYCLOHEXANE	0.50	81.6	81.6	0.14 U	0.15 U	0.26 U	0.23 U
DIBROMOCHLOROMETHANE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
DICHLORODIFLUOROMETHANE	0.50	--	--	**0.35**	**0.3**	**0.57**	**0.5**
DICHLOROTETRAFLUOROETHANE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
ETHYLBENZENE	0.50	69.1	69.1	0.14 U	0.15 U	0.26 U	0.23 U
HEXACHLOROBUTADIENE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
HEXANE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
METHYL TERT-BUTYL ETHER	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
METHYLENE CHLORIDE	1.00	2.72	0.07	0.14 UJ	0.15 UJ	0.26 UJ	0.23 UJ
N-HEPTANE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
O-XYLENE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
STYRENE	0.50	47	0.47	0.14 U	0.15 U	0.26 U	0.23 U
TETRACHLOROETHENE	0.50	136	0.003	0.14 U	0.15 U	0.26 U	0.23 U
TETRAHYDROFURAN	0.50	54	27	0.14 U	0.15 U	0.26 U	0.23 U
TOLUENE	0.50	21.23	5.31	0.14 U	0.15 U	**0.51**	**0.47**
TRANS-1,2-DICHLOROETHENE	2.00	--	--	0.14 U	0.15 U	0.26 U	0.23 U
TRANS-1,3-DICHLOROPROPENE	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
TRICHLOROETHENE	0.50	6.8	**0.11**	0.14 U	0.15 U	0.26 U	0.23 U
TRICHLOROFLUOROMETHANE	0.50	--	--	**0.17**	**0.16**	**0.25**	**0.24**
VINYL BROMIDE (BROMOETHENE)	0.50	--	--	0.14 U	0.15 U	0.26 U	0.23 U
VINYL CHLORIDE	0.50	1.4	0.15	0.14 U	0.15 U	0.26 U	0.23 U
XYLENE (TOTAL)	0.50	2.72	2.72	0.28 U	0.3 U	0.52 U	0.46 U

NOTES:
All values are in parts per billion by volume (ppbv).
The data are unvalidated.
MassDEP TELs - Massachusetts Department of Environmental Protection Threshold Effects Exposure Limits (24
MassDEP AALs - Massachusetts Department of Environmental Protection Allowable Ambient Limits (annual ave
Bold - Detected Concentration
CRQL - Contract Required Quantification Limit
Shading
Gray - Detected Concentration Exceeds the MassDEP AALs.

LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.

Legend

- Groundwater Sampling Locations
- ISTT Area A Boundary

N

0 20 40 80

Feet

1 inch = 40 feet

Nobis
Engineering a Sustainable Future

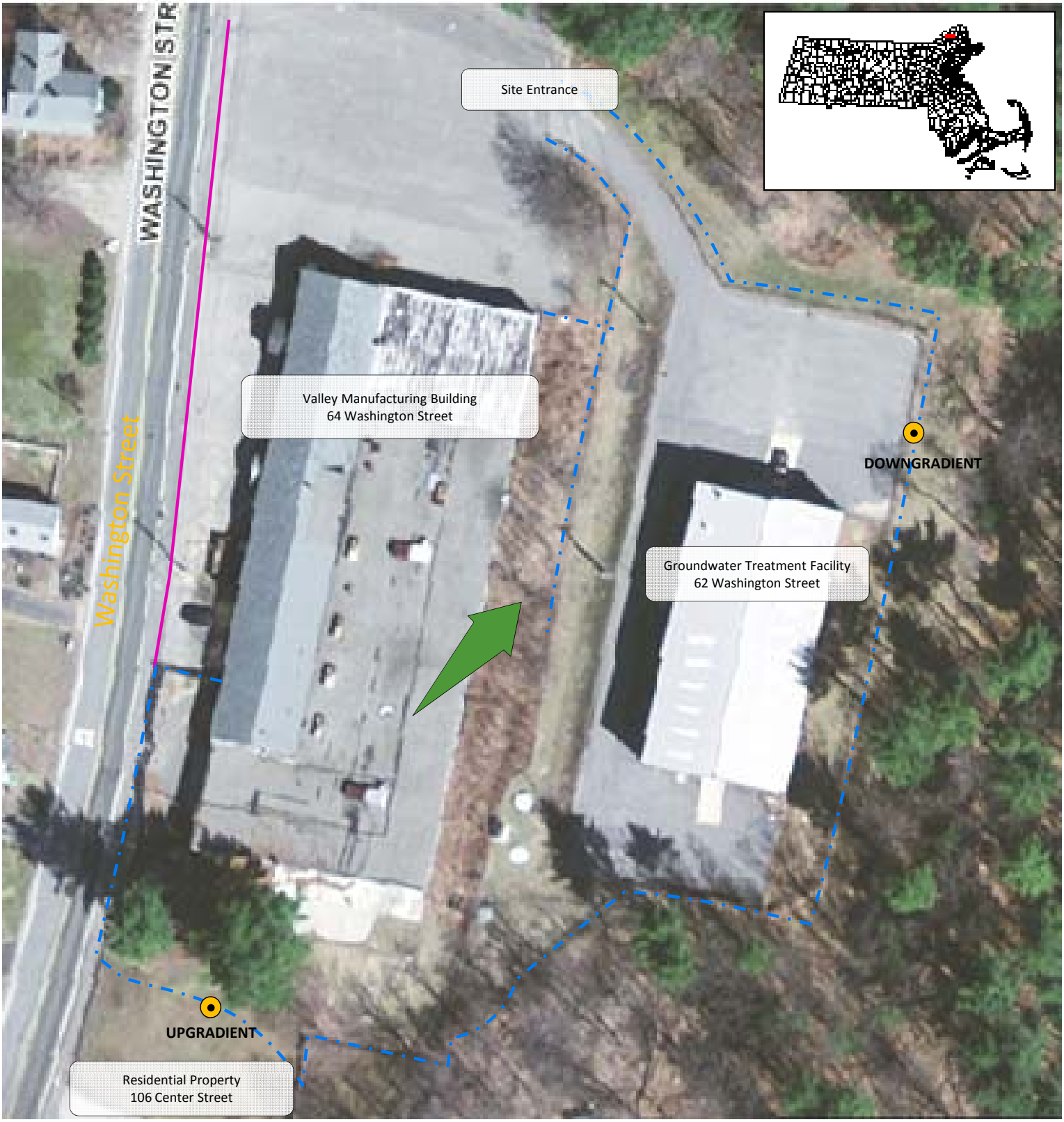
Nobis Engineering, Inc.
585 Middlesex Street
Lowell, MA 01851
(978) 683-0891
www.nobisengineering.com

FIGURE 1

ISTT OPERATION GROUNDWATER
SAMPLING LOCATIONS
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

PREPARED BY: JMH	CHECKED BY: DB
PROJECT NO. 80037	DATE: 8/24/2011

Path: R:\80000 Task Orders\80037 Groveland Wells RA\Technical Data - new and previous\GIS\Nobis Maps\Groundwater Maps\Fig_1_Operation_GW_Locations.mxd 8:24:11 AM



Legend:

- Property Limit
- Chain Link Fencing
- Ambient Air Monitoring Location
- Prevailing Wind Direction during ISTT operations, based on data collected from the Bradford College Weather Station.

Notes:

All locations are approximate. Ambient air monitoring locations were modified as needed based on the wind conditions on each monitoring day.

Aerial photograph used with permission from MASS GIS – USGS 2008 30 cm Color Ortho.

FIGURE 2

TYPICAL AMBIENT AIR MONITORING LOCATIONS

GROVELAND WELLS SUPERFUND SITE
GROVELAND, MA

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(978) 683-0891
www.nobisengineering.com

DATE:	August 2011
PROJECT NO.:	80037.11
DESIGNED BY:	LDS
DRAWN BY:	LDS
REVIEWED BY:	DB
SCALE:	As Shown

N

TECHNICAL MEMORANDUM

Date:	August 2011
To:	Derrick Golden, United States Environmental Protection Agency (USEPA), Region 1
From:	Diane Baxter, Project Manager, Nobis Engineering, Inc.
Prepared by:	Heidi Borchers, Staff Engineer, Nobis Engineering, Inc. Lauren Soós, Project Engineer, Nobis Engineering, Inc.
Subject:	In Situ Thermal Treatment Confirmation Data Summary Source Control Remedial Action Groveland Wells Nos. 1 & 2 Superfund Site, Groveland, Massachusetts

---

INTRODUCTION

Following the completion of the In-Situ Thermal Treatment (ISTT) system at the Groveland Wells Nos. 1 & 2 Superfund Site (the Site), soil and groundwater samples were collected from the treatment area. Samples were collected in order to determine if the Interim Cleanup Goals (CUG) have been met. These data will be used in order to assess the need for additional treatment in specific zones if the CUGs have not been met. This Technical Memorandum (Memo) presents and briefly summarizes the laboratory data collected during the ISTT confirmation. Tables and figures are included at the end of this Memo. Data discussed in this Memo are for the following activities:

- Confirmation Groundwater Sampling; and
- Confirmation Soil Sampling.

PURPOSE AND DESCRIPTION OF FIELD ACTIVITIES

The ISTT confirmation field activities performed by Nobis between March and August of 2011 are briefly described below. Refer to the *Quality Assurance Project Plan, Revision 3 (Nobis, April 2010)* (QAPP) for details of the sampling programs.

Confirmation Groundwater Sampling

The purpose of the confirmation groundwater samples collected from within the ISTT treatment area was to monitor the effectiveness of the ISTT, and to examine conformance with CUGs. Confirmation groundwater sampling was performed during three different sampling events (Events Numbers 1 through 3) following the completion of ISTT. The first confirmation groundwater sampling event occurred 6 weeks after the ISTT was shut down, the second at the 12 week interval, and the last occurred after 24 weeks. A total of 16 wells were sampled and analyzed using RAS low level VOCs (EPA SOW SOM01.2) during each confirmation groundwater sampling event. The locations of these groundwater monitoring wells are described in Figure 1.

Confirmation Soil Sampling

The purpose of the confirmation soil samples collected from within the ISTT treatment area was to monitor the effectiveness of the ISTT, and to examine conformance with CUGs. During ISTT confirmation soil sampling, soil samples were collected following the completion of ISTT and after subsurface temperatures in the treatment zone were below 100 degrees Celsius (approximately six weeks following ISTT shutdown).

Due to the dense nature of subsurface soils in the ISTT Areas, confirmation soil borings were drilled using hollow stem augers. The borings were sampled continuously using a 2-inch diameter, 24-inch long, split barrel sampler, lined with four, 6-inch long stainless steel sleeves. During confirmation soil sampling activities, there was a potential to encounter subsurface soils with temperatures greater than the boiling point of methanol (64.7 °C), a preservative used during VOC soil sampling. To ensure sample integrity, it was necessary to cool soil samples prior to sample preservation. After the samples were retrieved, the samples were capped and placed in an ice bath for cooling. Samples were allowed to cool to below 30 °C prior to sample screening with a PID and collection for laboratory analysis. Subsurface soil temperatures observed at select locations during drilling activities ranged from 47 to 68 °C.

A total of 43 soil samples were selected for laboratory analysis of RAS low level VOCs using EPA SOW SOM01.2 and a limited number of soil samples, approximately 10 percent, were also analyzed for total organic carbon (TOC) using the Lloyd-Kahn TOC method. In general, three samples were collected from each soil boring based on historic sample depths, geologic observations, and highest photoionization readings. The locations of these soil borings are described in Figure 2.

RESULTS

The results of the ISTT confirmation sampling are briefly summarized below. Refer to the attached Tables for the comprehensive analytical results.

Confirmation Groundwater Sampling – Event No. 1

The results of the Confirmation Groundwater Sampling Event No. 1 are summarized in Table 1. Trichloroethene (TCE) was detected in groundwater samples ranging from below the CUG of 5 micrograms per liter (µg/L) to a concentration of 130 µg/L, detected in Groundwater Monitoring Well TW-31. Cis-1,2-Dichloroethene (cis-1,2-DCE) was not detected at concentrations exceeding the CUG of 70 µg/L during the Confirmation Groundwater Sampling Event No. 1. Acetone and 2-butanone were detected at concentrations ranging from below the Contract Required Quantitation Limit (CRQL, both at 10 µg/L) to concentrations of 1300 (RW-09 and RW-10) and 210 µg/L (RW-10), respectively. There are no Site CUGs for acetone and 2-butanone.

Confirmation Groundwater Sampling – Event No. 2

The results of the Confirmation Groundwater Sampling Event No. 2 are summarized in Table 2. TCE was detected in groundwater samples ranging from below the CUG of 5 µg/L to a concentration of 83 µg/L (TW-31). Cis-1,2-DCE was not detected at concentrations exceeding the CUG of 70 µg/L during the Confirmation Groundwater Sampling Event No. 2. Acetone and 2-butanone were detected in groundwater samples at concentrations ranging from below the CRQL (both at 10 µg/L) to concentrations of 400 µg/L (RW-10) and 63 µg/L (RW-10), respectively.

Confirmation Groundwater Sampling – Event No. 3

The results of the Confirmation Groundwater Sampling Event No. 3 are summarized in Table 3. TCE and cis-1,2-DCE were detected in groundwater samples ranging from below the CUGs to concentrations above CUGs (maximum of 78 µg/L for both compounds at RW-05). Acetone was detected in groundwater samples ranging from below the CRQL (10 µg/L) to a concentration of 56 µg/L (RW-02). 2-butanone was not detected at concentrations exceeding the CRQL during the Confirmation Groundwater Sampling Event No. 3.

Confirmation Soil Sampling

The VOC and TOC results of the Confirmation Soil Sampling are summarized in Table 4. Three VOCs were detected at concentrations exceeding their respective CUGs: TCE (CUG of 77 micrograms per kilogram [µg/kg]), cis-1,2-DCE (CUG of 418 µg/kg), and methylene chloride (CUG of 22 µg/kg). Concentrations of TCE ranged from non-detect levels at most locations to a concentration of 7,000 µg/kg (CSB-13, at depths of 3-5 feet). Concentrations of cis-1,2-DCE ranged from non-detect levels at most locations to 1700 µg/kg at CSB-10 (at a depth of 23-25 ft bgs). Methylene chloride was detected at trace concentrations ranging from below the CUG of 22 µg/kg to 360 µg/kg (at CSB-10, at a depth of 23-25 ft bgs). Methylene chloride concentrations exceeded the relatively low CUG in several soil samples. Cis-1,2-DCE exceeded the CUG in only one sample. TCE concentrations exceeded the CUG in only two soil samples; however, the sample detection limits for TCE exceeded the CUG in several samples.

Acetone and 2-butanone were detected at concentrations ranging from below the CRQL (both at 10 µg/L) to concentrations of 3200 (CSB-13, at a depth of 3 to 5 ft bgs) and 1000 µg/kg (CSB-13, at a depth of 3 to 5 ft bgs), respectively. There are no site CUGs for acetone and 2-butanone. High concentrations of acetone caused interference with the laboratory instruments and were the reason for detection limits (ranging from 220 to 490 µg/kg) above the CRQL (5 µg/kg) in many of the samples.

TABLES:

Table 1 Analytical Results of Confirmation Groundwater Sampling Event No. 1
Table 2 Analytical Results of Confirmation Groundwater Sampling Event No. 2
Table 3 Analytical Results of Confirmation Groundwater Sampling Event No. 3
Table 4 Analytical Results of Confirmatory Soil Sampling

FIGURES:

Figure 1 Confirmation Groundwater Sampling Locations
Figure 2 Confirmation Soil Boring Locations

******

Table 1
Analytical Results of Confirmation Groundwater Sampling Event No. 1
In Situ Thermal Treatment
Groveland Wells Superfund Site

		Sample Name	A3109		A3091		A3092		A3093		A3094		A3107/A3095		A3106		A3097		A3098		A3099		A3100		A3101		A3102		A3103		A3104		A3105	
		Sample Location	EW-S3		RW-01		RW-02		RW-03		RW-04		RW-05		RW-06		RW-07		RW-07B		RW-08		RW-09		RW-10		RW-10B		TW-31		TW-40		TW-47	
		Sample Date	3/23/2011		3/21/2011		3/22/2011		3/21/2011		3/23/2011		3/22/2011		3/21/2011		3/23/2011		3/21/2011		3/22/2011		3/22/2011		3/22/2011		3/23/2011		3/23/2011		3/23/2011		3/23/2011	
Chemical Name	CRQL	CUG	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
1,1,1-TRICHLOROETHANE	5	200	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1,2,2-TETRACHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1,2-TRICHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1-DICHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1-DICHLOROETHENE	5	7	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2,3-TRICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2,4-TRICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	**2.7**	J	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DIBROMOETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROPROPANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,3-DICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,4-DICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,4-DIOXANE	100	--	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2-BUTANONE	10	--	10	U	10	U	10	U	**77**		10	U	**17**		10	U	**170**		10	U	10	U	**190**		**210**		10	U	10	U	10	U	10	U
2-HEXANONE	10	--	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	**12**		**24**		10	U	10	U	10	U	10	U
4-METHYL-2-PENTANONE	10	--	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	**8.9**	J	10	U	10	U	10	U	10	U	10	U
ACETONE	10	--	**66**		10	U	**14**		**350**	D	10	U	**105**		10	U	**38**		10	U	10	U	**1300**	D	**1300**	D	10	U	10	U	10	U	10	U
BENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	**140**		5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMOCHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMODICHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMOFORM	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMOMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CARBON DISULFIDE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CARBON TETRACHLORIDE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROFORM	5	--	5	U	5	U	**1.1**	J	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CIS-1,2-DICHLOROETHENE	5	70	**17**		5	U	**2**	J	**2.8**	J	**8.6**		**19**		5	U	**13**		5	U	**1.2**	J	**8.9**		5	U	5	U	**5**	J	5	U	5	U
CIS-1,3-DICHLOROPROPENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CYCLOHEXANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
DIBROMOCHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
DICHLORODIFLUOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
ETHYLBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
ISOPROPYLBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
M,P-XYLENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYL ACETATE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYL TERT-BUTYL ETHER	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYLCYCLOHEXANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYLENE CHLORIDE	5	5	**1.9**	J	5	U	5	U	**2.6**	J	**2.5**	J	**2.4**	J	**1.6**	J	**2.7**	J	**2.4**	J	**2.1**	J	**1.7**	J	**1.6**	J	**2.4**	J	5	U	**1.4**	J	**1.5**	J
O-XYLENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
STYRENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TETRACHLOROETHENE	5	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	**1.2**	J	5	U	5	U	5	U	5	U	5	U	5	U	5	U	**1.3**	J
TOLUENE	5	1000	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	**1.3**	J	5	U	5	U	5	U	5	U	5	U
TRANS-1,2-DICHLOROETHENE	5	100	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TRANS-1,3-DICHLOROPROPENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TRICHLOROETHENE	5	5	**36**		5	U	**1**	J	**5.9**		**24**		**37**		**1.2**	J	**28**		**4.6**	J	**1.2**	J	**12**		**3.3**	J	5	U	**130**		5	U	**2.3**	J
TRICHLOROFLUOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
VINYL CHLORIDE	2	2	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U

NOTES:

All values are in micrograms per liter (ug/L).

The data are unvalidated.

CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)

CRQL - Contract Required Quantitation Limit

Bold - Detected Concentration

Shaded - Detected Concentrations Exceeds the CUG

Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:

D - Concentration is reported from a dilution of the sample.

J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).

U - Not detected above the SSDL.

Table 2
Analytical Results of Confirmation Groundwater Sampling Event No. 2
In Situ Thermal Treatment
Groveland Wells Superfund Site

		Sample Name	A4382		A4386		A4376		A4372		A4389		A4390		A4380/A4383		A4378	
		Sample Location	EW-S3		MPE-06(1)		RW-01		RW-02		RW-03		RW-04		RW-05		RW-06	
		Sample Date	5/3/2011		5/4/2011		5/3/2011		5/2/2011		5/4/2011		5/4/2011		5/3/2011		5/3/2011	
Chemical Name	CRQL	CUG	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
1,1,1-TRICHLOROETHANE	5	200	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1,2,2-TETRACHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1,2-TRICHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1-DICHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1-DICHLOROETHENE	5	7	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2,3-TRICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	**3.9**	**J**	5	U	5	U	5	U
1,2,4-TRICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DIBROMOETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROPROPANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,3-DICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	**1.1**	**J**	5	U	5	U	5	U
1,4-DICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,4-DIOXANE	100	--	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2-BUTANONE	10	--	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2-HEXANONE	10	--	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
4-METHYL-2-PENTANONE	10	--	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
ACETONE	10	--	10	U	10	U	10	U	10	U	**18**		10	U	**97**		10	U
BENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMOCHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMODICHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMOFORM	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMOMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CARBON DISULFIDE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CARBON TETRACHLORIDE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROFORM	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CIS-1,2-DICHLOROETHENE	5	70	**6.1**		**5.2**		5	U	5	U	**7.8**		**9.6**		**13**		5	U
CIS-1,3-DICHLOROPROPENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CYCLOHEXANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
DIBROMOCHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
DICHLORODIFLUOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
ETHYLBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
ISOPROPYLBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
M,P-XYLENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYL ACETATE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYL TERT-BUTYL ETHER	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYLCYCLOHEXANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYLENE CHLORIDE	5	5	**3.9**	**J**	**4.5**	**J**	**4.3**	**J**	**4**	**J**	**4.9**	**J**	**5.4**		**4.1**	**J**	**4.8**	**J**
O-XYLENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
STYRENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TETRACHLOROETHENE	5	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TOLUENE	5	1000	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TRANS-1,2-DICHLOROETHENE	5	100	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TRANS-1,3-DICHLOROPROPENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TRICHLOROETHENE	5	5	**15**		**9.6**		5	U	5	U	**17**		**25**		**15**		5	U
TRICHLOROFLUOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
VINYL CHLORIDE	2	2	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CRQL - Contract Required Quantitation Limit
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)

Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG
(1) MPE-06 was sampled as a substitute for RW-07 (obstruction in well during sampling event prevented sampling).

LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.

Table 2
Analytical Results of Confirmation Groundwater Sampling Event No. 2
In Situ Thermal Treatment
Groveland Wells Superfund Site

		Sample Name	A4379		A4387		A4375		A4381		A4377		A4374		A4373		A4371	
		Sample Location	RW-07B		RW-08		RW-09		RW-10		RW-10B		TW-31		TW-40		TW-47	
		Sample Date	5/3/2011		5/4/2011		5/2/2011		5/3/2011		5/3/2011		5/2/2011		5/2/2011		5/3/2011	
Chemical Name	CRQL	CUG	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
1,1,1-TRICHLOROETHANE	5	200	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1,2,2-TETRACHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1,2-TRICHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1-DICHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1-DICHLOROETHENE	5	7	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2,3-TRICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2,4-TRICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DIBROMOETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROPROPANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,3-DICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,4-DICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,4-DIOXANE	100	--	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2-BUTANONE	10	--	10	U	10	U	10	U	**63**		10	U	10	U	10	U	10	U
2-HEXANONE	10	--	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
4-METHYL-2-PENTANONE	10	--	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
ACETONE	10	--	10	U	10	U	10	U	**400**		10	U	10	U	10	U	10	U
BENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMOCHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMODICHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMOFORM	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMOMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CARBON DISULFIDE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CARBON TETRACHLORIDE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROFORM	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CIS-1,2-DICHLOROETHENE	5	70	**1.1**	**J**	5	U	5	U	**5.9**		5	U	**4.6**	**J**	5	U	5	U
CIS-1,3-DICHLOROPROPENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CYCLOHEXANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
DIBROMOCHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
DICHLORODIFLUOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
ETHYLBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
ISOPROPYLBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
M,P-XYLENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYL ACETATE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYL TERT-BUTYL ETHER	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYLCYCLOHEXANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYLENE CHLORIDE	5	5	**4.8**	**J**	**5.4**		**3.9**	**J**	**6.5**		**4.7**	**J**	**5.2**		**4.3**	**J**	**4.4**	**J**
O-XYLENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
STYRENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TETRACHLOROETHENE	5	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TOLUENE	5	1000	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TRANS-1,2-DICHLOROETHENE	5	100	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TRANS-1,3-DICHLOROPROPENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TRICHLOROETHENE	5	5	**5.8**		5	U	5	U	**10**		5	U	**83**		5	U	**1.3**	**J**
TRICHLOROFLUOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
VINYL CHLORIDE	2	2	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CRQL - Contract Required Quantitation Limit
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)

Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG
(1) MPE-06 was sampled as a substitute for RW-07 (obstruction in well during sampling event prevented sampling).

LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.

Table 3
Analytical Results of Confirmation Groundwater Sampling Event No. 3
In Situ Thermal Treatment
Groveland Wells Superfund Site

		Sample Name	A4404		A4397		A4393		A4409		A4410		A4401/A4402		A4399		A4413		A4400		A4408		A4396		A4403		A4398		A4395		A4394		A4392	
		Sample Location	EW-S3		RW-01		RW-02		RW-03		RW-04		RW-05		RW-06		RW-07		RW-07B		RW-08		RW-09		RW-10		RW-10B		TW-31		TW-40		TW-47	
		Sample Date	8/3/2011		8/3/2011		8/2/2011		8/3/2011		8/3/2011		8/2/2011		8/2/2011		8/1/2011		8/1/2011		8/2/2011		8/2/2011		8/1/2011		8/1/2011		8/4/2011		8/2/2011		8/4/2011	
Chemical Name	CRQL	CUG	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
1,1,1-TRICHLOROETHANE	5	200	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1,2,2-TETRACHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1,2-TRICHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1-DICHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,1-DICHLOROETHENE	5	7	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2,3-TRICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2,4-TRICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DIBROMOETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROPROPANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,3-DICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,4-DICHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,4-DIOXANE	100	--	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2-BUTANONE	10	--	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2-HEXANONE	10	--	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
4-METHYL-2-PENTANONE	10	--	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
ACETONE	10	--	**14**		10	U	**56**		**33**		10	U	**13**		**15**		10	U	10	U	10	U	10	U	10	U	10	U	**27**		**17**		**32**	
BENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMOCHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMODICHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMOFORM	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
BROMOMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CARBON DISULFIDE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CARBON TETRACHLORIDE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROFORM	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CIS-1,2-DICHLOROETHENE	5	70	**17**		5	U	5	U	**11**		**14**		**78**		**4.7 J**		**9.2**		5	U	5	U	5	U	**1.9 J**		5	U	**4.1 J**		5	U	5	U
CIS-1,3-DICHLOROPROPENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
CYCLOHEXANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
DIBROMOCHLOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
DICHLORODIFLUOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
ETHYLBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
ISOPROPYLBENZENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
M,P-XYLENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYL ACETATE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYL TERT-BUTYL ETHER	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYLCYCLOHEXANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
METHYLENE CHLORIDE	5	5	**4.1 JB**		5	U	**4.2 JB**		**3.9 JB**		**4.3 JB**		**3.8 JB**		**3.1 JB**		**3.9 JB**		**4.4 JB**		**4.2 JB**		**4.2 JB**		**3.9 JB**		**4.2 JB**		**4.4 JB**		**3.9 JB**		**4.6 JB**	
O-XYLENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
STYRENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TETRACHLOROETHENE	5	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TOLUENE	5	1000	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TRANS-1,2-DICHLOROETHENE	5	100	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TRANS-1,3-DICHLOROPROPENE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
TRICHLOROETHENE	5	5	**38**		5	U	5	U	**17**		**20**		**78**		**8.9**		**11**		**7.2**		5	U	5	U	**1.9 J**		5	U	**38**		5	U	5	U
TRICHLOROFLUOROMETHANE	5	--	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
VINYL CHLORIDE	2	2	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U

NOTES:
All values are in micrograms per liter (ug/L).
The data are unvalidated.
CRQL - Contract Required Quantitation Limit
CUG - Interim Cleanup Goals - based on current federal and state Maximum Contaminant Levels per the Record of Decisions (1991)
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
D - Concentration is reported from a dilution of the sample.
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 1
Analytical Results of Confirmation Soil Sampling
In Situ Thermal Treatment
Groveland Wells Superfund Site

		Sample Name	A4314	A4315	A4316	A4312	A4313	A4330	A4317/A4318	A4319	A4331
		Sample Location	CSB-01	CSB-01	CSB-01	CSB-02	CSB-02	CSB-02	CSB-03	CSB-03	CSB-03
		Top Depth (feet below grade)	9	27	33	14	28	38	9	19	33
		Bottom Depth (feet below grade)	11	29	35	16	30	40	11	21	35
		Sample Date & Time	4/5/2011	4/5/2011	4/5/2011	4/4/2011	4/4/2011	4/4/2011	4/5/2011	4/5/2011	4/5/2011
Chemical Name	CRQL	CUG									
1,1,1-TRICHLOROETHANE	5	1388	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,1,2,2-TETRACHLOROETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,1,2-TRICHLOROETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,1-DICHLOROETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,1-DICHLOROETHENE	5	45	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	*400 U*	4.9 U
1,2,3-TRICHLOROBENZENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,2,4-TRICHLOROBENZENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,2-DIBROMOETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,2-DICHLOROBENZENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,2-DICHLOROETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,2-DICHLOROPROPANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,3-DICHLOROBENZENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,4-DICHLOROBENZENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
1,4-DIOXANE	100	--	96 U	100 U	130 U	110 U	110 U	97 U	150 U	7900 U	99 U
2-BUTANONE	10	--	**3.2 J**	10 U	13 U	11 U	**6.2 J**	9.7 U	15 U	790 U	**2.7 J**
2-HEXANONE	10	--	9.6 U	10 U	13 U	11 U	11 U	9.7 U	15 U	790 U	9.9 U
4-METHYL-2-PENTANONE	10	--	9.6 U	10 U	13 U	11 U	11 U	9.7 U	15 U	790 U	9.9 U
ACETONE	10	--	**17**	**18**	**16**	11 U	**32**	**25**	**75**	**1200 B**	**170**
BENZENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
BROMOCHLOROMETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
BROMODICHLOROMETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
BROMOFORM	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
BROMOMETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
CARBON DISULFIDE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
CARBON TETRACHLORIDE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
CHLOROBENZENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
CHLOROETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
CHLOROFORM	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
CHLOROMETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
CIS-1,2-DICHLOROETHENE	5	418	4.8 U	5.2 U	**0.61 J**	5.6 U	**0.76 J**	4.8 U	7.3 U	400 U	4.9 U
CIS-1,3-DICHLOROPROPENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
CYCLOHEXANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
DIBROMOCHLOROMETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
DICHLORODIFLUOROMETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
ETHYLBENZENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
ISOPROPYLBENZENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
M,P-XYLENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
METHYL ACETATE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
METHYL TERT-BUTYL ETHER	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
METHYLCYCLOHEXANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
METHYLENE CHLORIDE	5	22	**1.4 JB**	5.2 U	**1.7 JB**	5.6 U	**1.7 JB**	**1.7 JB**	**3.3 JB**	**340 JB**	**1.9 JB**
O-XYLENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
STYRENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
TETRACHLOROETHENE	5	56	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	*400 U*	4.9 U
TOLUENE	5	22753	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
TRANS-1,2-DICHLOROETHENE	5	626	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
TRANS-1,3-DICHLOROPROPENE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
TRICHLOROETHENE	5	77	4.8 U	5.2 U	**0.87 J**	5.6 U	**1 J**	4.8 U	7.3 U	*400 U*	**0.58** J
TRICHLOROFLUOROMETHANE	5	--	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	400 U	4.9 U
VINYL CHLORIDE	5	11	4.8 U	5.2 U	6.3 U	5.6 U	5.4 U	4.8 U	7.3 U	*400 U*	4.9 U
TOC (Total Organic Carbon)*			NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:
All values are in micrograms per kilogram (ug/kg).
*TOC values are in miligrams per kilogram (mg/kg)
The data are unvalidated.

CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG

CUG - Interim Cleanup Goals as defined in the Explanation of Significant Differences for OU2 (EPA, 2007)
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 1
Analytical Results of Confirmation Soil Sampling
In Situ Thermal Treatment
Groveland Wells Superfund Site

		Sample Name	A4361	A4363/A4362	A4364	A4356	A4357	A4358	A4341	A4342	A4337
		Sample Location	CSB-04	CSB-04	CSB-04	CSB-05	CSB-05	CSB-05	CSB-06	CSB-06	CSB-07
		Top Depth (feet below grade)	11	15	29	13	27	39	8	10	6
		Bottom Depth (feet below grade)	13	17	31	15	29	41	10	12	8
		Sample Date & Time	4/12/2011	4/12/2011	4/12/2011	4/11/2011	4/11/2011	4/12/2011	4/8/2011	4/8/2011	4/7/2011
Chemical Name	CRQL	CUG									
1,1,1-TRICHLOROETHANE	5	1388	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,1,2,2-TETRACHLOROETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,1,2-TRICHLOROETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,1-DICHLOROETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,1-DICHLOROETHENE	5	45	*310 U*	*240 U*	*340 U*	*220 U*	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,2,3-TRICHLOROBENZENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,2,4-TRICHLOROBENZENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,2-DIBROMOETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,2-DICHLOROBENZENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,2-DICHLOROETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,2-DICHLOROPROPANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,3-DICHLOROBENZENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,4-DICHLOROBENZENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
1,4-DIOXANE	100	--	6100 U	4800 U	6800 U	4500 U	110 U	100 U	110 U	120 U	100 U
2-BUTANONE	10	--	**220 J**	480 U	680 U	450 U	**2.1 J**	10 U	11 U	12 U	10 U
2-HEXANONE	10	--	610 U	480 U	680 U	450 U	11 U	10 U	11 U	12 U	10 U
4-METHYL-2-PENTANONE	10	--	610 U	480 U	680 U	450 U	11 U	10 U	11 U	12 U	10 U
ACETONE	10	--	**1600**	**810**	**1000**	**730 B**	**80**	10 U	**9.6** J	**9.2** J	**17**
BENZENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
BROMOCHLOROMETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
BROMODICHLOROMETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
BROMOFORM	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
BROMOMETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
CARBON DISULFIDE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
CARBON TETRACHLORIDE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
CHLOROBENZENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
CHLOROETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
CHLOROFORM	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
CHLOROMETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
CIS-1,2-DICHLOROETHENE	5	418	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
CIS-1,3-DICHLOROPROPENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
CYCLOHEXANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
DIBROMOCHLOROMETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
DICHLORODIFLUOROMETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
ETHYLBENZENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
ISOPROPYLBENZENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
M,P-XYLENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
METHYL ACETATE	5	--	310 U	240 U	340 U	220 U	5.5 U	**1.3** J	5.3 U	5.9 U	5.2 U
METHYL TERT-BUTYL ETHER	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
METHYLCYCLOHEXANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
METHYLENE CHLORIDE	5	22	**220 JB**	**215 JB**	**260 JB**	**260 B**	**2.1 JB**	**1.7 JB**	**1.2 JB**	**2.9 JB**	**1.2 JB**
O-XYLENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
STYRENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
TETRACHLOROETHENE	5	56	*310 U*	*240 U*	*340 U*	*220 U*	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
TOLUENE	5	22753	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
TRANS-1,2-DICHLOROETHENE	5	626	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
TRANS-1,3-DICHLOROPROPENE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
TRICHLOROETHENE	5	77	*310 U*	*240 U*	*340 U*	*220 U*	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
TRICHLOROFLUOROMETHANE	5	--	310 U	240 U	340 U	220 U	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
VINYL CHLORIDE	5	11	*310 U*	*240 U*	*340 U*	*220 U*	5.5 U	5.2 U	5.3 U	5.9 U	5.2 U
TOC (Total Organic Carbon)*			NA	NA	30	34	NA	NA	NA	NA	NA

NOTES:
All values are in micrograms per kilogram (ug/kg).
*TOC values are in miligrams per kilogram (mg/kg)
The data are unvalidated.

CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG

CUG - Interim Cleanup Goals as defined in the Explanation of Significant Differences for OU2 (EPA, 2007)
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 1
Analytical Results of Confirmation Soil Sampling
In Situ Thermal Treatment
Groveland Wells Superfund Site

		Sample Name	A4338	A4339	A4327	A4328	A4340	A4320	A4321	A4322	A4325
		Sample Location	CSB-07	CSB-07	CSB-08	CSB-08	CSB-08	CSB-09	CSB-09	CSB-09	CSB-10
		Top Depth (feet below grade)	10	16	8	20	24	7	15	27	9
		Bottom Depth (feet below grade)	12	18	10	22	26	9	17	29	11
		Sample Date & Time	4/7/2011	4/7/2011	4/6/2011	4/6/2011	4/7/2011	4/6/2011	4/6/2011	4/6/2011	4/6/2011
Chemical Name	CRQL	CUG									
1,1,1-TRICHLOROETHANE	5	1388	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,1,2,2-TETRACHLOROETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,1,2-TRICHLOROETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,1-DICHLOROETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,1-DICHLOROETHENE	5	45	6.4 U	5.2 U	*320 U*	*400 U*	*250 U*	*330 U*	*330 U*	5 U	*300 U*
1,2,3-TRICHLOROBENZENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,2,4-TRICHLOROBENZENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,2-DIBROMOETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,2-DICHLOROBENZENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,2-DICHLOROETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,2-DICHLOROPROPANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,3-DICHLOROBENZENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,4-DICHLOROBENZENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
1,4-DIOXANE	100	--	130 U	100 U	6400 U	7900 U	5100 U	6500 U	6700 U	100 U	6000 U
2-BUTANONE	10	--	13 U	10 U	640 U	790 U	510 U	650 U	670 U	**18**	600 U
2-HEXANONE	10	--	13 U	10 U	640 U	790 U	510 U	650 U	670 U	10 U	600 U
4-METHYL-2-PENTANONE	10	--	13 U	10 U	640 U	790 U	510 U	650 U	670 U	10 U	600 U
ACETONE	10	--	**86**	**50**	**990 B**	**1300 B**	**790 B**	**3000 B**	**1400 B**	**220**	**1900 B**
BENZENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
BROMOCHLOROMETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
BROMODICHLOROMETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
BROMOFORM	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
BROMOMETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
CARBON DISULFIDE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
CARBON TETRACHLORIDE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
CHLOROBENZENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
CHLOROETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
CHLOROFORM	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
CHLOROMETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
CIS-1,2-DICHLOROETHENE	5	418	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
CIS-1,3-DICHLOROPROPENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
CYCLOHEXANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
DIBROMOCHLOROMETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
DICHLORODIFLUOROMETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
ETHYLBENZENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
ISOPROPYLBENZENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
M,P-XYLENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
METHYL ACETATE	5	--	6.4 U	**1.1** J	320 U	400 U	250 U	330 U	330 U	5 U	300 U
METHYL TERT-BUTYL ETHER	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
METHYLCYCLOHEXANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
METHYLENE CHLORIDE	5	22	**2.1 JB**	**4.2 JB**	**270 JB**	***400 U***	**140 JB**	**270 JB**	**220 JB**	**2 JB**	**200 JB**
O-XYLENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
STYRENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
TETRACHLOROETHENE	5	56	6.4 U	5.2 U	*320 U*	*400 U*	*250 U*	*330 U*	*330 U*	5 U	*300 U*
TOLUENE	5	22753	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
TRANS-1,2-DICHLOROETHENE	5	626	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
TRANS-1,3-DICHLOROPROPENE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
TRICHLOROETHENE	5	77	6.4 U	5.2 U	*320 U*	*400 U*	*250 U*	*330 U*	*330 U*	5 U	*300 U*
TRICHLOROFLUOROMETHANE	5	--	6.4 U	5.2 U	320 U	400 U	250 U	330 U	330 U	5 U	300 U
VINYL CHLORIDE	5	11	6.4 U	5.2 U	*320 U*	*400 U*	*250 U*	*330 U*	*330 U*	5 U	*300 U*
TOC (Total Organic Carbon)*			NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:
All values are in micrograms per kilogram (ug/kg).
*TOC values are in miligrams per kilogram (mg/kg)
The data are unvalidated.

CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG

CUG - Interim Cleanup Goals as defined in the Explanation of Significant Differences for OU2 (EPA, 2007)
Italic - Reporting Limit is Higher Than the CUG

LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 1
Analytical Results of Confirmation Soil Sampling
In Situ Thermal Treatment
Groveland Wells Superfund Site

		Sample Name	A4326	A4333	A4359	A4360	A4323	A4324	A4334	A4335	A4336
		Sample Location	CSB-10	CSB-10	CSB-11	CSB-11	CSB-12	CSB-12	CSB-13	CSB-13	CSB-13
		Top Depth (feet below grade)	23	39	9	11	6	8	3	15	41
		Bottom Depth (feet below grade)	25	41	11	13	8	10	5	17	42
		Sample Date & Time	4/6/2011	4/7/2011	4/12/2011	4/12/2011	4/6/2011	4/6/2011	4/7/2011	4/7/2011	4/7/2011
Chemical Name	CRQL	CUG									
1,1,1-TRICHLOROETHANE	5	1388	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,1,2,2-TETRACHLOROETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,1,2-TRICHLOROETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,1-DICHLOROETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,1-DICHLOROETHENE	5	45	*490 U*	4.9 U	12 U	2.4 U	*290 U*	*300 U*	*300 U*	*290 U*	*300 U*
1,2,3-TRICHLOROBENZENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,2,4-TRICHLOROBENZENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,2-DIBROMOETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,2-DICHLOROBENZENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,2-DICHLOROETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,2-DICHLOROPROPANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,3-DICHLOROBENZENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,4-DICHLOROBENZENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
1,4-DIOXANE	100	--	9900 U	97 U	250 U	48 U	5800 U	6000 U	5900 U	5800 U	6000 U
2-BUTANONE	10	--	990 U	**1.8 J**	25 U	4.8 U	**600**	600 U	**1000**	580 U	600 U
2-HEXANONE	10	--	990 U	9.7 U	25 U	4.8 U	580 U	600 U	590 U	580 U	600 U
4-METHYL-2-PENTANONE	10	--	990 U	9.7 U	25 U	4.8 U	580 U	600 U	590 U	580 U	600 U
ACETONE	10	--	**1200 B**	**15**	**83**	**60**	**3200 B**	**1900 B**	**3100 B**	**1200 B**	**770 B**
BENZENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
BROMOCHLOROMETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
BROMODICHLOROMETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
BROMOFORM	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
BROMOMETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
CARBON DISULFIDE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
CARBON TETRACHLORIDE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
CHLOROBENZENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
CHLOROETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
CHLOROFORM	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
CHLOROMETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
CIS-1,2-DICHLOROETHENE	5	418	**1700**	**4.8** J	12 U	2.4 U	290 U	300 U	200 J	290 U	300 U
CIS-1,3-DICHLOROPROPENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
CYCLOHEXANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
DIBROMOCHLOROMETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
DICHLORODIFLUOROMETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
ETHYLBENZENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
ISOPROPYLBENZENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
M,P-XYLENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
METHYL ACETATE	5	--	490 U	4.9 U	**7.2 J**	2.4 U	**110 J**	300 U	300 U	290 U	300 U
METHYL TERT-BUTYL ETHER	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
METHYLCYCLOHEXANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
METHYLENE CHLORIDE	5	22	**360 JB**	**2.9 JB**	**10 JB**	**0.86 JB**	**250 JB**	**200 JB**	**170 JB**	**140 JB**	**170 JB**
O-XYLENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
STYRENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
TETRACHLOROETHENE	5	56	*490 U*	4.9 U	12 U	2.4 U	*290 U*	*300 U*	*300 U*	*290 U*	*300 U*
TOLUENE	5	22753	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
TRANS-1,2-DICHLOROETHENE	5	626	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
TRANS-1,3-DICHLOROPROPENE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
TRICHLOROETHENE	5	77	**5600**	**3.7** J	12 U	2.4 U	*290 U*	*300 U*	**7000**	*290 U*	*300 U*
TRICHLOROFLUOROMETHANE	5	--	490 U	4.9 U	12 U	2.4 U	290 U	300 U	300 U	290 U	300 U
VINYL CHLORIDE	5	11	*490 U*	4.9 U	12 U	2.4 U	*290 U*	*300 U*	*300 U*	*290 U*	*300 U*
TOC (Total Organic Carbon)*			NA	51	NA	NA	NA	NA	NA	NA	NA

NOTES:
All values are in micrograms per kilogram (ug/kg).
*TOC values are in miligrams per kilogram (mg/kg)
The data are unvalidated.

CRQL - Contract Required Quantitation Limit
Bold - Detected Concentration
Shaded - Detected Concentrations Exceeds the CUG

CUG - Interim Cleanup Goals as defined in the Explanation of Significant Differences for OU2 (EPA, 2007)
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LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.

Table 1
Analytical Results of Confirmation Soil Sampling
In Situ Thermal Treatment
Groveland Wells Superfund Site

		Sample Name	A4350	A4351	A4352	A4344/A4345	A4346	A4349	A4365	A4366
		Sample Location	CSB-14	CSB-14	CSB-14	CSB-15	CSB-15	CSB-15	CSB-16	CSB-16
		Top Depth (feet below grade)	5	11	31	1	17	37	9	11
		Bottom Depth (feet below grade)	7	13	33	3	19	39	11	13
		Sample Date & Time	4/11/2011	4/11/2011	4/11/2011	4/8/2011	4/8/2011	4/8/2011	4/12/2011	4/12/2011
Chemical Name	CRQL	CUG								
1,1,1-TRICHLOROETHANE	5	1388	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,1,2,2-TETRACHLOROETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,1,2-TRICHLOROETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,1-DICHLOROETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,1-DICHLOROETHENE	5	45	4.7 U	7.4 U	4.4 U	6 U	*390 U*	4.9 U	6.2 U	5.6 U
1,2,3-TRICHLOROBENZENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,2,4-TRICHLOROBENZENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,2-DIBROMO-3-CHLOROPROPANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,2-DIBROMOETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,2-DICHLOROBENZENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,2-DICHLOROETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,2-DICHLOROPROPANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,3-DICHLOROBENZENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,4-DICHLOROBENZENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
1,4-DIOXANE	100	--	94 U	150 U	87 U	120 U	7800 U	98 U	120 U	110 U
2-BUTANONE	10	--	9.4 U	**61**	8.7 U	12 U	780 U	9.8 U	12 U	11 U
2-HEXANONE	10	--	9.4 U	15 U	8.7 U	12 U	780 U	9.8 U	12 U	11 U
4-METHYL-2-PENTANONE	10	--	9.4 U	15 U	8.7 U	12 U	780 U	9.8 U	12 U	11 U
ACETONE	10	--	**150**	**520**	**11**	**79**	**1300 B**	**20**	**37 B**	**12 B**
BENZENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
BROMOCHLOROMETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
BROMODICHLOROMETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
BROMOFORM	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
BROMOMETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
CARBON DISULFIDE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	**0.72 J**	6.2 U	5.6 U
CARBON TETRACHLORIDE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
CHLOROBENZENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
CHLOROETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
CHLOROFORM	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
CHLOROMETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
CIS-1,2-DICHLOROETHENE	5	418	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
CIS-1,3-DICHLOROPROPENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
CYCLOHEXANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
DIBROMOCHLOROMETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
DICHLORODIFLUOROMETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
ETHYLBENZENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
ISOPROPYLBENZENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
M,P-XYLENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
METHYL ACETATE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
METHYL TERT-BUTYL ETHER	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
METHYLCYCLOHEXANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
METHYLENE CHLORIDE	5	22	**1.2 JB**	**1.2 JB**	**3.3 JB**	**4.3 JB**	**210 JB**	**1.3 JB**	**0.84 J**	**0.95 J**
O-XYLENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
STYRENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
TETRACHLOROETHENE	5	56	4.7 U	7.4 U	4.4 U	6 U	*390 U*	4.9 U	6.2 U	5.6 U
TOLUENE	5	22753	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
TRANS-1,2-DICHLOROETHENE	5	626	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
TRANS-1,3-DICHLOROPROPENE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
TRICHLOROETHENE	5	77	**2** J	7.4 U	4.4 U	**10**	*390 U*	4.9 U	6.2 U	5.6 U
TRICHLOROFLUOROMETHANE	5	--	4.7 U	7.4 U	4.4 U	6 U	390 U	4.9 U	6.2 U	5.6 U
VINYL CHLORIDE	5	11	4.7 U	7.4 U	4.4 U	6 U	*390 U*	4.9 U	6.2 U	5.6 U
TOC (Total Organic Carbon)*			NA	NA	49	**75.5**	NA	NA	NA	NA

NOTES:
All values are in micrograms per kilogram (ug/kg).
*TOC values are in miligrams per kilogram (mg/kg)
The data are unvalidated.

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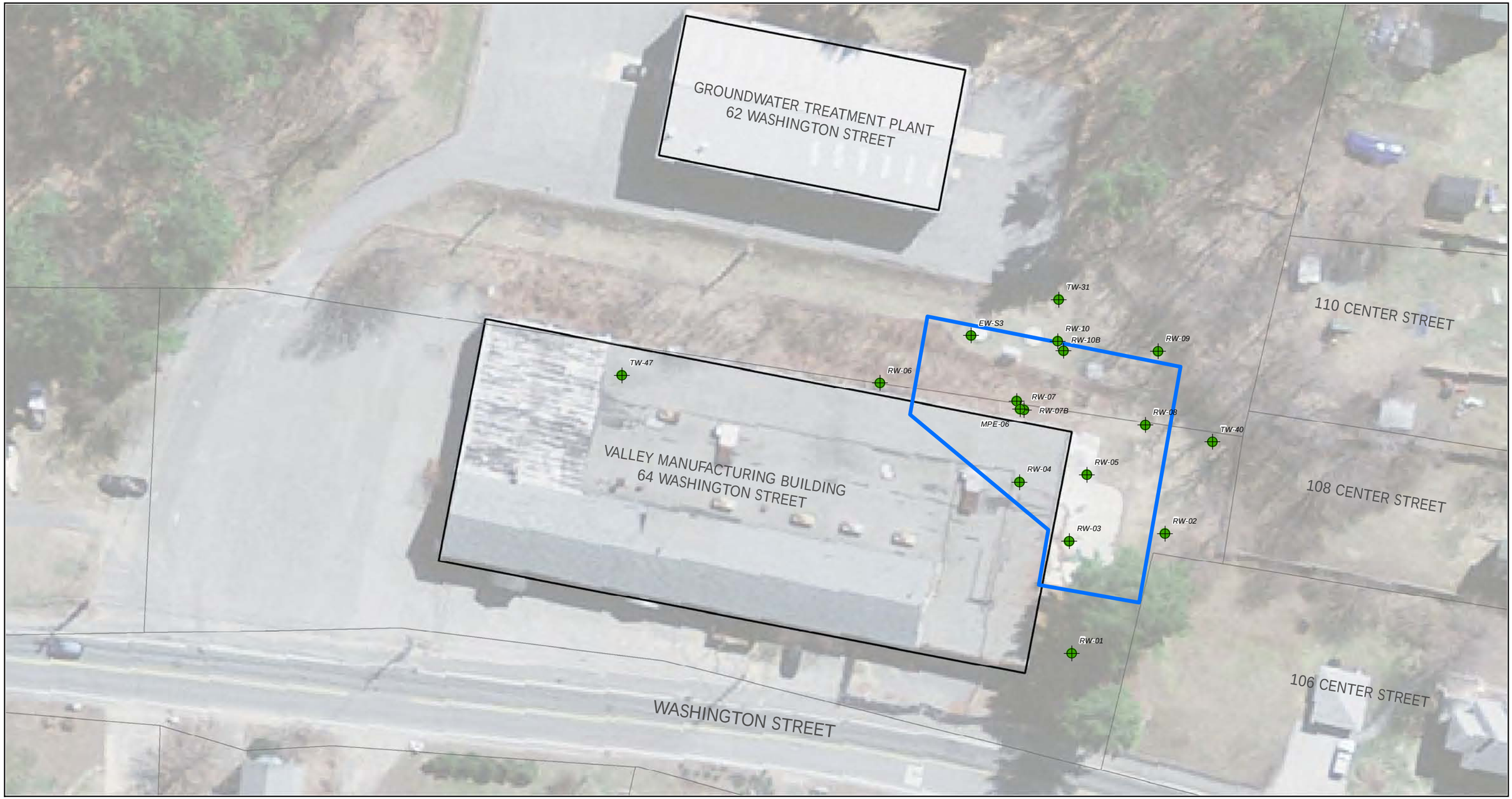
LABORATORY QUALIFIERS:
J - Quantitation is estimated as it is below the Sample-Specific Detection Limit (SSDL).
U - Not detected above the SSDL.
B - Analyte detected in laboratory blanks.



Legend

- Groundwater Monitoring Wells
- ISTT Area A Boundary

Note:
Well MPE-06 was used as a substitute for RW-07 during the second confirmation sampling event only.

N

0 20 40 80

Feet

1 inch = 40 feet

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FIGURE 1

CONFIRMATION GROUNDWATER SAMPLING LOCATIONS
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

PREPARED BY: JMH	CHECKED BY: DB
PROJECT NO. 80037	DATE: August 2011

Path: R:\80000 Task Orders\80037 Groveland Wells RA\Technical Data - new and previous\GIS\Nobis Maps\Groundwater Maps\Fig_7-2_Conf_GW_Locations.mxd

Legend

- Confirmation Soil Borings
- Thermal Treatment Area

N

0 20 40 80

Feet

1 inch = 40 feet

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FIGURE 2

CONFIRMATION SOIL BORING LOCATIONS
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

PREPARED BY: JMH	CHECKED BY: DB
PROJECT NO. 80037	DATE: August 2011

Path: R:\80000 Task Orders\80037 Groveland Wells RA\Technical Data - new and previous\GIS\Nobis Maps\Soil Maps\Fig_7-1_Conf_Soil_Locations.mxd

APPENDIX B

Date: May 20, 2009	**Location:** Valley Manufacturing Building

Description: Location and topographic survey being completed.

Date: June 29, 2009	**Location:** Valley Manufacturing Building

Description: Soil samples collected from ISTT Area D soil boring, AD-02.

Date: June 29, 2009	**Location:** Valley Manufacturing Building

Description: Mini-sonic drill rig drilling within ISTT Area D.

Date: June 29, 2009	**Location:** ISTT Area A, Looking Southeast

Description: Polyvinyl chloride groundwater monitoring well abandonment by grout injection using tremie method.

Date: June 31, 2009	**Location:** ISTT Area C, Looking South

Description: Protective casing and top portion of PVC monitoring well riser removed using over-drilling methods.

Date: June 31, 2009	**Location:** Valley Manufacturing Building

Description: Installation of overburden groundwater replacement well, RW-04.

Date: August 3, 2009	**Location:** ISTT Area A, Looking Northwest

Description: Installation of bedrock groundwater monitoring well RW-10B.

Date: August 10, 2009	**Location:** RW-07B

Description: Equipment used in packer testing completed at bedrock groundwater monitoring well RW-07B.

Date: August 11, 2009	**Location:** Not Applicable

Description: Stainless steel well screen materials used during replacement well installations.

Date: January 22, 2010	**Location:** Valley Manufacturing Property Line, Looking South

Description: Baseline ambient air monitoring completed at the Valley Manufacturing and 106 Center Street property line.

Date: January 26, 2010	**Location:** Washington Street, Looking North

Description: Wooden fence posts installed along Washington Street.

Date: January 27, 2010	**Location:** 106 Center Street, Looking Northeast

Description: Temporary construction fence installed at 106 Center Street property.

Date: January 27, 2010	**Location:** 106 Center Street, Looking Northeast

Description: Wooden stockade façade installed on temporary construction fence at 106 Center Street.

Date: January 28, 2010	**Location:** Washington Street, Looking Northeast

Description: Permanent fence in front of Valley Manufacturing building

Date: February 4, 2010	**Location:** ISTT Area A, Looking Northwest

Description: Clearing and grubbing activities completed east of the Valley Manufacturing building for preparation of ISTT construction.

Date: February 9, 2010	**Location:** ISTT Areas, Looking East

Description: The installation of sediment and erosion stormwater controls for preparation of ISTT construction.

Date: February 9, 2010	**Location:** ISTT Areas, Looking Northeast

Description: White pine trees removed for preparation of ISTT construction activities.

Date: February 18, 2010	**Location:** ISTT Process Equipment Area

Description: An additional power pole was installed to provide power to ISTT system.

Date: February 22, 2010	**Location:** Valley Manufacturing Building

Description: Mold abatement activities were completed within the Valley Manufacturing building.

Date: March 2, 2010	**Location:** ISTT Construction Staging Area

Description: Electrodes to be installed during subsurface installations.

Date: March 8, 2010	**Location:** Valley Manufacturing Building, Looking East

Description: Drilling at electrode well location, E-23.

Date: March 8, 2010	**Location:** Electrode Well, E-23

Description: Sand observed in vadose zone at electrode well location E-23.

Date: March 15, 2010	**Location:** Drainage Swale, Looking South

Description: Stormwater inspection completed at drainage swale following storm event.

Date: March 19, 2010	**Location:** Drainage Swale, Looking North

Description: Repairs to stormwater controls were completed following a storm event.

Date: March 30, 2010	**Location:** Drainage Swale, Looking South

Description: Stormwater inspection completed at drainage swale during storm event.

Date: April 2, 2010	**Location:** ISTT Areas, Looking South

Description: Valley Manufacturing's oil and water separator was abandoned in place using a concrete fill.

Date: April 6, 2010	**Location:** Electrode Well, E-01, Looking South

Description: Drilling operations at electrode well, E-01.

Date: April 8, 2010	**Location:** Electrode Well, E-43, Looking North

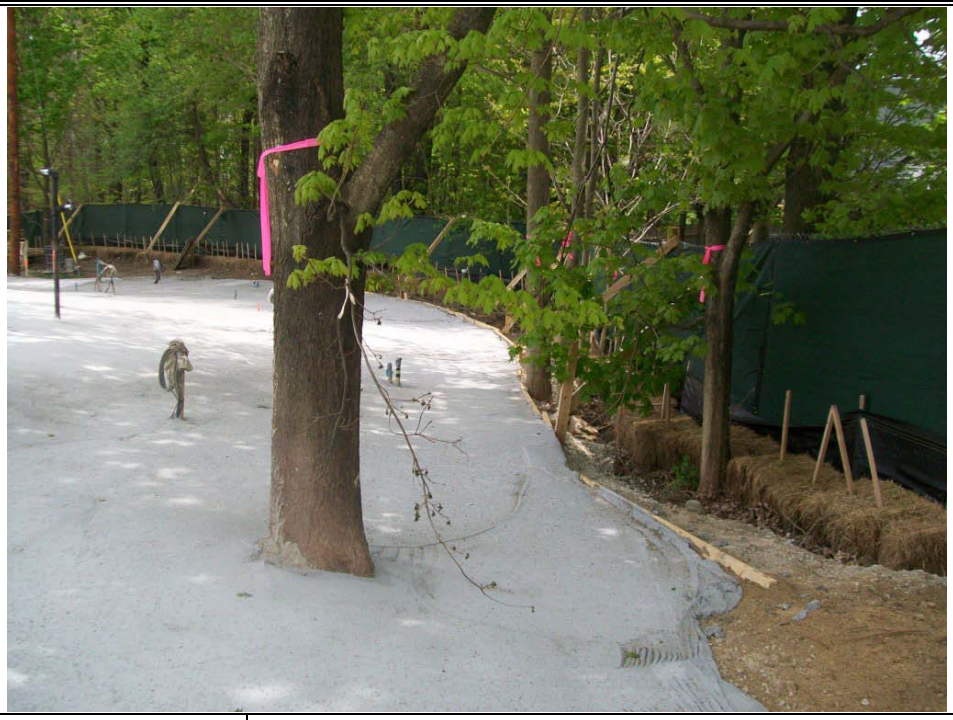
Description: Site visitors were present for drilling at electrode well, E-43.

Date: April 13, 2010	**Location:** OU1 Extraction Well, EW-S3

Description: Electrical supply and data communication conduit was removed at the OU1 extraction wells for preparation of ISTT operation.

Date: April 26, 2010	**Location:** ISTT Area A, Looking East

Description: Multi-phase extraction wells were developed using a waterra pump.

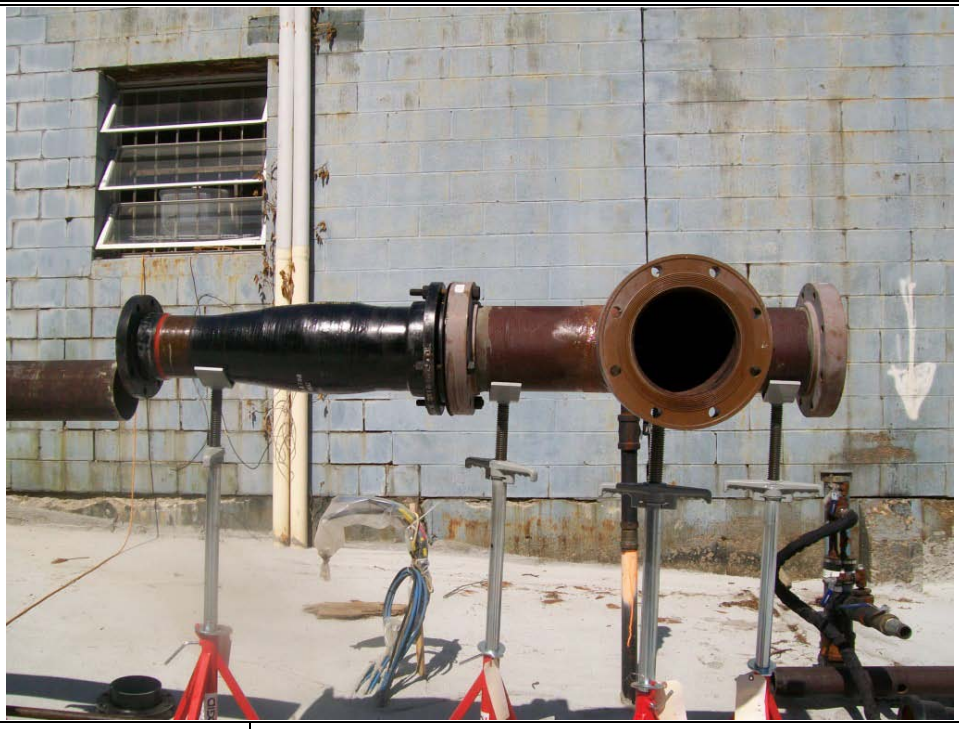


Date: April 26, 2010	**Location:** ISTT Area C, Looking East

Description: Vapor cover installation in the vicinity of preserved deciduous trees.

Date: May 14, 2010	**Location:** ISTT Area A, Looking North

Description: Groundwater extraction pumps were installed in multi-phase extraction wells.

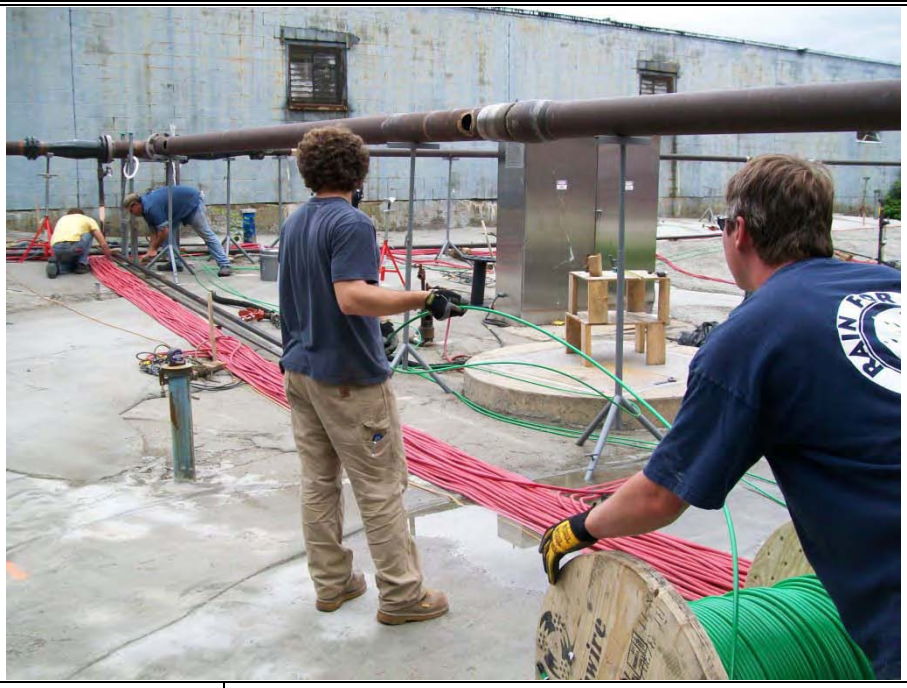


Date: May 24, 2010	**Location:** ISTT Areas

Description: The soil vapor extraction manifold was constructed out of reinforced fiberglass components.

Date: June 3, 2010	**Location:** ISTT Areas, Looking South

Description: Soil vapor and liquid extraction manifolds and conveyance were constructed in the ISTT Areas.



Date: June 17, 2010	**Location:** ISTT Areas, Looking Northwest

Description: Water injection (red) and water return (red) lines were installed at each of the electrodes.

Date: June 24, 2010	**Location:** ISTT Areas, Looking South

Description: Power cables (gray) were installed to each of the electrodes.

Date: July 1, 2010	**Location:** ISTT Mobilization Area, Looking South

Description: Power Distribution Systems were fabricated offsite and delivered to the Site.

Date: July 6, 2010	**Location:** ISTT Process Equipment Area

Description: The liquid extraction system was constructed of various process equipment contained in a secondary containment structure.

Date: July 13, 2010	**Location:** ISTT Process Equipment Area

Description: A carbon trailer was installed to treat recovered vapors.

Date: July 13, 2010	**Location:** ISTT Mobilization Area, Looking South

Description: Groveland Electric Light Department installed power to the ISTT system area.

Date: July 27, 2010	**Location:** ISTT Process Equipment Area

Description: Electrode power cables were installed at the Power Distribution Systems.

Date: July 27, 2010	**Location:** ISTT Process Equipment Area

Description: Emergency shutdown devices were installed on the ISTT system.

Date: July 29, 2010	**Location:** ISTT Process Equipment Area

Description: Water injection lines were connected to the Water Circulation Units.

Date: August 5, 2010	**Location:** ISTT Process Equipment Area

Description: The electrical equipment area contained a transformer, a distribution panel, and power distribution systems.

Date: August 9, 2010	**Location:** OU1 Groundwater Treatment Facility

Description: The ultraviolet system was optimized during ISTT system startup.

Date: August 10, 2010	**Location:** Upgradient Air Sampling Location

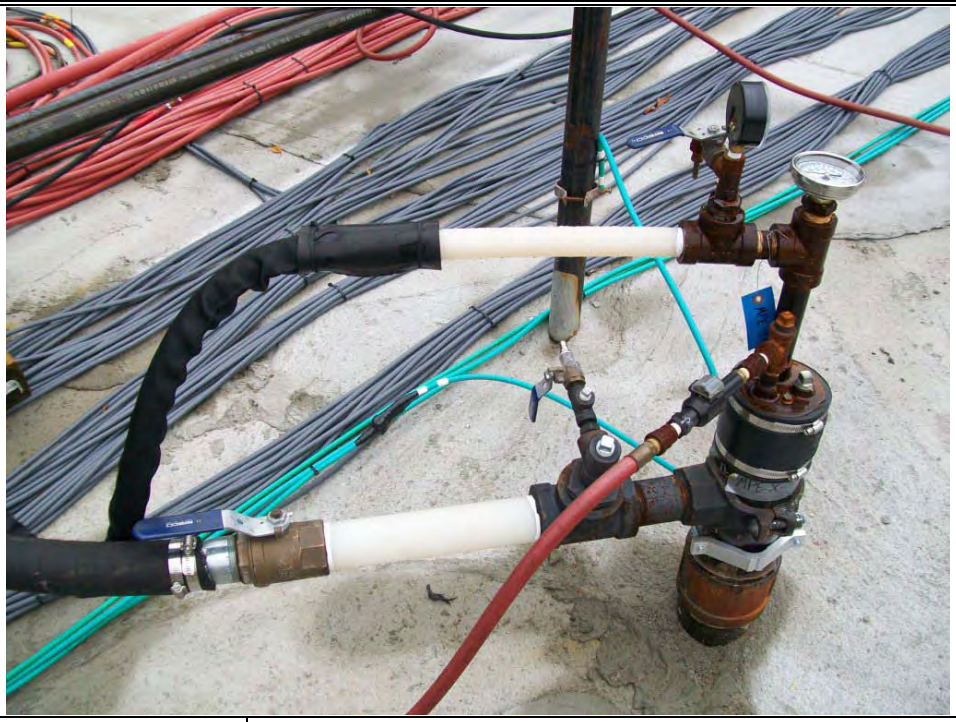
Description: Ambient air was sampled during ISTT system operation.

Date: August 10, 2010	**Location:** 106 Center Street

Description: Electrical potential testing was conducted at 106 Center Street during ISTT system startup.

Date: August 11, 2010	**Location:** 106 Center Street, Looking South

Description: Electrical potential testing was conducted at 106 Center Street during ISTT system startup.



Date: August 16, 2010	**Location:** ISTT Area A

Description: Kynar nipples were installed at multi-phase extraction well heads to separate two grounding systems at the Site.

Date: August 17, 2010	**Location:** ISTT Mobilization Area

Description: Each month during ISTT operations, EPA's OEME mobile laboratory analyzed split soil vapor samples collected from the ISTT Areas.

Date: August 17, 2010	**Location:** ISTT Areas

Description: Soil vapor extraction wells were sampled using a vacuum pump and a vacuum box.

Date: August 25, 2010	**Location:** ISTT Area C, Looking East

Description: The ISTT Areas contained various wells (electrodes, extraction, monitoring, and sensor wells) and associated components.

Date: September 15, 2010	**Location:** Groundwater Monitoring Well, RW-01

Description: During ISTT operations, bi-weekly groundwater sampling events were conducted using a bladder pump (in well) and cooling coil (in bucket filled with ice-water at left).

Date: October 8, 2010	**Location:** ISTT Process Equipment Area

Description: A sound absorbing barrier was installed at the vapor extraction system blowers.

Date: October 22, 2010	**Location:** ISTT Process Equipment Area

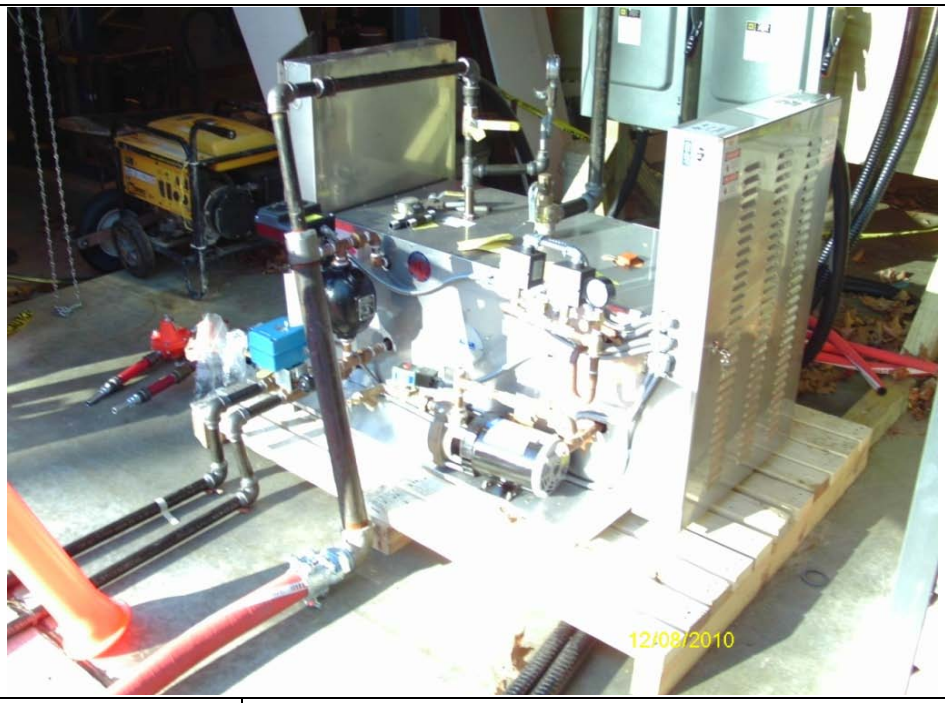
Description: Liquid extraction system upgrades included the installation of a second bag filter skid and organoclay filters.

Date: October 22, 2010	**Location:** ISTT Process Equipment Area

Description: Liquid extraction system upgrades included the installation of a 800-gallon weir tank.

Date: December 6, 2010	**Location:** ISTT Areas

Description: Steam-enhanced heating included the installation of steam spears using a track-mounted Geoprobe® rig.



Date: December 8, 2010	**Location:** ISTT Process Equipment Area

Description: Steam-enhanced heating included the installation of a steam generator.

Date: May 17, 2011	**Location:** Former Porch Area, Looking West

Description: Following ISTT shutdown, ISTT wells (MPE, Shallow SVE, Sensor, and Electrodes) were abandoned.

Date: August 19, 2011	**Location:** ISTT Areas, Looking Southwest

Description: The Site was graded during ISTT demobilization.

Date: August 24, 2011	**Location:** ISTT Areas, Looking Southwest

Description: The temporary construction fence used during ISTT construction and operations was removed and the permanent chain link fence was reinstalled.

Date: August 22, 2011	**Location:** OU1 Extraction Wells, Looking North

Description: During Site restoration, new electrical and control conduit was installed to support groundwater extraction from OU1 extraction wells EW-S1, EW-S2, and EW-S3.

Date: September 16, 2011	**Location:** 106 Center Street, Looking North

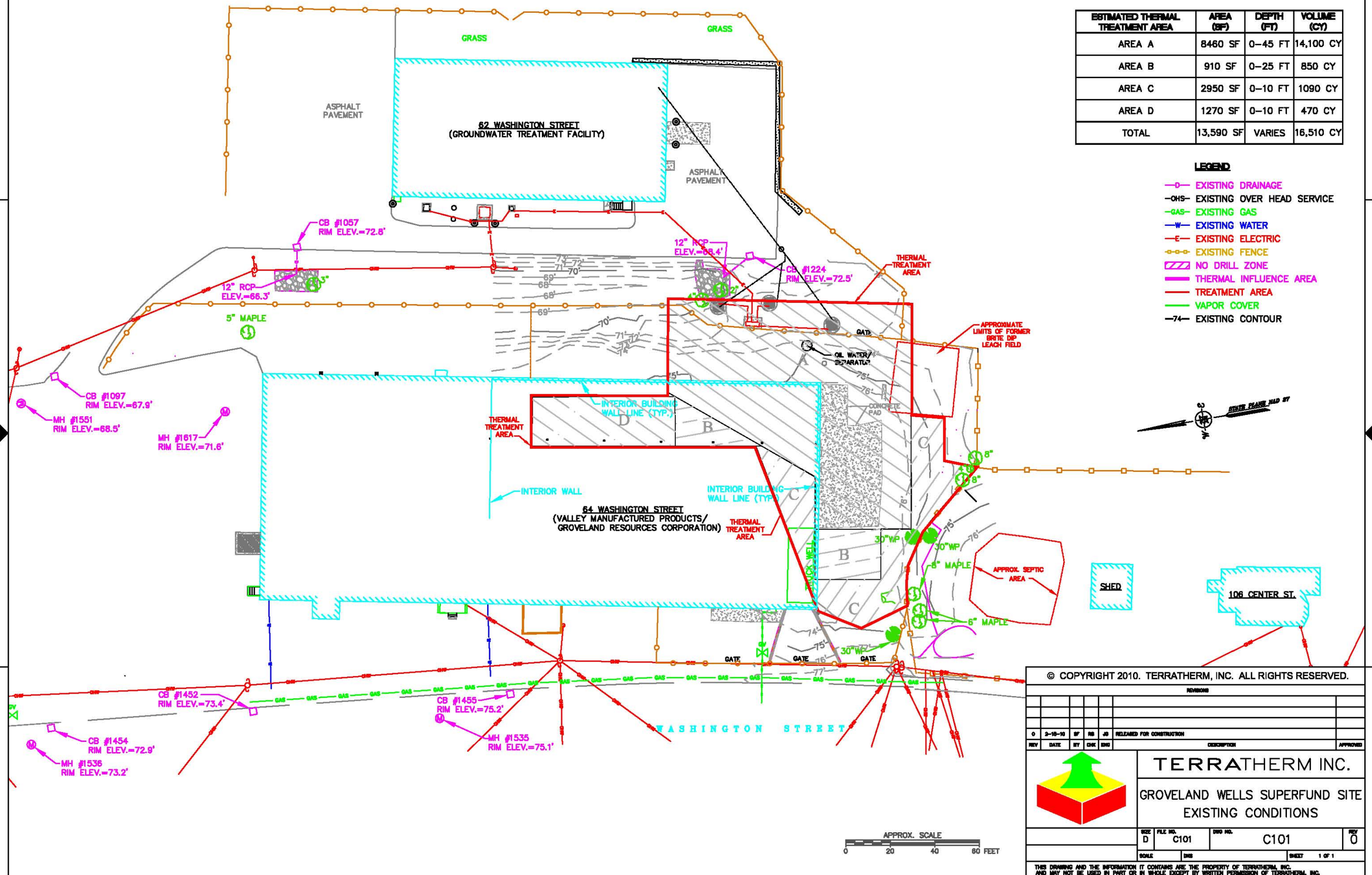
Description: During Site restoration, a replacement vinyl fence and vegetation was installed at the 106 Center Street residential property.

APPENDIX C

ESTIMATED THERMAL TREATMENT AREA	AREA (SF)	DEPTH (FT)	VOLUME (CY)
AREA A	8460 SF	0–45 FT	14,100 CY
AREA B	910 SF	0–25 FT	850 CY
AREA C	2950 SF	0–10 FT	1090 CY
AREA D	1270 SF	0–10 FT	470 CY
TOTAL	13,590 SF	VARIES	16,510 CY

LEGEND

- EXISTING DRAINAGE
- EXISTING OVER HEAD SERVICE
- EXISTING GAS
- EXISTING WATER
- EXISTING ELECTRIC
- EXISTING FENCE
- NO DRILL ZONE
- THERMAL INFLUENCE AREA
- TREATMENT AREA
- VAPOR COVER
- EXISTING CONTOUR



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REVISIONS

REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
0	2-18-10	SF	RB	JS	RELEASED FOR CONSTRUCTION	

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE
EXISTING CONDITIONS

SIZE	FILE NO.	DWG NO.	REV
D	C101	C101	0

SCALE | DNS | SHEET 1 OF 1

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NOTE	TASK	RESPONSIBLE
1	FILL APPROX. 1 FT AT LOW END OF TRUCK WELL WITH GRANULAR FILL TO ALLOW FOR PLACEMENT OF APPROX. 2" OF SHOTCRETE. GRADE SURFACE TO SHED WATER TO THE WEST. INSTALL TRENCH DRAIN AND SUMP ALONG EDGE OF BUILDING. (SEE TRENCH DETAIL ON SHEET C108)	TERRATHERM
2	REMOVE CHAIN-LINK FENCE ALONG SIDES OF EXTERIOR TRUCK WELL RAMP. CUT OFF POSTS FLUSH WITH CONCRETE BERMS.	NOBIS
3	REMOVE PARTIAL SECTION OF CHAIN-LINK FENCE AND POSTS EXTENDING EAST INTO THE SITE FROM THE SOUTHWEST PROPERTY CORNER.	NOBIS
4	REMOVE APPROX. 50 FT SECTION OF CHAIN-LINK FENCE AND POSTS, ALONG THE WESTERN EDGE OF PROPERTY, EXTENDING FROM SOUTHWEST PROPOERTY CORNER TO JUST NORTH OF TRUCK RAMP. REPLACE WITH WOODEN POSTS AND CHAIN-LINK FENCE WITH MIN. 3" GAP BETWEEN BOTTOM OF CHAIN-LINK AND GROUND SURFACE.	NOBIS
5	REMOVE CHAIN-LINK FENCE AND POSTS RUNNING NORTH-SOUTH BETWEEN BUILDING AND TREATMENT PLANT TO SOUTHERN PROPERTY LINE, INCLUDING SMALL SECTION RUNNING TO THE EAST AND THEN NORTHEAST.	NOBIS
6	PLACE FILL AND GRADE BETWEEN TREATMENT AREA AND GWTP PARKING LOT TO CREATE POSITIVE DRAINAGE TO SWALE.	TERRATHERM
7	SHAPE COVER TO FOLLOW NATURAL GROUND SURFACE CONTOUR ALONG SOUTHERN END OF TREATMENT AREA. SOUTHERN EDGE OF COVER WILL HAVE A 4-6' BERM WHICH WILL DIVERT SURFACE RUNOFF TO EASTERN SIDE OF TREATMENT AREA.	TERRATHERM
8	PLACE FILL AND GRADE IN AND AROUND THE NORTHEAST CORNER OF THE TREATMENT ZONE TO DIVERT SURFACE RUNOFF TO THE SWALE. REMOVE TWO TREES IN RIPRAP.	TERRATHERM (GRADE) NOBIS (TREES)
9	REMOVE THREE WHITE PINE TREES AT SOUTHWEST CORNER OF SITE. GRADE TO PROMOTE POSITIVE DRAINAGE.	NOBIS
10	PROTECT PUMPS AND CONDUIT AT EW-S1, S2, S3 PRIOR TO FINAL GRADING AND PLACEMENT OF SURFACE COVER.	NOBIS

PROPOSED CHAINLINK FENCE W/ WOOD POSTS

THERMAL TREATMENT AREA

SEE NOTE #6

SEE NOTE #8

SWALE

SEE NOTE #5

TT VAPOR COVER W/ BERM SEE NOTE #7

GATE

NO DRILL ZONE

SEE NOTE #6

5' STOCKADE FENCE

SEE NOTE #9

2' NO DRILL ZONE AROUND COLUMNS

8"X5" STEEL COLUMNS (TYP.)

2' NO DRILL ZONE AROUND COLUMNS

NO DRILL ZONE

EXISTING STOCKADE FENCE

GATE

PROPOSED CHAINLINK FENCE W/ WOOD POSTS

64 WASHINGTON STREET
(VALLEY MANUFACTURED PRODUCTS/
GROVELAND RESOURCES CORPORATION)

THERMAL TREATMENT AREA

TRUCK WELL

NO DRILL ZONE

6' CHAINLINK FENCE

NO DRILL ZONE

SEE NOTE #1 & SHEET C108

TT VAPOR COVER W/ BERM SEE NOTE #7

SEE NOTE #9

SEE NOTE #2

EXISTING 7' C.L.F. W/ BARBED WIRE

EX. C.L.F TO BE REPLACED WITH WOOD POST – SEE NOTE #4

GATE

GATE

GATE

SEE NOTE #3

—D— EXISTING DRAINAGE
—OHS— EXISTING OVER HEAD SERVICE
—GAS— EXISTING GAS
—E— EXISTING ELECTRIC
—x— PROPOSED FENCE
NO DRILL ZONE
THERMAL TREATMENT AREA
VAPOR COVER
—74— PROPOSED CONTOUR
—74— EXISTING CONTOUR
EXISTING RECOVERY WELL MANHOLE

APPROX. SCALE
0 10 20 30 FEET

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0	2/16/10	SF	RG	JS	RELEASED FOR CONSTRUCTION	

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE
SITE PREPARATION PLAN

SIZE D | FILE NO. C102 | DWG NO. C102 | REV 0
SCALE | DWG | SHEET 1 OF 1

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PROPOSED CHAINLINK FENCE W/ WOOD POSTS

TT VAPOR COVER W/ BERM

THERMAL TREATMENT AREA

TT VAPOR COVER W/ BERM

NO DRILL ZONE

GATE

OIL WATER/ SEPARATOR

2' NO DRILL ZONE AROUND COLUMNS

2' NO DRILL ZONE AROUND COLUMNS

NO DRILL ZONE

5' STOCKADE FENCE

EXISTING STOCKADE FENCE

GATE

PROPOSED CHAINLINK FENCE W/ WOOD POSTS

64 WASHINGTON STREET
(VALLEY MANUFACTURED PRODUCTS/
GROVELAND RESOURCES CORPORATION)

THERMAL TREATMENT AREA

NO DRILL ZONE

TRUCK WELL

TT VAPOR COVER W/ BERM

6' CHAINLINK FENCE

6' STOCKADE FENCE

NO DRILL ZONE

EXISTING 7' C.L.F. W/ BARBED WIRE

GATE

GATE

GATE

STATE PLANE NAD 27

APPROX. SCALE
0 10 20 30 FEET

—D— EXISTING DRAINAGE
—OHS— EXISTING OVER HEAD SERVICE
—GAS— EXISTING GAS
—E— EXISTING ELECTRIC
—x— PROPOSED FENCE
NO DRILL ZONE
THERMAL INFLUENCE AREA
THERMAL TREATMENT AREA
VAPOR COVER
—74— PROPOSED CONTOUR
ET-DSP ELECTRODE W/ONE 8" DIA ELECTRODE (9)
ET-DSP ELECTRODE W/TWO 8" DIA ELECTRODE (3)
ET-DSP ELECTRODE W/THREE 8" DIA ELECTRODE (28)
ET-DSP ELECTRODE W/ ONE 6" DIA ELECTRODE (13)
ET-DSP ELECTRODE W/ TWO 6" DIA ELECTRODE (2)
ET-DSP ELECTRODE W/ THREE 6" DIA ELECTRODE (9)
CO-LOCATED MPE & VEW WELLS – 4" DIA & 2" DIA ZONE A (15)
VEW WELLS ONLY – 2" DIA ZONES B, C & D (14)
TEMPERATURE SENSOR WELL (16)
TEMPERATURE, PRESSURE AND VACUUM SENSOR WELL (12)
A THERMAL TREATMENT AREA

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REVISIONS

REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
3	8/13/10	PT	RS	JG	AS-BUILT OF WELLFIELD LAYOUT	
2	3/25/10	PT	RS	JG	REVISED ELECTRODE E-48	
1	3/22/10	PT	RS	JG	ADDED ELECTRODES PER CLIENT REQUEST	
0	2/15/10	SF	RS	JG	RELEASED FOR CONSTRUCTION	

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE
WELLFIELD LAYOUT

SIZE	FILE NO.	DWG NO.	REV
D	C103	C103	3

SCALE | DWB | SHEET 1 OF 1

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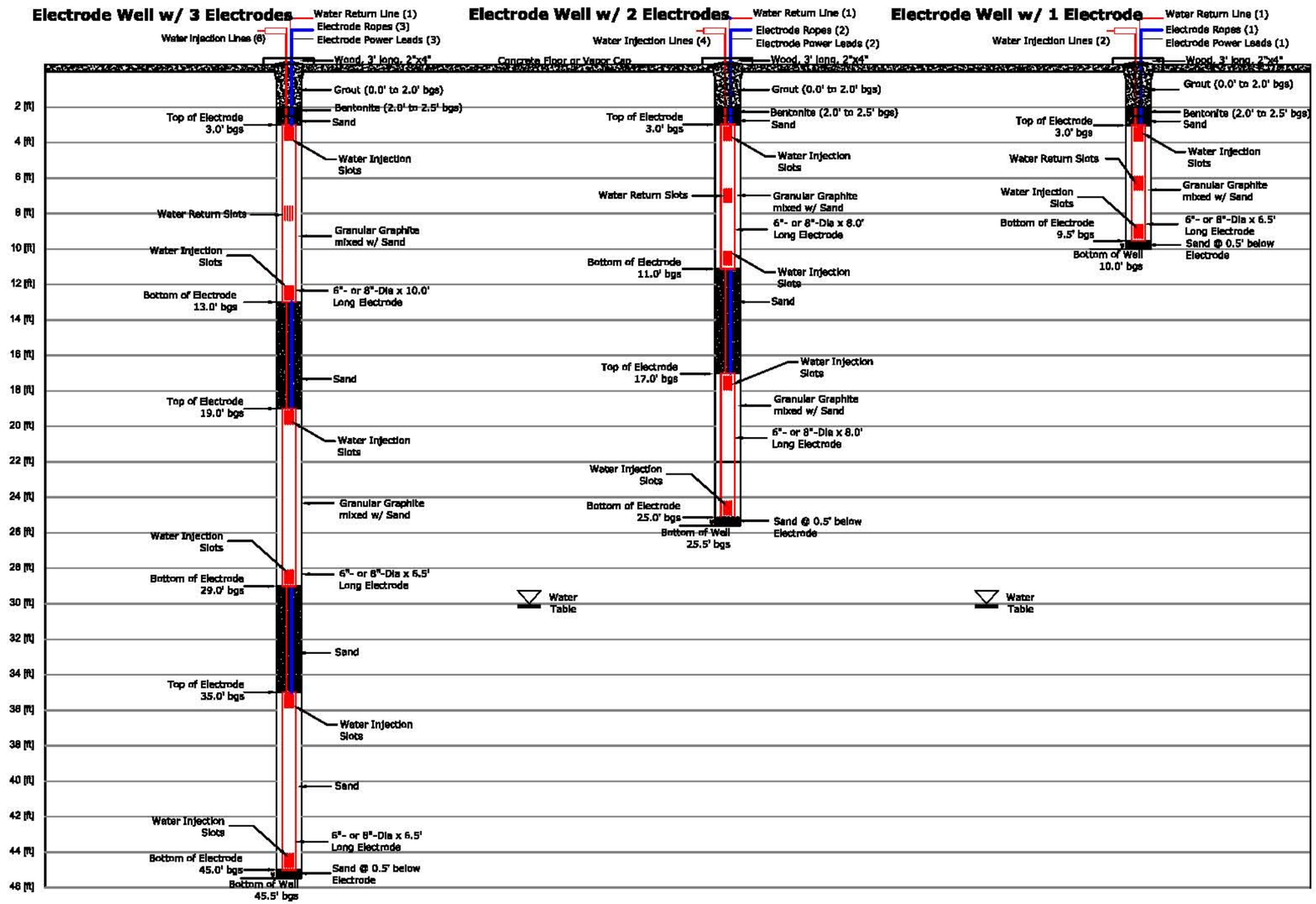

General Notes

1. Borings w/ Three 8"-Dia. Electrodes: E-01, E-02, E-03, E-04, E-05, E-06, E-07, E-08, E-09, E-10, E-11, E-12, E-13, E-14, E-15, E-16, E-17, E-18, E-27, E-29, E-30, E-39, E-43, E-44, E-46, E-50, E-51, E-53 (28 borings - 10" Dia).

2. Borings with Three 6"-Dia. Electrodes: E-23, E-24, E-25, E-26, E-36, E-37, E-38 (7 borings - 6 $\frac{3}{8}$" Dia).

3. Borings with Two 8"-Dia. Electrodes: E-55, E-56, E-58 (3 borings - 10" Dia).

4. Borings with Two 6"-Dia. Electrodes: E-34, E-35, E-42 (3 borings - 6 $\frac{3}{8}$" Dia).

5. Borings with One 8"-Dia. Electrode: E28, E-40, E-45, E-47, E-54, E-59, E-60, E-61 (8 borings - 10" Dia).

6. Borings with One 6"-Dia. Electrode: E-19, E-20, E-21, E-22, E-31, E-32, E-33, E-41, E-48, E-49, E-52, E-57 (12 borings - 6 $\frac{3}{8}$" Dia).

7. Electrode Well w/ 3 Electrodes: the bottom electrode has a sand placed around the electrode. A sand-graphite mixture is not used because of the difficulty in placing the mixture below the water table.

8. Slots at the end of the electrodes are used to uniformly inject water so that electrical conductivity can be maintained and to provide for convective heat transfer. Each electrode has two water injection lines, one line at each end of the electrode.

9. Slots in the middle of the upper electrodes allow for release of potential excess pressure in the electrode boring. Water at elevated pressure is conveyed to the water extraction line at surface through the water return slots in the middle of the upper electrode in a boring.

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GROVELAND WELLS SUPERFUND SITE
ELECTRODE WELL COMPLETIONS

SIZE	FILE NO.	DWG NO.	REV
D	C104	C104	0

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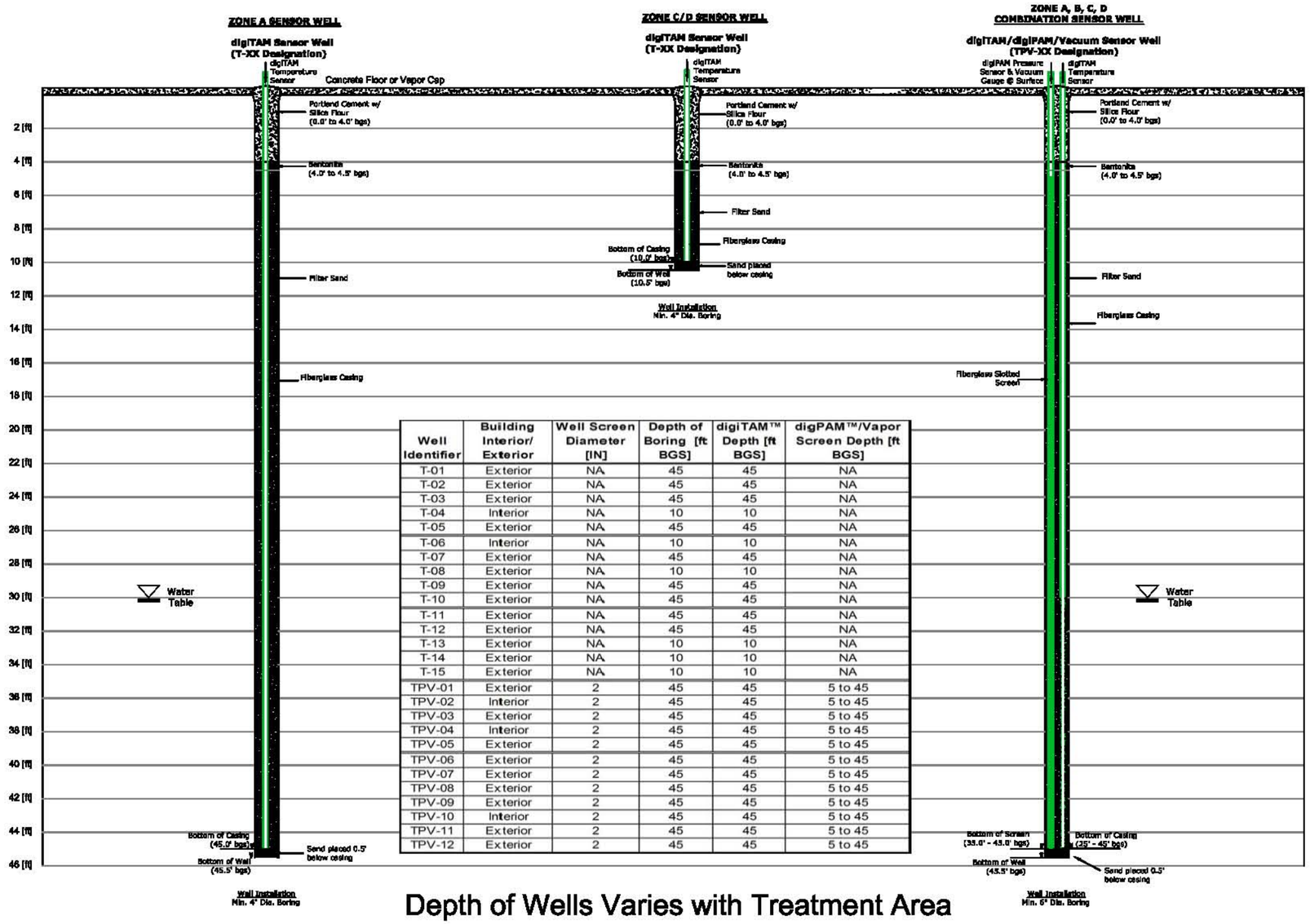

Well Identifier	Building Interior/ Exterior	Well Screen Diameter [IN]	Depth of Boring [ft BGS]	digiTAM™ Depth [ft BGS]	digPAM™/Vapor Screen Depth [ft BGS]
T-01	Exterior	NA	45	45	NA
T-02	Exterior	NA	45	45	NA
T-03	Exterior	NA	45	45	NA
T-04	Interior	NA	10	10	NA
T-05	Exterior	NA	45	45	NA
T-06	Interior	NA	10	10	NA
T-07	Exterior	NA	45	45	NA
T-08	Exterior	NA	10	10	NA
T-09	Exterior	NA	45	45	NA
T-10	Exterior	NA	45	45	NA
T-11	Exterior	NA	45	45	NA
T-12	Exterior	NA	45	45	NA
T-13	Exterior	NA	10	10	NA
T-14	Exterior	NA	10	10	NA
T-15	Exterior	NA	10	10	NA
TPV-01	Exterior	2	45	45	5 to 45
TPV-02	Interior	2	45	45	5 to 45
TPV-03	Exterior	2	45	45	5 to 45
TPV-04	Interior	2	45	45	5 to 45
TPV-05	Exterior	2	45	45	5 to 45
TPV-06	Exterior	2	45	45	5 to 45
TPV-07	Exterior	2	45	45	5 to 45
TPV-08	Exterior	2	45	45	5 to 45
TPV-09	Exterior	2	45	45	5 to 45
TPV-10	Interior	2	45	45	5 to 45
TPV-11	Exterior	2	45	45	5 to 45
TPV-12	Exterior	2	45	45	5 to 45

General Notes:

1. Fiberglass Casing - 2" diameter, male and female threaded ends.

2. Fiberglass Slotted Screen - 2" diameter, 0.010" slot opening, male & female threaded ends.

3. Filter Sand - Filter Sil #1 or equivalent.

Depth of Wells Varies with Treatment Area (Area A, B, C, or D)

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GROVELAND WELLS SUPERFUND SITE
PRESSURE AND TEMPERATURE
SENSOR WELL COMPLETION DIAGRAM

SIZE	FILE NO.	DWG NO.	REV
D	C105	C105	0

SCALE: DWN: SHEET 1 OF 1

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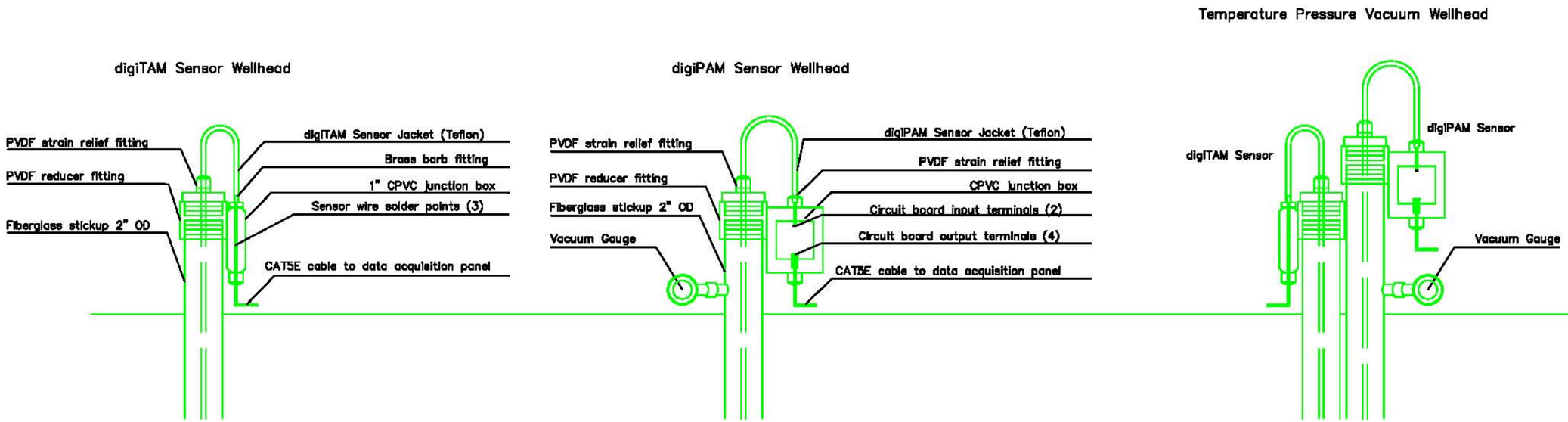

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GROVELAND WELLS SUPERFUND SITE
TYPICAL SENSOR DETAIL

SIZE	FILE NO.	DWG NO.	REV
D	C106	C106	0

SCALE | SHEET 1 OF 1

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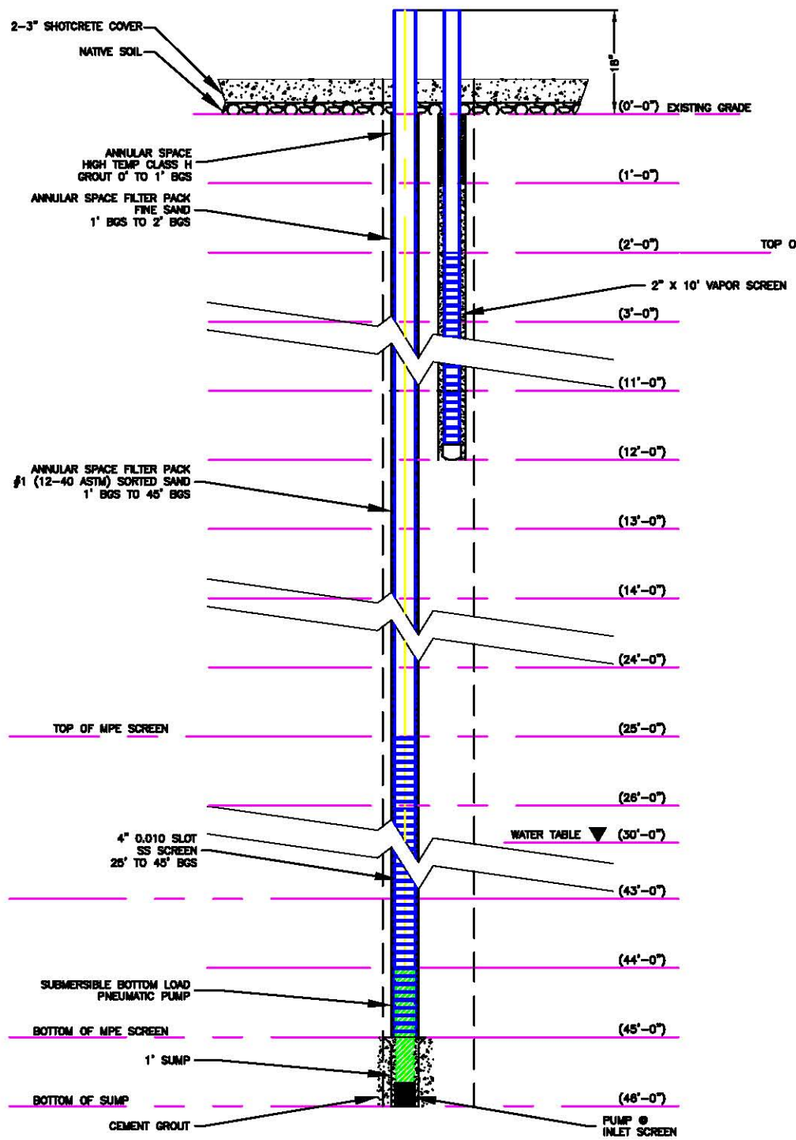
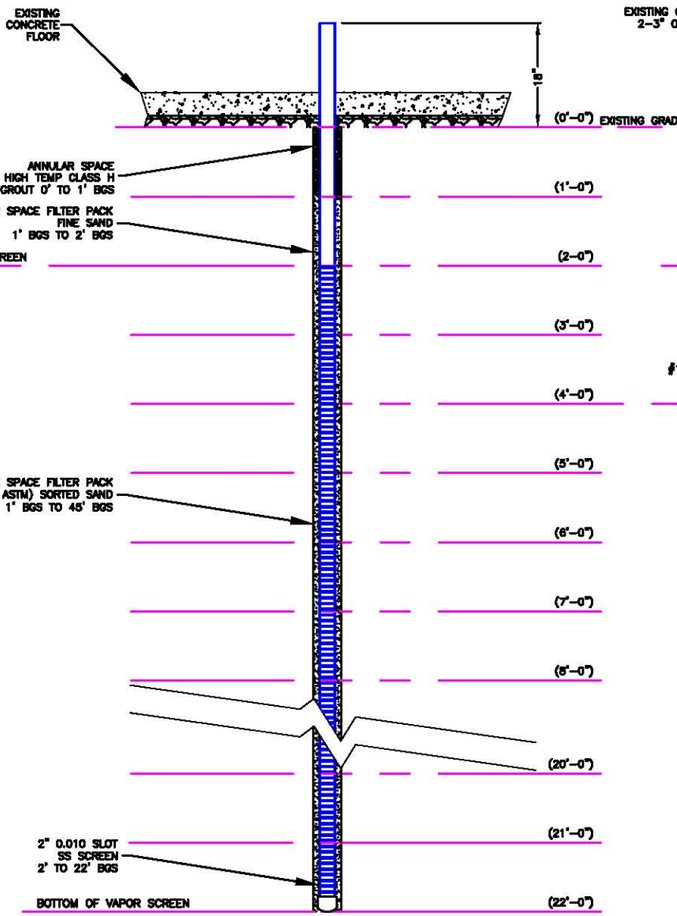
AREA A
MULTI-PHASE EXTRACTION WELL (MPE) DETAIL
QTY (15)
20'L X 4" WELL SCREEN, .010 SLOT, SS
4" SCH 40, C.S. RISER W/ 1' SUMP @ BOTTOM
10'L X 2" WELL SCREEN, .010 SLOT, SS
2" SCH 40, C.S. RISER W/THREADED END



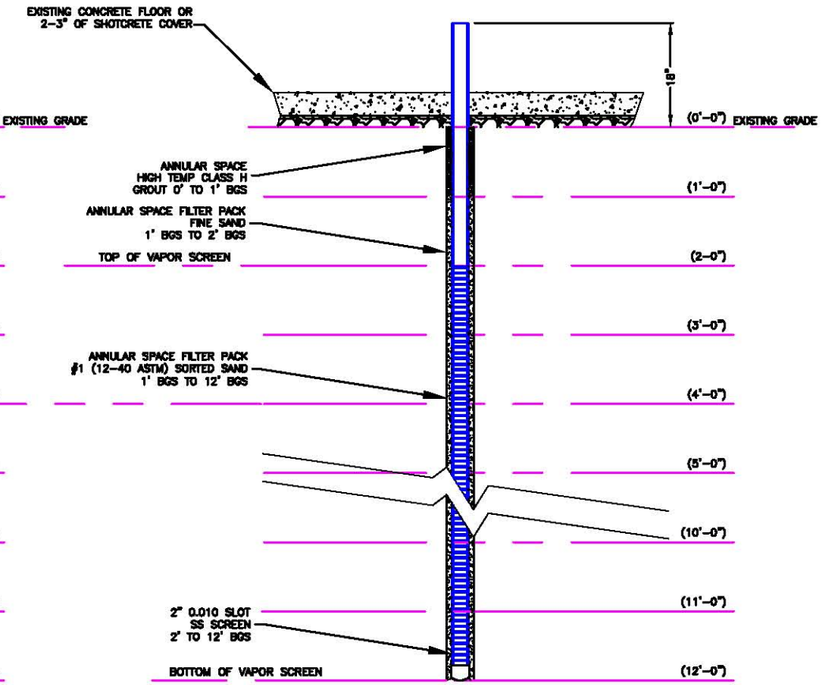
WELL INSTALLATION
MINIMUM 8" DIA BOREHOLE

AREA B
VAPOR EXTRACTION WELL (VEW) DETAIL
QTY (3)
20'L X 2" WELL SCREEN, .010 SLOT, SS
2" SCH 40, C.S. RISER W/THREADED END



WELL INSTALLATION
MINIMUM 6" DIA BOREHOLE

AREA C & D
VAPOR EXTRACTION WELL (VEW) DETAIL
QTY (9)
10'L X 2" WELL SCREEN, .010 SLOT, SS
2" SCH 40, C.S. RISER W/THREADED END



WELL INSTALLATION
MINIMUM 6" DIA BOREHOLE

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TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE
TYPICAL WELL DETAIL

SIZE	FILE NO.	DWG NO.	REV
D	C107	C107	0

SCALE | DWG | SHEET 1 OF 1

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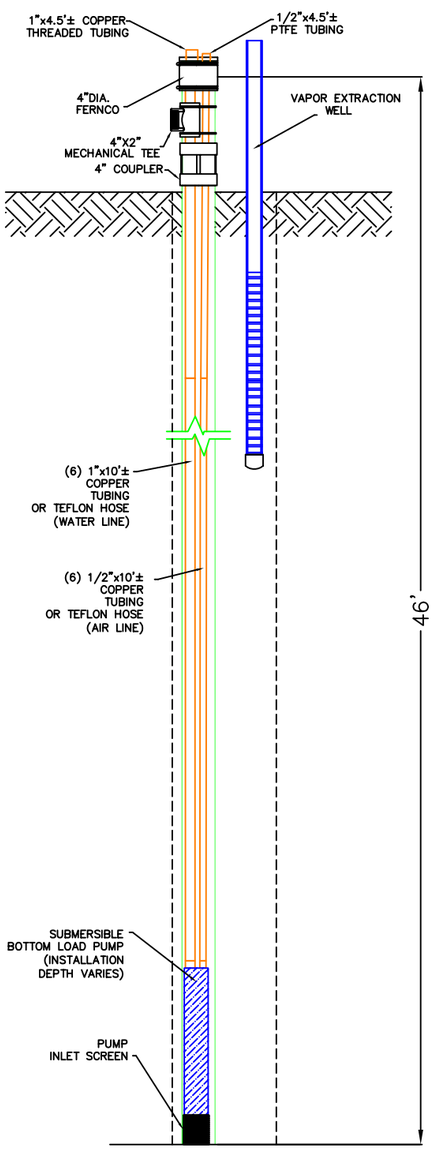
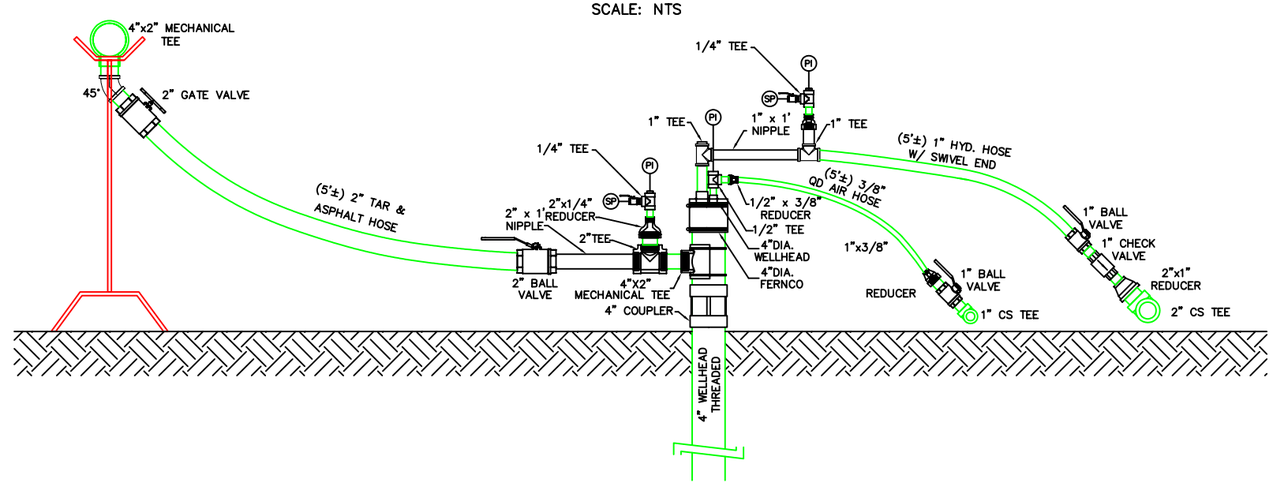
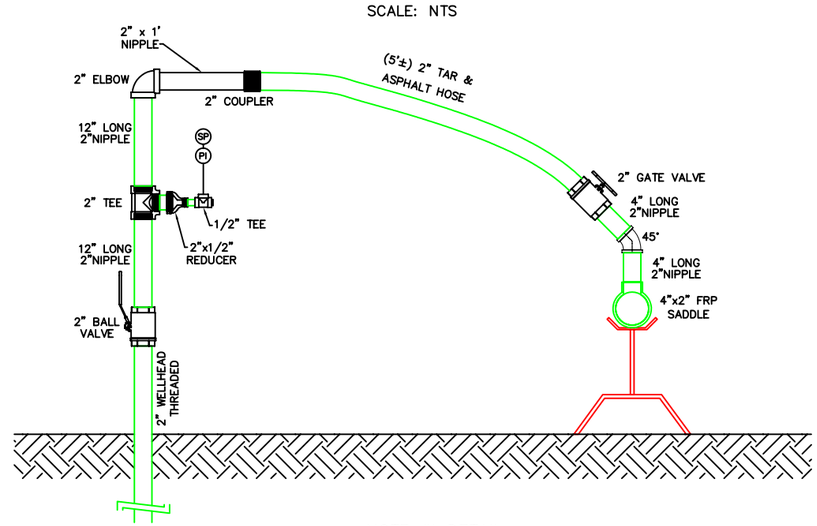
TYPICAL MPE WELL PUMP DETAIL
SCALE: NTS



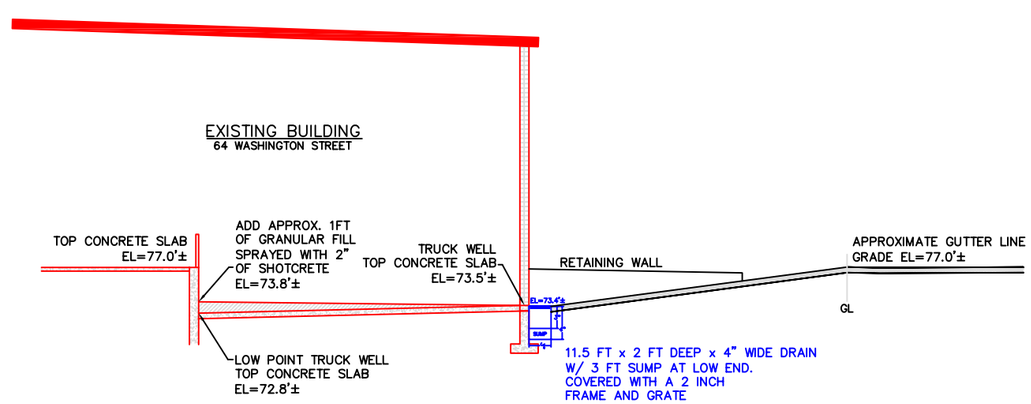
TYPICAL MPE WELLHEAD DETAIL
SCALE: NTS



TYPICAL VAPOR EXTRACTION WELL DETAIL
SCALE: NTS



NOTE #1 DETAIL
SCALE: NTS



TYPICAL MATERIALS OF CONSTRUCTION

Multi Phase Extraction (MPE) Wellheads	
Nipple, 2"x4"	Sch. 80 BL
2" 90	Forged steel
2" 45	Forged steel
2" Tee	Forged steel
Reducer Bushing, 2"x1/2"	Forged steel
Nipple, 1/2" x close	Sch. 80 BL
1/2" Tee	Forged steel
Reducer Bushing, 1/2"x1/4"	Forged steel
Nipple, 1/4" x close	Sch. 80 BL
1/2" Tee	Sch. 80 BL
Ball Valve, 1/4" MxF	Brass Steam Rated 125#
Mechanical Tee, 4"x2"	Vic Mechanical tee
Nipple 2"x12"	Kynar
Nipple 1"x12"	Kynar
Ball Valve, 2"	Brass Steam Rated 125#
Gate Valve, 2"	Brass Steam Rated 125#
2" ID Hose	Gates Long Horn Chemical Hose
Hose Clamps	HSS36
2" King Combo Nipple	STC25
Hydraulic Hose Assembly, 1"x5'	F/F JIC w/MALE ADPT TO 1" MALE NPT
Duroflex Hose Assembly, 3/8"x5'	1/4" MM w/C20 ATTACHED/CP21
Duroflex Hose Assembly, 3/8"x50'	1/4" MM w/C20 ATTACHED/CP21
MPE Liquid Wellheads	
Nipple, 1"x6"	Sch. 40 BL
Nipple, 1/4" x close	Sch. 40 BL
1/4" Tee	Sch. 40 BL
Ball Valve, 1/4" MxF	Brass Steam Rated 125#
Nipple, 1"x2"	Sch. 40 BL
1" Tee	Sch. 40 BL
Reducer Bushing, 1"x1/4"	Sch. 40 BL
Reducer Bushing, 1"x1/2"	Sch. 40 BL
1" Spring Check Valve	Brass Steam Rated 125#
Ball Valve, 1"	Brass Steam Rated 125#
MPE Air Wellheads	
Nipple, 1/2"x2"	Sch. 40 BL
1/2" Tee	Sch. 40 BL
Reducer Bushing, 1/2"x3/8"	Sch. 40 BL
Ball Valve, 1/2"	Brass Air Rated 125#
Reducer Bushing, 1"x1/2"	Sch. 40 BL
1" Tee	Sch. 40 BL
Reducer Bushing, 1/2"x1/4"	Sch. 40 BL

TYPICAL MATERIALS OF CONSTRUCTION

Vapor Extraction (VEW) Wellheads	
Nipple, 2"x4"	Sch. 80 BL
2" 90	Forged steel
2" 45	Forged steel
2" Tee	Forged steel
Reducer Bushing, 2"x1/2"	Forged steel
Nipple, 1/2" x close	Sch. 80 BL
1/2" Tee	Forged steel
Reducer Bushing, 1/2"x1/4"	Forged steel
Nipple, 1/4" x close	Sch. 80 BL
1/4" Tee	Sch. 80 BL
Ball Valve, 1/4" MxF	Brass Steam Rated 125#
Nipples, 2"x12"	Sch. 80 BL
Ball Valve, 2"	Brass Steam Rated 125#
Gate Valve, 2"	Brass Steam Rated 125#

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REVISIONS

REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
1	8/10/10	PW	SF	RS	AS BUILT OF FIELD WELL CONNECTIONS	
0	2/15/10	SF	RS	JG	RELEASE FOR CONSTRUCTION	

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE
TYPICAL WELL CONNECTION DETAILS

SIZE	FILE NO.	DWG NO.	REV
D	C108	C108	1

SCALE NTS | DNS | SHEET 1 OF 1

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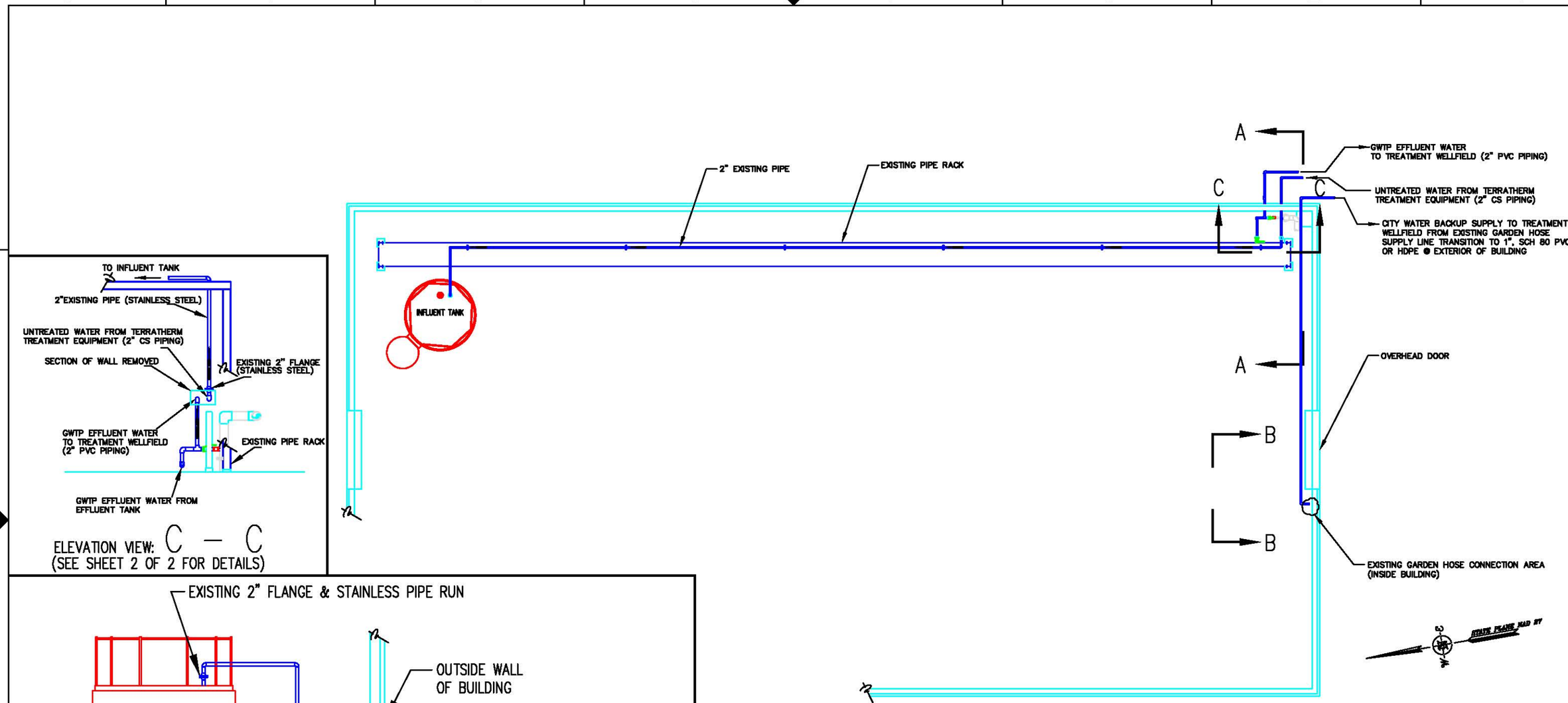
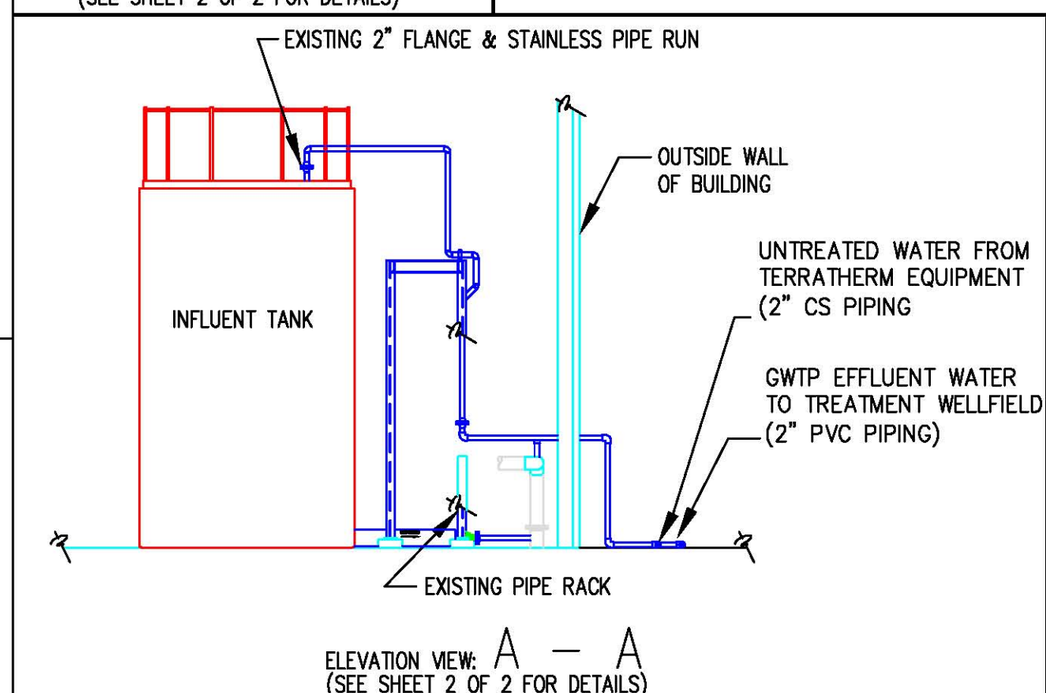
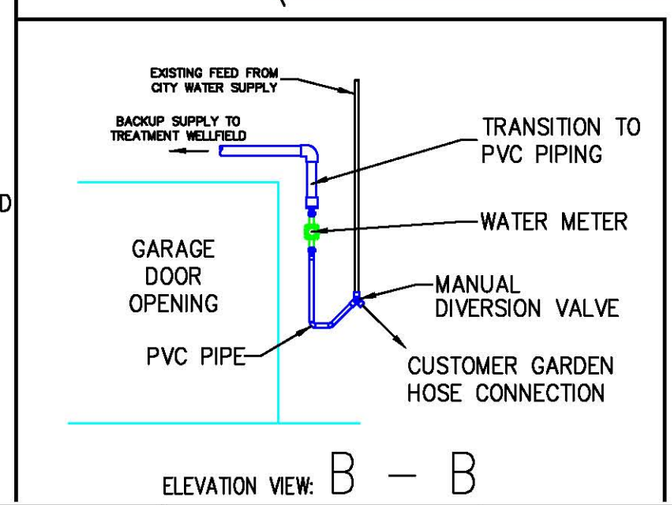


ELEVATION VIEW: C – C
(SEE SHEET 2 OF 2 FOR DETAILS)



ELEVATION VIEW: A – A
(SEE SHEET 2 OF 2 FOR DETAILS)



ELEVATION VIEW: B – B

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REVISIONS

REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
2	8/10/10	PW	RS	JG	AS-BUILT OF CONNECTIONS TO GWTP AND INFLUENT PIPING	
1	5/17/10	PW	RS	JG	REVISED CONNECTIONS TO GWTP AND INFLUENT PIPING	
0	2/18/10	TJM	RS	JG	ISSUED FOR REVIEW	

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE
CONNECTION TO/FROM GWTP
AND CITY WATER SUPPLY

SIZE	FILE NO.	DWG NO.	REV
D	C109	C109	2

SCALE | DWG | SHEET 1 OF 2

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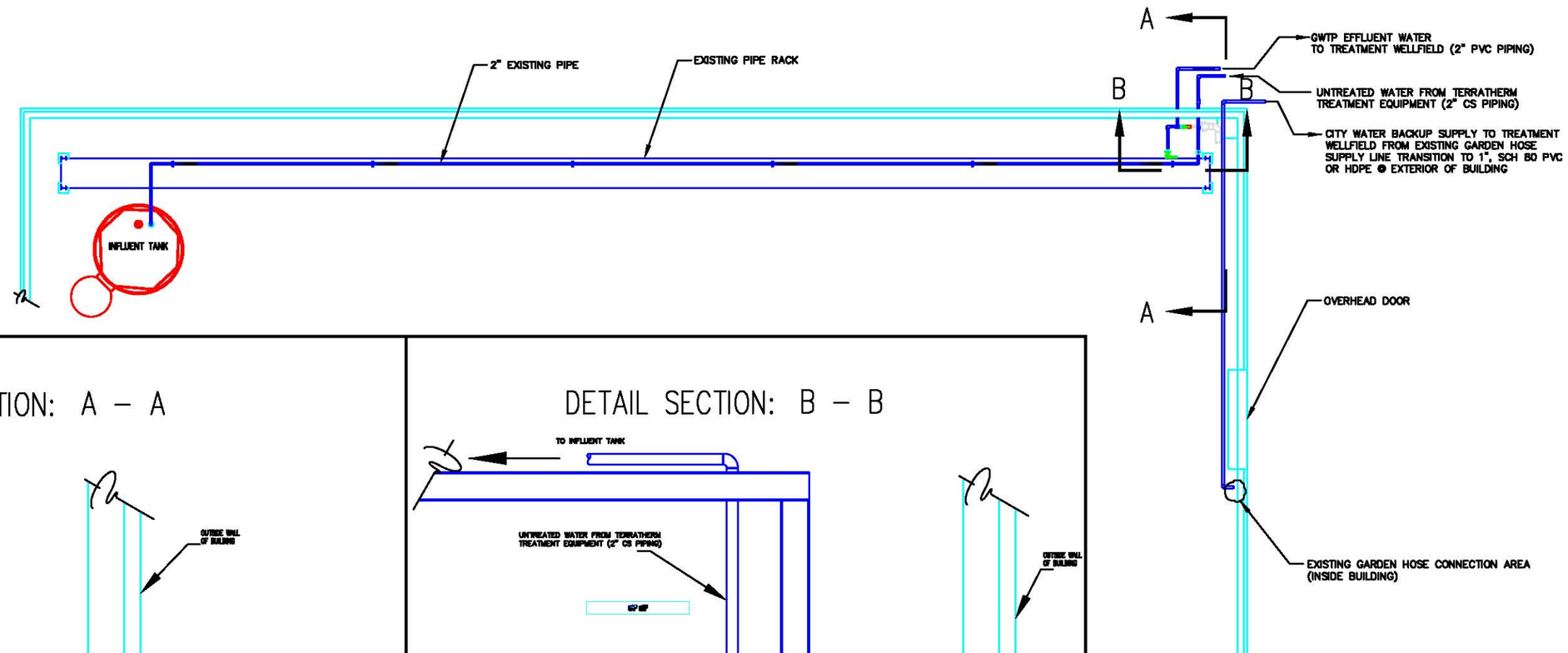
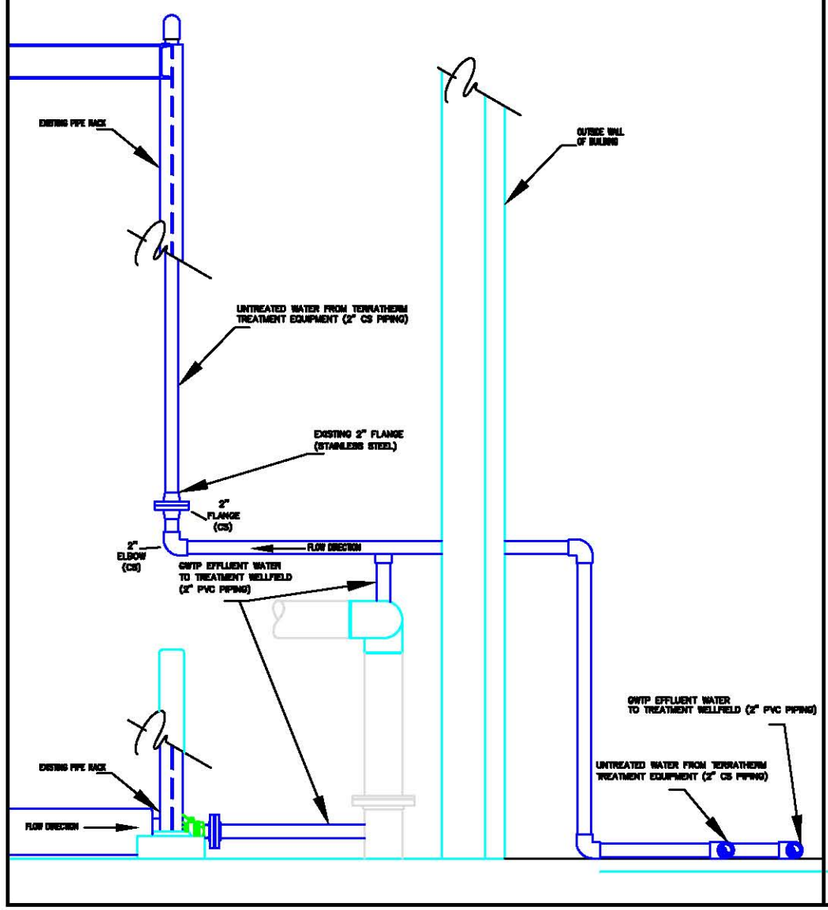
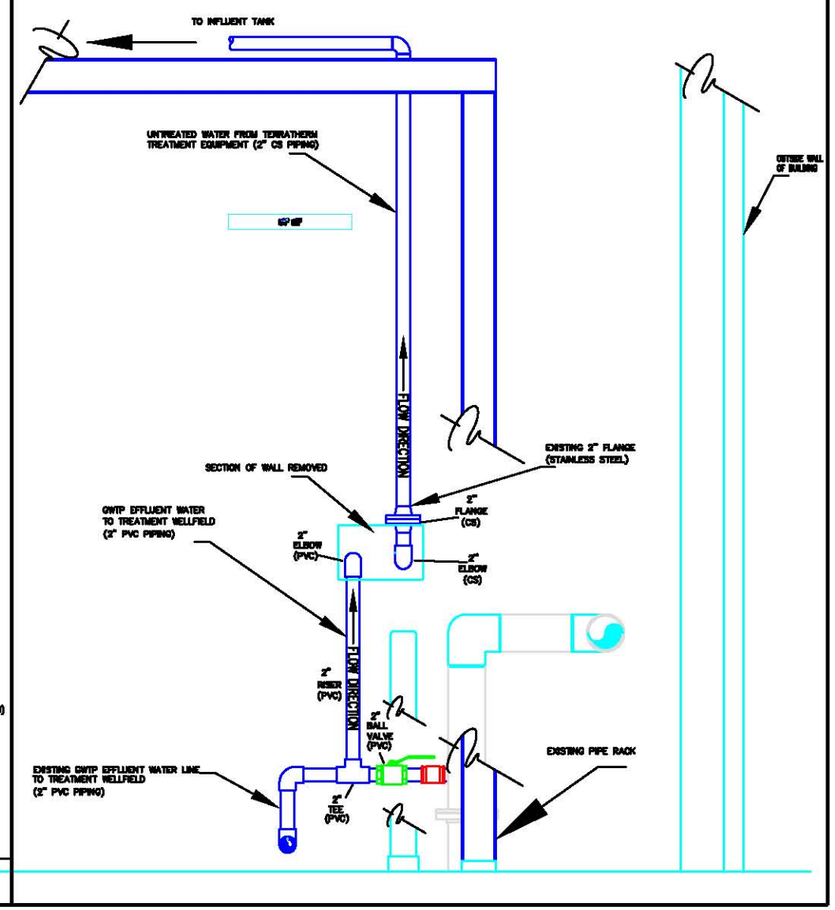


DETAIL SECTION: A – A



DETAIL SECTION: B – B



REVISIONS						
2	8/10/10	PW	RS	JG	AS-BUILT OF CONNECTIONS TO GWTP AND INFLUENT PIPING	
1	8/17/10	PW	RS	JG	ISSUED FOR REVIEW	
REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE
DETAILS FOR CONNECTIONS TO
WELLFIELD AND INFLUENT TANK

SIZE	FILE NO.	DWG NO.	REV
D	C109	C109	2
SCALE	DWG	SHEET 2 OF 2	

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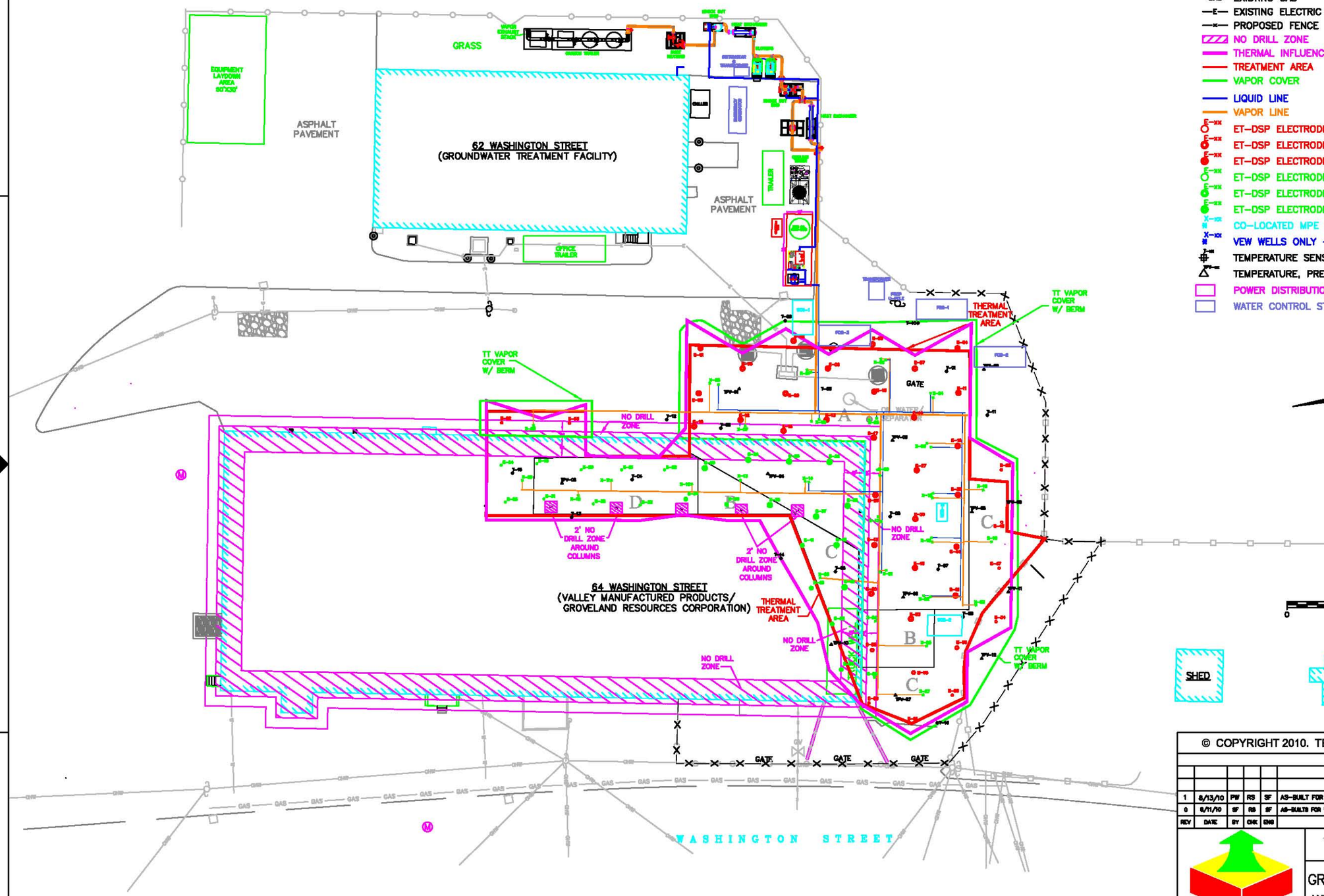
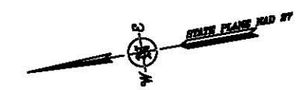
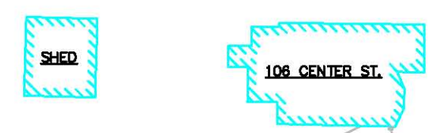
—D— EXISTING DRAINAGE
—OHS— EXISTING OVER HEAD SERVICE
—GAS— EXISTING GAS
—E— EXISTING ELECTRIC
—x— PROPOSED FENCE
NO DRILL ZONE
THERMAL INFLUENCE AREA
TREATMENT AREA
VAPOR COVER
LIQUID LINE
VAPOR LINE
ET-DSP ELECTRODE W/ONE 8" DIA ELECTRODE (9)
ET-DSP ELECTRODE W/TWO 8" DIA ELECTRODE (3)
ET-DSP ELECTRODE W/THREE 8" DIA ELECTRODE (28)
ET-DSP ELECTRODE W/ ONE 6" DIA ELECTRODE (14)
ET-DSP ELECTRODE W/ TWO 6" DIA ELECTRODE (3)
ET-DSP ELECTRODE W/ THREE 6" DIA ELECTRODE (7)
CO-LOCATED MPE & VEW WELLS – 4" DIA & 2" DIA ZONE A (15)
VEW WELLS ONLY – 2" DIA ZONES B, C & D (12)
TEMPERATURE SENSOR WELL (15)
TEMPERATURE, PRESSURE AND VACUUM SENSOR WELL (12)
POWER DISTRIBUTION SYSTEMS (3)
WATER CONTROL STATIONS (3)





APPROX. SCALE
0 20 40 60 FEET



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REVISIONS

REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
1	8/13/10	PW	RS	SF	AS-BUILT FOR PDS AND WCS LOCATIONS	
0	6/11/10	SF	RS	SF	AS-BUILTS FOR WELLFIELD AND PROCESS EQUIPMENT	

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE
WELLFIELD & PROCESS AS-BUILT

SIZE	FILE NO.	DWG NO.	REV
D	C110	C110	1

SCALE | DWN | SHEET 1 OF 1

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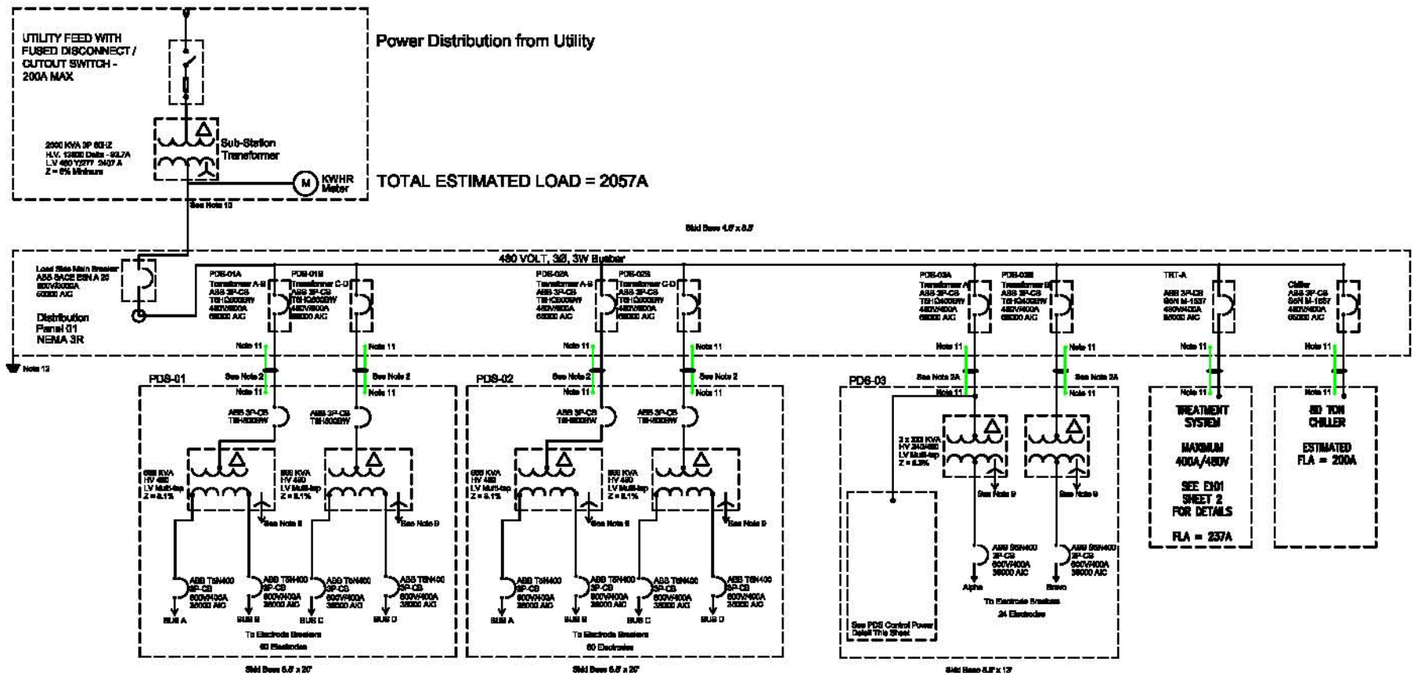


General Notes

1. Construction and material shall comply with Massachusetts building code, CSA/UL, National Electrical Code and applicable local and state codes.

2. Cable from distribution breaker to PDS-01/02, 3 parallel 3C-400 kcmil w/ #2 AWG AL Ground to each A-B and C-D transformer: STR AL NUAL Alcan Type ACWU90 XLPE INS AIA BLK PVC JKT 600V 90C HL CSA C22.2 NO.51. Above Ground.

2A. Cable from distribution breaker to PDS-03, 2 parallel 3C-250 kcmil w/ #2 AWG AL Ground to each ALPHA and BRAVO transformer: STR AL NUAL Alcan Type ACWU90 XLPE INS AIA BLK PVC JKT 600V 90C HL CSA C22.2 NO.51. Above Ground.

3. Cable from PDS-XX to E-XXX: 1C, No. 2 AWG Rockbestos Type DAA1048B EXANE XLPE STR TNC 110C FT4 600V CSA CSA/UL MARINE GRYJKT. Above Ground.

4. ET-DSP neutral cable: RWU-90 Copper AWG No. 2 INS 90 C PVC. Above ground.

5. Maximum operating load (12 electrodes) with a 1.5 margin factor for Alpha and Beta transformers is: 12 x 6.2kW x 1.5=112 kW.

6. All cable from PDS-XX to E-XXX is above ground rated.

7. All ET-DSP N-Cable is above ground rated.

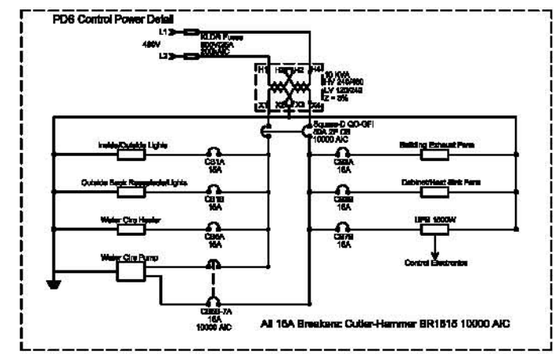
8. All electrical equipment shall be grounded in accordance with NEC section 250.

9. ET-DSP neutral grounding scheme determined during system commissioning and shall include all metal-constructed extraction wells. Derived from secondary neutral of main PDS transformers and separate from utility ground.

10. Cable from substation transformer to distribution panel, Six parallel 4C-750 kcmil to main distribution breaker: Copper conductor TECK cable.

11. Grounding terminals of PDS feed conductors in panels: bolted AL grounding lugs.

12. Power Distribution panel is to be grounded to the utility ground



Symbols

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REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
1	4/8/10	PT	WL	—	REVISED PER EQUIPMENT AVAILABILITY	
0	2/15/10	PT	WL	JG	RELEASE FOR CONSTRUCTION	

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE

ONE LINE ELECTRICAL

SIZE	FILE NO.	DWG NO.	REV
D	E101	E101	1

SCALE: NONE | DWN: | DSN: | SHEET 1 OF 1

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McMillan – McGee Corp.

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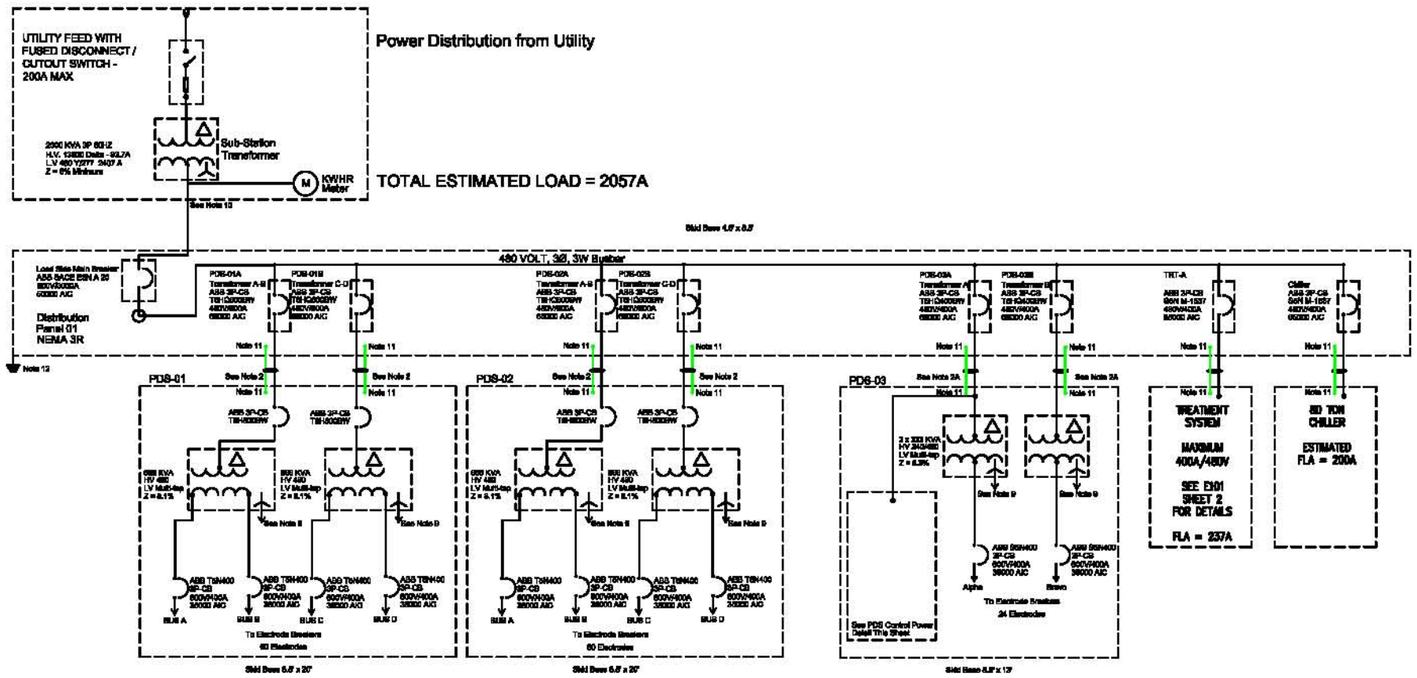


General Notes

1. Construction and material shall comply with Massachusetts building code, CSA/UL, National Electrical Code and applicable local and state codes.

2. Cable from distribution breaker to PDS-01/02, 3 parallel 3C-400 kcmil w/ #2 AWG AL Ground to each A-B and C-D transformer: STR AL NUAL Alcan Type ACWU90 XLPE INS AIA BLK PVC JKT 600V 90C HL CSA C22.2 NO.51. Above Ground.

2A. Cable from distribution breaker to PDS-03, 2 parallel 3C-250 kcmil w/ #2 AWG AL Ground to each ALPHA and BRAVO transformer: STR AL NUAL Alcan Type ACWU90 XLPE INS AIA BLK PVC JKT 600V 90C HL CSA C22.2 NO.51. Above Ground.

3. Cable from PDS-XX to E-XXX: 1C, No. 2 AWG Rockbestos Type DAA1048B EXANE XLPE STR TNC 110C FT4 600V CSA CSA/UL MARINE GRYJKT. Above Ground.

4. ET-DSP neutral cable: RWU-90 Copper AWG No. 2 INS 90 C PVC. Above ground.

5. Maximum operating load (12 electrodes) with a 1.5 margin factor for Alpha and Beta transformers is: 12 x 6.2kW x 1.5=112 kW.

6. All cable from PDS-XX to E-XXX is above ground rated.

7. All ET-DSP N-Cable is above ground rated.

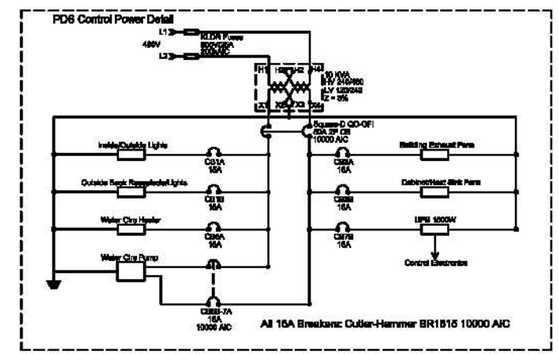
8. All electrical equipment shall be grounded in accordance with NEC section 250.

9. ET-DSP neutral grounding scheme determined during system commissioning and shall include all metal-constructed extraction wells. Derived from secondary neutral of main PDS transformers and separate from utility ground.

10. Cable from substation transformer to distribution panel, Six parallel 4C-750 kcmil to main distribution breaker: Copper conductor TECK cable.

11. Grounding terminals of PDS feed conductors in panels: bolted AL grounding lugs.

12. Power Distribution panel is to be grounded to the utility ground



Symbols

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REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
1	4/8/10	PT	WL	—	REVISED PER EQUIPMENT AVAILABILITY	
0	2/15/10	PT	WL	JG	RELEASE FOR CONSTRUCTION	

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE

ONE LINE ELECTRICAL

SIZE	FILE NO.	DWG NO.	REV
D	E101	E101	1

SCALE: NONE | DWN: | DSN: | SHEET 1 OF 1

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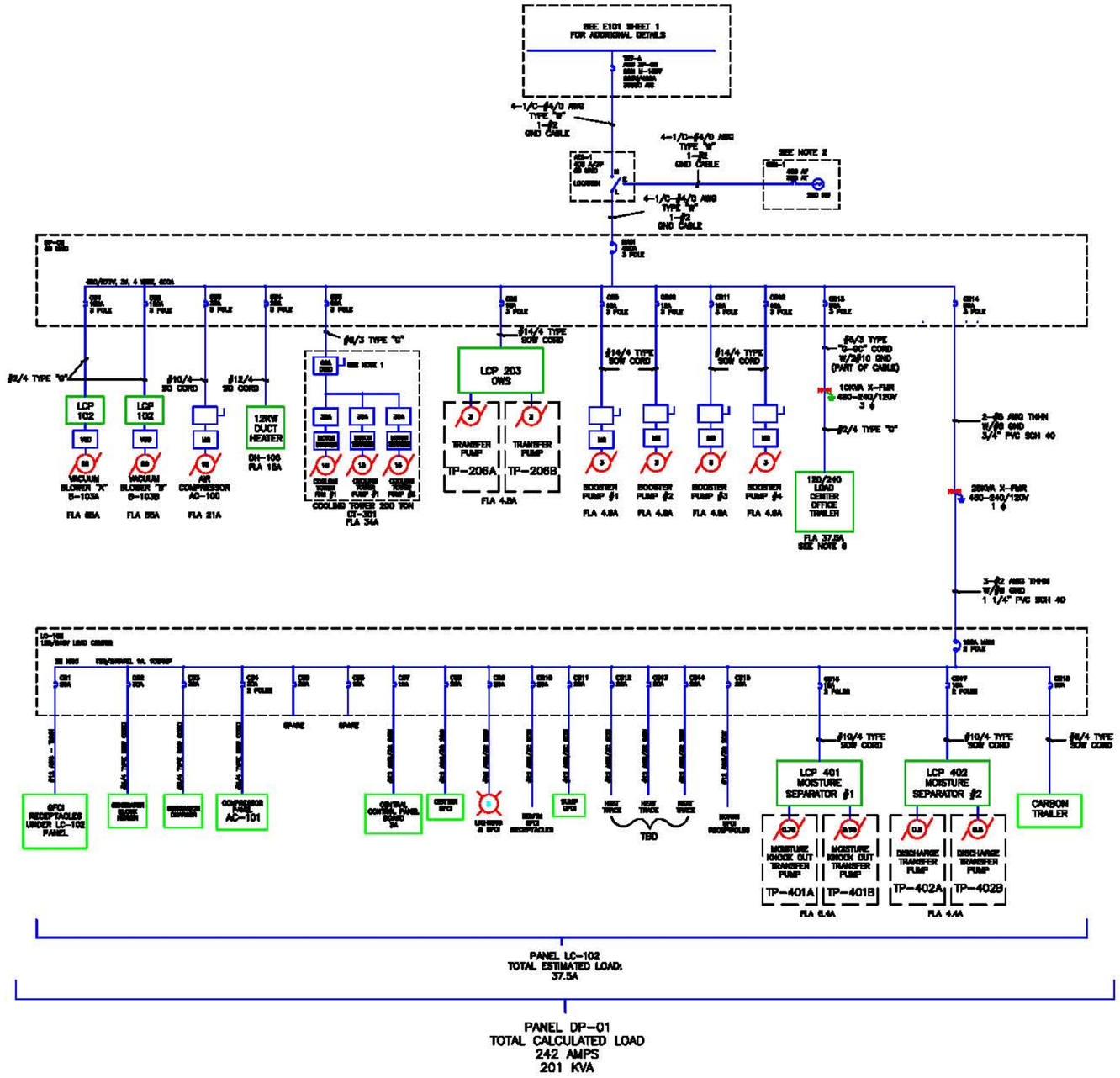

NOTES

1. TERRATHERM WILL PROVIDE ALL FLEXIBLE CORDS AND CONNECTORS FOR THIS WORK.

2. WIRE GENERATOR PER NEC-70, ARTICLE 700, EMERGENCY SYSTEMS. WIRE EMERGENCY STOP BUTTONS TO SHUNT TRIP AND GENERATOR START-STOP CIRCUIT. CONNECT E-STOP CIRCUIT TO DISABLE GENERATOR STARTING ON ACTIVATION OF EMERGENCY STOP. THE ATS IS A 3-POLE TYPE, I.E. THE GENERATOR IS NOT A SEPARATELY DERIVED SYSTEM.

3. MAINTAIN WORKING CLEARANCES PER NEC-70, ARTICLE 110, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

4. INSTALL GROUNDING PER NEC-70, ARTICLE 250, GROUNDING AND BONDING FOR ALL EQUIPMENT.

5. ARTICLE 400, FLEXIBLE CORDS AND CABLES, TABLE 400-4 CLASSIFIES TYPE "W" AND TYPE "G-GC" FOR PORTABLE EXTRA HARD USAGE. CABLE TYPE "W" AND "G-GC" USE TABLE 400-5 (B) USING 75°C COLUMN F3 FOR THREE-CONDUCTOR CABLES. COLUMN D1 IS USED FOR TYPE "W" SINGLE-CONDUCTOR (1/C) CABLE WHERE THE CONDUCTOR IS NOT IN PHYSICAL CONTACT WITH EACH OTHER.

6. LIGHTING WILL BE PROVIDED IN THE INTERIOR OF THE FORMER VALLEY MANUFACTURING BUILDING.

7. EQUIPMENT WITH "A" AND "B" TAG SUCH AS TP-202A AND TP-202B ARE NON-COINCIDENTAL LOADS.

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REVISIONS

REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
2	7/8/10	PT	VL	—	AS SHIPPED FROM SHOP	
1	4/8/10	PT	VL	—	REVISED PER EQUIPMENT AVAILABILITY	
0	3/15/10	PT	VL	JG	RELEASE FOR CONSTRUCTION	

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE

ONE LINE ELECTRICAL

SIZE	FILE NO.	DWG NO.	REV
D	E101	E101	1

SCALE: NONE | CHK | DWN | SHEET 2 OF 2

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—OHS— EXISTING OVER HEAD SERVICE
—GAS— EXISTING GAS
—E— EXISTING ELECTRIC
—x— PROPOSED FENCE
NO DRILL ZONE
THERMAL INFLUENCE AREA
TREATMENT AREA
VAPOR COVER
LIQUID LINE
VAPOR LINE
ET-DSP ELECTRODE W/ONE 8" DIA ELECTRODE (8)
ET-DSP ELECTRODE W/TWO 8" DIA ELECTRODE (3)
ET-DSP ELECTRODE W/THREE 8" DIA ELECTRODE (28)
ET-DSP ELECTRODE W/ ONE 6" DIA ELECTRODE (12)
ET-DSP ELECTRODE W/ TWO 6" DIA ELECTRODE (3)
ET-DSP ELECTRODE W/ THREE 6" DIA ELECTRODE (7)
CO-LOCATED MPE & VEW WELLS – 4" DIA & 2" DIA ZONE A (15)
VEW WELLS ONLY – 2" DIA ZONES B, C & D (12)
TEMPERATURE SENSOR WELL (15)
TEMPERATURE, PRESSURE AND VACUUM SENSOR WELL (12)

EQUIPMENT LAYDOWN AREA 80'X200'
ASPHALT PAVEMENT
GRASS
CARBON TRAILER
DUST HEATER
MANCHOUT BOX
BLOWER BOX
CHILLER
HEAT EXCHANGER
COOLING TOWER
AIR/H2O SEPARATOR TANK
CONTAINMENT W/Acid PLUME ONLY = 12K
OFFICE TRAILER
CONTROL BOX
62 WASHINGTON STREET
(GROUNDWATER TREATMENT FACILITY)
THERMAL TREATMENT AREA
TT VAPOR COVER W/ BERM
GATE
OIL WATER SEPARATOR
NO DRILL ZONE
2' NO DRILL ZONE AROUND COLUMNS
64 WASHINGTON STREET
(VALLEY MANUFACTURED PRODUCTS/
GROVELAND RESOURCES CORPORATION)
APPROX. SCALE
0 20 40 60 FEET
SHED
106 CENTER ST.
WASHINGTON STREET
STATE PLANE NAD 27

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REVISIONS

REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
0	2/26/10	SF	RS	JS	RELEASED FOR CONSTRUCTION	

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE
MECHANICAL LAYOUT

SIZE	FILE NO.	DWG NO.	REV
D	M101	M101	0

SCALE | DNS | SHEET 1 OF 1

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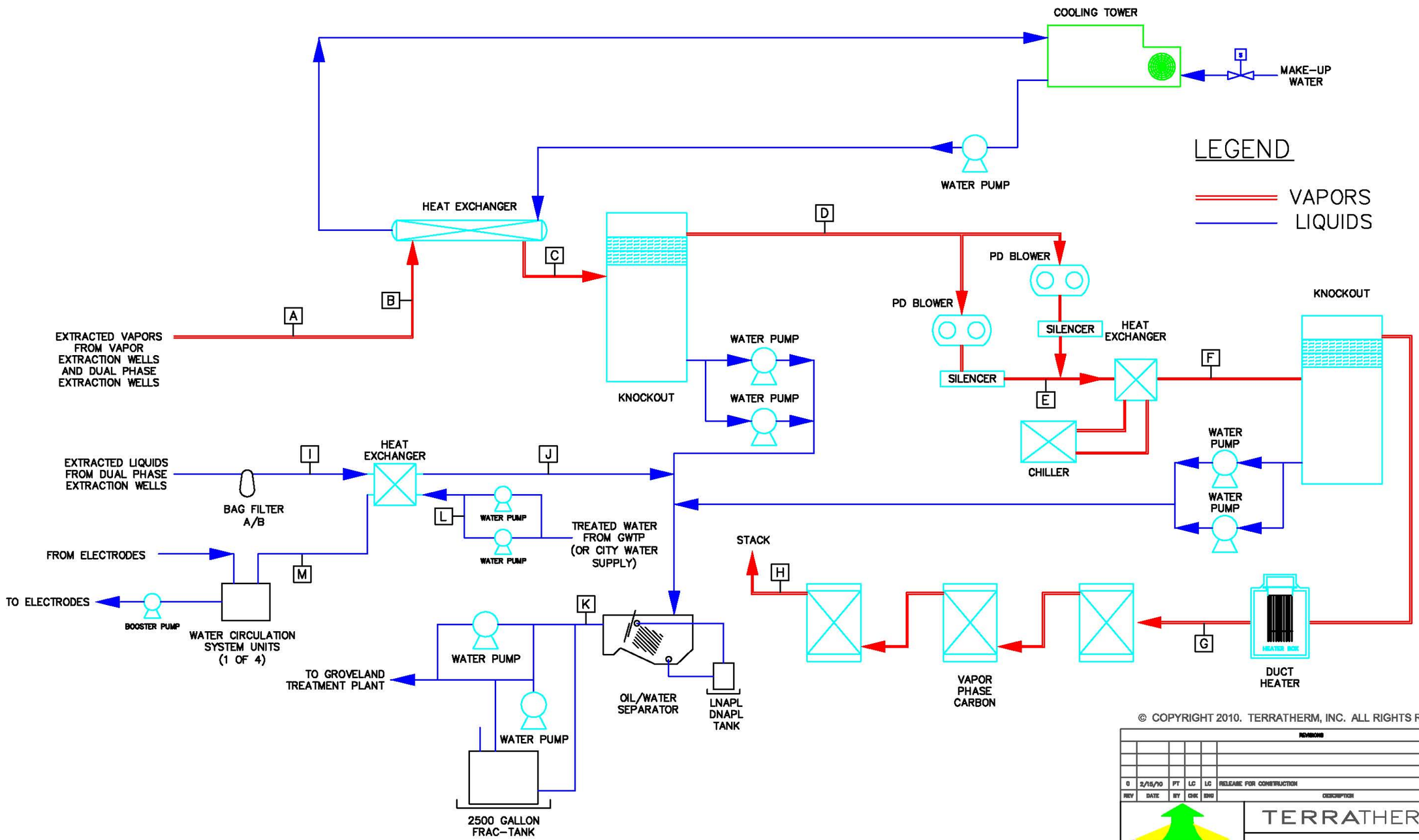

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REVISIONS

REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
0	2/15/10	PT	LC	LC	RELEASE FOR CONSTRUCTION	

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE
PROCESS FLOW DIAGRAM

SIZE	FILE NO.	DWG NO.	REV
D	P101	P101	0

SCALE NTS | DWG | SHEET 1 OF 2

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MAX VAC

	STREAM ID#	dry bulb deg F	abs. press atm	rel. press. "wc	Sat. Vapor Pressure mmHg	Vapor Pressure mmHg	Dew Point F	Sat. Humidity #/# Dry	Enthalpy Btu/# Dry Air	Dry Mass Flow #/min	Wet Mass flow #/min	Wet Density #/Ft^3	Air Flow SCFM	Steam Flow SCFM	Total Flow SCFM	Flow ACFM	Enthalpy Btu/Hr	Δ Enthalpy Btu/Hr	Tons
	AIR STREAM FROM WELLFIELD	59	0.83	-68						15		0.07290	206						
	WATER STREAM FROM WELLFIELD	59	0.83	-68							9.36			332					
	BACKGROUND SOIL	59	1.00	0	12.73	12.73	58.93	0.00655											
A	WELLS	200	0.83	-68.0	633.33	402.46	180.98	1.02289	828.00	15.00	24.75	0.03799	206	332	538	807	745200		
B	FIRST HX INLET	202	0.81	-78.0	614.71	505.00	191.28	1.02289	829.78	15.00	24.75	0.03676	206	332	538	834	746802	1602	
C	FIRST HX OUTLET, PRE-SEPARATOR INLET	140	0.80	-80.0	149.04	149.04	139.76	0.11119	160.36	15.00	16.67	0.04817	206	54	260	367	144323	-602479	-50.2
D	BLOWER INFLUENT	140	0.79	-85.0	149.04	146.75	139.17	0.11323	160.34	15.00	16.67	0.04745	206	54	260	373	144308	-15	
E	BLOWER EFFLUENT, 2ND HX INLET	287	1.04	15.0		192.20	149.75		211.98	15.00	16.67	0.05496	206	30	236	322	190782	46474	
F	SECOND HX OUTLET, 2ND KO INLET	75	1.02	10.0	22.16	22.16	74.98	0.01120	30.04	15.00	15.17	0.07503	206	0	206	203	27039	-163743	-13.6
G	AIR HEATER OUTLET, GAC INLET	100	1.02	7.0	48.98	22.06	74.84	0.02550	36.36	15.00	15.17	0.07118	206	0	206	214	32721	5682	
H	DISCHARGE	80	1.00	0.0	26.15	21.80	74.49	0.01359	31.40	15.00	15.17	0.07255	206	0	206	210	28257	-4465	

MAX FLOW

	STREAM ID#	dry bulb deg F	abs. press atm	rel. press. "wc	Sat. Vapor Pressure mmHg	Vapor Pressure mmHg	Dew Point F	Sat. Humidity #/# Dry	Enthalpy Btu/# Dry Air	Dry Mass Flow #/min	Wet Mass flow #/min	Wet Density #/Ft^3	Air Flow SCFM	Steam Flow SCFM	Total Flow SCFM	Flow ACFM	Enthalpy Btu/Hr	Δ Enthalpy Btu/Hr	Tons
	AIR STREAM FROM WELLFIELD	59	0.95	-20						60.00		0.07290	823						
	WATER STREAM FROM WELLFIELD	59	0.95	-20										412					
	BACKGROUND SOIL	59	1.00	0	12.73	12.73	58.93	0.00655											
A	WELLS	200	0.95	-20.0	722.75	300.00	168.15	1.02289	348.00	60.00	75.00	0.05179	823	412	1235	1624	1252800		
B	FIRST HX INLET	195	0.94	-24.0	715.29	174.82	145.99	1.02289	345.55	60.00	75.00	0.05165	823	412	1235	1628	1243980	-8820	
C	FIRST HX OUTLET, PRE-SEPARATOR INLET	130	0.93	-28.0	114.68	114.68	129.84	0.06966	109.92	60.00	64.18	0.05869	823	124	947	1136	395711	-848269	-70.7
D	BLOWER INFLUENT	130	0.92	-32.0	114.68	113.50	129.45	0.07049	109.94	60.00	64.18	0.05808	823	124	947	1149	395797	86	
E	BLOWER EFFLUENT, 2ND HX INLET	200	1.04	15.0		127.70	133.87		131.63	60.00	64.18	0.06221	823	66	889	1072	473870	78073	
F	SECOND HX OUTLET, 2ND KO INLET	75	1.02	10.0	22.16	22.16	74.98	0.01120	30.04	60.00	60.67	0.07503	823	0	823	814	108157	-365713	-30.5
G	AIR HEATER OUTLET, GAC INLET	100	1.02	7.0	48.98	22.06	74.84	0.02550	36.36	60.00	60.67	0.07118	823	0	823	858	130885	22728	
H	DISCHARGE	80	1.00	0.0	26.15	21.80	74.49	0.01359	31.40	60.00	60.68	0.07255	823	0	823	842	113027	-17859	

MAX VAC & MAX FLOW

	STREAM ID#	dry bulb deg F	abs. press atm	rel. press. "wc	Sat. Vapor Pressure mmHg	Vapor Pressure mmHg	Dew Point F	Sat. Humidity #/# Dry	Enthalpy Btu/# Dry Air	Dry Mass Flow #/min	Wet Mass flow #/min	Wet Density #/Ft^3	Air Flow SCFM	Steam Flow SCFM	Total Flow SCFM	Flow ACFM	Enthalpy Btu/Hr	Δ Enthalpy Btu/Hr	Tons
	AIR STREAM FROM WELL FIELD	59	0.83	-68						60		0.07290	823						
	WATER STREAM FROM WELL FIELD	59	0.83	-68							15.00			412					
	BACKGROUND SOIL	59	1.00	0	12.73	12.73	58.93	0.00655											
A	WELLS	200	0.83	-68.0	633.33	291.75	166.96	1.02289	348.00	60.00	75.00	0.04538	823	412	1235	1853	1252800		
B	FIRST HX INLET	200	0.81	-78.0	614.71	283.50	165.75	1.02289	348.08	60.00	75.00	0.04405	823	412	1236	1909	1253072	272	
C	FIRST HX OUTLET, PRE-SEPARATOR INLET	120	0.80	-80.0	87.33	87.33	119.90	0.06066	96.74	60.00	63.64	0.05193	823	105	928	1268	348271	-904801	-75.4
D	BLOWER INFLUENT	120	0.79	-85.0	87.33	86.00	119.35	0.06169	96.74	60.00	63.64	0.05114	823	105	928	1287	348271	0	
E	BLOWER EFFLUENT, 2ND HX INLET	287	1.04	15.0		112.60	129.16		146.93	60.00	63.64	0.05496	823	55	878	1198	528960	180689	
F	2ND HX OUTLET, 2ND KO INLET	75	1.02	10.0	22.16	22.16	74.98	0.01120	30.04	60.00	60.67	0.07503	823	0	823	814	108156	-420804	-35.1
G	AIR HEATER OUTLET, GAC INLET	100	1.02	7.0	48.98	22.06	74.84	0.02550	36.36	60.00	60.67	0.07118	823	0	823	858	130885	22729	
H	DISCHARGE	80	1.00	0.0	26.15	21.80	74.49	0.01359	31.40	60.00	60.68	0.07255	823	0	823	842	113027	-17859	

STREAM ID		TEMP F	FLOW GPM	MASS RATE #/HR
I	WELL PRODUCTION	220	10	5004
J	HX OUTLET	155	10	5004
K	OWS OUTLET	150	10	5004
L	CITY WATER	50	15	7506
M	TO ELECTRODES	120	15	7506

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REVISIONS

REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
0	2/15/10	PT	LC	LC	RELEASE FOR CONSTRUCTION	

TERRATHERM INC.

GROVELAND WELLS SUPERFUND SITE
PROCESS FLOW VALUES

SIZE D | FILE NO. P101 | DWG NO. P101 | REV 0

SCALE NTS | DNS | SHEET 2 OF 2

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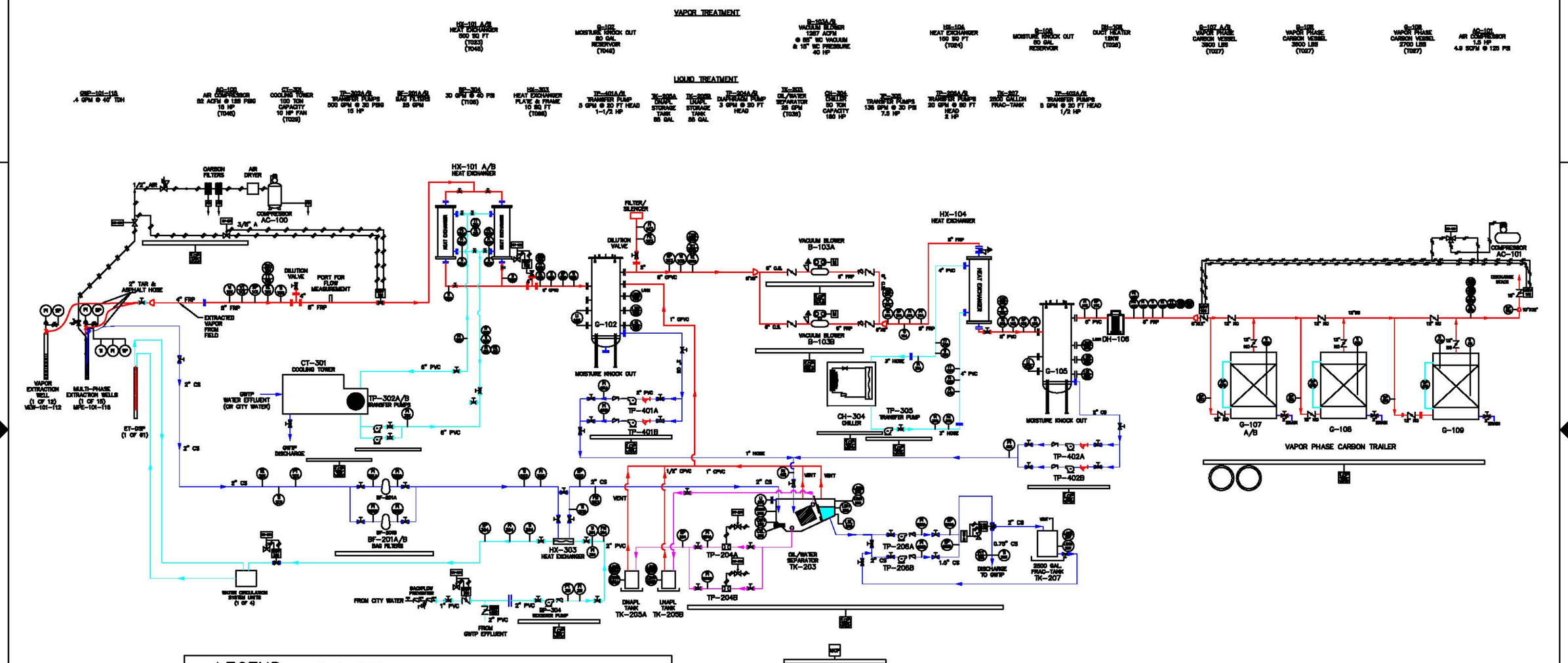

LEGEND

- BACK PRESSURE VALVE
- NORMALLY OPEN GATE VALVE
- NORMALLY CLOSED GATE VALVE
- PRESSURE REGULATOR VALVE
- CHECK VALVE
- WATER PUMP
- SKID PACKAGE
- Y-STRAINER
- QUICK DISCONNECT
- AIR LINE
- PRESSURE RELIEF VALVE
- VACUUM RELIEF VALVE
- MOTOR OPERATED VALVE
- COMPRESSOR
- BALL VALVE
- BUTTERFLY VALVE
- POSITIVE DISPLACEMENT VACUUM BLOWER
- FLANGED CONNECTION
- AIR OPERATED DIAPHRAGM PUMP
- SAMPLE PORT
- LOCALLY MOUNTED INSTRUMENT
- SIGNAL TO MASTER CONTROL PANEL
- VAPOR PROCESS LINE
- LIQUID PROCESS LINE
- INSTRUMENT LINE
- PRODUCT PROCESS LINE
- SOLENOID VALVE
- FLOW METER
- AIR DRAIN

INSTRUMENT LETTERS
P=DIFFERENTIAL PRESSURE
T=TEMP
F=FLOW
L=LEVEL
A=ANALYSIS
P=PRESSURE
O=O2
S=SAMPLE
T=TEMPERATURE
V=VACUUM
Z=POSITION

ELECTRONIC LETTERS
A=ALARM
C=CONTROLLER
E=ELEMENT
F=FLOW
I=INDICATOR
L=LEVEL
M=METER
O=OPERATED
P=PORT
S=SWITCH
T=TRANSMITTER
V=VALVE
Y=CONVERTER/RELAY

LCP LOCAL CONTROL PANEL
MCP MASTER CONTROL PANEL

CS CARBON STEEL
PVC POLYVINYLCHLORIDE
CPVC CHLORINATED PVC
FRP FIBERGLASS REINFORCED PLASTIC

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REVISIONS

REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
1	8/22/10	DXC	GC	KC	UNDER REVISION	
0	2/15/10	SF	JG	LC	RELEASED FOR CONSTRUCTION	

TERRATHERM INC.

GROVELAND SUPERFUND SITE
PIPING & INSTRUMENTATION DIAGRAM

SIZE	FILE NO.	DWG NO.	REV
D	P102	P102	1

SCALE | DWG | SHEET 1 OF 1

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APPENDIX D

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 2/1/2010

Activities Performed Week of 1/25/2010:	**Status**
Replacement of Existing Fence Along Washington Street	Complete
Removal of Wooden Stockade Fence Along 106 Center Street Property	Complete
Installation of Temporary Construction Fence Along Southern Property Boundary of Treatment Areas. Wooden stockade panels installed on southern side of fence on 106 Center Street property.	Complete
Removal of chain link fence sections between Valley Building and GWTP, preservation of fence and storage in north end of Valley Building.	Complete
Installation of fence section at northeast corner of Valley Building, to connect to remaining fence and complete enclosure of Site.	Complete
Coordination with Mrs. Young on Fencing and Landscaping Activities	On-going – See Issues Below
Subcontractors Onsite: Parker Fence	
Planned Activities for Week of 2/1/2010:	
• Installation of sediment controls (straw bales and silt fences) around anticipated construction area limits; • Removal of large pine trees along southern property boundary; and • Clearing and grubbing.	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None	
Issues or Action Items:	**Lead Person(s)/Status**
1. During fencing activities, a cluster of three small diameter deciduous trees and one small shrub were noted along the 106 Center Street fence line that had not been previously identified for removal. It was concluded that they are located within the ISTT wellfield/ construction zone and will need to be removed. • D. Baxter notified D. Golden of the issue on 1/28. • Nobis will contact Mrs. Young to discuss issue and determine types of trees so that appropriate restoration can be planned.	LS / DB LS left telephone message for Mrs. Young, morning of 2/1/10. Trees will not be removed until contact is made. DG will be notified of contact w/ Mrs. Young

Applicable Site Photographs:

Date: 1/28/2010	**Location:** Washington Street, Looking Southeast

Description: New chain link fence replacing old fence in front of Valley Manufacturing building. New fence installed with metal posts (in foreground) and wood posts (background).

Date: 1/28/2010	**Location:** 106 Center Street, Looking Northeast

Description: Temporary construction fence, with wood stockade fence propped and secured against chain link, installed along the southern property boundary with the 106 Center Street property.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 2/8/2010

Activities Performed Week of 2/1/2010:	**Status**
Installation of sediment controls – straw bales and silt fences along the new fence line and drainage swale.	On-going, See Issues #1
Clearing and grubbing the area east of the Valley Manufacturing building.	Complete
Clearing the area south of the Valley Manufacturing building.	Complete
Removal of two large pine trees along the southern property limit.	Complete
Removal of select small trees and shrubs in the drainage swale and in the vicinity of one large pine tree (previously discussed in the Construction Status Report #1).	Complete
Subcontractors Onsite: Atherton, Eaton Chips	
Planned Activities for Week of 2/1/2010:	
• Removal of debris piles associated with clearing and grubbing activities; and • Removal of one large pine tree in southwest corner of Site.	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None. Waiting on OEME laboratory data from the Baseline Ambient Air Monitoring Event completed on January 22, 2010.	
Issues or Action Items:	**Lead Person(s)/Status**
1. Due to the cold weather and the resulting frost layer (approximately 6 inches thick), securing the straw bales via wooden stakes has been difficult. L. Soos will work closely with the Site Preparation contractor (Atherton) to evaluate the frost thickness and identify an appropriate time to secure the sediment controls as soon as possible.	LS
2. A large branch on the top of a maple tree located on the 106 Center Street property was removed in preparation for large pine tree removal (see photographs). The branch, which points to the North, was in the fall path of a large pine tree. The branch was removed to prevent further damage to the tree and from potentially interfering with the fall path of the large pine tree.	-
Next Project Status Conference Call: February 10, 2010 at 11 am **Next Project Status Meeting:** February 17, 2010 at 10:00 am – Construction Kick Off at the Site	

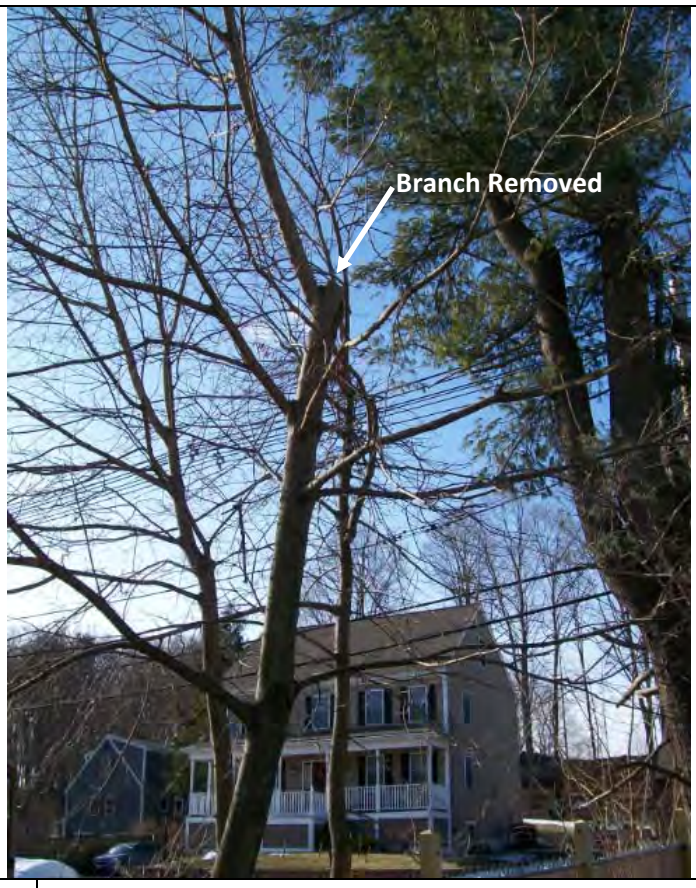
Applicable Site Photographs:

Date: 2/5/2010	**Location:** Southern Fence Line, Looking East

Description: Sediment controls installed along the new temporary construction fence. Trees in the background are marked with pink surveying tape, indicating they must remain in place.

Date: 2/5/2010	**Location:** East of Valley Manufacturing Building, Looking North

Description: Area east of the Valley Manufacturing building that was cleared and grubbed. Sediment controls were installed along the drainage swale (far right).



Date: 2/5/2010	**Location:** 106 Center Street

Description: A large branch on the top of a maple tree was removed to prevent further damage to the tree and from potentially interfering with the fall path of the large pine tree.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 2/15/2010

Activities Performed Week of 2/8/2010:	**Status**
Installation of sediment controls – straw bales and silt fences along the new fence line and drainage swale. Wooden stakes were installed at each of the straw bales; an unsuccessful attempt was made to get through the frost.	On-going See Action Item #1
Removal of one large pine tree in the southwest corner of the Site.	Complete
Removal of debris piles associated with clearing, grubbing, and tree removal activities.	Complete
Demobilization of site preparation contractor and equipment.	Complete
Subcontractors Onsite: Atherton (Nobis subcontractor) and lower-tied subcontractors: Eaton Chips (Tree Removal) and T.W. Excavating (T&D)	
Planned Activities for Week of 2/15/2010:	
• TerraTherm mobilizing site trailer and various health and safety supplies.	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: Data was received for the baseline ambient air monitoring event completed on January 22, 2010. Reporting limits are below what was targeted in the project QAPP. Data has been accepted as the baseline ambient air monitoring results.	
Action Items:	**Lead Person(s)/Status**
1. Due to the cold weather and the resulting frost layer (approximately 6 inches thick), securing the straw bales via wooden stakes has been difficult. L. Soos will work closely with the Site Preparation contractor (Atherton) to evaluate the frost thickness and identify an appropriate time to secure the sediment controls as soon as possible.	LS
Next Project Status Conference Call: February 17, 2010 at 10:00 am **Next Project Status Meeting:** February 24 or 25, 2010, TBD	

Applicable Site Photographs:

Date: 2/9/2010	**Location:** South of Valley Manufacturing building, looking northeast.

Description: Logs from the large pine trees (removed on February 5 and 9, 2010) are loaded onto log truck and taken off site.

Date: 2/9/2010	**Location:** South of Valley Manufacturing building, looking east.

Description: Area cleared as part of the Site Preparation activities. Straw bales in background have wooden stakes partially installed (see action item #1).

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 2/22/2010

Activities Performed Week of 2/15/2010:	**Status**
TerraTherm mobilized Site Trailer to the Site.	Complete
TerraTherm received health & safety, office, and miscellaneous field supplies.	Complete
Installation of additional power pole needed to bring power to the ISTT system.	Complete
Subcontractors Onsite: TerraTherm and Groveland Electric	
Planned Activities for Week of 2/22/2010:	
• Mold abatement on the interior of the Valley Manufacturing building. Level C PPE (skin and respiratory protection) is still anticipated while working within the building during ISTT construction and operation activities. • Construction Kick-Off – Site meeting on Wednesday, 2/22, with key project team members: EPA, Mass DEP, Nobis, and TerraTherm.	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. None	-
Next Project Status Meeting: February 24, 2010 at 10 am at the GWTP	

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 3/1/2010

Activities Performed Week of 2/22/2010:	**Status**
Limited mold abatement was completed within the ISTT area inside the Valley Manufacturing building. Ceiling panels (which contained high concentrations of mold) were removed, bagged for containment, and stored on the north end of the building. Other miscellaneous debris was also moved from the ISTT work area to north end of the building. In addition, a containment wall was constructed to limit re-infestation of mold into ISTT area. Level C PPE (skin and respiratory protection) is still planned while working within the building during ISTT construction and operation activities.	Complete
The electrodes, sensor wells, and soil vapor and multi-phase extraction wells were located and marked using surveying equipment.	On-going, This activity will be finished early next week.
Electrodes and other construction materials for the well field installations were delivered to the Site.	On-going, This activity will be finished early next week.
TerraTherm mobilized supplies and construction equipment.	Complete
IDW subcontractor delivered 2 – 20 cy roll-off containers to site	Ongoing, 3rd container will be delivered when needed
A construction kick-off meeting was held at the Site (it included an initial meeting at the GWTP and a tour of the Site). TerraTherm and Nobis were in attendance, while EPA, MassDEP, and McMillan-McGee participated via teleconference (initial meeting only).	Complete
Communication was initiated with the Groveland Fire Department (GFD) Chief, John Clement. Informed the GFD that the ISTT construction is beginning and recent changes in Site controls (dummy-locked front gate).	On-going, Nobis will communicate with the GFD as major project phases commence.
Project power needs and operation schedule was discussed with Michael Cloutier of the Groveland Electric Light Department (GELD). Some take away points, include: 1. The project start up will not need to be delayed because of GELD concerns. 2. There will be no difference in power costs regardless of start time. 3. Nobis will continue to coordinate with them regarding schedule and usage projections to minimize impacts to the GELD. 4. Nobis will coordinate with them regarding administrative requirements for setting up electric service. Working on having meter deposit requirement waived for EPA-funded project.	On-going, Nobis will continue to coordinate with the GMED.
Subcontractors Onsite: TerraTherm and Advanced Mold Remediation	

Planned Activities for Week of 3/1/2010:	
• Well field installations will begin. Two sonic drill rigs will be used at the Site, one dedicated to the interior of the building and the other will remain outside. • Concrete coring of all interior electrodes, sensor points, and soil vapor and multi-phase extraction wells to be performed prior to start of interior drilling. • Nobis will begin baseline soil sampling during the drilling of select electrodes. Planned drilling includes the Treatment Area D. Nobis has coordinated with EPA for expedited turn-around time of 2 days for approximately 15 percent of samples (Area D and southern property boundary).	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
2. "Decommissioning" of existing groundwater extraction wells within the source area (EW-S1, EW-S2, and EW-S3).	FS
3. Integration of programming controls and logic with the GWTP. Nobis is currently procuring a programming subcontractor to assist with this task. A controls meeting is planned for mid-April.	FS
Next Project Status Conference Call: March 3, 2010 at 11:00 am	
Next Project Status Meeting: tentative March 11, 2010 at 10 am at the GWTP - trying to reschedule	

Applicable Site Photographs:

Date: 2/22/2010	**Location:** Valley Manufacturing building, looking north from South entrance.

Description: Installation of containment wall (wooden frame on left side of photograph) and removal of ceiling tiles (work area on the right).

Date: 2/24/2010	**Location:** Interior of Valley Manufacturing building.

Description: Completed containment wall (right side of photograph). Buckets were used to collect rainwater flowing into work zone through the roof.

Date: 2/24/2010	**Location:** 106 Center Street, looking southwest from Site.

Description: No ponded rainwater was observed at the property boundary between the Site and the 106 Center Street property. Storm on 2/25-2/26 damaged much of the temporary fence shown here.

Prepared By: Adam Roy	**Date Prepared:** 3/7/2010
Activities Performed Week of 3/1/2010:	**Status**
Boart Longyear (drilling subcontractor) mobilized to the Site. Drilling activities commenced on 3/2/10. Borings were drilled for electrode locations only. TerraTherm is still waiting on supply shipments for the construction of the sensor wells and vapor/liquid extraction wells. Electrodes were installed in exterior locations E-11 and E-04. Electrodes were installed in interior locations E-64, E-65, E-19, E-31, E-32, E-33, E-20, E-21, E-22, and E-34.	On going, this activity is expected to last approximately 6 weeks.
Nobis collected soil samples for laboratory analysis from select electrode locations. One location in Treatment Zone D was targeted for 2 day turnaround time for preliminary results.	Complete
Atherton Excavation completed the installation of silt fencing and secured the hay bales with grade stakes. This work was previously incomplete due to the frost in the ground during the initial installation.	Complete
Parker Fence mobilized to the Site to repair the fence along the 106 Center Street property. The fence was damaged during the wind storm on 2/25/10.	Complete
Subcontractors Onsite: TerraTherm, Boart Longyear, Parker Fence, and Atherton Excavation	
Planned Activities for Week of 3/7/2010:	
• Well field installations will continue. • Nobis will continue baseline soil sampling during the drilling of select electrodes. Planned drilling will likely include areas inside the building and along the treatment area perimeter. • Nobis will coordinate with Atherton Excavation to remove approximately 6, 6-inch diameter trees located in the expanded Treatment Area D (east of the Valley Building, immediately north of the previously defined limit of treatment.)	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation. -- OEME availability has been confirmed. First sampling event scheduled for Tuesday August 3, then first Tuesday of each month.	Provide OEME updated schedule as work proceeds. DG / DB
2. "Decommissioning" of existing groundwater extraction wells within the source area (EW-S1, EW-S2, and EW-S3).	FS
3. Integration of programming controls and logic with the GWTP. Nobis is currently procuring a programming subcontractor to assist with this task. A controls meeting is planned for mid-April.	FS
Next Project Status Meeting: March 11, 2010 at 1 pm at the GWTP	
Next Project Status Conference Call: March 18, 2010 at 1:00 pm	

Applicable Site Photographs:

Date: 3/04/2010	**Location:** Southern Site boundary along 106 Center Street Property.

Description: Repair of the fence along the Site boundary and 106 Center Street.

Date: 3/02/2010	**Location:** Material storage area near the groundwater treatment plant.

Description: Electrodes to be installed.

Applicable Site Photographs:

Date: 3/04/2010	**Location:** Site boundary along 106 Center Street.

Description: Atherton Excavation completing the installation of the silt fencing.

Date: 3/04/2010	**Location:** Electrode location E-04.

Description: Boart and TerraTherm installing an electrode in E-04.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 3/15/2010

Activities Performed Week of 3/8/2010:	**Status**
Well field installations continued. The electrodes installed last week include the following: • *Exterior*: E-05, E-06, E-08, and E-09; and • *Interior*: E-23, E-25, E-36, and E-37 A total of 22 electrode locations have been completed to date.	On-going, this activity is expected to last approximately 4 more weeks.
Nobis collected soil samples for laboratory analysis from select electrode locations within Treatment Area B (E-23 and E-35).	Complete
Atherton Excavation removed 6 trees in preparation for the expanded Treatment Area D (east of the Valley Manufacturing building, immediately north of the previously defined limit of treatment).	Complete
Extraction well construction materials were delivered to the Site.	Complete
Nobis performs Site safety inspection. Corrective actions included the following: • Fire extinguisher installed at generator used to support interior drilling activities; and • Boart Longyear to complete a hot work permit when spot welding or hot cutting is needed for drill rig maintenance.	On-going, safety inspections will be completed monthly or when deemed necessary by SHSO.
Procedures regarding general housekeeping were established by Nobis and TerraTherm. Procedures include: • Daily management of accumulated gravel and soil in southwest corner of GWTP parking lot; • Daily removal of accumulated liquids from decontamination pad, if applicable; • Installation and maintenance of silt screen in storm drain located in the southwest corner of GWTP parking lot; and • Handling and management of contaminated PPE and trash.	On-going, Site housekeeping will be continuously monitored throughout the duration of this construction project.
A construction status meeting was held at the Site which included a Site tour. Nobis, TerraTherm, EPA, and MassDEP were in attendance.	Complete
Davis-Bacon Labor Standard interviews were completed with two Boart Longyear employees.	Complete
Subcontractors Onsite: TerraTherm, McMillan McGee, Boart Longyear, and Atherton Excavation	

Planned Activities for Week of 3/15/2010:	
• Continue well field installations and baseline soil sampling at select locations. • TerraTherm to receive construction materials for the sensor wells. • Truck well in the interior of the building will be filled prior to the installation of electrodes E-52 and E-57.	
Laboratory Data Received:	
Soil: Analytical data was received for soil samples collected from electrode location E-65 at depths 5 to 7 and 9 to 10 ft bgs. Nobis performed an initial review of the data. VOCs were detected at concentrations below the Site cleanup goals.	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
2. Plan for "decommissioning" of existing groundwater extraction wells within the source area (EW-S1, EW-S2, and EW-S3), but keeping EW-S1 running until start of ISTT system using above-ground electrical connections.	FS
3. Integration of programming controls and logic with the GWTP. Nobis is currently procuring a programming subcontractor to assist with this task. A controls meeting is planned for mid-April.	FS/DB
4. Installation of high-speed internet service to the Site.	Nobis
Next Project Status Conference Call: March 18, 2010 at 1:00 pm	
Next Project Status Meeting: March 25, 2010 at 1 pm at the GWTP	

Applicable Site Photographs:

Date: 3/8/2010	**Location:** Electrode Location E-06, Looking Northeast

Description: Installation of electrode at location E-06.

Date: 3/8/2010	**Location:** Electrode Location E-06

Description: Electrode, awaiting installation at location E-06.

Applicable Site Photographs:

Date: 3/8/2010	**Location:** Interior of Valley Manufacturing Building

Description: Drilling at electrode location, E-23.

Date: 3/8/2010	**Location:** Electrode Location E-23

Description: Fine and medium grained sands observed at electrode location E-23 within the upper 20 feet of the borehole.

Prepared By: Lauren Soós	**Date Prepared:** 3/22/2010

Activities Performed Week of 3/15/2010:	**Status**
TerraTherm received additional extraction and sensor well materials.	Complete
Well field installations continued. TerraTherm and lower-tiered subcontractor, Boart Longyear, began installing extraction wells. The electrodes and extraction wells installed last week include the following: • *Exterior*: E-12, E-13, E-15, E-16, E-62, E-63, X-07, and X-28; and • *Interior*: E26, E-38, E-41, E-42 A total of 32 electrode locations and 2 extraction wells have been completed to date.	On-going, this activity is expected to last approximately 3 more weeks.
Nobis collected soil samples for laboratory analysis from select electrode locations within Treatment Area A (E-12 and E-26), C (E-42), and D (E-62 and E-63).	Complete
Nobis performed a stormwater inspection of the Site following the 3/12 to 3/15 storm event. Observations included the following: • The erosion and sediment (E&S) controls installed along the southern perimeter of the Site appeared to be in good working condition; • The E&S controls installed along the drainage swale were generally in working condition, with the following exceptions: ▫ One E&S control location along the drainage swale had reached full capacity (sediment accumulated to the top of the straw bales, flowed over the bales, and into and past the silt fence fabric); ▫ One E&S control location along drainage swale was undermined; ▫ Sediment accumulated to a height of ~ 8 inches to 1 foot along a section of E&S controls along the drainage swale • No pooling or ponding of water was observed at 106 Center Street; • One section of the temporary construction fence along 106 Center Street was damaged; • The silt screen within the storm drain in the southwest corner of the GWTP was full of sediment and debris.	Complete
Atherton Excavation performed maintenance of the E&S controls around the drainage swale, which included the following: • Removal of sediment accumulation upgradient of E&S controls (approximately 100 linear ft) using a Bobcat Mini-Excavator; and • Reinstall select E&S controls that were compromised during storm event and maintenance.	Complete
Parker Fence repaired fence along 106 Center Street. Damage was incurred due to the weight of the fence with the saturated soils and wind conditions. Parker Fence secured existing brackets by driving stakes deeper into the subsurface. Nobis installed gravel in and around wooden posts to support and secure fence.	Complete

Nobis and TerraTherm installed a new silt screen within the storm drain in the southwest corner of the GWTP.	Complete
TerraTherm received materials to address the truck well within the Valley Manufacturing building. The truck well was filled with clean, crushed, recycled concrete. A sump pump and gravel filter will be installed upgradient to remove water flowing into this area from Washington Street. Temporary hose will bring the water to the GWTP for treatment. The sump pump will be hard piped during the ISTT above ground construction.	On-going, will be completed the week of 3/22.
Subcontractors Onsite: TerraTherm, McMillan McGee, Boart Longyear, Parker Fence, and Atherton Excavation	
Planned Activities for Week of 3/22/2010:	
• Continue well field installations and baseline soil sampling at select locations. • Finish construction within truck well to facilitate the installation of E-52, E-57, and TPV-10. • Host the Project Status meeting on Thursday, 3/25	
Laboratory Data Received:	
Soil: VOC data were received for samples collected from electrode locations E-3, E-11, E-21, and E-34, situated along the perimeter of treatment areas A and D. Nobis performed an initial review of the data. VOC concentrations were below the Site cleanup criteria in all samples.	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
2. Plan for "decommissioning" of existing groundwater extraction wells within the source area (EW-S1, EW-S2, and EW-S3), but keeping EW-S1 running until start of ISTT system using above-ground electrical connections.	FS
3. Integration of programming controls and logic with the GWTP. Nobis is currently procuring a programming subcontractor to assist with this task. A controls meeting is planned for mid-April.	FS/DB
4. Installation of high-speed internet service to the Site.	Nobis/TerraTherm
Next Project Status Meeting: March 25, 2010 at 1 pm at the GWTP	
Next Project Status Conference Call: April 1, 2010 at 1 pm	

Applicable Site Photographs:

Date: 3/15/2010	**Location:** Slope to the East of Valley Manufacturing Building, Looking South

Description: General Site conditions encountered following the 3/12 to 3/15 storm event.

Date: 3/15/2010	**Location:** Drainage Swale, Looking Northeast from Valley Property

Description: Sediment loading to the E&S controls installed along the drainage swale.

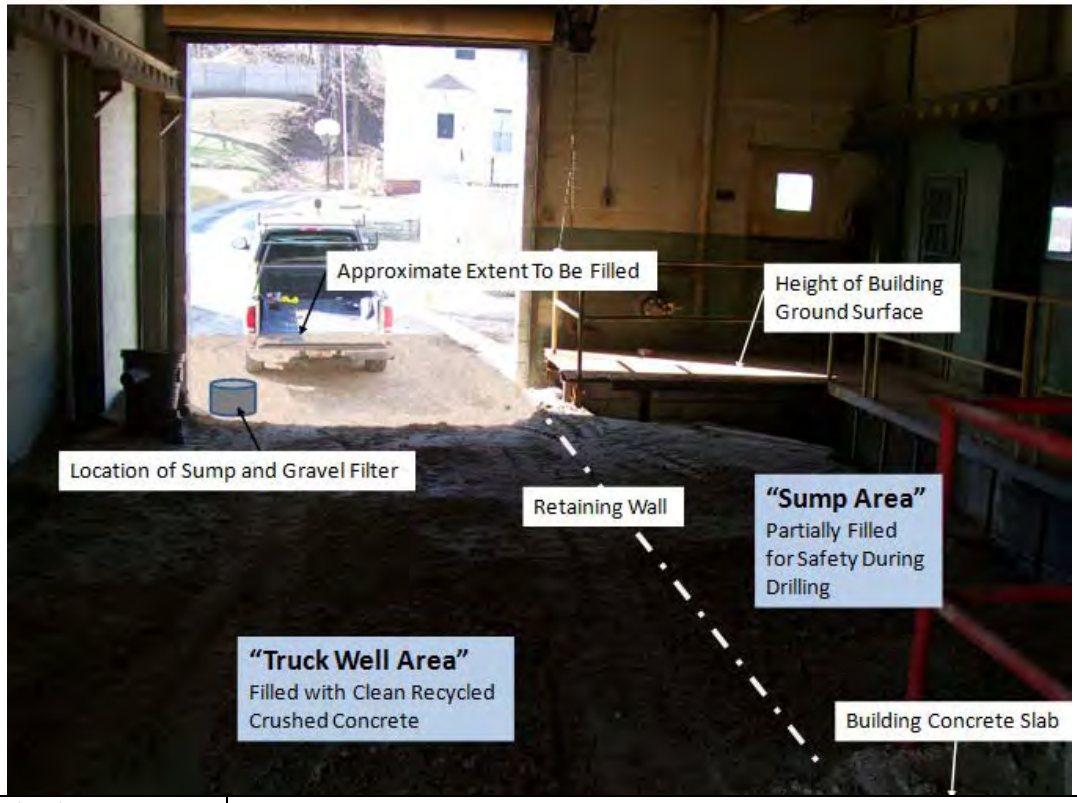
Applicable Site Photographs:

Date: 3/15/2010	**Location:** 106 Center Street, Looking West

Description: Damage to temporary construction fence and wooden stockade façade following the 3/12 to 3/15 storm event. Parker Fence repaired fence on 3/16/2010.

Date: 3/19/2010	**Location:** Drainage Swale, Looking South

Description: E&S controls were maintained following the 3/12 to 3/15 storm event.



Date: 3/19/2010	**Location:** Truck Well within Valley Manufacturing Building, Looking West

Description: Truck well under construction in preparation of electrode and sensor well installations within this area.

Groveland Wells Numbers 1 and 2 Superfund Site
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ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 3/30/2010

Activities Performed Week of 3/22/2010:	**Status**
Well field installations continued. TerraTherm and lower-tiered subcontractor, Boart Longyear, began installing extraction wells. The electrodes and extraction wells installed last week include the following: • *Exterior*: E-10, E-17, E-18, E-28, E-30, E-40, and E-51; and • *Interior*: E-48, E-49, T-04, T-13, T-14, T-16, TPV-04, X-29, X-10, X-11, X-12, X-13, and X-14 A total of 41 electrode locations, 5 sensor wells, and 8 extraction wells have been completed to date.	On-going, this activity is expected to last approximately 2 more weeks.
Nobis collected soil samples for laboratory analysis from select electrode locations within Treatment Area A (E-10 and E-18), C (E-40, E-48, and E-49), and D (T-16, a replacement for E-64).	Complete
TerraTherm finished the truck well within the Valley Manufacturing building. The truck well was filled with clean, crushed, recycled concrete. A sump pump and gravel filter was installed upgradient to remove water flowing into this area from Washington Street. Temporary hose conveys the water to the GWTP for treatment. The sump pump will be hard piped during the ISTT above ground construction.	Complete
Nobis received the third roll-off bin for soil wastes. One full roll-off bin was sampled for waste profiling purposes. Nobis will coordinate the disposal with the EPA.	On-going
Nobis performed a stormwater inspection of Site following the 3/23 storm event. Observations included the following: • The erosion and sediment (E&S) controls installed along the drainage swale and around the southern perimeter of the Site appeared to be in good working condition; and • Sediment accumulated to a height of approximately 4 inches along a section of the E&S controls along the drainage swale; • No pooling or ponding of water was observed at 106 Center Street; • No significant ponding of water was observed at the Site; • The temporary construction fence along 108 and 110 Center Street was damaged; and • The silt screen within the storm drain in the southwest corner of the GWTP was full of sediment and debris.	Complete
TerraTherm modified the wellfield to exclude electrode E-45. A maple tree (requested by 106 Center Street to remain) would need to be removed in order to install the electrode.	Complete

Subcontractors Onsite: TerraTherm, McMillan McGee, Boart Longyear, United Industrial Services	
Planned Activities for Week of 3/29/2010:	
• Continue well field installations and baseline soil sampling at select locations. • Mobilize third Boart Longyear mini-sonic rig.	
Laboratory Data Received:	
Soil: VOC data were received for samples collected from electrode locations E-23, E- 35, E-62, E-63, and T-16. These boreholes are located along the perimeters of Treatment Areas B and D. Nobis performed an initial review of the data. VOC concentrations were below the Site cleanup criteria in all samples with the exception of T-16 at a depth of 9 to 10 feet below ground surface (draft data showed a concentration of 130 ppm).	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
2. Plan for "decommissioning" of existing groundwater extraction wells within the source area (EW-S1, EW-S2, and EW-S3), but keeping EW-S1 running until start of ISTT system using above-ground electrical connections.	FS
3. Integration of programming controls and logic with the GWTP. Nobis is currently procuring a programming subcontractor to assist with this task. A controls meeting is planned for mid-April.	FS/DB
4. Installation of high-speed internet service to the Site.	Nobis
5. Electrical Permit with the Groveland Municipal Electric Department	TerraTherm
Next Project Status Conference Call: April 1, 2010 at 1 pm	
Next Project Status Meeting: April 8, 2010 at 1 pm at the GWTP	

Applicable Site Photographs:

Date: 3/25/2010	**Location:** Truck Well, Looking East

Description: Completed truck well with sump.

Date: 3/22/2010	**Location:** Sensor Well Location, T-16

Description: Color change in soil observed at 8 to 9 feet below the ground surface at borehole T-16. In addition to the color change, root structures were observed in the dark brown soil.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

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ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 4/6/2010

Activities Performed Week of 3/29/2010:	**Status**
TerraTherm's lower tiered subcontractor, Boart Longyear, mobilized a third mini-sonic rig and crew to assist with the last phase of drilling.	Complete
Well field installations continued. The electrodes, sensor probes, and extraction wells installed last week include the following: • *Rig #1 (previously 'Exterior Rig')*: E-47, E-44, E-54, E-55, E-56, E-58, E-59, E-60, E-61, TPV-09, TPV-11, TPV-12, and X-23; • *Rig #2 (previously 'Interior Rig')*: E-52, E-57, T-06, TPV-10, X-20, and X-24; and • *Rig #3*: E-02 and E-29. A total of 54 electrode locations, 10 sensor wells, and 11 extraction wells have been completed to date.	On-going, this activity is expected to last approximately 2 more weeks.
Nobis collected soil samples for laboratory analysis from select electrode locations within Treatment Area A (E-02) and C (E-47, E-54, E-56, E-57, E-60, and E-61).	Complete
Boart Longyear Rig #2 grouted all interior electrode, sensor, and extraction well locations.	Complete
Power to Groundwater Extraction Wells EW-S1, EW-S2, and EW-S3 was temporarily shut off during hand augering and drilling operations at E-02. This work was coordinated with the GWTP Operator, Bob Ricard.	Complete
Parker Fence performed repairs to the temporary construction fence and Washington Street gates. Repairs to the temporary construction fence consisted of bracing (similar to fencing at 106 Center Street) and additional support (gravel and sand) installed at the wood posts.	Complete
Nobis maintained erosion and sediment controls installed along the drainage swale. Maintenance included the removal of accumulated sediments.	Complete
Nobis performed a stormwater inspection of Site following the 3/30 storm event. Observations included the following: • The erosion and sediment (E&S) controls installed along the drainage swale and around the southern perimeter of the Site appeared to be in good working condition; and • Accumulated sediment was observed at the E&S controls along the drainage swale; and • No pooling or ponding of water was observed at 106 Center Street; • Some ponding of water was observed at the Site and at 108 Center Street (receded within 24 hours).	Complete

The Nobis CHSO performed a Site Safety Inspection. Observations included the following: • Drilling operations were clean and orderly; • Digsafe ticket numbers should be obtained from subcontractors; • Drums and roll-off bins should be labeled when in use.	Complete
TerraTherm filled the oil/water separator with flowable fill.	Complete
Subcontractors Onsite: TerraTherm, McMillan McGee, Boart Longyear, Parker Fence	
Planned Activities for Week of 4/5/2010:	
• Continue well field installations and baseline soil sampling at select locations. • Site grading in preparation of vapor cap installation. • Begin extraction well development.	
Laboratory Data Received:	
Soil: VOC data were received for samples collected from electrode locations E-47 and E- 54. These boreholes are located along the southern perimeter of Treatment Area C, on the 106 Center Street Property. Nobis performed an initial review of the data. VOC concentrations were below the Site cleanup criteria in all samples.	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
2. Plan for "decommissioning" of existing groundwater extraction wells within the source area (EW-S1, EW-S2, and EW-S3), but keeping EW-S1 running until start of ISTT system using above-ground electrical connections.	FS
3. Integration of programming controls and logic with the GWTP. Nobis has procured a programming subcontractor to assist with this task. A controls meeting is planned for mid-April.	FS/DB
4. Installation of high-speed internet service to the Site.	Nobis
5. Electrical Permit with the Groveland Municipal Electric Department	TerraTherm
Next Project Status Meeting: April 8, 2010 at **12:30 pm** at the GWTP	
Next Project Status Conference Call: April 15, 2010 at 12:30 pm	

Applicable Site Photographs:

Date: 3/29/2010	**Location:** 106 Center Street, Looking Southeast

Description: Drilling at electrode location, E-47, located at the southern perimeter of Treatment Area C at the 106 Center Street property.

Date: 3/30/2010	**Location:** Drainage Swale, Looking Northeast

Description: Run-off and sediment loading to the erosion and sediment controls installed around drainage swale.

Date: 4/2/2010	**Location:** GWTP Southern Parking Lot, Looking South
Description: Flowable fill being delivered and installed at the oil/water separator in preparation of ISTT treatment.	

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 4/12/2010

Activities Performed Week of 4/5/2010:	**Status**
Well field installations continued. The electrodes, sensor probes, and extraction wells installed last week include the following: • *Rig #1 (previously 'Exterior Rig')*: E-01, E-50, E-53, E-43, T-01, T-11, TPV-05, TPV-08, ; • *Rig #2 (previously 'Interior Rig')*: T-08, T-10, T-15, TPV-07, X-16, X-19, X-22, X-25, X-26, X-27; and • *Rig #3*: T-02, T-12, TPV-01, and X-03. A total of 55 electrode locations, 21 sensor wells, and 18 extraction wells have been completed to date.	On-going, this activity is expected to last approximately 2 more weeks.
Nobis collected soil samples for laboratory analysis from select electrode locations within Treatment Area A (E-01) and B (E-53).	Complete
Nobis maintained erosion and sediment controls installed along the drainage swale in the vicinity of electrode location, E-01. Maintenance included the removal of accumulated sediments. Erosion and sediment controls were temporarily removed in this area in order to accommodate drilling activities on 4/6/10 at E-01. Controls were reinstalled on 4/7/2010.	Complete
A fourth roll-off bin for soil is received. The second roll-off bin, full of drill cuttings, is transferred to on Site temporary storage area, north of the Valley Manufacturing building. Nobis will coordinate the disposal with the EPA.	On-going
Comcast Cable's Installation contractor (Comcast) was onsite installing cable to the Site. Cable was pulled from neighboring power poles to the existing on Site power poles. Comcast was escorted by the Groveland Police Department, who conducted traffic control both off- and on-Site. Comcast will be sending a technician to install cable internet at the Site at a later date (early May).	On-going
A construction status meeting was held at the Site which included a Site tour. Nobis, TerraTherm, EPA, and MassDEP were in attendance.	Complete
EPA conducted a tour of the GWTP for neighboring residents (110 Center Street).	Complete
Boart Longyear demobilized Rig #2 and Rig #3 from the Site on Friday, 4/9/2010. Rig #2 was scheduled to leave the Site as planned. Rig #3 will be replaced by a new Rig and crew on Monday, 4/12/2010.	Complete
Subcontractors Onsite: TerraTherm, McMillan McGee, Boart Longyear, United Oil Services, Comcast Cable Installation Contractor, Groveland Police Department	

Planned Activities for Week of 4/12/2010:	
• Mobilize a replacement Boart Longyear mini-sonic rig for Rig #3. • Continue well field installations and baseline soil sampling at select locations. • Begin extraction well development. • Decommission existing groundwater extraction wells EW-S2 and EW-S3. Temporarily connect power to EW-S1, using an above-ground electrical connection. • TerraTherm and Nobis personnel and subcontractors to meet to discuss the integration of programmable controls and logic with GWTP.	
Laboratory Data Received:	
Soil: no data received this week	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
2. Installation of high-speed internet service to the Site.	Nobis
3. Electrical Permit with the Groveland Municipal Electric Department	TerraTherm
Next Project Status Conference Call: April 15, 2010 at 12:30 pm	
Next Project Status Meeting: April 22, 2010 at 12:30 pm at the GWTP	

Applicable Site Photographs:

Date: 4/6/2010	**Location:** Drainage Swale, Looking Southwest

Description: Drilling at electrode location, E-01, located within the drainage swale.

Date: 4/7/2010	**Location:** "Porch Area", Looking East

Description: Rig #1 (foreground) and Rig #3 (background) set up at different electrode locations within the "Porch Area" located south of the Valley Manufacturing building.

Date: 4/8/2010	**Location:** GWTP Southern Parking Lot, Looking North

Description: Comcast Cable Installation contractor installing cable to the Site power poles.

Date: 4/8/2010	**Location:** "Porch Area", Looking North

Description: Site Visitors viewing electrode installation at E-43.

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ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 4/19/2010

Activities Performed Week of 4/12/2010:	**Status**
Well field installations continued. The electrodes, sensor probes, and extraction wells installed last week (4/12/2010 to 4/16/2010) include the following: • *Rig #1 (previously called 'Exterior Rig')*: E-07, E-14, E-27, E-39, E-46, T-03, T-05, T-07, and TPV-03; and • *Rig #4 (replacement for Rig #3)*: TPV-06, X-01, X-05, X-06, X-09, X-17, X-18, X-21, and X-22. A total of 60 electrodes, 28 sensor wells, and 26 extraction wells have been completed to date. All of the electrodes and sensor well installations have been completed.	On-going, this activity will be complete during the week of 4/19/2010.
Nobis collected soil samples for laboratory analysis from select electrode locations within Treatment Area A (E-27 and E-46).	Complete
Nobis subcontractors, Electrical Installation, Inc. (EII) and Atherton Excavation, decommissioned source area groundwater extraction wells EW-S1, EW-S2, and EW-S3. Power and data communication lines and associated conduits were removed in preparation of ISTT operations. A temporary above ground power connection will be installed to continue operation of groundwater extraction well EW-S1 until ISTT start-up (July 2010). This temporary connection will be installed during the week of 4/19/2010.	On-going, this activity will be complete during the week of 4/19/2010.
A programmable logic and controls meeting was conducted on 4/14/2010 with applicable staff from Nobis, Nobis Subcontractor, EII, and TerraTherm. The focus of the meeting was integration of TerraTherm's remediation process equipment with the GWTP. The following expectations were also discussed: goals, data needs, and the construction schedule.	Complete
Following payment from the USEPA on 4/13/2010, Nobis hand delivered the $100,000 security deposit for electric service to the Groveland Light Department (the municipal electricity provider).	Complete
Following approval from USEPA's RCRA coordinator, Nobis coordinated the off-Site transportation and disposal of two roll-off bins with United Industrial Services. The roll-off bins contained soil and drill cuttings generated as part of the ISTT subsurface installations during March and April 2010. Two additional roll-off bins are currently in use at the Site. Nobis will coordinate their disposal when appropriate.	On-going
Subcontractors Onsite: TerraTherm, McMillan McGee, Boart Longyear, Electrical Installation, Inc., Atherton Excavation, and United Industrial Services	

Planned Activities for Week of 4/19/2010:

- Continue remaining well field installations (Treatment Area A extraction wells).
- Demobilize TerraTherm's drilling subcontractor, Boart Longyear.
- Install a temporary above ground power connection at groundwater extraction well EW-S1.
- Install high-speed internet service to the Site.
- Begin well development of Treatment Area A's multi-phase extraction wells.
- Perform limited site grading activities in preparation of vapor cover installation.
- Install vapor cover.

Laboratory Data Received:

Soil: VOC data were received for samples collected from electrode locations E-01, E-02, E-40, E-43, E-44, E-48, E-49, E-53, E-60, and E-61. These boreholes are located: (i) along the perimeters of Treatment Areas A (E-01 and E-02) and C (E-40, E-48, E-60, and E-61); and (ii) within Treatment Areas A (E-43, E-44, and E-49) and B (E-53). Nobis performed an initial review of the data. VOC concentrations were below the Site cleanup criteria in soil samples collected along the perimeters, with the exception of E-02 (PCE detected at a concentration of 72 ppb) and E-61 (TCE and 1,1-DCE detected at concentrations of 2,900 and 2,600 ppb, respectively) at depths of 10 to 11 and 5 to 6 feet below ground surface, respectively. In addition, TCE was detected at concentrations above the Site cleanup criteria in samples collected from the boreholes located within Treatment Areas A and B, E-43, E-44, E-49, and E-53. PCE and cis-1,2-DCE were detected at concentrations above the cleanup criteria at samples collected from E-43.

Liquid: None

Vapor: None

Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
2. Electrical Permit with the Groveland Light Department (the municipal electricity provider)	TerraTherm

Next Project Status Meeting: April 22, 2010 at 12:30 pm at the GWTP

Next Project Status Conference Call: April 29, 2010 at 12:30 pm

Applicable Site Photographs:

Date: 4/13/2010	**Location:** EW-S3, Looking North

Description: Power and data communication lines and associated conduits at the source area groundwater extraction wells were removed in preparation of ISTT operation.

Date: 4/15/2010	**Location:** Treatment Areas A and B, Looking East

Description: Electrodes, sensor wells, extraction wells, and monitoring wells (as indicated by traffic cones and stick ups) installed within Treatment Areas A and B. Rig #4 is drilling at extraction well, X-17.

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EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 4/26/2010

Activities Performed Week of 4/19/2010:	**Status**
Well field installations finished on 4/20/2010. The extraction wells installed last week (4/19/2010 and 4/20/2010) included the following: • *Rig #4 (replacement for Rig #3)*: X-04, X-08, and X-15. A total of 60 electrodes, 28 sensor wells, and 29 extraction wells have been completed to date.	Complete
Boart Longyear grouted all exterior electrode, sensor well, and extraction well locations. Interior well field locations were previously grouted.	Complete
Boart Longyear demobilized Rig #1 and Rig #2 equipment and crew, following the completion of the well field installation task.	Complete
Nobis packaged 10 fluorescent light bulbs for disposal by CRS Recycle. These light bulbs were removed during well field installations within the Valley building. Several fluorescent light bulbs were previously shipped off Site as part of Site preparation work within the Valley building.	Ongoing, this task will be complete when CRS picks up the package.
Electrical Installation, Inc. installed a temporary above ground power supply line to continue operation of groundwater extraction well EW-S1 until ISTT start-up (July 2010). EW-S1 was restarted on 4/20/2010. No issues were observed by the GWTP operator during the restart. The pump flow rate was observed to be approximately 5 gpm – the pump will be manually adjusted as needed to increase or decrease flow rate.	Complete
TerraTherm performed site grading activities, which included the following: • Reshaping of the slope east of the Valley building; • Importing and grading fill materials to the low spots east and south of Treatment Area A; and • General contouring of treatment area to promote drainage and prevent ponding.	Complete
Comcast Cable installed high speed internet to the GWTP and TerraTherm's Site trailer.	Complete
TerraTherm's concrete contractor, Accelerated Concrete began the installation of the vapor cover on 4/23/2010. Extraction well EW-S1 was temporarily shut off due to concrete pouring in the vicinity of the well. Accelerated Concrete encountered mechanical issues with their concrete pump and could not finish the vapor cover on 4/23/2010. Accelerated Concrete will install remaining portions of concrete vapor cover on 4/26/2010.	Ongoing, this task will be complete the week of 4/26/2010.
Subcontractors Onsite: TerraTherm, McMillan McGee, Boart Longyear, Electrical Installations, Inc., Comcast Cable, Accelerated Concrete	

Planned Activities for Week of 4/26/2010:	
• Complete installation of vapor cover • Begin well development of multi-phase extraction wells in Treatment Area A. • Install vapor extraction well heads. • Off-Site transport and disposal of remaining bulk-soil roll-off bins.	
Laboratory Data Received:	
Soil: VOC data were received for soil samples collected from electrode locations E-27 at depths of 4 to 5, 15 to 16, and 25 to 26 feet below ground surface (ft bgs) and E-46 at depths of 16 to 17 and 29 to 30 ft bgs. These two electrodes are located within Treatment Area A. Nobis performed an initial review of the data. TCE was detected at concentrations above the Site cleanup criteria (77 ppb) in the soil samples, with the exception of the sample collected from 15 to 16 ft bgs at E-46. TCE concentrations ranged from 160 ppb (at E-27 from 29 to 30 ft bgs) to 2,800 ppb (at E-46 from 4 to 5 ft bgs). In addition, PCE was detected at concentrations above the Site cleanup criteria (56 ppb) in samples collected from E-46 at 4 to 5 ft bgs (300 ppb) and 25 to 26 ft bgs (80 ppb).	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
2. Electrical Permit with the Groveland Light Department (the municipal electricity provider)	TerraTherm
Next Project Status Conference Call: April 29, 2010 at 12:30 pm	
Next Project Status Meeting: May 6, 2010 at 12:30 pm at the GWTP	

Applicable Site Photographs:

Date: 4/23/2010	**Location:** Treatment Area A, Looking Southwest

Description: Accelerated Concrete workers used hoses, in combination with the concrete pump, for the installation of the vapor cover.

Date: 4/23/2010	**Location:** Treatment Area A, Looking Northeast

Description: When mechanical issues were encountered with the concrete pump, workers used concrete troughs to deliver concrete while workers manually spread the vapor cover material.

Date: 4/23/2010	**Location:** Treatment Area A, Looking Southwest

Description: Installation of the concrete vapor cover in the vicinity of the source area extraction wells, EW-S1, EW-S2, and EW-S3, and associated control panel.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 5/3/2010

Activities Performed Week of 4/26/2010:	**Status**
TerraTherm's concrete contractor, Accurate Concrete finished the installation of the vapor cover on 4/26/2010 (installation began on 4/23/2010). Extraction well EW-S1 was restarted on 4/26/2010.	Complete
Nobis Coordinated the off-Site transportation and disposal of one roll-off bin with United Industrial Services. The roll-off bin contained soil and drill cuttings generated as part of the ISTT subsurface installations during April 2010. One additional roll-off bin, used for settling and containment of sediment generated during drilling, remains on Site. After the sediment failed a Paint Filter Test (required for transport), TerraTherm began efforts to remove additional liquid and add absorbents to "solidify" the sludge-like sediment material. Nobis will coordinate disposal when the roll-off bin is ready (estimated by 5/7).	Ongoing, this activity will be complete the week of 5/3.
TerraTherm finished the construction of the vapor extraction wellheads.	Complete
TerraTherm continued construction of multi-phase extraction wellheads.	Ongoing, this activity will be complete the week of 5/3.
Nobis performed maintenance of the sediment control installed in the storm drain located in the southwest corner of the GWTP parking lot.	Complete
TerraTherm graded and installed the transformer pad that will be used to house the ISTT power transformer.	Complete
TerraTherm developed multi-phase extraction wells. Development water was treated at the GWTP.	Complete
Comcast Cable finished the installation of high speed internet service to TerraTherm's Site trailer.	Complete
Subcontractors Onsite: TerraTherm, Accurate Concrete, United Industrial Services, Comcast Cable	
Planned Activities for Week of 4/26/2€010:	
• **Complete multi-phase extraction well heads.** • **Off-Site transport and disposal of remaining bulk-soil roll-off bins.**	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
Next Project Status Meeting: May 6, 2010 at 12:30 pm at the GWTP	
Next Project Status Conference Call: May 13, 2010 at 12:30 pm	

Applicable Site Photographs:

Date: 4/26/2010	**Location:** Southern Perimeter of Treatment Area C

Description: The concrete vapor cover surrounds a tree left in place at the request of residents at 106 Center Street.

Date: 4/26/2010	**Location:** Treatment Area A, Looking East

Description: Multi-phase extraction well development activities in Treatment Area A. Vapor extraction wellheads are also present.

Date: 4/29/2010	**Location:** GWTP

Description: Paint Filter Test apparatus used to determine if "sludge-like" sediment materials are ready for off-Site transport.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 5/10/2010

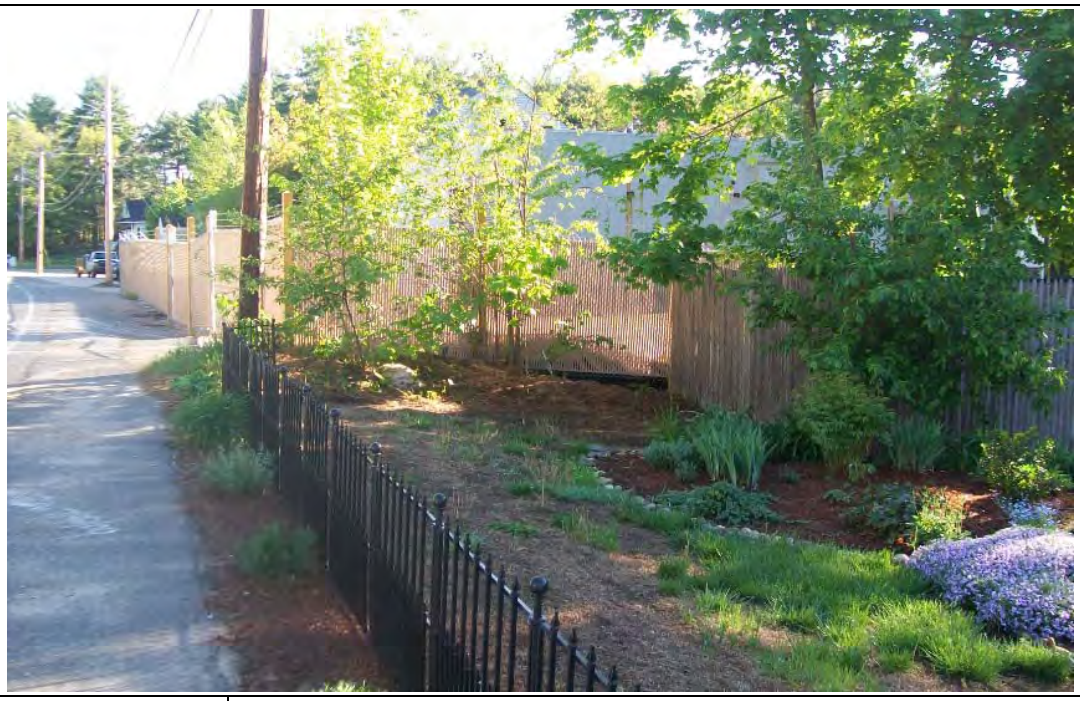
Activities Performed Week of 5/3/2010:	**Status**
TerraTherm continued construction of multi-phase extraction wellheads.	Ongoing
TerraTherm received construction materials and equipment for the mechanical well field assembly (water and air lines and manifolds).	Complete
TerraTherm mixed the contents of the sediment roll-off bin with 350 pounds of ZapZorb to "solidify" the sludge-like material. Nobis conducted several Paint Filter Tests to confirm the material was "fit for transport". Nobis coordinated the off-Site transportation and disposal of the sediment roll-off bin (generated as part of the ISTT subsurface installations during March and April 2010) with United Industrial Services.	Complete
TerraTherm demobilized multi-phase extraction well development activities and equipment decontamination area (previously used to decon drilling equipment during the ISTT subsurface installations). TerraTherm also demobilized the investigation derived waste storage area following the off-Site shipment of the last roll-off bin.	Complete
TerraTherm configured the Site cameras (inside and outside of the Valley building). TerraTherm to share the website links to view the video feeds, when available.	Complete
TerraTherm began construction on the carbon steel water lines (extracted groundwater conduit) and manifolds.	Ongoing
Nobis performed a stormwater inspection of the Site following the 5/3 storm event. Observations included the following: • The erosion and sediment controls installed along the drainage swale and around the southern perimeter of the Site appeared to be in good working condition; • No ponding or Site runoff was observed at the neighboring properties (106 and 108 Center Street); • Some ponding was observed in limited locations on the concrete vapor cover; and • The temporary construction fence along 106, 108, and 110 Center Street appeared to be in good working order. Water was observed to be pooling within the drainage swale due to the vapor cover installation in this area. TerraTherm and Nobis will continue to monitor the flow within the drainage swale. TerraTherm will remove the vapor cover within the drainage swale, if needed.	Complete
Nobis coordinated the off-Site transport and recycling of 10 fluorescent light bulbs (from the Valley building) with Complete Recycling Solutions.	Complete

Subcontractors Onsite: TerraTherm, United Industrial Services, Complete Recycling Solutions	
Planned Activities for Week of 5/10/2010:	
• Continue construction of the water lines and manifolds. • Install the groundwater extraction pumps at the multi-phase extraction wells. • Construct the compressed air lines (for pneumatic pumps at multi-phase extraction wells). • Construct the vapor extraction lines and manifolds.	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
2. TerraTherm will work with McMillan and McGee to provide an opinion and recommendation on the wrought iron decorative fence located within close proximity (~25 feet) to the ISTT area.	TerraTherm
Next Project Status Conference Call: May 13, 2010 at 12:30 pm	
Next Project Status Meeting: May 20, 2010 at 12:30 pm at the GWTP	

Applicable Site Photographs:

Date: 5/5/2010	**Location:** Investigation Derived Waste Storage Area

Description: 350 pounds of the absorbent, ZapZorb, was mixed with the "sludge-like" sediment material prior to off-Site shipment of the roll-off bin.



Date: 5/5/2010	**Location:** 106 Center Street, Looking North-Northeast

Description: A wrought iron decorative gate was recently installed at 106 Center Street. The gate is located within approximately 25 feet of the ISTT area.

Date: 5/6/2010	**Location:** Treatment Area A, Looking South
Description: Carbon steel conduit is used to construct the water (extracted water from the multi-phase extraction wells) lines and manifolds.	

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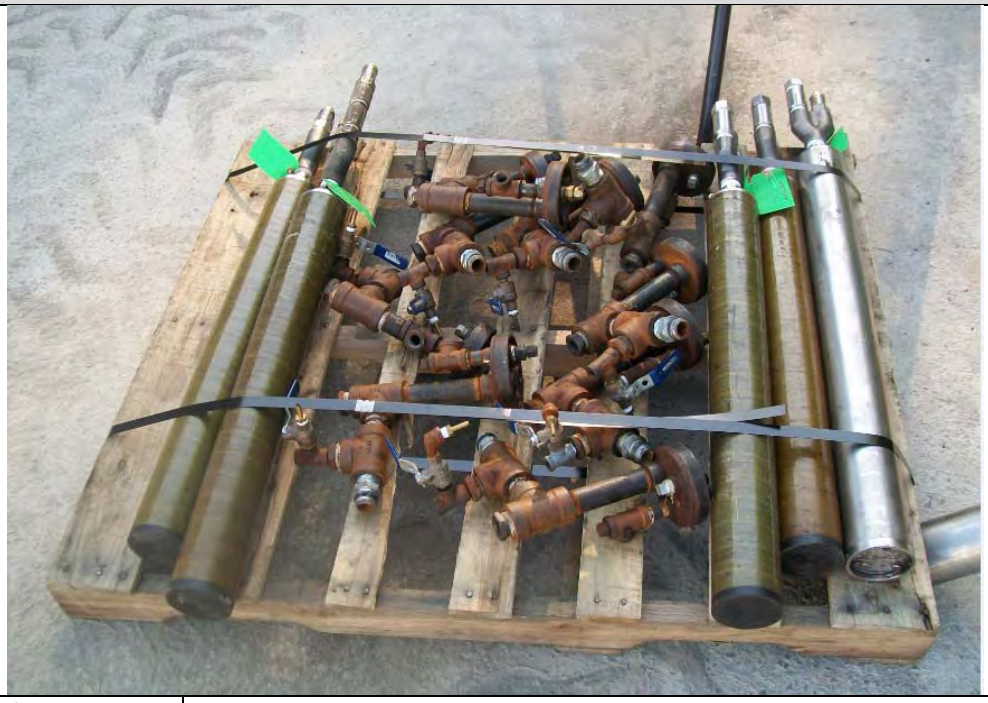
ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 5/17/2010

Activities Performed Week of 5/10/2010:	**Status**
TerraTherm continued construction of multi-phase extraction wellheads.	Ongoing
TerraTherm finished construction of the carbon steel water and air lines (extracted groundwater and compressed air conduit associated with the multi-phase extraction wells) and manifolds.	Complete
TerraTherm received construction materials for the installation of the groundwater extraction pumps for the multi-phase extraction wells.	Complete
TerraTherm assembled and field tested submersible compressed air driven pumps (QED AP-4) for installation in multi-phase extraction wells. TerraTherm began to install the downhole pumps at the multi-phase extraction wells.	Ongoing
TerraTherm began to construct the fiberglass vapor extraction conveyance and manifolds.	Ongoing
Subcontractors Onsite: TerraTherm	
Planned Activities for Week of 5/17/2010:	
• Continue to install the groundwater extraction pumps at the multi-phase extraction wells. • Continue to construct the vapor extraction lines and manifolds. • Construct connections to/from GWTP and city water. • Prepare Site for receipt of electrical and process equipment.	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
2. TerraTherm will work with McMillan and McGee to provide an opinion and recommendation on the wrought iron decorative fence located within close proximity (~25 feet) to the ISTT area. During the Project Status Conference Call conducted on May 13th, TerraTherm stated the wrought iron fence located at the 106 Center Street is not believed to be an issue due to its location, 25 feet outside of the ISTT area. This fence will be monitored as part of the start up and routine step and touch potential testing. This action item is COMPLETE.	TerraTherm/ COMPLETE
Next Project Status Meeting: May 20, 2010 at 12:30 pm – The Site visit portion of this meeting has been cancelled. This meeting will be held via teleconference.	
Next Project Status Conference Call: May 27, 2010 at 12:30 pm	

Applicable Site Photographs:



Date: 5/13/2010	**Location:** Equipment Staging Area

Description: Fiberglass and stainless steel submersible compressed air driven pumps (QED AP-4) are being installed in the multi-phase extraction wells.

Date: 5/14/2010	**Location:** Treatment Area A, Looking North

Description: Installation of the submersible pump at multi-phase extraction well, X-03. Carbon steel and Teflon tubing is for extracted groundwater and compressed air, respectively. The downhole conduit ties into the hard pipe carbon steel lines (extracted groundwater and compressed air) at the well head.

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Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

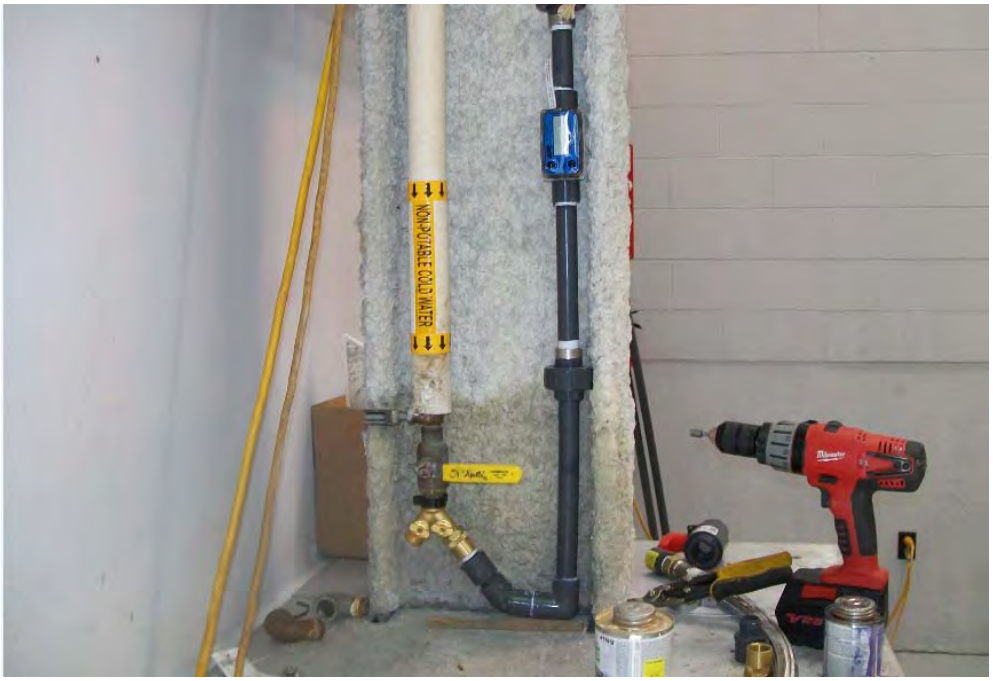
Prepared By: Lauren Soós	**Date Prepared:** 5/24/2010

Activities Performed Week of 5/17/2010:	**Status**
TerraTherm finished installing the submersible compressed air driven pumps (QED AP-4) in multi-phase extraction wells.	Complete
TerraTherm constructed the connection to City water for the backup water line.	Complete
Nobis and TerraTherm prepared the Site for the receipt of process equipment. Process equipment is due to arrive the week of 5/31.	Ongoing
TerraTherm continued construction of multi-phase extraction wellheads and the connections to the liquid/air lines.	Ongoing
TerraTherm received construction materials for the construction of the fiberglass vapor extraction well conveyance and manifolds. TerraTherm continued construction on these lines.	Ongoing
Nobis conducted a stormwater inspection following the storm event on 5/19/10. The following observations were noted: • Erosion & sediment (E&S) controls in working condition; • No significant loading to the E&S controls; • Standing water within the drainage swale; • No ponding at neighboring residences (106 and 108 Center Street); • Limited ponding at the Site; and • Fence and gate in working condition. As a result of flow conditions observed the drainage swale, TerraTherm removed a portion of the vapor cover which extended into this area.	Complete
Subcontractors Onsite: TerraTherm	
Planned Activities for Week of 5/17/2010:	
• Continue to prepare Site for process equipment. • Continue to construct the vapor extraction lines and manifolds. • Construct connections to/from GWTP. • Repair cracks in vapor cover.	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
Next Project Status Conference Call: May 27, 2010 at 12:30 pm	
Next Project Status Meeting: June 3, 2010 at 12:30 pm	

Applicable Site Photographs:

Date: 5/20/2010	**Location:** Drainage Swale

Description: Due to observed flow conditions during the 5/19 storm event, the concrete vapor cover within the drainage swale was removed.



Date: 5/20/2010	**Location:** Groundwater Treatment Plant, Connection to City Water

Description: TerraTherm will use this as a back-up water supply during the ISTT operation. The GWTP effluent will be the primary source of water for the ISTT operation.

Groveland Wells Numbers 1 and 2 Superfund Site
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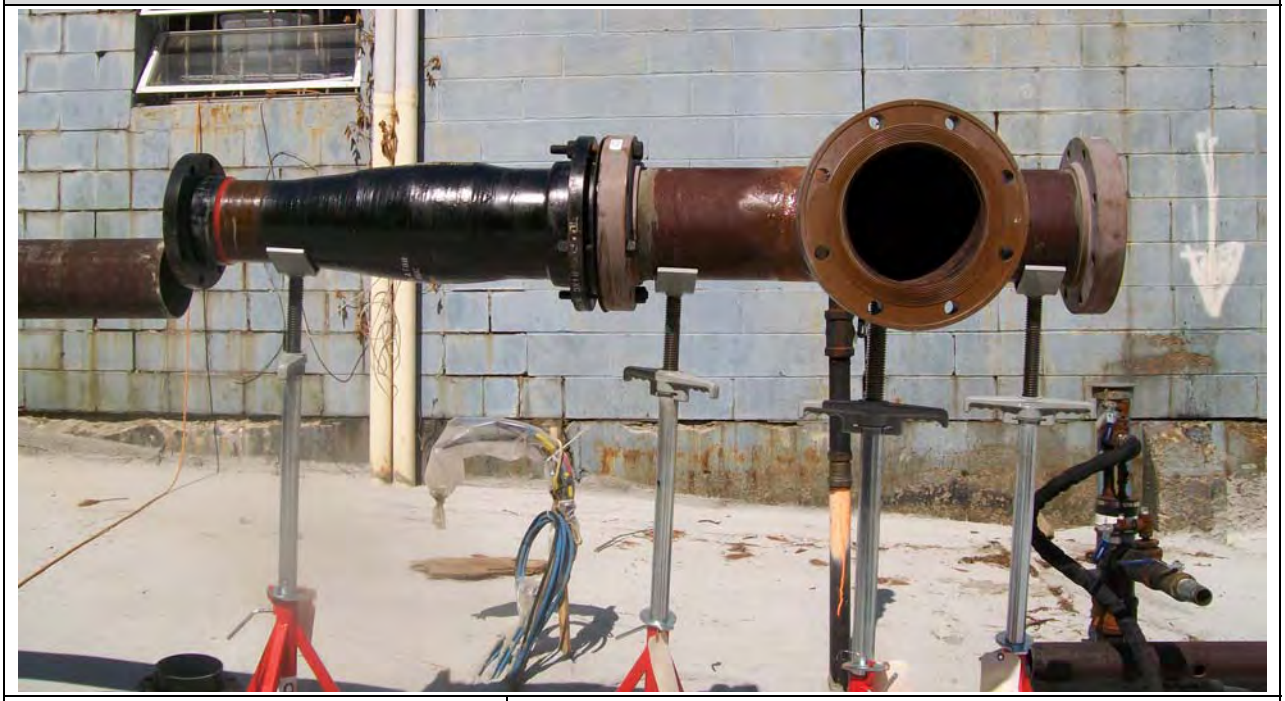
ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 6/1/2010

Activities Performed Week of 5/24/2010:	**Status**
TerraTherm finished connecting the multi-phase extraction wellheads to the associated liquid (extracted groundwater) and air (compressed air for pneumatic pump operation) lines.	Complete
At the request of Groveland Electric Light Department (GELD), TerraTherm installed underground conduit from the new power pole (previously installed by the GELD) to the transformer pad. The transformer will arrive the week of 5/31.	Complete
TerraTherm prepared the east exterior side of the GWTP for process equipment installation (carbon trailer). TerraTherm installed a layer of fill material (recycled crushed concrete) approximately 2-inches thick. TerraTherm will install a traffic plate (the week of 5/31), to protect the GWTP septic tank located just outside of the northeast corner of the GWTP.	Ongoing
TerraTherm continued construction of the vapor extraction conveyance and manifolds using the fiberglass reinforced pipe and associated valve components.	Ongoing
Eng Concrete repaired a portion of the Treatment Area A vapor cover that had begun to crack. Eng Concrete applied a layer of concrete approximately 1 to 2-inches thick to the compromised vapor cover. Eng Concrete will return, the week of 5/31, to finish the repairs by applying acrylic to the repaired portion of the concrete vapor cover (consistent with the original vapor cover construction).	Ongoing
Subcontractors Onsite: TerraTherm	
Planned Activities for Week of 5/31/2010:	
• Continue to prepare Site for process equipment. • Continue to construct the vapor extraction lines and manifolds. • Begin to receive process equipment.	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
Next Project Status Meeting: June 3, 2010 at 12:30 pm	
Next Project Status Conference Call: June 17, 2010 at 12:30 pm	

Applicable Site Photographs:



Date: 5/24/2010	**Location:** Wellfield

Description: Construction of the vapor extraction manifolds which consists of fiberglass conduit resting on elevated pipe racks.

Date: 5/25/2010	**Location:** Treatment Area A, Looking Southwest

Description: Repairs to the concrete vapor cover consisted of overlaying an additional layer (approximately 1 to 2 inches thick) on top of the original vapor cover.

Applicable Site Photographs, Continued:

Date: 5/27/2010	**Location:** East Exterior of GWTP, Looking South

Description: TerraTherm prepares the east exterior side of the GWTP for process equipment. Area was prepped by laying down approximately 2-inches of recycled crushed concrete fill material.

Groveland Wells Numbers 1 and 2 Superfund Site
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Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 6/8/2010

Activities Performed Week of 5/31/2010:	**Status**
TerraTherm received the 2,000 kVA transformer. At the request of the Groveland Light Department, the transformer will be tested in order to confirm its integrity. This testing is scheduled for the week of 6/7.	Ongoing
TerraTherm prepared the south exterior side of the GWTP for process equipment delivery (knock out pot and heat exchanger).	Ongoing
TerraTherm continued construction of the vapor extraction conveyance and manifolds using the fiberglass reinforced pipe and associated components.	Ongoing
TerraTherm continued connecting the multi-phase extraction wells to the associated liquid lines.	Ongoing
TerraTherm received delivery of various pieces of process equipment (heat exchangers, knock out pot skid, and frac tank) and associated components (CPVC and PVC parts). Additional process equipment will be delivered during the weeks of 6/7 and 6/14.	Ongoing
TerraTherm constructed the connection to the GWTP effluent tank (for use in the process equipment and electrodes).	Ongoing
Subcontractors Onsite: TerraTherm	
Planned Activities for Week of 6/7/2010:	
• Continue to receive process equipment. • Continue to construct the vapor extraction lines and manifolds. • Perform testing of transformer to confirm integrity.	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
2. Confirmation of 108 Center Street access agreement (verbal agreement). Access will be necessary for the step and touch potential testing that will be completed at the 106 and 108 Center Street properties (currently planned for early July and continuing throughout duration of treatment).	DG
Next Project Status Conference Calls: June 17 and 24, 2010 at 12:30 pm. The conference call for 6/10 has been cancelled due to the TerraTherm planned absence (6/9 to 6/11). The project team changed the next status meeting, planned for 6/17, to a conference call.	
Next Project Status Meeting: July 1, 2010 at 12:30 pm	

Applicable Site Photographs:

Date: 6/3/2010	**Location:** ISTT Process Equipment Area

Description: Knock out pot skid will receive extracted vapor once it is cooled using the upgradient heat exchangers (racks are in the background).

Date: 6/3/2010	**Location:** ISTT Process Equipment Area

Description: Transformer was placed on the transformer pad, located adjacent to the new power pole (previously installed by GLD). Power will be delivered to the Transformer from the power pole via an underground conduit.

Applicable Site Photographs, Continued:

Date: 6/3/2010	**Location:** Treatment Area A, Looking South

Description: Construction of the vapor extraction conveyance and manifolds is ongoing. Fiberglass reinforced pipe elevated on pipe racks will transport extracted vapor to the process equipment.

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Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 6/14/2010

Activities Performed Week of 6/7/2010:	**Status**
At the request of the Groveland Light Department, TerraTherm and its electrician, Electrical Engineering & Service Co., Inc., tested the 2,000 kVA transformer in order to confirm its integrity. No issues were noted during the testing of the transformer.	Ongoing
TerraTherm continued construction of the vapor extraction conveyance and manifolds using the fiberglass reinforced pipe and associated components.	Ongoing
TerraTherm received delivery of the blower skid units, a key component of the ISTT soil vapor extraction system. Additional process equipment will be delivered during the week 6/14.	Ongoing
Engineering Concrete finished repairing the Treatment Area A vapor cover (week of 5/24) by applying a layer of acrylic to the repaired portion of the vapor cover.	Complete
Nobis conducted a stormwater inspection following the storm event on 6/6/10. The following observations were noted: • Erosion & sediment (E&S) controls in working condition; • No significant loading to the E&S controls; • No ponding or standing water within the drainage swale; • No ponding at neighboring residences (106 and 108 Center Street); • Limited ponding at the Site; and • Fence and gate in working condition.	Complete
Subcontractors Onsite: TerraTherm, Electrical Engineering & Service Co., Inc., Engineering Concrete	
Planned Activities for Week of 6/14/2010:	
• Continue to receive process equipment. • Set up and make process equipment connections. • Continue to construct the vapor extraction lines and manifolds.	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory testing during the ISTT operation.	DG / DB
2. Confirmation of 108 Center Street access agreement. This access agreement is necessary for the step and touch potential testing that will be completed at the 106 and 108 Center Street properties (currently planned for early July).	DG
Next Project Status Conference Calls: June 17 and 24, 2010 at 12:30 pm. The project team changed the next status meeting, planned for 6/17, to a conference call.	
Next Project Status Meeting: July 1, 2010 at 12:30 pm	

Applicable Site Photographs:

Date: 6/7/2010	**Location:** ISTT Process Equipment Area

Description: Integrity testing of the 2,000 kVa transformer.

Date: 6/7/2010	**Location:** Interior of Valley Building, Looking Northeast

Description: Construction of the vapor extraction manifold within Treatment Areas A and D, located inside of the Valley Building.

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Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 6/21/2010

Activities Performed Week of 6/14/2010:	**Status**
McMillan & McGee (Chris Kyriazis) mobilized to the Site for the ET-DSP wellfield construction.	Complete
McMillan & McGee installed the electrode water injection and water return lines in the wellfield. Connections to the electrodes, the water delivery system, and the groundwater extraction line will be made during the week of 6/21.	Ongoing
McMillan & McGee installed the grounding cable that will be used to ground the multiphase and shallow soil vapor extraction wells. The connections to the extraction wells will be made during the week of 6/21	Ongoing
McMillan & McGee installed the data communication lines to the temperature and pressure/vacuum sensor wells. The connections to the sensor wells and the installation of DigiTAMs and DigiPAMs will be made during the week of 6/28.	Ongoing
TerraTherm finished the construction of the vapor extraction conveyance and manifolds using the fiberglass reinforced pipe and associated components.	Complete
TerraTherm installed the steel plate over the GWTP septic tank located along the east side of the GWTP building. The plate is used to evenly distribute weight across the tank to prevent damage when vehicles drive over it. The plate was installed in advance of the delivery of process equipment to the east side of the GWTP (chiller and carbon trailer).	Complete
TerraTherm received delivery of the second knock out pot for the ISTT vapor extraction system. Additional process equipment will be delivered during the week 6/21.	Ongoing
TerraTherm placed and installed the following process equipment: the blowers, a knock out pot, and two heat exchangers. TerraTherm installed header pipes and began to connect the process equipment.	Ongoing
TerraTherm began to install the kynar nipples at each of the extraction well heads. The nipples will be used to electrically isolate the wells from the ground. This was a necessary design change identified by McMillan & McGee.	Ongoing
Nobis conducted a stormwater inspection following the storm event on 6/16/10. The following observations were noted: • Erosion & sediment (E&S) controls in working condition; • No significant loading to the E&S controls; • No ponding or standing water within the drainage swale; • No ponding at neighboring residences (106 and 108 Center Street); • Limited ponding at the Site; and • Fence and gate in working condition.	Complete
Nobis coordinated with EPA OEME laboratory personnel to plan for the analysis of ambient air samples that will be collected during the ISTT operation. OEME will perform analysis of all air and process vapor samples – some using the mobile lab and some at the fixed-lab in Chelmsford, MA. Details regarding provision of Summa canisters and flow controllers still must be worked out – EPA will likely provide some canisters, but no flow controllers.	Complete
Subcontractors Onsite: TerraTherm, McMillan & McGee	

Planned Activities for Week of 6/21/2010:	
• Continue to receive process equipment. • Set up and make process equipment connections. • Continue to construct the ET-DSP wellfield.	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory and fixed laboratory testing during the ISTT operation.	DG / DB
2. 108 Center Street verbal access agreement for step and touch potential testing. *Access to the 108 Center Street property is needed during the checkout and start up testing that will begin on July 19th concluding on July 30th. In addition to the checkout and start up testing, access will be needed periodically during the ISTT operation during operational and/or weather conditions that may require additional testing - weekly planned access, as-needed additional access. DG will contact 108 Center St. resident and arrange for access for the period from mid-July through December 2010.*	DG
Next Project Status Conference Calls: June 24, 2010 at 12:30 pm	
Next Project Status Meeting: July 1, 2010 at 12:30 pm	

Applicable Site Photographs:

Date: 6/16/2010	**Location:** Treatment Area A, Looking West

Description: McMillan & McGee installed the electrode water injection and water return lines (red hose) in the ET-DSP wellfield.

Date: 6/16/2010	**Location:** ISTT Process Equipment Area, Looking East

Description: TerraTherm placed the heat exchangers (in the foreground), knock out pot (behind the heat exchangers), and the blowers (in the background, behind the tank).

Date: 6/16/2010	**Location:** ISTT Process Equipment Area

Description: Connections between the various pieces of process equipment are made using flanges sealed with high temperature-compatible, Teflon gaskets.

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EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 6/28/2010

Activities Performed Week of 6/21/2010:	**Status**
McMillan & McGee began to connect the water injection and water return hoses at the electrodes. These connections will be finished during the weeks of 7/5 and 7/12.	Ongoing
McMillan & McGee installed the power cables that will be used to supply power to the electrodes from the PDS units. The connections to the electrodes will be made during the weeks of 7/5 and 7/12.	Ongoing
McMillan & McGee finished installing the data communication lines to the temperature and pressure/vacuum sensor wells. The connections to the sensor wells and the installation of DigiTAMs and DigiPAMs will be made during the weeks of 7/5 and 7/12.	Ongoing
TerraTherm installed header pipes and connections to the following ISTT Process Equipment: Heat Exchangers, Knock Out Pot, and Blowers.	Complete
TerraTherm received delivery of an additional heat exchanger and cooling tower for the ISTT vapor extraction system. TerraTherm set up the heat exchanger and cooling tower. TerraTherm will begin to make the connections during the week of 6/28.	Complete
TerraTherm installed the Kynar nipples at some of the extraction well heads. The nipples will be used to electrically isolate the wells from the ground. This was a necessary design change identified by McMillan & McGee.	Ongoing
Subcontractors Onsite: TerraTherm, McMillan & McGee	
Planned Activities for Week of 6/28/2010:	
• Continue to receive process equipment. • Set up and make process equipment connections.	
Laboratory Data Received:	
Soil: None	
Liquid: None	
Vapor: None	
Action Items:	**Lead Person(s)/Status**
1. Coordination with EPA's OEME Laboratory for mobile laboratory and fixed laboratory testing during the ISTT operation.	DG / DB
2. 108 Center Street verbal access agreement for step and touch potential testing. *Introductions will be made between the resident engineer and the neighboring residents at 106 and 108 Center Street. In July, the initial testing will be documented (using an email memorandum and photographs). All future testing will be documented in email communication to the resident (with copy to DG).*	DG/LS
Next Project Status Meeting: July 1, 2010 at 12:30 pm	
Next Project Status Conference Calls: July 8, 2010 at 12:30 pm	

Applicable Site Photographs:

Date: 6/24/2010	**Location:** ISTT Process Equipment Area

Description: TerraTherm constructed the header pipes to the Heat Exchangers. Influent flow is divided into the two heat exchangers at the T, located at the valve (in the bottom right side of the photo).

Date: 6/24/2010	**Location:** Treatment Area A, Looking South

Description: McMillan & McGee constructed the above ground ET-DSP lines which consisted of red, green, gray, and black hoses/cables (injection, grounding, power, and communication, respectively).

Date: 6/24/2010	**Location:** Treatment Area A

Description: Kynar nipples were installed in order to electrically isolate the extraction wells from the ground.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

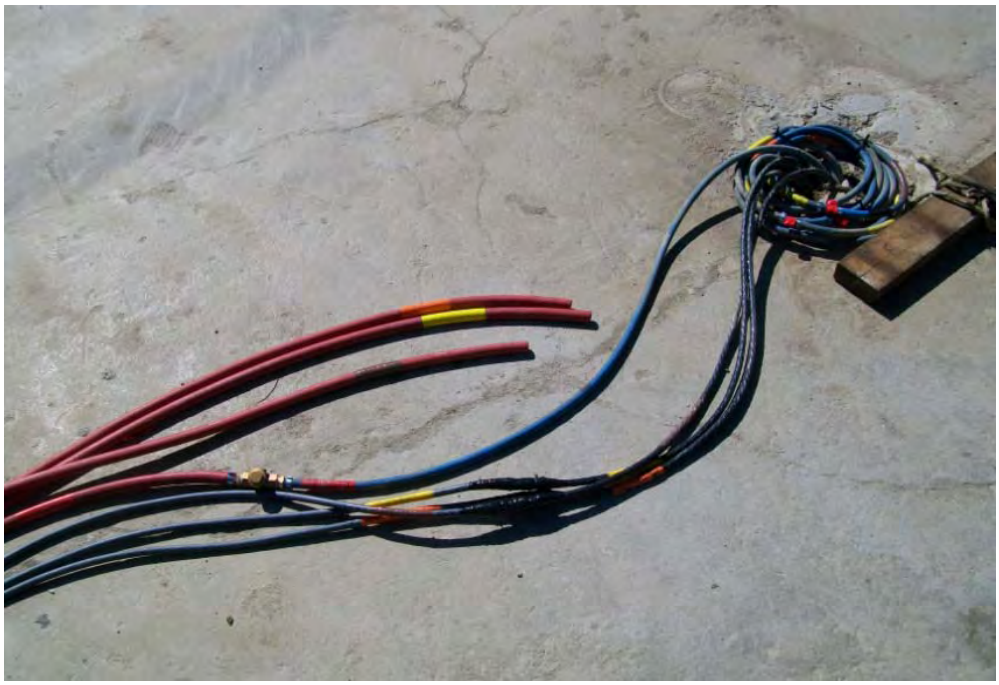
Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 7/6/2010

Activities Performed Week of 6/28/2010:	**Status**
McMillan & McGee continued to make power and water connections to the electrodes.	Ongoing
McMillan & McGee installed the grounding cable connections to the extraction wells.	Complete
McMillan & McGee and TerraTherm received and placed three PDS units and one WCU. The placement of the PDS units involved the construction of wooden foundations for the PDS units to rest on.	Complete
TerraTherm continued to work on the ISTT vapor extraction and treatment system. TerraTherm constructed wooden pipe stands to support the suspended pipes and process equipment connections. TerraTherm placed the duct heater and began to pipe the connections between the duct heater and knock out pot.	Ongoing
TerraTherm finished the installation of the Kynar nipples and reconstruction of the extraction well heads. The nipples will be used to electrically isolate the two grounding systems that will be used at the Site. One system will ground the extraction wells, and the other will ground the ISTT treatment system. This was a necessary design change to the extraction wells identified by McMillan & McGee.	Complete
TerraTherm constructed the secondary containment area for the ISTT liquid treatment system.	Complete
TerraTherm placed several pieces of the ISTT liquid treatment system including the bag filters, heat exchanger, oil and water separator, and frac tank. Piping on the liquid treatment system will begin the week of 7/6/2010.	Ongoing
Nobis' electrical controls subcontractor, Electrical Installations, Inc., installed additional programming logic within the GWTP controls in preparation of its integration with the ISTT system.	Complete
Subcontractors Onsite: TerraTherm, McMillan & McGee, Electrical Installations, Inc., Locke Crane	
Planned Activities for Week of 7/6/2010:	
• Install power to the Site (Groveland Electric Department). • Continue construction on the ISTT process equipment.	
Action Items:	**Lead Person(s)**
1. Coordination with EPA's OEME Laboratory for mobile laboratory and fixed laboratory testing during the ISTT operation. *With Phase I operations delayed until early August, DG has scheduled the mobile laboratory accordingly.*	DG / DB
2. Review of TerraTherm's ISTT system start-up checklists in preparation of the ISTT system start-up/check out testing scheduled to begin the week of 7/19.	LS / DB
Next Project Status Conference Call: July 8, 2010 at 12:30 pm	
Next Project Status Meeting: July 15, 2010 at 12:30 pm	

Applicable Site Photographs:



Date: 7/1/2010	**Location:** ISTT Wellfield

Description: McMillan & McGee has connected the power cables (gray) to the electrodes (black). In addition they have began to connect the water injection and return hoses (red).

Date: 7/1/2010	**Location:** West of GWTP, Looking South

Description: A crane was used to place the Power Delivery Systems within the ISTT electrical process equipment area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 7/12/2010

Activities Performed Week of 6/28/2010:	**Status**
McMillan & McGee finished the power and water connections to the electrodes.	Complete
McMillan & McGee performed general housekeeping within the ISTT wellfield, in preparation of the electrical installations (planned for the week of 7/12). General housekeeping included installation of wood and rubber materials to electrically isolate metal materials (pipe racks) and protect ET-DSP materials throughout the wellfield.	Complete
TerraTherm's electrical engineer worked with McMillan & McGee on the electrical installation specifications.	Complete
TerraTherm continued to work on the ISTT vapor extraction and treatment system. TerraTherm constructed the conveyance and connections between the cooling tower and heat exchangers.	Ongoing
TerraTherm performed general housekeeping within the process equipment and storage areas of the Site. General housekeeping activities were in preparation of the final process equipment delivery (week of 7/12)	Complete
Groveland Electric Department (GED) was onsite and installed grounding cables to the transformer in preparation of the power installation at the Site. GED mobilized staff and equipment to the Site several times throughout the week. However, at the request of GED the power installation was delayed until the week of 7/12 due to extreme weather conditions, high temperatures and humidity.	Complete
Subcontractors Onsite: TerraTherm, McMillan & McGee, Groveland Electric Department	
Planned Activities for Week of 7/12/2010:	
• Install power to the Site (Groveland Electric Department). • Install power and data communication lines to the PDS units and process equipment. • Receive the final delivery of process equipment. • Continue construction on the ISTT process equipment.	
Action Items:	**Lead Person(s)**
1. Coordination with EPA's OEME Laboratory for mobile laboratory and fixed laboratory testing during the ISTT operation. *Based on recent discussions with the project team, the first mobile laboratory sampling event is postponed until the week of 8/9 or later. DG is coordinating directly with the EPA OEME. DB continues to prepare and coordinate the fixed laboratory needs during the ISTT operation (August).*	DG / DB
2. Review of TerraTherm's ISTT system start-up checklists in preparation of the ISTT system start-up/check out testing scheduled to begin the week of 7/19. *Nobis provided TerraTherm comments on the ISTT system start-up checklists. These comments will be included in the final Startup/Check Out Testing procedures to be followed during the testing planned for the weeks of 7/19 and 7/26.*	LS / DB
Next Project Status Meeting: July 15, 2010 at 12:30 pm	
Next Project Status Conference Call: July 22, 2010 at 12:30 pm	

Applicable Site Photographs:

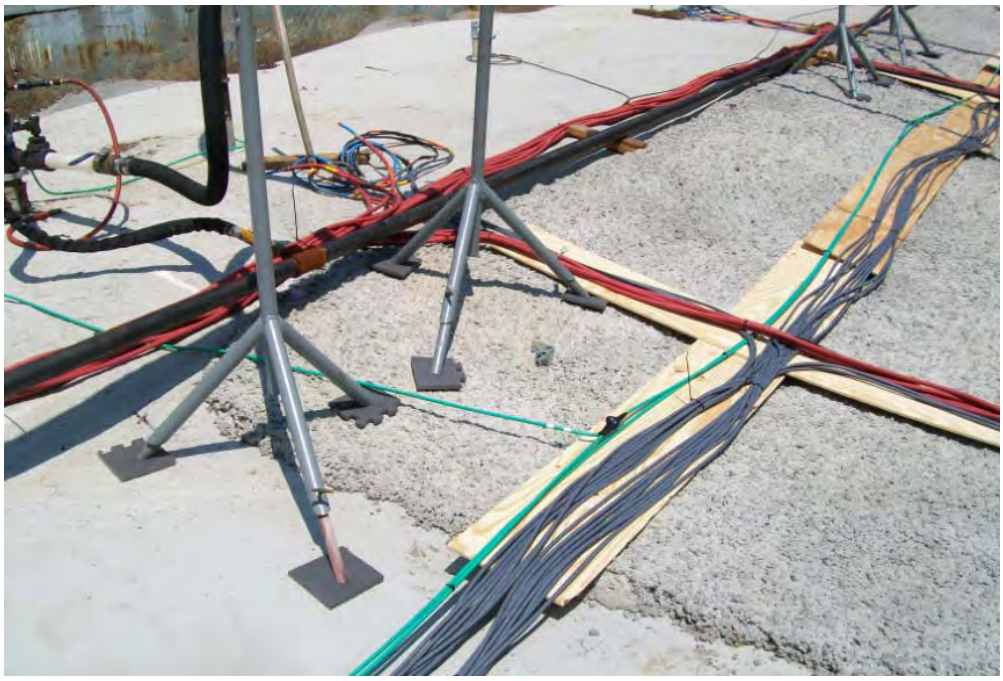
Date: 7/6/2010	**Location:** ISTT Process Equipment Area

Description: The liquid treatment system (bag filters, oil/water separator, and frac tank) is located within secondary containment.

Date: 7/6/2010	**Location:** ISTT Electrical Process Equipment Area

Description: A crane was used to place the Power Delivery Systems within the ISTT electrical process equipment area.

Applicable Site Photographs, Continued:



Date: 7/7/2010	**Location:** ISTT Wellfield, Treatment Area A

Description: General housekeeping within the ISTT wellfield included the installation of rubber pads at the pipe racks to isolate them and wood beneath the hoses to protect against wear.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 7/19/2010

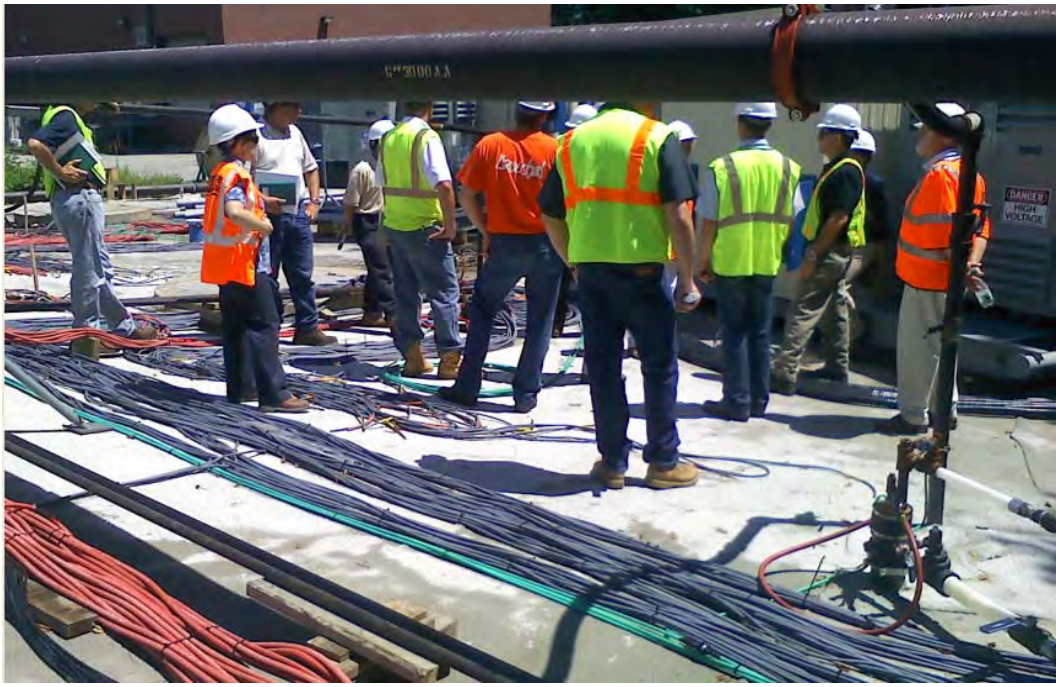
Activities Performed Week of 7/12/2010:	**Status**
TerraTherm received and placed the final process equipment: carbon trailer, chiller, and emergency, back-up generator.	Complete
TerraTherm finished construction of the vapor conveyance within the ISTT vapor system. The liquid line from the chiller to the heat exchanger will be piped the week of 7/19, which will conclude the ISTT vapor system construction.	Ongoing
TerraTherm performed a quality control check of all the bolts at each flange within the ISTT vapor system. Missing or loose bolts were fixed during the check.	Complete
TerraTherm started to pipe the ISTT liquid system by connecting the wellfield liquid manifold, bag filter, liquid heat exchanger, and oil/water separator.	Ongoing
TerraTherm's electrician, Gilbride Electric, mobilized and began making power connections to the power delivery system (PDS) units, process equipment, and emergency generator.	Ongoing
TerraTherm made a hole in the outer wall of the GWTP to prepare for the GWTP tie-ins at the influent and effluent lines, which will be made during the week of 7/19.	Ongoing
Groveland Electric Department installed cable to the new power pole (previously installed at the Site) and made the final connections to the power transformer. Following inspection, see line item below, the line was energized and the transformer output voltages were within specification. The transformer is currently de-energized to facilitate the electrical installations, but is ready for use when installations conclude.	Complete
The Town of Groveland inspected the electrical installations made from the power pole to the transformer and PDS units, prior to energizing. No issues noted during his inspection.	Complete
Nobis performed a stormwater inspection of the Site following the 7/12 storm event. Observations included the following: • The erosion and sediment controls installed along the drainage swale and around the southern perimeter of the Site appeared to be in good working condition. • No ponding or Site runoff was observed at the neighboring properties (106 and 108 Center Street). • Some ponding was observed in limited locations, including the ISTT electrical equipment area, on the concrete vapor cover. • The temporary construction fence along 106, 108, and 110 Center Street appeared to be intact and in good working order.	Complete
Nobis and TerraTherm conducted a Site tour for the EPA TOPO and his guests, which included several Region 1 and national EPA representatives as well as personnel from NH Department of Environmental Services and Sanborn Head and Associates.	Complete
Nobis cut power to the Source Area Extraction Well, EW-S1, to allow the water table to equilibrate prior to monitoring of baseline groundwater flow conditions within the ISTT area (planned for the week of 7/19). The pumps and associated conduit and wiring will be removed from the Source Area Extraction Wells during the week of 7/19 in preparation for ISTT Start-up and Checkout Testing.	Ongoing
Subcontractors Onsite: TerraTherm, Groveland Electric Department, Gilbride Electric	

Planned Activities for Week of 7/19/2010:	
• Finish construction of the ISTT liquid treatment system. • Integrate the ISTT system with the GWTP. • Continue electrical installations at the power delivery systems and process equipment. • Begin Start-up/Checkout Testing of the ISTT process equipment. • Receive and place the water circulation units within the ISTT Wellfield (ET-DSP).	
Action Items:	**Lead Person(s)**
1. Coordination with EPA and laboratories for mobile laboratory and fixed laboratory analysis during the ISTT operation. *Based on discussions with the project team during the 7/15 project status meeting, the first mobile laboratory sampling event is postponed until the week of August 16th (preference is for Wednesday, August 18th). DG is coordinating directly with the EPA OEME mobile laboratory chemist to schedule sampling.* *DB and the Nobis lead chemist continue to coordinate with EPA for OEME fixed laboratory and RAS analysis and with DAS laboratories to obtain air sampling equipment needed for OEME fixed lab analysis.*	DG / DB
2. Review of TerraTherm's ISTT System Operation and Maintenance Manual in preparation of the ISTT Phase I Operation beginning in August. *The Nobis team is currently preparing comments and will submit them to TerraTherm by July 23rd.*	LS / DB
3. TerraTherm will inspect the ponding occurring within the ISTT electrical equipment area and will provide engineering controls if needed.	TerraTherm
Next Project Status Conference Call: July 22, 2010 at **11:00 am** – ***TIME CHANGE FOR THIS WEEK ONLY***	
Next Project Status Meeting or Call: July 29, 2010 at 12:30 pm *Based on input from the project team, this meeting may be changed to a conference call. The determination will be made during the July 22 conference call.*	

Applicable Site Photographs:

Date: 7/13/2010	**Location:** GWTP, Looking South

Description: Groveland Electric Department uses boom trucks to install power cables from the existing power poles to the new one located within the ISTT electrical equipment area.



Date: 7/15/2010	**Location:** ISTT Wellfield, Treatment Area A

Description: Visitors, including personnel from EPA, NH Department of Environmental Services, and Sanborn Head & Associates, tour the Site.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 7/26/2010

Activities Performed Week of 7/19/2010:	**Status**
McMillan & McGee received the remaining Water Circulation Units.	Complete
McMillan & McGee began mechanical connections to the ISTT wellfield by connecting electrodes to the Power Delivery System (PDS) units. McMillan & McGee also prepared the sensor wells for the installations of the digi-TAMs and digi-PAMs. This task will be completed during the week of 7/26.	Ongoing
TerraTherm finished piping in the fresh water lines to and from the chiller and heat exchanger, which concludes the mechanical construction of the ISTT vapor system.	Complete
TerraTherm finished the mechanical construction of the ISTT liquid system, including the connection to the GWTP.	Complete
TerraTherm finished the mechanical construction of water supply that will be used for the electrode operation within the ISTT wellfield. Construction included connection to the GWTP effluent, city water, and the installation of a booster pump to achieve the necessary water pressures.	Complete
TerraTherm's electrician, Gilbride Electric, continued to make the electrical installations at the PDS units, process equipment, and emergency generator.	Ongoing
TerraTherm pressure tested the fresh water lines, GWTP connections, extraction water manifolds, and the ISTT liquid process equipment. No leaks or issues were observed.	Complete
TerraTherm began to install gauges, sample ports, and instrumentation (pressure, flow, and temperature indicators and transmitters) within the manifold piping and process equipment	Ongoing
Nobis performed a stormwater inspection of the Site following the 7/19 storm event. Observations included the following: • The erosion and sediment controls installed along the drainage swale and around the southern perimeter of the Site appeared to be in good working condition; • No ponding or Site runoff was observed at the neighboring properties (106 and 108 Center Street); • Some ponding was observed in limited locations, including the ISTT electrical equipment area, on the concrete vapor cover; and • The temporary construction fence along 106, 108, and 110 Center Street appeared to be in good working order.	Complete
Nobis' electrical controls subcontractor, Electrical Installations, Inc., reprogrammed and tested the GWTP influent tank shutdown alarms. In addition, wiring was installed and supplied to TerraTherm for direct connection to the GWTP PLC, in preparation of integration with the ISTT system.	Complete
Subcontractors Onsite: TerraTherm, McMillan & McGee, Gilbride Electric, Electrical Installations, Inc.	
Planned Activities for Week of 7/26/2010:	
• Continue the electrical and instrumentation installations. • Finish the mechanical construction and electrical installations of the ISTT wellfield (electrodes and sensor wells). • Begin process equipment Start-Up/Checkout Testing.	

Action Items:	**Lead Person(s)**
1. Coordination with EPA's OEME Laboratory for mobile laboratory and fixed laboratory testing during the ISTT operation. *Based on discussions with the project team during the 7/15 project status meeting, the mobile laboratory sampling event is postponed until the week of August 16th. DG has coordinated directly with the EPA OEME for Monday, August 16th. DB and the Nobis lead chemist continue to prepare and coordinate the fixed laboratory needs during the ISTT operation beginning in August.*	DG / DB
2. Review of TerraTherm's ISTT System Operation and Maintenance Manual in preparation of the ISTT Phase I Operation beginning in August. *The Nobis team prepared comments and submitted them to TerraTherm on July 23rd. This action item is now complete*	LS / DB
3. TerraTherm will inspect the ponding that occurs within the ISTT electrical equipment area and will provide engineering controls if needed. *McMillan & McGee inspected the area and recommended raising the electrode power cables, which run through the area of question. TerraTherm's O&M Manual and HASP will have detailed safety procedures for work conducted within the ISTT wellfield.*	TerraTherm
Next Project Status Meeting: July 29, 2010 at 12:30 pm *Based on input from the project team, this meeting has been* ***revised as a conference call****. The next project status meeting will be held on August 12th, consistent with the original meeting schedule.*	
Next Project Status Conference Call: August 5, 2010 at 12:30 pm	

Applicable Site Photographs:

Date: 7/20/2010	**Location:** ISTT Process Equipment Area, Looking Northeast

Description: Mechanical construction of the ISTT liquid system included the piping of the bag filters, heat exchanger, oil/water separator, and frac tank.

Date: 7/20/2010	**Location:** ISTT Electrical Equipment Area, Looking Southwest

Description: During storm events, rain water ponds in the vicinity of the electrical equipment area which includes the PDS units, electrode power cables, and associated connections.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 8/2/2010

Activities Performed Week of 7/26/2010:	**Status**
McMillan & McGee placed the remaining two water circulation units and connected the electrode water injection lines to the units.	Complete
McMillan & McGee installed an equipment communication server, data logging equipment, and alarm systems in preparation of bring the ET-DSP system online.	Ongoing
McMillan & McGee continued the mechanical and electrical connections within the ET-DSP system by connecting electrodes to the Power Delivery System (PDS) units and installing the digi-TAMs and digi-PAMs. This task should be completed during the week of 8/2.	Ongoing
McMillan & McGee prepared and programmed the PDS units for the interaction with the electrodes. This task should be completed during the week of 8/2.	Ongoing
TerraTherm's electrician, Gilbride Electric, continued the electrical installations within the ET-DSP and extraction systems. This task should be completed during the week of 8/2.	Ongoing
TerraTherm finished installing the instrumentation (temperature and pressure gauges) at various locations throughout the extraction system and associated extraction wells.	Complete
TerraTherm continued wiring the process equipment control panels. This task should be completed during the week of 8/2.	Ongoing
TerraTherm began to perform Start-Up/Checkout Testing to the extraction system's process equipment. Using the backup generator, TerraTherm tested the motors to verify that they were spinning in the correct direction. Start-Up/Checkout Testing of the extraction system should be completed during the week of 8/2.	Ongoing
Verizon Phone Company installed two phone lines for data call out capabilities.	Complete
Groveland Electric Department mobilized to the Site to install the meter and to apply power to the Site.	Complete
Subcontractors Onsite: TerraTherm, McMillan & McGee, Gilbride Electric, Groveland Electric and Light Department, Verizon	
Planned Activities for Week of 8/2/2010:	
• Finish the electrical installations and Start-Up/Checkout Testing of the extraction system. • Finish the mechanical and electrical connections of the ET-DSP system. • Conduct baseline vapor and groundwater sampling. • Begin ISTT wellfield Start-Up/Checkout (Acceptance) Testing.	
Action Items:	**Lead Person(s)**
1. Coordination with EPA's OEME Laboratory for mobile laboratory and fixed laboratory testing during the ISTT operation. *EPA's OEME laboratory has been scheduled for Monday, August 16th. Nobis continues to prepare the fixed laboratory for the ISTT operation sampling beginning in August.*	DG / DB
Next Project Status Conference Call: August 5, 2010 at 12:30 pm	
Next Project Status Meeting: August 12, 2010 at 12:30 pm *The Site will host visitors from EPA's Region I and Headquarters in the morning for an ISTT operations tour. In addition, MassDEP staff will be present for a GWTP tour in the afternoon.*	

Applicable Site Photographs:

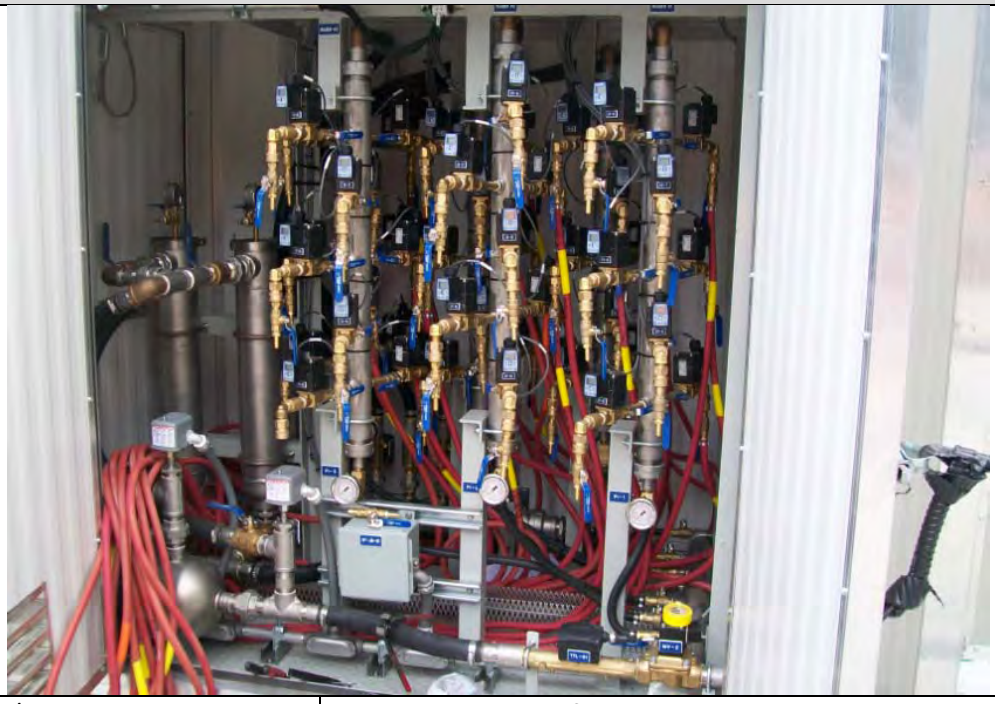
Date: 7/27/2010	**Location:** ISTT Process Equipment Area, Looking East

Description: Electrical installations included the wiring of the Emergency Shut Down station and the back-up emergency generator (red unit).

Date: 7/27/2010	**Location:** ISTT Electrical Equipment Area, Looking South

Description: The electrode power cable is connected using exterior, easy plug-in connections to two of the Site PDS units.

Applicable Site Photographs, Continued:



Date: 7/29/2010	**Location:** ISTT Wellfield

Description: The electrode water injection lines are installed in-line with solenoid valves which control the flow to the individual electrode at one of the water circulation units that will be used at the Site.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Construction Status Report

Prepared By: Lauren Soós	**Date Prepared:** 8/9/2010

Activities Performed Week of 8/2/2010:	**Status**
McMillan & McGee mobilized additional staff to the Site to assist with the ET-DSP check out and acceptance testing.	Complete
McMillan & McGee tested the ET-DSP system's equipment communication server. Additional instrumentation will be installed and tested throughout the ET-DSP acceptance testing.	Complete
McMillan & McGee began testing the water circulation units. Several leaks were discovered during the testing. These leaks were addressed when identified. Work on the water circulation units continued over the weekend, 8/7 and 8/8. This task should be completed during the week of 8/9.	Ongoing
McMillan & McGee began the ET-DSP acceptance testing by triggering power to each electrode and confirming communication within the PDS unit.	Ongoing
McMillan & McGee, with oversight from Nobis, performed a testing location baseline survey of the neighboring residential properties, 106 and 108 Center Street. In preparation for the survey, Nobis communicated directly with the residents. McMillan & McGee concluded that continued monitoring will be necessary in the northwest corner of the 106 Center Street property (in vicinity of the power pole and decorative fence). No additional testing is needed at the 108 Center Street property.	Complete
McMillan & McGee installed shields at each of the PDS beacon lights. The beacon lights are a safety device used to inform operators of the wellfield's electrical status. However, Nobis received a complaint from a resident located at 112 Center Street regarding the intensity of the lights during the nighttime. McMillan & McGee installed directional shields on the beacon lights in order to limit it's visibility to the residents. The shields will allow the light to be visible to the Site operators. Nobis will follow up with the resident at 112 Center Street during the week of 8/9.	Complete
TerraTherm's electrician, Gilbride Electric, finished the electrical installations within the ET-DSP and extraction systems.	Complete
TerraTherm finished the wiring and programming the ISTT extraction system controls.	Complete
TerraTherm finished the Start-Up/Checkout Testing of the extraction system's process equipment. TerraTherm tested each input and output, programming, and logic of the extraction system controls. In addition, to inspect the lines for leaks TerraTherm pressurized water lines and applied a vacuum to the vapor lines. TerraTherm brought each piece of process equipment online and tested the overall system operation using ambient air and the city water supply. Corrective actions, such as programming issues, faulty valves, heater issues, leaks, etc., were addressed when identified.	Ongoing
TerraTherm performed a quality control inspection of the ISTT extraction system. Discrepancies in the Process & Instrumentation Diagram were documented in preparation of construction as-builts.	Complete
TerraTherm trained operators (Denis, Jason, and Kevin) to operate and maintain the ISTT extraction system. Additional training on the ET-DSP system will be performed by McMillan & McGee Staff at the conclusion of the acceptance testing.	Ongoing

TerraTherm and Nobis performed GWTP and ISTT extraction system testing. During testing, the ISTT extraction system effluent automatic switching from discharge to the GWTP to the back-up frac tank (in case the GWTP is down) was confirmed. In addition, the automatic switch to the city water supply from the GWTP effluent (for use in the ET-DSP system) was confirmed.	Complete
Nobis performed the final inspection of the ISTT extraction system. Nobis reviewed and inspected the following: the liquid and vapor extraction systems, the main control panel, the emergency stop procedures, emergency power operation, reviewed the safety procedures within the ISTT wellfield, and operation sampling procedures. Nobis gave conditional approval to start-up of the ISTT extraction system after completion of limited corrective actions, which will be addressed by TerraTherm prior to the planned 8/9 system start.	Complete
Nobis performed a noise evaluation of the ISTT extraction system process equipment. Nobis confirmed that the noise level is less than 85 decibels at 5 feet from the equipment, consistent with the contract terms. Nobis also confirmed that the noise level is close to background levels (65 to 70 decibels) at the fence line adjacent to the residential properties.	Complete
Parker Fence repaired the barbed-wire on the permanent fence that is adjacent to Washington Street.	Complete
Nobis prepared sampling supplies and coordinated with OEME, RAS, and DAS Laboratories regarding the sampling events scheduled for the week of 8/9 (process air influent and effluent, ambient air, and process water effluent.)	Complete
Subcontractors Onsite: TerraTherm, McMillan & McGee, Gilbride Electric, Parker Fence	
Planned Activities for Week of 8/9/2010:	
• Continue acceptance testing of the ET-DSP system. • Start the ISTT extraction system. • Conduct baseline vapor sampling.	
Action Items:	**Lead Person(s)**
1. Coordination with EPA's OEME Laboratory for mobile laboratory and fixed laboratory testing during the ISTT operation and coordination with DAS and RAS laboratories. *EPA's OEME laboratory is scheduled to be on site Tuesday, August 17th for analysis of wellfield vapor samples.*	DG / DB
Next Project Status Meeting: August 12, 2010 at 12:30 pm *The Site will host visitors from EPA's Region I and Headquarters in the morning for an ISTT operations tour (10 am). In addition, MassDEP staff will be present for a GWTP tour in the afternoon (1:30 pm).*	
Next Project Status Conference Call: August 19, 2010 at **1:30 pm – NOTE TIME CHANGE**	

Applicable Site Photographs:

Date: 8/5/2010	**Location:** ISTT Electrical Equipment Area, Looking South

Description: A resident has complained about the orange, flashing beacon light (a wellfield safety device) located on top of the PDS units.

Date: 8/6/2010	**Location:** 106 Center Street, Looking Northeast

Description: McMillan & McGee performed a baseline survey of the neighboring residential properties, recording the conductive locations which will require stray voltage testing.

APPENDIX E

Prepared By: Lauren Soós	**Date Prepared:** August 17, 2010

Activities Performed during the Period from 8/9/2010 to 8/15/2010	**Status**
Following approval from Nobis, TerraTherm started to extract and treat vapors and groundwater from the ISTT wellfield. The ISTT extraction system will operate for approximately one week prior to the ET-DSP (heating) system in order to establish pneumatic and hydraulic control within the treatment area before the heating begins.	Ongoing
TerraTherm completed the Week 1 routine system performance monitoring and sampling which included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) Nobis managed and shipped samples collected by TerraTherm to the appropriate laboratories (RAS laboratory for water samples and OEME Chelmsford Laboratory for air samples).	Complete
Nobis collected ambient air samples at an upgradient and downgradient location. Sample locations were based on wind speed and direction data collected from the Bradford College weather station (located less than three miles from the Site.) Nobis managed and shipped the samples to the OEME Chelmsford Laboratory for analysis.	Complete
Nobis performed a noise evaluation of the extraction system process equipment. Noise levels were less than 85 decibels (db) at a distance of 5 feet from the process equipment – this level meets the requirements outlined in the contract documents. At the fence closest to the observed noisiest piece of equipment (the cooling tower), the noise level was 77 db. This fence line is located approximately 350 feet north of the southern boundary of the GWTP property, where the process equipment is located.	Complete
Nobis conducted a Site tour for the EPA TOPO and his guests, which included several EPA contracting personnel from Region 1 and Headquarters.	Complete
McMillan-McGee continued the ET-DSP system acceptance testing, which included introducing power to the electrodes and performing step and touch potential testing. Corrective actions identified during the testing, such as adding insulation to address unacceptable touch potential at extraction well heads, were initiated during or immediately following testing. Acceptance testing will be completed once the system is brought online with full power and full water injection at the electrodes (following Nobis authorization to start operation.)	Ongoing
McMillan-McGee trained the TerraTherm system operators on how to operate the ET-DSP system. Training topics included various safety controls such as: • Step and touch potentials, • Emergency stop devices, • Sampling safety and intrusive activity protocols, and • Other job safety analysis procedures.	Complete

Activities Performed, Continued	Status
Nobis performed the final ET-DSP system inspection. The following items were discussed and reviewed by Nobis' Project Manager and Resident Engineer: • ET-DSP acceptance testing procedures; confirmation of power to each electrode; • Step and touch potential testing results; • Review of safety and emergency stop procedures; and • Water circulation units testing; and • Operation of the digi-TAMs (temperature sensors) and digi-PAMs (pressure sensors). The following items were identified as requiring completion prior to Nobis authorization to begin operation: • Completion of the corrective action resulting from touch potential testing (installing rubber insulation around steel connector/valves at the multiphase extraction well heads); • Documentation of ET-DSP O&M training for TerraTherm operators; and • Evaluation of hydraulic and pneumatic control achieved by the extraction system. These items are scheduled to be completed by Monday August 16th.	Ongoing

Applicable Site Photograph:

Date: 8/12/2010	**Location:** GWTP Parking Lot, Looking West into ISTT Area A

Description: Nobis project manager, Diane Baxter, describes the various components of the ISTT wellfield to the EPA contracting personnel.

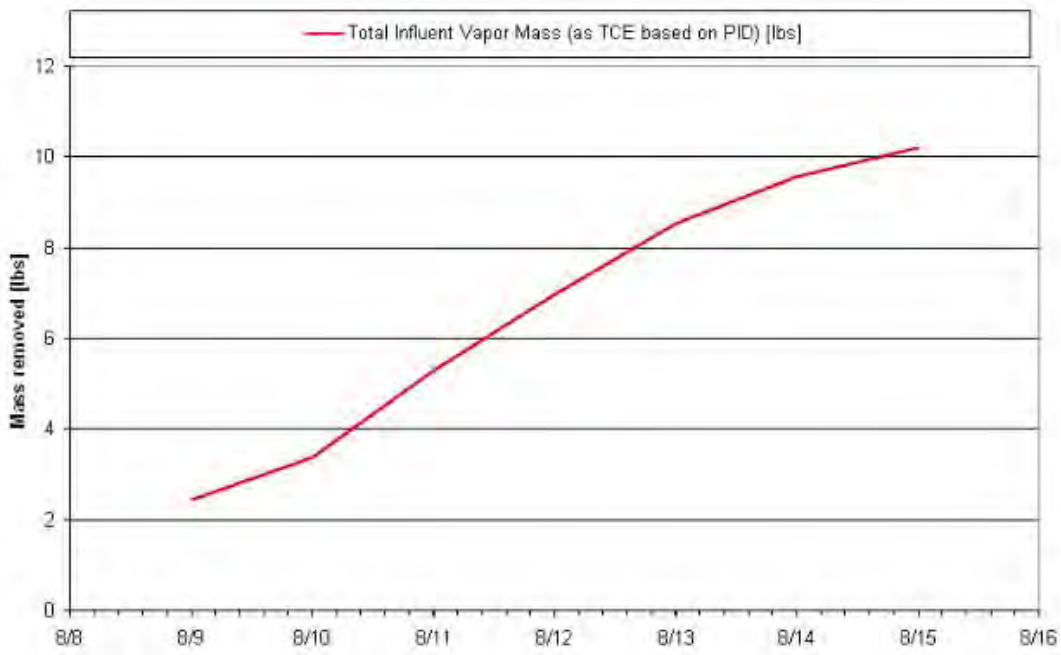
ISTT Operational Data – Collected by TerraTherm during the Period of 8/9/2010 to 8/15/2010		
Extraction Wells		
Temperature (°F): ~51° to 55°, Baseline	Volume Extracted (gal): ~60,000	Groundwater (ft msl): ~35 to 47
Minimum VOC Reading (ppm): 0.6 at VEW-23 (Area A)	Maximum VOC Reading (ppm): 15.9 at VEW-17 (Area C)	Average VOCs (ppm): 6.1
ISTT Extraction System		
Average Air Flow (scfm): ~500	Average Extracted Water Rate (gpm): ~7	Est. Mass Removed (lbs of TCE): ~10
GAC Influent (ppm): ~12	GAC Effluent (ppm): ~0	Removal Efficiency (%): >95%

Status of Performance Matrices	
Temperature: ET-DSP system has not been started. This system start up is planned for the week of 8/16.	Clean Up Goals: Baseline samples are being collected in order to evaluate clean up goals during the ISTT operation.
Pneumatic Control: Extraction system was started on 8/9, pneumatic control is necessary in order to start the ET-DSP.	Hydraulic Control: Extraction system was started on 8/9, pneumatic control is necessary in order to start the ET-DSP.

Analytical Laboratory Data Received
Process Liquid: None
Process Vapor: None
Extraction Wells: None
Ambient Air: None

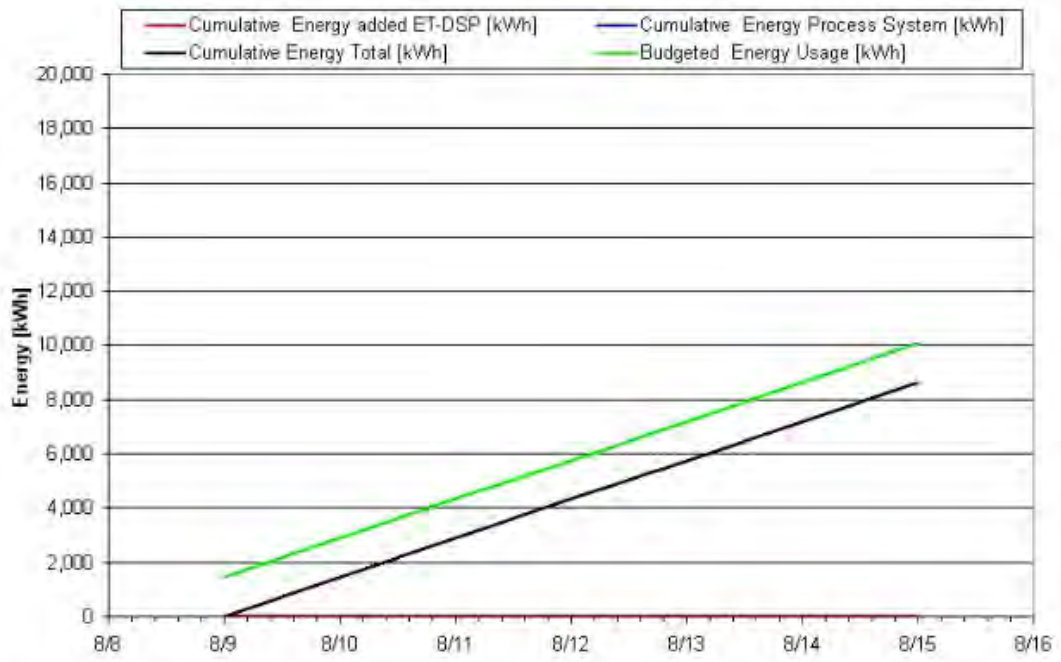
Optimization Activities for the Following Week
ISTT Extraction System – Continue operation of the extraction system and maintain a balance between the water injection and the groundwater extraction rates when the ET-DSP system is started.
ET-DSP System – Following approval from Nobis, the ET-DSP system will be started. The system will be closely monitored and tested to optimize the conductivity between electrodes.
GWTP – Continue operation of the GWTP, while monitoring and optimizing the use of the ultra violet oxidation reactors during the ET-DSP system start up.
Performance Monitoring – Conduct the baseline groundwater monitoring event. Continue weekly routine performance sampling.
Next Project Status Conference Call: Thursday, August 19th at **1:30 pm – note time change**
Next Project Status Meeting: Thursday, August 26th at 12:30 pm

Mass Removal Estimate:



Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system; operations began on August 9, 2010.

Cumulative Energy Use:



Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós and Adam Roy	**Date Prepared:** August 24, 2010

Activities Performed during the Period from 8/14/2010 to 8/20/2010	**Status**
TerraTherm completed the baseline groundwater monitoring event on Monday, 8/16, prior to the ET-DSP system start up. Nobis managed and shipped the samples, collected by TerraTherm, to the appropriate laboratory (RAS laboratory for volatiles).	Complete
Following approval from Nobis which included confirmation of pneumatic and hydraulic control, McMillan-McGee started the ET-DSP system on Tuesday, 8/17. Acceptance testing, which included powering electrodes and performing step and touch potential testing continued throughout the week as the system was brought to full power. Acceptance testing included step/touch potential testing at the 106 Center Street property. No stray voltage was measured at this location.	Complete
In order to enhance the soil conductivity within the vadose zone, McMillan & McGee introduced water conditioning salts to applicable electrode injection water. Increasing the salinity of the injection water will increase the ability of the water to pass an electrical current.	Ongoing
TerraTherm completed the Week 2 routine system performance monitoring and sampling, which included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) Nobis managed and shipped samples collected by TerraTherm to the appropriate laboratories (RAS laboratories for water samples and OEME Chelmsford Laboratory for air samples). In addition, OEME's mobile laboratory analyzed split vapor extraction well samples.	Complete
The Nobis team continues to monitor influent GWTP concentrations and optimize the operation of the GWTP. A decrease in influent concentrations, from 900 ppb (week 1) to 100 ppb (week 2) was observed. The Nobis team gradually reduced the use of ultraviolet oxidation reactors/bulbs from three to one in response to the decrease in influent concentrations.	Complete
Parker Fence modified the permanent chain link fence and gate along Washington Street to deter public access to the Site.	Complete

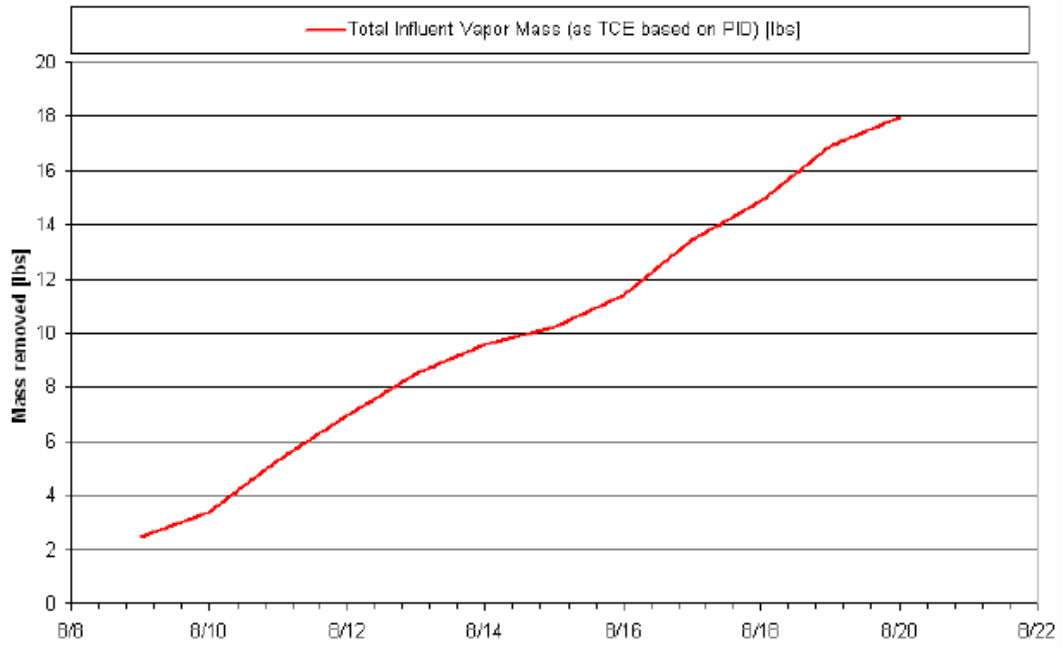
ISTT Operational Data – Collected by TerraTherm during the Period of 8/14/2010 to 8/20/2010		
ISTT Wellfield		
Temperature (°F): ~57° to 60°	Volume Extracted (gal): ~35,000	Groundwater Elevation (ft msl): ~37 to 50
Minimum VOC Reading (ppm-PID) 0.0 at VEW-9 (Area A)	Maximum VOC Reading (ppm PID): 16 at VEW-17 (Area C)	Average VOCs – (ppm-PID): 6.7
ISTT Extraction System		
Average Air Flow (scfm): 485	Average Extracted Water Rate (gpm): 5.24	Average Injection Water Rate (gpm): 2.95
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): ~8 (Figure 1)	Est. Energy Used (kWh): 59,520 (Figure 2)
GAC Influent (ppm-PID): 10.4	GAC Effluent (ppm-PID): 0	Removal Efficiency (%): > 95%

Status of Performance Metrics	
Temperature (See Figure 3): A change of approx. 5° F has been observed in the temperature sensor wells since ISTT start up.	Hydraulic Control (See Figure 5): Hydraulic control was established prior to the start the ET-DSP.
Pneumatic Control (See Figure 4): Pneumatic control was established prior to the start of the ET-DSP system.	Clean Up Goals: Current status not known. Baseline samples were collected in order to evaluate clean up goals during the ISTT operation.

Analytical Laboratory Data Received
Process Liquid: 1,900 ppb of TCE and 36 ppb of cis-1,2-DCE were detected from a sample collected at the ISTT process equipment effluent (prior to discharge to the GWTP).
Process Vapor: None
Extraction Wells: TCE was detected in all the samples collected from the 16 vapor extraction wells at concentrations ranging from 1.0 (at X-28) to 2,430 ppb (at X-18). PCE and cis-1,2-DCE were also detected in several samples, at maximum concentrations of 84 ppb (at X-15) and 890 ppb (X-09), respectively.
Ambient Air: None

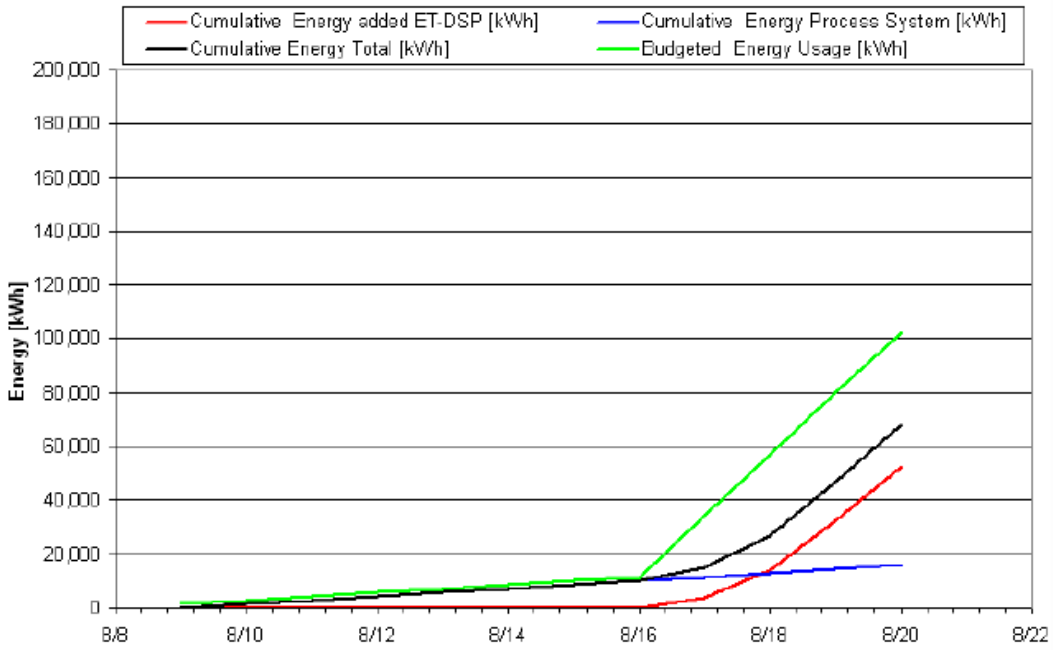
Optimization Activities for the Following Week
ISTT Extraction System – Continue operation of the extraction system and maintain a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.
ET-DSP System – Continue operation and optimization (saline injection water) of the ET-DSP system, while maintaining the balance with the ISTT extraction system.
GWTP – Continue operation of the GWTP, while performing daily monitoring of influent concentrations to optimize the use of the ultra violet oxidation reactors.
Performance Monitoring – Continue weekly routine performance sampling. Collect bi-weekly ambient air samples.
Next Project Status Meeting: Thursday, August 26th at 12:30 pm
Next Project Status Conference Call: Thursday, September 9th at 12:30 pm **– proposed**

Figure 1, Mass Removal Estimate:



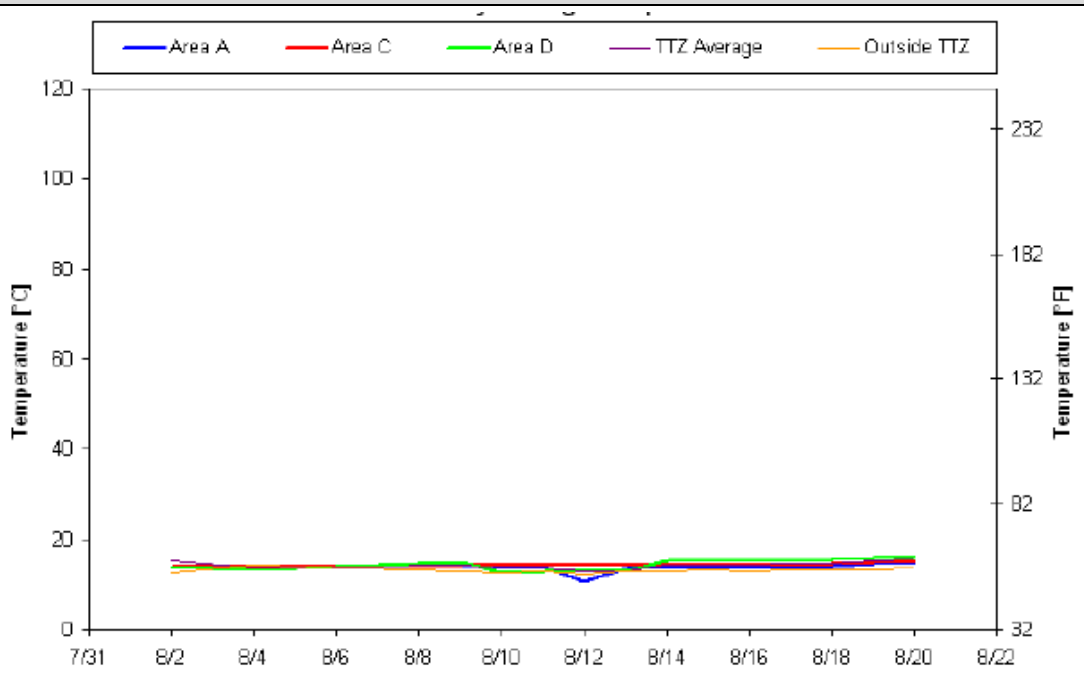
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



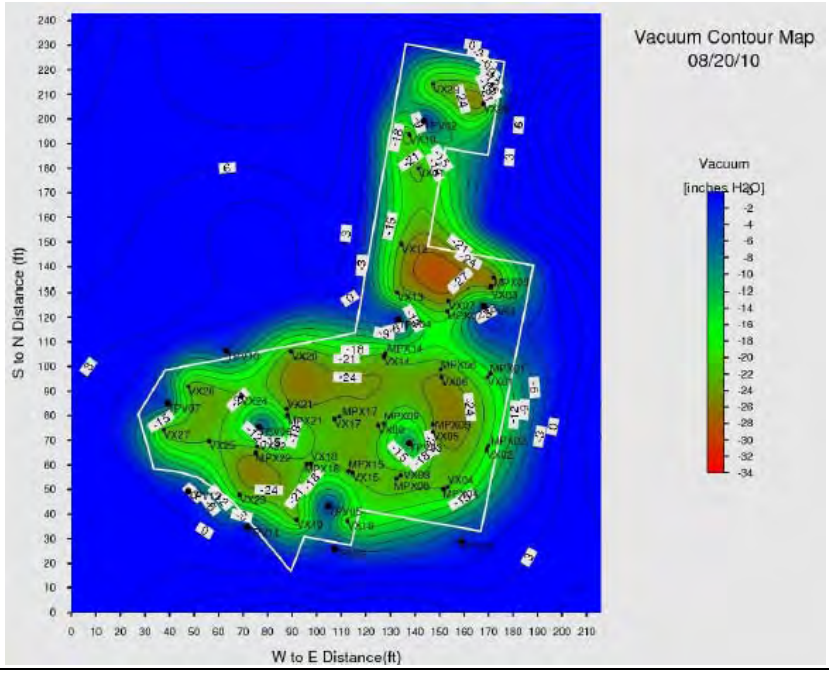
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



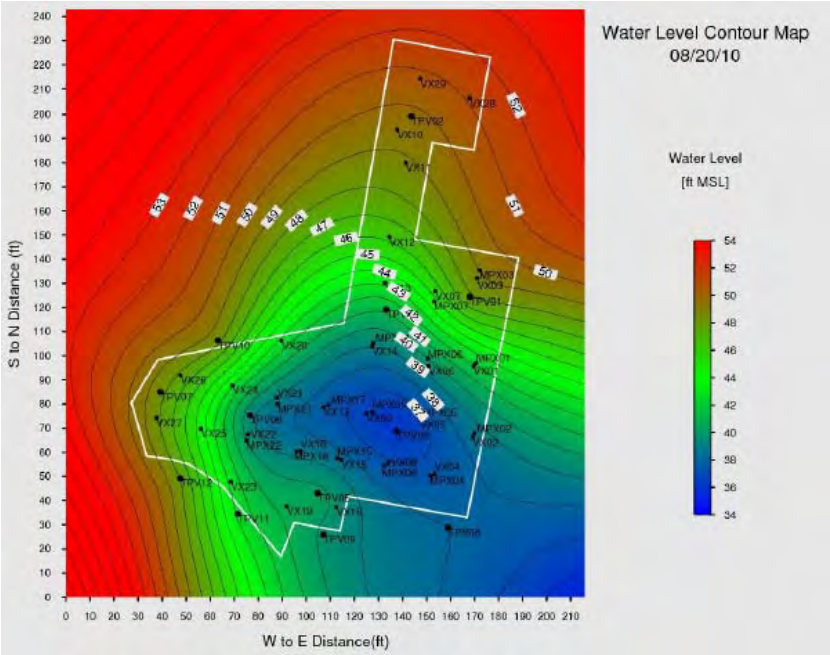
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This graph describes the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This graph describes the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Prepared By: Lauren Soós and Adam Roy	**Date Prepared:** August 31, 2010

ISTT Operational Data – Collected by TerraTherm during the Period of 8/21/2010 to 8/27/2010		
ISTT Wellfield		
Temperature (°F): 61° to 72°	Volume Extracted (gal): 64,865	Groundwater Elevation (ft msl): ~36 to 53
Minimum VOC Reading (ppm-PID) 2.1 at VEW-3 (Area A)	Maximum VOC Reading (ppm PID): 8.4 at VEW-17 (Area A)	Average VOCs – (ppm-PID): 5.3
ISTT Extraction System		
Average Air Flow (scfm): 490	Average Extracted Water Rate (gpm): 6.7	Average Injection Water Rate (gpm): 6.5
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 4 (Figure 1)	Est. Energy Used (kWh): 158,976 (Figure 2)
GAC Influent (ppm-PID): 13	GAC Effluent (ppm-PID): 0	Removal Efficiency (%): > 95%

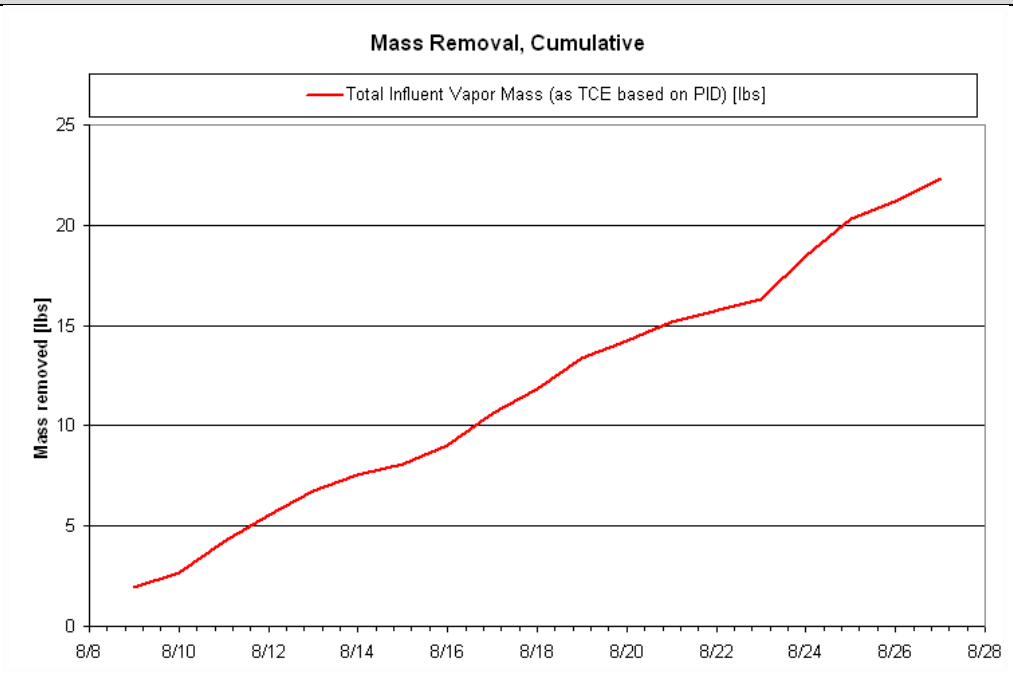
Status of Performance Metrics	
Temperature (See Figure 3): A change of approx. 20° F has been observed in the temperature sensor wells since ISTT start up.	Hydraulic Control (See Figure 5): Hydraulic control continues to be maintained by the ET-DSP.
Pneumatic Control (See Figure 4): Pneumatic control continues to be maintained by the ET-DSP system.	Clean Up Goals: Current status not known. Baseline samples were collected in order to evaluate clean up goals during the ISTT operation.

Analytical Laboratory Data Received
Process Liquid: 1,900 ppb of TCE and 23 ppb of cis-1,2-DCE were detected from a sample collected on August 17, 2010, at the ISTT process equipment effluent (prior to discharge to the GWTP).
Process Vapor: Data was received for the process vapor samples collected on August 10, 2010. Influent concentrations of TCE and Cis-1,2-DCE were 3,400 and 1,900 ppbv, respectively. Several other VOCs were also detected in the influent sample. There were no VOCs except for methyl ethyl ketone and methylene chloride (common laboratory contaminants) detected in the GAC effluent sample, indicating the vapor treatment is operating as designed.
Extraction Wells: No new data available for this reporting period.
Ambient Air: Data was received for the ambient air samples collected on August 10, 2010. TCE was detected between 0.230 ppbv (upgradient) and 0.420 ppbv (down gradient). Other VOCs detected in both upgradient and downgradient locations were generally equivalent or less than concentrations observed in the baseline ambient air samples collected in January 2010.

Optimization Activities Performed during the Period from 8/21/2010 to 8/27/2010 and Activities for the Following Week
<u>*ISTT Extraction System*</u> – Continue operation of the extraction system and maintain a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.
<u>*ET-DSP System*</u> – In order to enhance the soil conductivity within the vadose zone, McMillan & McGee introduced water conditioning salts to applicable electrode injection water. On August 21, 23, 24, 26, and 27, a daily total of 80 lbs of water conditioning salt was injected into the treatment zone through targeted electrodes in order to increase the conductivity of the soil. Increasing the salinity of the

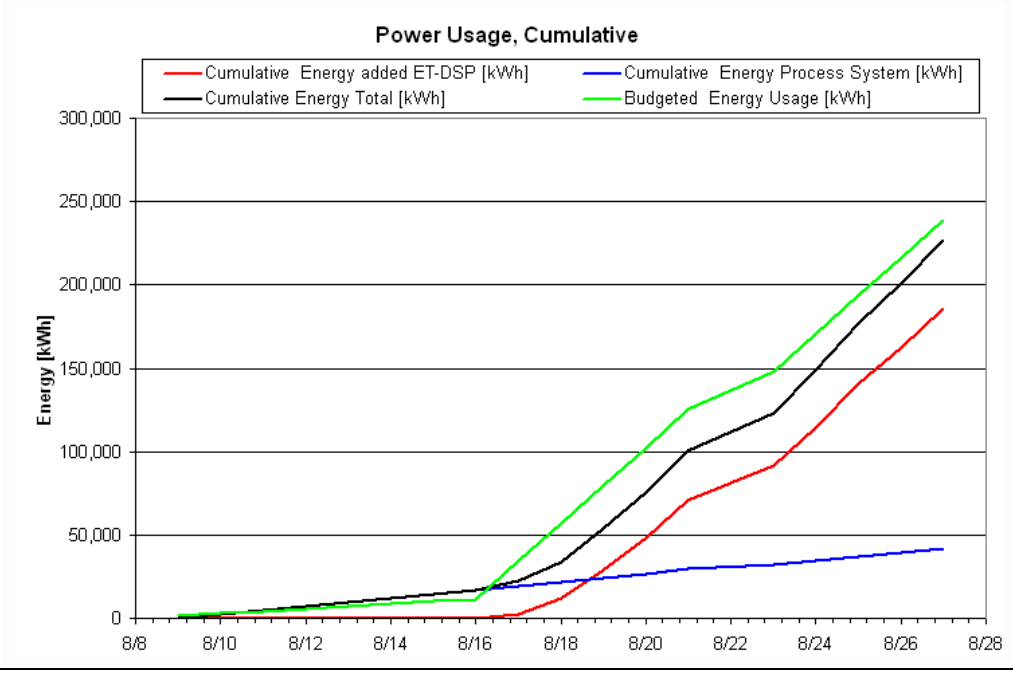
injection water will increase the ability of the water to pass an electrical current. McMillan & McGee plans to continue operation and optimization (saline injection water) of the ET-DSP system, while maintaining the balance with the ISTT extraction system.
GWTP – The Nobis team continues to monitor influent GWTP concentrations and optimize the operation of the GWTP. TCE concentrations during the period from 8/23 to 8/27 ranged from 101-174 µg/L. On 8/26 TCE was detected (4.6 µg/L) at the UV reactor effluent while operating one ultraviolet oxidation reactors/bulb, so a second bulb was activated. The Nobis team plans to continue operation of the GWTP, while performing daily monitoring of influent concentrations to optimize the use of the ultra violet oxidation reactors.
Performance Monitoring – TerraTherm completed the Week 3 routine system performance monitoring and sampling, which included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) Nobis managed and shipped samples collected by TerraTherm to the appropriate laboratories (RAS laboratories for water samples and OEME Chelmsford Laboratory for air samples). Nobis performed ambient air monitoring on Thursday 8/26 and delivered the samples to the OEME Chelmsford Laboratory. TerraTherm will continue weekly routine performance sampling. The following week TerraTherm plans to collect groundwater samples from select monitoring wells. If a selected monitoring well contains insufficient water for sampling, the nearest MPE well will be sampled in its place. In addition, OEME's mobile laboratory will be onsite to analyze split vapor extraction well samples.
Next Project Status Conference Call: Thursday, September 9th at 12:30 pm
Next Project Status Meeting: Thursday, September 23th at 12:30 pm

Figure 1, Mass Removal Estimate:



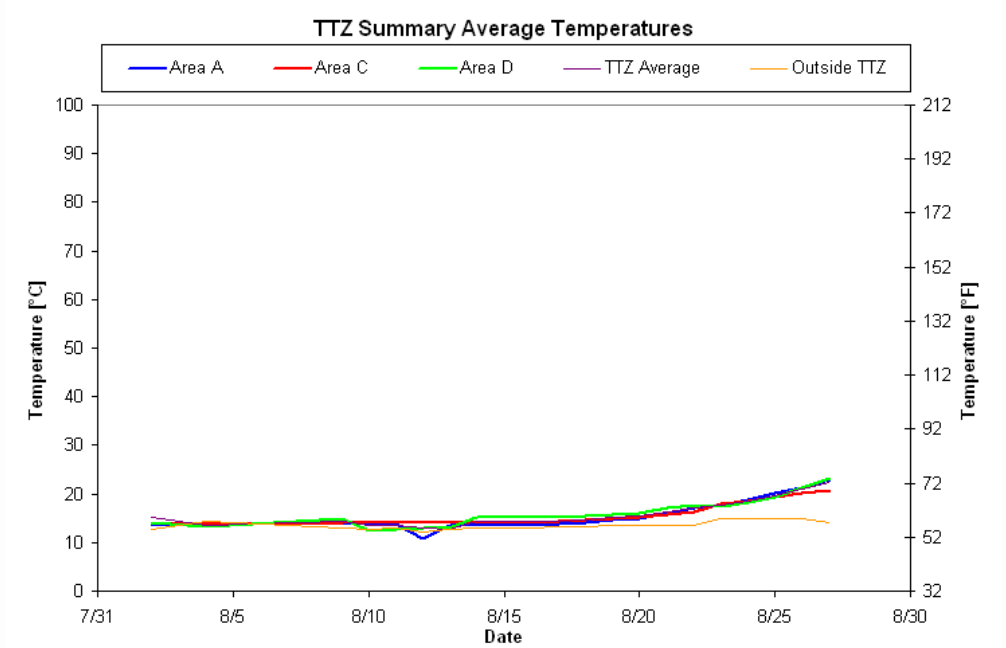
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



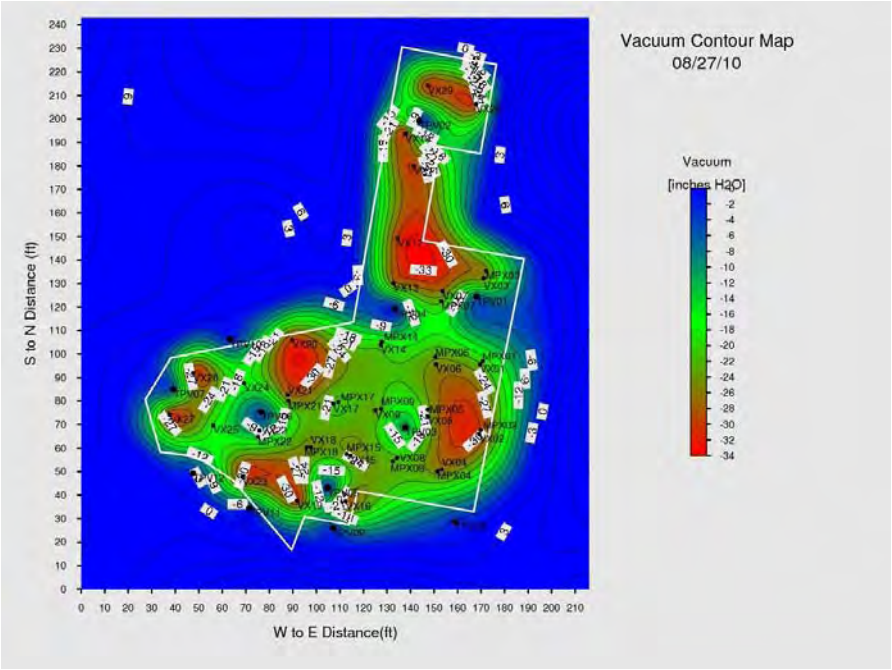
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



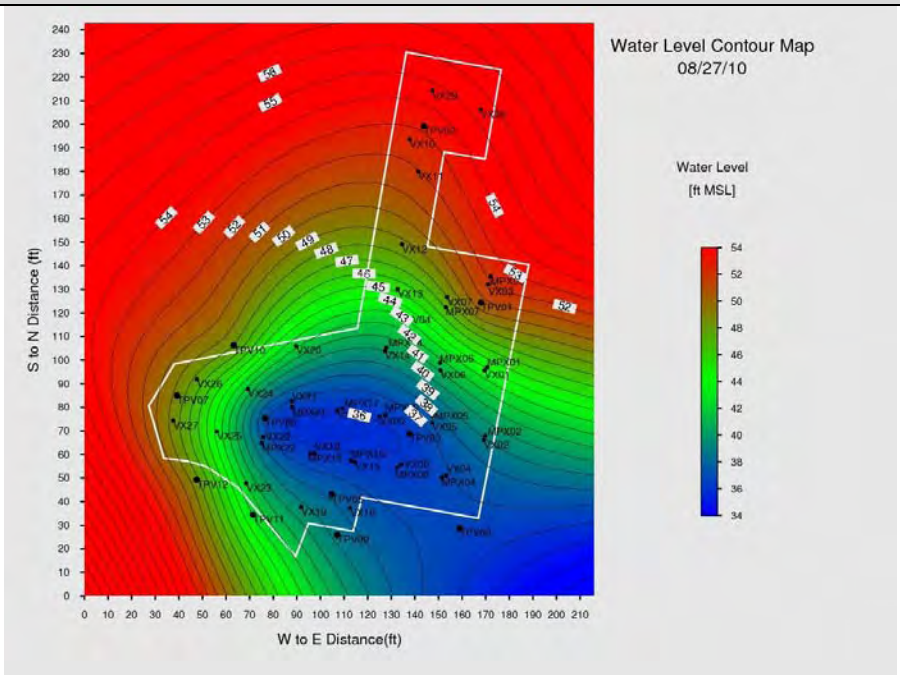
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Prepared By: Lauren Soós and Adam Roy	**Date Prepared:** September 7, 2010

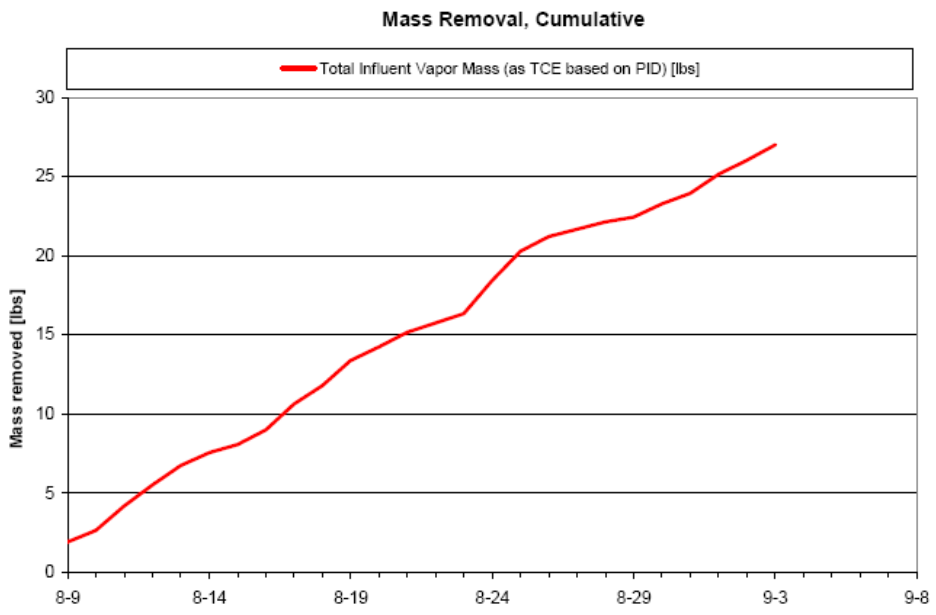
ISTT Operational Data – Collected by TerraTherm during the Period of 8/28/2010 to 9/04/2010		
ISTT Wellfield		
Temperature (°F): 75° to 96°	Volume Extracted (gal): 87,385	Groundwater Elevation (ft msl): ~36 to 54
Minimum VOC Reading (ppm-PID) 2 at VEW-27 (Area C)	Maximum VOC Reading (ppm PID): 101 at VEW-17 (Area A)	Average VOCs – (ppm-PID): 20
ISTT Extraction System		
Average Air Flow (scfm): 466	Average Extracted Water Rate (gpm): 9.7	Average Injection Water Rate (gpm): 8.2
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 5 (Figure 1)	Est. Energy Used (kWh): 112,400 (Figure 2)
GAC Influent (ppm-PID): 8.6	GAC Effluent (ppm-PID): <1	Removal Efficiency (%): > 95%

Status of Performance Metrics	
Temperature (See Figure 3): A change of approx. 37° F has been observed in the temperature sensor wells since ISTT start up.	Hydraulic Control (See Figure 5): Hydraulic control continues to be maintained by the ET-DSP.
Pneumatic Control (See Figure 4): Pneumatic control continues to be maintained by the ET-DSP system.	Clean Up Goals: Clean Up Goals have not been met. Baseline groundwater sample data indicates contaminant concentrations are above the current Clean Up Goals.

Analytical Laboratory Data Received
Process Liquid: Several metals including: barium, cadmium, chromium, iron, lead, manganese, mercury, nickel, and zinc; were detected from a sample collected on August 17, 2010, at the ISTT process equipment effluent (prior to discharge to the GWTP). The concentrations detected in the sample are not high enough to require any change in the current treatment system process at the GWTP (i.e. addition of polymers for flocculation).
Process Vapor: No new data available for this reporting period.
Extraction Wells: TCE was detected in all the samples collected from the 16 vapor extraction wells at concentrations ranging from 6.8 (VEW-28) to 14,670 ppbv (VEW-18). PCE and cis-1,2-DCE were also detected in several samples, at maximum concentrations of 347 ppb (VEW-17) and 2,200 ppbv (VEW-21), respectively.
Groundwater: Groundwater data was received for the baseline groundwater sampling event performed on 8/16/10. Concentrations of TCE ranged from 0.21J (J indicates an estimated value) to 28,000 ppb in monitoring well RW-05. Concentrations of Cis-1,2-DCE ranged from non detect (<5 ppb) to 250 ppb at monitoring well RW-05.
Ambient Air: No new data available for this reporting period.
Optimization Activities Performed during the Period from 8/28/2010 to 09/04/2010 and Activities for the Following Week
ISTT Extraction System – Continue operation of the extraction system and maintain a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.

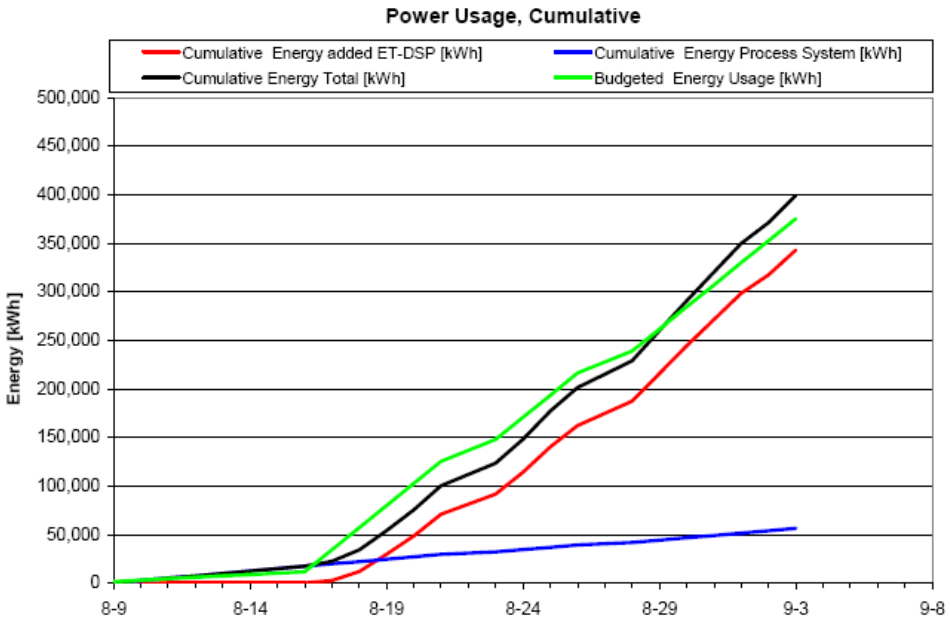
ET-DSP System – In order to enhance the soil conductivity within the vadose zone, McMillan & McGee introduced water conditioning salts to applicable electrode injection water. On August 28, 29, 30 a daily total of 80 lbs of water conditioning salt was injected into the treatment zone through targeted electrodes in order to increase the conductivity of the soil. Increasing the salinity of the injection water will increase the ability of the water to pass an electrical current. McMillan & McGee plans to continue operation and optimization (saline injection water) of the ET-DSP system, while maintaining the balance with the ISTT extraction system.
GWTP – The Nobis team continues to monitor influent GWTP concentrations and optimize the operation of the GWTP. From the period of 8/28 to 9/4, TCE concentrations in the GWTP influent ranged from 163-349 ppb. During the same period, TCE concentrations in samples collected from the effluent of the first UV reactor ranged from 2 to 10 ppb. Based on those concentrations, a second UV reactor continued to operate. The Nobis team plans to continue operation of the GWTP, while performing daily monitoring of influent concentrations to optimize the use of the ultra violet oxidation reactors.
Performance Monitoring – TerraTherm completed the Week 4 routine system performance monitoring and sampling, which included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) TerraTherm collected the second round of groundwater samples from select monitoring wells. If a selected monitoring well contained insufficient water for sampling, the nearest MPE well was sampled in its place. Nobis managed and shipped samples collected by TerraTherm to the appropriate laboratories (RAS laboratories for water samples and OEME Chelmsford Laboratory for air samples). In addition, OEME's mobile laboratory was onsite on 9/1 and analyzed split samples collected from vapor extraction wells (Refer to *Extraction Wells* data discussion above). TerraTherm will continue weekly routine performance sampling. This week's performance monitoring also includes metals analysis and associated QC samples. Nobis plans to collect ambient air monitoring on Wednesday 9/8 and deliver the samples to the OEME Chelmsford Laboratory.
Next Project Status Conference Call: Thursday, September 9th at 12:30 pm
Next Project Status Meeting: Thursday, September 23th at 12:30 pm

Figure 1, Mass Removal Estimate:



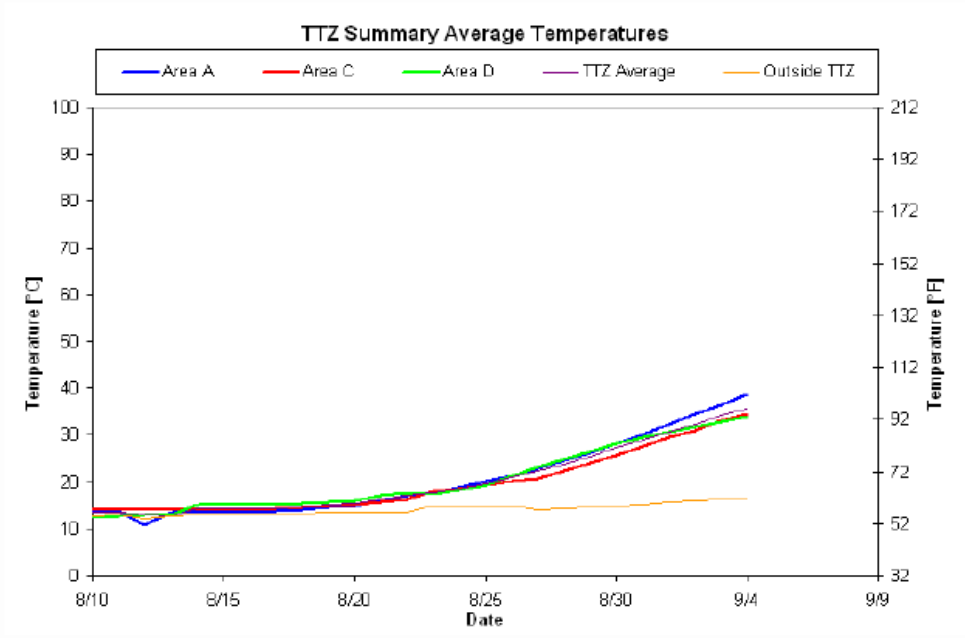
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



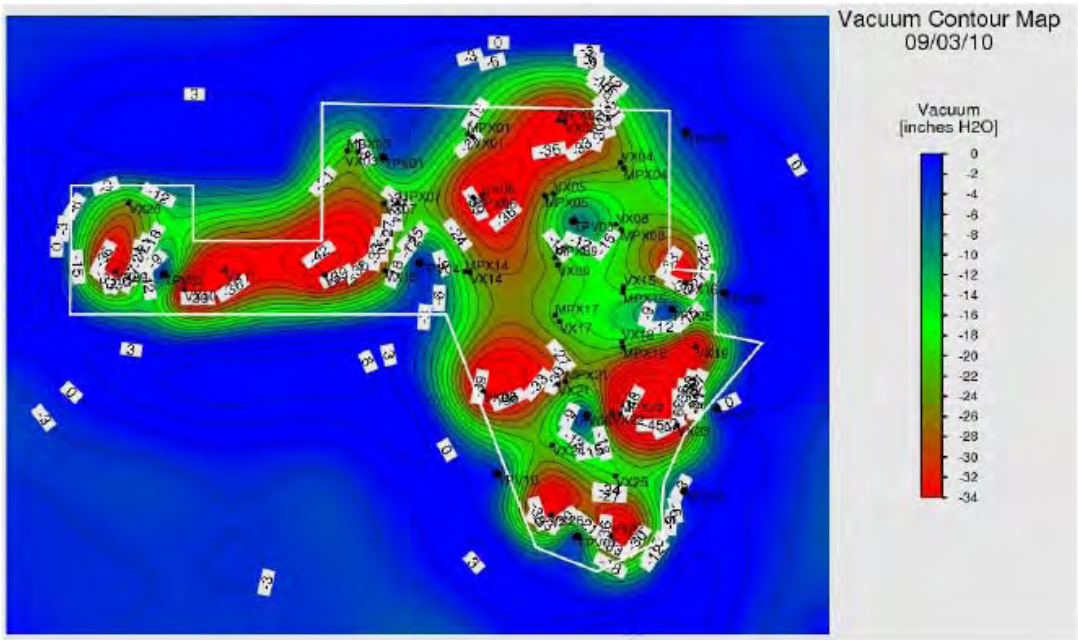
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



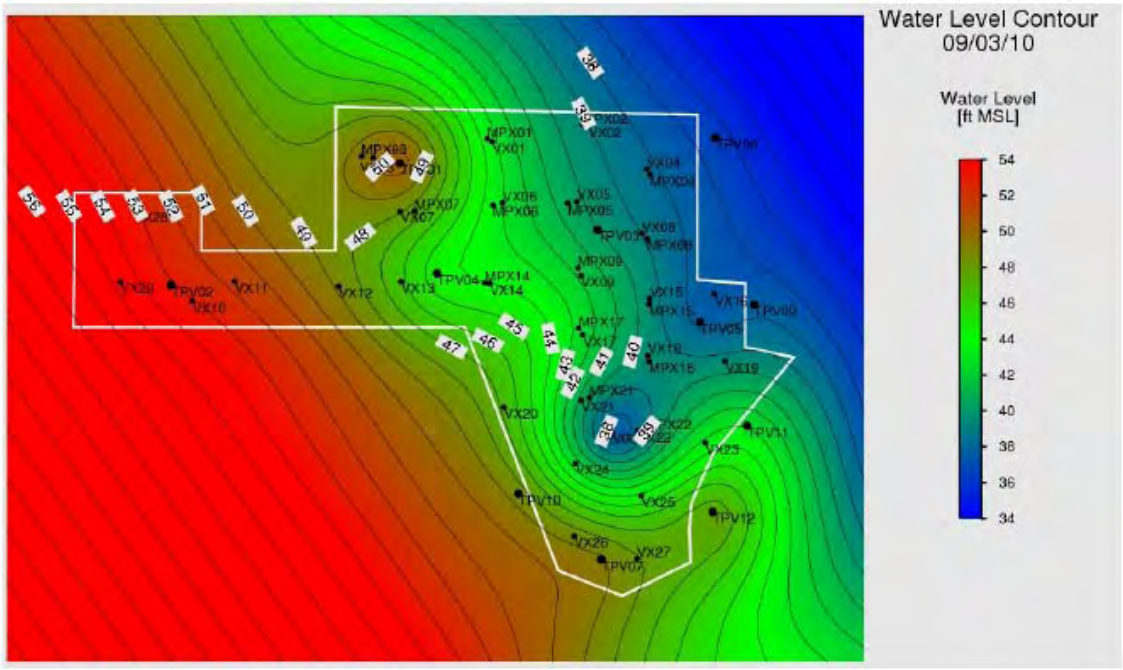
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** September 14, 2010

Operation and Maintenance Activities Performed beginning 9/4/2010 to 9/10/2010	**Status**
Nobis performed an extensive noise evaluation to collect readings in response to a noise complaint received from the resident of 115 Center Street. These results were summarized and presented to the project team on September 8, 2010. The project team is currently evaluating sound muffling options for the extraction system's blowers (which is the suspected origin of the complaint.)	On-going
TerraTherm and Mc2 continue to enhance soil conductivity by introducing water conditioning salts to the injection water at targeted shallow electrodes. On September 5, 6, 7, 9, and 10, a daily total of approximately 80 pounds of water conditioning salt was injected into the targeted electrodes. This activity may continue throughout the operation of the ISTT system.	On-going
TerraTherm performed maintenance on the extraction system's duct heater, following the discovery of a vapor leak. The duct heater was repaired and the extraction system was turned back on. Approximately 8 hours of system downtime on September 9, 2010 are associated with this maintenance item.	Complete
TerraTherm operators responded to and troubleshooted two ISTT system alarms this week. The first alarm occurred on September 4, 2010, was a high pressure level on the bag filters, which shut down the extraction system. The condition was addressed immediately, resulting in approximately 30 minutes of extraction system downtime. The second alarm occurred on September 10, 2010 when a main circuit breaker tripped and caused the entire ISTT system (extraction and ET-DSP system) to shut down. Following an extensive evaluation, electrodes were turned down to prevent them from drawing more power than the set limit of the main breaker. This will allow the ISTT systems to operate in unison without tripping the main breaker and shutting down the systems. The systems were down for approximately 100 minutes.	Complete
TerraTherm shut down the ET-DSP system on September 9, 1010 following step and touch potential tests which revealed elevated voltage readings at the construction fence adjacent to 108 Center Street. TerraTherm attempted several corrective actions, however the elevated voltage readings continued. As a result, TerraTherm turned the ET-DSP system back on after approximately 1.5 hours of downtime, but powered down select electrodes. Step and touch potential testing performed after reenergizing the system confirmed that voltage potential readings in the area were within the 15 volt project limit. The final corrective action includes modifying the construction fence to interrupt the circuit along the fence line. This activity is currently scheduled for Monday, September 13, 2010.	On-going
TerraTherm completed the Week 5 routine system performance monitoring and sampling, which included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) Nobis conducted an ambient air monitoring event. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (RAS and OEME Chelmsford Laboratory).	Complete

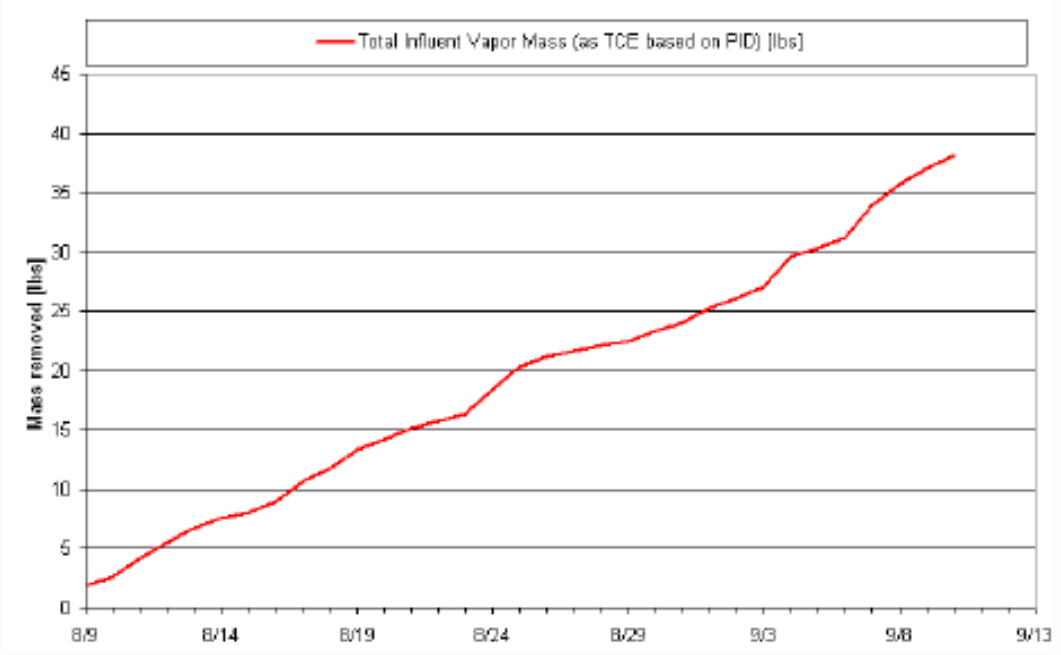
ISTT Operational Data – Collected by TerraTherm during the Period of 9/04/2010 to 9/10/2010		
ISTT Wellfield		
Temperature (°F): 98° to 112°	Volume Extracted/Injected (gal): 105,486 / 82,427	Groundwater Elevation (ft msl): ~38 to 54
Min. VOC Reading (ppm PID) 4.2 at VEW-26 (Area C)	Max. VOC Reading (ppm PID): 164 at VEW-17 (Area A)	Average VOCs (ppm PID): 40
ISTT Extraction System		
Average Air Flow (scfm): 460	Average Extracted Water Rate (gpm): 10.5	Average Injection Water Rate (gpm): 8.2
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 11 (Figure 1)	Est. Energy Used (kWh): 252,160 (Figure 2)
GAC Influent (ppm-PID): 16	GAC Effluent (ppm-PID): 0	Removal Efficiency (%): > 95%

Status of Performance Metrics	
Temperature (See Figure 3): A change of approx. 61° F has been observed since the heat injections begun.	Pneumatic Control (See Figure 4): The vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The extraction system continues to maintain hydraulic control within Treatment Zone A.	Clean Up Goals: Clean Up Goals have not been met. Baseline data collected prior to ISTT start up indicates contaminant concentrations are above the current Clean Up Goals.

Optimization Activities for the Following Week:
ISTT Extraction System – Continue operation of the extraction system while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.
ET-DSP System – Continue to enhance soil conductivity within the vadose zone with saline water injection. The ET-DSP system will be shutdown on Wednesday, September 15, 2010, for the planned groundwater monitoring event. The ET-DSP system will be powered up once all intrusive activities (groundwater sampling) have been completed within the ISTT wellfield.
GWTP – The Nobis team will continue to monitor influent GWTP concentrations while optimizing the operation of the GWTP (e.g. the ultra violet oxidation reactors).
Performance Monitoring –TerraTherm will continue weekly routine process performance sampling, which includes samples collected from the vapor and liquid process equipment. In addition, TerraTherm will perform a groundwater monitoring event on Wednesday, September 15, 2010. Nobis will perform a ambient air monitoring event on Thursday, September 16, 2010. All samples will be processed, handled, and shipped by Nobis.
Analytical Laboratory Data Received:
Process Liquid: TCE (1,500 and 1,400 ppb) and cis-1,2-DCE (16 and 9.9 ppb) were detected from samples collected on August 25 and September 1, 2010, respectively, at the ISTT process equipment effluent (prior to discharge to the GWTP).
Process Vapor: No new data available for this reporting period.
Extraction Wells: No new data available for this reporting period.

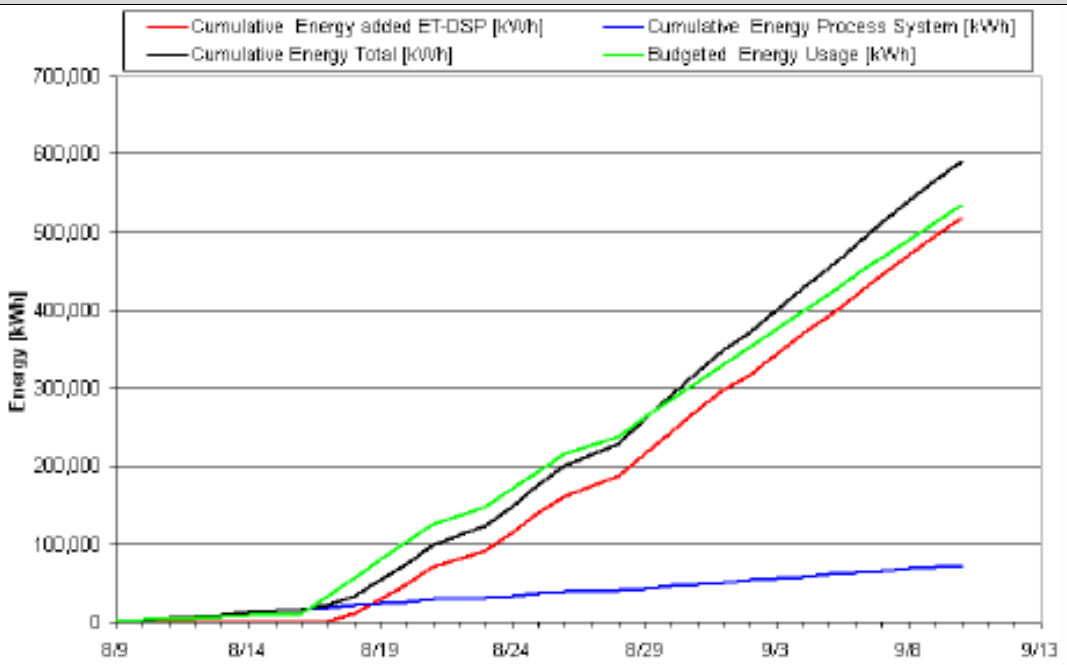
Groundwater: TCE was detected in all of the groundwater samples collected during the monitoring event on August 25, 2010, with the exception of RW-01 and RW-06. Detected concentrations of TCE ranged from 1.4 J (J indicates an estimated concentration) at RW-10B to 11,000 µg/L at RW-03 and RW-05. Concentrations of cis-1,2-DCE ranged from non detect (<5 µg/L) to 330 µg/L at RW-05.
Ambient Air: No new data available for this reporting period.
Next Project Status Meeting: Thursday, September 23th at 12:30 pm
Next Project Status Conference Call: Thursday, October 7th at 12:30 pm

Figure 1, Mass Removal Estimate:



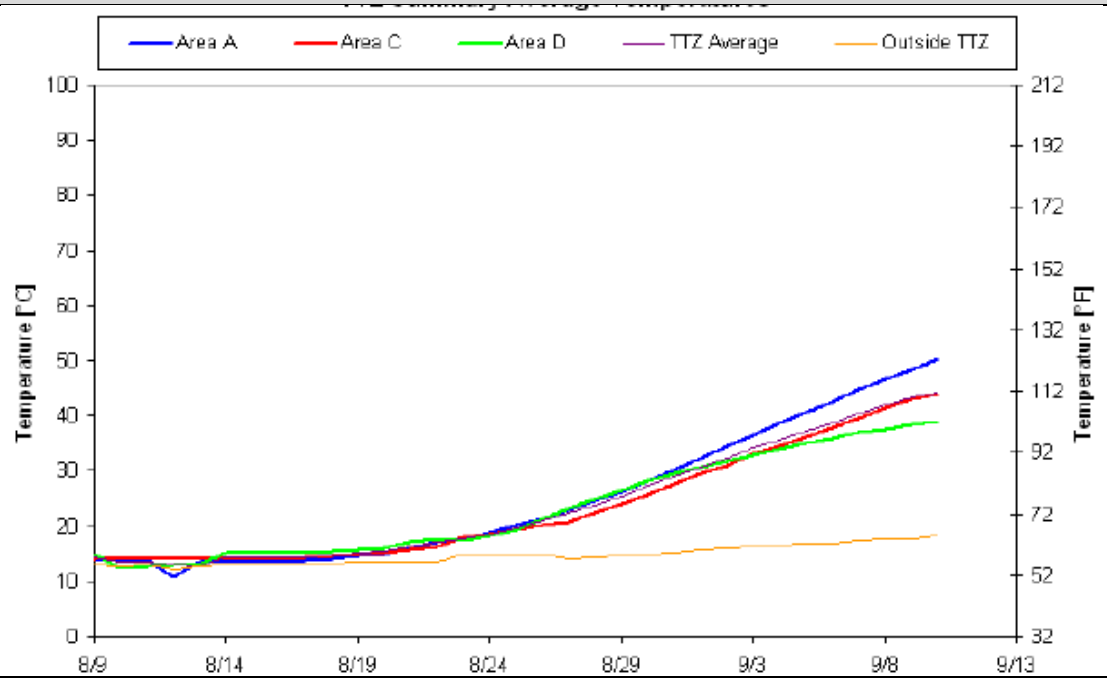
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



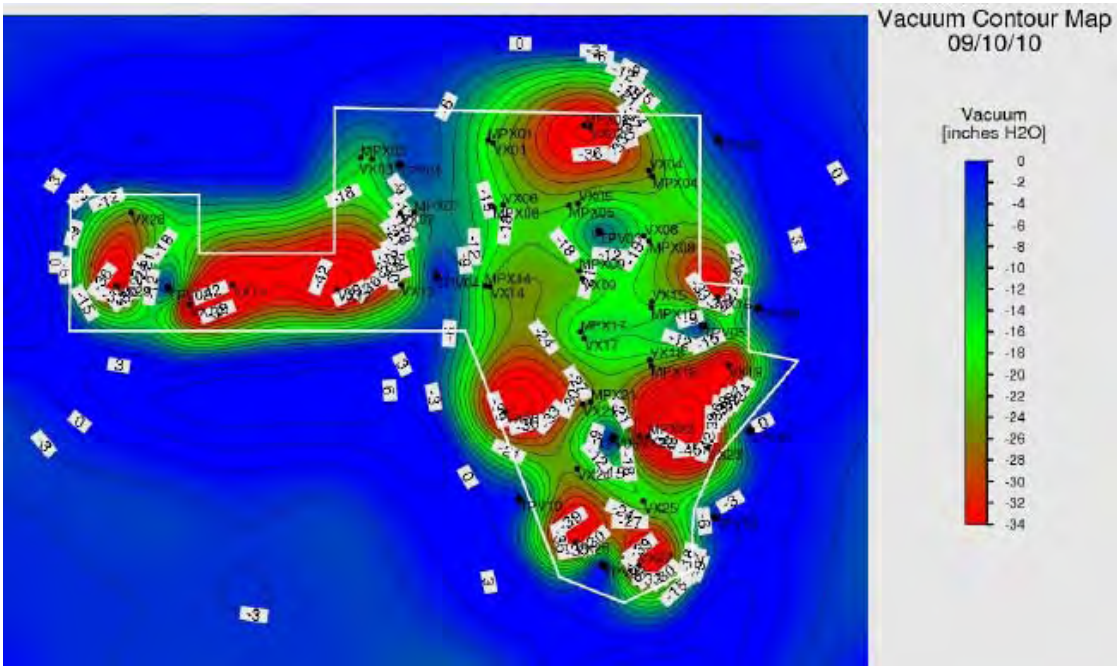
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



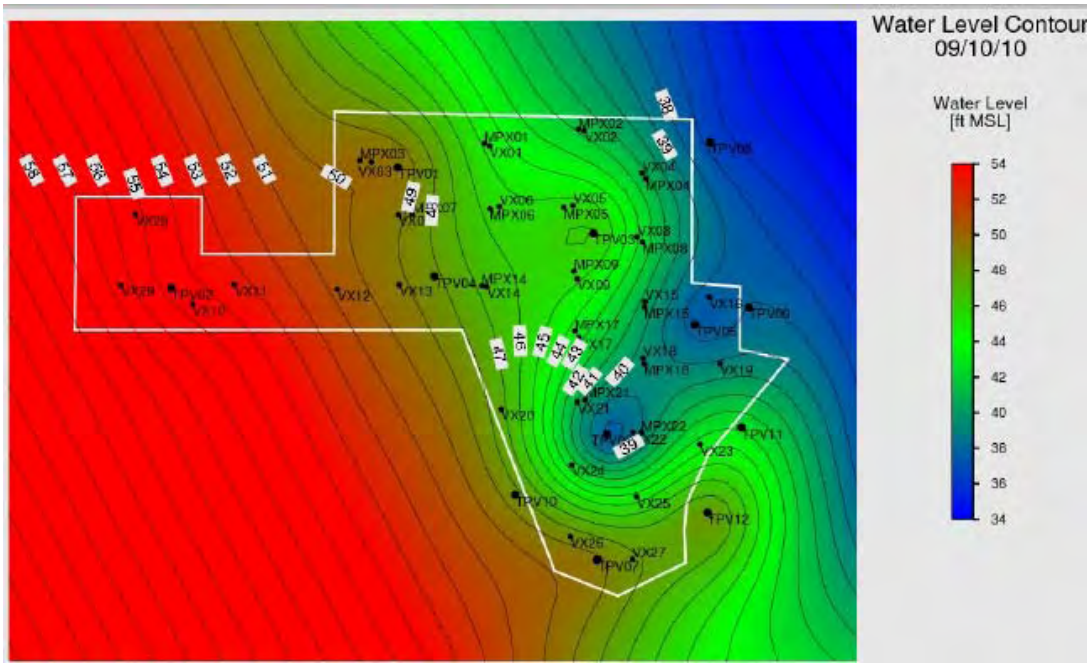
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** September 21, 2010

Operation and Maintenance Activities Performed from 9/11/2010 to 9/17/2010	**Status**
TerraTherm continued maintenance on the extraction system's duct heater, following the discovery of several small vapor leaks. In addition, a vapor leak was discovered and repaired at the second knockout skid. Repairs were made while the extraction system remained operational. These process equipment skids continue to be closely monitored for odors and leaks by TerraTherm operators and Nobis staff.	Complete
TerraTherm modified the temporary construction fence along the southern property line. These fence modifications were in response to the elevated voltage readings measured at the fence line on September 9, 2010. This fence modification was designed to electrically isolate sections of the fence by cutting it at 20-ft intervals and reattaching it to the wooden fence posts. At select locations, grounding cables were also installed.	Complete
TerraTherm completed the Week 6 routine system performance monitoring and sampling, which included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition, TerraTherm conducted a groundwater monitoring event, in which the ET-DSP system was temporarily shut down for the intrusive activities. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
The project team has completed its evaluation of sound muffling options for the extraction system's blowers, in response to a noise complaint received from the resident at 115 Center Street. The recommendation includes a 24 feet long by 20 feet high sound absorbing barrier. Nobis is currently working with EPA, the Nobis procurement team, and TerraTherm to execute a subcontract modification.	On-going
The project team evaluated the subsurface response to the injection of GWTP effluent water, free of the water conditioning salts. Therefore, no saline water was injected during this monitoring period (9/11 to 9/17). Saline injections will begin again starting the week of 9/18.	On-going
Due to the ongoing injections of saline water, The Nobis team began to monitor concentrations of chlorides in the GWTP influent water. Chloride is measured in the combined influent (GWTP production wells & ISTT effluent) using a HACH chloride titration test kit. The results are summarized under the 'ISTT Operational Data' section of this report. Chloride levels observed to date do not pose a concern.	On-going

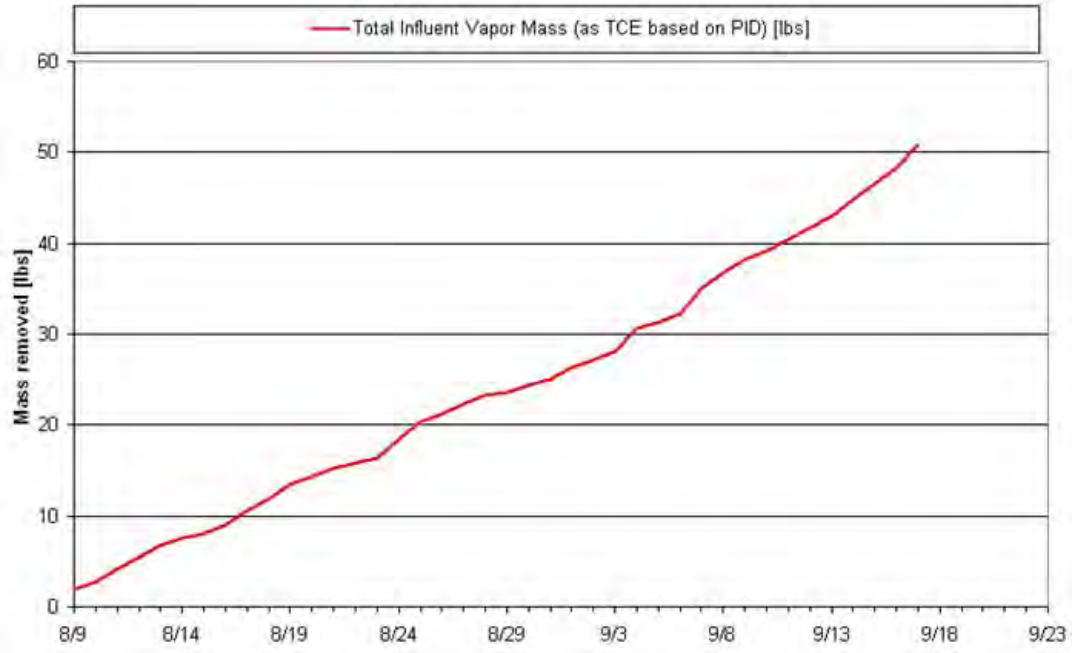
ISTT Operational Data – Collected by TerraTherm during the Period of 9/11/2010 to 9/17/2010		
ISTT Wellfield		
Temperature (°F): 105° to 133°	Volume Extracted/Injected (gal): 112,311 / 73,449	Groundwater Elevation (ft msl): ~37 to 54
Min. VOC Reading (ppm PID) 2.9 at VEW-2 (Area A)	Max. VOC Reading (ppm PID): 88.8 at VEW-21 (Area A)	Average VOCs (ppm PID): 28
ISTT Extraction System		
Average Air Flow (scfm): 465	Average Groundwater Extraction Rate (gpm): 11.1	Average Groundwater Injection Rate (gpm): 7.3
Volume of NAPL Recovered (gal): 3	Est. Mass Removed (lbs of TCE): 13 (Figure 1)	Est. Energy Used (kWh): 187,120 (Figure 2)
GAC Influent (ppm-PID): 17	GAC Effluent (ppm-PID): <1	Removal Efficiency (%): > 95%
GWTP (Collected by the Nobis team)		
Chloride (ppm): 113	Temperature (°F): 68	pH (pH units): 6.4

Status of Performance Metrics	
Temperature (See Figure 3): A change of approx. 67° F has been observed since the heat injections begun.	Pneumatic Control (See Figure 4): The vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The extraction system continues to maintain hydraulic control within Treatment Zone A.	Clean Up Goals: Clean Up Goals have not been met. Baseline data collected prior to ISTT start up indicates contaminant concentrations are above the current Clean Up Goals.

Optimization Activities for the Following Week:
ISTT Extraction System – Continue operation of the extraction system while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.
ET-DSP System – Continue to enhance soil conductivity within the vadose zone with saline water injection.
GWTP – The Nobis team will continue to monitor influent GWTP VOC and chloride concentrations while optimizing the operation of the GWTP (e.g. the ultra violet oxidation reactors).
Performance Monitoring –TerraTherm will continue weekly routine process performance sampling, which includes samples collected from the vapor and liquid process equipment. In addition, Nobis will perform an ambient air monitoring event. All samples will be processed, handled, and shipped by Nobis.

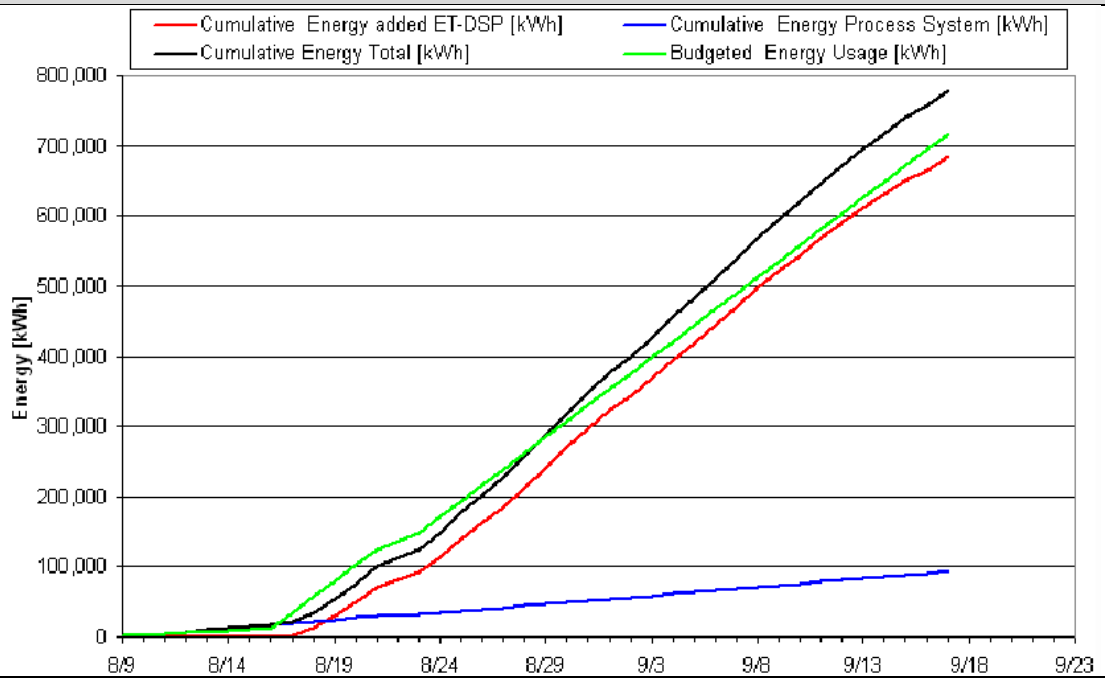
Analytical Laboratory Data Received:
Process Liquid: No new data available for this reporting period.
Process Vapor: Data was received for process vapor samples collected on August 18 and 24, 2010 (all data refers to the sampling events in this order). TCE (at concentrations of 420 and 800 ppbv) and cis-1,2-DCE (at concentrations of 110 and 130 ppbv) were detected in the influent samples. The total VOC concentrations were 621 and 1,056 ppbv. TCE was detected in the effluent samples at a non-detect level and 0.18 ppbv. Cis-1,2-DCE was not detected in either of the samples. Total VOC concentrations were 6.7 and 71 ppbv. The VOC removal efficiencies were calculated to be approximately 99% and 93% (the contract removal efficiency is 95%). The project team will evaluate the need for a carbon change out based on subsequent data deliveries and field readings.
Extraction Wells: No new data available for this reporting period.
Groundwater: No new data available for this reporting period.
Ambient Air: Data was received for ambient air samples collected on August 26, 2010. TCE was detected at a concentration of 0.12 ppbv at the upgradient location. TCE was detected at the downgradient location at a concentration of 0.16 ppbv, slightly above the upgradient sample. TCE concentrations at both the upgradient and downgradient locations are slightly higher than the MassDEP Allowable Ambient Limit (annual average) of 0.11 ppbv, but well below the Threshold Effects Exposure Limit (24-hour average) of 6.8 ppbv.
Next Project Status Meeting: Thursday, September 23th at 12:30 pm. Several MassDEP and Groveland Water Department visitors will be touring the ISTT and GWTP operations beginning at 11 am.
Next Project Status Conference Call: Thursday, October 7th at 12:30 pm

Figure 1, Mass Removal Estimate:



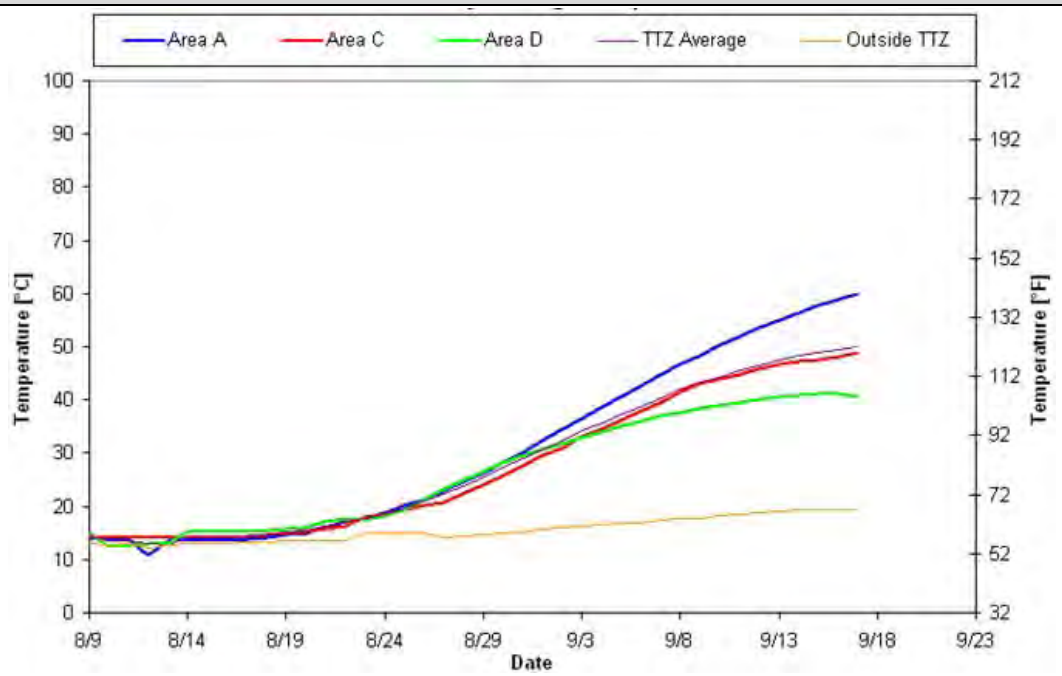
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



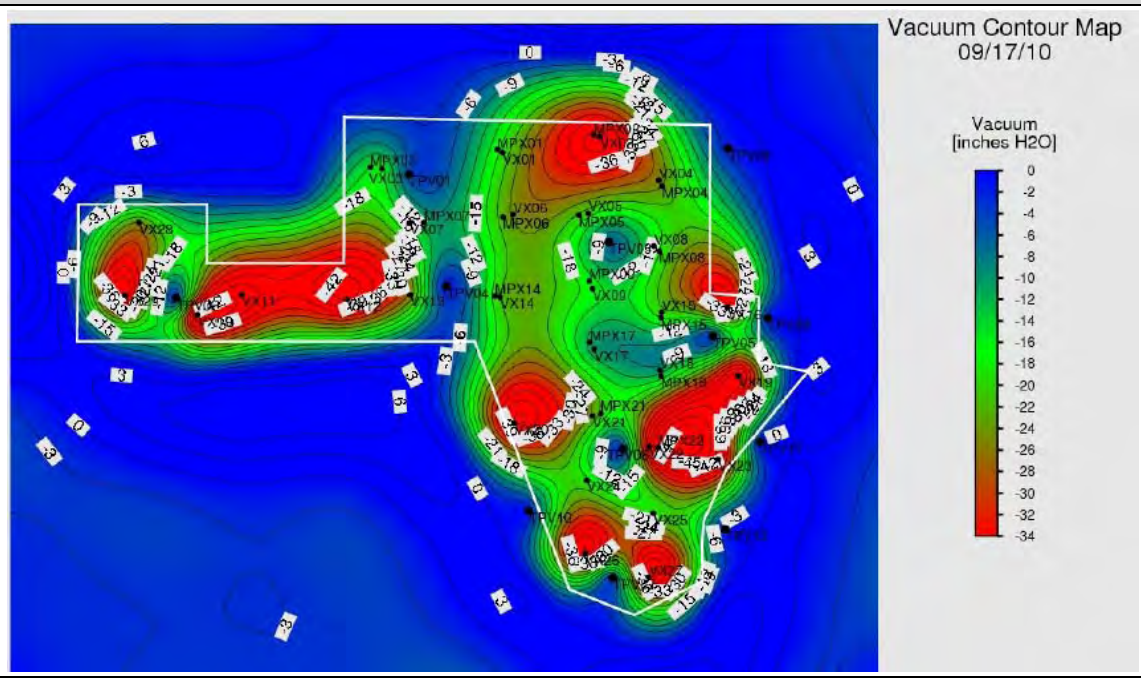
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



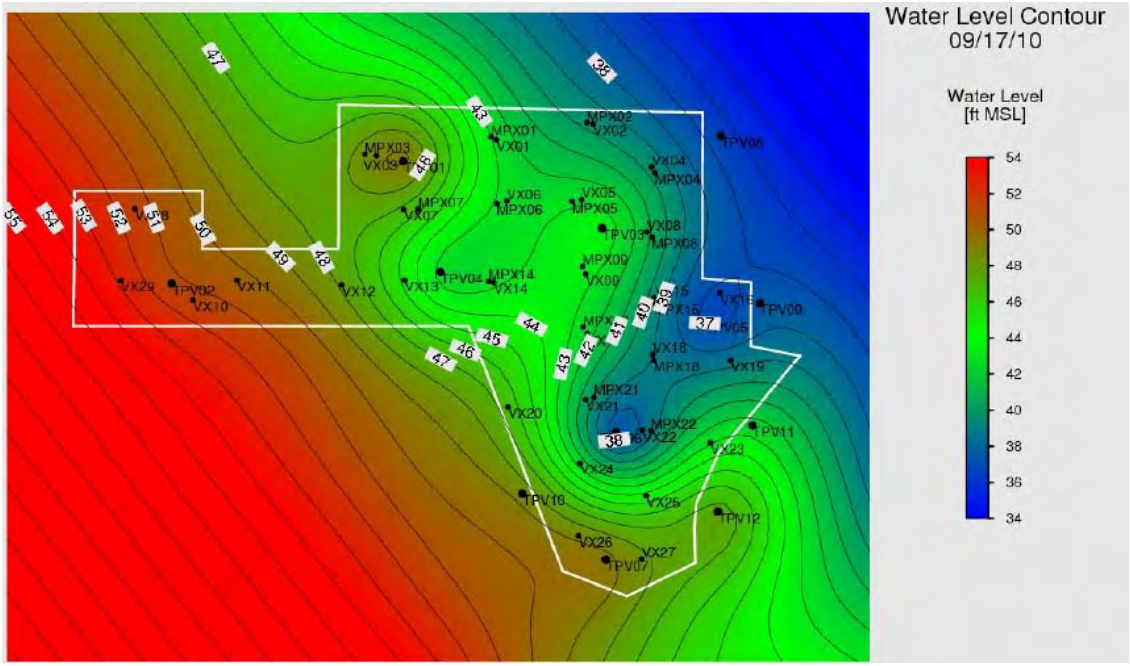
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** September 28, 2010

Operation and Maintenance Activities Performed from 9/18/2010 to 9/24/2010	**Status**
TerraTherm completed the Week 7 routine system performance monitoring and sampling, which included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
TerraTherm replaced the pump in Extraction Well MPE-06.	Complete
The project team continues to monitor and evaluate the carbon efficiency at the Site. Recent field photo-ionization detector readings show a slight increase of total volatile organic compounds at the midfluent carbon sampling location. Nobis recommends the collection of influent, midfluent, and effluent samples for laboratory analysis as part of Week 8 routine system performance monitoring. Nobis will coordinate with OEME and request an expedited turn around for these samples.	On-going
The project team has completed its evaluation of sound muffling options for the extraction system's blowers, in response to a noise complaint received from the resident at 115 Center Street. The recommendation includes a 24 feet long by 20 feet high, sound absorbing barrier. Nobis is currently working with TerraTherm to execute a subcontract modification. The installation of the sound-absorbing barrier is tentatively scheduled for October 7th and 8th.	On-going
TerraTherm continues to enhance soil conductivity by introducing water conditioning salts to the injection water at targeted shallow electrodes. On September 21, 23, and 24, a daily total of approximately 80 pounds of water conditioning salt was injected into the targeted electrodes. This activity may continue throughout the operation of the ISTT system.	On-going
The Nobis team continues to monitor concentrations of chlorides, along with other water quality parameters (such as pH and temperature) and volatile organic compounds, in the GWTP influent water. Samples are collected at the combined influent (GWTP production wells & ISTT effluent). The water quality parameters observed during this monitoring period do not pose a concern. The GWTP continues to treat the volatile organic compounds using two ultraviolet reactors.	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 9/18/2010 to 9/24/2010		
ISTT Wellfield		
Temperature (°F): 110° to 147°	Volume Extracted/Injected (gal): 107,837 / 87,139	Groundwater Elevation (ft msl): ~37 to 54
Min. VOC Reading (ppm PID) 6.2 at VEW-23 (Area C)	Max. VOC Reading (ppm PID): 139 at VEW-21 (Area A)	Average VOCs (ppm PID): 40
ISTT Extraction System		
Average Air Flow (scfm): 469	Average Groundwater Extraction Rate (gpm): 10.7	Average Groundwater Injection Rate (gpm): 8.6
Volume of NAPL Recovered (gal): 15	Est. Mass Removed (lbs of TCE): 55 (Figure 1)	Est. Energy Used (kWh): 187,120 (Figure 2)
GAC Influent (ppm-PID): 64	GAC Effluent (ppm-PID): 0	Removal Efficiency (%): > 95%
GWTP (Collected by the Nobis team)		
Chloride (ppm): 107	Temperature (°F): 68	pH (pH units): 6.7

Status of Performance Metrics	
Temperature (See Figure 3): A change of approx. 76° F has been observed since the heat injections began.	Pneumatic Control (See Figure 4): The vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The extraction system continues to maintain hydraulic control within Treatment Zone A.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.

Optimization Activities for the Following Week:

ISTT Extraction System – Continue operation of the extraction system while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation. Continue to monitor the carbon efficiency. An additional vapor sample will be collected at the effluent of the lead vessel and analyzed by the OEME fixed lab to evaluate the carbon efficiency of this vessel.

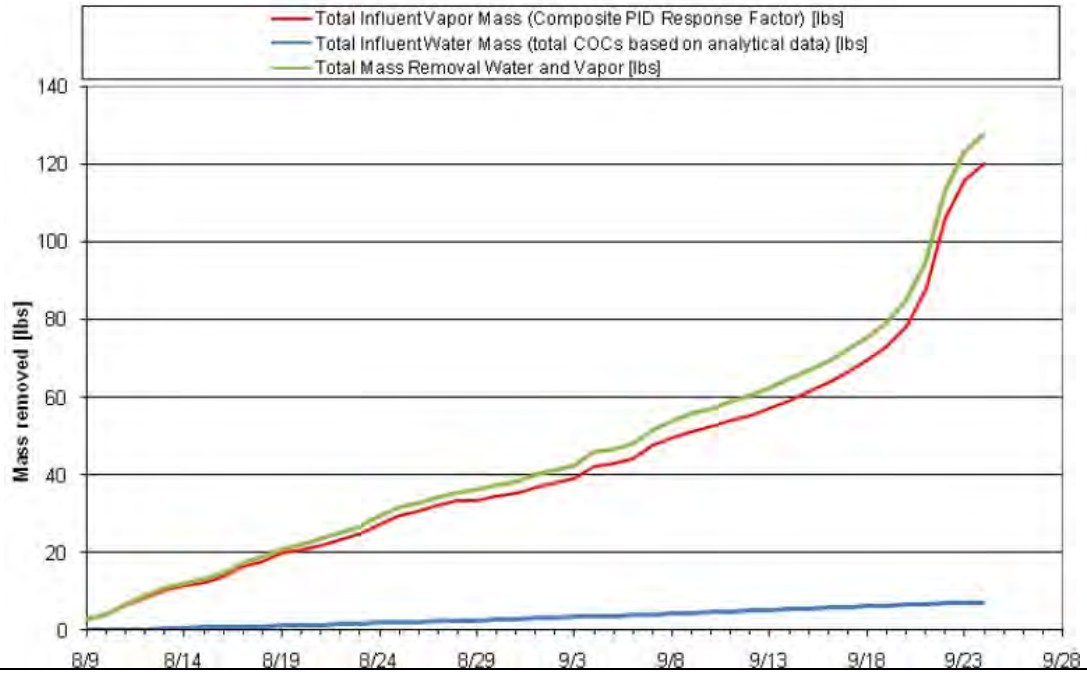
ET-DSP System – McMillan-McGee will be onsite to reconfigure electrodes E-26 and E-29. In addition, McMillan-McGee will install circuit boards to two of the water circulation units at the Site. The circuit boards will fully automate the units, allowing for McMillan-McGee staff to remotely control the flow of injection water to individual electrodes. Continue to enhance soil conductivity within the vadose zone with saline water injection.

GWTP – The Nobis team will continues to monitor influent GWTP VOC and chloride concentrations while optimizing the operation of the GWTP (e.g. the ultra violet oxidation reactors).

Performance Monitoring – TerraTherm will continue weekly routine process performance sampling, which includes samples collected from the vapor (influent, midfluent, and effluent) and liquid process equipment. The process vapor samples will be submitted for expedited turn around in order to assist with the lead vessel's carbon efficiency evaluation. In addition, groundwater and ambient air monitoring events are scheduled for September 27th and September 30th, respectively. All samples will be processed, handled, and shipped by Nobis.

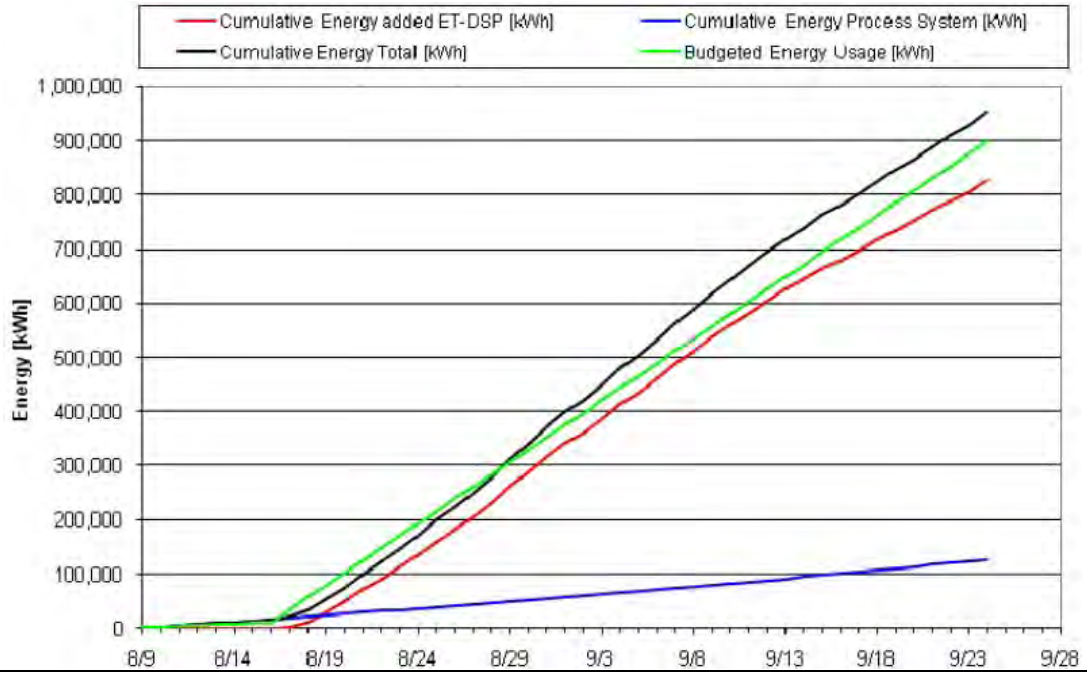
Analytical Laboratory Data Received:
Process Liquid: Data was received for the process water sample (ISTT process equipment effluent, prior to discharge to the GWTP) collected on September 8, 2010. TCE was detected at a concentration of 1,500 ug/L. Cis-1,2-DCE was not detected in this sample.
Process Vapor: Data was received for process vapor samples collected on August 31 and September 8, 2010 (all data refers to the sampling events in this order). TCE (at concentrations of 1,200 and 3,300 ppbv) and cis-1,2-DCE (at concentrations of 140 and 220 ppbv) were detected in the influent samples. The total VOC concentrations were 1,450 and 3,859 ppbv. TCE and cis-1,2-DCE were not detected in the effluent samples. Total VOC concentrations were 26 and 56 ppbv. The VOC removal efficiencies were calculated to be approximately 98% and 99%, both above the contract removal efficiency of 95%.
Extraction Wells: No new data available for this reporting period.
Groundwater: No new data available for this reporting period.
Ambient Air: Data was received for ambient air samples collected on September 8, 2010. TCE was detected at a concentration of 0.12 ppbv at the upgradient location and 0.45 ppbv at the downgradient location. The ambient air samples were collected during the period when the vapor extraction system duct heater was experiencing a vapor leak. As a result, the downgradient ambient air sample may contain higher than typical contaminant concentrations. The duct heater has undergone several maintenance events, in which this leak (and others) was repaired. TCE concentrations at both the upgradient and downgradient locations are slightly higher than the MassDEP Allowable Ambient Limit (annual average) of 0.11 ppbv, but below the Threshold Effects Exposure Limit (24-hour average) of 6.8 ppbv. All other VOCs detected were consistent with the compounds and concentrations detected during the Baseline ambient air monitoring event.
Next Project Status Conference Call: Thursday, October 7th at 12:30 pm
Next Project Status Meeting: Thursday, October 21st at 12:30 pm.

Figure 1, Mass Removal Estimate:



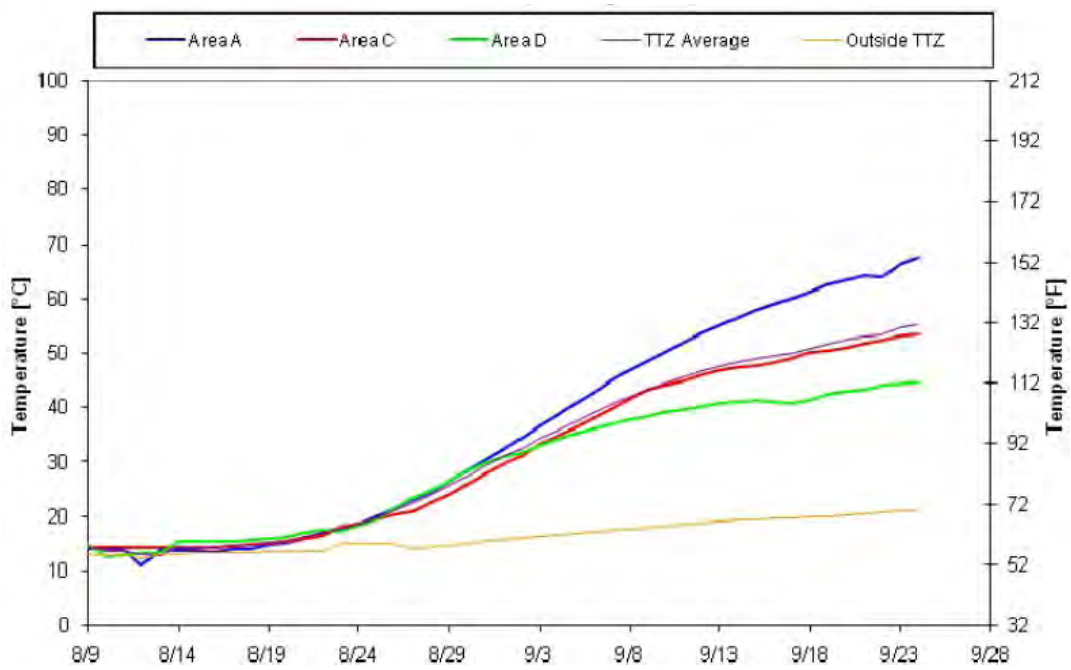
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



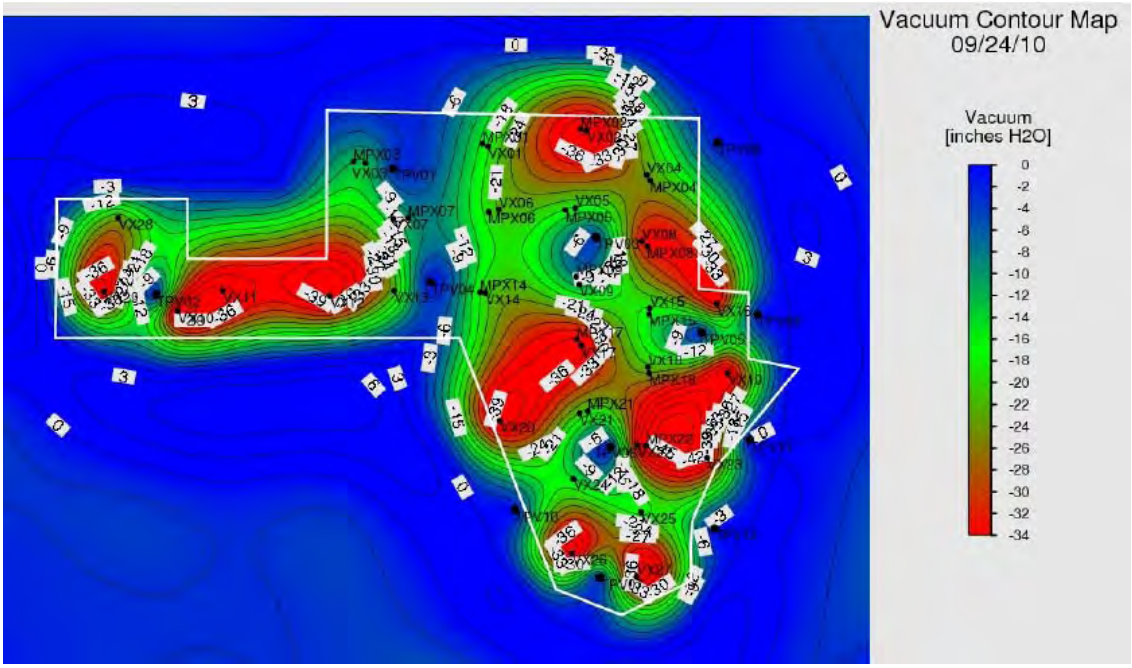
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



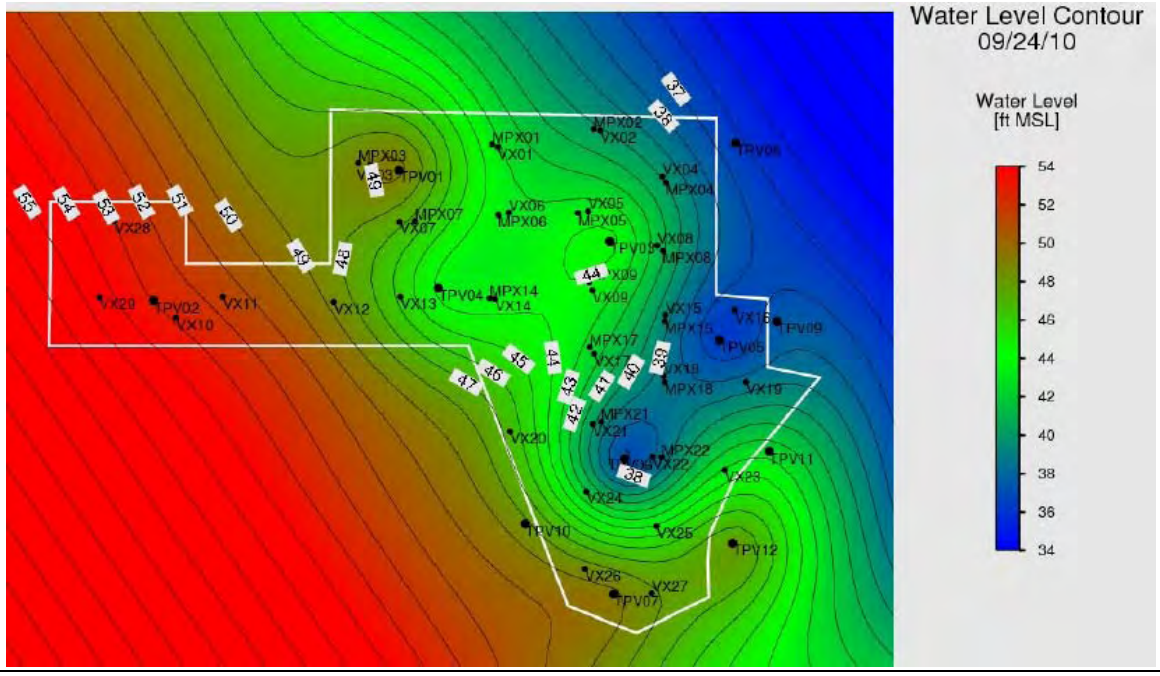
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** October 5, 2010

Operation and Maintenance Activities Performed from 9/25/2010 to 10/1/2010	**Status**
TerraTherm completed the Week 8 routine system performance monitoring and sampling, which included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition, ambient air and groundwater monitoring were conducted. Groundwater samples were collected from select groundwater monitoring and extraction wells as part of the bi-weekly groundwater monitoring event (the ET-DSP system was temporarily disabled for this event). Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
TerraTherm installed a replacement back-up transfer pump at the second knockout skid.	Complete
TerraTherm performed a soil vapor extraction well monitoring event, during which individual flow rates and total volatile organic compounds (VOCs) were monitored using field instruments. Individual flow rates were adjusted based on the observed VOC readings.	Complete
McMillan-McGee performed calibration checks on the digiPAMs, which were all found to be within 3-inches of the recorded values.	Complete
McMillan-McGee reconfigured the taps at the Power Distribution System (PDS) units and changed electrodes' positions at the PDS units. This task was performed in order to get the electrode power outputs within the designed power range. Electrodes were temporarily disabled on October 1st to allow for the reconfigurations and to confirm the reporting to the database.	Complete
McMillan-McGee installed circuit boards into the Water Circulation Units (WCUs). The circuit boards have fully automated the WCUs, allowing for McMillan-McGee to remotely control the flow of injection water to individual electrodes.	Complete
McMillan-McGee installed an additional grounding rod behind the PDS units.	Complete
Nobis coordinated with OEME for the expedited analysis of three process air samples in support of the ongoing carbon efficiency evaluation.	Complete
The project team continues to monitor and evaluate the carbon efficiency and usage. Recent field photo-ionization detector readings show an increase of total VOCs at the midfluent air sampling location between the carbon vessels. This data suggests that the carbon in the primary or lead vessel may be spent. It was concluded that laboratory analysis of a midfluent sample is needed, in addition to the standard weekly influent and effluent samples, to confirm the carbon status. Nobis arranged with OEME to perform expedited analysis of the three process vapor samples (influent, midfluent, and effluent) that will be collected on Monday, October 4th. The data will be used by the project team to evaluate the carbon status of the lead carbon vessel and better estimate the expected carbon usage for the duration of treatment.	On-going

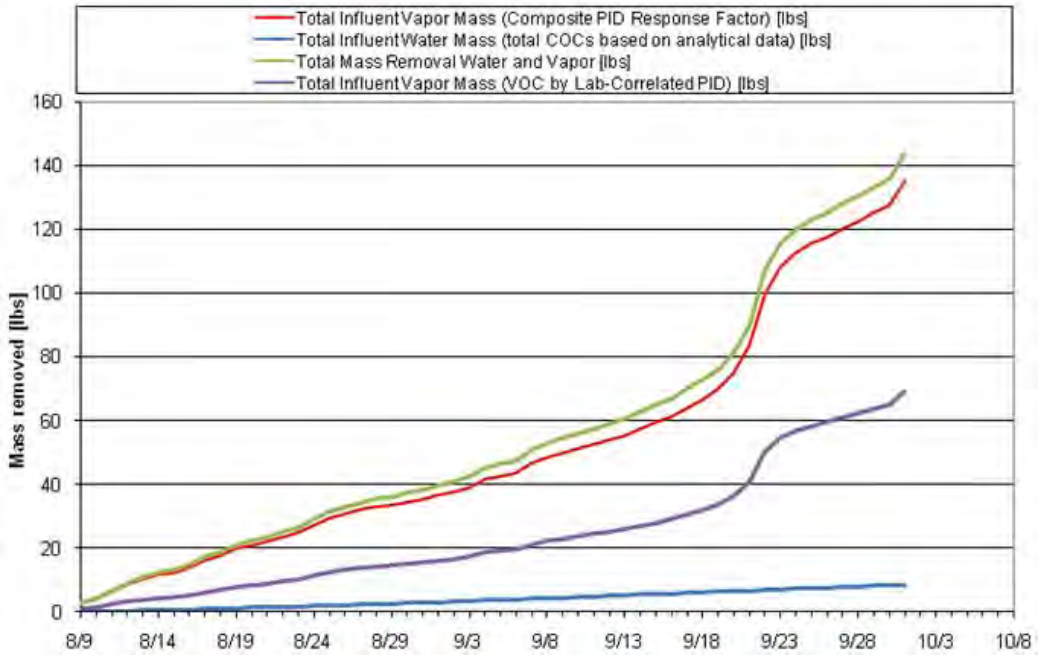
The project team is evaluating alternate methods for estimating the amount of VOC mass removed in attempt to determine the most accurate method for the site. Two methods have been employed to estimate the vapor mass removed. The first, which has been used for the duration of the treatment period, uses calculated composite PID response factors determined using the laboratory data received to date (through to 9/8) and published response factors for the individual constituents detected. The calculated response factors are applied to the daily PID readings as a step function for the periods represented by each sample set to estimate the mass removal. The second method uses a correlation between the influent PID readings and the laboratory data collected on the same day. The correlation factor, calculated using a linear regression, is applied to the daily PID readings to calculate the mass removal. There is a significant difference in the VOC removal estimates obtained using the two methods; however, it is not certain at this time which method is more representative of actual conditions. The project team will continue to evaluate both methods as more analytical data becomes available. Until a definitive method is selected, the mass removal estimates calculated using the first method will continue to be presented in the data summary tables, but the mass removal graph (Figure 1) will present both estimates.	On-going
TerraTherm continues to enhance soil conductivity by introducing water conditioning salts to the injection water at targeted shallow electrodes with currents less than 5 kW. On October 1st, approximately 80 pounds of water conditioning salt was injected into the targeted electrodes. This activity may continue throughout the operation of the ISTT system.	On-going
Nobis and TerraTherm have finished a subcontract modification for the installation of a sound-absorbing barrier. The sound-absorbing barrier will be constructed in the vicinity of the extraction system's blowers, in response to a noise complaint received from the resident at 115 Center Street. Installation of the sound-absorbing barrier is scheduled to begin on October 6th.	On-going
The Nobis team continues to monitor concentrations of chlorides, along with other water quality parameters (such as pH and temperature) and VOCs, in the GWTP influent water. Samples are collected at the combined influent (GWTP production wells & ISTT effluent). The water quality parameters observed during this monitoring period do not pose a concern. The GWTP continues to treat the VOCs using two ultraviolet reactors.	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 9/25/2010 to 10/1/2010		
ISTT Wellfield		
Temperature (°F): 115° to 160°	Volume Extracted/Injected (gal): 105,281 / 85,938	Groundwater Elevation (ft msl): ~36 to 53
Min. VOC Reading (ppm PID) 5.3 at VEW-27 (Area C)	Max. VOC Reading (ppm PID): 268 at VEW-15 (Area A)	Average VOCs (ppm PID): 53
ISTT Extraction System		
Average Air Flow (scfm): 446	Average Groundwater Extraction Rate (gpm): 10.4	Average Groundwater Injection Rate (gpm): 9
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 23 (Figure 1)	Est. Energy Used (kWh): 156,944 (Figure 2)

GAC Influent (ppm-PID): 31	GAC Effluent (ppm-PID): 1	Removal Efficiency (%): > 95%
GWTP (Collected by the Nobis team)		
Chloride (ppm): 93	Temperature (°F): 69	pH (pH units): 6.5

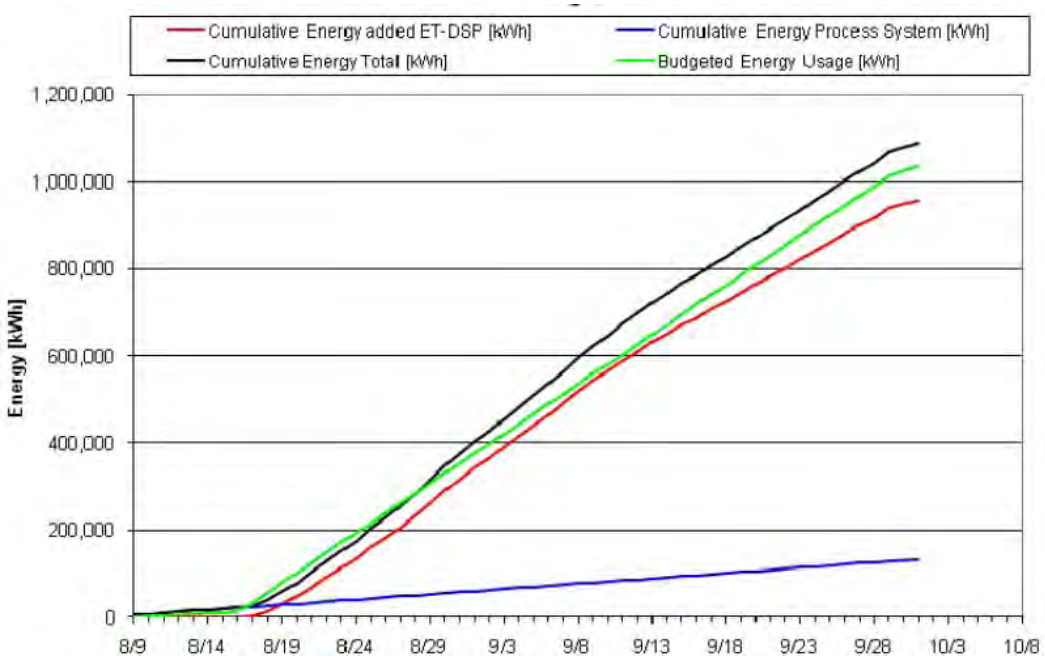
Status of Performance Metrics	
Temperature (See Figure 3): A change of approx. 84° F has been observed since the heat injections began.	Pneumatic Control (See Figure 4): The vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The extraction system continues to maintain hydraulic control within Treatment Zone A.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Optimization Activities for the Following Week:	
ISTT Extraction System – Continue operation of the extraction system while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation. Continue to monitor the carbon efficiency. TerraTherm is prepared to perform a carbon changeout when necessary. In addition, construction of the sound-absorbing barrier will begin.	
ET-DSP System – Continue to enhance soil conductivity within the vadose zone with saline water injection.	
GWTP – The Nobis team will continues to monitor influent GWTP VOC and chloride concentrations while optimizing the operation of the GWTP (e.g. the ultra violet oxidation reactors).	
Performance Monitoring – TerraTherm will continue weekly routine process performance monitoring and sampling, which includes samples collected from the vapor (influent, midfluent, and effluent) and liquid process equipment. As previously described, the process vapor samples will be submitted for expedited turn around in order to assist with the lead vessel's carbon efficiency evaluation. All samples will be processed, handled, and shipped by Nobis.	
Analytical Laboratory Data Received:	
Process Liquid: Organic data was received for the process water samples (ISTT process equipment effluent, prior to discharge to the GWTP) collected on September 16 and 22, 2010. TCE was detected at concentrations of 1,400 ug/L and 740 ug/L, respectively. Cis-1,2-DCE was not detected in either of these samples. In addition, inorganic data was received for the process water sample collected on September 8, 2010. The concentrations of metals observed in the process water sample were well below the GWTP discharge limits, with the exception of lead. Lead was detected at a concentration of 15.6 ug/L, which is higher than the average monthly limit of 1.3 ug/L but lower than the daily maximum of 34 ug/L. Lead was detected at a trace concentration (0.08 ug/L) from the sample collected at the GWTP effluent on September 8, 2010.	
Process Vapor: No new data available for this reporting period.	
Extraction Wells: No new data available for this reporting period.	
Groundwater: No new data available for this reporting period.	
Ambient Air: No new data available for this reporting period.	
Next Project Status Conference Call: Thursday, October 7th at 12:30 pm	
Next Project Status Meeting: Thursday, October 21st at 12:30 pm	

Figure 1, Mass Removal Estimate:



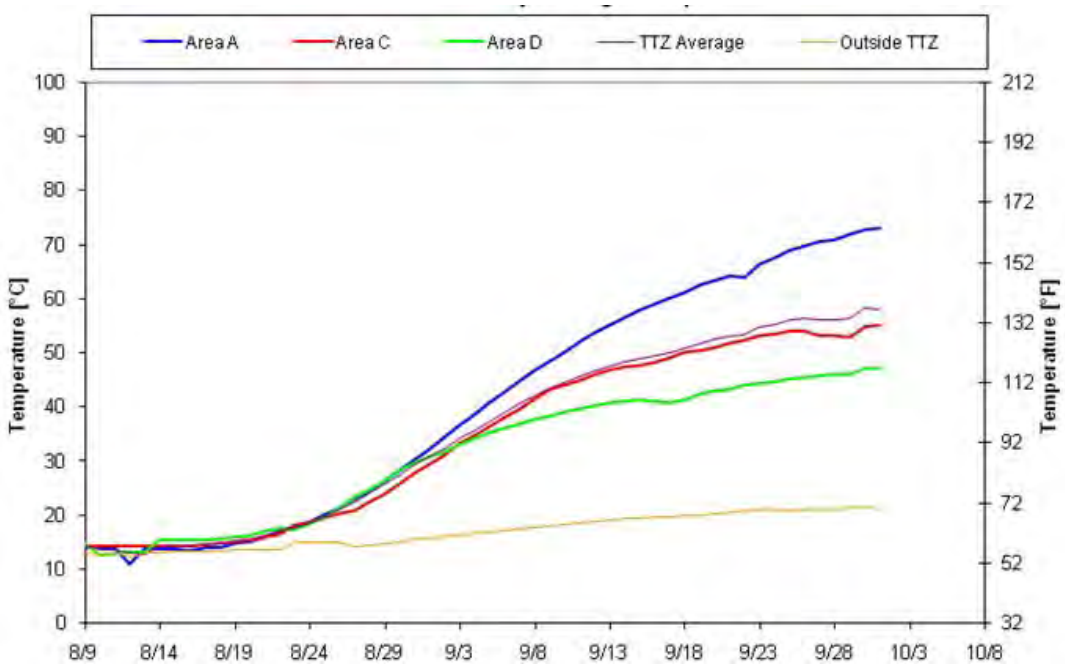
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



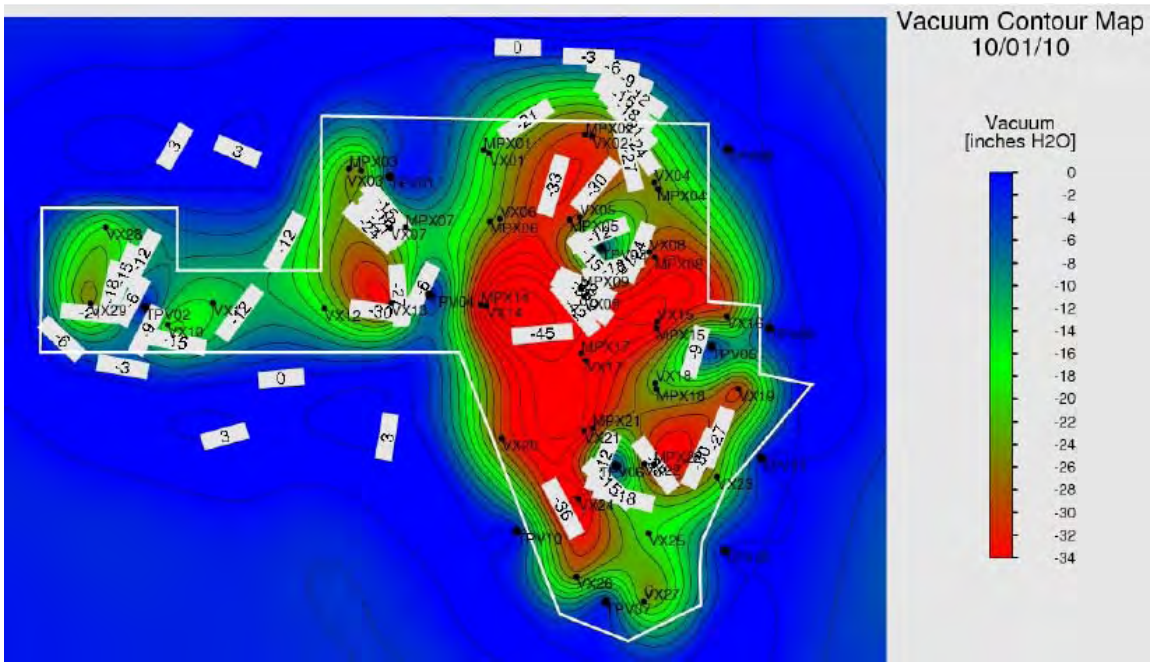
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



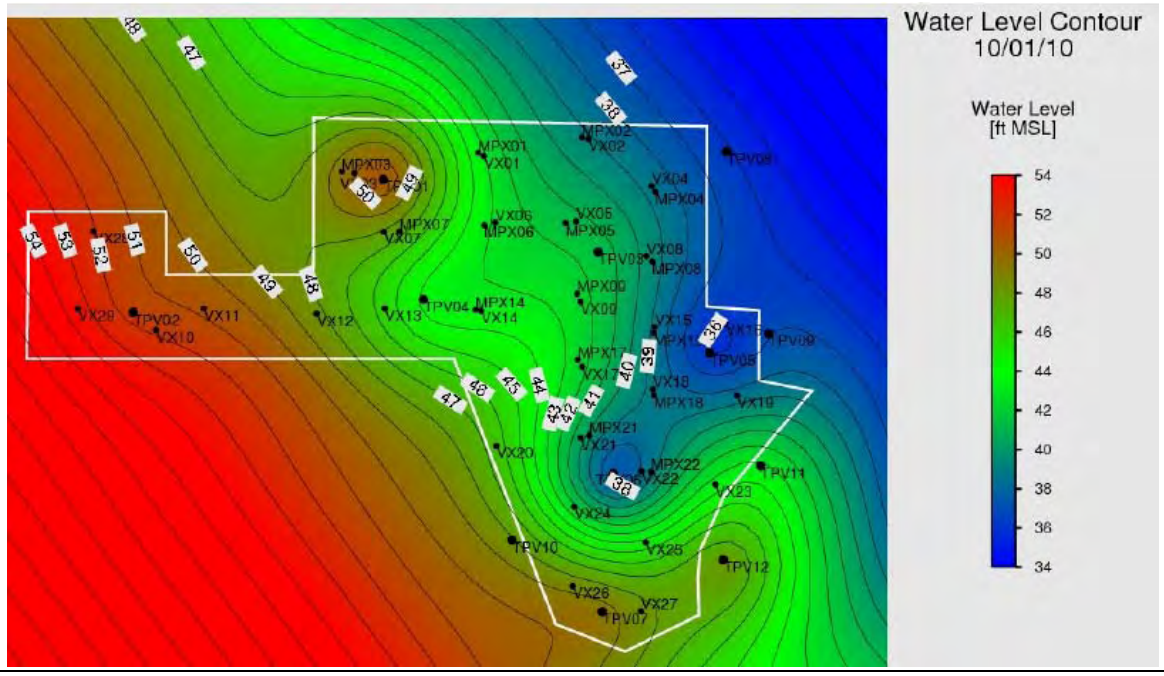
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** October 12, 2010

Operation and Maintenance Activities Performed from 10/2/2010 to 10/8/2010	**Status**
TerraTherm completed the Week 9 routine system performance monitoring and sampling, which included collection of samples for analysis and/or total volatile organic compound (VOC) screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) Influent, midfluent, and effluent samples vapor samples were collected for expedited laboratory analysis to assist with the carbon efficiency evaluation. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
TerraTherm performed multiphase extraction (MPE) well pump troubleshooting and maintenance on MPE-01, -06, -07, and -15. Pumps in MPE-01 and -06 were replaced with back up pumps. The electrodes were manually shut down (for approximately 2 hours) for this maintenance event.	Complete
TerraTherm installed a sound-absorbing barrier in the vicinity of the extraction system's blowers. This sound-absorbing barrier was designed in response to a noise complaint received from the resident at 115 Center Street. The location of the sound-absorbing barrier is such that noise will be muffled in the direction of the 115 Center Street residence.	Complete
TerraTherm troubleshot and replaced three digiTAMs at sensor well locations: T-08, T-15, and TPV-12	Complete
TerraTherm installed a drum at one of the water circulation units to assist with the delivery of water conditioning salt to injection water.	Complete
The project team continued to monitor and evaluate the vapor carbon efficiency. Field photo-ionization detector readings show limited removal of total VOCs from the first carbon vessel. Influent, midfluent, and effluent vapor samples were collected on October 4th and submitted for expedited laboratory analysis. Preliminary results show trichloroethene (TCE) detected in the influent at a concentration of 1,100 ppbv with the midfluent at a concentration of 5,400 ppbv. These data suggest that the carbon in the primary or lead vessel is spent and TCE is breaking through to the secondary vessel. As a result, on October 8th, the primary carbon vessel was taken offline, the secondary carbon vessel was moved into the primary position, and a third vessel was added in the secondary position. It should be noted that the total VOC removal efficiency (through the original two carbon units) was calculated to be 97% based on the results from the October 4th samples, indicating that the removal efficiency did not drop below the requirement for 95% removal despite the first vessel being spent.	Complete
McMillan-McGee investigated issues they were experiencing with their power distribution systems circuit boards. Their electrical engineer was onsite to perform the necessary maintenance and to confirm that all systems were operating as designed.	On-going

TerraTherm continues to enhance soil conductivity by introducing water conditioning salts to the injection water at targeted shallow electrodes with currents less than 5 kW. On October 6th and 8th, a daily total of approximately 80 pounds and 160 pounds, respectively, of water conditioning salt was injected into the targeted electrodes. This activity may continue throughout the operation of the ISTT system.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed. The purpose of this evaluation is to determine the most accurate method for the site. Two methods, a composite PID response factor method and a PID correlation factor method, have been employed to estimate the vapor mass removed. Both methods use the weekly laboratory data and the daily PID readings. The project team continues to evaluate both methods as more analytical data becomes available. Until a definitive method is selected, the mass removal estimates calculated using the first method (composite PID response factors) will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going
During this operational period, water injection rates within the shallow electrodes were increased to optimize the resistivity of the soil in this zone. This resulted in a temporary net water extraction of -26,167 gallons. Site hydraulic control has been maintained with a total of 651,810 gallons of water injected since system startup while a total of 815,315 gallons of water extracted, for a net extraction of 163,505 gallons. On October 8th, McMillan-McGee ceased injecting water into the lower portion of the shallow electrodes and focused injections into the uppermost portion to further balance the water extraction/injection rates. The purpose of this activity is to focus and facilitate more energy delivery to this zone while balancing the water injection and extraction rates. The project team continues to monitor Site hydraulic control, specifically the balance of water injection and extraction rates.	On-going
The Nobis team continues to monitor concentrations of chlorides, along with other water quality parameters (such as pH and temperature) and VOCs, in the GWTP influent water. Samples are collected at the combined influent (GWTP production wells & ISTT effluent). The water quality parameters observed during this monitoring period do not pose a concern. The GWTP continues to treat the VOCs using two ultraviolet reactors.	On-going

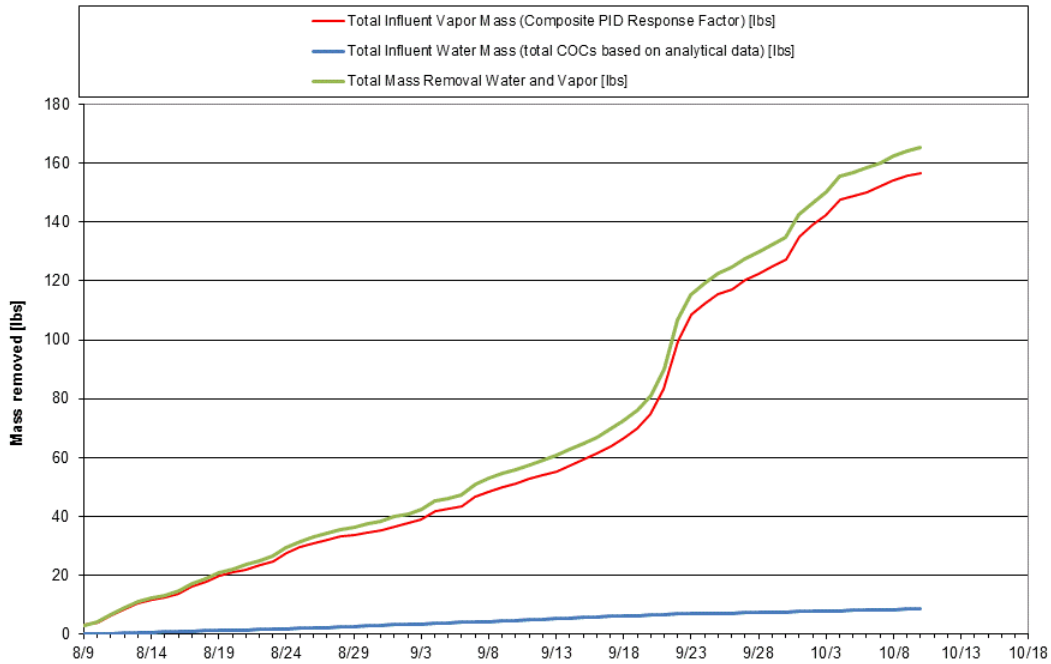
ISTT Operational Data – Collected by TerraTherm during the Period of 10/2/2010 to 10/8/2010		
ISTT Wellfield		
Temperature (°F): 122° to 168°	Volume Extracted/Injected (gal): 114,906 / 141,073	Groundwater Elevation (ft msl): ~39 to 54
Min. VOC Reading (ppm PID) 5.2 at VEW-2 (Area A)	Max. VOC Reading (ppm PID): 164.3 at VEW-15 (Area A)	Average VOCs (ppm PID): 53
ISTT Extraction System		
Average Air Flow (scfm): 469	Average Groundwater Extraction Rate (gpm): 11.4	Average Groundwater Injection Rate (gpm): 14
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 19.7 (Figure 1)	Est. Energy Used (kWh): 184,800 (Figure 2)
GAC Influent (ppm-PID): 25	GAC Effluent (ppm-PID): 1	Removal Efficiency (%): > 95%
GWTP (Collected by the Nobis team)		
Chloride (ppm): 108	Temperature (°F): 69	pH (pH units): 6.5

Status of Performance Metrics	
Temperature (See Figure 3): A change of approx. 91° F has been observed since the heat injections began.	Pneumatic Control (See Figure 4): The vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The extraction system continues to maintain hydraulic control within Treatment Zone A.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 163 lbs	Total NAPL Removed To Date: 18 gallons

Optimization Activities for the Following Week:
ISTT Extraction System – Continue operation of the extraction system while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation. Operational issues with the oil/water separator and impacts to the GWTP were identified on Tuesday, October 12th. The ISTT System was temporarily shut down to minimize impacts to the GWTP. Corrective actions are being evaluated and will be implemented as soon as possible (anticipated this week) and the system will be restarted.
ET-DSP System – The ET-DSP System will be temporarily shut down as a result of operational issues within the ISTT Extraction System impacting the GWTP operation. Once corrective actions are implemented, the project team will be notified and the system will be brought back online.
GWTP – Impacts from the ISTT Extraction System were identified on Tuesday, October 12th. The GWTP will undergo maintenance while remaining operational. The Nobis team will continue to monitor influent GWTP VOC and chloride concentrations while optimizing the operation of the GWTP (e.g. the ultra violet oxidation reactors).
Performance Monitoring – Routine process performance monitoring and sampling will not be performed while the system is temporarily shut down. Nobis will collect product samples for LNAPL characterization. In addition, Nobis will collect select aqueous samples in response to the recent ISTT

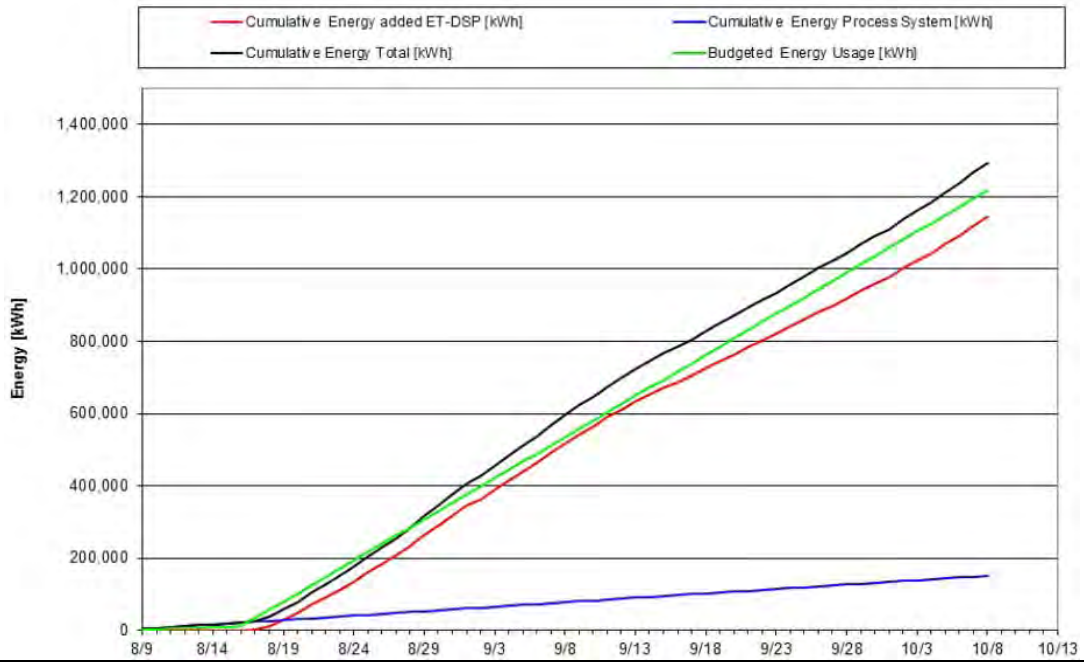
Extraction System operational issues. The purpose of this sampling event is to characterize any petroleum hydrocarbons that are being sent to the GWTP and to confirm their absence in the GWTP effluent. All samples will be processed, handled, and shipped by Nobis.
Analytical Laboratory Data Received:
Process Liquid: No new data available for this reporting period.
Process Vapor: No new data available for this reporting period.
Extraction Wells: No new data available for this reporting period.
Groundwater: No new data available for this reporting period.
Ambient Air: No new data available for this reporting period.
Next Project Status Meeting: Thursday, October 21st at 12:30 pm
Next Project Status Conference Call: Thursday, November 4th at 12:30 pm

Figure 1, Mass Removal Estimate:



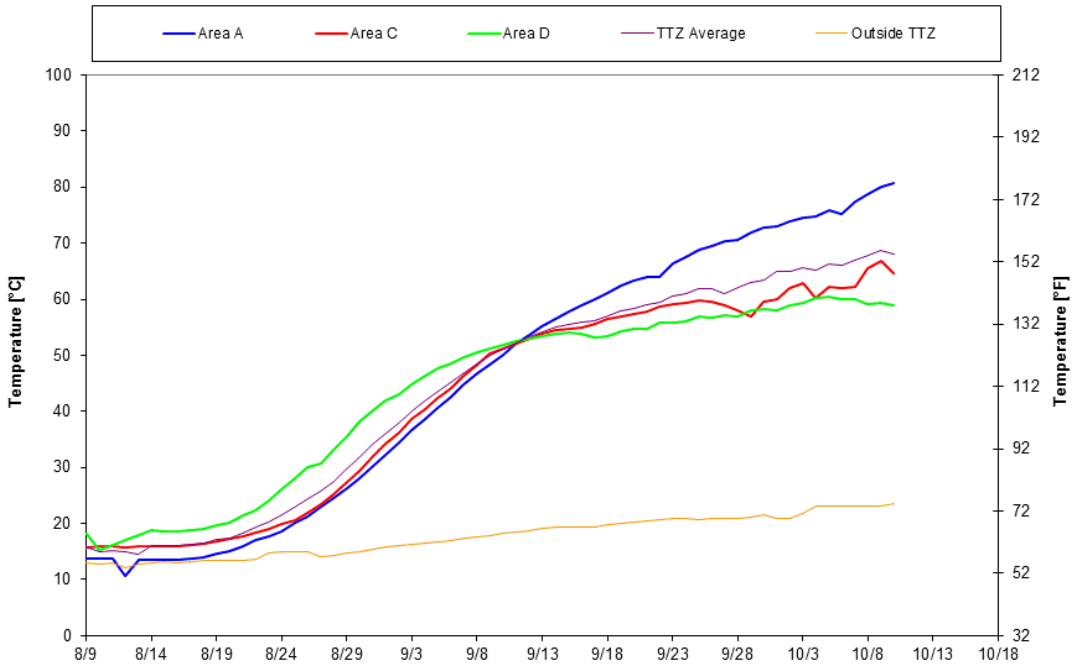
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



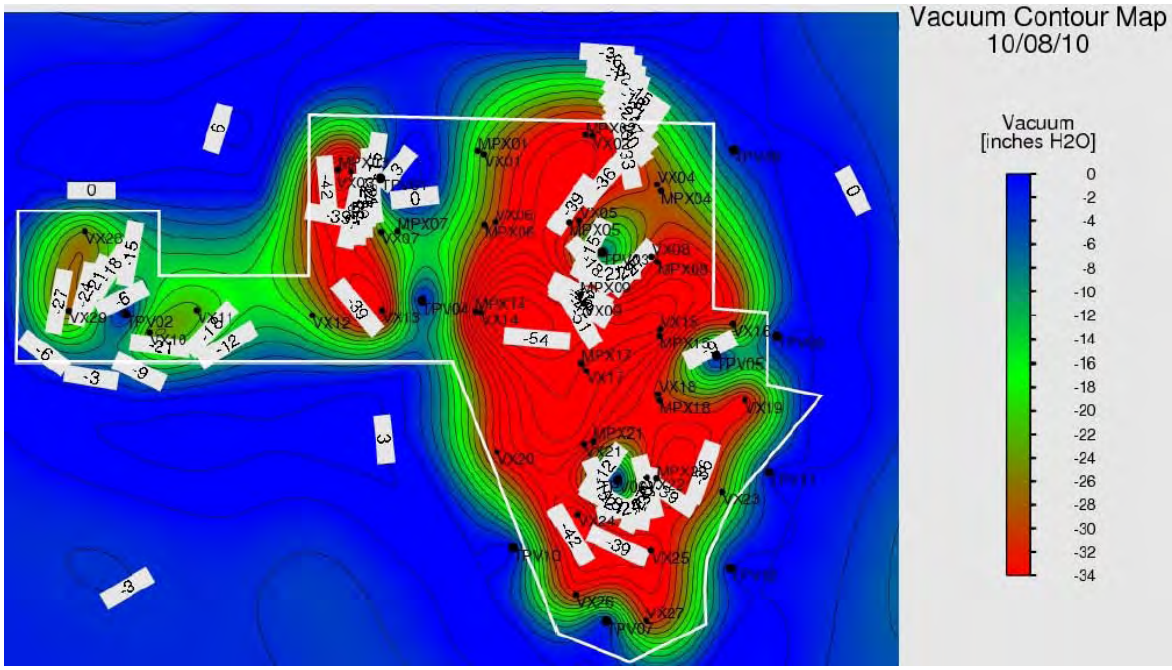
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



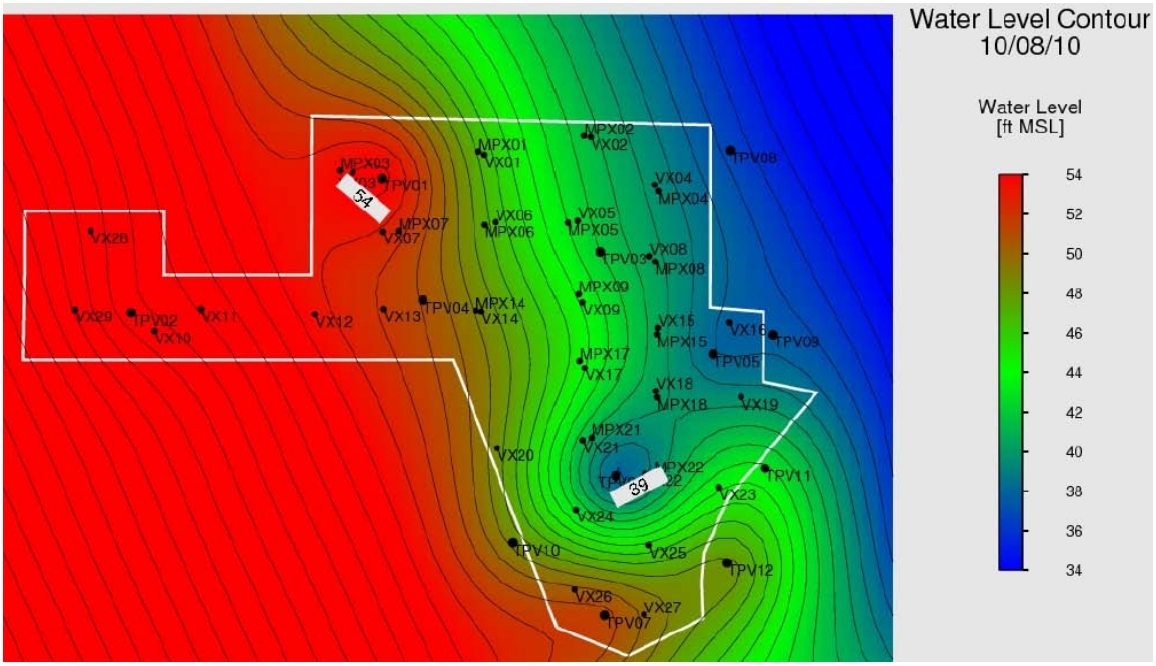
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Prepared By: Lauren Soós	**Date Prepared:** October 19, 2010

Operation and Maintenance Activities Performed from 10/9/2010 to 10/15/2010	**Status**
The ISTT liquid extraction and ET-DSP systems were shut down on Tuesday, October 12th, after operational issues were discovered with the liquid process treatment train. The OWS and associated treatment systems were not effectively separating the light non-aqueous phase liquid (LNAPL) from the hot groundwater being extracted from the ISTT treatment zone. The LNAPL was remaining in solution in the heated water stream and discharging to the OU1 GWTP. The LNAPL came out of solution after mixing with the rest of the flow in the GWTP. The presence of LNAPL in the GWTP impacted the treatment operations by coating and fouling the treatment equipment, and reducing the effectiveness of treatment. As a result, the project team shut down the ISTT liquid extraction (at 5:30 pm) and ET-DSP operations (at 7:00 pm) and stopped all fluid flow to the GWTP for treatment. While the ISTT liquid extraction and ET-DSP systems remain off, hydraulic control of the Site will not be maintained and the ISTT treatment zone will begin to cool. Therefore, it is imperative that a corrective action be identified and implemented quickly in order to restore hydraulic control of the ISTT treatment zone and prevent further cooling of the subsurface, which will require the use of additional energy to re-heat. The project team began working immediately after identification of the LANPL removal issue to design and implement changes to the process water treatment train to improve the effectiveness of LNAPL removal (see below for details).	Ongoing
In response to the LNAPL-related shutdown on October 12th, the ISTT vapor extraction system flow rate was reduced to approximately 350 scfm and kept running. This flowrate is intended to ensure pneumatic control within the ISTT treatment zone, but limit the generation of excess fluids from condensation of the extracted soil vapor. TerraTherm mobilized a 5,000-gallon weir tank to temporarily contain the condensate until discharge to the GWTP is permitted. The ISTT vapor extraction system will return to normal operation (at approximately 470 scfm) when the ISTT liquid extraction and ET-DSP systems are turned back on.	Complete
The project team has identified several corrective action options, which enhanced cooling of influent water prior to the OWS, increased retention and settling time prior to the OWS, increased retention time in the OWS, increased maintenance of the existing OWS, and carbon/clay filters to polish the water stream. The project team concluded that the ISTT liquid extraction system will need to be modified with enough flexibility to optimize the long-term ISTT operations and minimize impacts to the GWTP. The final corrective action includes the following modifications (and status) in sequential order: • Modifications to the existing liquid heat exchanger to cool influent water to a temperature of approximately 85°F (the temperature at which the LNAPL was observed to separate from the water). (ON-GOING) • Installation of a trough tank, before the OWS, to add retention time and decrease turbulence of the liquid traveling to the OWS. (ON-GOING) • Increased maintenance frequency of the existing OWS. (ON-GOING) • Installation of a second bag filter skid after the OWS with coalescing filter	On-going

bags to capture LNAPL that bypasses the OWS. (ON-GOING) • Installation of two polishing organo-clay filters after the bag filters to remove any remaining LNAPL that may make its way through the OWS and bag filters. (ONGOING) • Installation of a temporary 5,000-gallon weir tank to monitor the presence/absence of LNAPL in the water discharging from the process water treatment train. The weir tank will be demobilized from the Site only after it has been verified that the design changes were effective and that the discharge water is free of LNAPL and ready for discharge to the GWTP. (COMPLETE) These treatment train modifications are flexible and can be operated in line with each other or brought on line when needed. These modifications are being installed as part of the immediate response measures taken to bring the ISTT liquid extraction and ET-DSP systems back online as quickly as possible.	
Due to the shutdown of ISTT liquid extraction and ET-DSP systems on October 12th, routine system performance sampling (for Week 10) was not completed.	Complete
Nobis collected two LNAPL samples, from the OWS product drum and the GWTP clarifier. These samples were submitted for diesel range organics analysis, petroleum fingerprinting, specific gravity, and surfactant analyses. Nobis also collected two aqueous samples, from the ISTT effluent (influent to the GWTP) and the GWTP effluent. These samples were submitted for analysis of volatile and extractable petroleum hydrocarbons. Nobis managed and shipped all samples collected to the appropriate laboratory for analysis (by a DAS Laboratory).	Complete
TerraTherm replaced the pump in multiphase extraction (MPE) well MPE-07.	Complete
McMillan-McGee calibrated the digi-PAMs. In addition, McMillan-McGee performed limited testing on select electrodes.	Complete
TerraTherm performed a round of groundwater level measurements. 6-feet of LNAPL product was observed at sensor well location TPV-03. The LNAPL was removed (via a bailer) and drummed for disposal.	Complete
TerraTherm continued to enhance soil conductivity, while the ET-DSP system was operational, by introducing water conditioning salts to the injection water at targeted shallow electrodes with currents less than 5 kW. On October 9th and 10th, a daily total of approximately 80 pounds of water conditioning salt was injected into the targeted electrodes. This activity may continue throughout the operation of the ISTT system.	On-going
During this reporting period, while the ET-DSP system was operational, water injection rates within the shallow electrodes were increased to optimize the resistivity of the soil in this zone. This resulted in a temporary net water extraction of -8,088 gallons. Until the ISTT groundwater extraction system was shut down, site hydraulic control had been maintained with a total of 734,609 gallons of water injected since system startup while a total of 890,026 gallons of water extracted, for a net extraction of 155,417 gallons. The project team will continue to monitor Site hydraulic control, specifically the balance of water injection and extraction rates, when the system is restarted.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed. The purpose of this evaluation is to determine the most accurate method for the site. Two methods, a composite PID response factor method and a PID correlation factor method, have been employed to estimate the vapor mass	On-going

removed. Both methods use the weekly laboratory data and the daily PID readings. The project team continues to evaluate both methods as more analytical data becomes available. Until a definitive method is selected, the mass removal estimates calculated using the first method (composite PID response factors) will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	

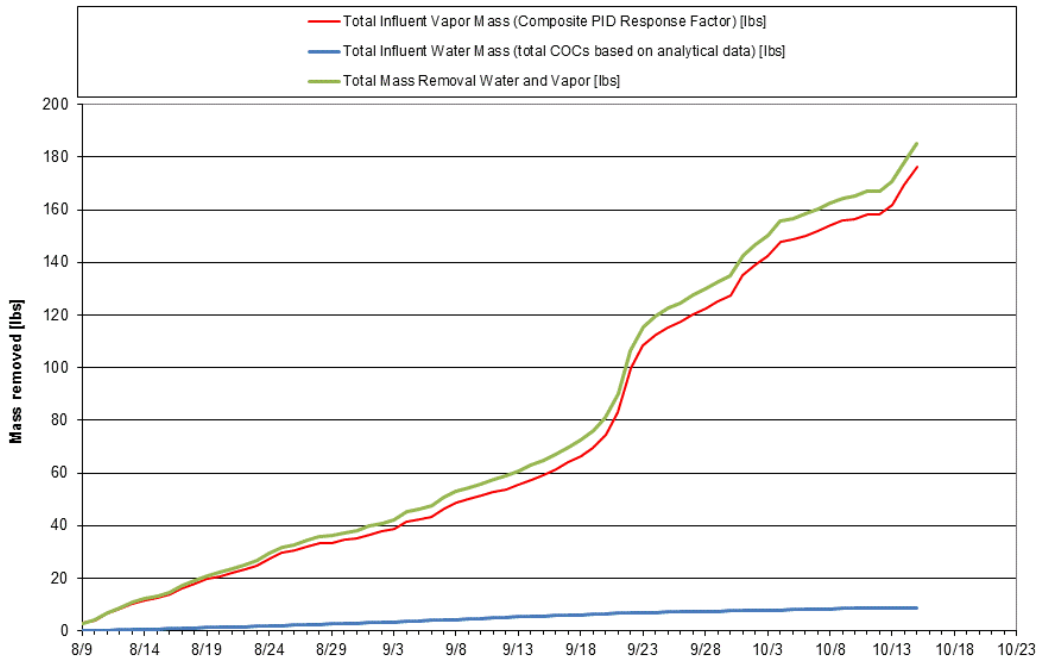
ISTT Operational Data – Collected by TerraTherm during the Period of 10/9/2010 to 10/15/2010		
ISTT Wellfield		
Temperature (°F): 136° to 178°	Volume Extracted/Injected (gal): 74,711 / 82,799	Groundwater Elevation (ft msl): ~38 to 52
Min. VOC Reading (ppm PID) No PID readings were collected.	Max. VOC Reading (ppm PID): No PID readings were collected.	Average VOCs (ppm PID): No PID readings were collected.
ISTT Extraction System		
Average Air Flow (scfm): 429	Average Groundwater Extraction Rate (gpm): 7.4	Average Groundwater Injection Rate (gpm): 8.2
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 22.5 (Figure 1)	Est. Energy Used (kWh): 132,640 (Figure 2)
GAC Influent (ppm-PID): 48	GAC Effluent (ppm-PID): <1	Removal Efficiency (%): > 95%

Status of Performance Metrics	
Temperature (See Figure 3): A change of approx. 105° F has been observed since the heat injections began.	Pneumatic Control (See Figure 4): The vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The liquid extraction system was temporarily shut down due to operational issues with the OWS. Hydraulic control will be re-established when the system is turned back on.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 185 lbs	Total NAPL Removed To Date: 18.4 gallons

Optimization Activities for the Following Week:
ISTT Extraction System – Operational issues with the OWS and impacts to the GWTP were identified on Tuesday, October 12th. The ISTT liquid extraction and ET-DSP systems were temporarily shut down to minimize impacts to the GWTP. Corrective actions will continue to be implemented. The ISTT liquid extraction and ET-DSP systems will be restarted as soon as corrective actions are in place, expected for early next week.
ET-DSP System – The ET-DSP System will be temporarily shut down as a result of operational issues within the ISTT liquid extraction system which impacted operations within GWTP. Once corrective actions are implemented, the project team will be notified and the system will be brought back online.
GWTP – Impacts from the ISTT Extraction System were identified on Tuesday, October 12th. The GWTP will continue to undergo maintenance while remaining operational (for treatment of remaining OU1 extraction well flow). The ISTT system and GWTP will be re-integrated once the corrective actions are in place, expected for early next week.

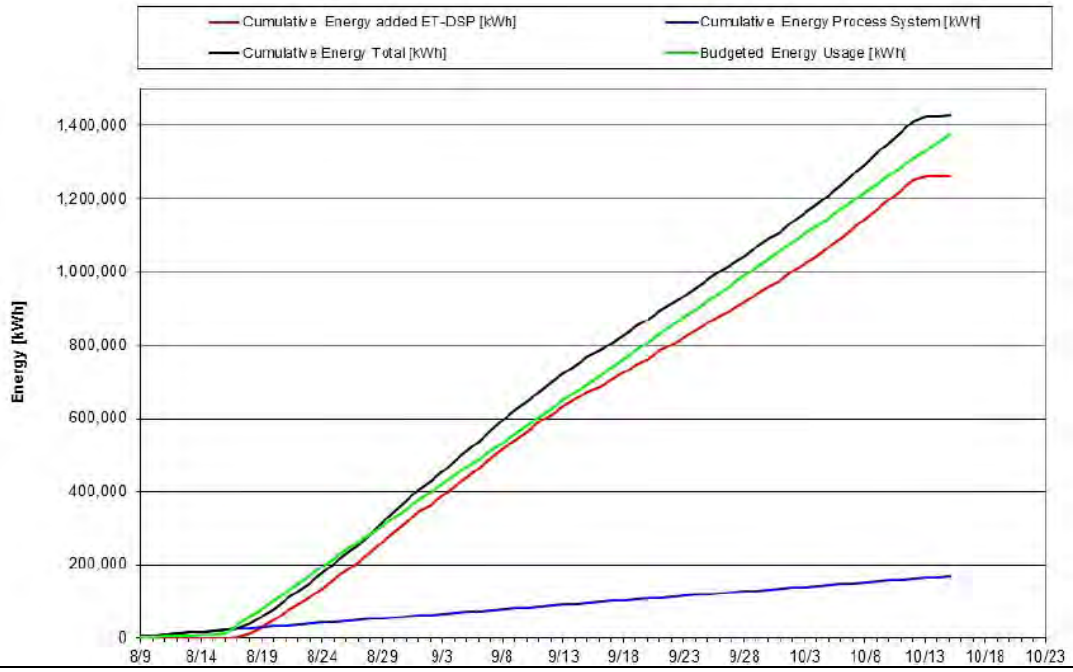
Performance Monitoring – Routine process performance monitoring and sampling will resume. All samples will be processed, handled, and shipped by Nobis.
Analytical Laboratory Data Received:
Process Liquid: Organic data was received for the process water sample (ISTT process equipment effluent, prior to discharge to the GWTP) collected on September 30, 2010. TCE was detected at a concentration of 710 ug/L. Cis-1,2-DCE was not detected.
Process Vapor: Data were received for process vapor samples collected on September 23 and 28, 2010 (all data refers to the sampling events in this order). TCE (at concentrations of 22,000 and 2,000 ppbv) and cis-1,2-DCE (at concentrations of 250 and 190 ppbv) were detected in the influent samples. The total VOC concentrations were 22,557 and 2,327 ppbv. TCE (at concentrations of 3.1 and 3.9 ppbv) and cis-1,2-DCE (at concentrations of 0.3 and 0.3 ppbv) were detected at relatively low concentrations in the effluent samples. Total VOC concentrations were 55 and 53 ppbv. The VOC removal efficiencies were calculated to be approximately 99.8% and 97.7%, both above the contract removal efficiency of 95%.
Extraction Wells: No new data available for this reporting period.
Groundwater: No new data available for this reporting period.
Ambient Air: Data were received for ambient air samples collected on September 27, 2010. TCE was detected at a concentration of 1.32 ppbv at the upgradient location and 0.46 ppbv at the downgradient location. TCE concentrations at both the upgradient and downgradient locations are slightly higher than the MassDEP Allowable Ambient Limit (annual average) of 0.11 ppbv, but below the Threshold Effects Exposure Limit (24-hour average) of 6.8 ppbv. All other VOCs detected were consistent with the compounds and concentrations detected during the Baseline ambient air monitoring event.
Next Project Status Meeting: Thursday, October 21st at 2:00 pm – *note time change*
Next Project Status Conference Call: Thursday, November 4th at 12:30 pm

Figure 1, Mass Removal Estimate:



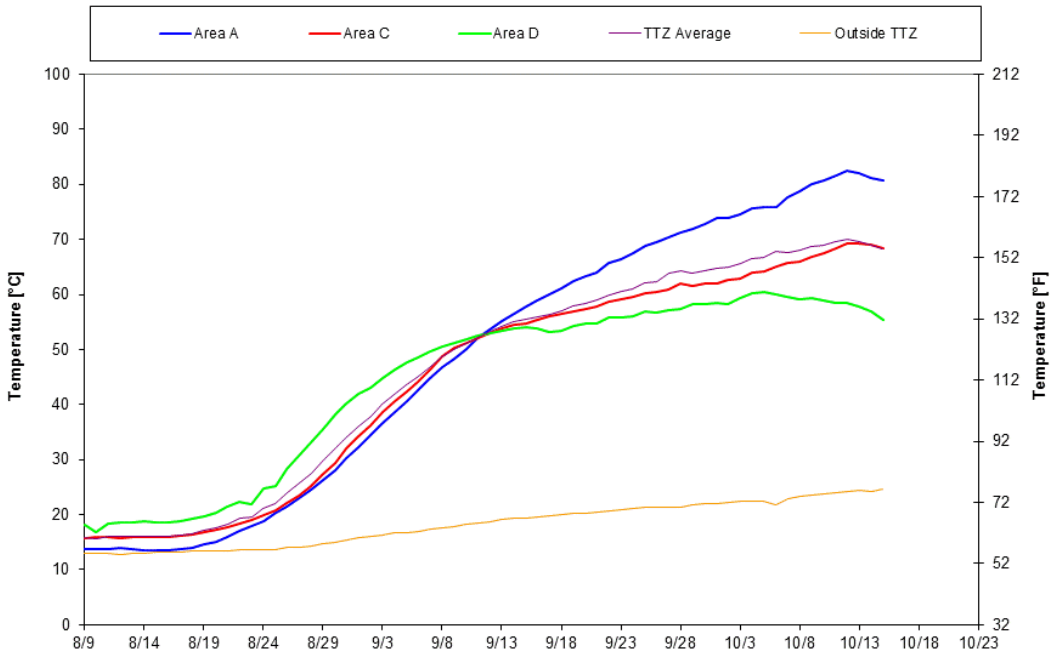
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



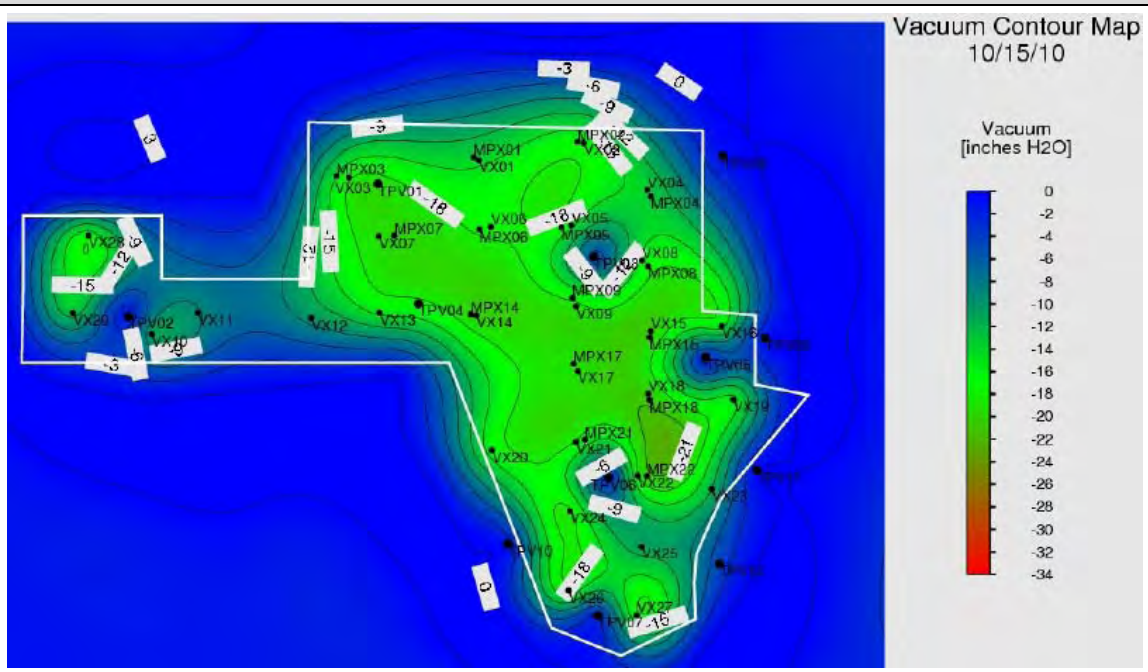
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



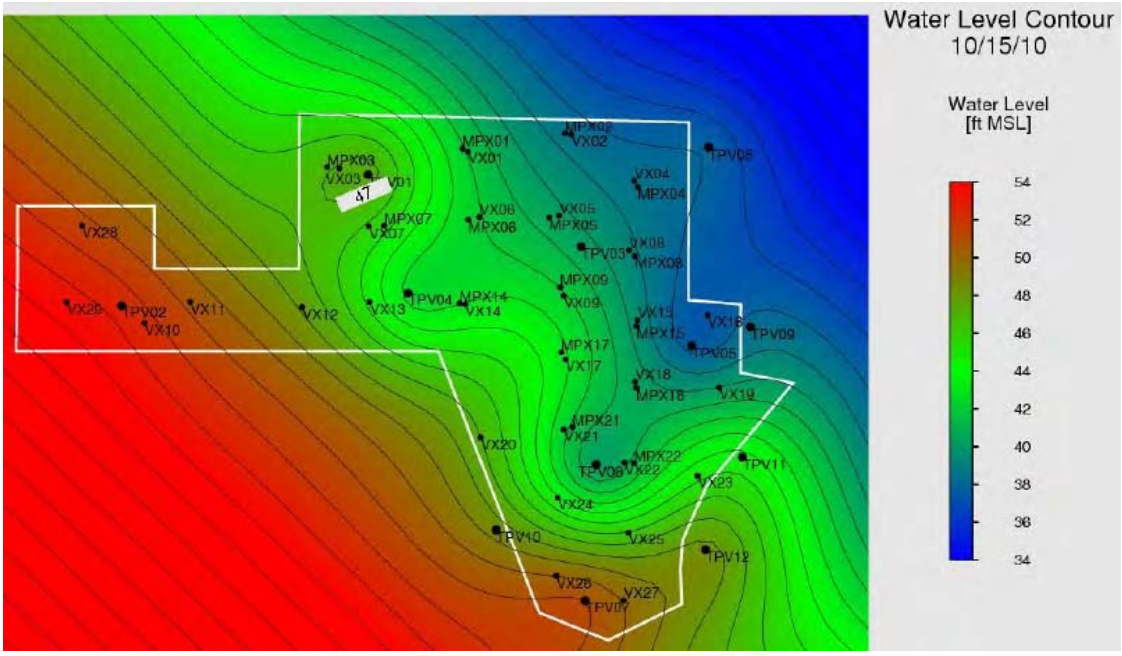
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** October 26, 2010

Operation and Maintenance Activities Performed from 10/16/2010 to 10/22/2010	**Status**
The ISTT liquid extraction and ET-DSP systems were shut down on Tuesday, October 12th, after operational issues were discovered with the liquid process treatment train. The oil / water separator (OWS) and associated treatment systems were not effectively separating the light non-aqueous phase liquid (LNAPL) and other by-products from the hot groundwater extracted from the ISTT treatment zone. The LNAPL remained, in solution within the heated water, and was discharged to the OU1 GWTP. The LNAPL came out of solution after mixing with the rest of the flow in the GWTP. The presence of LNAPL in the GWTP impacted the treatment operations by coating and fouling the treatment equipment and reducing the effectiveness of treatment. As a result, the project team shut down the ISTT liquid extraction and ET-DSP operations on October 12th and stopped all fluid flow to the GWTP for treatment. Immediately following the identification of the LNAPL removal issue, the project team began working to design and implement changes to the process water treatment train. The corrective actions were designed with flexibility to optimize the long-term ISTT operations and minimize impacts to the GWTP. The goal of these corrective actions is to improve the effectiveness of LNAPL removal. The following corrective actions were implemented: • Modifications to the existing liquid heat exchanger to cool influent water to a temperature of approximately 85°F (the temperature at which the LNAPL was observed to separate from the water). • Installation of a trough tank, before the OWS, to add retention time and decrease turbulence of the liquid traveling to the OWS. • Increased maintenance frequency of the existing OWS. • Installation of a second bag filter skid after the OWS with coalescing filter bags to capture LNAPL that bypasses the OWS. • Installation of two polishing organo-clay filters after the bag filters to remove any remaining LNAPL that may make its way through the OWS and bag filters. • Installation of a temporary 5,000-gallon weir tank to monitor the presence/absence of LNAPL in the water discharging from the process water treatment train. The weir tank will be demobilized from the Site only after it has been verified that the design changes were effective and that the discharge water is free of LNAPL and ready for discharge to the GWTP. These corrective actions were incorporated into the existing ISTT programmable logic controls. Following approval from Nobis, the ISTT liquid extraction system was re-started on Wednesday, October 20th. Once hydraulic control was re-established, the ET-DSP system (electrodes) was re-started on Thursday, October 21st. Water injections to the electrodes began on Friday, October 22nd.	Complete

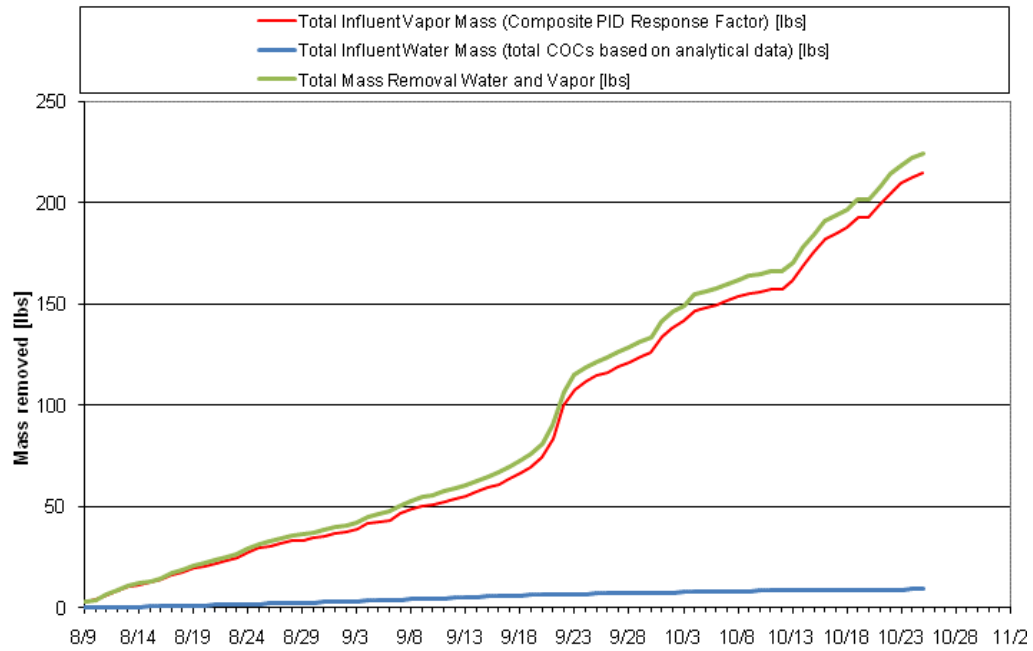
In response to the LNAPL-related shutdown on October 12th, the ISTT vapor extraction system flow rate was temporarily reduced to approximately 350 scfm and kept running. This flow rate was intended to ensure pneumatic control within the ISTT treatment zone, but limit the generation of excess fluids from condensation of the extracted soil vapor. On Wednesday, October 20th, the ISTT vapor extraction system returned to normal operation (at approximately 470 scfm).	Complete
Due to the shutdown of ISTT liquid extraction and ET-DSP systems on October 12th, routine system performance sampling (for Week 11) was not completed. Routine system performance sampling will resume during Week 12.	Complete
Nobis collected two additional LNAPL samples, from the OWS product drum and the GWTP clarifier. These samples were submitted for organics analysis, petroleum fingerprinting, specific gravity, and surfactant analyses. Nobis managed and shipped all samples collected to the appropriate laboratory for analysis (by a DAS Laboratory).	Complete
On October 20th, TerraTherm temporarily shut down the ISTT vapor extraction system to perform a planned maintenance event on the chiller. The chiller was winterized in preparation of freezing temperatures.	Complete
On October 21st, TerraTherm performed maintenance on one of knock-out pots which had a high level alarm. Maintenance to the condensate transfer pump was performed and the lines were cleaned.	Complete
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed. The purpose of this evaluation is to determine an accurate method for the site. Two methods, a composite PID response factor method and a PID correlation factor method, have been employed to estimate the vapor mass removed. Both methods use the weekly laboratory data and the daily PID readings. The project team continues to evaluate both methods as more analytical data becomes available. Until a definitive method is selected, the mass removal estimates calculated using the first method (composite PID response factors) will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 10/16/2010 to 10/22/2010		
ISTT Wellfield		
Temperature (°F): 126° to 174°	Volume Extracted/Injected (gal): 45,989 / 111	Groundwater Elevation (ft msl): ~36 to 50
Min. VOC Reading (ppm PID) 13.3 at VEW-27 (Area C)	Max. VOC Reading (ppm PID): 265.8 at VEW-15 (Area A)	Average VOCs (ppm PID): 70
ISTT Extraction System		
Average Air Flow (scfm): 403	Average Groundwater Extraction Rate (gpm): 4.6	Average Groundwater Injection Rate (gpm): 0.01
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 29.3 (Figure 1)	Est. Energy Used (kWh): 36,960 (Figure 2)
GAC Influent (ppm-PID): 55	GAC Effluent (ppm-PID): <1	Removal Efficiency (%): > 95%

Status of Performance Metrics	
Temperature (See Figure 3): A change of approx. 99° F has been observed since the heat injections began. There has been a slight decrease in the average temperature of the ISTT Treatment Area due to the recent shutdown.	Pneumatic Control (See Figure 4): The vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The liquid extraction system was re-started on October 20th. Hydraulic control was re-established at this time.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown on October 12th, the total operational duration may be prolonged. Early estimates show that approximately two days for each day of heating system downtime (or approximately 14 days) may be needed.	
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 214 lbs	Total NAPL Removed To Date: 18.4 gallons
Optimization Activities for the Following Week:	
ISTT Extraction System – Continue to operate the extraction systems while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.	
ET-DSP System – Continue to enhance soil conductivity within the vadose zone with saline water injection. Continue to troubleshoot electrodes E-29, E-39, and E-43. A steam electricity generator will be mobilized to the Site during the week of November 1st. The generator will be used to inject steam/hot water at targeted select electrodes. This increased energy delivery to select electrodes will result in an increase in subsurface temperatures in the targeted zones.	
GWTP – The Nobis team will closely monitor the influent liquid from the ISTT extraction system. The Nobis team will continue to monitor the influent GWTP VOC concentrations and water quality parameters (i.e. chloride) while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).	
Performance Monitoring – Routine process performance monitoring and sampling will resume. In addition, a groundwater monitoring event is planned for Wednesday, October 27th. All samples will be processed, handled, and shipped by Nobis.	
Analytical Laboratory Data Received:	
Process Liquid: Volatile organic compounds data was received for the process water sample (ISTT process equipment effluent, prior to discharge to the GWTP) collected on October 6, 2010. TCE was detected at a concentration of 250 ug/L. Cis-1,2-DCE was detected at a trace concentration, 4.4 ug/L. In addition, acetone was detected at a concentration of 790 ug/L. Acetone was also detected in the trip blank, but at a trace concentration, 7.9 ug/L. The total VOCs concentration was calculated to be 1,136.8 ug/L.	

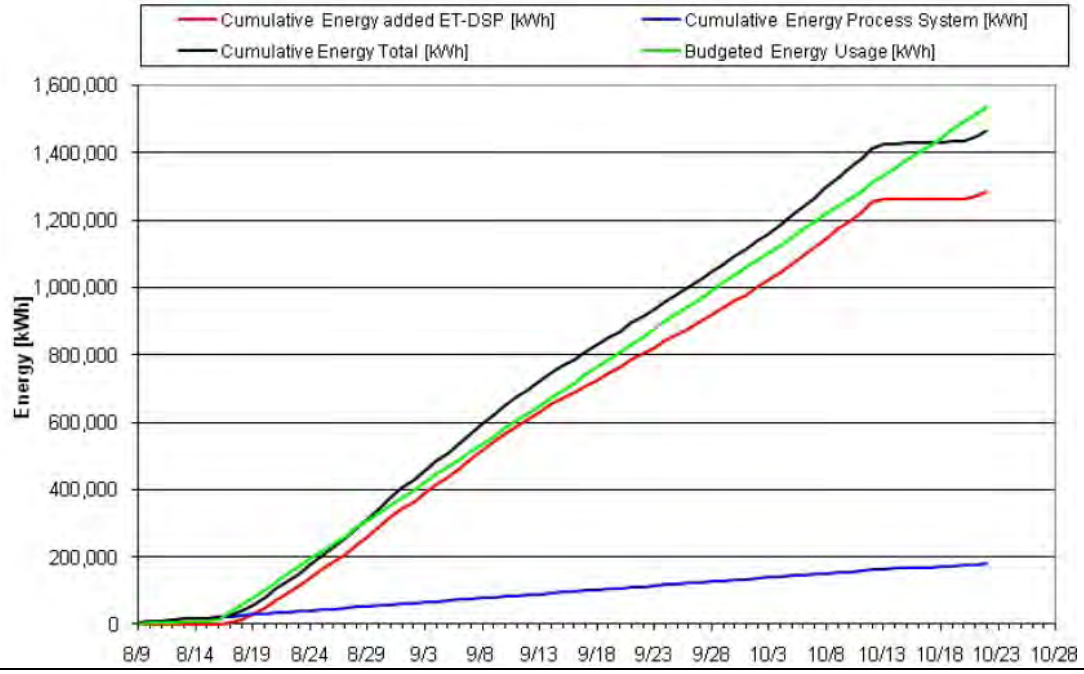
Process Liquid (cont.): Inorganic data was received for the process water sample collected on October 6, 2010. The concentrations of metals observed in the process water sample were below the GWTP discharge limits, with the exception of arsenic, lead, and mercury. Arsenic was detected at a trace concentration of 6.2 ug/L, which is higher than the average monthly limit of 0.75 ug/L. Lead was detected at a concentration of 10.6 ug/L, which is higher than the average monthly limit of 1.3 ug/L but lower than the daily maximum of 34 ug/L. Mercury was detected at a concentration of 0.28 ug/L, which is slightly higher than the average monthly limit of 0.273 ug/L. Arsenic (0.55 ug/L), lead (non-detect, less than 1 ug/L), and mercury (0.088 ug/L) were detected at concentrations below the GWTP discharge limits from the sample collected at the GWTP effluent on October 5, 2010, indicating that the metals contained in the process water are sufficiently removed during treatment in the GWTP.
Process Vapor: Data were received for process vapor samples collected on September 15 and October 4, 2010 (all data refers to the sampling events in this order). TCE (at concentrations of 3,900 and 1,100 ppbv) and cis-1,2-DCE (at concentrations of 190 and 280 ppbv) were detected in the influent samples. The total VOC concentrations were 4,325 and 1,672 ppbv. TCE and cis-1,2-DCE were not detected in the effluent sample collected on September 15th. TCE (at a concentration 2.4 ppbv) and cis-1,2-DCE (at a concentration of 0.3 ppbv) were detected at relatively low concentrations in the effluent sample collected on October 4th. Total VOC concentrations were 39.6 and 54.8 ppbv. The VOC removal efficiencies were calculated to be approximately 99.1% and 96.7%, both above the contract removal efficiency of 95%.
Extraction Wells: No new data available for this reporting period.
Groundwater: No new data available for this reporting period.
Ambient Air: No new data available for this reporting period.
Next Project Status Conference Call: Thursday, November 4th at 12:30 pm
Next Project Status Meeting: Thursday, November 18th at 12:30 pm

Figure 1, Mass Removal Estimate:



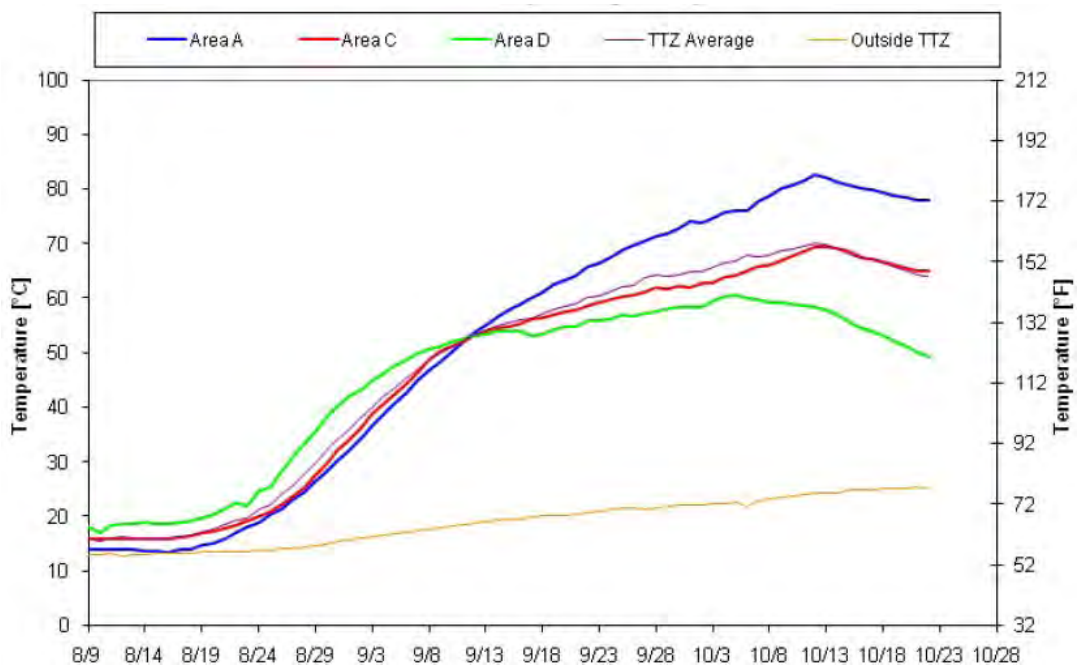
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



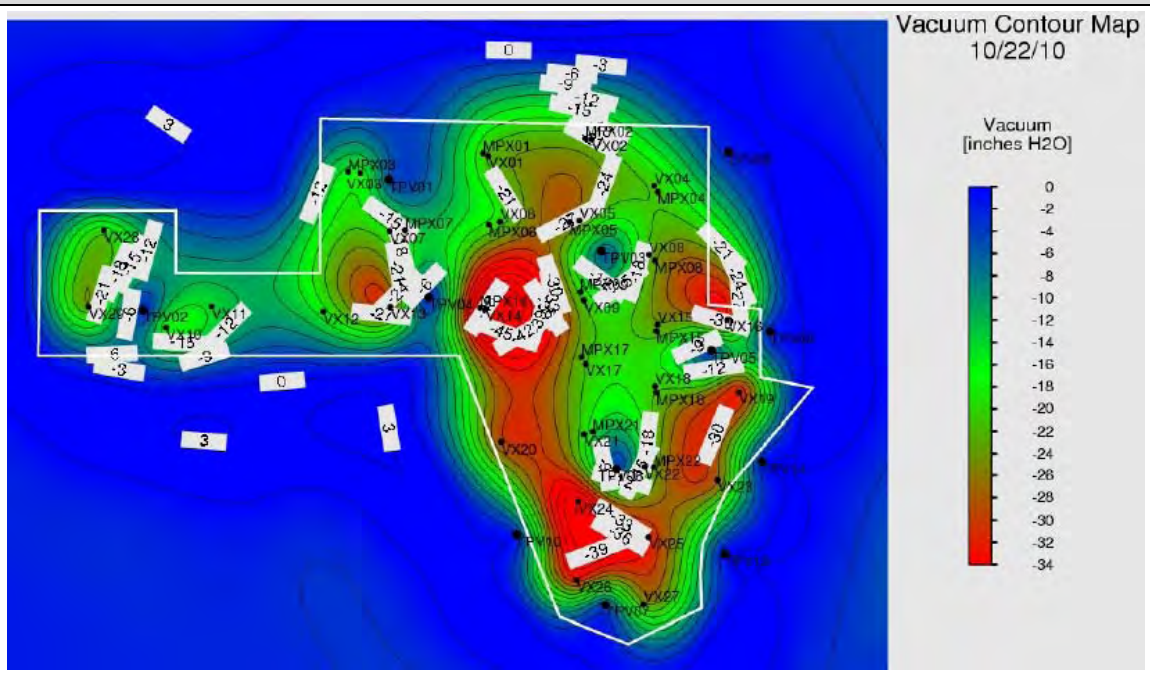
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



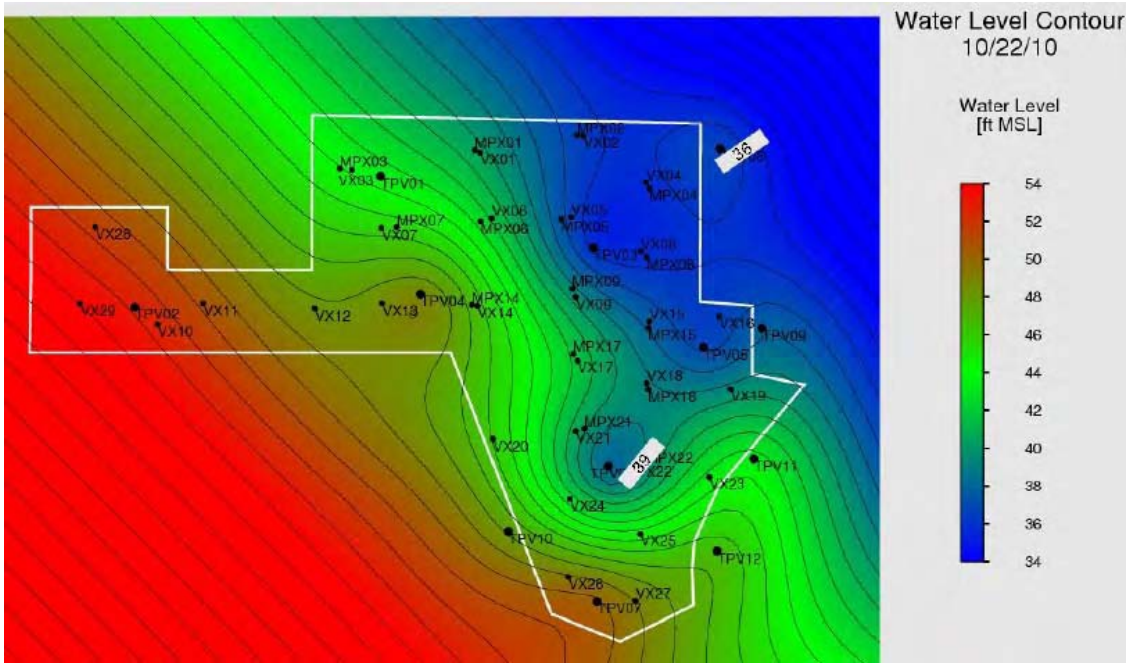
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** November 2, 2010

Operation and Maintenance Activities Performed from 10/23/2010 to 10/29/2010	**Status**
The Week 12 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition, a groundwater monitoring event and an ambient air monitoring event was completed. The ET-DSP system (electrodes) was temporarily shut down for the groundwater monitoring event. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
TerraTherm turned off the liquid extraction system to troubleshoot and maintain the primary bag filter skid. The liquid extraction system was shut down for a total of 1.5 hours.	Complete
TerraTherm replaced the pump in Extraction Well MPE-18.	Complete
TerraTherm replaced a gauge on one of the extraction wells and an effluent sample port on one of the organo clay vessels.	Complete
TerraTherm began to winterize water lines and process equipment.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed. The purpose of this evaluation is to determine an accurate method for the site. Two methods, a composite PID response factor method and a PID correlation factor method, have been employed to estimate the vapor mass removed. Both methods use the weekly laboratory data and the daily PID readings. The project team continues to evaluate both methods as more analytical data becomes available. Until a definitive method is selected, the mass removal estimates calculated using the first method (composite PID response factors) will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 10/23/2010 to 10/29/2010		
ISTT Wellfield		
Temperature (°F): 124° to 175°	Volume Extracted/Injected (gal): 100,958 / 86,825	Groundwater Elevation (ft msl): ~36 to 46
Min. VOC Reading (ppm PID) 6.5 at VEW-29 (Area D)	Max. VOC Reading (ppm PID): 164.3 at VEW-15 (Area A)	Average VOCs (ppm PID): 37.2
ISTT Extraction System		
Average Air Flow (scfm): 466	Average Groundwater Extraction Rate (gpm): 10.02	Average Groundwater Injection Rate (gpm): 8.61
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 16.9 (Figure 1)	Est. Energy Used (kWh): 152,640 (Figure 2)
GAC Influent (ppm-PID): 21	GAC Effluent (ppm-PID): 1	Removal Efficiency (%): 95%

Status of Performance Metrics	
Temperature (See Figure 3): A change of approx. 99° F has been observed since the heat injections began. There has been a slight decrease in the average temperature of the ISTT Treatment Area due to the recent shutdown.	Pneumatic Control (See Figure 4): The vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The extraction system is maintaining hydraulic control within Treatment Zone A.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown on October 12th until October 20th, the total operational duration may be prolonged. Early estimates show that approximately two days for each day of heating system downtime (or approximately 14 days) may be needed.	
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 233 lbs	Total NAPL Removed To Date: 18.4 gallons
Optimization Activities for the Following Week:	
ISTT Extraction System – Continue to operate the extraction systems while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.	
ET-DSP System – Continue to enhance soil conductivity within the vadose zone with saline water injection. Continue to troubleshoot electrodes E-29, E-39, and E-43. A steam electricity generator will be mobilized and installed at the Site during the week of November 1st. The generator will be used to inject steam/hot water at targeted select electrodes. This increased energy delivery to select electrodes will result in an increase in subsurface temperatures in the targeted zones.	
GWTP – The Nobis team will closely monitor the influent liquid from the ISTT extraction system. The Nobis team will continue to monitor the influent GWTP VOC concentrations and water quality parameters (i.e. chloride) while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).	
Performance Monitoring – Routine process performance monitoring and sampling will continue. In addition, an OEME mobile laboratory event (for the analysis of vapor extraction well samples) is planned for Wednesday, November 3rd. All samples will be processed, handled, and shipped by Nobis.	
Analytical Laboratory Data Received:	
Process Liquid: Analytical data was received for the process liquid samples collected in response to the shutdown on October 12th. Petroleum hydrocarbons were detected in the ISTT effluent (influent to the GWTP) at the following concentrations: • C9 to C18 Aliphatics – 23,000 ug/L; • C11 to C22 Aromatics – 8,400 ug/L; and • C19 to C36 Aliphatics – 15,000 ug/L. No petroleum hydrocarbons were detected in the GWTP effluent.	
Process Vapor: No new data available for this reporting period.	
Extraction Wells: No new data available for this reporting period.	
Groundwater: No new data available for this reporting period.	

Ambient Air: No new data available for this reporting period.

Product (NAPL) Samples: Analytical data was received for the product samples collected from the product drum (product that has been removed from the oil/water separator) and floating "scum" material (floating flocs that have been observed in the ISTT process equipment and GWTP) – samples are referred to in this order. Specific gravities were described as slightly higher (1.002 g/mL) and slightly lower (0.990 g/mL) than water. Petroleum hydrocarbons were detected at the following concentrations:

- Product Drum Sample:
  - C9 to C36, unknown hydrocarbons – 1,100,000 ppm; and
  - C10 to C28, diesel range organics – 970,000 ppm.

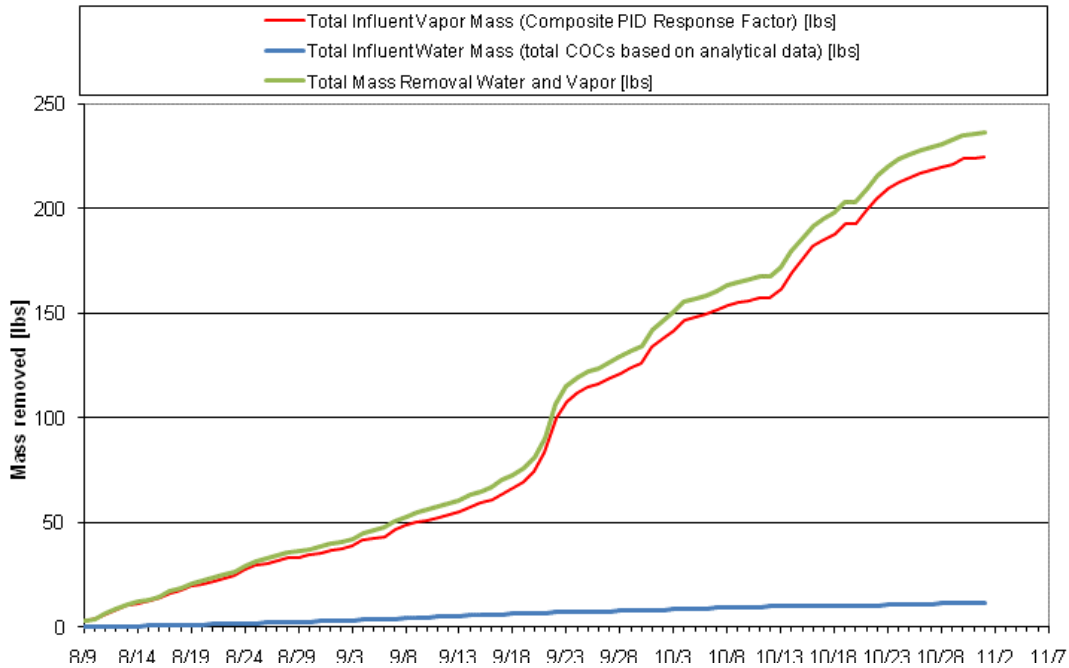
- Floating "scum" material:
  - C9 to C36, unknown hydrocarbons – 1,200,000 ppm; and
  - C10 to C28, diesel range organics – 1,100,000 ppm.

No surfactants were detected in either sample. The analytical laboratory indicated the hydrocarbon range is typical of transformer oil. However, the samples chromatograms do not exactly match the transformer oil reference.

Next Project Status Conference Call: Thursday, November 4th at 12:30 pm

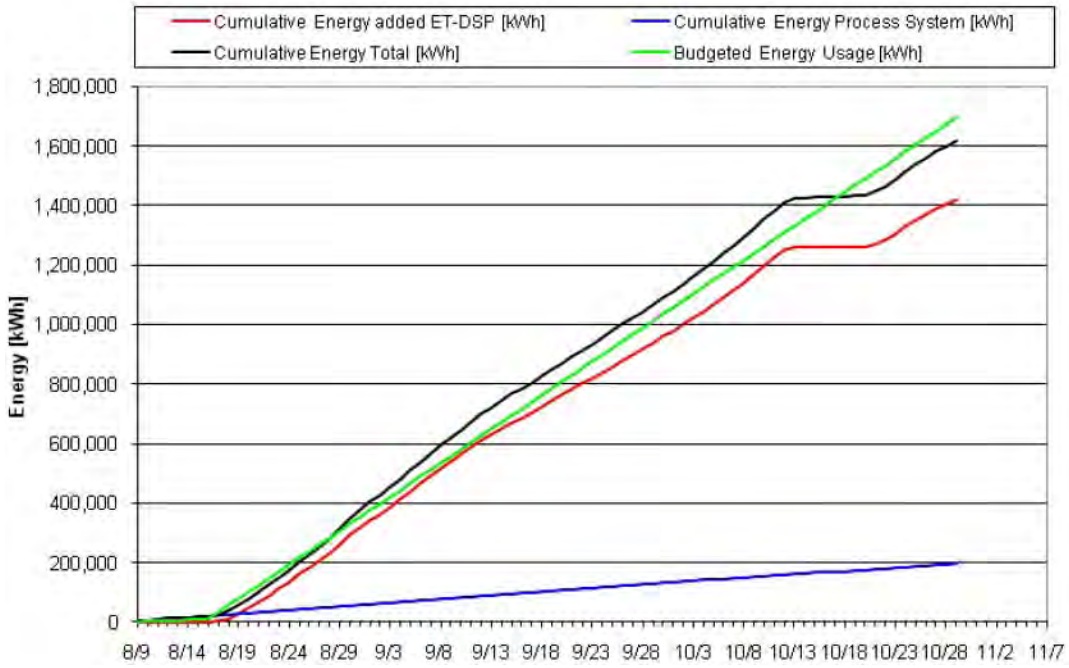
Next Project Status Meeting: Thursday, November 18th at 12:30 pm

Figure 1, Mass Removal Estimate:



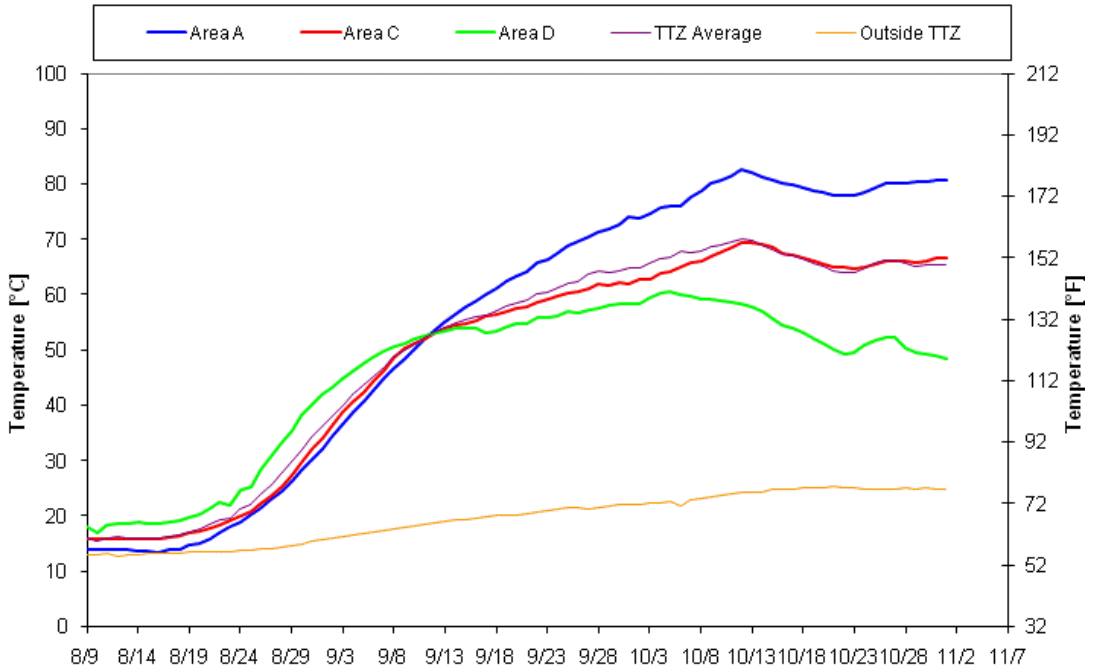
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



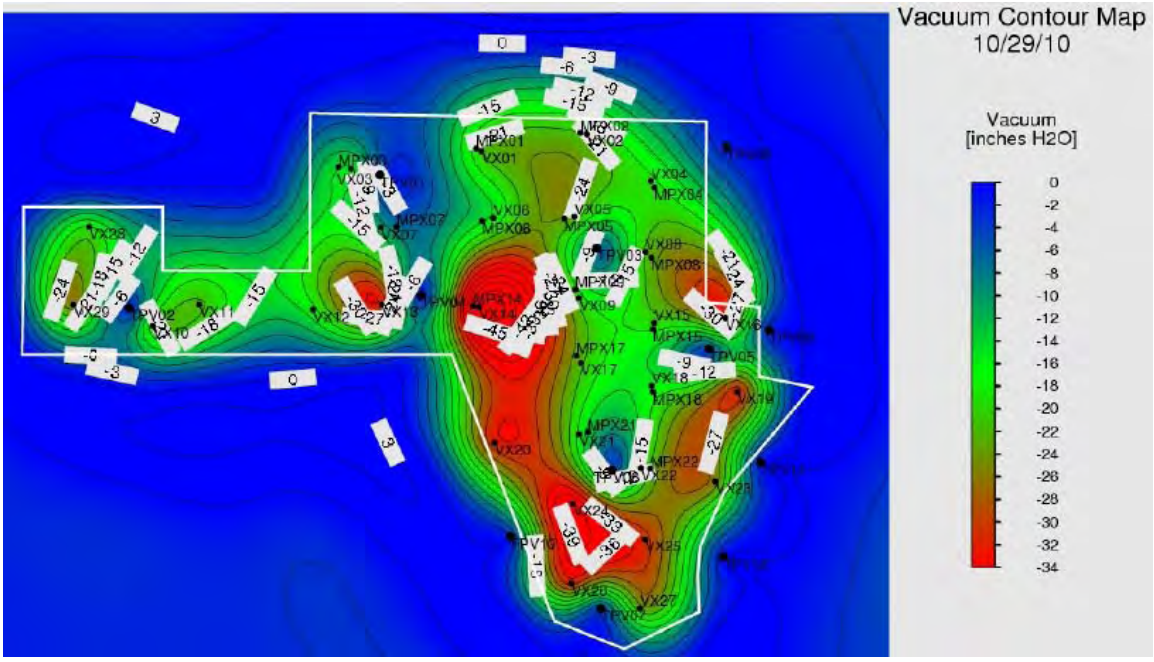
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



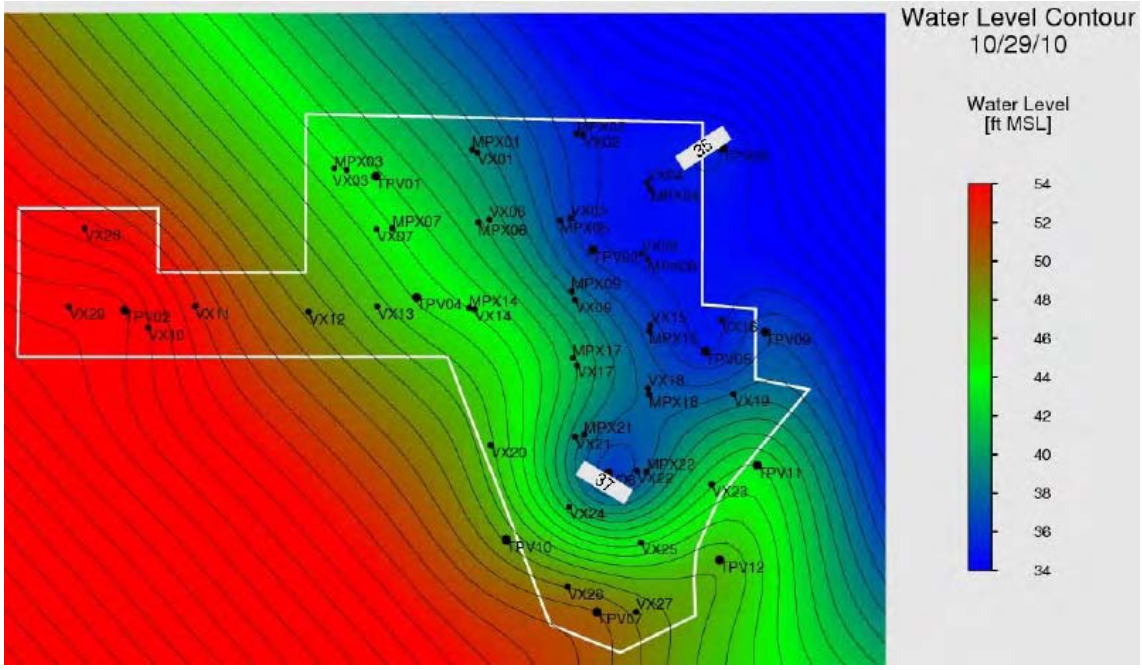
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** November 9, 2010

Operation and Maintenance Activities Performed from 10/30/2010 to 11/5/2010	**Status**
The Week 12 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition, an OEME mobile laboratory event (analyzing samples from vapor extraction wells) was completed. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
The liquid and vapor extraction systems were down for approximately two hours on October 30th due to a high pressure alarm on the organoclay vessel. A second organoclay vessel was brought online and the liquid and vapor extraction systems were restarted. The first organoclay vessel was backwashed for future use.	Complete
The vapor extraction system was down for approximately 30 minutes on November 4th due to an alarm on the first knockout tank. Maintenance was performed on the knockout tank's pump and the vapor extraction system was restarted.	Complete
Nobis reviewed the results of the recent Health and Safety inspection (completed on October 29th) with TerraTherm. No issues requiring immediate attention or corrective actions were identified. Winterization and the use of a buddy system or call-in program, when applicable, were discussed with the applicable project team.	Complete
McMillan-McGee mobilized to the Site to install the steam generator. The generator will be used to inject steam/hot water at targeted electrodes. This increased energy delivery to select electrodes will result in an increase in subsurface temperatures in the targeted zones. The generator will focus on Electrodes E-29, E-39, and E-43, and can move to other electrode locations, if necessary. This task will be completed during the week of November 6th.	On-going
TerraTherm continues to winterize water lines and process equipment. In addition, Nobis coordinated with TerraTherm in planning for the 2010 to 2011 winter GWTP snowplowing activities that will be performed under TO12.	On-going
The downhole pump in multiphase extraction well MPE-01 was taken offline due to the compressed air (used to cycle the pump) being present in the groundwater extraction water conveyance at this location. Pump troubleshooting continues and will be re-installed at MPE-01 when complete.	On-going
The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent. In addition, the carbon efficiency is evaluated daily. The overall vapor extraction system removal efficiency, based on field data collected during this operational period, is estimated at 91%. The removal efficiency is based on both influent and effluent concentrations. This week the influent concentrations (2 to 21 ppm) were relatively low, which results in a relatively low calculated removal efficiency. The project team will continue to monitor the vapor extraction system's removal efficiency. At this time, a carbon change out is not necessary.	On-going

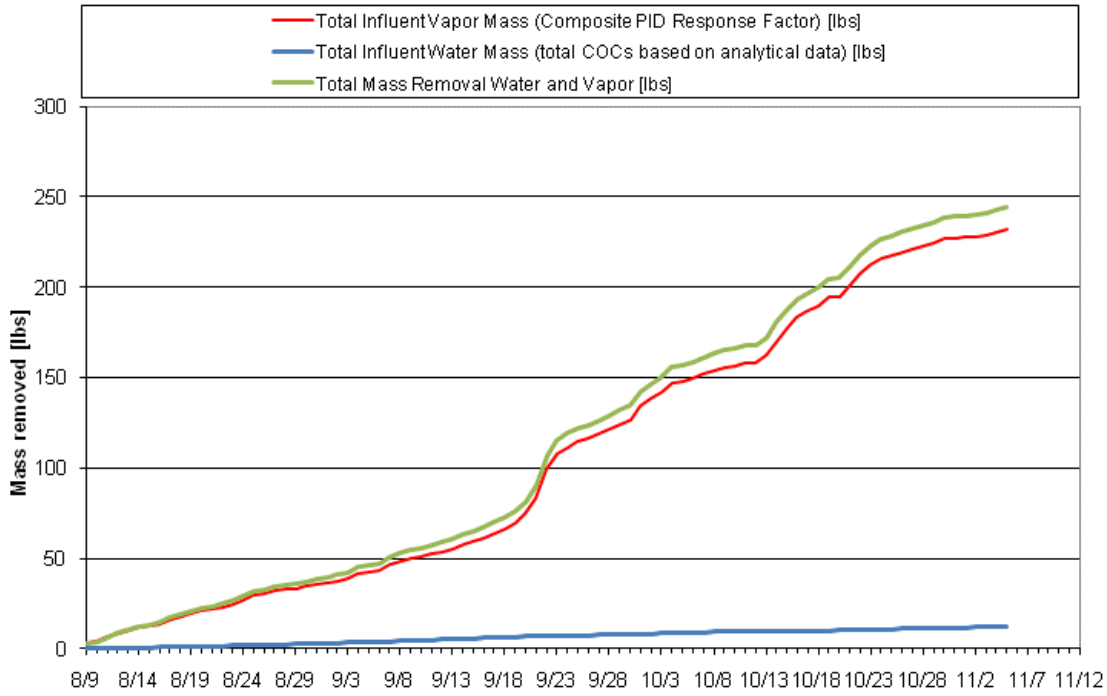
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 10/30/2010 to 11/5/2010		
ISTT Wellfield		
Temperature (°F): 119° to 177°	Volume Extracted/Injected (gal): 82,371 / 78,073	Groundwater Elevation (ft msl): ~37 to 47
Min. VOC Reading (ppm PID) 1.2 at VEW-14 (Area A)	Max. VOC Reading (ppm PID): 50.2 at VEW-17 (Area A)	Average VOCs (ppm PID): 12.6
ISTT Extraction System		
Average Air Flow (scfm): 487	Average Groundwater Extraction Rate (gpm): 8.17	Average Groundwater Injection Rate (gpm): 7.75
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 8.8 (Figure 1)	Est. Energy Used (kWh): 145,600 (Figure 2)
GAC Influent (ppm-PID): 9.6	GAC Effluent (ppm-PID): 1	Removal Efficiency (%): 91%
GWTP (Collected by the Nobis team)		
Chloride (ppm): 105	Temperature (°F): 64	pH (pH units): 6.8

Status of Performance Metrics	
Temperature (See Figure 3): The current average subsurface temperature is approximately 99° F above the baseline average temperature, before the start of heating. The average temperature remains approximately 5 degrees below the peak average temperature recorded before the October 12 through 20 shut-down of the ISTT system.	Pneumatic Control (See Figure 4): The vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The extraction system is maintaining hydraulic control within Treatment Zone A.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown on October 12th until October 20th, the total operational duration may be prolonged. Early estimates show that approximately two days for each day of heating system downtime (or approximately 14 days) may be needed.	
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 245 lbs	Total NAPL Removed To Date: 18.4 gallons

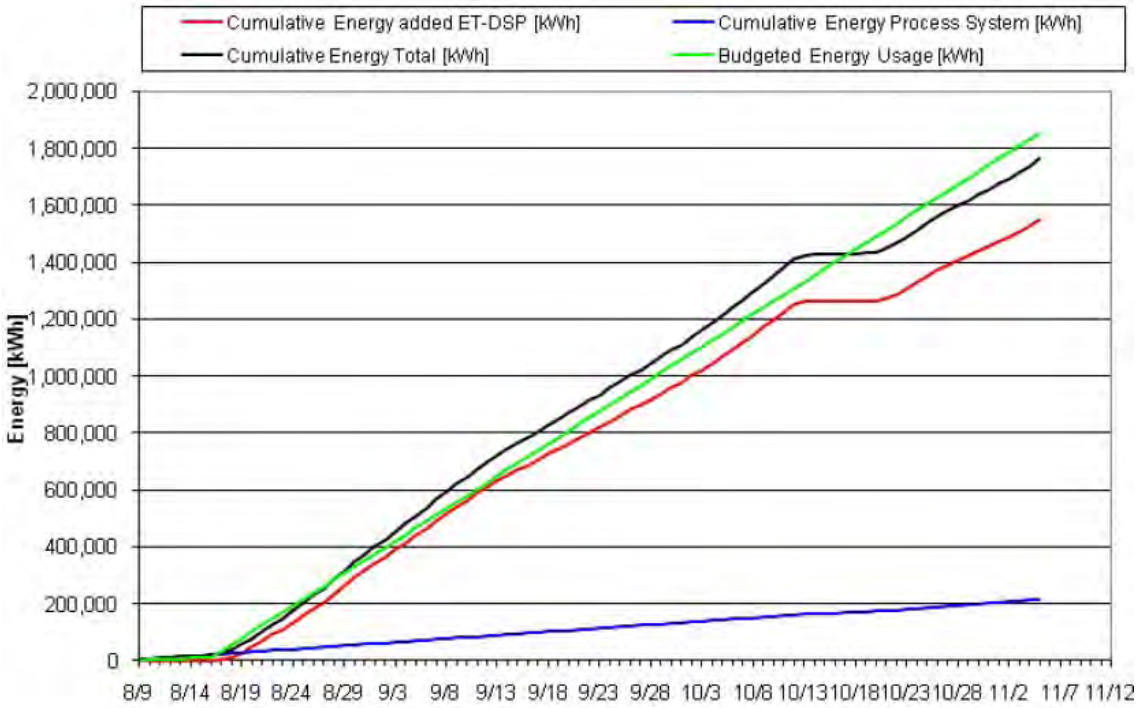
Optimization Activities for the Following Week:
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Continue to operate the extraction systems while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.
ET-DSP System – Continue to enhance soil conductivity within the vadose zone with saline water injection. Continue to troubleshoot electrodes E-29, E-39, and E-43. Finish the installation of the steam electricity generator; begin steam injection.
GWTP – The Nobis team will closely monitor the influent liquid from the ISTT extraction system. The Nobis team will continue to monitor the influent GWTP VOC concentrations and water quality parameters (i.e. chloride) while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).
Performance Monitoring – Routine process performance monitoring and sampling will continue. In addition, groundwater monitoring and ambient air sampling events are planned. All samples will be processed, handled, and shipped by Nobis.
Analytical Laboratory Data Received:
Process Liquid: No new data available for this reporting period.
Process Vapor: No new data available for this reporting period.
Extraction Wells: No new data available for this reporting period.
Groundwater: No new data available for this reporting period.
Ambient Air: No new data available for this reporting period.
Next Project Status Meeting: Thursday, November 18th at 12:30 pm
Next Project Status Conference Call: Thursday, December 2nd at 12:30 pm

Figure 1, Mass Removal Estimate:



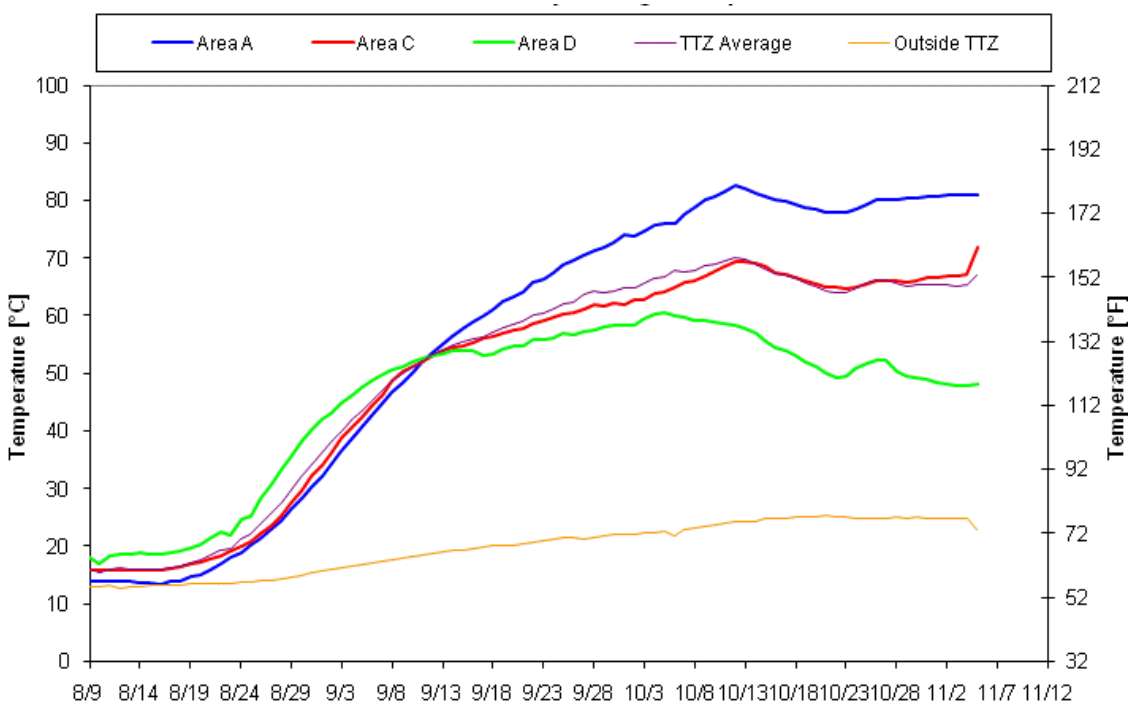
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



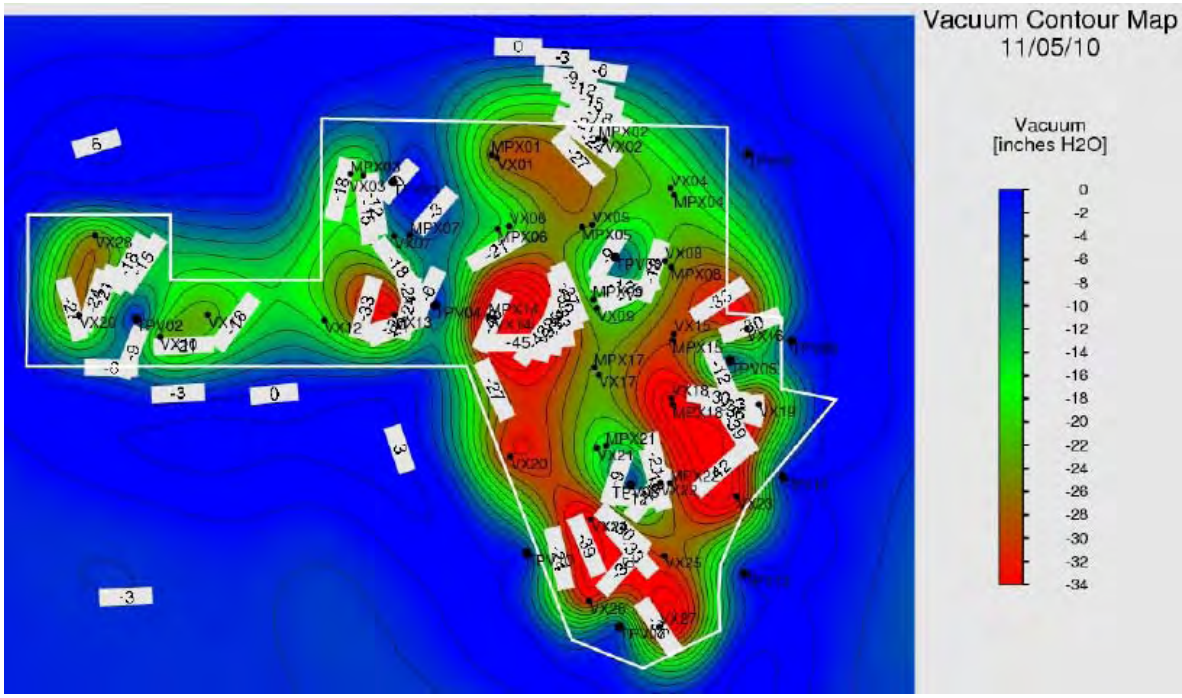
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



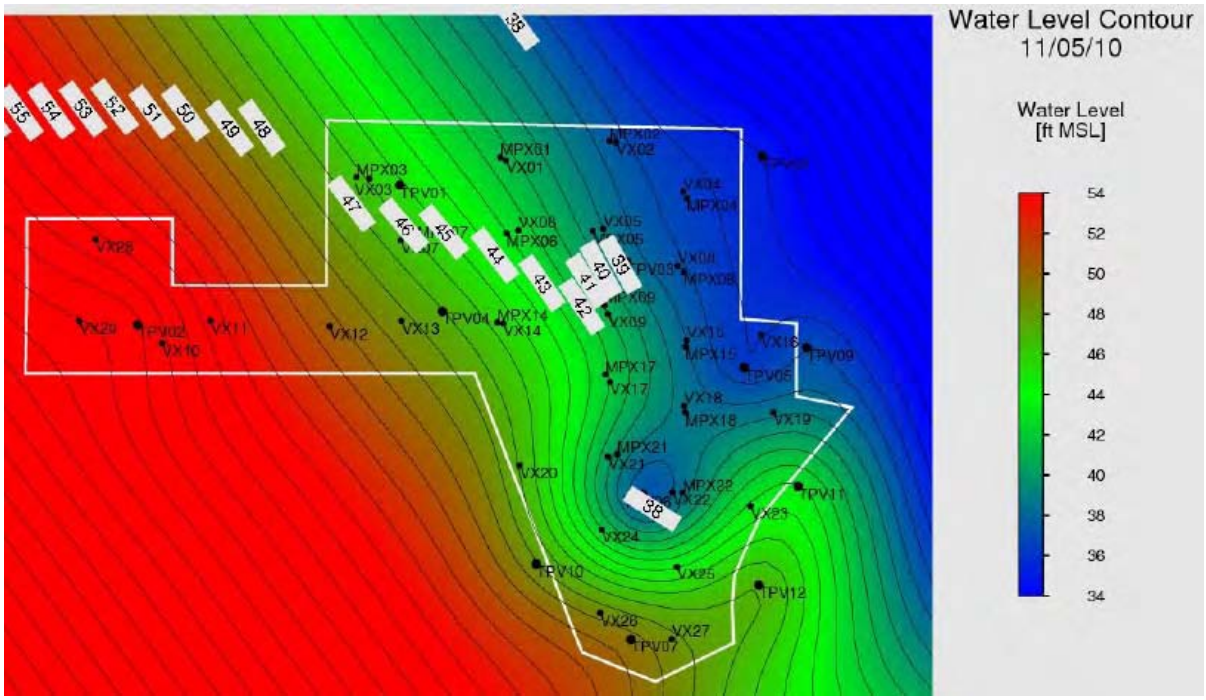
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** November 16, 2010

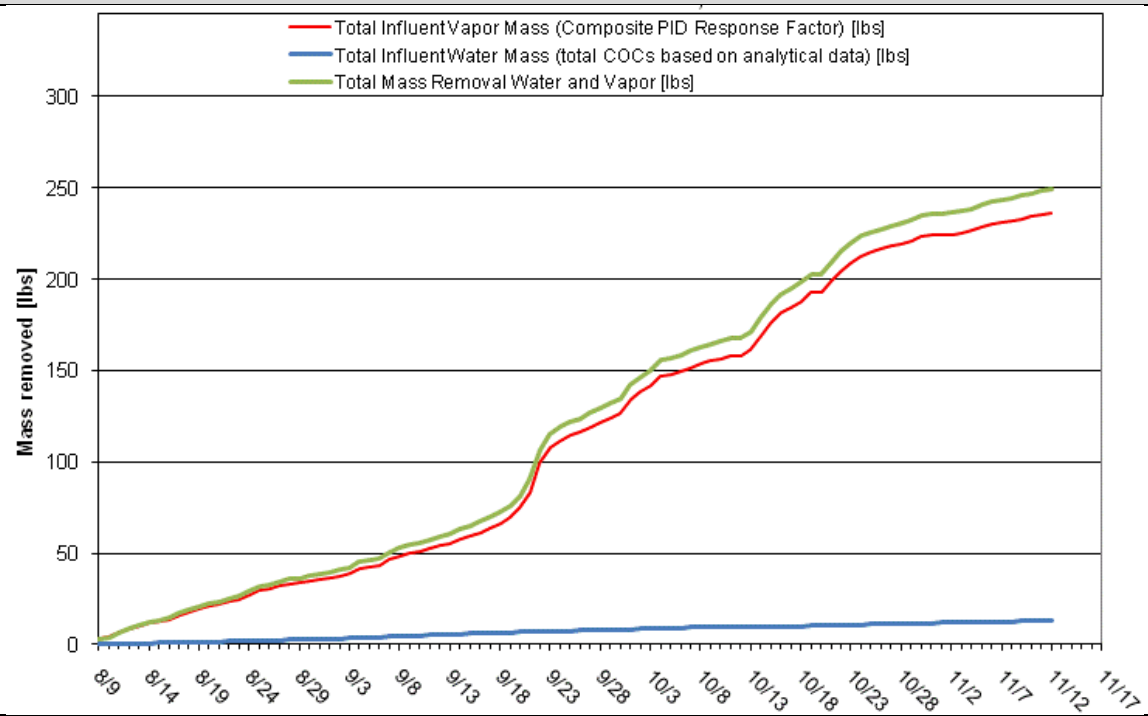
Operation and Maintenance Activities Performed from 11/6/2010 to 11/12/2010	**Status**
The Week 14 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition, a groundwater monitoring event was completed. The ET-DSP system was temporarily disabled during the intrusive activities. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
The Nobis team re-routed influent flow within the GWTP in order to improve current maintenance issues related to the iron biofouling (previously described as product "scum" or flocs). The ISTT process water was directed to the plate clarifier, while the other GWTP influent water (from downgradient TO12 extraction wells) bypasses the clarifier and goes directly to the filter feed tank.	Complete
During the modifications to the GWTP (as described above), the GWTP operator received a mild electrical shock (at approximately 25 volts) while working on the ISTT piping connected to the GWTP. No injuries were incurred by the GWTP operator during this incident. An incident report was prepared in accordance with the Site-specific Health & Safety Plan. In addition, Nobis team health and safety officers performed an incident evaluation. TerraTherm and McMillan-McGee investigated the source of the voltage on the pipe at the GWTP. It was determined that there was a conflict between the separate ground for the GWTP and the separate ground for the ISTT liquid extraction system. The two systems were grounding out (no observed voltage potential) at the location of the ISTT piping and its connection to the GWTP. When the pipes were disconnected, during the modifications, a voltage potential was observed. TerraTherm and McMillan-McGee modified the existing grounding system at the Site to include jumpers between the ISTT piping and the existing GWTP pipe to bond the two separate grounding systems together.	Complete
TerraTherm repaired the downhole pump in multiphase extraction well MPE-01 while the ET-DSP system was temporarily disabled for groundwater monitoring activities.	Complete
TerraTherm operators removed approximately six gallons of iron biofouling material from the trough tank and oil water separator. TerraTherm will continue to remove this material from the trough tank and oil water separator in order to assist with maintenance issues within the GWTP due to iron biofouling.	On-going
TerraTherm continues to enhance soil conductivity by introducing water conditioning salts to the injection water at targeted shallow electrodes with currents less than 5 kW. On November 9th, a total of approximately 120 pounds of water conditioning salt was injected into the targeted electrodes. This activity may continue, sporadically, throughout the operation of the ISTT system.	On-going

McMillan-McGee continued making connections to the steam header for the steam injection into select electrodes. This task will be completed during the week of November 15th.	On-going
McMillan-McGee temporarily disabled one of the three Site water circulation units. The main valve on this water circulation unit was removed and sent to the manufacturer for analysis. The water circulation unit will be brought back online when the valve is returned from the manufacturer.	On-going
The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent. In addition, the carbon efficiency is evaluated daily. The overall vapor extraction system removal efficiency, based on field data collected during this operational period, is estimated at 89%. The removal efficiency is based on both influent and effluent concentrations. This week the influent concentrations (5 to 14 ppm) were relatively low, which results in a relatively low calculated removal efficiency. The project team will continue to monitor the vapor extraction system's removal efficiency. At this time, a carbon change out is not anticipated.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 11/6/2010 to 11/12/2010		
ISTT Wellfield		
Temperature (°F): 116° to 179°	Volume Extracted/Injected (gal): 83,217 / 72,393	Groundwater Elevation (ft msl): ~37 to 47
Min. VOC Reading (ppm PID) 3.5 at VEW-22 (Area A)	Max. VOC Reading (ppm PID): 57.2 at VEW-15 (Area A)	Average VOCs (ppm PID): 19.9
ISTT Extraction System		
Average Air Flow (scfm): 496	Average Groundwater Extraction Rate (gpm): 8.26	Average Groundwater Injection Rate (gpm): 7.18
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 7.8 (Figure 1)	Est. Energy Used (kWh): 153,120 (Figure 2)
GAC Influent (ppm-PID): 9	GAC Effluent (ppm-PID): 1	Removal Efficiency (%): 89%
GWTP (Collected by the Nobis team)		
Chloride (ppm): 90	Temperature (°F): 64	pH (pH units): 6.9

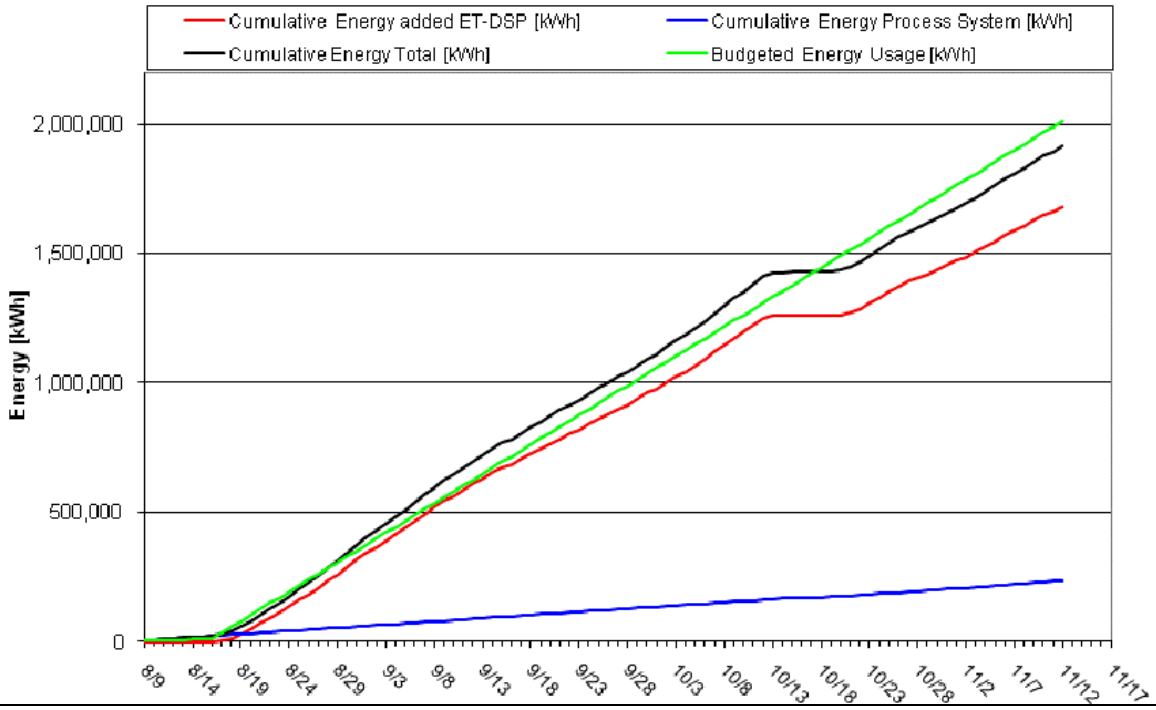
Status of Performance Metrics	
Temperature (See Figure 3): The current average subsurface temperature is approximately 99° F above the baseline average temperature, before the start of heating. The average temperature remains approximately 5° F below the peak average temperature recorded before the October 12 through 20 shut-down of the ET-DSP and liquid extraction system.	Pneumatic Control (See Figure 4): The ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The ISTT liquid extraction system is maintaining hydraulic control within Treatment Zone A.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown on October 12th until October 20th, the total operational duration may be prolonged. Early estimates show that approximately two days for each day of heating system downtime (or approximately 14 days) may be needed.	
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 249 lbs	Total NAPL Removed To Date: 18.4 gallons
Optimization Activities for the Following Week:	
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Continue to operate the extraction systems while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.	
ET-DSP System – Continue to enhance soil conductivity within the vadose zone with saline water injection. Continue to troubleshoot electrodes E-29, E-39, and E-43. Complete connection of the steam generator and begin steam injection into targeted electrodes if possible. (Start of steam generation may be delayed by ARARs compliance issues that are being investigated.) TerraTherm is currently evaluating other heating system enhancements to accelerate heating at the Site.	
GWTP – The Nobis team will closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters (i.e. chloride) while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).	
Performance Monitoring – Continue routine process performance monitoring and sampling. In addition, an ambient air sampling event is planned. All samples will be processed, handled, and shipped by Nobis.	
Analytical Laboratory Data Received:	
Process Liquid: No new data available for this reporting period.	
Process Vapor: No new data available for this reporting period.	
Extraction Wells: No new data available for this reporting period.	
Groundwater: No new data available for this reporting period.	
Ambient Air: No new data available for this reporting period.	
Next Project Status Meeting: Thursday, November 18th at 12:30 pm	
Next Project Status Conference Call: Thursday, December 2nd at 12:30 pm	

Figure 1, Mass Removal Estimate:



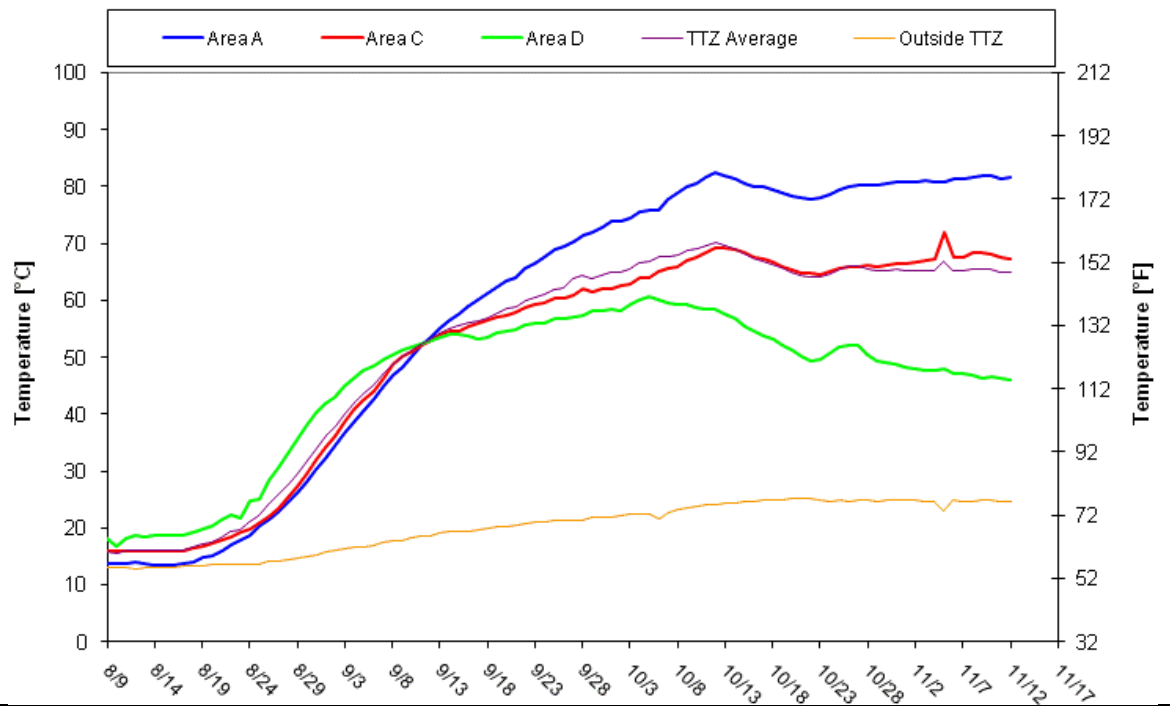
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



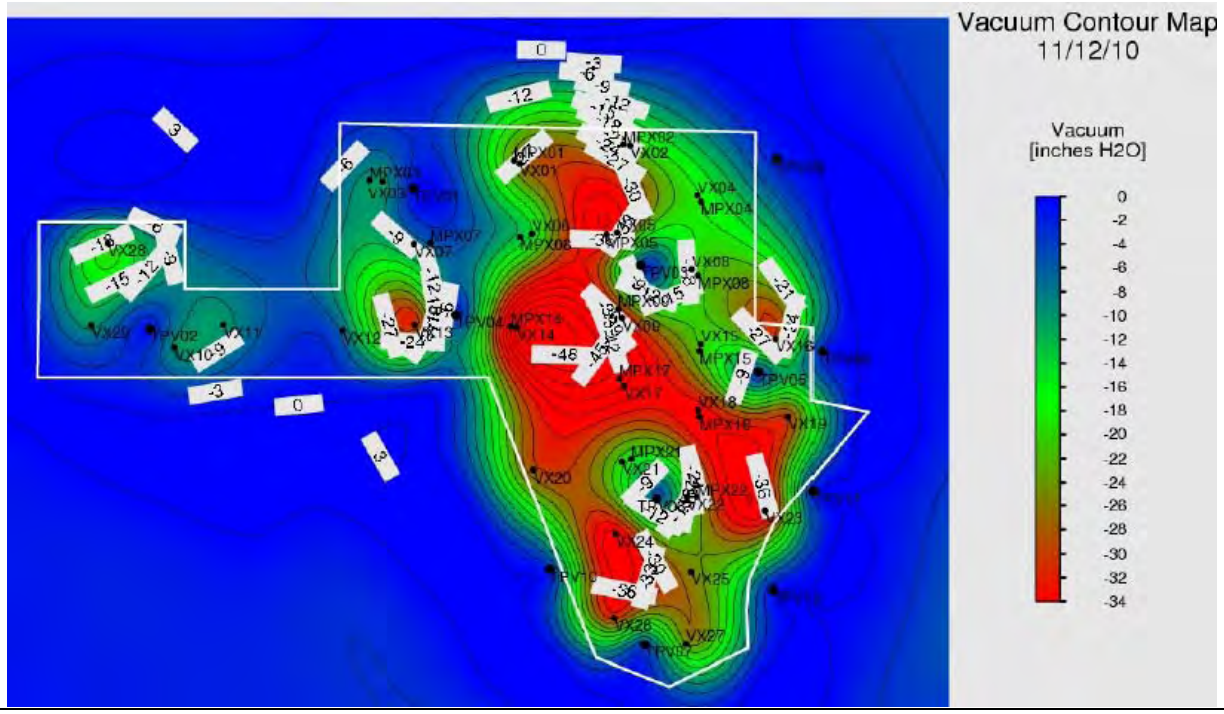
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



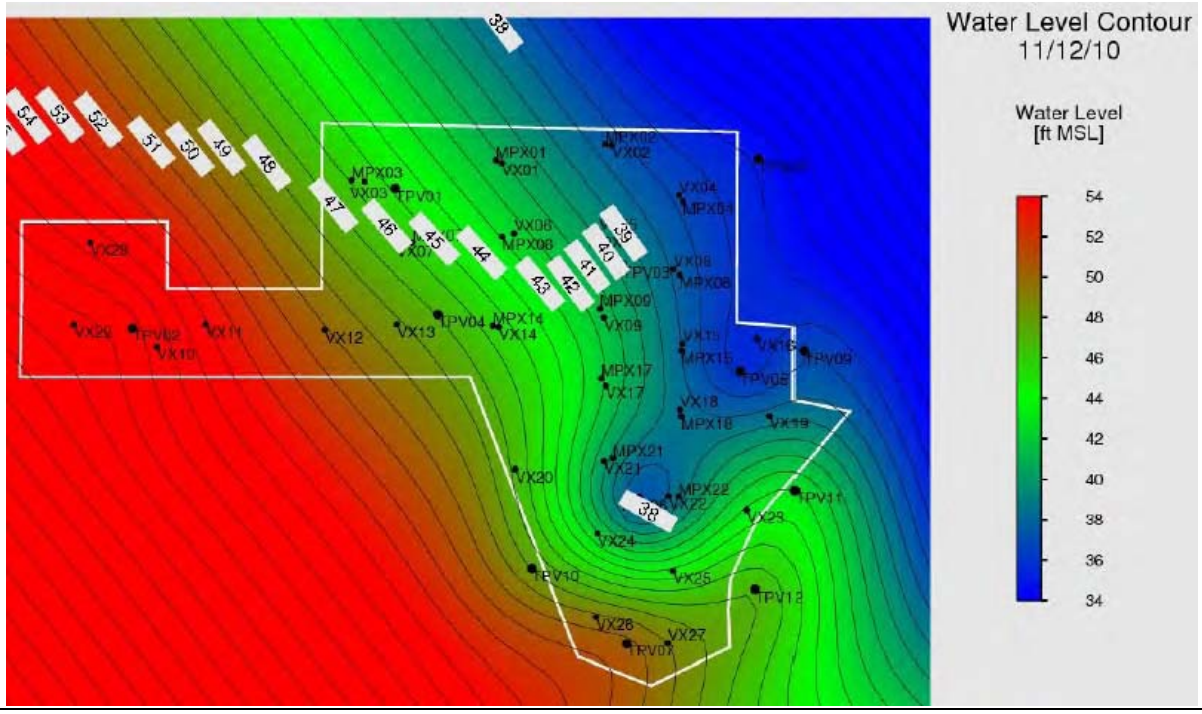
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** November 22, 2010

Operation and Maintenance Activities Performed from 11/13/2010 to 11/19/2010	**Status**
The Week 15 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition, an ambient air monitoring event was completed. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
TerraTherm optimized groundwater extraction rates by adjusting several extraction well pump settings. In addition, the downhole pump in multiphase extraction well MPE-01, was raised to minimize silt impacts at this location. These efforts were completed in order to enhance the ET-DSP system by increasing groundwater extraction rates and therefore increasing water injection rates. The ET-DSP system was temporarily disabled during these intrusive activities.	Complete
TerraTherm removed approximately one ounce (0.01 gallon) of product from sensor location TPV-03.	Complete
The Nobis team installed well caps within the three source area extraction wells (under Task Order 12). During this activity, it was observed that PVC within extraction well EW-S1's well vault has been damaged by the high temperatures.	Complete
The Nobis team continues GWTP maintenance related to the iron biofouling (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
TerraTherm operators removed approximately one half gallon of iron biofouling material from the trough tank and oil water separator. TerraTherm will continue to remove this material from the trough tank and oil water separator in order to assist with maintenance issues within the GWTP due to iron biofouling.	On-going
TerraTherm continues to enhance soil conductivity by introducing water conditioning salts to the injection water at targeted shallow electrodes with currents less than 5 kW. The following injections were made during this operational period: • November 15th – 60 lbs; • November 16th – 80 lbs; • November 17th – 120 lbs; • November 18th – 80 lbs; and • November 19th – 80 lbs. This activity may continue, sporadically, throughout the operation of the ISTT system.	On-going
The project team evaluated heating enhancements to accelerate heating at the Site. The steam generator (mobilized and installed at the Site) will be used to inject steam into specific electrodes, E-29, E-39, E-43, and several shallow electrodes. In addition, steam spears (small diameter wells) will be installed and used to inject steam at select locations throughout the shallow vadose zone. Due to the size of the steam generator, special safety assurance measures are required. The project team is currently working on meeting these conditions. TerraTherm is currently working with	On-going

the Massachusetts Department of Safety to have the steam generator and associated piping inspected. TerraTherm anticipates the final piping and inspection of the steam generator will occur during the week of 11/29. The steam injections will begin shortly thereafter. In addition, TerraTherm operators will undergo steam generator and injection training prior to the start of the steam generator.	
The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent. In addition, the carbon efficiency is evaluated daily. The removal efficiency is based on both influent and effluent concentrations. This week the influent concentrations were relatively low early in the week (6 to 12 ppm), which results in a relatively low calculated removal efficiency. Later in the week, influent concentrations increased to 18 and 45 ppm. The overall vapor extraction system removal efficiency for this operational period is estimated at 90%. The project team will continue to monitor the vapor extraction system's removal efficiency. At this time, a carbon change out is not anticipated.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 11/13/2010 to 11/19/2010		
ISTT Wellfield		
Temperature (°F): 117° to 181°	Volume Extracted/Injected (gal): 81,520 / 75,782	Groundwater Elevation (ft msl): ~37 to 47
Min. VOC Reading (ppm PID) 0.0 at VEW-07 (Area A), -27 (Area C), -28, and -29 (Area D)	Max. VOC Reading (ppm PID): 102.3 at VEW-15 (Area A)	Average VOCs (ppm PID): 13.5
ISTT Extraction System		
Average Air Flow (scfm): 456	Average Groundwater Extraction Rate (gpm): 8.09	Average Groundwater Injection Rate (gpm): 7.52
Volume of NAPL Recovered (gal): 0.01	Est. Mass Removed (lbs of TCE): 11.8 (Figure 1)	Est. Energy Used (kWh): 169,440 (Figure 2)
GAC Influent (ppm-PID): 15	GAC Effluent (ppm-PID): 1.5	Removal Efficiency (%): 90%
GWTP Combined Influent (Collected by the Nobis team)		
Chloride (ppm): 80	Temperature (°F): 60	pH (pH units): 6.8

Status of Performance Metrics	
Temperature (See Figure 3): The current average subsurface temperature is approximately 100° F above the baseline average temperature, before the start of heating. The average temperature remains approximately 5° F	Pneumatic Control (See Figure 4): The ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.

below the peak average temperature recorded before the October 12 through 20 shut-down of the ET-DSP and liquid extraction system.	
Hydraulic Control (See Figure 5): The ISTT liquid extraction system is maintaining hydraulic control within Treatment Zone A.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown on October 12th until October 20th, the total operational duration may be prolonged. Early estimates show that approximately two days for each day of heating system downtime (or approximately 14 days) may be needed. In addition, the observed rate of heating since the ET-DSP shutdown has been slower than the observed rate of heating before the shutdown. The project team is currently evaluating heating enhancements (steam injections) to accelerate heating at the Site.	
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 261 lbs	Total NAPL Removed To Date: 18.4 gallons
Optimization Activities for the Following Week:	
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Continue to operate the extraction systems while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.	
ET-DSP System – Continue to enhance soil conductivity within the vadose zone with saline water injection. The start of the steam generation has been delayed by ARARs compliance issues that are being evaluated. Once the ARARs have been met, steam injections at select targeted electrodes will begin. The project team is currently evaluating other heating system enhancements (i.e. steam spears) to accelerate heating at the Site.	
GWTP – Continue to closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters (i.e. chloride) while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).	
Performance Monitoring – Continue routine process performance monitoring and sampling. In addition, a groundwater monitoring and soil vapor extraction well sampling (with OEME) events are planned. All samples will be processed, handled, and shipped by Nobis.	
Analytical Laboratory Data Received:	
Process Liquid: Volatile organic compounds data was received for the process water samples (ISTT process equipment effluent, prior to discharge to the GWTP) collected on October 27 and November 3, 2010. All data refers to the sampling events in this order. TCE was detected at a concentration of 54 µg/L and 3.3 µg/L, while cis-1,2-DCE was not detected. In addition, acetone (at concentrations of 790 and 1,100 µg/L) and MEK (at concentrations of 100 and 140 µg/L) were detected.	
Process Vapor: Data were received for process vapor samples collected on October 26 and November 3, 2010 (all data refers to the sampling events in this order). TCE (at concentrations of 340 and 340 ppbv) and cis-1,2-DCE (at concentrations of 95 and 140 ppbv) were detected in the influent samples. The total VOC concentrations were 649 and 600 ppbv. TCE was not detected in the effluent sample collected on October 26th, cis-1,2-DCE as detected at a concentration of 3.5 ppbv. TCE (at a concentration 4.6 ppbv) and cis-1,2-DCE (at a concentration of 25 ppbv) were detected in the effluent sample collected on November 3rd. Total VOC concentrations were 41.53 and 80.66 ppbv. The VOC removal efficiencies were calculated to be approximately 94% and 87%. The relatively low influent concentrations result in a	

low calculated VOC removal efficiency in the carbon. The carbon efficiency continues to be evaluated on a daily basis using field data and when available, laboratory data.

Extraction Wells: No new data available for this reporting period.

Groundwater: Analytical data was received for the groundwater monitoring events conducted on September 15th, 30th, and October 27th.

September 15th:
VOCs were detected in all of the groundwater monitoring and groundwater extraction wells sampled during this monitoring event, with the exception of RW-07B and RW-10B. TCE was detected at concentrations ranging from non-detect (less than 5 µg/L) to 3,300 µg/L at MPE-21. Concentrations of cis-1,2-DCE ranged from non-detect (less than 5 µg/L) to 7.1 µg/L at MPE-01. In addition, acetone and MEK were detected at concentrations ranging from non-detect (less than 10 µg/L) to 370 and 800 µg/L at MPE-21 and RW-01, respectively.

September 30th:
VOCs were detected in all of the groundwater monitoring and groundwater extraction wells sampled during this monitoring event. TCE was detected at concentrations ranging from non-detect (less than 5 µg/L) to 4,200 µg/L at MPE-09. Concentrations of cis-1,2-DCE ranged from non-detect (less than 5 µg/L) to 19 µg/L at MPE-14. In addition, acetone and MEK were detected at concentrations ranging from non-detect (less than 10 µg/L) to 430 and 43 µg/L at MPE-17 and MPE-21, respectively.

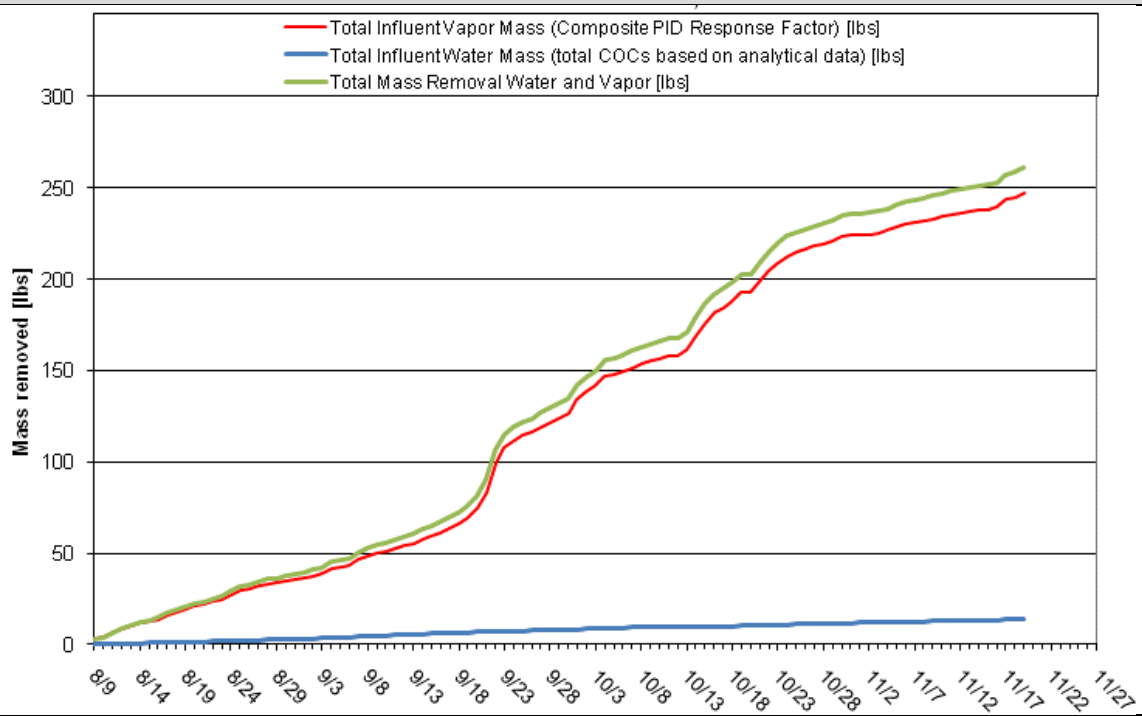
October 27th:
VOCs were detected in all of the groundwater monitoring and groundwater extraction wells sampled during this monitoring event. TCE was detected at concentrations ranging from non-detect (less than 5 µg/L) to 470 µg/L at MPE-09. Concentrations of cis-1,2-DCE ranged from non-detect (less than 5 µg/L) to 8.8 µg/L at MPE-14. In addition, acetone and MEK were detected at concentrations ranging from non-detect (less than 10 µg/L) to 750 and 78 µg/L, respectively, at MPE-01.

Ambient Air: Data were received for ambient air samples collected on October 26, 2010. TCE was not detected at either the upgradient or downgradient locations. All other VOCs detected were consistent with the compounds and concentrations detected during the Baseline ambient air monitoring event.

Next Project Status Conference Call: Thursday, December 2nd at 12:30 pm

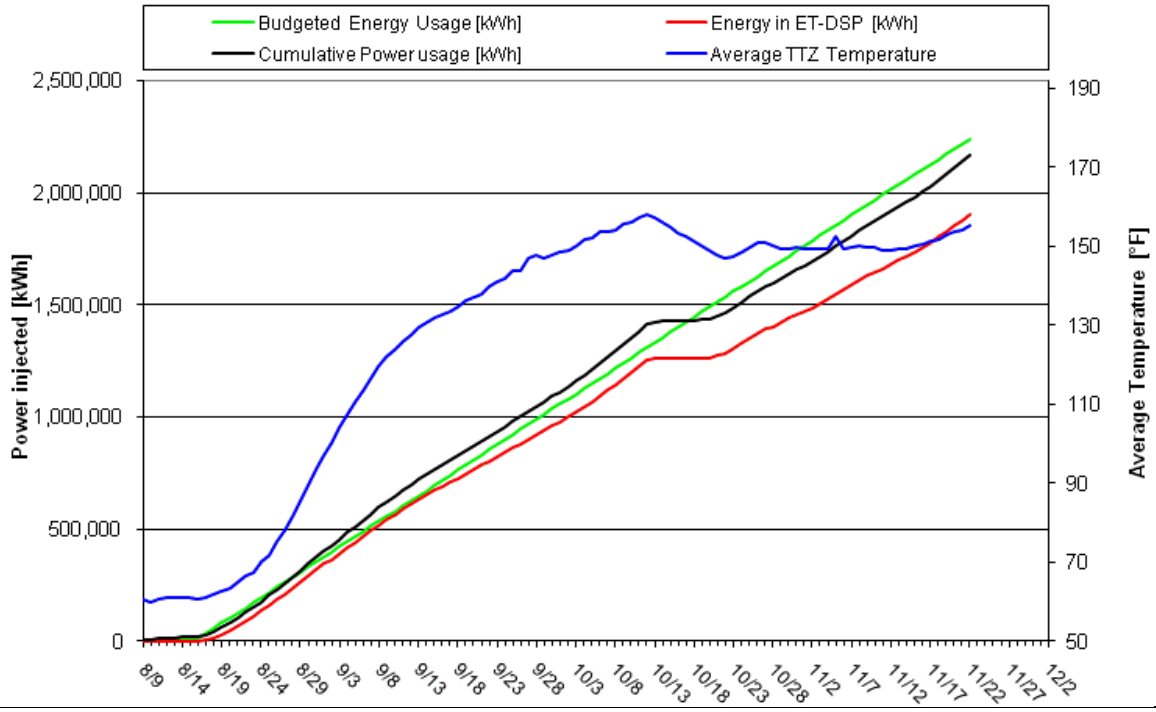
Next Project Status Meeting: Thursday, December 16th at 12:30 pm

Figure 1, Mass Removal Estimate:



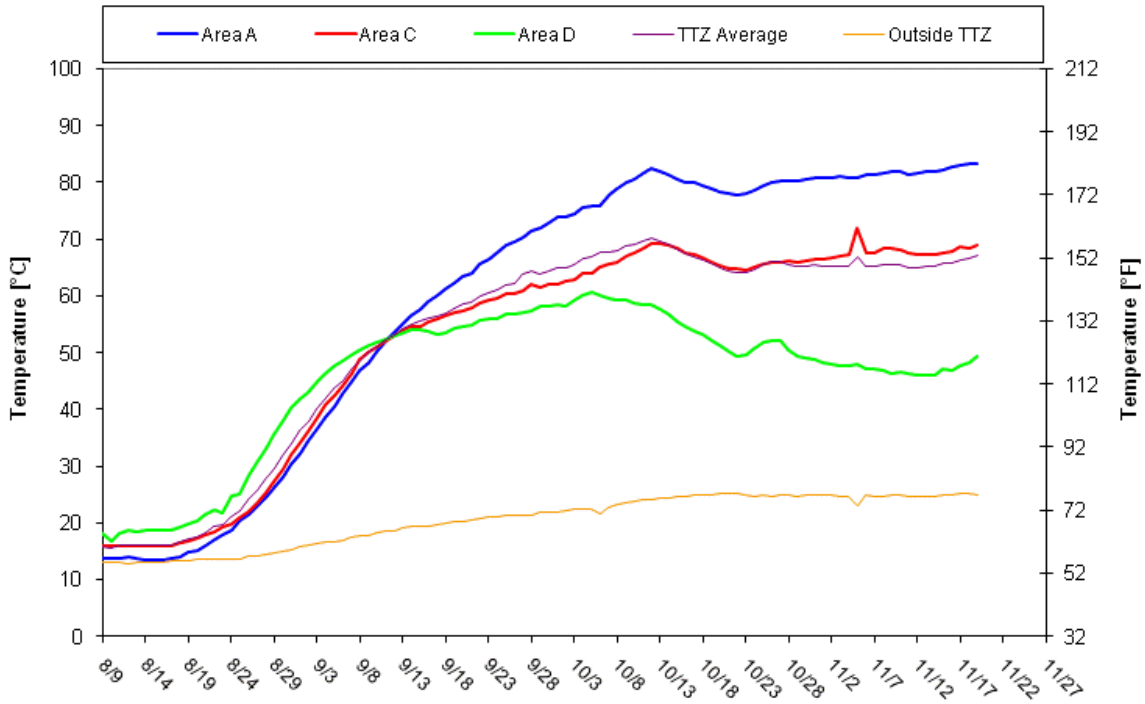
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



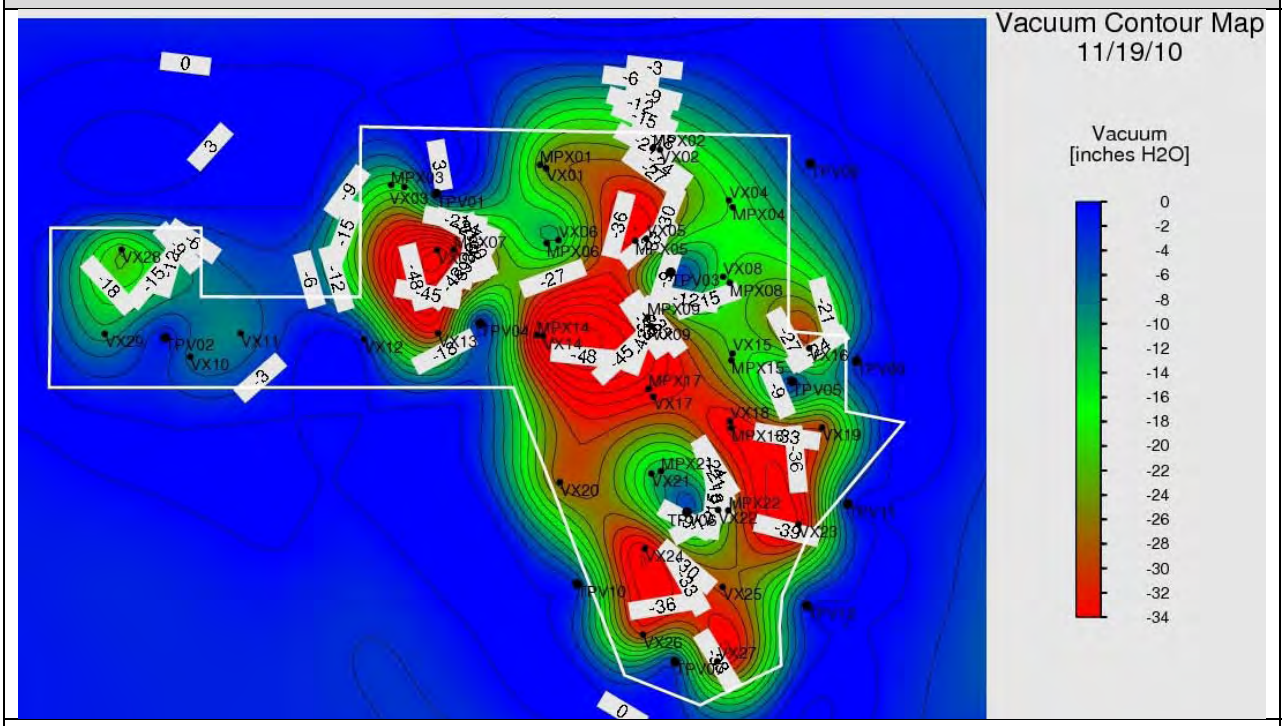
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



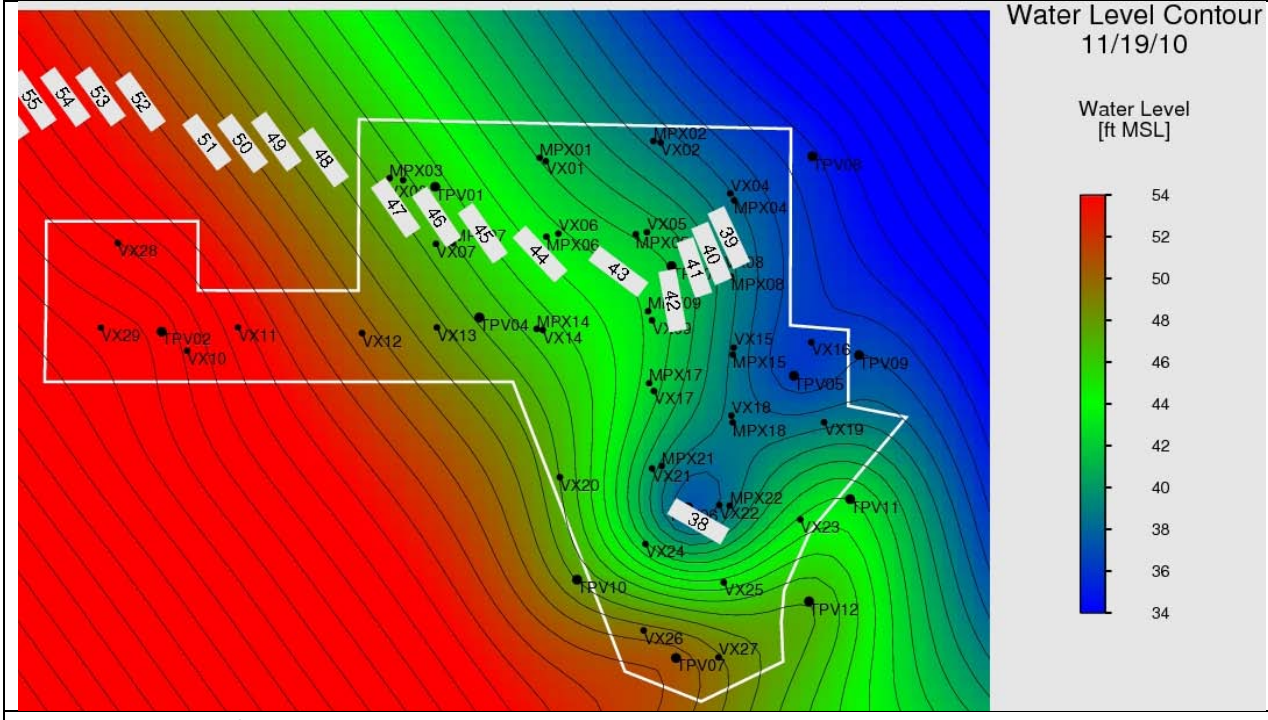
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** November 30, 2010

Operation and Maintenance Activities Performed from 11/20/2010 to 11/26/2010	**Status**
The Week 15 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) OEME's mobile laboratory was onsite to analyze split samples from the vapor extraction wells. In addition, a groundwater monitoring event was completed. The ET-DSP system was temporarily disabled for this planned intrusive event. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
The vapor extraction system shutdown on November 24th due to an alarm at the first knockout pot. The knockout pot was maintained and the vapor extraction system was restarted approximately 30 minutes later.	Complete
The Nobis team continues GWTP maintenance related to the iron biofouling (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
TerraTherm operators removed approximately one gallon of iron biofouling material from the trough tank and oil water separator. TerraTherm will continue to remove this material from the trough tank and oil water separator in order to assist with maintenance issues within the GWTP due to iron biofouling.	On-going
TerraTherm continues to enhance soil conductivity by introducing water conditioning salts to the injection water at targeted shallow electrodes with currents less than 5 kW. The following injections were made during this operational period: • November 26th – 100 lbs. This activity may continue, sporadically, throughout the operation of the ISTT system.	On-going
The project team evaluated heating enhancements to accelerate heating at the Site. A steam generator (mobilized and installed at the Site) will be used to inject steam into targeted electrodes. In addition, steam spears (small diameter wells) will be installed and used to inject steam at select locations throughout the shallow vadose zone. TerraTherm and McMillan-McGee continued working on the installation of the steam injection infrastructure. The steam generator will be inspected on Thursday, December 2nd. Following approval, steam injections will begin at the targeted electrodes. In addition, the installation of the steam spears will begin on Friday, December 3rd. Following installation, steam injections to steam spears will begin (week of 12/6).	On-going
The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent. In addition, the carbon efficiency is evaluated daily. The removal efficiency is based on both influent and effluent concentrations. This week the influent concentrations were relatively low early in the week (9 to 25 ppm), which results in a relatively low calculated removal efficiency. The overall vapor extraction system removal efficiency for this operational period is estimated at 88%. The project team will continue to monitor the	On-going

vapor extraction system's removal efficiency. At this time, a carbon change out is not believed to be needed.	
During this operational period, water injection rates within the shallow electrodes were increased to optimize the resistivity of the soil in this zone. This resulted in a temporary net water extraction of -1,791 gallons. Site hydraulic control has been maintained with a total of 1,140,173 gallons of water injected since system startup while a total of 1,374,670 gallons of water extracted, for a net extraction of 234,497 gallons. The project team continues to monitor Site hydraulic control, specifically the balance of water injection and extraction rates.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 11/20/2010 to 11/26/2010

ISTT Wellfield		
Temperature (°F): 127° (Area D) to 183° (Area A)	Volume Extracted/Injected (gal): 90,589 / 92,380	Groundwater Elevation (ft msl): ~37 to 47
Min. VOC Reading (ppm PID) 2.8 at VEW-27 (Area C)	Max. VOC Reading (ppm PID): 127.5 at VEW-15 (Area A)	Average VOCs (ppm PID): 42.4
ISTT Extraction System		
Average Air Flow (scfm): 481	Average Groundwater Extraction Rate (gpm): 9.0	Average Groundwater Injection Rate (gpm): 9.2
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 14.8 (Figure 1)	Est. Energy Used (kWh): 178,400 (Figure 2)
GAC Influent (ppm-PID): 17	GAC Effluent (ppm-PID): 2	Removal Efficiency (%): 88%
GWTP Combined Influent (Collected by the Nobis team)		
Chloride (ppm): 90	Temperature (°F): 64	pH (pH units): 6.7

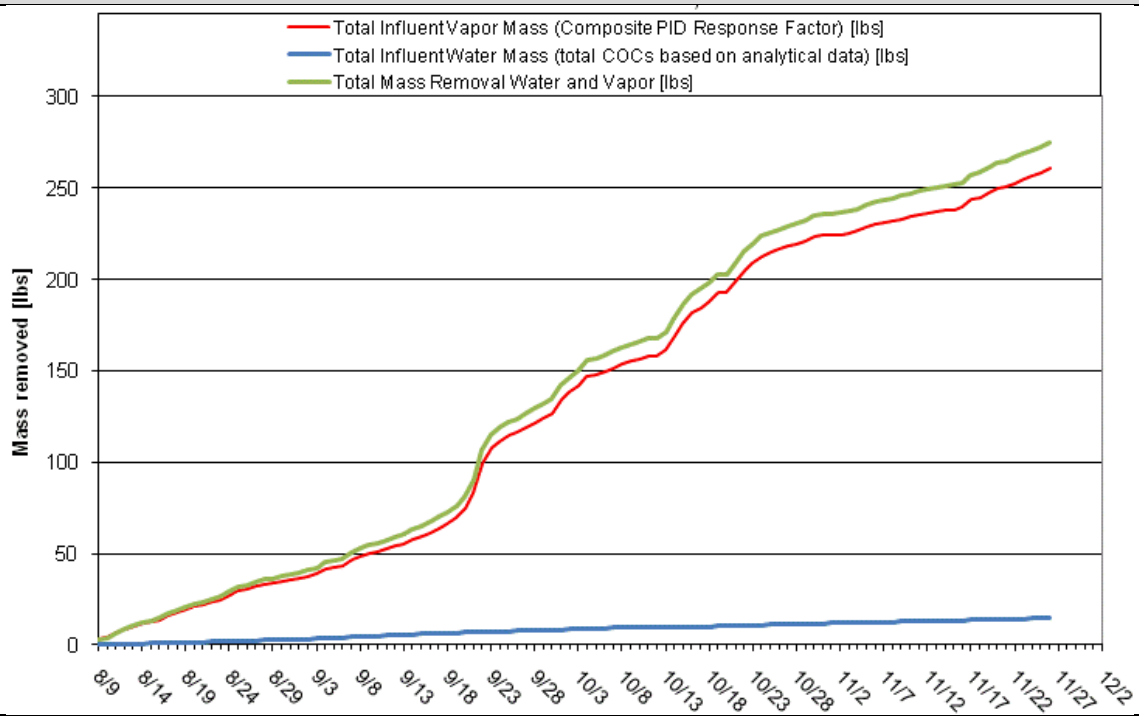
Status of Performance Metrics

Temperature (See Figure 3): The current average subsurface temperature is approximately 105° F above the baseline average temperature, before the start of heating. The current average temperature equals the peak average temperature recorded (Week 10) before the October 12 through 20 shut-down of the ET-DSP and liquid extraction system.	Pneumatic Control (See Figure 4): The ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The ISTT liquid extraction system is maintaining hydraulic control within Treatment Zone A.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant

	concentrations are above the current CUGs.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown on October 12th until October 20th, the total operational duration has been prolonged. In addition, the project team is concerned with the overall rate of heating. Heating enhancements (steam injections) have been evaluated to accelerate heating at the Site. Installation of the steam infrastructure is currently underway. Steam injections will begin the week of December 6th.	
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 275 lbs	Total NAPL Removed To Date: 18.4 gallons
Optimization Activities for the Following Week:	
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Continue to operate the extraction systems while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.	
ET-DSP System – Continue to enhance soil conductivity within the vadose zone with saline water injection. Continue the installation of steam infrastructure and steam generator inspection.	
GWTP – Continue to closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters (i.e. chloride) while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).	
Performance Monitoring – Continue routine process performance monitoring and sampling. In addition, an ambient air monitoring event is planned. All samples will be processed, handled, and shipped by Nobis.	
Analytical Laboratory Data Received:	
Process Liquid: Laboratory data were received for the process liquid samples collected on November 3 (inorganic data only) and 10 (organic data only), 2010. Inorganic Data: The concentrations of metals observed in the process water sample were below the GWTP discharge limits, with the exception of arsenic and lead. Arsenic was detected at a trace concentration of 5.4 ug/L, which is higher than the average monthly limit of 0.75 ug/L. Lead was detected at a trace concentration of 3.8 ug/L, which is higher than the average monthly limit of 1.3 ug/L but lower than the daily maximum of 34 ug/L. Arsenic (0.65 ug/L) and lead (0.079 ug/L) were detected at trace concentrations below the GWTP discharge limits from the sample collected at the GWTP effluent on November 4, 2010, indicating that the metals contained in the process water are sufficiently removed during treatment in the GWTP. Organic Data: TCE was detected at a concentration of 20 µg/L, while cis-1,2-DCE was not detected in the process liquid sample collected on November 10, 2010. In addition, acetone and MEK were detected at concentrations of 940 µg/L and 140 µg/L, respectively.	
Process Vapor: No new data available for this reporting period.	
Extraction Wells: TCE was detected in all the air samples collected from the 16 vapor extraction wells at concentrations ranging from 12 ppbv (VEW-07) to 3,160 ppbv (VEW-15). PCE, cis-1,2-DCE, 1,1-DCE, and trans-1,2-DCE were also detected in several samples, at maximum concentrations of 149 ppbv (VEW-04),	

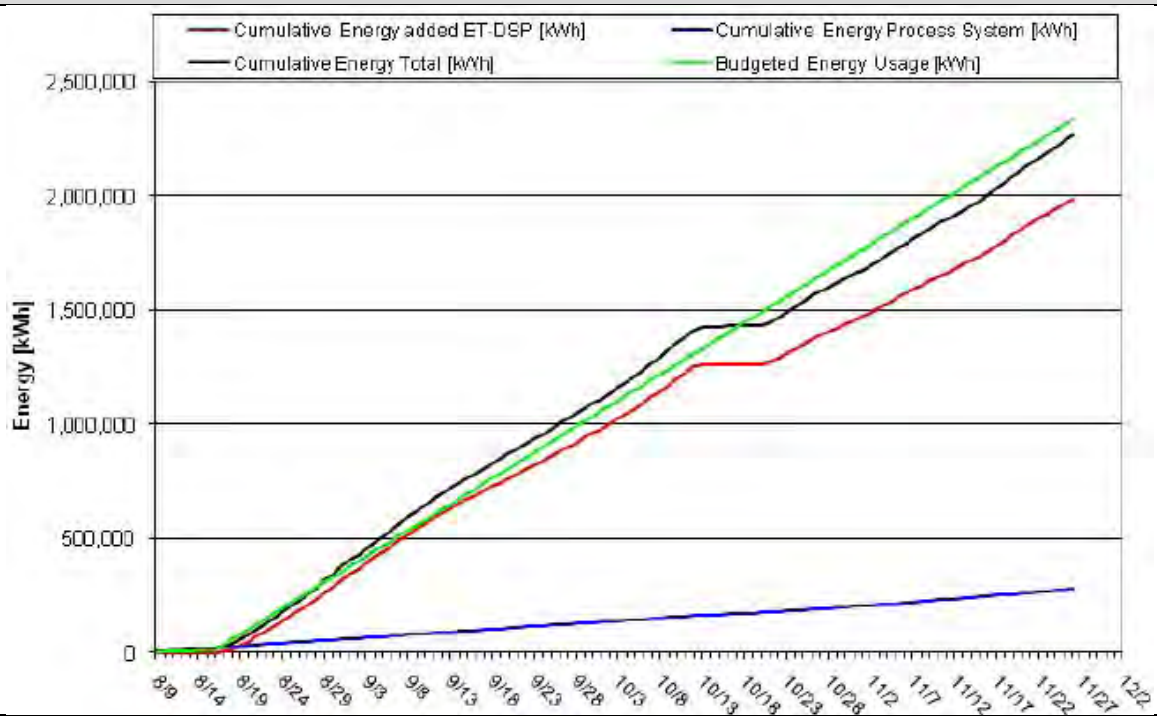
5,400 ppbv (VEW-15), 1,200 ppbv (VEW-09), and 964 ppbv (VEW-23), respectively.
Groundwater: No new data available for this reporting period.
Ambient Air: No new data available for this reporting period.
Next Project Status Conference Call: Thursday, December 2nd at 12:30 pm
Next Project Status Meeting: Thursday, December 16th at 12:30 pm

Figure 1, Mass Removal Estimate:



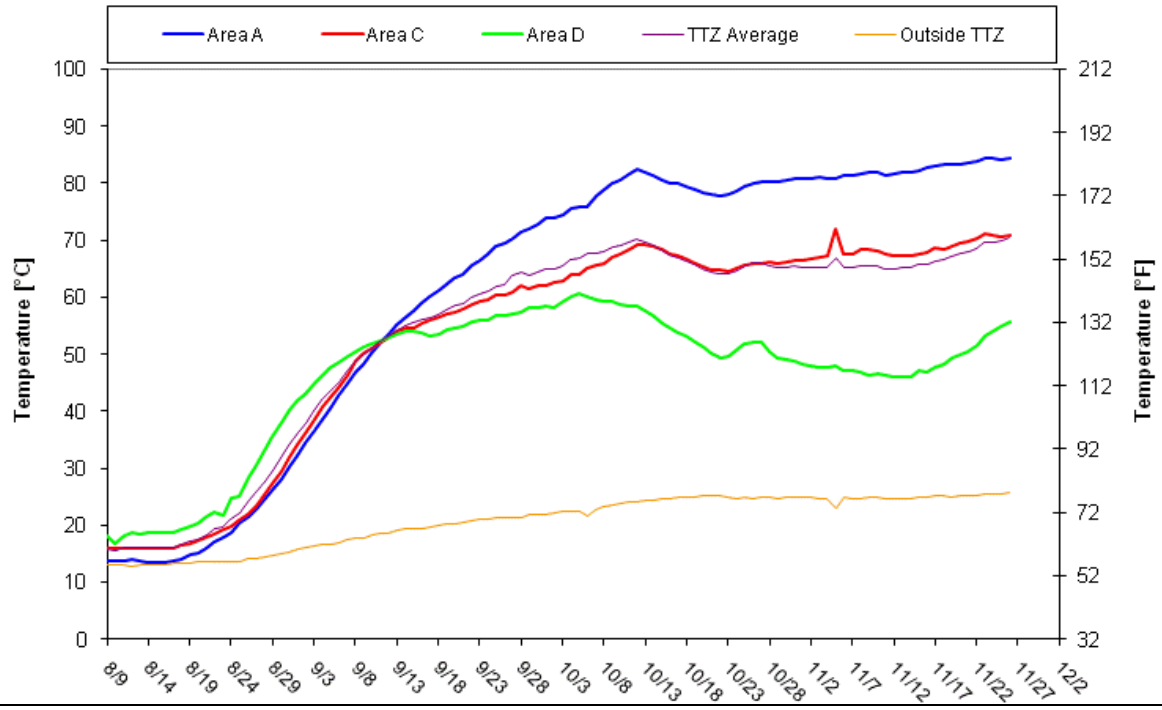
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



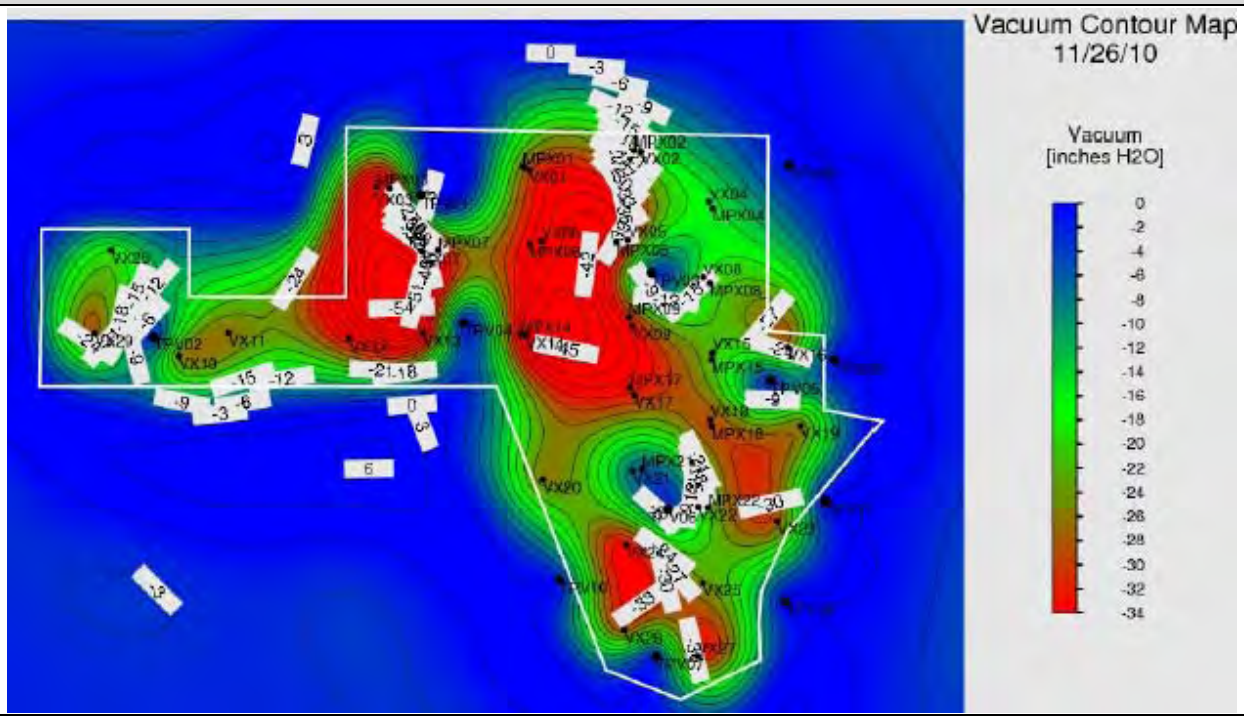
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



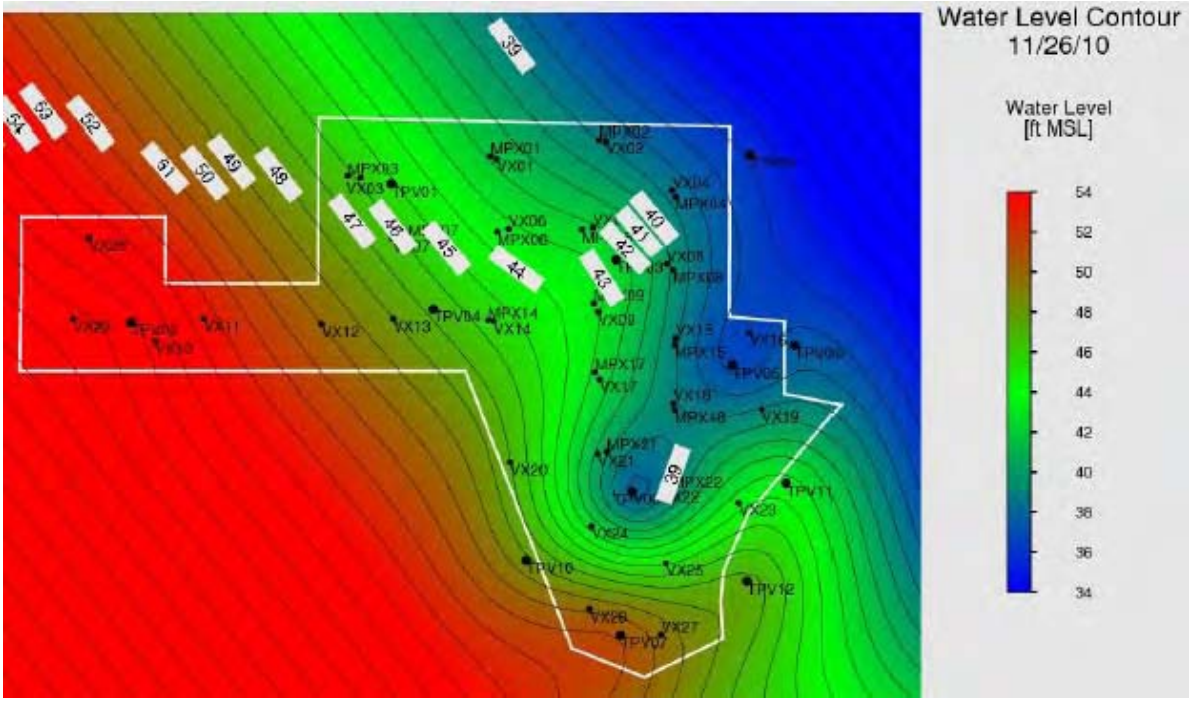
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** December 7, 2010

Operation and Maintenance Activities Performed from 11/27/2010 to 12/3/2010	**Status**
The Week 17 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition, an ambient air sampling event was completed. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
The vapor extraction system shutdown on November 27th and 28th due to alarms at the first knockout pot. TerraTherm operators concluded that the knockout pot transfer pump lost its prime during both incidents. TerraTherm has taken the pump offline and connected a new alternate pump.	Complete
TerraTherm revised their approach to evaluating and reporting temperature changes in Treatment Area C (Area C). Previously, data collected from the thermocouples installed in Area C, located from approximately 0 to 22 feet below ground surface (ft bgs), have been used in the evaluation of temperatures in Area C. Area C has a treatment depth of 0 to 10 ft bgs. As a result, TerraTherm has changed the range of depths used to evaluate temperatures in Area C to be consistent with the treatment depth of 0 to 10 ft bgs. Figure 3, Average Temperatures within the ISTT Wellfield, shows the new data used for the Area C temperature evaluation.	Complete
TerraTherm continues to winterize the water extraction, electrode injection, and steam injection piping, including installing heat trace in preparation of freezing conditions.	On-going
The Nobis team continues GWTP maintenance related to the iron biofouling (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
TerraTherm operators removed approximately four gallons of iron biofouling material from the trough tank and oil water separator. TerraTherm will continue to remove this material from the trough tank and oil water separator in order to assist with maintenance issues within the GWTP due to iron biofouling.	On-going
TerraTherm continues to enhance soil conductivity by introducing water conditioning salts to the injection water at targeted shallow electrodes with currents less than 5 kW. The following injections were made during this operational period: • November 29th – 80 lbs; and • November 30th – 10 lbs. This activity may continue, sporadically, throughout the operation of the ISTT system.	On-going
TerraTherm and McMillan-McGee continued the installation of the steam injection infrastructure, including the installation of steam spears on Friday, December 3rd. The ET-DSP system was temporarily disabled (for approximately 8.5 hours) for this planned intrusive activity. The installation of steam spears will be complete during the week of December 6th. The project team is currently waiting for the inspection of the steam generator in order to begin the steam injections. The Massachusetts'	On-going

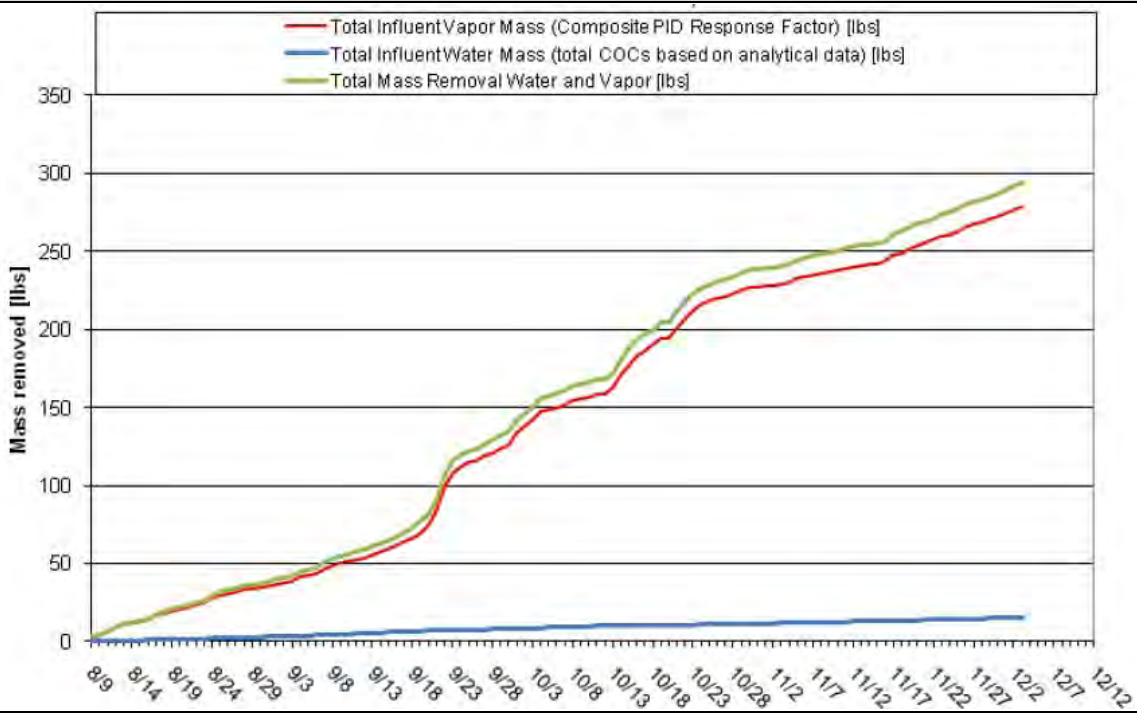
Department of Health and Safety and its recommended contractor, NRG Services, have not provided a rescheduled inspection date after missing the planned December 2nd inspection.	
The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent. In addition, the carbon efficiency is evaluated daily. The removal efficiency is based on both influent and effluent concentrations. This week the influent concentrations were relatively low early in the week (14 to 24 ppm, average of 18 ppm), which results in a relatively low calculated removal efficiency. The overall vapor extraction system removal efficiency for this operational period is estimated at 88%. The project team continues to monitor the vapor extraction system's removal efficiency. At this time, a carbon change out is not believed to be needed.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 11/27/2010 to 12/3/2010		
ISTT Wellfield		
Temperature (°F): 134° (Area D), 141° (Area C), and 185° (Area A)	Volume Extracted/Injected (gal): 100,961 / 84,390	Groundwater Elevation (ft msl): ~37 to 47
Min. VOC Reading (ppm PID) 0.8 at VEW-28 (Area D)	Max. VOC Reading (ppm PID): 69.3 at VEW-15 (Area A)	Average VOCs (ppm PID): 20.2
ISTT Extraction System		
Average Air Flow (scfm): 427	Average Groundwater Extraction Rate (gpm): 10.0	Average Groundwater Injection Rate (gpm): 8.4
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 14 (Figure 1)	Est. Energy Used (kWh): 166,720 (Figure 2)
GAC Influent (ppm-PID): 18	GAC Effluent (ppm-PID): 2	Removal Efficiency (%): 88%

Status of Performance Metrics	
Temperature (See Figure 3): The current average subsurface temperature is approximately 102° F above the baseline average temperature, before the start of heating.	Pneumatic Control (See Figure 4): The ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The ISTT liquid extraction system is maintaining hydraulic control within Treatment Zone A.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown on October 12th until October 20th, the total	

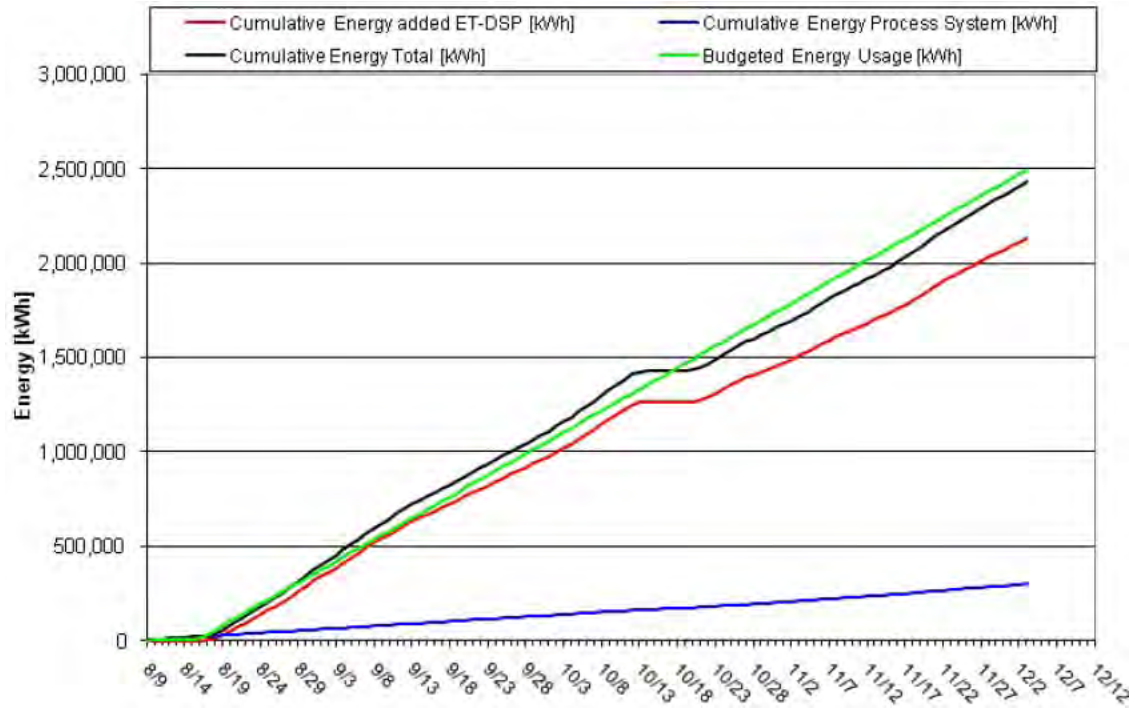
operational duration has been prolonged. In addition, the project team is concerned with the overall rate of heating. The installation of heating enhancements (steam injections) to accelerate heating at the Site is currently underway. Steam injections will begin once the steam generator has been inspected.	
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 294 lbs	Total NAPL Removed To Date: 18.4 gallons
Optimization Activities for the Following Week:	
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Continue to operate the extraction systems while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.	
ET-DSP System – Continue to enhance soil conductivity within the vadose zone with saline water injection. Begin steam injections once the steam generator is inspected (waiting on the Massachusetts Department of Safety).	
GWTP – Continue to closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters (i.e. chloride) while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).	
Performance Monitoring – Continue routine process performance monitoring and sampling. In addition, a groundwater monitoring event is planned. All samples will be processed, handled, and shipped by Nobis.	
Analytical Laboratory Data Received:	
Process Liquid: Organic laboratory data was received for the process liquid sample collected on November 17, 2010. TCE was detected at a concentration of 28 µg/L, while cis-1,2-DCE was detected at a trace concentration of 4.1 µg/L. In addition, acetone and MEK were detected at concentrations of 1,200 µg/L and 240 µg/L, respectively.	
Process Vapor: No new data available for this reporting period.	
Extraction Wells: No new data available for this reporting period.	
Groundwater: Analytical data was received for the groundwater monitoring event conducted on November 10th. VOCs were detected in all of the groundwater monitoring and groundwater extraction wells sampled during this monitoring event. TCE was detected at concentrations ranging from non-detect (less than 5 µg/L) to 380 µg/L at MPE-05. Concentrations of cis-1,2-DCE ranged from non-detect (less than 5 µg/L) to 22 µg/L at MPE-05. In addition, acetone and MEK were detected at concentrations ranging from non-detect (less than 10 µg/L) to 490 and 90 µg/L at MPE-17.	
Ambient Air: No new data available for this reporting period.	
Next Project Status Meeting: Thursday, December 16th at 12:30 pm	
Next Project Status Conference Call: Thursday, December 30th at 12:30 pm	

Figure 1, Mass Removal Estimate:



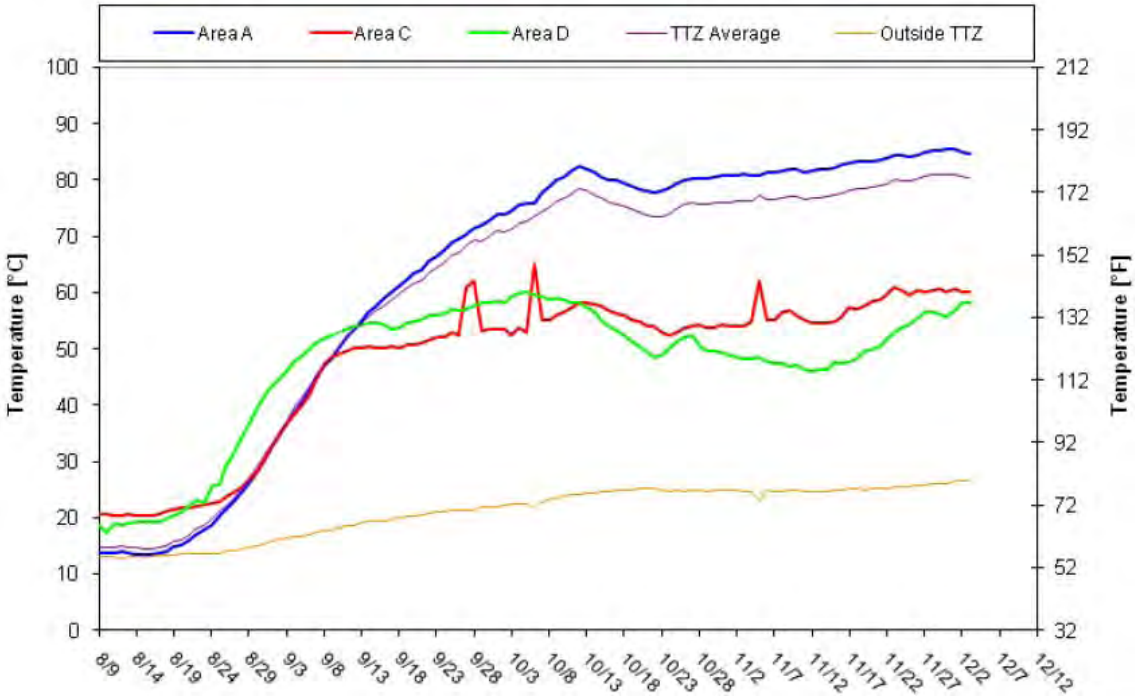
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



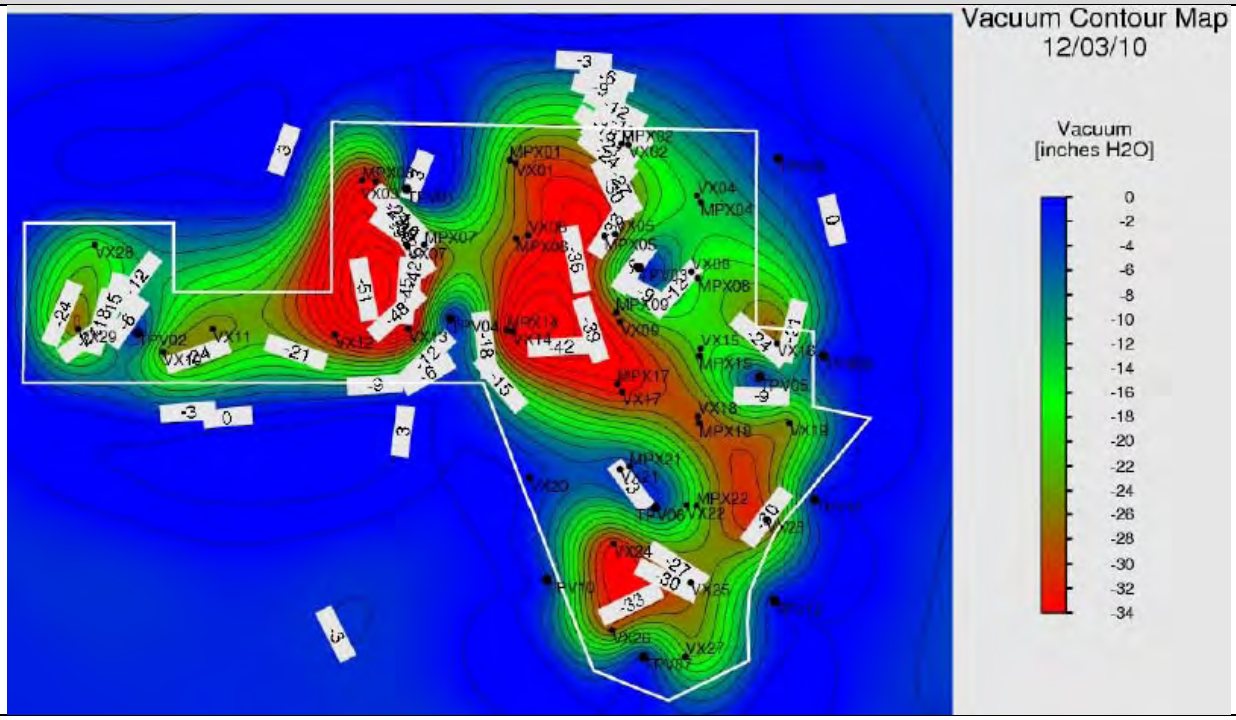
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



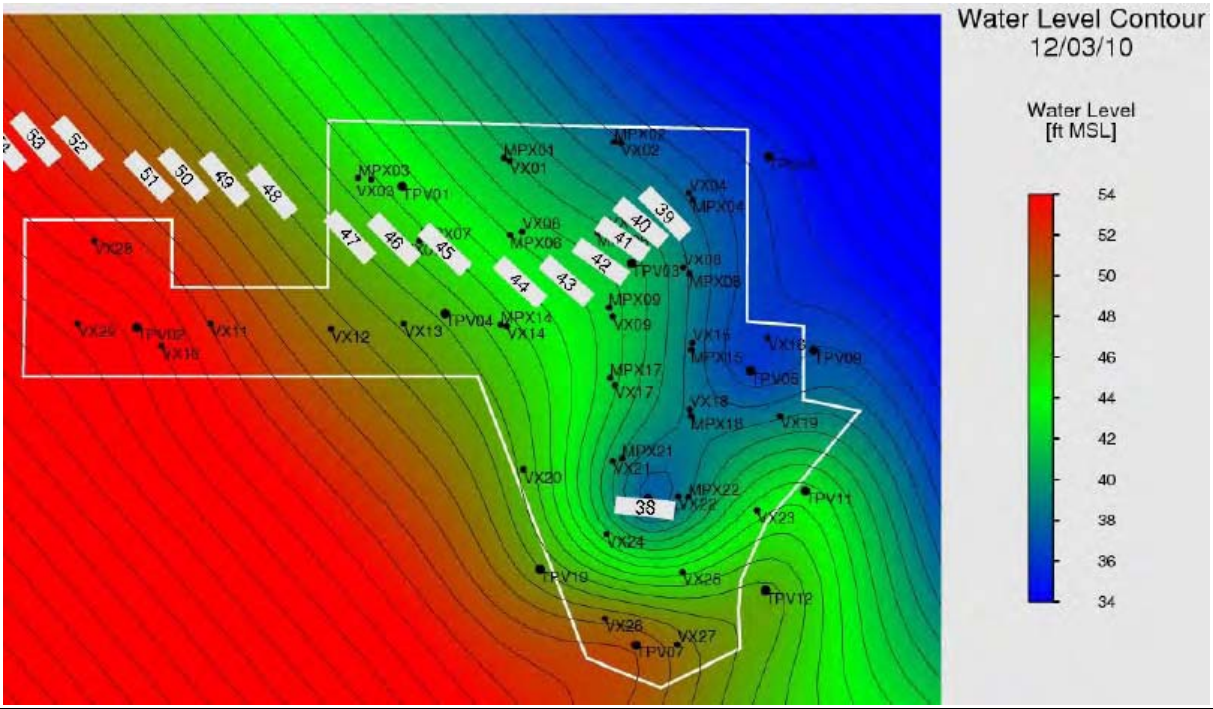
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** December14, 2010

Operation and Maintenance Activities Performed from 12/4/2010 to 12/10/2010	**Status**
The Week 18 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition, a groundwater monitoring event was completed. The ET-DSP system was temporarily disabled for this planned intrusive event. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
The vapor extraction system shut down on December 7th, December 8th, and December 9th, due to alarms at the first knockout pot. TerraTherm operators restarted the vapor extraction system on the 12/7 and 12/8 incidents within a few minutes of the shutdowns. One 12/9, the vapor extraction system was restarted in approximately one hour, due to the incident occurring after hours.	Complete
The vapor extraction system shut down sometime during the evening hours of December 10th, due to a high temperature alarm. TerraTherm operators did not receive a dial out. The system was restarted the following morning, upon the operator's arrival in the morning. In addition, the autodialer was reset, in order to notify operators of a similar alarm condition.	Complete
The chiller and cooling tower shut down on December 10th due to low ambient air temperature and the accumulation of ice, respectively. TerraTherm reprogrammed the chiller, under direction by the manufacturer, in order to prevent this alarm condition from occurring again. TerraTherm performed maintenance to the cooling tower. Both the chiller and cooling tower were restarted on December 10th.	Complete
TerraTherm reconfigured the liquid extraction system modifications (location of pump within weir tank) in an attempt to improve the water quality being sent to the GWTP.	Complete
TerraTherm continues to winterize the water extraction, electrode injection, and steam injection piping, including conduits located inside the Valley Manufacturing building.	On-going
The Nobis team continues GWTP maintenance related to the iron biofouling (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
TerraTherm continues to enhance soil conductivity by introducing water conditioning salts to the injection water at targeted shallow electrodes with currents less than 5 kW. The following injections were made during this operational period: • December 9th – 40 lbs; • December 10th – 80 lbs; and • December 11th – 40 lbs. This activity may continue, sporadically, throughout the operation of the ISTT system.	On-going
TerraTherm completed the installation of the steam spears. The ET-DSP system was temporarily disabled for this planned intrusive event. The project team is waiting for the inspection of the steam generator in order to begin the steam injections into	On-going

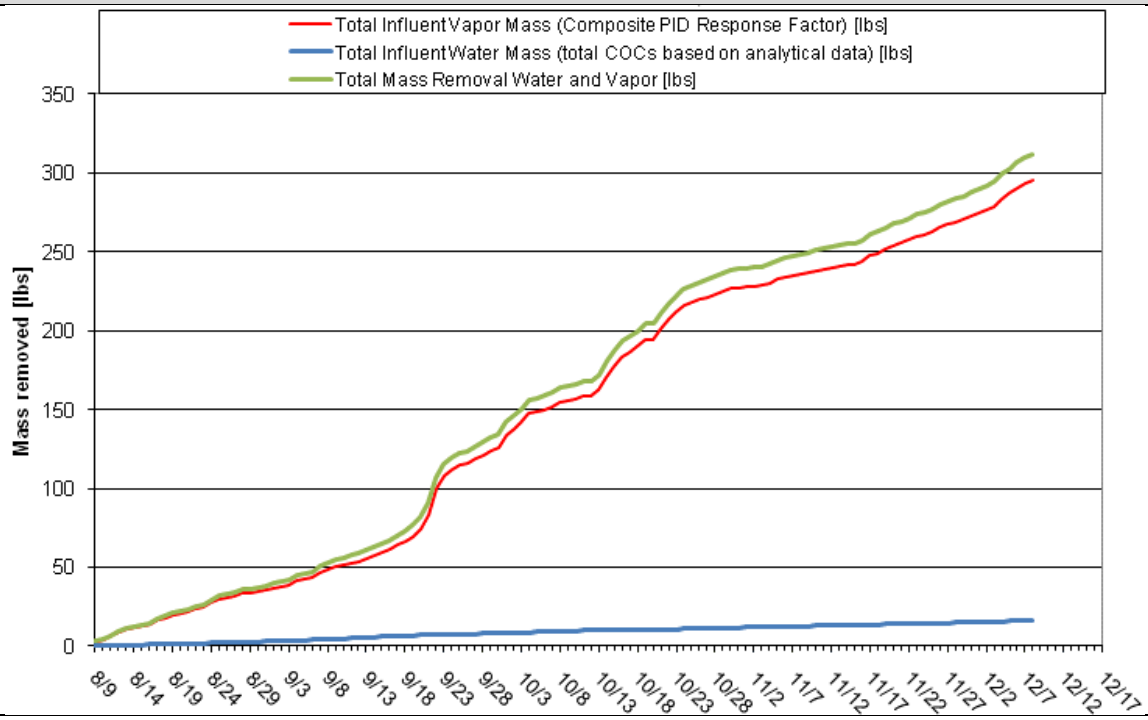
electrodes and the new steam spears. The Massachusetts' Department of Health and Safety and its recommended contractor, NRG Services, is scheduled to be onsite on Friday, December 17, 2010 for the steam generator inspection.	
The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent. In addition, the carbon efficiency is evaluated daily. The removal efficiency is based on both influent and effluent concentrations. This week the influent concentrations were relatively low early in the week (10 to 40 ppm, average of 22.6 ppm), which results in a relatively low calculated removal efficiency. The overall vapor extraction system removal efficiency for this operational period is estimated at 79%. The project team continues to monitor the vapor extraction system's removal efficiency. At this time, a carbon change out is not believed to be needed.	On-going
During this operational period, water injection rates were increased to optimize the resistivity of the soil throughout the treatment zone. This resulted in a temporary net water extraction of -6,400 gallons. Site hydraulic control has been maintained with a total of 1,314,333 gallons of water injected since system startup while a total of 1,558,931 gallons of water extracted, for a net extraction of 244,598 gallons. The project team continues to monitor Site hydraulic control.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 12/4/2010 to 12/10/2010		
ISTT Wellfield		
Temperature (°F): 133° (Area D), 136° (Area C), and 182° (Area A)	Volume Extracted/Injected (gal): 83,300 / 89,770	Groundwater Elevation (ft msl): ~37 to 47
Min. VOC Reading (ppm PID) 2.2 at VEW-28 (Area D)	Max. VOC Reading (ppm PID): 64.8 at VEW-15 (Area A)	Average VOCs (ppm PID): 26.2
ISTT Extraction System		
Average Air Flow (scfm): 522	Average Groundwater Extraction Rate (gpm): 8.3	Average Groundwater Injection Rate (gpm): 8.9
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 20.8 (Figure 1)	Est. Energy Used (kWh): 140,960 (Figure 2)
GAC Influent (ppm-PID): 22.6	GAC Effluent (ppm-PID): 4.7	Removal Efficiency (%): 79%

Status of Performance Metrics	
Temperature (See Figure 3): The current average subsurface temperature is approximately 99° F above the baseline average temperature, before the start of heating.	Pneumatic Control (See Figure 4): The ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.

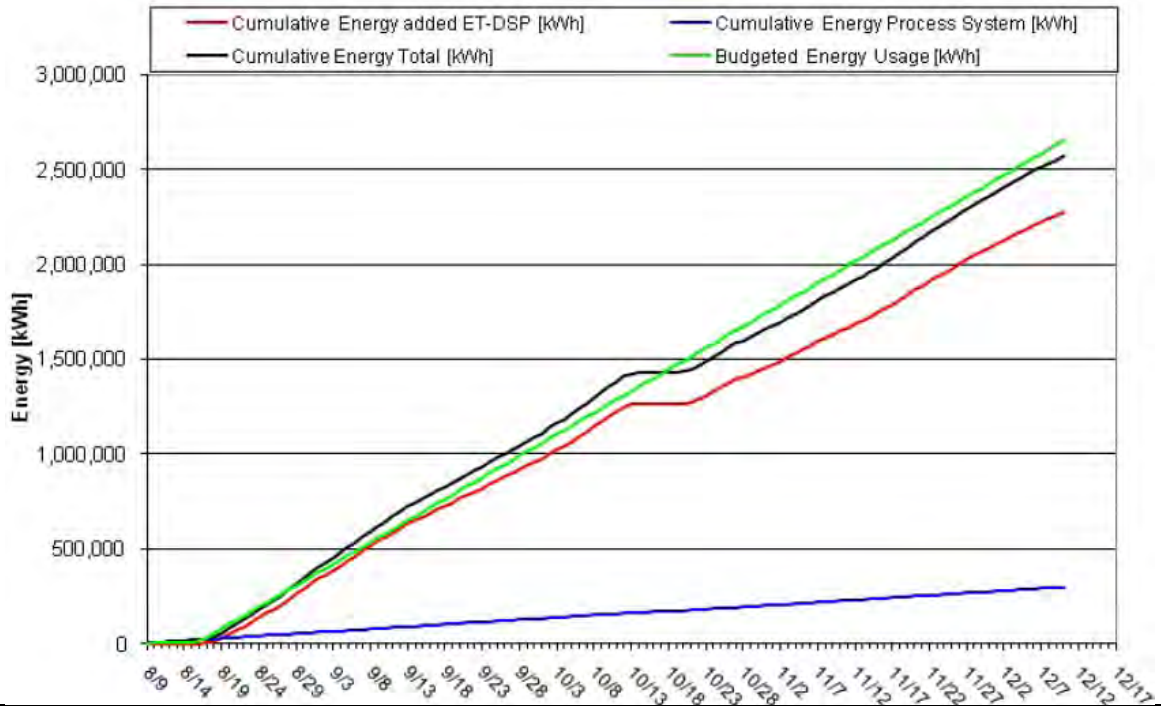
Hydraulic Control (See Figure 5): The ISTT liquid extraction system is maintaining hydraulic control within Treatment Zone A.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown on October 12th until October 20th, the total operational duration has been prolonged. In addition, the project team is concerned with the overall rate of heating. The installation of heating enhancements (steam injections) to accelerate heating at the Site is currently underway. Steam injections will begin once the steam generator has been inspected.	
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 316 lbs	Total NAPL Removed To Date: 18.4 gallons
Optimization Activities for the Following Week:	
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Continue to operate the extraction systems while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.	
ET-DSP System – Continue to enhance soil conductivity within the vadose zone with saline water injection. Begin steam injections once the steam generator is inspected (Massachusetts Department of Safety inspection planned for Friday, December 17th).	
GWTP – Continue to closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters (i.e. chloride) while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).	
Performance Monitoring – Continue routine process performance monitoring and sampling. In addition, an ambient air sampling event and a soil vapor extraction well sampling event (with the OEME mobile laboratory) is planned. All samples will be processed, handled, and shipped by Nobis.	
Analytical Laboratory Data Received:	
Process Liquid: Organic laboratory data was received for the process liquid sample collected on November 23, 2010. TCE was detected at a concentration of 19 µg/L, while cis-1,2-DCE was not detected. In addition, acetone and MEK were detected at concentrations of 1,700 µg/L and 230 µg/L, respectively.	
Process Vapor: No new data available for this reporting period.	
Extraction Wells: No new data available for this reporting period.	
Groundwater: Analytical data was received for the groundwater monitoring event conducted on November 23, 2010. VOCs were detected in all of the groundwater monitoring and groundwater extraction wells sampled during this monitoring event, except RW-01. TCE was detected at concentrations ranging from non-detect (less than 5 µg/L) to a maximum concentration of 97 µg/L (MPE-02). Concentrations of cis-1,2-DCE ranged from non-detect (less than 5 µg/L) to a maximum concentration of 10 µg/L (MPE-14). In addition, acetone and MEK were detected at concentrations ranging from non-detect (less than 10 µg/L) to maximum concentrations of 2,300 and 500 µg/L (MPE-18), respectively.	
Ambient Air: No new data available for this reporting period.	
Next Project Status Conference Call: Thursday, December 16th at 12:30 pm	
Next Project Status Conference Call: Wednesday, December 22nd at *10:00 am* **– Steam Injection Update Only**	
Next Project Status Meeting: Thursday, January 6th at 12:30 pm	

Figure 1, Mass Removal Estimate:



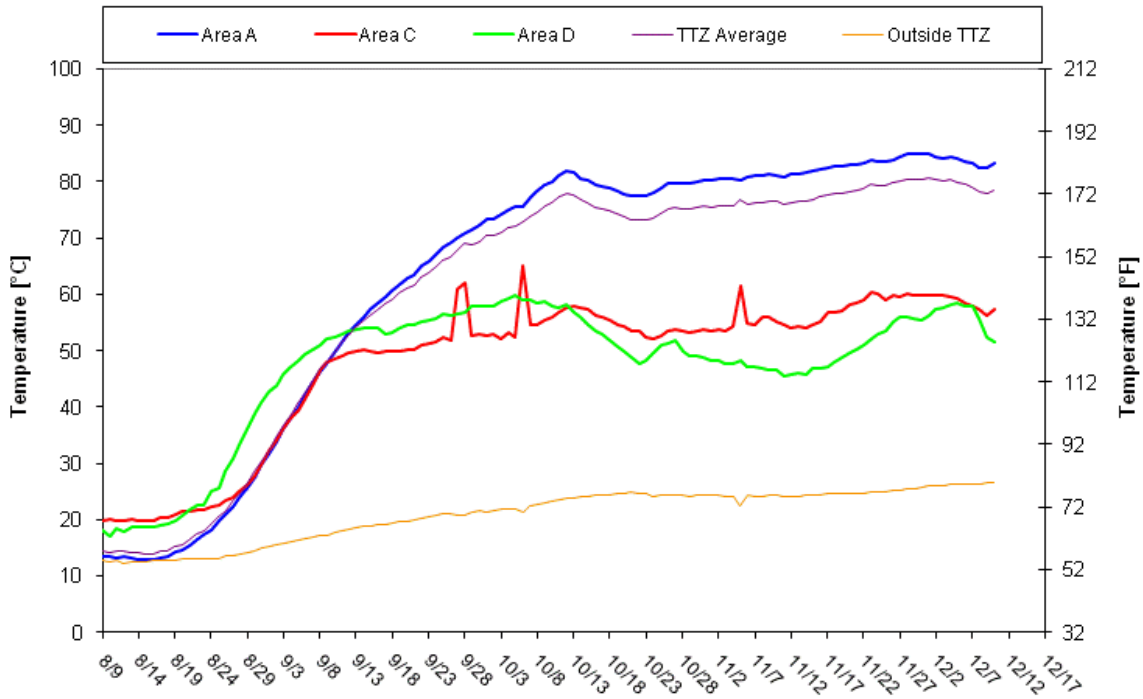
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



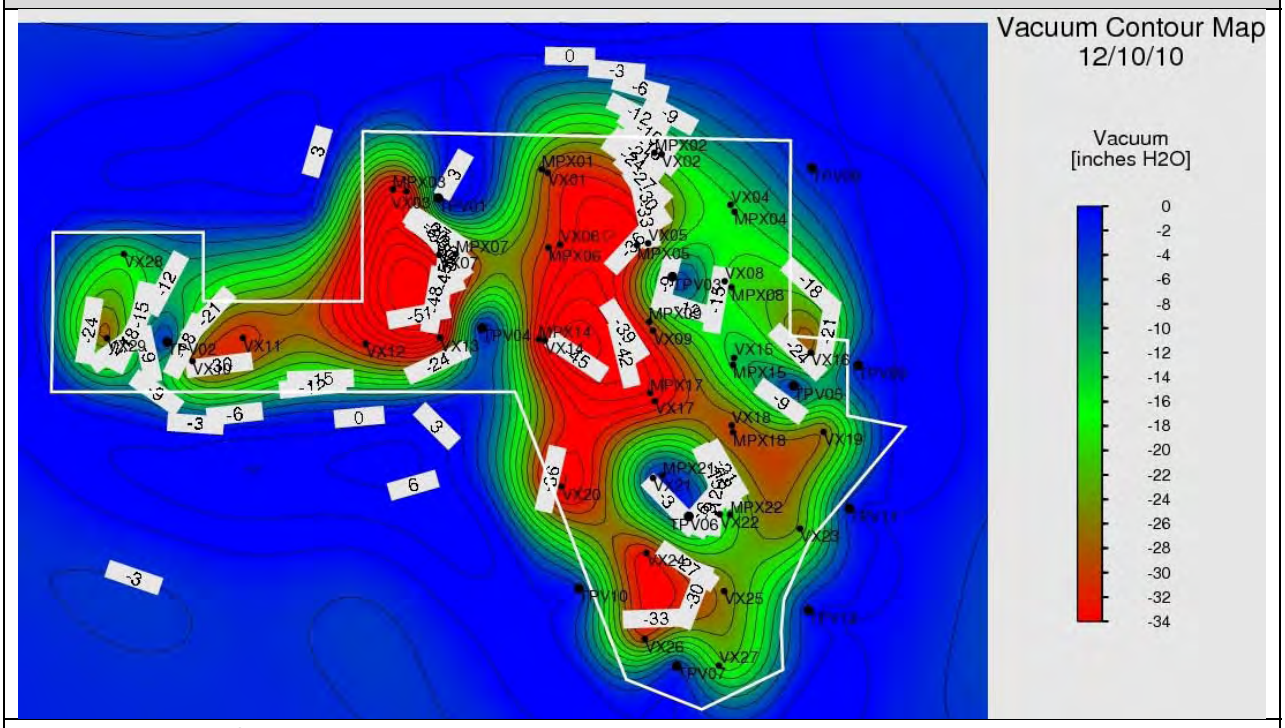
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



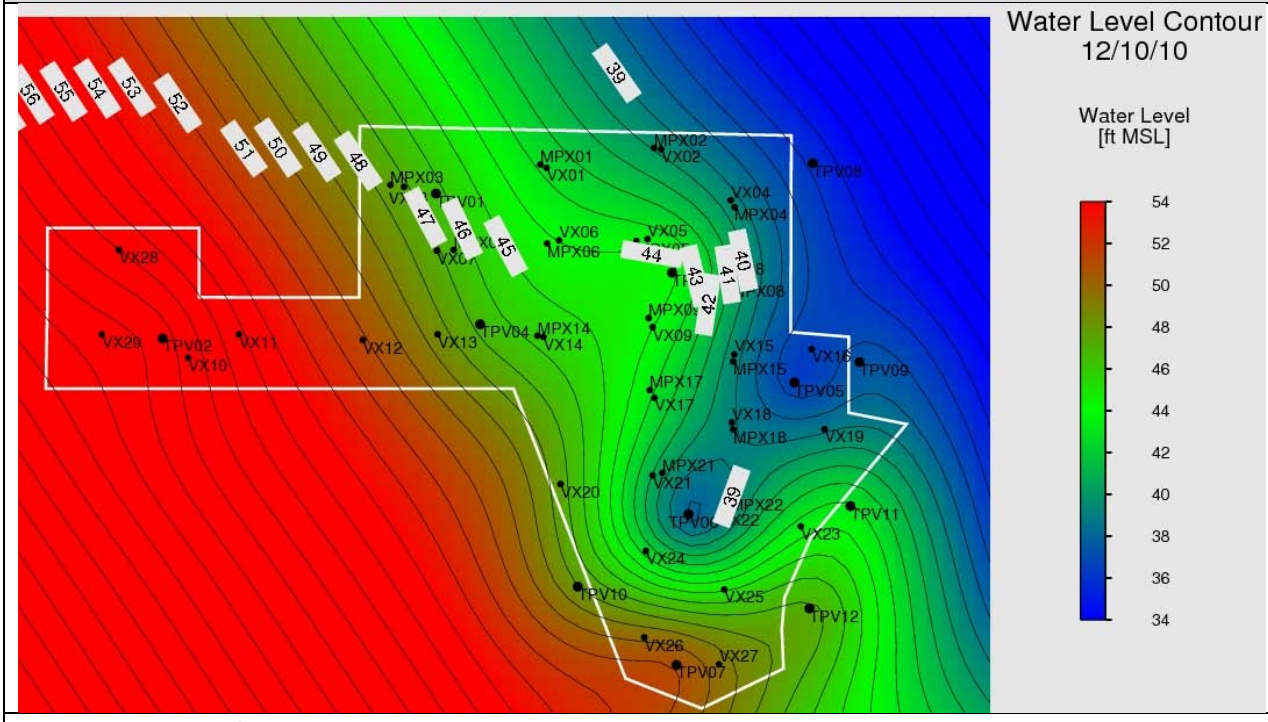
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** December 21, 2010

Operation and Maintenance Activities Performed from 12/11/2010 to 12/17/2010	**Status**
The Week 19 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition, an ambient air sampling event and soil vapor extraction well sampling event (with the OEME mobile laboratory) were completed. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
TerraTherm replaced the primary vapor carbon vessel with a fresh vapor carbon vessel on December 14th.	Complete
The Massachusetts' Department of Health and Safety's (MassDHS) recommended contractor, NRG Services, performed a pre-inspection of the steam generator in preparation of the MassDHS inspection performed on Friday, December 17th. A few minor corrective actions were identified with both inspections. TerraTherm completed the minor corrective actions. The steam generator will be started up for shakedown testing on December 20th. Steam injections into electrodes and steam spears will begin following the completion of shakedown testing (early next week, 12/21 or 12/22).	On-going
The air compressor, which supplies air to the pneumatic downhole pumps in the MPE wells, shutdown. A temporary generator, equipped with an air compressor, was temporarily mobilized to the Site to provide air required to operate the pneumatic pumps. The generator will remain onsite until the air compressor is repaired. This work will be completed during the following week (12/18 to 12/24).	On-going
TerraTherm mobilized supplies and began installation of a thermal insulation cap to assist with heat loss from the shallow treatment zone. This work will be completed during the following week (12/18 to 12/24).	On-going
TerraTherm continues winterization activities at the water extraction, electrode injection, and steam injection piping and process equipment.	On-going
The Nobis team continues GWTP maintenance related to the iron biofouling (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
TerraTherm operators removed approximately three gallons of iron biofouling material from the trough tank and oil water separator. TerraTherm will continue to remove this material from the trough tank and oil water separator in order to assist with maintenance issues within the GWTP due to iron biofouling.	On-going
During this operating period (12/11 to 12/17), the vapor extraction system influent concentrations were relatively low (10 to 22 ppm, average of 15.9 ppm), which results in a relatively low calculated removal efficiency. The overall vapor extraction system removal efficiency for this operational period is estimated at 80%. The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent and evaluate carbon efficiency daily.	On-going

The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

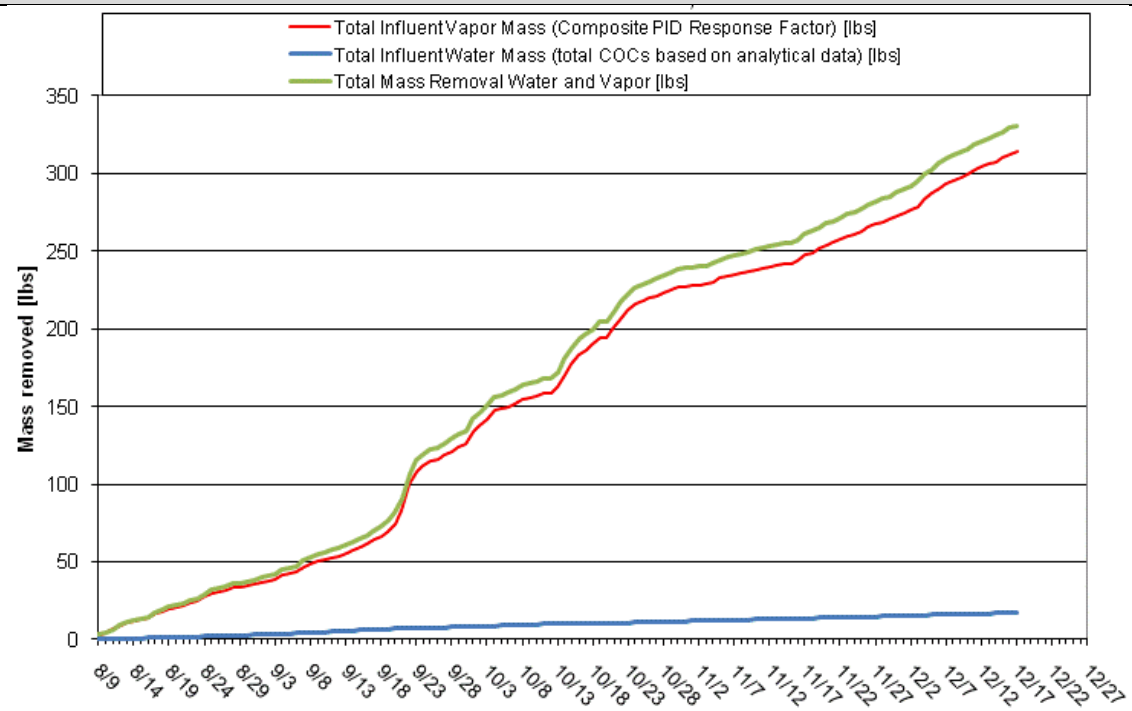
ISTT Operational Data – Collected by TerraTherm during the Period of 12/11/2010 to 12/17/2010		
ISTT Wellfield		
Temperature (°F): 124° (Area D), 134° (Area C), and 181° (Area A)	Volume Extracted/Injected (gal): 82,116 / 62,080	Groundwater Elevation (ft msl): ~37 to 46
Min. VOC Reading (ppm PID) 0.7 at VEW-28 (Area D)	Max. VOC Reading (ppm PID): 43 at VEW-15 (Area A)	Average VOCs (ppm PID): 13.8
ISTT Extraction System		
Average Air Flow (scfm): 540	Average Groundwater Extraction Rate (gpm): 8.2	Average Groundwater Injection Rate (gpm): 6.2
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 14.8 (Figure 1)	Est. Energy Used (kWh): 140,320 (Figure 2)
GAC Influent (ppm-PID): 15.9	GAC Effluent (ppm-PID): 3.1	Removal Efficiency (%): 80%

Status of Performance Metrics	
Temperature (See Figure 3): The current average subsurface temperature is approximately 95° F above the baseline average temperature, before the start of heating.	Pneumatic Control (See Figure 4): The ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The ISTT liquid extraction system is maintaining hydraulic control within Treatment Zone A. Current water levels are approximately 3 to 10 feet below baseline water levels.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown on October 12th until October 20th, the total operational duration has been prolonged. In addition, the project team is concerned with the overall rate of heating. The installation of heating enhancements (steam injections) to accelerate heating at the Site is currently underway. Steam injections will begin once the steam generator has been inspected.	
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 330 lbs	Total NAPL Removed To Date: 18.4 gallons

Optimization Activities for the Following Week:
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Continue to operate the extraction systems while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.

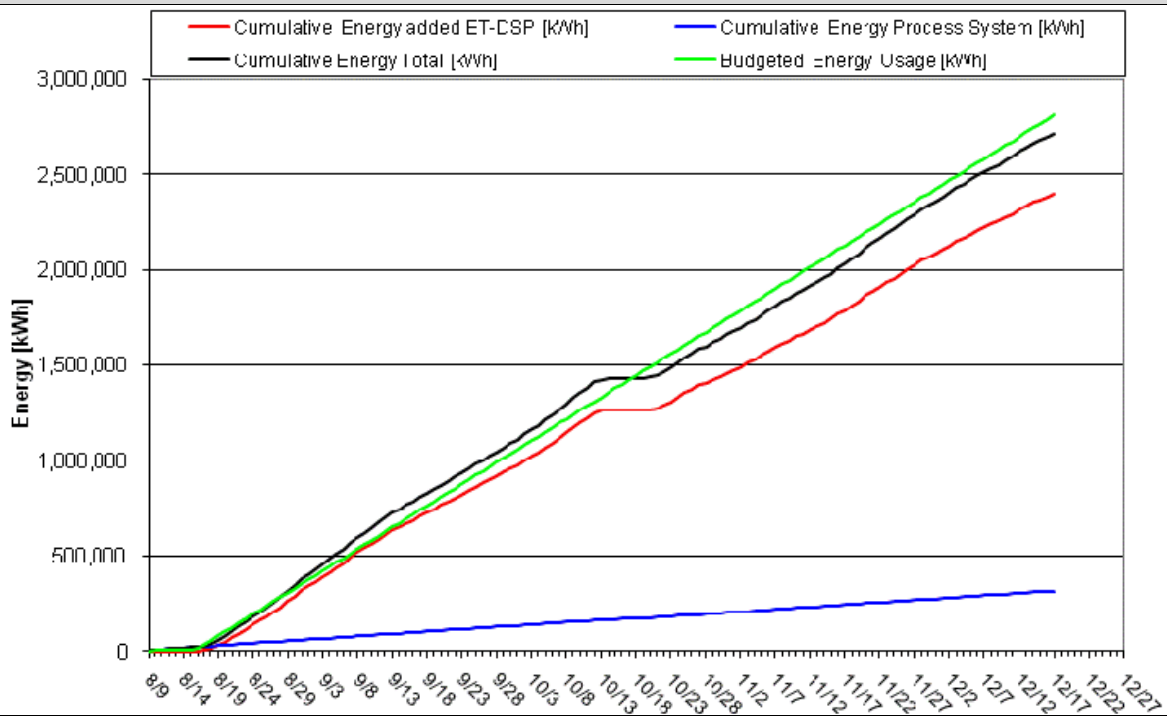
ET-DSP System – Continue to enhance soil conductivity within the vadose zone with saline water injection. Start-up and shakedown steam generator. Begin steam injections.
GWTP – Continue to closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters (i.e. chloride) while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).
Performance Monitoring – Continue routine process performance monitoring and sampling. In addition, groundwater monitoring event is planned. All samples will be processed, handled, and shipped by Nobis.
Analytical Laboratory Data Received:
Process Liquid: No new data available for this reporting period.
Process Vapor: No new data available for this reporting period.
Extraction Wells: TCE was detected in all the air samples collected from the 16 vapor extraction wells at concentrations ranging from 5 ppbv (VEW-28) to 5,820 ppbv (VEW-17). PCE, cis-1,2-DCE, and trans-1,2-DCE were also detected in several samples, at maximum concentrations (in VEW-15) of 96 ppbv, 3,780 ppbv, and 848 ppbv, respectively.
Groundwater: No new data available for this reporting period.
Ambient Air: No new data available for this reporting period.
Next Project Status Conference Call: Wednesday, December 22nd at *10:00 am* **– Steam Injection Update Only**
Next Project Status Meeting: Thursday, January 6th at 12:30 pm

Figure 1, Mass Removal Estimate:



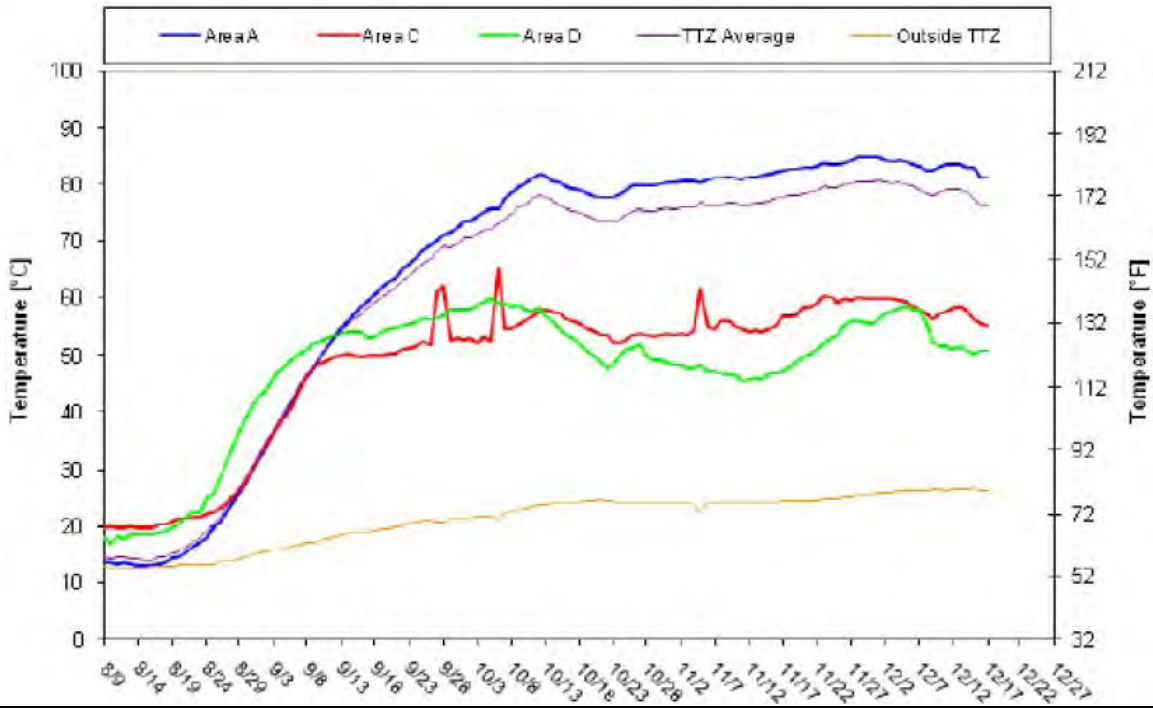
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



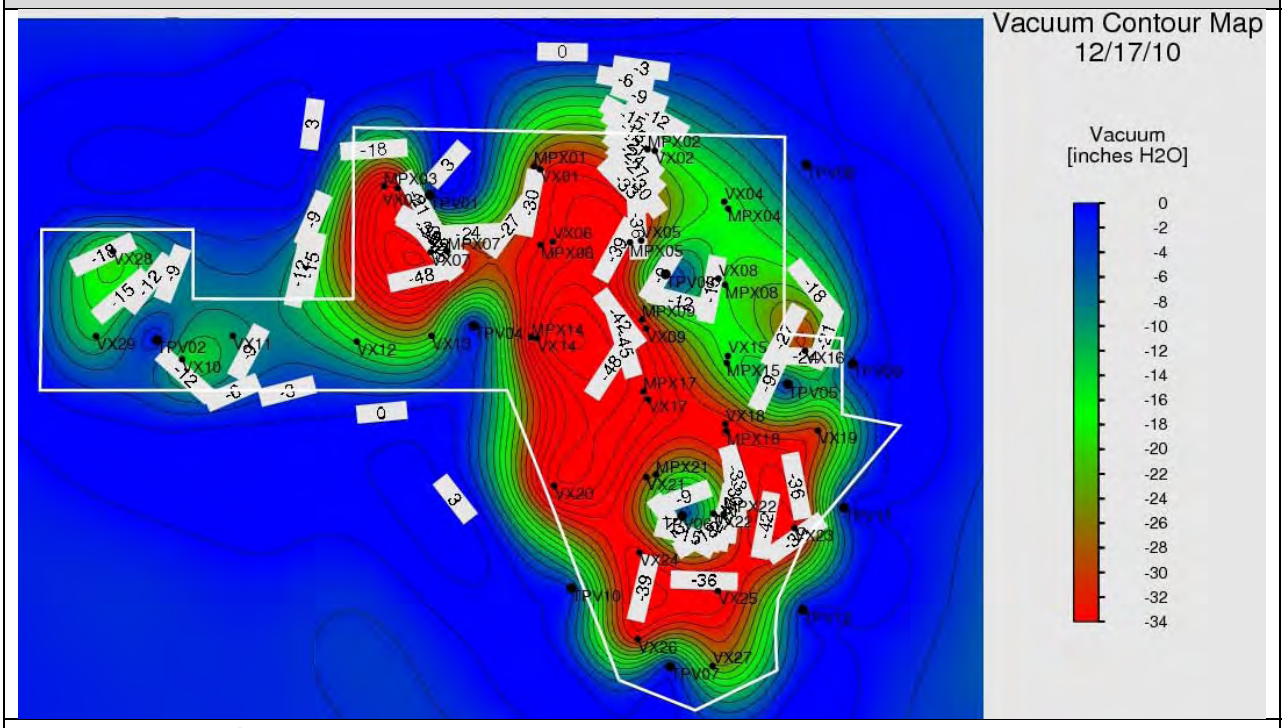
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



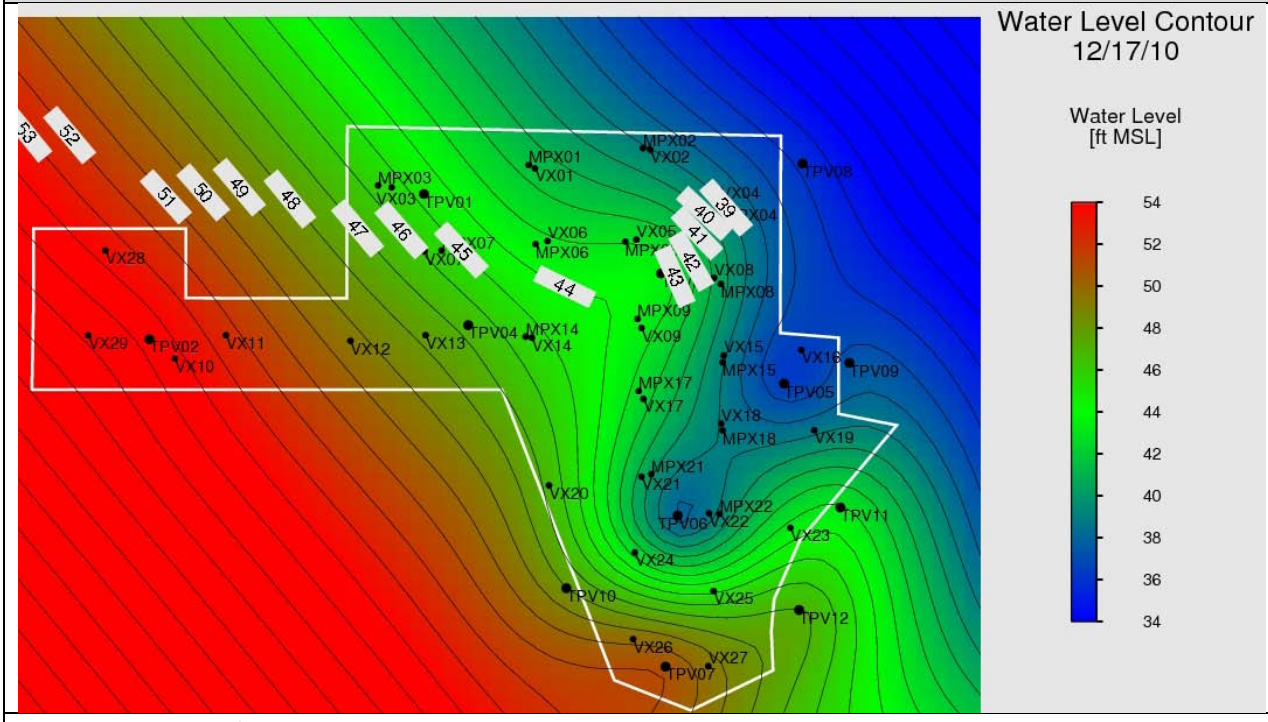
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** December 29, 2010

Operation and Maintenance Activities Performed from 12/18/2010 to 12/24/2010	**Status**
The Week 20 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition, groundwater monitoring event was completed. The ET-DSP system was temporarily disabled for this planned intrusive sampling event. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
TerraTherm performed routine maintenance on downhole groundwater extraction pumps (located within MPE wells) while the ET-DSP system was temporarily disabled for the groundwater monitoring event.	Complete
TerraTherm retrofitted the steam lines and connections with Schedule 40 malleable iron nipples in place of Kynar, following an unwanted steam release incident. On December 22nd, TerraTherm operators observed a release of steam near the steam header. After shutting down the steam generator, an investigation was conducted. It was determined that the threads on the Kynar nipples would not withstand the pressure in the line. The Kynar nipples were replaced and the steam generator was restarted on December 22nd.	Complete
Following the steam generator start up and shakedown, steam injections within the shallow treatment zones began. Injections were focused within the interior of the Valley Manufacturing building at Steam Spear locations SP-06, SP-07, and SP-08. Steam injections will continue, throughout the ISTT wellfield, until temperatures within the treatment zones are met (approximately 90°C within the vadose zone) and sustained (during Phase II operations).	On-going
TerraTherm observed product at sensor location TPV-03. The project team suspects the digiPAM in TPV-03 is malfunctioning due to the continued presence of product in the sensor well (Figure 5). McMillan-McGee is troubleshooting the digiPAM, but the digiTAM (also located at TPV-03) is unaffected by the presence of product.	On-going
TerraTherm mobilized additional supplies and continued the installation of a thermal insulation cap to assist with heat loss from the shallow treatment zone. The goal of the thermal insulation cap is to provide additional thermal efficiency and to decrease potential heat losses within the shallow treatment zones.	On-going
TerraTherm continues winterization activities at the water extraction, electrode injection, and steam injection piping and process equipment.	On-going
The Nobis team continues GWTP maintenance (of the clarifier, sand filters, and peroxide destruction unit) related to the iron biofouling (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
TerraTherm operators removed approximately three gallons of iron biofouling material from the trough tank and oil water separator. TerraTherm will continue to remove this material from the trough tank and oil water separator in order to assist with maintenance issues within the GWTP due to iron biofouling.	On-going

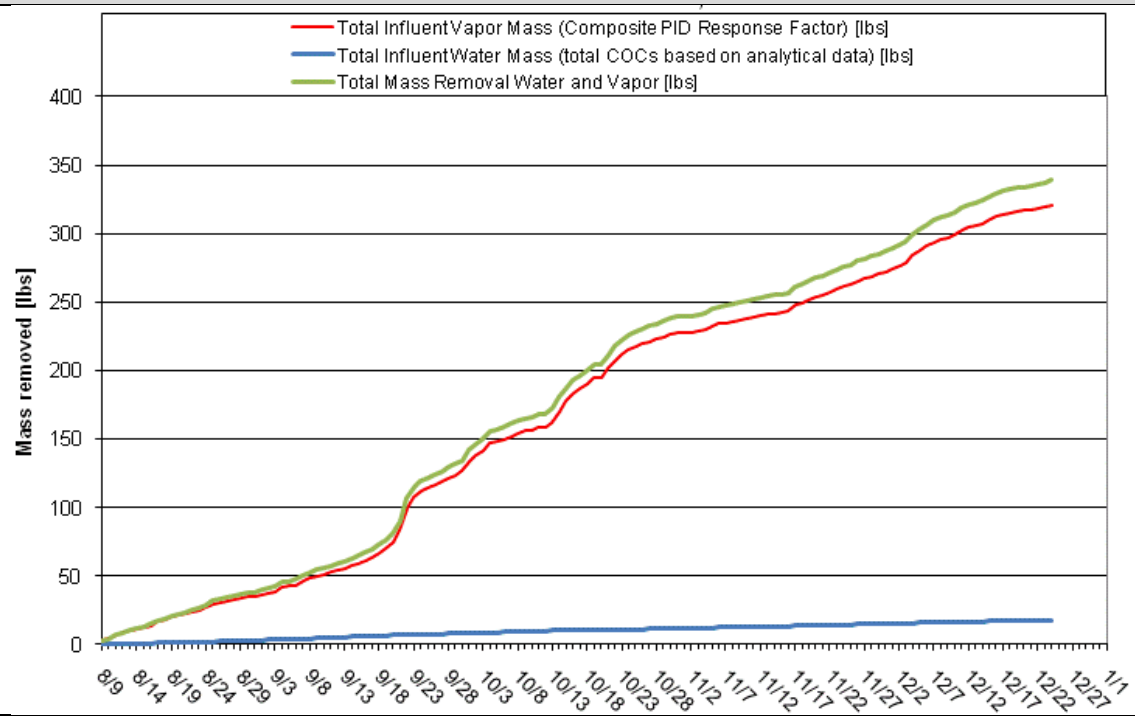
During this operating period (12/11 to 12/17), the vapor extraction system influent concentrations were relatively low (5 to 10 ppm, average of 7.7 ppm), which results in a relatively low calculated removal efficiency. The overall vapor extraction system removal efficiency for this operational period is estimated at 81%. The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent and evaluate carbon efficiency daily.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 12/18/2010 to 12/24/2010		
ISTT Wellfield		
Temperature (°F): 127° (Area D), 130° (Area C), and 177° (Area A)	Volume Extracted/Injected (gal): 75,794 / 38,950	Groundwater Elevation (ft msl): ~37 to 49
Min. VOC Reading (ppm PID) 3.8 at VEW-28 (Area D)	Max. VOC Reading (ppm PID): 38.3 at VEW-17 (Area A)	Average VOCs (ppm PID): 12.2
ISTT Extraction System		
Average Air Flow (scfm): 540	Average Groundwater Extraction Rate (gpm): 7.5	Average Groundwater Injection Rate (gpm): 3.9
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 7.7 (Figure 1)	Est. Energy Used (kWh): 114,720 (Figure 2)
GAC Influent (ppm-PID): 7.7	GAC Effluent (ppm-PID): 1.4	Removal Efficiency (%): 81%
GWTP Combined Influent (Collected by the Nobis team)		
Chloride (ppm): 75	Temperature (°F): 66	pH (pH units): 6.6

Status of Performance Metrics	
Temperature (See Figure 3): The current average subsurface temperature is approximately 94° F above the baseline average temperature, before the start of heating.	Pneumatic Control (See Figure 4): The ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The ISTT liquid extraction system is maintaining hydraulic control within Treatment Zone A. Current water levels are approximately 3 to 10 feet below baseline water levels.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.

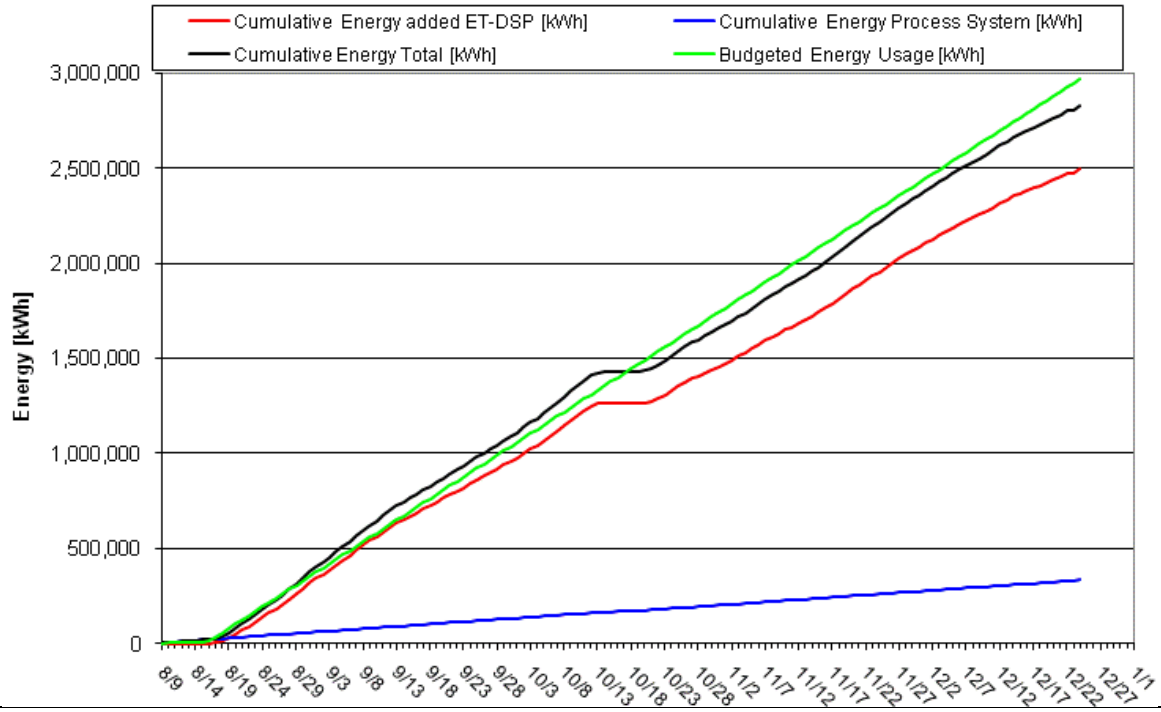
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown on October 12th until October 20th, the total operational duration has been prolonged. In addition, the project team is concerned with the overall rate of heating. Heating enhancements (steam injections and thermal insulation cap), to accelerate heating at the Site, are currently underway.	
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 339 lbs	Total NAPL Removed To Date: 18.4 gallons
Optimization Activities for the Following Week:	
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Continue to operate the extraction systems while maintaining a balance between the water injection and the groundwater extraction rates during ET-DSP system operation.	
ET-DSP System – Continue to focus on heating the shallow vadose zone with the use of the steam generator and injections. Continue to enhance soil conductivity within the vadose zone with saline water injection.	
GWTP – Continue to closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters (i.e. chloride) while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).	
Performance Monitoring – Continue routine process performance monitoring and sampling. All samples will be processed, handled, and shipped by Nobis.	
Analytical Laboratory Data Received:	
Process Liquid: No new data available for this reporting period.	
Process Vapor: No new data available for this reporting period.	
Extraction Wells: No new data available for this reporting period.	
Groundwater: No new data available for this reporting period.	
Ambient Air: No new data available for this reporting period.	
Next Project Status Meeting: Thursday, January 6th at 12:30 pm	
Next Project Status Conference Call: Thursday, January 20th at 12:30 pm	

Figure 1, Mass Removal Estimate:



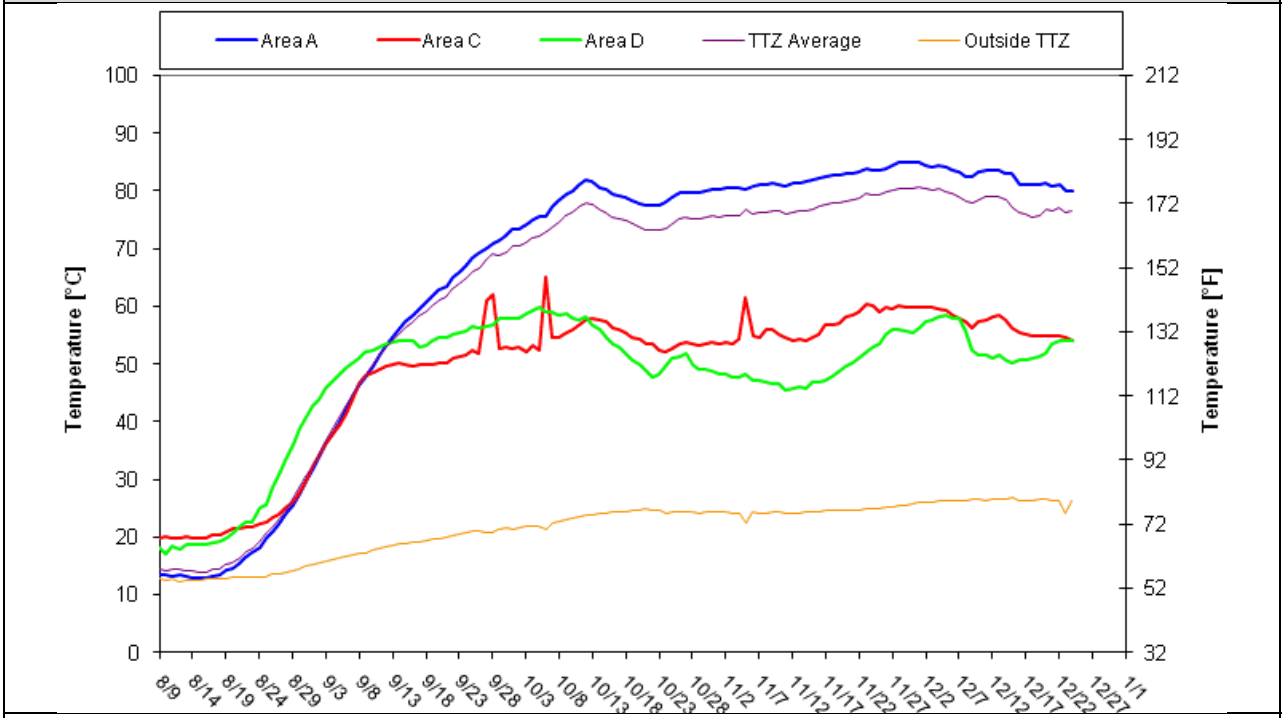
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



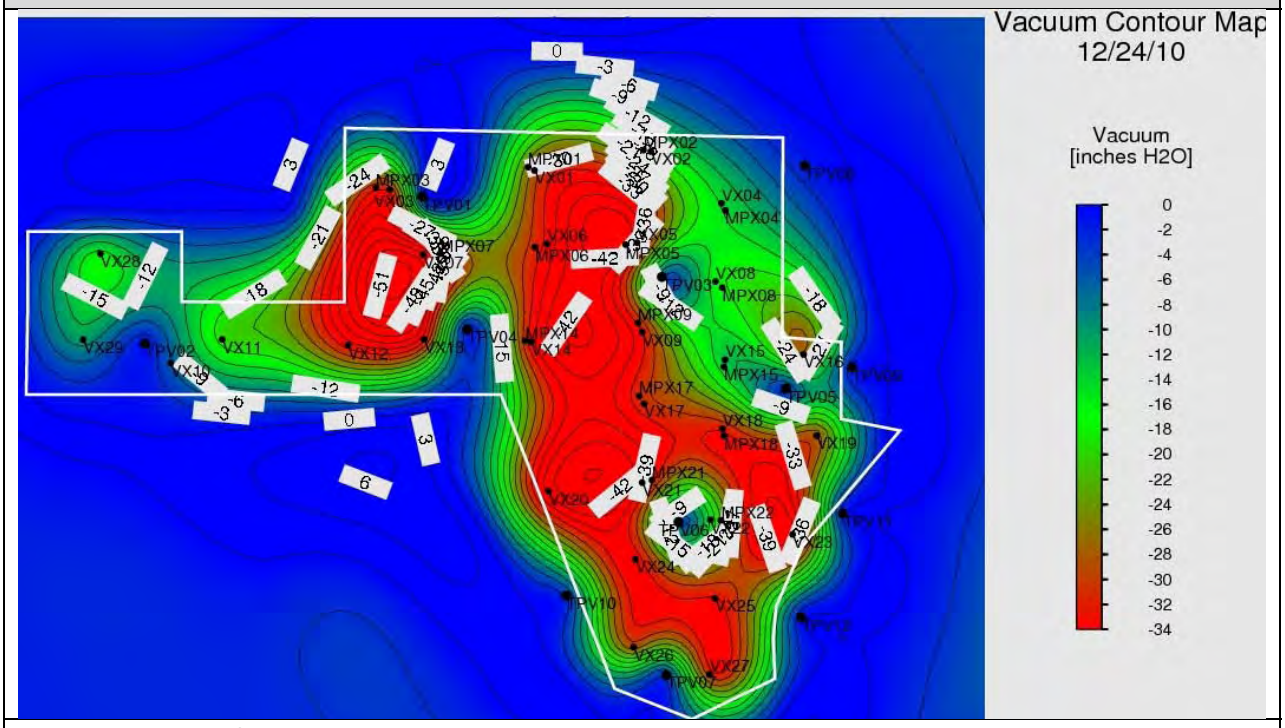
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



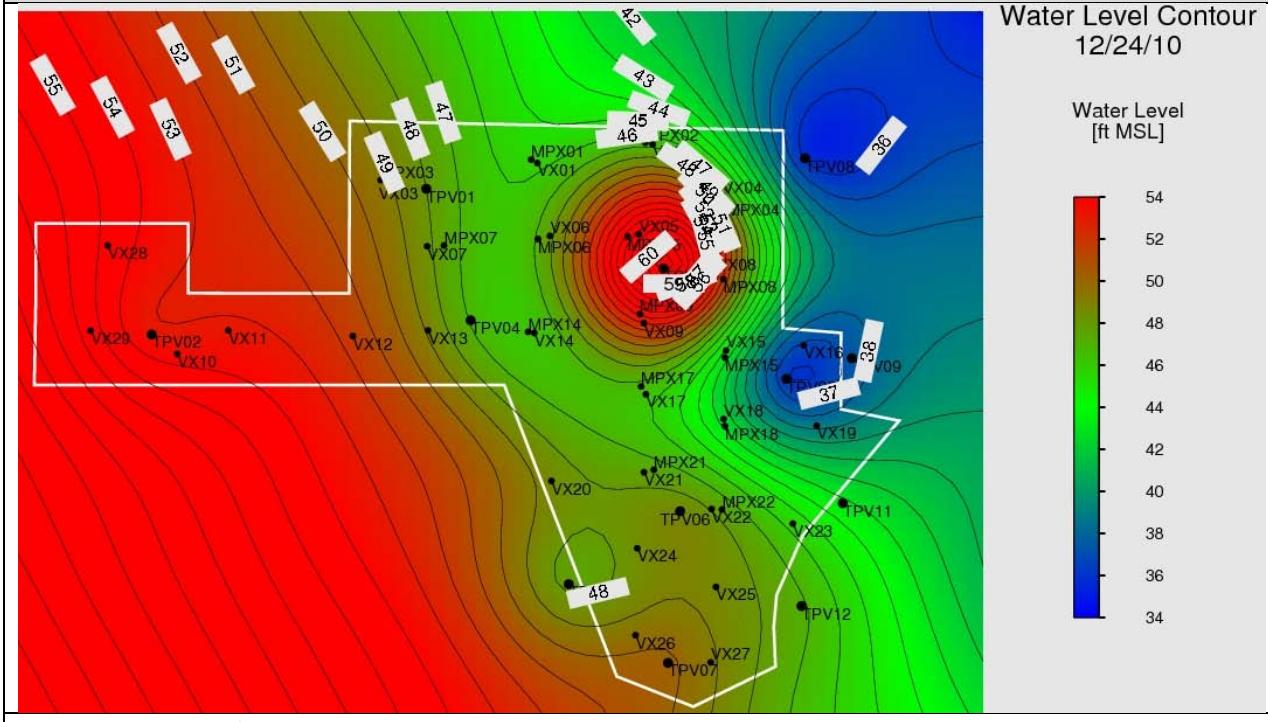
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** January 4, 2011

Operation and Maintenance Activities Performed from 12/25/2010 to 12/31/2010	**Status**
The Week 21 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
TerraTherm conducted preventative maintenance and calibration activities of the process equipment.	Complete
Freezing temperatures and the use of the temporary air compressor (due to the air compressor shutdown on December 13th previously documented in the ISTT Operations and Optimization Report dated December 21st) not equipped with a water trap, caused the air supply lines to the downhole pneumatic pumps in the MPE wells to freeze. The freezing air supply lines resulted in the freezing of stagnant water lines and a series of system alarms and shutdowns received on December 25th. The vapor extraction system remained operational during this incident, but the liquid extraction system shut down. Work began to thaw the affected lines on December 25th and was completed on December 26th. The liquid extraction system was brought back online on December 26th.	Complete
TerraTherm's air compressor vendor was onsite to repair the air compressor on December 28th. The temporary air compressor was removed from the Site at this time. The liquid extraction system was temporarily shut down during air compressor repair and maintenance.	Complete
On December 29th, electrode water injections lines from one of the water circulation units were observed to be frozen. Despite the frozen electrode injection lines, the ET-DSP remained operational. Injection lines were thawed for saline additions.	Complete
On December 30th, TerraTherm received a liquid extraction system alarm due to the shutdown of the recently repaired air compressor. TerraTherm's air compressor vendor returned to the Site to repair a faulty temperature sensor and the air compressor and liquid extraction system were restarted.	Complete
TerraTherm and McMillan-McGee continued steam injections, focused within the interior of the Valley Manufacturing building at Steam Spear locations SP-06, SP-07, and SP-08. Local shallow (less than 10 feet below ground surface) temperatures have increased since the startup of steam injections by approximately 120°F. Steam injections will continue, throughout the ISTT wellfield, until temperatures within the treatment zones are met (approximately 90°C or 194°F within the vadose zone) and sustained (during Phase II operations).	On-going
TerraTherm continued the installation of a thermal insulation cap to assist with heat loss from the shallow treatment zone. The goal of the thermal insulation cap is to provide additional thermal efficiency and to decrease potential heat losses within the shallow treatment zones. The thermal insulation cap installation will be completed	On-going

during the week of January 3rd.	
TerraTherm continues to enhance soil conductivity by introducing water conditioning salts to the injection water at targeted shallow electrodes with currents less than 5 kW. The following injections were made during this operational period: • December 30th – 80 lbs. This activity may continue, sporadically, throughout the operation of the ISTT system.	On-going
The Nobis team continues GWTP maintenance (of the clarifier, sand filters, and peroxide destruction unit) related to the iron biofouling (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
During this operating period (12/25 to 12/31), the vapor extraction system influent concentrations were relatively low (6 to 11 ppm, average of 8.4 ppm), which results in a relatively low calculated removal efficiency. The overall vapor extraction system removal efficiency for this operational period is estimated at 85%. The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent and evaluate carbon efficiency daily.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

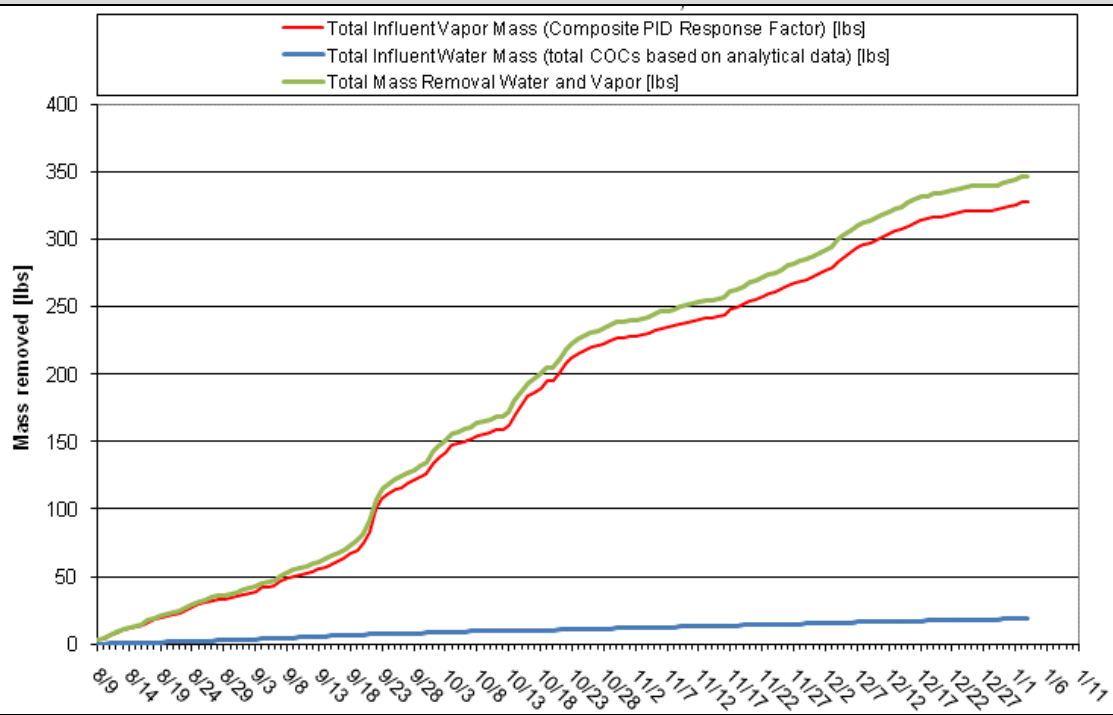
ISTT Operational Data – Collected by TerraTherm during the Period of 12/25/2010 to 12/31/2010		
ISTT Wellfield		
Temperature (°F): 160° (Area D), 137° (Area C), and 176° (Area A)	Volume Extracted/Injected (gal): 58,953 / 58,091	Groundwater Elevation (ft msl): ~37 to 47
Min. VOC Reading (ppm PID) 1.4 at VEW-14 (Area A)	Max. VOC Reading (ppm PID): 9.4 at VEW-17 (Area A)	Average VOCs (ppm PID): 4.5
Steam Injection Locations: SP-06, SP-07, and SP-08	Combined Total Steam Pressure (psi): 50	
ISTT Extraction System		
Average Air Flow (scfm): 540	Average Groundwater Extraction Rate (gpm): 5.8	Average Groundwater Injection Rate (gpm): 5.8
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 8.6 (Figure 1)	Est. Energy Used (kWh): 121,280 (Figure 2)
GAC Influent (ppm-PID): 8.4	GAC Effluent (ppm-PID): 1.3	Removal Efficiency (%): 85%

Status of Performance Metrics	
Temperature (See Figure 3): The current average subsurface temperature is approximately 107° F above the baseline average temperature, before the start of heating.	Pneumatic Control (See Figure 4): The ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.

Hydraulic Control (See Figure 5): The ISTT liquid extraction system is maintaining hydraulic control within Treatment Zone A. Current water levels are approximately 4 to 6 feet below baseline water levels.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown on October 12th until October 20th, the total operational duration has been prolonged. In addition, the project team is concerned with the overall rate of heating. Heating enhancements (steam injections and thermal insulation cap), to accelerate heating at the Site, are currently underway.	
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 347 lbs	Total NAPL Removed To Date: 18.4 gallons
Optimization Activities for the Following Week:	
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Continue to operate the extraction systems while maintaining a balance between the water injection, steam injection, and the groundwater extraction rates during ET-DSP system operation.	
ET-DSP System – Continue to focus on heating the shallow vadose zone with the use of the steam generator and injections. Optimize steam injections and vapor and liquid extraction rates. Continue to enhance soil conductivity within the vadose zone with saline water injection.	
GWTP – Continue to closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters (i.e. chloride) while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).	
Performance Monitoring – Continue routine process performance monitoring and sampling. All samples will be processed, handled, and shipped by Nobis.	
Analytical Laboratory Data Received:	
Process Liquid: Organic laboratory data was received for the process liquid samples collected on December 1, 8, and 14, 2010. All organic data refers to the sampling events in this order. In addition, inorganic data was received for the process liquid sample collected on December 8, 2010. Organic Data TCE and cis-1,2-DCE were not detected at concentrations above the detection limit (5.0 µg/L) in the process water samples, with the exception of TCE detected in the sample collected on December 14, 2010. TCE was detected in the process water sample collected on December 14, 2010 at a concentration of 5.7 µg/L. In addition, acetone (at concentrations of 990, 1,500, and 2,000 µg/L) and MEK (at concentrations of 140, 220, and 230 µg/L) were detected. The project team suspects the recent production of acetone and MEK in Site groundwater is a direct result of humic acid (naturally occurring in Site soil) breaking down with the elevated subsurface temperatures. The project team expects the concentrations of acetone and MEK in Site groundwater to return to baseline conditions when the Site returns to baseline temperatures. Site Clean Up Goals for acetone or MEK do not exist. Inorganic Data The concentrations of metals observed in the process water sample were below the GWTP discharge limits, with the exception of arsenic. Arsenic was detected at a trace concentration of 6.6 ug/L, which is	

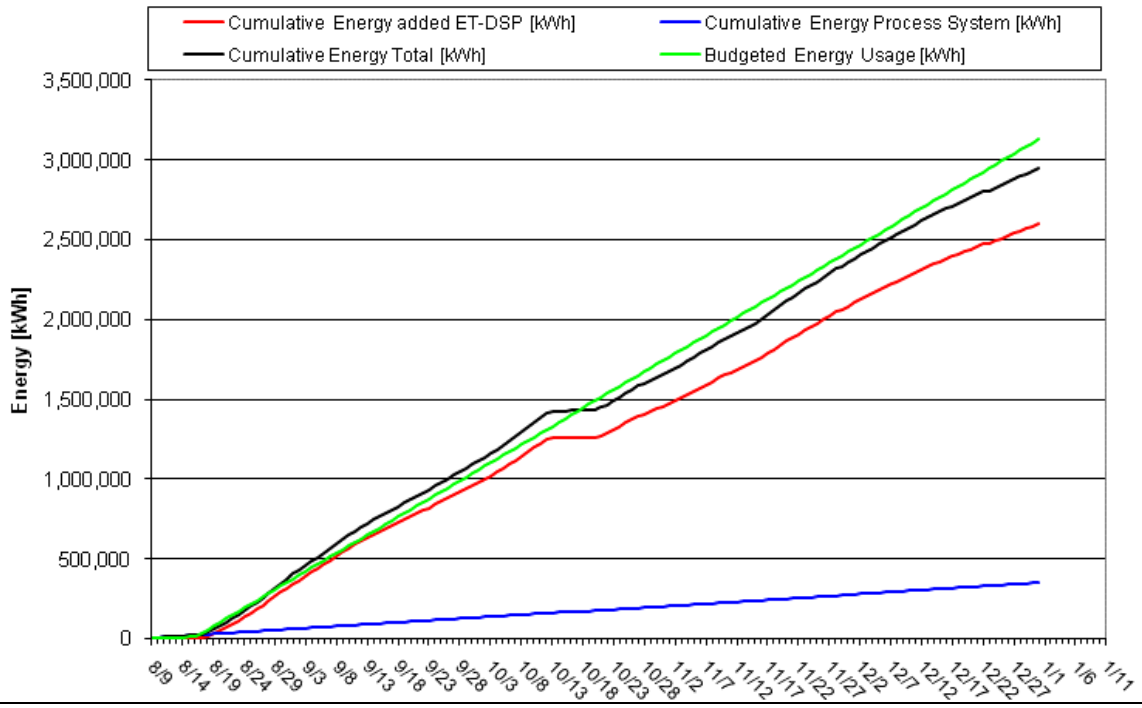
higher than the average monthly limit of 0.75 ug/L. During an initial review of unvalidated GWTP effluent data, the arsenic concentration in the GWTP effluent sample collected on December 8, 2010 is observed to be 1.4 ug/L. GWTP effluent inorganic and organic data will be evaluated in the TO12 Monthly Operations Report.
Process Vapor: No new data available for this reporting period.
Extraction Wells: No new data available for this reporting period.
Groundwater: Organic laboratory data was received for the groundwater monitoring event conducted on December 8, 2010. VOCs were detected in all of the groundwater monitoring and groundwater extraction wells sampled during this monitoring event. TCE was detected at concentrations ranging from non-detect (less than 5 µg/L) to a maximum concentration of 49 µg/L (MPE-14). Concentrations of cis-1,2-DCE ranged from non-detect (less than 5 µg/L) to a maximum concentration of 14 µg/L (MPE-17). In addition, acetone and MEK were detected at concentrations ranging from non-detect (less than 10 µg/L) to maximum concentrations of 570 and 64 µg/L (MPE-17), respectively.
Ambient Air: No new data available for this reporting period.
Next Project Status Meeting: Thursday, January 6th at 12:30 pm
Next Project Status Conference Call: Thursday, January 20th at 12:30 pm

Figure 1, Mass Removal Estimate:



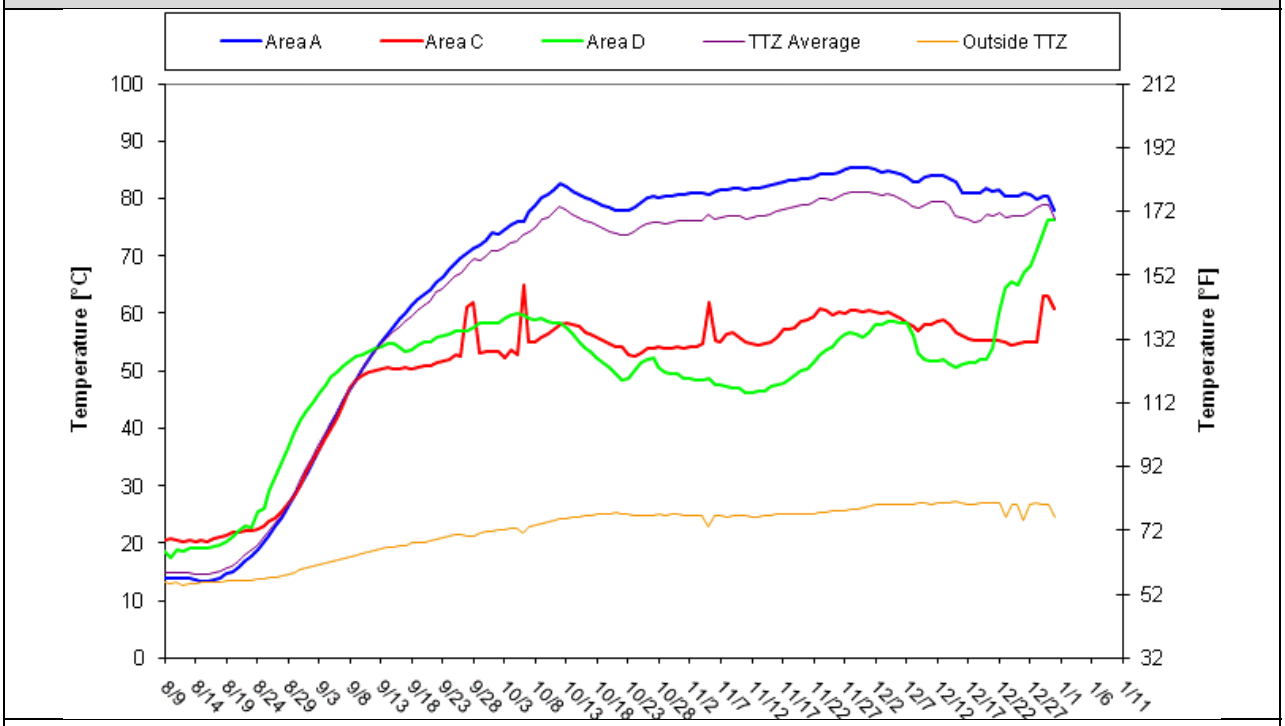
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



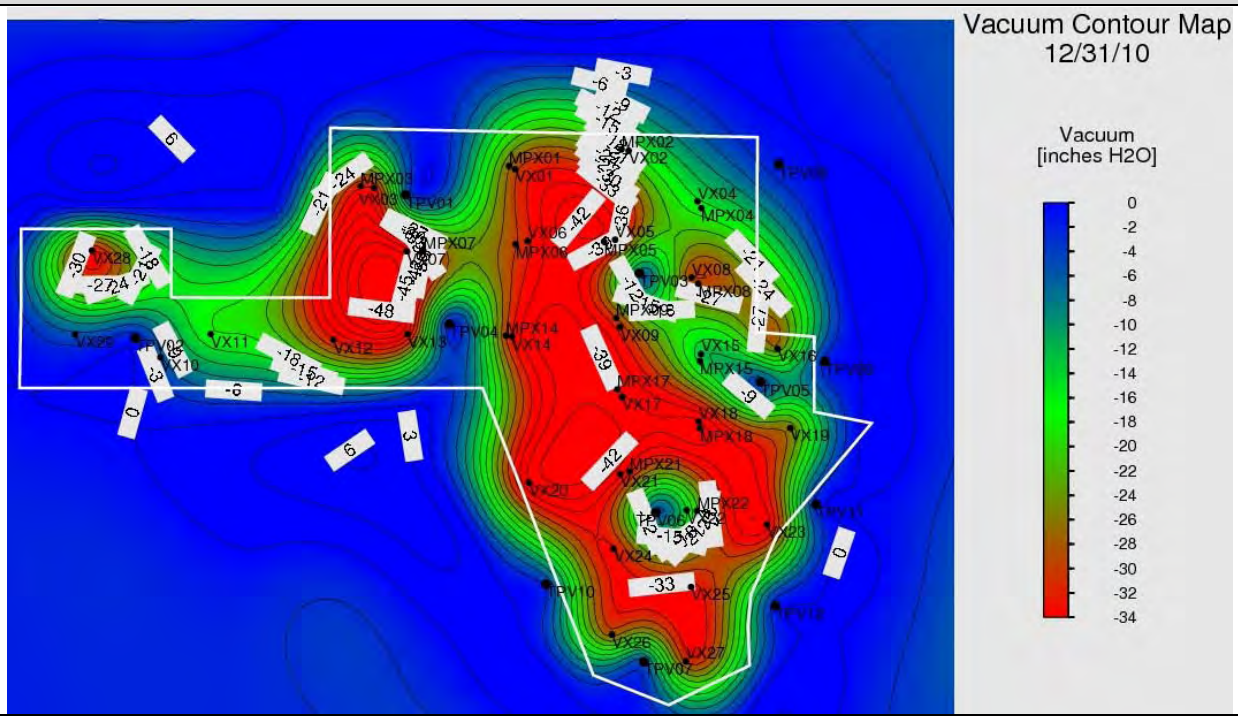
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



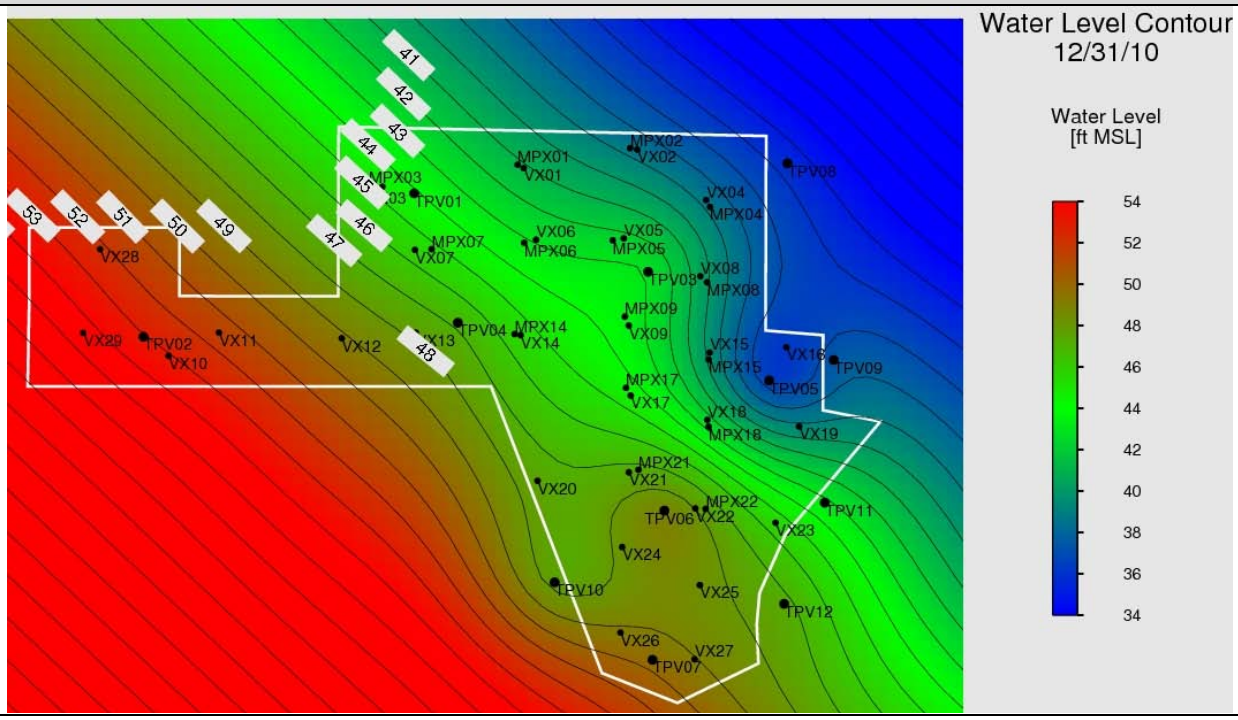
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** January 11, 2011

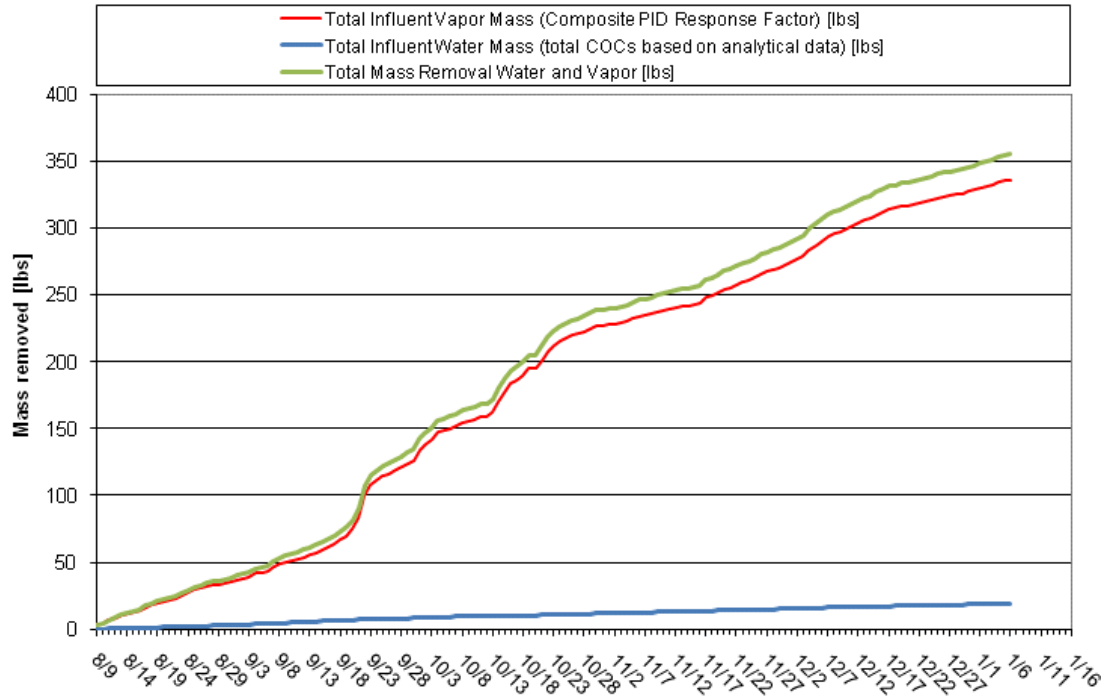
Operation and Maintenance Activities Performed from 1/1/2011 to 1/7/2011	**Status**
The Week 22 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition groundwater monitoring and ambient air sampling events were conducted. The ET-DSP system was temporarily disabled for the planned intrusive activities (groundwater monitoring). Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
TerraTherm replaced the downhole pump located at extraction well location MPE-01 to a top-loading pump. This activity was performed while the ET-DSP system was disabled for the groundwater monitoring event.	Complete
TerraTherm replaced temperature sensors in TPV-01 and TPV-03. This activity was performed while the ET-DSP system was disabled for the groundwater monitoring event.	Complete
TerraTherm optimized the speed of the vacuum blowers in an effort to maintain heat in the ISTT wellfield.	Complete
On January 4th, the GWTP shutdown due to issues associated with the UV Oxidation System. The ISTT extraction systems were operated in 'emergency mode' using reduced extraction rates and discharging extracted liquids to the backup frac tank. Once the GWTP was brought back online (approximately 6 hours after incident occurred) the ISTT extraction systems were returned to normal operation.	Complete
During the early morning hours of January 7th, the breaker that controls the air compressor tripped and shutdown operation of the downhole extraction pumps. Due to the freezing temperatures, several air and water lines froze resulting in the shutdown of the ISTT extraction systems. TerraTherm thawed the lines specific to the ISTT vapor extraction system and brought the system online by 11:00 am. TerraTherm thawed the ISTT liquid extraction system lines and replaced the associated breaker. The ISTT liquid extraction system was brought online by 5:00 pm. No ISTT extraction system shutdowns (through to January 10th) have occurred since the breaker was replaced. Due to the ISTT extraction system shutdowns, vacuum data was not recorded on this date (January 7th). The Vacuum Contour Map (Figure 4) describes vacuum data collected on Saturday, January 8th.	Complete
TerraTherm and McMillan-McGee continued steam injections, focused within the interior of the Valley Manufacturing building at locations SP-07, SP-08, and X-29 until January 5th. Beginning on January 5th, steam injections continued at locations SP-03, SP-04, SP-05, (Area A) and X-29 (Area D). Average Area D temperatures have increased since the startup of steam injections (on December 21st) by approximately 50°F. Steam injections will continue, throughout the ISTT wellfield, until temperatures within the treatment zones are met (approximately 90°C or 194°F within the vadose zone) and sustained (during Phase II operations).	On-going

TerraTherm continued the installation of a thermal insulation cap to assist with heat loss from the shallow treatment zone. The goal of the thermal insulation cap is to provide additional thermal efficiency and to decrease potential heat losses within the shallow treatment zones. The thermal insulation cap installation will be completed during the week of January 3rd.	On-going
TerraTherm continues to enhance soil conductivity by introducing water conditioning salts to the injection water at targeted electrodes with currents less than 5 kW. The following injections were made during this operational period: • January 4th – 80 lbs. This activity may continue, sporadically, throughout the operation of the ISTT system.	On-going
The Nobis team continues GWTP maintenance (of the clarifier, sand filters, and peroxide destruction unit) related to the iron biofouling (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
During this operating period (1/1 to 1/7), the vapor extraction system influent concentrations were relatively low (5 to 14 ppm, average of 9.4 ppm), which results in a relatively low calculated removal efficiency. The vapor extraction system removal efficiency for this operational period is estimated at 83%. The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent and evaluate carbon efficiency daily.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 1/1/2011 to 1/7/2011		
ISTT Wellfield		
Temperature (°F): 180° (Area D), 135° (Area C), and 176° (Area A)	Volume Extracted/Injected (gal): 68,627 / 59,053	Groundwater Elevation (ft msl): ~37 to 48
Min. VOC Reading (ppm PID) 4.1 at VEW-28 (Area D)	Max. VOC Reading (ppm PID): 179.4 at VEW-15 (Area A)	Average VOCs (ppm PID): 28.2
Steam Injection Locations: SP-07, SP-08, and X-29 until 1/5/11 SP-03, SP-04, SP-05 and X-29 beginning 1/5/11	Combined Total Steam Pressure (psi): 50	
ISTT Extraction System		
Average Air Flow (scfm): 490.5	Average Groundwater Extraction Rate (gpm): 6.8	Average Groundwater Injection Rate (gpm): 5.9
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 8.6 (Figure 1)	Est. Energy Used (kWh): 104,000 (Figure 2)
GAC Influent (ppm-PID): 9.4	GAC Effluent (ppm-PID): 1.6	Removal Efficiency (%): 83%

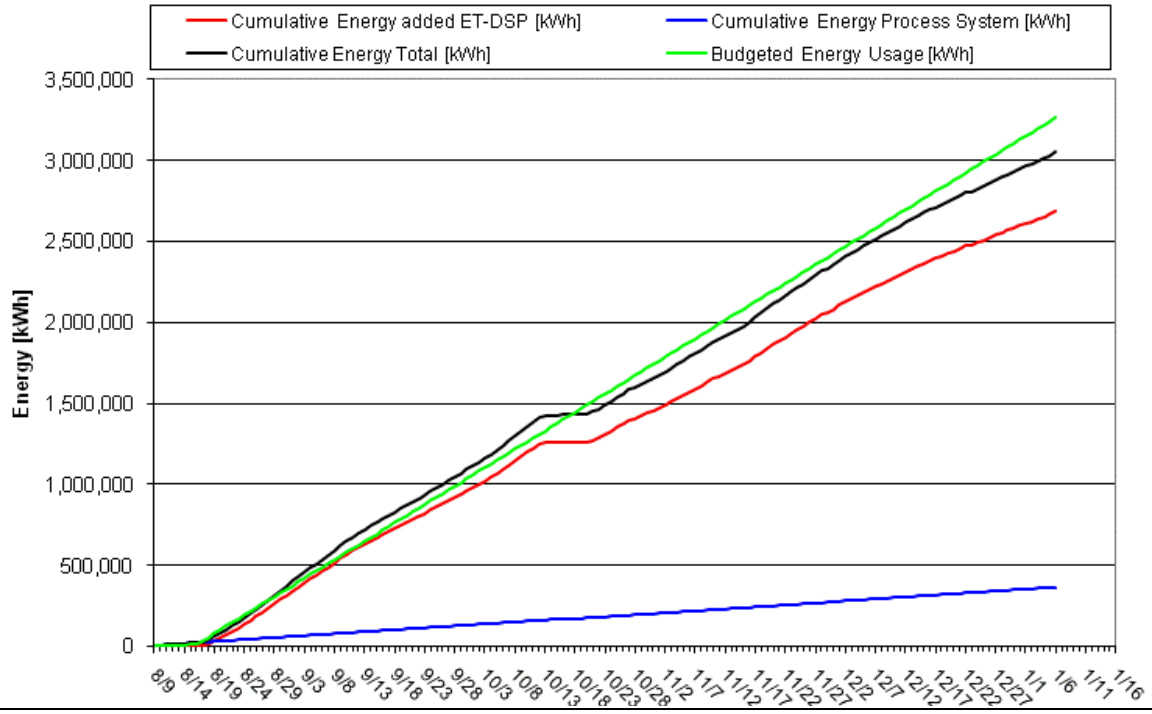
Status of Performance Metrics	
Temperature (See Figure 3): The current average subsurface temperature is approximately 113° F above the baseline average temperature, before the start of heating.	Pneumatic Control (See Figure 4): The ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The ISTT liquid extraction system is maintaining hydraulic control within Treatment Zone A. Current water levels are approximately 4 to 6 feet below baseline water levels.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown on October 12th until October 20th, the total operational duration has been prolonged. In addition, the project team is concerned with the overall rate of heating. Heating enhancements (steam injections and thermal insulation cap), to accelerate heating at the Site, are currently underway.	
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 356 lbs	Total NAPL Removed To Date: 18.4 gallons
Optimization Activities for the Following Week:	
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Optimize the extraction systems to maintain heat in the ISTT wellfield. Continue to operate the extraction systems while maintaining a balance between the water injection, steam injection, and the groundwater extraction rates during ET-DSP system operation.	
ET-DSP System – Continue to focus on heating the shallow vadose zone with the use of the steam generator and injections. Optimize steam injections and vapor and liquid extraction rates. Continue to enhance soil conductivity within the vadose zone with saline water injection.	
GWTP – Continue to closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).	
Performance Monitoring – Continue routine process performance monitoring and sampling. All samples will be processed, handled, and shipped by Nobis.	
Analytical Laboratory Data Received:	
Process Liquid: No new data available for this reporting period.	
Process Vapor: No new data available for this reporting period.	
Extraction Wells: No new data available for this reporting period.	
Groundwater: No new data available for this reporting period.	
Ambient Air: No new data available for this reporting period.	
Next Project Status Conference Calls: January 13th, 20th, and 27th at 12:30 pm	
Next Project Status Meeting: Thursday, February 3rd at 12:30 pm	

Figure 1, Mass Removal Estimate:



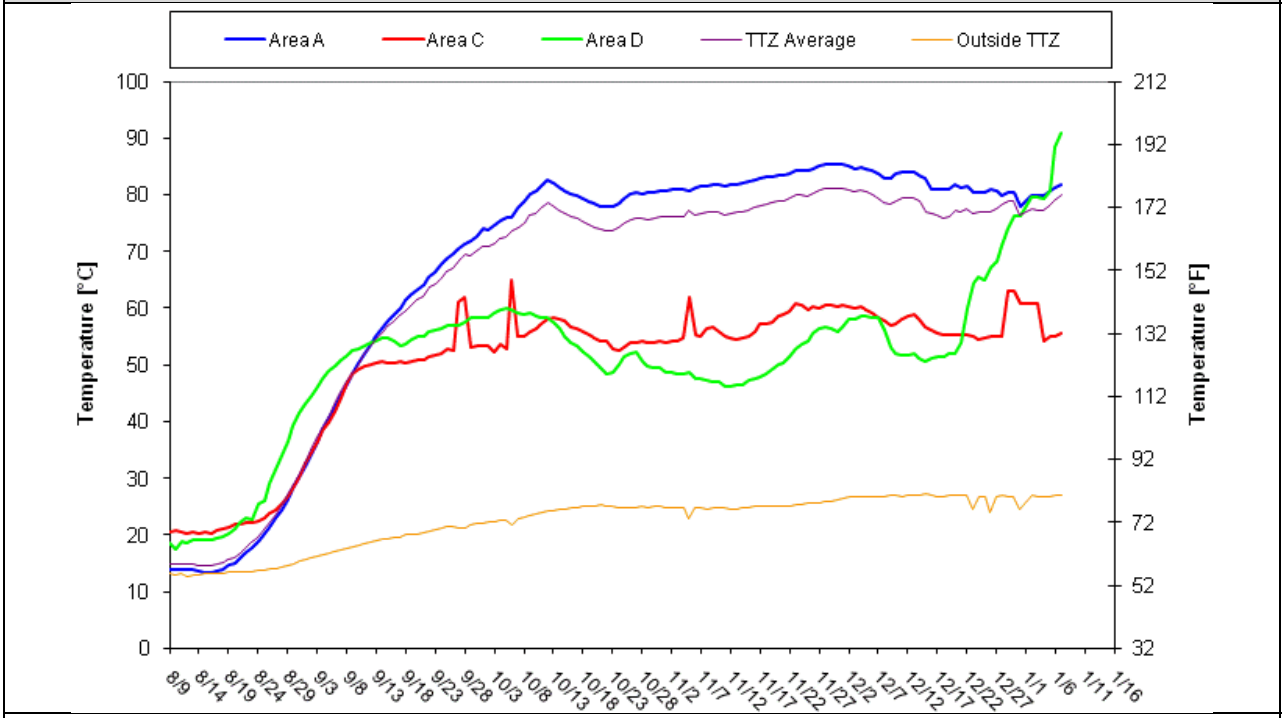
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



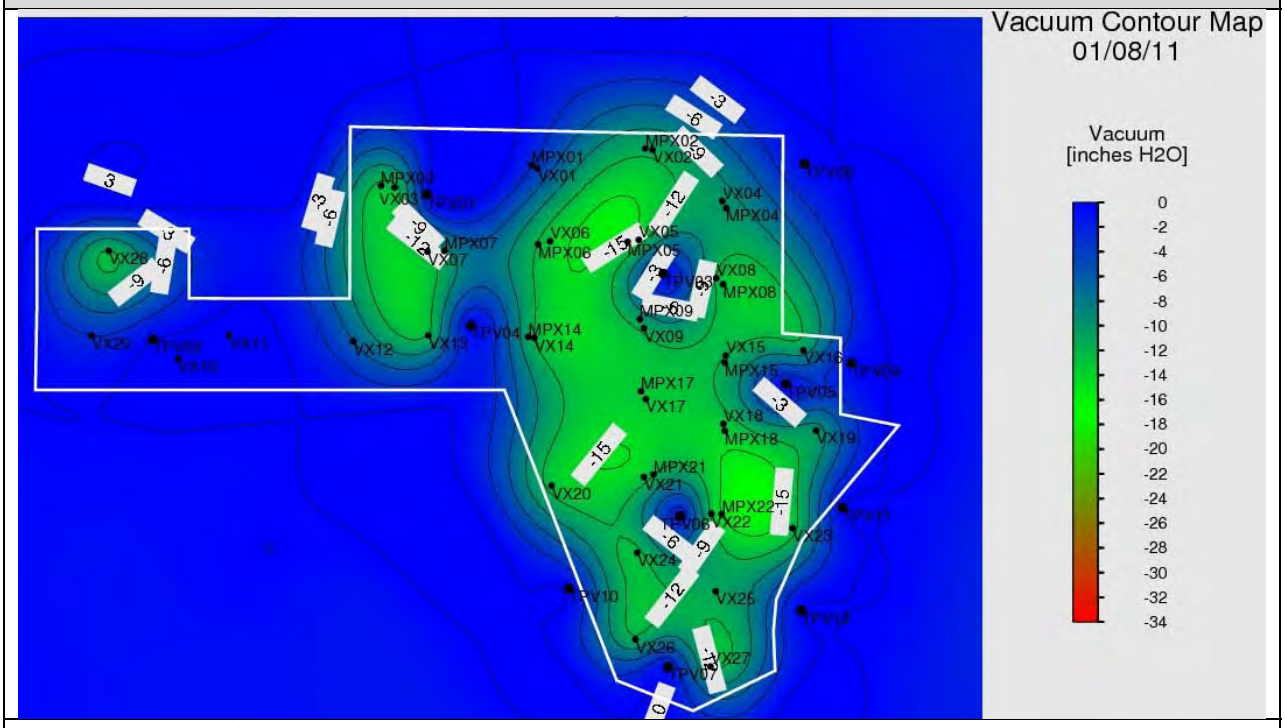
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



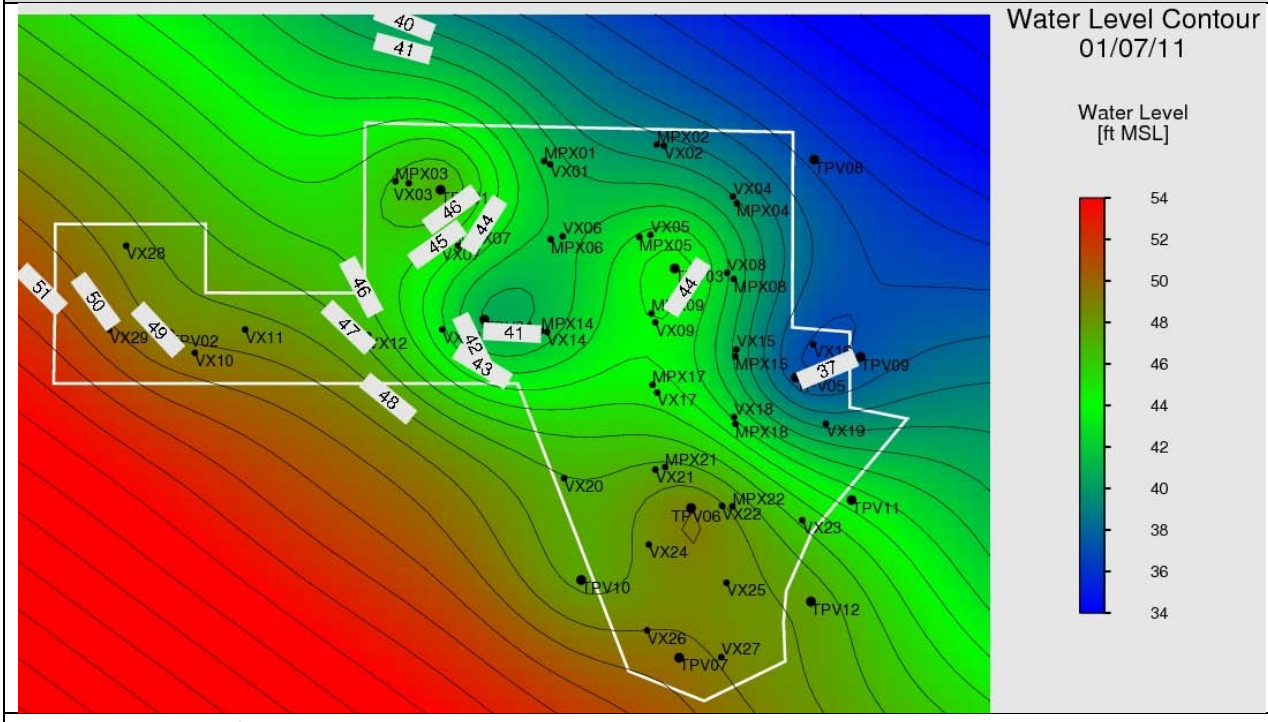
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** January 18, 2011

Operation and Maintenance Activities Performed from 1/8/2011 to 1/14/2011	**Status**
Beginning in late December, TerraTherm noted potential problems with the Magnehelic® pressure gauge being used to measure vapor extraction system pressure (the pressure readings are used to calculate extraction system flow rates and determine VOC mass removal estimates). TerraTherm replaced the pressure gauge and continued to evaluate the issue. After confirmation using different instruments (Magnehelic® gauge, manometer, and pitot tube) and consultation with vacuum blower manufacturer, it was determined that the initial pressure gauge was faulty and extraction system vacuum pressure readings recorded from the start of the project were incorrect (significantly lower than actual) and the extraction system flow rates reported were similarly incorrect. New calculations reveal that the previous flow rates, from the start of the vapor extraction system in August 2010 to January 2nd (when the vapor extraction system was optimized to maintain heat in the ISTT wellfield), have ranged from approximately 1,400 scfm to 2,000 scfm (instead of 250 scfm to 550 scfm, as previously reported). These flow rates were calculated and confirmed by the blower manufacturer using process data information collected daily at the blower (such as hertz and temperature and pressure readings going in and out of the blowers) As a result of the error in the reported vapor extraction system flow rates, the previously presented total VOC mass estimates were also determined to be significantly under-estimated. Historical total VOC mass estimates have been revised accordingly (Figure 1). The total VOC mass removed from Site vapor and water to date is estimated to be 961 lbs.	Complete
The Week 23 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
TerraTherm completed the installation of a thermal insulation cap, with the exception of a small area outside of the building. Currently, this small area is covered in snow, which will provide some thermal insulation. The goal of the thermal insulation cap is to provide additional thermal efficiency and to decrease potential heat losses within the shallow treatment zones.	Complete
TerraTherm performed maintenance in response to a warning alarm on the cooling tower. No extraction system shutdowns occurred during this maintenance event.	Complete
Modifications were made to the steam spear manifold to allow for steam injections at a vapor extraction well. In order to protect worker health and safety, the ET-DSP system was temporarily disabled for this event (approximately 1 hour).	Complete
TerraTherm optimized the speed of the vacuum blowers in an effort to maintain heat	Complete

in the ISTT wellfield.	
TerraTherm and McMillan-McGee continued steam injections, focused within the interior of the Valley Manufacturing building at locations SP-07, SP-08, and X-29 until January 5th. Beginning on January 5th, steam injections continued at locations SP-03, SP-04, SP-05, (Area A) and X-29 (Area D). Average Area D temperatures have increased since the startup of steam injections (on December 21st) by approximately 50°F. Steam injections will continue, throughout the ISTT wellfield, until temperatures within the treatment zones are met (approximately 90°C or 194°F within the vadose zone) and sustained (during Phase II operations).	On-going
TerraTherm continues to enhance soil conductivity by introducing water conditioning salts to the injection water at targeted electrodes with currents less than 5 kW. The following injections were made during this operational period: • January 10th – 80 lbs; • January 11th – 80 lbs; and • January 13th – 80 lbs. This activity may continue, sporadically, throughout the operation of the ISTT system.	On-going
TerraTherm operators removed approximately nine gallons of iron biofouling material from the trough tank and oil water separator. TerraTherm will continue to remove this material, as needed, from the trough tank and oil water separator in order to assist with maintenance issues within the GWTP due to iron biofouling.	On-going
The Nobis team continues GWTP maintenance (of the clarifier, sand filters, and peroxide destruction unit) related to the iron biofouling (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
During this operating period (1/8 to 1/14), the vapor extraction system influent concentrations were relatively low (8 to 19 ppm, average of 12.4 ppm), which results in a relatively low calculated removal efficiency. The vapor extraction system removal efficiency for this operational period is estimated at 88%. The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent and evaluate carbon efficiency daily.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 1/8/2011 to 1/14/2011		
ISTT Wellfield		
Temperature (°F): 198° (Area D), 136° (Area C), and 184° (Area A)	Volume Extracted/Injected (gal): 82,451 / 62,019	Groundwater Elevation (ft msl): ~38 to 48
Min. VOC Reading (ppm PID) 0.0 at VEW-01 (Area A)	Max. VOC Reading (ppm PID): 218 at VEW-05 (Area A)	Average VOCs (ppm PID): 22.3
Steam Injections continued at SP-03 and SP-05. Injections began at VEW20 and deep electrodes at E-29, E-39, and E-43.	Combined Total Steam Pressure (psi): 50	

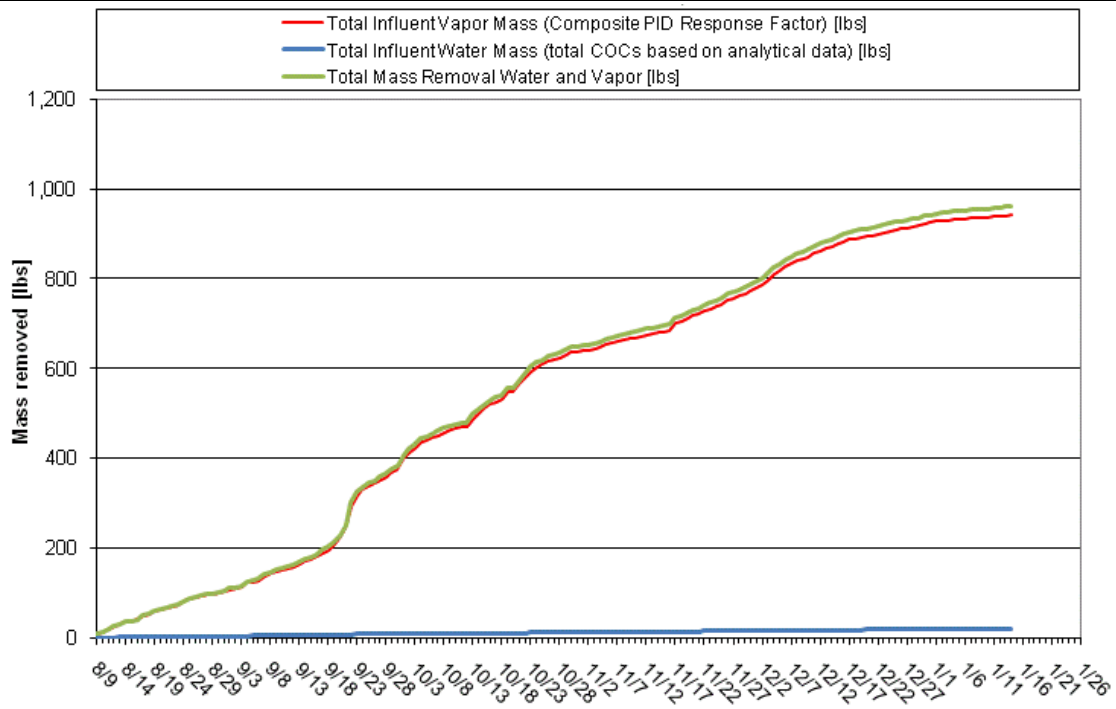
ISTT Extraction System		
Average Air Flow (scfm): 364	Average Groundwater Extraction Rate (gpm): 8.2	Average Groundwater Injection Rate (gpm): 6.2
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 8.8 (Figure 1)	Est. Energy Used (kWh): 155,200 (Figure 2)
GAC Influent (ppm-PID): 12.4	GAC Effluent (ppm-PID): 1.5	Removal Efficiency (%): 88%

Status of Performance Metrics	
Temperature (See Figure 3): The current average subsurface temperature is approximately 123° F above the baseline average temperature, before the start of heating.	Pneumatic Control (See Figure 4): The ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The ISTT liquid extraction system is maintaining hydraulic control within Treatment Zone A. Current water levels are approximately 4 to 6 feet below baseline water levels.	Clean Up Goals: Clean Up Goals have not been met. Groundwater samples, collected bi-weekly during ISTT operation, indicate contaminant concentrations are above the current CUGs.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown from October 12th until October 20th and the heating difficulties experienced in other areas of the site (primarily shallow zones), the total operational duration has been prolonged. Heating enhancements (steam injections and thermal insulation cap), to accelerate heating in the "difficult to treat" areas at the Site, are currently underway.	
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 961 lbs	Total NAPL Removed To Date: 18.4 gallons

Optimization Activities for the Following Week:
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Optimize the extraction systems to maintain heat in the ISTT wellfield. Continue to operate the extraction systems while maintaining a balance between the water injection, steam injection, and the groundwater extraction rates during ET-DSP system operation.
ET-DSP System – Continue to focus on heating the treatment zones with the use of the electrodes and steam injections. Continue to enhance soil conductivity with saline water injection.
GWTP – Continue to closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).
Performance Monitoring – Continue routine process performance monitoring and sampling. In addition, a comprehensive groundwater monitoring event is planned On January 25th. All samples will be processed, handled, and shipped by Nobis.
Analytical Laboratory Data Received:
Process Liquid: Organic laboratory data was received for the process liquid samples collected on December 22 and 29, 2010. TCE and cis-1,2-DCE was detected at concentrations of 2.5 µg/L (Trace) and 5.4 µg/L in the process water samples. In addition, acetone (at concentrations of 1,600 µg/L and 1,500 µg/L, respectively) and MEK (at concentrations of 170 µg/L and 200 µg/L, respectively) were detected. The project team suspects the recent production of acetone and MEK in Site groundwater is a direct

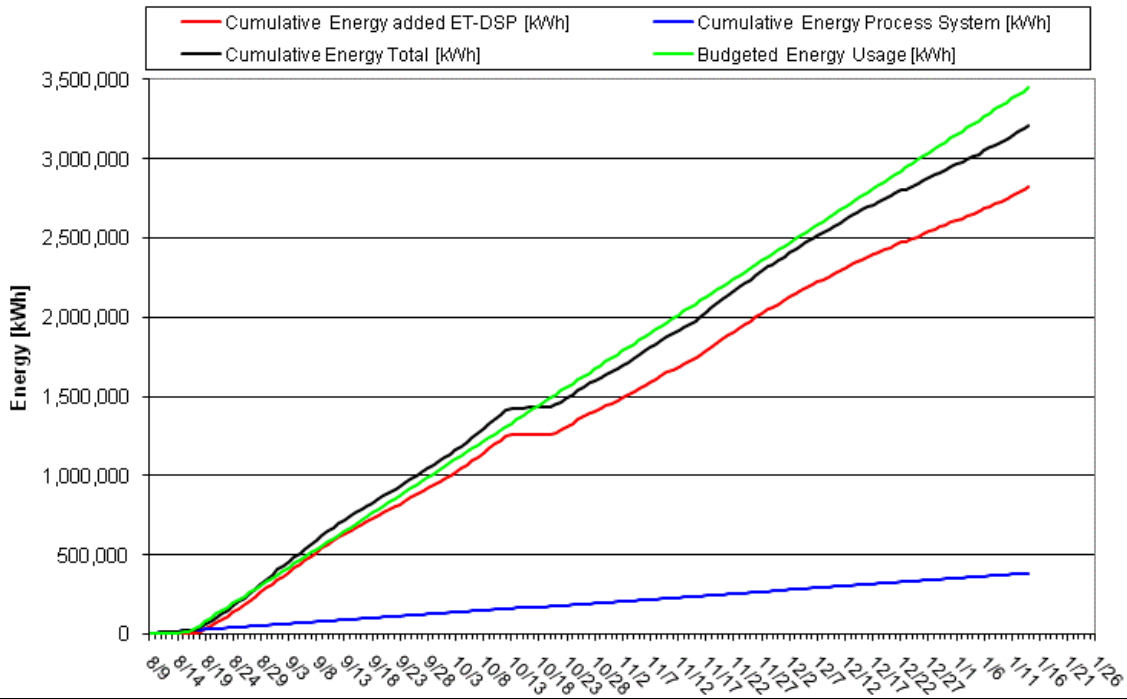
result of humic acid (naturally occurring in Site soil) breaking down with the elevated subsurface temperatures. The project team expects the concentrations of acetone and MEK in Site groundwater to return to baseline conditions when the Site returns to baseline temperatures. Site Clean Up Goals for acetone or MEK do not exist.
Process Vapor: Data were received for process vapor samples collected on November 16th, November 23rd, December 1st, December 9th, and December 14th (all data refers to the sampling events in this order). TCE (at concentrations of 240 ppbv, 430 ppbv, 470 ppbv, 580 ppbv, and 420 ppbv) and cis-1,2-DCE (at concentrations of 79 ppbv, 130 ppbv, 116 ppbv, 140 ppbv, and 120 ppbv) were detected in the influent samples. The total VOC concentrations were 566 ppbv, 896 ppbv, 875 ppbv, 1,233 ppbv, and 712 ppbv. The VOC removal efficiencies were calculated to be approximately 82%, 84%, 81%, 87%, and 81%. A carbon change out of the primary vessel was performed on December 14th. The carbon efficiency continues to be evaluated on a daily basis using field data and when available, laboratory data.
Extraction Wells: No new data available for this reporting period.
Groundwater: Organic laboratory data was received for the groundwater monitoring event conducted on December 22, 2010. VOCs were detected in all of the groundwater monitoring and groundwater extraction wells sampled during this monitoring event. TCE and cis-1,2-DCE were detected at concentrations ranging from non-detect (less than 5 µg/L) to maximum concentrations of 37 µg/L and 19 µg/L (MPE-14), respectively. In addition, acetone and MEK were detected at concentrations ranging from non-detect (less than 10 µg/L) to maximum concentrations of 590 µg/L (MPE-17) and 68 µg/L (MPE-18), respectively.
Ambient Air: Data were received for ambient air samples collected on November 16th, December 1st, and December 14th. TCE was not detected at either the upgradient or downgradient locations during these ambient air sampling events. All other VOCs detected were consistent with the compounds and concentrations detected during the Baseline ambient air monitoring event.
Next Project Status Conference Calls: January 20th and 27th at 12:30 pm
Next Project Status Meeting: Thursday, February 3rd at 12:30 pm

Figure 1, Mass Removal Estimate:



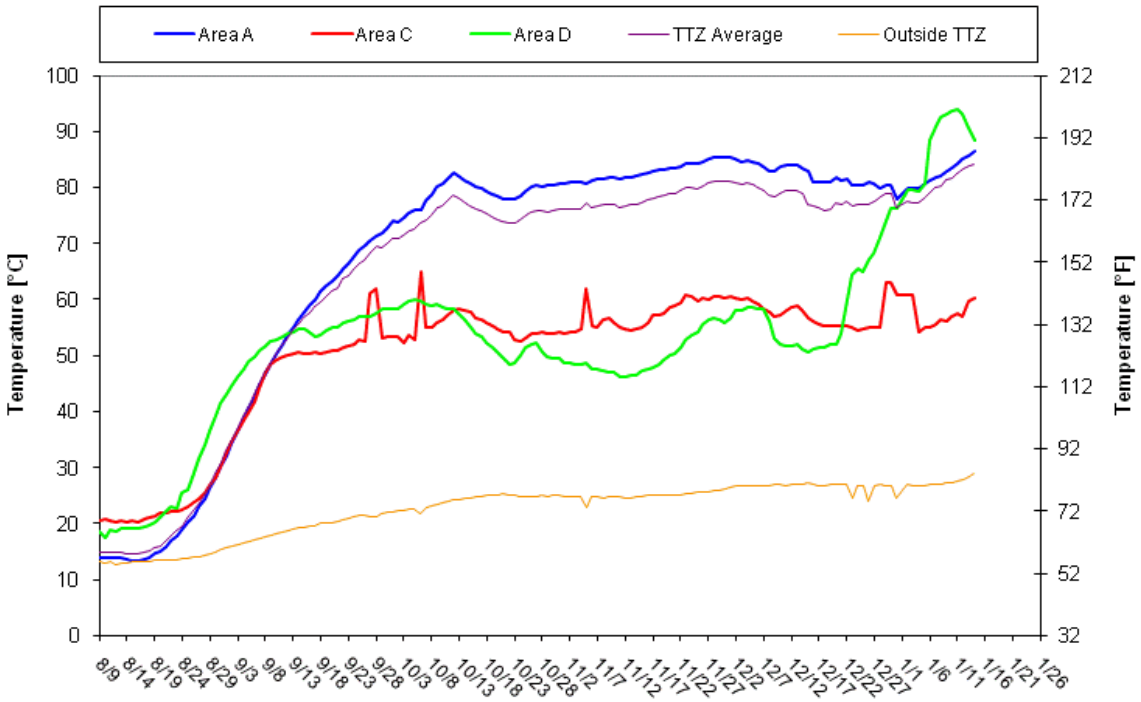
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



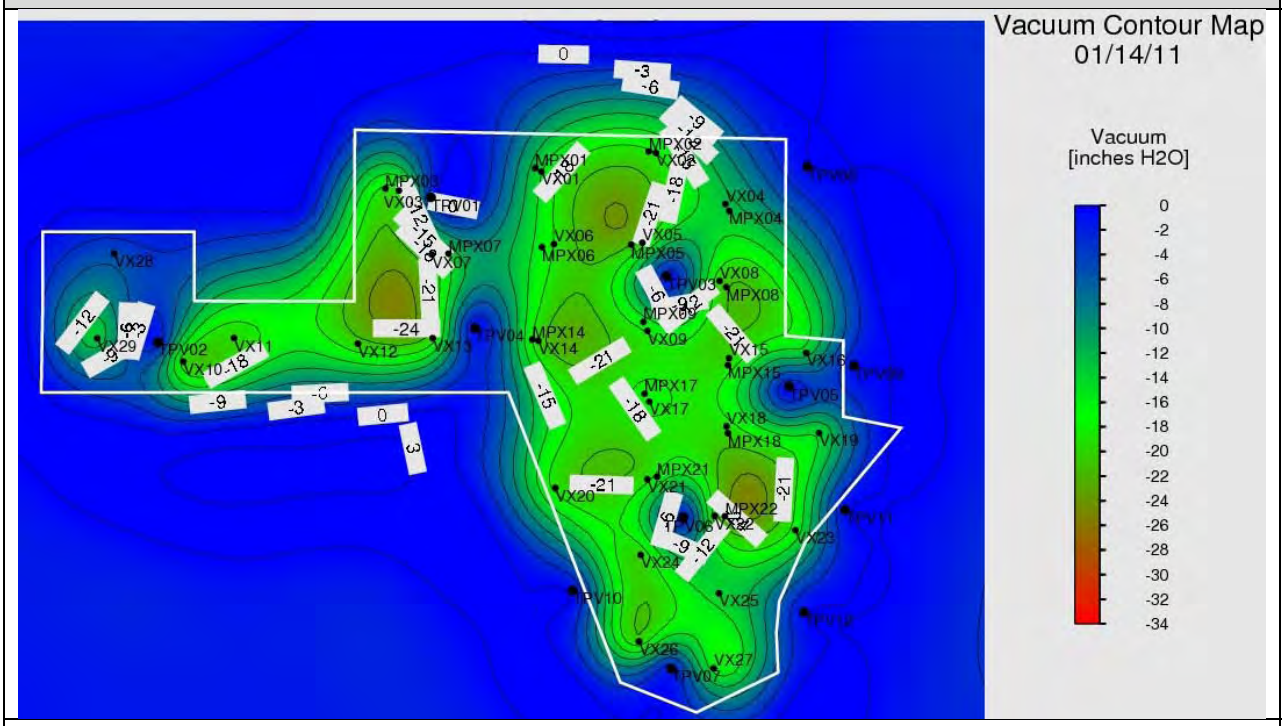
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



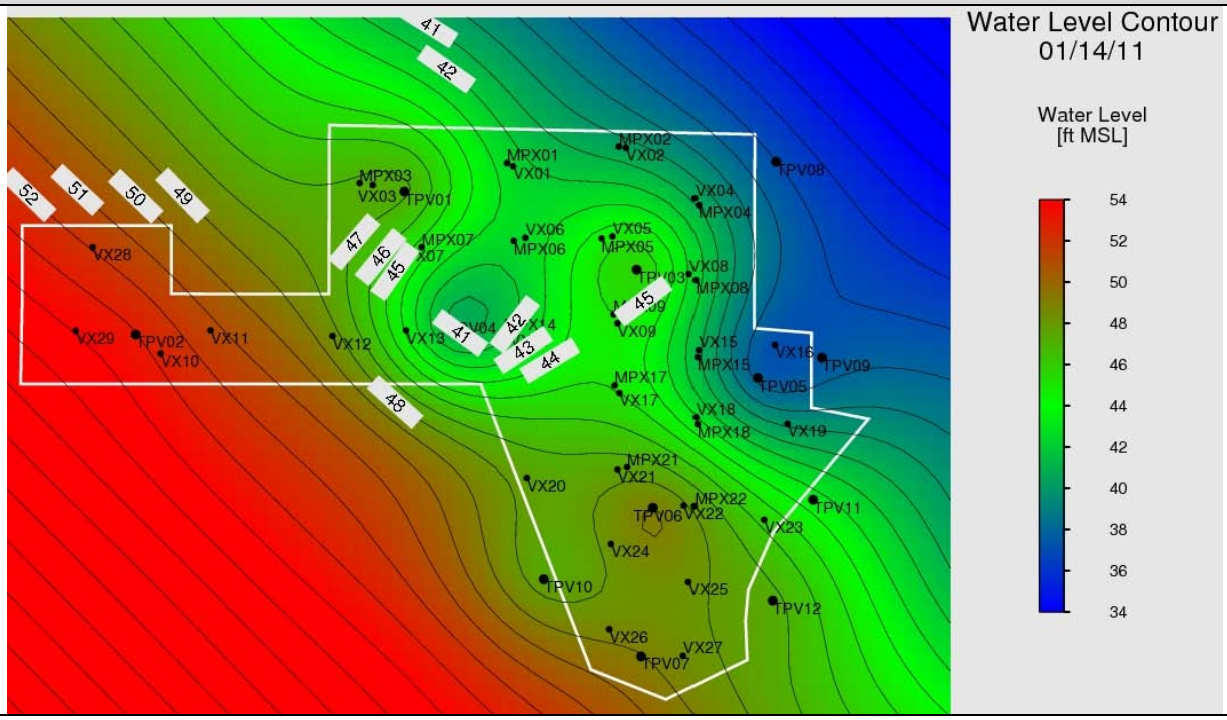
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

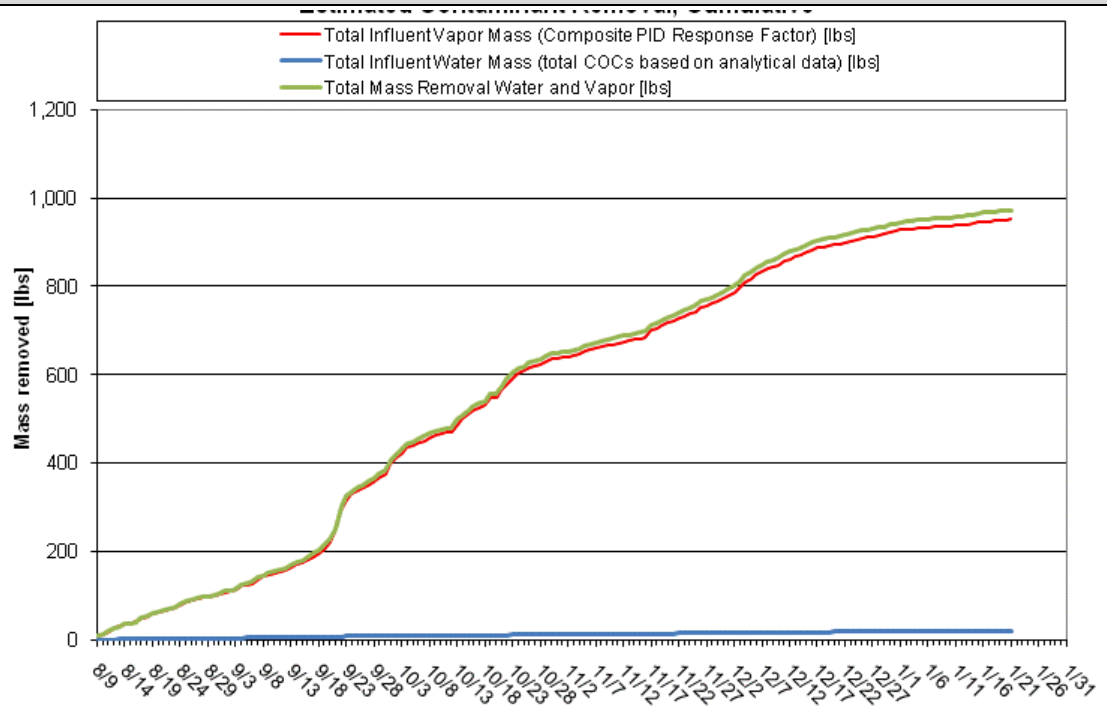
Prepared By: Lauren Soós	**Date Prepared:** January 25, 2011

Operation and Maintenance Activities Performed from 1/15/2011 to 1/21/2011	**Status**
The Week 24 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
TerraTherm and McMillan-McGee continued steam injections focused along the southern perimeter of the ISTT wellfield at locations SP-03, SP-05, SP-10, SP-12 and SP-13. Steam injections will continue, throughout the ISTT wellfield, until temperatures within the treatment zones are met (approximately 90°C or 194°F within the vadose zone) and sustained (during Phase II operations).	On-going
TerraTherm and McMillan-McGee identified inaccurate pressure and temperature readings at sensor locations TPV-01 and TPV-05, respectively. The digi-TAM (thermocouples) at TPV-05 has been replaced. The digi-PAM (pressure logger) at TPV-01 is currently undergoing troubleshooting activities and may be replaced. As a result, water level elevation contours presented in Figure 5 show an elevated water level elevation at TPV-01.	On-going
TerraTherm continues to enhance soil conductivity by introducing water conditioning salts to the injection water at targeted electrodes with currents less than 5 kW. The following injections were made during this operational period: • January 17th – 80 lbs; and • January 20th – 80 lbs. This activity may continue, sporadically, throughout the operation of the ISTT system.	On-going
The Nobis team continues GWTP maintenance (of the clarifier, sand filters, and peroxide destruction unit) related to the iron biofouling (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
During this operational period, water injection rates were increased to optimize the resistivity of the soil throughout the treatment zone. This resulted in a temporary net water extraction of -1,186 gallons. Site hydraulic control has been maintained with a total of 1,687,721 gallons of water injected since system startup while a total of 2,018,881 gallons of water extracted, for a net extraction of 331,160 gallons. The project team continues to monitor Site hydraulic control.	On-going
During this operating period (1/15 to 1/21), the vapor extraction system influent concentrations were relatively low (8 to 32 ppm, average of 19.1 ppm), which results in a relatively low calculated removal efficiency. The vapor extraction system removal efficiency for this operational period is estimated at 91%. The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent and evaluate carbon efficiency daily.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to	On-going

previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).		
ISTT Operational Data – Collected by TerraTherm during the Period of 1/8/2011 to 1/14/2011		
ISTT Wellfield		
Temperature (°F): 197° (Area D), 170° (Area C), and 196° (Area A)	Volume Extracted/Injected (gal): 92,005 / 93,191	Groundwater Elevation (ft msl): ~39 to 49 (excluding TPV-01)
Min. VOC Reading (ppm PID) 0.0 at VEW-02 (Area A), -07 (Area A), and -28 (Area D)	Max. VOC Reading (ppm PID): 71 at VEW-29 (Area D)	Average VOCs (ppm PID): 10.2
Steam Injections Locations: SP-03, -05, -10, -12, and -13	Combined Total Steam Pressure (psi): 50	
ISTT Extraction System		
Average Air Flow (scfm): 289	Average Groundwater Extraction Rate (gpm): 9.13	Average Groundwater Injection Rate (gpm): 9.25
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of TCE): 10.9 (Figure 1)	Est. Energy Used (kWh): 143,840 (Figure 2)
GAC Influent (ppm-PID): 19.1	GAC Effluent (ppm-PID): 1.6	Removal Efficiency (%): 91%
Status of Performance Metrics		
Temperature (See Figure 3): The current average subsurface temperature is approximately 137° F above the baseline average temperature, before the start of heating.	Pneumatic Control (See Figure 4): Extraction from the ISTT wellfield was recently decreased to optimize heating in it. However, the ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.	
Hydraulic Control (See Figure 5): The ISTT liquid extraction system is maintaining hydraulic control within Treatment Zone A. Current water levels are approximately 3 to 5 feet below baseline water levels.	Clean Up Goals: A Site-wide groundwater monitoring event will be conducted on January 25th. Data will be used to determine where current groundwater concentrations exist with respect to Site Clean Up Goals.	
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown from October 12th until October 20th and the heating difficulties experienced in other areas of the site (primarily shallow zones), the total operational duration has been prolonged. Heating enhancements (steam injections and thermal insulation cap), to accelerate heating in the "difficult to treat" areas at the Site, are currently underway.		
Total Contaminant Mass Removed to Date in Vapor and Water (Figure 1): 973 lbs	Total NAPL Removed To Date: 18.4 gallons	

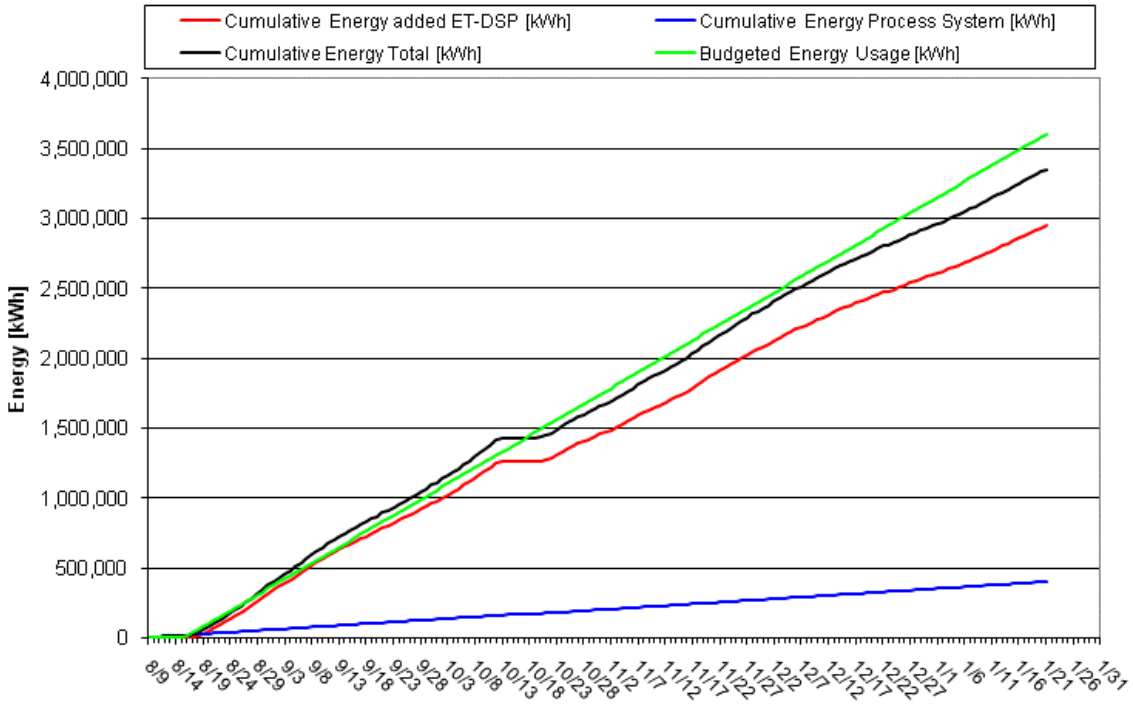
Optimization Activities for the Following Week:
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Optimize the extraction systems to maintain heat in the ISTT wellfield. Continue to operate the extraction systems while maintaining a balance between the water injection, steam injection, and the groundwater extraction rates during ET-DSP system operation.
ET-DSP System – Continue to focus on heating the treatment zones with the use of the electrodes and steam injections. Continue to enhance soil conductivity with saline water injection.
GWTP – Continue to closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).
Performance Monitoring – Continue routine process performance monitoring and sampling. In addition, a comprehensive groundwater monitoring and split soil vapor sampling events are planned on January 25th and 27th, respectively. All samples will be processed, handled, and shipped by Nobis. An expedited turnaround time for all VOC analyses will be requested from both CLP and OEME laboratories.
Analytical Laboratory Data Received:
Process Liquid: No new data available for this reporting period.
Process Vapor: Preliminary data were received for process vapor samples collected on December 29th, January 5th, and January 12th (all data refers to the sampling events in this order). TCE (at concentrations of 200 ppbv, 330 ppbv, and 1,400 ppbv) and cis-1,2-DCE (at concentrations of 86 ppbv, 150 ppbv, and 350 ppbv) were detected in the influent samples. The total VOC concentrations were 412.7 ppbv, 668 ppbv, and 2,565 ppbv. The VOC removal efficiencies were calculated to be approximately 66%, 75%, and 91%. The carbon efficiency continues to be evaluated on a daily basis using field data and when available, laboratory data.
Extraction Wells: No new data available for this reporting period.
Groundwater: No new data available for this reporting period.
Ambient Air: Data were received for ambient air samples collected on January 5th. TCE was not detected at either the upgradient or downgradient locations during this ambient air sampling event. All other VOCs detected were consistent with the compounds and concentrations detected during the Baseline ambient air monitoring event.
Next Project Status Conference Calls: Thursday, January 27th at 12:30 pm
Next Project Status Meeting: Thursday, February 3rd at 12:30 pm

Figure 1, Mass Removal Estimate:



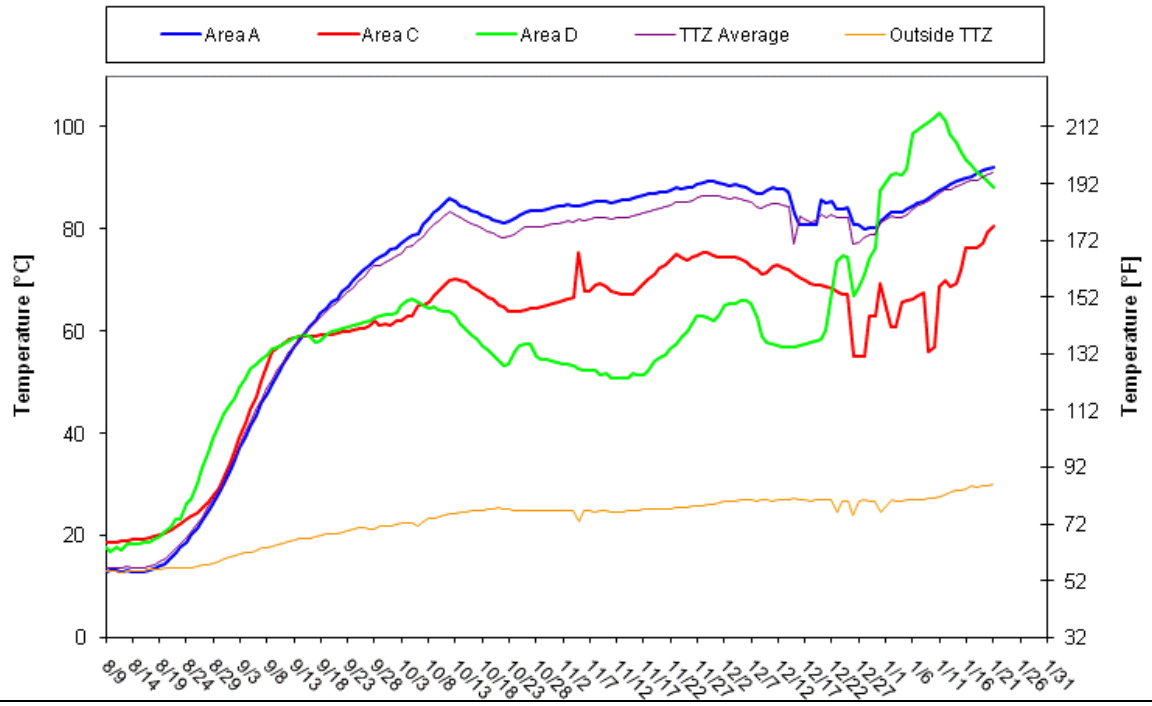
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



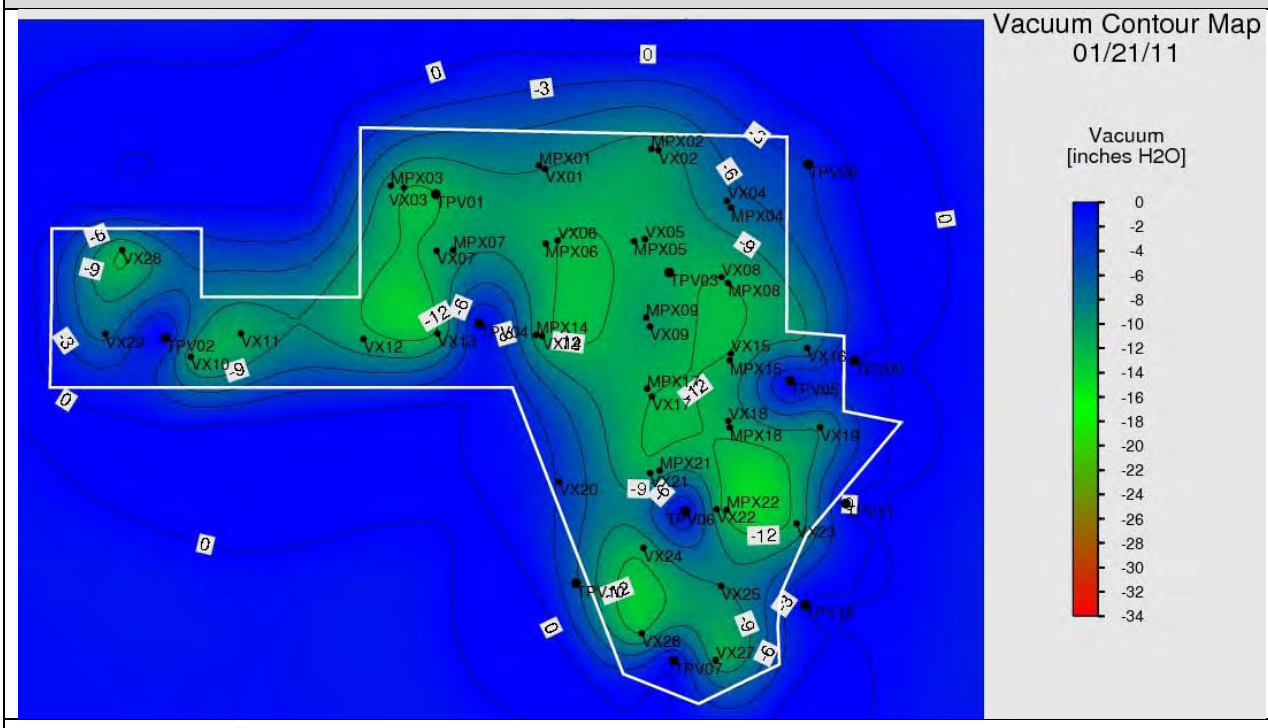
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



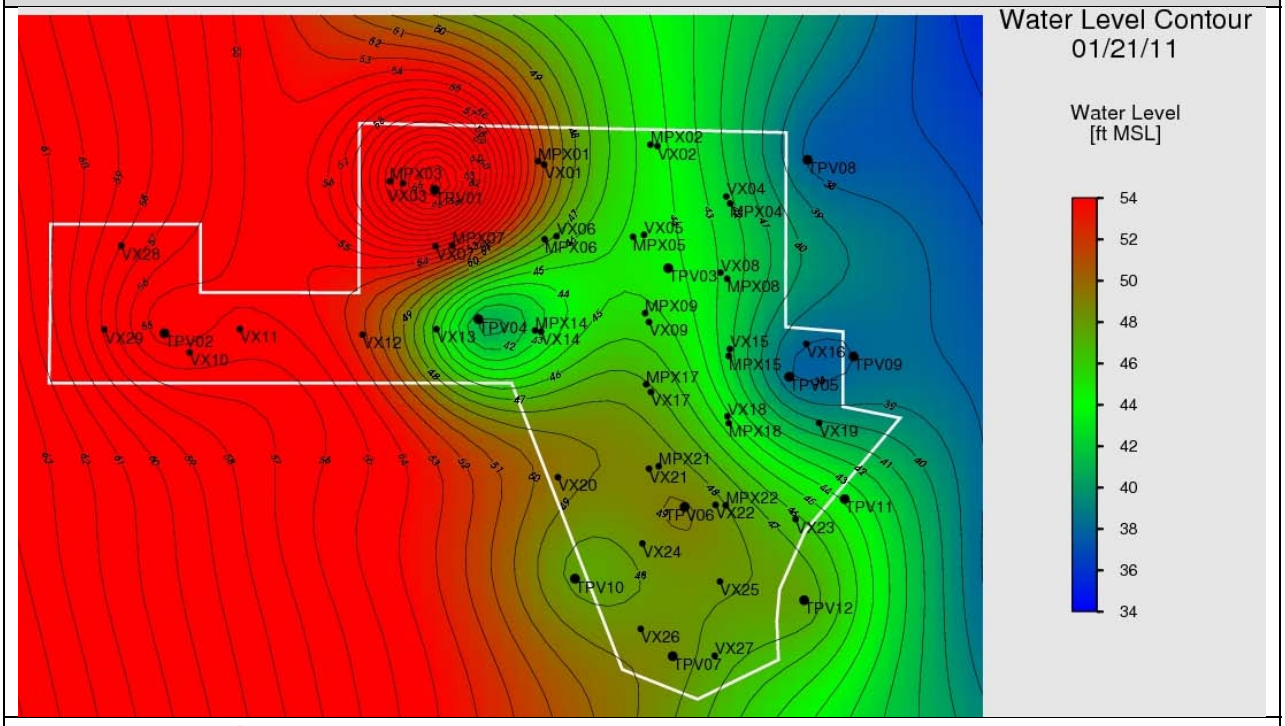
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** February 1, 2011

Operation and Maintenance Activities Performed from 1/22/2011 to 1/28/2011	**Status**
The Week 25 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent; vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition, TerraTherm conducted a Site-wide groundwater monitoring event. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
On January 24th, at approximately 17:30, the ISTT extraction systems shut down following a power surge. The power surge caused the Programmable Logic Control (PLC) system to malfunction. As a result, no alarms were received by the TerraTherm operators. After several days of troubleshooting, it was identified that the battery that operates the PLC system failed. After extensive thawing events and replacing the PLC battery, the groundwater extraction system was brought online on January 26th at approximately 20:30. Following additional thawing, the soil vapor extraction system was brought online on January 27th at approximately 11:00. Two spare batteries are currently available, if needed, at the Site.	Complete
TerraTherm and McMillan-McGee continued to troubleshooting inaccurate pressure readings from the digi-PAM located at sensor well TPV-01. Steam temperatures at TPV-01 are above the rating of the pressure sensor (digi-PAM) located at TPV-01, causing inaccurate pressure (or water level) readings. Water level elevation contours presented in Figure 5 show an elevated water level elevation at TPV-01. Due to the temperatures in the sensor well, the digi-PAM will not be replaced, but instead water levels will be manually collected. In the future, this data will be used to generate the water level elevation contours.	Complete
TerraTherm and McMillan-McGee continued steam injections focused along the southern perimeter of the ISTT wellfield at soil vapor extraction locations VEW-16, VEW-23, and VEW-27 and steam spear locations SP-10 and SP-13. Steam injections will continue, throughout the ISTT wellfield, until temperatures within the treatment zones are met (approximately 90°C or 194°F within the vadose zone) or until the project team decides the treatment objectives have been met.	On-going
The Nobis team continues GWTP maintenance (of the clarifier, sand filters, and peroxide destruction unit) related to the iron biofouling (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
During this operating period (1/22 to 1/28), the vapor extraction system influent concentrations were relatively low (18 to 28 ppm, average of 24 ppm), which results in a relatively low calculated removal efficiency. The vapor extraction system removal efficiency for this operational period is estimated at 93% (slightly below the contract required 95% removal efficiency). The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent and evaluate carbon efficiency daily.	On-going

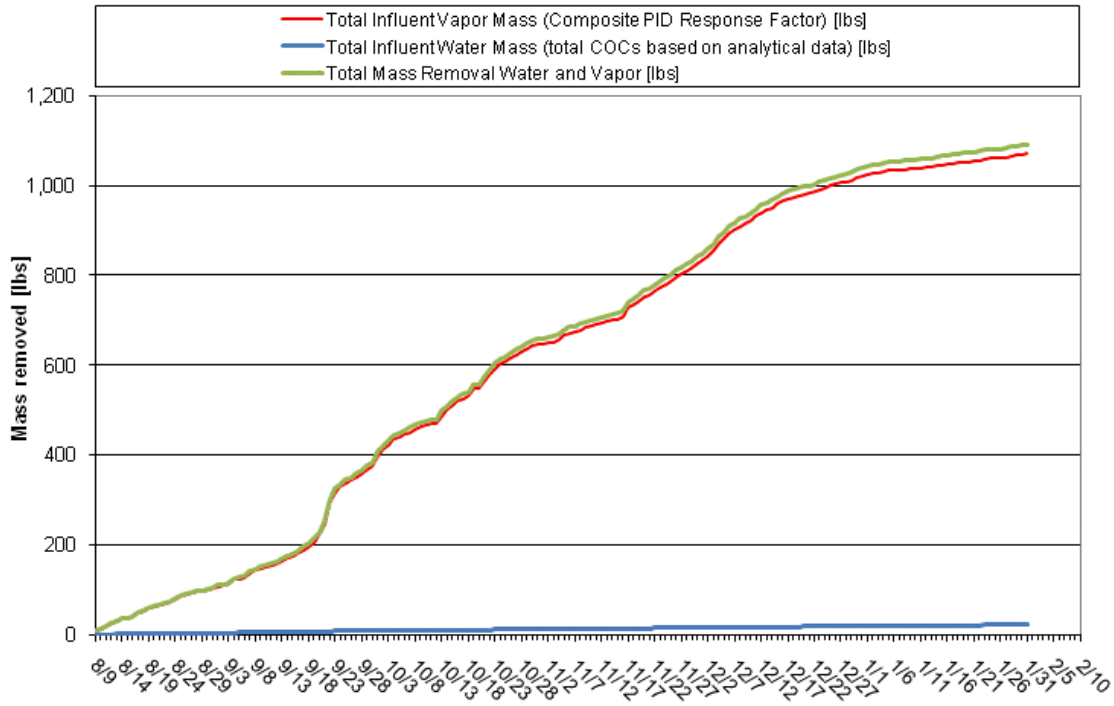
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 1/22/2011 to 1/28/2011		
ISTT Wellfield		
Temperature (°F): 186° (Area D), 183° (Area C), and 199° (Area A)	Volume Extracted/Injected (gal): 52,288 / 32,481	Groundwater Elevation (ft msl): ~42 to 49 (excluding TPV-01)
Min. VOC Reading (ppm PID) 2.0 at VEW-10 (Area D)	Max. VOC Reading (ppm PID): 16 at VEW-04 (Area A)	Average VOCs (ppm PID): 37.3
Steam Injections Locations: SP-10, SP-13, VEW-16, VEW-23, and VEW-27	Combined Total Steam Pressure (psi): 50	
ISTT Extraction System		
Average Air Flow (scfm): 289	Average Groundwater Extraction Rate (gpm): 5.2	Average Groundwater Injection Rate (gpm): 3.2
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of VOC): 11.5 (Figure 1)	Est. Energy Used (kWh): 96,960 (Figure 2)
GAC Influent (ppm-PID): 24	GAC Effluent (ppm-PID): 1.6	Removal Efficiency (%): 93%

Status of Performance Metrics	
Temperature (See Figure 3): The current average subsurface temperature is 189° F, which is approximately 138° F above the baseline average temperature and somewhat lower than the target temperatures (194°F/212°F)	Pneumatic Control (See Figure 4): Extraction from the ISTT wellfield was recently decreased to optimize heating in it. However, the ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.
Hydraulic Control (See Figure 5): The ISTT liquid extraction system is maintaining hydraulic control within Treatment Zone A. Current water levels are approximately 1 to 2 feet below baseline water levels.	Clean Up Goals: A Site-wide groundwater monitoring event was conducted on January 25th. Data is being used to determine where current groundwater concentrations meet Site Clean Up Goals.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown from October 12th until October 20th and the heating difficulties experienced in other areas of the site (primarily shallow zones), the total operational duration has been prolonged. Heating enhancements (steam injections and thermal insulation cap), to accelerate heating in the "difficult to treat" areas at the Site, are currently underway.	
Total Contaminant Mass Removed to Date in Vapor and Water (incl. NAPL) (Figure 1): 1,206 lbs	Total NAPL Removed To Date: 18.4 gallons (~120 lbs of VOCs)

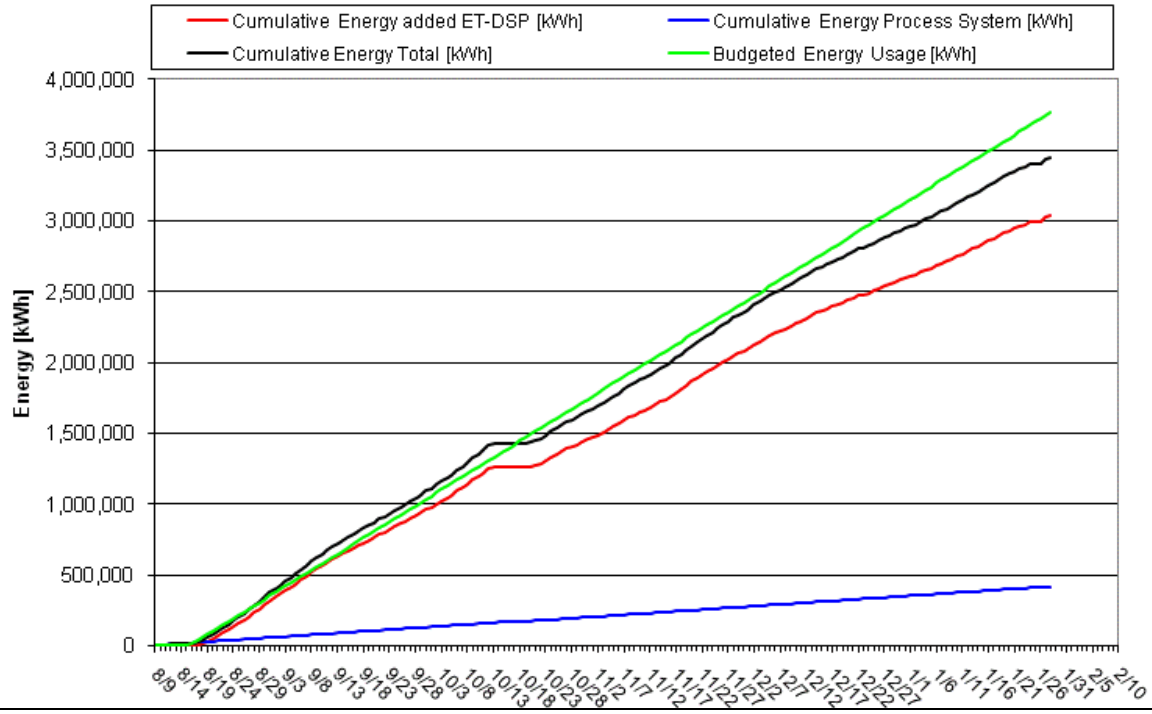
Optimization Activities for the Following Week:
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Optimize the extraction systems to maintain heat in the ISTT wellfield. Continue to operate the extraction systems while maintaining a balance between the water injection, steam injection, and the groundwater extraction rates during ET-DSP system operation.
ET-DSP System – Continue to focus on heating the treatment zones with the use of the electrodes and steam injections. Continue to enhance soil conductivity with saline water injection.
GWTP – Continue to closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).
Performance Monitoring – Continue routine process performance monitoring and sampling. In addition, a comprehensive groundwater monitoring and split soil vapor sampling events are planned on January 25th and 27th, respectively. All samples will be processed, handled, and shipped by Nobis. An expedited turnaround time for all VOC analyses will be requested from both CLP and OEME laboratories.
Analytical Laboratory Data Received:
Process Liquid: No new data available for this reporting period.
Process Vapor: Preliminary data were received for process vapor samples collected on December 21st. TCE and cis-1,2-DCE were detected in the influent sample at concentrations of 200 ppbv and 91 ppbv, respectively. The total VOC concentration was 426.1 ppbv. During this sampling event, the vapor extraction system influent concentration was relatively low, which results in a relatively low calculated removal efficiency (approximately 60%.) The primary carbon vessel was replaced approximately one week prior to this sampling event. The carbon efficiency continues to be evaluated on a daily basis using field data and when available, laboratory data.
Extraction Wells: No new data available for this reporting period.
Groundwater: Preliminary analytical results were received for the groundwater monitoring event conducted on January 25, 2010. VOCs were detected in all of the groundwater monitoring and groundwater extraction wells sampled during this monitoring event. TCE and cis-1,2-DCE were detected at concentrations ranging from non-detect (less than 5 µg/L) to maximum concentrations of 180 µg/L and 88 µg/L (RW-03), respectively. The concentrations of these compounds in most wells were lower than their MCLs. Only 8 of the 22 wells sampled had TCE concentrations greater than the MCL of 5 µg/L; the maximum TCE concentration (180 µg/L) was detected in RW-03, all other wells had TCE concentrations of less than 30 µg/L. Cis-1,2-DCE was detected above its MCL of 70 µg/L in only one location (RW-03 @ 88 µg/L). In addition, acetone and MEK were detected at concentrations ranging from non-detect (less than 10 µg/L) to maximum concentrations of 1,800 µg/L (MPE-17 and RW-03) and 340 µg/L (RW-07), respectively.
Ambient Air: No new data available for this reporting period.
Next Project Status Conference Calls: Thursday, February 3rd at 12:30 pm (previously a Site meeting)

Figure 1, Mass Removal Estimate:



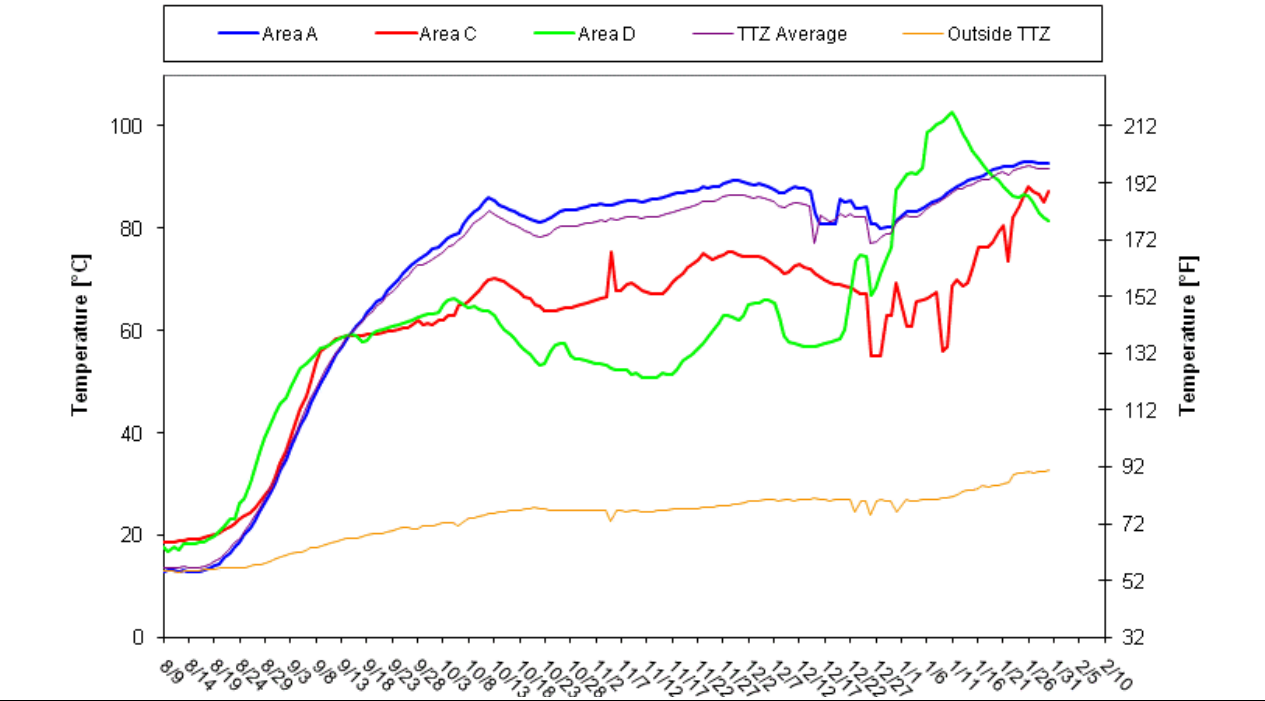
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



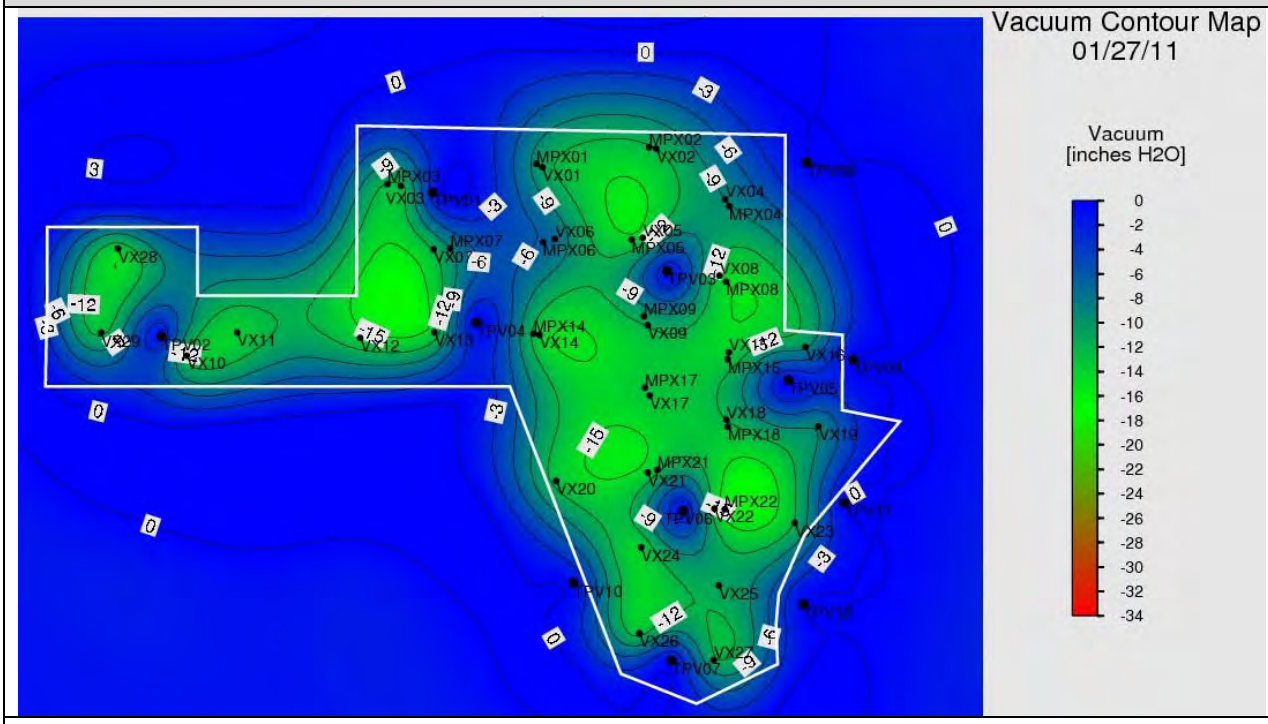
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



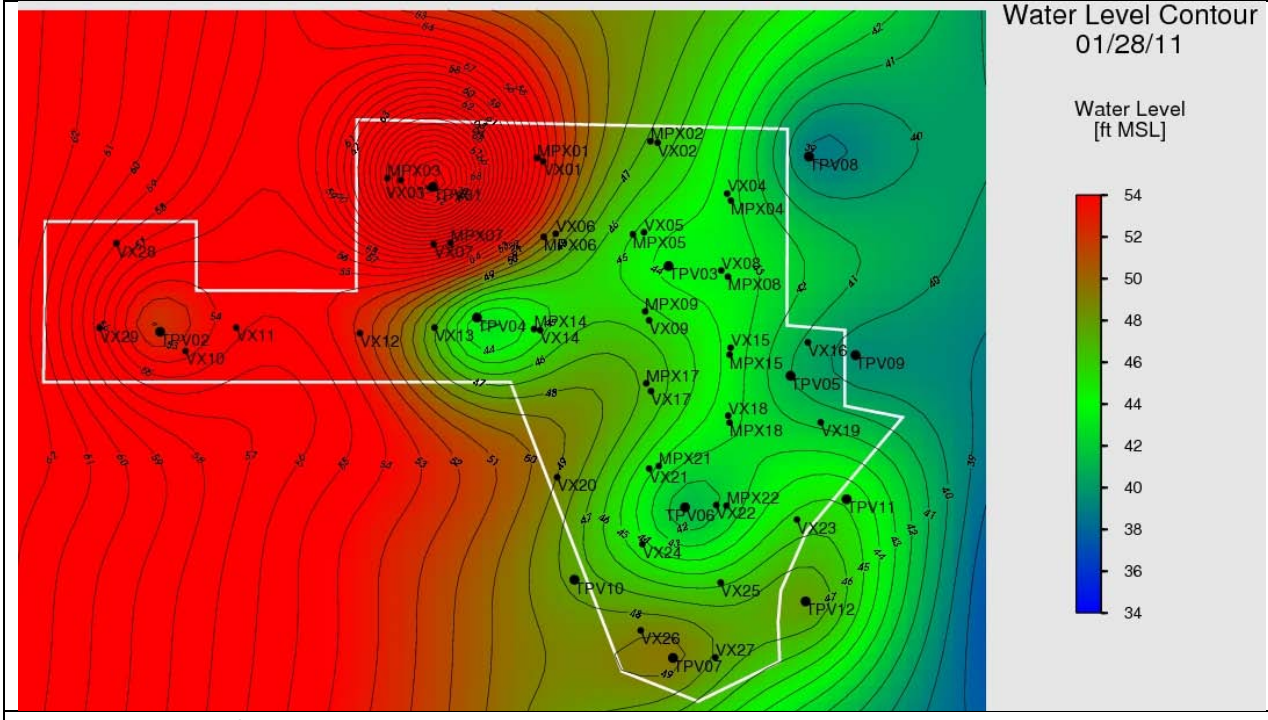
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** February 8, 2011

Operation and Maintenance Activities Performed from 1/29/2011 to 2/4/2011	**Status**
Following receipt and evaluation of the preliminary results from the Site-wide groundwater event (conducted on January 25th), Nobis authorized TerraTherm and McMillan-McGee to shutdown all deep electrodes in the saturated portion of Treatment Area A. The deep electrodes were shutdown on February 3rd.	Complete
Following receipt and evaluation of preliminary results from select interior (to the Valley Manufacturing Building) soil vapor extraction wells sampled on January 28th, Nobis authorized TerraTherm and McMillan-McGee to shutdown all electrodes (shallow and mid) within the interior portions Treatment Areas A, B, C, and D, with the exception of the southernmost portion of Treatment Area A. Heating will continue in the remaining areas of the ISTT wellfield pending continued heating in the exterior areas and review of soil vapor extraction well data to be collected during the week of February 7th.	Complete
The Week 26 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent, and the process liquid system effluent (influent to the GWTP.) In addition, Nobis conducted an ambient air sampling event. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory). As a result of large snow storms on Tuesday and Wednesday, TerraTherm was unable to collect routine field monitoring of total VOCs (using a Photoionization Detector) from select soil vapor extraction wells. A comprehensive soil vapor extraction well sampling event is planned for the week of February 7th, using OEME's mobile laboratory.	Complete
On January 30th, the vapor extraction system shut down due to a frozen air line. The line was thawed and the vapor extraction system was brought back online within approximately one hour.	Complete
On January 31st, the ET-DSP system was shut down for approximately two hours to repair an air line on the downhole pump located in groundwater extraction well MPE-07. Once the repair was made, the ET-DSP system was brought back online.	Complete
TerraTherm and McMillan-McGee continued steam injections focused at various soil vapor extraction locations, VEW-01, VEW-06, VEW-23, and VEW-27, within Areas A and C. Steam injections will continue until temperatures within the treatment zones are met (approximately 90°C or 194°F within the vadose zone) or until the project team decides the treatment objectives have been met.	On-going
The Nobis team continues GWTP maintenance (of the clarifier, sand filters, and peroxide destruction unit) related to the iron biofouling (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
During this operating period (1/29 to 2/4), the vapor extraction system influent concentrations were relatively low (8 to 32 ppm, average of 19 ppm), which results in a relatively low calculated removal efficiency. The vapor extraction system removal	On-going

efficiency for this operational period is estimated at 93% (slightly below the contract required 95% removal efficiency). The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent and evaluate carbon efficiency daily.	
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

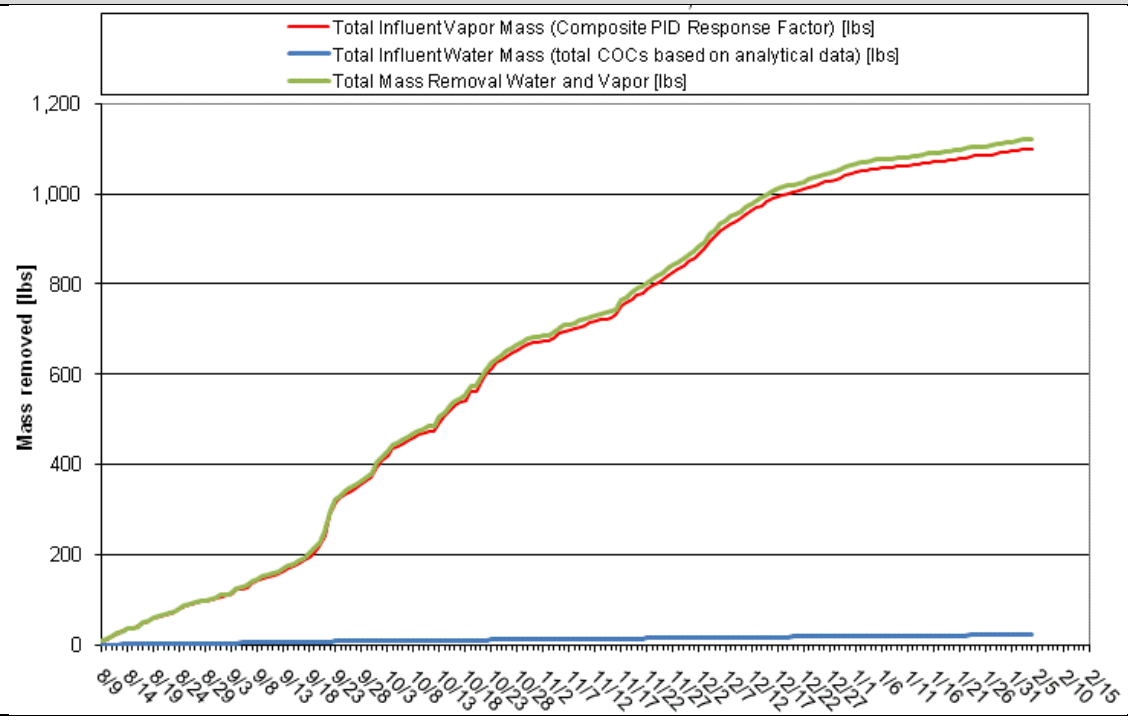
ISTT Operational Data – Collected by TerraTherm during the Period of 1/29/2011 to 2/4/2011		
ISTT Wellfield		
Temperature (°F): 175° (Area D), 192° (Area C), and 199° (Area A)	Volume Extracted/Injected (gal): 63,956 / 7,210	Groundwater Elevation (ft msl): ~40 to 45 (excluding TPV-01)
Min. VOC Reading (ppm PID) No samples collected	Max. VOC Reading (ppm PID): No samples collected	Average VOCs (ppm PID): No samples collected
Steam Injections Locations: VEW-01, VEW-06, VEW-23, and VEW-27	Combined Total Steam Pressure (psi): 50	
ISTT Extraction System		
Average Air Flow (scfm): 289	Average Groundwater Extraction Rate (gpm): 6.3	Average Groundwater Injection Rate (gpm): 0.7
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of VOC): 12.6 (Figure 1)	Est. Energy Used (kWh): 104,960 (Figure 2)
GAC Influent (ppm-PID): 19	GAC Effluent (ppm-PID): 1.3	Removal Efficiency (%): 93%

Status of Performance Metrics	
Temperature (See Figure 3): The current average subsurface temperature is 189° F, which is approximately 138° F above the baseline average temperature and somewhat lower than the target temperatures (194°F/212°F)	Pneumatic Control (See Figure 4): Extraction from the ISTT wellfield was recently decreased to optimize heating in it. However, the ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.

Hydraulic Control (See Figure 5): The ISTT liquid extraction system is maintaining hydraulic control within Treatment Zone A. Current water levels are approximately 3 to 5 feet below baseline water levels.	Clean Up Goals: TCE was detected in 7 out of the 22 groundwater monitoring and extraction well samples (collected during the Site-Wide groundwater monitoring event) at a concentration above the Site Clean Up Goal (5 ug/L). However, concentrations are significantly lower when compared to baseline concentrations. The project team is confident that natural attenuation and/or pump and treat using the existing GWTF will be a cost effective means of reducing the remaining concentrations of TCE.
Performance Goal Attainment Issues: Due to the ET-DSP system (heating system) shutdown from October 12th until October 20th and the heating difficulties experienced in other areas of the site (primarily shallow zones), the total operational duration has been prolonged. Heating enhancements (steam injections and thermal insulation cap), to accelerate heating in the "difficult to treat" areas at the Site, are currently underway.	
Total Contaminant Mass Removed to Date in Vapor and Water (incl. NAPL) (Figure 1): 1,241 lbs	Total NAPL Removed To Date: 18.4 gallons (~120 lbs of VOCs)
Optimization Activities for the Following Week:	
ISTT Extraction System – Continue to closely monitor the efficiencies of the extraction systems. Optimize the extraction systems to maintain heat in the ISTT wellfield. Continue to operate the extraction systems while maintaining a balance between the water injection, steam injection, and the groundwater extraction rates during active ET-DSP system operation. The groundwater extraction system will be shutdown at the conclusion of the ET-DSP system operations. However, the vapor extraction system will remain in operation for up to two weeks.	
ET-DSP System – Continue to focus on heating the select treatment zones with the use of the electrodes and steam injections. Continue to enhance soil conductivity with saline water injection, when needed.	
GWTP – Continue to closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).	
Performance Monitoring – Continue routine process performance monitoring and sampling. In addition, an OEME mobile laboratory event is planned for the week of February 7th. The data will be used to determine if shutdown active heating of the remaining portions of the ISTT wellfield is warranted. All samples will be processed, handled, and shipped by Nobis. An expedited turnaround time for all VOC analyses will be requested from both CLP and OEME laboratories.	
Analytical Laboratory Data Received:	
Process Liquid: No new data available for this reporting period.	
Process Vapor: Preliminary data was received for process vapor samples collected on January 28th. TCE and cis-1,2-DCE were detected in the influent sample at concentrations of 2,100 ppbv and 750 ppbv, respectively. The total VOC concentration was 3,306 ppbv (including 2,946 ppbv of ClVOCs). During this sampling event, the calculated removal efficiency was approximately 90%. The carbon efficiency continues to be evaluated on a daily basis using field data and when available, laboratory data.	
Extraction Wells: Preliminary results were received for samples collected on January 28th from soil vapor extraction wells VEW-13, VEW-20, and VEW-29. TCE and cis-1,2-DCE were detected in all of the samples	

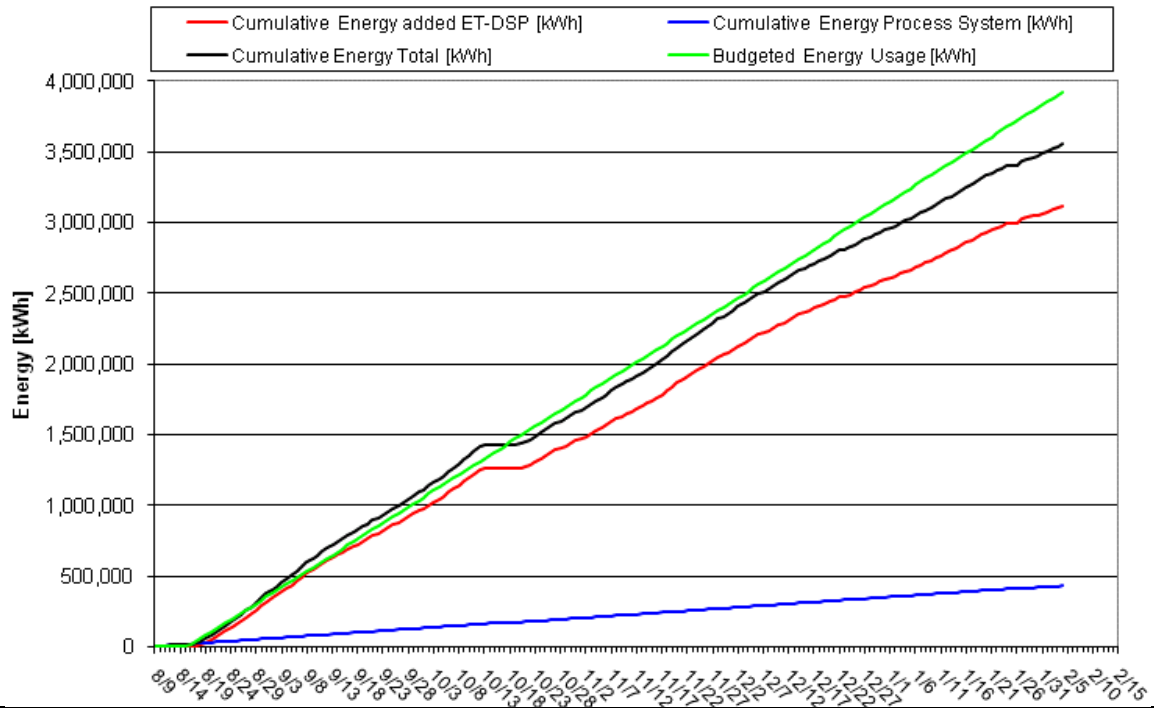
at maximum concentrations of 1.9 ppbv and 4.6 ppbv, respectively (at VEW-20). In addition, preliminary results were received a sample was collected from the Area D manifold line on January 28th. TCE and cis-1,2-DCE was detected at concentrations of 1,400 ppbv and 500 ppbv, respectively.
Groundwater: No new data available for this reporting period.
Ambient Air: No new data available for this reporting period.
Next Project Status Conference Calls: Thursday, February 3rd at 12:30 pm (previously a Site meeting)

Figure 1, Mass Removal Estimate:



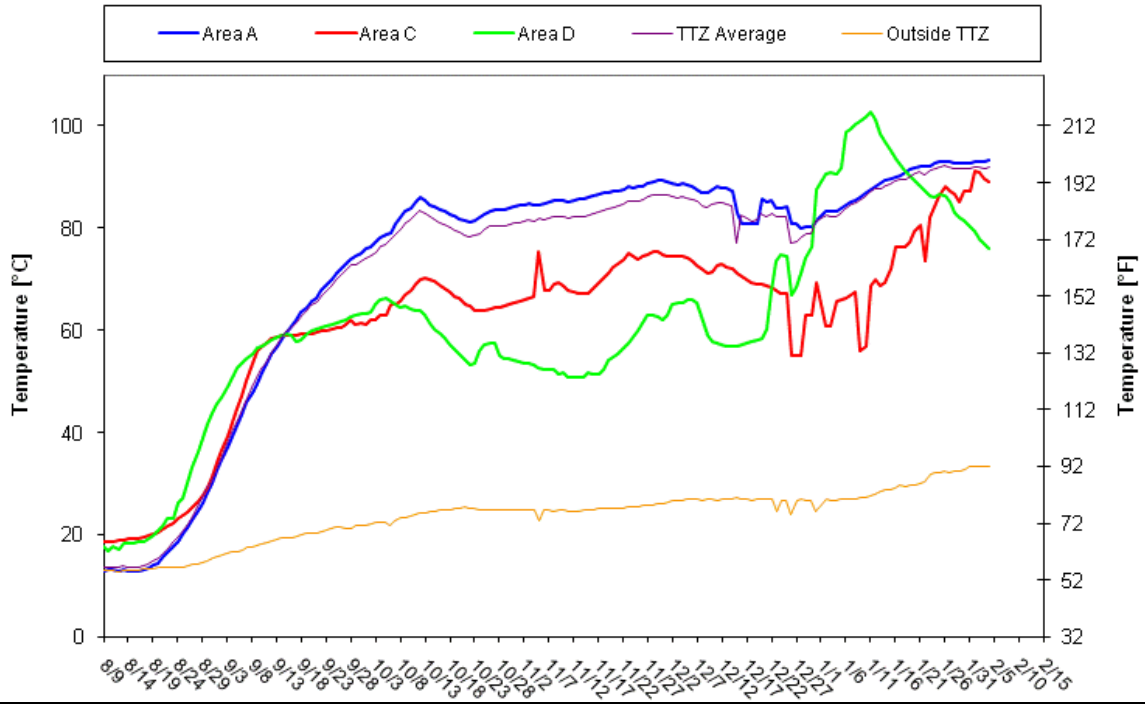
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



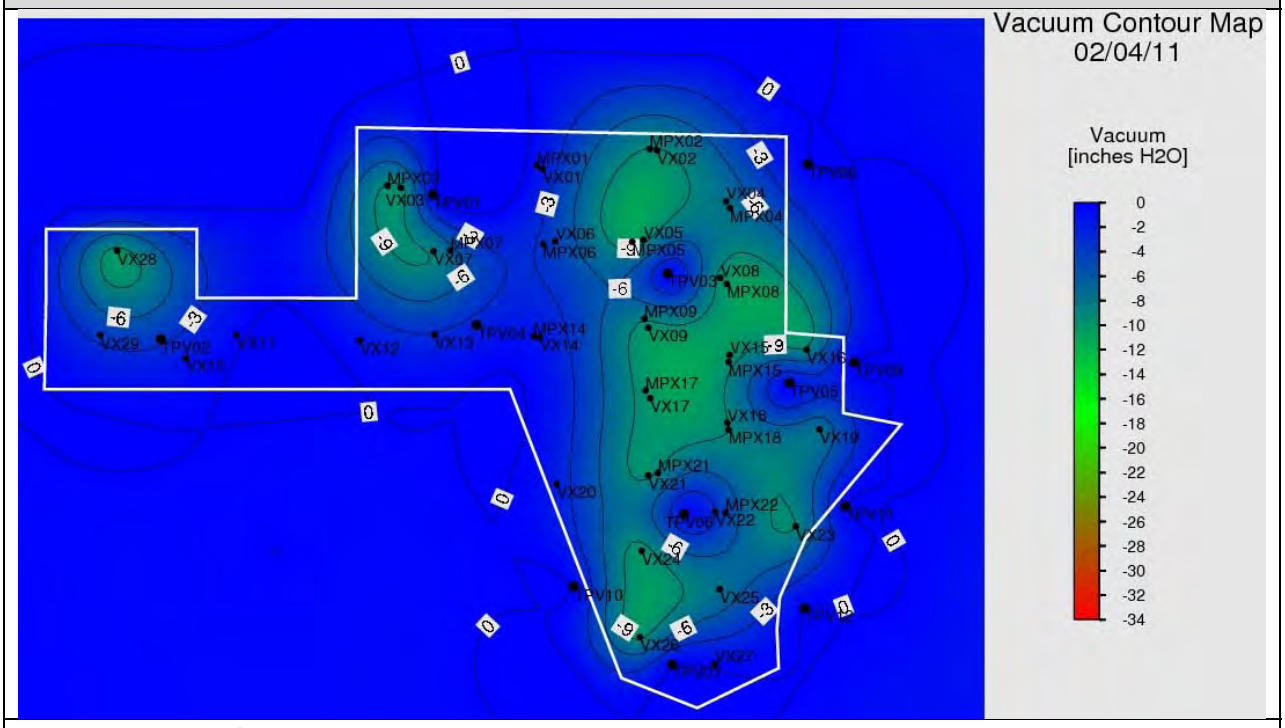
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



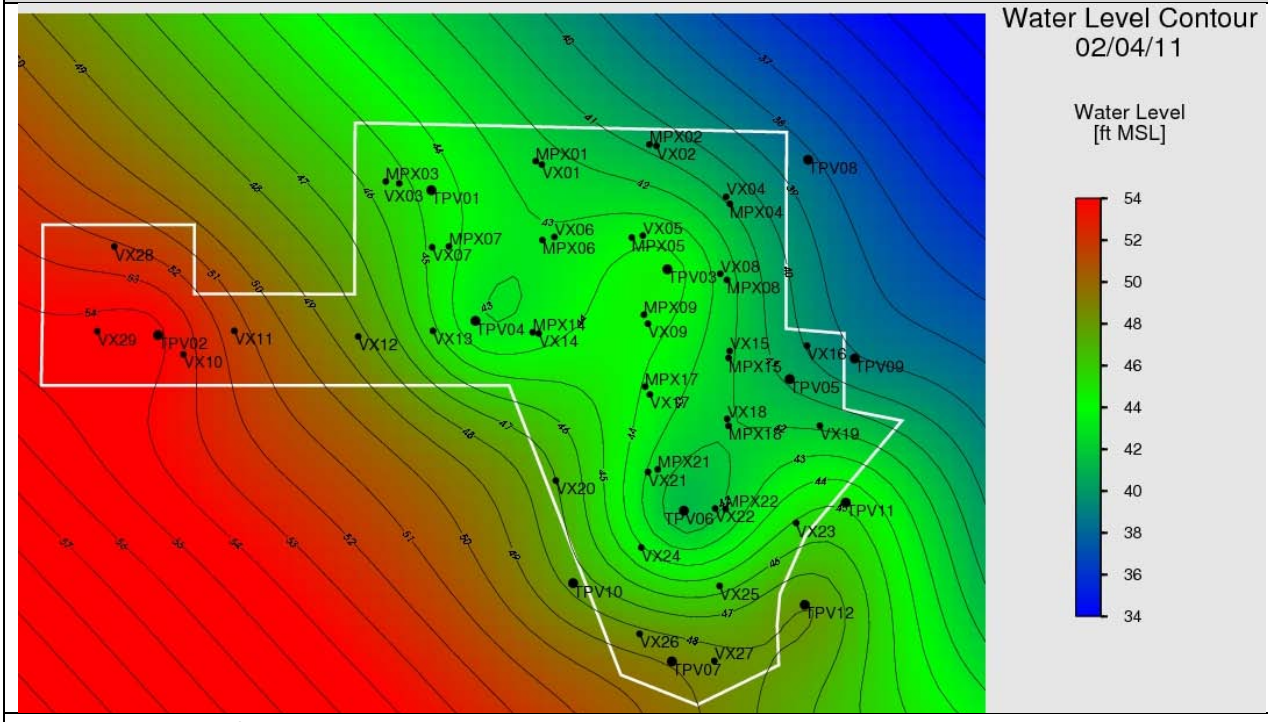
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

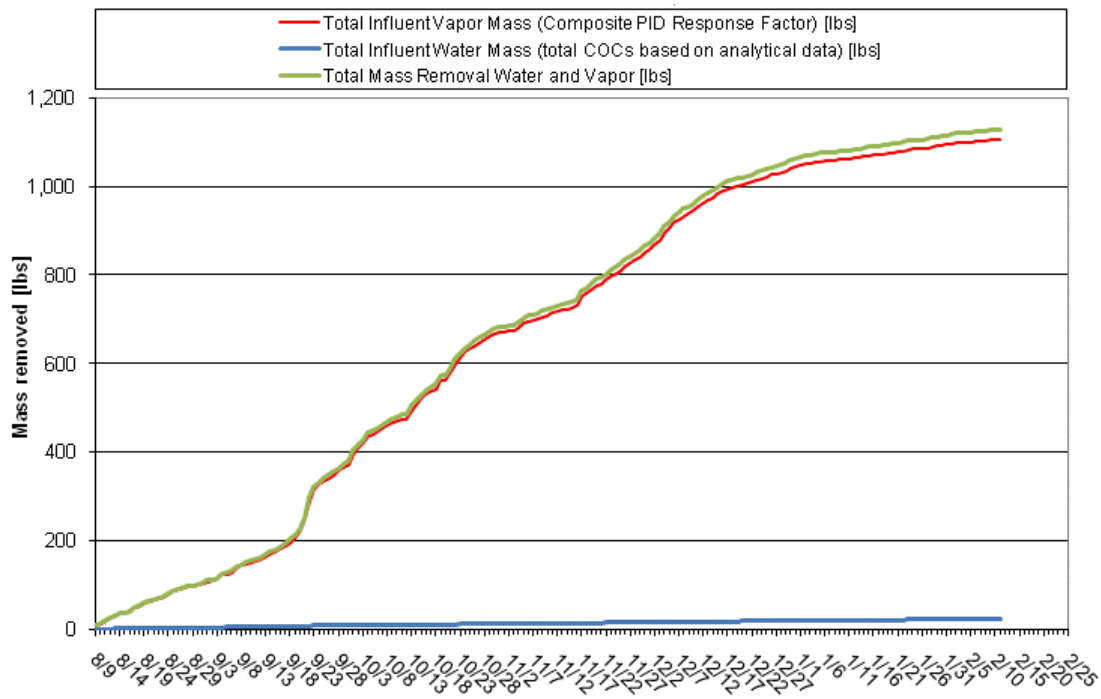
Prepared By: Lauren Soós	**Date Prepared:** February 15, 2011

Operation and Maintenance Activities Performed from 2/5/2011 to 2/11/2011	**Status**
The Week 27 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent, select soil vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition, OEME's mobile laboratory analyzed samples collected on February 7th from select soil vapor extraction wells. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
Nobis received and evaluated OEME's mobile laboratory results from samples collected from select exterior (to the Valley Manufacturing Building) soil vapor extraction wells sampled on February 7th. After agreement from the Project Team (Nobis team, EPA, and MassDEP), Nobis authorized TerraTherm and McMillan-McGee on February 9th to shut down all remaining electrodes and immediately commence Phase III cooling throughout the ISTT wellfield. Phase III cooling is currently planned for approximately two weeks, through February 23rd.	Complete
On February 10th, the soil vapor extraction system was shut down for a high level alarm at the knockout pot. Maintenance was performed and approximately 30 minutes after alarm was received, the system was restarted.	Complete
TerraTherm and McMillan-McGee continued steam injections focused at various soil vapor extraction locations, VEW-01, VEW-06, VEW-23, and VEW-27, within Areas A and C. Steam injections ceased at the initiation of Phase III on February 9th.	On-going
The Nobis team continues GWTP maintenance (of the clarifier, sand filters, and peroxide destruction unit) related to the iron biofouling (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
During this operating period (2/5 to 2/11), the vapor extraction system influent concentrations were relatively low (6 to 18 ppm, average of 10.6 ppm), which results in a relatively low calculated removal efficiency. The vapor extraction system removal efficiency for this operational period is estimated at 91% (below the contract required 95% removal efficiency). The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent and evaluate carbon efficiency daily.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 1/29/2011 to 2/4/2011		
ISTT Wellfield		
Temperature (°F): 161° (Area D), 192° (Area C), and 199° (Area A)	Volume Extracted/Injected (gal): 81,662 / 0	Groundwater Elevation (ft msl): ~37 to 43 (excluding TPV-01)
Min. VOC Reading (ppm PID) 1 ppm at VEW-23 and VEW-26 (Area C)	Max. VOC Reading (ppm PID): 40 ppm at VEW-4 (Area A)	Average VOCs (ppm PID): 11 ppm
Steam Injections Locations: VEW-01, VEW-06, VEW-23, and VEW-27	Combined Total Steam Pressure (psi): 50	
ISTT Extraction System		
Average Air Flow (scfm): 306	Average Groundwater Extraction Rate (gpm): 8.1	Average Groundwater Injection Rate (gpm): 0.0
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of VOC): 7.8 (Figure 1)	Est. Energy Used (kWh): 68,480 (Figure 2)
GAC Influent (ppm-PID): 10.6	GAC Effluent (ppm-PID): 1.0	Removal Efficiency (%): 91%
Status of Performance Metrics		
Temperature (See Figure 3): The current average subsurface temperature is 184° F, which is approximately 133° F above the baseline average temperature and somewhat lower than the target temperatures (194°F/212°F).	Pneumatic Control (See Figure 4): Following the initiation of Phase III (on February 9th), extraction from the ISTT wellfield was increased to optimize steam and vapor removal. The ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.	
Hydraulic Control (See Figure 5): The ISTT liquid extraction system maintained hydraulic control within Treatment Zone A during ISTT heating operations. Current water levels are approximately 5 to 7 feet below baseline water levels. Following the initiation of Phase III (on February 9th), the ISTT liquid extraction system was shutdown.	Clean Up Goals: Concentrations of TCE detected during the Site-wide groundwater monitoring event are significantly lower than baseline concentrations. Nobis will continue to monitor concentrations in soil and groundwater with several confirmation sampling events scheduled through to August 2011.	
Performance Goal Attainment Issues: Following several sampling events and data evaluations, the project team decided to shutdown ISTT heating operations in various stages after confirming significant reductions in concentrations of the Site contaminants of concern. The first group of electrodes was shut down on February 3rd, the second group on February 4th, and the remaining electrodes were shutdown on February 9th.		
Total Contaminant Mass Removed to Date in Vapor and Water (incl. NAPL) (Figure 1): 1,249 lbs	Total NAPL Removed To Date: 18.4 gallons (~120 lbs of VOCs)	

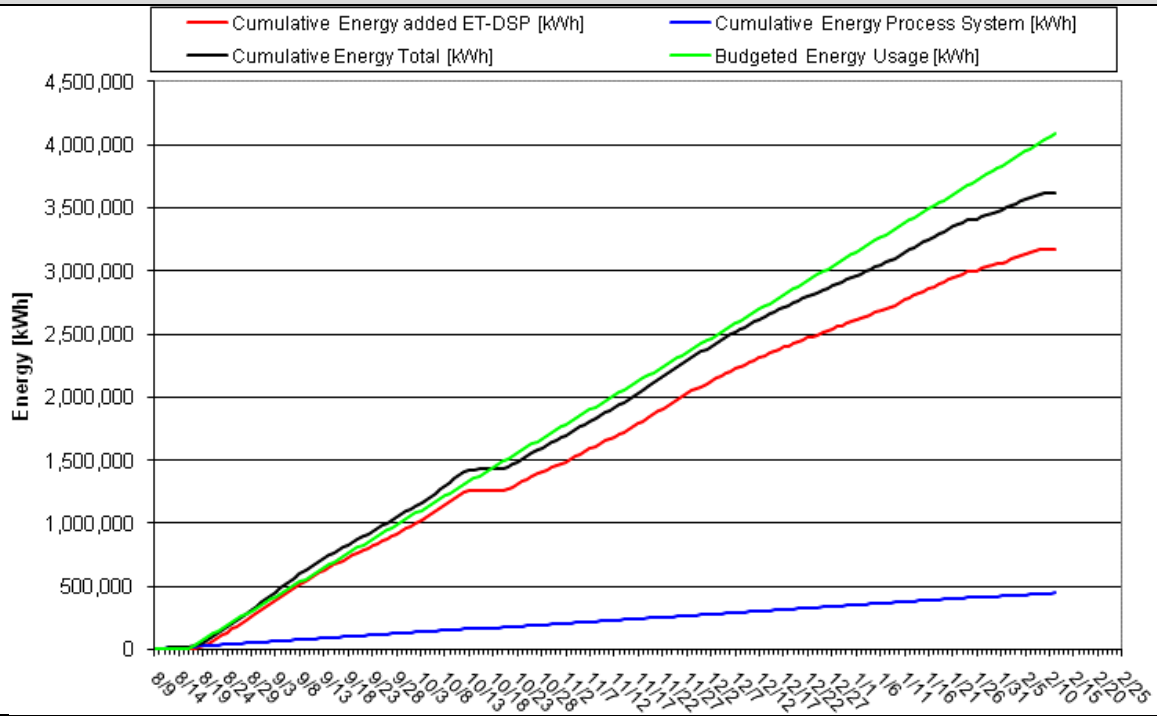
Optimization Activities for the Following Week:
ISTT Extraction System – Optimize the vapor extraction system to remove steam and vapors during Phase III (Cooling).
ET-DSP System – Prepare for demobilization.
GWTP – Continue to closely monitor the influent liquid from the ISTT extraction system and the influent GWTP VOC concentrations and water quality parameters while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).
Performance Monitoring – Continue routine process performance monitoring and sampling while the ISTT vapor extraction system remains online. All samples will be processed, handled, and shipped by Nobis. An expedited turnaround time for all VOC analyses will be requested from both CLP and OEME laboratories.
Demobilization Activities – Continue to demobilize MPE wells by removing and decontaminating MPE downhole pumps. Begin demobilization of the ISTT liquid extraction system.
Analytical Laboratory Data Received:
Process Liquid: Preliminary results were received for samples collected on February 3rd and 9th (all data refers to the sampling events in this order). TCE and cis-1,2-DCE were not detected at concentrations above the detection limit (5.0 µg/L) in the process water samples, with the exception of TCE detected in the sample collected on February 3rd. TCE was detected in the process water sample collected on February 3, 2011 at a concentration of 5.2 µg/L. In addition, acetone (at concentrations of 3,000 and 1,600 µg/L) and MEK (at concentrations of 560 and 230 µg/L) were detected.
Process Vapor: Preliminary data was received for process vapor samples collected on February 3rd and 9th (all data refers to the sampling events in this order). TCE was detected in the influent samples at concentrations of 420 ppbv and 260 ppbv, respectively. The concentrations of total VOCs in these samples were 796 ppbv and 567 ppbv, respectively. Cis-1,2-DCE was detected at concentrations of 230 ppbv and 160 ppbv, respectively. During these sampling events, the calculated removal efficiencies were approximately 61% and 45%. The carbon efficiency continues to be evaluated on a daily basis using field data and when available, laboratory data.
Extraction Wells: OEME mobile laboratory results were received for samples collected on February 7th from select Area A, B, and C soil vapor extraction wells (VEW-02, -03, -04, -05, -09, -15, -16, -19, -21, -23, -25, and -26). TCE and cis-1,2-DCE were detected in all of the samples at maximum concentrations of 8,350 ppbv (at VEW-19) and 4,500 ppbv (at VEW-09), respectively.
Groundwater: No new data available for this reporting period.
Ambient Air: No new data available for this reporting period.
Next Project Status Conference Calls: Tuesday, February 22nd at 1:00 pm

Figure 1, Mass Removal Estimate:



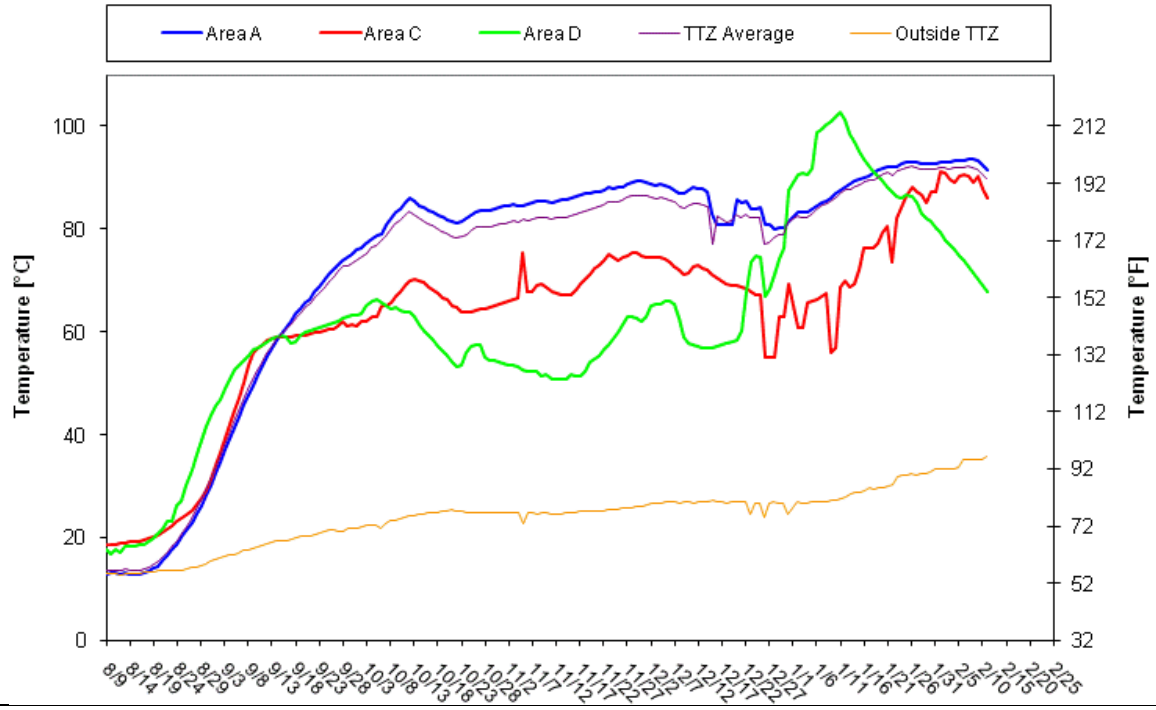
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



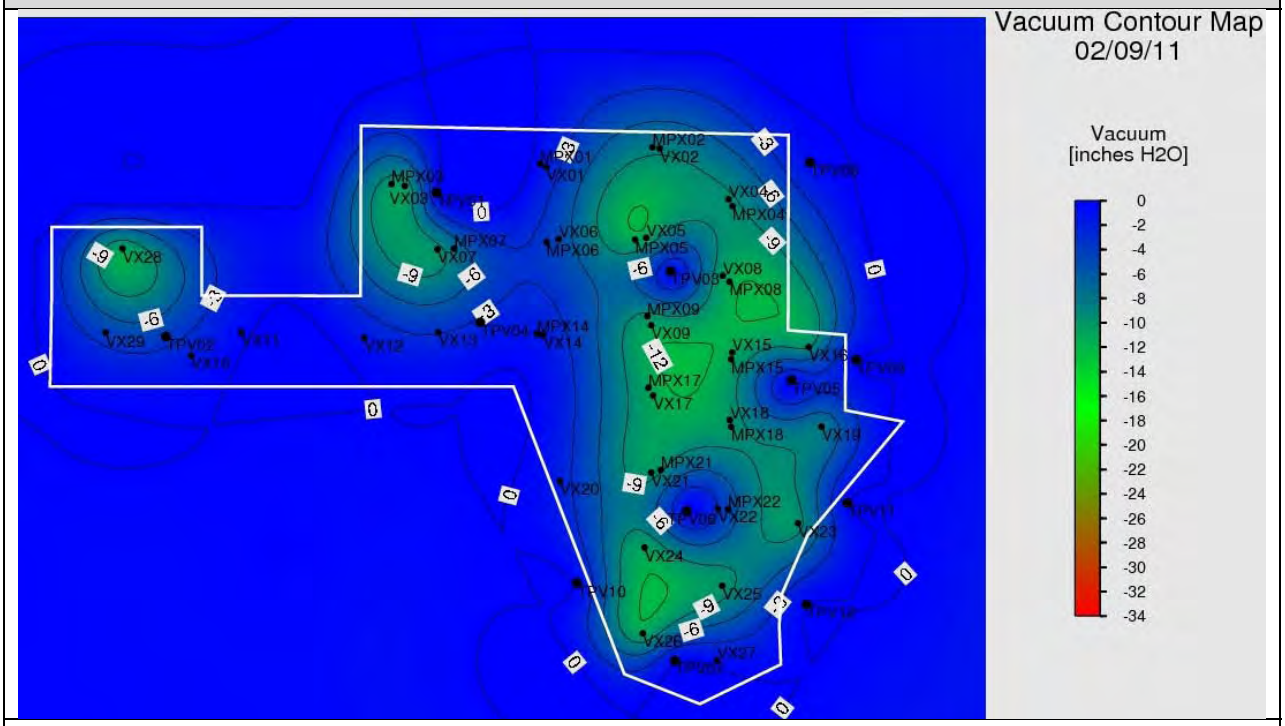
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



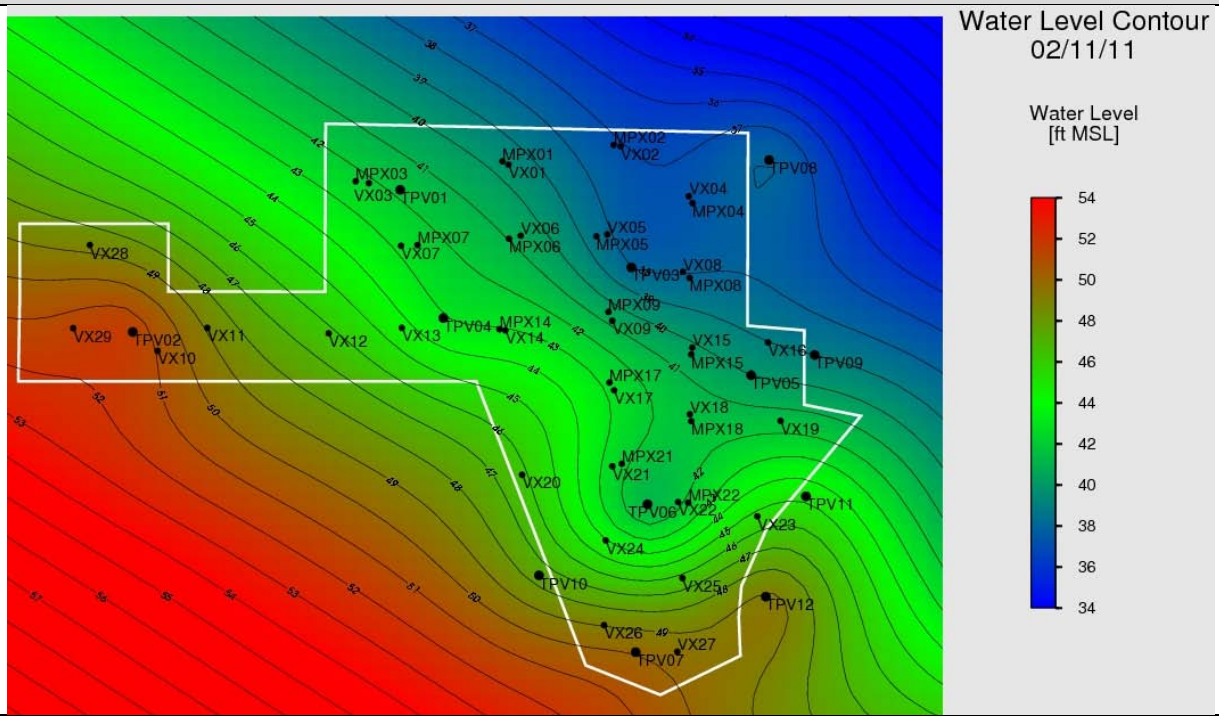
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

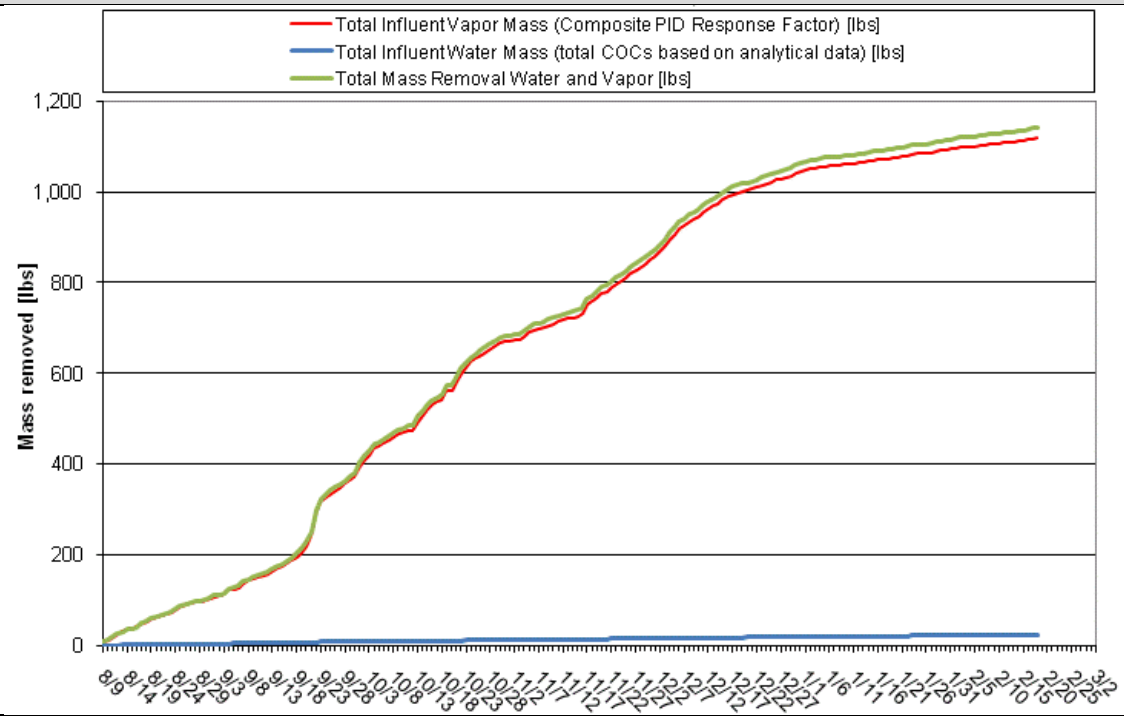
Prepared By: Lauren Soós	**Date Prepared:** February 23, 2011

Operation and Maintenance Activities Performed from 2/12/2011 to 2/18/2011	**Status**
The Week 28 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent, select soil vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) In addition, Nobis collected an ambient air monitoring event. Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
On February 16th, the extraction systems shutdown for a high level alarm at the knockout pot. Maintenance was performed and approximately 30 minutes after alarm was received, the system was restarted.	Complete
TerraTherm continued Phase III cooling operations. Phase III cooling is currently planned for approximately two weeks, through February 23rd.	On-going
As a result of the health and safety concern related to the snow load on top of Valley Manufacturing building roof, work within the building has been restricted. Therefore, no vacuum readings are collected at sensor well locations TPV-02, TPV-04, and TPV-10. In addition, no applied vacuum readings are collected at interior vapor extraction locations. The Vacuum Contour Map (Figure 4) presents vacuum readings collected at the Site, with the exception of the above mentioned locations.	On-going
The Nobis team continues GWTP maintenance (of the clarifier, sand filters, and peroxide destruction unit) related to the iron biofouling and other impacts (under Task Order 12). This activity may continue throughout the operation of the ISTT system.	On-going
During this operating period (2/12 to 2/18), the vapor extraction system influent concentrations were relatively low (6 to 15 ppm, average of 9.7 ppm), which results in a relatively low calculated removal efficiency. The vapor extraction system removal efficiency for this operational period is estimated at 76% (below the contract required 95% removal efficiency). The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent and evaluate carbon efficiency daily.	On-going
The project team continues to evaluate alternate methods for estimating the amount of VOC mass removed to determine the most accurate method for the site. Refer to previous weekly reports for method details. Until a definitive method is selected, the mass removal estimates will be calculated using both methods, but the results from the composite PID response factors method will continue to be presented in the data summary tables and the mass removal graph (Figure 1).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 2/12/2011 to 2/18/2011		
ISTT Wellfield		
Temperature (°F): 146° (Area D), 177° (Area C), and 191° (Area A)	Volume Extracted/Injected (gal): 30,848 / 0	Groundwater Elevation (ft msl): ~38 to 43
Min. VOC Reading (ppm PID) 0 ppm at VEW-1 (Area A)	Max. VOC Reading (ppm PID): 54 ppm at VEW-9 (Area A)	Average VOCs (ppm PID): 7 ppm
Steam Injections Locations: Steam activities concluded at the start of Phase III cooling (February 9th)	Combined Total Steam Pressure (psi): N/A	
ISTT Extraction System		
Average Air Flow (scfm): 524	Average Groundwater Extraction Rate (gpm): 3.1 (Condensate)	Average Groundwater Injection Rate (gpm): 0.0
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of VOC): 12.3 (Figure 1)	Est. Energy Used (kWh): 10,720 (Figure 2)
GAC Influent (ppm-PID): 9.7	GAC Effluent (ppm-PID): 2.3	Removal Efficiency (%): 76%
Status of Performance Metrics		
Temperature (See Figure 3): The current average subsurface temperature is 171° F, which is approximately 120° F above the baseline average temperature.	Pneumatic Control (See Figure 4): Following the initiation of Phase III (on February 9th), extraction from the ISTT wellfield was increased to optimize steam and vapor removal. The ISTT vapor extraction system continues to maintain pneumatic control of the treatment zones.	
Hydraulic Control (See Figure 5): The ISTT liquid extraction system maintained hydraulic control within Treatment Zone A during ISTT heating operations. Current water levels are approximately 3 to 5 feet below baseline water levels. Following the initiation of Phase III (on February 9th), the ISTT liquid extraction system was shutdown.	Clean Up Goals: Concentrations of TCE detected during the Site-wide groundwater monitoring event are significantly lower than baseline concentrations. Nobis will continue to monitor concentrations in soil and groundwater with several confirmation sampling events scheduled through to August 2011.	
Performance Goal Attainment Issues: Following several sampling events and data evaluations, the project team decided to shutdown ISTT heating operations in various stages after confirming significant reductions in concentrations of the Site contaminants of concern. The first group of electrodes was shut down on February 3rd, the second group on February 4th, and the remaining electrodes were shutdown on February 9th.		
Total Contaminant Mass Removed to Date in Vapor and Water (incl. NAPL) (Figure 1): 1,262 lbs	Total NAPL Removed To Date: 18.4 gallons (~120 lbs of VOCs)	

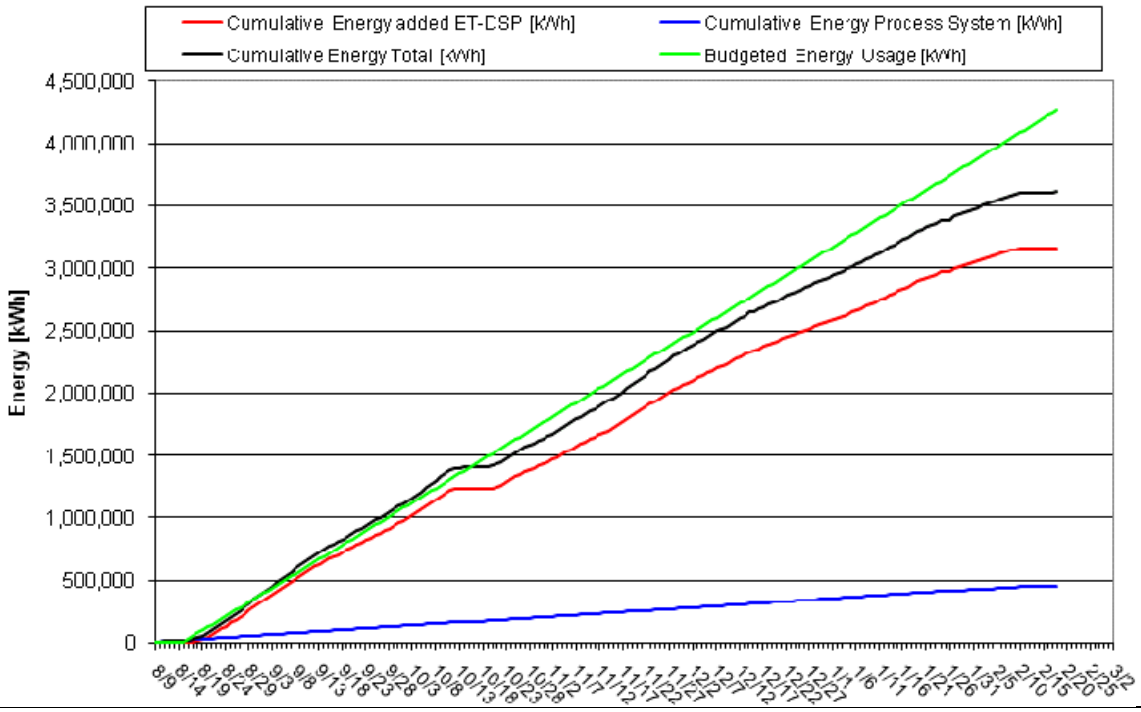
Optimization Activities for the Following Week:
ISTT Extraction System – Optimize the vapor extraction system to remove steam and vapors during Phase III Cooling. Shutdown the vapor extraction system at the conclusion of Phase III Cooling.
ET-DSP System – Prepare for demobilization.
GWTP – Continue to closely monitor the influent liquid from the ISTT vapor extraction system (condensate) and decontamination fluids, the influent GWTP VOC concentrations, and water quality parameters while optimizing the operation of the GWTP (i.e. the ultra-violet oxidation reactors).
Performance Monitoring – Continue routine process performance monitoring and sampling while the ISTT vapor extraction system remains online. All samples will be processed, handled, and shipped by Nobis. An expedited turnaround time for all VOC analyses will be requested from both CLP and OEME laboratories.
Demobilization Activities – Continue demobilization of liquid extraction system process equipment and wellfield that will not be used during demobilization decontamination procedures. Following the conclusion of Phase III Cooling activities, begin the demobilization of the vapor extraction system process equipment.
Analytical Laboratory Data Received:
Process Liquid: Preliminary results were received for samples collected on February 16th. TCE and cis-1,2-DCE were not detected at concentrations above the detection limit (5.0 µg/L) in the process water sample. Acetone (at a concentration of 1,700 µg/L) and MEK (at a concentration of 220 µg/L) were detected.
Process Vapor: No new data available for this reporting period.
Extraction Wells: No new data available for this reporting period.
Groundwater: No new data available for this reporting period.
Ambient Air: No new data available for this reporting period.
Next Project Status Conference Calls: Tuesday, March 1st at 1:00 pm

Figure 1, Mass Removal Estimate:



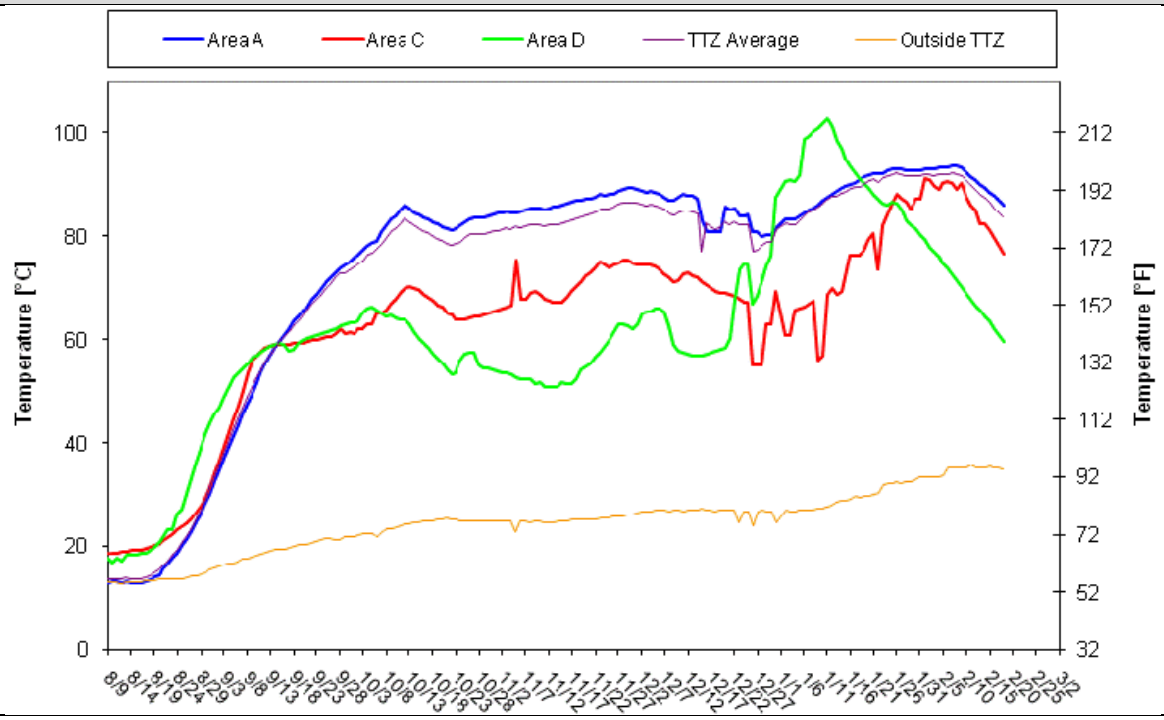
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



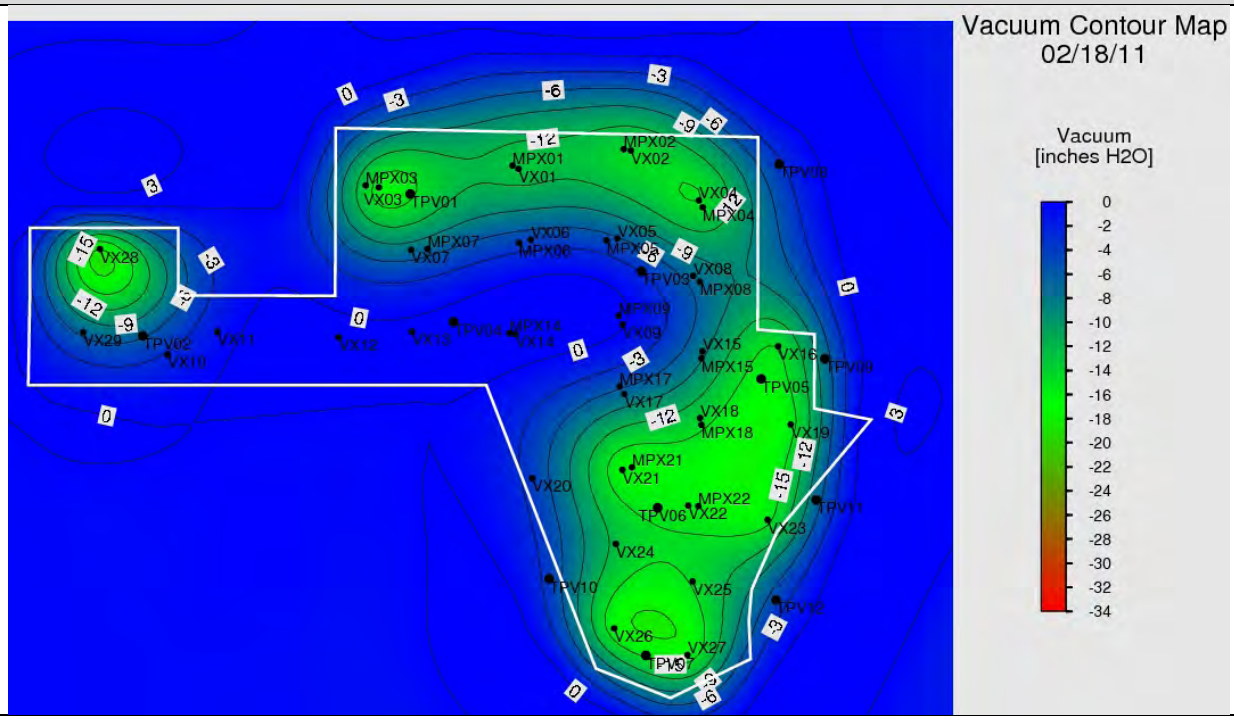
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



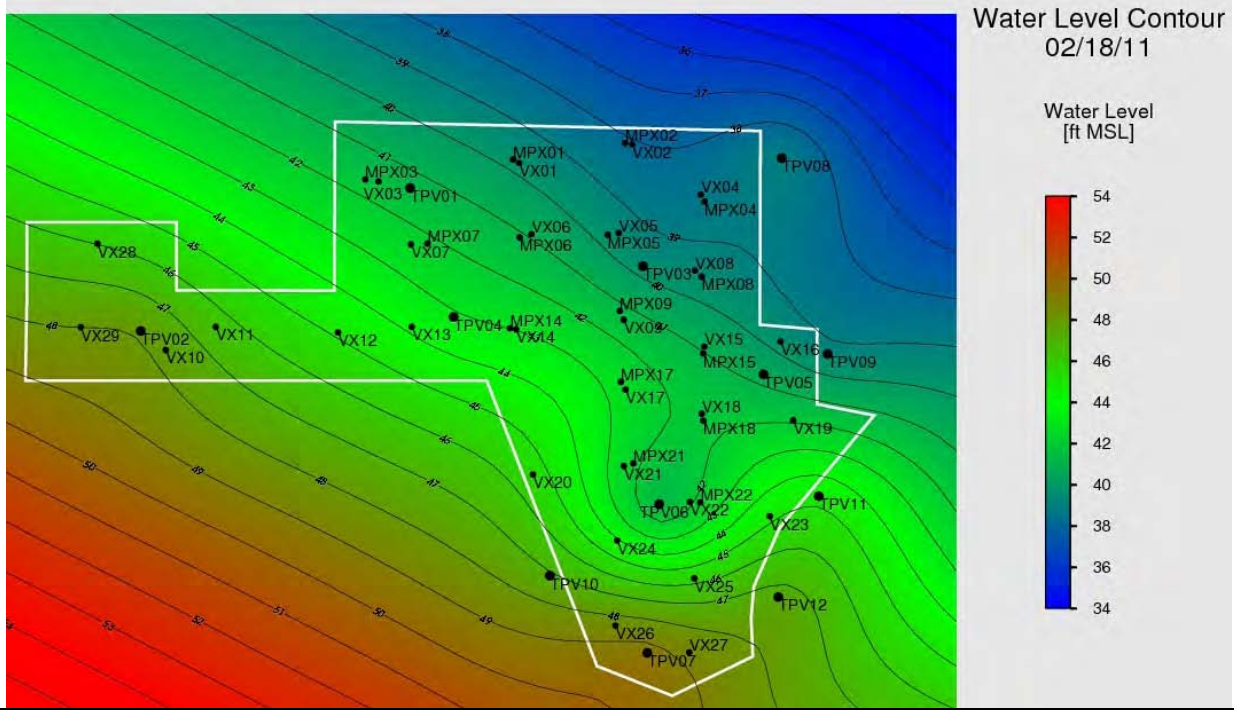
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Operations & Optimization Report

Prepared By: Lauren Soós	**Date Prepared:** March 4, 2011

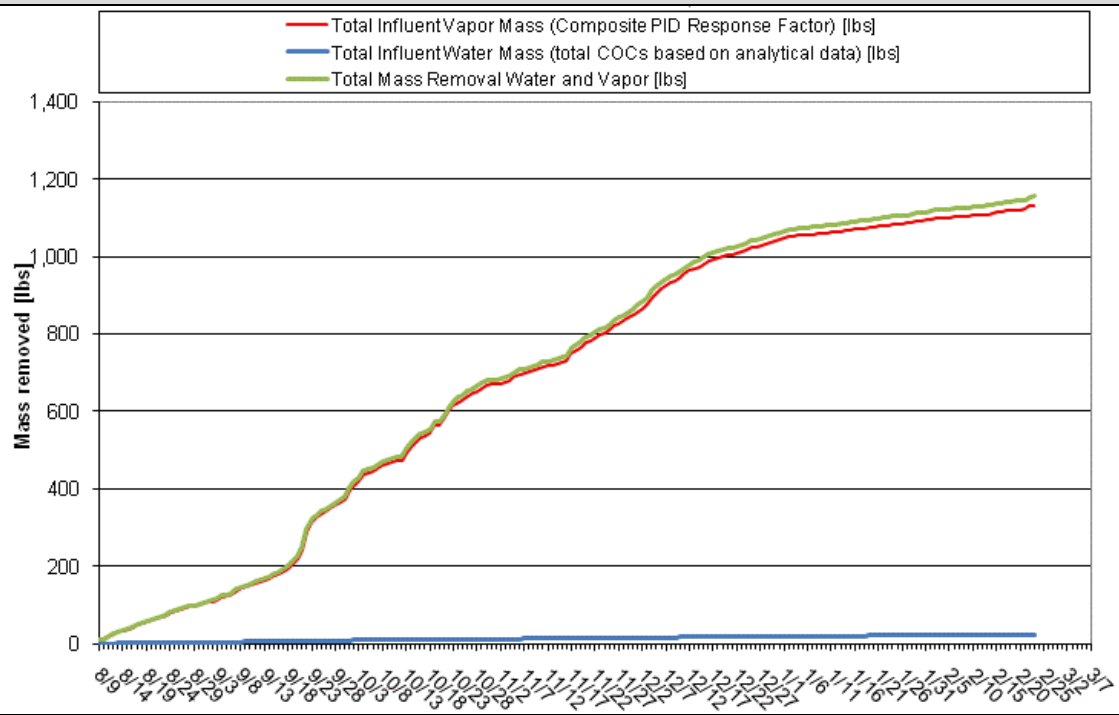
Operation and Maintenance Activities Performed from 2/19/2011 to 2/24/2011	**Status**
The Week 29 routine system performance monitoring and sampling was completed. It included collection of samples for analysis or screening from the process vapor system influent, midfluent, and effluent, select soil vapor extraction wells, and the process liquid system effluent (influent to the GWTP.) Nobis managed and shipped all samples collected to the appropriate laboratories for analysis (by RAS and OEME Chelmsford Laboratory).	Complete
On February 19th, the extraction systems shutdown due to an unknown alarm condition (no alarm received by TerraTherm operators). Troubleshooting activities were completed and it is believed that the pump downstream of the oil/water separator froze (as well as its piping and connections). The pump, piping, and connections were re-built before the extraction systems were brought back online on Monday, February 21st. The extraction systems were down for approximately 36 hours.	Complete
TerraTherm continued Phase III cooling operations through to February 24th. As planned, Phase III cooling operations concluded on February 24th when Nobis confirmed soil temperatures were below the boiling point of water.	Complete
During this operating period (2/19 to 2/24), the vapor extraction system influent concentrations were relatively low (3 to 7 ppm, average of 5.5 ppm), which results in a relatively low calculated removal efficiency. The vapor extraction system removal efficiency for this operational period is estimated at 91% (slightly below the contract required 95% removal efficiency). The project team continues to monitor the total volatile organic compounds concentrations in the vapor extraction system influent and effluent and evaluate carbon efficiency daily.	Complete
As a result of the health and safety concern related to the snow load on top of Valley Manufacturing building roof, work within the building has been restricted. Therefore, no vacuum readings are collected at sensor well locations TPV-02, TPV-04, and TPV-10. In addition, no applied vacuum readings are collected at interior vapor extraction locations. The Vacuum Contour Map (Figure 4) presents vacuum readings collected at the Site, with the exception of the above mentioned locations. Demobilization activities within the Valley Manufacturing building will also be restricted until the snow load is removed (via melting).	On-going

ISTT Operational Data – Collected by TerraTherm during the Period of 2/19/2011 to 2/24/2011		
ISTT Wellfield		
Temperature (°F): 140° (Area D), 170° (Area C), and 187° (Area A)	Volume Extracted/Injected (gal): 1,474 (vapor condensate) / 0	Groundwater Elevation (ft msl): ~39 to 43
Min. VOC Reading (ppm PID) 0.4 ppm at VEW-5 (Area A)	Max. VOC Reading (ppm PID): 17.8 ppm at VEW-17 (Area A)	Average VOCs (ppm PID): 10 ppm

Steam Injections Locations: Steam activities concluded at the start of Phase III cooling (February 9th)	Combined Total Steam Pressure (psi): N/A	
ISTT Extraction System		
Average Air Flow (scfm): 536	Average Groundwater Extraction Rate (gpm): 0.2 (Condensate)	Average Groundwater Injection Rate (gpm): 0.0
Volume of NAPL Recovered (gal): 0	Est. Mass Removed (lbs of VOC): 20.1 (Figure 1)	Est. Energy Used (kWh): 7,520 (Figure 2)
GAC Influent (ppm-PID): 4	GAC Effluent (ppm-PID): 0	Removal Efficiency (%): 91%
Status of Performance Metrics		
Temperature (See Figure 3): The current average subsurface temperature is 166° F, which is approximately 115° F above the baseline average temperature.	Pneumatic Control (See Figure 4): Following the initiation of Phase III (on February 9th), extraction from the ISTT wellfield was increased to optimize steam and vapor removal. The ISTT vapor extraction system continued to maintain pneumatic control of the treatment zones until Phase III concluded on February 24th.	
Hydraulic Control (See Figure 5): The ISTT liquid extraction system maintained hydraulic control within Treatment Zone A during ISTT heating operations. Current water levels are approximately 2 to 5 feet below baseline water levels. Following the initiation of Phase III (on February 9th), the ISTT liquid extraction system was shutdown.	Clean Up Goals: Concentrations of TCE detected during the Site-wide groundwater monitoring event were significantly lower than baseline concentrations. Nobis will continue to monitor concentrations in soil and groundwater with several confirmation sampling events scheduled through to August 2011.	
Performance Goal Attainment Issues: Following several sampling events and data evaluations, the project team decided to shutdown ISTT heating operations in various stages after confirming significant reductions in concentrations of the Site contaminants of concern. The first group of electrodes was shut down on February 3rd, the second group on February 4th, and the remaining electrodes were shutdown on February 9th. The vapor extraction system remained on until February 24th to cool the subsurface sufficiently to prevent steam and vapor excursion from the treatment area.		
Total Contaminant Mass Removed to Date in Vapor and Water (incl. NAPL) (Figure 1): 1,277 lbs	Total NAPL Removed To Date: 18.4 gallons (~120 lbs of VOCs)	
Optimization Activities for the Following Week:		
ISTT Extraction System – Prepare for demobilization		
ET-DSP System – Prepare for demobilization.		
GWTP – Prepare for demobilization activities and plan for rehabilitation of various process equipment affected by ISTT operations.		
Performance Monitoring – No performance monitoring events are planned during demobilization activities.		

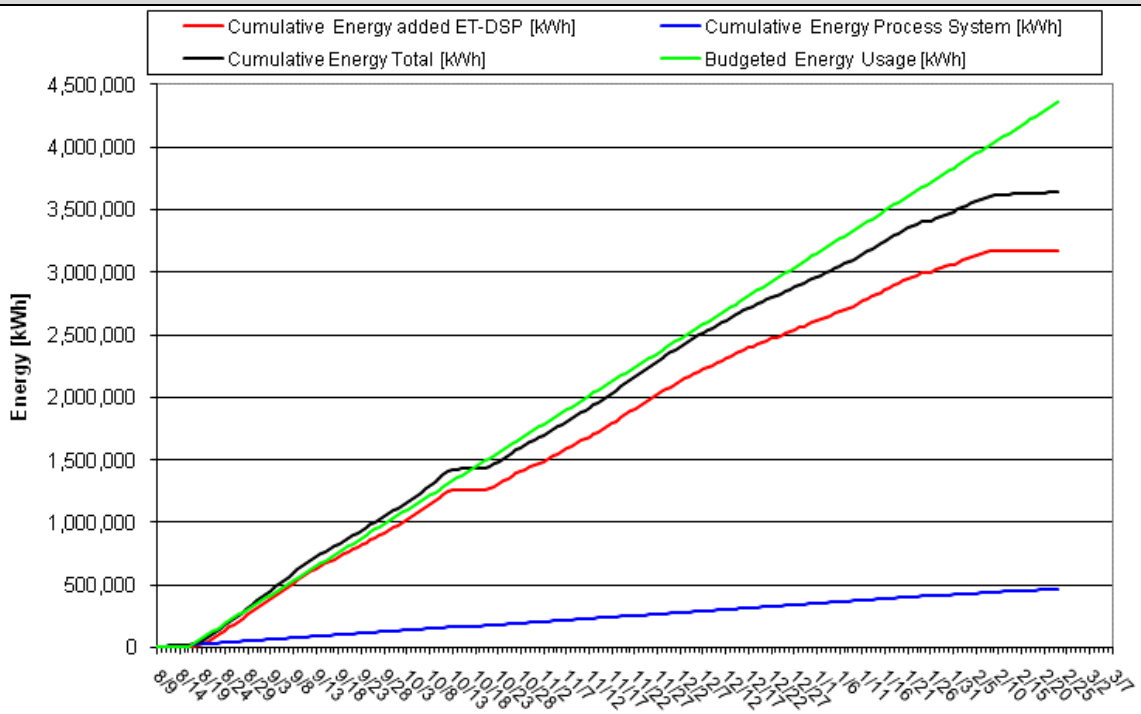
Demobilization Activities – Continue demobilization of liquid extraction system process equipment and wellfield that will not be used during demobilization decontamination procedures. Following the conclusion of Phase III Cooling activities, begin the demobilization of the vapor extraction system process equipment.
Analytical Laboratory Data Received:
Process Liquid: Preliminary results were received for a process water sample collected on February 24th. TCE and cis-1,2-DCE were not detected at concentrations above the detection limit (5.0 µg/L) in the process water sample. Acetone (at a concentration of 4,100 µg/L) and MEK (at a concentration of 570 µg/L) were also detected.
Process Vapor: Preliminary data was received for process vapor samples collected on February 24th. TCE and cis-1,2-DCE were detected in the influent sample at concentrations of 260 ppbv and 120 ppbv, respectively. In addition, MEK was detected at a concentration of 280 ppbv (Acetone was not analyzed). The concentration of total VOCs in this sample was 638.8 ppbv. During this sampling event, the calculated removal efficiency (between the influent and effluent samples) was approximately 20%.
Extraction Wells: No new data available for this reporting period.
Groundwater: No new data available for this reporting period.
Ambient Air: Data were received for ambient air samples collected on February 18th. TCE was not detected at either the upgradient or downgradient locations during this ambient air sampling event. All other VOCs detected were consistent with the compounds and concentrations detected during the Baseline ambient air monitoring event.
Next Project Status Conference Calls: Tuesday, March 8th at 1:00 pm

Figure 1, Mass Removal Estimate:



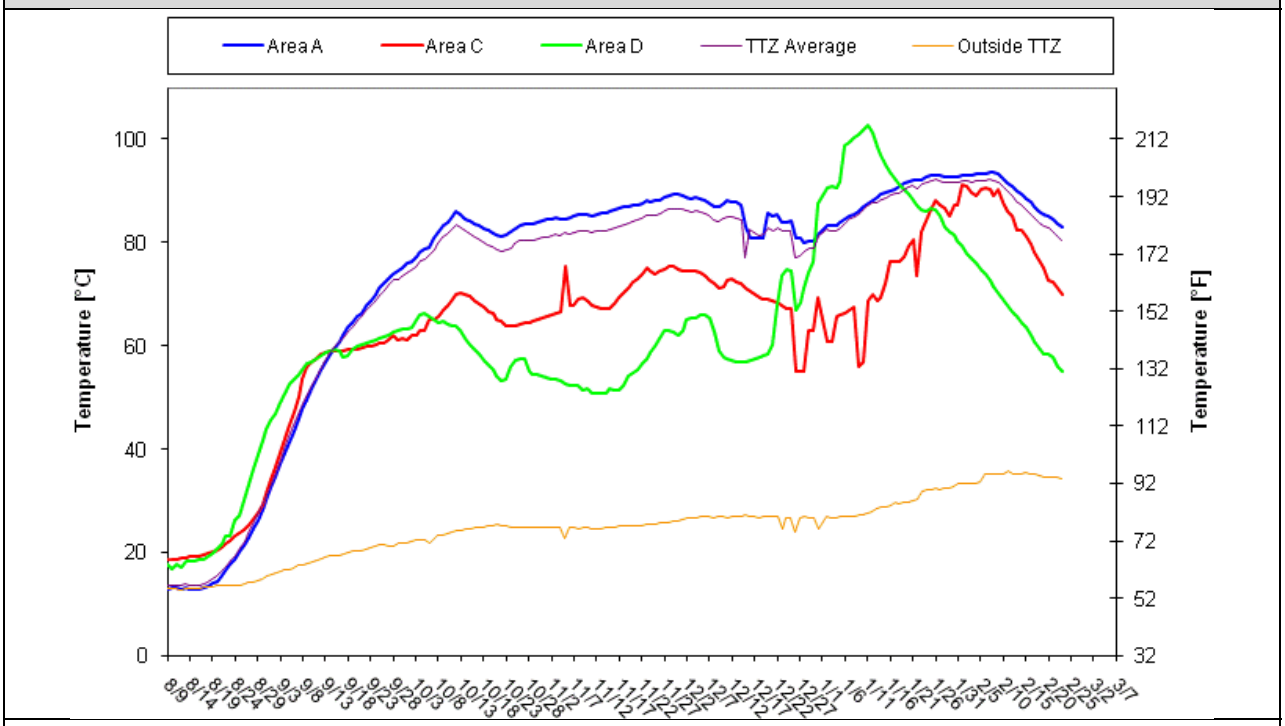
Description: This graph describes the estimated total volatile organic compound mass removed by the ISTT system to date; operations began on August 9, 2010.

Figure 2, Cumulative Energy Use:



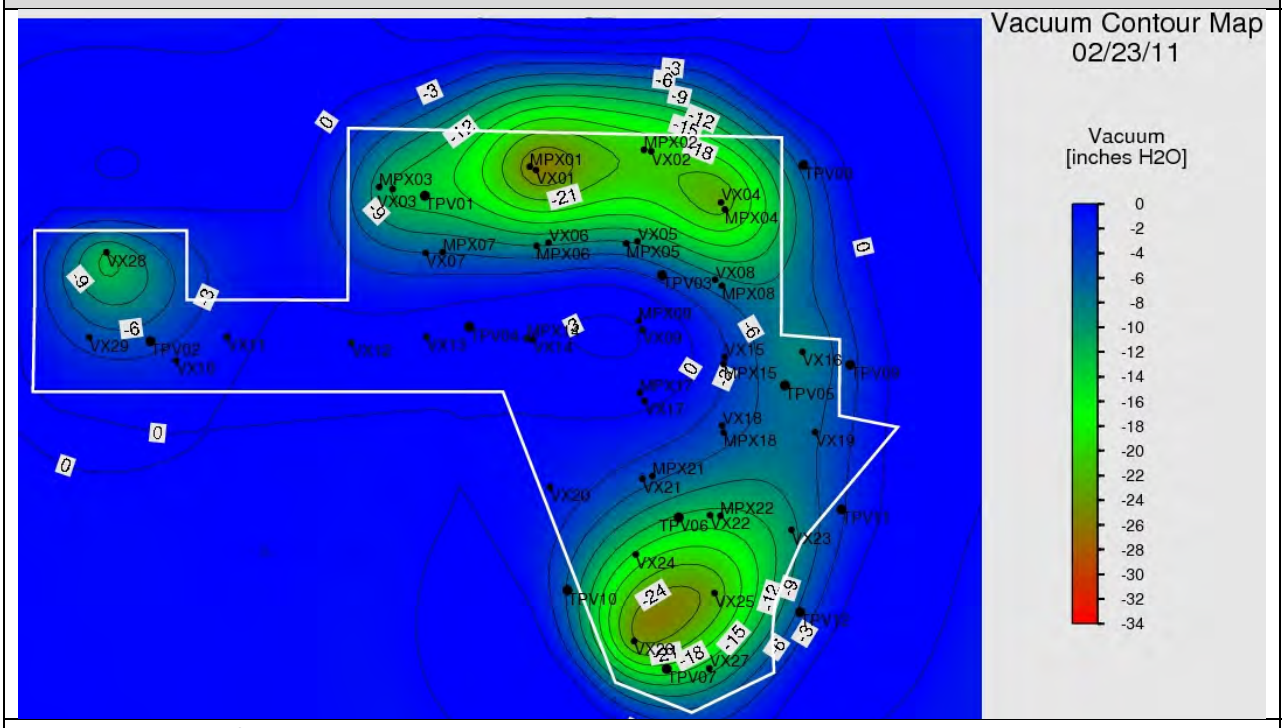
Description: This graph describes the cumulative energy consumed by the ISTT system during Phase I Operations, beginning on August 9, 2010 (extraction system) and August 17, 2010 (ET-DSP system).

Figure 3, Average Temperatures within the ISTT Wellfield:



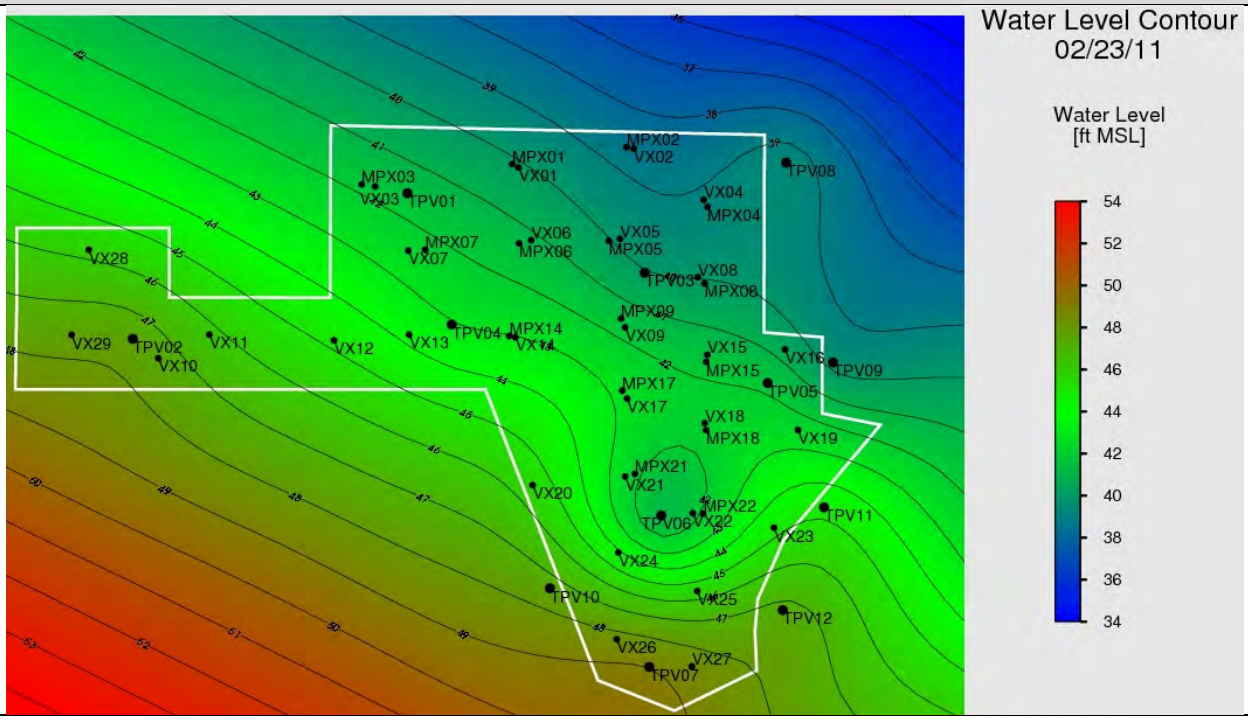
Description: This graph summarizes the average temperatures collected from temperature sensor wells located throughout the ISTT wellfield (Treatment Zones A, B, C, and D).

Figure 4, Vacuum Contour Map:



Description: This figure depicts the applied and observed vacuums at the extraction wells and sensor wells, respectively, located throughout the ISTT areas.

Figure 5, Groundwater Elevation Contour Map:



Description: This figure depicts the groundwater elevation observed at pressure sensor wells located throughout the ISTT area.

APPENDIX F

TECHNICAL MEMORANDUM

Date:	August 2011
To:	Derrick Golden, United States Environmental Protection Agency (USEPA), Region 1
From:	Diane Baxter, Project Manager, Nobis Engineering, Inc.
Prepared by:	Lauren Soós, Project Engineer, Nobis Engineering, Inc.
Subject:	In Situ Thermal Treatment Data Trend Report Groveland Wells Superfund Site Groveland, Massachusetts

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INTRODUCTION

During In Situ Thermal Treatment (ISTT) operations at the Groveland Wells Superfund Site (Site), several monitoring systems were in place to evaluate overall ISTT operations and performance. ISTT monitoring systems were established in the ISTT Areas (ISTT Area A, Area B, Area C, and Area D) and the ISTT extraction systems. Monitoring system data was regularly reviewed by the project team and was used to monitor the progress and effectiveness of the ISTT operations. In addition, the monitoring data supported the development of system optimizations, the modification of performance criteria, and the decision to shutdown ISTT operations.

This Technical Memorandum (Memo) presents monitoring data trend analysis plots of the following:

- Water balance;
- Vapor balance;
- Power usage;
- Temperatures;
- Volatile Organic Compounds (VOC);
- Estimated VOC mass removed; and

The trend plots are provided in Figures F-1 through F-28 (titles listed below). Additionally, two attachments are included. Attachment A is a compilation of weekly progress reports prepared by the ISTT subcontractor, TerraTherm, Inc. (TerraTherm). The weekly progress reports documented ISTT operations, maintenance issues, shutdowns, temperatures, mass removal estimates, hydraulic and pneumatic controls, power usage, and optimization efforts. Attachment B is a compilation of additional temperature trend plots prepared to support shutdown discussions near project completion. Discussion of the data trends for each of the six ISTT elements listed above is provided in Section 6.2 of the Remedial Action Report.

FIGURES:

Figure F-1 Cumulative Water Extracted
Figure F-2 Water Extraction Rates
Figure F-3 Cumulative Vapor Extracted
Figure F-4 Vapor Extraction Rates
Figure F-5 Cumulative Power Usage
Figure F-6 Power Usage Rate
Figure F-7 Cumulative Energy Balance
Figure F-8 Average Temperatures of ISTT Areas
Figure F-9 Average Temperature of Sensor Wells in ISTT Area A
Figure F-10 Average Temperature of Sensor Wells in ISTT Area C
Figure F-11 Average Temperature of Sensor Wells in ISTT Area D
Figure F-12 Percentage of Thermocouples Greater than 90° C in ISTT Area A Vadose Zone
Figure F-13 Percentage of Thermocouples Greater than 100° C in ISTT Area A Saturated Zone
Figure F-14 Percentage of Thermocouples Greater than 90° C in ISTT Area C Vadose Zone
Figure F-15 Percentage of Thermocouples Greater than 90° C in ISTT Area D Vadose Zone
Figure F-16 Concentrations of Select VOCs in Process Water
Figure F-17 Concentrations of Volatile Organic Compounds in Process Vapor
Figure F-18 Influent and Effluent PID Readings and Calculated Destruction and Removal Efficiency
Figure F-19 Total Volatile Organic Compounds in Shallow Soil Vapor Extraction Wells
Figure F-20 Trichloroethene in ISTT Area A Shallow Soil Vapor Extraction Wells
Figure F-21 Cis-1,2-Dichloroethene in ISTT Area A S Shallow Soil Vapor Extraction Wells
Figure F-22 Volatile Organic Compounds in ISTT Area B Interior Soil Vapor Extraction Wells
Figure F-23 Volatile Organic Compounds in ISTT Area B Exterior Soil Vapor Extraction Wells
Figure F-24 Volatile Organic Compounds in ISTT Area C Interior Soil Vapor Extraction Wells
Figure F-25 Volatile Organic Compounds in ISTT Area C Exterior Soil Vapor Extraction Wells
Figure F-26 Volatile Organic Compounds in ISTT Area D Soil Vapor Extraction Wells
Figure F-27 Estimated Cumulative Total Contaminant Mass Removed

ATTACHMENTS:

Attachment A ISTT Operation Progress Reports [TerraTherm]
Attachment B Additional Temperature Trend Plots [TerraTherm]

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FIGURE F-1
CUMULATIVE WATER EXTRACTED
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

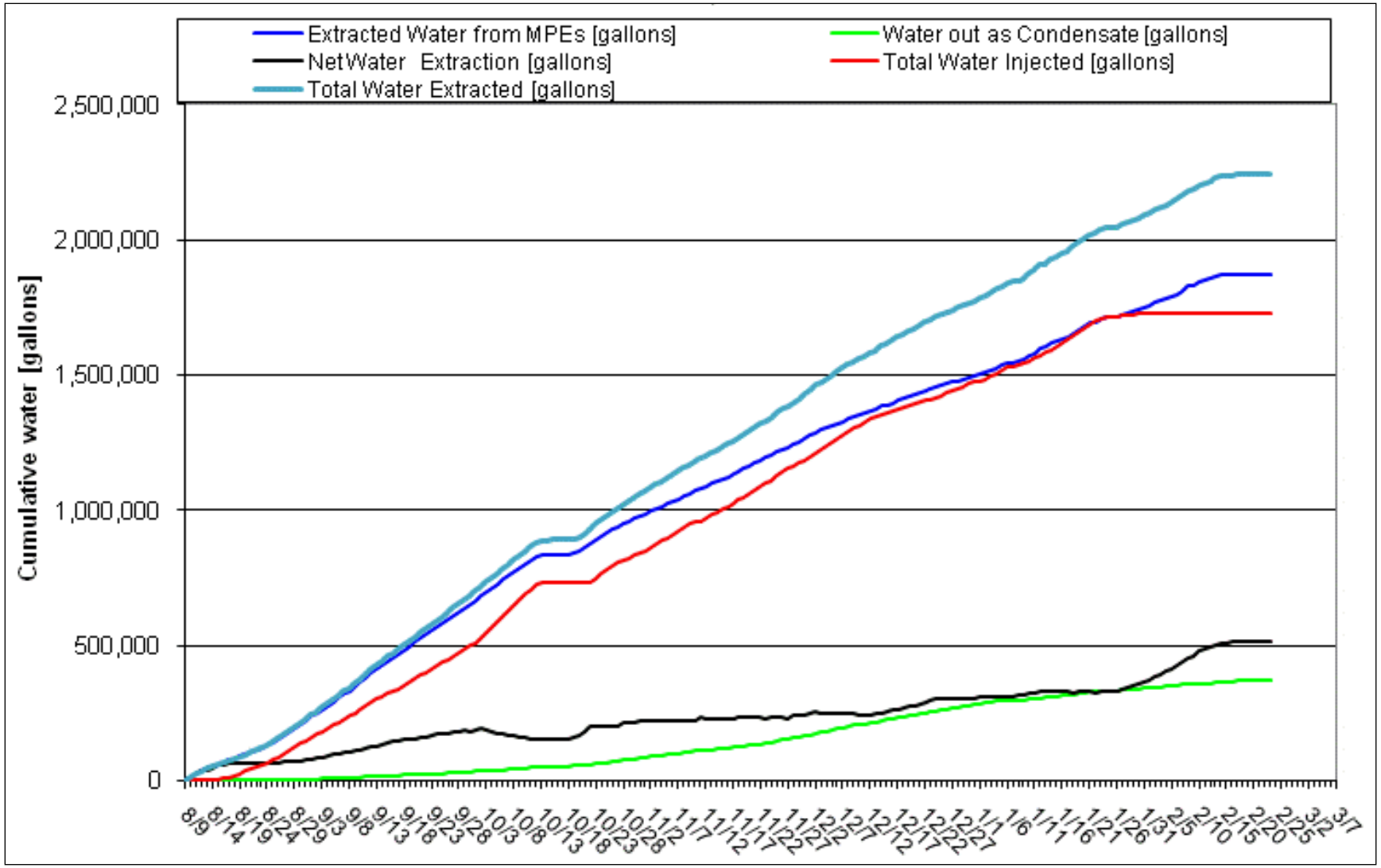


FIGURE F-2
WATER EXTRACTION RATES
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

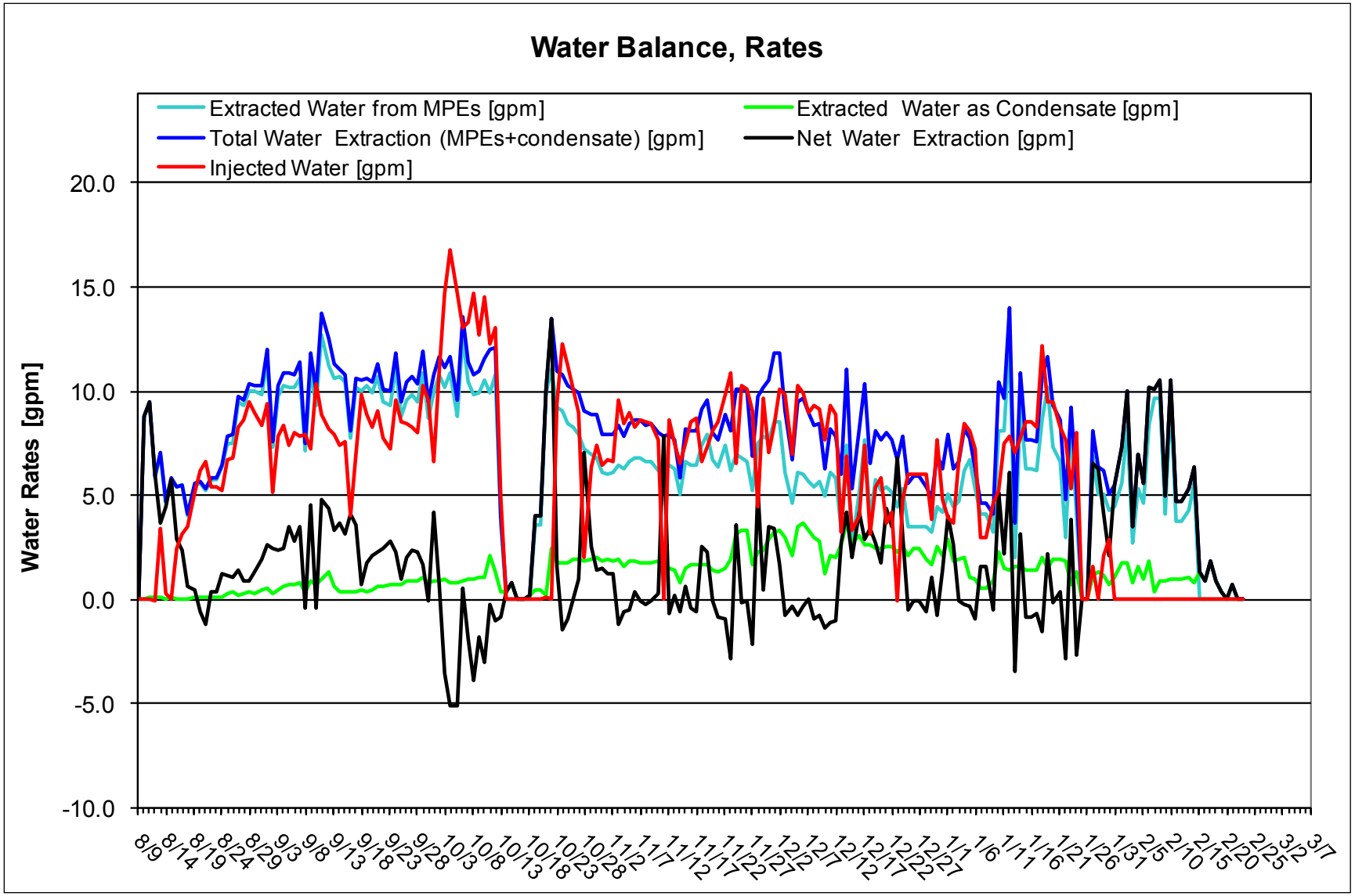


FIGURE F-3
CUMULATIVE VAPOR EXTRACTED
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

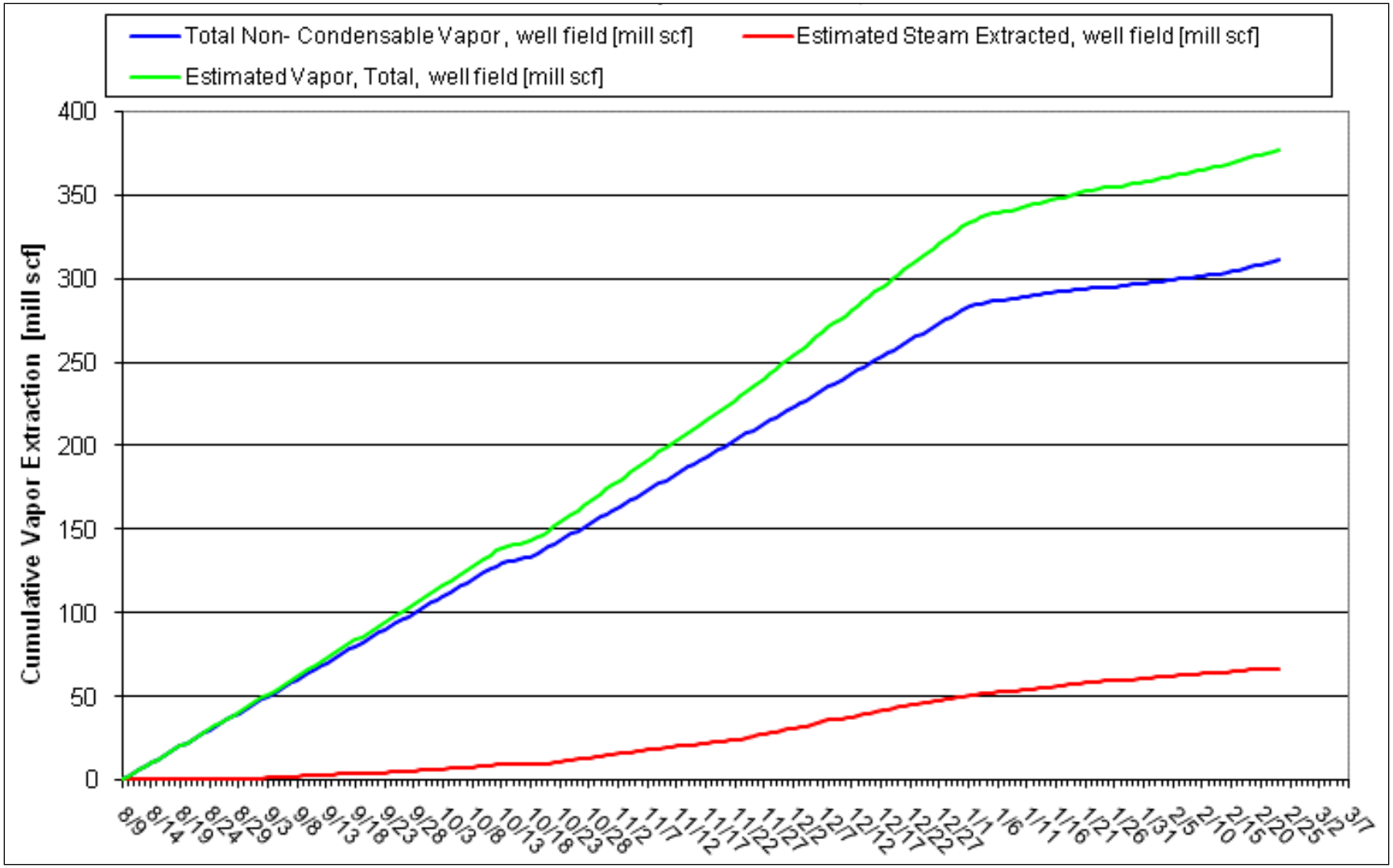


FIGURE F-4
VAPOR EXTRACTION RATES
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

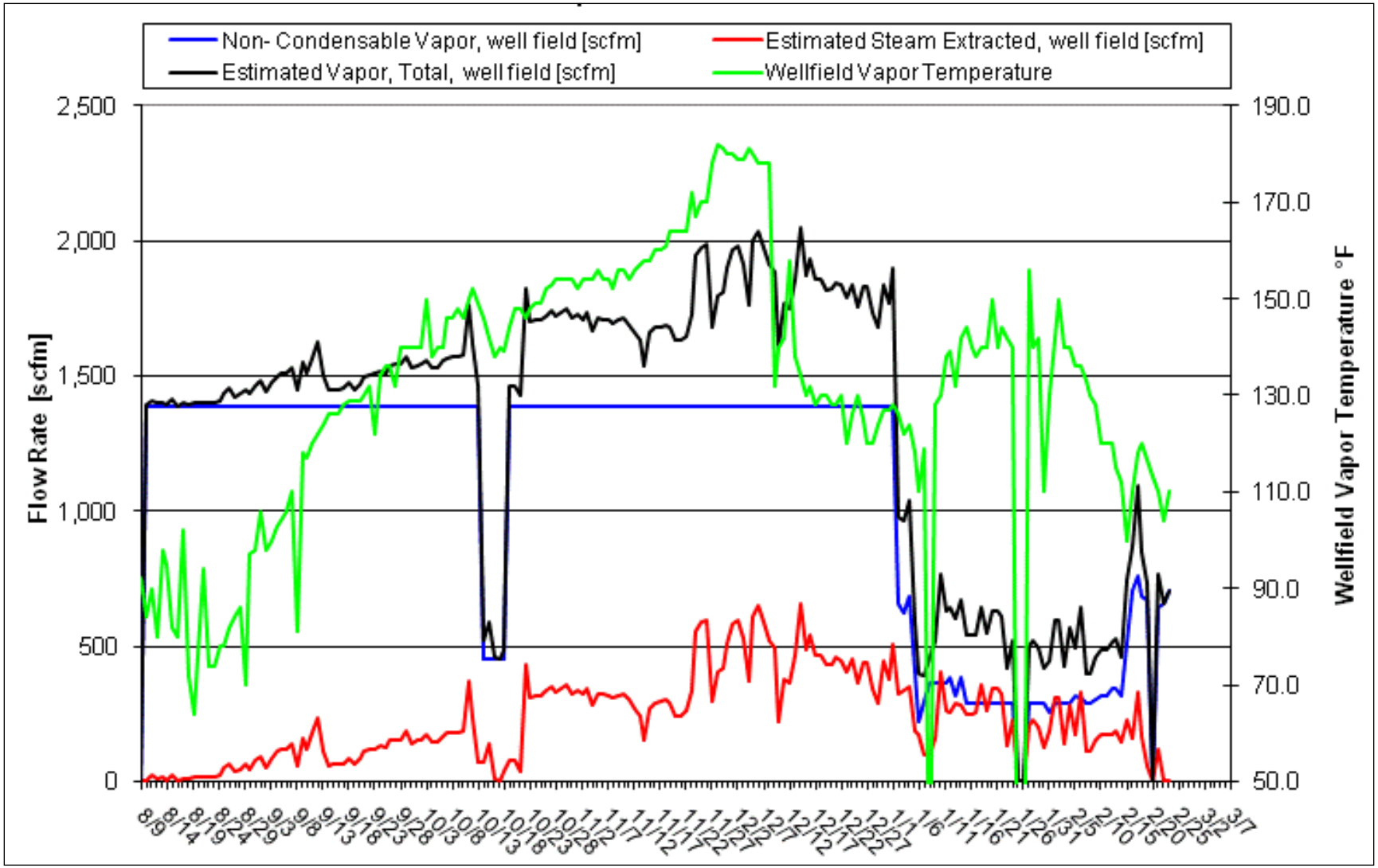


FIGURE F-5
CUMULATIVE POWER USAGE
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

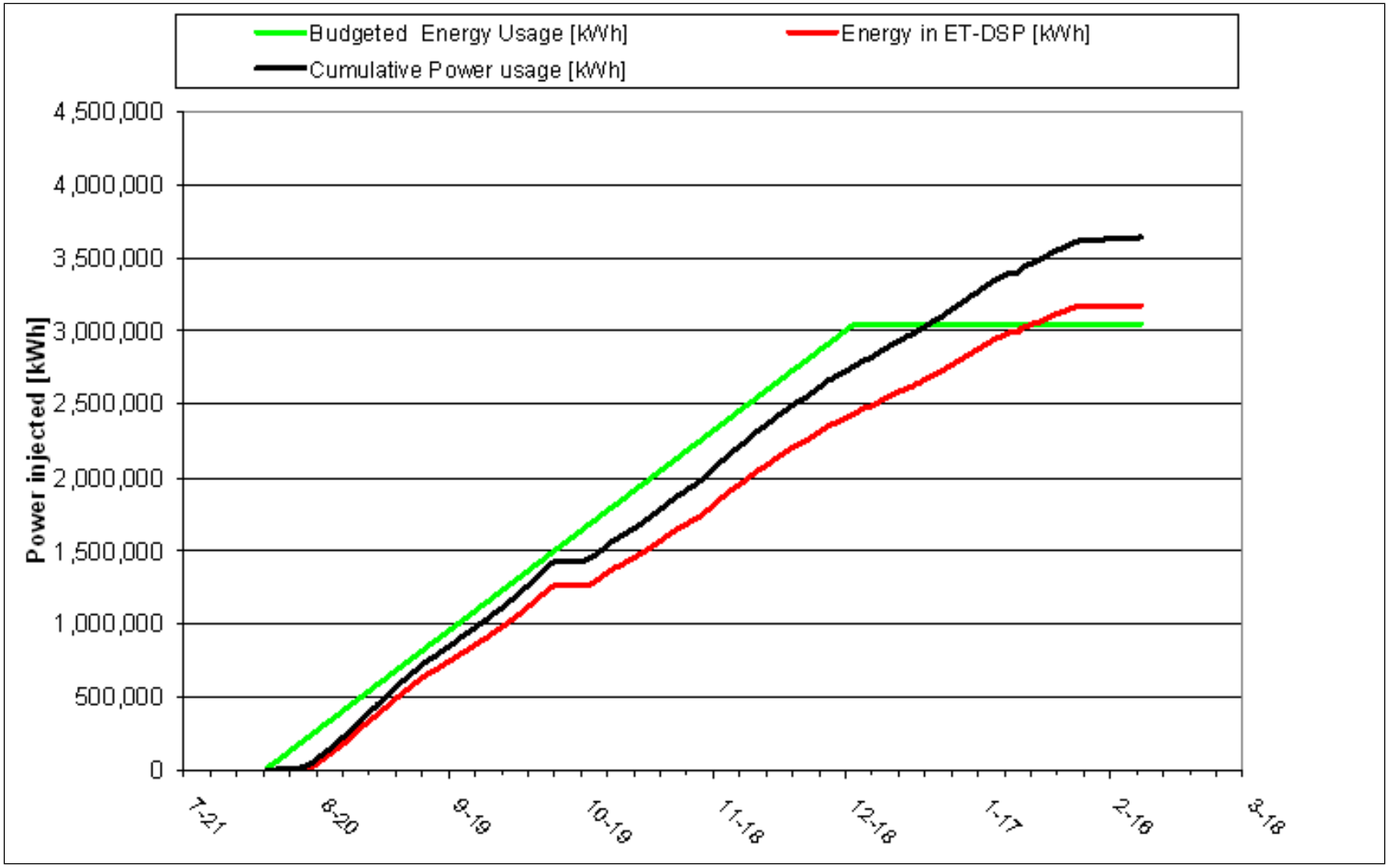


FIGURE F-6
POWER USAGE RATE
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

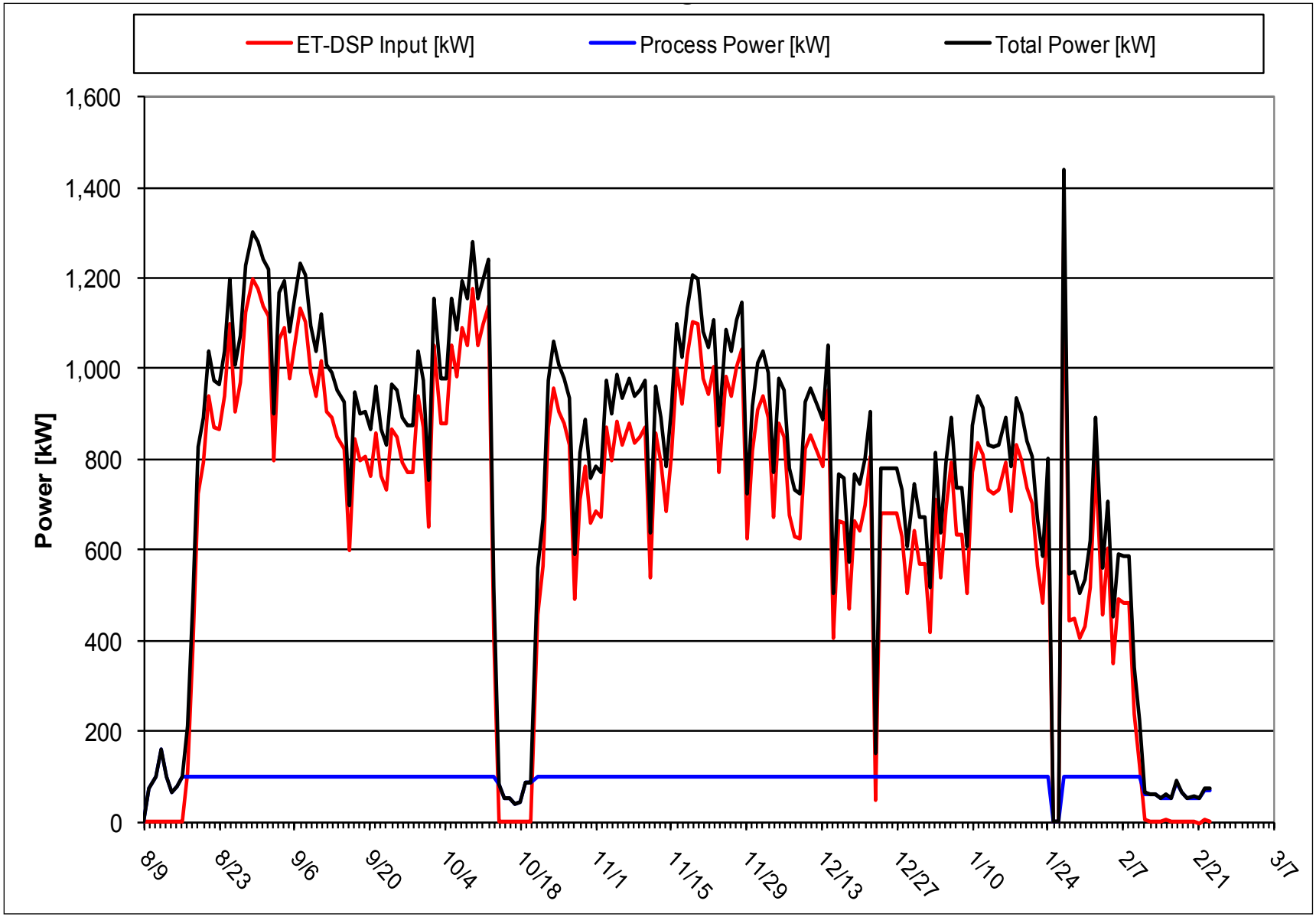


FIGURE F-7
CUMULATIVE ENERGY BALANCE
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

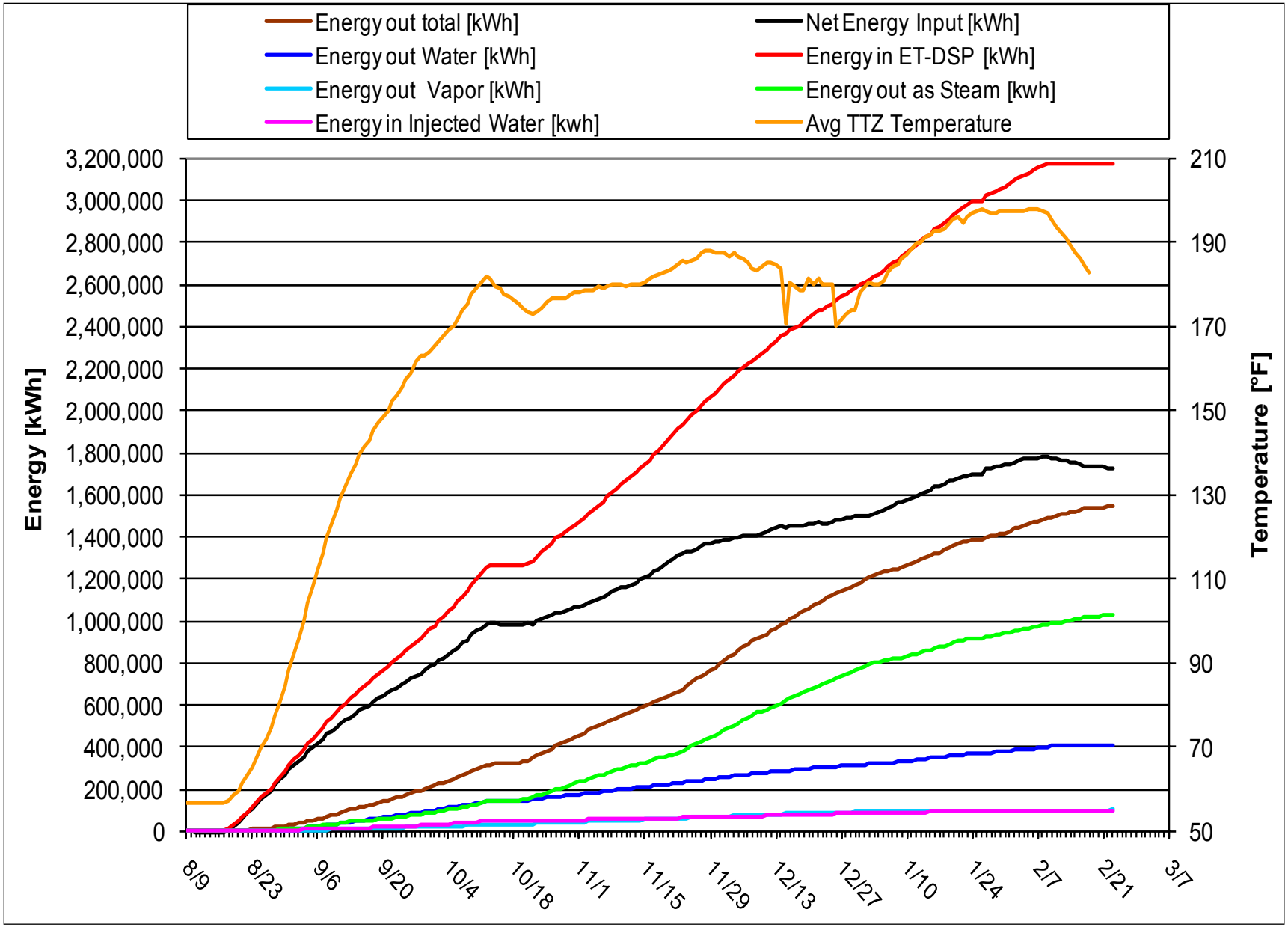


FIGURE F-8
AVERAGE TEMPERATURES OF ISTT AREAS
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

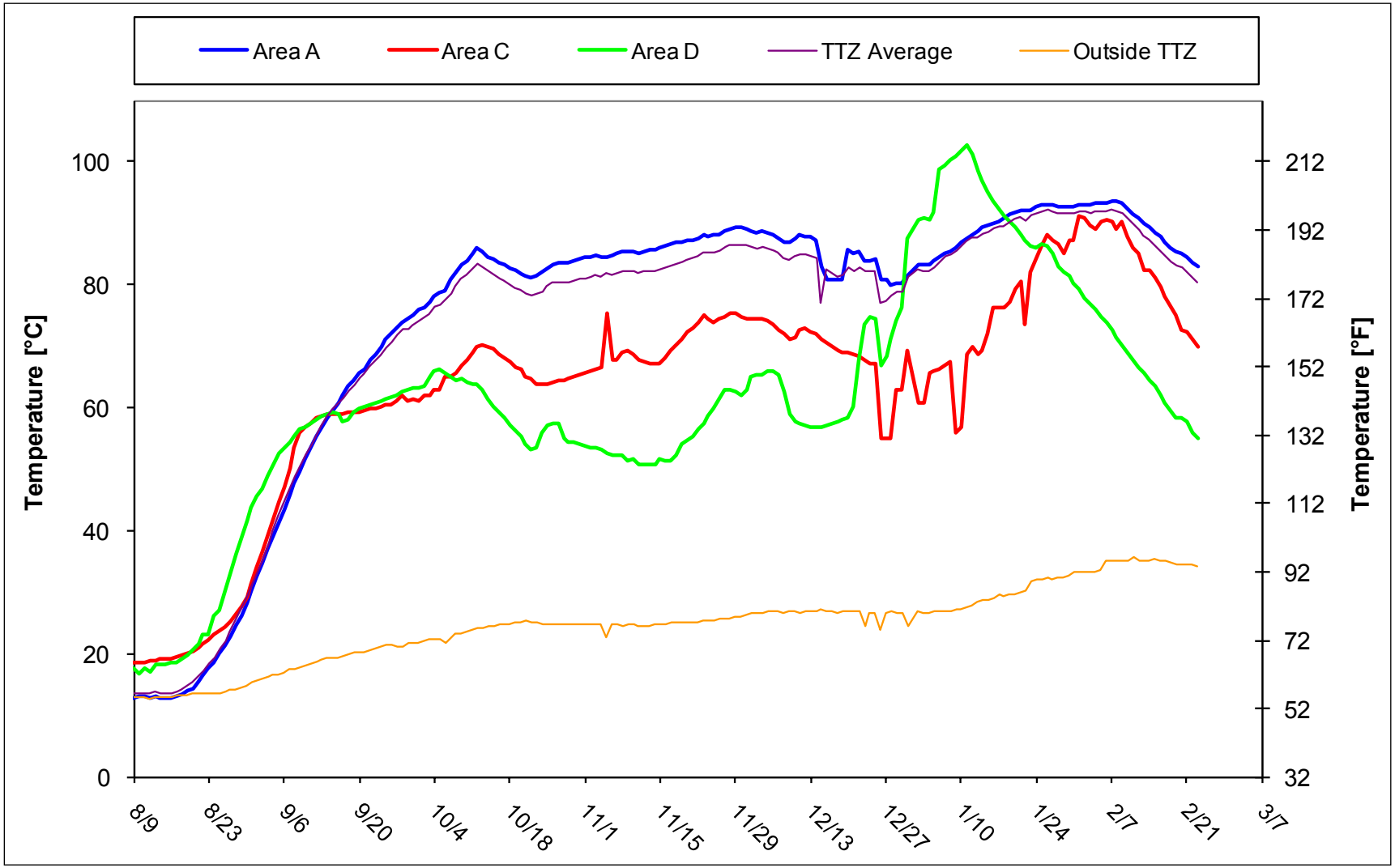


FIGURE F-9
AVERAGE TEMPERATURE OF SENSOR WELLS IN ISTT AREA A
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

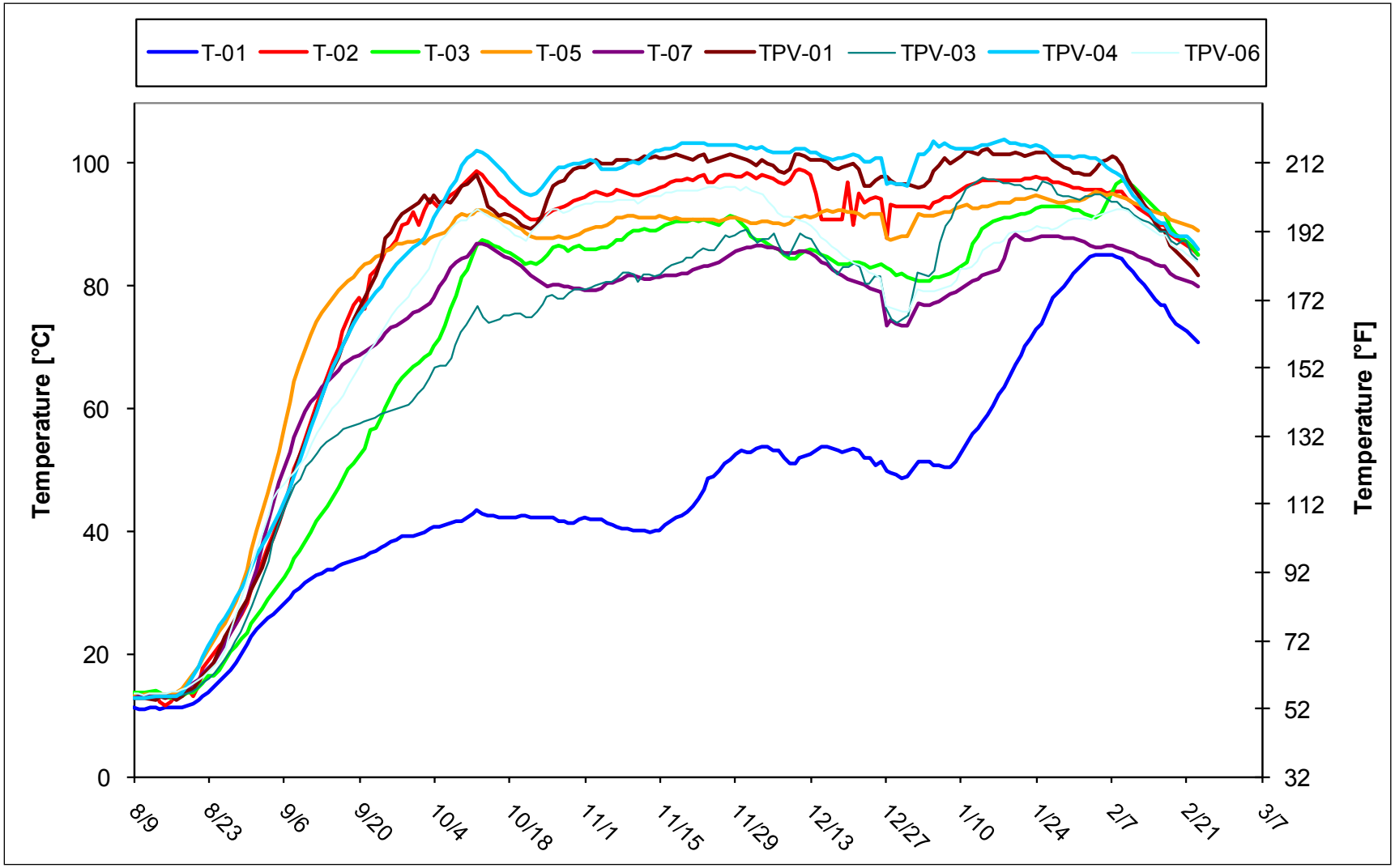


FIGURE F-10
AVERAGE TEMPERATURE OF SENSOR WELLS IN ISTT AREA C
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

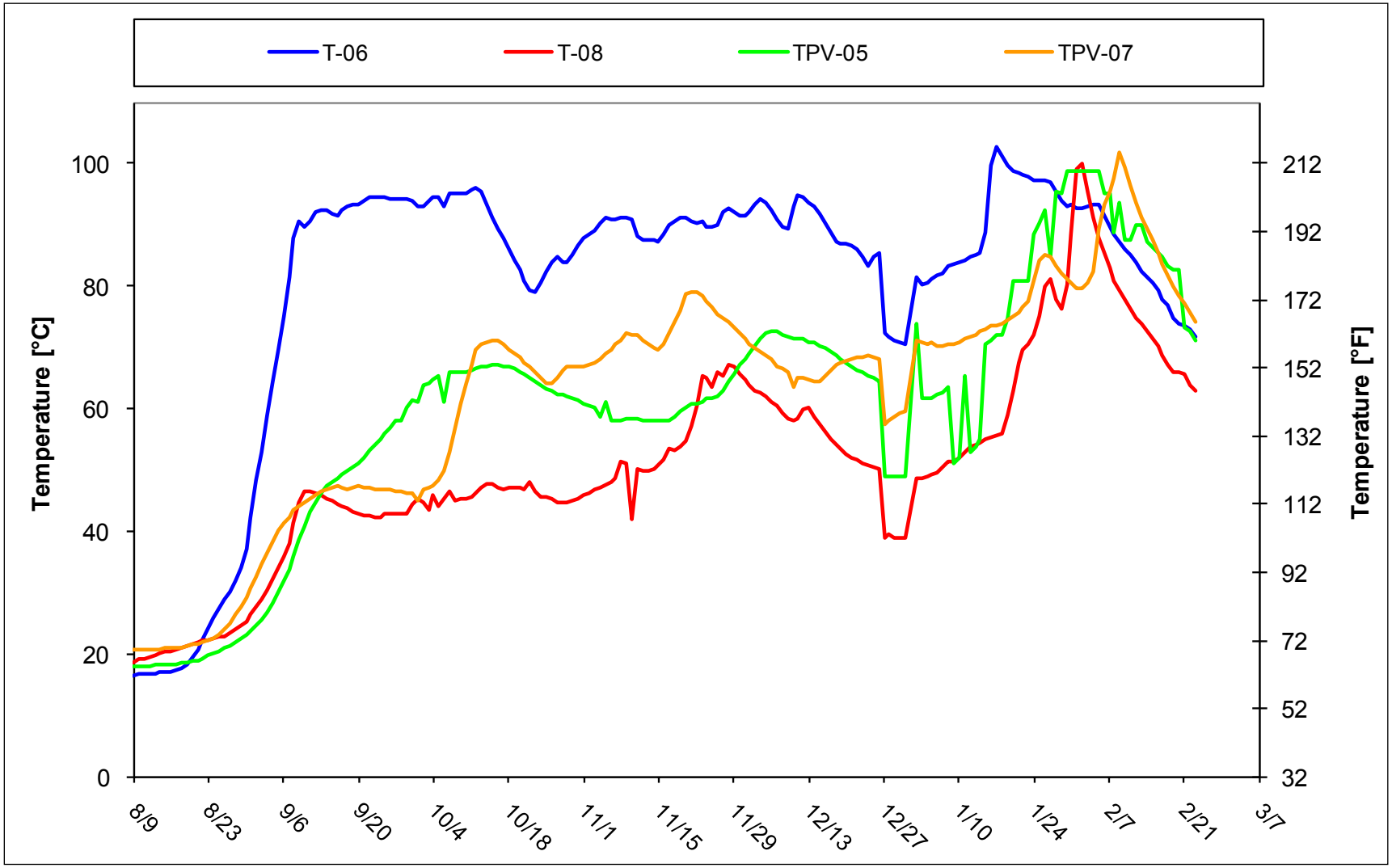


FIGURE F-11
AVERAGE TEMPERATURE OF SENSOR WELLS IN ISTT AREA D
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

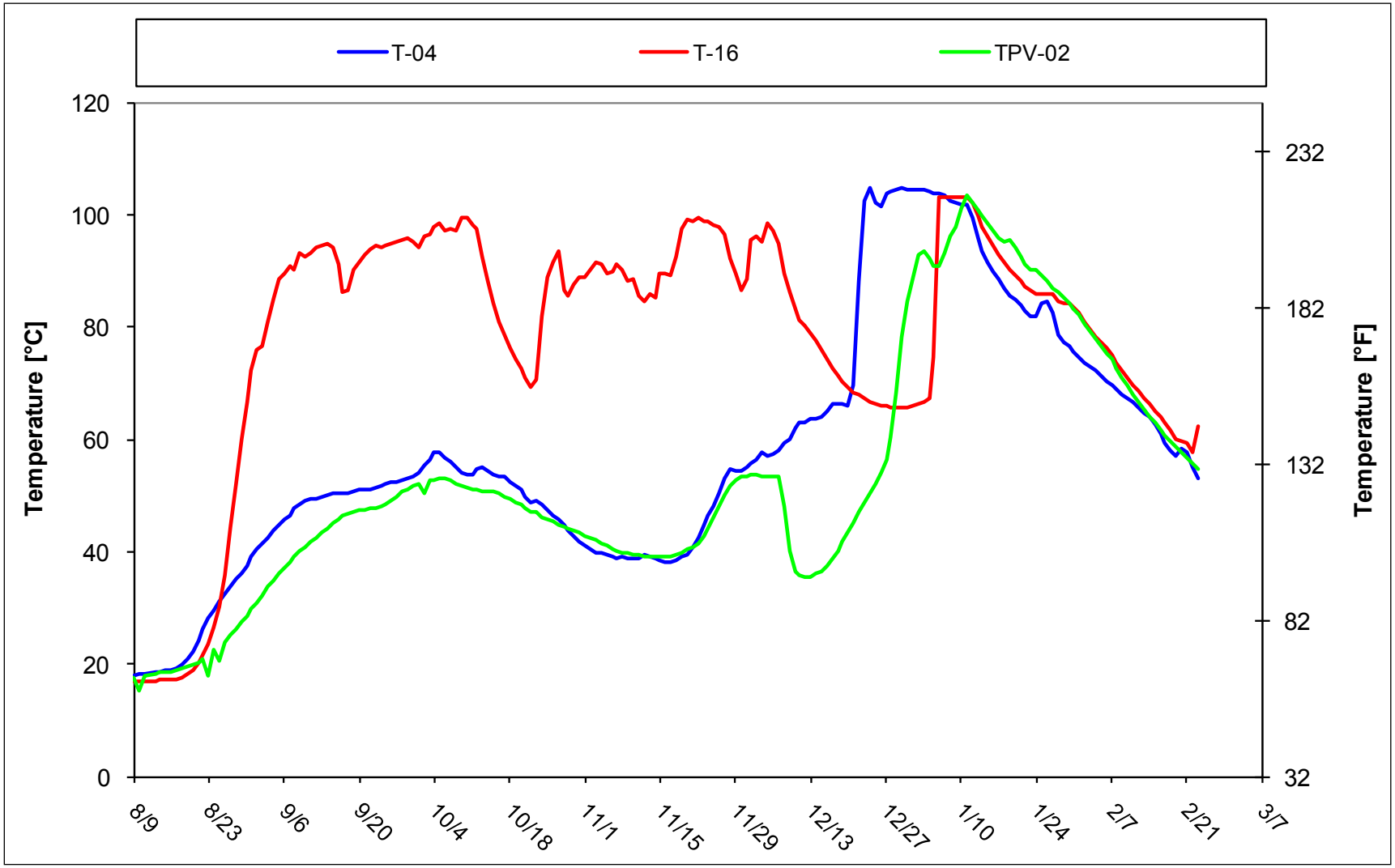


FIGURE F-12
PERCENTAGE OF THERMOCOUPLES GREATER THAN 90°C IN ISTT AREA A VADOSE ZONE
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

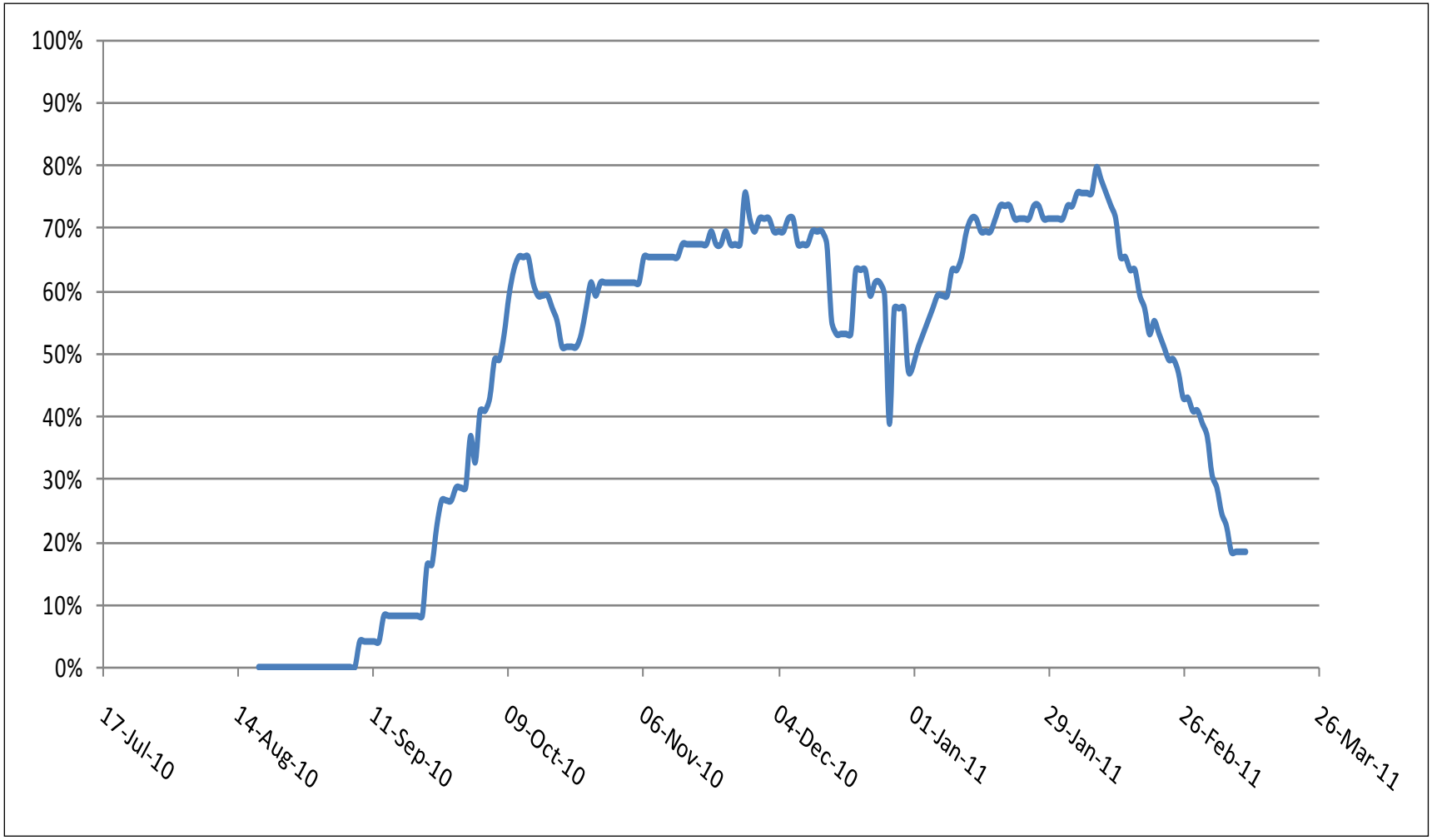


FIGURE F-13
PERCENTAGE OF THERMOCOUPLES GREATER THAN 100°C IN ISTT AREA A SATURATED ZONE
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

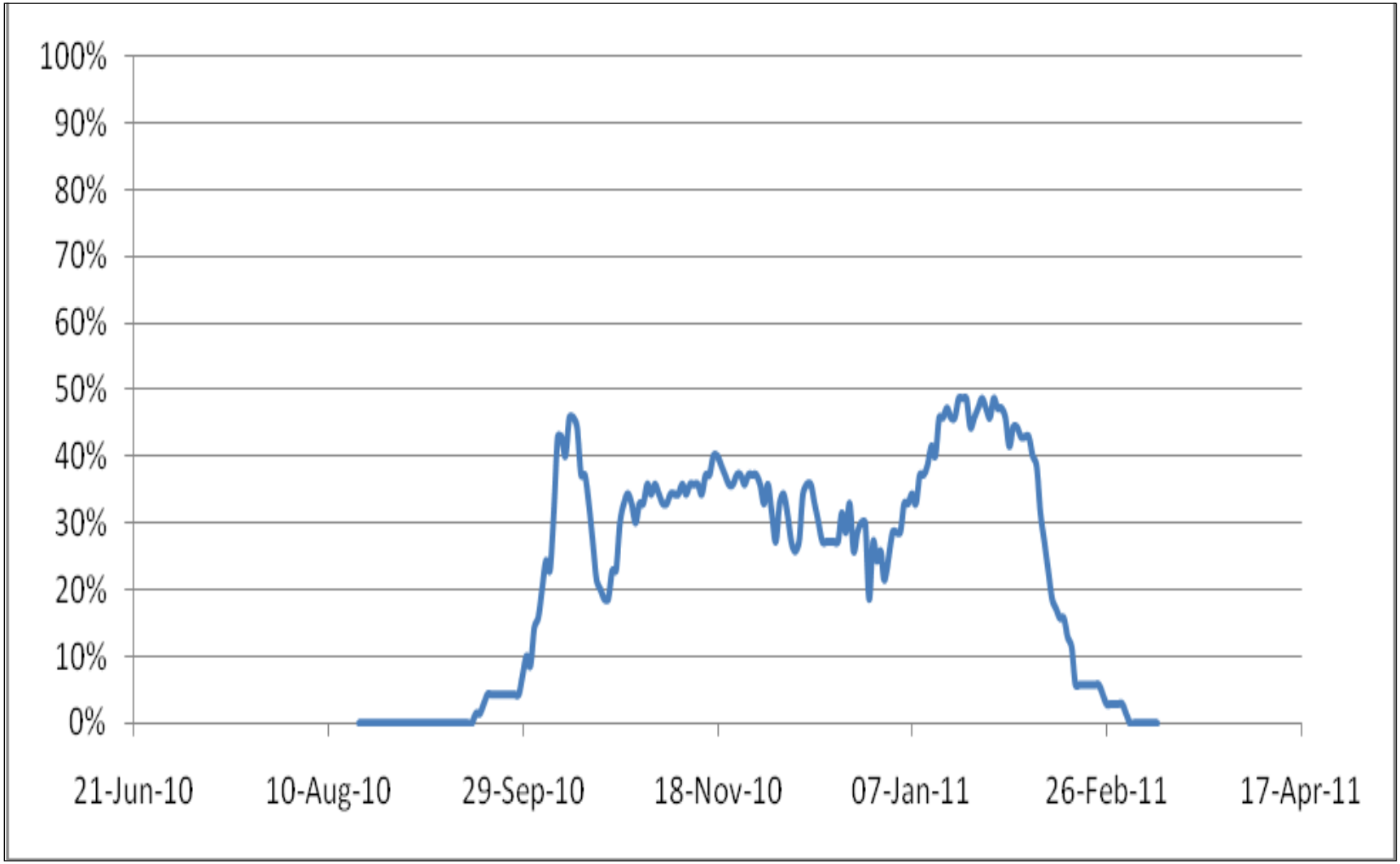


FIGURE F-14
PERCENTAGE OF THERMOCOUPLES GREATER THAN 90° C IN ISTT AREA C VADOSE ZONE
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

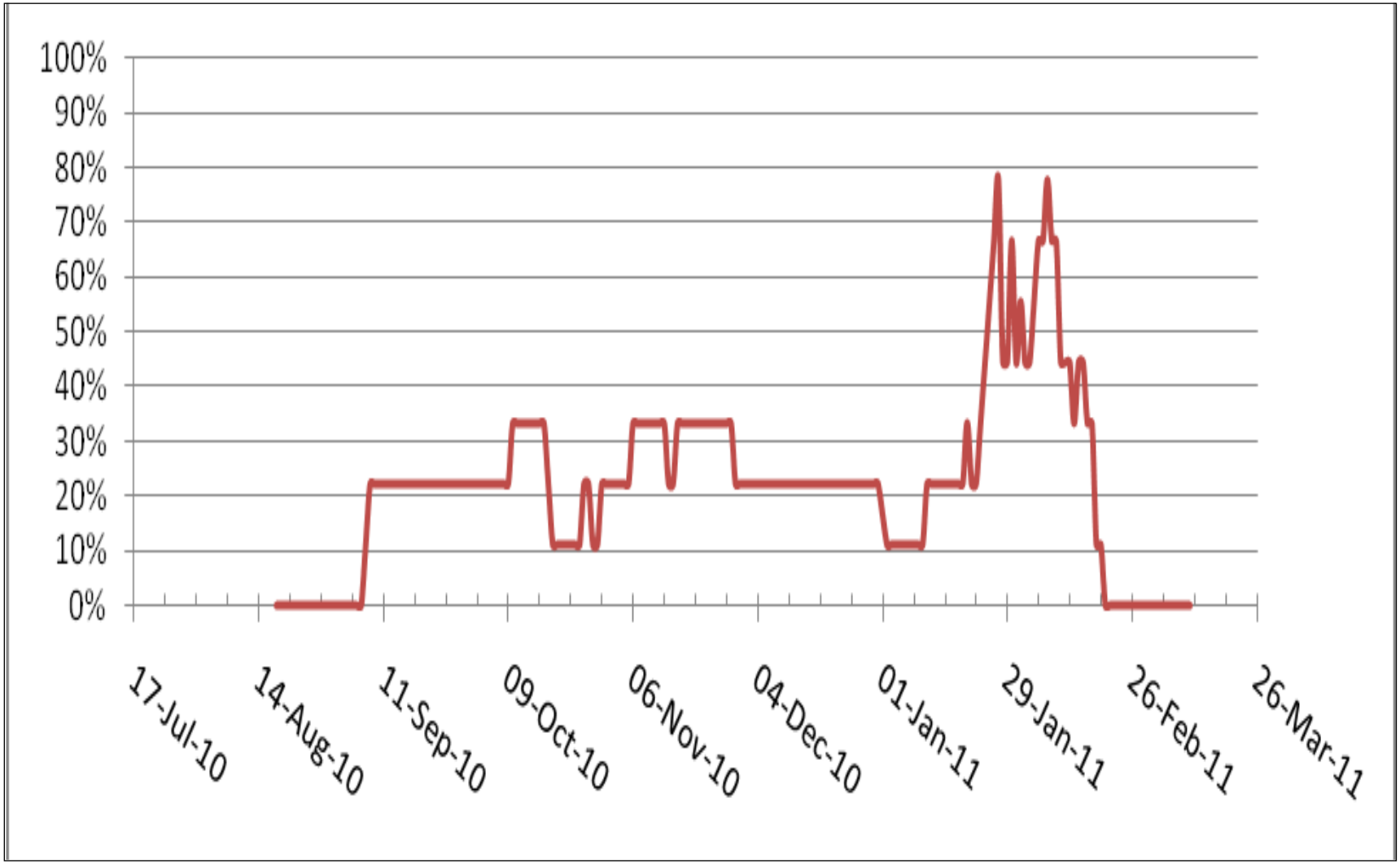


FIGURE F-15
PERCENTAGE OF THERMOCOUPLES GREATER THAN 90°C IN ISTT AREA D VADOSE ZONE
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

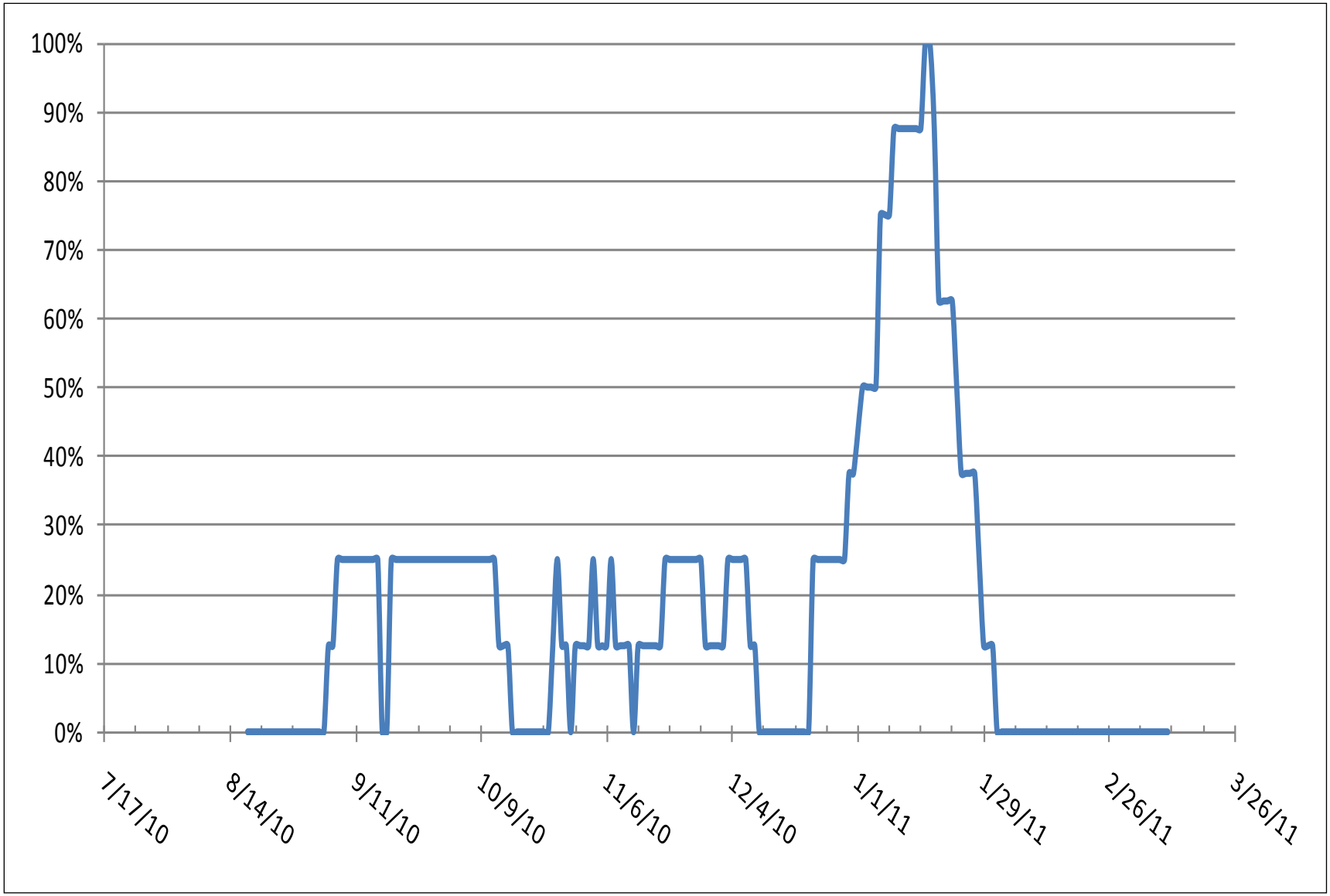


FIGURE F-16
CONCENTRATIONS OF SELECT VOCS IN PROCESS WATER
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

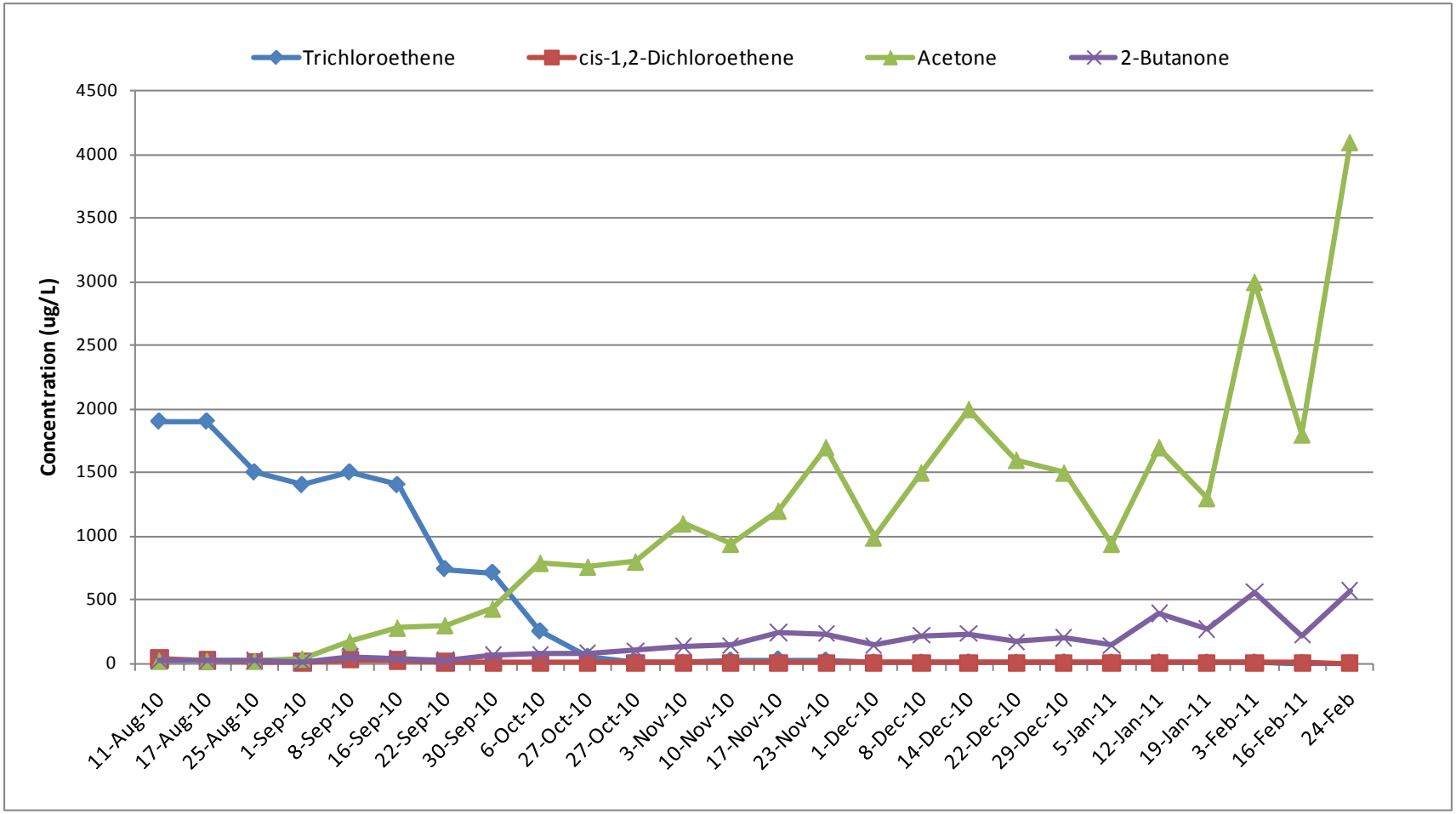


FIGURE F-17
VOLATILE ORGANIC COMPOUNDS CONCENTRATIONS IN PROCESS VAPOR
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

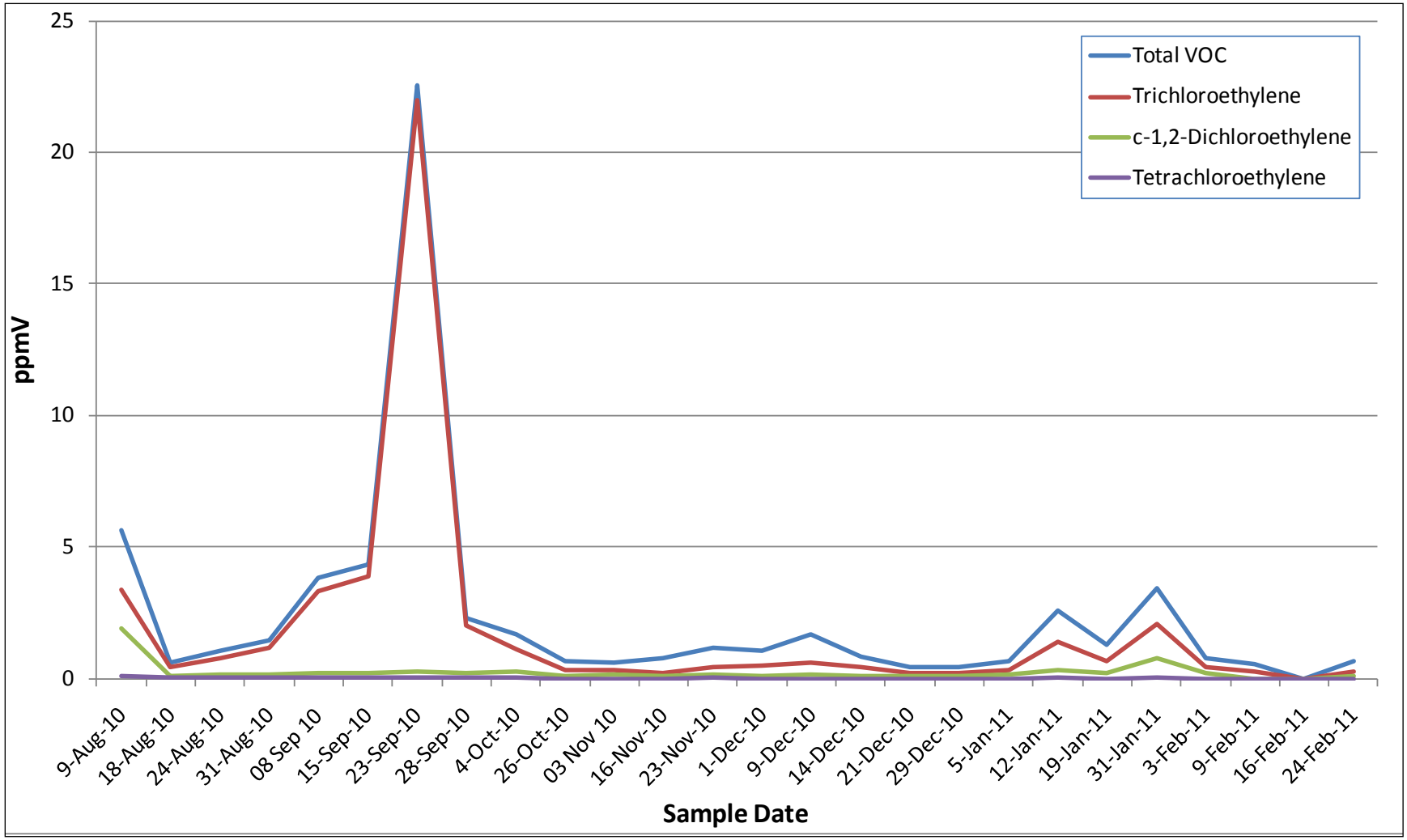
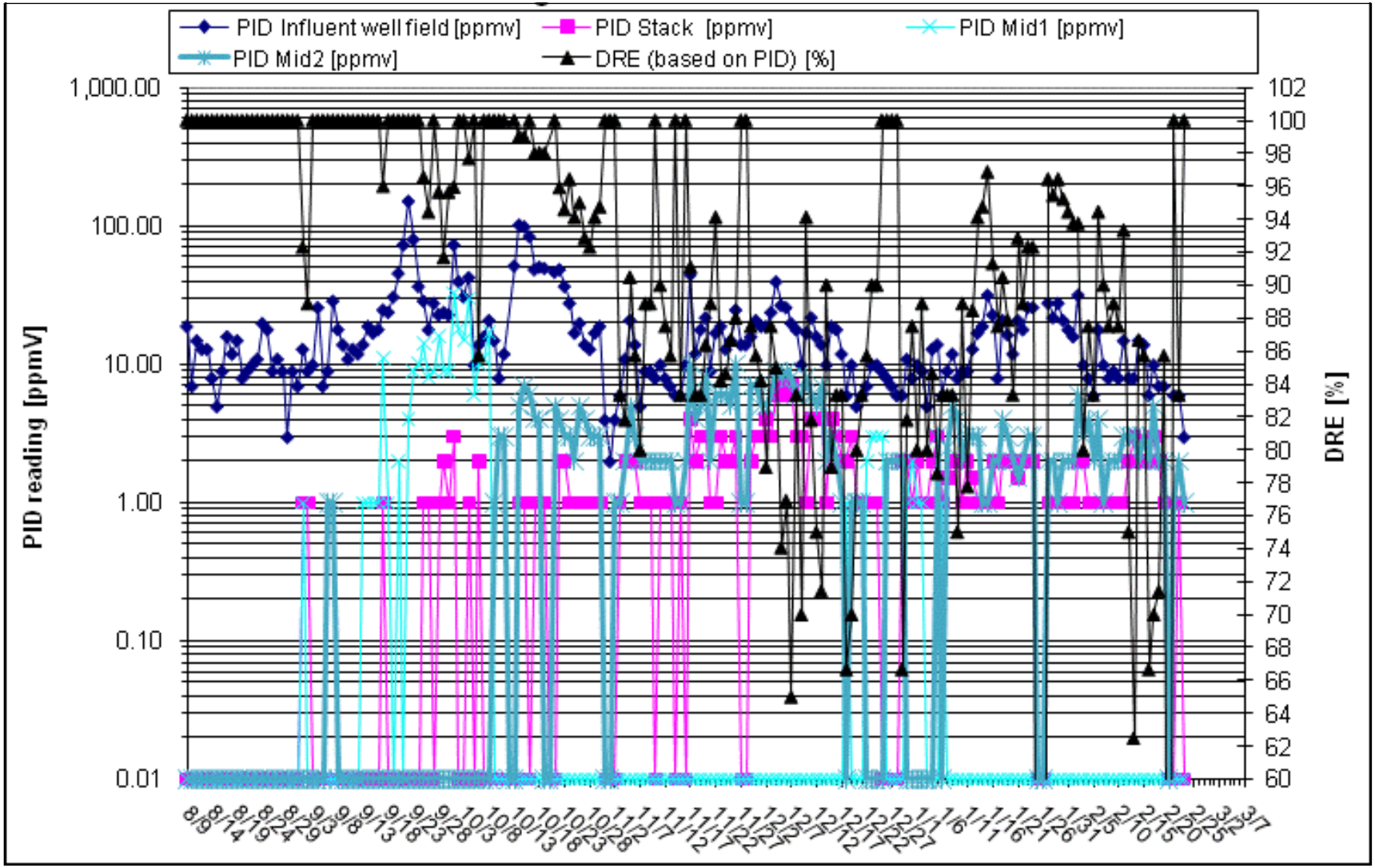


FIGURE F-18
INFLUENT AND EFFLUENT PID READINGS AND CALCULATED DESTRUCTION AND REMOVAL EFFICIENCY (TERRATHERM)
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS



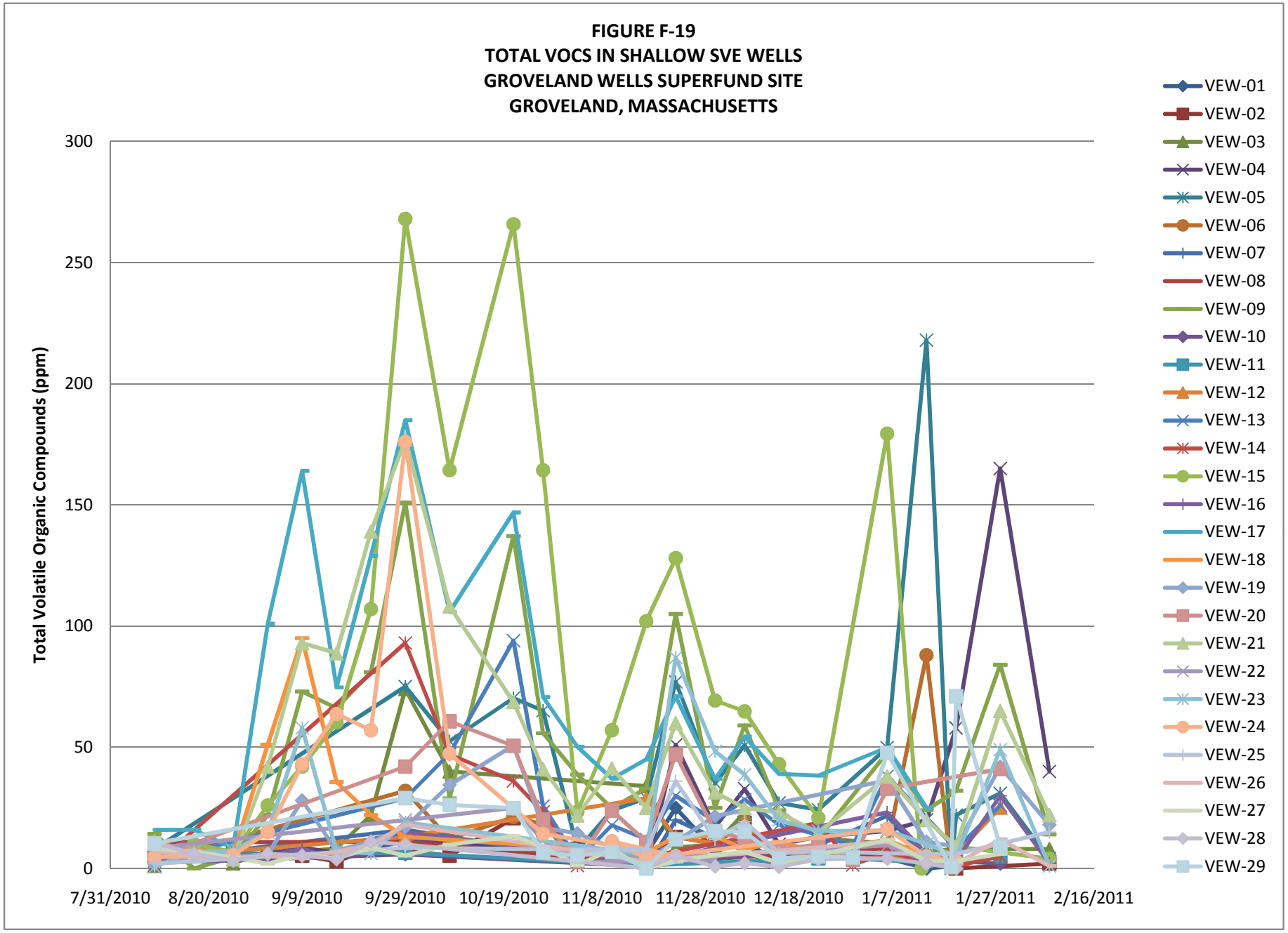
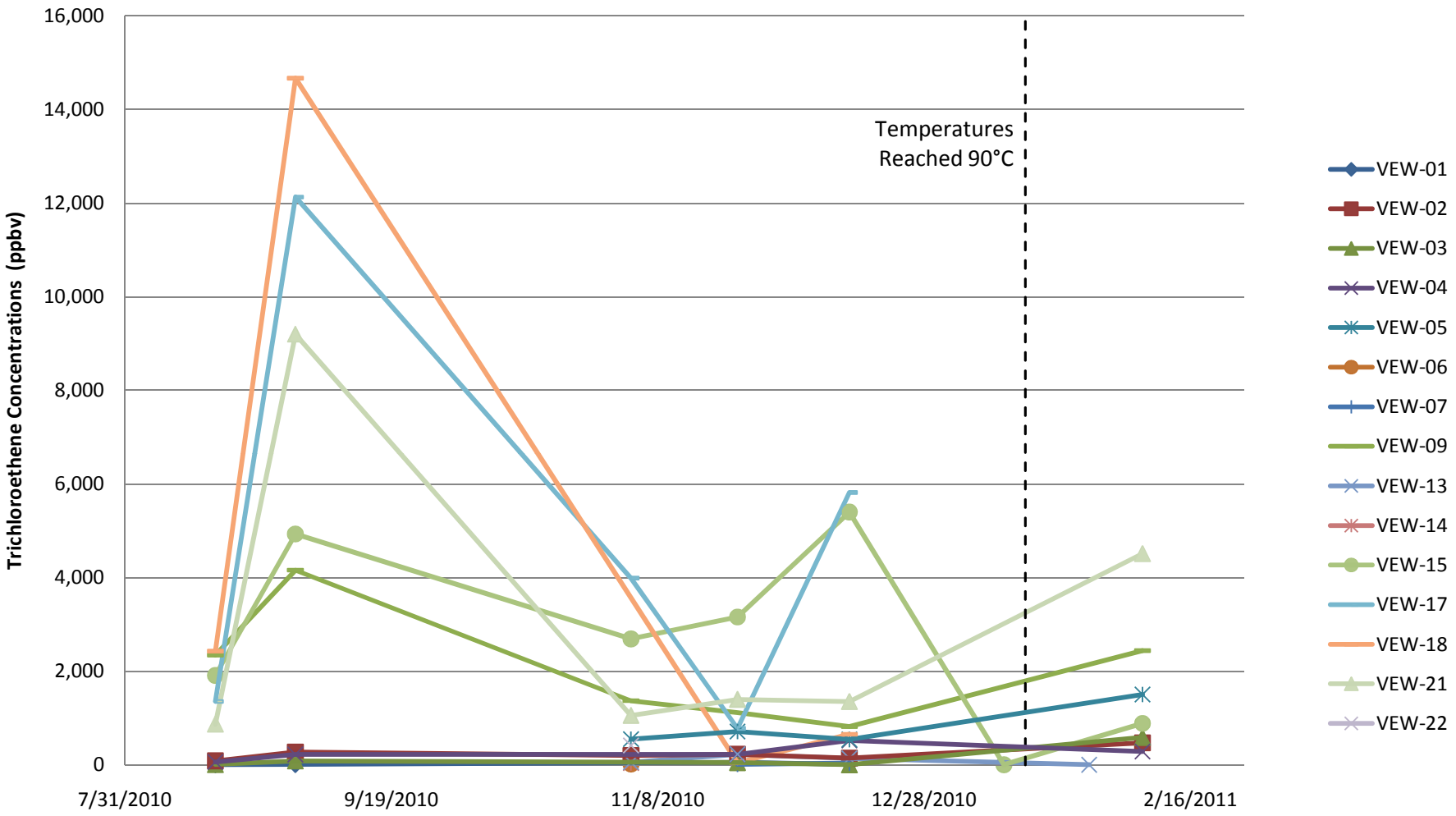


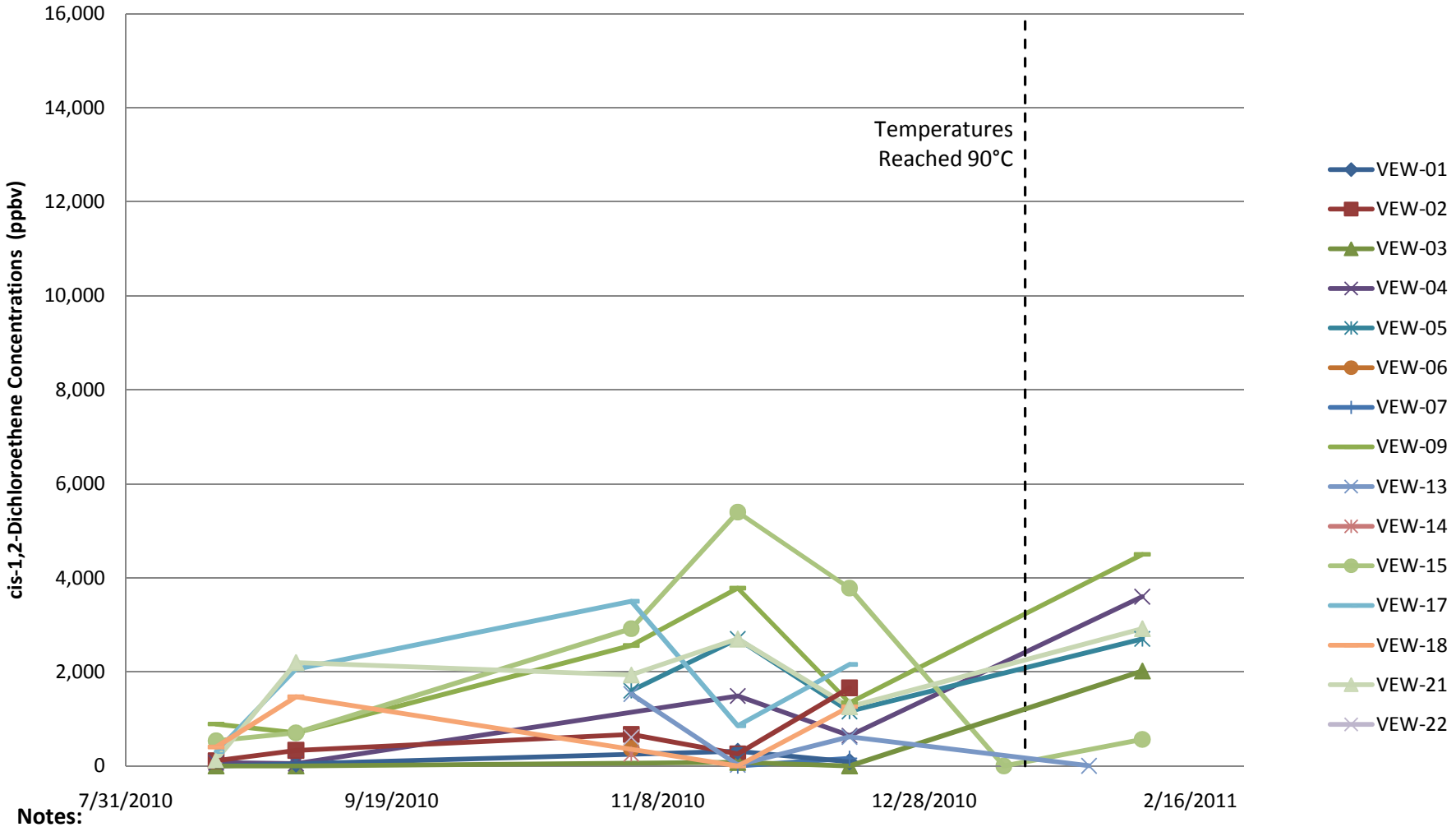
FIGURE F-19
TOTAL VOCS IN SHALLOW SVE WELLS
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS
Total Volatile Organic Compounds (ppm)
300
250
200
150
100
50
0
7/31/2010
8/20/2010
9/9/2010
9/29/2010
10/19/2010
11/8/2010
11/28/2010
12/18/2010
1/7/2011
1/27/2011
2/16/2011
VEW-01
VEW-02
VEW-03
VEW-04
VEW-05
VEW-06
VEW-07
VEW-08
VEW-09
VEW-10
VEW-11
VEW-12
VEW-13
VEW-14
VEW-15
VEW-16
VEW-17
VEW-18
VEW-19
VEW-20
VEW-21
VEW-22
VEW-23
VEW-24
VEW-25
VEW-26
VEW-27
VEW-28
VEW-29

FIGURE F-20
TRICHLOROETHENE CONCENTRATIONS IN ISTT AREA A SHALLOW SVE WELLS
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS



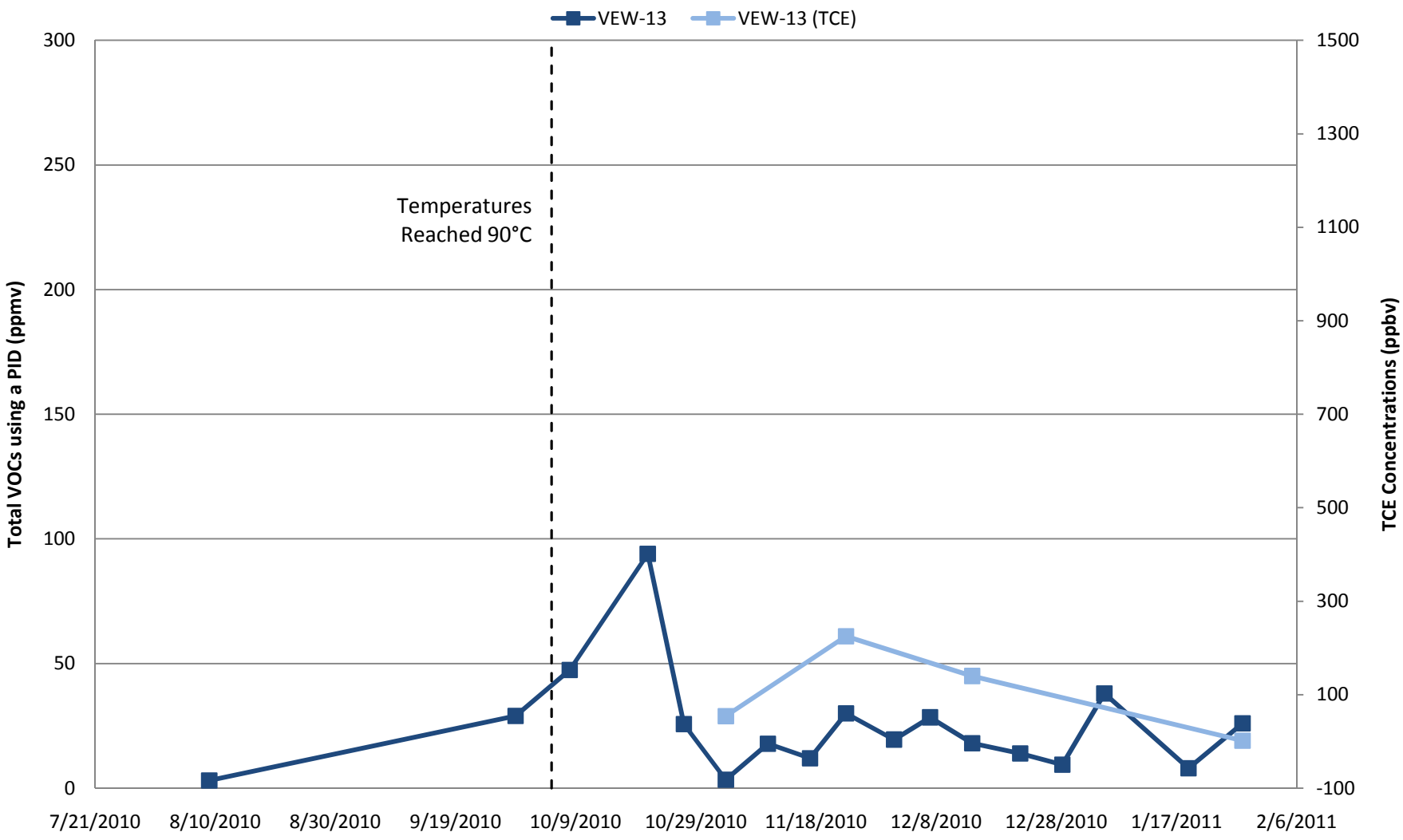
Notes:
(1) Temperature assumptions are based on average Area A temperatures presented on TerraTherm's website.
(2) Samples were not collected from VEW-01 and VEW-17 during the February 7th sampling event due to their use as steam injection locations.

FIGURE F-21
CIS-1,2-DICHLOROETHENE CONCENTRATIONS IN ISTT AREA A SHALLOW SVE WELLS
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS



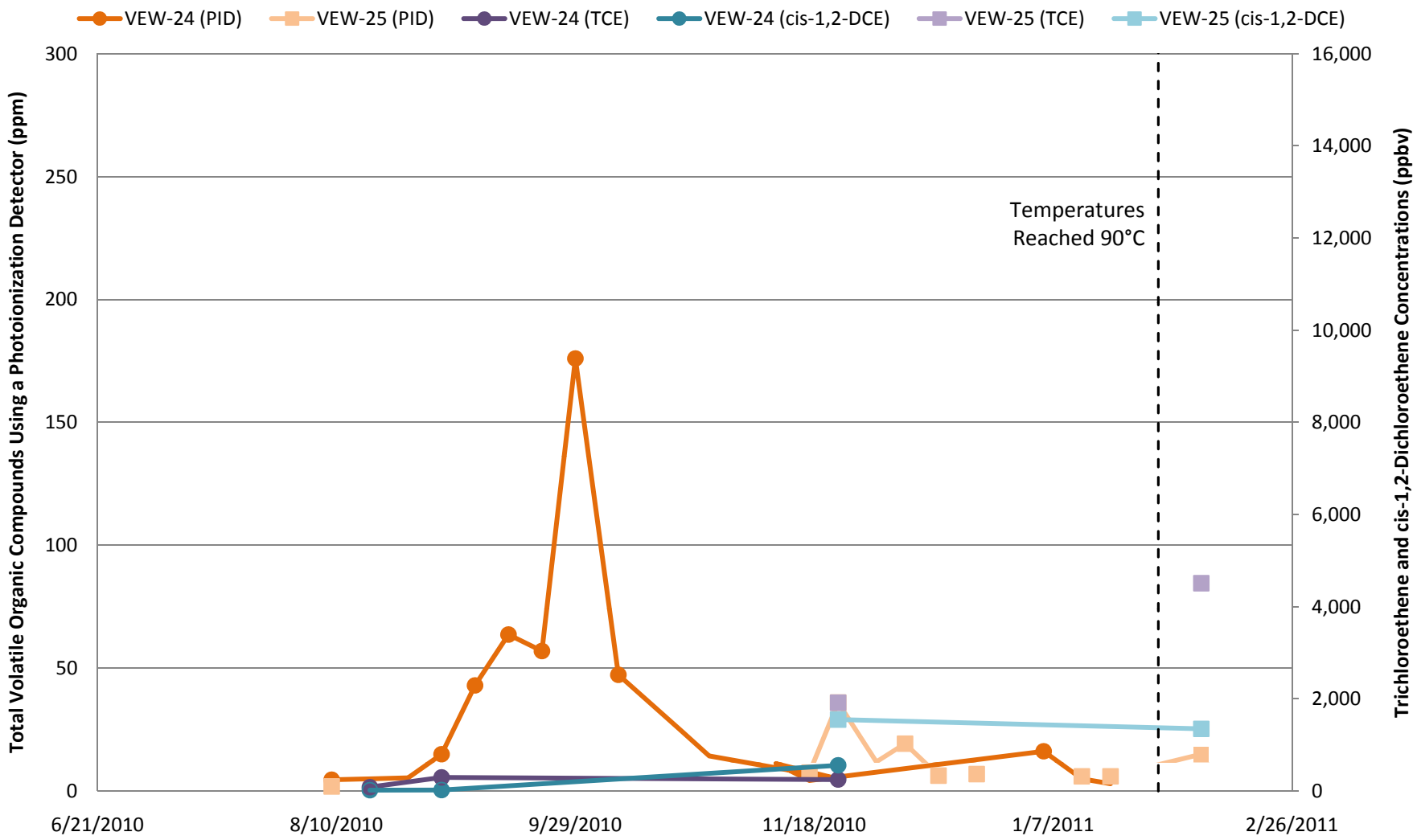
Notes:
(1) Temperature assumptions are based on average Area A temperatures presented on TerraTherm's website.
(2) Samples were not collected from VEW-01 and VEW-17 during the February 7th sampling event due to their use as steam injection locations.
(3) Concentrations that are below the detection limit are shown as zero.

FIGURE F-22
TOTAL VOCS (PID) AND TCE CONCENTRATIONS IN THE INTERIOR ISTT AREA B SVE WELL
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS



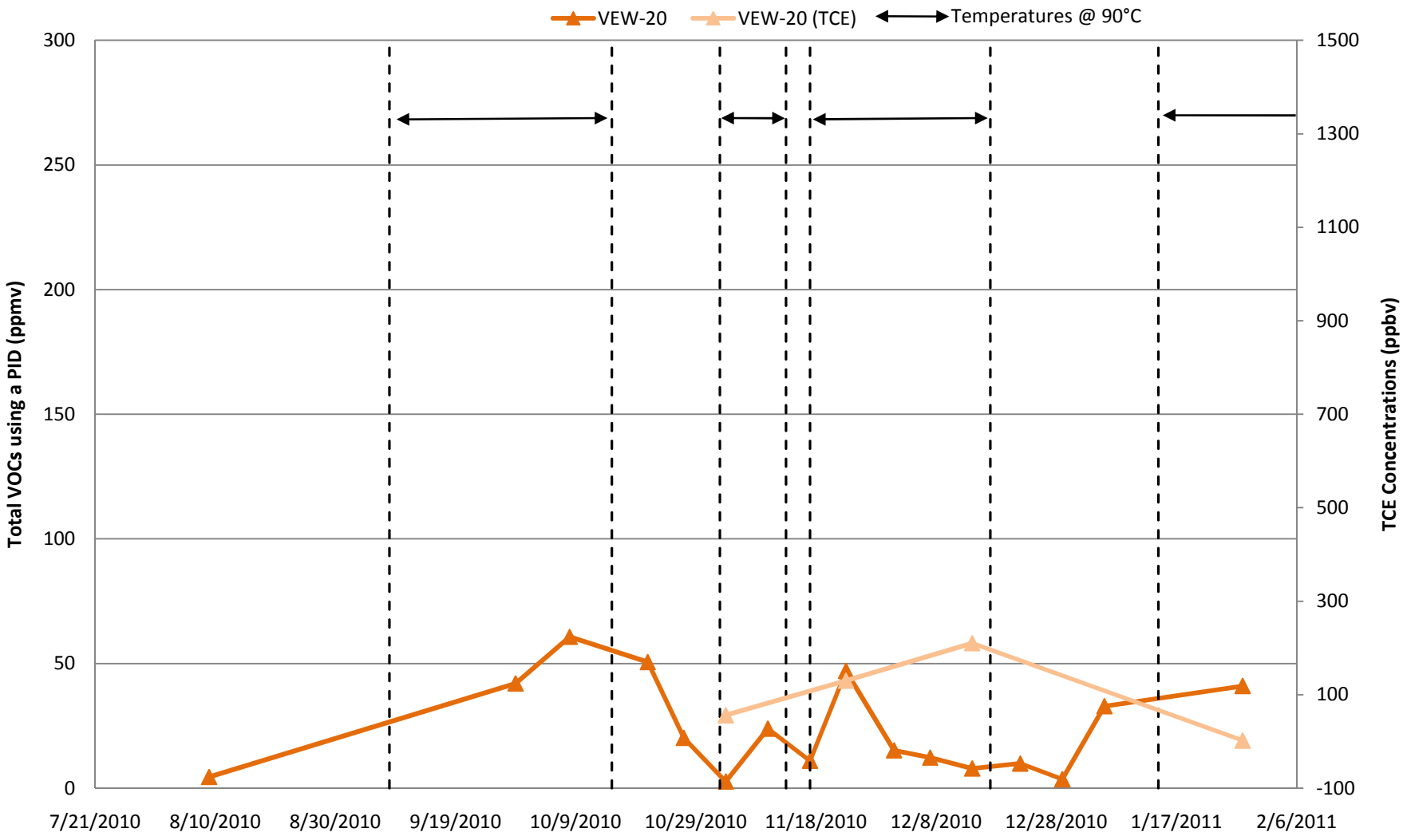
Note: There are no Sensor Wells located within Area B. Temperature assmption is based on data presented on TerraTherm's website for nearby Area A Sensor Well, TPV-04.

FIGURE F-23
TOTAL VOCS (PID) AND TCE CONCENTRATIONS IN THE EXTERIOR ISTT AREA B SVE WELLS
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS



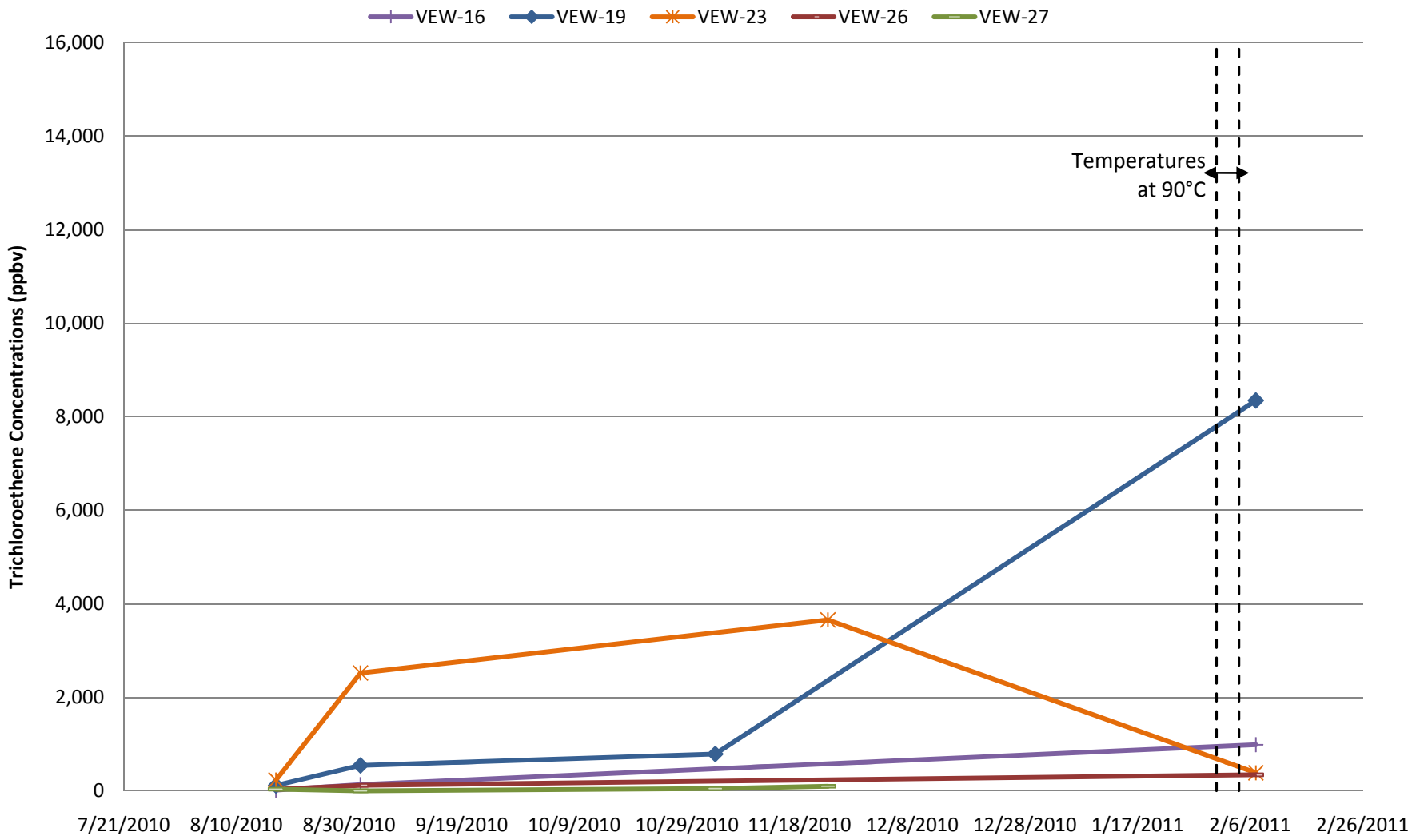
Note: There are no Sensor Wells located within Area B. The temperature assmption is based on data presented on TerraTherm's website for nearby Area A Sensor Well, TPV-06.

FIGURE F-24
TOTAL VOCS (PID) AND TCE CONCENTRATIONS IN THE INTERIOR ISTT AREA C SVE WELL
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS



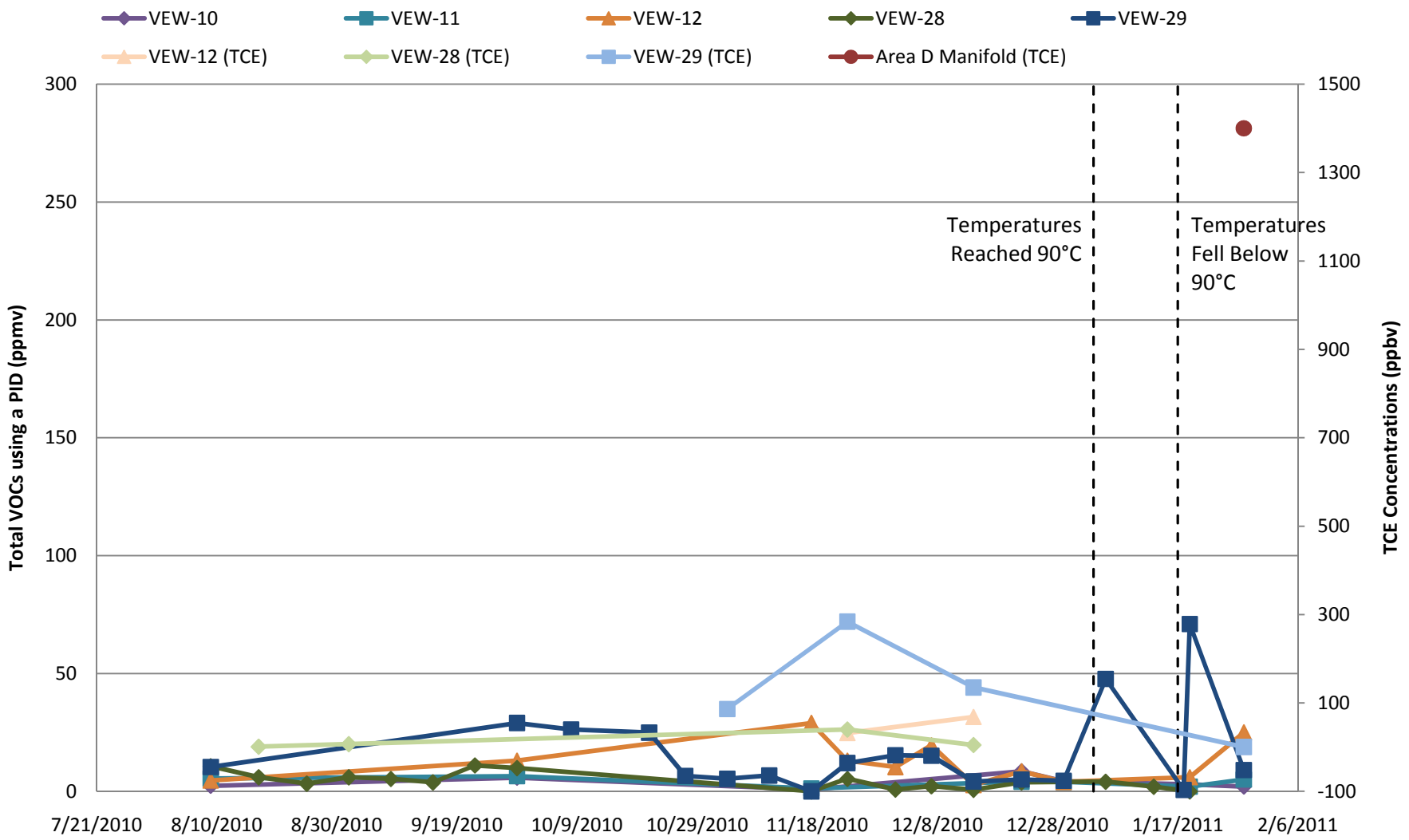
Note: Temperature assmptions are based on data represented on TerraTherm's webiste for T-06.

FIGURE F-25
TCE CONCENTRATIONS IN THE EXTERIOR ISTT AREA C SVE WELLS
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS



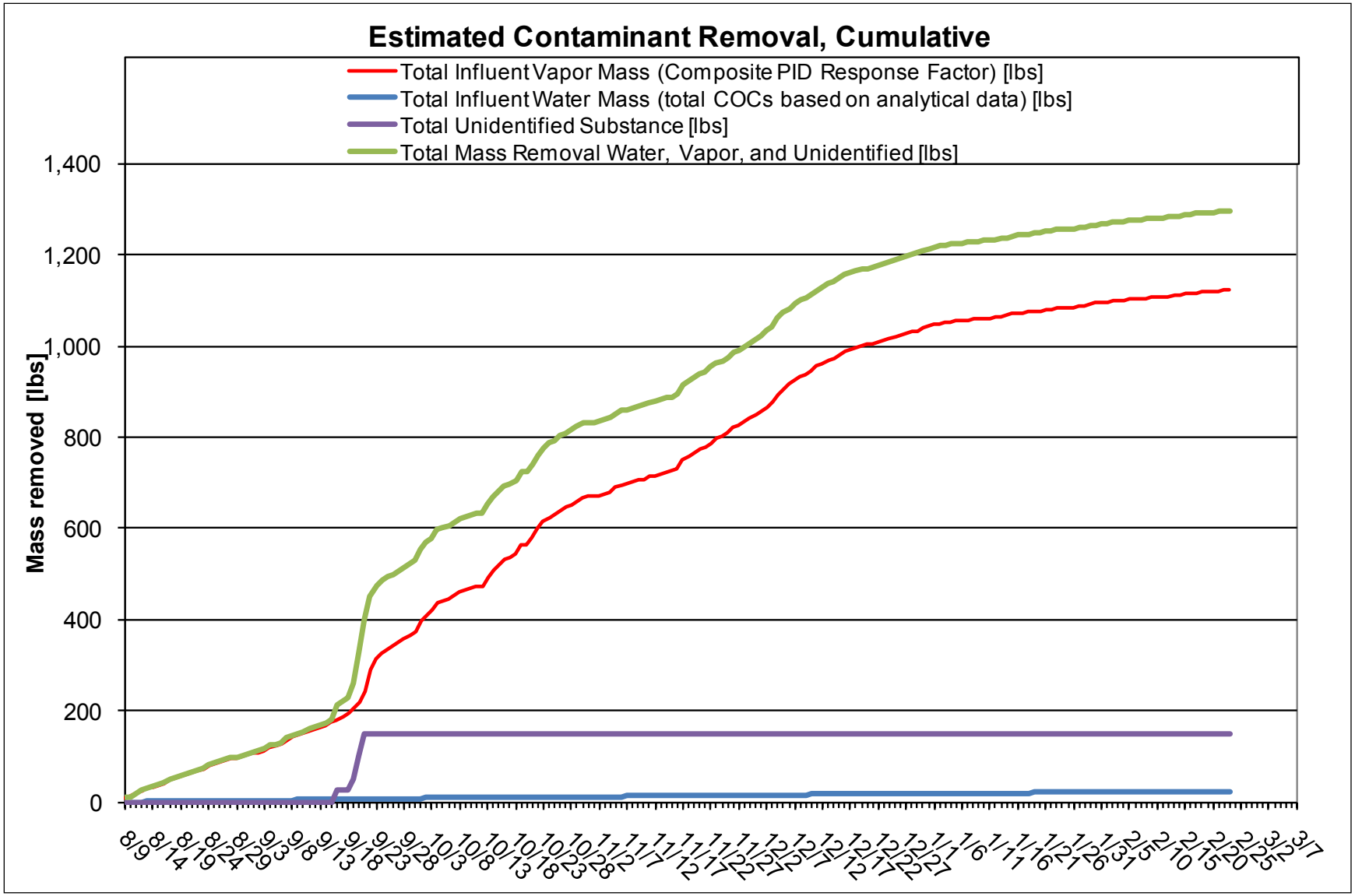
Note: Temperature assumptions are based on average Area C temperatures presented on TerraTherm's website.

FIGURE F-26
TOTAL VOCS (PID) AND TCE CONCENTRATIONS IN ISTT AREA D SVE WELLS
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS



Note: Temperature assumptions are based on average Area D temperatures presented on TerraTherm's website.

FIGURE F-27
ESTIMATED CUMULATIVE TOTAL CONTAMINANT MASS REMOVED
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS



An Employee-Owned Company

ATTACHMENT A - TABLE OF CONTENTS
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IN SITU THERMAL TREATMENT
GROVELAND WELLS SUPERFUND SITE

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Progress Report

August 16, 2010

In Situ Thermal Remediation

Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from August 9 through August 16, 2010 at the Groveland Wells Superfund Site in Groveland, MA. Extraction system startup occurred on August 9, 2010. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	08/16/10	
Projected days of operation	134	
Projected total energy usage	3,049,000	kWh
Days of operation	0	days
Energy used to date	8,640	kWh
Injected energy per soil volume	0	kWh/cy
Water mass removal based on analytical data	0.0	lbs
Vapor mass removal based on PID	10	lbs
Average temperature Area A	51	°F
Average temperature Area C	55	°F
Average temperature Area D	55	°F
Volume of NAPL recovered to date	0.0	gal
Average power input last 24 hours	0	kW
Average pumped water rate last 24 hours	5.8	gpm
Average vapor extraction rate (non condensable) last 24 hours	491	scfm

System Shutdowns

One system shutdown occurred on 8/10/10 due to a high level on the second knock out pot drain that was clogged with rust. Total extraction system downtime was approximately 5 minutes.

System Maintenance

Normal system maintenance was performed.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

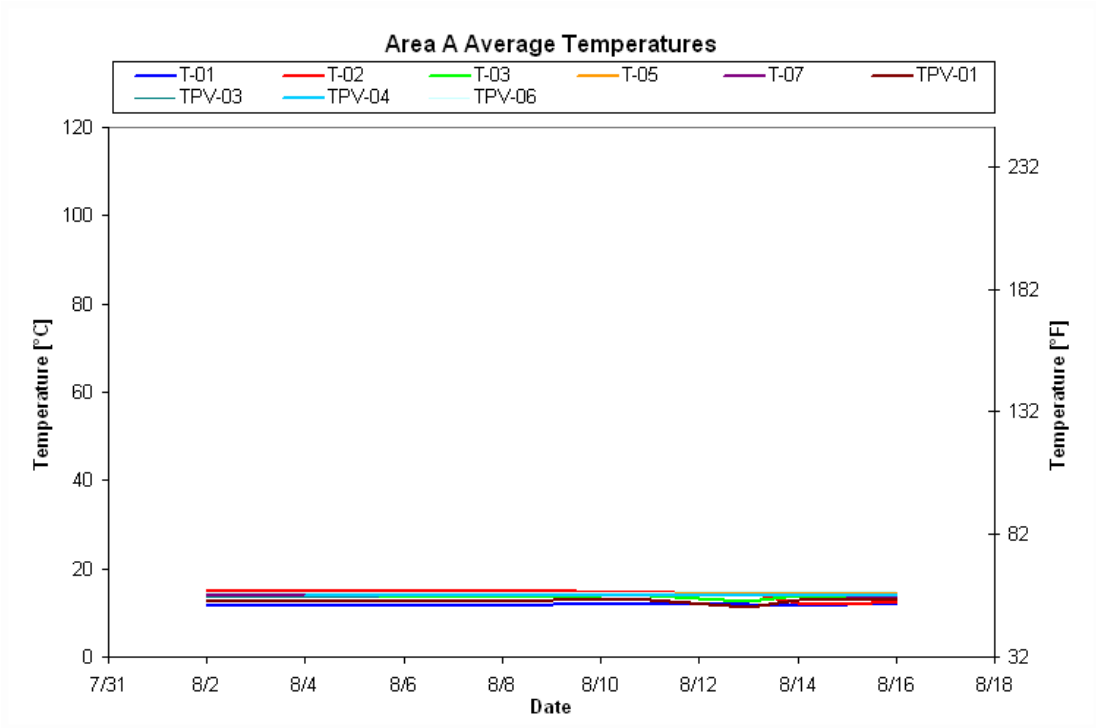


Figure 1. Average Temperature – Area A

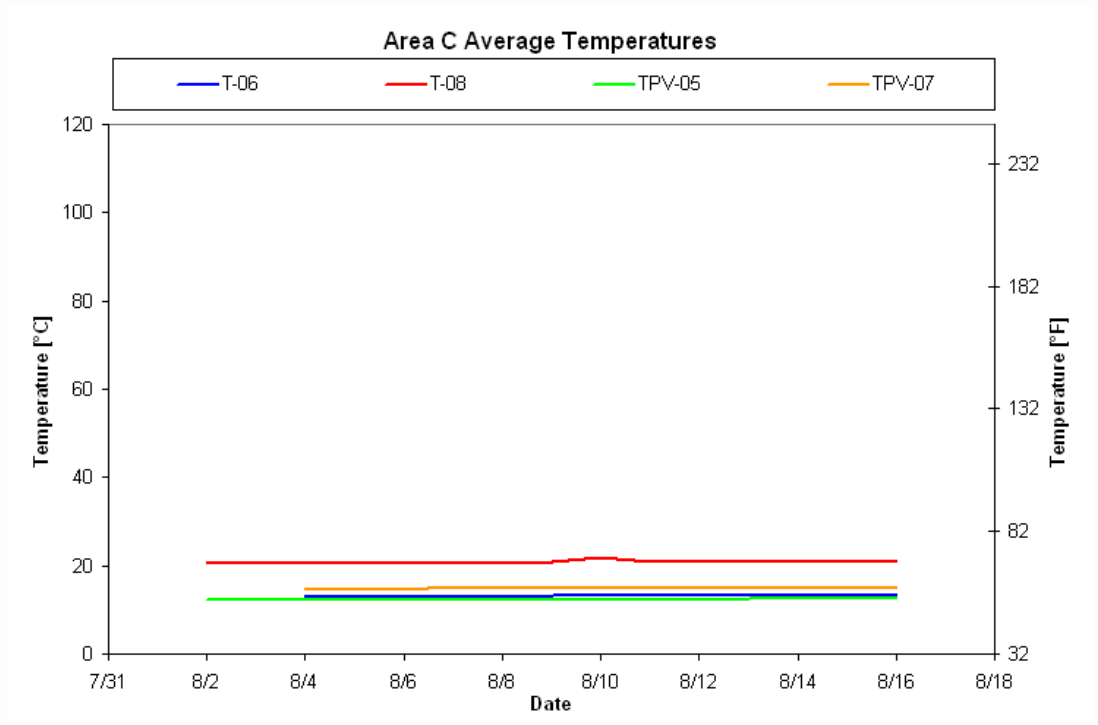


Figure 2. Average Temperature – Area C

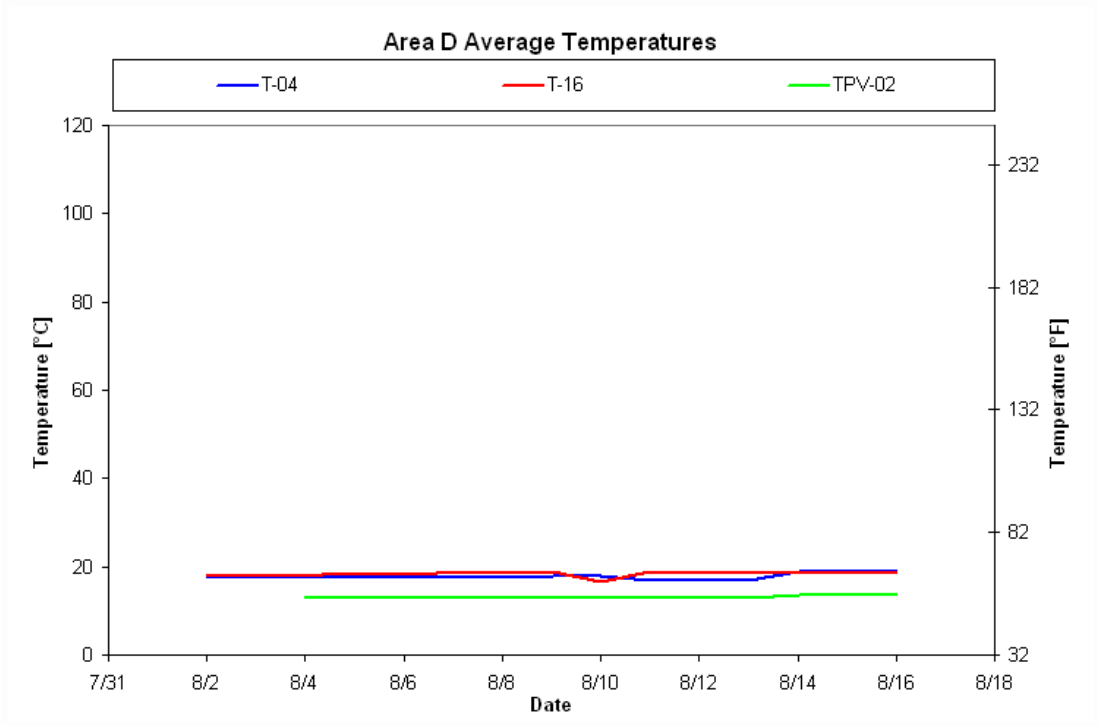


Figure 3. Average Temperature – Area D

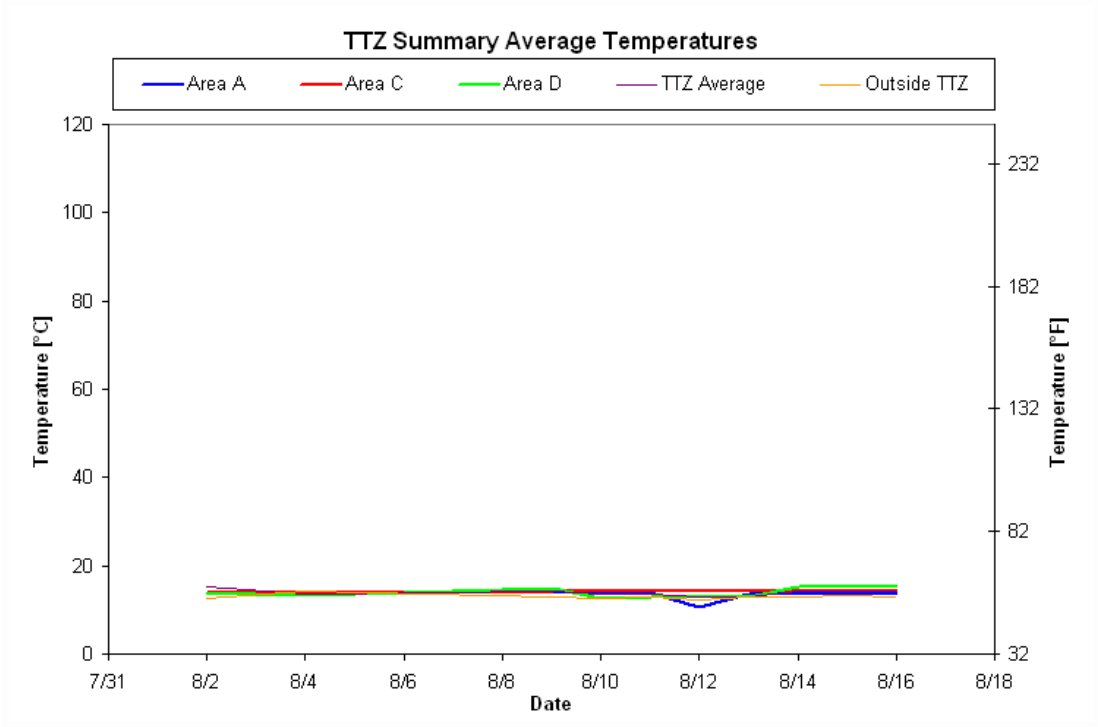


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment.

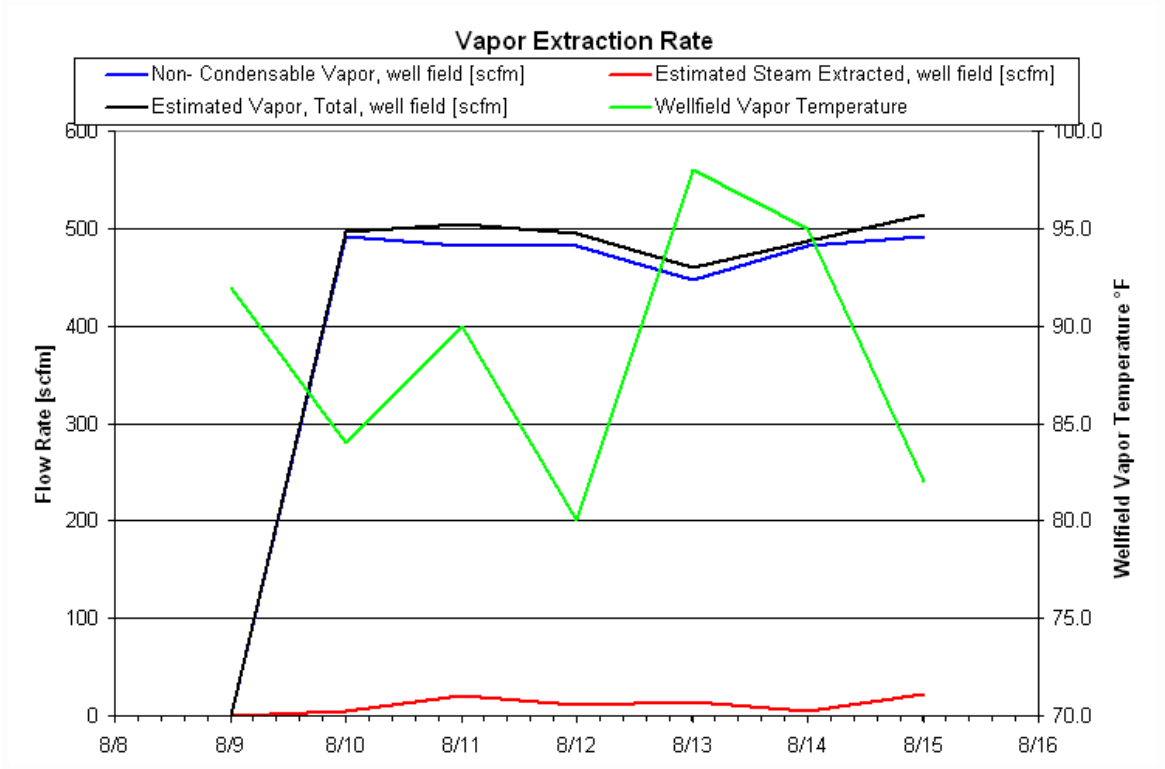


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the Destruction and Removal Efficiency (DRE) of the treatment system. Note that PID readings of 0.0 ppmV are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of 0-values.

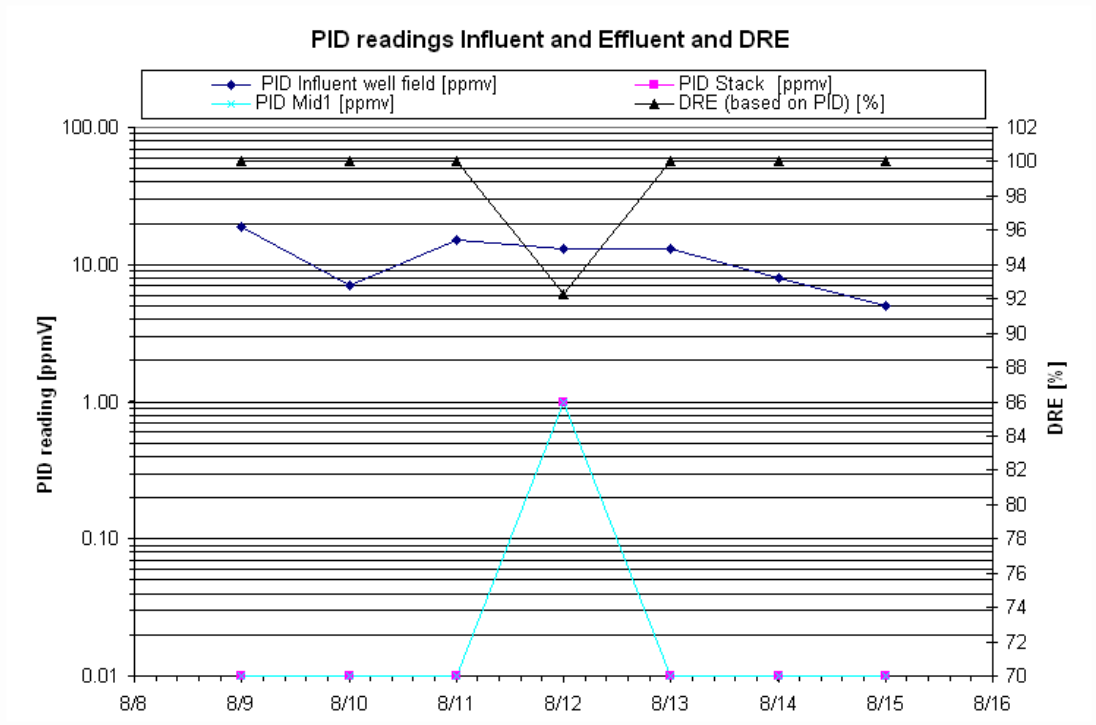


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Mass Removal

The mass removal is calculated by adjusting the wellfield PID reading based on the correction factors for each major COC identified in the most recent lab analysis.

Since no lab analyses have been received to date, it has been assumed that all COCs extracted are TCE.

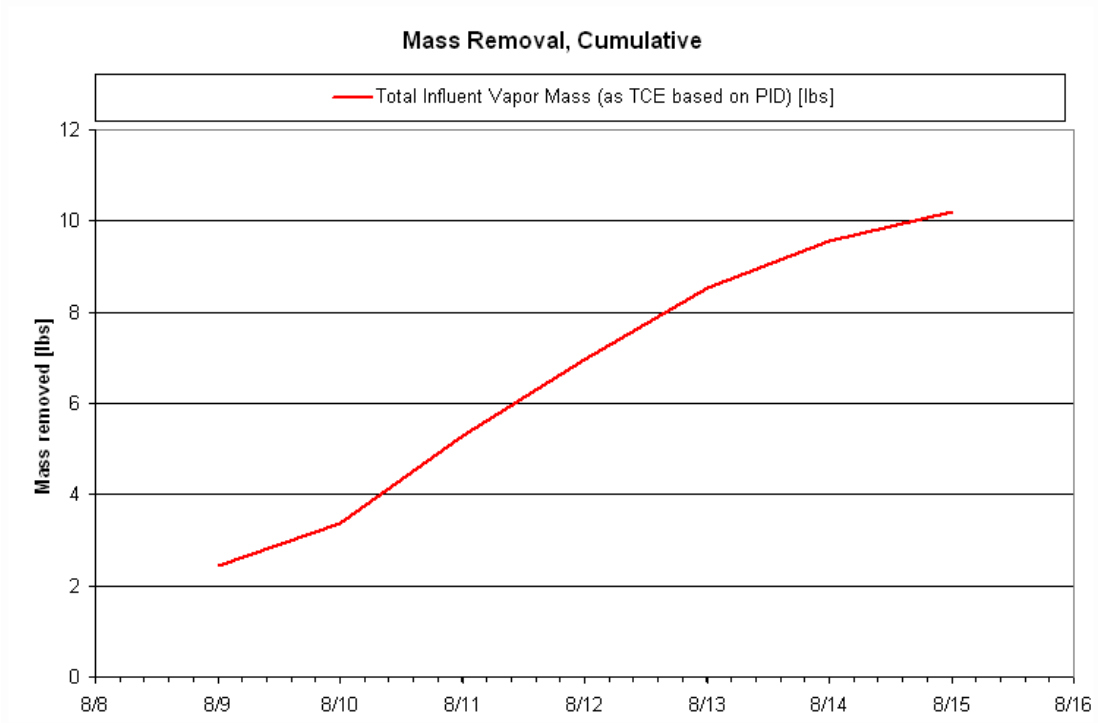


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A baseline round of PID readings was collected from the extraction wells at the site on 8/9/10. The table below presents the results (ppmV).

Table 2. Baseline PID Readings at the Extraction Wells (readings in ppmV)

VEW 1	*5.1*
VEW 2	*4.5*
VEW 3	*1.1*
VEW 4	*4.1*
VEW 5	*7.9*
VEW 6	*2.9*
VEW 7	*3.5*
VEW 8	*10.8*
VEW 9	*14.2*
VEW 10	*2.3*
VEW 11	*5.4*
VEW 12	*4.6*
VEW 13	*3.1*
VEW 14	*1.3*
VEW 15	*6.2*
VEW 16	*4.0*
VEW 17	*15.9*
VEW 18	*10.3*
VEW 19	*1.6*
VEW 20	*4.5*
VEW 21	*11.1*
VEW 22	*8.4*
VEW 23	*0.6*
VEW 24	*4.6*
VEW 25	*1.9*
VEW 26	*7.1*
VEW 27	*8.1*
VEW 28	*10.7*
VEW 29	10.3

7. Water Level

The figure below presents a water level contour map for the site.

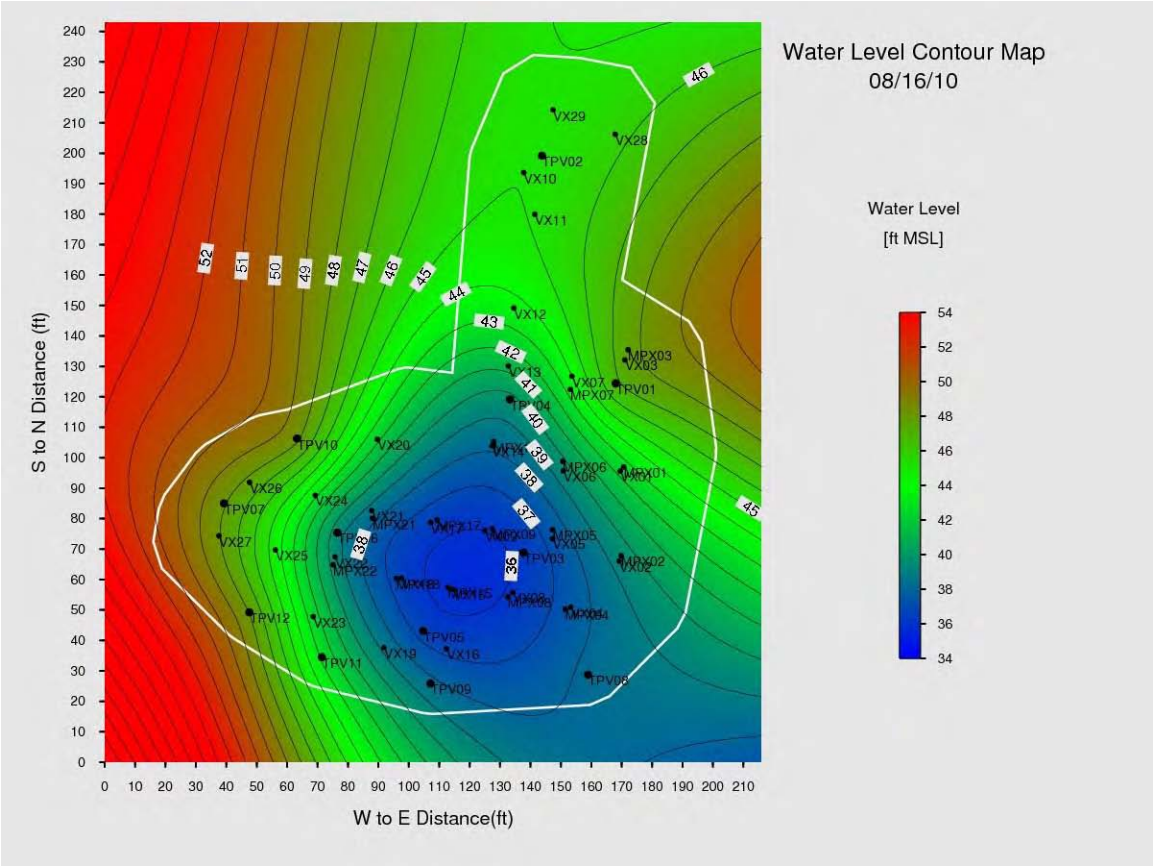


Figure 8. Water Level Contour Map

8. Water Balance

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, and the net water extraction from the site. The graph below also shows the total water injected to the site.

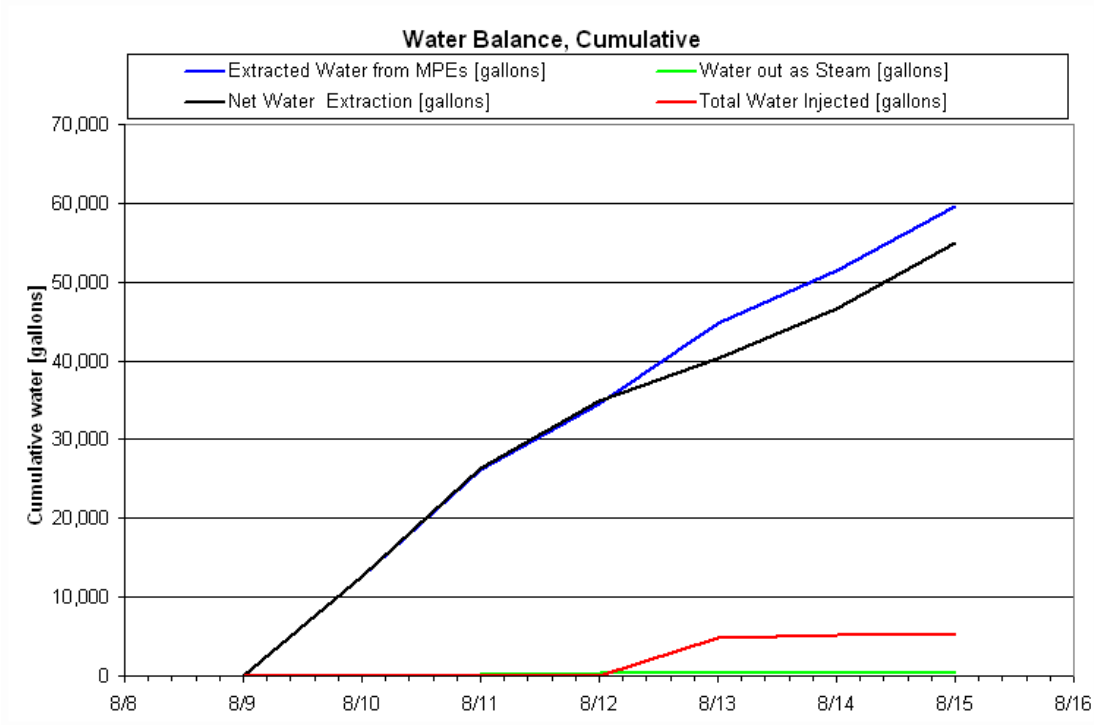


Figure 9. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the net water injected to the site is shown in the figure below.

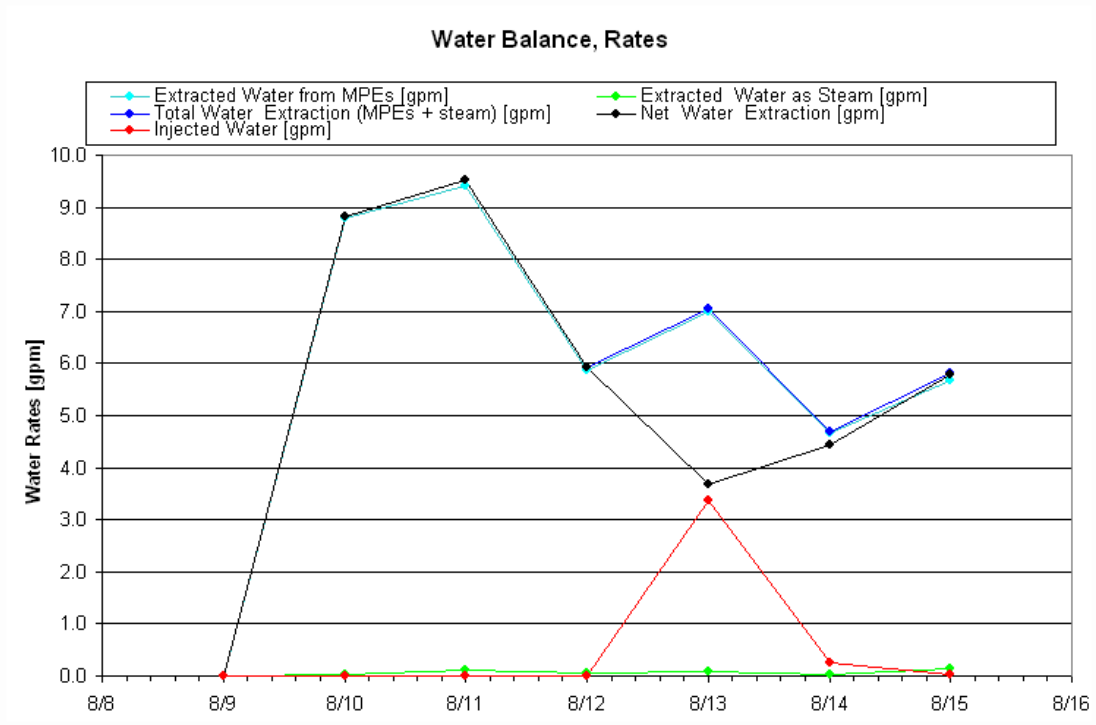


Figure 10. Liquid Condensate Production, Water Injection and Water Extraction Rates

9. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

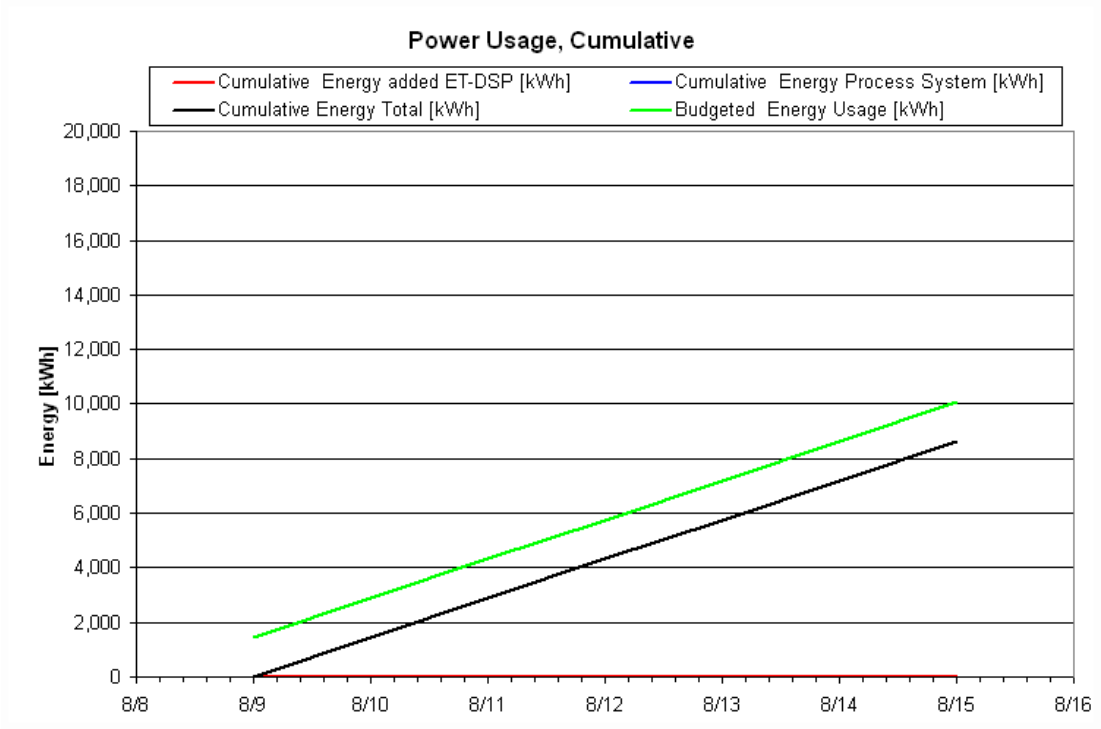


Figure 10. Cumulative Power Usage

10. Discussion

Optimization:

No optimization evaluations were conducted this week. No optimization actions are recommended at this time.

Incidents:

No safety or environmental compliance issues were identified at the site this week.

Performance Goal Attainment Issues or Concerns:

No issues or concerns related to attainment of performance goals.

Progress Report

Period 8/14/2010 through 8/20/2010
August 23, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Final Construction/Startup Activities Summary

Construction/startup activities performed 8/7/10 through 8/13/10

TerraTherm and McMillan-McGee continued with equipment testing and shakedown activities. TerraTherm started the extraction system on 8/9/10. McMillan-McGee continued with test firing electrodes, acceptance testing and step and touch potential testing. Nobis performed the final inspection of the ET-DSP™ system on 8/12/10 in preparation of heating system startup. McMillan-McGee conducted initial ET-DSP™ system training for TerraTherm's operators.

Construction/startup activities performed 8/14/10 through 8/20/10

McMillan-McGee completed acceptance testing and step and touch potential testing. Nobis gave approval for system startup on 8/17/10. The ET-DSP™ heating began on 8/17/10. McMillan-McGee conducted additional ET-DSP™ system training for TerraTherm's operators.

2. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from August 14 through August 20, 2010 at the Groveland Wells Superfund Site in Groveland, MA. Heating system startup occurred on August 17, 2010. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 8/20/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	134	
Projected total energy usage	3,049,000	kWh
Days of operation	3	days
Energy used to date	68,160	kWh
Injected energy per soil volume to date	3	kWh/cy
VOC mass removal to date	18	lbs
Volume of NAPL recovered to date	0.0	gal
Average temperature Area A last 7 days	57	°F
Average temperature Area C last 7 days	60	°F
Average temperature Area D last 7 days	60	°F
Average power usage last 7 days	371	kW
Average pumped water rate last 7 days	5.2	gpm
Average injected water rate last 7 days	2.9	gpm
Average vapor extraction rate (non condensable) last 7 days	485	scfm

System Shutdowns

No system shutdowns occurred during the 8/14/2010 through 8/20/2010 operational period.

System Maintenance

Normal system maintenance was performed.

3. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

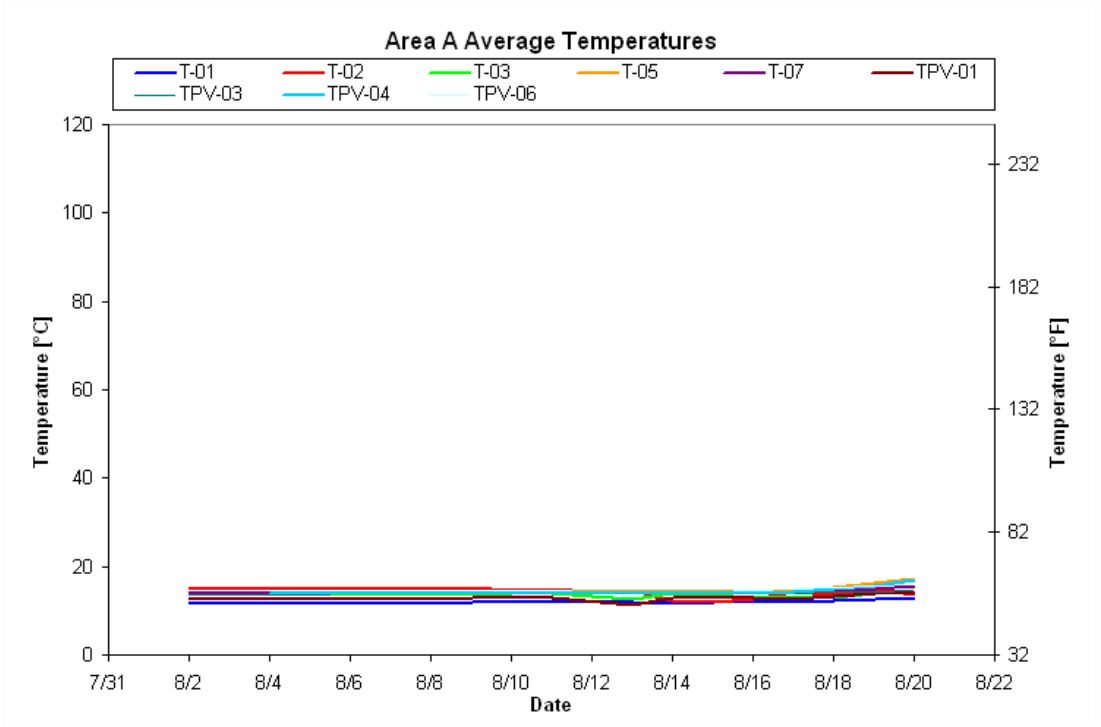


Figure 1. Average Temperature – Area A

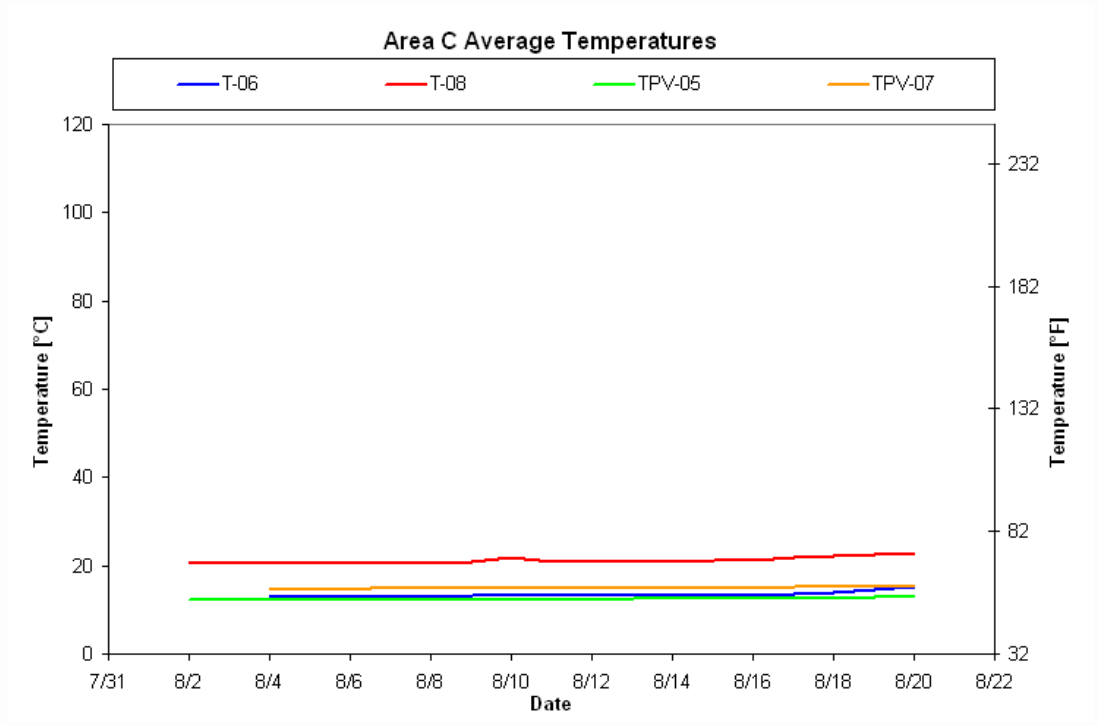


Figure 2. Average Temperature – Area C

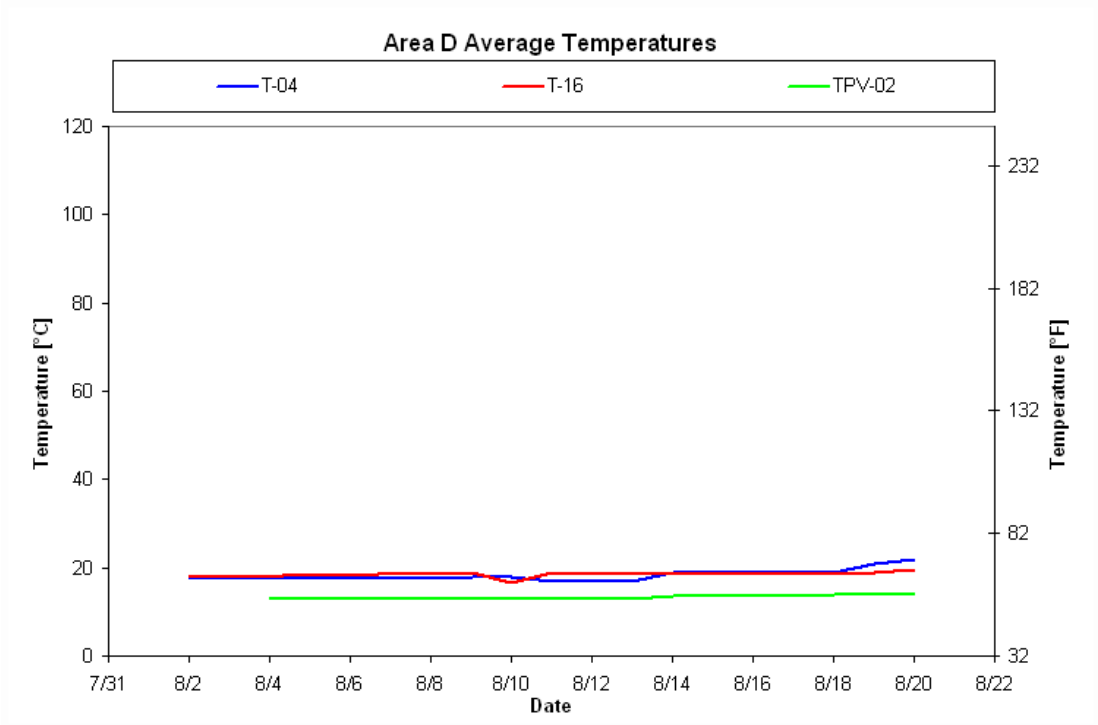


Figure 3. Average Temperature – Area D

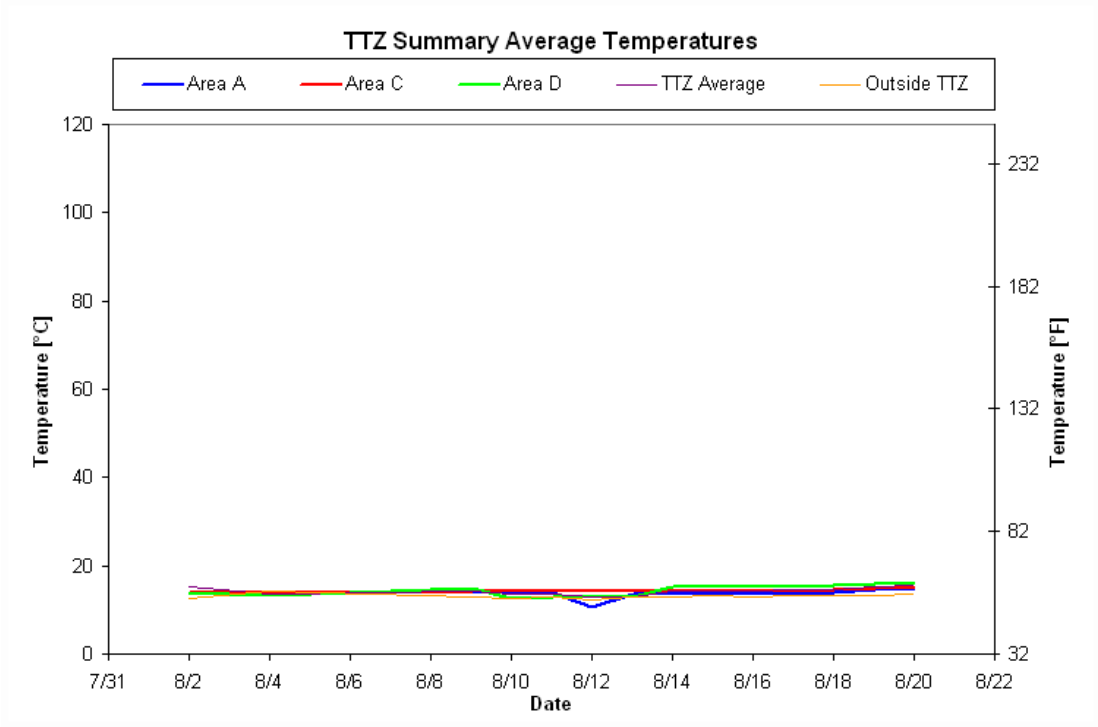


Figure 4. Average Temperature – Entire TTZ

4. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment.

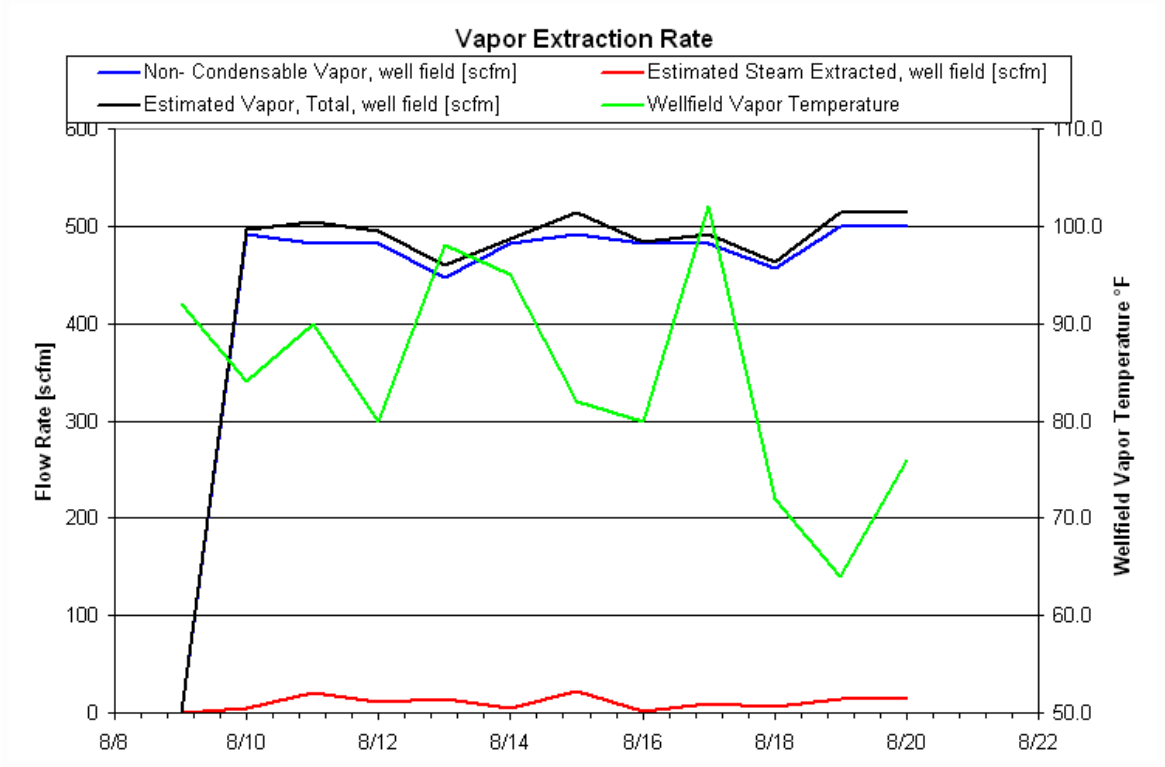


Figure 5. Vapor Extraction Rate and Temperature

5. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the Destruction and Removal Efficiency (DRE) of the treatment system. Note that PID readings of 0.0 ppmV are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of 0-values.

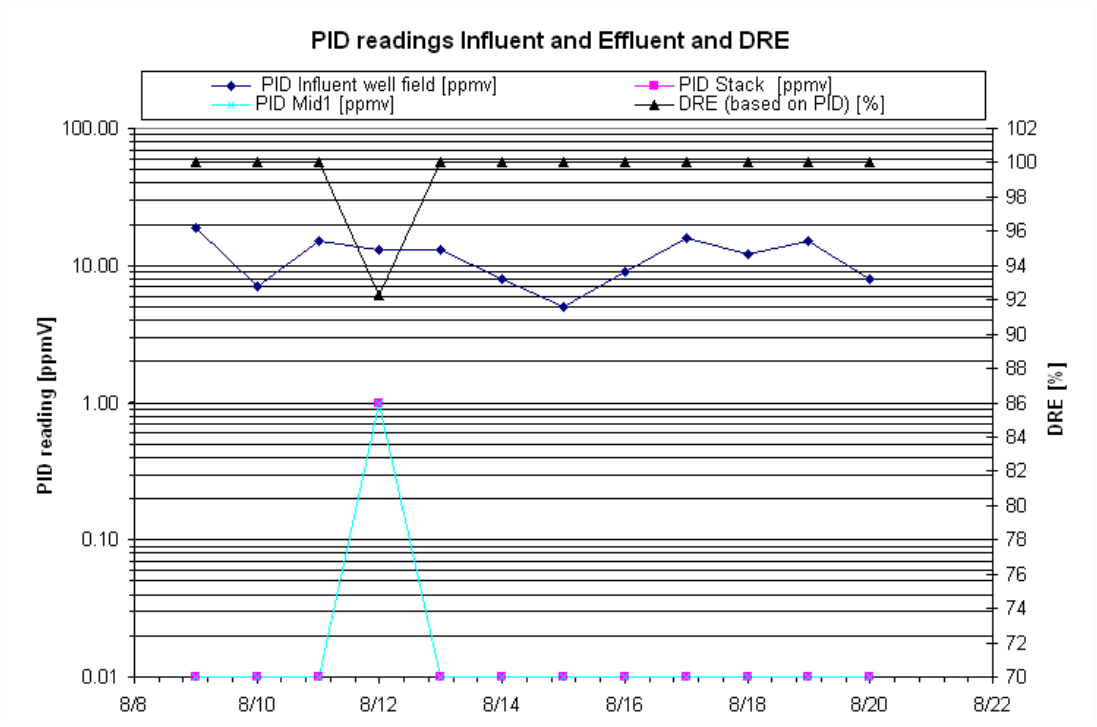


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

6. Mass Removal

The mass removal is calculated by adjusting the wellfield PID reading based on the correction factors for each major COC identified in the most recent lab analysis.

Since no lab analyses have been received to date, it has been assumed that all COCs extracted are TCE.

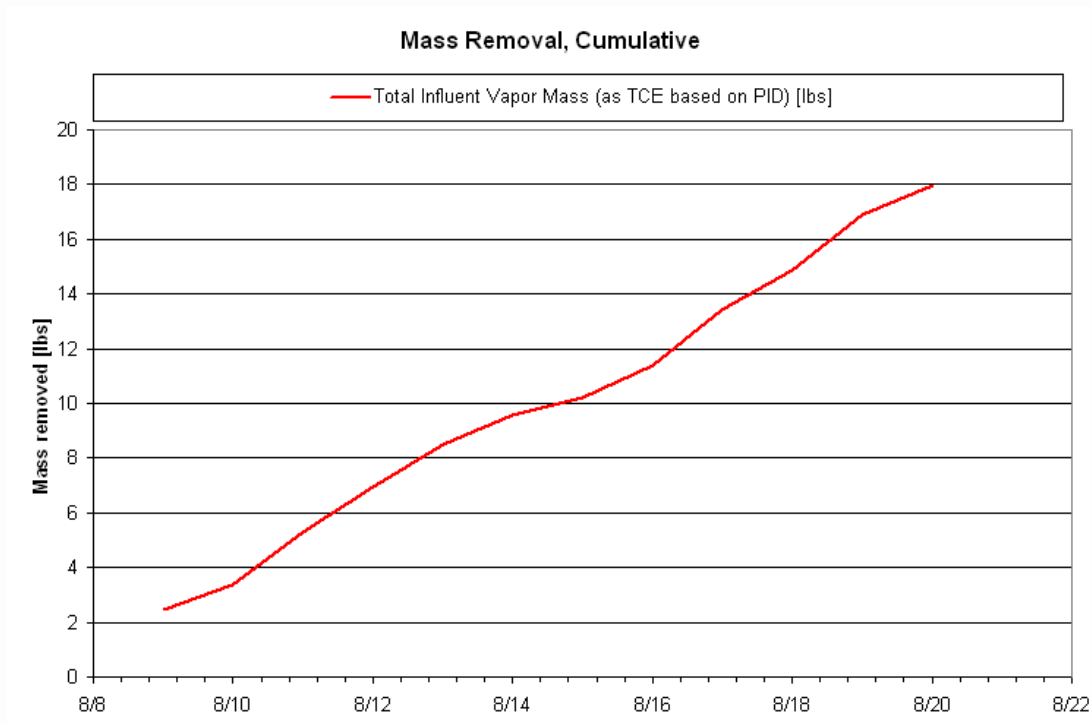


Figure 7. Mass Removal

7. PID Wellfield Vapor Monitoring

A second round of PID readings was collected from 16 vapor extraction wells at the site on 8/17/10. The table below presents the results from the baseline sampling event and the second sampling event (ppmV).

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/2010	8/17/2010
VEW 1	*5.1*	*5*
VEW 2	*4.5*	*8*
VEW 3	*1.1*	*8*
VEW 4	*4.1*	*6*
VEW 5	*7.9*	
VEW 6	*2.9*	
VEW 7	*3.5*	
VEW 8	*10.8*	
VEW 9	*14.2*	*0*
VEW 10	*2.3*	
VEW 11	*5.4*	
VEW 12	*4.6*	
VEW 13	*3.1*	
VEW 14	*1.3*	
VEW 15	*6.2*	*10*
VEW 16	*4.0*	*6*
VEW 17	*15.9*	*16*
VEW 18	*10.3*	*8*
VEW 19	*1.6*	*5*
VEW 20	*4.5*	
VEW 21	*11.1*	*5*
VEW 22	*8.4*	
VEW 23	*0.6*	*7*
VEW 24	*4.6*	*5*
VEW 25	*1.9*	
VEW 26	*7.1*	*5*
VEW 27	*8.1*	*7*
VEW 28	*10.7*	*6*
VEW 29	10.3	

8. Water Level

The figure below presents a water level contour map for the site.

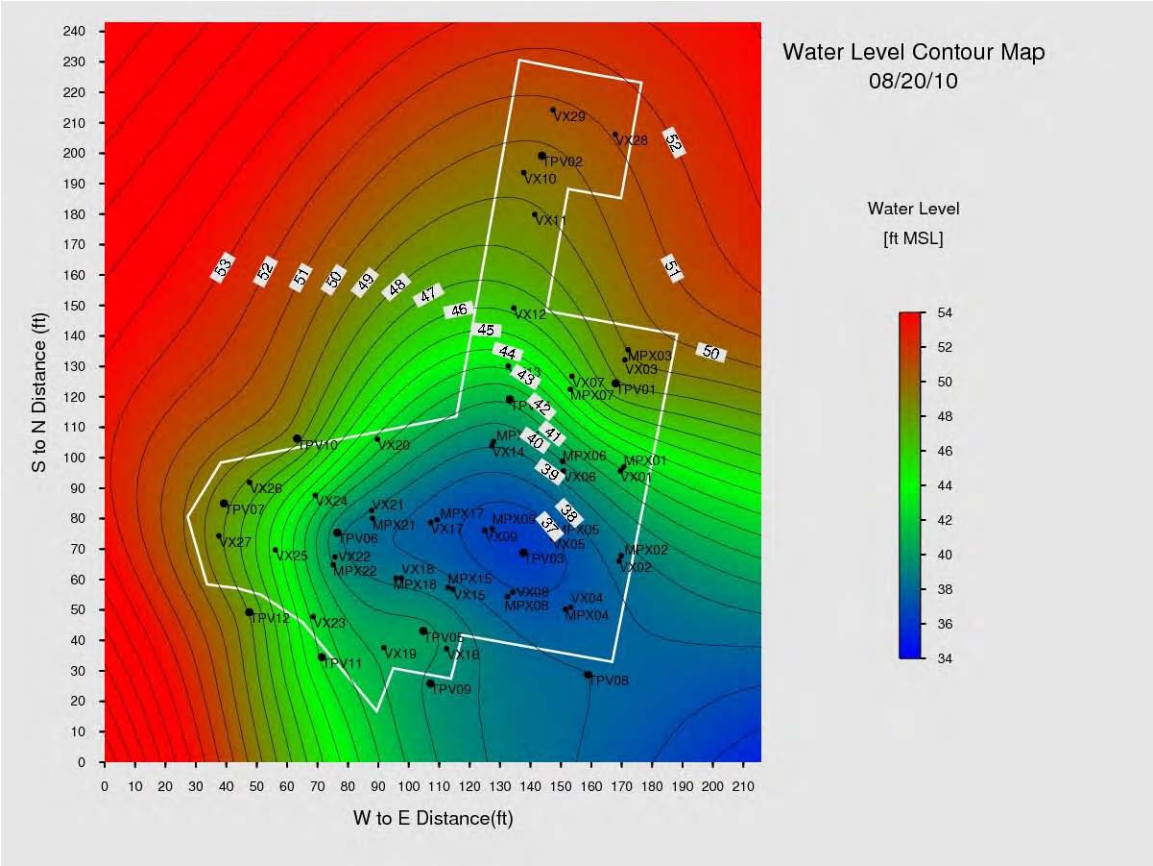


Figure 8. Water Level Contour Map

9. Vacuum Contour

The figure below presents a vacuum contour map for the site.

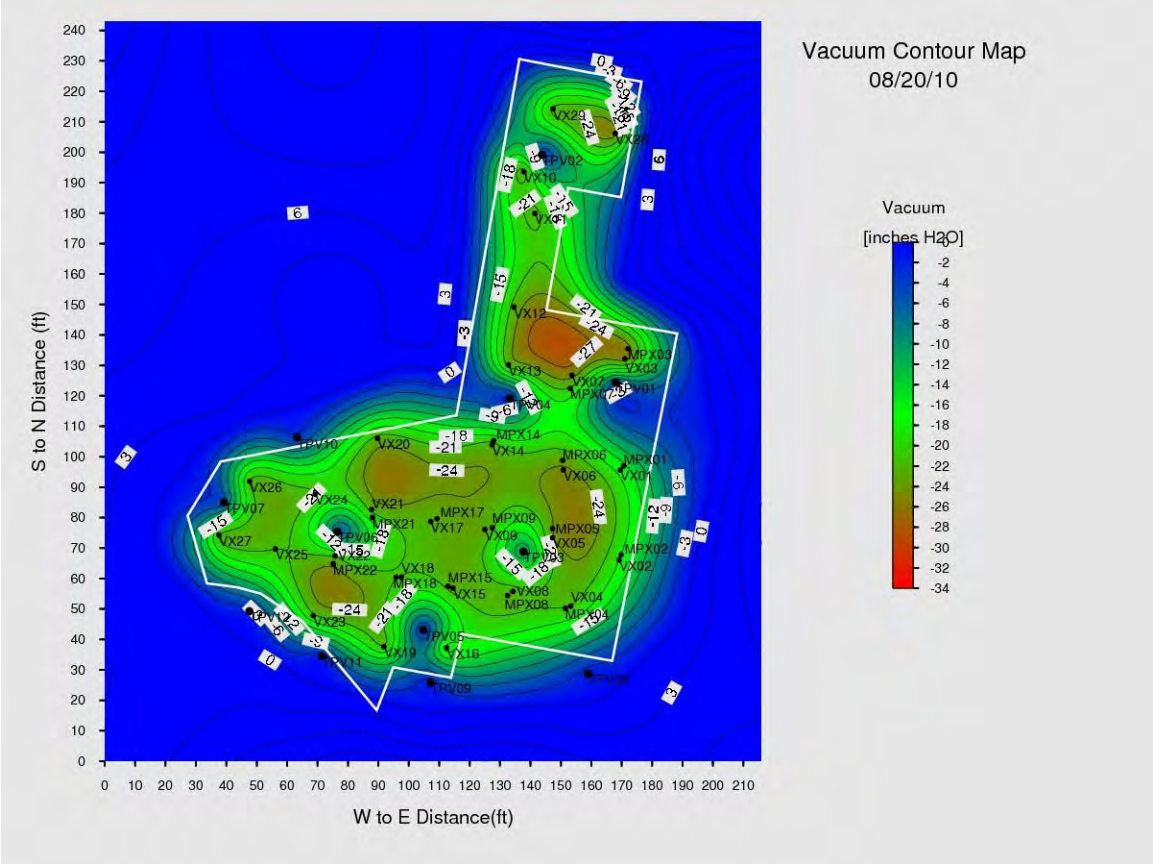


Figure 9. Vacuum Contour Map

10. Water Balance

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site.

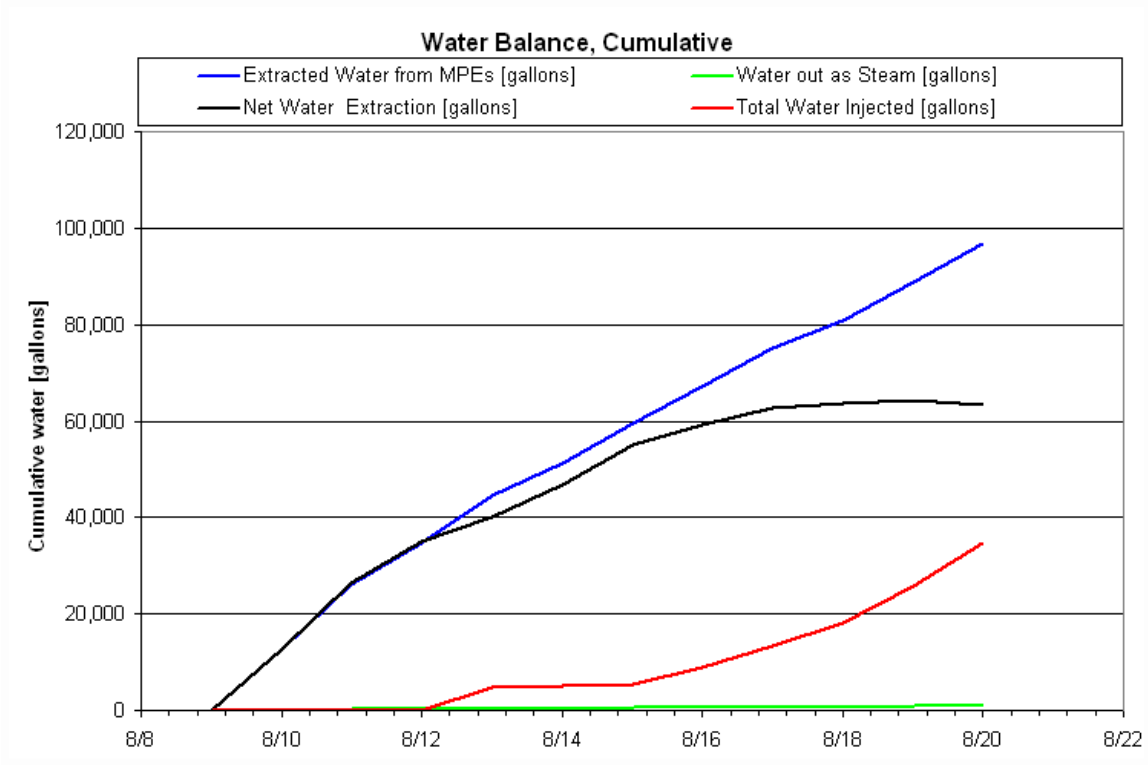


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

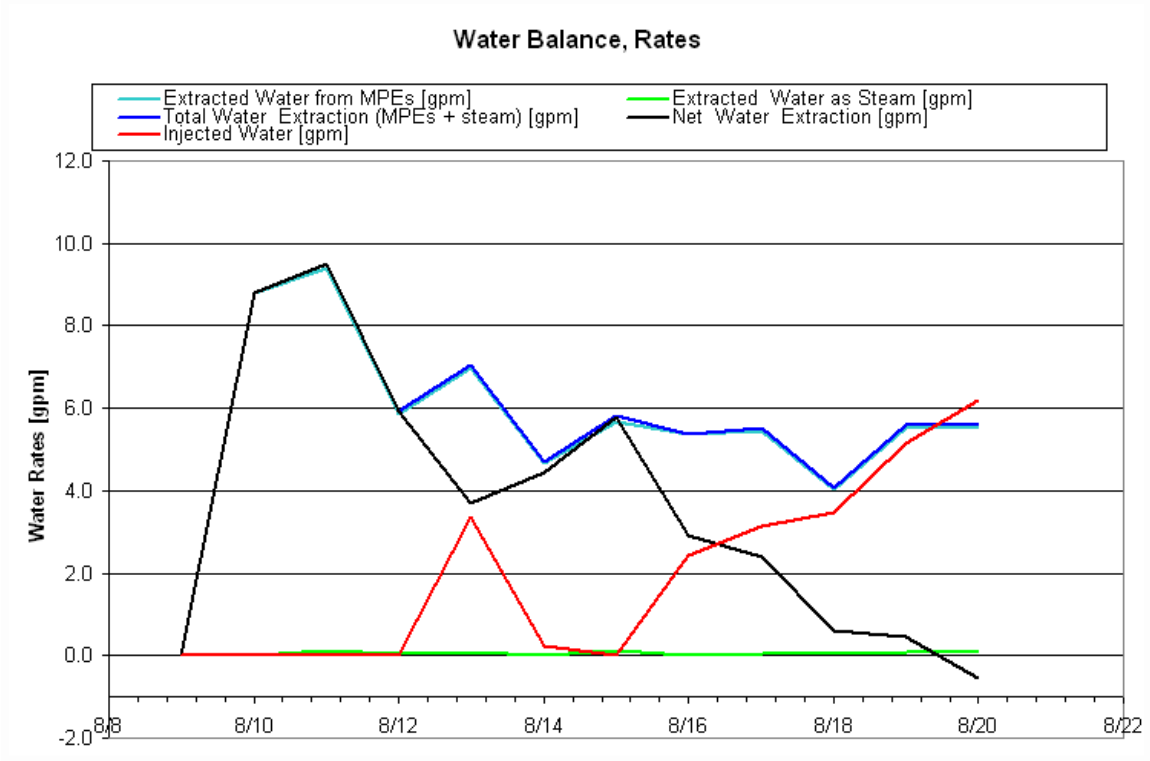


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

11. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

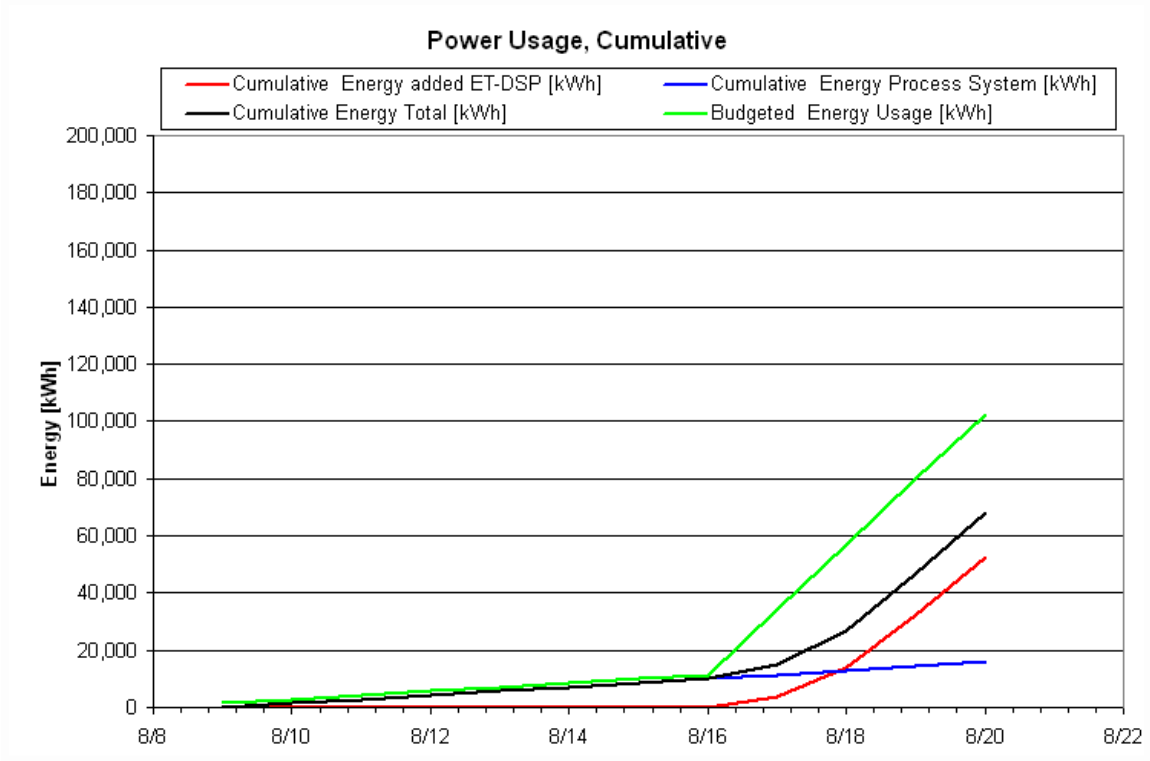


Figure 12. Cumulative Power Usage

12. Discussion

Optimization:

In order to enhance soil conductivity at the Groveland Wells Superfund site, saline was added to the bag filters within the Water Circulation units and then injected into shallow electrodes that showed below 5kW currents. This system optimization was made to address the apparent low conductivity of the water from the Groundwater Treatment Plant that is being used to inject to the electrodes. Introducing saline to the injection water increases the concentration of ions present in the water, which increases the ability of the water to pass current.

On August 19th, a total of 80 lbs of water conditioning salt was injected into the treatment zone at the Grovleand Wells Superfund site through targeted electrodes in order to increase the conductivity of the soil. WCS01 and WCS02 each received 40 lbs of saline.

Incidents:

No safety or environmental compliance issues were identified at the site this week.

Performance Goal Attainment Issues or Concerns:

No issues or concerns related to attainment of performance goals.

Progress Report

Period 8/21/2010 through 8/27/2010
August 30, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

TERRATHERM
Think Thermal

McMILLAN-McGEE CORP

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from August 21 through August 27, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 8/27/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	134	
Projected total energy usage	3,049,000	kWh
Days of operation	10	days
Energy used to date	227,136	kWh
Injected energy per soil volume to date	11	kWh/cy
Water VOC mass removal last 7 days	0.0	lbs
Vapor VOC mass removal last 7 days	7	lbs
Volume of NAPL last 7 days	0.0	gal
Total VOC mass removal to date	22	lbs
Average temperature Area A last 7 days	66	°F
Average temperature Area C last 7 days	65	°F
Average temperature Area D last 7 days	66	°F
Average power usage last 7 days	1,053	kW
Average pumped water rate last 7 days	6.7	gpm
Average injected water rate last 7 days	6.5	gpm
Average vapor extraction rate (non condensable) last 7 days	490	scfm

System Shutdowns

The following table provides a breakdown of the system shutdowns occurring during the 8/21/10 through 8/27/10 operational period. As seen in Table 2 below, three water treatment system shutdowns occurred during the 8/21 through 8/22 period due to a low flow alarm on the first knock out vessel. TerraTherm's System Operator responded to

the system call out to restart the system. The electrode system was shutdown on 8/26 to allow for maintenance to be performed on two monitoring wells in the wellfield.

Table 2. System Shutdown Log

Date	System Shutdown Reason	Down Time	Up Time
8/21/2010	Water treatment system shutdown due to low flow alarm on the knock out	10:44	11:02
8/21-22/2010	Water treatment system shutdown due to low flow alarm on the knock out	22:56	2:00
8/22/2010	Water treatment system shutdown due to low flow alarm on the knock out	10:35	13:30
8/26/2010	Electrodes shutdown for TPV maintenance	11:00	15:00

System Maintenance

8/22/10: Totalizer 203 was opened and the inlet was found to be plugged with a broken rubber seal and the screen was also partly plugged. Rubber seal was removed, screen was cleaned and totalizer was put back into service.

8/26/10: The digiTAM sensor was replaced on TPV02. Additionally, the wiring was checked on TPV03.

Other normal system maintenance was performed.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

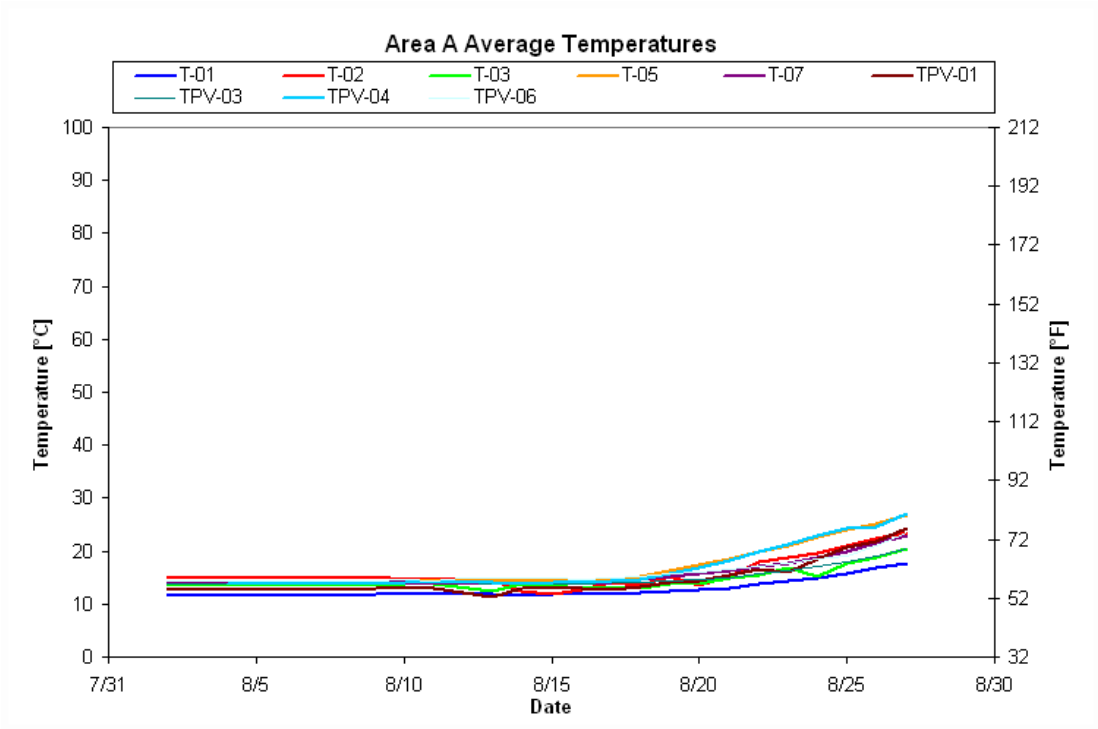


Figure 1. Average Temperature – Area A

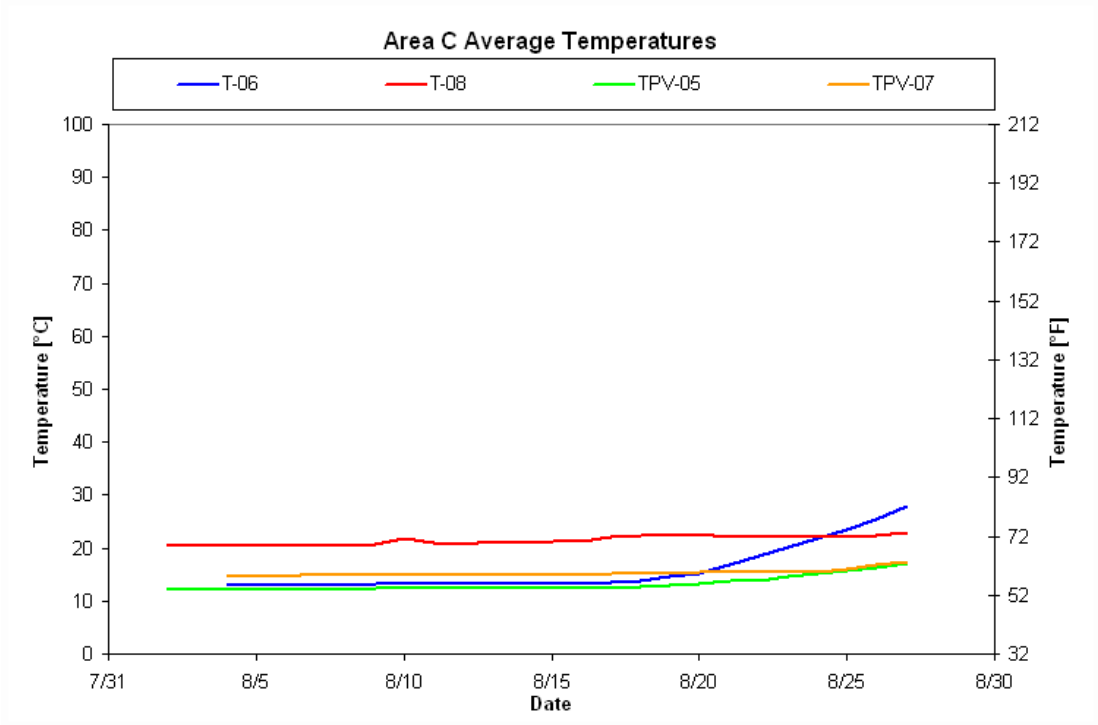


Figure 2. Average Temperature – Area C

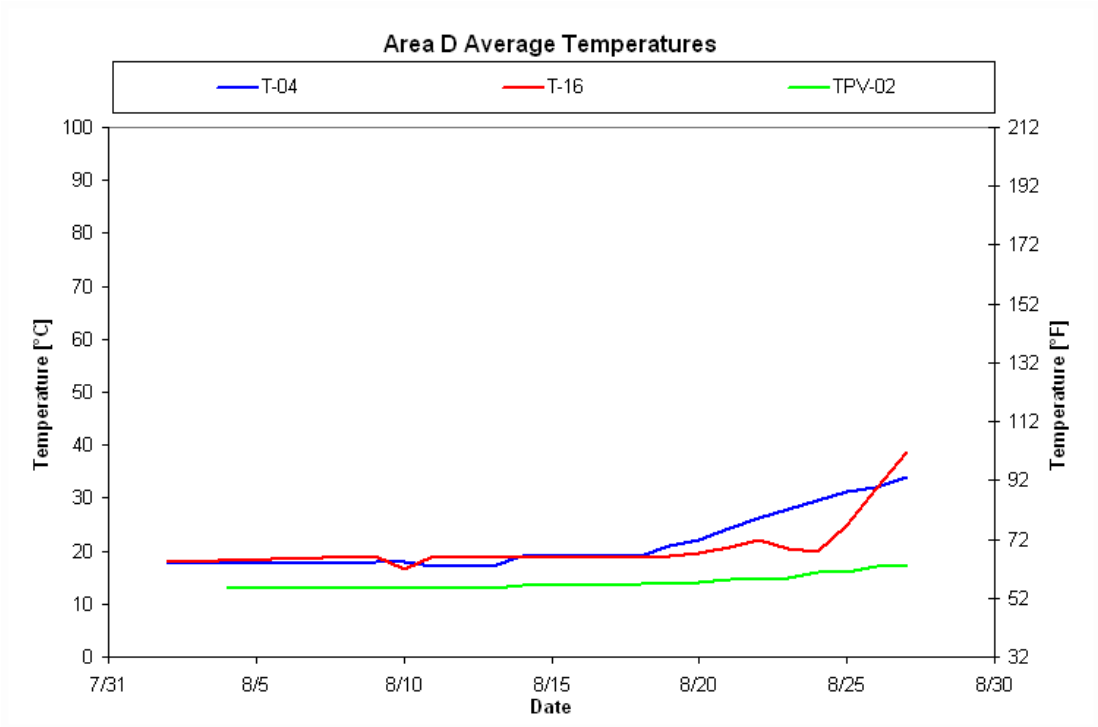


Figure 3. Average Temperature – Area D

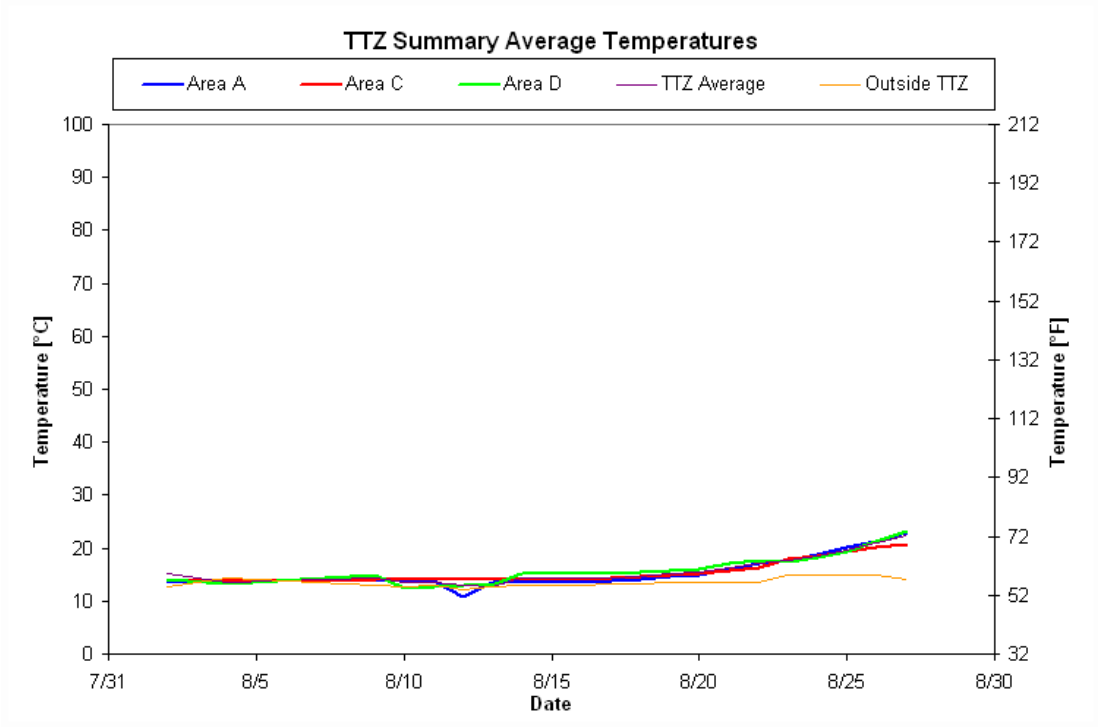


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment.

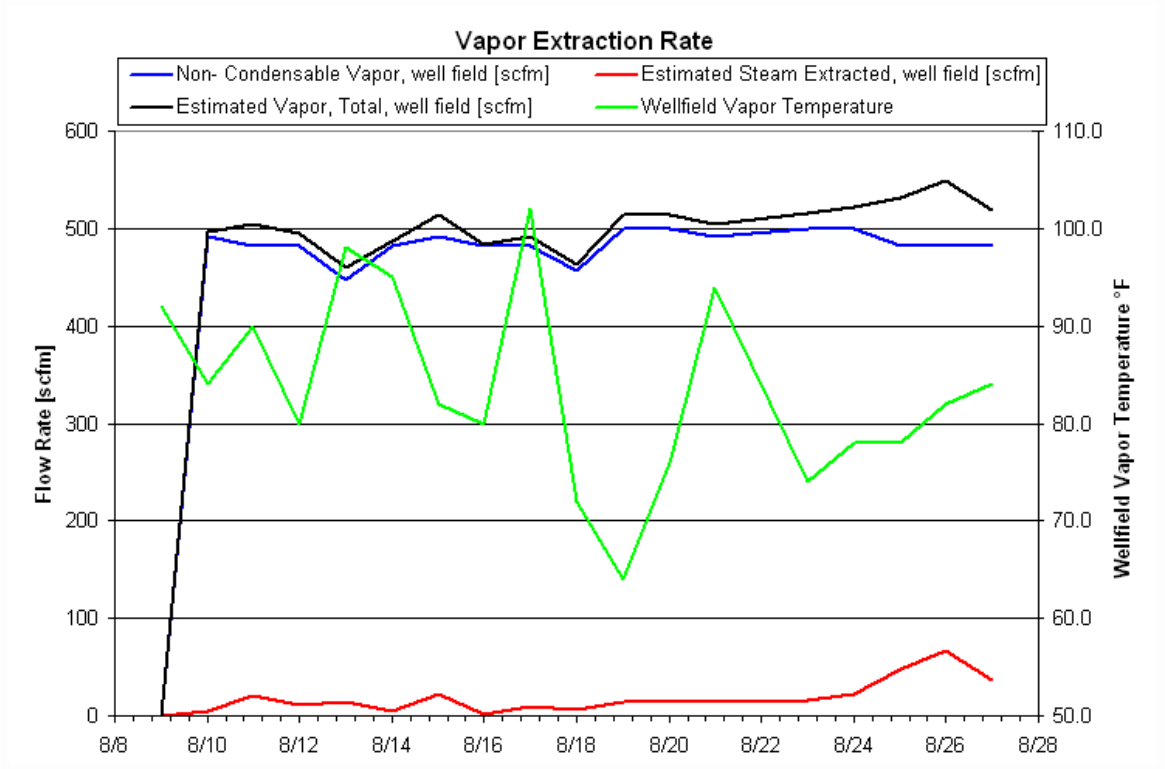


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent (*to be added to site-specific graph*) and effluent PID readings and the Destruction and Removal Efficiency (DRE) of the treatment system. Note that PID readings of 0.0 ppmV are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of 0-values.

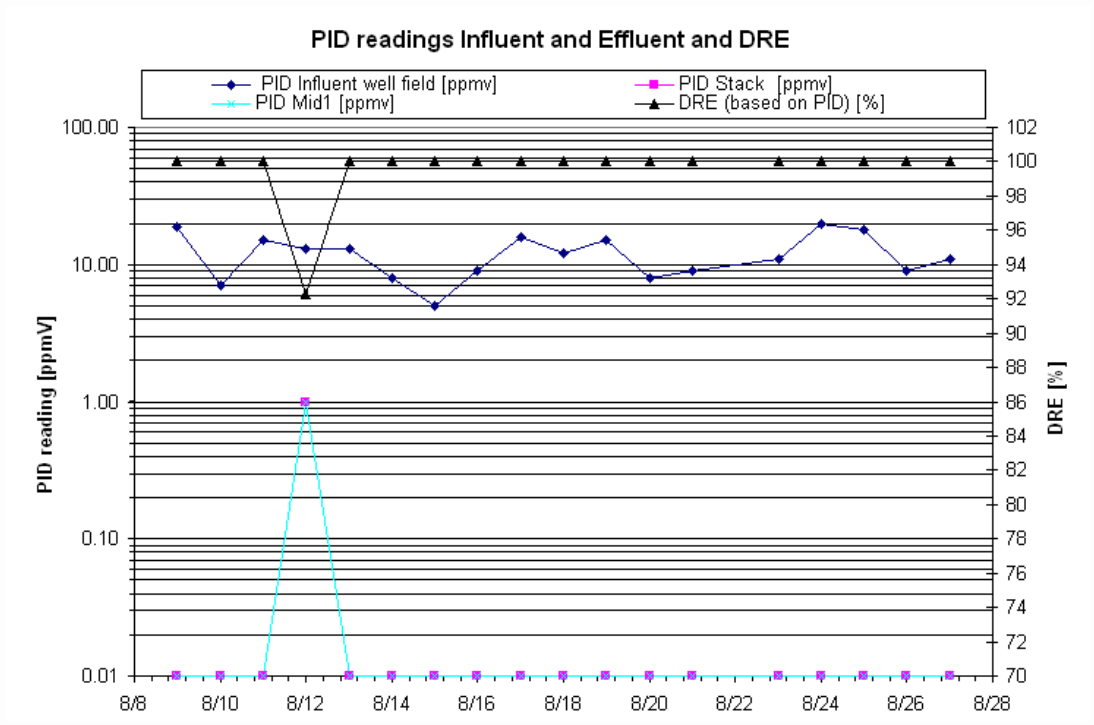


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Mass Removal

The mass removal is calculated by adjusting the wellfield PID reading based on the correction factors for each major COC identified in the most recent lab analysis.

Since no lab analyses have been received to date, it has been assumed that all COCs extracted are TCE.

A correction was made to the molecular weight that was used for the mass removal calculation in TerraTherm Progress Report for the period 8/14/2010 through 8/20/2010. The revised mass removal calculation is shown in Figure 7 below.

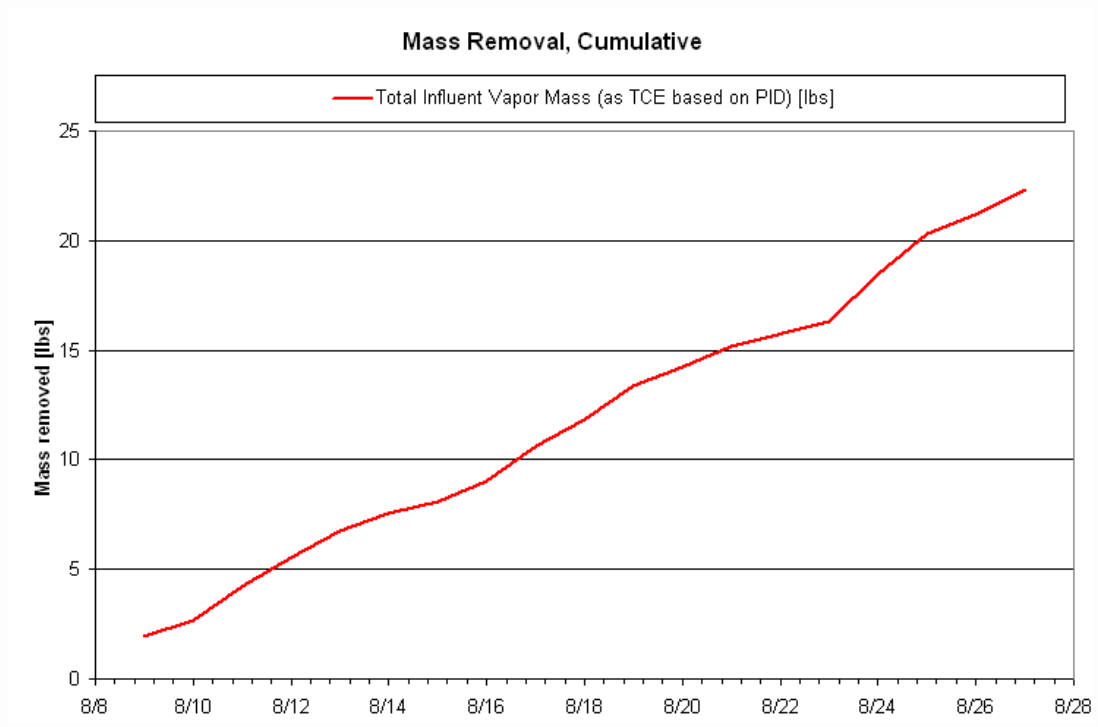


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A third round of PID readings was collected from 16 vapor extraction wells at the site on 8/25/10. The table below presents the results from the baseline sampling event and the second sampling event (ppmV).

Table 3. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/2010	8/17/2010	8/25/2010
VEW 1	*5.1*	*5*	*6.4*
VEW 2	*4.5*	*8*	*6.5*
VEW 3	*1.1*	*8*	*2.1*
VEW 4	*4.1*	*6*	*5.2*
VEW 5	*7.9*		
VEW 6	*2.9*		
VEW 7	*3.5*		
VEW 8	*10.8*		
VEW 9	*14.2*	*0*	*4.5*
VEW 10	*2.3*		
VEW 11	*5.4*		
VEW 12	*4.6*		
VEW 13	*3.1*		
VEW 14	*1.3*		
VEW 15	*6.2*	*10*	*6.8*
VEW 16	*4.0*	*6*	*5.9*
VEW 17	*15.9*	*16*	*8.4*
VEW 18	*10.3*	*8*	*5.8*
VEW 19	*1.6*	*5*	*4.8*
VEW 20	*4.5*		
VEW 21	*11.1*	*5*	*3.8*
VEW 22	*8.4*		
VEW 23	*0.6*	*7*	*7.3*
VEW 24	*4.6*	*5*	*5.4*
VEW 25	*1.9*		
VEW 26	*7.1*	*5*	*4.4*
VEW 27	*8.1*	*7*	*4.5*
VEW 28	*10.7*	*6*	*3.3*
VEW 29	10.3		

7. Water Level

The figure below presents a water level contour map for the site.

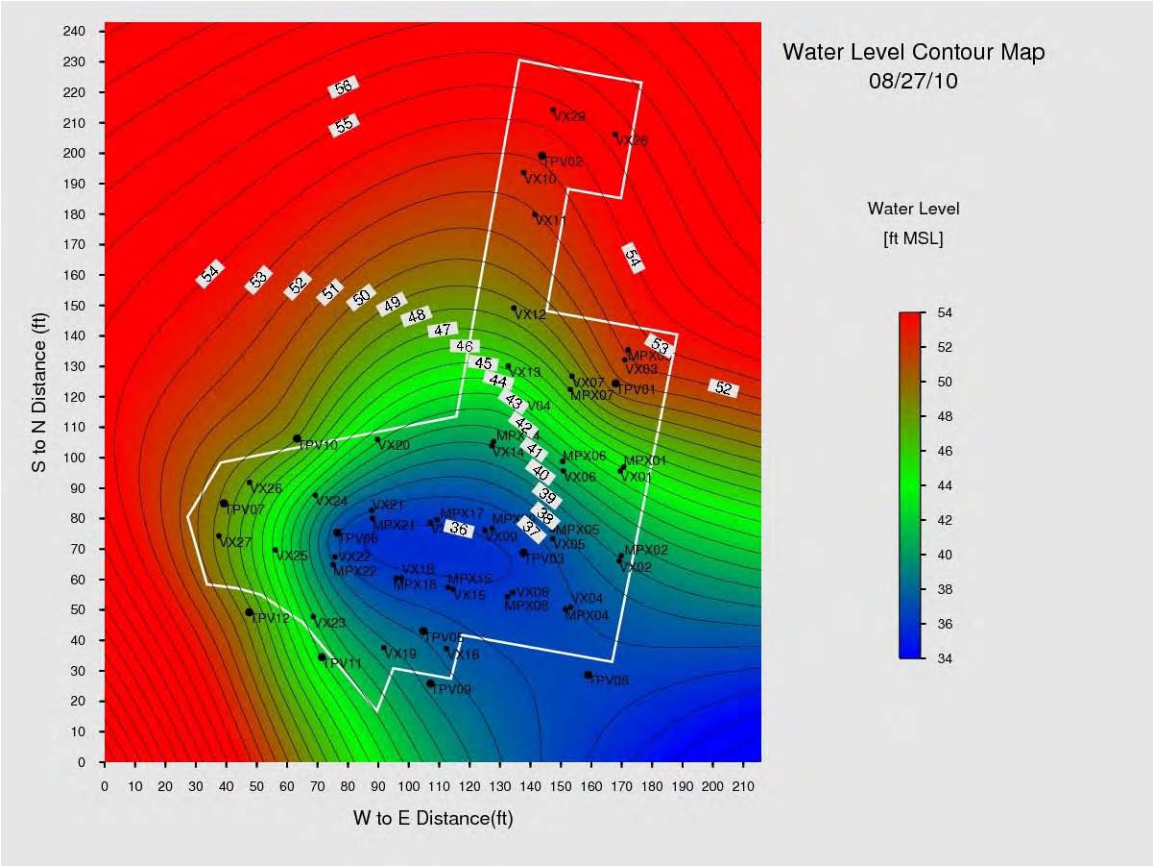


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

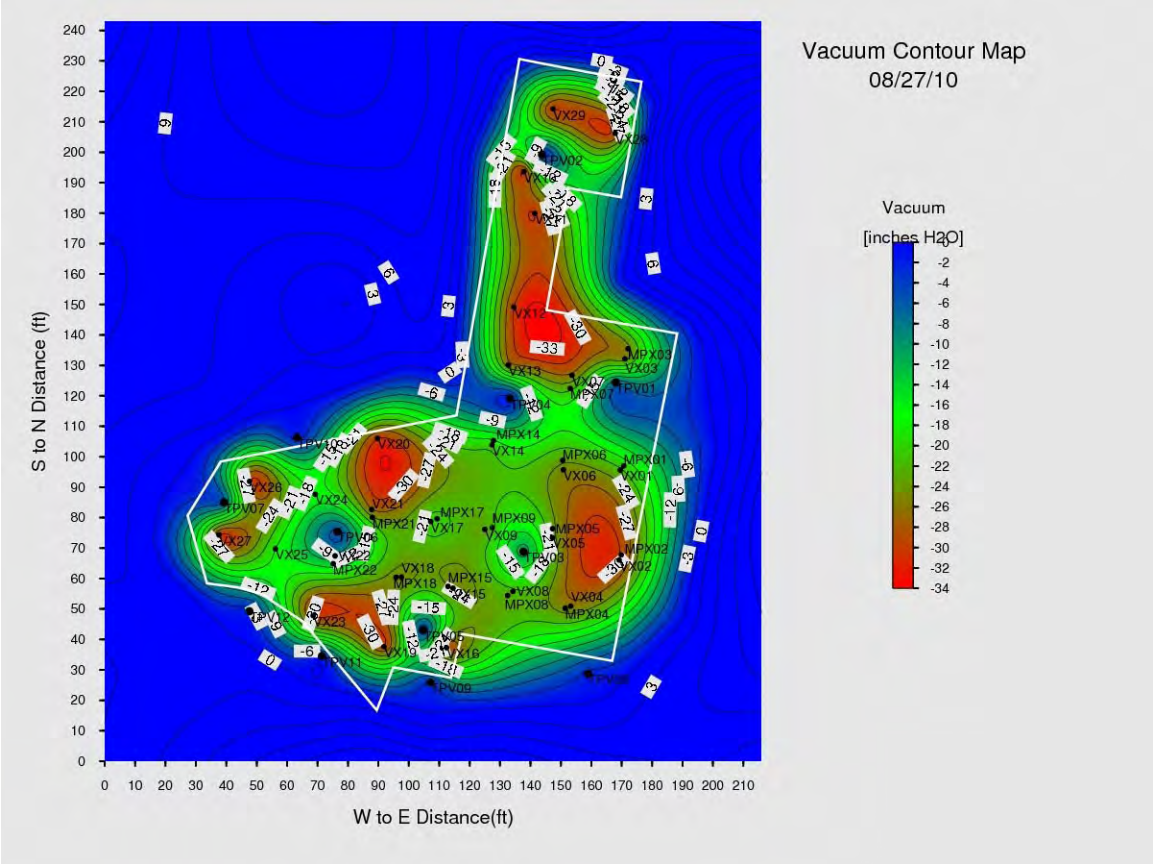


Figure 9. Vacuum Contour Map

9. Water Balance

To facilitate the initial operation of the electrodes, targeted water injection has been used to increase the resistivity of the soil around primarily shallow electrodes in the treatment zone. Since heating system startup, we have had periods of increased water injection (up to an 8.4 gpm average on 8/27/10 as seen in Figure 11 below). Site hydraulic control has been maintained as we have injected a total of 90,746 gallons of water since system startup while extracting a total of 159,865 gallons of water for a net water extraction of 69,119 gallons as of 8/27/10 (as seen in Figure 10 below). While a net extraction is being maintained at the site, there may be some periods (e.g., a day) where the incremental injection rate is higher than the incremental extraction rate to promote electrode firing during system ramp up.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

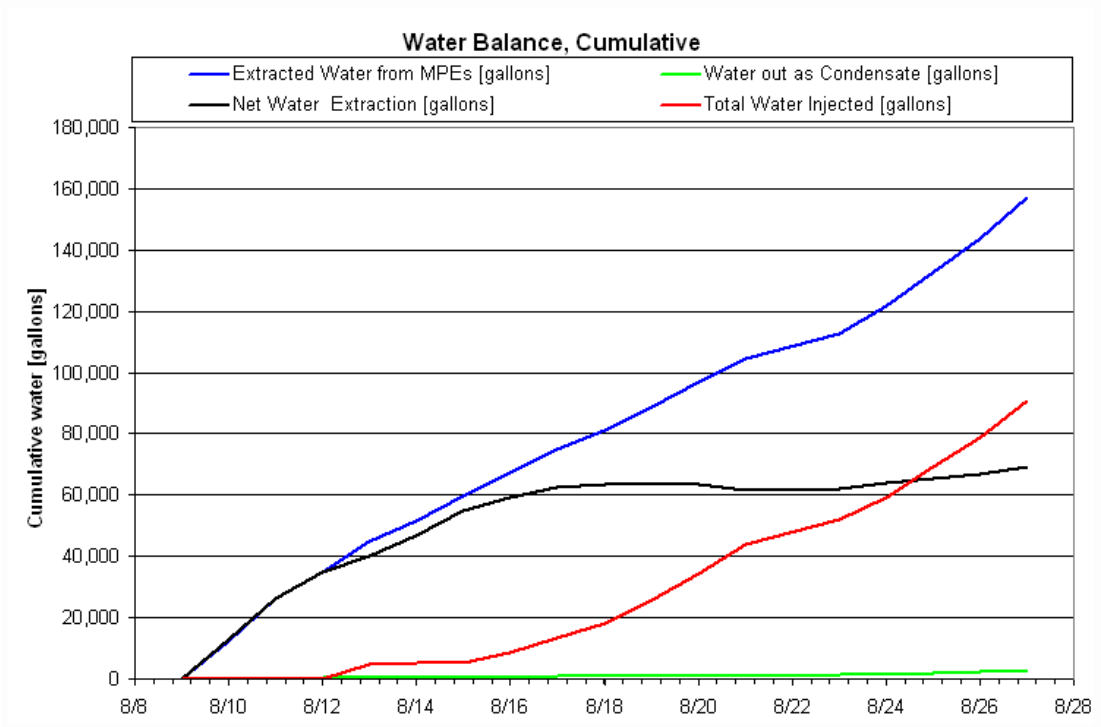


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Extracted to Date

The rates of extracted groundwater from the MPE wells, the condensate collected, the net water extracted and the total water injected to the site is shown in the figure below.

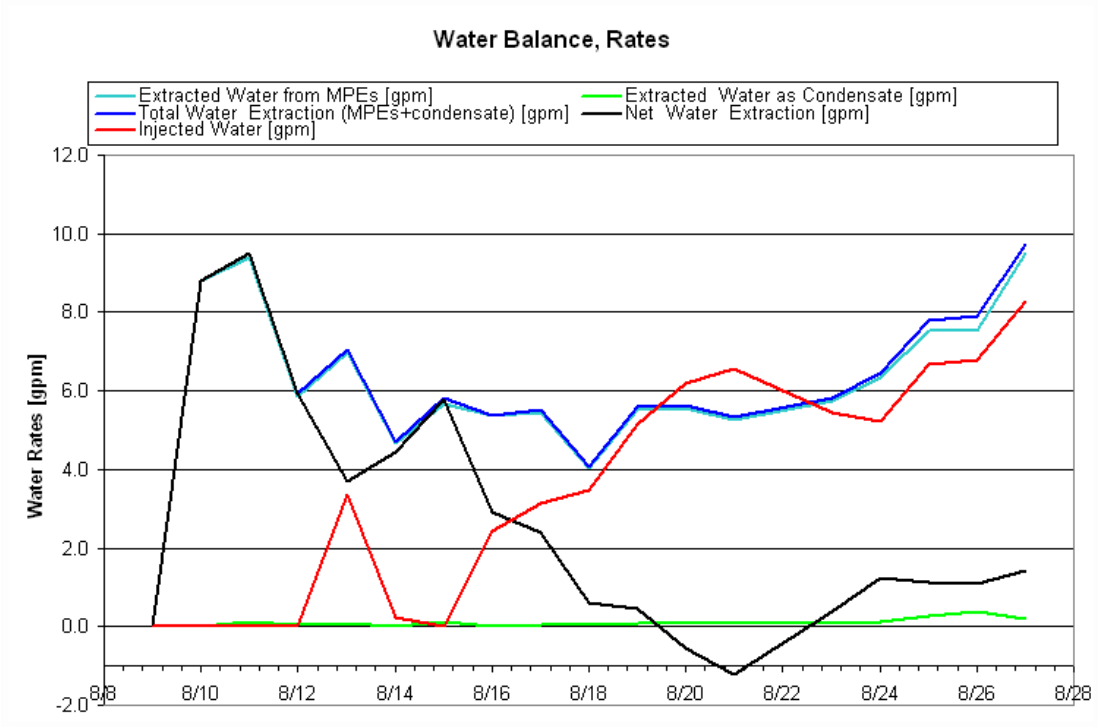


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

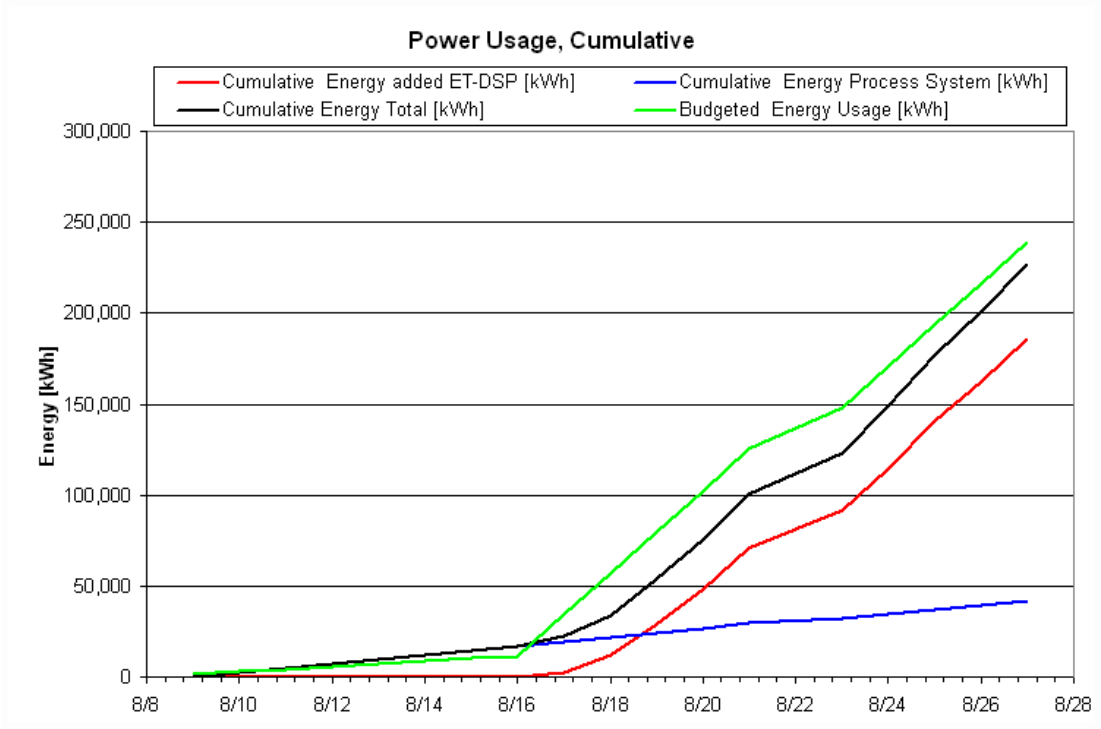


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Saline Addition
In order to enhance soil conductivity at the Groveland Wells Superfund site, saline continued to be added to the bag filters within the Water Circulation units and then injected into shallow electrodes that showed below 5kW currents.

On August 21st, 23rd, 24th, 26th, and 27th, a daily total of 80 lbs of water conditioning salt was injected into the treatment zone through targeted electrodes in order to increase the conductivity of the soil.

Incidents:

No safety or environmental compliance issues were identified at the site this week.

Performance Goal Attainment Issues or Concerns:

No issues or concerns related to attainment of performance goals.

Progress Report

Period 8/28/2010 through 9/3/2010
September 7, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from August 28 through September 3, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 9/3/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	134	
Projected total energy usage	3,049,000	kWh
Days of operation	17	days
Energy used to date	399,536	kWh
Injected energy per soil volume to date	21	kWh/cy
Water VOC mass removal last 7 days	0.0	lbs
Vapor VOC mass removal last 7 days	5	lbs
Volume of NAPL last 7 days	0.0	gal
Total VOC mass removal to date	27	lbs
Average temperature Area A last 7 days	87	°F
Average temperature Area C last 7 days	82	°F
Average temperature Area D last 7 days	85	°F
Average power usage last 7 days	1,180	kW
Average pumped water rate last 7 days	9.7	gpm
Average injected water rate last 7 days	8.2	gpm
Average vapor extraction rate (non condensable) last 7 days	466	scfm

System Shutdowns

The following table provides a breakdown of the system shutdowns occurring during the 8/28/10 through 9/3/10 operational period. As seen in Table 2 below, two process treatment system shutdowns occurred on 8/31/10 for process treatment programming downloads. Additionally, the electrodes were shutdown on 9/1/10 for the groundwater sampling event.

Date	System Shutdown Reason	Down Time	Up Time
8/31/2010	Program Downloads for Process Equipment - Shut Down Process Equip. Only	10:00	10:10
8/31/2010	Program Downloads for Process Equipment - Shut Down Process Equip. Only	11:40	11:50
9/1/2010	Electrodes Shut Down for Groundwater Sampling	8:00	16:30

System Maintenance

9/1/10: Check valves were added to (8) multi-phase extraction wells to eliminate back pressure.

Other normal system maintenance was performed.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

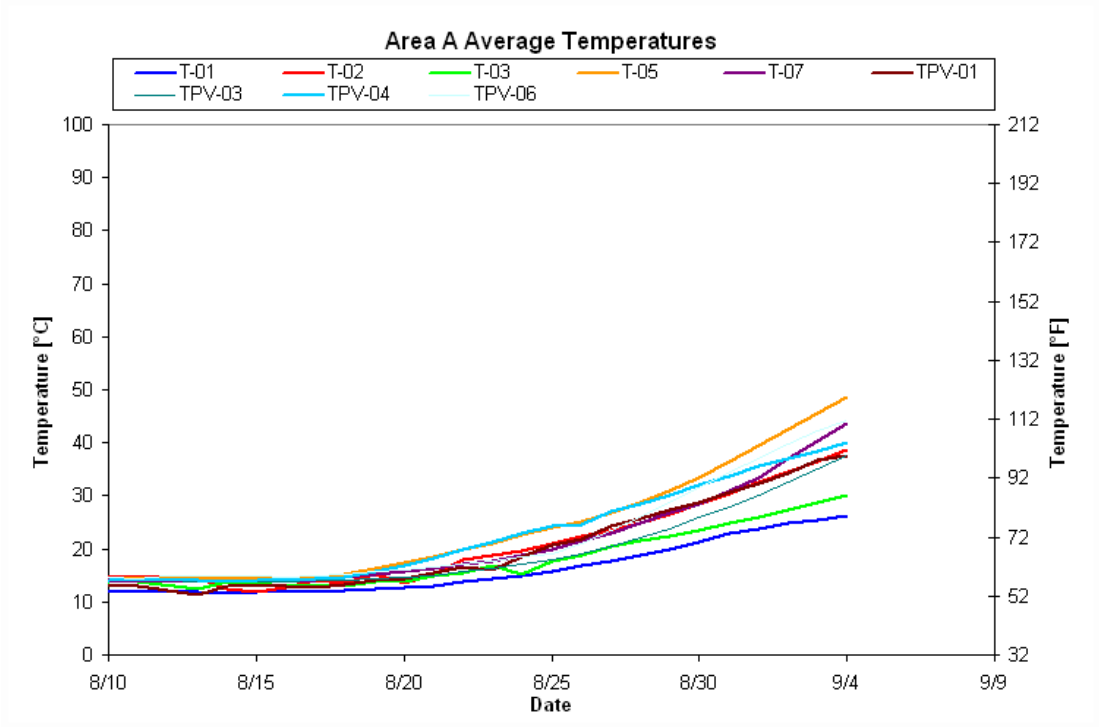


Figure 1. Average Temperature – Area A

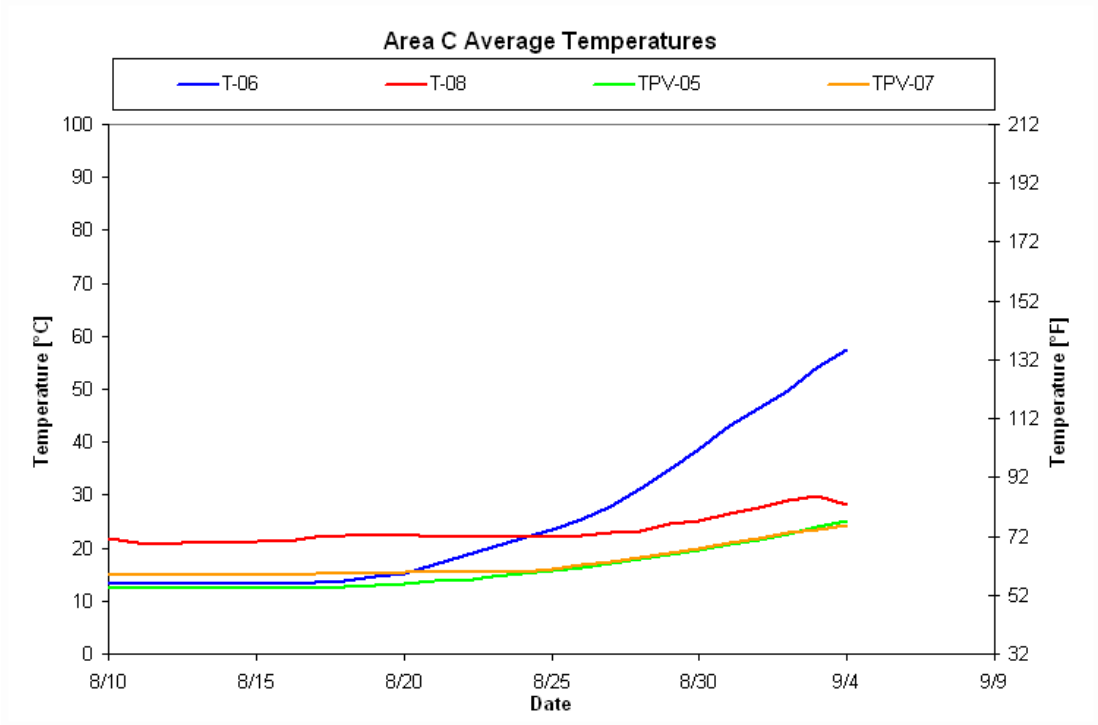


Figure 2. Average Temperature – Area C

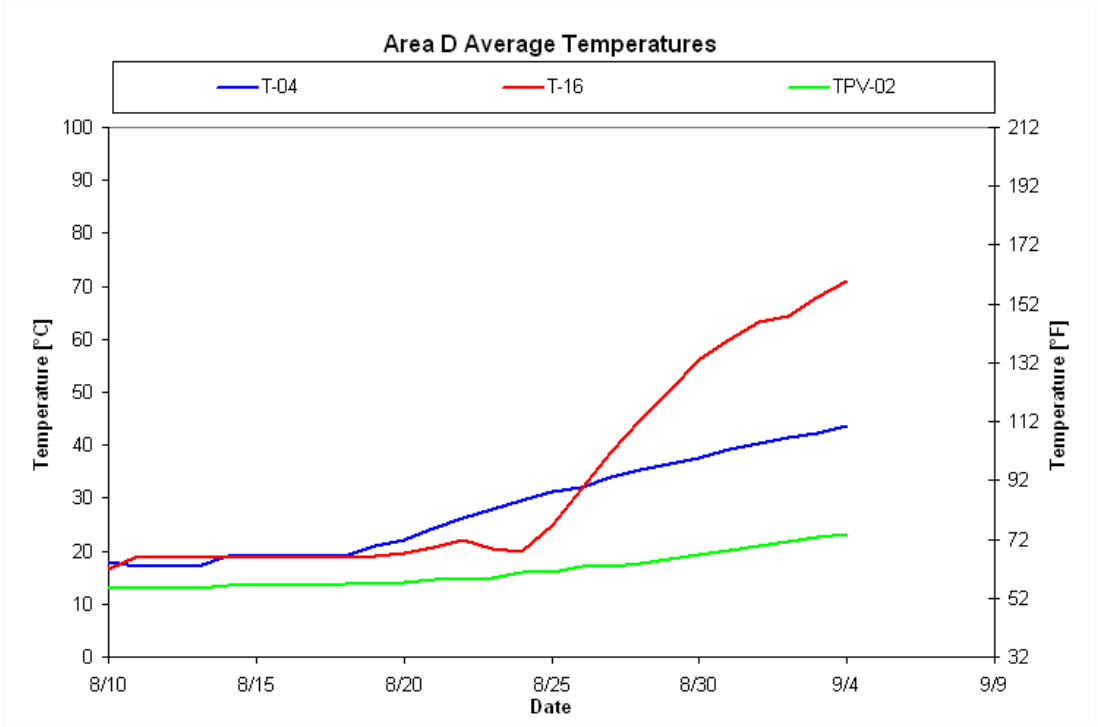


Figure 3. Average Temperature – Area D

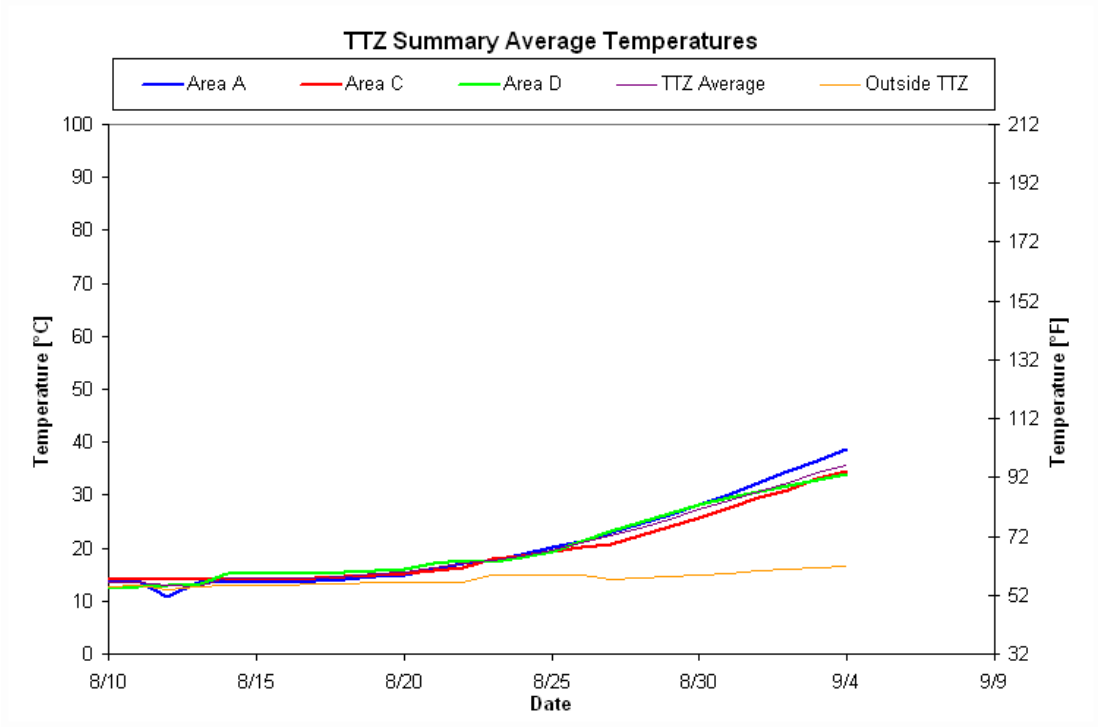


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment.

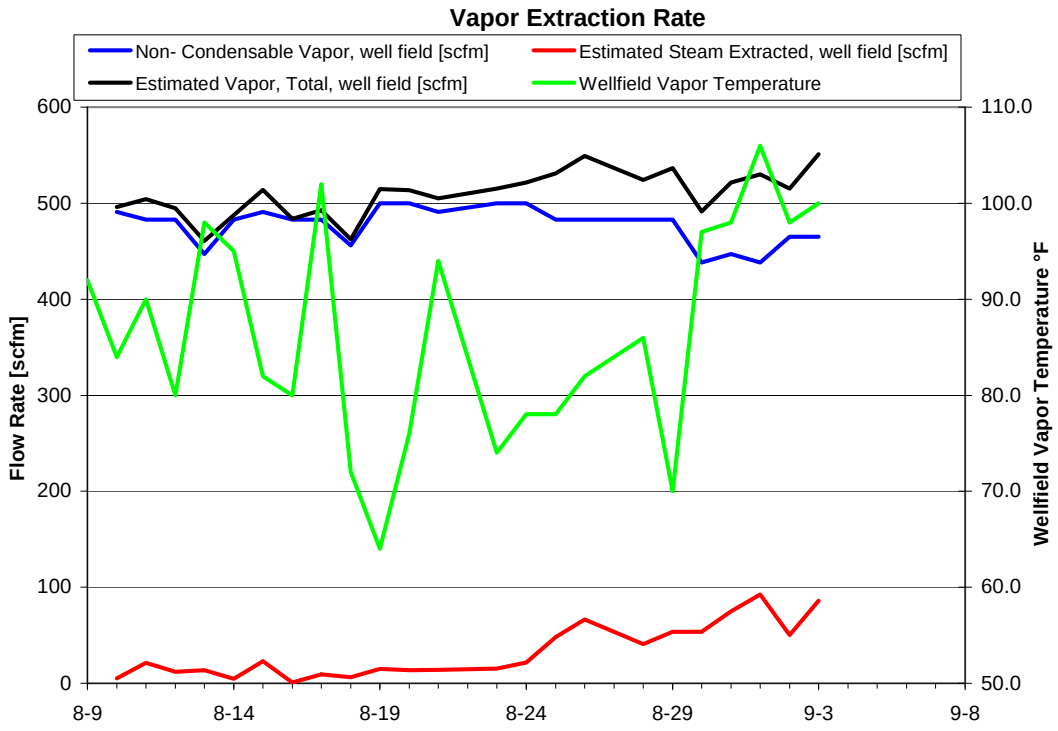


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the Destruction and Removal Efficiency (DRE) of the treatment system. Note that PID readings of 0.0 ppmV are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of 0-values.

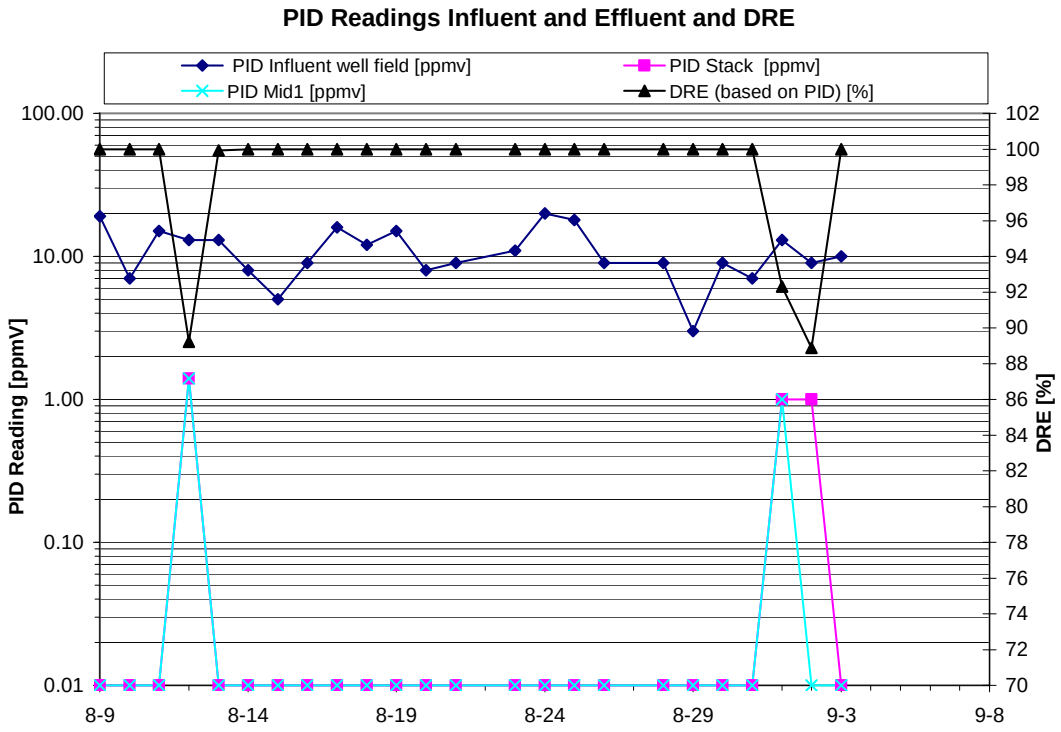


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Mass Removal

The mass removal is calculated by adjusting the wellfield PID reading based on the correction factors for each major COC identified in the most recent lab analysis.

Since no lab analyses have been received to date, it has been assumed that all COCs extracted are TCE.

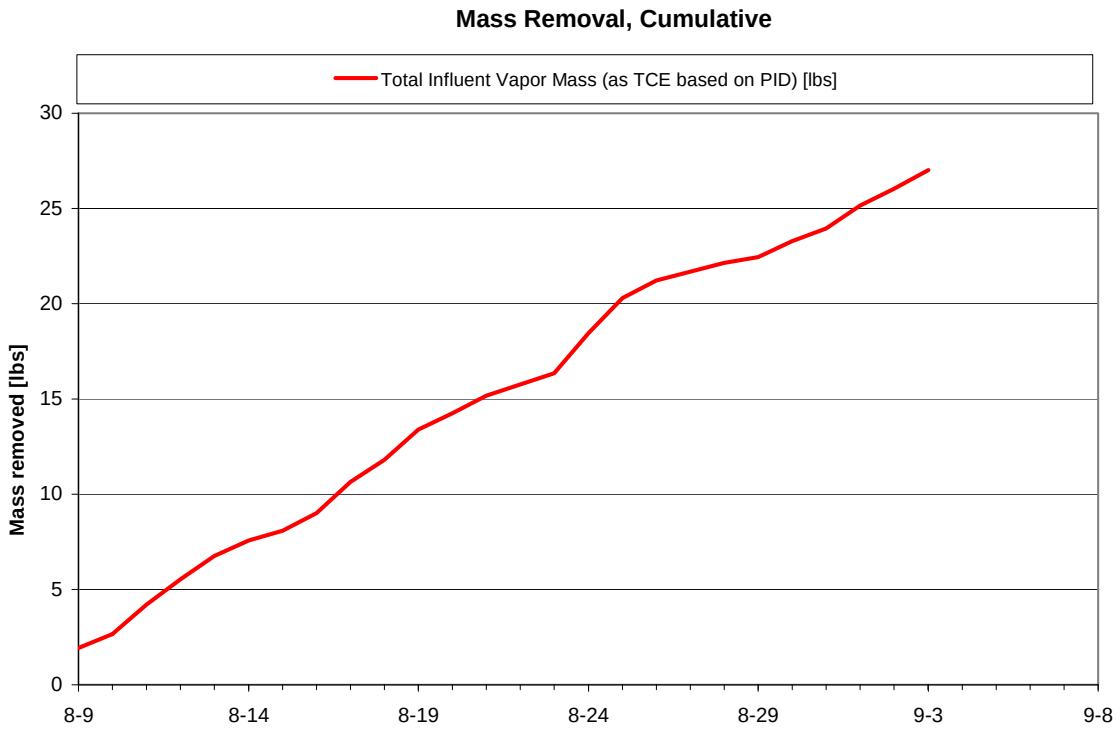


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A fourth round of PID readings was collected from 16 vapor extraction wells at the site on 9/1/10. The table below presents the results from the three previous sampling events (ppmV).

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/2010	8/17/2010	8/25/2010	9/1/2010
VEW 1	*5.1*	*5*	*6.4*	*6*
VEW 2	*4.5*	*8*	*6.5*	*5*
VEW 3	*1.1*	*8*	*2.1*	*7*
VEW 4	*4.1*	*6*	*5.2*	*6*
VEW 5	*7.9*			
VEW 6	*2.9*			
VEW 7	*3.5*			
VEW 8	*10.8*			
VEW 9	*14.2*	*0*	*4.5*	*22*
VEW 10	*2.3*			
VEW 11	*5.4*			
VEW 12	*4.6*			
VEW 13	*3.1*			
VEW 14	*1.3*			
VEW 15	*6.2*	*10*	*6.8*	*26*
VEW 16	*4.0*	*6*	*5.9*	*5*
VEW 17	*15.9*	*16*	*8.4*	*101*
VEW 18	*10.3*	*8*	*5.8*	*51*
VEW 19	*1.6*	*5*	*4.8*	*6*
VEW 20	*4.5*			
VEW 21	*11.1*	*5*	*3.8*	*42*
VEW 22	*8.4*			
VEW 23	*0.6*	*7*	*7.3*	*15*
VEW 24	*4.6*	*5*	*5.4*	*15*
VEW 25	*1.9*			
VEW 26	*7.1*	*5*	*4.4*	*5*
VEW 27	*8.1*	*7*	*4.5*	*2*
VEW 28	*10.7*	*6*	*3.3*	*6*
VEW 29	10.3			

7. Water Level

The figure below presents a water level contour map for the site.

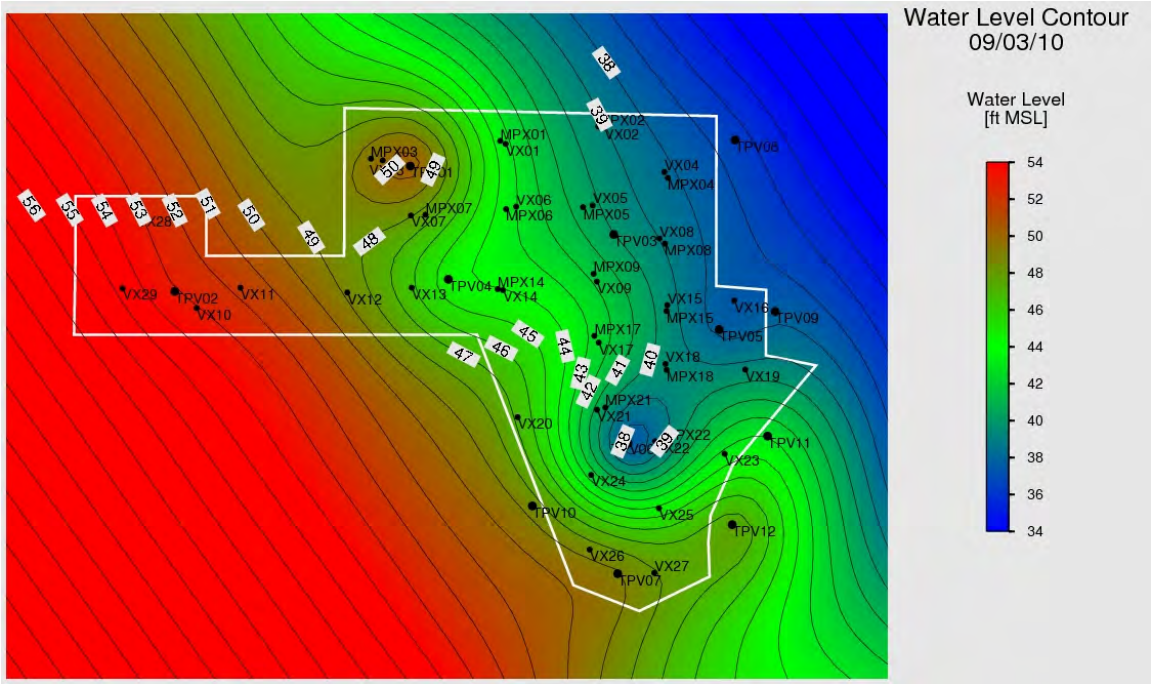


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

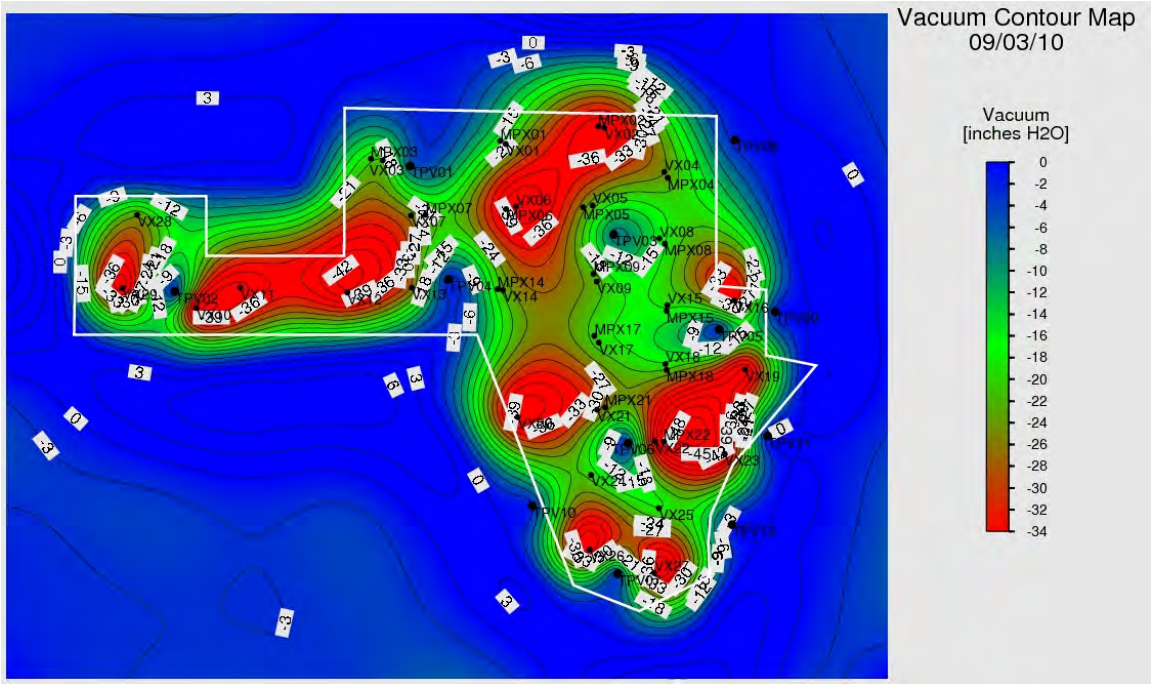


Figure 9. Vacuum Contour Map

9. Water Balance

To facilitate the initial operation of the electrodes, targeted water injection has been used to increase the resistivity of the soil around primarily shallow electrodes in the treatment zone. Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 161,770 gallons of water since system startup while extracting a total of 247,250 gallons of water for a net water extraction of 85,480 gallons as of 9/3/10 (as seen in Figure 10 below). While a net extraction is being maintained at the site, there may be some periods (e.g., a day) where the incremental injection rate is higher than the incremental extraction rate to promote electrode firing during system ramp up.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

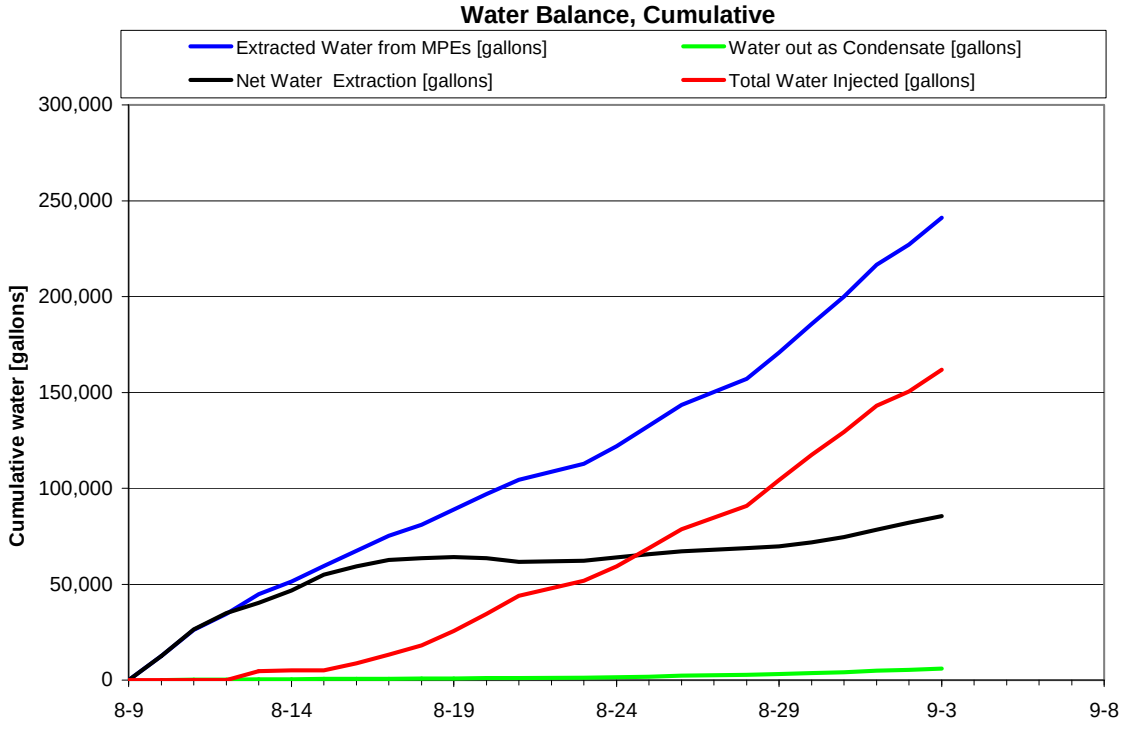


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

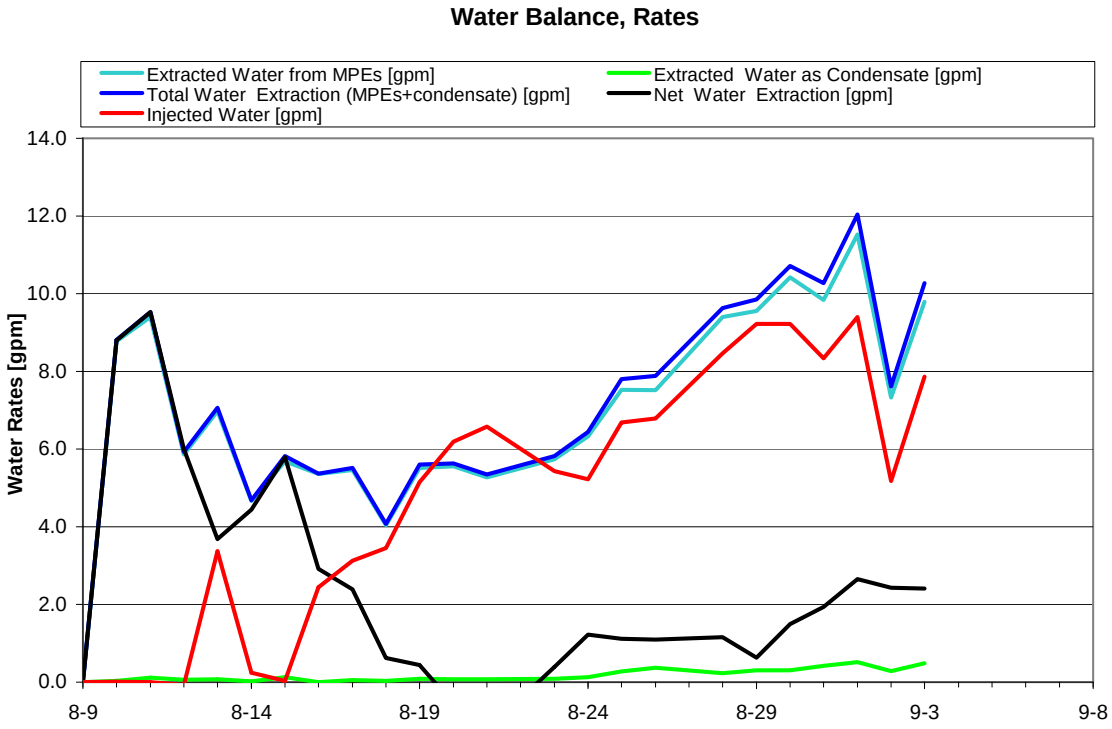


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

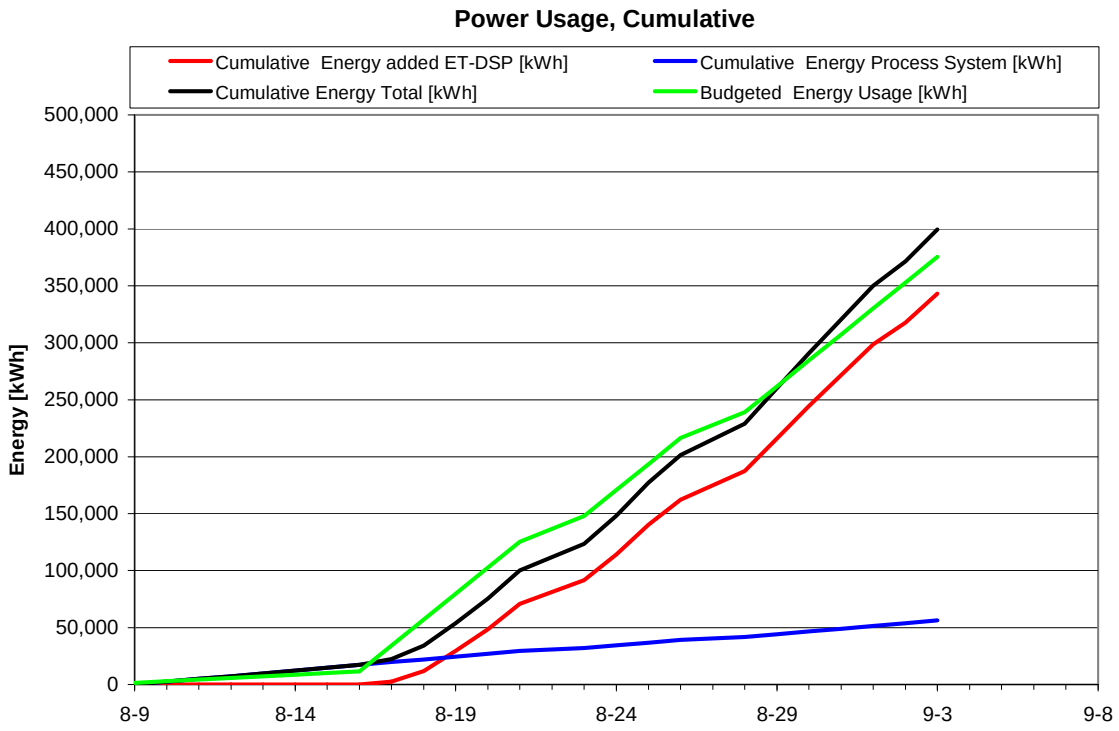


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Saline Addition
In order to enhance soil conductivity at the Groveland Wells Superfund site, saline continued to be added to the bag filters within the Water Circulation units and then injected into shallow electrodes that showed below 5kW currents.

On August 28th, 29th, and 30th, a daily total of 80 lbs of water conditioning salt was injected into the treatment zone through targeted electrodes in order to increase the conductivity of the soil.

Incidents:

No safety or environmental compliance issues were identified at the site this week.

Performance Goal Attainment Issues or Concerns:

No issues or concerns related to attainment of performance goals.

Progress Report

9/4/2010 through 9/10/2010
September 13, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from September 4 through September 10, 2010, at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 9/10/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13,590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	134	
Projected total energy usage	3,049,000	kWh
Days of operation	24	days
Energy used to date	591,696	kWh
Injected energy per soil volume to date	31	kWh/cy
Water VOC mass removal last 7 days	0.0	lbs
Vapor VOC mass removal last 7 days	9	lbs
Volume of NAPL last 7 days	0.0	gal
Total VOC mass removal to date	38	lbs
Average temperature Area A last 7 days	112	°F
Average temperature Area C last 7 days	103	°F
Average temperature Area D last 7 days	98	°F
Average power usage last 7 days	1,144	kW
Average pumped water rate last 7 days	9.8	gpm
Average injected water rate last 7 days	8.2	gpm
Average vapor extraction rate (non condensable) last 7 days	460	scfm

System Shutdowns

The following table provides a breakdown of the system shutdowns occurring during the 9/4/10 through 9/10/10 operational period. As seen in Table 2 below, there were four occasions within this operational period where the system either alarmed or was manually shut down.

Table 2. System Shutdown Log

Date	System Shutdown Reason	Estimated Down Time	Up Time
9/4/2010	High level on bag filters	2:30	3:00
9/9/2010	Leak at duct heater weld	9:09	17:00
9/9/2010	Electrodes shut down due to high voltage identified at fence	12:30	14:00
9/10/2010	Main circuit breaker tripped	14:07	15:45

System Maintenance

9/4/10: A high level alarmed at approximately 2:30 in the morning. By the time the system operator had arrived at the site, the alarm had cleared. Evaluation of the bag filters was performed and the alarm could not be identified. No further bag filter alarms have occurred.

9/9/10: The vapor treatment system was manually shutdown so that leak found in the weld of the duct heater could be repaired. The duct heater weld was grinded to a smooth surface and resealed with a high temperature silicone.

9/9/10: The electrodes were manually shut down due to high voltage readings identified at the fence line. The system operator performed several step and touch potential tests along the fence line to isolate the high voltage areas. Additional grounding rods were installed; however, voltage readings still remained higher than the project action limit of 15 volts. Six shallow electrodes (as discussed in detail later in Section 12) were shut off until additional maintenance could be performed.

9/10/10: The entire thermal treatment system shut down due to a trip of the main circuit breaker. After extensive evaluations, it appeared that the electrodes were drawing more power than the set limit of the main breaker and were subsequently turned down to be below this protective limit.

Other normal system maintenance was performed.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

Note that "T" indicates a temperature point and "TPV" indicates a temperature, pressure, vacuum point.

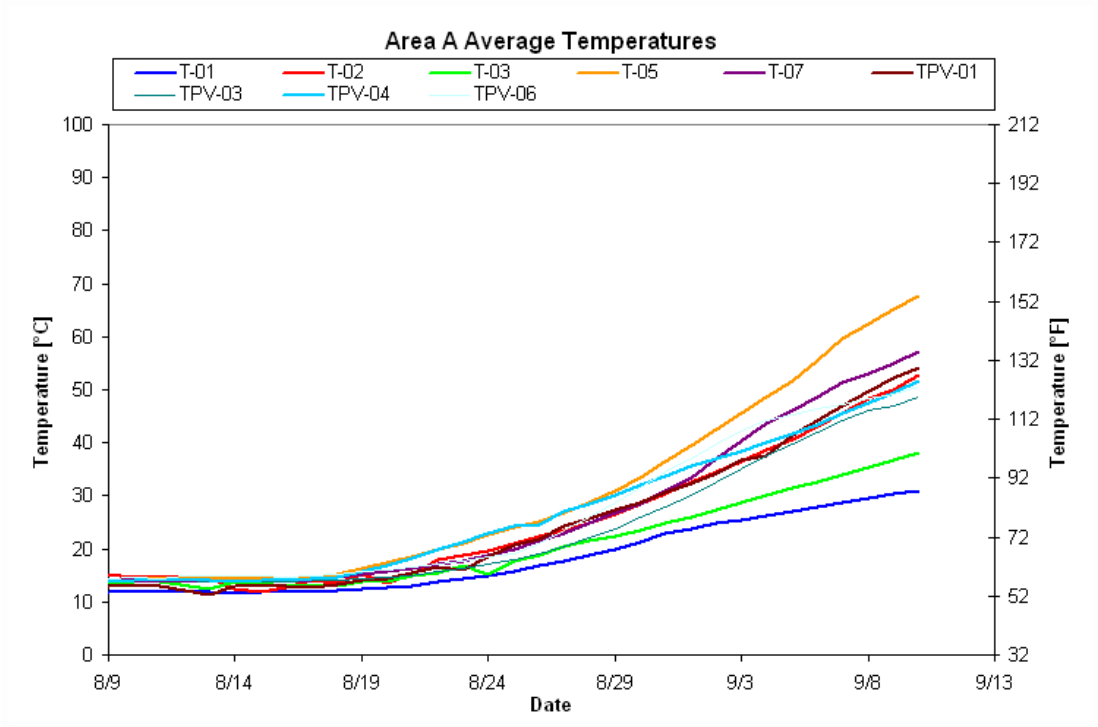


Figure 1. Average Temperature – Area A

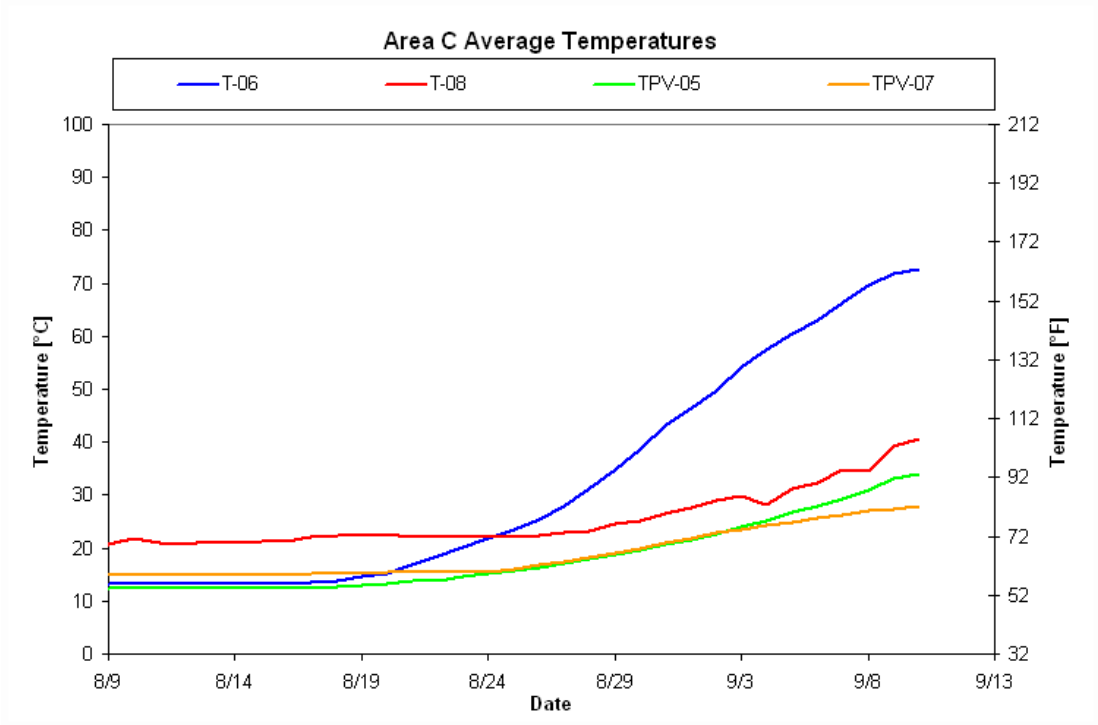


Figure 2. Average Temperature – Area C

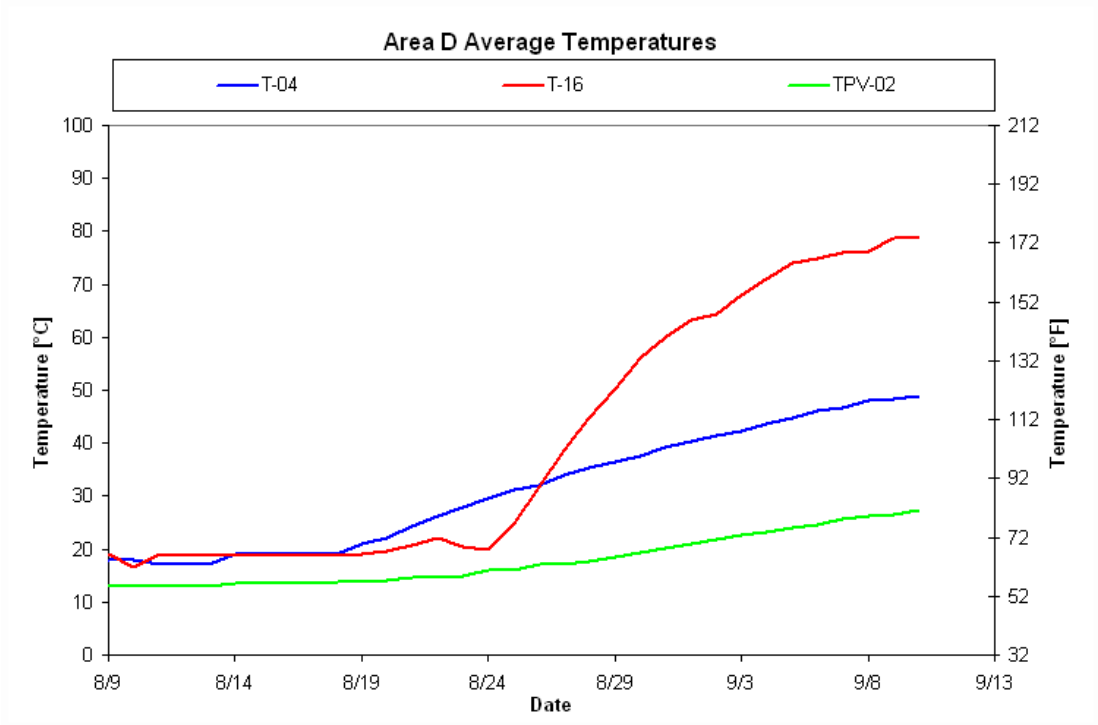


Figure 3. Average Temperature – Area D

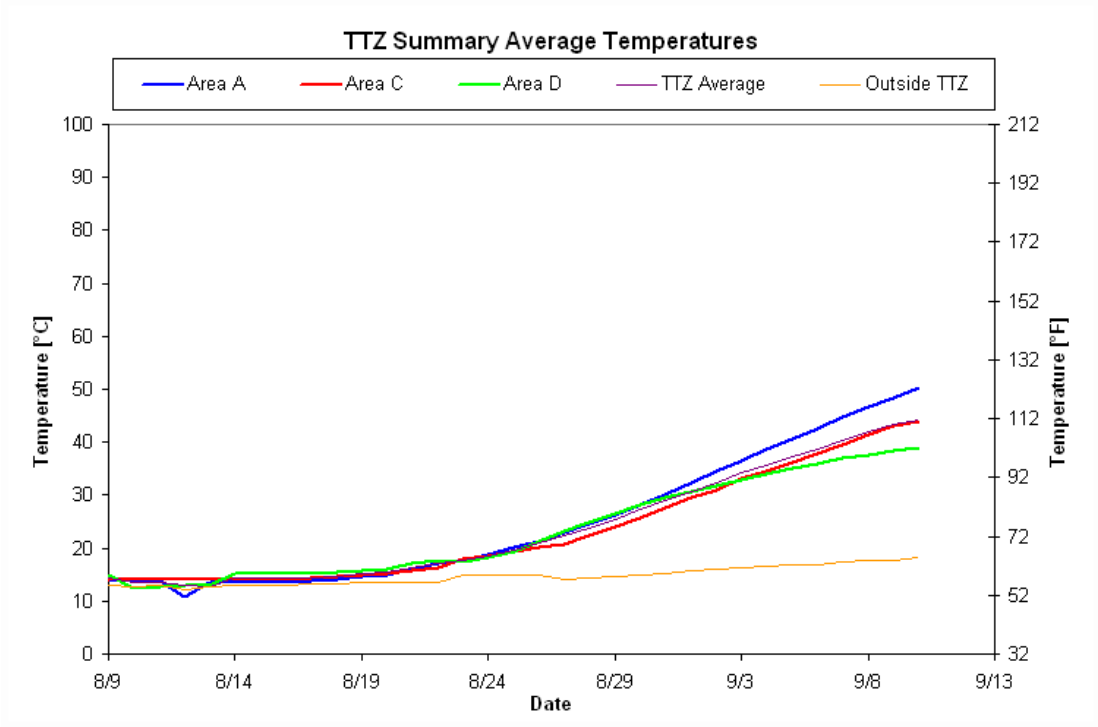


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment.

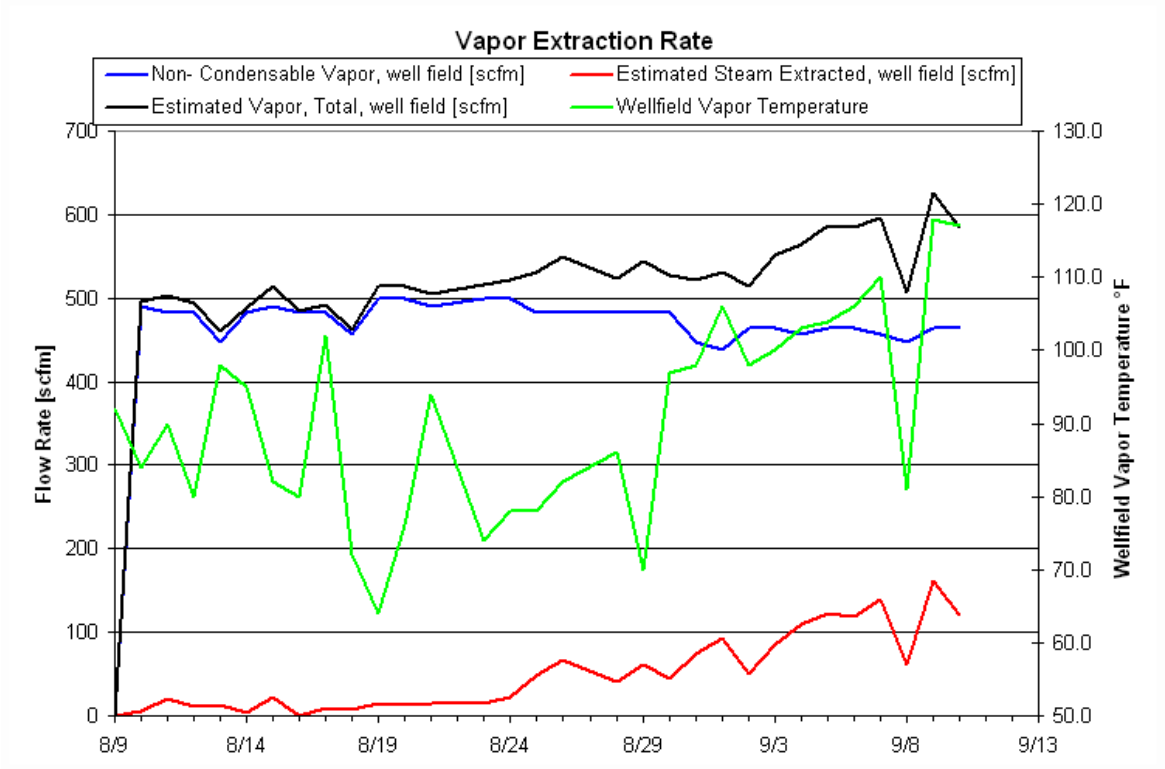


Figure 5. Vapor Extraction Rate and Temperature

4. Photo Ionization Detector (PID) and Destruction and Removal Efficiency (DRE)

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 ppmV are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Also note that previous reports show a concentration of 1.4 ppmV at the mid and stack locations on 08/12/10. A subsequent field report with corrected readings was provided and uploaded to the project database.

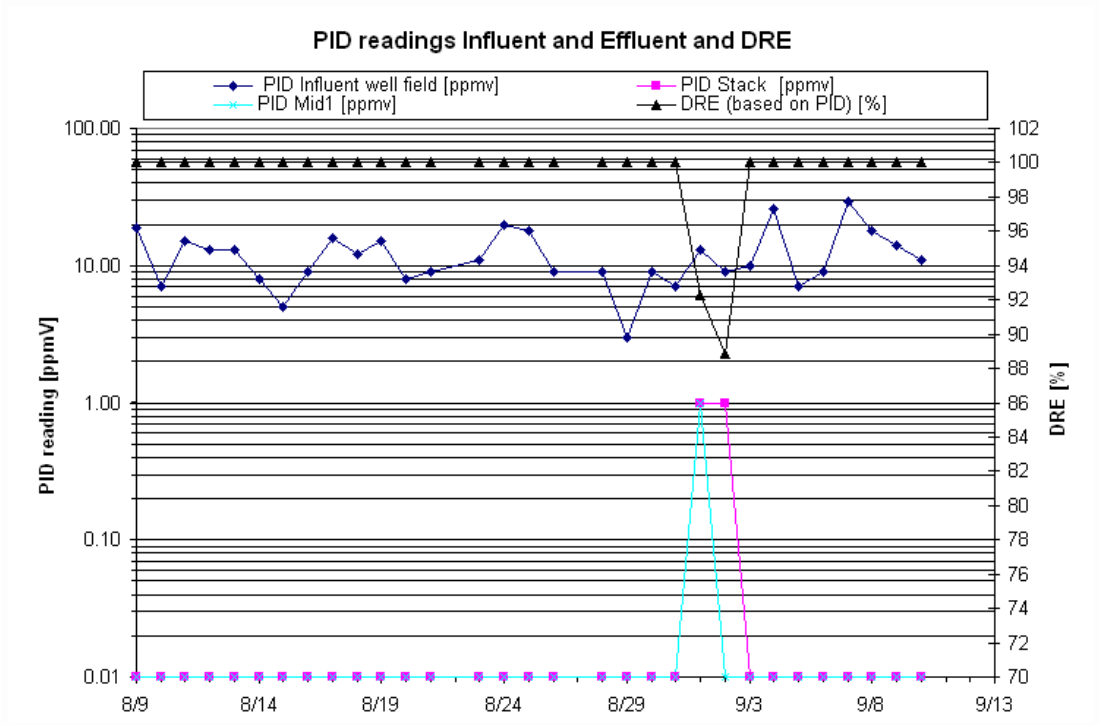


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Mass Removal

The mass removal is calculated by adjusting the wellfield PID reading based on the correction factors for each major Contaminant of Concern (COC) identified in the most recent lab analysis.

Since no lab analyses have been received to date, it has been assumed that all COCs extracted are trichloroethene (TCE).

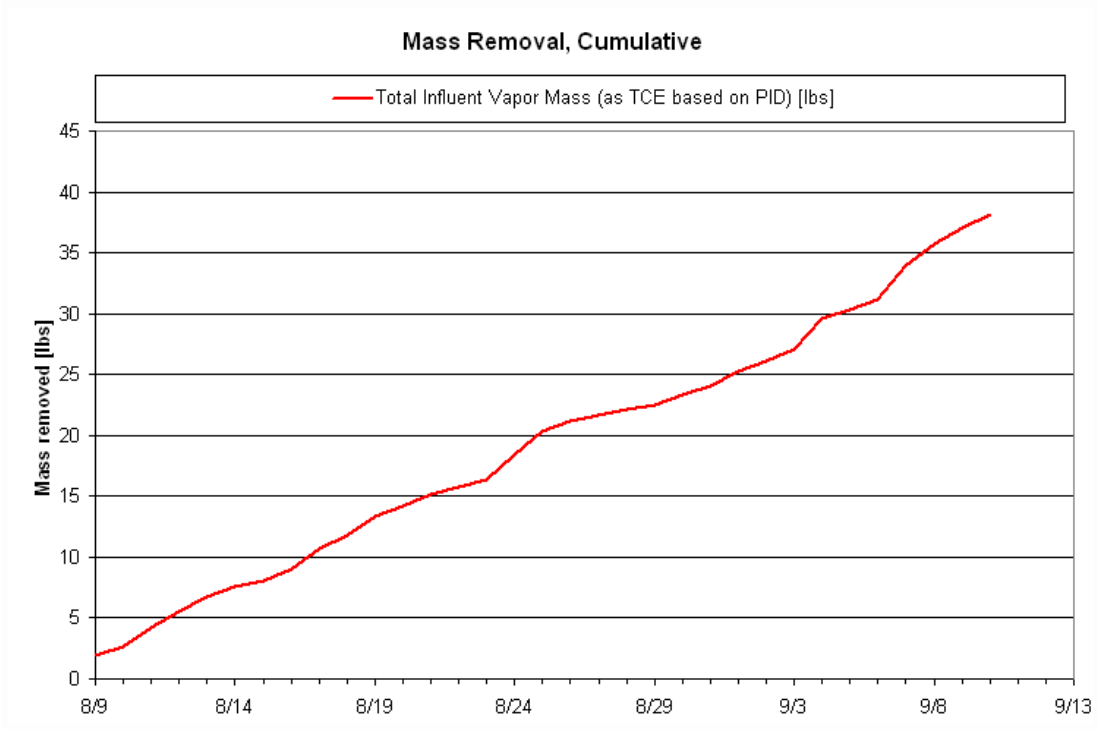


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A fifth round of PID readings was collected from 16 vapor extraction wells at the site on 9/8/10. The table below presents the concentrations in parts per million by volume (ppmV) from the four previous sampling events.

Table 2. PID Readings at the Extraction Wells (concentrations in ppmV)

	8/9/2010	8/17/2010	8/25/2010	9/1/2010	9/8/2010
VEW 1	*5.1*	*5*	*6.4*	*6*	*7.3*
VEW 2	*4.5*	*8*	*6.5*	*5*	*5.2*
VEW 3	*1.1*	*8*	*2.1*	*7*	*7.1*
VEW 4	*4.1*	*6*	*5.2*	*6*	*8.7*
VEW 5	*7.9*				
VEW 6	*2.9*				
VEW 7	*3.5*				
VEW 8	*10.8*				
VEW 9	*14.2*	*0*	*4.5*	*22*	*73*
VEW 10	*2.3*				
VEW 11	*5.4*				
VEW 12	*4.6*				
VEW 13	*3.1*				
VEW 14	*1.3*				
VEW 15	*6.2*	*10*	*6.8*	*26*	*42*
VEW 16	*4.0*	*6*	*5.9*	*5*	*8.1*
VEW 17	*15.9*	*16*	*8.4*	*101*	*164*
VEW 18	*10.3*	*8*	*5.8*	*51*	*95*
VEW 19	*1.6*	*5*	*4.8*	*6*	*28*
VEW 20	*4.5*				
VEW 21	*11.1*	*5*	*3.8*	*42*	*93*
VEW 22	*8.4*				
VEW 23	*0.6*	*7*	*7.3*	*15*	*58*
VEW 24	*4.6*	*5*	*5.4*	*15*	*43*
VEW 25	*1.9*				
VEW 26	*7.1*	*5*	*4.4*	*5*	*4.2*
VEW 27	*8.1*	*7*	*4.5*	*2*	*5.6*
VEW 28	*10.7*	*6*	*3.3*	*6*	*5.3*
VEW 29	10.3				

7. Water Level

The figure below presents a water level contour map for the site.

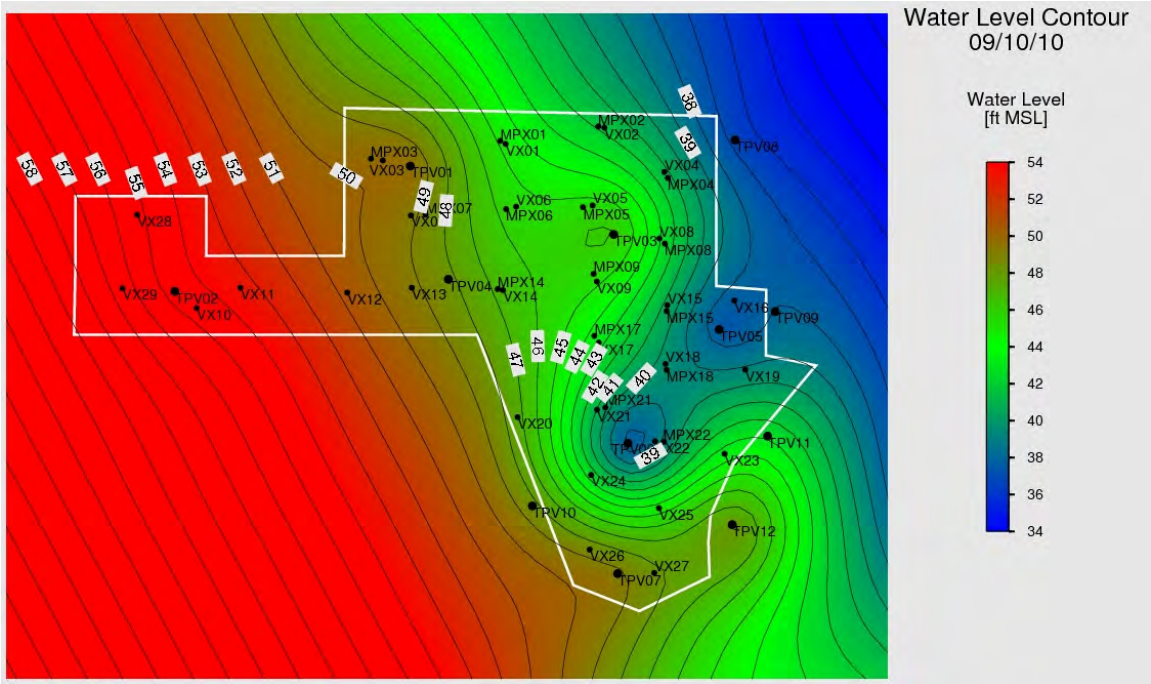


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

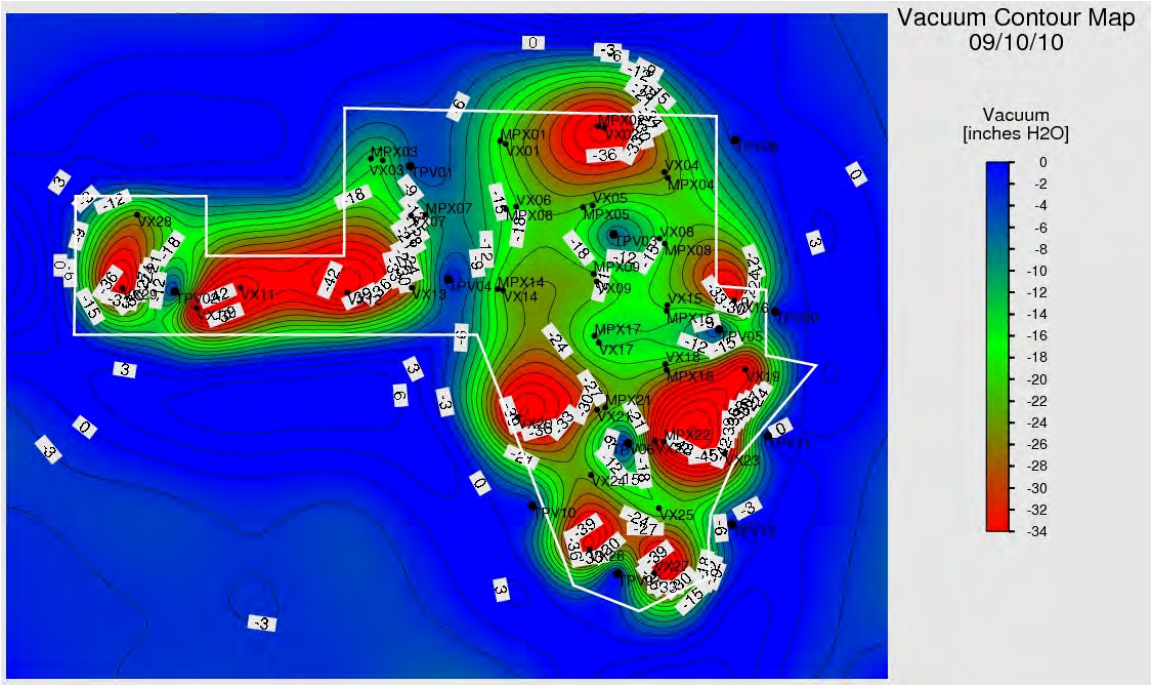


Figure 9. Vacuum Contour Map

9. Water Balance

To facilitate the initial operation of the electrodes, targeted water injection has been used to increase the resistivity of the soil around primarily shallow electrodes in the treatment zone. Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 264,197 gallons of water since system startup while extracting a total of 352,736 gallons of water for a net water extraction of 108,539 gallons as of 9/10/10 (as seen in Figure 10 below). While a net extraction is being maintained at the site, there may be some periods (e.g., a day) where the incremental injection rate is higher than the incremental extraction rate to promote electrode firing during system ramp up.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

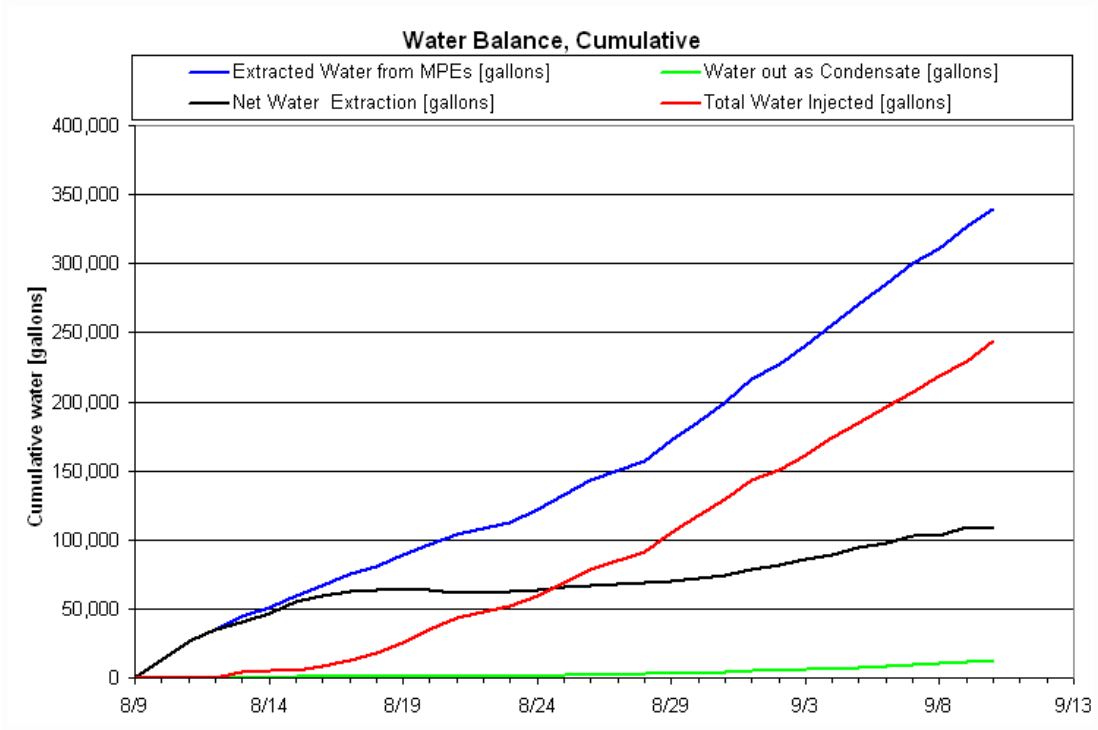


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the Multi Phase Extraction (MPE) wells, the condensate collected, and the net water extraction from the site is shown in the figure below.

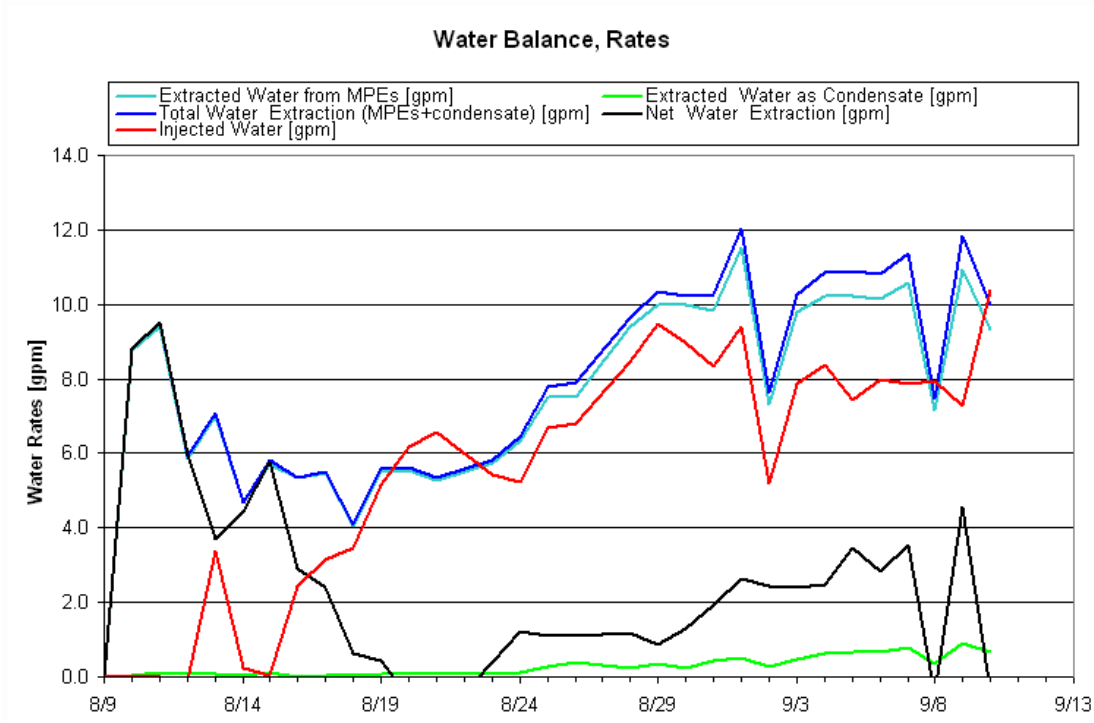


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment process system is an estimated value.

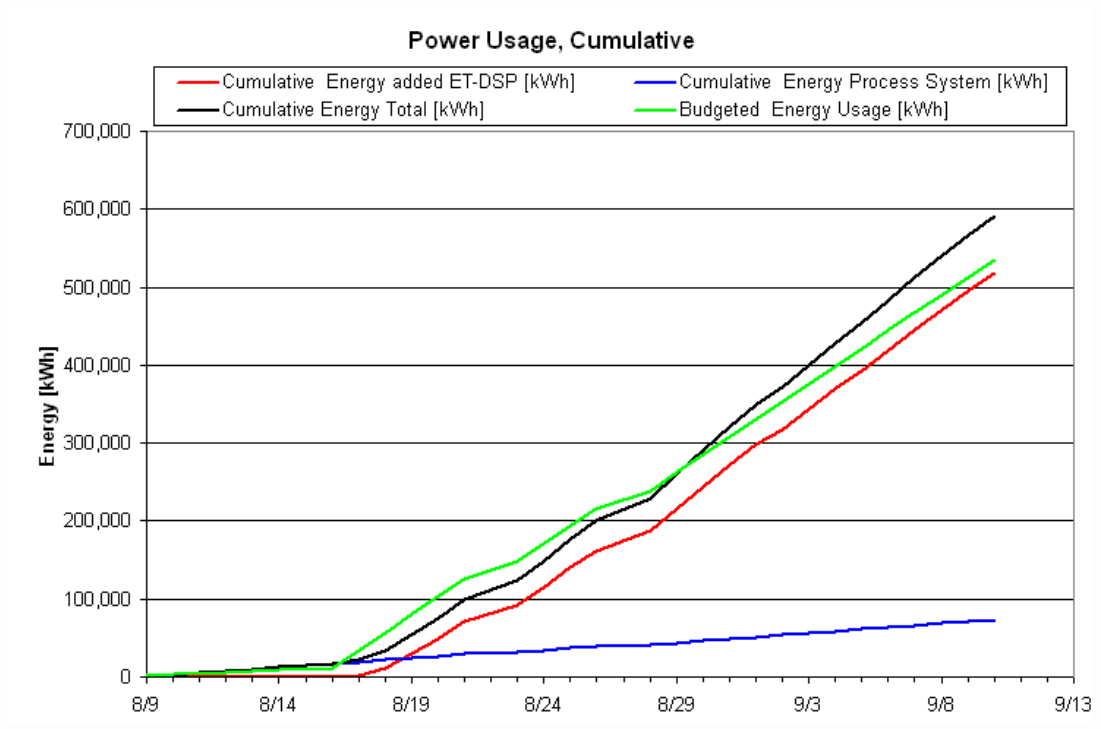


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Saline Addition
In order to enhance soil conductivity at the Groveland Wells Superfund site, saline continued to be added to the bag filters within the Water Circulation units and then injected into select shallow electrodes with currents less than 5kW.

On September 5, 6, 7, 9 and 10, a daily total of 80 pounds of salt was injected into the treatment zone through targeted shallow electrodes in order to increase the conductivity of the soil.

Incidents:

On September 9th 2010, routine step and touch potential monitoring by TerraTherm's System Operator along the fence line of the Groveland Wells Superfund Site boundary found voltage potentials along sections of the chain link fence near the wellfield and vapor carbon trailer, exceeding the project limit of a 15 volts. As a result of these readings, the project team made the decision to shut down the electrodes at the site until the voltage could be remedied.

It is believed that ponding and/or saturation from the recent rainfall near the 106/108 properties caused the wooden fence posts to become conductive with the metal chain link fence. The cause near the vapor carbon trailer is still being evaluated but voltages are currently below the 15 volt limit.

Several additional step and touch potential tests were conducted, and the electrode wellfield was re-energized on 9/9/10, with the exception of electrodes E28S, E40S, E47S, E51S, E54S, and E56S. Further step and touch potential readings collected on 9/9/10 after reenergizing the system were within the 15 volt project limit.

The project team is currently interrupting the circuit along the fence line by cutting the chain link fence at the fence posts and reattaching to the wood posts. An additional grounding rod will be added near the vapor carbon trailer. After maintenance is complete, the project team will conduct a thorough step and touch potential monitoring round to ensure the issue has been resolved. Currently, this effort is scheduled for Monday, 13 September.

Performance Goal Attainment Issues or Concerns:

No issues or concerns related to attainment of performance goals.

Progress Report

9/11/2010 through 9/17/2010
September 20, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from September 11 through September 17, 2010, at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 9/17/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	134	
Projected total energy usage	3,049,000	kWh
Days of operation	31	days
Energy used to date	778,816	kWh
Injected energy per soil volume to date	41	kWh/cy
Water VOC mass removal last 7 days	0.0	lbs
Vapor VOC mass removal last 7 days	13	lbs
Volume of NAPL last 7 days	0.0	gal
Total VOC mass removal to date	51	lbs
Average temperature Area A last 7 days	133	°F
Average temperature Area C last 7 days	117	°F
Average temperature Area D last 7 days	105	°F
Average power usage last 7 days	950	kW
Average pumped water rate last 7 days	10.5	gpm
Average injected water rate last 7 days	7.3	gpm
Average vapor extraction rate (non condensable) last 7 days	465	scfm

System Shutdowns

The electrodes were manually shut down on 9/13/10 for maintenance of the site fence. The electrodes were shut down at approximately 11:00 AM and powered back on at approximately 3:00 PM.

The electrodes were manually shut down on 9/15/10 for the biweekly groundwater sampling event. The electrodes were shut down at 7:35 AM and powered back on at approximately 4:30 PM.

System Maintenance

9/11/10: Piping near the process treatment system was electrically insulated.

9/13/10: The electrodes were manually shut down so that work could be done on the existing site fence to electrically isolate it. The chain link fence on the south side of the side was cut at approximately 20 ft intervals and reattached to the wooden fence posts. A leak was identified in the duct heater and was repaired.

9/15, 16 & 17/10: Additional leaks were identified in the electrical conduit feeding the duct heater and were repaired.

9/17/10: A leak was identified in the second knockout skid and repaired. Electrodes E29M and E29D were shut off at noon on Friday Sep 17, 2010 and will be reset manually by McMillan-McGee.

Other normal system maintenance was performed.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

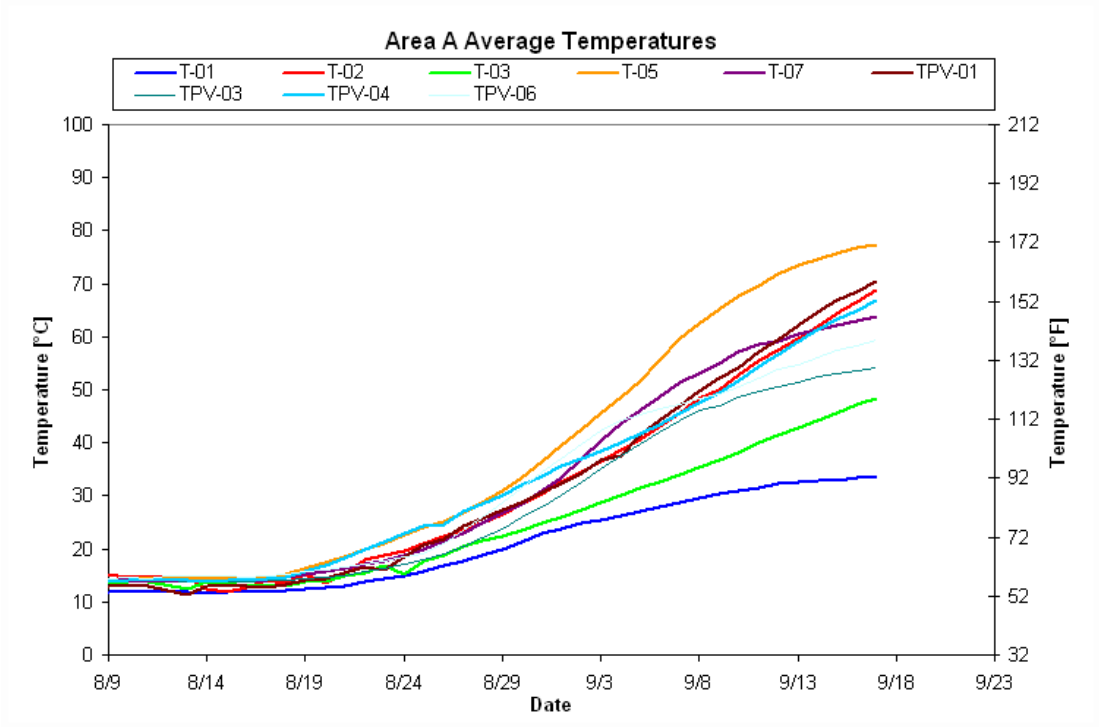


Figure 1. Average Temperature – Area A

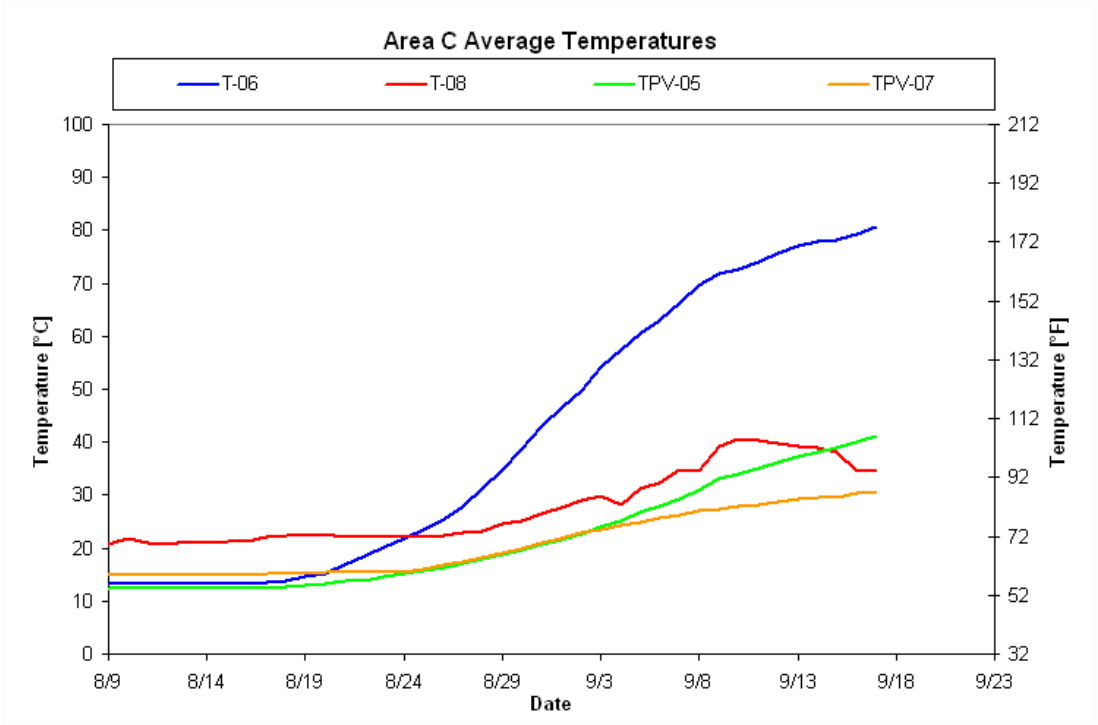


Figure 2. Average Temperature – Area C

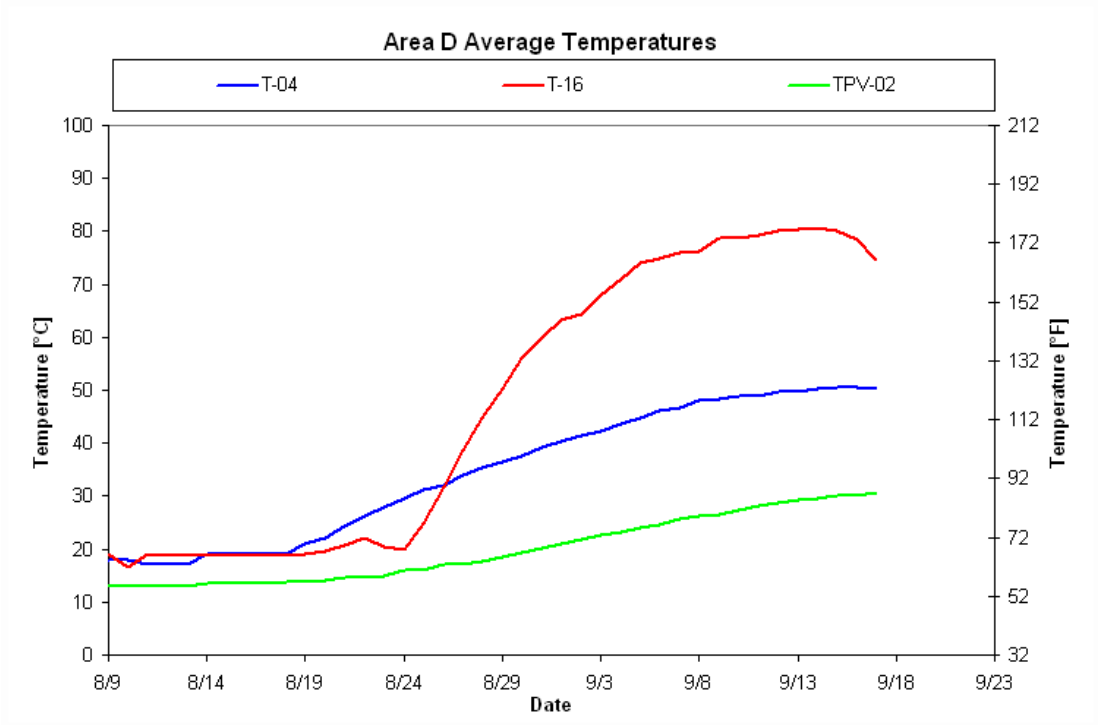


Figure 3. Average Temperature – Area D

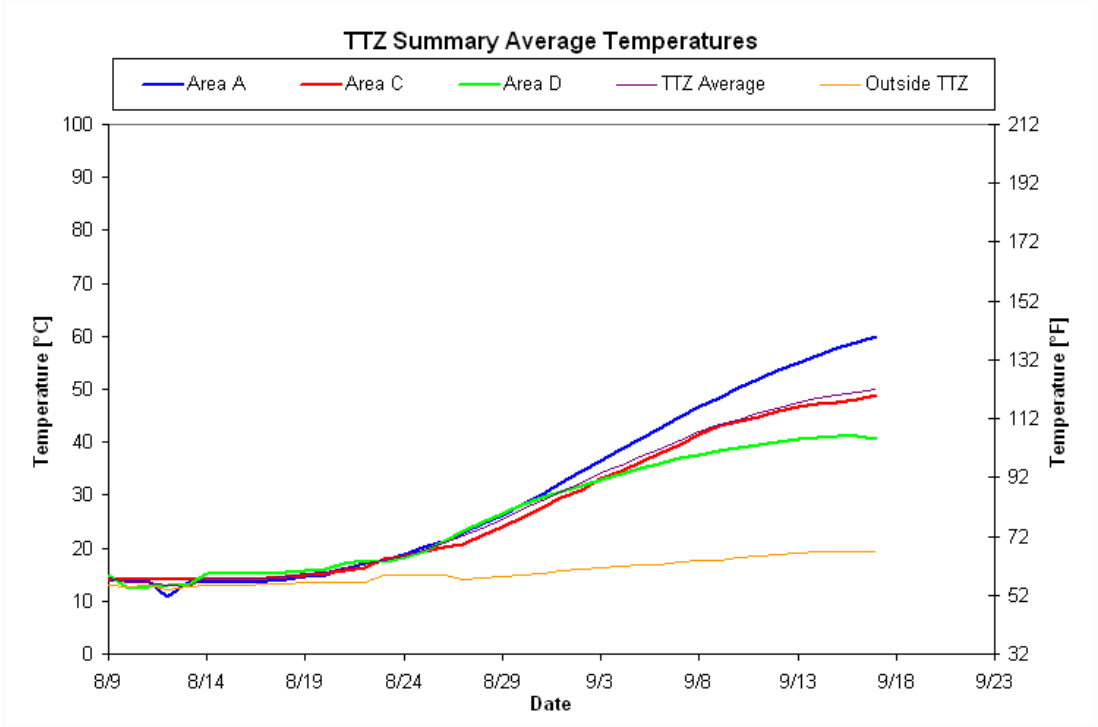


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment.

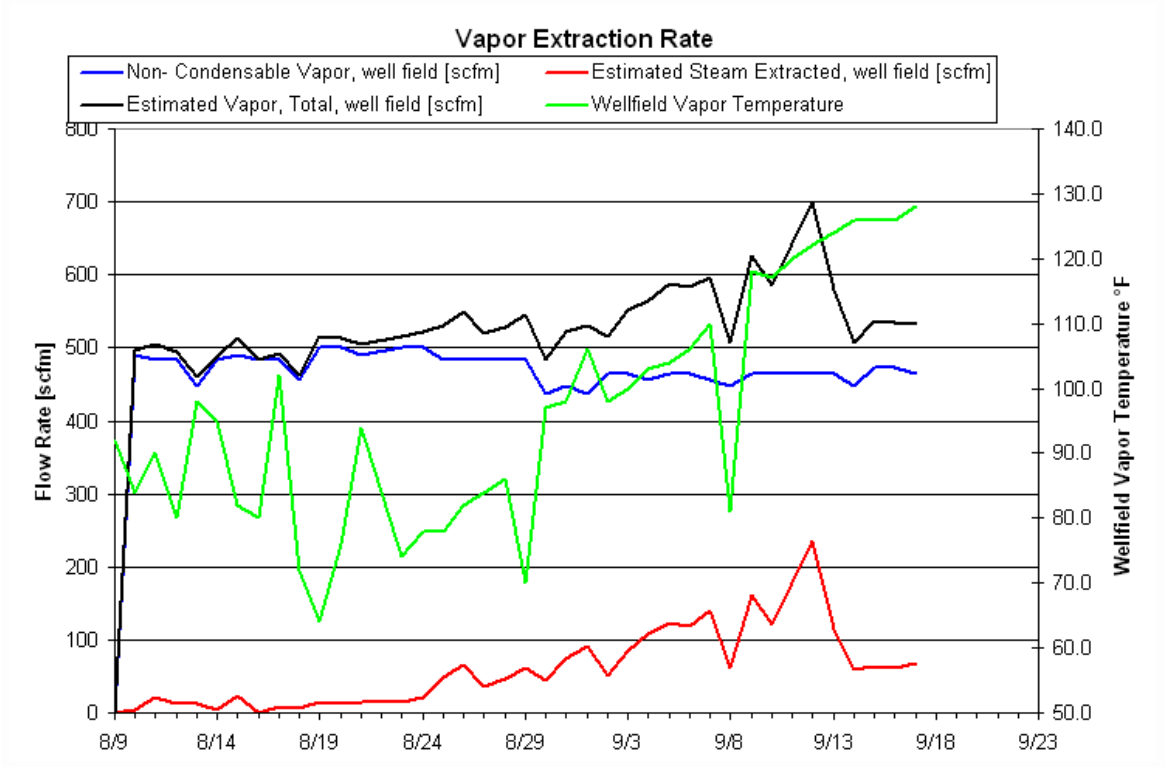


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the Destruction and Removal Efficiency (DRE) of the treatment system. Note that PID readings of 0.0 ppmV are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of 0-values (*N.B. Subsequent PID stack readings collected on 9/18 and 9/19 have shown 0 ppm readings)*.

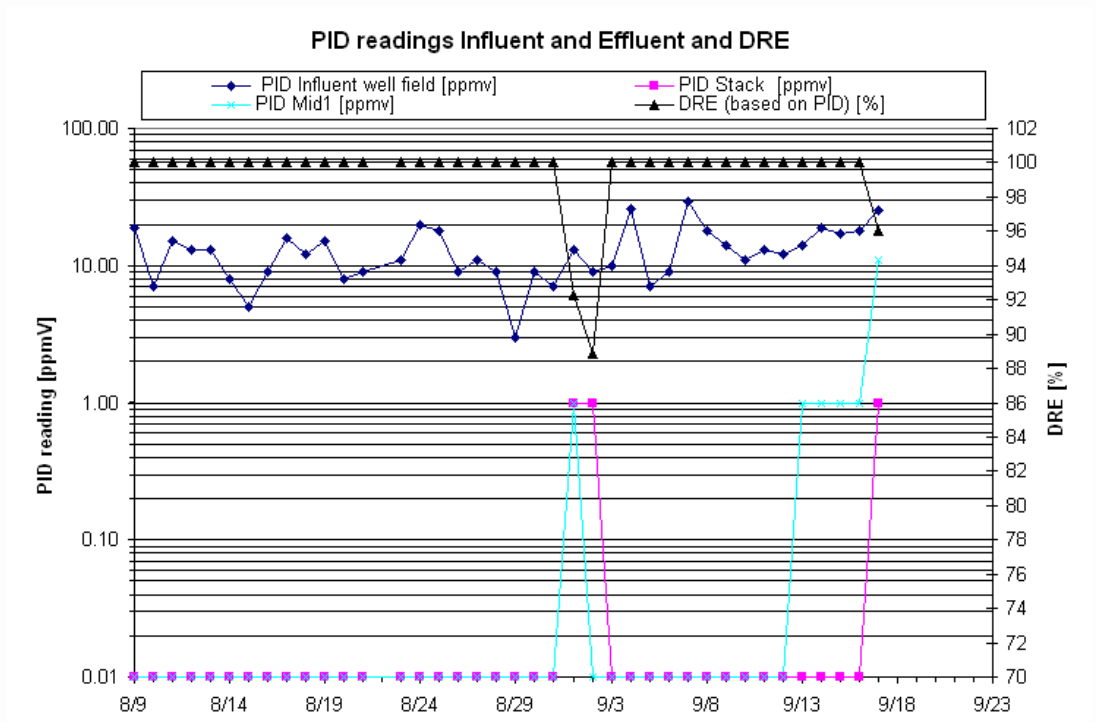


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Mass Removal

The mass removal is calculated by adjusting the wellfield PID reading based on the correction factors for each major COC identified in the most recent lab analysis.

Since no lab analyses have been received to date, it has been assumed that all COCs extracted are TCE.

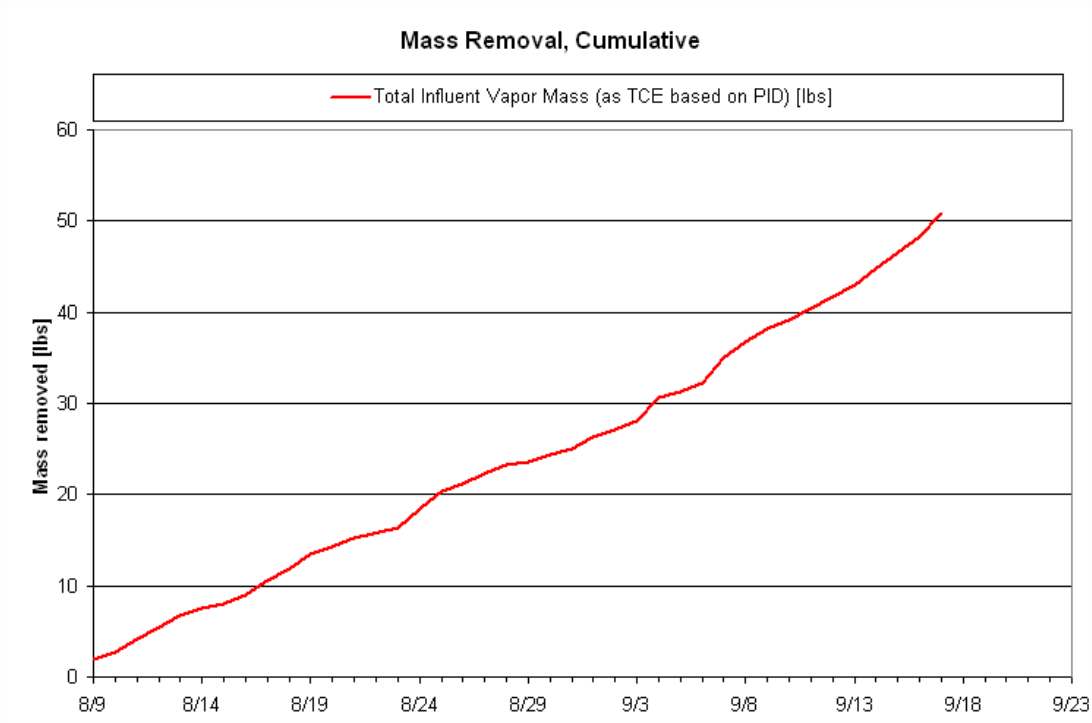


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from 16 vapor extraction wells at the site on 9/15/10. The table below presents the concentrations in parts per million by volume (ppmV) from the most recent and previous sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/2010	8/17/2010	8/25/2010	9/1/2010	9/8/2010	9/15/2010
VEW 1	*5.1*	*5*	*6.4*	*6*	*7.3*	*6.5*
VEW 2	*4.5*	*8*	*6.5*	*5*	*5.2*	*2.9*
VEW 3	*1.1*	*8*	*2.1*	*7*	*7.1*	*8.2*
VEW 4	*4.1*	*6*	*5.2*	*6*	*8.7*	*6.3*
VEW 5	*7.9*					
VEW 6	*2.9*					
VEW 7	*3.5*					
VEW 8	*10.8*					
VEW 9	*14.2*	*0*	*4.5*	*22*	*73*	*66.1*
VEW 10	*2.3*					
VEW 11	*5.4*					
VEW 12	*4.6*					
VEW 13	*3.1*					
VEW 14	*1.3*					
VEW 15	*6.2*	*10*	*6.8*	*26*	*42*	*60.2*
VEW 16	*4.0*	*6*	*5.9*	*5*	*8.1*	*3.4*
VEW 17	*15.9*	*16*	*8.4*	*101*	*164*	*74.7*
VEW 18	*10.3*	*8*	*5.8*	*51*	*95*	*35.6*
VEW 19	*1.6*	*5*	*4.8*	*6*	*28*	*7.4*
VEW 20	*4.5*					
VEW 21	*11.1*	*5*	*3.8*	*42*	*93*	*88.8*
VEW 22	*8.4*					
VEW 23	*0.6*	*7*	*7.3*	*15*	*58*	*7.1*
VEW 24	*4.6*	*5*	*5.4*	*15*	*43*	*63.7*
VEW 25	*1.9*					
VEW 26	*7.1*	*5*	*4.4*	*5*	*4.2*	*6.9*
VEW 27	*8.1*	*7*	*4.5*	*2*	*5.6*	*4.2*
VEW 28	*10.7*	*6*	*3.3*	*6*	*5.3*	*3.8*
VEW 29	10.3					

7. Water Level

The figure below presents a water level contour map for the site.

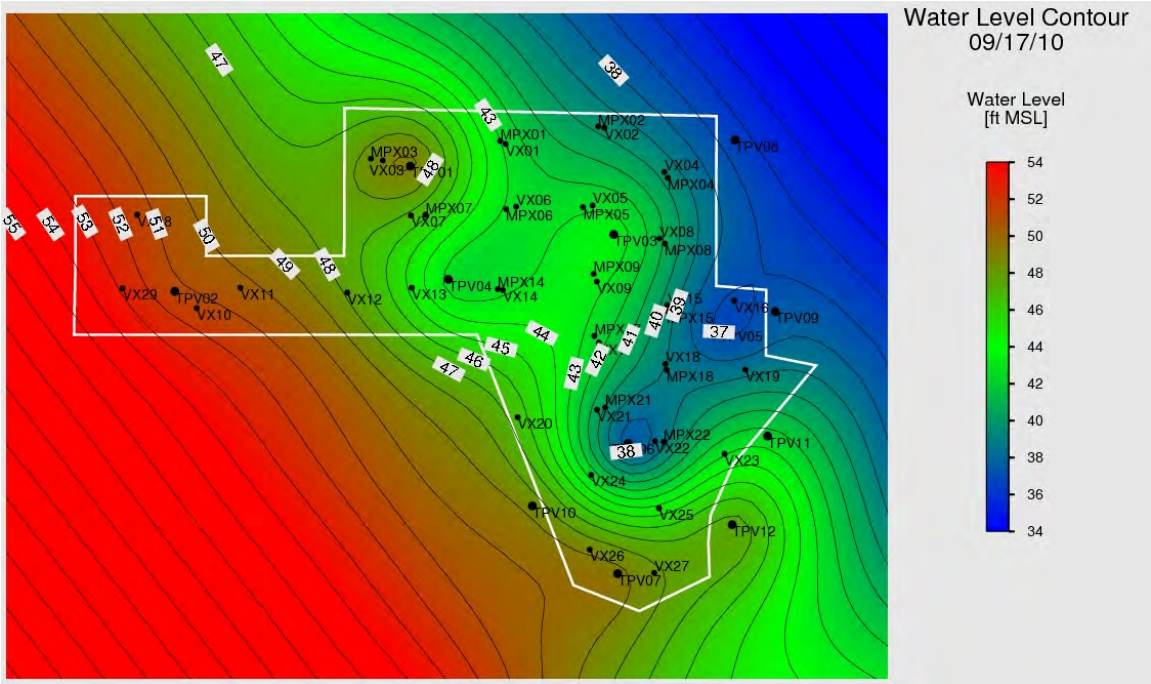


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

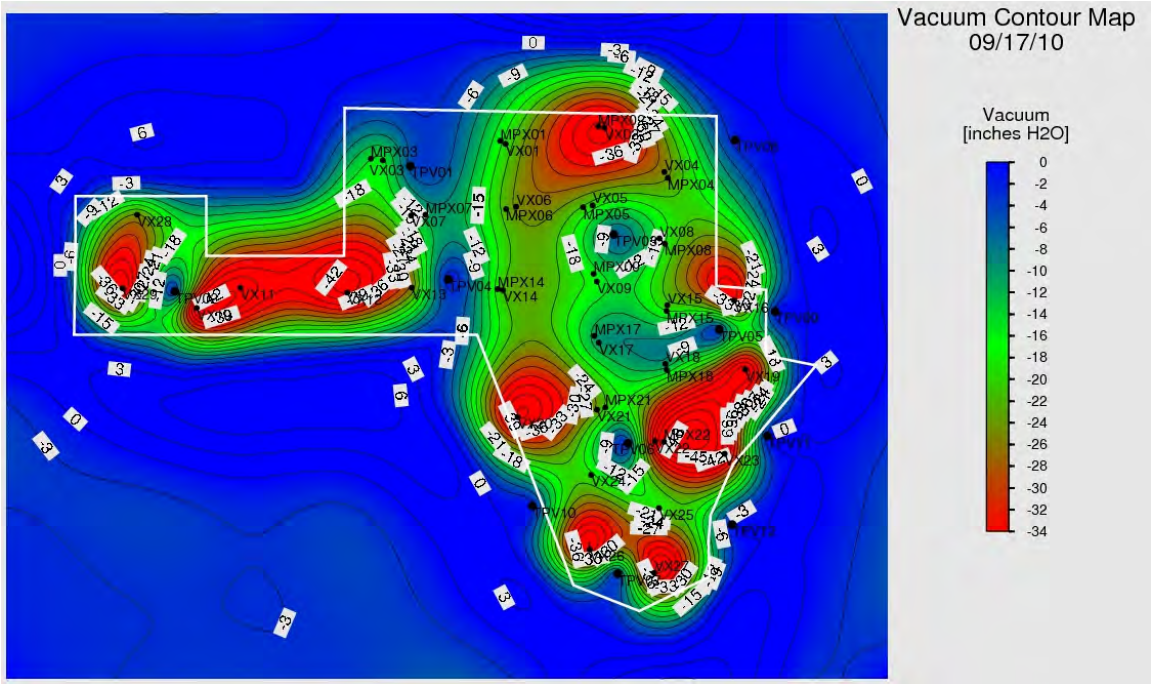


Figure 9. Vacuum Contour Map

9. Water Balance

To facilitate the initial operation of the electrodes, targeted water injection has been used to increase the resistivity of the soil around primarily shallow electrodes in the treatment zone. Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 329,837 gallons of water since system startup while extracting a total of 478,909 gallons of water for a net water extraction of 149,072 gallons as of 9/17/10 (as seen in Figure 10 below). While a net extraction is being maintained at the site, there may be some periods (e.g., a day) where the incremental injection rate is higher than the incremental extraction rate to promote electrode firing during system ramp up.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

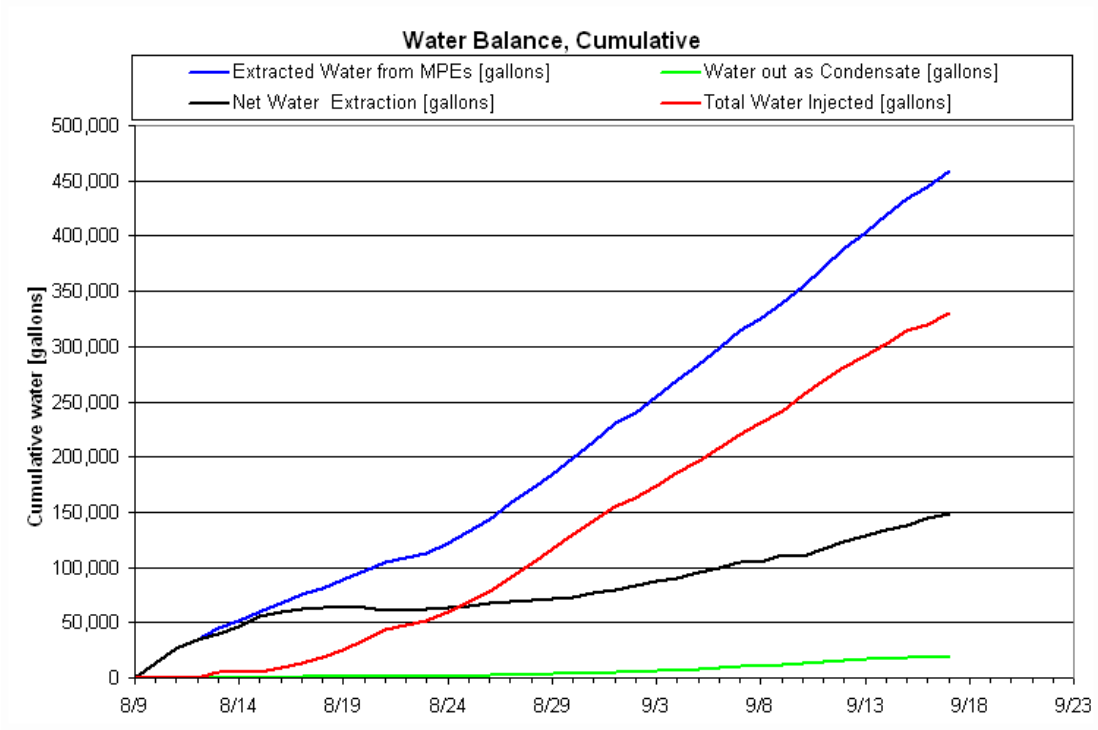


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

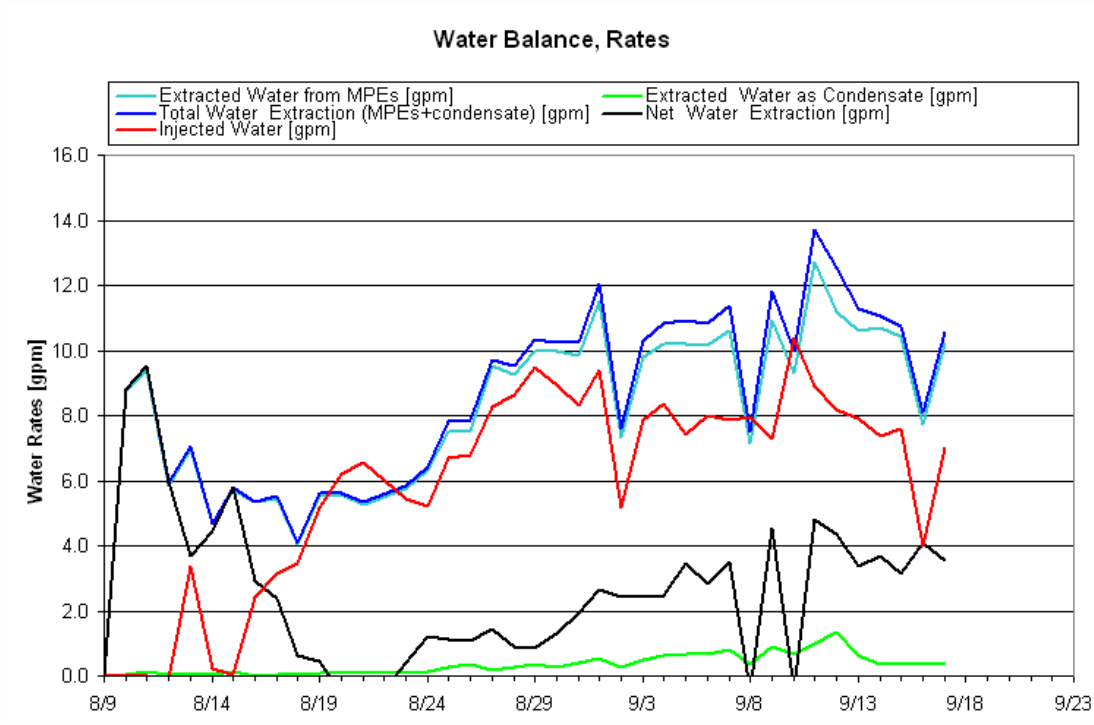


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

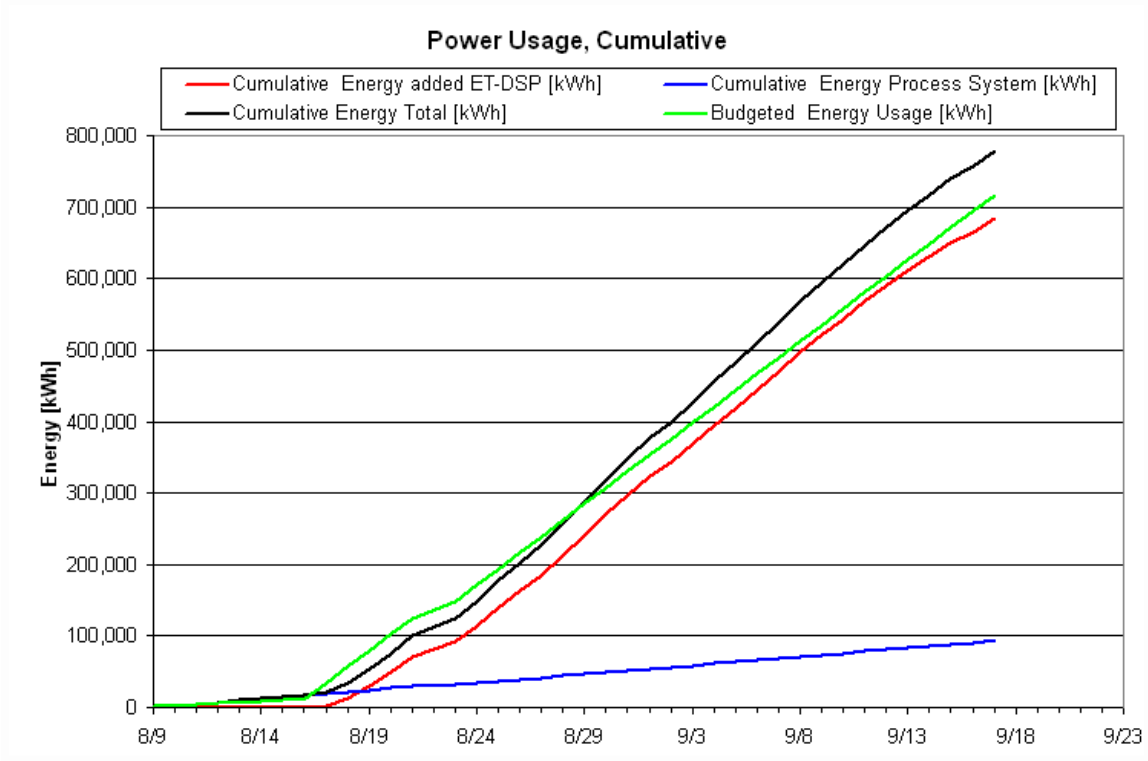


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

No optimization evaluations were conducted this week.

Incidents:

No safety or environmental compliance issues were identified at the site this week.

Performance Goal Attainment Issues or Concerns:

No issues or concerns related to attainment of performance goals.

Progress Report

9/18/2010 through 9/24/2010
September 28, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from September 18 through September 24, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 9/24/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	134	
Projected total energy usage	3,049,000	kWh
Days of operation	38	days
Energy used to date	953,296	kWh
Injected energy per soil volume to date	50	kWh/cy
Water VOC mass removal last 7 days	1.3	lbs
Vapor VOC mass removal last 7 days	54	lbs
Volume of NAPL last 7 days	15	gal
Total VOC mass removal to date	127	lbs
Average temperature Area A last 7 days	147	°F
Average temperature Area C last 7 days	125	°F
Average temperature Area D last 7 days	110	°F
Average power usage last 7 days	900	kW
Average pumped water rate last 7 days	10	gpm
Average injected water rate last 7 days	8.6	gpm
Average vapor extraction rate (non condensable) last 7 days	469	scfm

System Shutdowns

The electrodes were manually shut down from 13:15 to 14:45 on 09/20/10 for maintenance of the pump in Multi Phase Extraction (MPE) well 06.

System Maintenance

09/20/10: The system operators pulled the pump in MPE 6 and found the pump body to be cracked. A replacement pump was installed and the well brought back online.

09/23/10: Electrodes E26M was shut off at 13:30 on 09/23/10. This, together with E29M and D, will be reconfigured by McMillan-McGee while onsite this week.

Other routine maintenance was performed.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

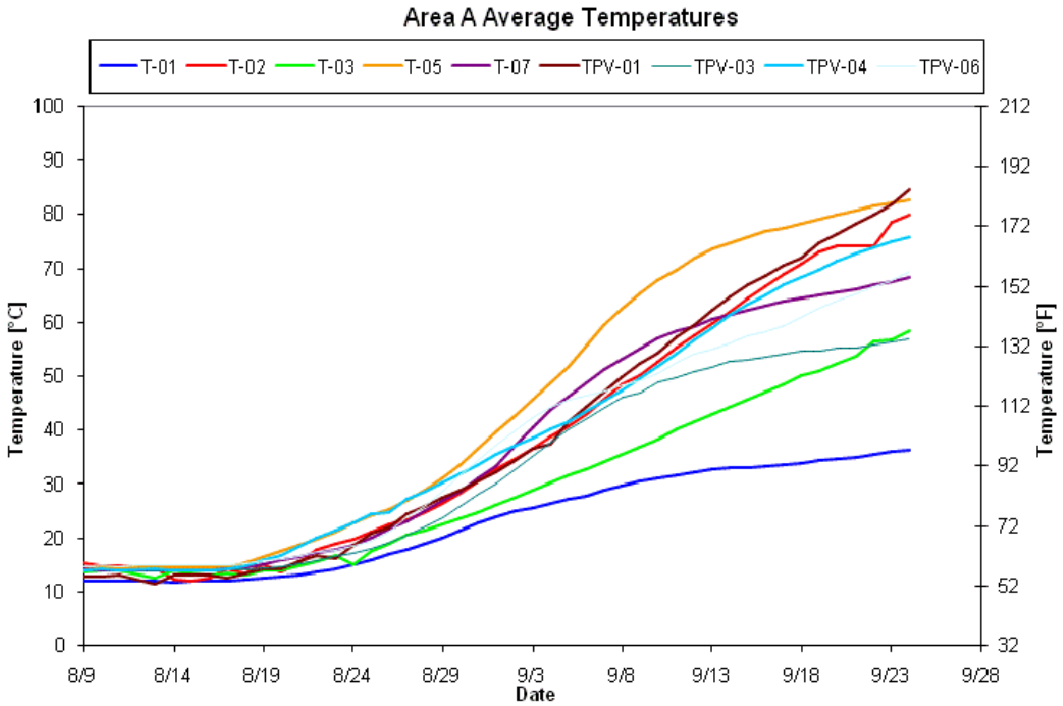


Figure 1. Average Temperature – Area A

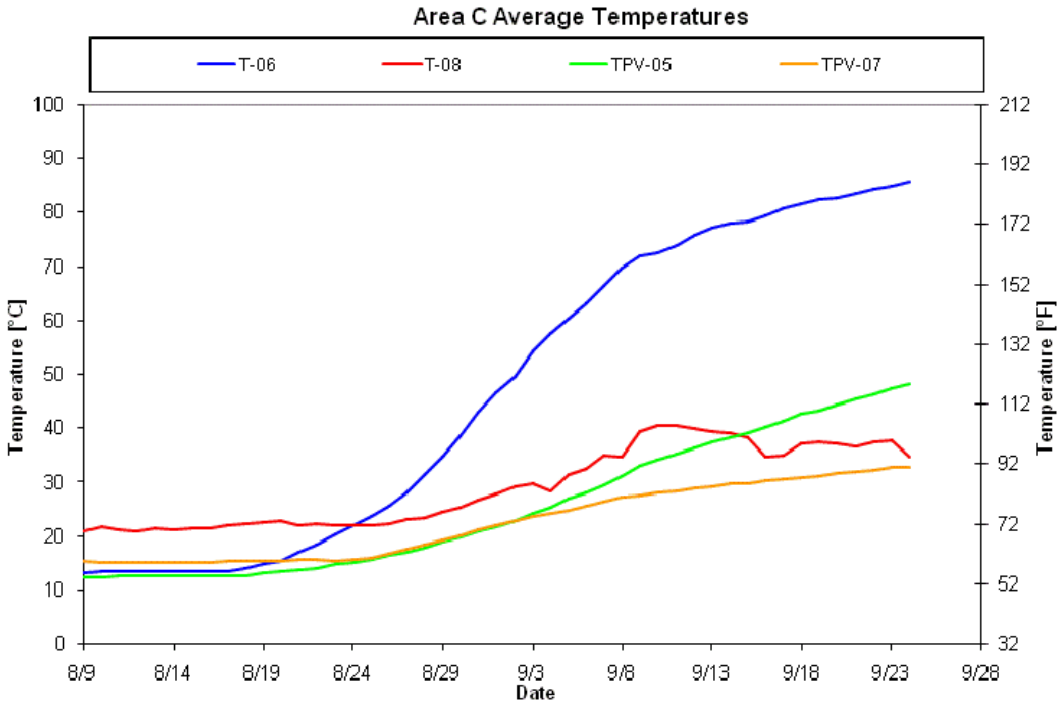


Figure 2. Average Temperature – Area C

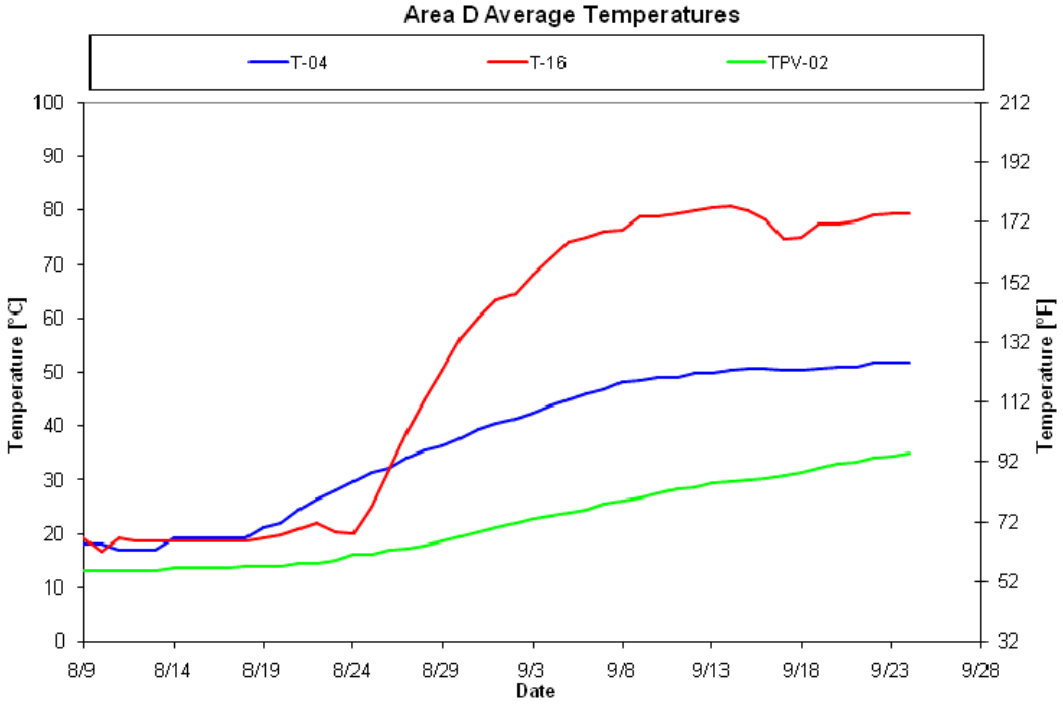


Figure 3. Average Temperature – Area D

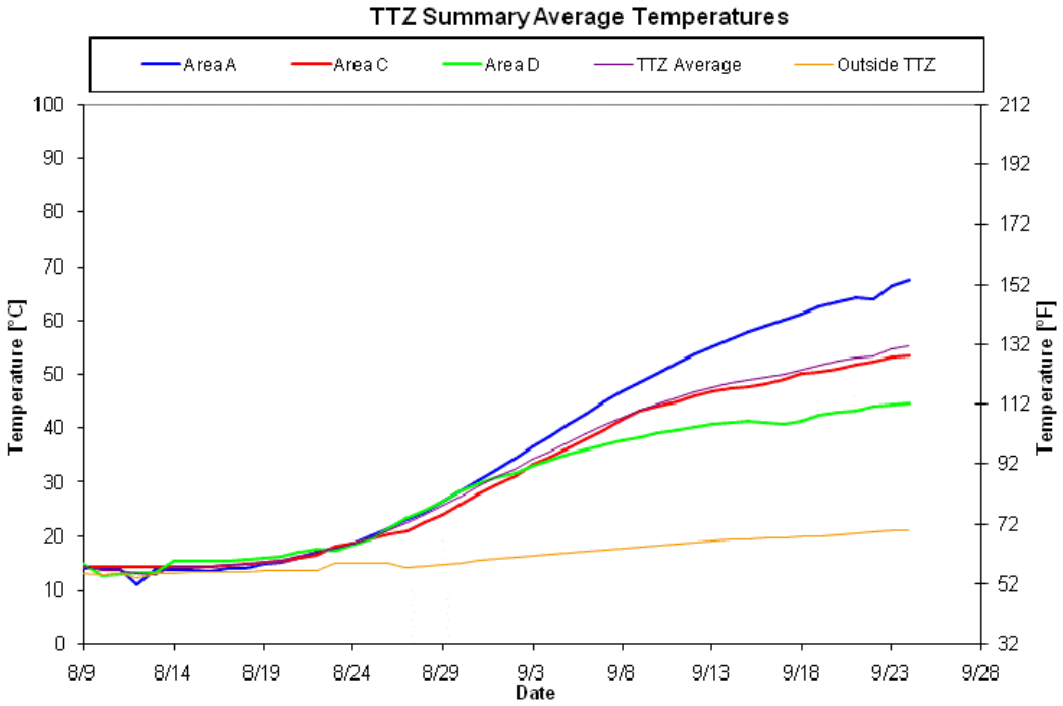


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment.

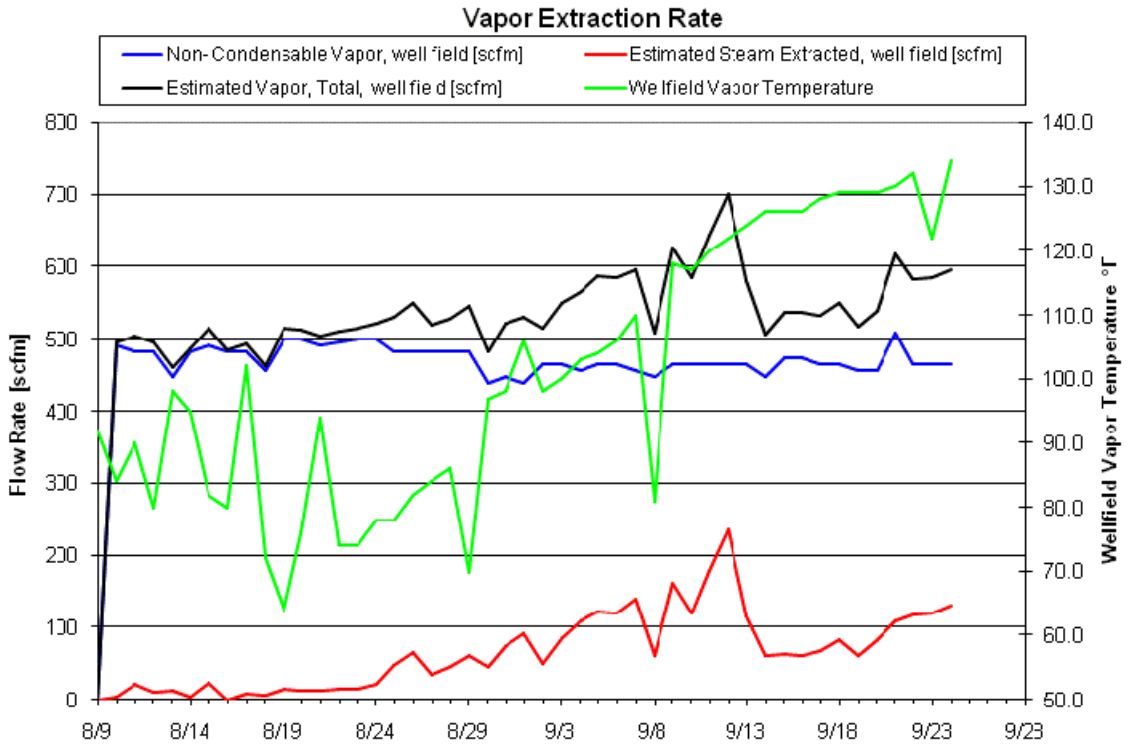


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent, and effluent PID readings and the Destruction Removal Efficiency (DRE) of the treatment system. Note that PID readings of 0.0 parts per million volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that does not allow display of zero values. Recent midfluent data suggest that the granular activated carbon in the primary vessel may be spent. TerraTherm evaluates PID readings collected in the field daily from multiple locations along the vapor carbon trailer. We are prepared to perform a carbon changeout when necessary.

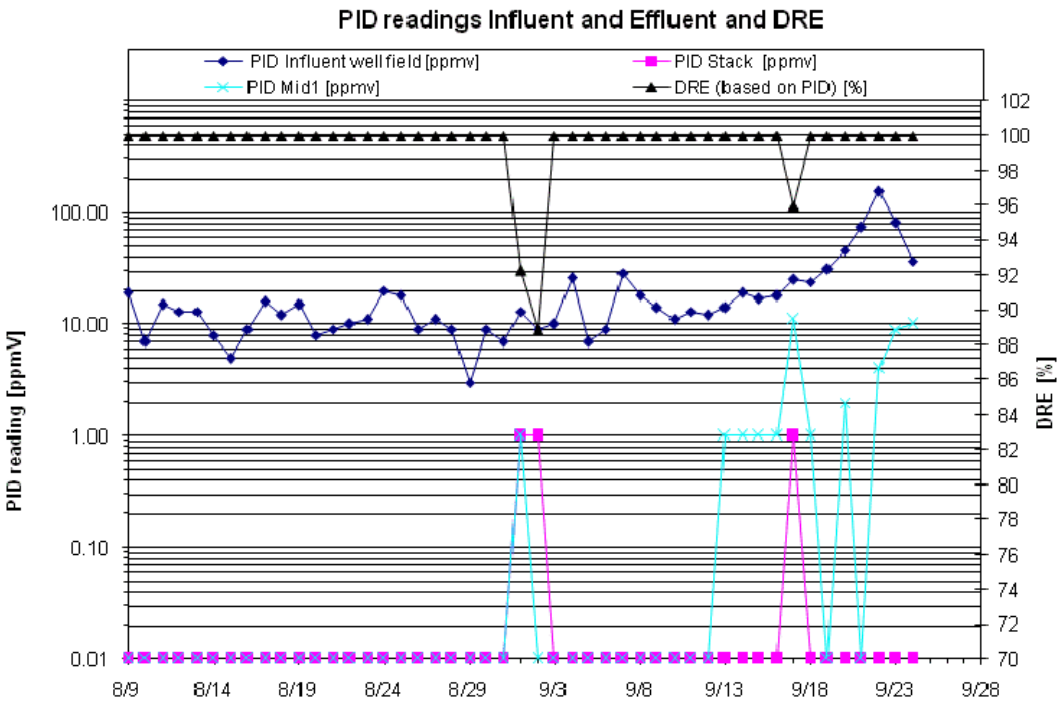


Figure 6. Influent, Midfluent, and Effluent PID Readings and Calculated DRE

5. Mass Removal

The figure below presents the total influent vapor mass removal using calibrated PID response factors based on analytical data received to date and total influent liquid mass removal based on analytical data received to date. Calibrated PID response factors have been applied as a step function using the lab data received for the 8/10, 8/18, and 8/24 sampling dates. The graph will be updated as new analytical data are received. Additionally, the figure below presents the cumulative mass removal to date.

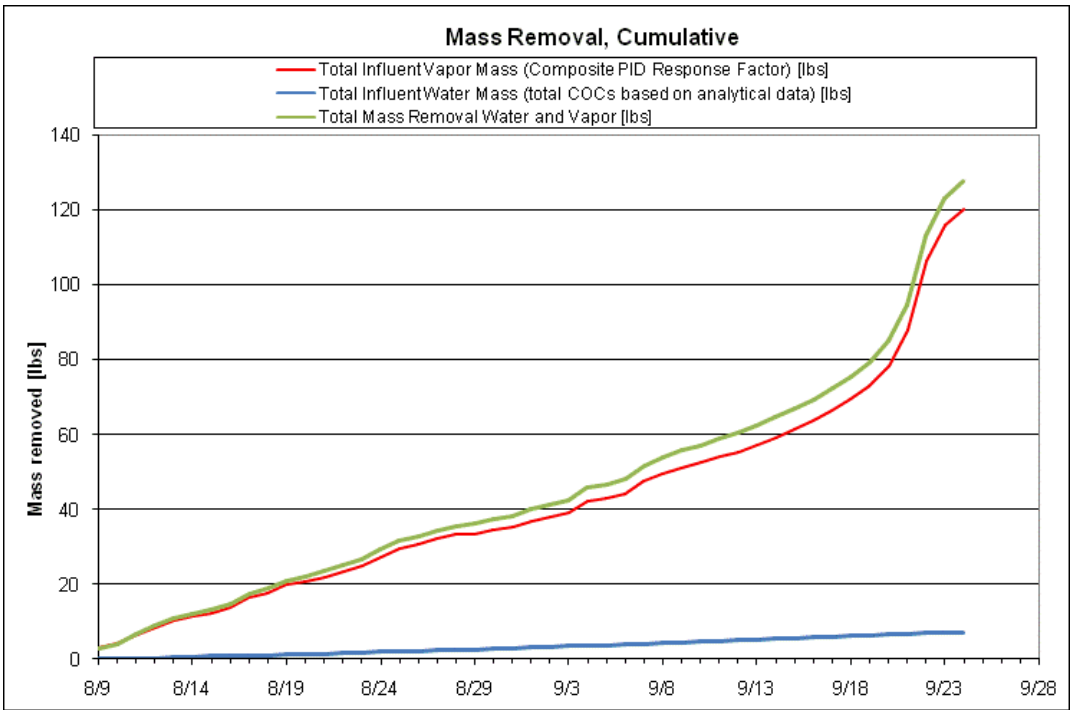


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from 16 vapor extraction wells at the site on 9/22/10. The table below presents the concentrations in ppmV from the most recent and previous sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/2010	8/17/2010	8/25/2010	9/1/2010	9/8/2010	9/15/2010	9/22/2010
VEW 1	*5.1*	*5*	*6.4*	*6*	*7.3*	*6.5*	*8.7*
VEW 2	*4.5*	*8*	*6.5*	*5*	*5.2*	*2.9*	*7.8*
VEW 3	*1.1*	*8*	*2.1*	*7*	*7.1*	*8.2*	*22*
VEW 4	*4.1*	*6*	*5.2*	*6*	*8.7*	*6.3*	*7.9*
VEW 5	*7.9*						
VEW 6	*2.9*						
VEW 7	*3.5*						
VEW 8	*10.8*						
VEW 9	*14.2*	*0*	*4.5*	*22*	*73*	*66*	*81*
VEW 10	*2.3*						
VEW 11	*5.4*						
VEW 12	*4.6*						
VEW 13	*3.1*						
VEW 14	*1.3*						
VEW 15	*6.2*	*10*	*6.8*	*26*	*42*	*60*	*107*
VEW 16	*4.0*	*6*	*5.9*	*5*	*8.1*	*3.4*	*12*
VEW 17	*15.9*	*16*	*8.4*	*101*	*164*	*75*	*129*
VEW 18	*10.3*	*8*	*5.8*	*51*	*95*	*36*	*22*
VEW 19	*1.6*	*5*	*4.8*	*6*	*28*	*7.4*	*11*
VEW 20	*4.5*						
VEW 21	*11.1*	*5*	*3.8*	*42*	*93*	*89*	*139*
VEW 22	*8.4*						
VEW 23	*0.6*	*7*	*7.3*	*15*	*58*	*7.1*	*6.2*
VEW 24	*4.6*	*5*	*5.4*	*15*	*43*	*64*	*57*
VEW 25	*1.9*						
VEW 26	*7.1*	*5*	*4.4*	*5*	*4.2*	*6.9*	*9.6*
VEW 27	*8.1*	*7*	*4.5*	*2*	*5.6*	*4.2*	*8.5*
VEW 28	*10.7*	*6*	*3.3*	*6*	*5.3*	*3.8*	*11*
VEW 29	10.3						

7. Water Level

The figure below presents a water level contour map for the site.

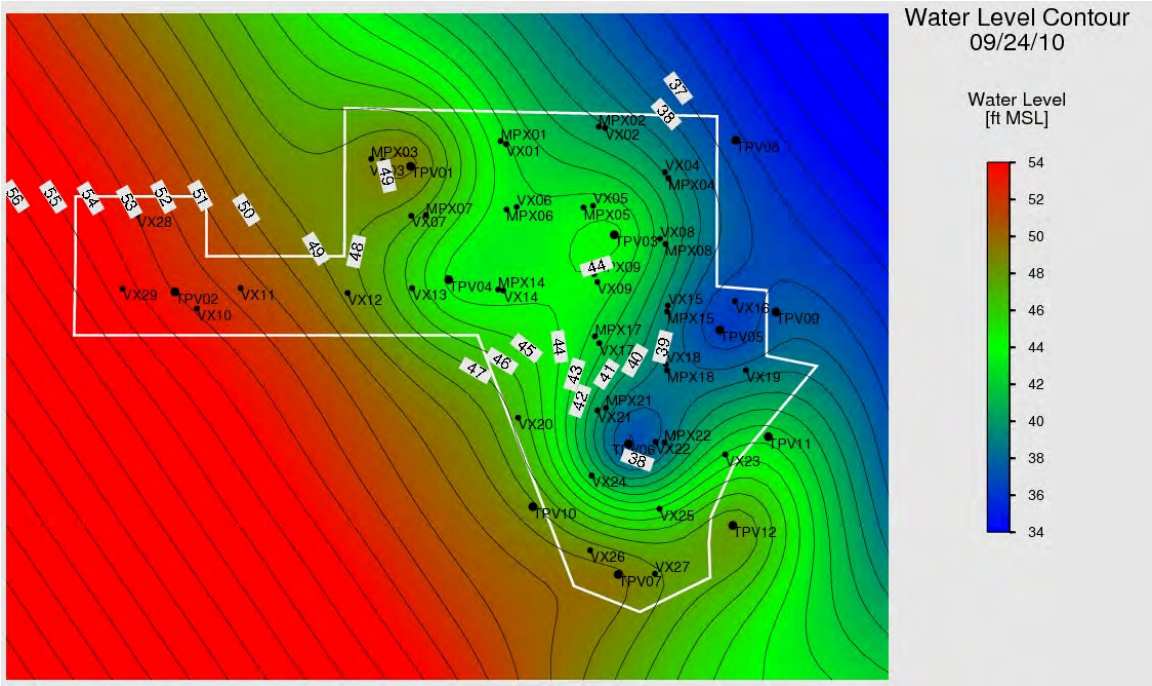


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

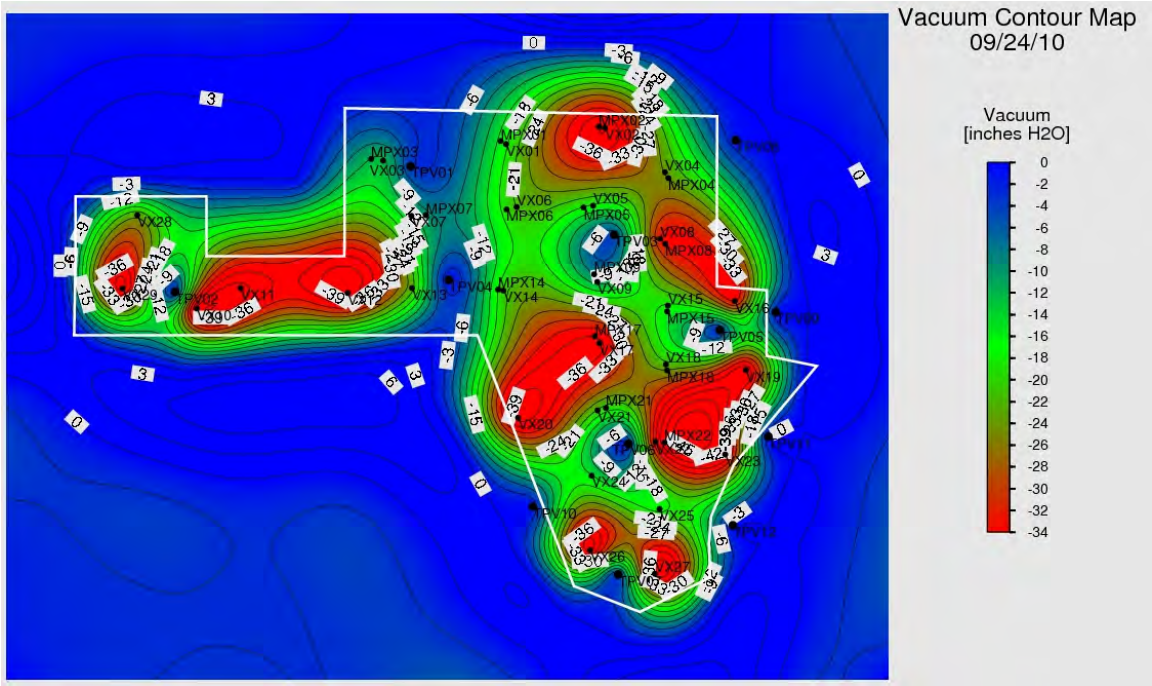


Figure 9. Vacuum Contour Map

9. Water Balance

To facilitate the initial operation of the electrodes, targeted water injections have been used to increase the resistivity of the soil around primarily shallow electrodes I the treatment zone. Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 424,799 gallons of water since system startup while extracting a total of 595,128 gallons of water for a net water extraction of 170,329 gallons as of 09/24/10 (as seen in Figure 10 below).

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

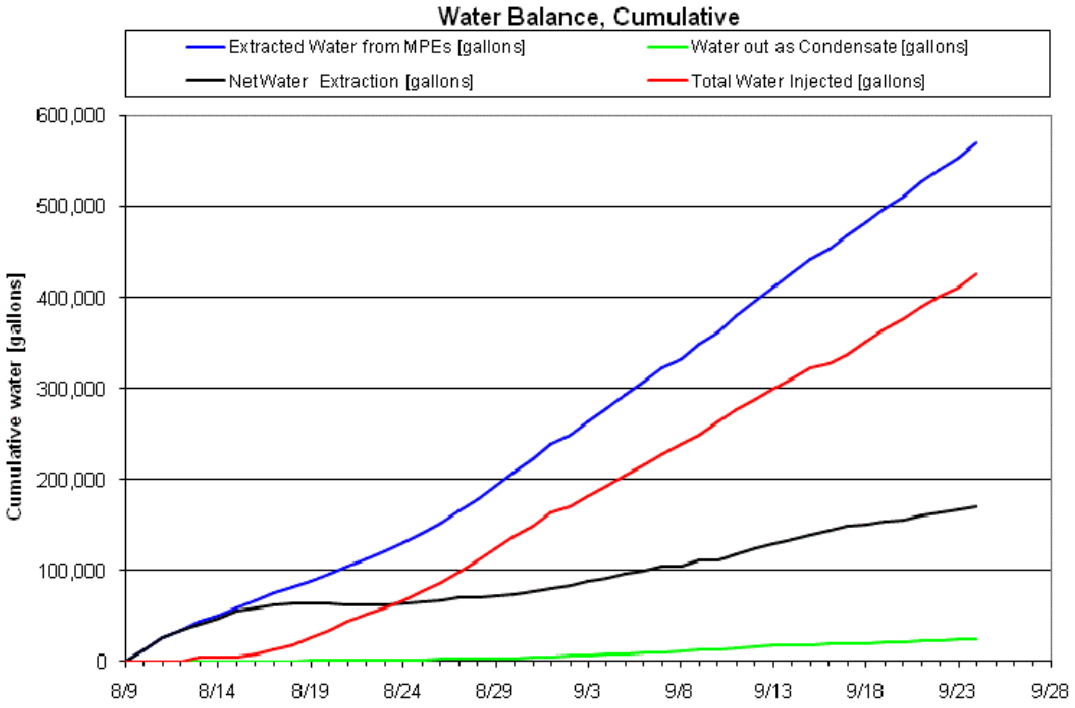


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

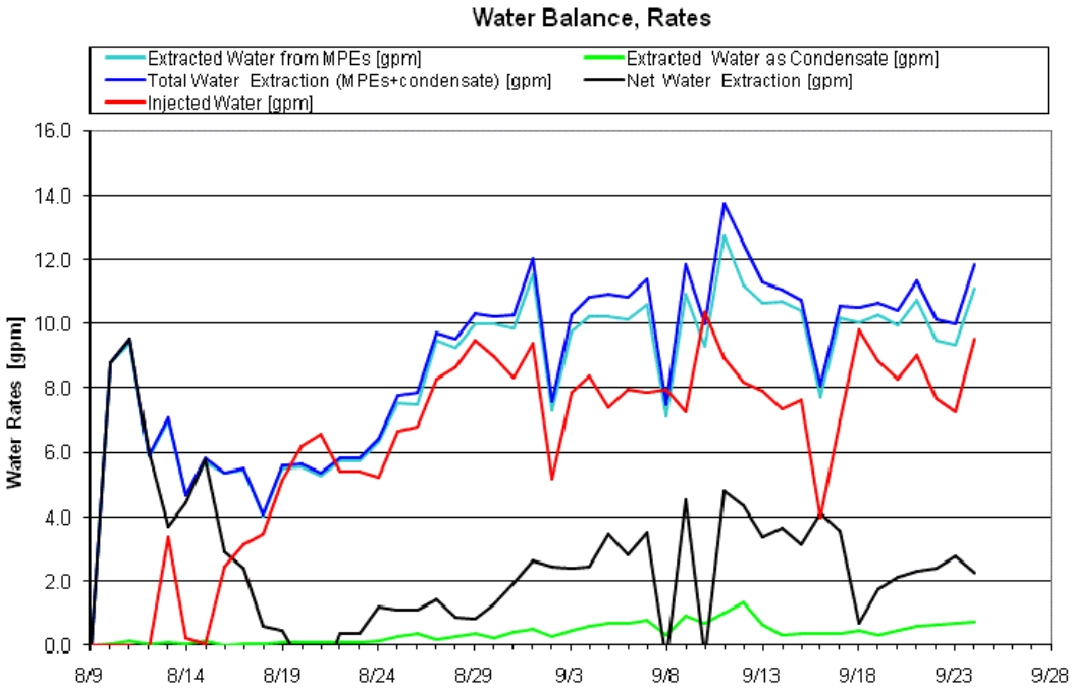


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

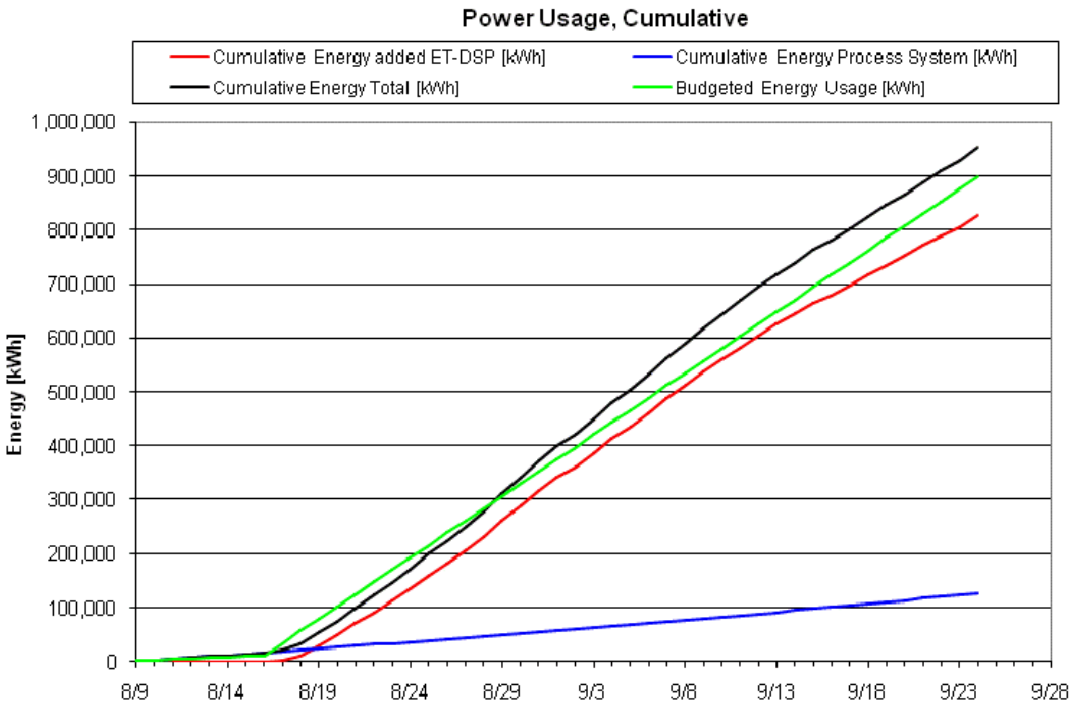


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Saline Addition
In order to enhance soil conductivity at the Groveland Wells Superfund site, saline was added to the bag filters within the water circulation units to be injected into select electrodes with currents less the 5 kW.

On September 21, 23 and 24, a daily total of 80 pounds of salt was injected into the treatment zone through targeted electrodes in order to increase the conductivity of the soil.

Incidents:

No safety or environmental compliance issues were identified at the site this week.

Performance Goal Attainment Issues or Concerns:

No issues or concerns related to attainment of performance goals.

Progress Report

9/25/2010 through 10/1/2010
October 4, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from September 25 through October 1, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 10/1/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	134	
Projected total energy usage	3,049,000	kWh
Days of operation	45	days
Energy used to date	1,110,240	kWh
Injected energy per soil volume to date	59	kWh/cy
Water VOC mass removal last 7 days	1.2	lbs
Water VOC mass removal to date	8.5	lbs
Vapor VOC mass removal last 7 days	22	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total VOC mass removal to date	143	lbs
Average temperature Area A last 7 days	160	°F
Average temperature Area C last 7 days	129	°F
Average temperature Area D last 7 days	115	°F
Average power usage last 7 days	909	kW
Average pumped water rate last 7 days	9.6	gpm
Average injected water rate last 7 days	8.5	gpm
Average vapor extraction rate (non condensable) last 7 days	446	scfm

System Shutdowns

The electrodes were manually shut down from 7:30 to 14:00 on 09/30/10 for groundwater sampling at the site.

Additionally, the electrodes were turned off in half hour increments 3 times on 10/1/10 to further configure electrodes and check the reporting to the database.

System Maintenance

09/27-29/10: McMillan-McGee installed circuit boards into the Water Circulation Units (WCUs). The circuit boards will allow for the ability to open and close valves in the WCUs remotely thus controlling which electrodes receive saline during injections at the site.

09/30/10: TerraTherm installed a replacement backup pump on the second knockout skid.

10/1/10: McMillan-McGee installed an additional grounding rod behind the PDS units at the site.

Other routine maintenance was performed.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

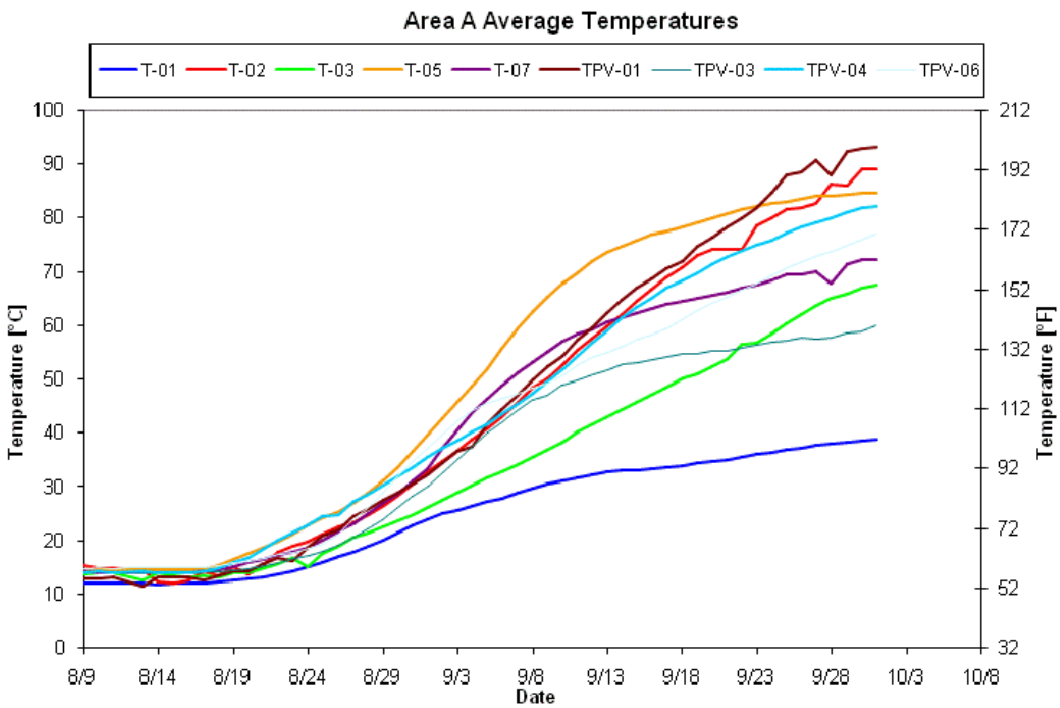


Figure 1. Average Temperature – Area A

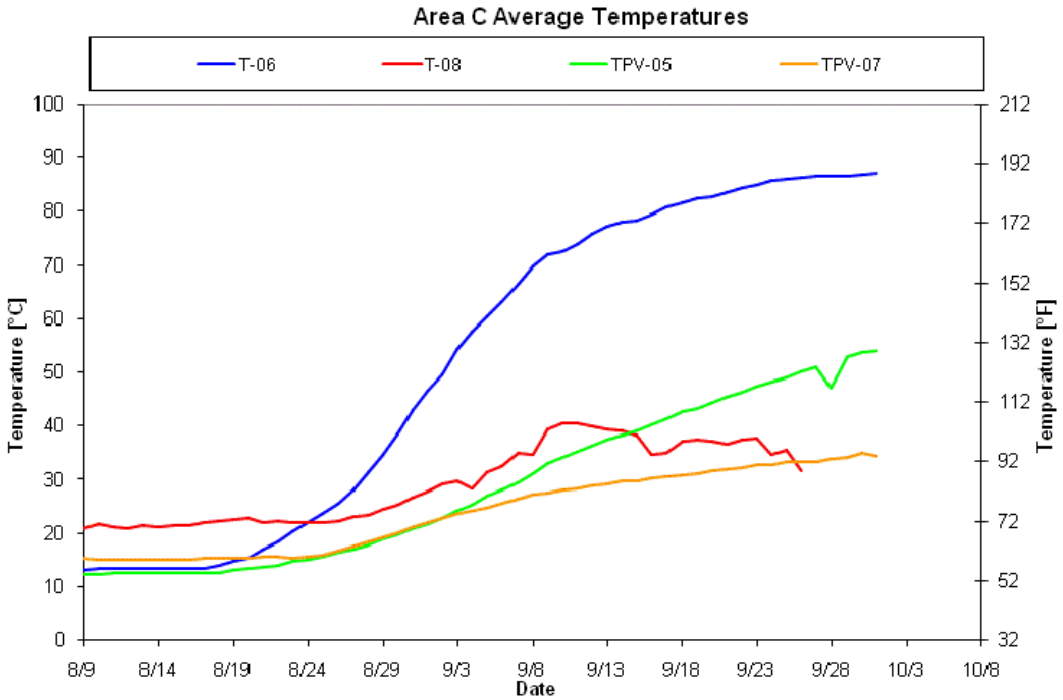


Figure 2. Average Temperature – Area C

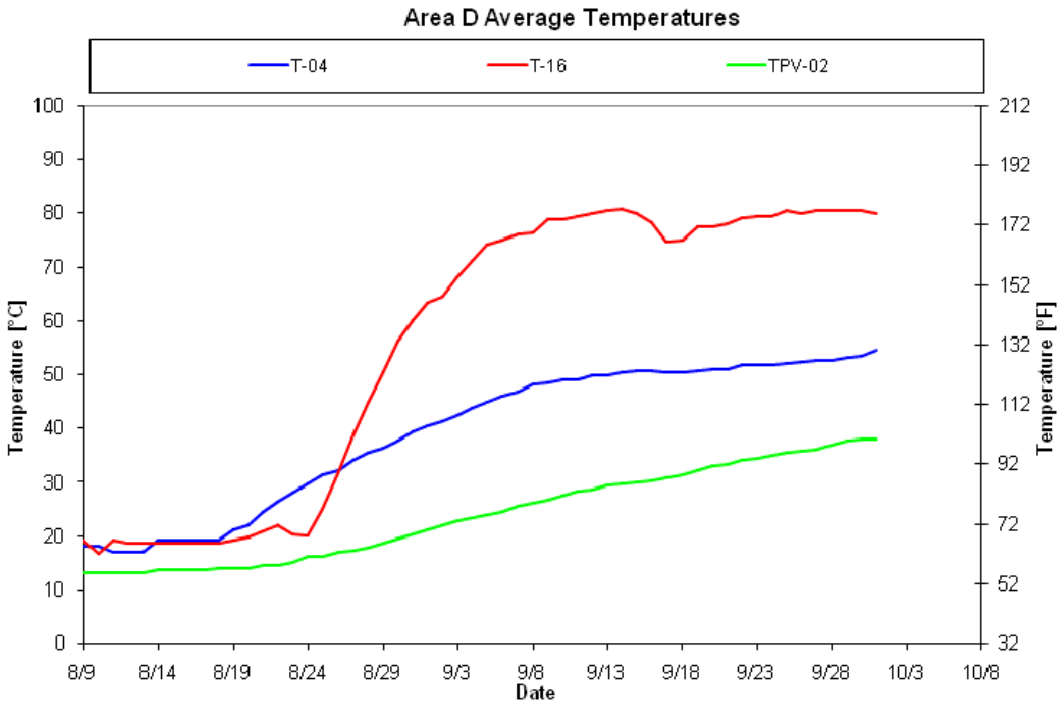


Figure 3. Average Temperature – Area D

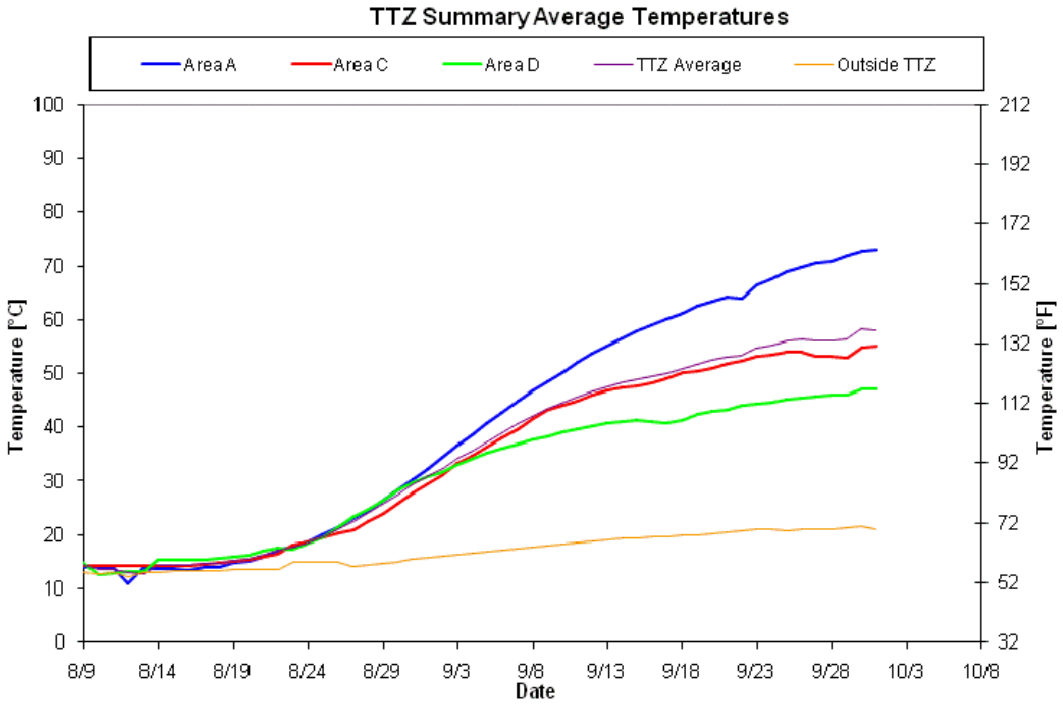


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment.

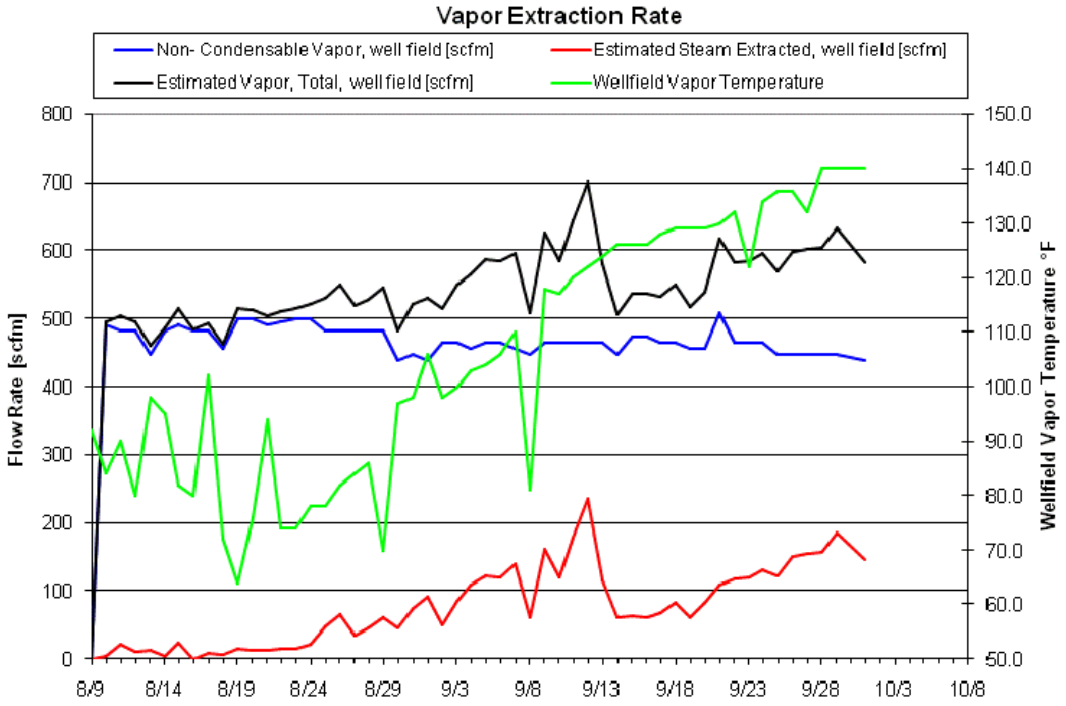


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Recent midfluent data suggest that the granular activated carbon in the primary vessel may be spent. TerraTherm evaluates PID readings collected in the field daily from multiple locations along the vapor carbon trailer. Nobis is currently collecting summa samples at the influent, midfluent and effluent to the vapor carbon vessels to assist in the evaluation of carbon changeout. We are prepared to be perform a carbon changeout when necessary.

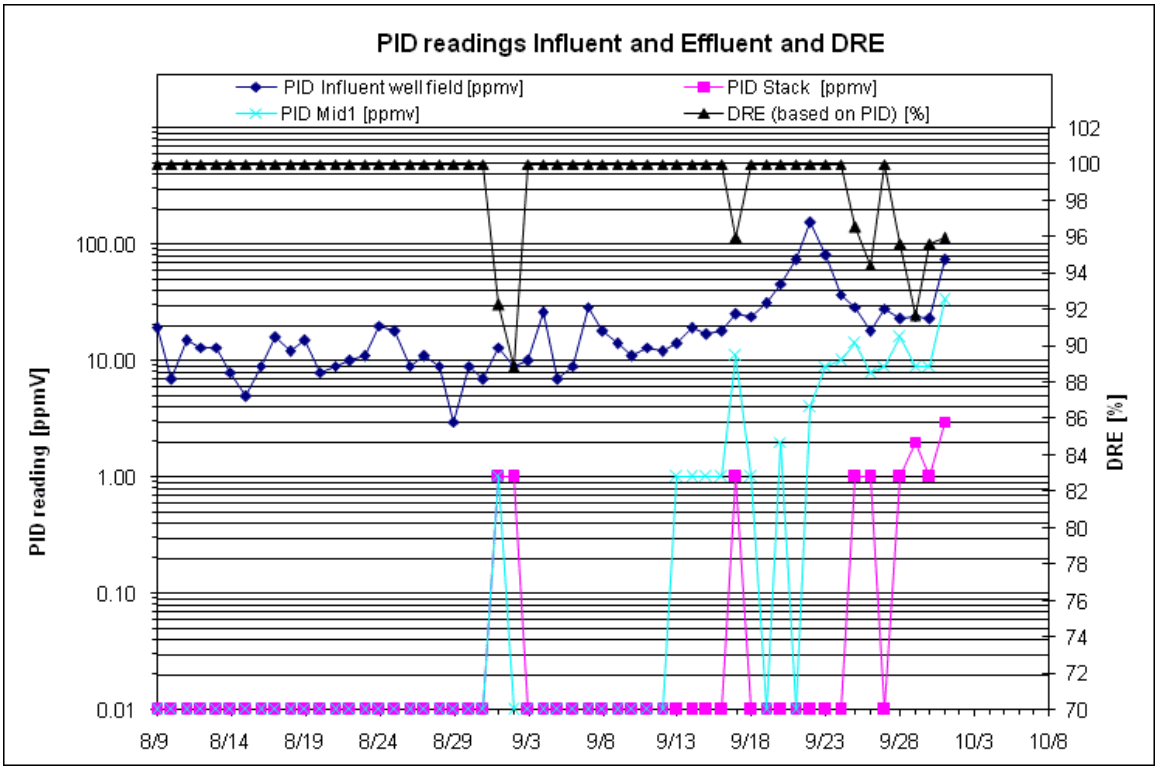


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Mass Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the lab data received for the 8/10, 8/18, 8/24, 8/31, and 9/8 sampling dates. A composite PID response factor for the VOC mix identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the lab data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and lab data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by Lab-Correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in pumped groundwater based on water lab analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

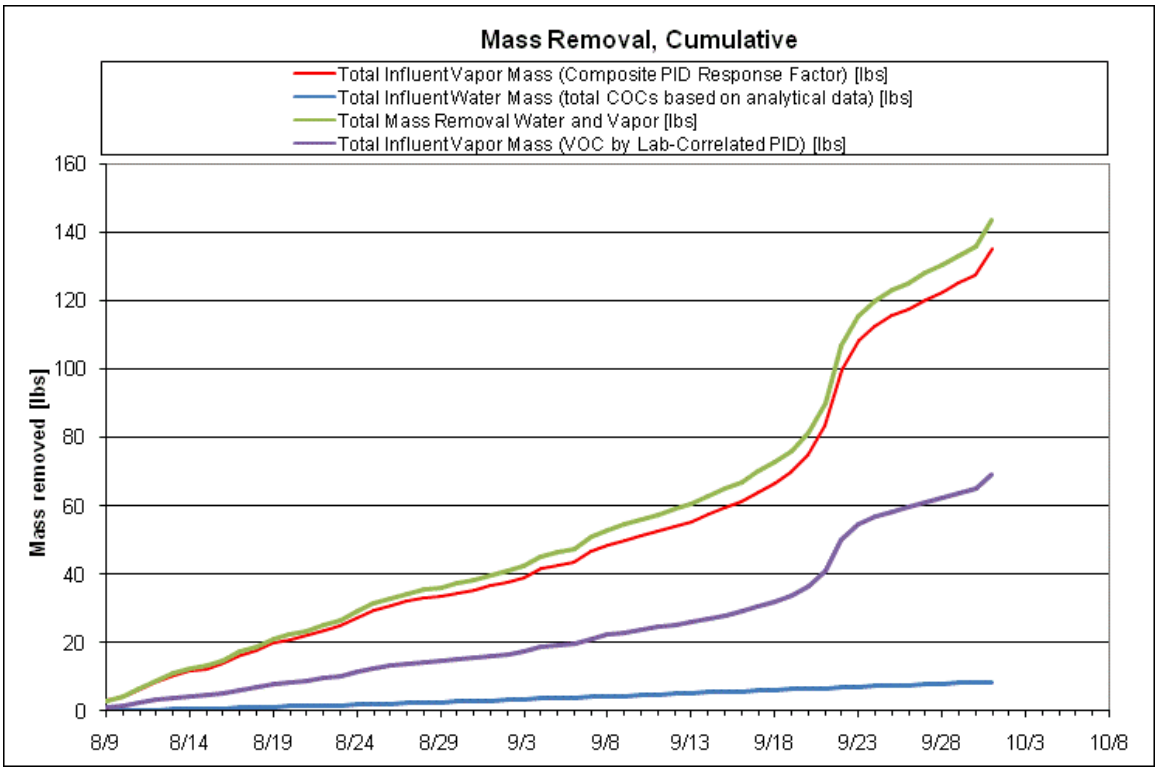


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from all 29 vapor extraction wells at the site on 9/29/10. The table below presents the concentrations in ppmV from the most recent and previous sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/2010	8/17/2010	8/25/2010	9/1/2010	9/8/2010	9/15/2010	9/22/2010	9/29/2010
VEW 1	*5.1*	*5*	*6.4*	*6*	*7.3*	*6.5*	*8.7*	*11*
VEW 2	*4.5*	*8*	*6.5*	*5*	*5.2*	*2.9*	*7.8*	*7.4*
VEW 3	*1.1*	*8*	*2.1*	*7*	*7.1*	*8.2*	*22*	*74*
VEW 4	*4.1*	*6*	*5.2*	*6*	*8.7*	*6.3*	*7.9*	*13*
VEW 5	*7.9*							*75*
VEW 6	*2.9*							*32*
VEW 7	*3.5*							*16*
VEW 8	*10.8*							*11*
VEW 9	*14.2*	*0*	*4.5*	*22*	*73*	*66*	*81*	*151*
VEW 10	*2.3*							*5.8*
VEW 11	*5.4*							*6.4*
VEW 12	*4.6*							*13*
VEW 13	*3.1*							*29*
VEW 14	*1.3*							*93*
VEW 15	*6.2*	*10*	*6.8*	*26*	*42*	*60*	*107*	*268*
VEW 16	*4.0*	*6*	*5.9*	*5*	*8.1*	*3.4*	*12*	*15*
VEW 17	*15.9*	*16*	*8.4*	*101*	*164*	*75*	*129*	*185*
VEW 18	*10.3*	*8*	*5.8*	*51*	*95*	*36*	*22*	*13*
VEW 19	*1.6*	*5*	*4.8*	*6*	*28*	*7.4*	*11*	*17*
VEW 20	*4.5*							*42*
VEW 21	*11.1*	*5*	*3.8*	*42*	*93*	*89*	*139*	*177*
VEW 22	*8.4*							*20*
VEW 23	*0.6*	*7*	*7.3*	*15*	*58*	*7.1*	*6.2*	*19*
VEW 24	*4.6*	*5*	*5.4*	*15*	*43*	*64*	*57*	*176*
VEW 25	*1.9*							*8.5*
VEW 26	*7.1*	*5*	*4.4*	*5*	*4.2*	*6.9*	*9.6*	*18*
VEW 27	*8.1*	*7*	*4.5*	*2*	*5.6*	*4.2*	*8.5*	*5.3*
VEW 28	*10.7*	*6*	*3.3*	*6*	*5.3*	*3.8*	*11*	*9.9*
VEW 29	*10.3*							*29*

7. Water Level

The figure below presents a water level contour map for the site.

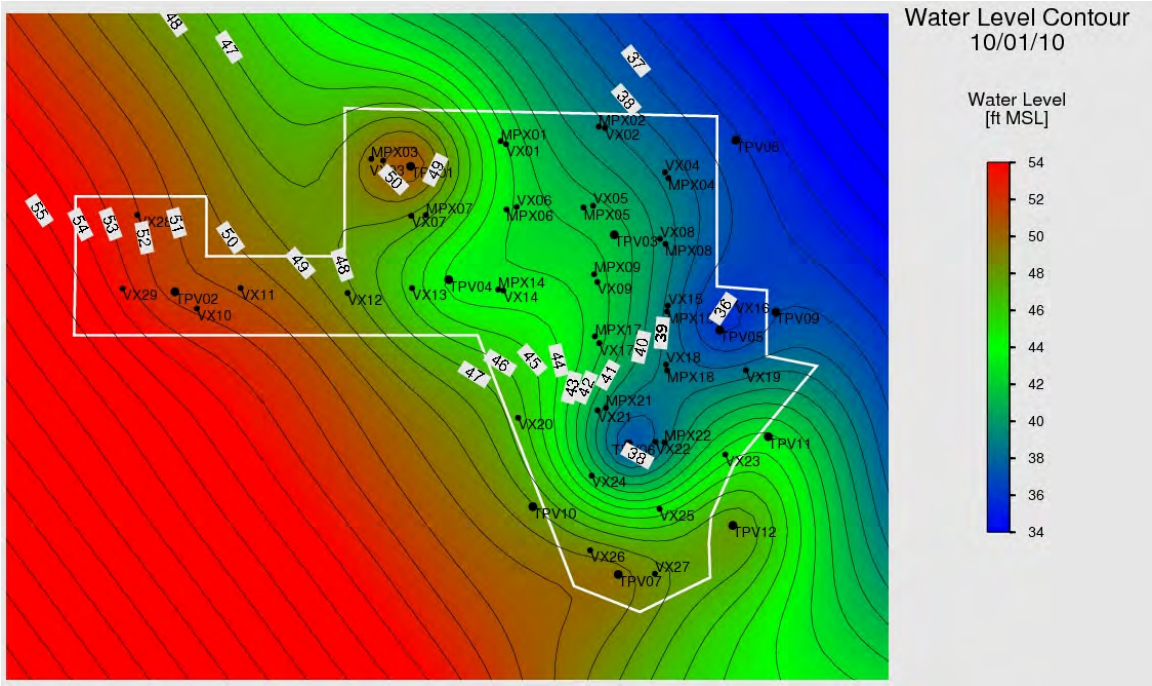


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

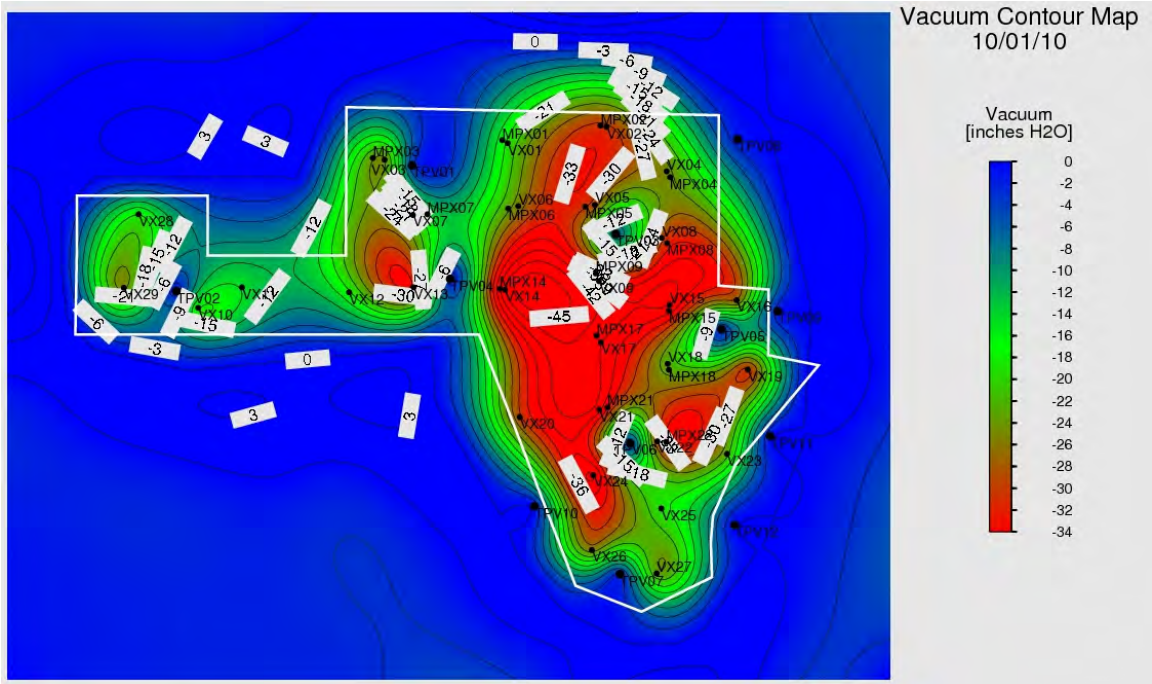


Figure 9. Vacuum Contour Map

9. Water Balance

Targeted water injections have been used to increase the resistivity of the soil around electrodes in the treatment zone. Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 510,737 gallons of water since system startup while extracting a total of 700,409 gallons of water for a net water extraction of 189,672 gallons as of 10/1/10 (as seen in Figure 10 below).

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

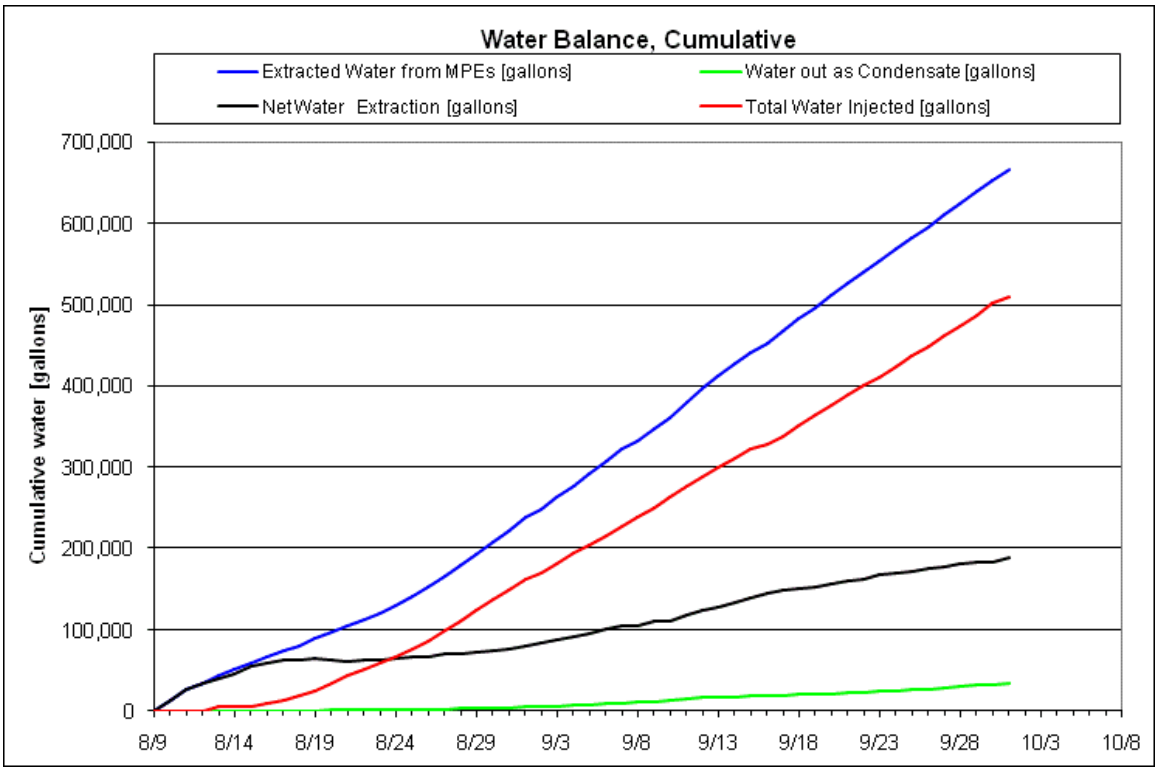


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

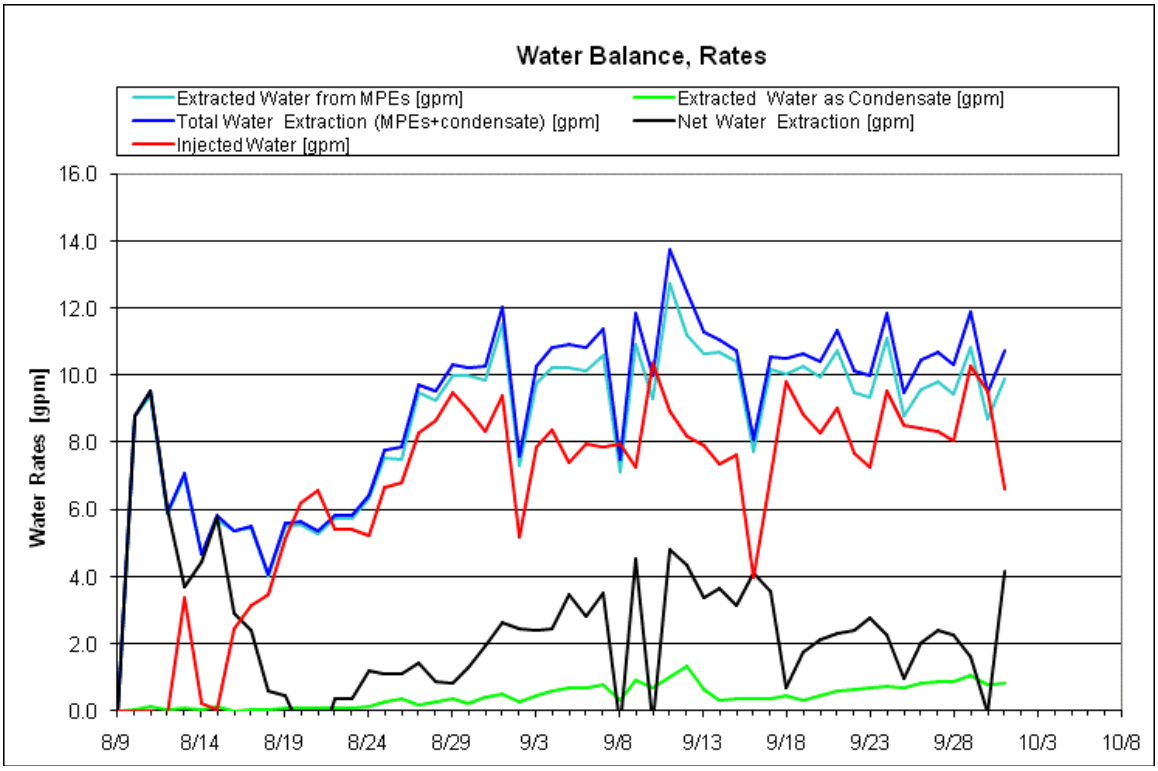


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

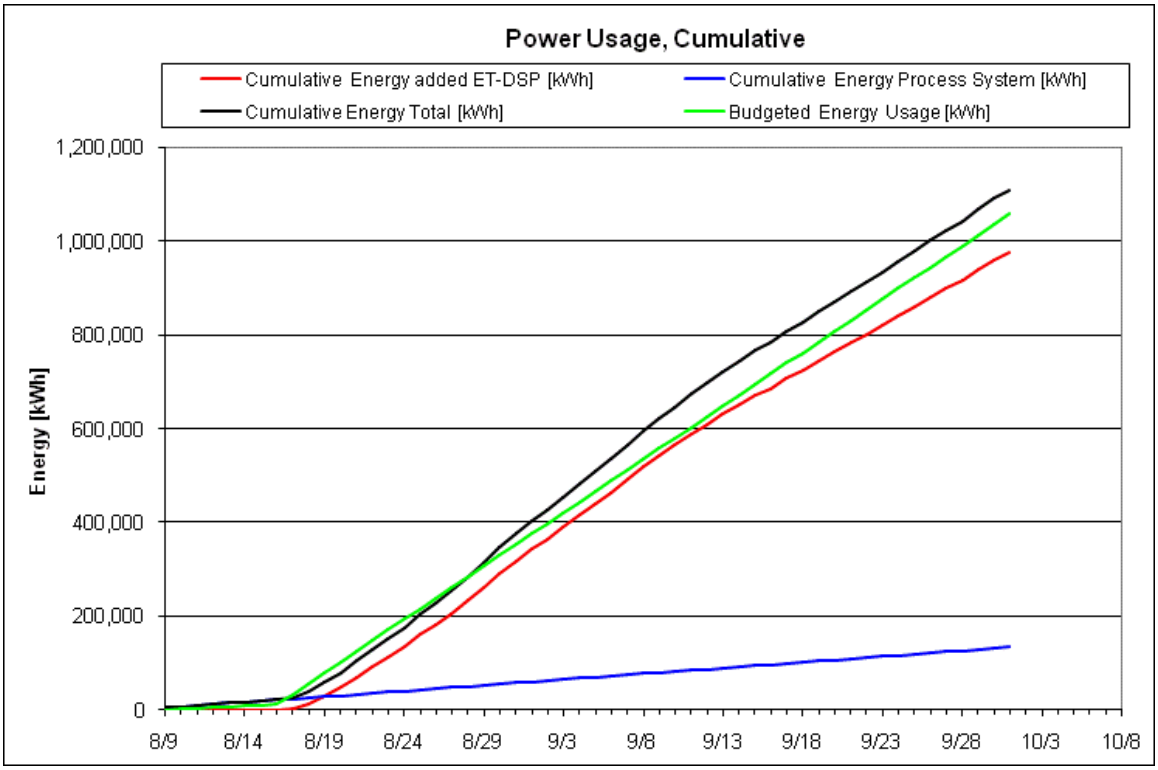


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Saline Addition
In order to enhance soil conductivity at the Groveland Wells Superfund site, saline was added to the bag filters within the water circulation units to be injected into select electrodes with currents less the 5 kW. On October 1, a total of 80 pounds of salt was injected into the treatment zone through targeted electrodes in order to increase the conductivity of the soil.

DigiPAM Calibration
McMillan-McGee checked the digiPAM calibration which was found to be within 3" of the recorded values.

Electrode Reconfiguration
McMillan-McGee reconfigured the taps at the PDS units and changed electrodes positions at the PDS units to get the electrode power outputs within the designed power for this site.

Incidents:

No safety or environmental compliance issues were identified at the site this week.

Performance Goal Attainment Issues or Concerns:

No issues or concerns related to attainment of performance goals.

Progress Report

10/2/2010 through 10/8/2010
October 11, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from October 2 through October 8, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 10/8/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13,590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	134	
Projected total energy usage	3,049,000	kWh
Days of operation	52	days
Energy used to date	1,295,040	kWh
Injected energy per soil volume to date	69	kWh/cy
Water contaminant removal last 7 days	0.70	lbs
Water contaminant removal to date	8.4*	lbs
Vapor contaminant removal last 7 days	19	lbs
Volume of NAPL removed last 7 days	0.0	gal
Volume of NAPL removed to date	18	gal
Total contaminant removal to date	163	lbs
Average temperature Area A last 7 days	168	°F
Average temperature Area C last 7 days	135	°F
Average temperature Area D last 7 days	122	°F
Average power usage rate last 7 days	1,100	kW
Average pumped water rate last 7 days	11	gpm
Average injected water rate last 7 days	14	gpm
Average vapor extraction rate (non condensable) last 7 days	469	scfm

* The water mass has been recalculated for each day after 9/22 using recently received laboratory data

System Shutdowns

The electrodes were manually shut down from 14:30 to 16:30 on 10/5/10 for Multi Phase Extraction (MPE) well pump troubleshooting and maintenance.

System Maintenance

10/5/10: MPE well pump troubleshooting and maintenance on MPEs 1, 6, 7 and 15. Pumps were replaced in MPEs 1 and 6 with backup pumps on site.

10/6-8/10: TerraTherm installed a sound barrier wall around the blower cabinet.

10/7-8/10: McMillan-McGee onsite to troubleshoot circuit boards in Power Delivery System units.

10/8/10: TerraTherm installed a drum at Water Circulation System unit #3 for salt injections.

Performed carbon vessel changeout; took vessel #1 offline and put vessel #3 online.

Troubleshot and replaced three digiTAMs (T8, TPV12, and T15).

Other routine maintenance was performed.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

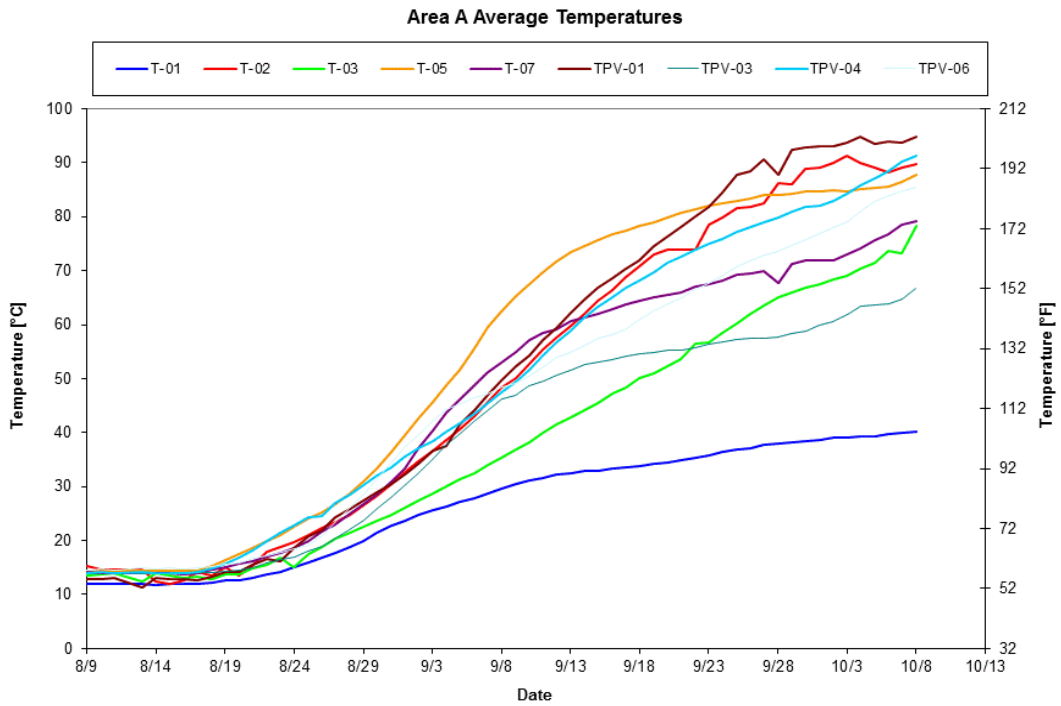


Figure 1. Average Temperature –Area A

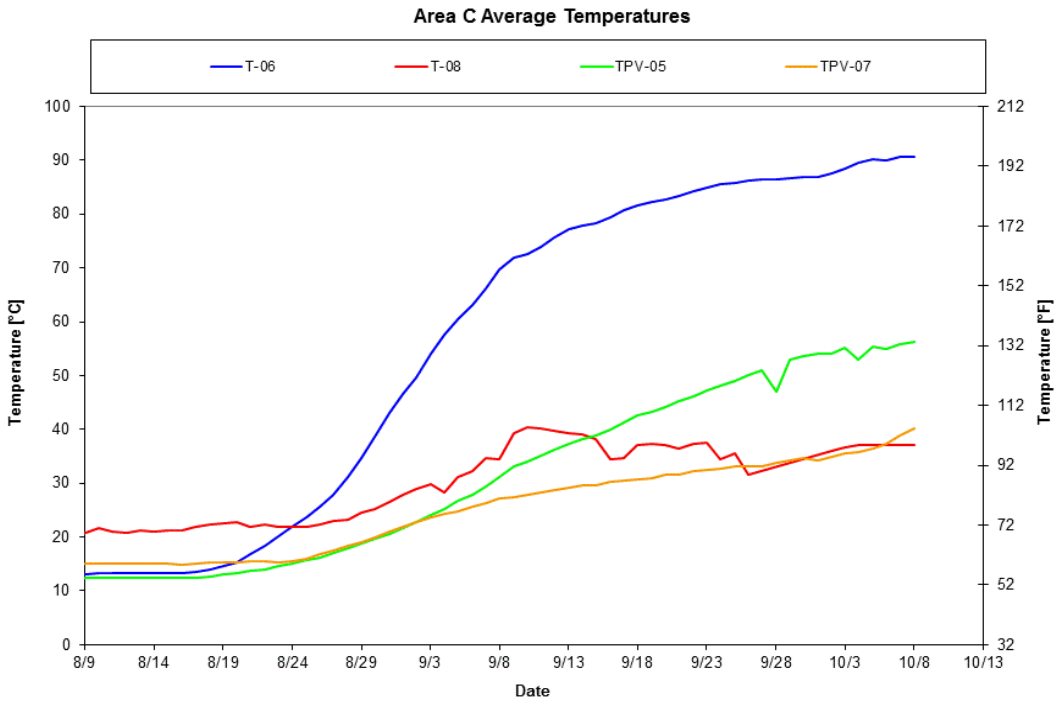


Figure 2. Average Temperature –Area C

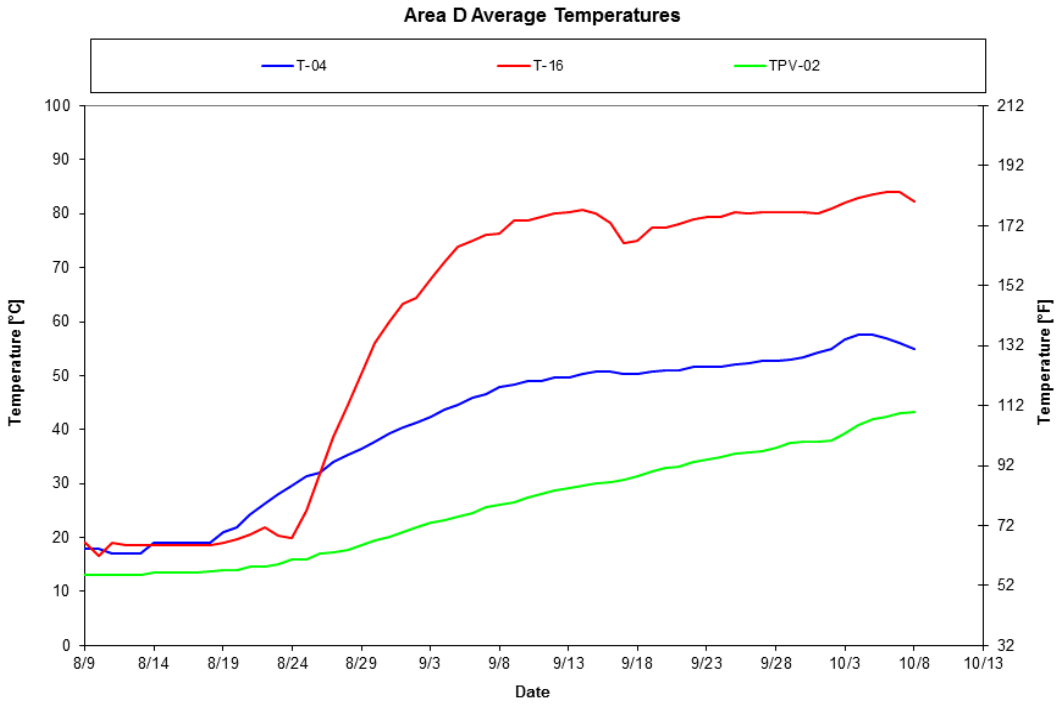


Figure 3. Average Temperature –Area D

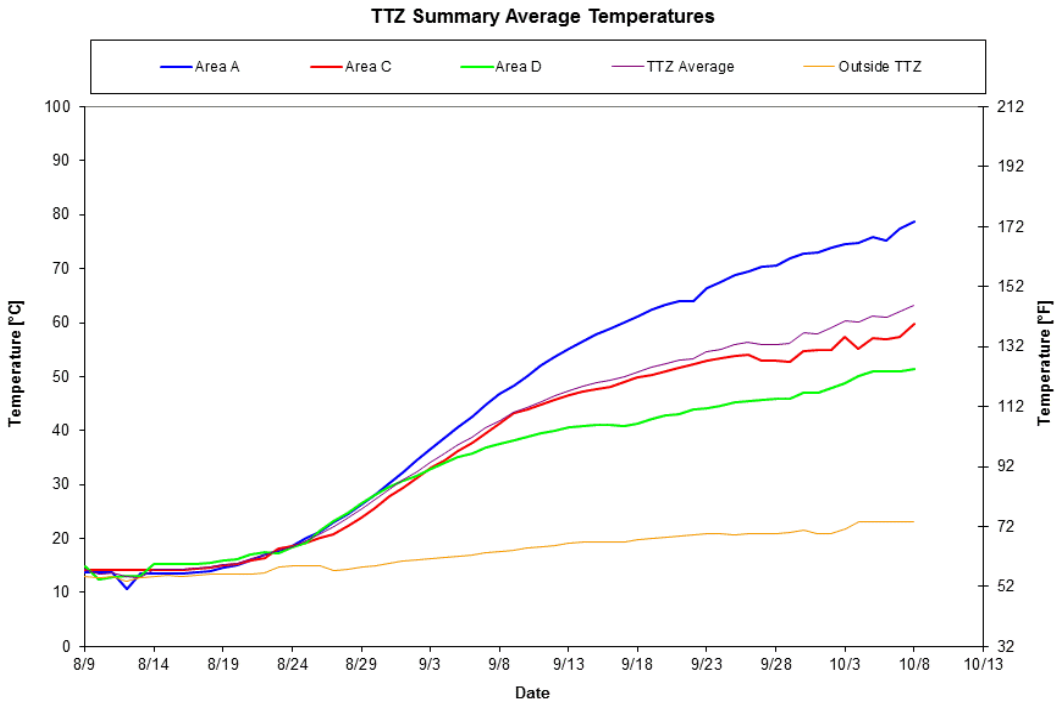


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment.

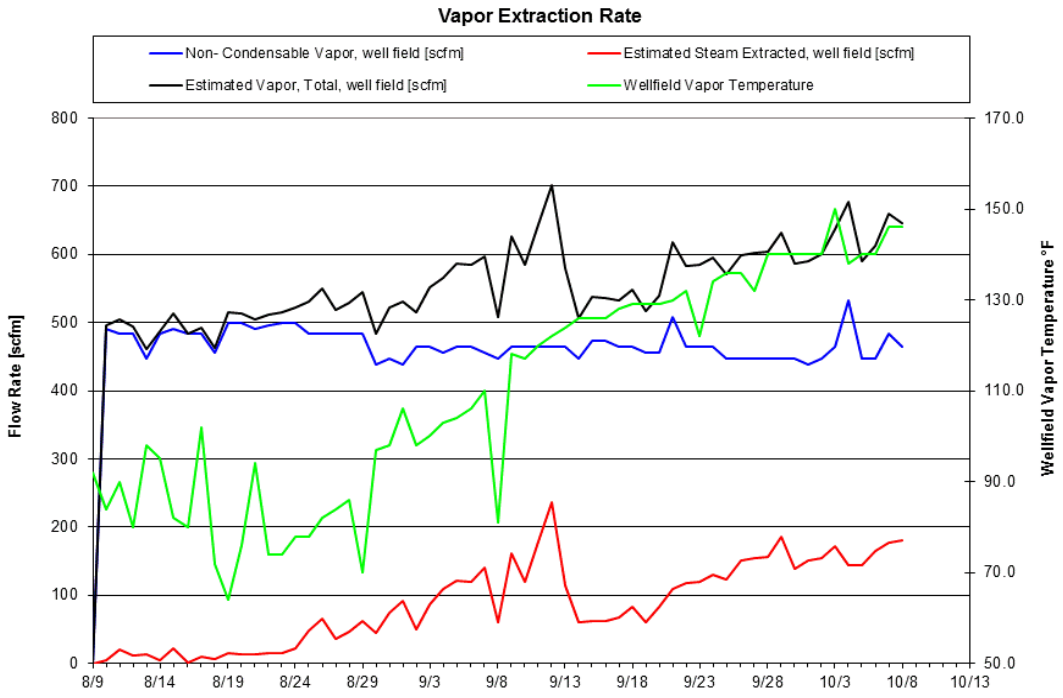


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Recent midfluent data suggested that the granular activated carbon in the primary vessel was spent. Nobis collected summa samples from the influent, midfluent, and effluent to the vapor treatment system on 10/4/10. Preliminary data were received by TerraTherm on 10/7/10 confirming that the primary carbon vessel was spent. On 10/8/10, TerraTherm took the first (primary) carbon vessel offline, making the second vessel the primary vessel and connected the third vessel as the secondary vessel.

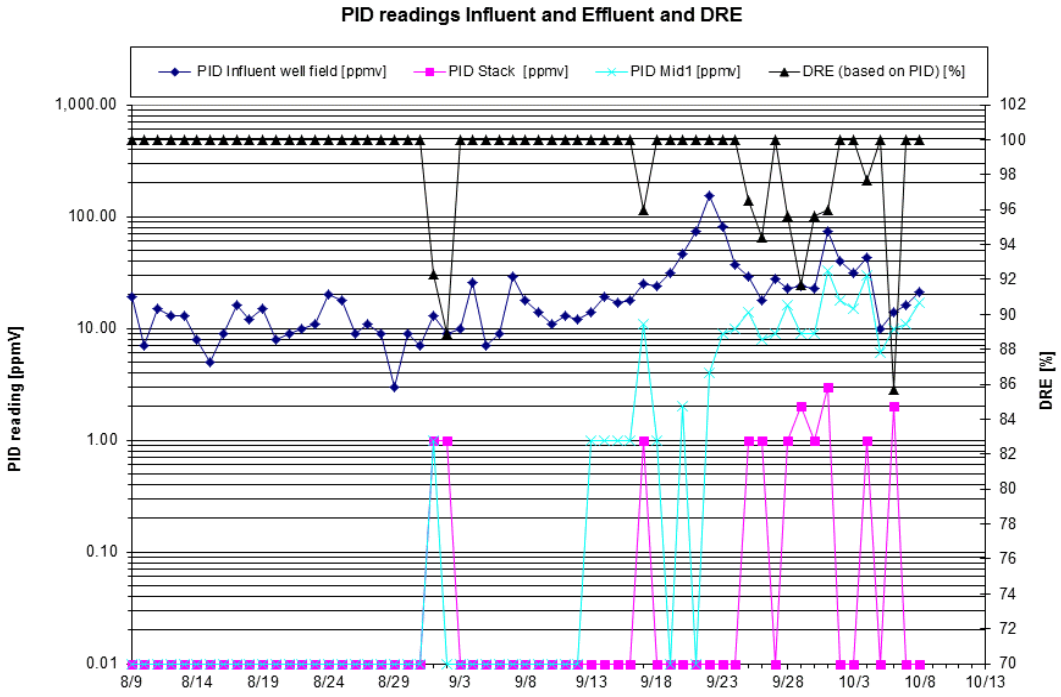


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the lab data received for the 8/10, 8/18, 8/24, 8/31, and 9/8 sampling dates. A composite PID response factor for the VOC mix identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the lab data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in pumped groundwater based on water lab analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

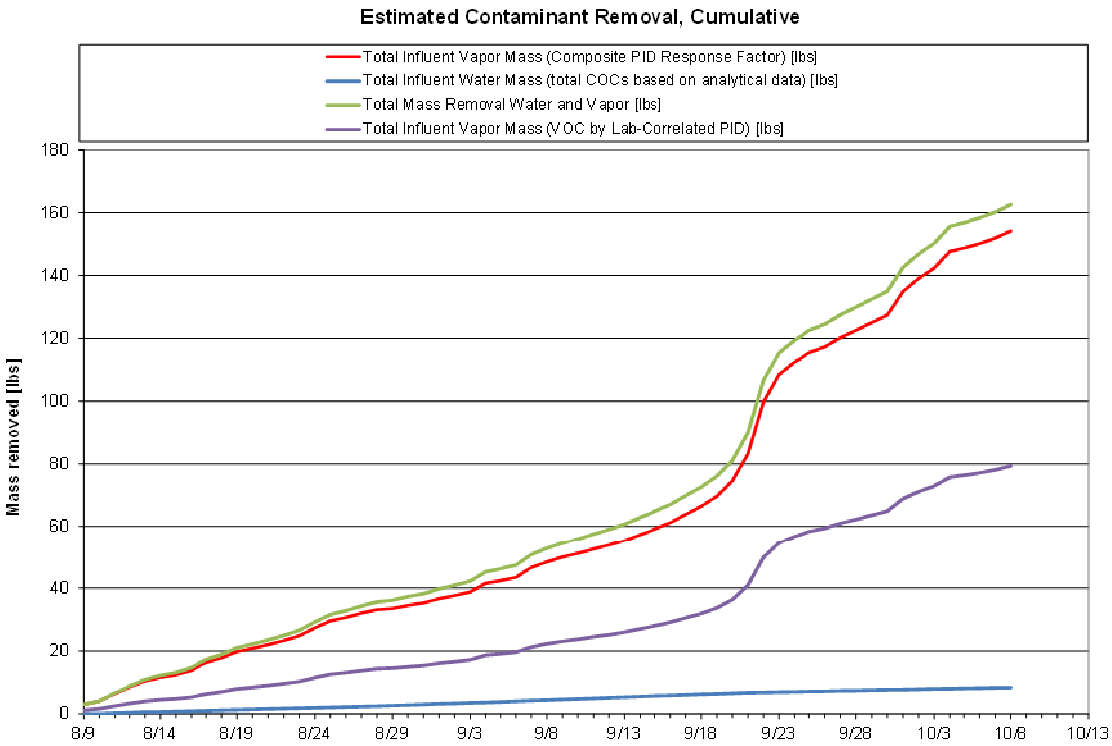


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 10/8/2010. The table below presents the concentrations in ppmV from the most recent and previous sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/10	8/17/10	8/25/10	9/1/10	9/8/10	9/15/10	9/22/10	9/29/10	10/8/10
VEW 1	*5.1*	*5*	*6.4*	*6*	*7.3*	*6.5*	*8.7*	*11*	
VEW 2	*4.5*	*8*	*6.5*	*5*	*5.2*	*2.9*	*7.8*	*7.4*	*5.2*
VEW 3	*1.1*	*8*	*2.1*	*7*	*7.1*	*8.2*	*22*	*74*	*40.0*
VEW 4	*4.1*	*6*	*5.2*	*6*	*8.7*	*6.3*	*7.9*	*13*	
VEW 5	*7.9*							*75*	*52.5*
VEW 6	*2.9*							*32*	*12.1*
VEW 7	*3.5*							*16*	
VEW 8	*10.8*							*11*	
VEW 9	*14.2*	*0*	*4.5*	*22*	*73*	*66*	*81*	*151*	*28.9*
VEW 10	*2.3*							*5.8*	
VEW 11	*5.4*							*6.4*	
VEW 12	*4.6*							*13*	
VEW 13	*3.1*							*29*	*47.4*
VEW 14	*1.3*							*93*	*47.0*
VEW 15	*6.2*	*10*	*6.8*	*26*	*42*	*60*	*107*	*268*	*164.3*
VEW 16	*4.0*	*6*	*5.9*	*5*	*8.1*	*3.4*	*12*	*15*	
VEW 17	*15.9*	*16*	*8.4*	*101*	*164*	*75*	*129*	*185*	*105.8*
VEW 18	*10.3*	*8*	*5.8*	*51*	*95*	*36*	*22*	*13*	
VEW 19	*1.6*	*5*	*4.8*	*6*	*28*	*7.4*	*11*	*17*	*34.4*
VEW 20	*4.5*							*42*	*60.7*
VEW 21	*11.1*	*5*	*3.8*	*42*	*93*	*89*	*139*	*177*	*108.2*
VEW 22	*8.4*							*20*	
VEW 23	*0.6*	*7*	*7.3*	*15*	*58*	*7.1*	*6.2*	*19*	
VEW 24	*4.6*	*5*	*5.4*	*15*	*43*	*64*	*57*	*176*	*47.3*
VEW 25	*1.9*							*8.5*	
VEW 26	*7.1*	*5*	*4.4*	*5*	*4.2*	*6.9*	*9.6*	*18*	
VEW 27	*8.1*	*7*	*4.5*	*2*	*5.6*	*4.2*	*8.5*	*5.3*	*9.8*
VEW 28	*10.7*	*6*	*3.3*	*6*	*5.3*	*3.8*	*11*	*9.9*	
VEW 29	*10.3*							*29*	26.2

7. Water Level

The figure below presents a water level contour map for the site.

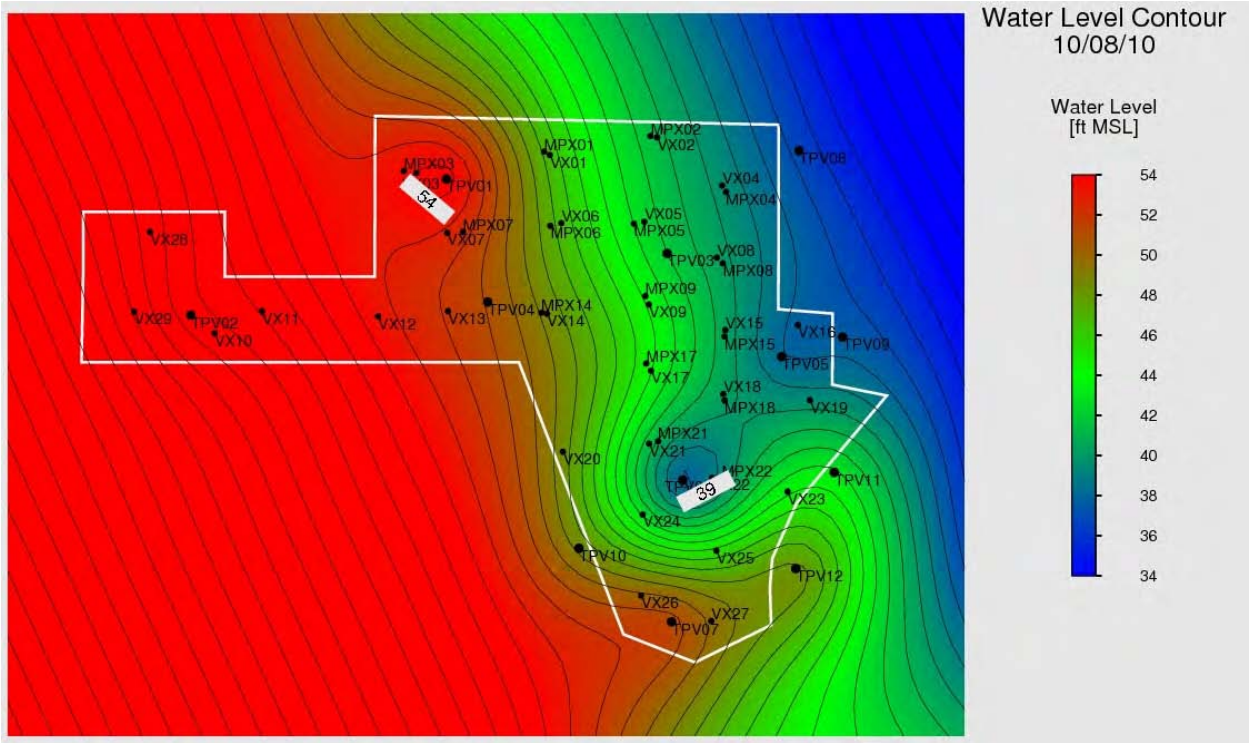


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

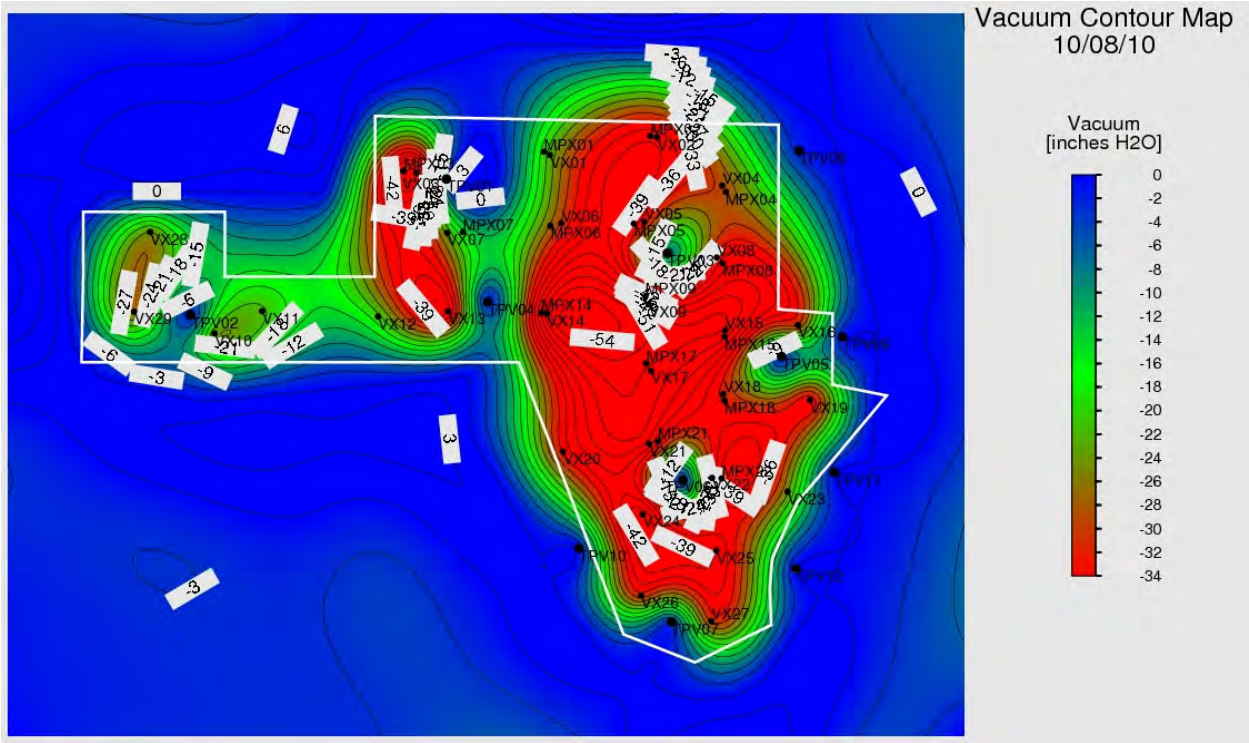


Figure 9. Vacuum Contour Map

9. Water Balance

Targeted water injections have been used to increase the resistivity of the soil around electrodes in the treatment zone. Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 651,810 gallons of water since system startup while extracting a total of 815,315 gallons of water for a net water extraction of 163,505 gallons as of 10/8/10 (as seen in Figure 10 below). During the 10/2-8/10 operational period, we had increased water injection rates as more water was directed toward shallow electrodes to increase the resistivity of the soil in this zone (as seen in Figure 11 below).

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

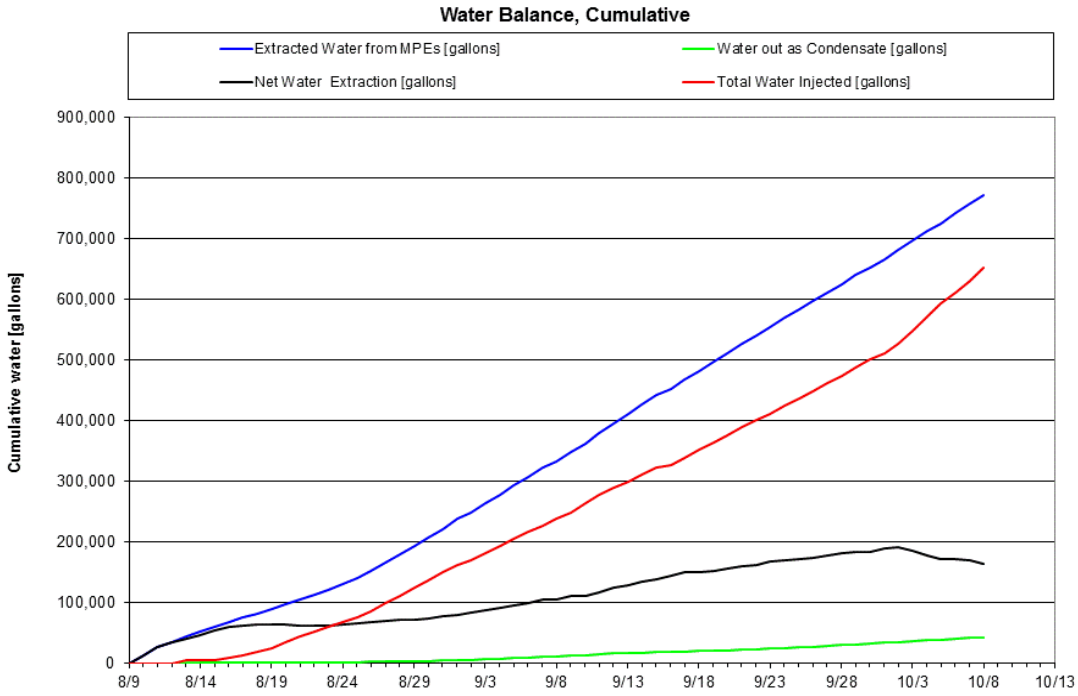


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

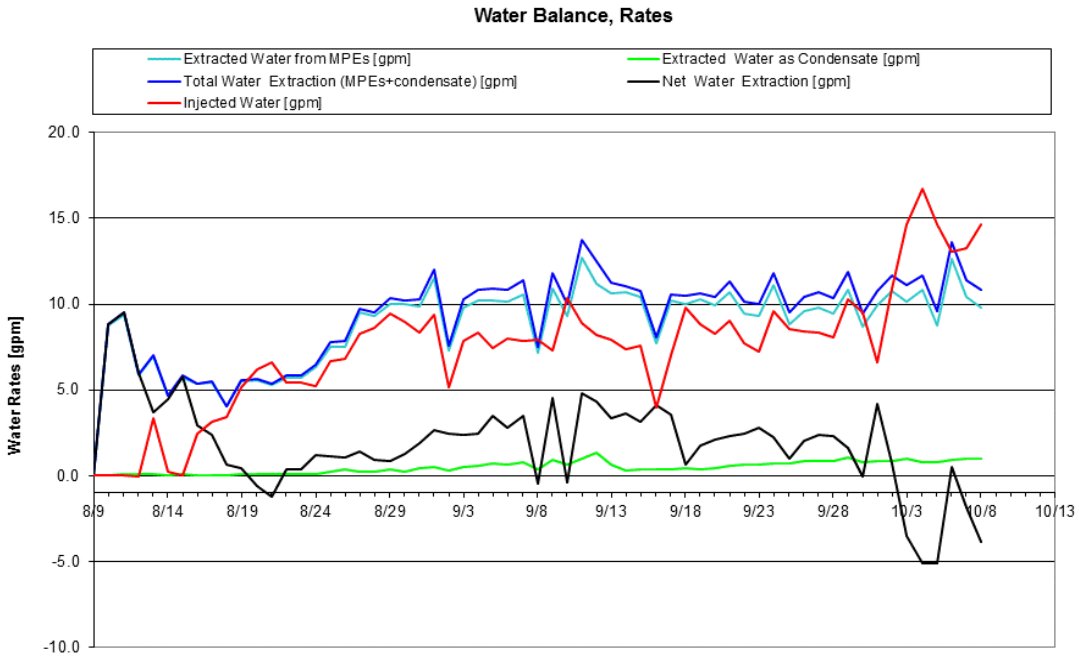


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

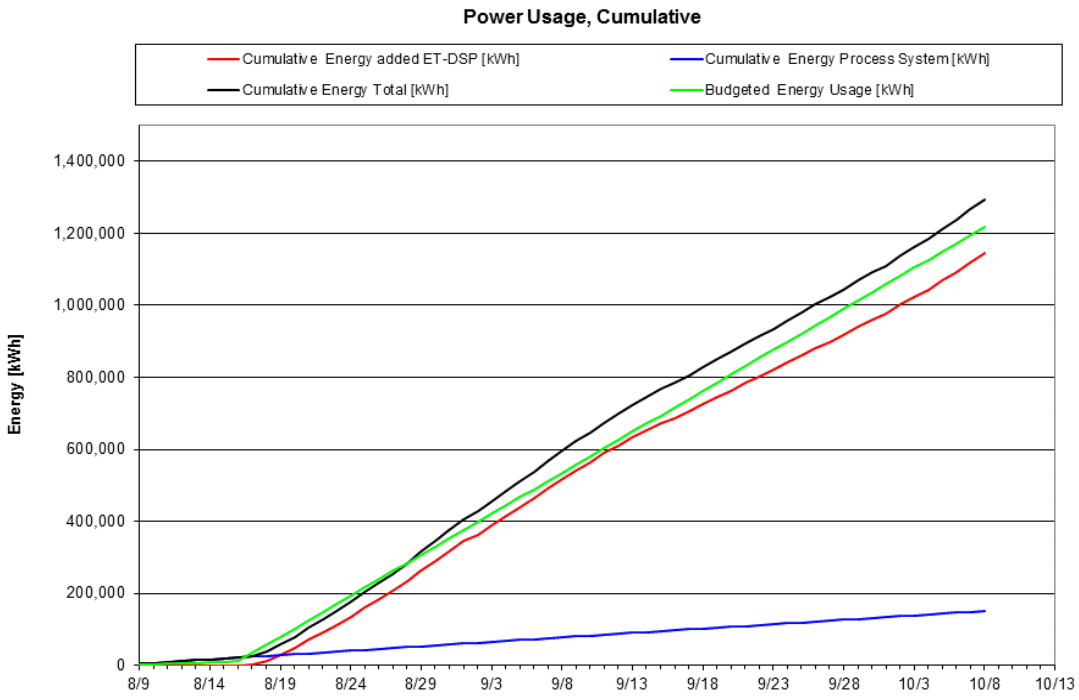


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

In order to enhance soil conductivity at the Groveland Wells Superfund site, saline was added to the bag filters within the water circulation system units to be injected into select electrodes with currents less the 5 kW.

On October 6 and 8, a daily total of 80 and 160 pounds, respectively, of salt was injected into the treatment zone through targeted electrodes in order to increase the conductivity of the soil.

On October 8, McMillan-McGee ceased injecting water into the lower portion of the shallow electrodes so that more water could be injected into the uppermost portion to facilitate energy delivery to this zone.

Incidents:

No safety or environmental compliance issues were identified at the site this week.

Performance Goal Attainment Issues or Concerns:

No issues or concerns related to attainment of performance goals.

Progress Report

10/9/2010 through 10/15/2010
October 18, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from October 9 through October 15, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 10/15/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	134	
Projected total energy usage	3,049,000	kWh
Days of operation	59	days
Energy used to date	1,427,680	kWh
Injected energy per soil volume to date	76	kWh/cy
Water contaminant removal last 7 days	0.5	lbs
Water contaminant removal to date	8.9	lbs
Vapor contaminant removal last 7 days	22	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	185	lbs
Average temperature Area A last 7 days	178	°F
Average temperature Area C last 7 days	155	°F
Average temperature Area D last 7 days	136	°F
Average power usage rate last 7 days	790	kW
Average pumped water rate last 7 days	6.4	gpm
Average injected water rate last 7 days	8.2	gpm
Average vapor extraction rate (non condensable) last 7 days	410	scfm

System Shutdowns

Tuesday, October 12: The groundwater extraction system was shut down at approximately 5:30 pm EST due to a sheen and petroleum odors observed within the groundwater treatment plant. The vapor system was reduced to a minimum flow rate, approximately 350 scfm, enough to ensure control within the wellfield. The electrodes were shut down at 7:00 pm EST.

Friday, October 15: The vapor system shutdown due to a lack of available tank space for influent groundwater. The system was down from 9:48 – 11:55 am EST.

System Maintenance

Wednesday, October 13: TerraTherm staff was on site to evaluate the treatment system, specifically measures that could be taken to minimize petroleum hydrocarbons from passing to the treatment plant.

Several options were identified and discussed with Nobis and Weston. The final decision was to modify the treatment system with enough flexibility to handle the unknown petroleum hydrocarbon and associated mass. Initial system modifications performed on Wednesday included:

- A loop was installed around the heat exchanger from the cooling tower to assist in decreasing extracted groundwater temperatures from approximately 130 F to 85 F.

- Two 500 gallon vessels were delivered to the site. These will be installed after the oil water separator and filled with organoclay media. This will be the last preventive step in the modified system for groundwater prior to entering the treatment plant.

Additional site activities included collecting groundwater levels from all Nobis monitoring wells and TPV wells. Reddish/brown product was observed in TPV-03 at approximately 28 ft below ground surface. The product was bailed from the TPV on Thursday and Friday and drummed for disposal.

The below ground pump was pulled from MPE-07 and replaced with a new timer pump. This pump allows for more control of the compressed air being introduced to the treatment system.

Thursday, October 14: Hanging of the last sound blanket occurred; construction of the sound wall was complete.

Friday, October 15: A 5,000 gallon weir tank was delivered to the site for additional storage. The treatment plant was not able to accept additional water from TerraTherm.

Although the treatment system was not extracting water, water is generated as condensate and steam through the vapor treatment train.

McMillan-McGee calibrated digiPAMs as well as performed megger testing on a few electrodes.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below. Due to the electrode system shutdown on October 12, 2010 the average temperatures in all areas of the treatment zone have started to decline.

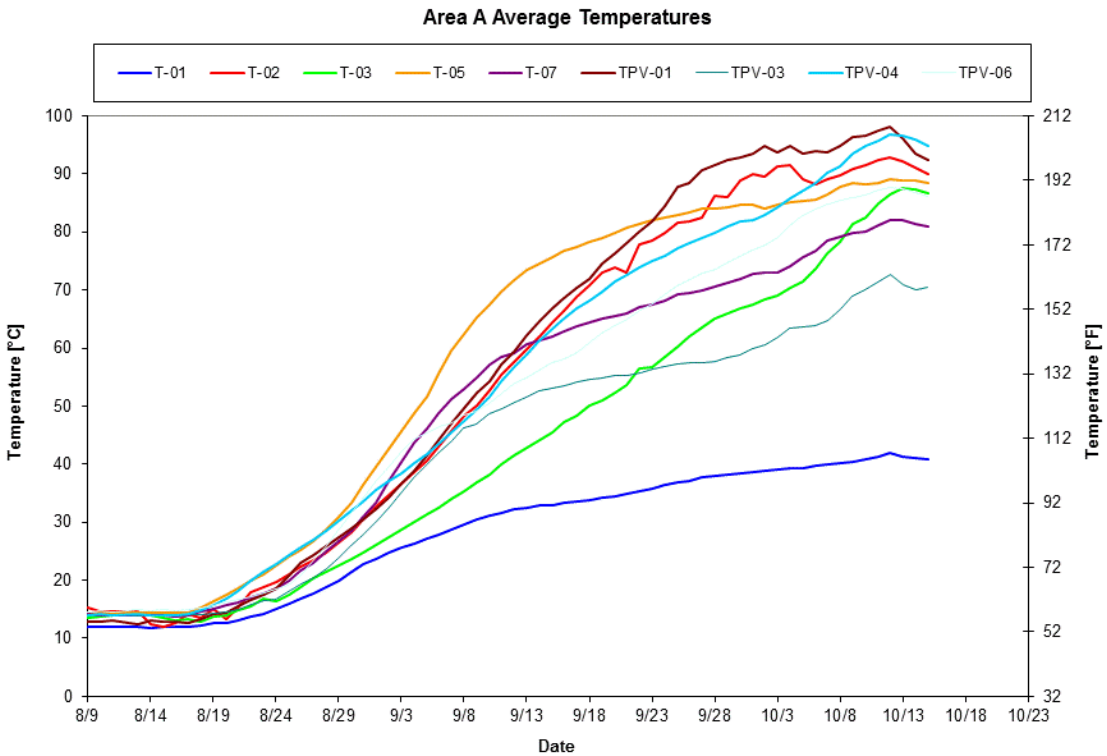


Figure 1. Average Temperature –Area A

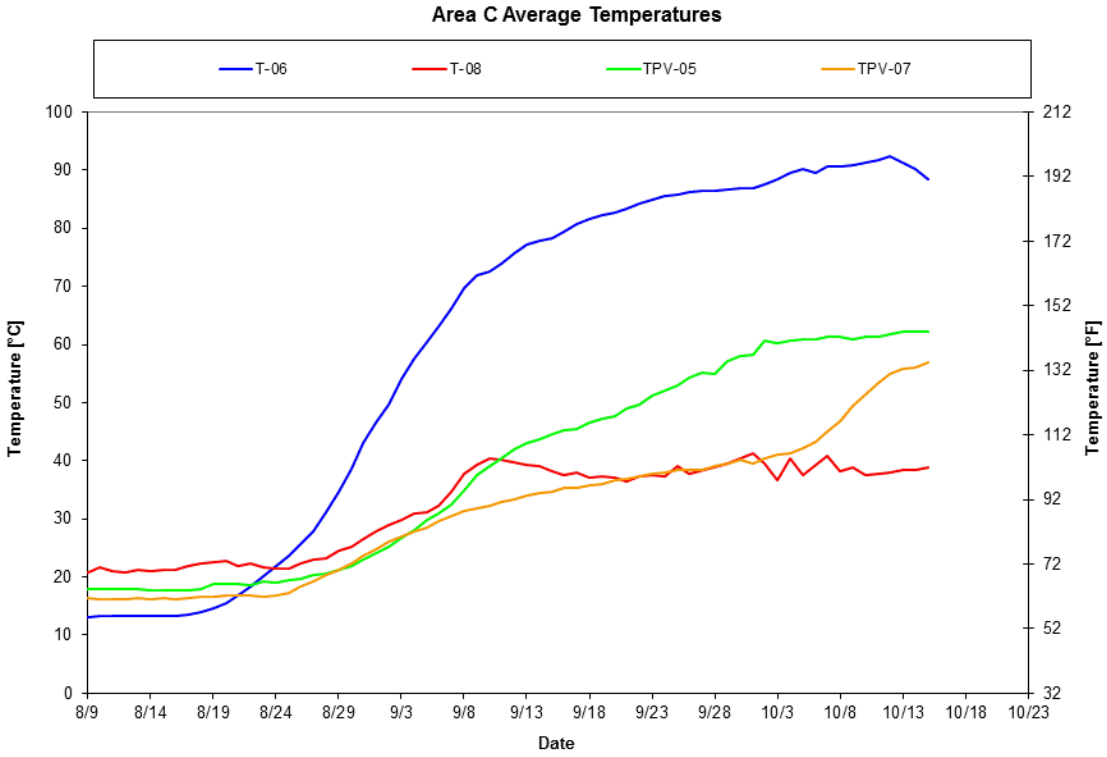


Figure 2. Average Temperature –Area C

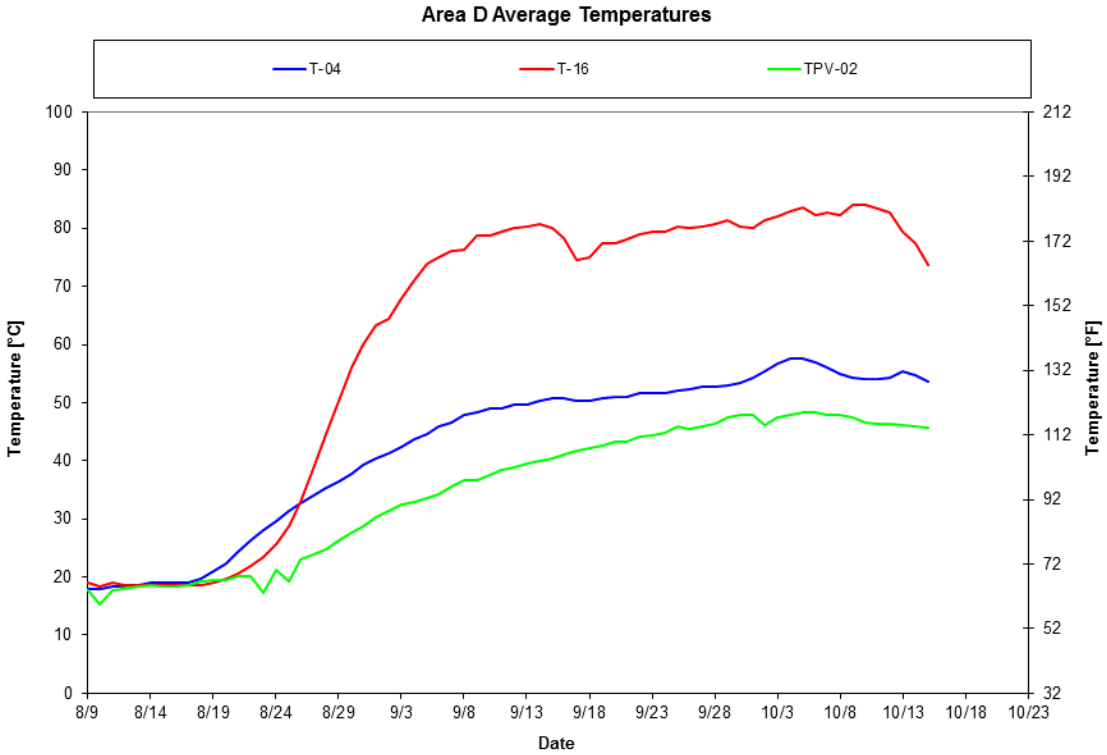


Figure 3. Average Temperature –Area D

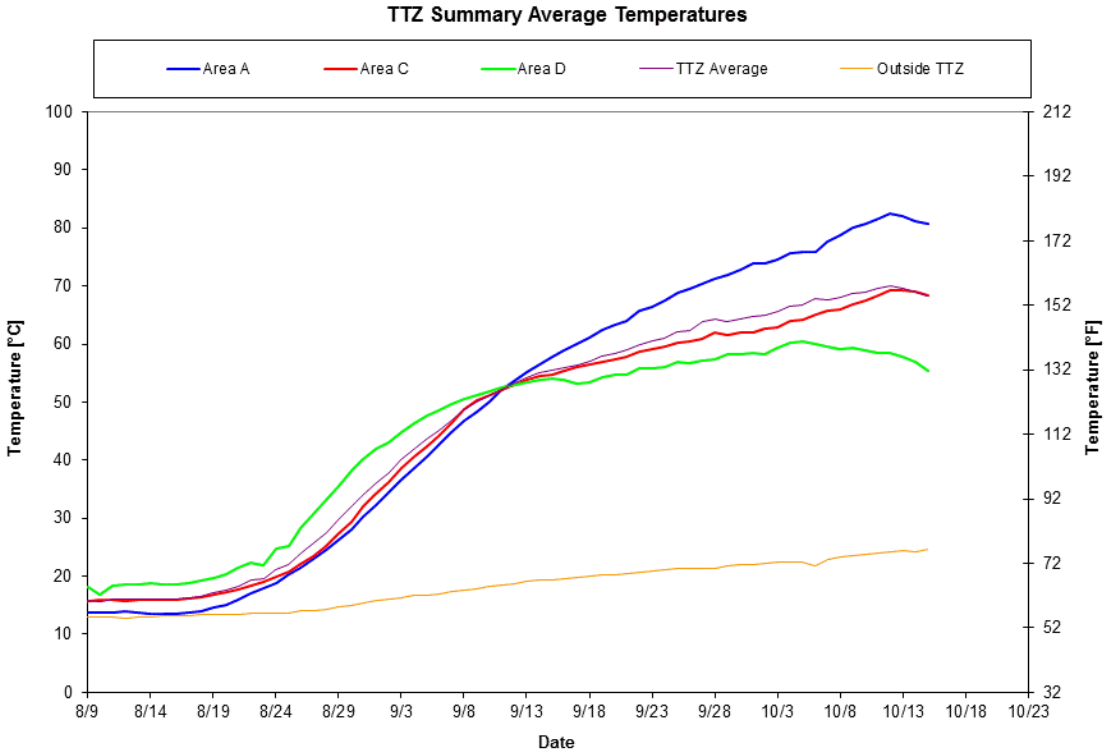


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment. As is seen in the figure below, the process treatment system was ramped down on October 12, 2010 and is now operating only to maintain pneumatic control of the wellfield.

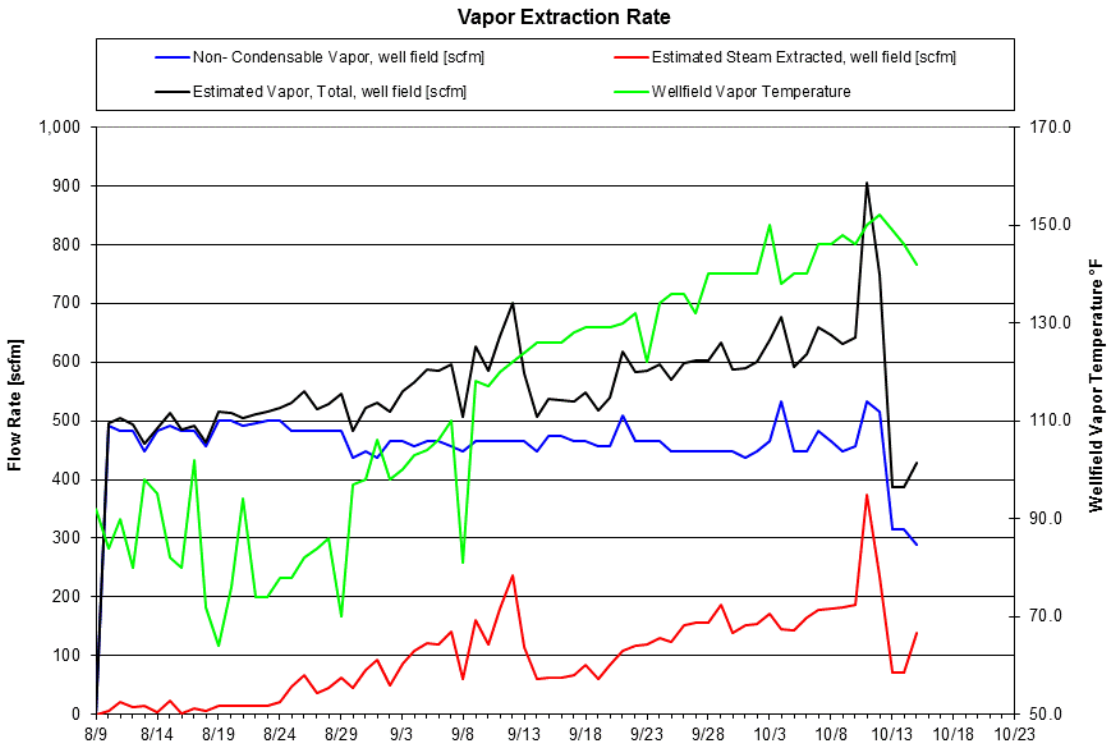


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values.

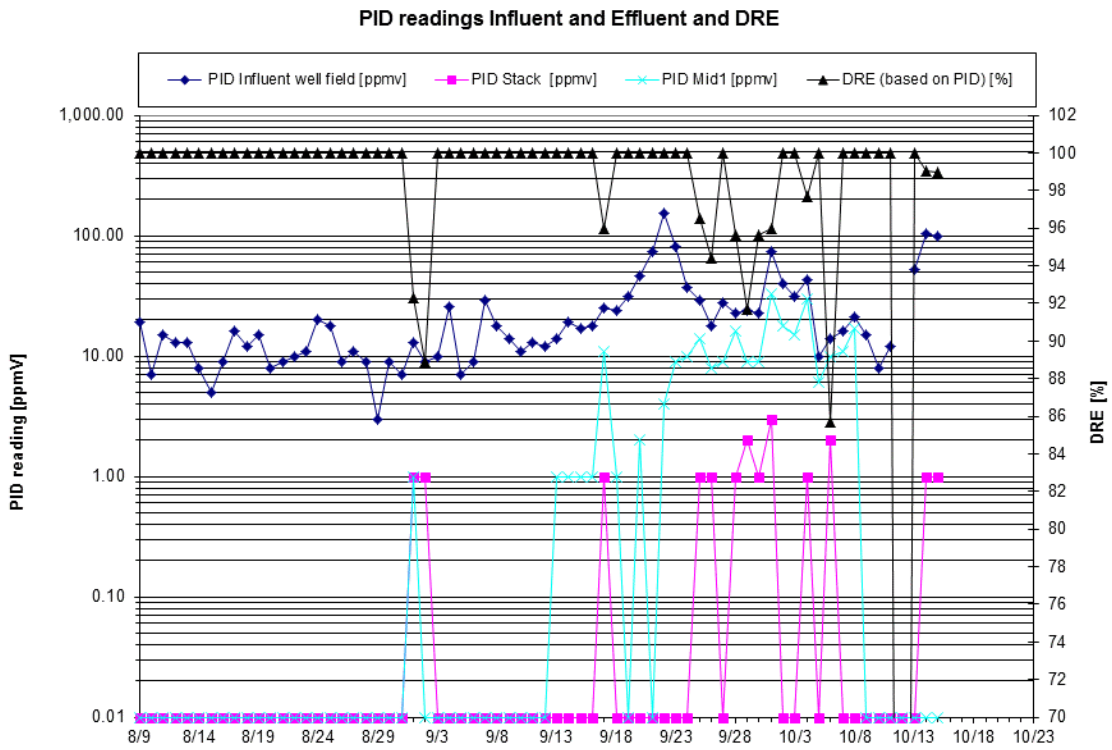


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the lab data received for the 8/10, 8/18, 8/24, 8/31, and 9/8 sampling dates. A composite PID response factor for the VOC mix identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the lab data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in pumped groundwater based on water lab analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

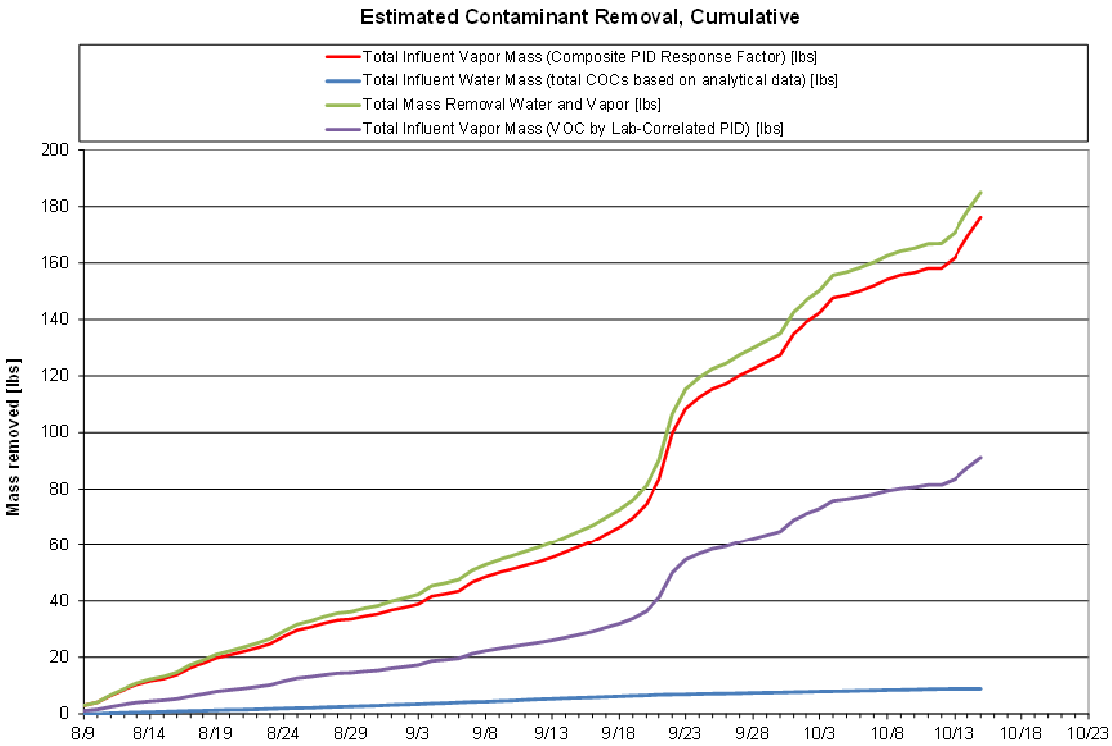


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

No PID readings were collected from vapor extraction wells last week. The table below presents the concentrations in ppmV from the previous sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/10	8/17/10	8/25/10	9/1/10	9/8/10	9/15/10	9/22/10	9/29/10	10/8/10
VEW 1	*5.1*	*5*	*6.4*	*6*	*7.3*	*6.5*	*8.7*	*11*	
VEW 2	*4.5*	*8*	*6.5*	*5*	*5.2*	*2.9*	*7.8*	*7.4*	*5.2*
VEW 3	*1.1*	*8*	*2.1*	*7*	*7.1*	*8.2*	*22*	*74*	*40.0*
VEW 4	*4.1*	*6*	*5.2*	*6*	*8.7*	*6.3*	*7.9*	*13*	
VEW 5	*7.9*							*75*	*52.5*
VEW 6	*2.9*							*32*	*12.1*
VEW 7	*3.5*							*16*	
VEW 8	*10.8*							*11*	
VEW 9	*14.2*	*0*	*4.5*	*22*	*73*	*66*	*81*	*151*	*28.9*
VEW 10	*2.3*							*5.8*	
VEW 11	*5.4*							*6.4*	
VEW 12	*4.6*							*13*	
VEW 13	*3.1*							*29*	*47.4*
VEW 14	*1.3*							*93*	*47.0*
VEW 15	*6.2*	*10*	*6.8*	*26*	*42*	*60*	*107*	*268*	*164.3*
VEW 16	*4.0*	*6*	*5.9*	*5*	*8.1*	*3.4*	*12*	*15*	
VEW 17	*15.9*	*16*	*8.4*	*101*	*164*	*75*	*129*	*185*	*105.8*
VEW 18	*10.3*	*8*	*5.8*	*51*	*95*	*36*	*22*	*13*	
VEW 19	*1.6*	*5*	*4.8*	*6*	*28*	*7.4*	*11*	*17*	*34.4*
VEW 20	*4.5*							*42*	*60.7*
VEW 21	*11.1*	*5*	*3.8*	*42*	*93*	*89*	*139*	*177*	*108.2*
VEW 22	*8.4*							*20*	
VEW 23	*0.6*	*7*	*7.3*	*15*	*58*	*7.1*	*6.2*	*19*	
VEW 24	*4.6*	*5*	*5.4*	*15*	*43*	*64*	*57*	*176*	*47.3*
VEW 25	*1.9*							*8.5*	
VEW 26	*7.1*	*5*	*4.4*	*5*	*4.2*	*6.9*	*9.6*	*18*	
VEW 27	*8.1*	*7*	*4.5*	*2*	*5.6*	*4.2*	*8.5*	*5.3*	*9.8*
VEW 28	*10.7*	*6*	*3.3*	*6*	*5.3*	*3.8*	*11*	*9.9*	
VEW 29	*10.3*							*29*	26.2

7. Water Level

The figure below presents a water level contour map for the site.

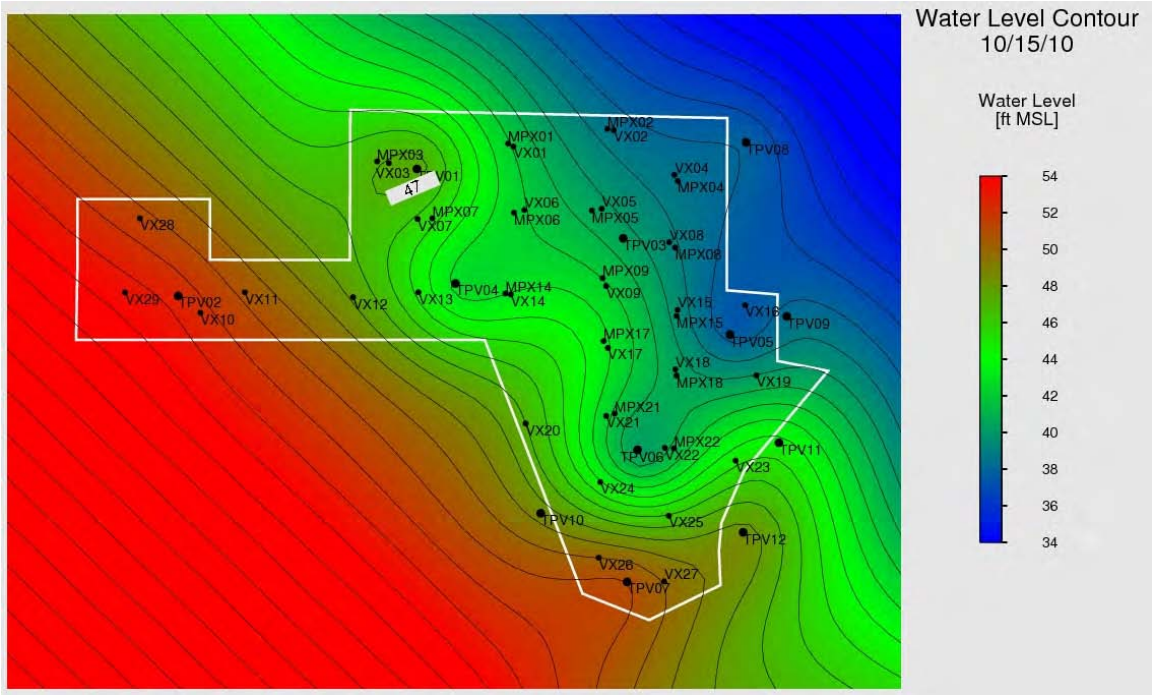


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site. Vacuum extraction rates have been reduced during system downtime to limit condensate production.

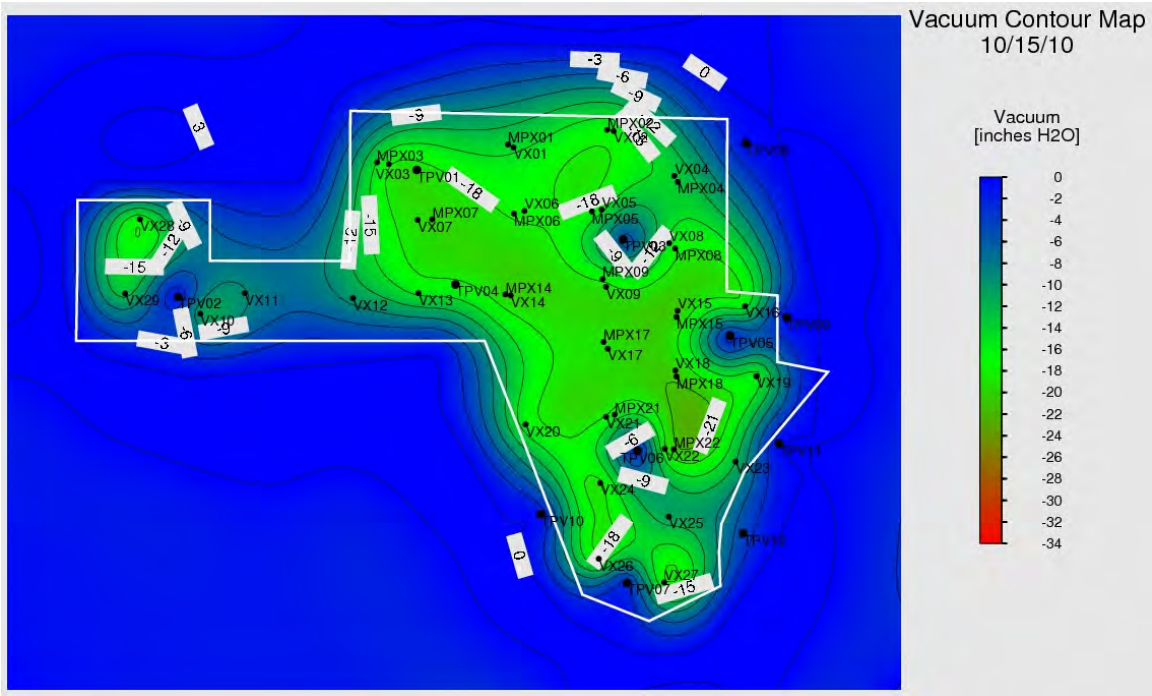


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 734,609 gallons of water since system startup while extracting a total of 890,026 gallons of water for a net water extraction of 155,417 gallons as of 10/15/10 (as seen in Figure 10 below).

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

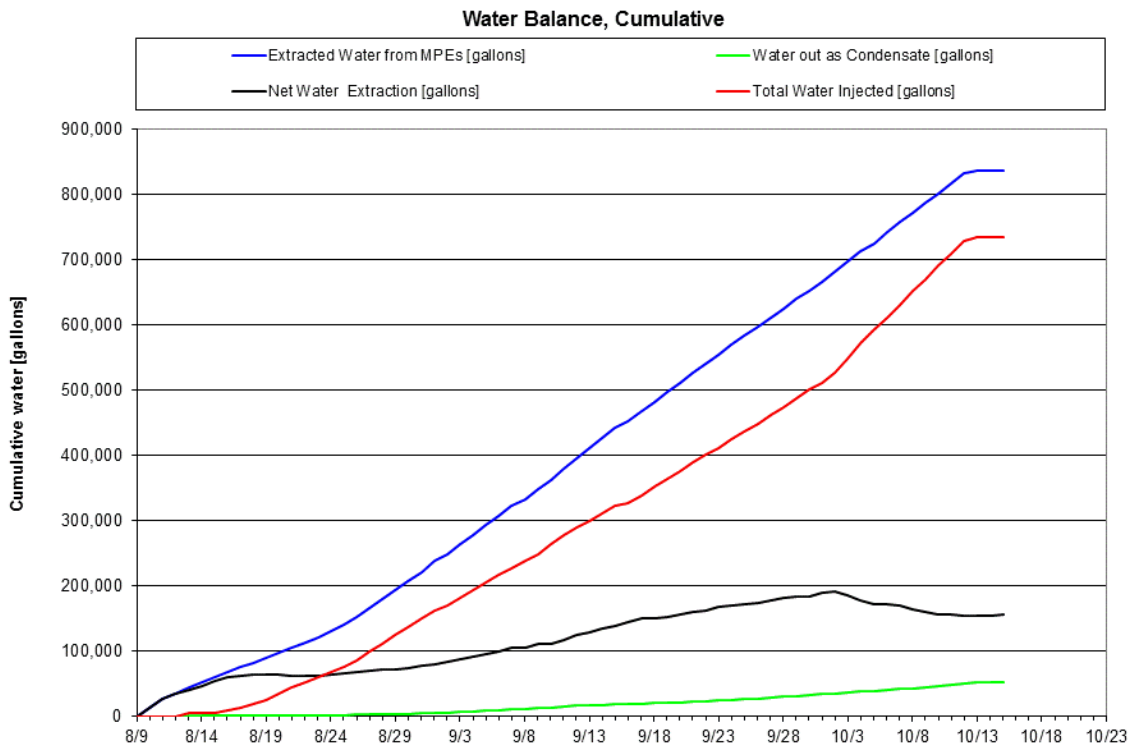


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

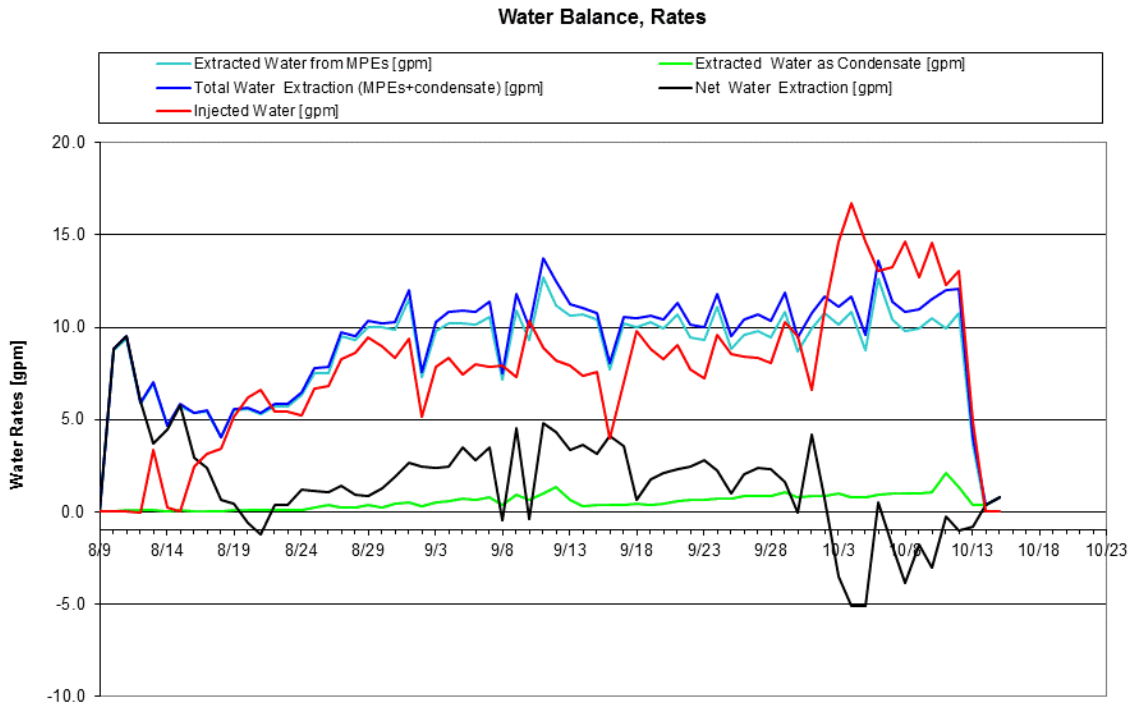


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

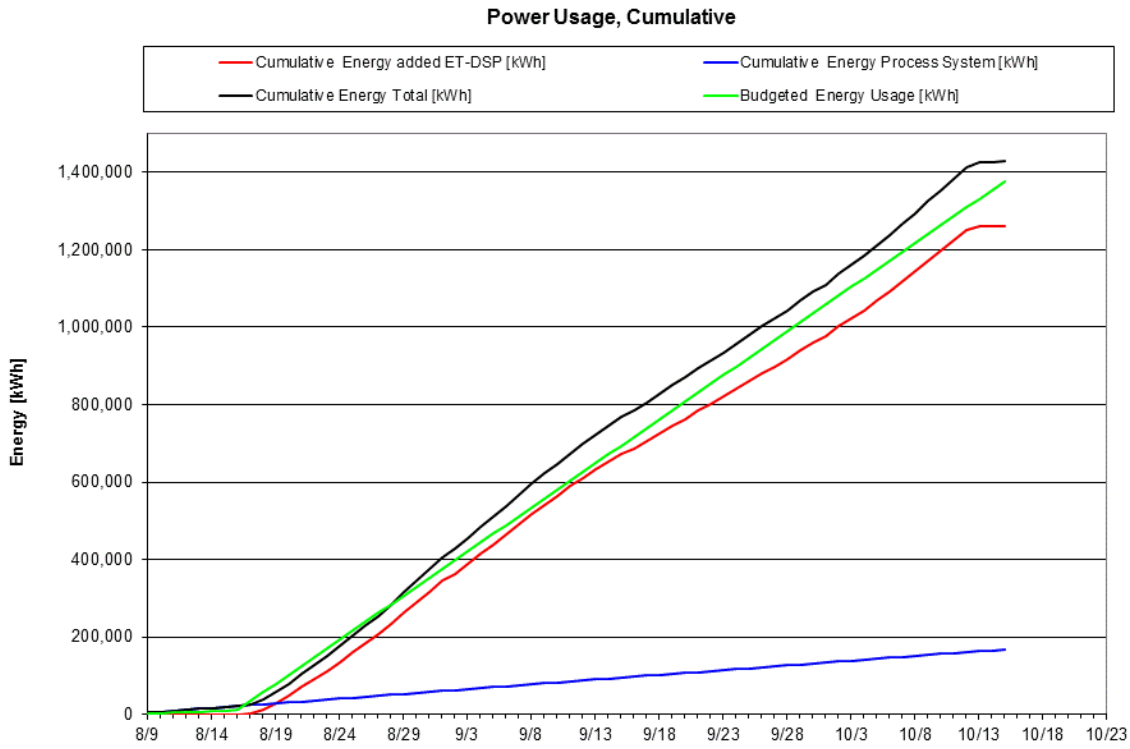


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

In order to enhance soil conductivity at the Groveland Wells Superfund site, saline was added to the bag filters within the water circulation system units to be injected into select electrodes with currents less the 5 kW.

On October 9 and 10, a daily total of 80 of salt was injected into the treatment zone through targeted electrodes in order to increase the conductivity of the soil.

Incidents:

No safety or environmental compliance issues were identified at the site this week.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged approximately two days for each day of heating system downtime.

Progress Report

10/16/2010 through 10/22/2010
October 25, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from October 16 through October 22, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 10/22/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	66	days
Energy used to date	1,464,640	kWh
Injected energy per soil volume to date	78	kWh/cy
Water contaminant removal last 7 days	0.3	lbs
Water contaminant removal to date	9.1	lbs
Vapor contaminant removal last 7 days	29	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	214	lbs
Average temperature Area A last 7 days	174	°F
Average temperature Area C last 7 days	151	°F
Average temperature Area D last 7 days	126	°F
Average power usage rate last 7 days	220	kW
Average pumped water rate last 7 days	4.0	gpm
Average injected water rate last 7 days	0.0	gpm
Average vapor extraction rate (non condensable) last 7 days	403	scfm

System Shutdowns

Wednesday, October 20: System shut down to winterize chiller.

Thursday, October 21: The pump downstream of knock pot lost its prime and resulting in a high level alarm at the knock out pot. The pump was primed and the lines cleaned as preventative maintenance.

System Maintenance

Monday, October 18: The additional liquid treatment process equipment pieces were plumbed together. Two 500 lb vessels were filled with organoclay and saturated over night. Water was drained from the vessels approximately 24 hours later (Tuesday, October 19) and filled again with water. Two additional bag filters were plumbed behind the organoclay vessels which house coalescing bag filters. Float levels were installed on the 5,000 gallon weir tank. Language to the PLC was modified to incorporate the additional float and additional transfer pump.

Tuesday, October 19: The thermal treatment system was turned back on, including downhole pumps in the wellfield, and tested. Minor leaks were identified and corrected.

Wednesday, October 20: The thermal treatment system was turned back on. Multiphase extraction wells were brought back online. Water rates were recorded and balanced throughout the day.

Thursday, October 21: The electrodes were turned back on.

Friday, October 22: Water injection to the electrodes began.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

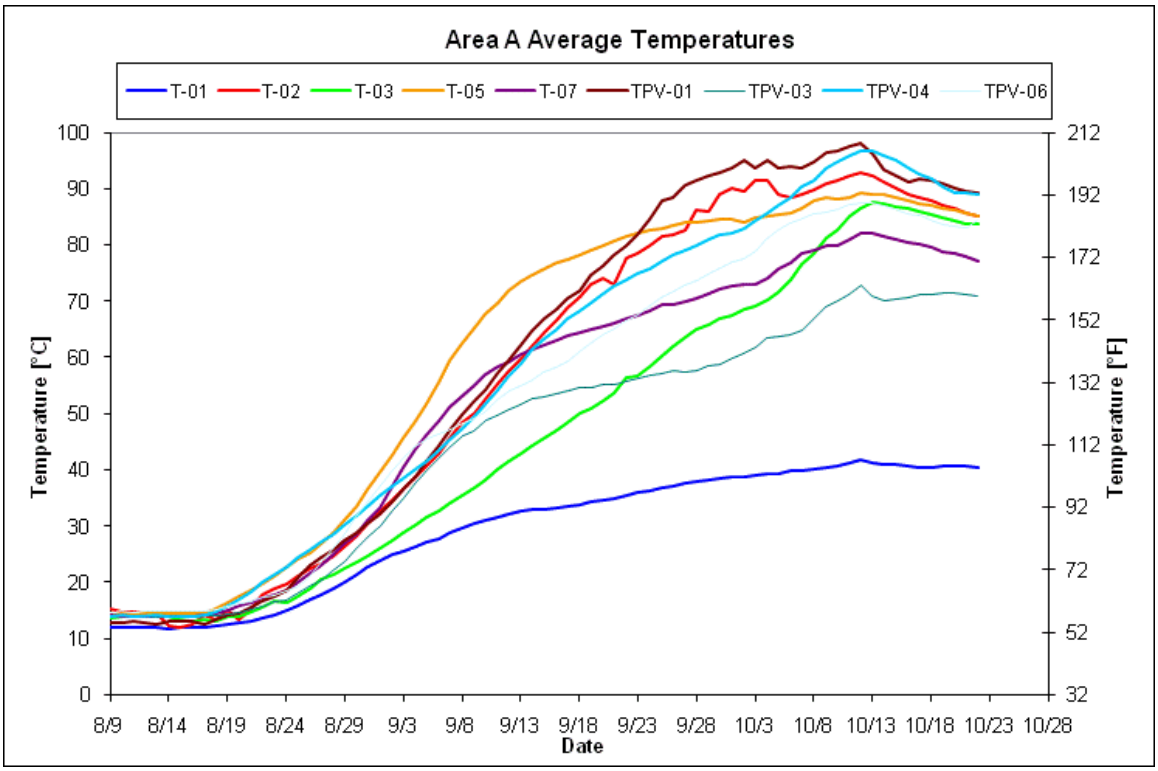


Figure 1. Average Temperature –Area A

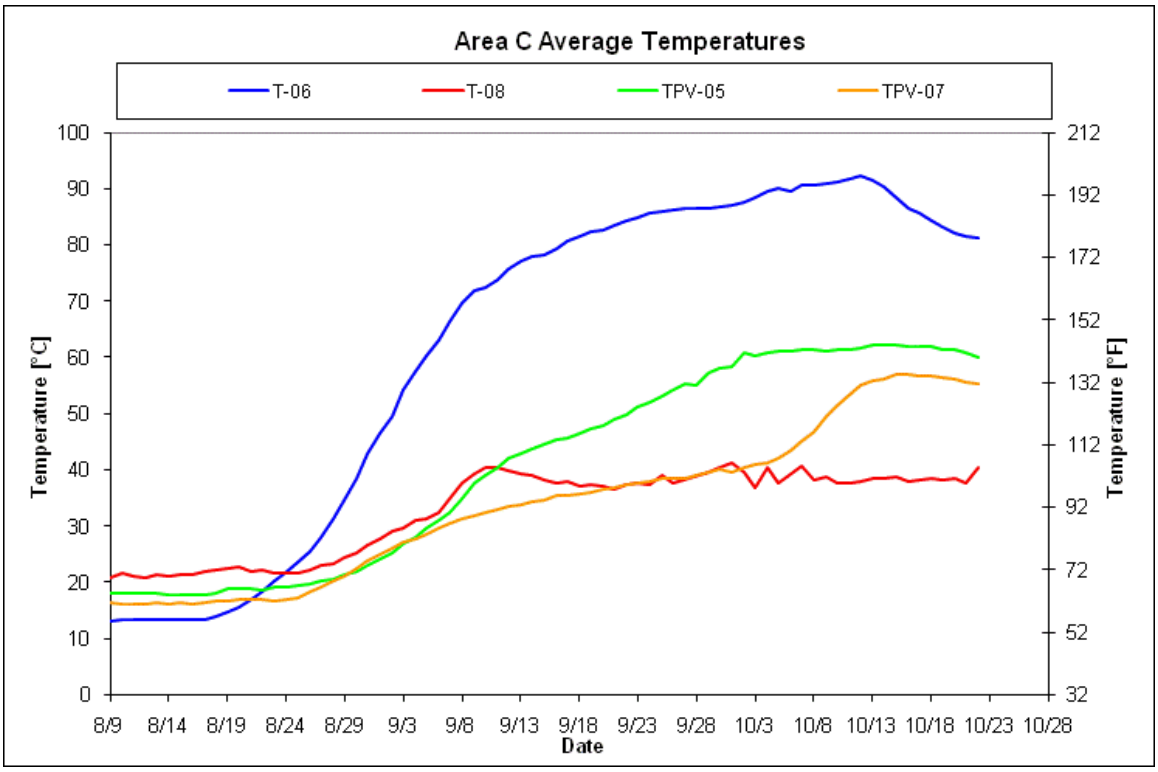


Figure 2. Average Temperature –Area C

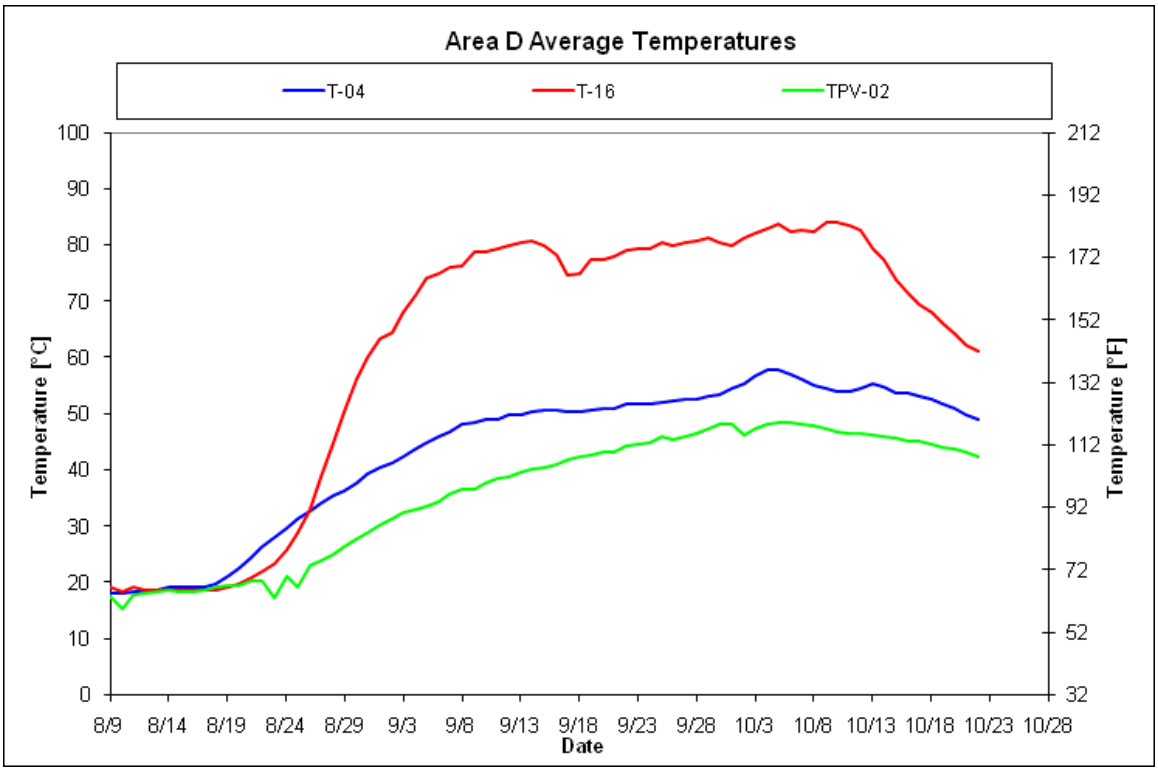


Figure 3. Average Temperature –Area D

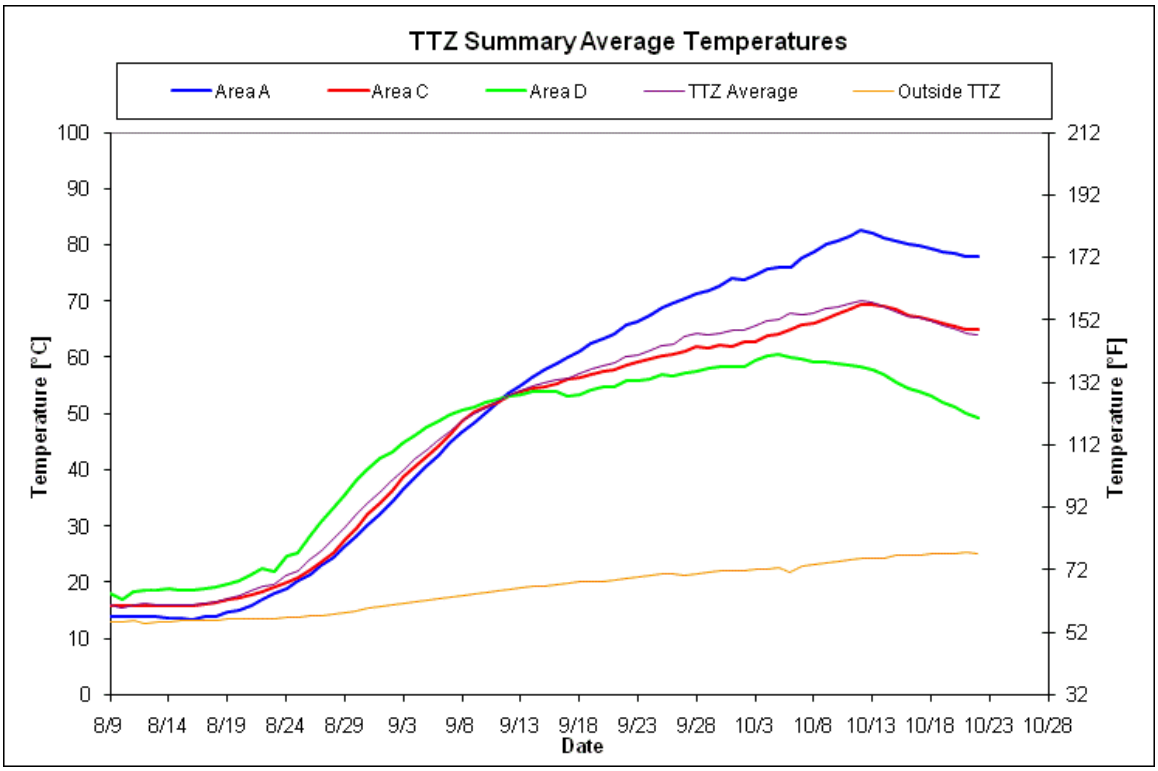


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment.

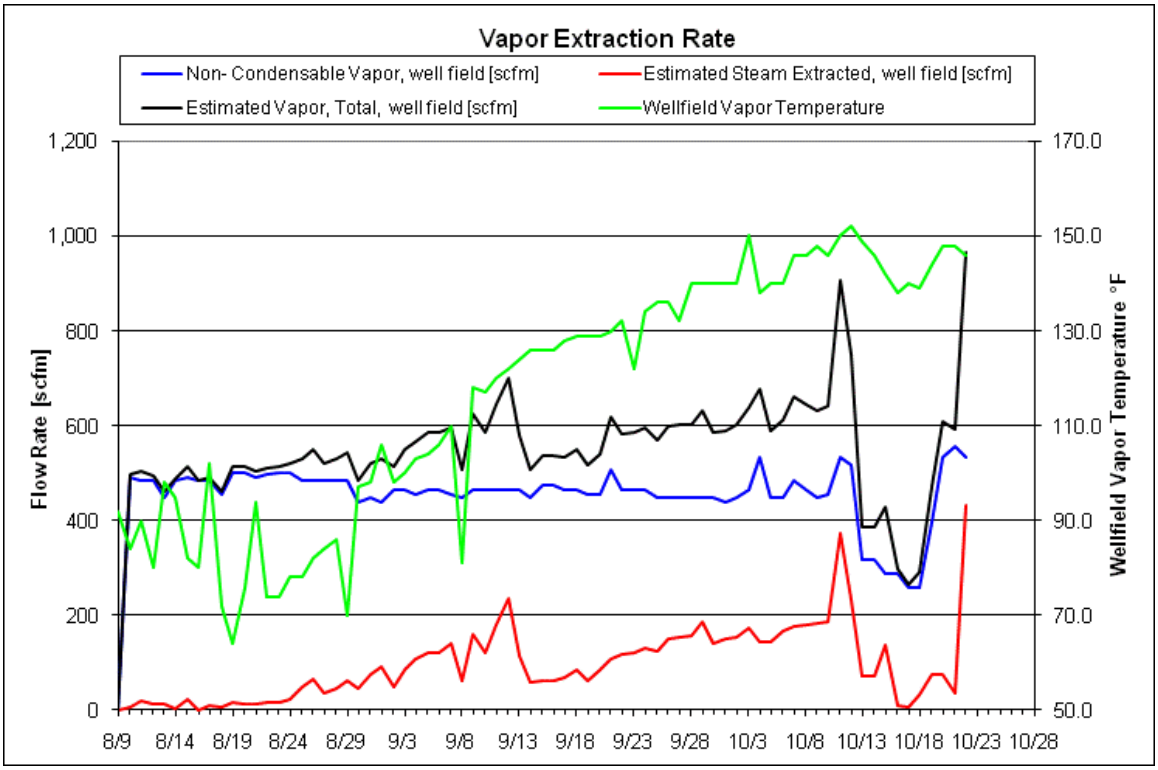


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values.

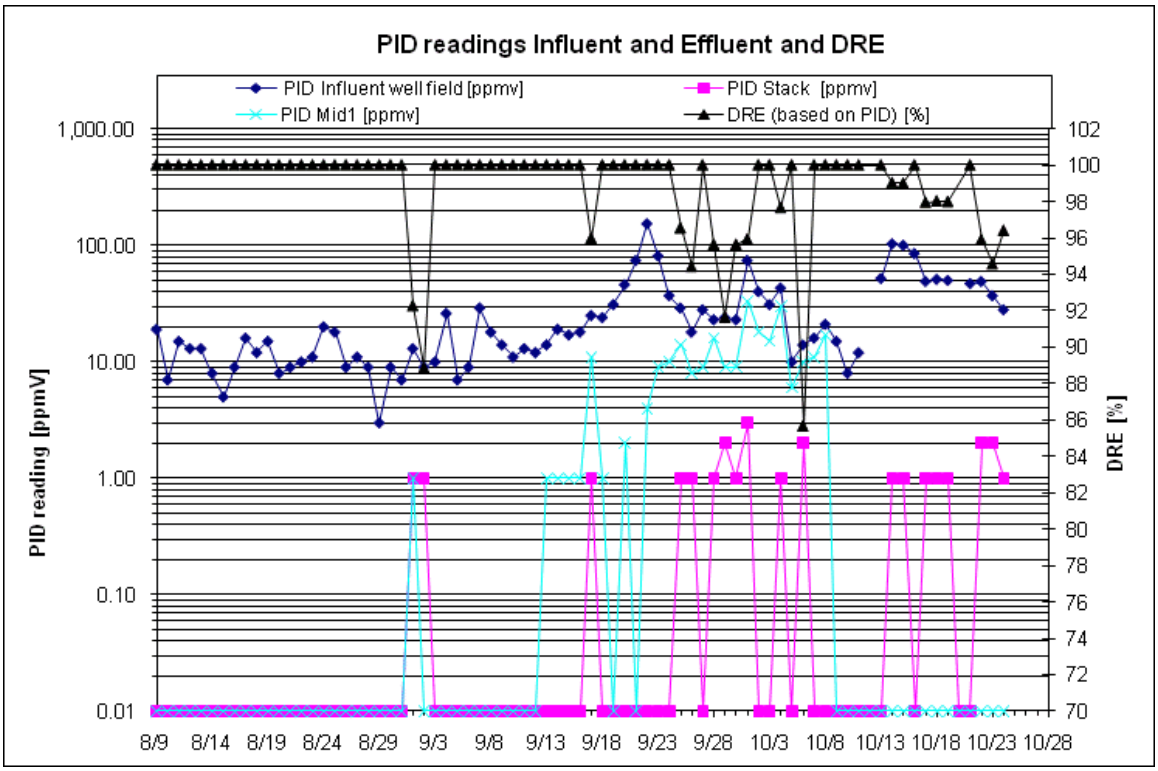


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the lab data received for the 8/10, 8/18, 8/24, 8/31, 9/8, 9/15, and 9/23 sampling dates. A composite PID response factor for the VOC mix identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the lab data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in pumped groundwater based on water lab analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

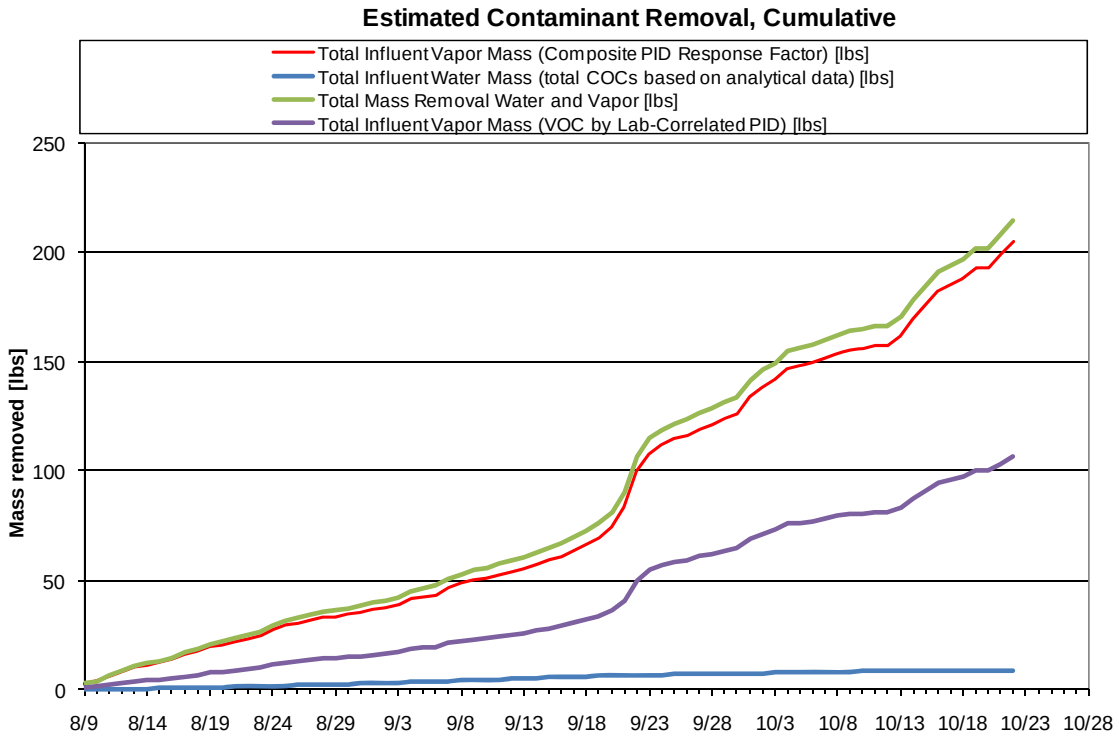


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 10/21/2010. The table below presents the concentrations in ppmV from the most recent and previous sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/10	8/17/10	8/25/10	9/1/10	9/8/10	9/15/10	9/22/10	9/29/10	10/8/10	10/21/10
VEW 1	5.1	5	6.4	6	7.3	6.5	8.7	11		
VEW 2	4.5	8	6.5	5	5.2	2.9	7.8	7.4	5.2	20.7
VEW 3	1.1	8	2.1	7	7.1	8.2	22	74	40.0	
VEW 4	4.1	6	5.2	6	8.7	6.3	7.9	13		
VEW 5	7.9							75	52.5	70.3
VEW 6	2.9							32	12.1	21.2
VEW 7	3.5							16		
VEW 8	10.8							11		
VEW 9	14.2	0	4.5	22	73	66	81	151	28.9	137.1
VEW 10	2.3							5.8		
VEW 11	5.4							6.4		
VEW 12	4.6							13		
VEW 13	3.1							29	47.4	94.0
VEW 14	1.3							93	47.0	36.1
VEW 15	6.2	10	6.8	26	42	60	107	268	164.3	265.8
VEW 16	4.0	6	5.9	5	8.1	3.4	12	15		
VEW 17	15.9	16	8.4	101	164	75	129	185	105.8	146.9
VEW 18	10.3	8	5.8	51	95	36	22	13		
VEW 19	1.6	5	4.8	6	28	7.4	11	17	34.4	50.7
VEW 20	4.5							42	60.7	50.6
VEW 21	11.1	5	3.8	42	93	89	139	177	108.2	68.7
VEW 22	8.4							20		25.0
VEW 23	0.6	7	7.3	15	58	7.1	6.2	19		
VEW 24	4.6	5	5.4	15	43	64	57	176	47.3	24.8
VEW 25	1.9							8.5		
VEW 26	7.1	5	4.4	5	4.2	6.9	9.6	18		
VEW 27	8.1	7	4.5	2	5.6	4.2	8.5	5.3	9.8	13.3
VEW 28	10.7	6	3.3	6	5.3	3.8	11	9.9		
VEW 29	10.3							29	26.2	24.9

7. Water Level

The figure below presents a water level contour map for the site.

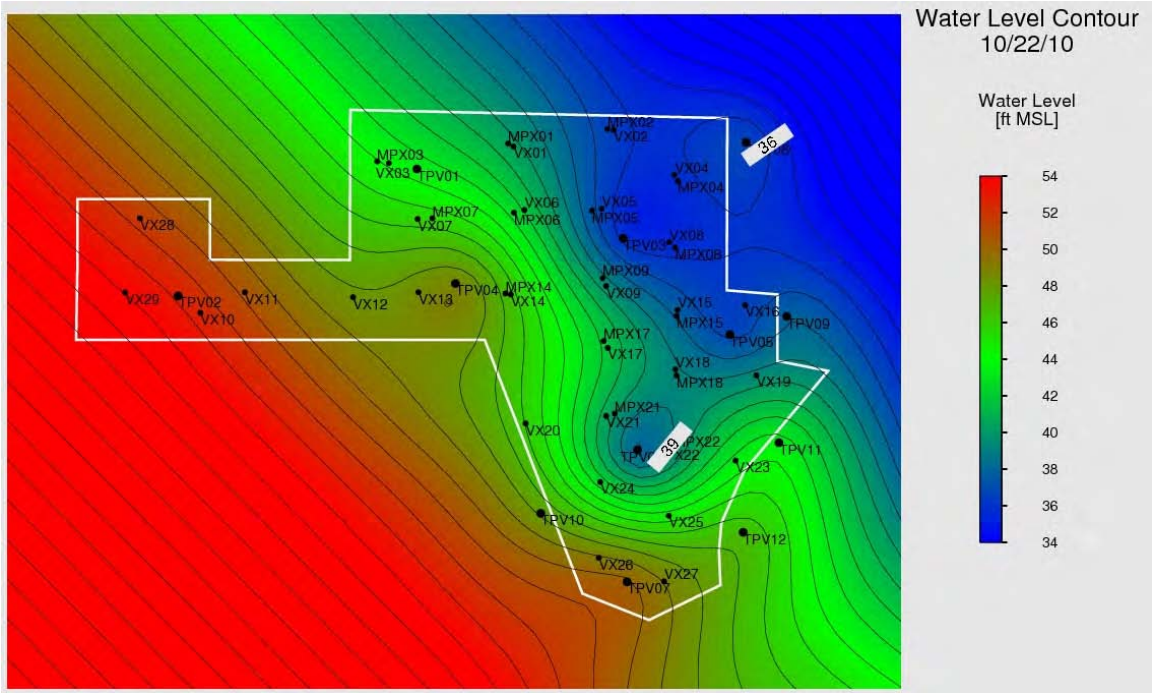


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

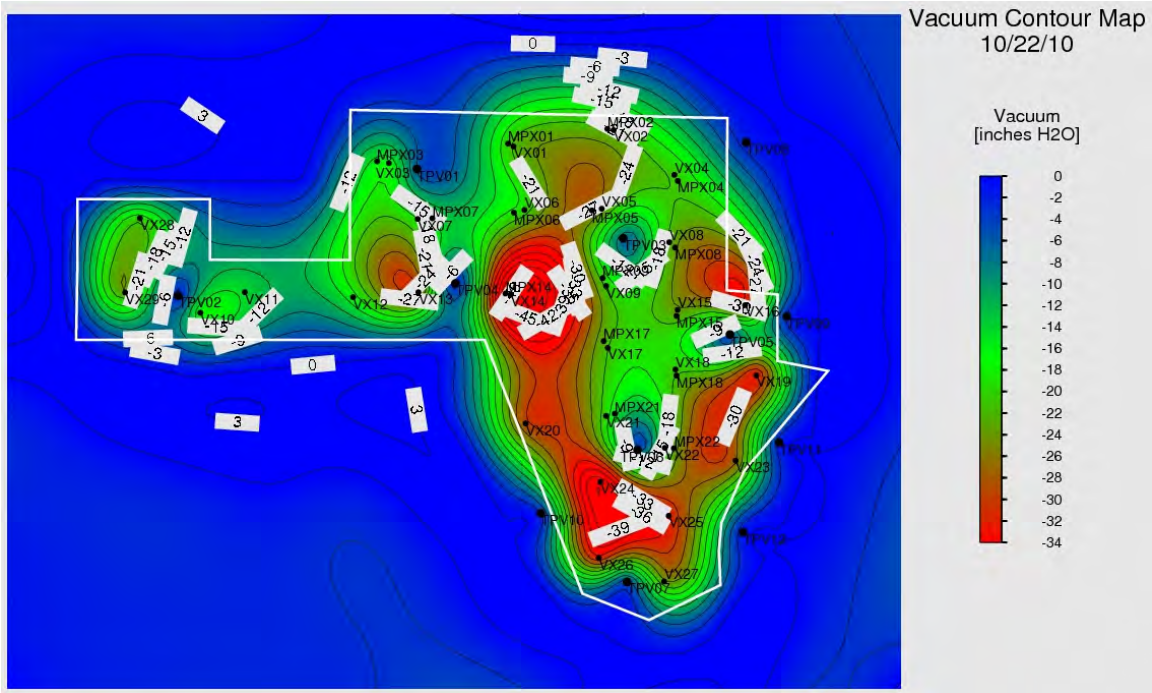


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 734,720 gallons of water since system startup while extracting a total of 936,015 gallons of water for a net water extraction of 201,295 gallons as of 10/22/10 (as seen in Figure 10 below).

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

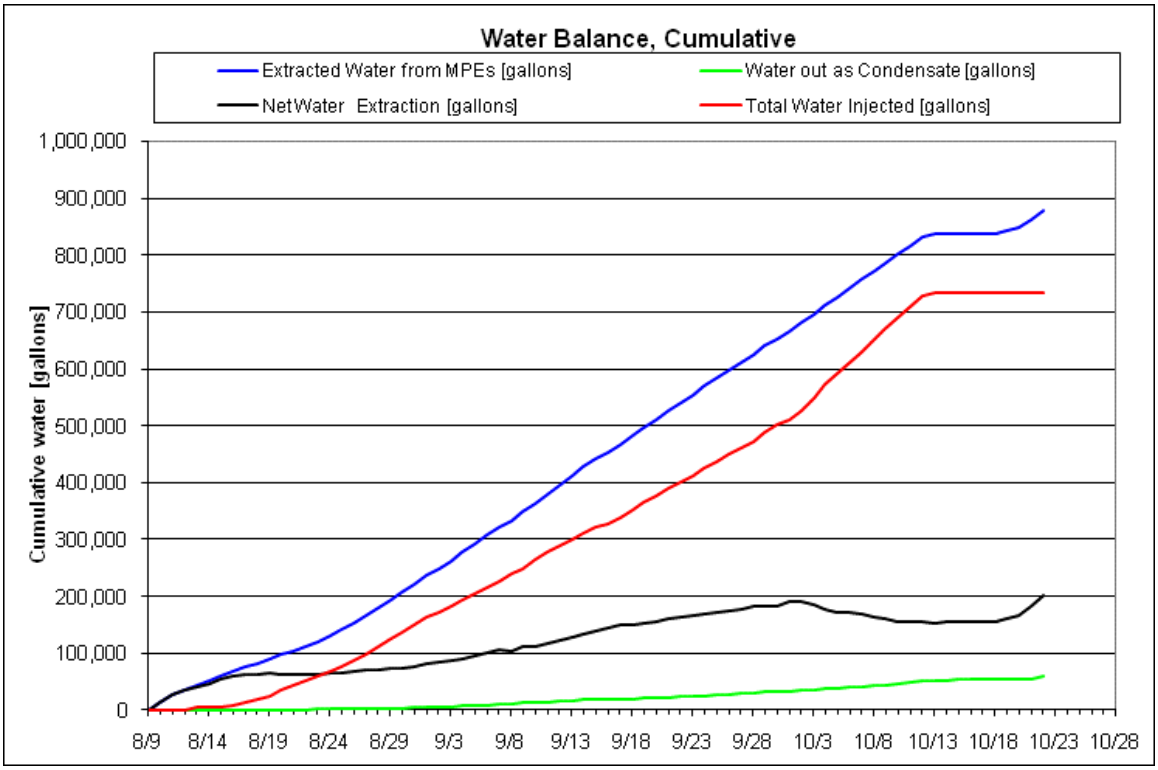


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

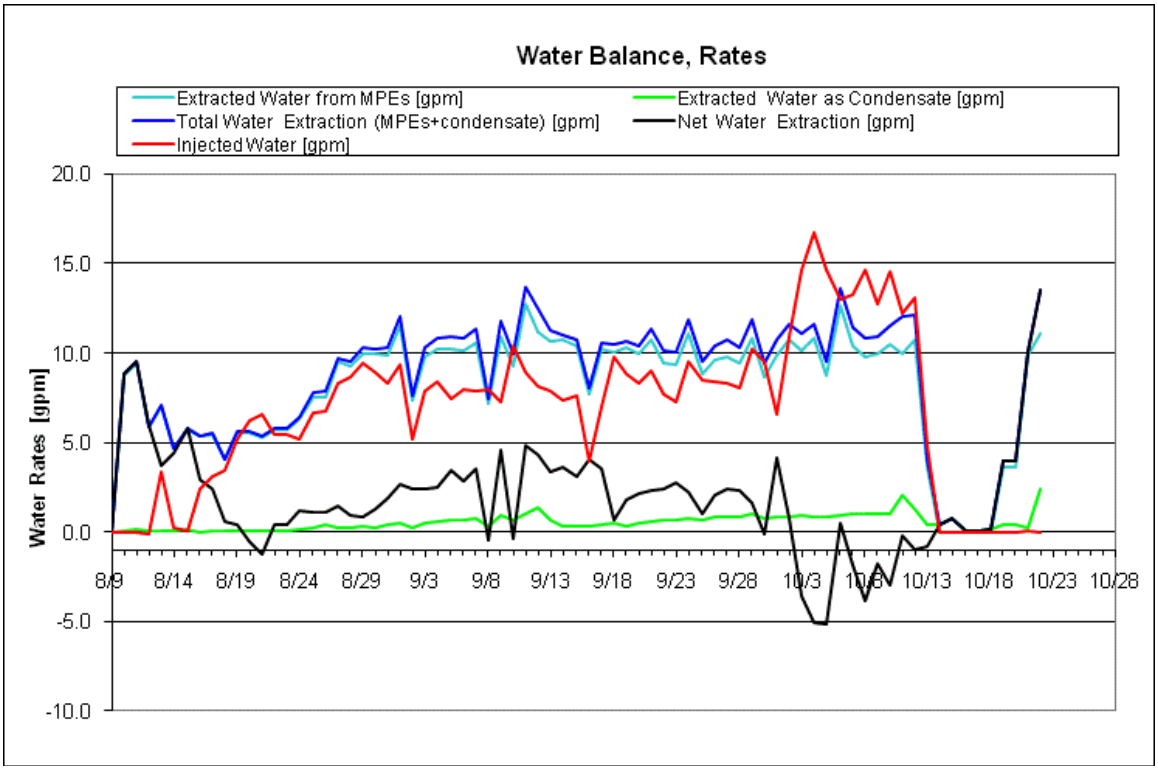


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

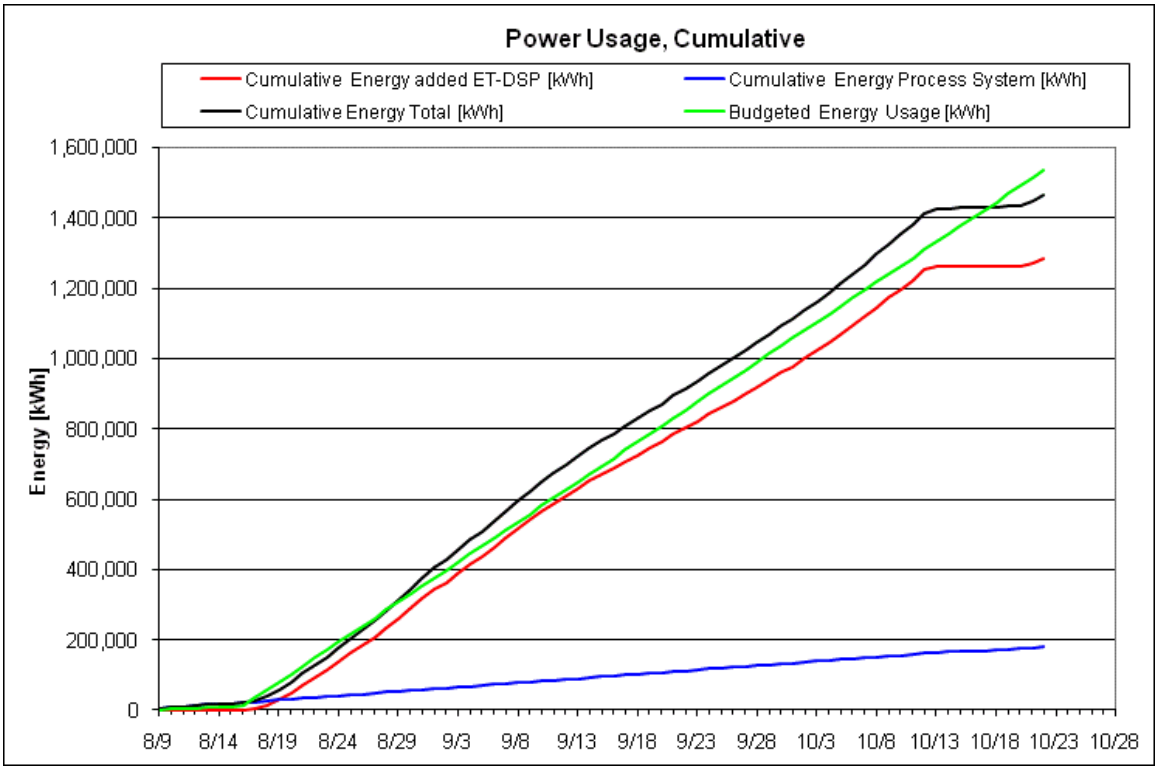


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

A steam generator will be mobilized to the site the week of 11/1/10 and will be used to target select electrodes for steam/hot water injection. This increased energy delivery to select electrodes will result in increased subsurface temperatures in the targeted zones.

Incidents:

No safety or environmental compliance issues were identified at the site this week.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged approximately two days for each day of heating system downtime or approximately 14 days.

Progress Report

10/23/2010 through 10/29/2010
November 1, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from October 23 through October 29, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 10/29/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	73	days
Energy used to date	1,617,280	kWh
Injected energy per soil volume to date	86	kWh/cy
Water contaminant removal last 7 days	0.9	lbs
Water contaminant removal to date	11.5	lbs
Vapor contaminant removal last 7 days	16	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	233	lbs
Average temperature Area A last 7 days	175	°F
Average temperature Area C last 7 days	150	°F
Average temperature Area D last 7 days	124	°F
Average power usage rate last 7 days	909	kW
Average pumped water rate last 7 days	8.2	gpm
Average injected water rate last 7 days	8.6	gpm
Average vapor extraction rate (non condensable) last 7 days	466	scfm

System Shutdowns

Sunday, October 24: Water influent turned off to troubleshoot primary bag filter skid (1400 – 1500).

Monday, October 25: Water influent turned off to work on primary bag filter skid (1300 – 1330).

Wednesday, October 27: Electrodes turned off for groundwater sampling event (0700 – 1700).

System Maintenance

Monday, October 25: Installed new gasket on first bag filter. Installed new coalescing bags in the second bag filter.

Wednesday, October 27: Pulled pump in MPE 18 and replaced it with a timer pump. Replaced temperature gauge on MPE 15.

Thursday, October 28: Started to winterize water lines in wellfield.

Friday, October 29: Installed new sample port on effluent line at clay vessels.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

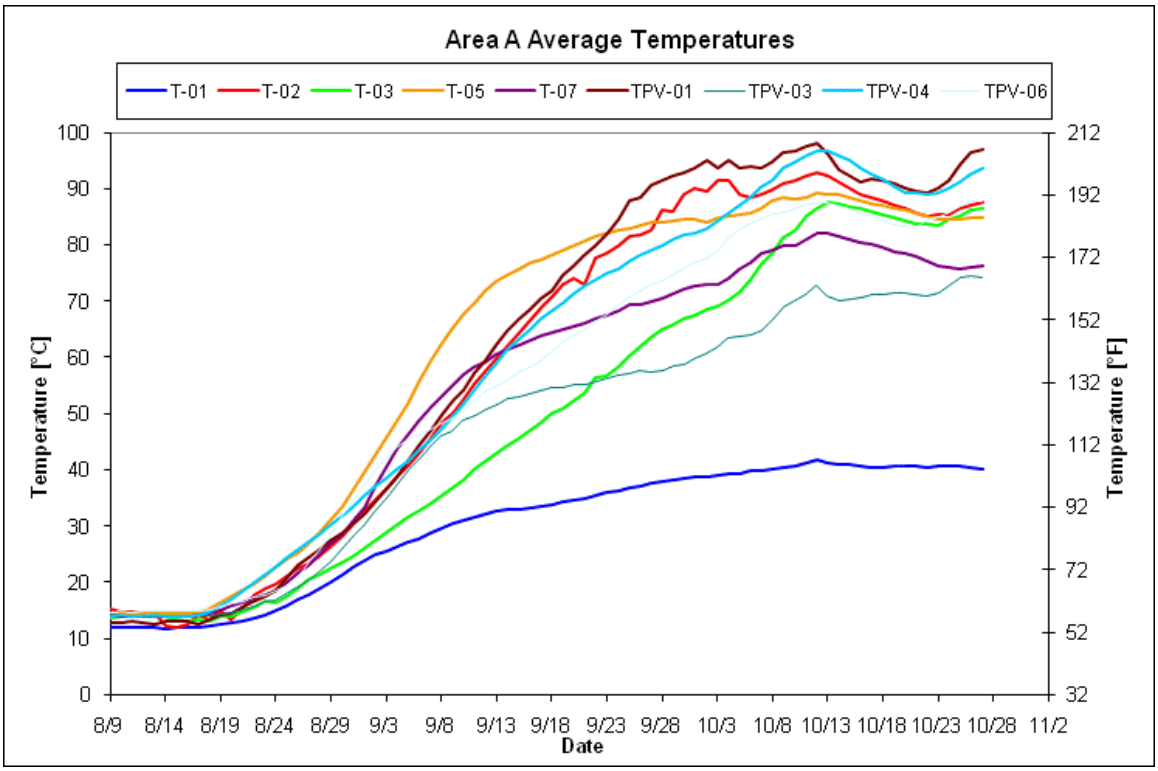


Figure 1. Average Temperature –Area A

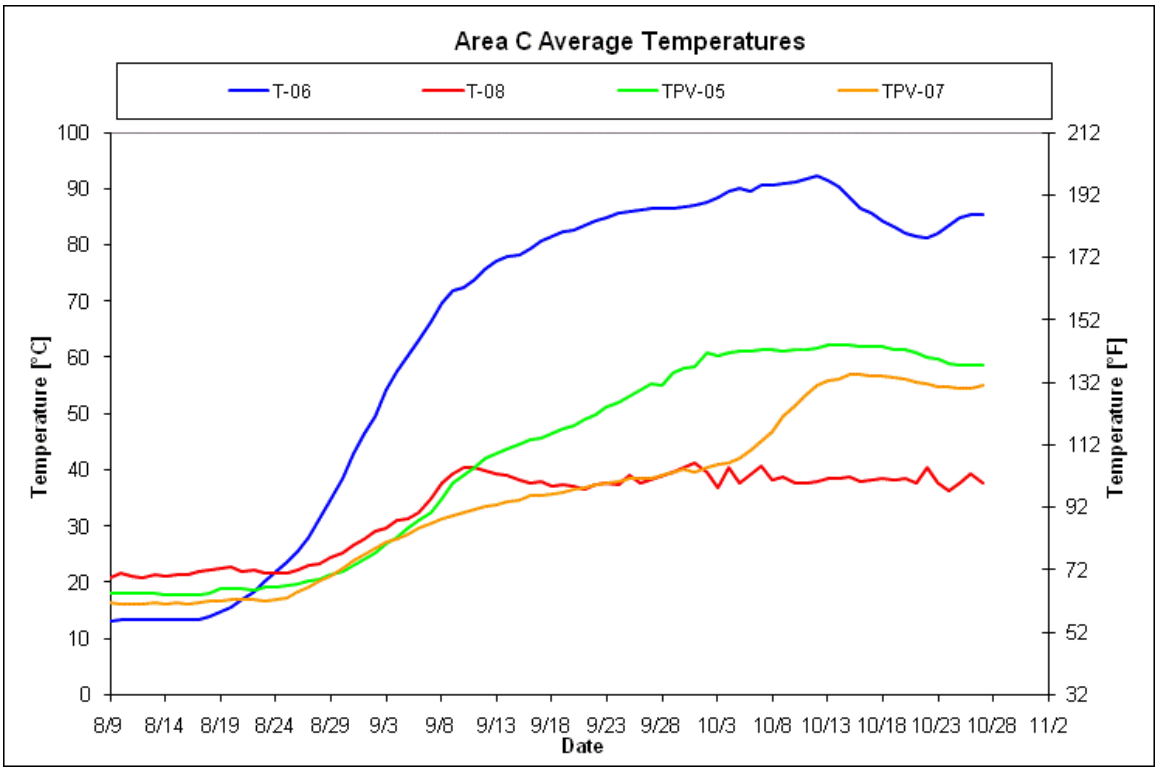


Figure 2. Average Temperature –Area C

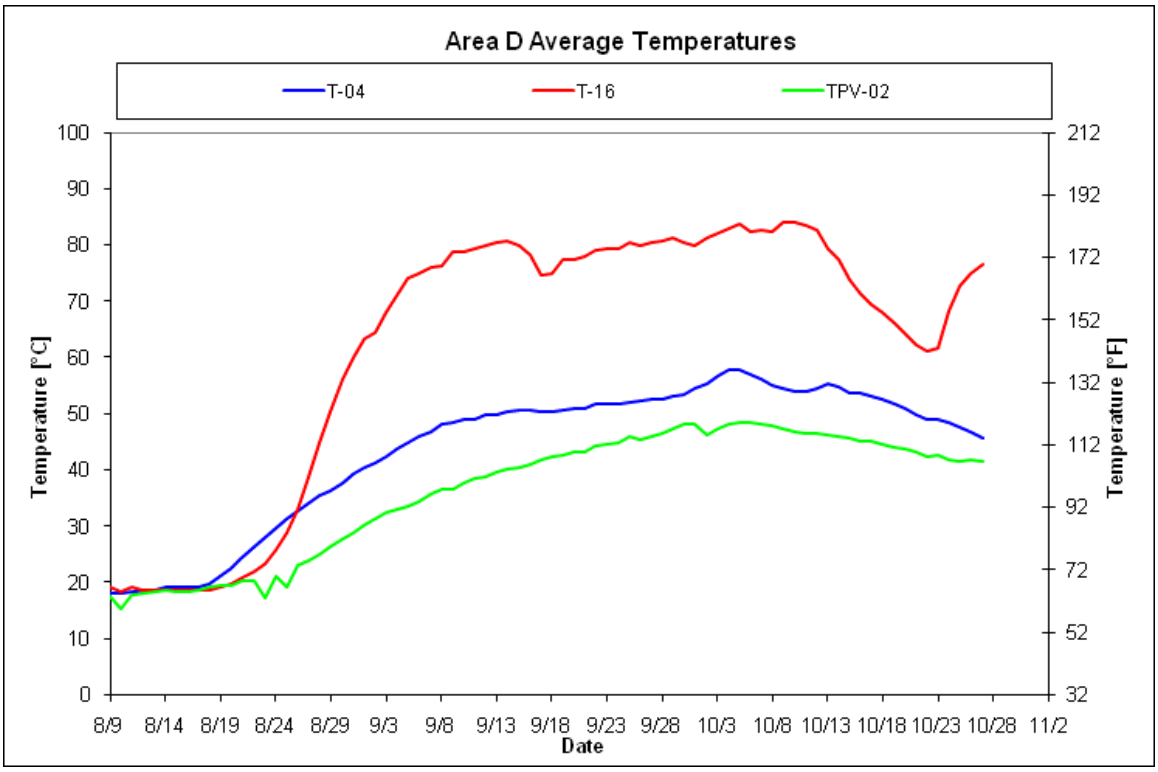


Figure 3. Average Temperature –Area D

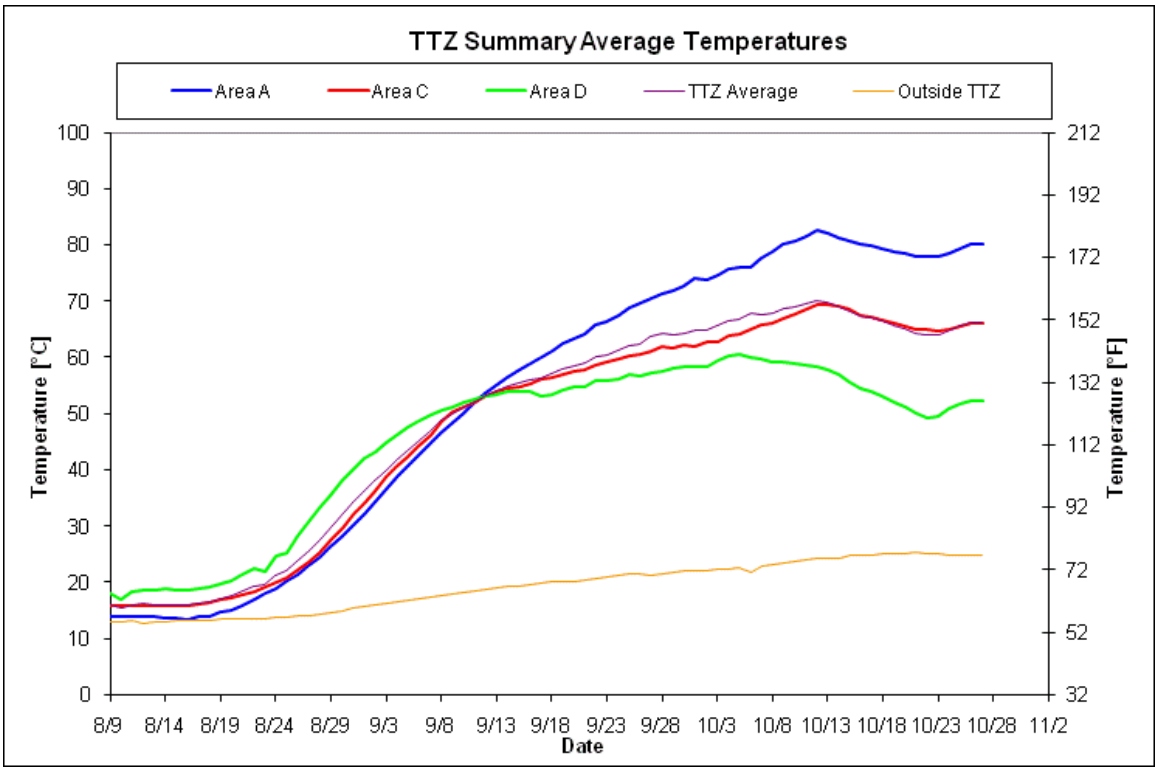


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment.

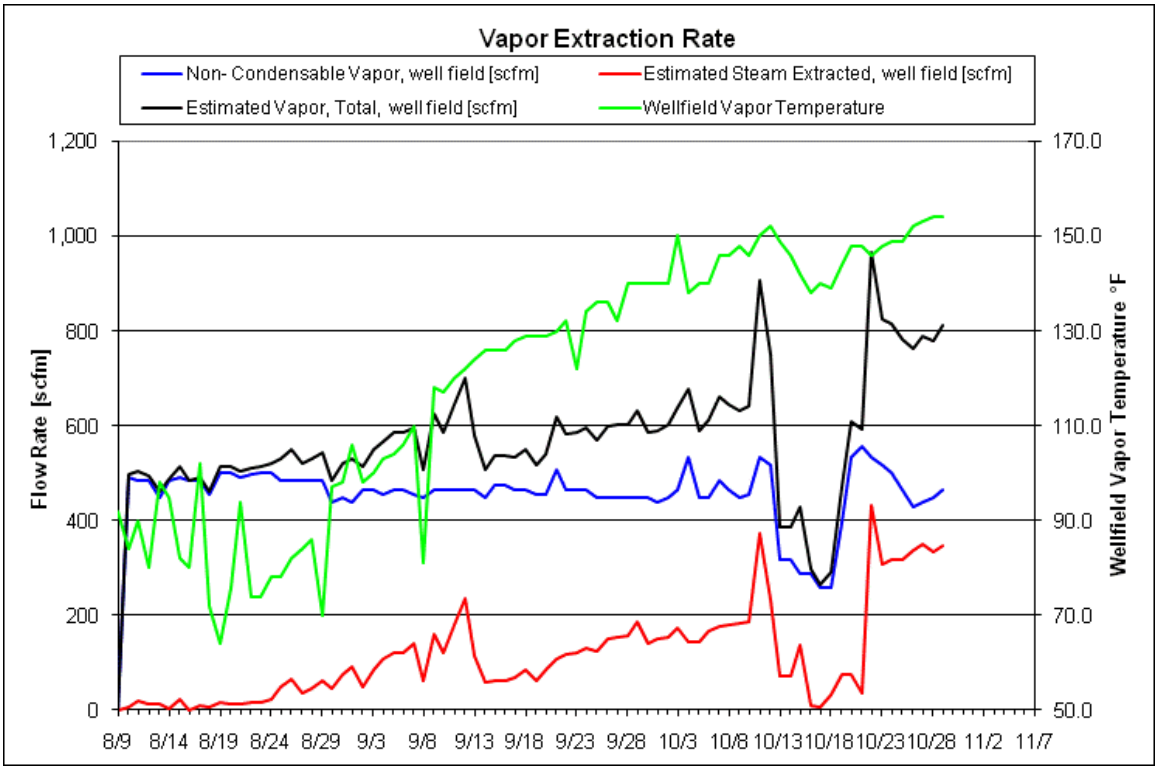


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, our carbon efficiency may not achieve greater than 95% DRE.

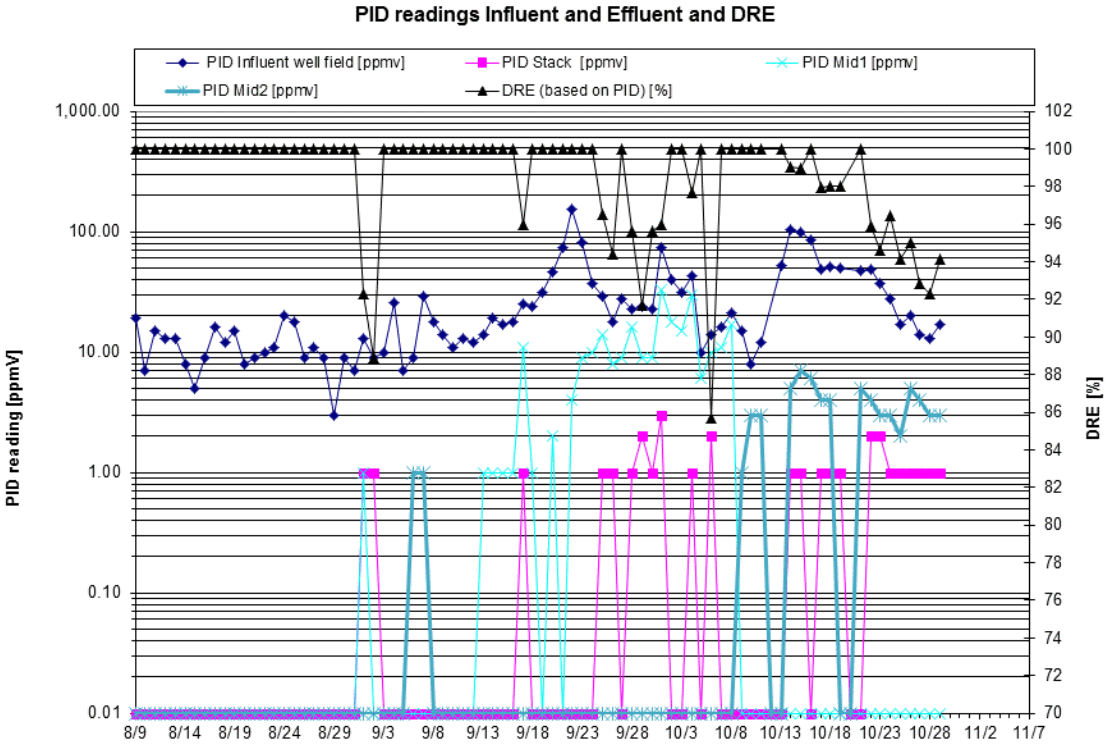


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the lab data received for the 8/10, 8/18, 8/24, 8/31, 9/8, 9/23 and 9/28 sampling dates. A composite PID response factor for the VOC mix identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the lab data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in pumped groundwater based on water lab analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

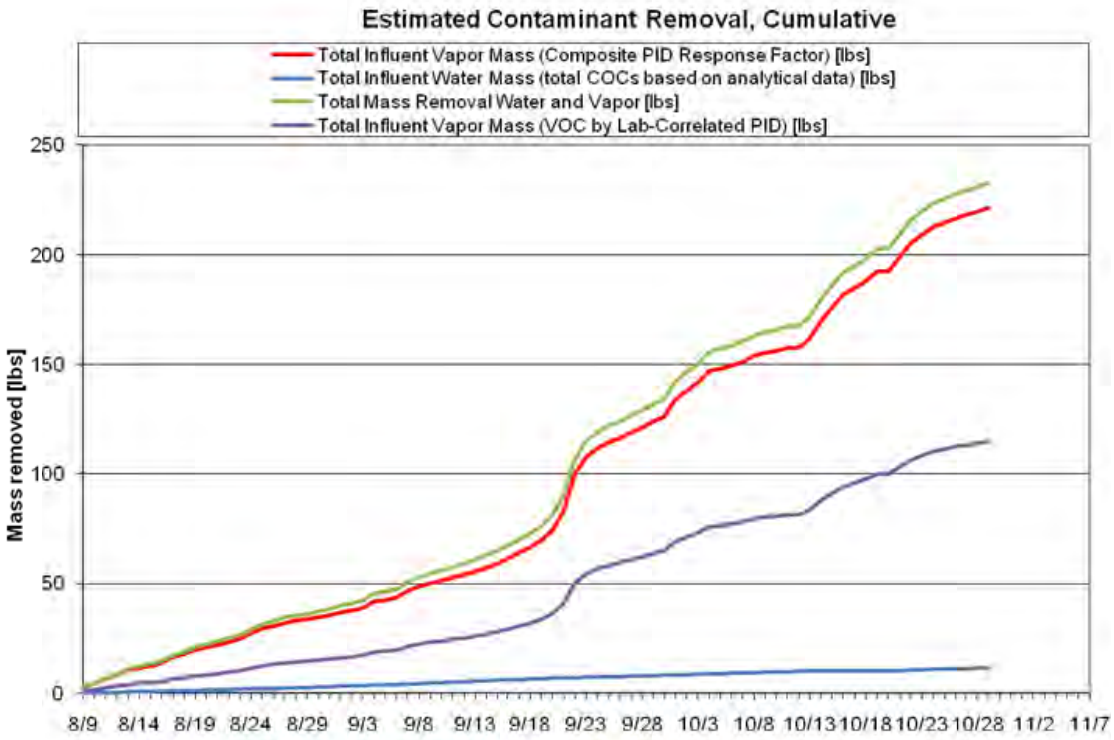


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 10/27/2010. The table below presents the concentrations in ppmV from the most recent and previous sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/10	8/17/10	8/25/10	9/1/10	9/8/10	9/15/10	9/22/10	9/29/10	10/8/10	10/21/10	10/27/10
VEW 1	5.1	5	6.4	6	7.3	6.5	8.7	11			
VEW 2	4.5	8	6.5	5	5.2	2.9	7.8	7.4	5.2	20.7	15.8
VEW 3	1.1	8	2.1	7	7.1	8.2	22	74	40.0		
VEW 4	4.1	6	5.2	6	8.7	6.3	7.9	13			
VEW 5	7.9							75	52.5	70.3	65.1
VEW 6	2.9							32	12.1	21.2	18.2
VEW 7	3.5							16			
VEW 8	10.8							11			
VEW 9	14.2	0	4.5	22	73	66	81	151	28.9	137.1	55.8
VEW 10	2.3							5.8			
VEW 11	5.4							6.4			
VEW 12	4.6							13			
VEW 13	3.1							29	47.4	94.0	25.7
VEW 14	1.3							93	47.0	36.1	23.3
VEW 15	6.2	10	6.8	26	42	60	107	268	164.3	265.8	164.3
VEW 16	4.0	6	5.9	5	8.1	3.4	12	15			
VEW 17	15.9	16	8.4	101	164	75	129	185	105.8	146.9	70.7
VEW 18	10.3	8	5.8	51	95	36	22	13			
VEW 19	1.6	5	4.8	6	28	7.4	11	17	34.4	50.7	16.9
VEW 20	4.5							42	60.7	50.6	20.2
VEW 21	11.1	5	3.8	42	93	89	139	177	108.2	68.7	41.1
VEW 22	8.4							20		25.0	11.6
VEW 23	0.6	7	7.3	15	58	7.1	6.2	19			
VEW 24	4.6	5	5.4	15	43	64	57	176	47.3	24.8	14.3
VEW 25	1.9							8.5			
VEW 26	7.1	5	4.4	5	4.2	6.9	9.6	18			
VEW 27	8.1	7	4.5	2	5.6	4.2	8.5	5.3	9.8	13.3	8.9
VEW 28	10.7	6	3.3	6	5.3	3.8	11	9.9			
VEW 29	10.3							29	26.2	24.9	6.5

7. Water Level

The figure below presents a water level contour map for the site.

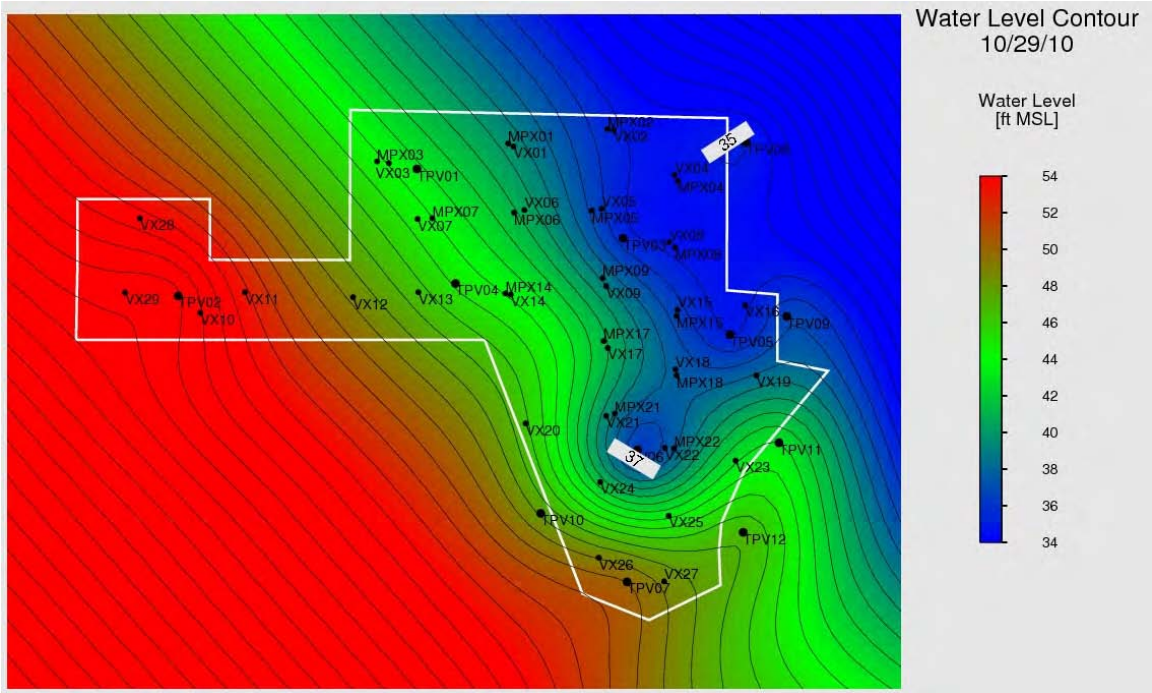


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

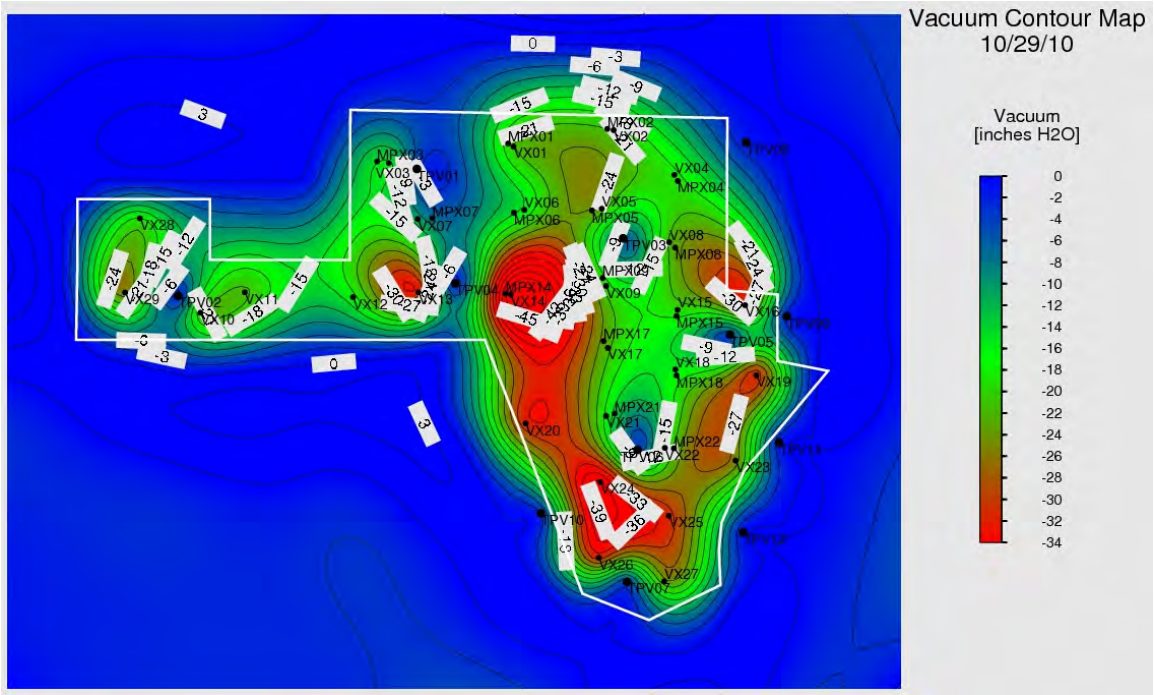


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 821,545 gallons of water since system startup while extracting a total of 1,036,973 gallons of water for a net water extraction of 215,428 gallons as of 10/29/10 (as seen in Figure 10 below).

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

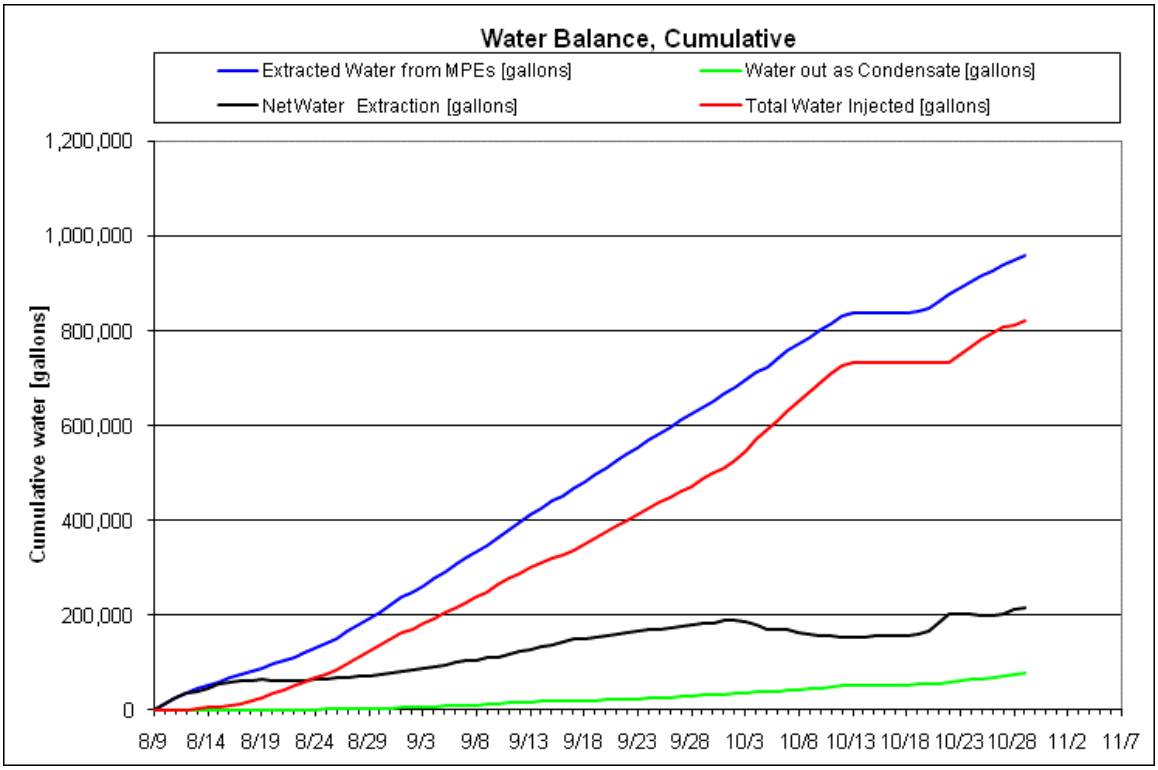


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

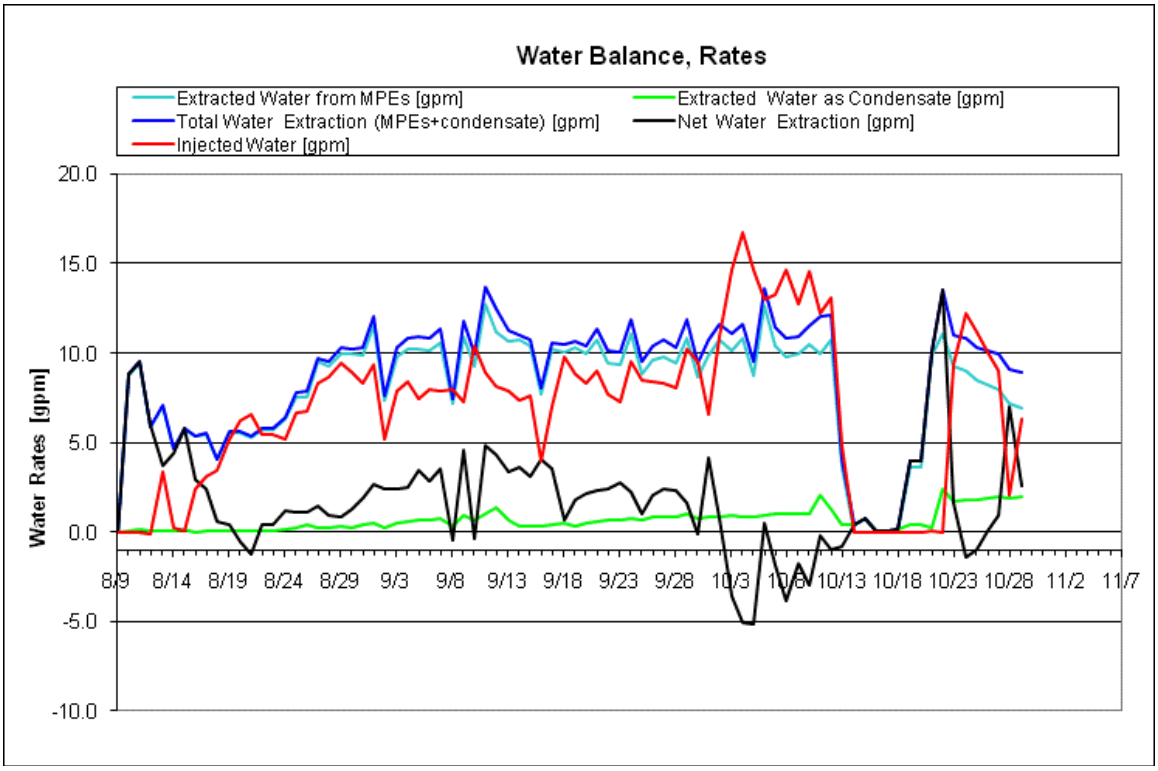


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

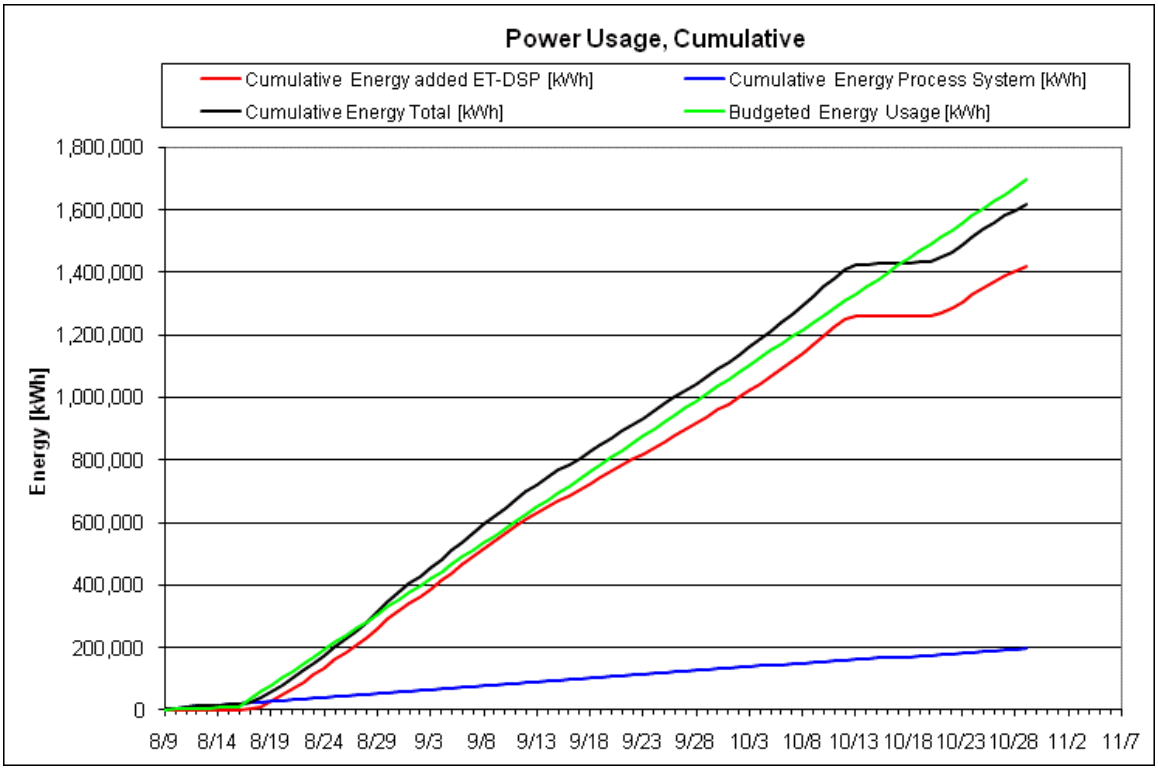


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

A steam generator will be mobilized to the site the week of 11/1/10 and will be used to target select electrodes for steam/hot water injection. This increased energy delivery to select electrodes will result in increased subsurface temperatures in the targeted zones.

Incidents:

No safety or environmental compliance issues were identified at the site this week.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged approximately two days for each day of heating system downtime or approximately 14 days.

Progress Report

10/30/2010 through 11/5/2010
November 8, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from October 30 through November 5, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 11/5/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	80	days
Energy used to date	1,762,880	kWh
Injected energy per soil volume to date	94	kWh/cy
Water contaminant removal last 7 days	0.8	lbs
Water contaminant removal to date	12.2	lbs
Vapor contaminant removal last 7 days	8	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	245	lbs
Average temperature Area A last 7 days	177	°F
Average temperature Area C last 7 days	153	°F
Average temperature Area D last 7 days	119	°F
Average power usage rate last 7 days	867	kW
Average total water extracted rate last 7 days	8.2	gpm
Average injected water rate last 7 days	7.7	gpm
Average vapor extraction rate (non condensable) last 7 days	487	scfm

System Shutdowns

Saturday, 30 October: The groundwater extraction system shut down at 05:45 EST due to a high pressure alarm on the primary organoclay vessel. The primary vessel was disconnected and the secondary vessel connected. As a result of the high pressure in the clay vessel, the vapor system also shut down at approximately 05:45 EST due to alarms at the oil water separator and knockout. Both systems were down for approximately two hours.

Thursday, 4 November: The vapor system shutdown at 18:38 EST due to an alarm at the first knockout tank. Observations to the treatment equipment indicate that the pump downstream of the knockout tank had lost its prime. The pump was reprimed and the system restarted. No further alarms have occurred. The system was down for approximately 30 minutes.

Downhole pump in MPE-01 was taken offline due to air being injected into the system. Troubleshooting continues with this pump.

System Maintenance

Approximately eight gallons total of unidentified material was removed from the “trough” and oil water separator on 29 October, 31 October, 1 November and 4 November. At this point, it has not been determined that this unidentified material is NAPL and therefore it is not counted for in the summary table on page 1.

Monday, 1 November: Mc2 began installation of the steam generator.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

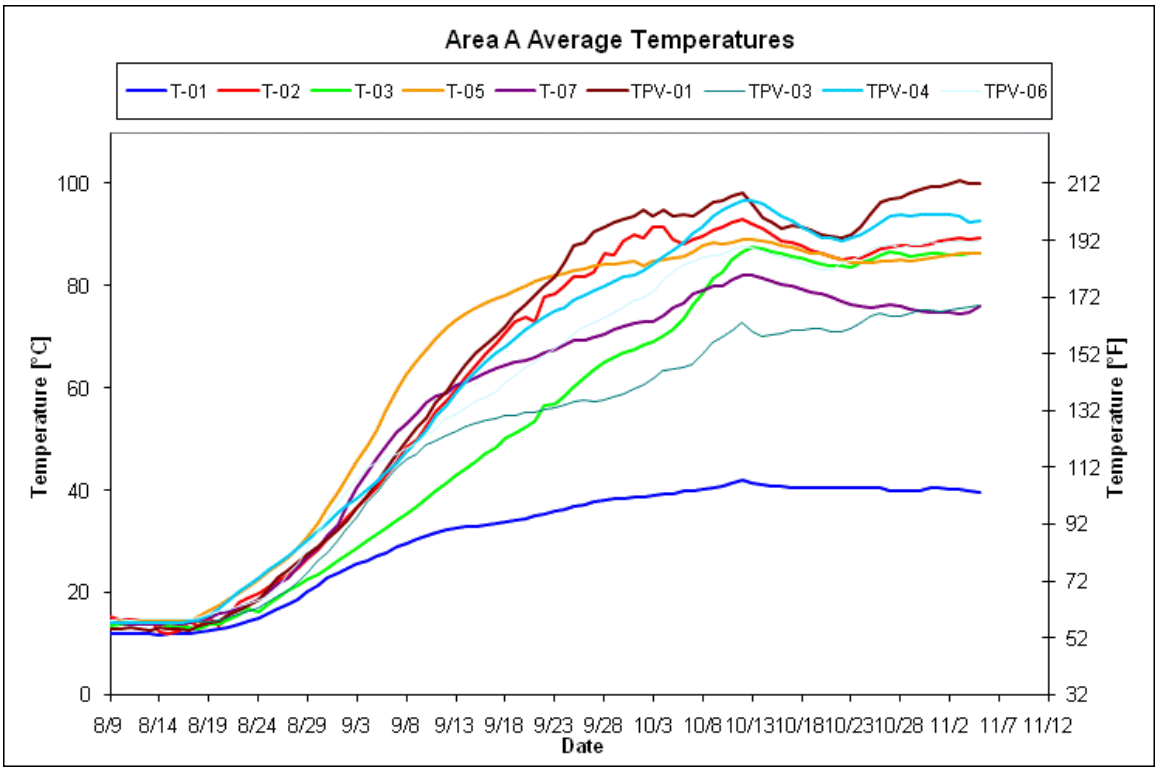


Figure 1. Average Temperature –Area A

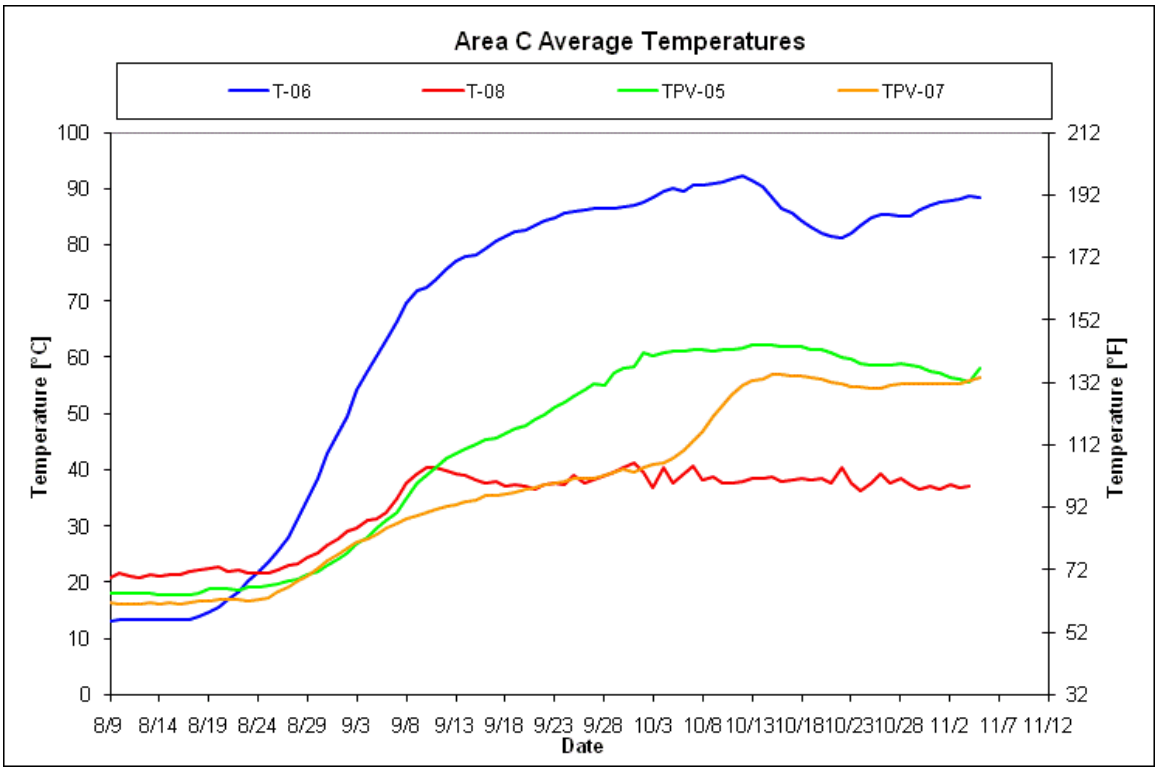


Figure 2. Average Temperature –Area C

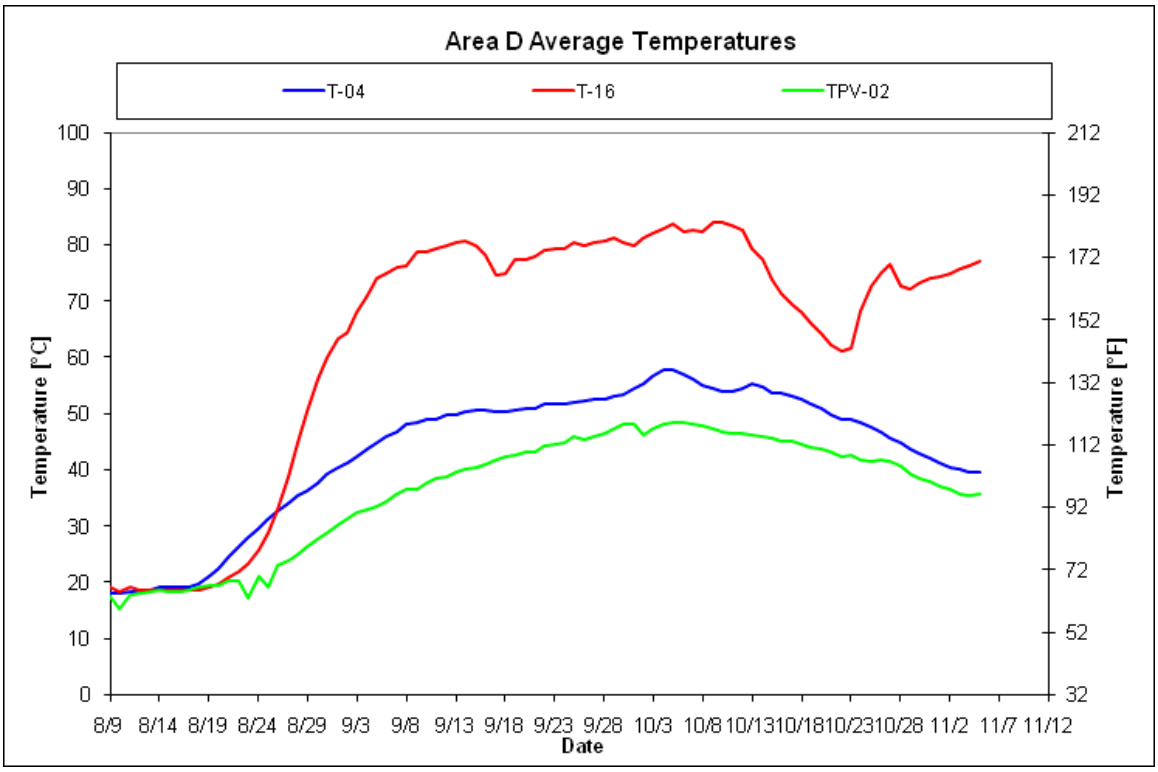


Figure 3. Average Temperature –Area D

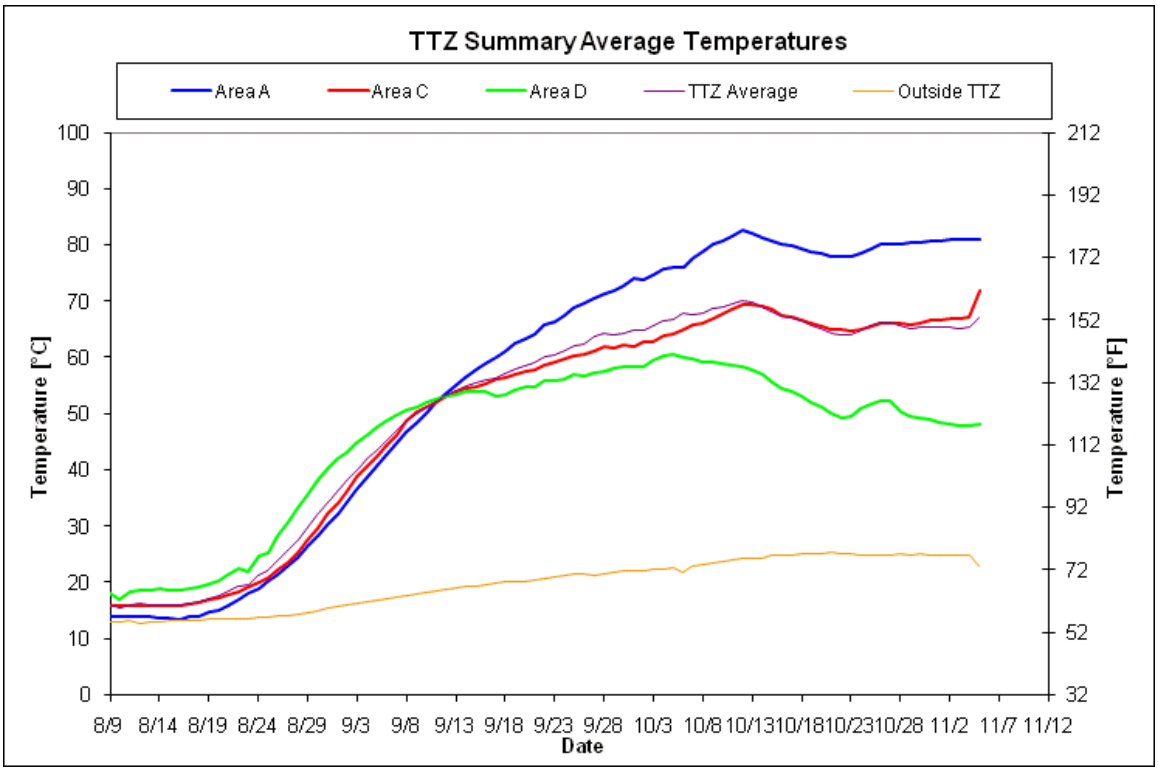


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment.

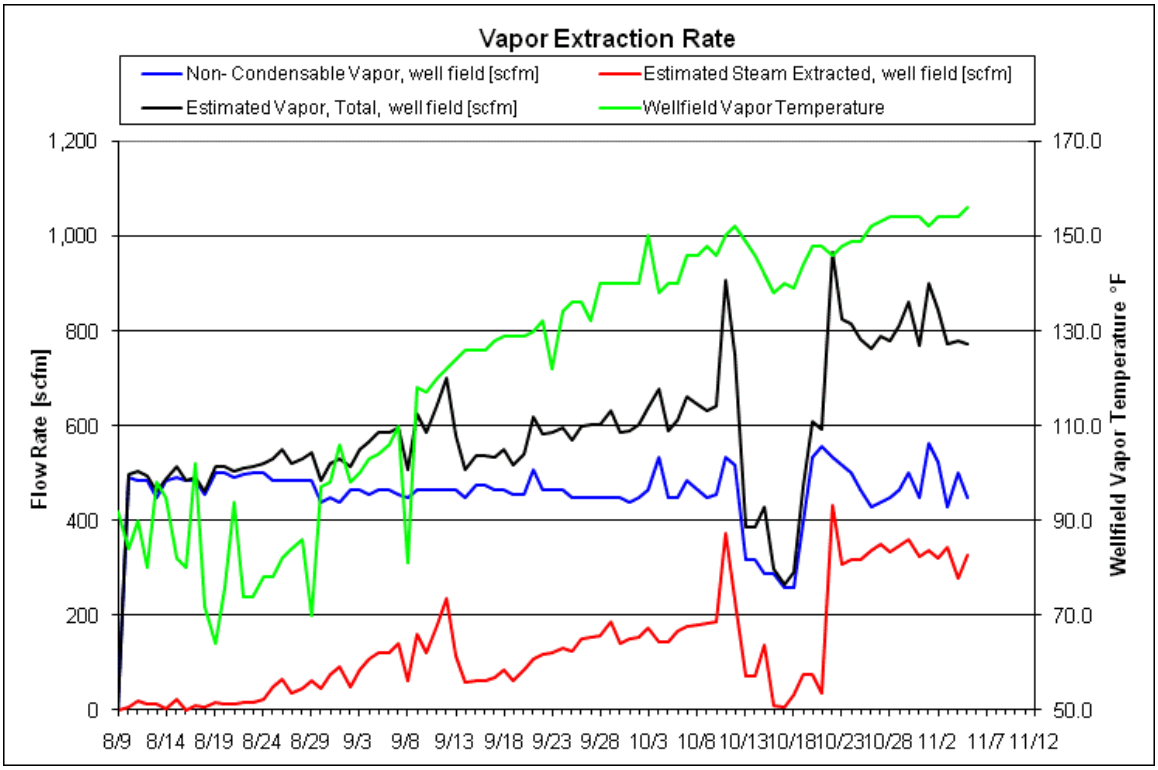


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, our carbon efficiency may not achieve greater than 95% DRE.

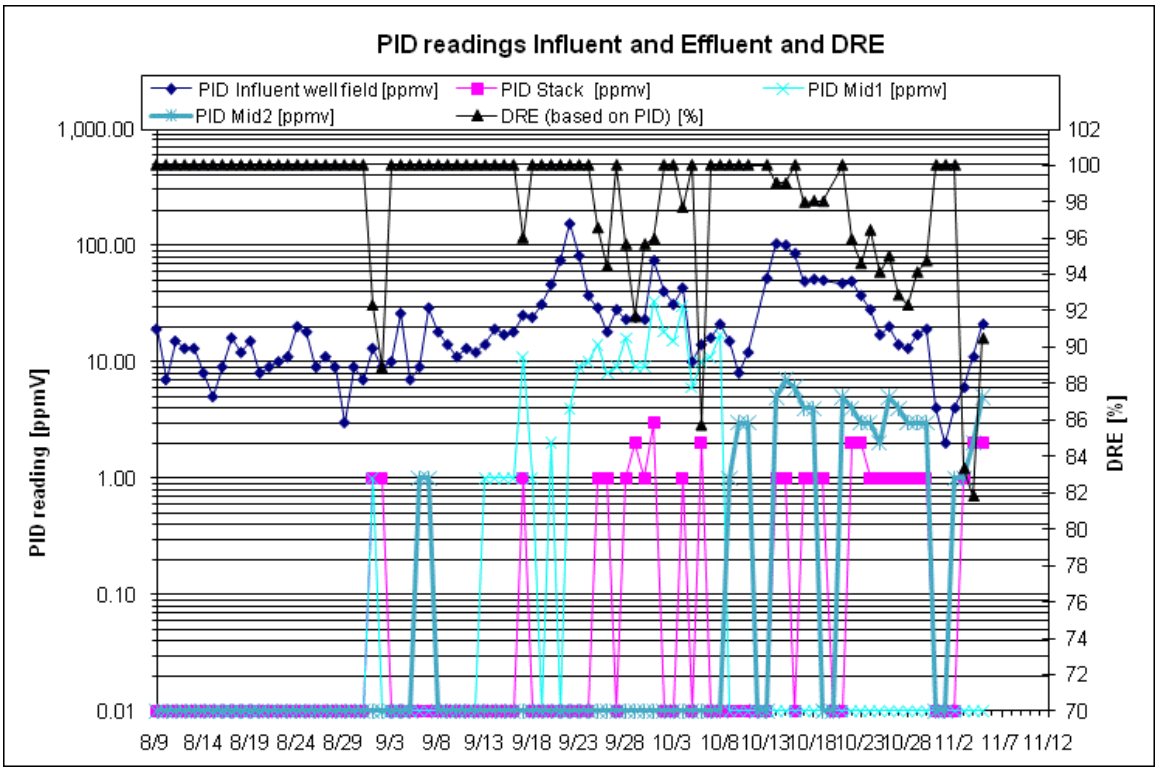


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the lab data received for the 8/10, 8/18, 8/24, 8/31, 9/8, 9/15, 9/23, 9/28 and 10/4 sampling dates. A composite PID response factor for the VOC mix identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the lab data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in pumped groundwater based on water lab analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

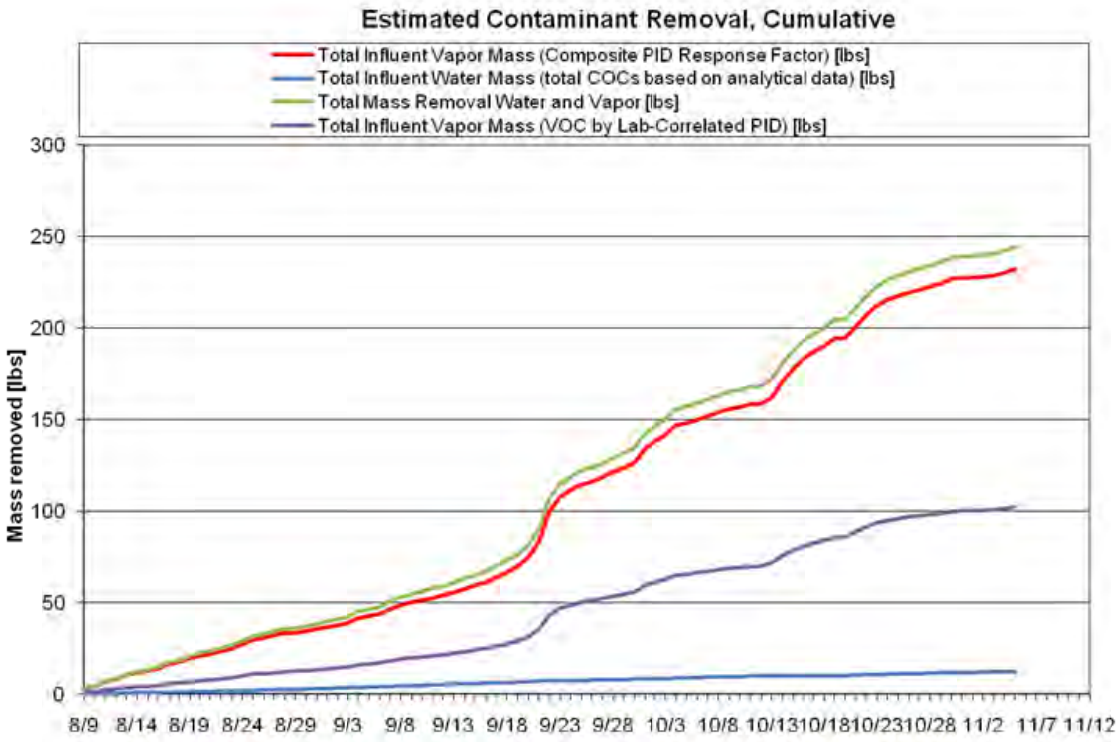


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 11/3/2010. The table below presents the concentrations in ppmV from the most recent and previous sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/10	8/17/10	8/25/10	9/1/10	9/8/10	9/15/10	9/22/10	9/29/10	10/8/10	10/21/10	10/27/10	11/3/10
VEW 1	5.1	5	6.4	6	7.3	6.5	8.7	11				
VEW 2	4.5	8	6.5	5	5.2	2.9	7.8	7.4	5.2	20.7	15.8	*8.1*
VEW 3	1.1	8	2.1	7	7.1	8.2	22	74	40.0			
VEW 4	4.1	6	5.2	6	8.7	6.3	7.9	13				
VEW 5	7.9							75	52.5	70.3	65.1	*7.6*
VEW 6	2.9							32	12.1	21.2	18.2	*2.9*
VEW 7	3.5							16				
VEW 8	10.8							11				
VEW 9	14.2	0	4.5	22	73	66	81	151	28.9	137.1	55.8	*38.7*
VEW 10	2.3							5.8				
VEW 11	5.4							6.4				
VEW 12	4.6							13				
VEW 13	3.1							29	47.4	94.0	25.7	*3.4*
VEW 14	1.3							93	47.0	36.1	23.3	*1.2*
VEW 15	6.2	10	6.8	26	42	60	107	268	164.3	265.8	164.3	*23.4*
VEW 16	4.0	6	5.9	5	8.1	3.4	12	15				
VEW 17	15.9	16	8.4	101	164	75	129	185	105.8	146.9	70.7	*50.2*
VEW 18	10.3	8	5.8	51	95	36	22	13				
VEW 19	1.6	5	4.8	6	28	7.4	11	17	34.4	50.7	16.9	*14.4*
VEW 20	4.5							42	60.7	50.6	20.2	*2.7*
VEW 21	11.1	5	3.8	42	93	89	139	177	108.2	68.7	41.1	*21.9*
VEW 22	8.4							20		25.0	11.6	*2.6*
VEW 23	0.6	7	7.3	15	58	7.1	6.2	19				
VEW 24	4.6	5	5.4	15	43	64	57	176	47.3	24.8	14.3	*5.0*
VEW 25	1.9							8.5				
VEW 26	7.1	5	4.4	5	4.2	6.9	9.6	18				
VEW 27	8.1	7	4.5	2	5.6	4.2	8.5	5.3	9.8	13.3	8.9	*1.3*
VEW 28	10.7	6	3.3	6	5.3	3.8	11	9.9				
VEW 29	10.3							29	26.2	24.9	6.5	5.3

7. Water Level

The figure below presents a water level contour map for the site.

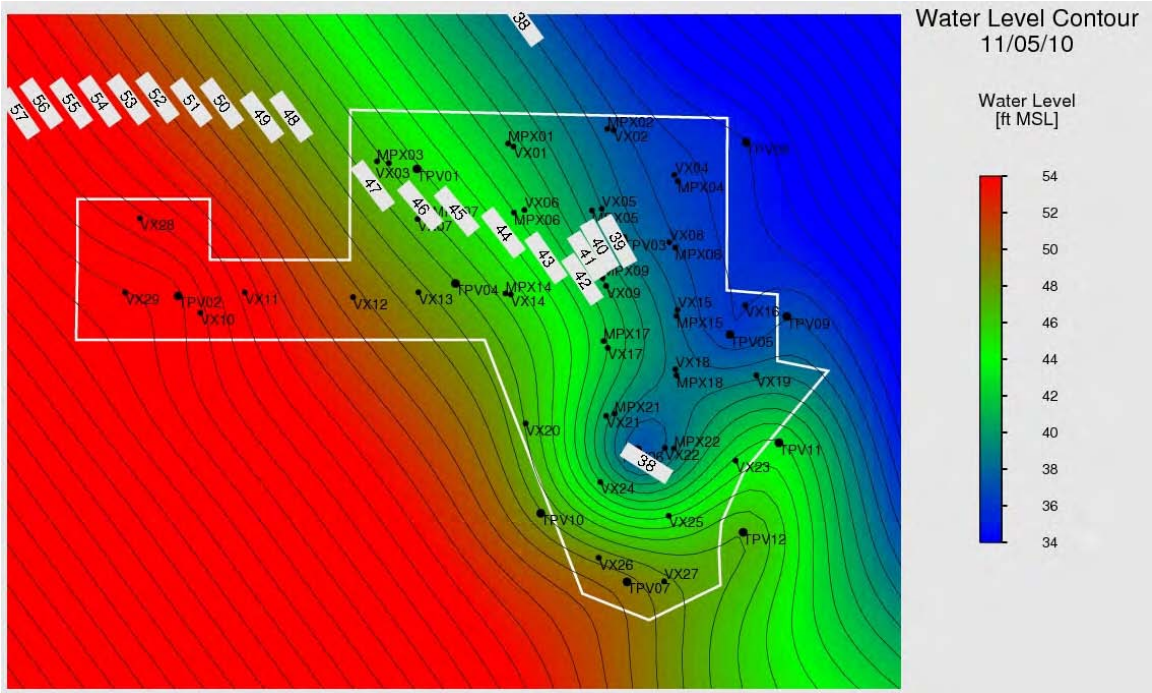


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

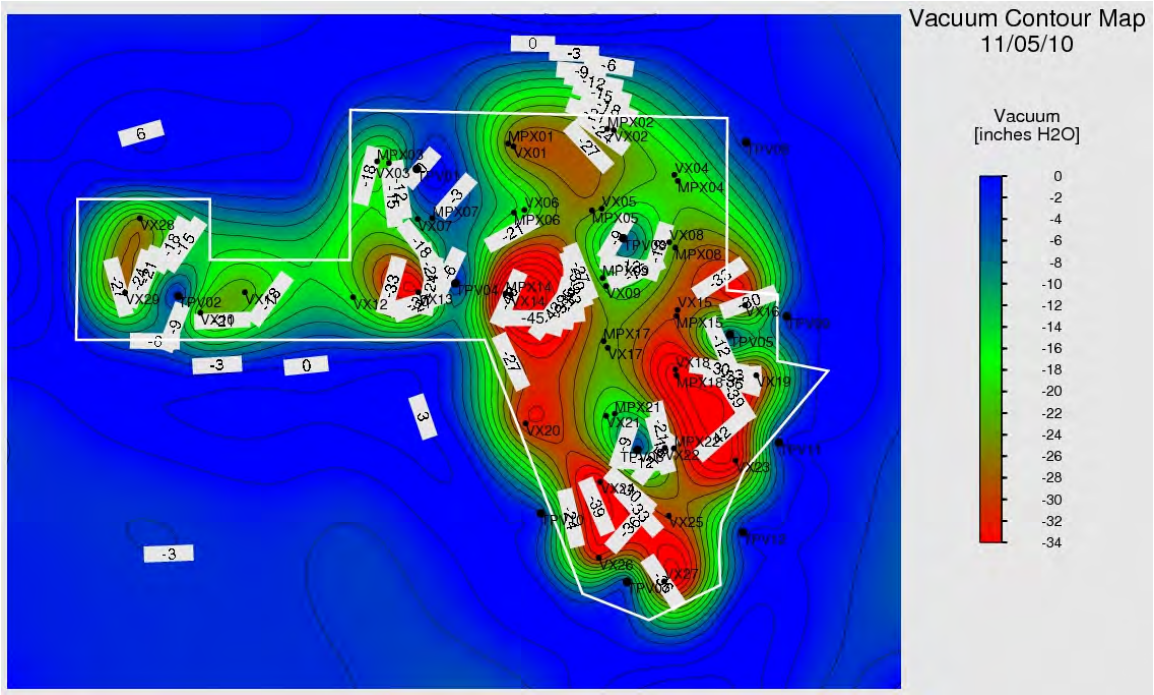


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 899,618 gallons of water since system startup while extracting a total of 1,119,344 gallons of water for a net water extraction of 219,726 gallons as of 11/5/10 (as seen in Figure 10 below).

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

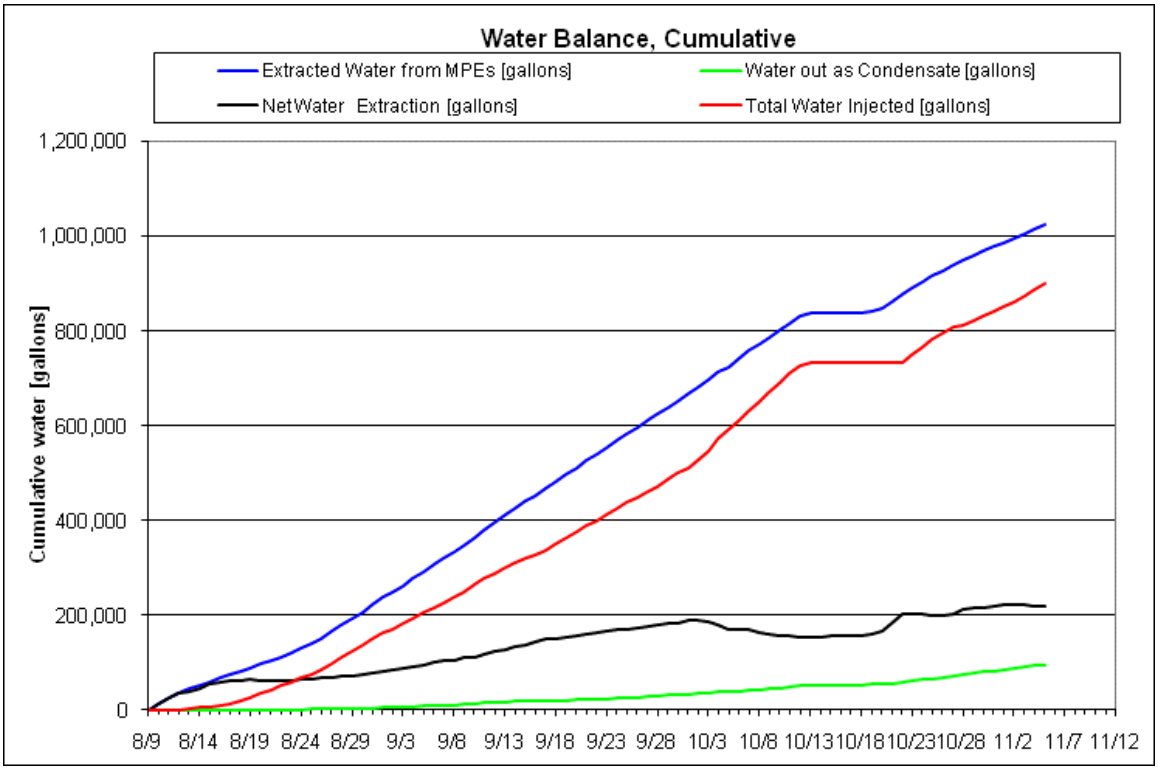


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

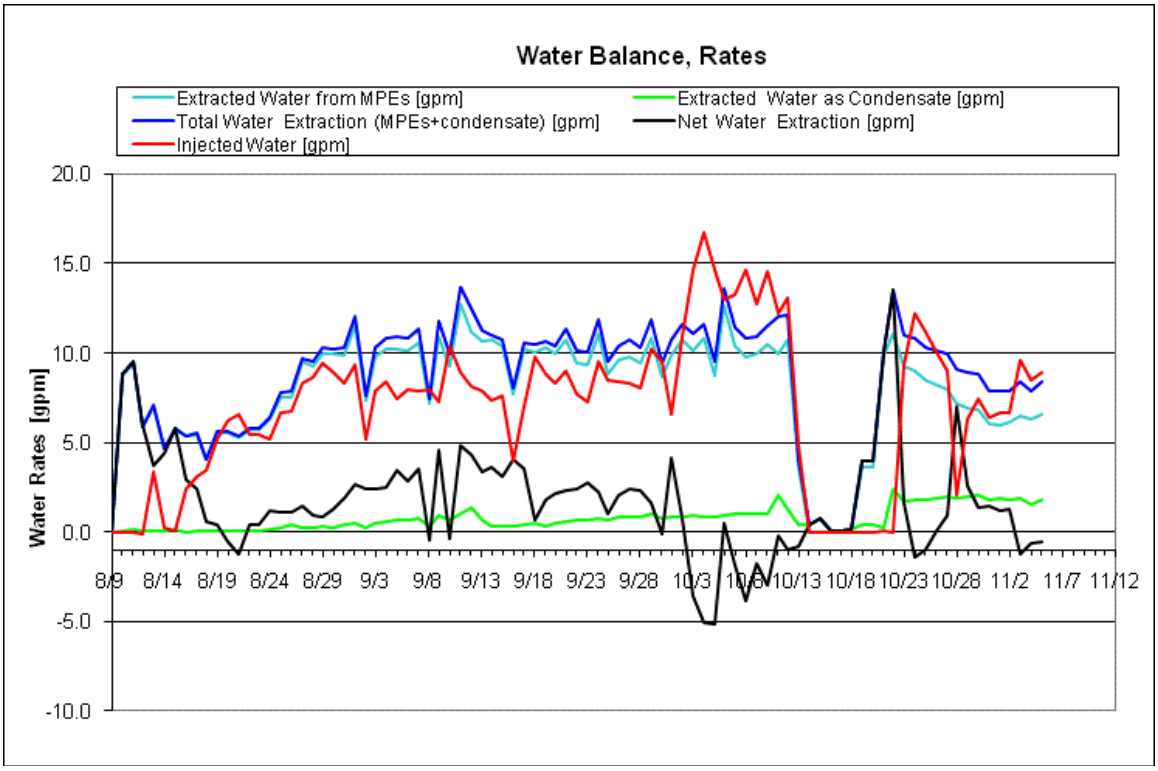


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

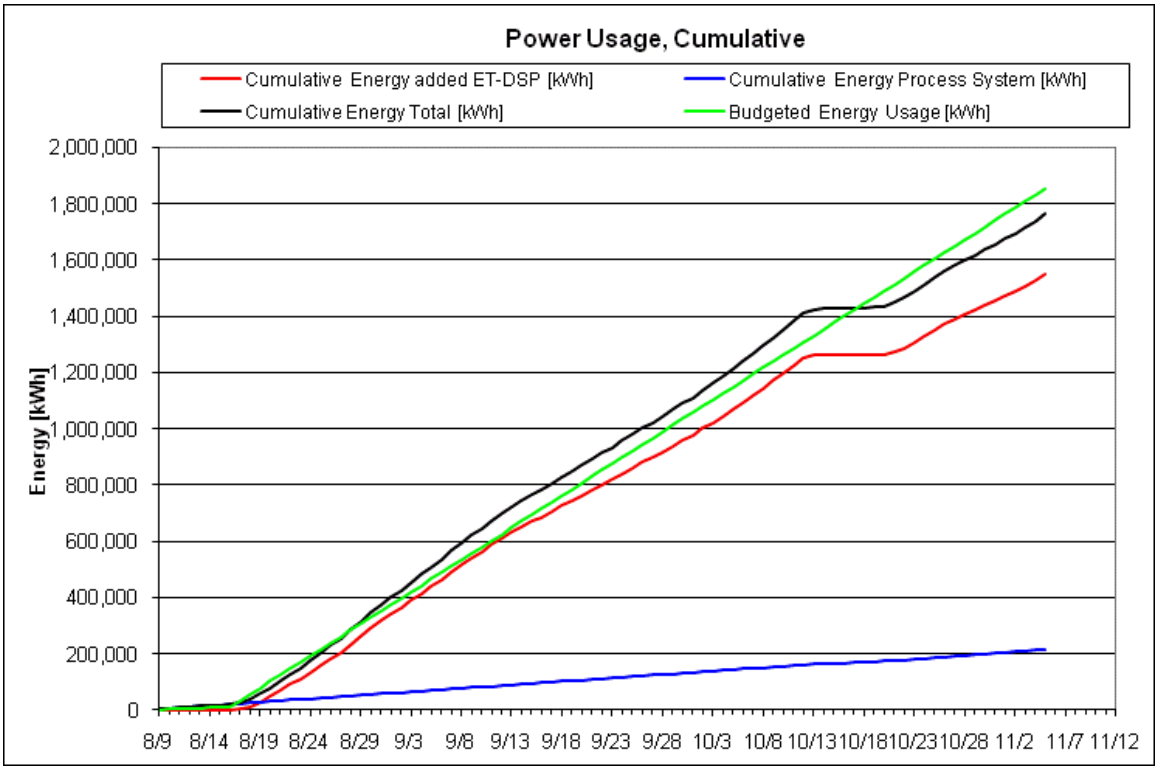


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

A steam generator will begin steam/hot water injection to select electrodes this week.

Incidents:

No safety or environmental compliance issues were identified at the site this week.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged approximately two days for each day of heating system downtime or approximately 14 days.

Progress Report

11/6/2010 through 11/12/2010
November 15, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from November 6 through November 12, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 11/12/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	87	days
Energy used to date	1,916,000	kWh
Injected energy per soil volume to date	102	kWh/cy
Water contaminant removal last 7 days	0.8	lbs
Water contaminant removal to date	13.0	lbs
Vapor contaminant removal last 7 days	7	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	249	lbs
Average temperature Area A last 7 days	179	°F
Average temperature Area C last 7 days	154	°F
Average temperature Area D last 7 days	116	°F
Average power usage rate last 7 days	911	kW
Average total water extracted rate last 7 days	8.3	gpm
Average injected water rate last 7 days	7.2	gpm
Average vapor extraction rate (non condensable) last 7 days	496	scfm

System Shutdowns

Wednesday, 10 November: The electrodes were shut down at approximately 0700 for the groundwater sampling effort. They were energized again at approximately 1500. The downhole pump in MPE-01 was pulled and repaired.

Friday, 12 November: A surge in power occurred at approximately 0820 causing the thermal treatment system and treatment plant to shut down. The system was restarted at 0825. The cause of this surge is unknown. No further surges have occurred.

System Maintenance

Approximately six gallons total of unidentified material was removed from the “trough” and oil water separator on 6 November, 7 November, and 11 November. At this point, it has not been determined that this unidentified material is NAPL and therefore not counted for in the summary table on page 2.

Friday, 12 November: TerraTherm and McMillan-McGee (Mc2) reviewed the locations of additional grounding wires within the treatment plant with Weston and Nobis Health & Safety personnel.

Mc2 continued making connections to the steam header for steam injection into select electrode locations.

Saturday, 13 November: Grounding wires were attached at several locations along the thermal treatment influent piping and the existing metal piping inside the treatment plant to remedy the separate grounds between the thermal treatment equipment and the treatment plant.

The main valve on water circulation system unit 1 was removed and sent to the manufacturer for analysis. The water circulation system is currently bypassed until the valve returns from the manufacturer.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

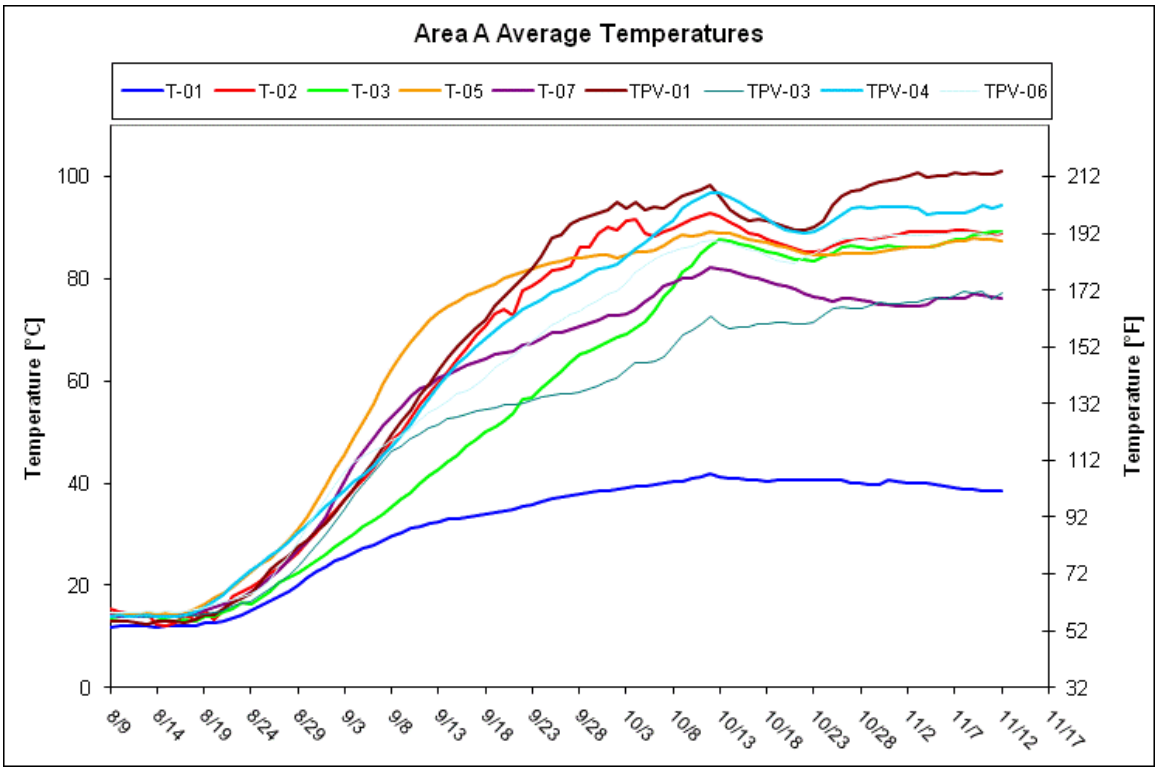


Figure 1. Average Temperature –Area A

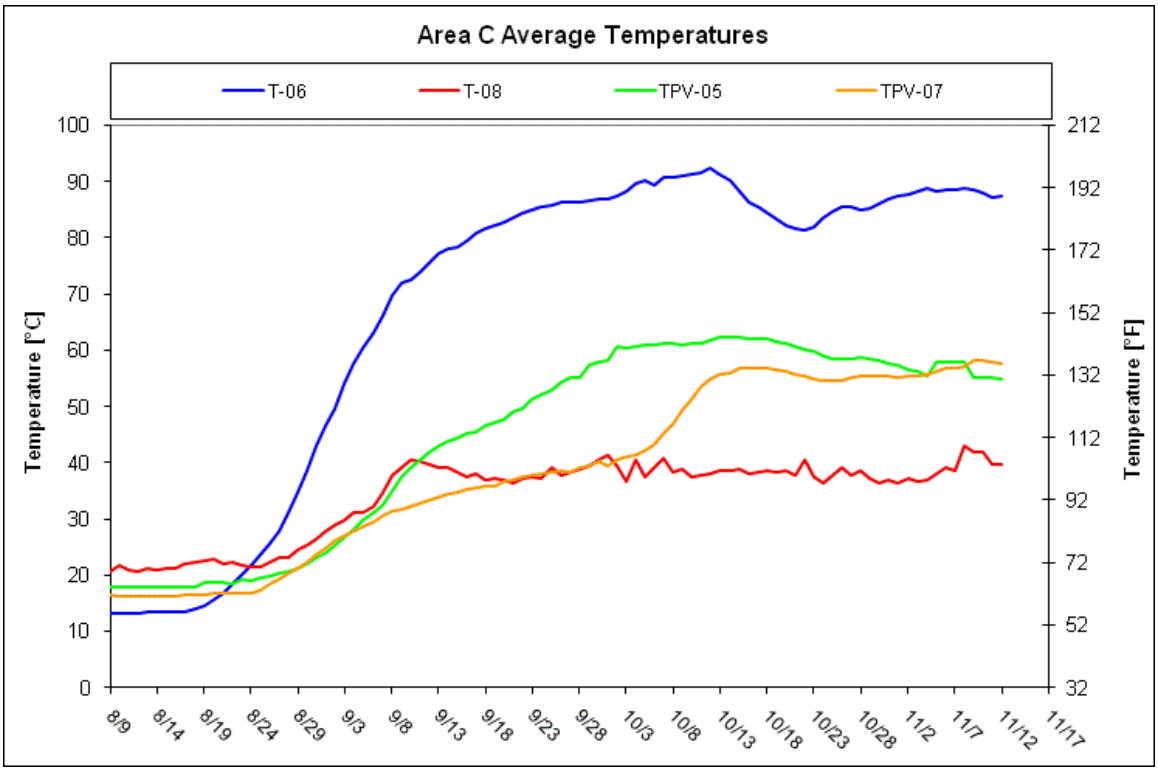


Figure 2. Average Temperature –Area C

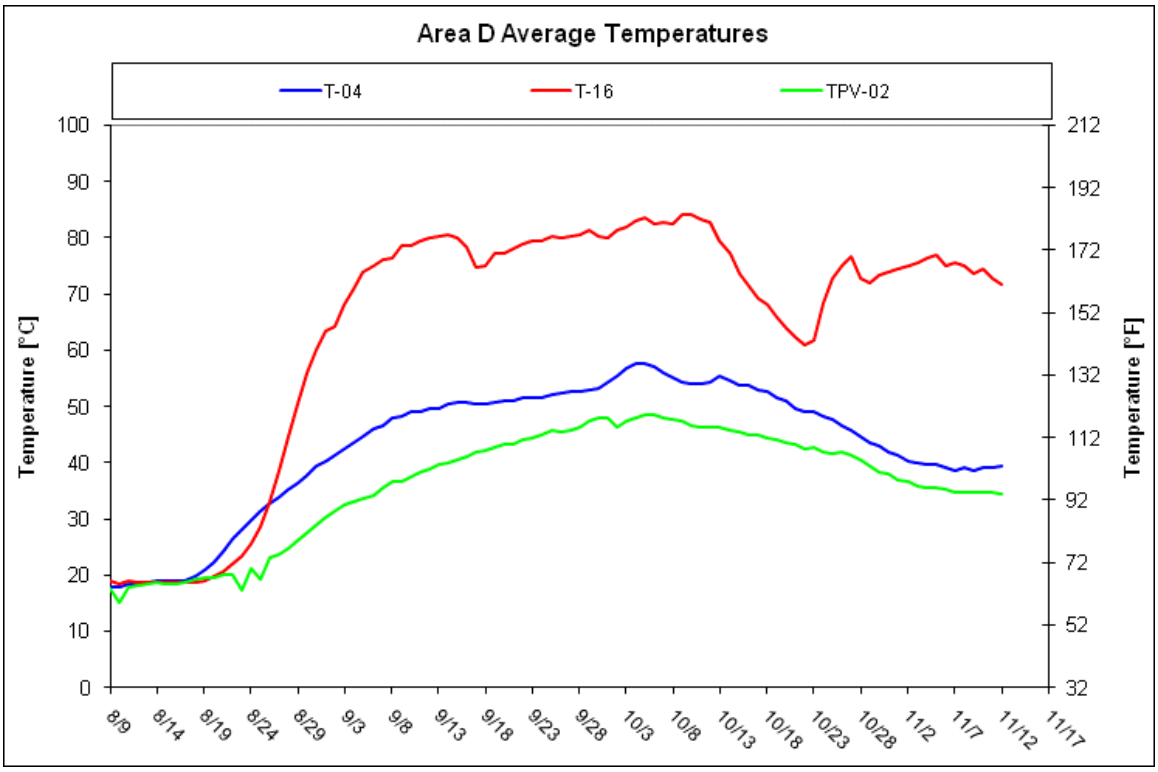


Figure 3. Average Temperature –Area D

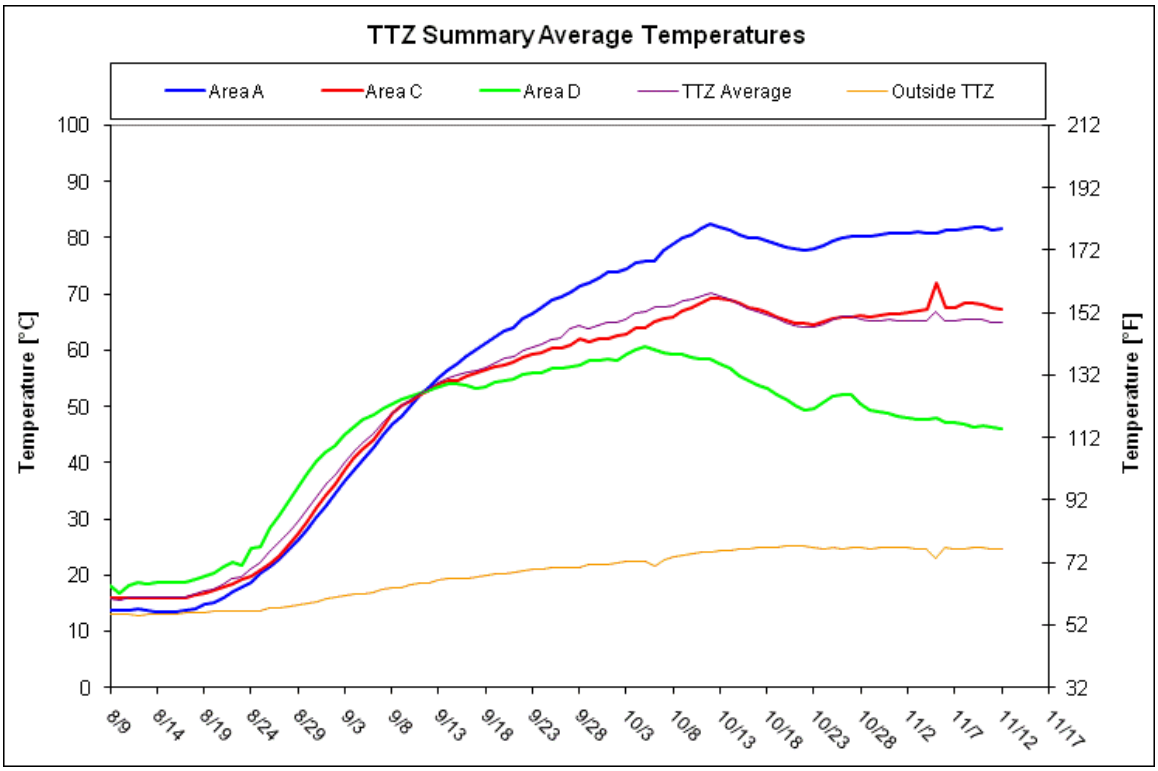


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph below also shows the vapor temperature at the inlet of the process treatment equipment.

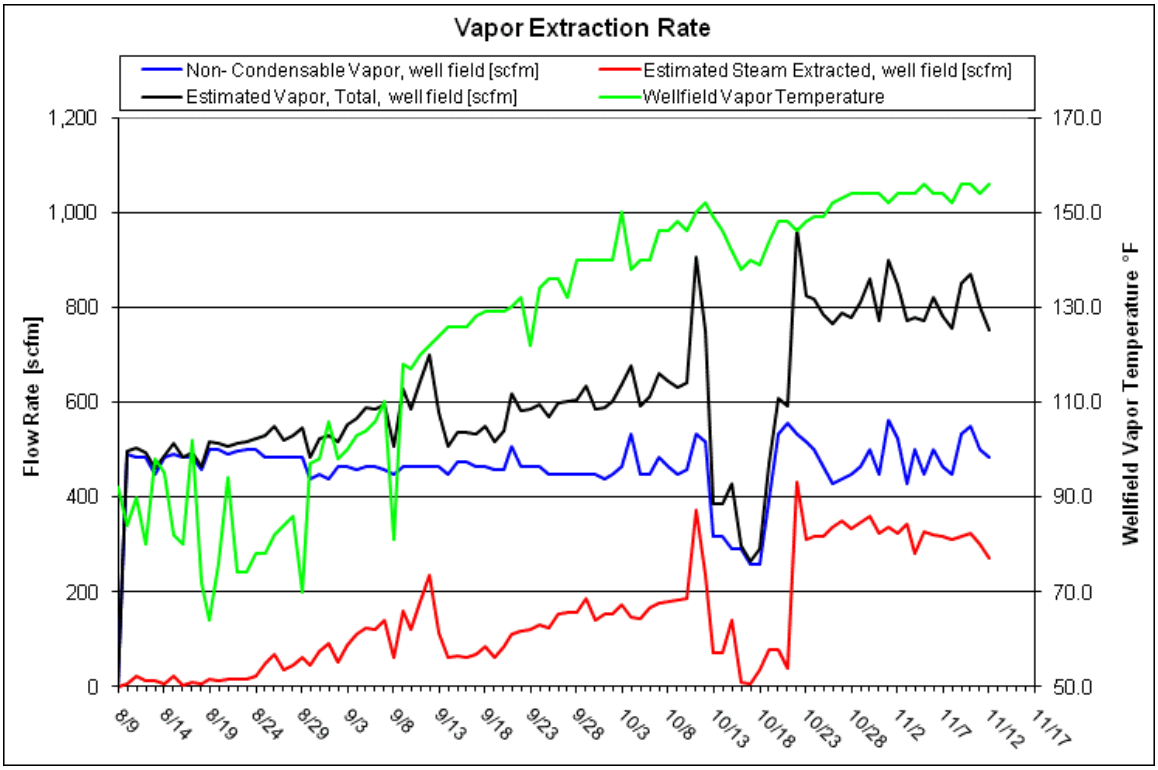


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, our carbon efficiency may not achieve greater than 95% DRE.

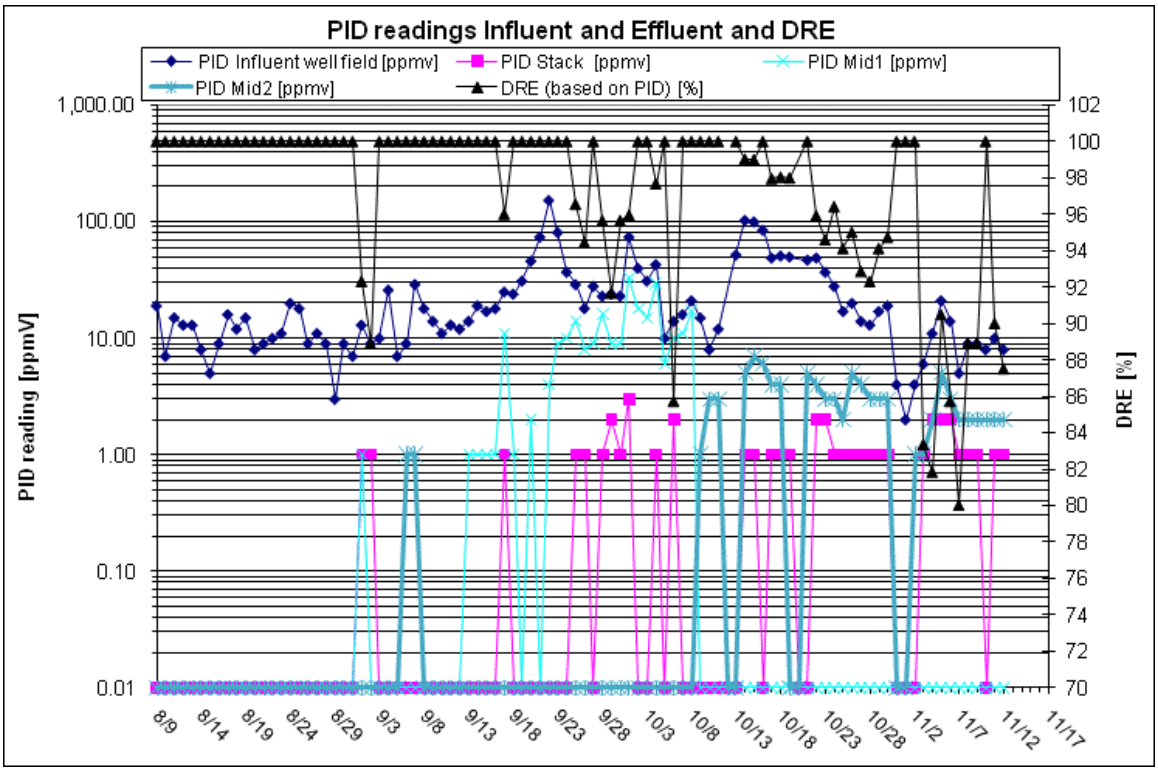


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received lab data. A composite PID response factor for the VOC mix identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the lab data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in pumped groundwater based on water lab analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

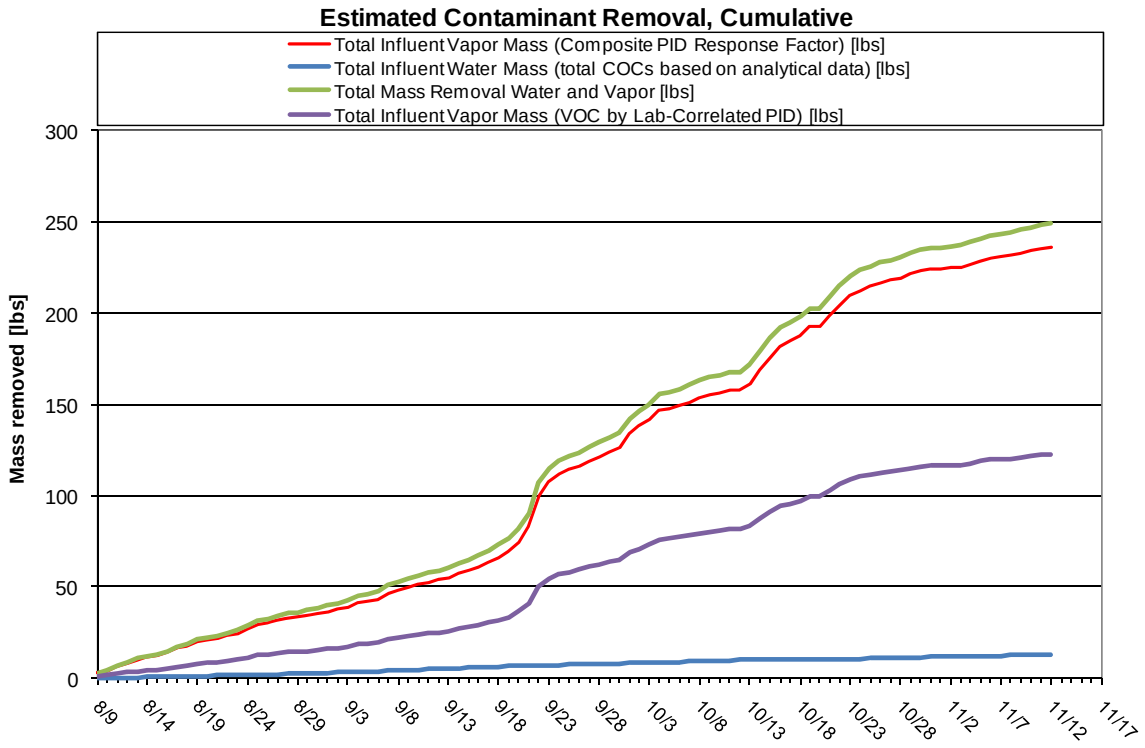


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 11/10/2010. The table below presents the concentrations in ppmV from the most recent and previous sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/10	8/17/10	8/25/10	9/1/10	9/8/10	9/15/10	9/22/10	9/29/10	10/8/10	10/21/10	10/27/10	11/3/10	11/10/10
VEW 1	5.1	5	6.4	6	7.3	6.5	8.7	11					
VEW 2	4.5	8	6.5	5	5.2	2.9	7.8	7.4	5.2	20.7	15.8	*8.1*	*6.8*
VEW 3	1.1	8	2.1	7	7.1	8.2	22	74	40.0				
VEW 4	4.1	6	5.2	6	8.7	6.3	7.9	13					
VEW 5	7.9							75	52.5	70.3	65.1	*7.6*	*23.9*
VEW 6	2.9							32	12.1	21.2	18.2	*2.9*	*7.3*
VEW 7	3.5							16					
VEW 8	10.8							11					
VEW 9	14.2	0	4.5	22	73	66	81	151	28.9	137.1	55.8	*38.7*	*24.8*
VEW 10	2.3							5.8					
VEW 11	5.4							6.4					
VEW 12	4.6							13					
VEW 13	3.1							29	47.4	94.0	25.7	*3.4*	*17.8*
VEW 14	1.3							93	47.0	36.1	23.3	*1.2*	*8.0*
VEW 15	6.2	10	6.8	26	42	60	107	268	164.3	265.8	164.3	*23.4*	*57.2*
VEW 16	4.0	6	5.9	5	8.1	3.4	12	15					
VEW 17	15.9	16	8.4	101	164	75	129	185	105.8	146.9	70.7	*50.2*	*37.0*
VEW 18	10.3	8	5.8	51	95	36	22	13					
VEW 19	1.6	5	4.8	6	28	7.4	11	17	34.4	50.7	16.9	*14.4*	*21.5*
VEW 20	4.5							42	60.7	50.6	20.2	*2.7*	*23.9*
VEW 21	11.1	5	3.8	42	93	89	139	177	108.2	68.7	41.1	*21.9*	*41.4*
VEW 22	8.4							20		25.0	11.6	*2.6*	*3.5*
VEW 23	0.6	7	7.3	15	58	7.1	6.2	19					
VEW 24	4.6	5	5.4	15	43	64	57	176	47.3	24.8	14.3	*5.0*	*11.2*
VEW 25	1.9							8.5					
VEW 26	7.1	5	4.4	5	4.2	6.9	9.6	18					
VEW 27	8.1	7	4.5	2	5.6	4.2	8.5	5.3	9.8	13.3	8.9	*1.3*	*7.8*
VEW 28	10.7	6	3.3	6	5.3	3.8	11	9.9					
VEW 29	10.3							29	26.2	24.9	6.5	5.3	6.7

7. Water Level

The figure below presents a water level contour map for the site.

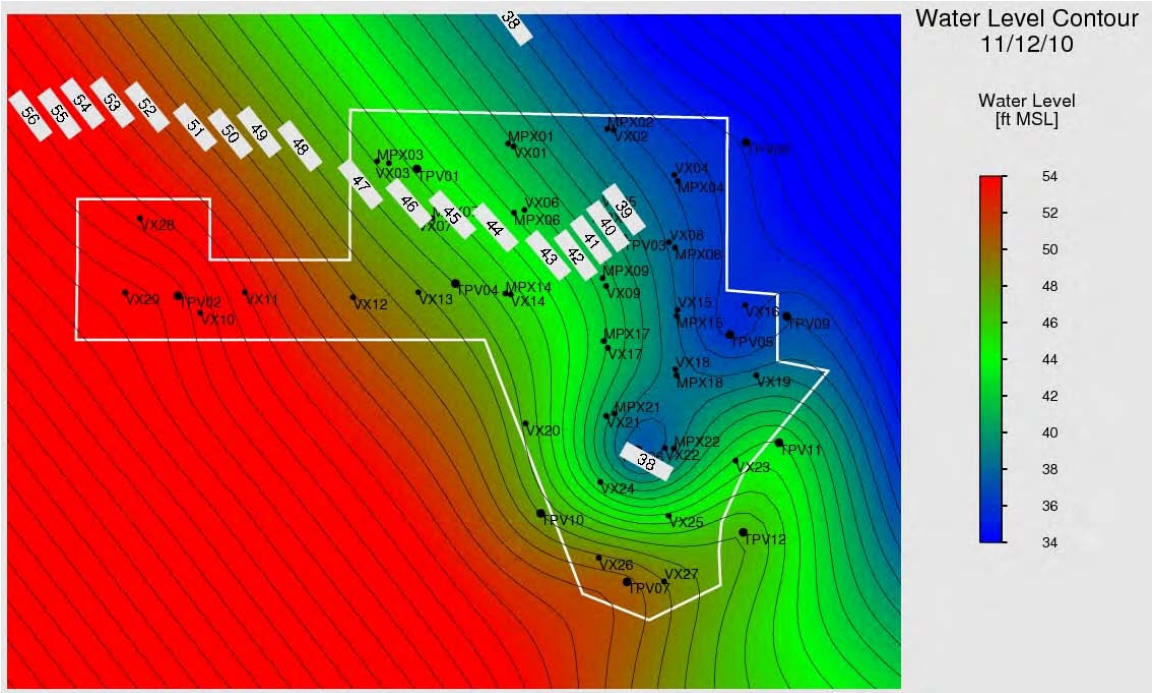


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

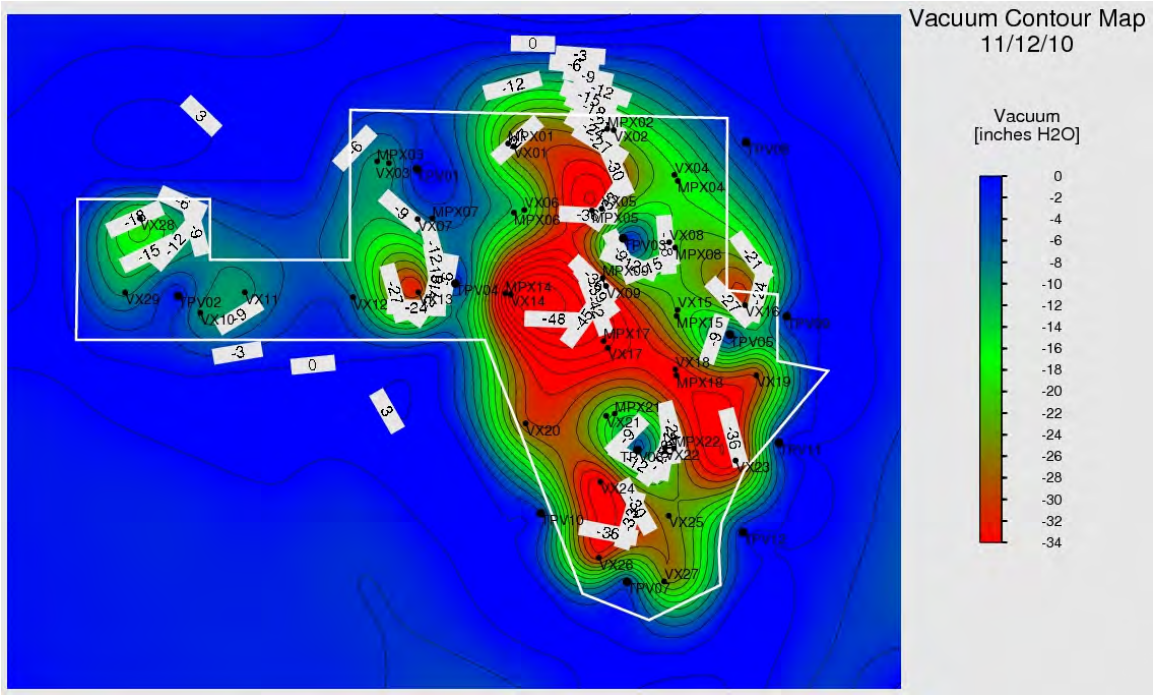


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 972,011 gallons of water since system startup while extracting a total of 1,202,561 gallons of water for a net water extraction of 230,550 gallons as of 11/12/10 (as seen in Figure 10 below).

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

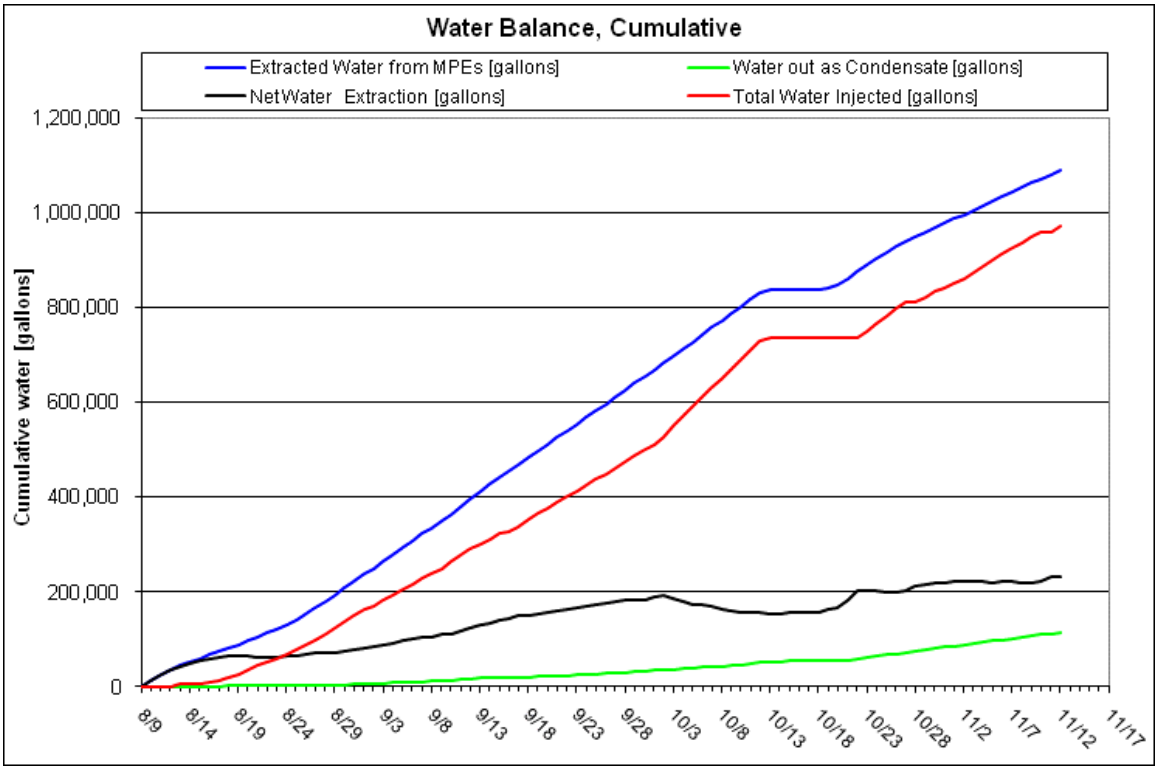


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

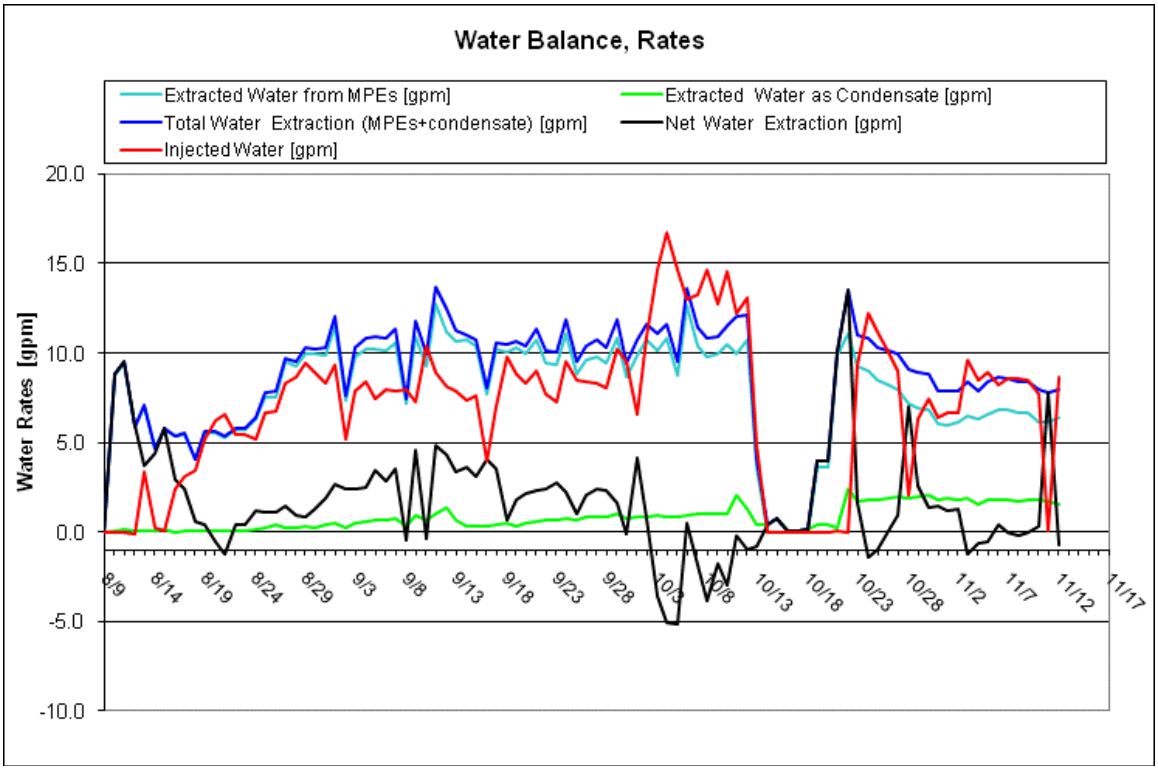


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

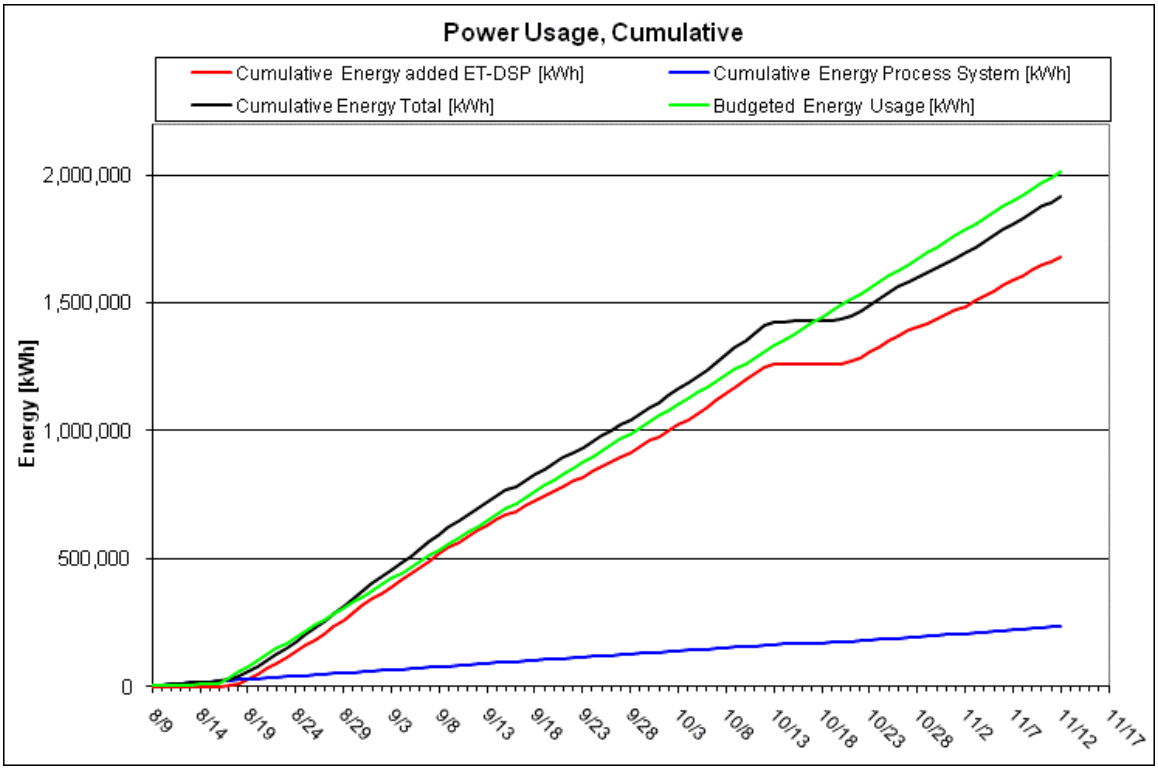


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

On Tuesday, November 9, approximately 120 pounds of salt was injected into the treatment zone through targeted electrodes in order to increase the conductivity of the soil.

A steam generator will begin steam/hot water injection to select electrodes this week.

Incidents:

On Thursday, November 11, 2010, Bob Ricard was shocked with approximately 25 volts when disconnecting piping from the Groundwater Treatment Plant (GWTP) and piping from the ISTR liquid treatment effluent. TerraTherm, Gilbride Electric and McMillan-McGee investigated the source of the voltage on the pipe at the GWTP. It is believed that there was a conflict between the separate ground for the GWTP and the separate ground for the ISTR liquid treatment system. TerraTherm, Gilbride Electric and Mc2 modified the existing grounding system at the site to include jumpers between the ISTR influent pipe and the existing GWTP pipe to bond the two separate grounding systems together.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged approximately two days for each day of heating system downtime or approximately 14 days.

In addition to the steam generator, TerraTherm and Mc2 are discussing other heating system enhancements to accelerate heating at the site and will prepare a summary to discuss these options.

Progress Report

11/13/2010 through 11/19/2010
November 22, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from November 13 through November 19, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 11/19/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13,590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	94	days
Energy used to date	2,085,440	kWh
Injected energy per soil volume to date	111	kWh/cy
Water contaminant removal last 7 days	0.80	lbs
Water contaminant removal to date	13.8	lbs
Vapor contaminant removal last 7 days	11	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18	gal
Total contaminant removal to date	261	lbs
Average temperature Area A last 7 days	181	°F
Average temperature Area C last 7 days	154	°F
Average temperature Area D last 7 days	117	°F
Average power usage rate last 7 days	1,009	kW
Average total water extracted rate last 7 days	8.1	gpm
Average injected water rate last 7 days	7.5	gpm
Average vapor extraction rate (non condensable) last 7 days	456	scfm

System Shutdowns

Wednesday, 17 November: The electrodes were shut down at approximately 07:00 EST for pump maintenance. Several of the pump settings were adjusted to increase flow extracted from the wellfield. Downhole pump MPE-01 was raised and a section of the piping removed. This was done to minimize the addition of silt into the treatment system.

Saturday, 20 November: At approximately 21:43 EST, an alarm occurred at the first knock out tank causing the vapor treatment system to shut down. After evaluation of the process equipment, the system was restarted at approximately 23:00 EST.

System Maintenance

Approximately one half gallon total of unidentified material was removed from the "trough" and oil water separator on 19 November. At this point, it has not been determined that this unidentified material is NAPL and therefore not counted for in the summary table on page 2. Additionally, approximately 1 oz of product was removed from TPV-03.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

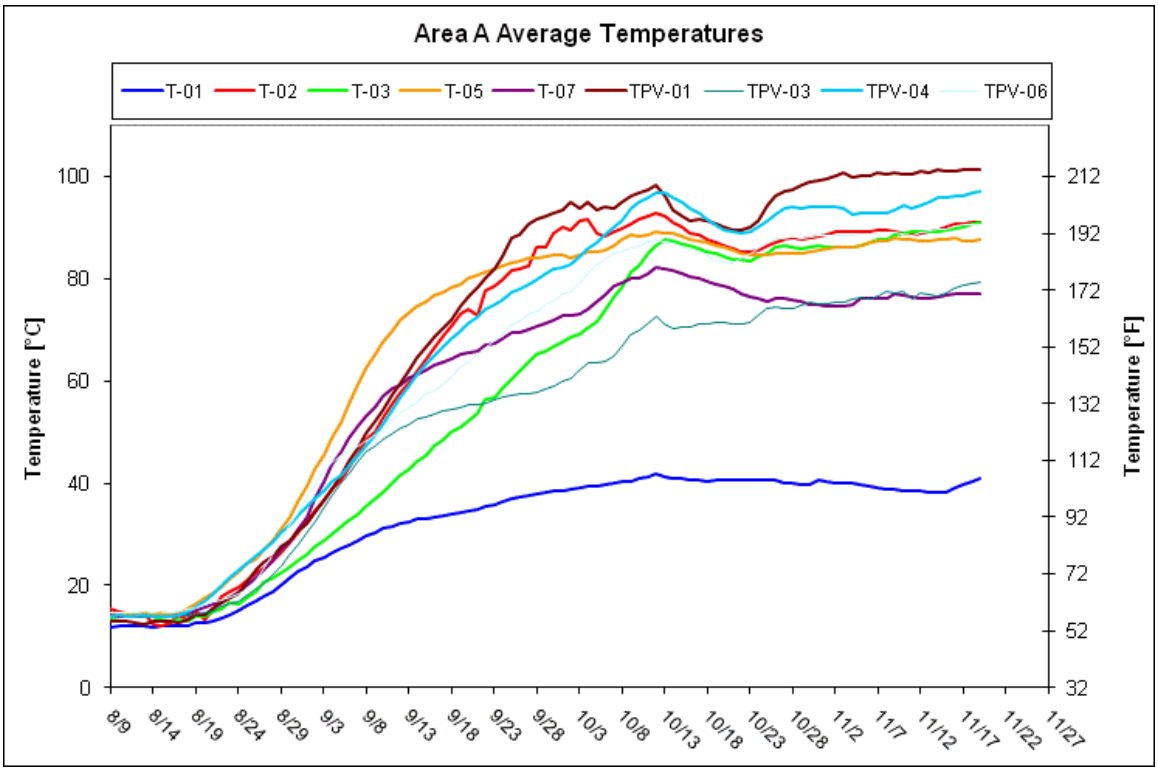


Figure 1. Average Temperature – Area A

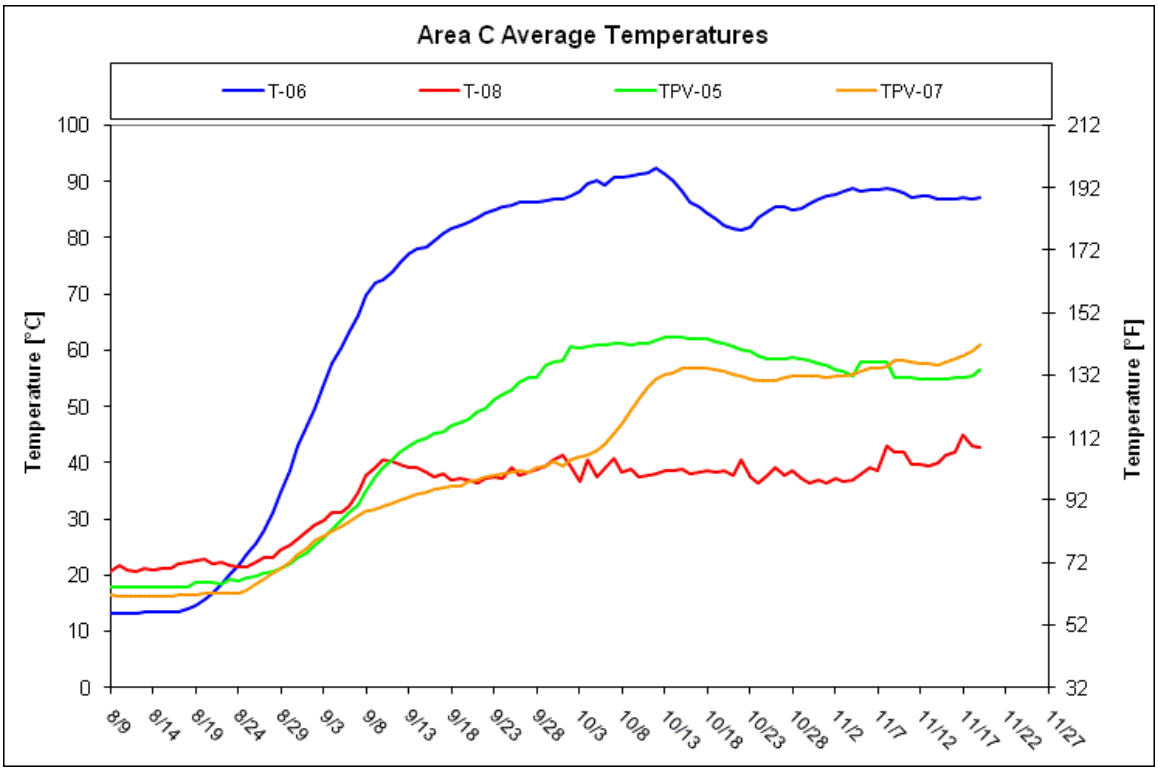


Figure 2. Average Temperature – Area C

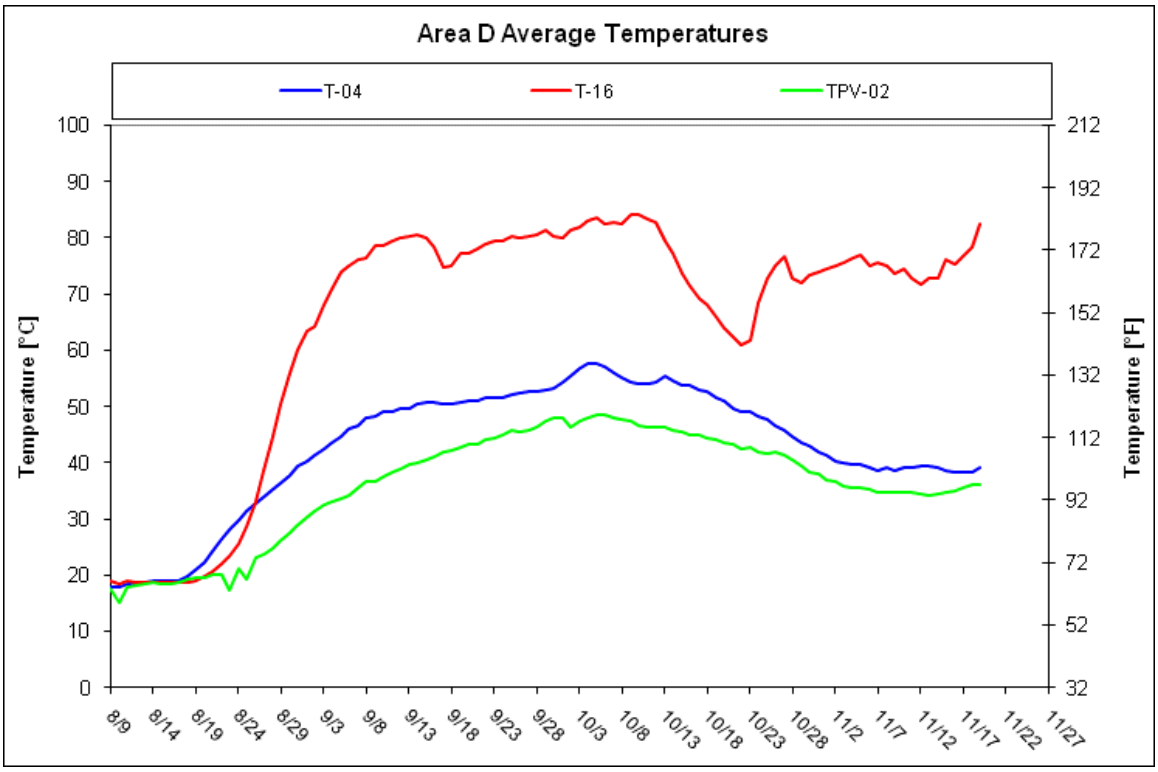


Figure 3. Average Temperature – Area D

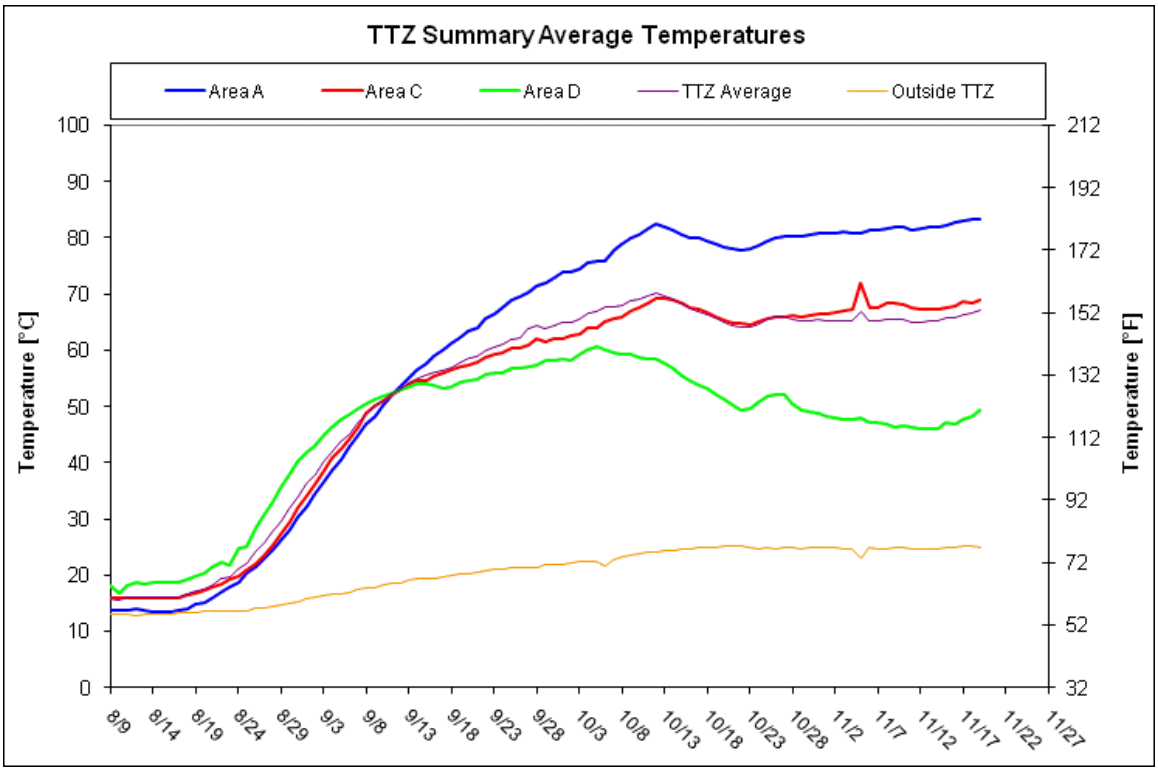


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

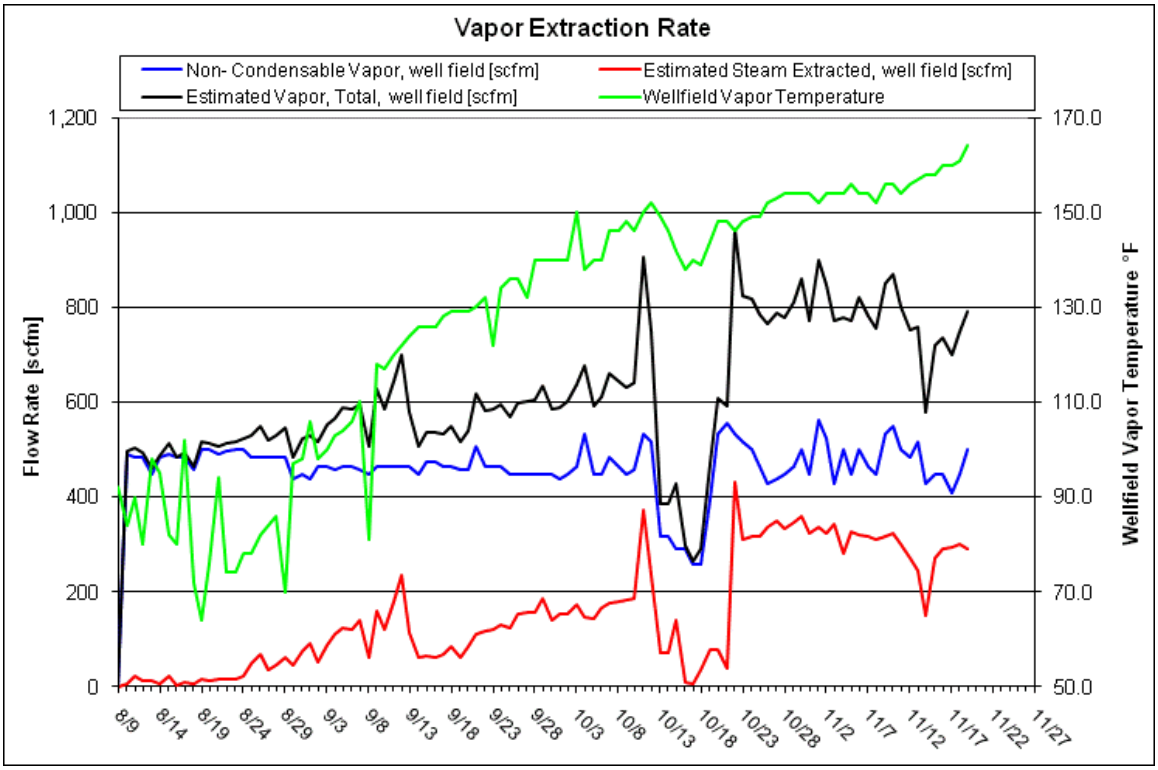


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

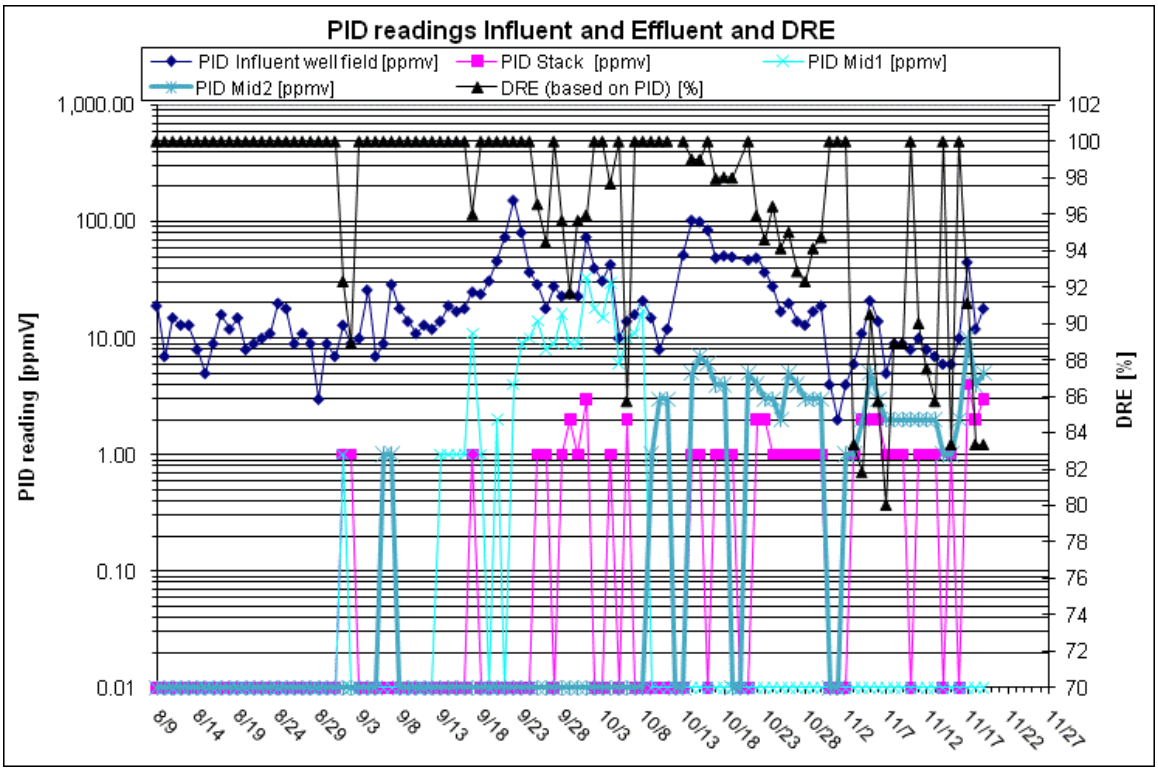


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

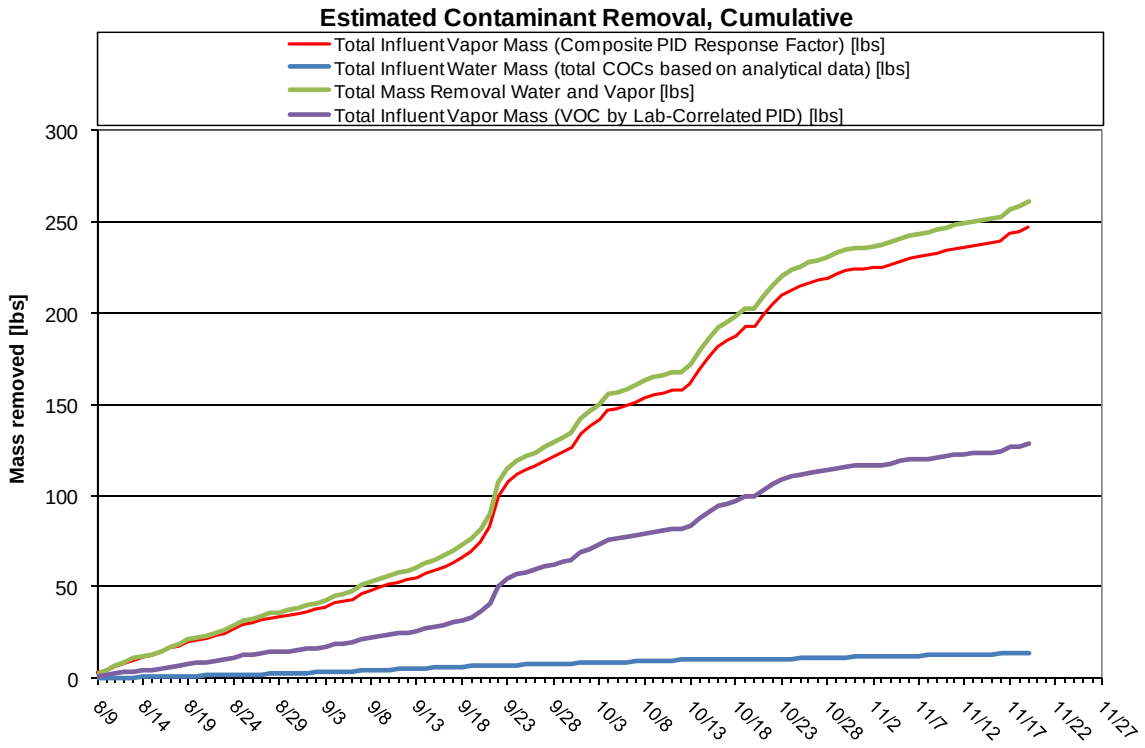


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 11/17/2010. The table below presents the concentrations in ppmV from the most recent and previous sampling events. A reading was not collected from sample location VEW-4.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/10	8/17/10	8/25/10	9/1/10	9/8/10	9/15/10	9/22/10	9/29/10	10/8/10	10/21/10	10/27/10	11/3/10	11/10/10	11/17/10
VEW 1	5.1	5	6.4	6	7.3	6.5	8.7	11						*6.1*
VEW 2	4.5	8	6.5	5	5.2	2.9	7.8	7.4	5.2	20.7	15.8	*8.1*	*6.8*	*5.3*
VEW 3	1.1	8	2.1	7	7.1	8.2	22	74	40.0					*34.0*
VEW 4	4.1	6	5.2	6	8.7	6.3	7.9	13						
VEW 5	7.9							75	52.5	70.3	65.1	*7.6*	*23.9*	*28.7*
VEW 6	2.9							32	12.1	21.2	18.2	*2.9*	*7.3*	*2.2*
VEW 7	3.5							16						*0.0*
VEW 8	10.8							11						*2.2*
VEW 9	14.2	0	4.5	22	73	66	81	151	28.9	137.1	55.8	*38.7*	*24.8*	*32.8*
VEW 10	2.3							5.8						*0.8*
VEW 11	5.4							6.4						*1.2*
VEW 12	4.6							13						*28.6*
VEW 13	3.1							29	47.4	94.0	25.7	*3.4*	*17.8*	*12.4*
VEW 14	1.3							93	47.0	36.1	23.3	*1.2*	*8.0*	*4.7*
VEW 15	6.2	10	6.8	26	42	60	107	268	164.3	265.8	164.3	*23.4*	*57.2*	*102.3*
VEW 16	4.0	6	5.9	5	8.1	3.4	12	15						*2.5*
VEW 17	15.9	16	8.4	101	164	75	129	185	105.8	146.9	70.7	*50.2*	*37.0*	*45.4*
VEW 18	10.3	8	5.8	51	95	36	22	13						*6.5*
VEW 19	1.6	5	4.8	6	28	7.4	11	17	34.4	50.7	16.9	*14.4*	*21.5*	*3.1*
VEW 20	4.5							42	60.7	50.6	20.2	*2.7*	*23.9*	*11.1*
VEW 21	11.1	5	3.8	42	93	89	139	177	108.2	68.7	41.1	*21.9*	*41.4*	*24.8*
VEW 22	8.4							20		25.0	11.6	*2.6*	*3.5*	*4.1*
VEW 23	0.6	7	7.3	15	58	7.1	6.2	19						*5.7*
VEW 24	4.6	5	5.4	15	43	64	57	176	47.3	24.8	14.3	*5.0*	*11.2*	*4.3*
VEW 25	1.9							8.5						*7.5*
VEW 26	7.1	5	4.4	5	4.2	6.9	9.6	18						*2.8*
VEW 27	8.1	7	4.5	2	5.6	4.2	8.5	5.3	9.8	13.3	8.9	*1.3*	*7.8*	*0.0*
VEW 28	10.7	6	3.3	6	5.3	3.8	11	9.9						*0.0*
VEW 29	10.3							29	26.2	24.9	6.5	5.3	6.7	0.0

7. Water Level

The figure below presents a water level contour map for the site.

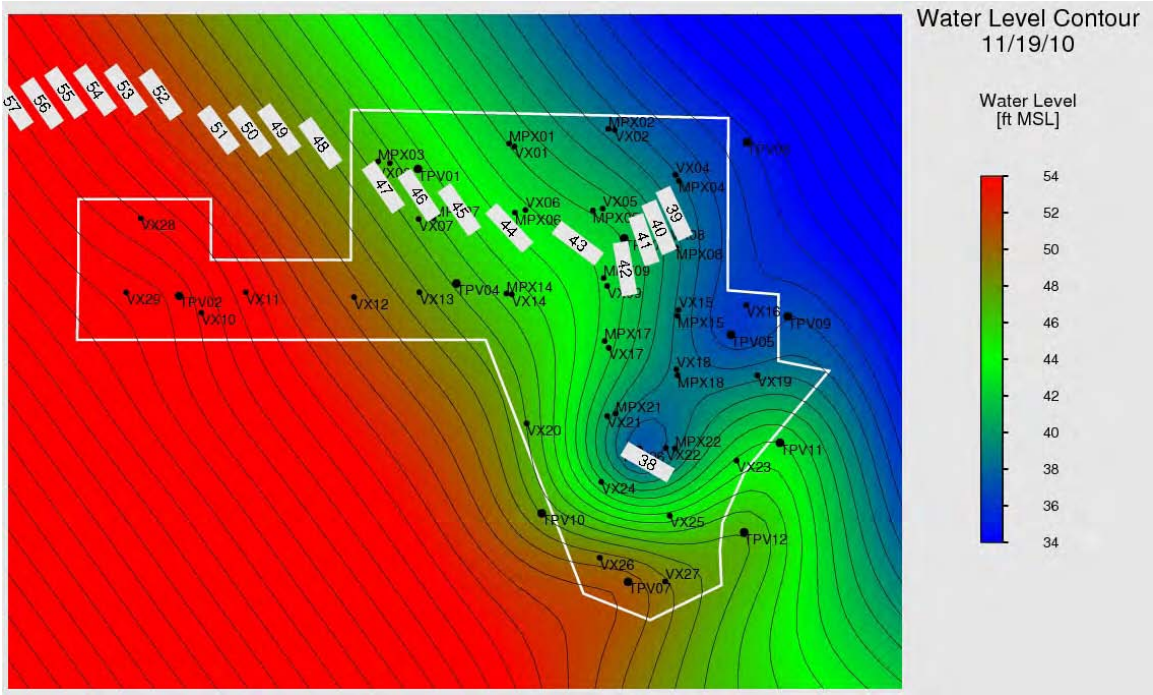


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

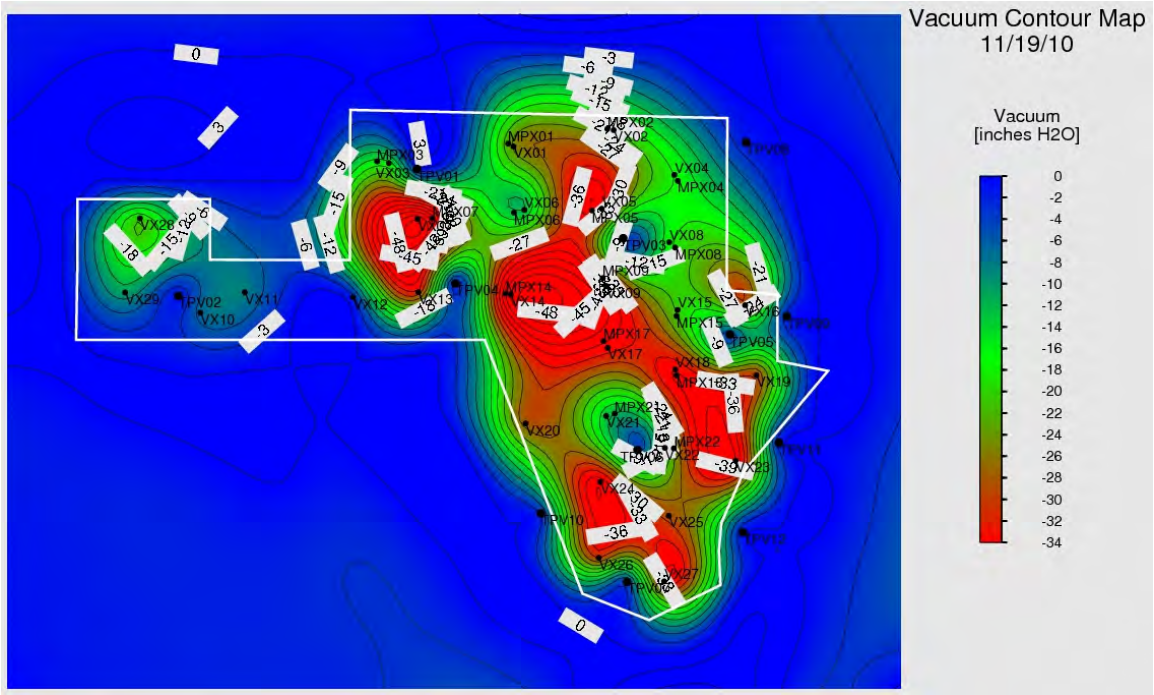


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,047,793 gallons of water since system startup while extracting a total of 1,284,081 gallons of water for a net water extraction of 236,288 gallons as of 11/19/10 (as seen in Figure 10 below).

The figure below also shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

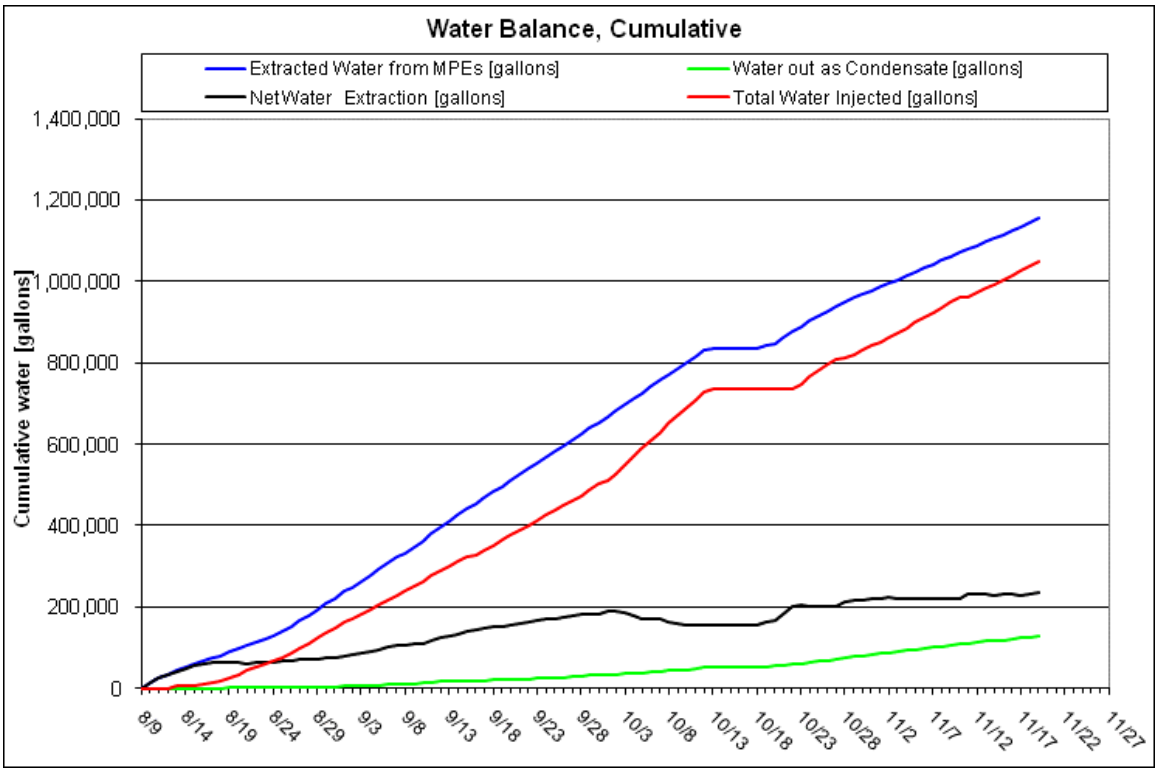


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

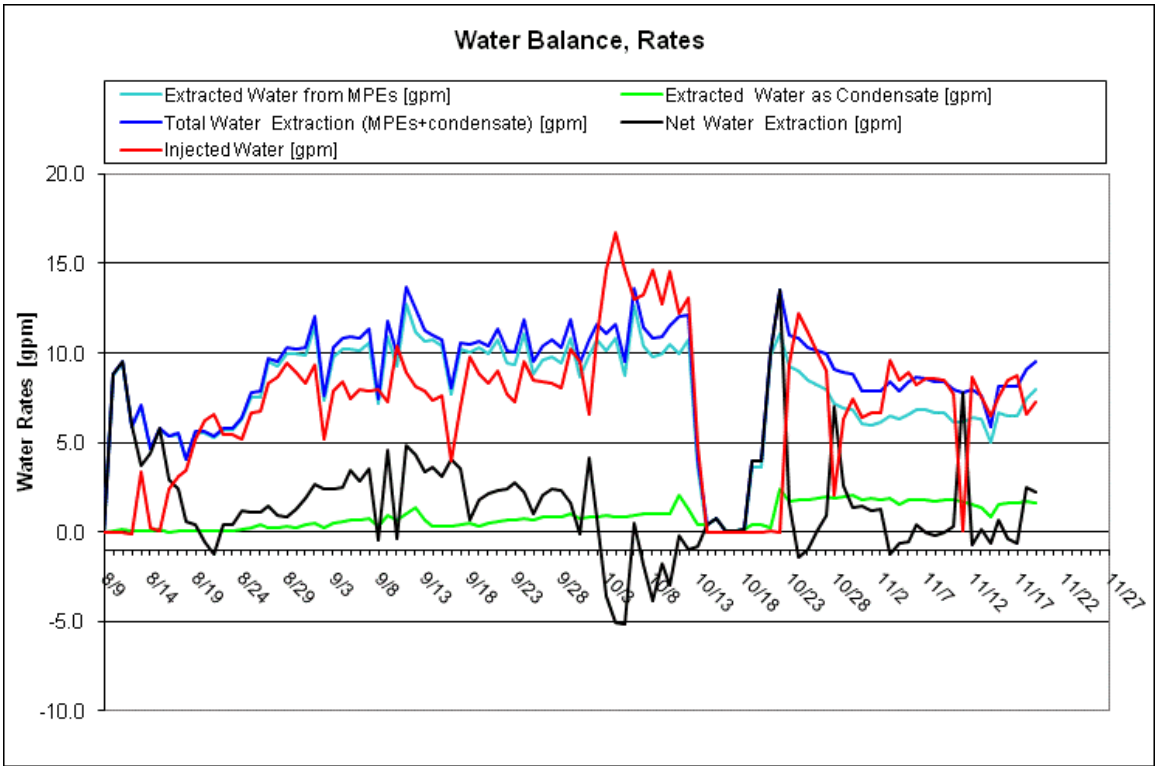


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

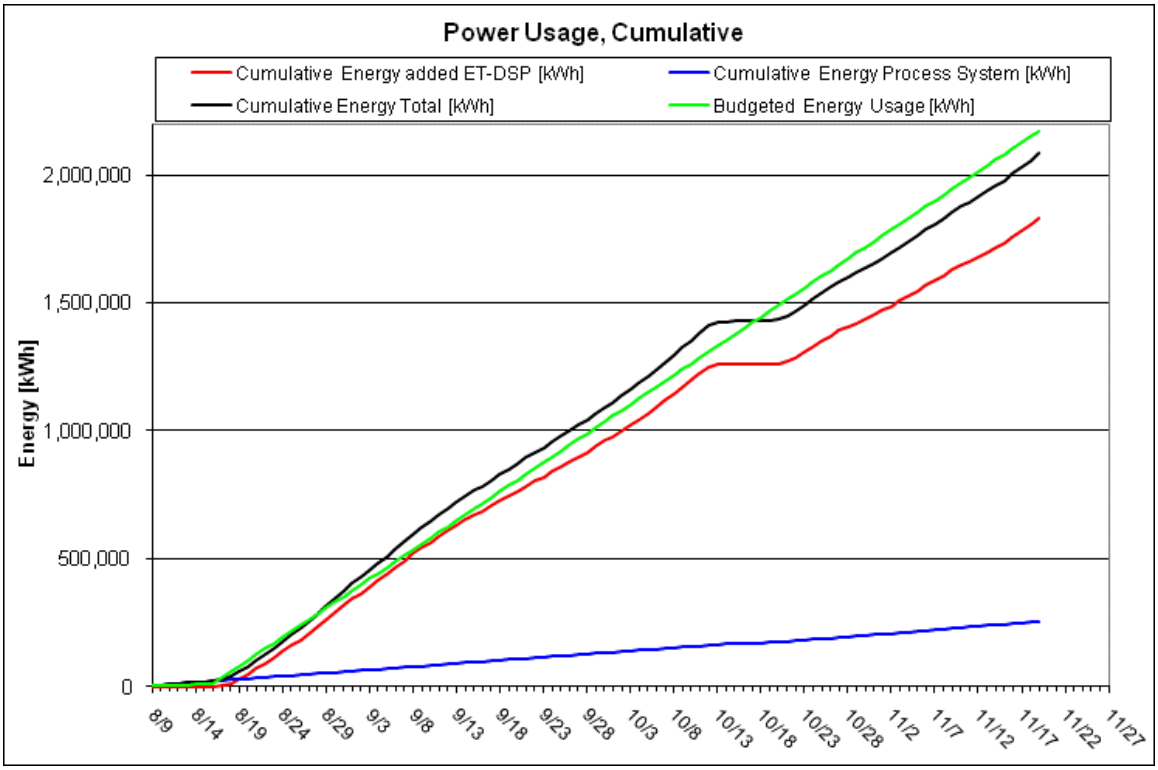


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Salt was injected into the treatment zone through targeted electrodes in order to increase the conductivity of the soil. The following injections were made during the November 13 through 19, 2010 operational period:

11/15/10 – 60 lbs
11/16/10 – 80 lbs
11/17/10 – 120 lbs
11/18/10 – 80 lbs
11/19/10 – 80 lbs
11/22/10 – 80 lbs

TerraTherm is currently working with NRG Services (recommended by the Massachusetts Department of Safety) to have the steam generator and associated piping inspected at the Groveland Wells site. We anticipate that final piping and inspection of the generator will take place next week, with steam/hot water injections to begin shortly thereafter.

Incidents:

No safety or environmental compliance incidents were reported for the November 13 through 19, 2010 operational period.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged approximately two days for each day of heating system downtime or approximately 14 days.

Progress Report

11/20/2010 through 11/26/2010
November 29, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from November 20 through November 26, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 11/26/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	101	days
Energy used to date	2,263,840	kWh
Injected energy per soil volume to date	120	kWh/cy
Water contaminant removal last 7 days	0.8	lbs
Water contaminant removal to date	14.6	lbs
Vapor contaminant removal last 7 days	14	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	275	lbs
Average temperature Area A last 7 days	183	°F
Average temperature Area C last 7 days	159	°F
Average temperature Area D last 7 days	127	°F
Average power usage rate last 7 days	1,062	kW
Average total water extracted rate last 7 days	9.0	gpm
Average injected water rate last 7 days	9.2	gpm
Average vapor extraction rate (non condensable) last 7 days	481	scfm

System Shutdowns

Tuesday, 23 November: The electrodes were shut down from approximately 1000 EST to 1600 EST for the bi-weekly groundwater sampling effort.

Wednesday, 24 November: At approximately 0645 EST, an alarm occurred at the first knock out tank causing the vapor treatment system to shut down. After evaluation of the process equipment, it is believed that the pump lost its prime. The system was restarted at 0715 EST.

At approximately 1523 EST, an alarm occurred at the first knock out tank causing the vapor treatment system to shut down. The system had restarted on its own approximately 10 minutes later. This alarm was believed to be due to a power surge as the treatment plant operator also received an alarm.

System Maintenance

Approximately one gallon total of unidentified material was removed from the “trough” and oil water separator on 23 and 26 November. At this point, it has not been determined that this unidentified material is NAPL and therefore not counted for in the summary table on page 2.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

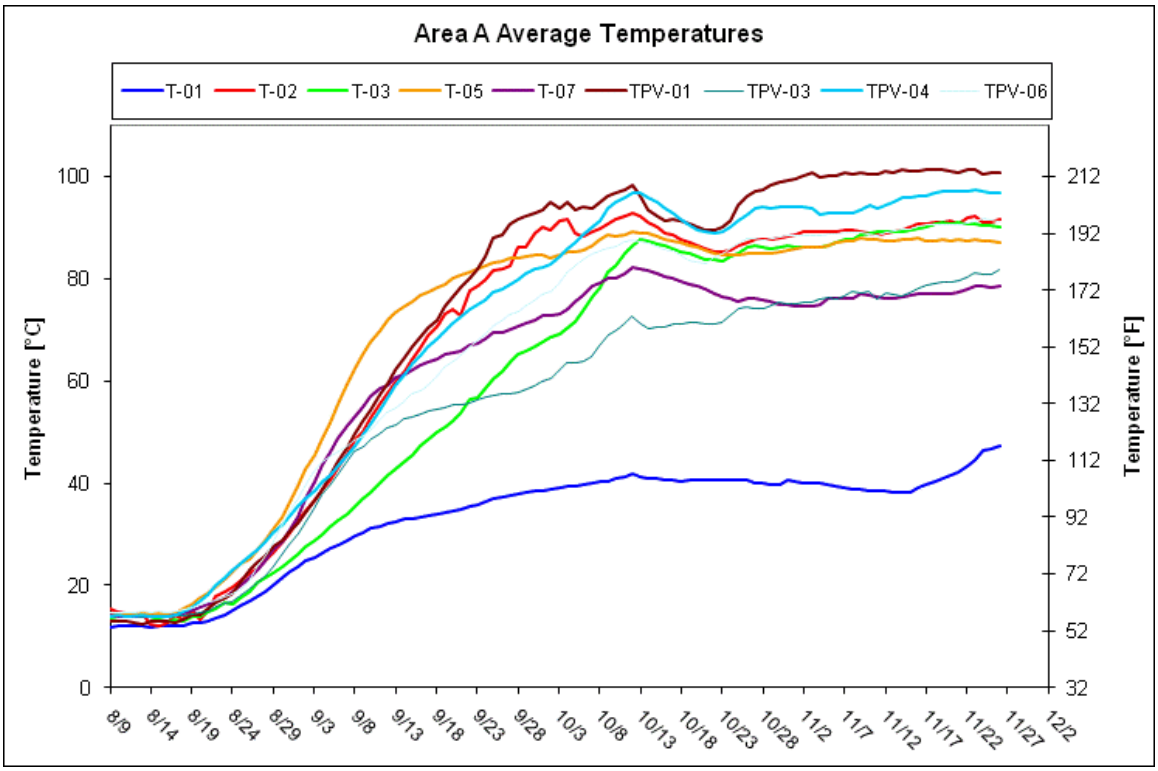


Figure 1. Average Temperature – Area A

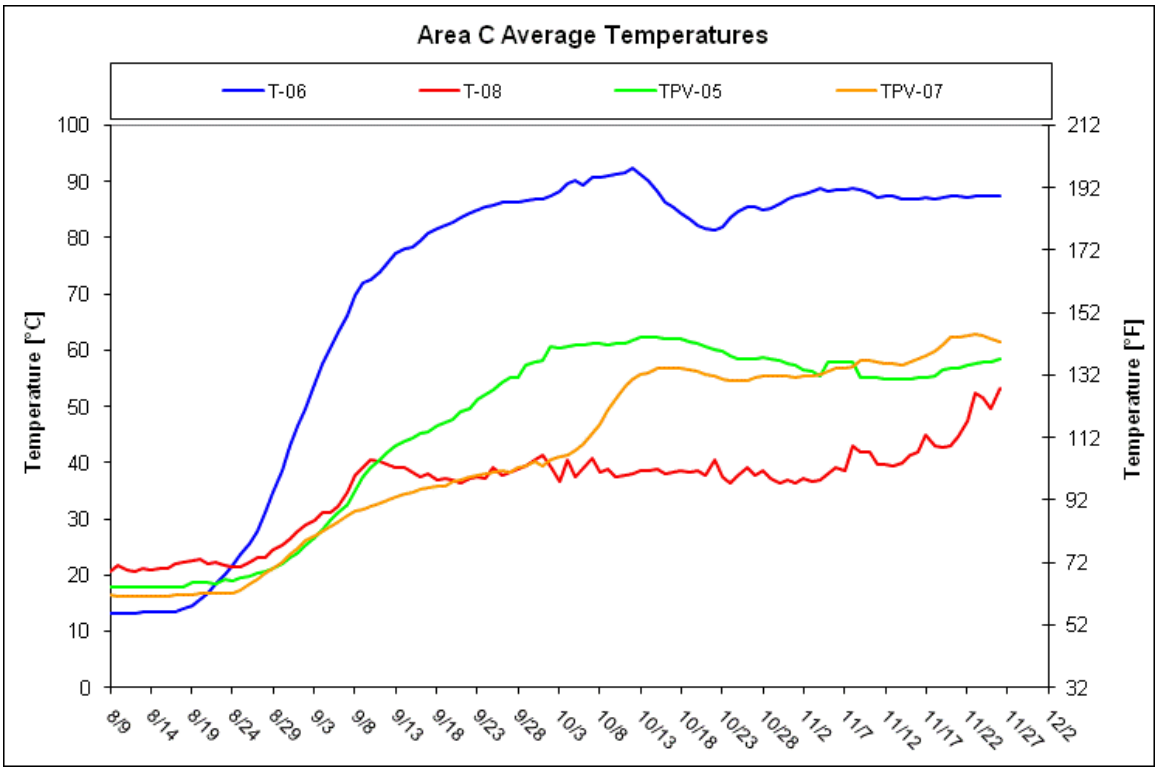


Figure 2. Average Temperature – Area C

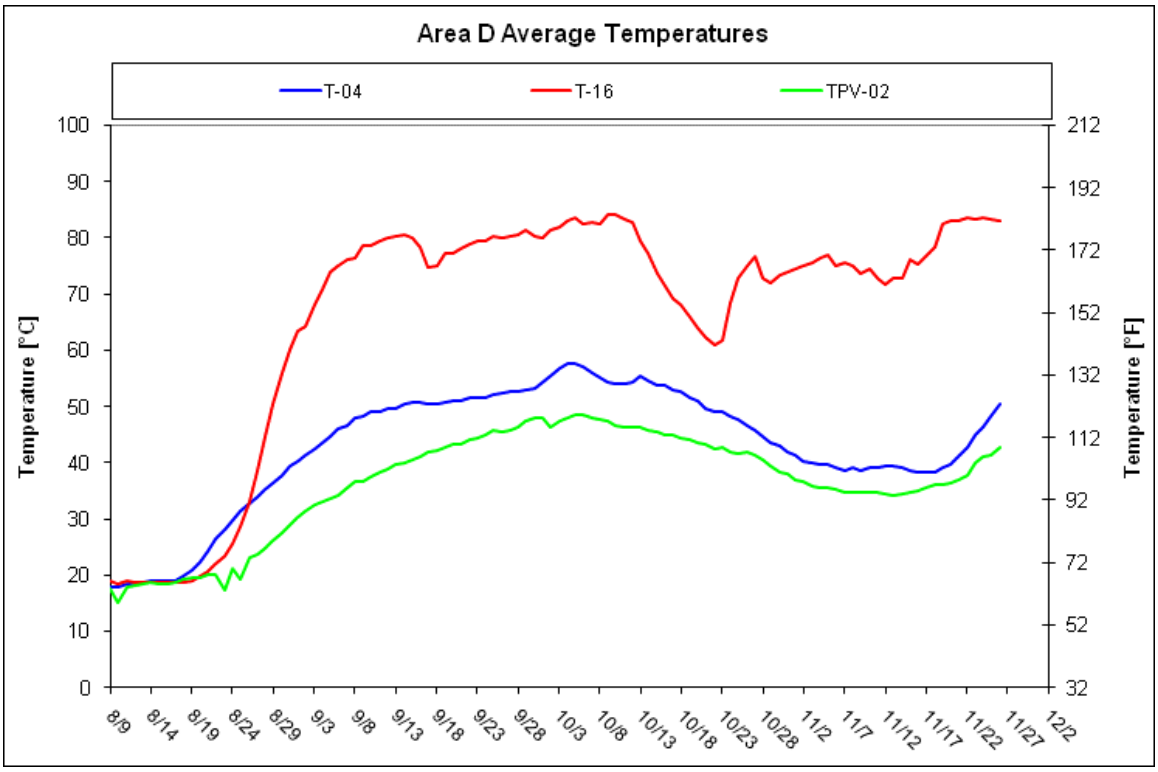


Figure 3. Average Temperature – Area D

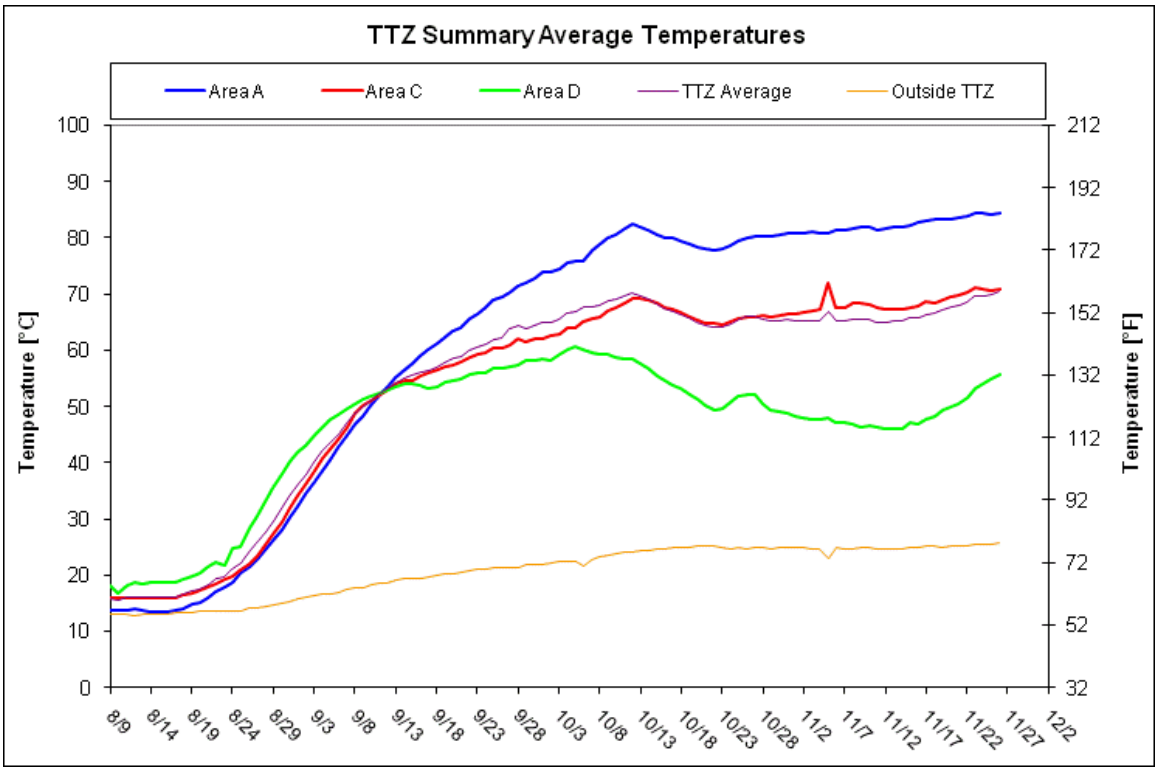


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

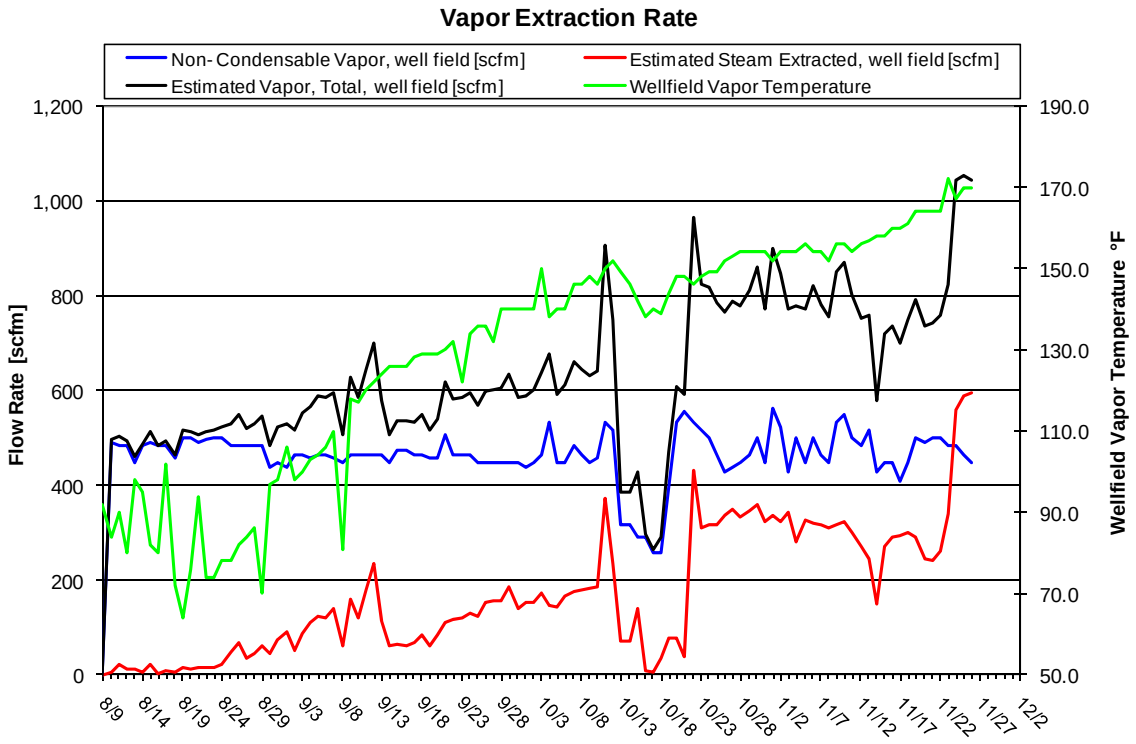


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

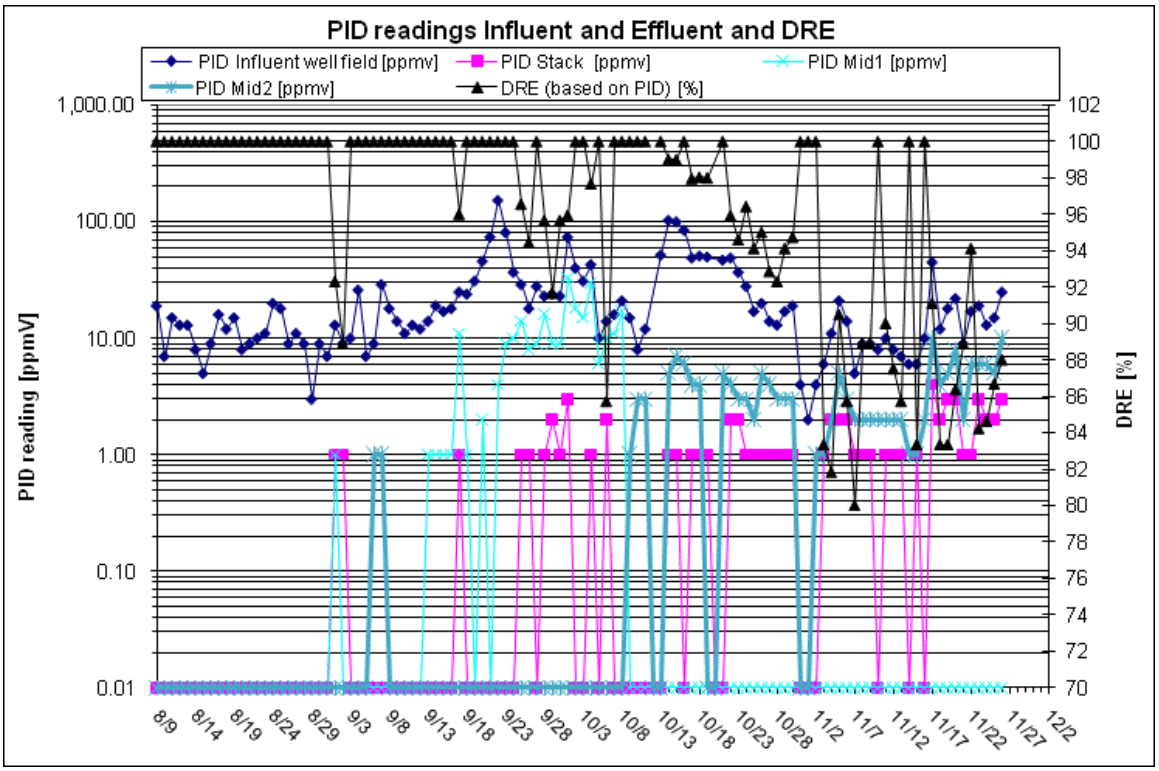


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

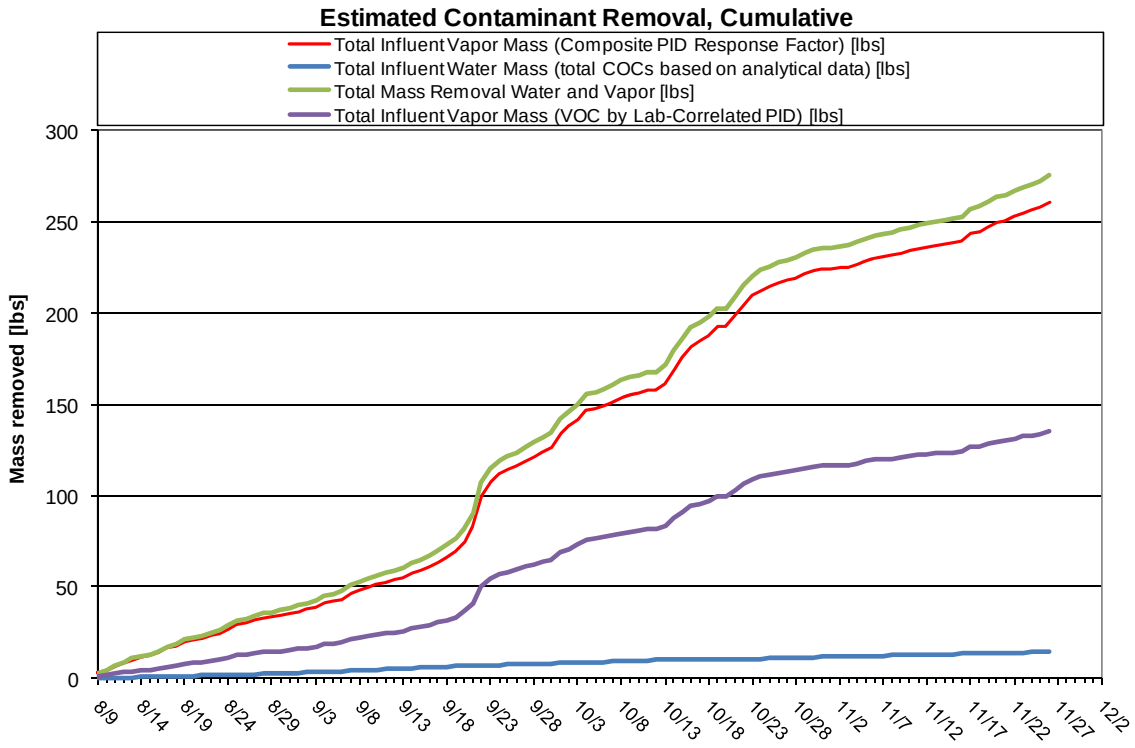


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 11/23/2010. The table below presents the concentrations in ppmV from the most recent and previous sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	8/9/10	8/17/10	8/25/10	9/1/10	9/8/10	9/15/10	9/22/10	9/29/10	10/8/10	10/21/10	10/27/10	11/3/10	11/10/10	11/17/10	11/23/10
VEW 1	5.1	5	6.4	6	7.3	6.5	8.7	11						*6.1*	*25.0*
VEW 2	4.5	8	6.5	5	5.2	2.9	7.8	7.4	5.2	21	16	*8.1*	*6.8*	*5.3*	*12.8*
VEW 3	1.1	8	2.1	7	7.1	8.2	22	74	40					*34*	*9.7*
VEW 4	4.1	6	5.2	6	8.7	6.3	7.9	13						*NR*	*51.0*
VEW 5	7.9							75	53	70	65	*7.6*	*24*	*29*	*77.4*
VEW 6	2.9							32	12	21	18	*2.9*	*7.3*	*2.2*	
VEW 7	3.5							16						*0.0*	*19.7*
VEW 8	10.8							11						*2.2*	
VEW 9	14.2	0	4.5	22	73	66	81	151	29	137	56	*39*	*25*	*33*	*105.3*
VEW 10	2.3							5.8						*0.8*	
VEW 11	5.4							6.4						*1.2*	
VEW 12	4.6							13						*29*	*13.2*
VEW 13	3.1							29	47	94	26	*3.4*	*18*	*12*	*29.6*
VEW 14	1.3							93	47	36	23	*1.2*	*8.0*	*4.7*	
VEW 15	6.2	10	6.8	26	42	60	107	268	164	266	164	*23*	*57*	*102*	*127.5*
VEW 16	4.0	6	5.9	5	8.1	3.4	12	15						*2.5*	
VEW 17	15.9	16	8.4	101	164	75	129	185	106	147	71	*50*	*37*	*45*	*70.8*
VEW 18	10.3	8	5.8	51	95	36	22	13						*6.5*	*13.0*
VEW 19	1.6	5	4.8	6	28	7.4	11	17	34	51	17	*14*	*22*	*3.1*	
VEW 20	4.5							42	61	51	20	*2.7*	*24*	*11*	*47.0*
VEW 21	11.1	5	3.8	42	93	89	139	177	108	69	41	*22*	*41*	*25*	*59.7*
VEW 22	8.4							20		25	12	*2.6*	*3.5*	*4.1*	
VEW 23	0.6	7	7.3	15	58	7.1	6.2	19						*5.7*	*86.7*
VEW 24	4.6	5	5.4	15	43	64	57	176	47	25	14	*5.0*	*11*	*4.3*	
VEW 25	1.9							8.5						*7.5*	*36.2*
VEW 26	7.1	5	4.4	5	4.2	6.9	9.6	18						*2.8*	
VEW 27	8.1	7	4.5	2	5.6	4.2	8.5	5.3	9.8	13	8.9	*1.3*	*7.8*	*0.0*	*2.8*
VEW 28	10.7	6	3.3	6	5.3	3.8	11	9.9						*0.0*	*5.3*
VEW 29	10.3							29	26	25	6.5	5.3	6.7	0.0	12.2

NR = not recorded

7. Water Level

The figure below presents a water level contour map for the site.

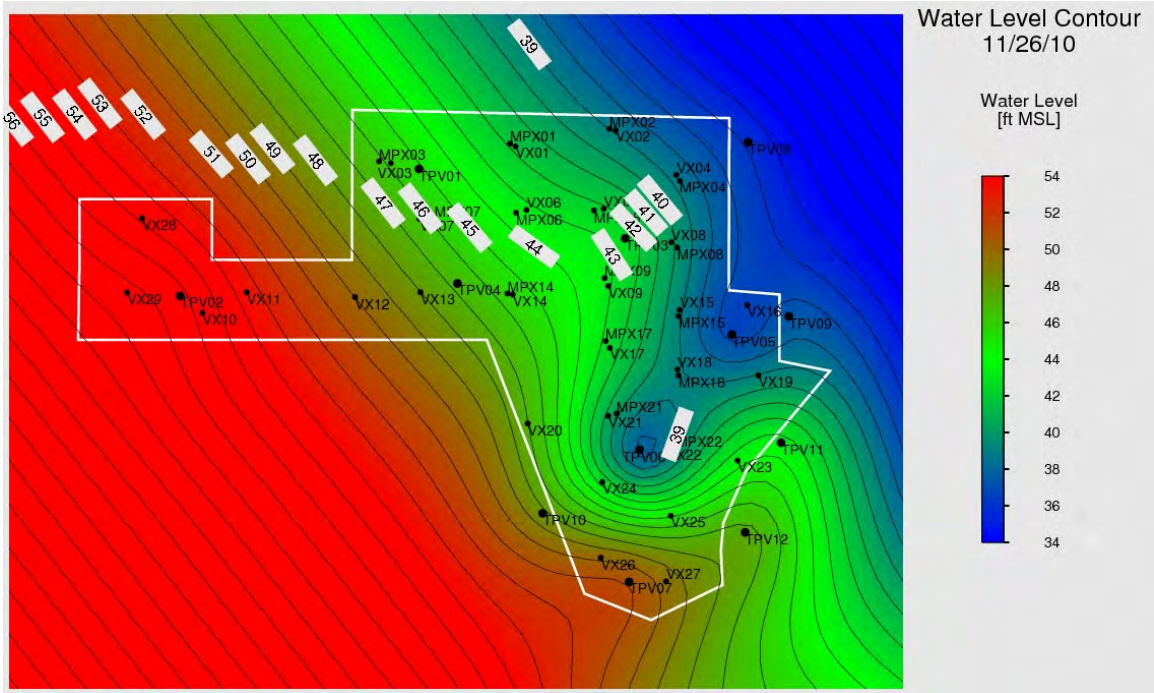


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

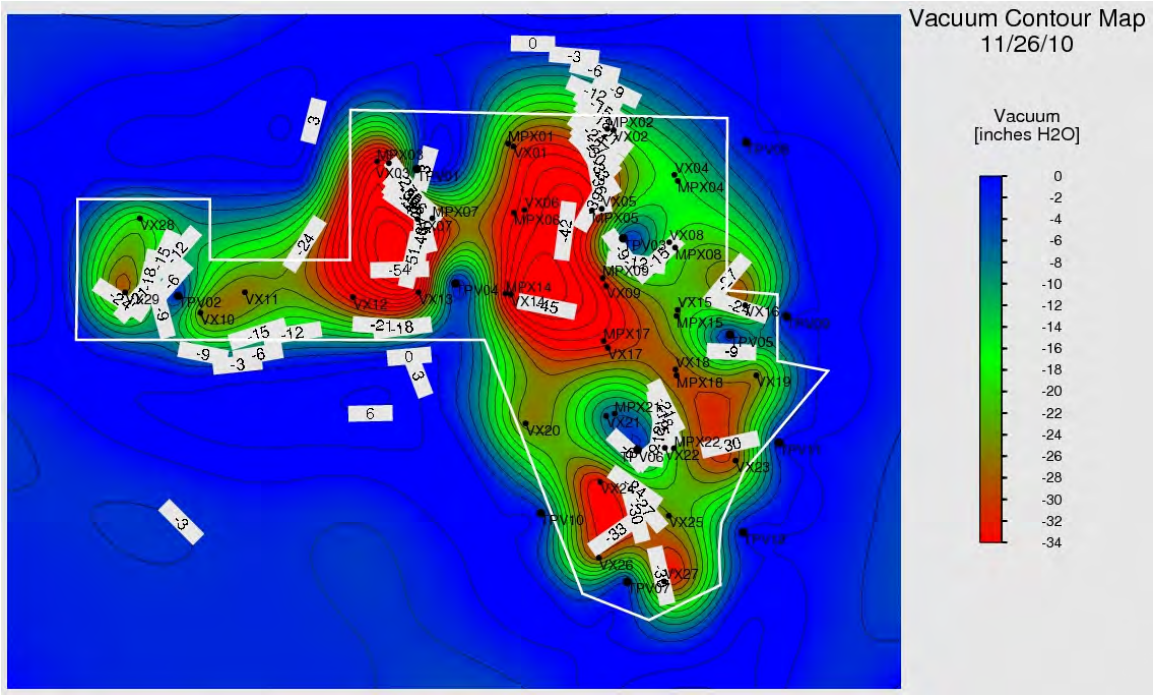


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,140,173 gallons of water since system startup while extracting a total of 1,374,670 gallons of water for a net water extraction of 234,497 gallons as of 11/26/10 (as seen in Figure 10 below).

The figure below also shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

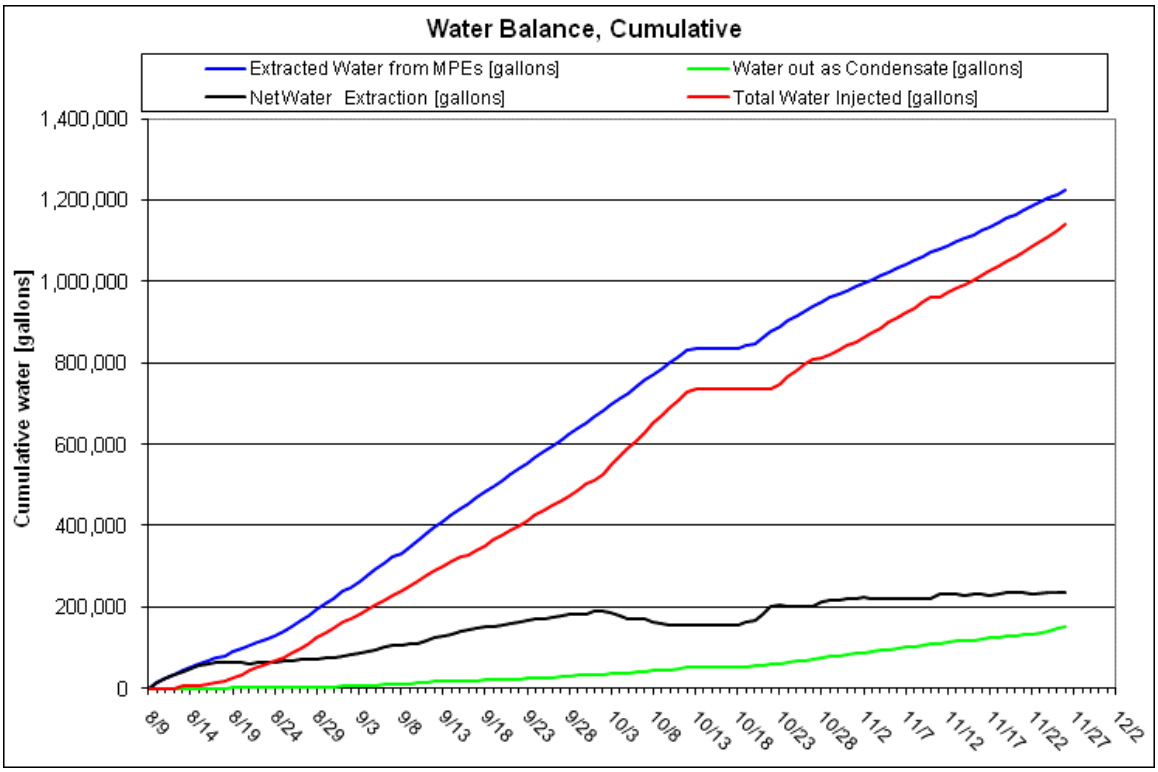


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

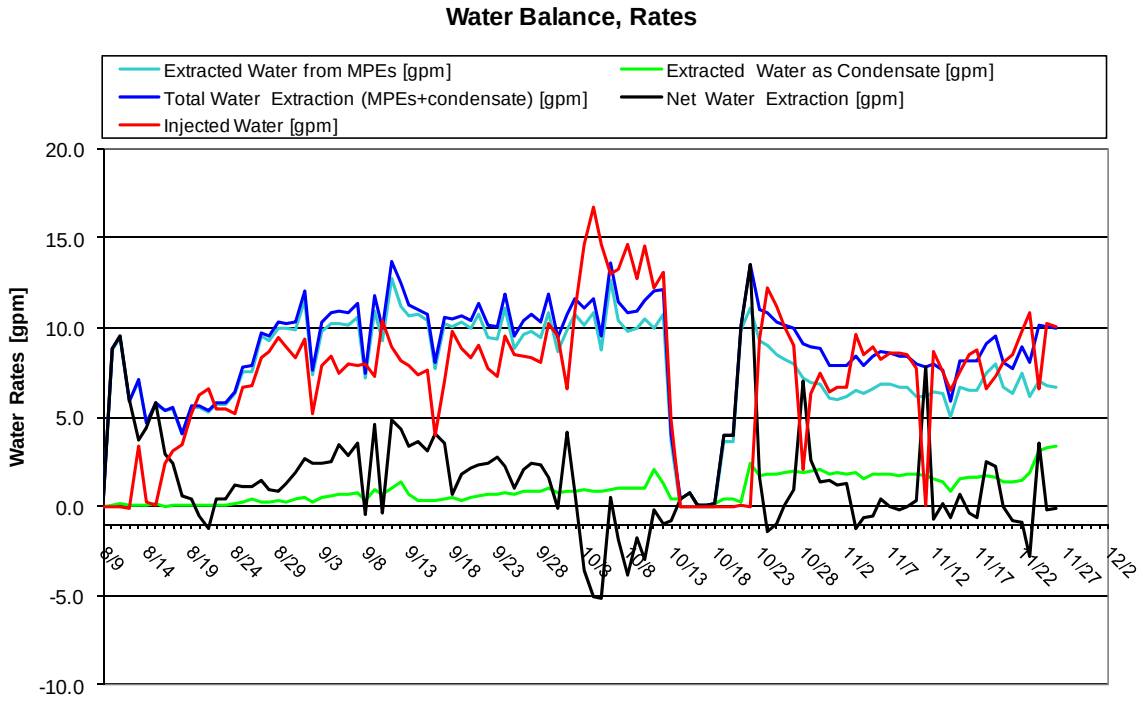


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

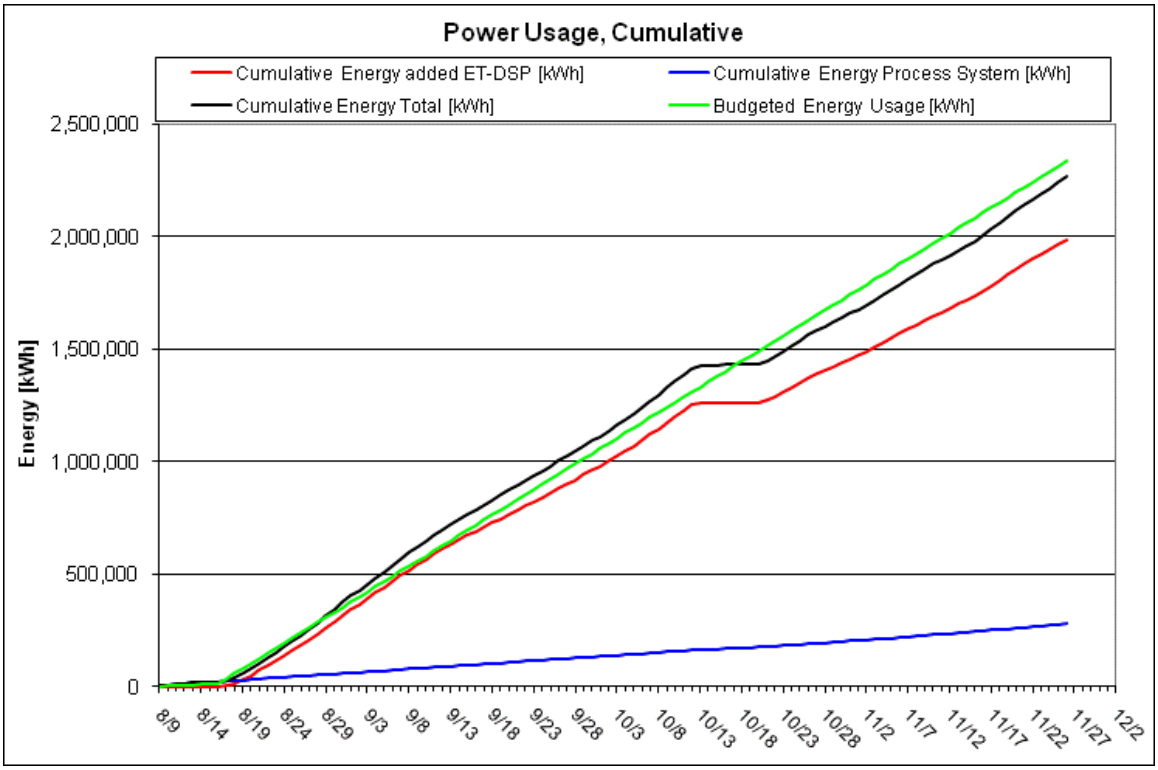


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Salt was injected into the treatment zone through targeted electrodes in order to increase the conductivity of the soil. The following injections were made during the November 20 through 26, 2010 operational period:

11/26/10 – 100 lbs

TerraTherm is currently working with NRG Services (recommended by the Massachusetts Department of Safety) to have the steam generator and associated piping inspected at the Groveland Wells site. We anticipate that final piping and inspection of the generator will take place this week, steam spear installation will begin on Friday, December 3rd, with steam/hot water injections to begin next week.

Incidents:

No safety or environmental compliance incidents were reported for the November 20 through 26, 2010 operational period.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged.

Progress Report

11/27/2010 through 12/3/2010
December 6, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from November 27 through December 3, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 12/3/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	108	days
Energy used to date	2,430,560	kWh
Injected energy per soil volume to date	129	kWh/cy
Water contaminant removal last 7 days	1.0	lbs
Water contaminant removal to date	15.4	lbs
Vapor contaminant removal last 7 days	13	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	294	lbs
Average temperature Area A last 7 days	185	°F
Average temperature Area C last 7 days	141	°F
Average temperature Area D last 7 days	134	°F
Average power usage rate last 7 days	992	kW
Average total water extracted rate last 7 days	10.0	gpm
Average injected water rate last 7 days	8.4	gpm
Average vapor extraction rate (non condensable) last 7 days	426	scfm

System Shutdowns

Saturday, 27 November: Upon arrival to the site, the vapor system was down. No alarm was sent to the TerraTherm operators. TerraTherm is currently evaluating the PLC system. After evaluation of the process equipment, it is believed that the pump lost its prime. The system was restarted at approximately 0715 EST.

Sunday, 28 November: Upon arrival at the site, the vapor system was down. It is believed that the pump lost its prime. The pump has been taken offline and a new alternate pump connected.

Friday, 3 December: The electrodes were shut down at approximately 0700 EST for the drilling effort (installation of 14 steam spears). The electrodes were turned back on at approximately 1530 EST.

System Maintenance

Wednesday, 1 December: TerraTherm electrician on site to connect heat trace to main electrical panel.

Approximately four gallons total of unidentified material was removed from the “trough” and oil water separator on 29 and 30 November and 2 December. At this point, it has not been determined that this unidentified material is NAPL and therefore not counted for in the summary table on page 2.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

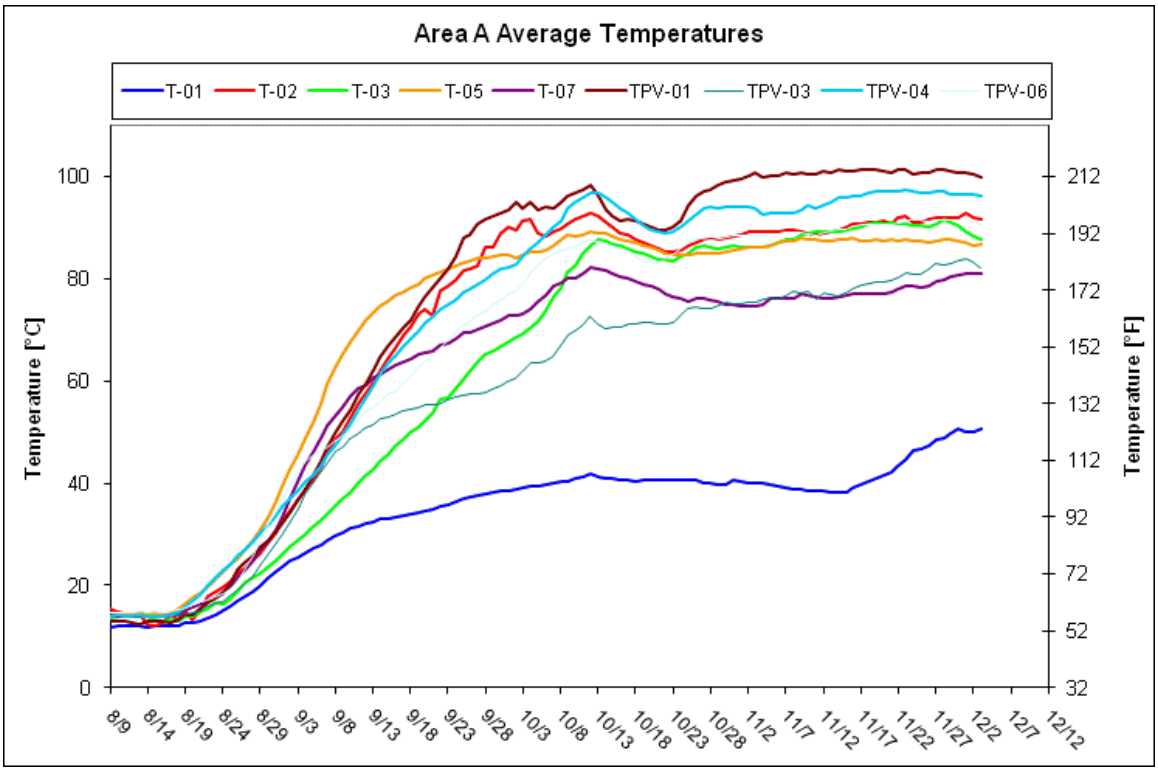


Figure 1. Average Temperature – Area A

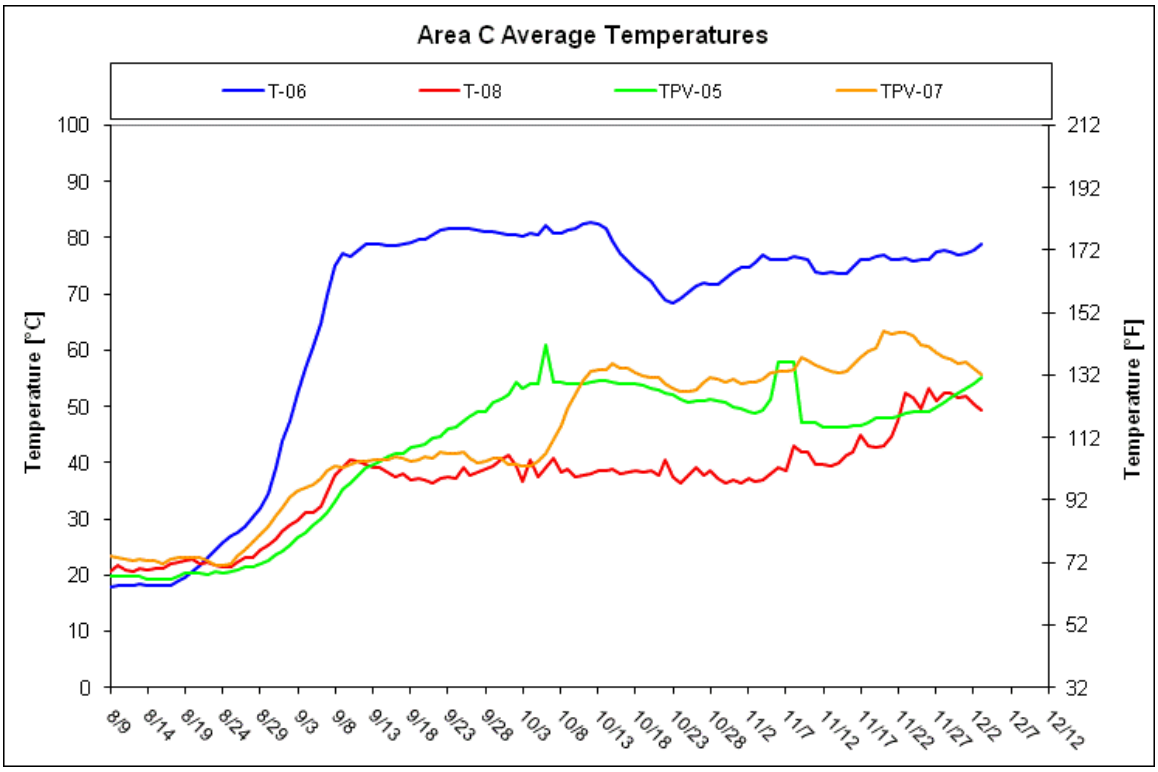


Figure 2. Average Temperature – Area C

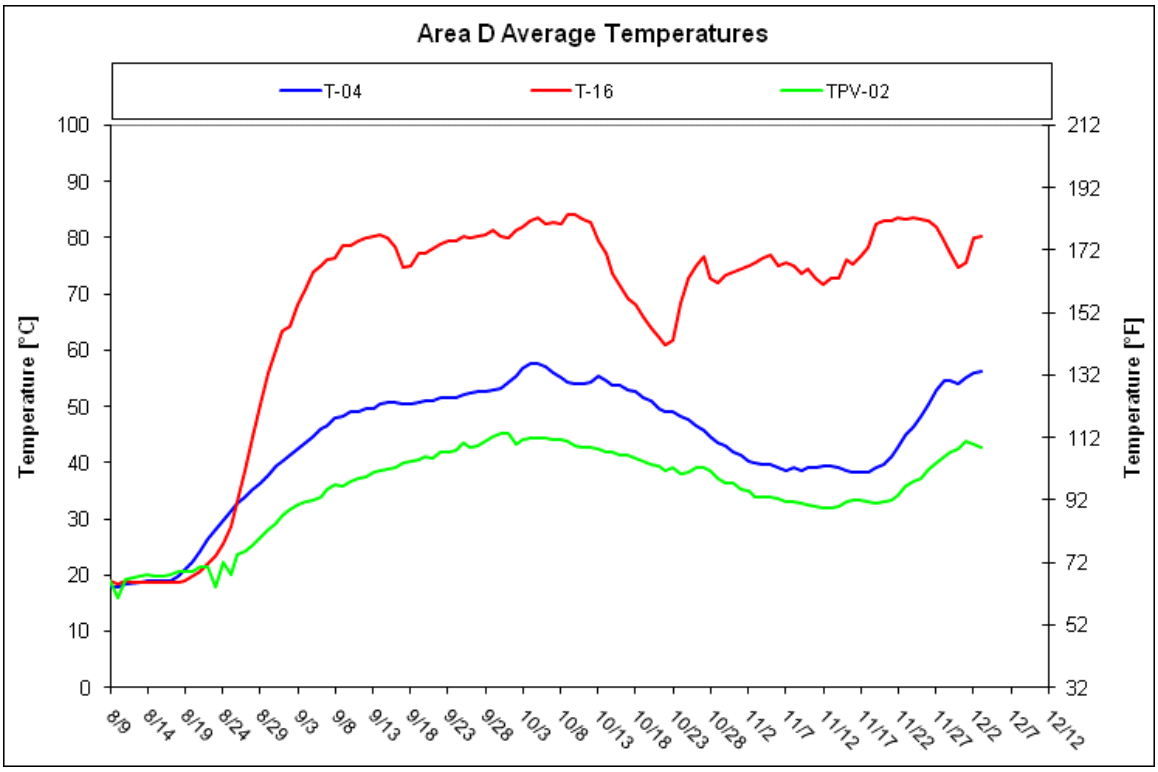


Figure 3. Average Temperature – Area D

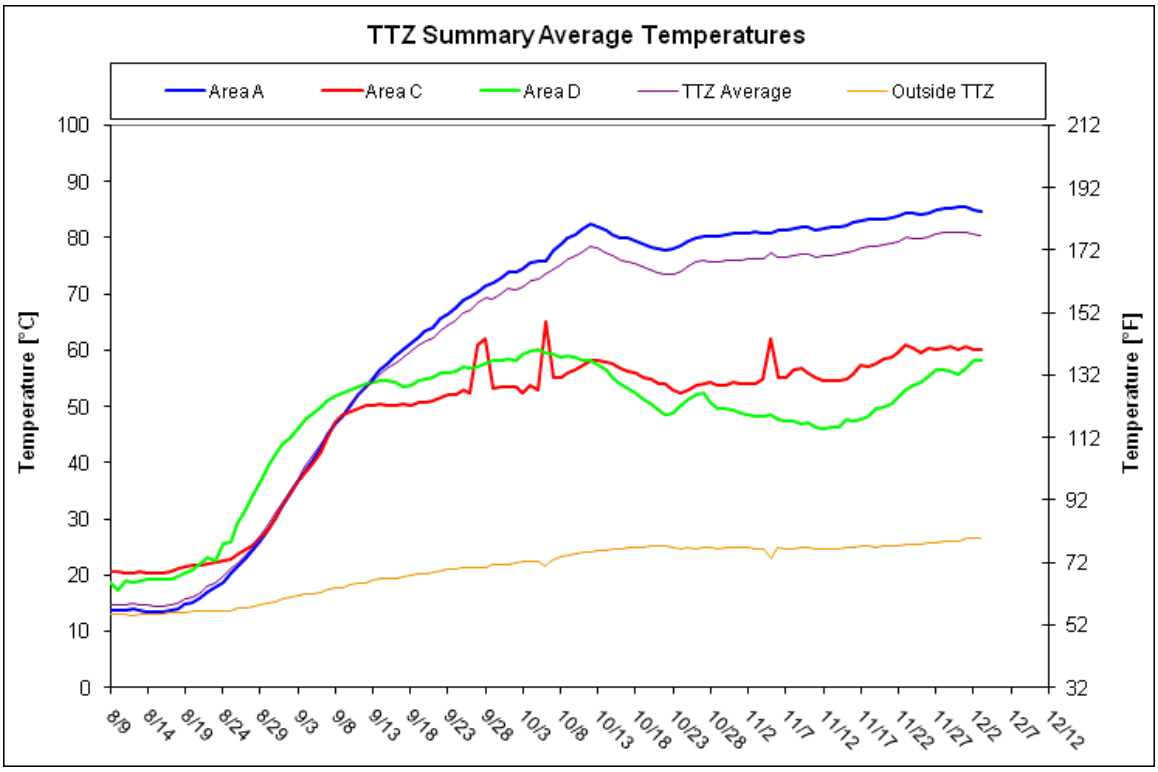


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

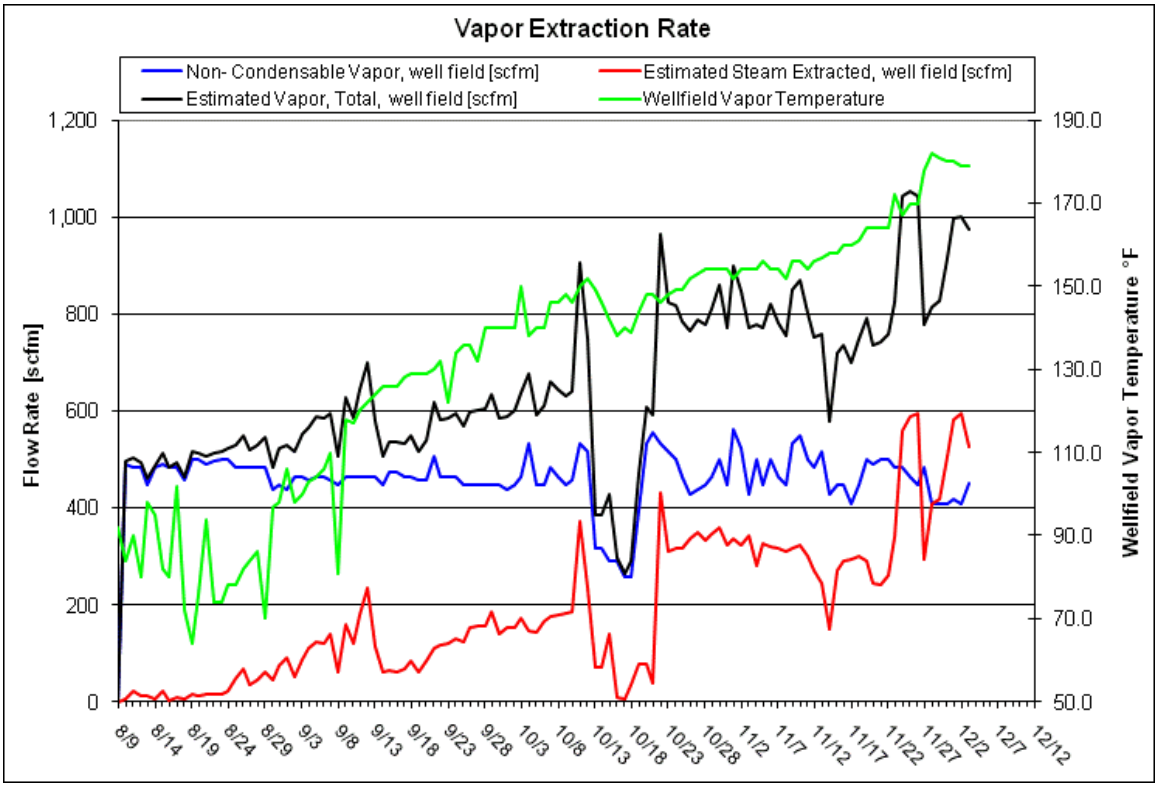


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

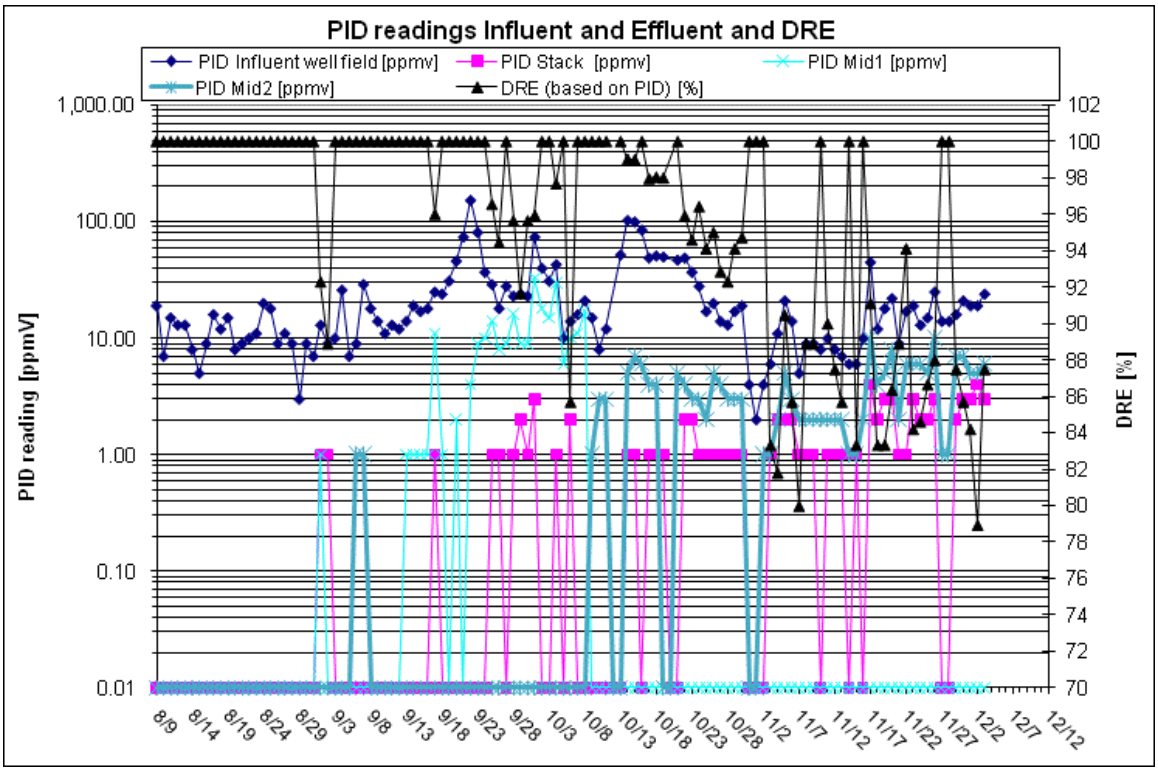


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

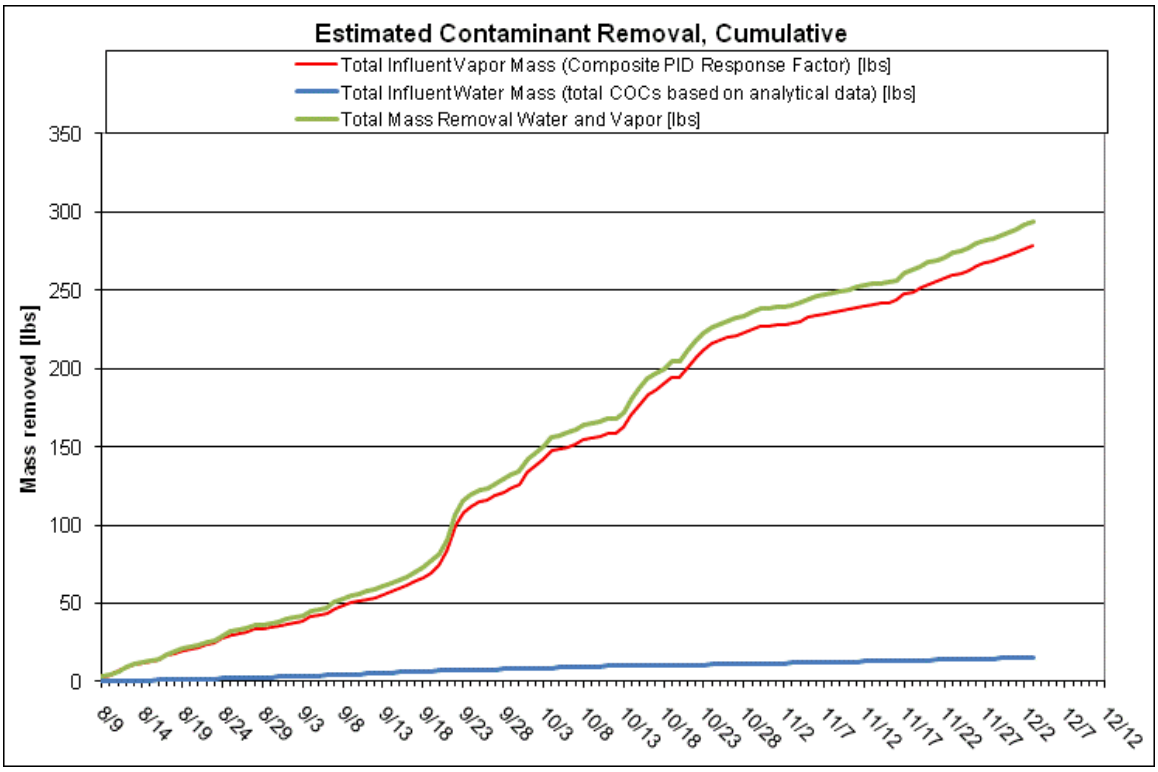


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 12/1-2/2010. The table below presents the concentrations in ppmV from the 9/29/10 sampling event through the most recent sampling event.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	9/29/10	10/8/10	10/21/10	10/27/10	11/3/10	11/10/10	11/17/10	11/23/10	12/1-2/2010
VEW 1	11						6.1	25	7.3
VEW 2	7.4	5.2	21	16	8.1	6.8	5.3	13	10.1
VEW 3	74	40					34	9.7	9.9
VEW 4	13						NR	51	17.0
VEW 5	75	53	70	65	7.6	24	29	77	35.2
VEW 6	32	12	21	18	2.9	7.3	2.2		
VEW 7	16						0.0	20	2.4
VEW 8	11						2.2		
VEW 9	151	29	137	56	39	25	33	105	25.0
VEW 10	5.8						0.8		
VEW 11	6.4						1.2		
VEW 12	13						29	13	10.3
VEW 13	29	47	94	26	3.4	18	12	30	19.5
VEW 14	93	47	36	23	1.2	8.0	4.7		
VEW 15	268	164	266	164	23	57	102	128	69.3
VEW 16	15						2.5		
VEW 17	185	106	147	71	50	37	45	71	36.9
VEW 18	13						6.5	13	13.3
VEW 19	17	34	51	17	14	22	3.1		
VEW 20	42	61	51	20	2.7	24	11	47	15.2
VEW 21	177	108	69	41	22	41	25	60	31.4
VEW 22	20		25	12	2.6	3.5	4.1		
VEW 23	19						5.7	87	48.3
VEW 24	176	47	25	14	5.0	11	4.3		
VEW 25	8.5						7.5	36	11.9
VEW 26	18						2.8		
VEW 27	5.3	9.8	13	8.9	1.3	7.8	0.0	2.8	5.6
VEW 28	9.9						0.0	5.3	0.8
VEW 29	29	26	25	6.5	5.3	6.7	0.0	12	15.3

NR = not recorded

7. Water Level

The figure below presents a water level contour map for the site.

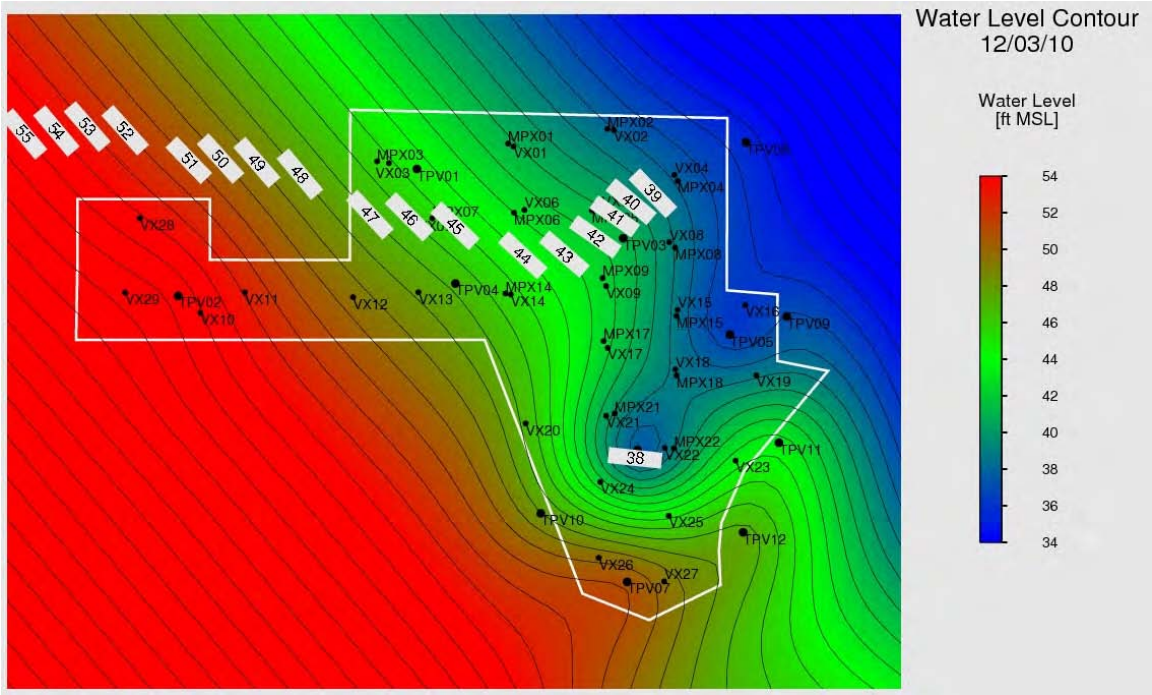


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

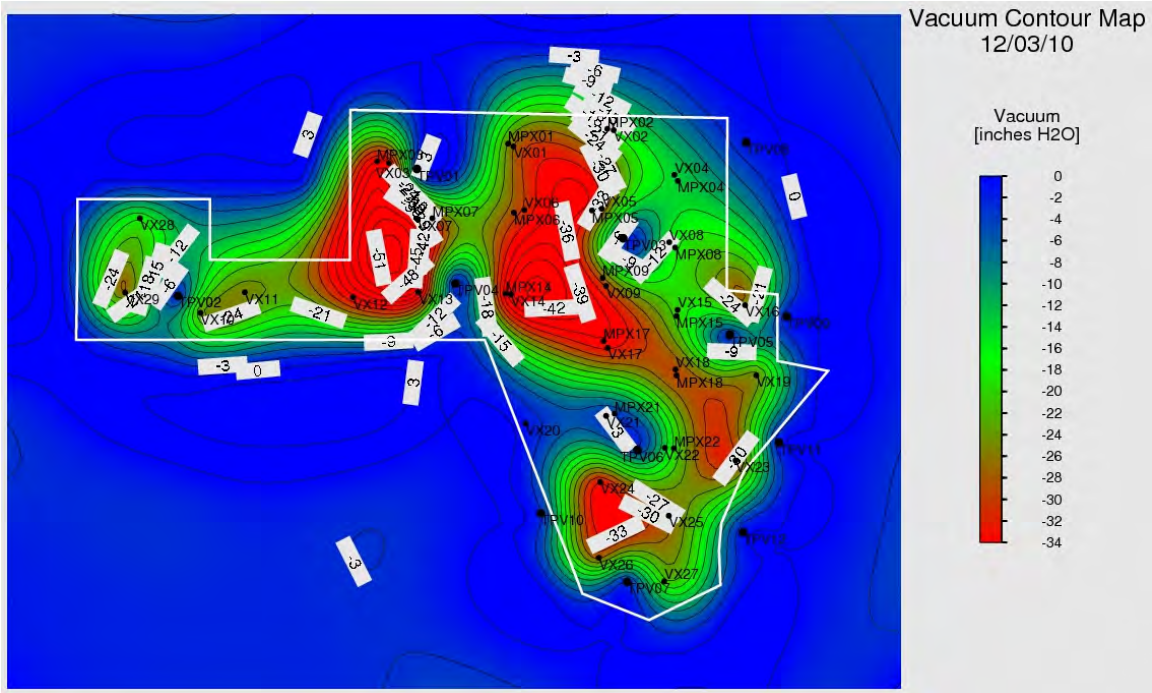


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,224,563 gallons of water since system startup while extracting a total of 1,475,631 gallons of water for a net water extraction of 251,068 gallons as of 12/3/10 (as seen in Figure 10 below).

The figure below also shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

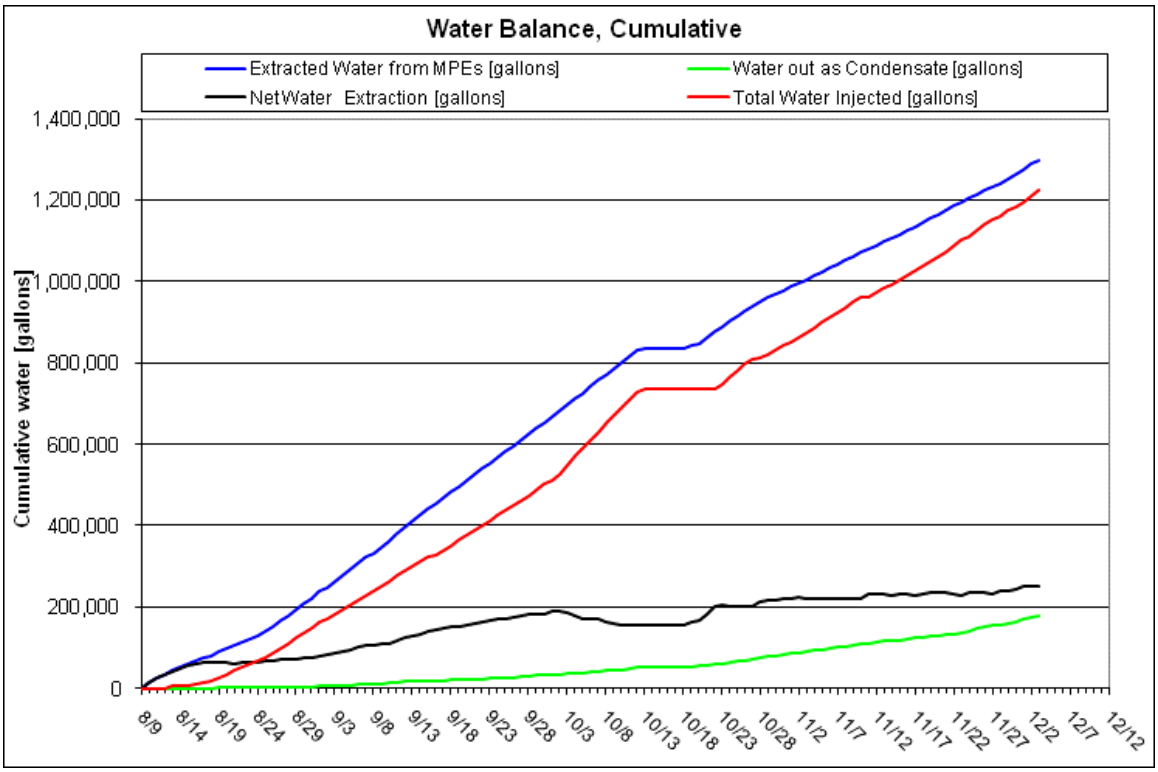


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

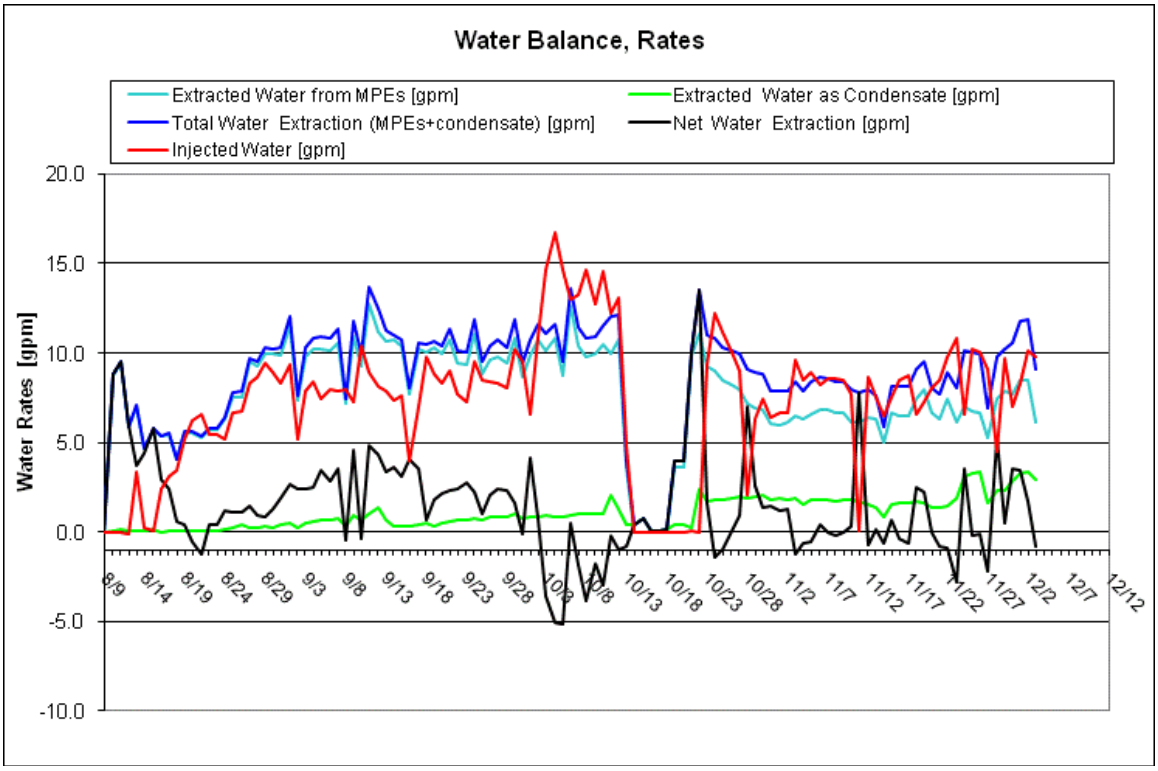


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

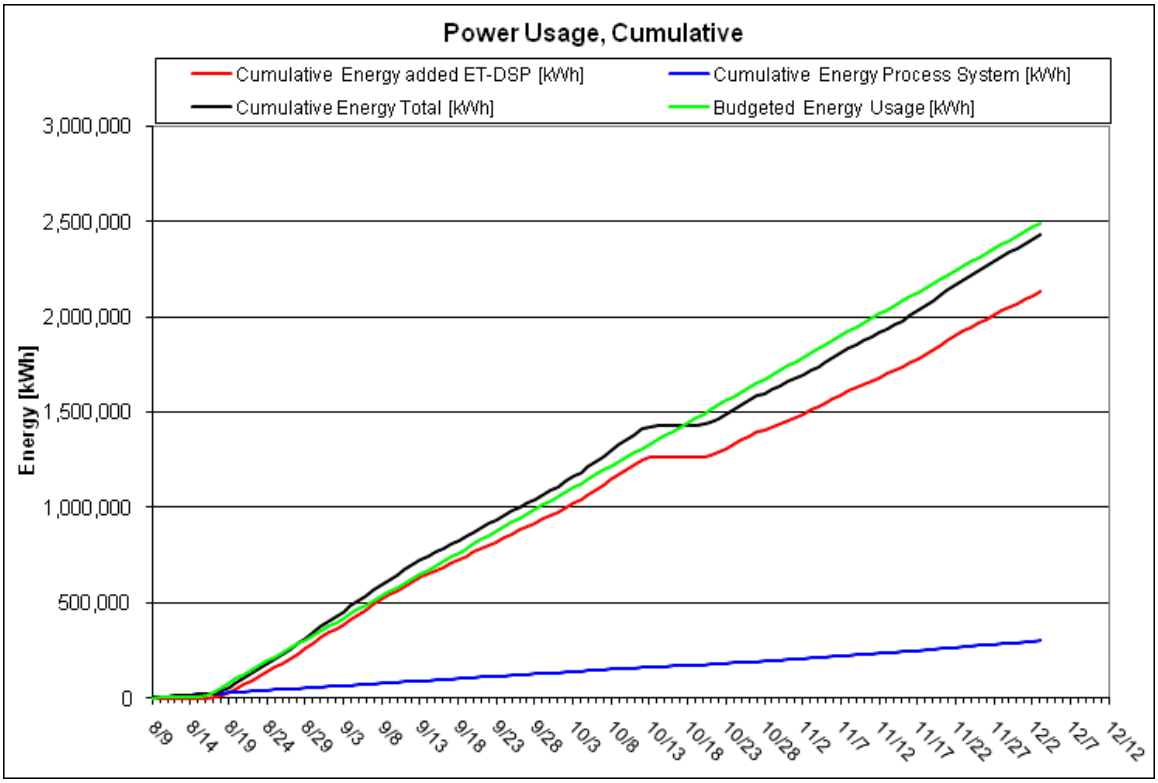


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Salt was injected into the treatment zone through targeted electrodes in order to increase the conductivity of the soil. The following injections were made:

November 29: 80 lbs
November 30: 10 lbs

TerraTherm is currently working with NRG Services (recommended by the Massachusetts Department of Safety) to have the steam generator and associated piping inspected at the Groveland Wells site. We are still coordinating with NRG to schedule the final piping and inspection of the generator. Steam spear installation began on Friday, December 3rd and is scheduled to be completed on Tuesday, December 7th. Steam/hot water injections will begin once the steam generator has been inspected.

Incidents:

No safety or environmental compliance incidents were reported for the November 27 through December 3, 2010 operational period.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged.

Progress Report

12/4/2010 through 12/10/2010
December 13, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from December 4 through December 10, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 12/10/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	115	days
Energy used to date	2,571,520	kWh
Injected energy per soil volume to date	138	kWh/cy
Water contaminant removal last 7 days	0.8	lbs
Water contaminant removal to date	16.3	lbs
Vapor contaminant removal last 7 days	20	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	316	lbs
Average temperature Area A last 7 days	182	°F
Average temperature Area C last 7 days	136	°F
Average temperature Area D last 7 days	133	°F
Average power usage rate last 7 days	839	kW
Average total water extracted rate last 7 days	8.3	gpm
Average injected water rate last 7 days	8.9	gpm
Average vapor extraction rate (non condensable) last 7 days	522	scfm

System Shutdowns

Saturday, 4 December: Troubleshooting of KO 1 HH alarm.

Monday, 6 December: KO 1 HH alarm at 12:30. System was restarted at 12:35. Electrodes were shutdown for continuing installation of the steam spears at 07:00 and restarted at 14:30.

Tuesday, 7 December: KO 1 HH Alarm at 17:21. System was restarted at 17:38. Electrodes were shutdown for completing the installation of the steam spears at 07:30 and restarted at 16:00.

Wednesday, 8 December: Electrodes were shutdown for groundwater sampling at 07:30 and restarted at 16:00.

Thursday, 9 December: 18:50 KO 1 Alarm HH level. Mobilized to site, re-primed pump and restarted system at 20:00.

Friday, 10 December: Site shut down during the night due to KO 2 high temperature alarm. No dial out to operators. Reset system in the morning. Reset dial out/EOS modem.

Friday, 10 December: Cooling tower high temperature alarm believed to be caused by strainer being clogged and ice preventing air flow. Cleaned out strainer and restarted.

Friday, 10 December: Chiller low ambient temp alarm shut chiller down. Called rental vendor and was instructed to change the ambient temperature alarm.

System Maintenance

Sunday, 5 December: TerraTherm began installation of insulation inside of Valley Treatment Building.

Wednesday, 8 December: Moved pump in Adler tank to third weir to enhance water quality being sent to GWTP.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

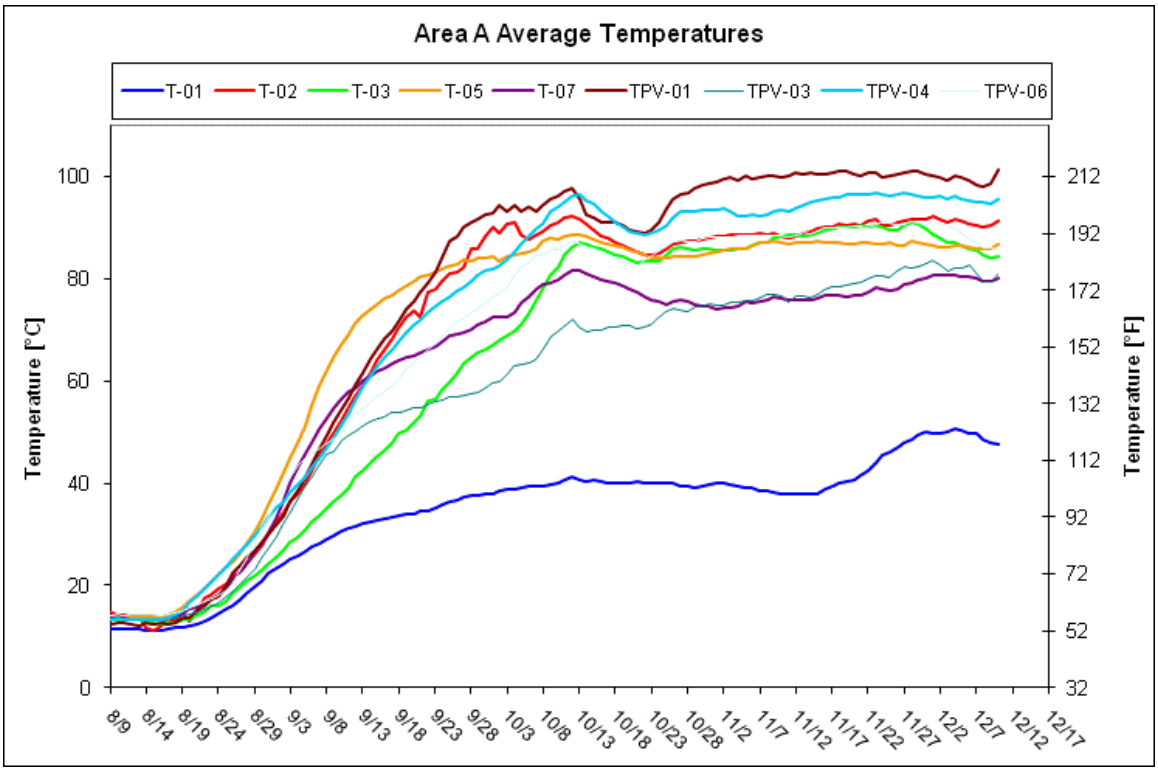


Figure 1. Average Temperature – Area A

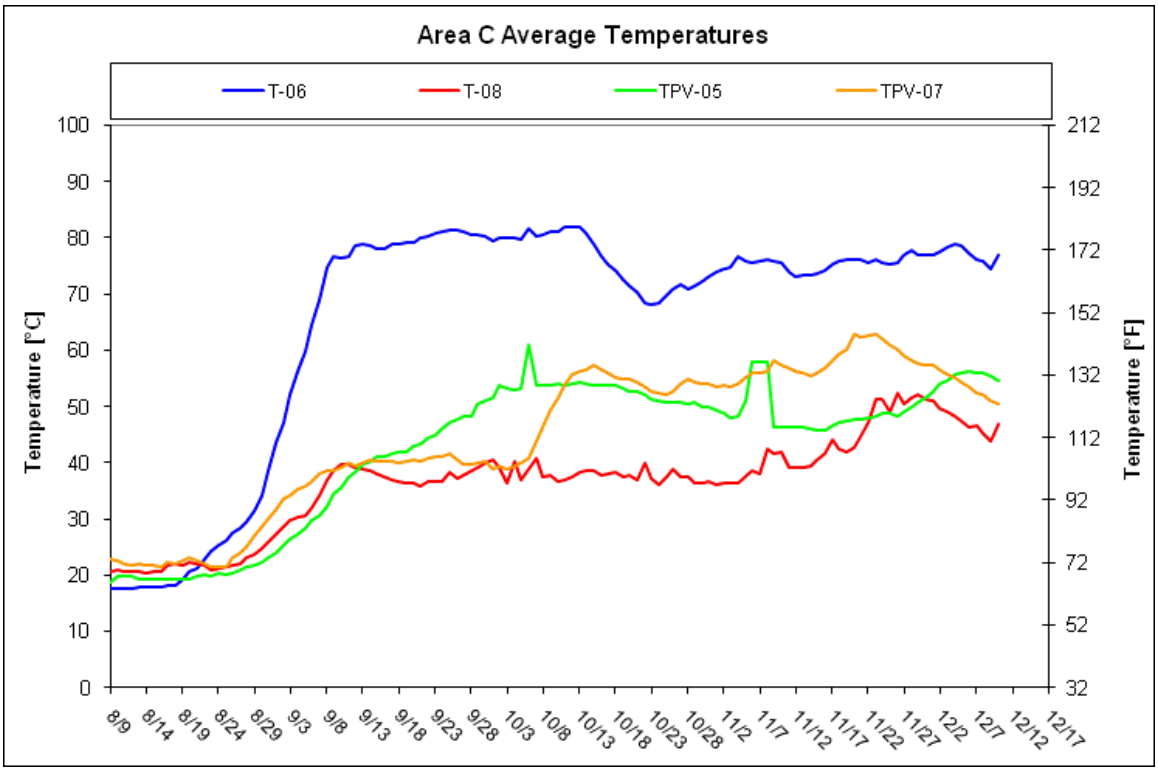


Figure 2. Average Temperature – Area C

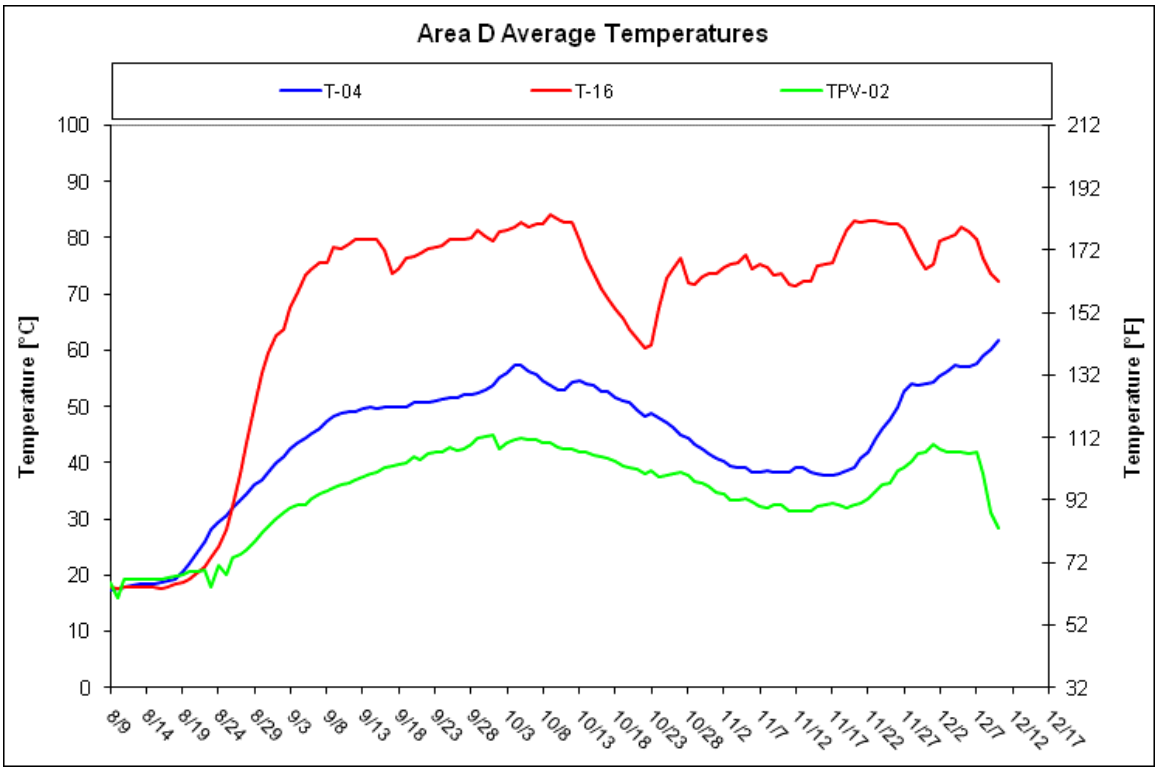


Figure 3. Average Temperature – Area D

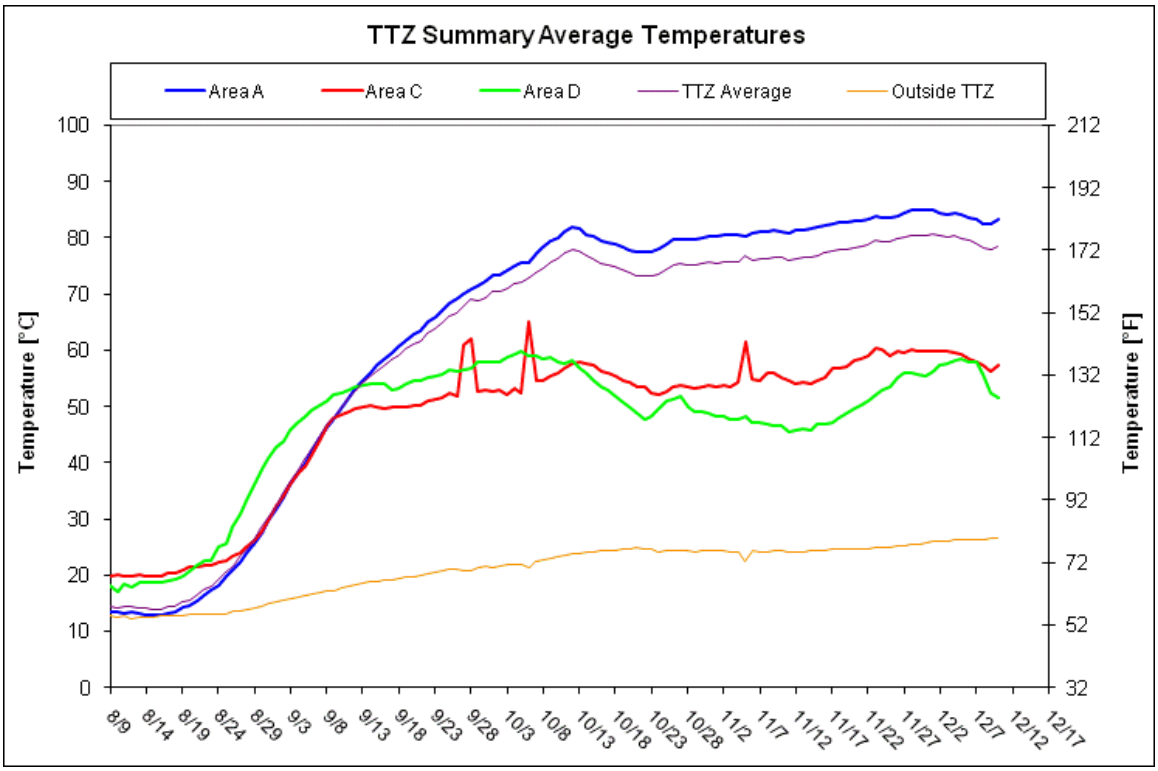


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

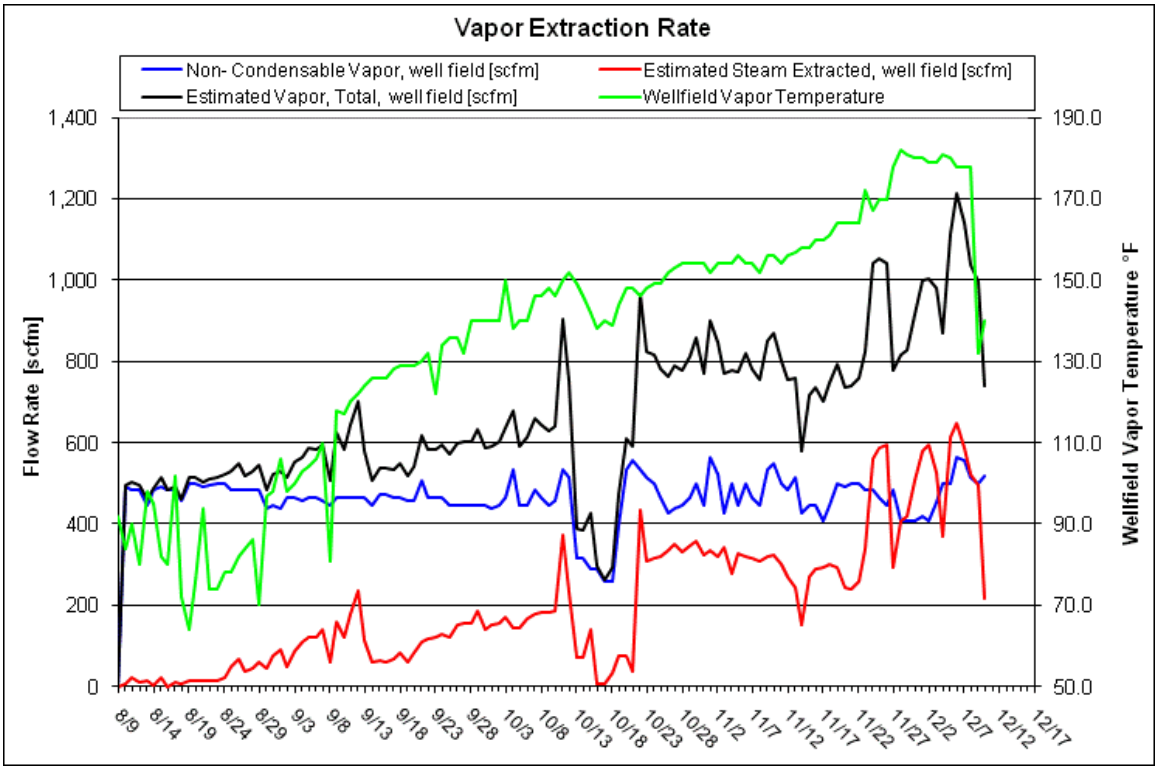


Figure 5. Vapor Extraction Rate and Temperature

4. PID and DRE

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved. We are continuing to evaluate the efficiency of the carbon and are prepared to bring a new carbon vessel online if necessary.

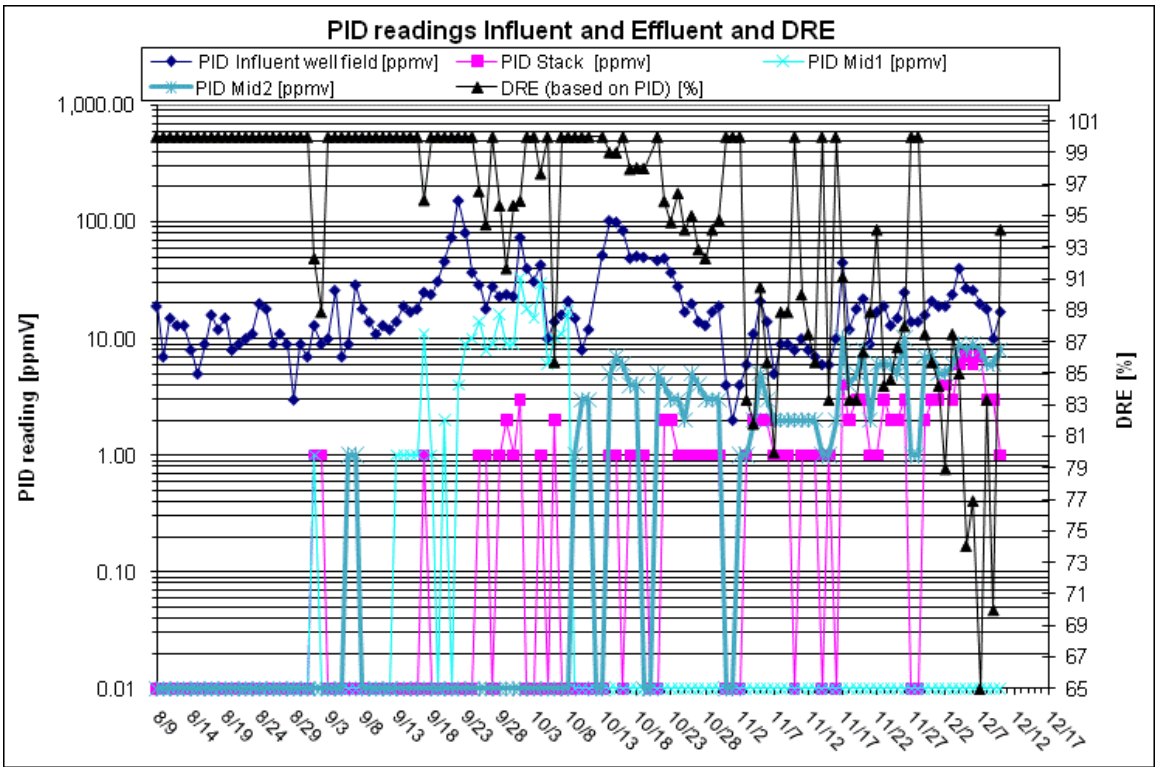


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

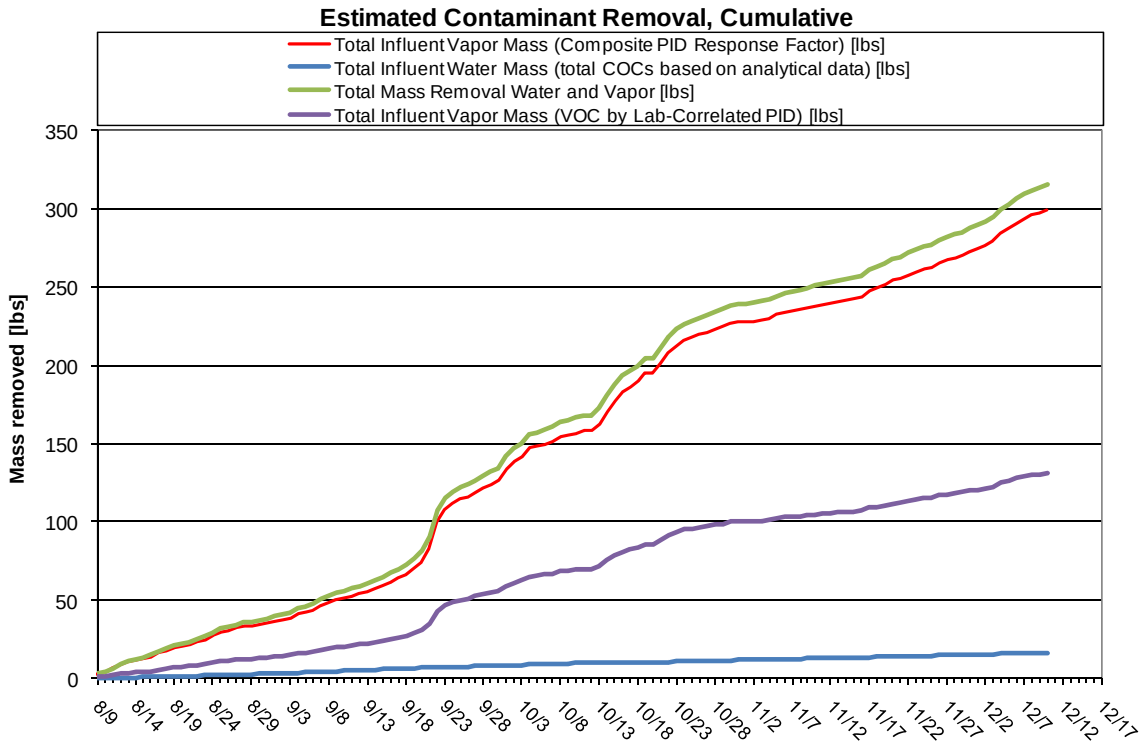


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 12/7/2010. The table below presents the concentrations in ppmV from the 9/29/10 through the most recent sampling event.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	9/29/10	10/8/10	10/21/10	10/27/10	11/3/10	11/10/10	11/17/10	11/23/10	12/1-2/2010	12/7/10
VEW 1	11						6.1	25	7.3	10.6
VEW 2	7.4	5.2	21	16	8.1	6.8	5.3	13	10.1	18.8
VEW 3	74	40					34	9.7	9.9	23.0
VEW 4	13						NR	51	17.0	32.8
VEW 5	75	53	70	65	7.6	24	29	77	35.2	50.8
VEW 6	32	12	21	18	2.9	7.3	2.2			
VEW 7	16						0.0	20	2.4	7.7
VEW 8	11						2.2			
VEW 9	151	29	137	56	39	25	33	105	25.0	59.0
VEW 10	5.8						0.8			
VEW 11	6.4						1.2			
VEW 12	13						29	13	10.3	19.5
VEW 13	29	47	94	26	3.4	18	12	30	19.5	28.4
VEW 14	93	47	36	23	1.2	8.0	4.7			
VEW 15	268	164	266	164	23	57	102	128	69.3	64.8
VEW 16	15						2.5			
VEW 17	185	106	147	71	50	37	45	71	36.9	54.4
VEW 18	13						6.5	13	13.3	7.9
VEW 19	17	34	51	17	14	22	3.1			
VEW 20	42	61	51	20	2.7	24	11	47	15.2	12.3
VEW 21	177	108	69	41	22	41	25	60	31.4	25.0
VEW 22	20		25	12	2.6	3.5	4.1			
VEW 23	19						5.7	87	48.3	38.7
VEW 24	176	47	25	14	5.0	11	4.3			
VEW 25	8.5						7.5	36	11.9	19.3
VEW 26	18						2.8			
VEW 27	5.3	9.8	13	8.9	1.3	7.8	0.0	2.8	5.6	6.8
VEW 28	9.9						0.0	5.3	0.8	2.2
VEW 29	29	26	25	6.5	5.3	6.7	0.0	12	15.3	15.1

NR = not recorded

7. Water Level

The figure below presents a water level contour map for the site.

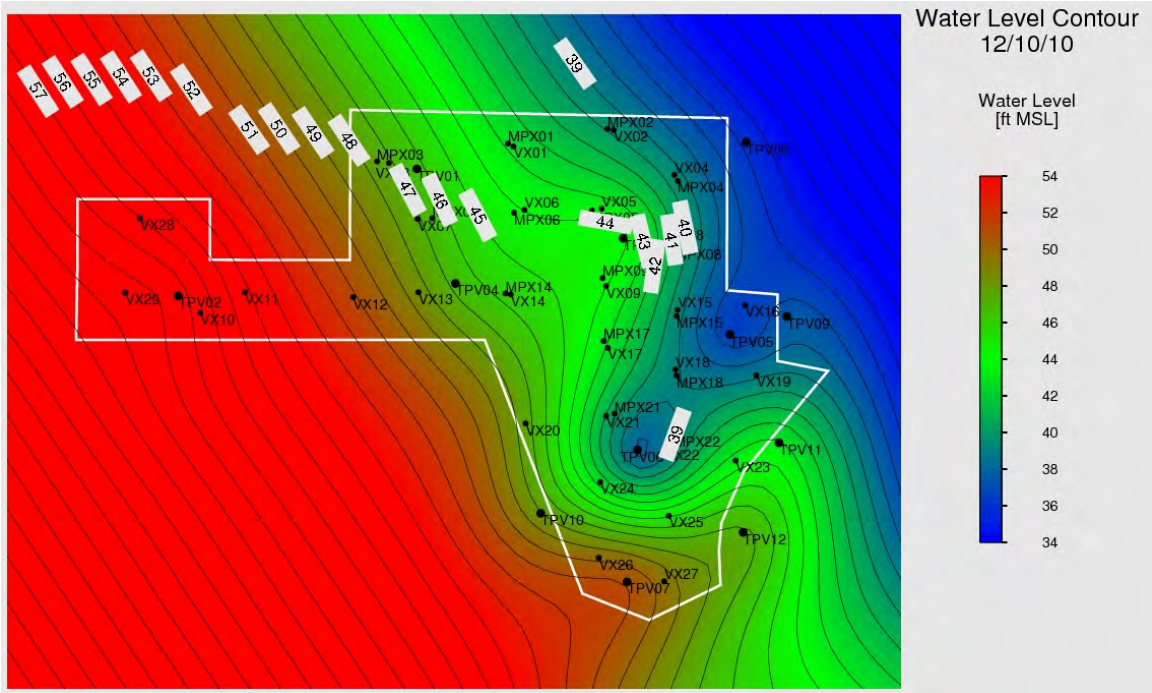


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

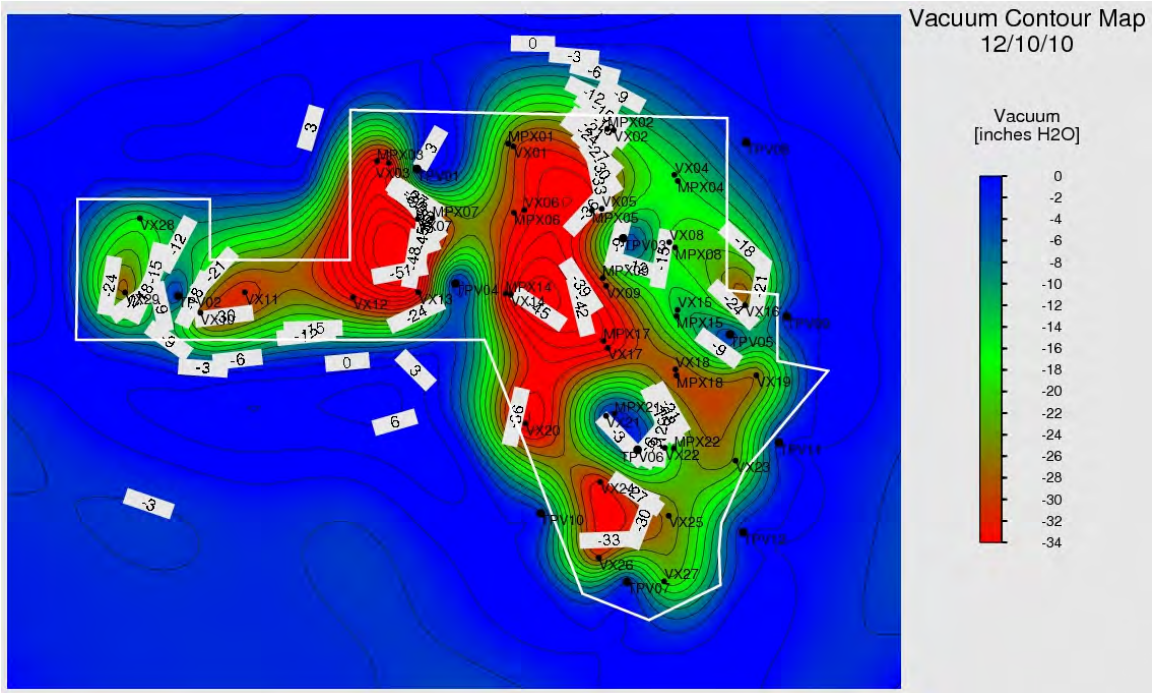


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,314,333 gallons of water since system startup while extracting a total of 1,558,931 gallons of water for a net water extraction of 244,598 gallons as of 12/10/10 (as seen in Figure 10 below).

The figure below also shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

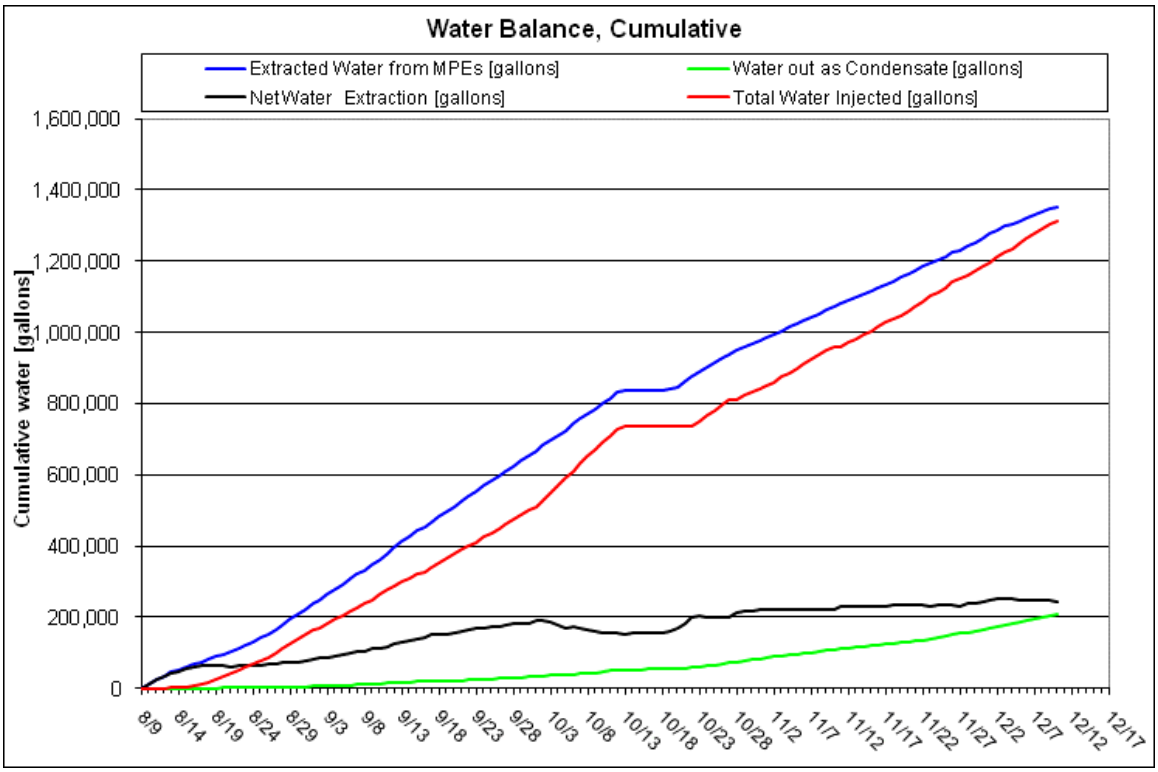


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

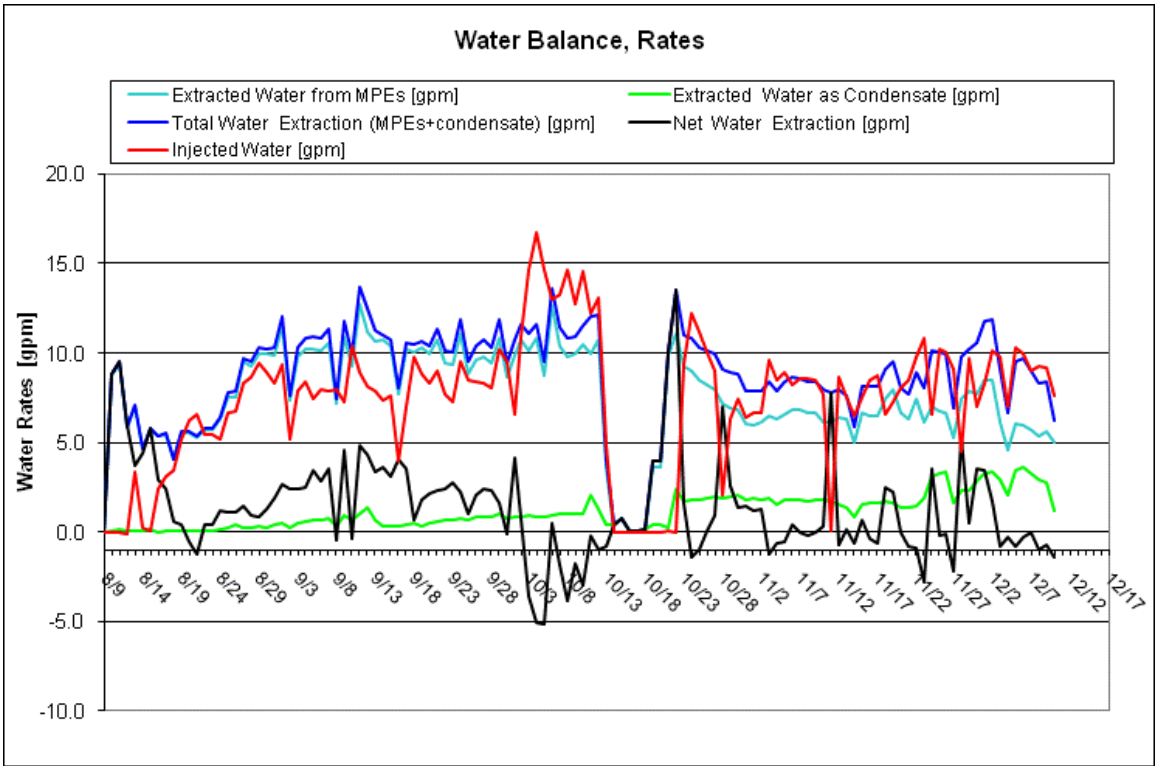


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

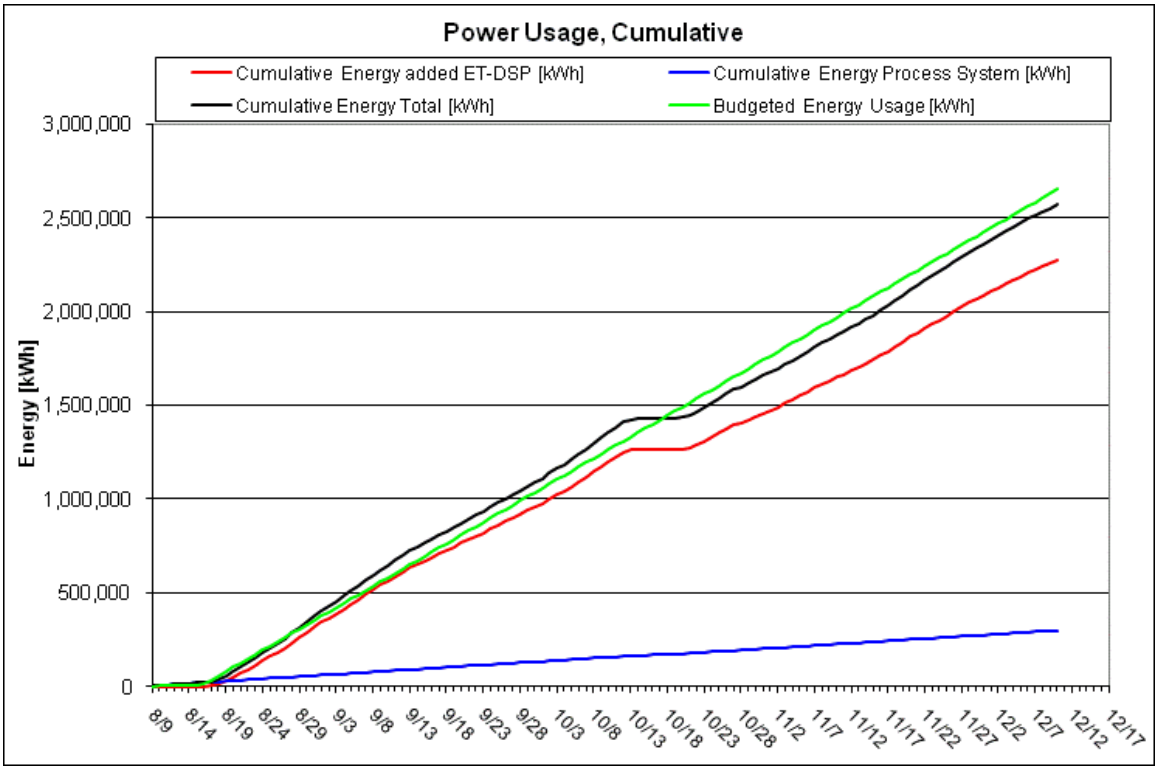


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Salt was injected into the treatment zone through targeted electrodes in order to increase the conductivity of the soil. The following injections were made:

December 9: 40 lbs
December 10: 80 lbs
December 11: 40 lbs

TerraTherm is currently working with NRG Services (recommended by the Massachusetts Department of Safety) to have the steam generator and associated piping inspected at the Groveland Wells site. The steam generator inspection is currently scheduled for Friday, December 17th. NRG Services will be onsite on Tuesday, December 14th to commission the boiler prior to the inspection. Steam spear drilling installation was completed on Tuesday, December 7th. Final steam spear hookup will be completed by Thursday, December 16th with steam/hot water injections beginning once the steam generator has been inspected.

Incidents:

No safety or environmental compliance incidents were reported for the December 4 through December 10, 2010 operational period.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged.

Progress Report

12/11/2010 through 12/17/2010
December 20, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from December 11 through December 17, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project Summary as of 12/17/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13,590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	122	days
Energy used to date	2,711,840	kWh
Injected energy per soil volume to date	145	kWh/cy
Water contaminant removal last 7 days	0.80	lbs
Water contaminant removal to date	17	lbs
Vapor contaminant removal last 7 days	14	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18	gal
Total contaminant removal to date	330	lbs
Average temperature Area A last 7 days	181	°F
Average temperature Area C last 7 days	134	°F
Average temperature Area D last 7 days	124	°F
Average power usage rate last 7 days	835	kW
Average total water extracted rate last 7 days	8.1	gpm
Average injected water rate last 7 days	6.2	gpm
Average vapor extraction rate (non condensable) last 7 days	540	scfm

System Shutdowns

Monday, 13 December: The air compressor shut down at approximately 0130 EST which subsequently shutdown the downhole pumps in multiphase extraction wells. A temporary generator was brought on site to operate the pumps until parts arrive for the air compressor. Downhole pumps were brought back online around 0745 EST.

Wednesday, 15 December: The wellfield was shutdown from approximately 0730 EST to approximately 0800 EST to repair a malfunctioning solenoid valve on the generator.

Friday, 17 December: The electrodes were shut down at approximately 0730 EST while insulation was added to the wellfield. The electrodes were turned back on at approximately 1600 EST.

System Maintenance

Tuesday, 14 December: The primary vapor carbon vessel was taken offline and a fresh vapor carbon vessel was put online.

Approximately three gallons total of unidentified material was removed from the “trough” and oil water separator on 12 December. At this point, it has not been determined that this unidentified material is NAPL and therefore not counted for in the summary table on page 2.

Other routine maintenance such as bag filter changes, backwashing of carbon vessels, winterization, etc. continues to occur.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

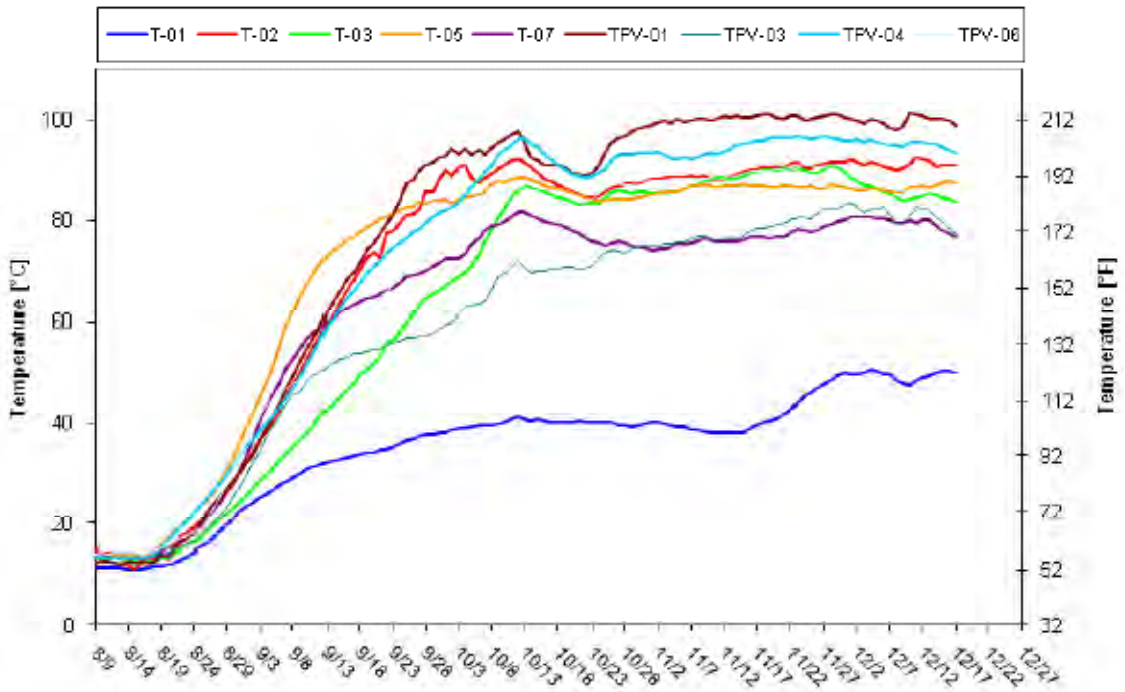


Figure 1. Average Temperature – Area A

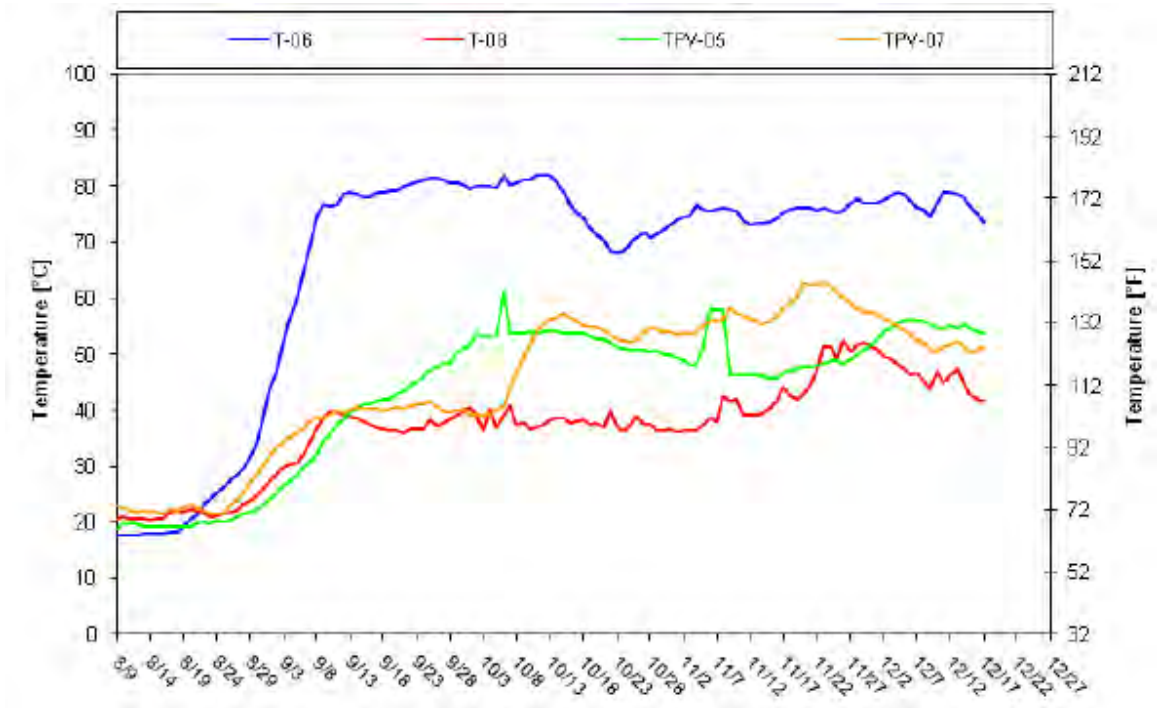


Figure 2. Average Temperature – Area C

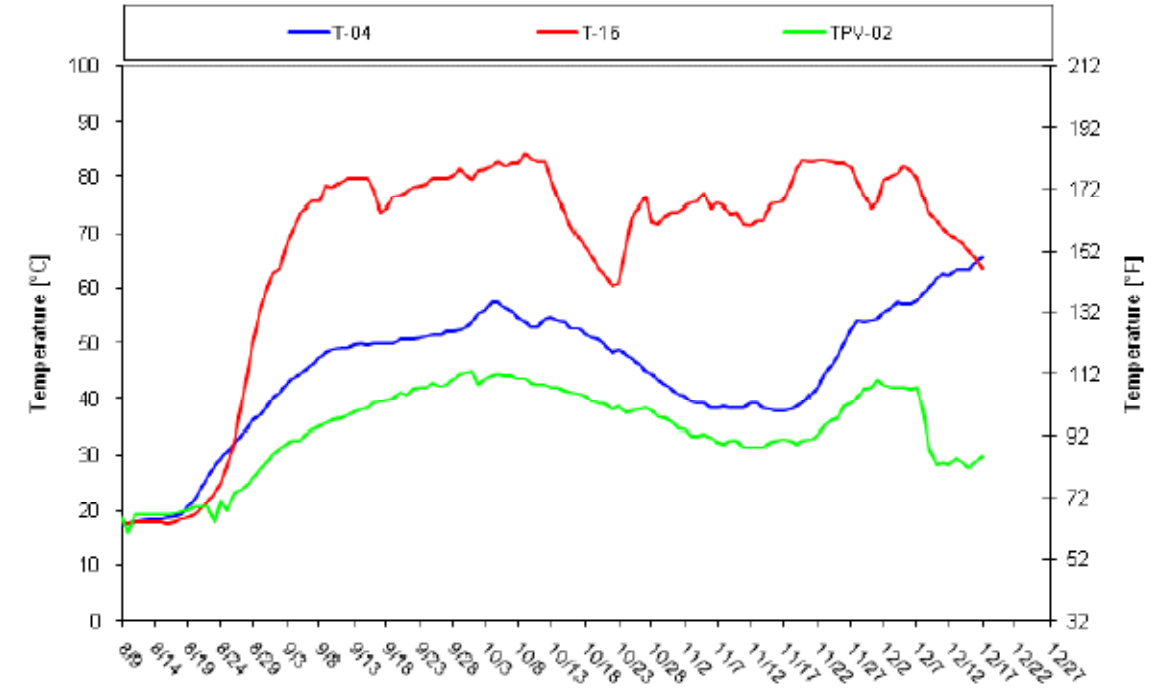


Figure 3. Average Temperature – Area D

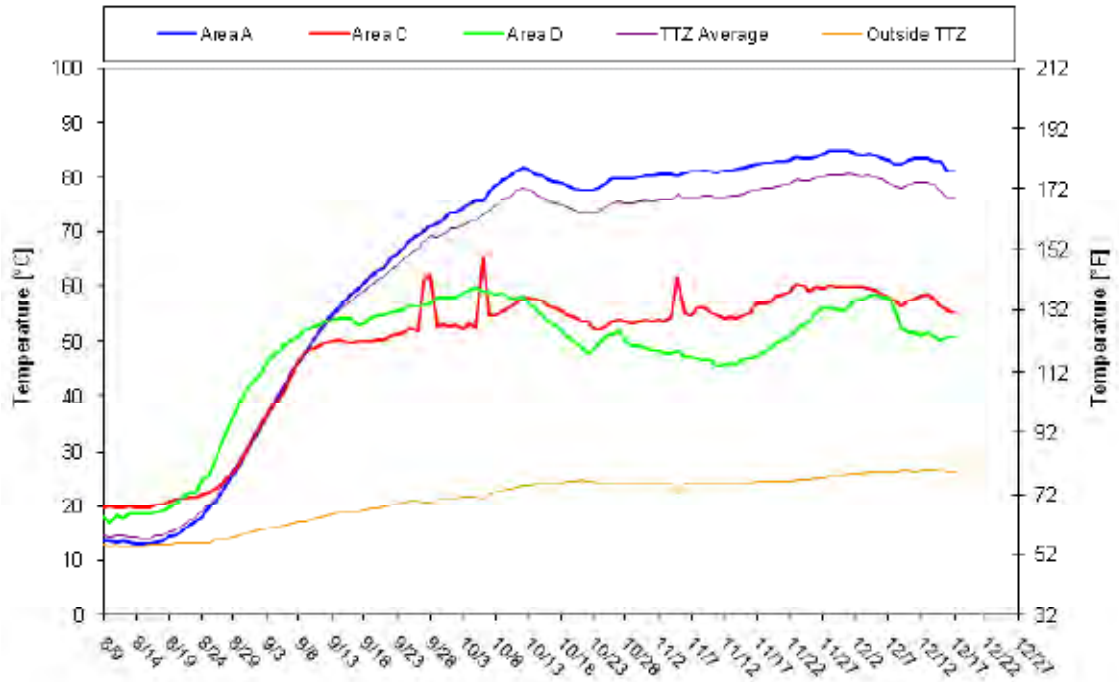


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

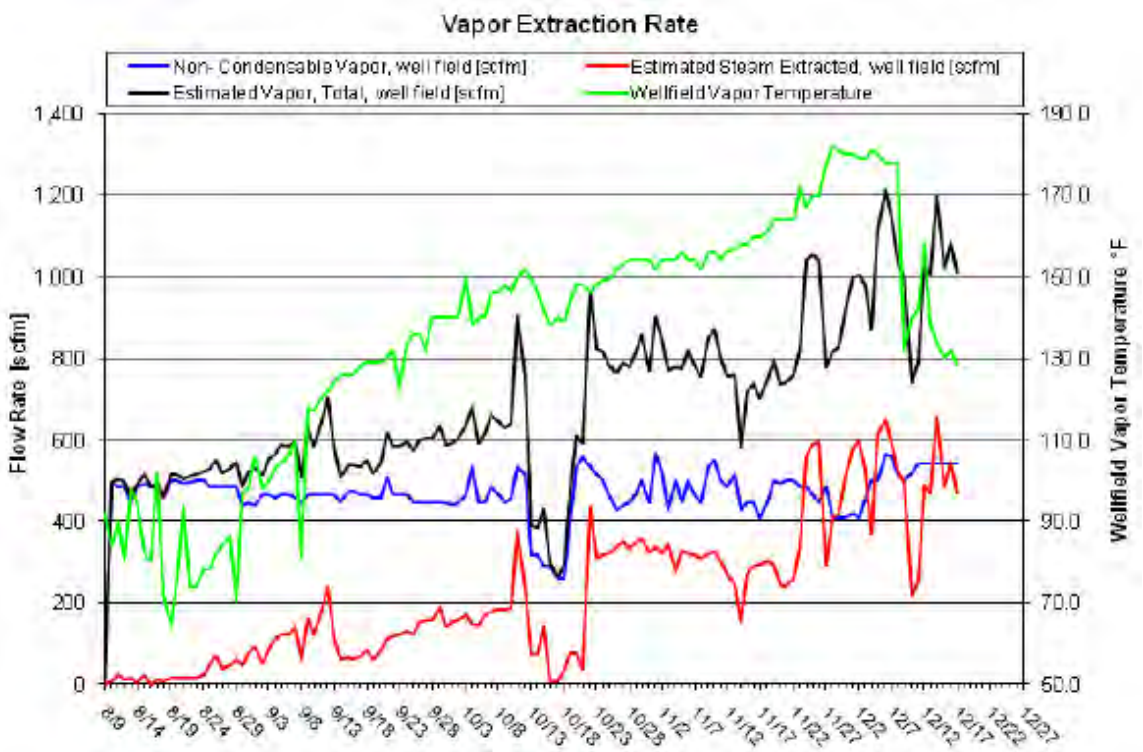


Figure 5. Vapor Extraction Rate and Temperature

4. Photo Ionization Detector (PID)and Destruction Removal Efficiency (DRE)

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

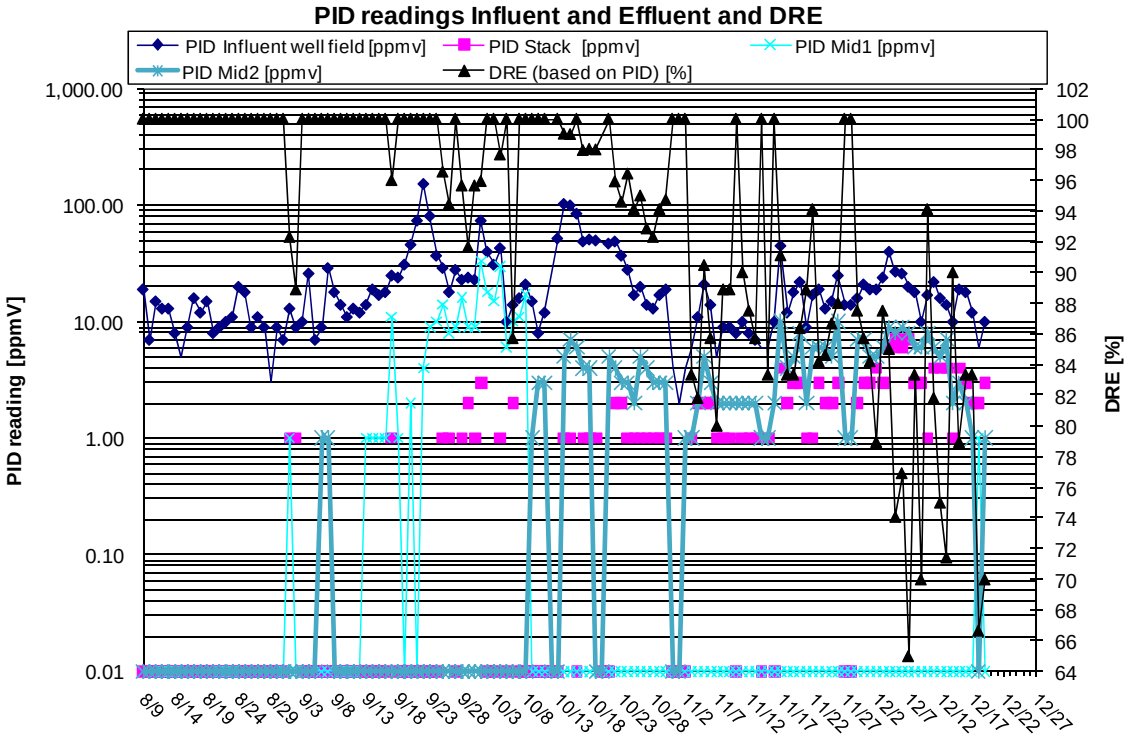


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

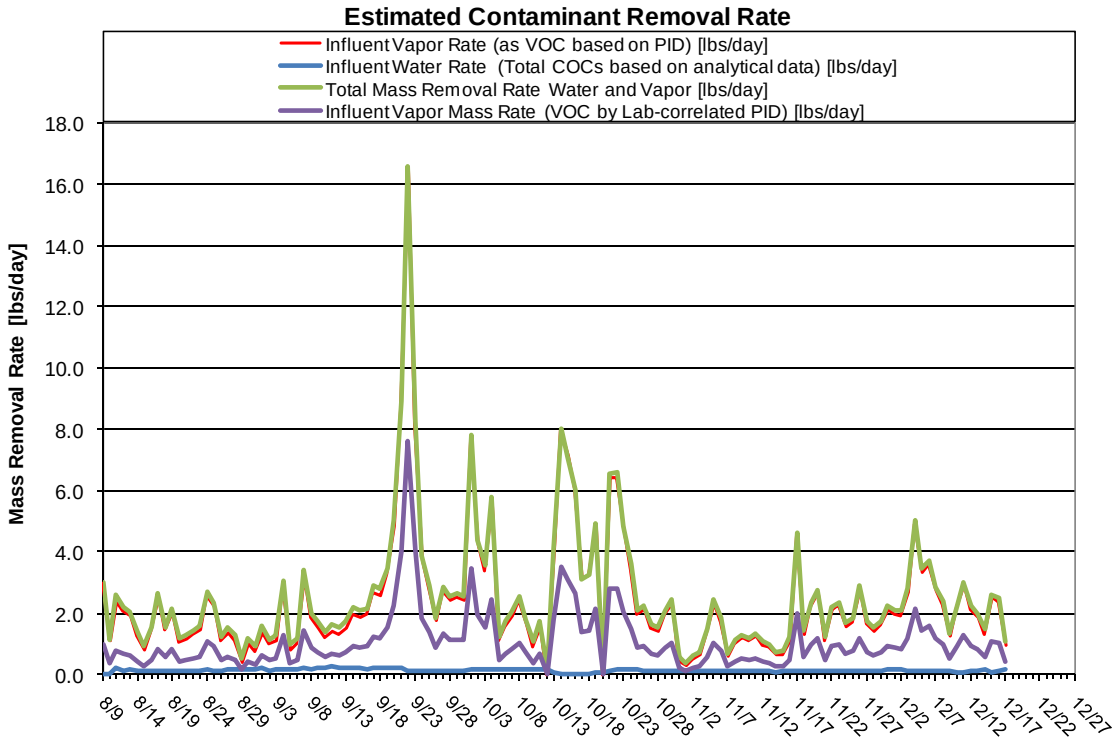
The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.



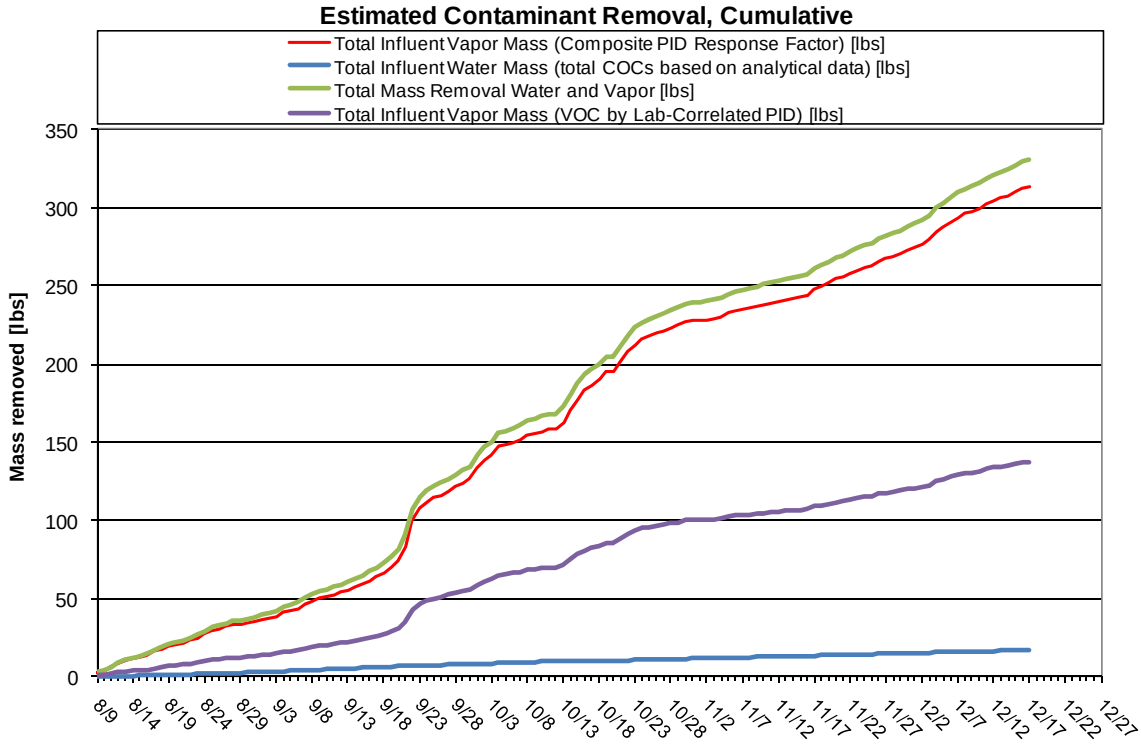


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 12/14/2010. The table below presents the concentrations in ppmV from the 9/29/10 through the most recent sampling event.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	9/29/10	10/8/10	10/21/10	10/27/10	11/3/10	11/10/10	11/17/10	11/23/10	12/1-2/2010	12/7/10	12/14/10
VEW 1	11						6.1	25	7.3	11	3.1
VEW 2	7.4	5.2	21	16	8.1	6.8	5.3	13	10	19	2.8
VEW 3	74	40					34	9.7	9.9	23	
VEW 4	13						NR	51	17	33	9.9
VEW 5	75	53	70	65	7.6	24	29	77	35	51	27
VEW 6	32	12	21	18	2.9	7.3	2.2				
VEW 7	16						0.0	20	2.4	7.7	3.5
VEW 8	11						2.2				
VEW 9	151	29	137	56	39	25	33	105	25	59	24
VEW 10	5.8						0.8				
VEW 11	6.4						1.2				
VEW 12	13						29	13	10	19	2.7
VEW 13	29	47	94	26	3.4	18	12	30	19	28	18
VEW 14	93	47	36	23	1.2	8.0	4.7				
VEW 15	268	164	266	164	23	57	102	128	69	65	43
VEW 16	15						2.5				
VEW 17	185	106	147	71	50	37	45	71	37	54	39
VEW 18	13						6.5	13	13	7.9	11
VEW 19	17	34	51	17	14	22	3.1				
VEW 20	42	61	51	20	2.7	24	11	47	15	12	7.9
VEW 21	177	108	69	41	22	41	25	60	31	25	23
VEW 22	20		25	12	2.6	3.5	4.1				
VEW 23	19						5.7	87	48	39	20
VEW 24	176	47	25	14	5.0	11	4.3				
VEW 25	8.5						7.5	36	12	19	6.3
VEW 26	18						2.8				
VEW 27	5.3	9.8	13	8.9	1.3	7.8	0.0	2.8	5.6	6.8	2.3
VEW 28	9.9						0.0	5.3	0.8	2.2	0.7
VEW 29	29	26	25	6.5	5.3	6.7	0.0	12	15	15	4.2

NR = not recorded

7. Water Level

The figure below presents a water level contour map for the site.

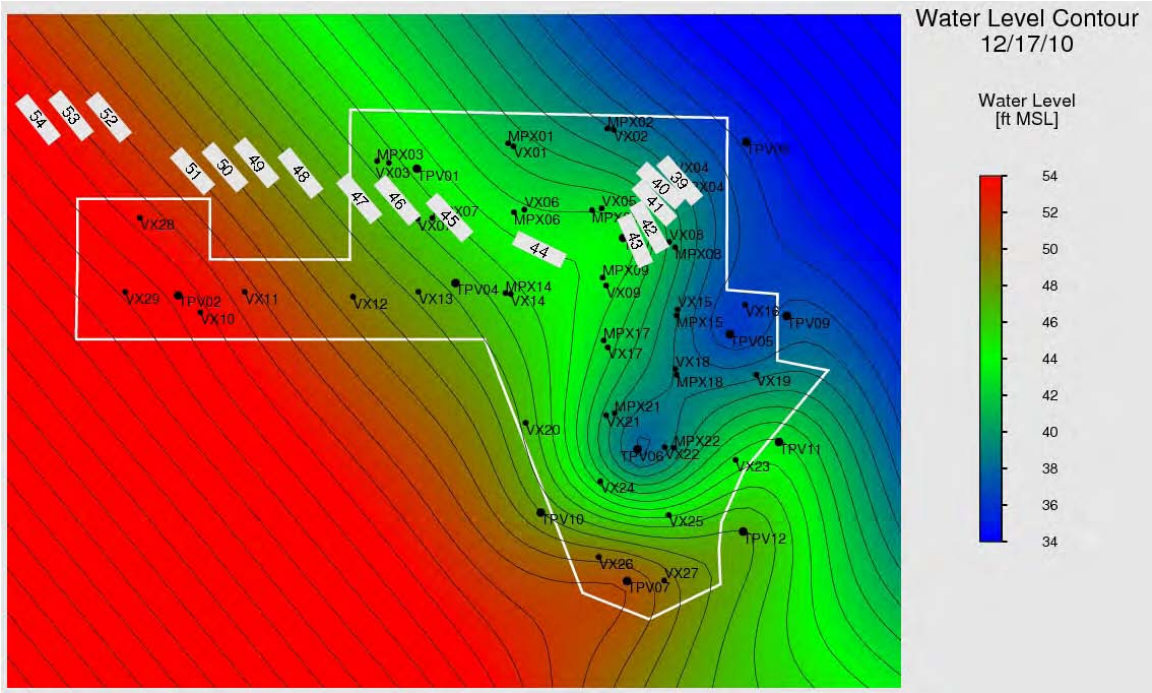


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

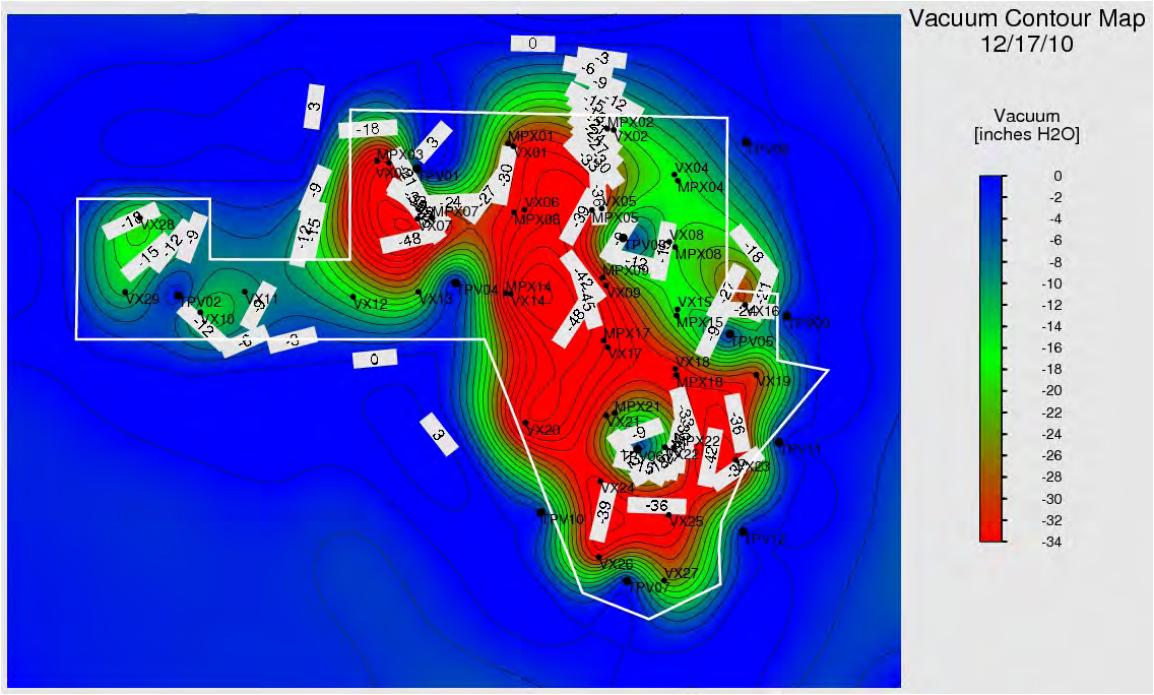


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,376,413 gallons of water since system startup while extracting a total of 1,407,393 gallons of water from the wellfield (as seen in Figure 10 below) plus an additional 233,654 gallons as condensate.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

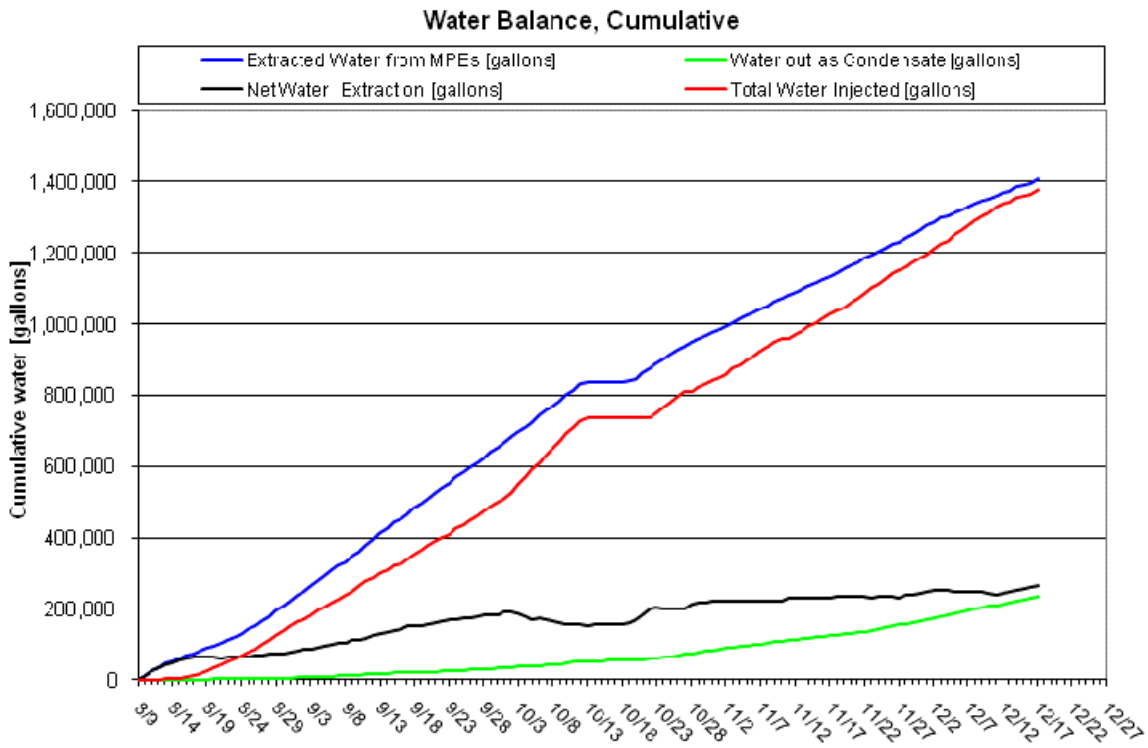


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

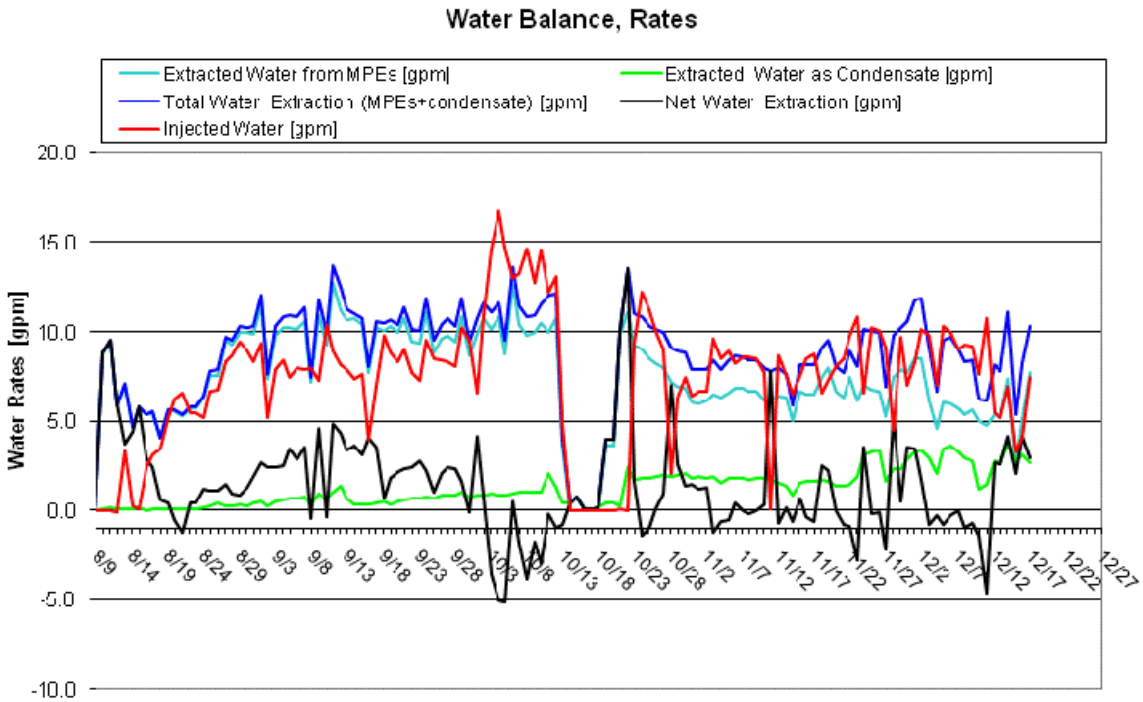


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

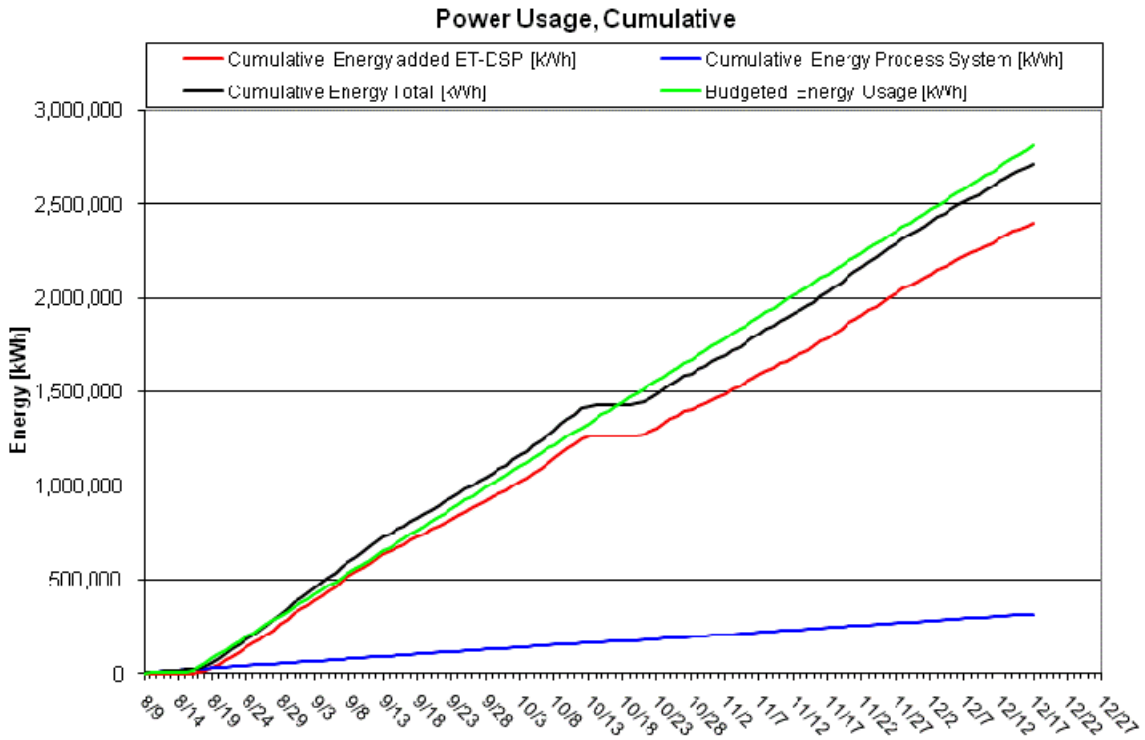


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

The steam boiler was inspected by the State District Engineering Inspector on Friday, 17 December 2010. The generator has been approved for operation.

No salt was added during this reporting period.

Incidents:

No safety or environmental compliance incidents were reported for the December 11 through December 17, 2010 operational period.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged.

Progress Report

12/18/2010 through 12/24/2010
December 27, 2010
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from December 18 through December 24, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 12/24/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	129	days
Energy used to date	2,826,560	kWh
Injected energy per soil volume to date	151	kWh/cy
Water contaminant removal last 7 days	0.7	lbs
Water contaminant removal to date	17.8	lbs
Vapor contaminant removal last 7 days	7	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	339	lbs
Average temperature Area A last 7 days	177	°F
Average temperature Area C last 7 days	130	°F
Average temperature Area D last 7 days	127	°F
Average power usage rate last 7 days	683	kW
Average total water extracted rate last 7 days	7.5	gpm
Average injected water rate last 7 days	3.9	gpm
Average vapor extraction rate (non condensable) last 7 days	540	scfm

System Shutdowns

Wednesday, 22 December: The electrodes were shut down at approximately 0700 EST for the groundwater sampling effort. During this time, Nobis monitoring wells, TPVs, and MPEs were gauged. Downhole pumps were pulled for routine maintenance and reinstalled. The electrodes were turned back on at approximately 1600 EST.

System Maintenance

Tuesday and Wednesday, 21 & 22 December: Modifications to the steam lines and spear connections were made. Kynar nipples were replaced with black malleable iron nipples on the steam header.

Approximately three gallons total of unidentified material was removed from the “trough” and oil water separator on 19 December. At this point, it has not been determined that this unidentified material is NAPL and therefore not counted for in the summary table on page 2.

Other routine maintenance such as bag filter changes, gauge maintenance, flushing of lines, backwashing of carbon vessels, winterization, etc. continues to occur.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

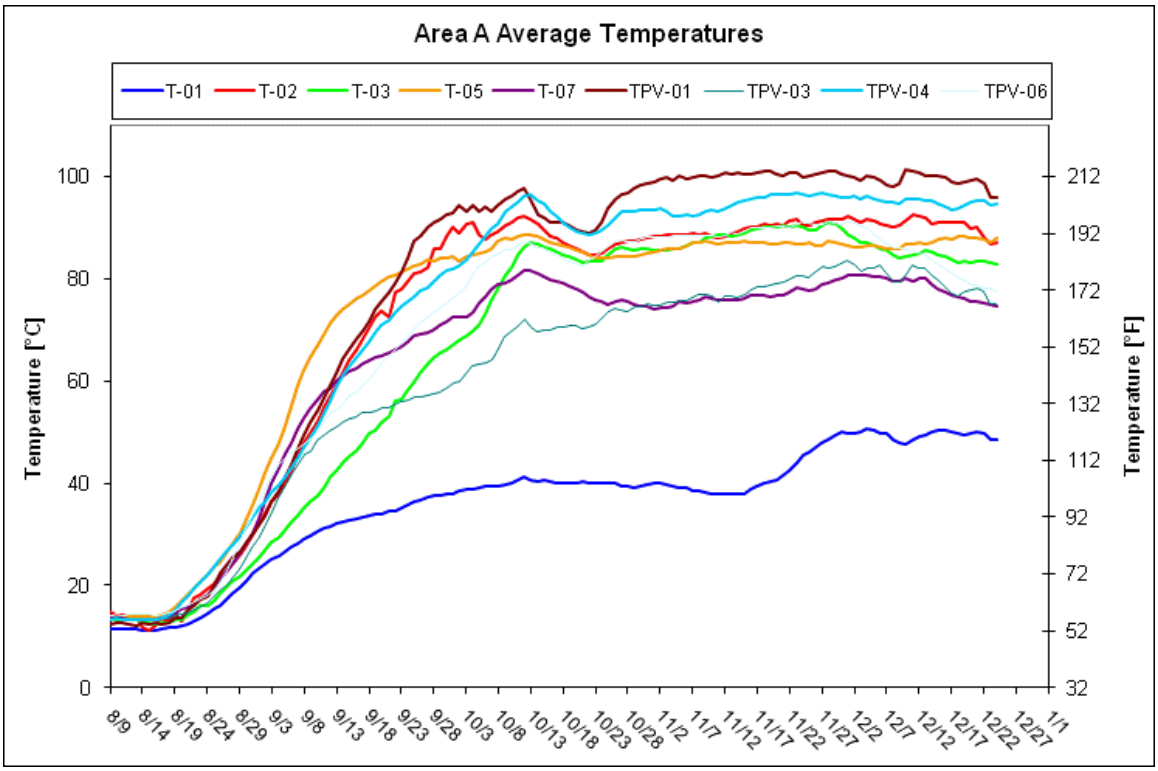


Figure 1. Average Temperature – Area A

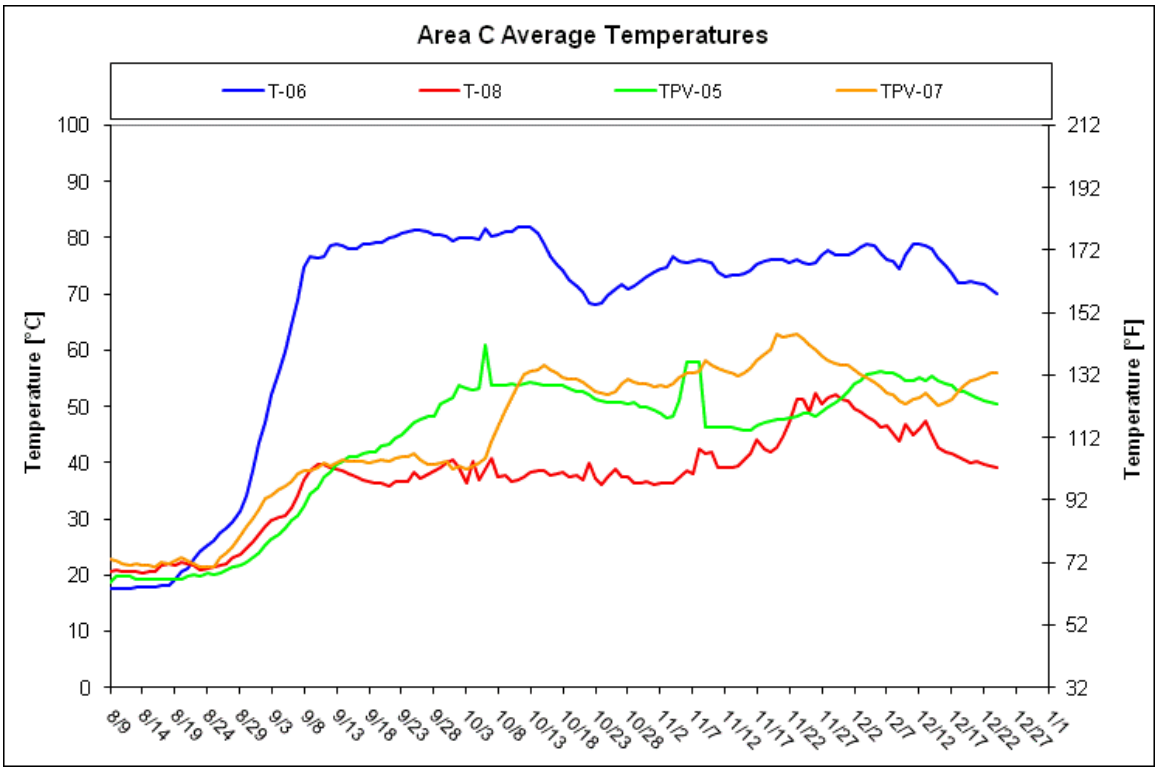


Figure 2. Average Temperature – Area C

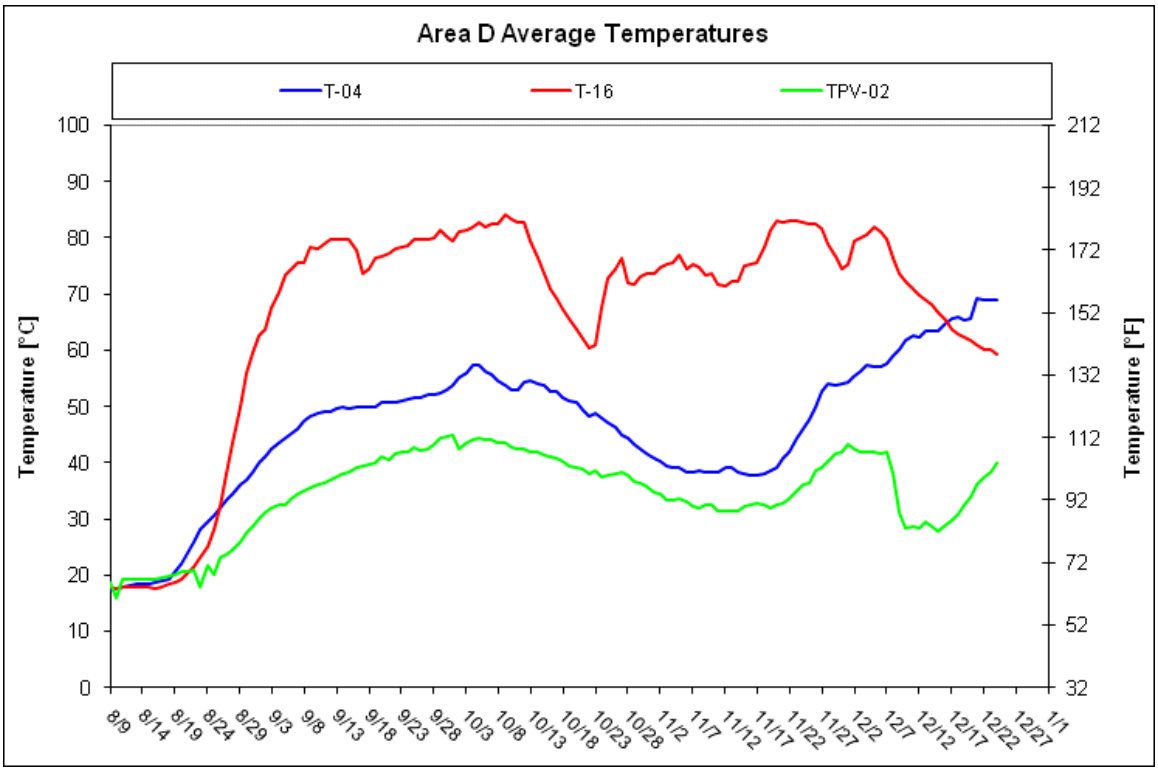


Figure 3. Average Temperature – Area D

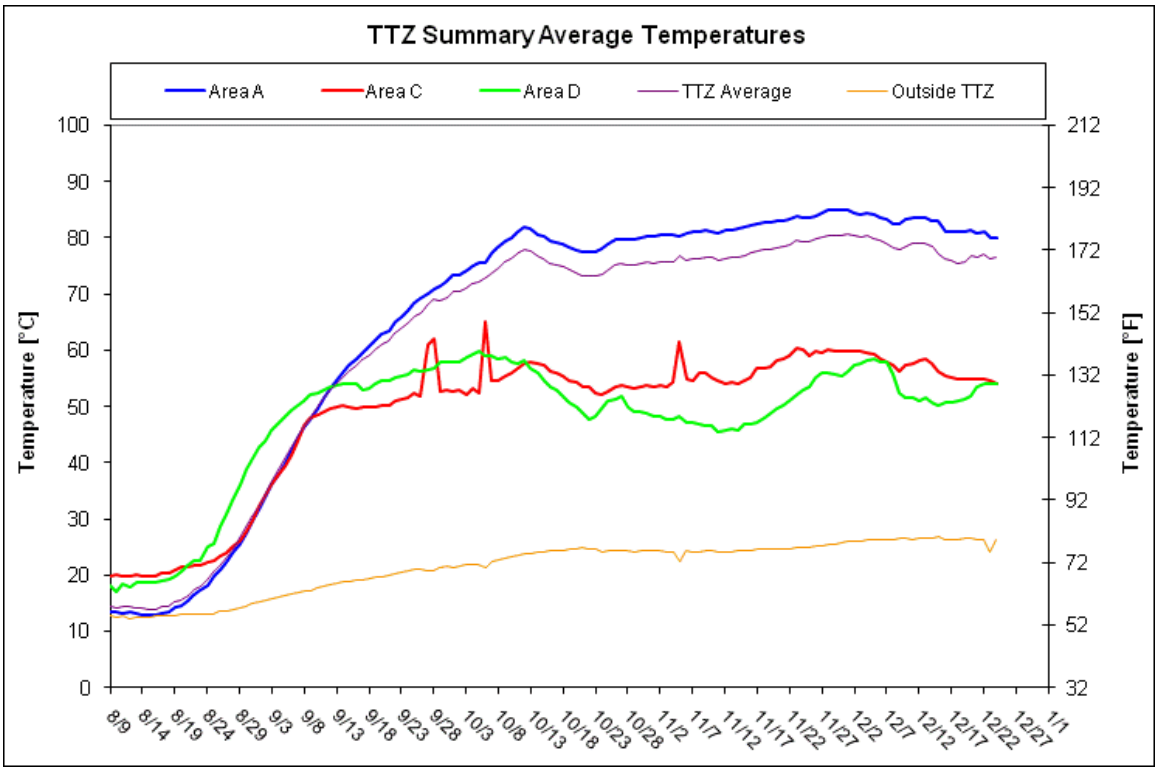


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

The pitot tube used to measure the non-condensable vapor data is malfunctioning and will be replaced. The missing data will be interpolated once the new pitot tube has been installed.

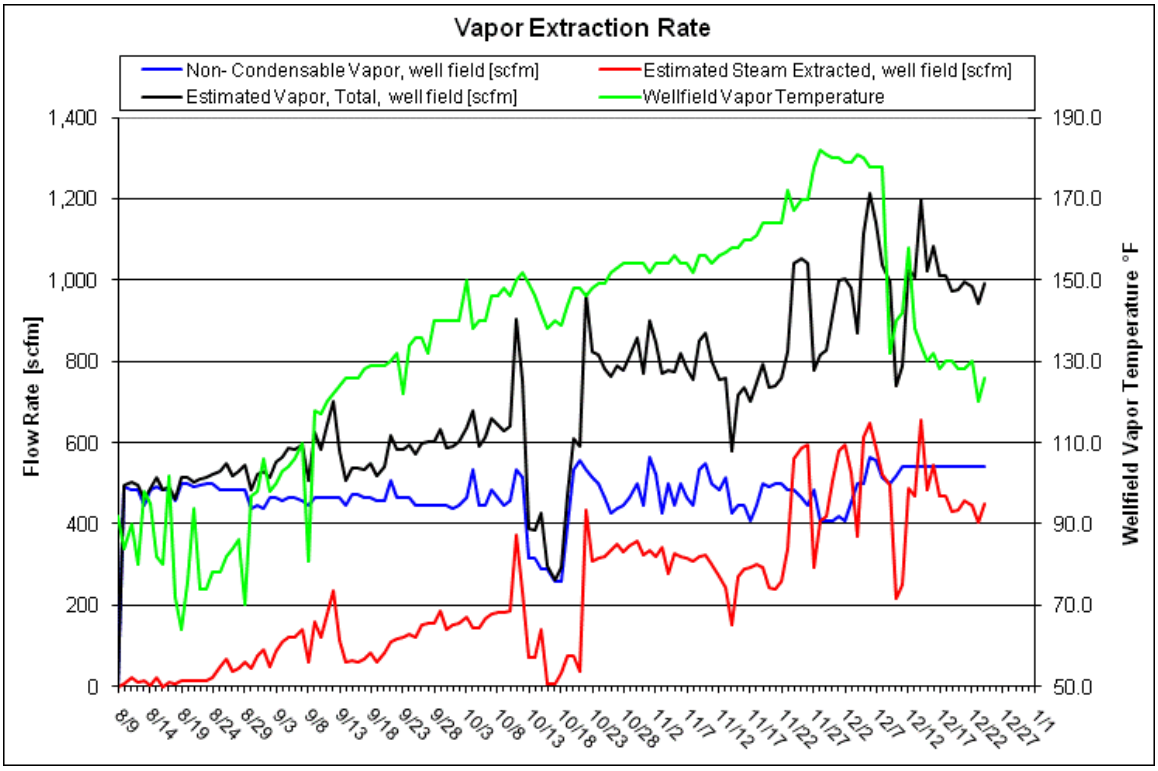


Figure 5. Vapor Extraction Rate and Temperature

4. Photo Ionization Detector (PID) and Destruction Removal Efficiency (DRE)

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

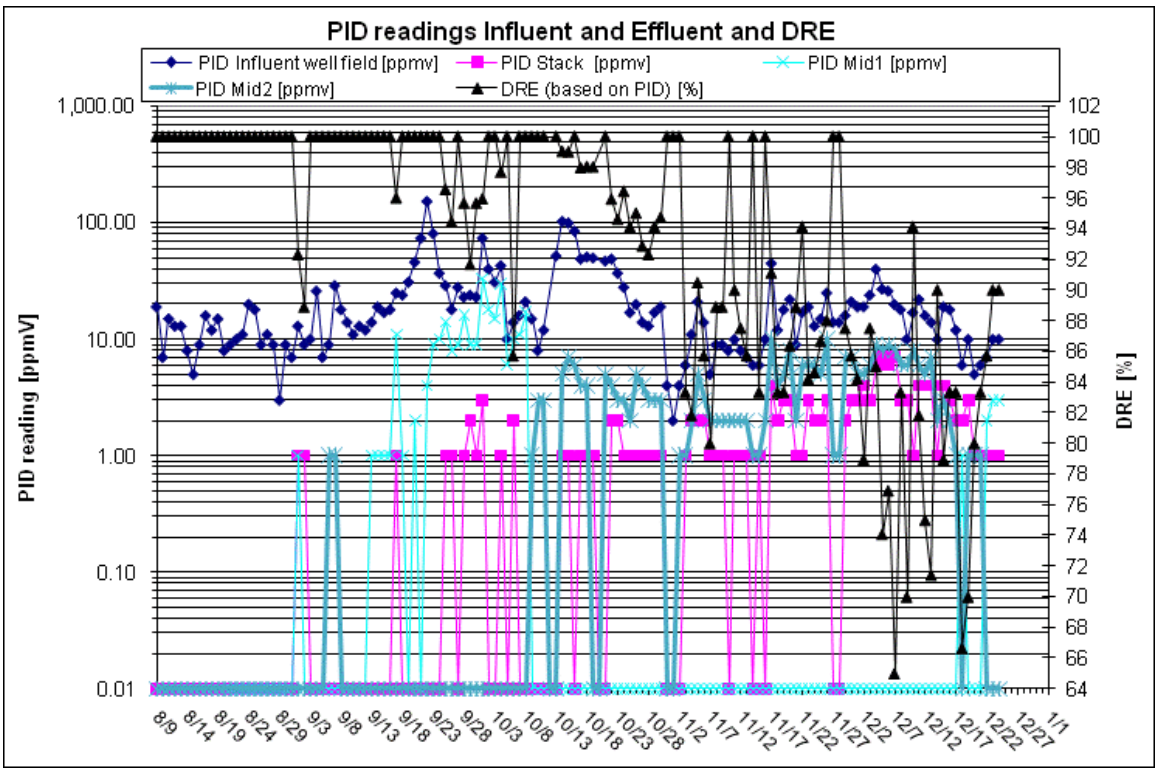


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

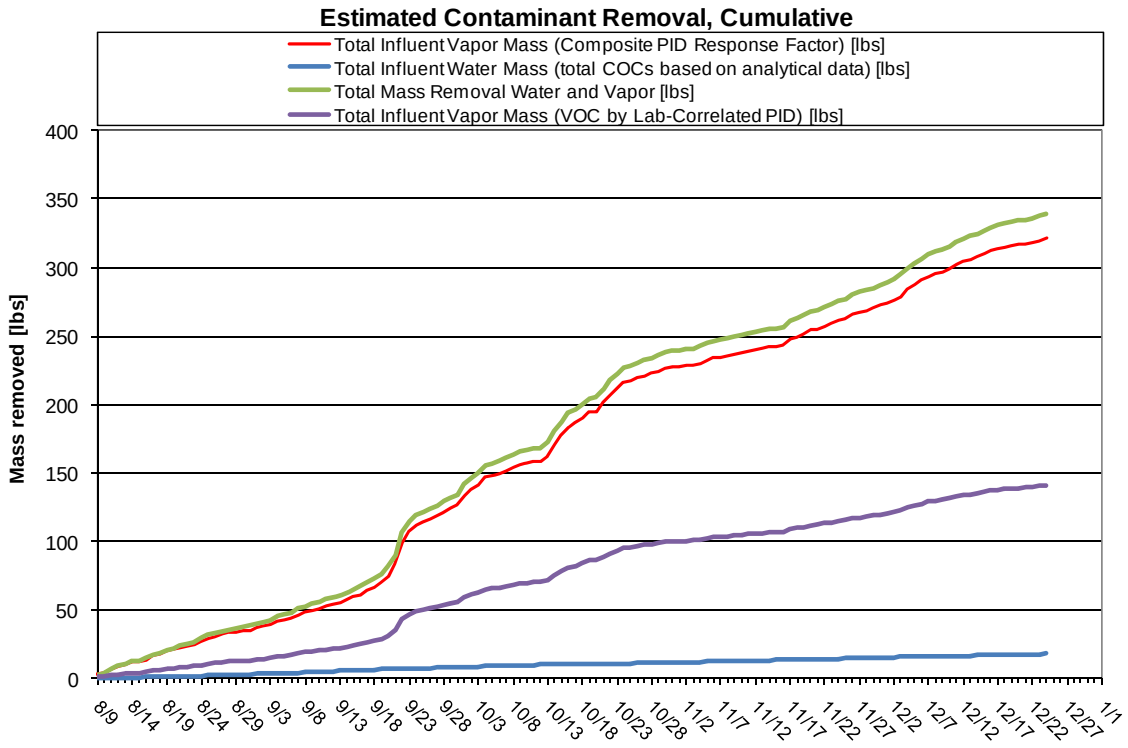


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 12/22/2010. The table below presents the concentrations in ppmV from the 9/29/10 through the most recent sampling event.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	9/29/10	10/8/10	10/21/10	10/27/10	11/3/10	11/10/10	11/17/10	11/23/10	12/1-2/2010	12/7/10	12/14/10	12/22/10
VEW 1	11						6.1	25	7.3	11	3.1	9.8
VEW 2	7.4	5.2	21	16	8.1	6.8	5.3	13	10	19	2.8	5.2
VEW 3	74	40					34	9.7	9.9	23		12.5
VEW 4	13						NR	51	17	33	9.9	13.1
VEW 5	75	53	70	65	7.6	24	29	77	35	51	27	24.2
VEW 6	32	12	21	18	2.9	7.3	2.2					
VEW 7	16						0.0	20	2.4	7.7	3.5	9.6
VEW 8	11						2.2					
VEW 9	151	29	137	56	39	25	33	105	25	59	24	12.4
VEW 10	5.8						0.8					8.5
VEW 11	6.4						1.2					4.1
VEW 12	13						29	13	10	19	2.7	8.5
VEW 13	29	47	94	26	3.4	18	12	30	19	28	18	13.9
VEW 14	93	47	36	23	1.2	8.0	4.7					18.8
VEW 15	268	164	266	164	23	57	102	128	69	65	43	20.8
VEW 16	15						2.5					
VEW 17	185	106	147	71	50	37	45	71	37	54	39	38.3
VEW 18	13						6.5	13	13	7.9	11	6.8
VEW 19	17	34	51	17	14	22	3.1					
VEW 20	42	61	51	20	2.7	24	11	47	15	12	7.9	9.9
VEW 21	177	108	69	41	22	41	25	60	31	25	23	14.7
VEW 22	20		25	12	2.6	3.5	4.1					
VEW 23	19						5.7	87	48	39	20	15.4
VEW 24	176	47	25	14	5.0	11	4.3					
VEW 25	8.5						7.5	36	12	19	6.3	6.9
VEW 26	18						2.8					
VEW 27	5.3	9.8	13	8.9	1.3	7.8	0.0	2.8	5.6	6.8	2.3	5.5
VEW 28	9.9						0.0	5.3	0.8	2.2	0.7	3.8
VEW 29	29	26	25	6.5	5.3	6.7	0.0	12	15	15	4.2	5.0

NR = not recorded

7. Water Level

The figure below presents a water level contour map for the site. The project team believes the digiPAM in TPV03 is malfunctioning due to the continued presence of product in the well.

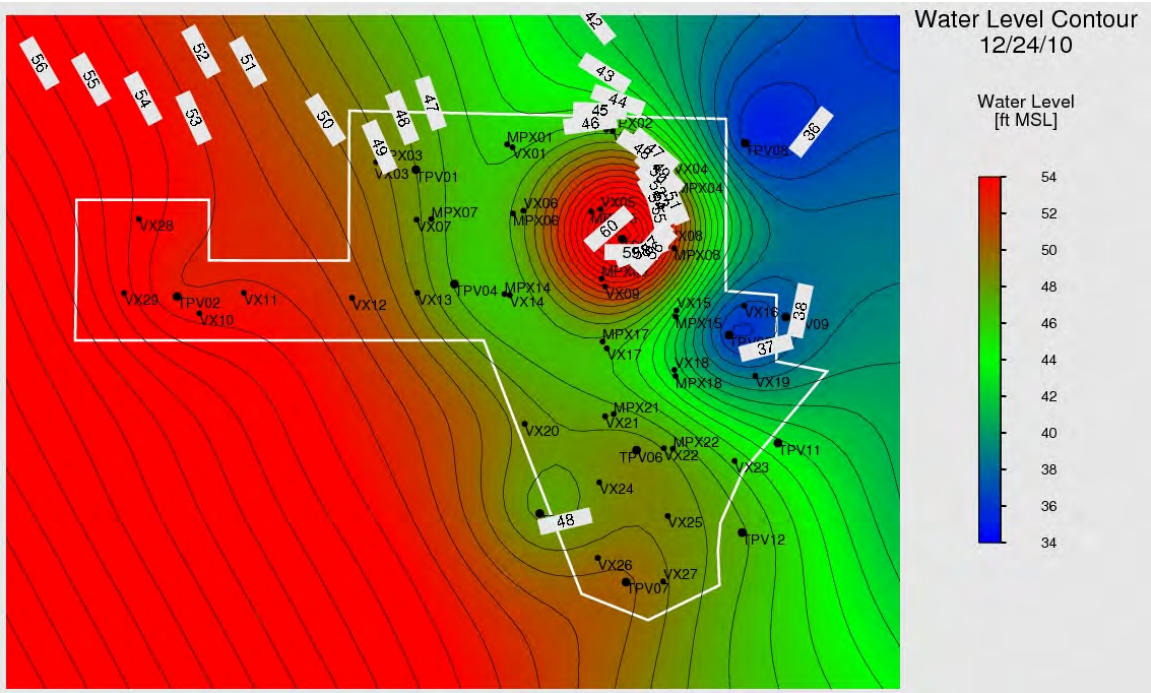


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

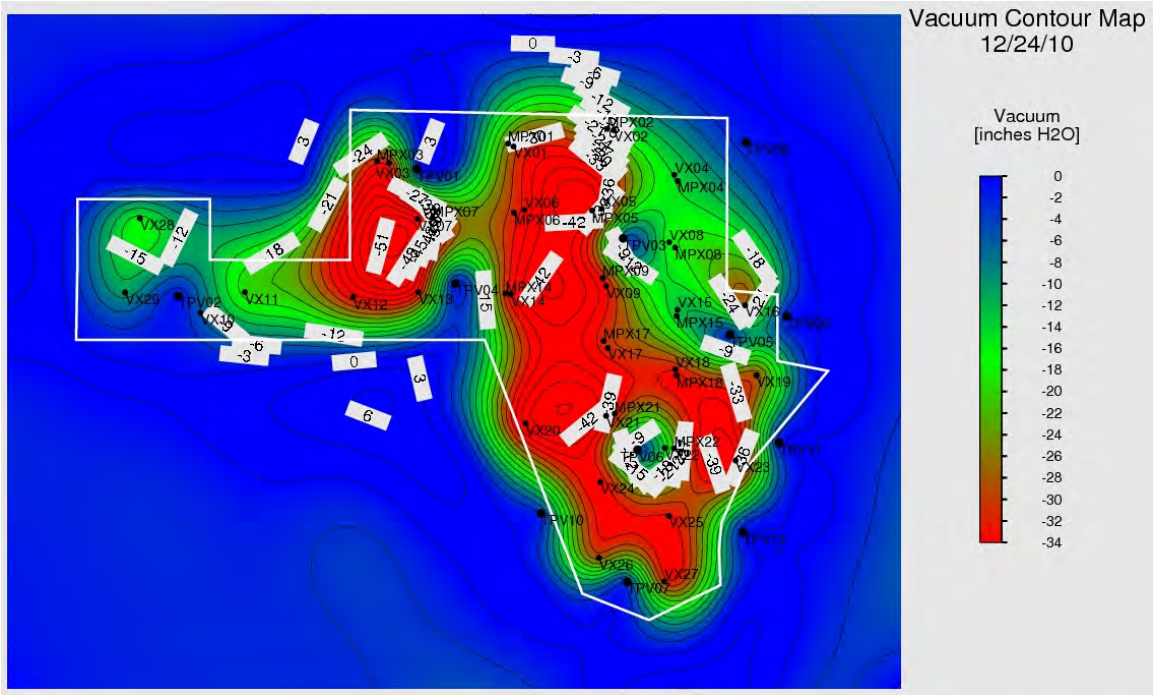


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,415,363 gallons of water since system startup while extracting a total of 1,716,841 gallons of water from the wellfield (as seen in Figure 10 below) plus an additional 301,478 gallons as condensate.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

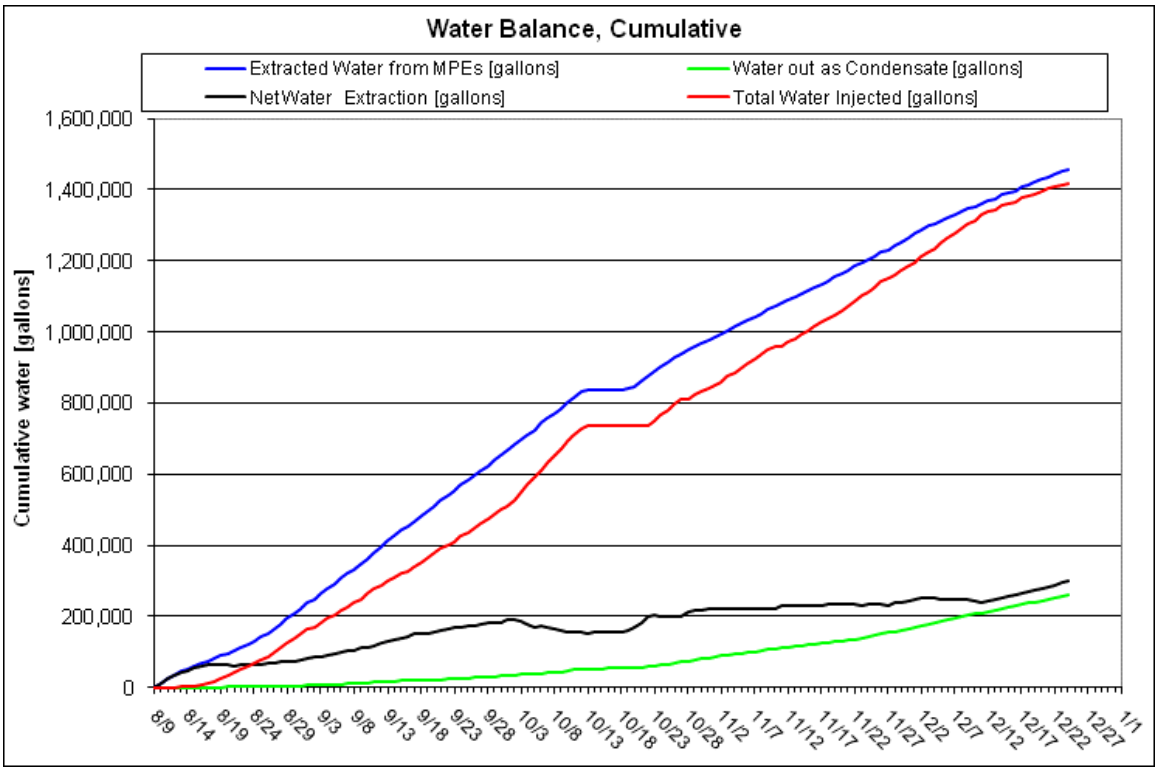


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

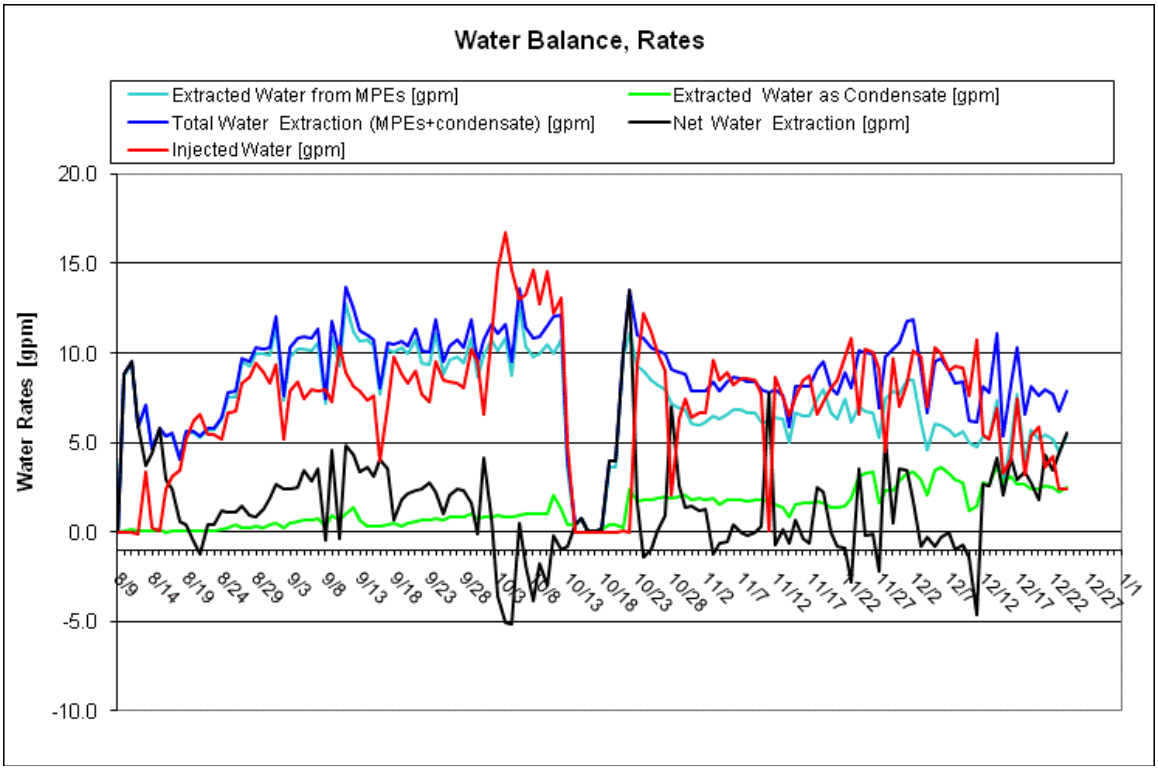


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

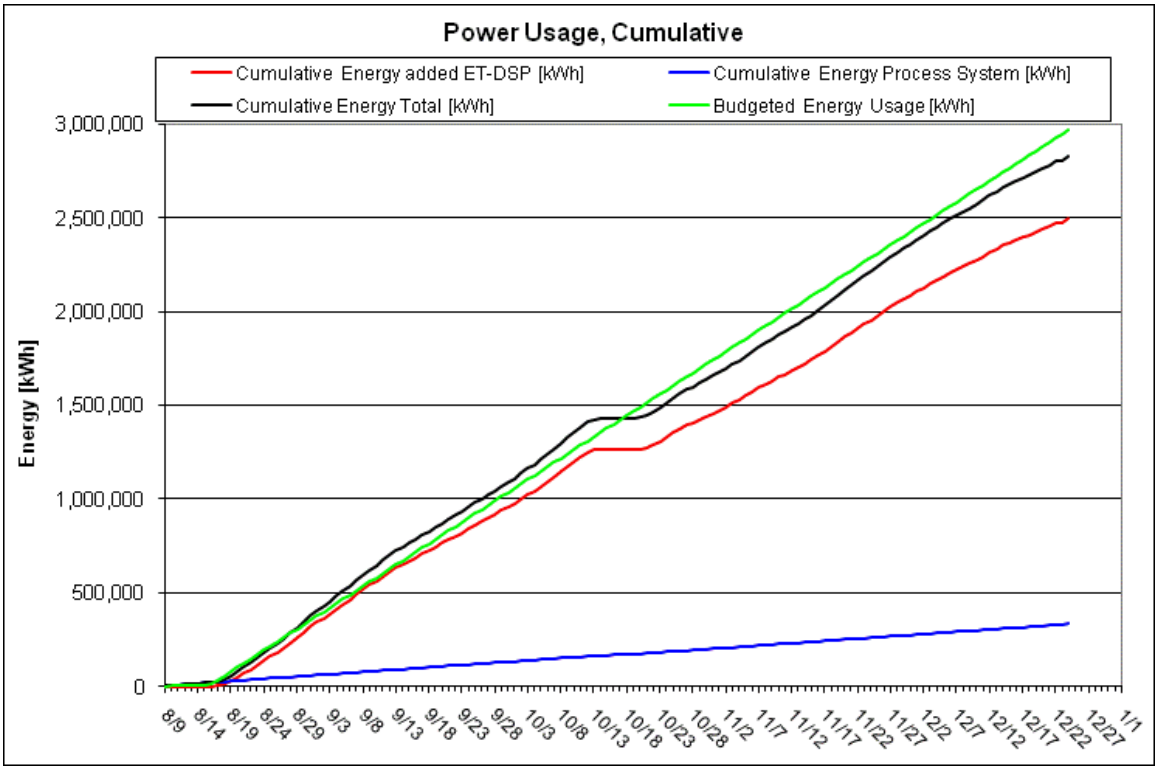


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Steam injection began into Steam Spears 6, 7 and 8 at a combined total pressure of 50 psi.

Incidents:

On 22 December, at approximately 1715 EST, TerraTherm staff heard a noise in the wellfield and then observed the release of steam near the steam header line at the site (observed steam was directly from the steam generator line and was not from the subsurface). TerraTherm staff turned the power off to the steam generator. An investigation was conducted and it was determined that the threads on one of the Kynar nipples installed in the steam line at the steam header gave due to the pressure in the line. The Kynar nipples were removed and replaced with Schedule 40 malleable iron on 22 December.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged.

Progress Report

12/25/2010 through 12/31/2010
January 3, 2011
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from December 25 through December 31, 2010 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 12/31/2010		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	136	days
Energy used to date	2,947,840	kWh
Injected energy per soil volume to date	157	kWh/cy
Water contaminant removal last 7 days	0.6	lbs
Water contaminant removal to date	18.4	lbs
Vapor contaminant removal last 7 days	8	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	347	lbs
Average temperature Area A last 7 days	176	°F
Average temperature Area C last 7 days	137	°F
Average temperature Area D last 7 days	160	°F
Average power usage rate last 7 days	729	kW
Average total water extracted rate last 7 days	5.8	gpm
Average injected water rate last 7 days	5.8	gpm
Average vapor extraction rate (non condensable) last 7 days	540	scfm

System Shutdowns

Saturday, 25 December: Upon arrival at the site, the thermal treatment system was not operating. It is believed that freezing overnight temperatures caused the rental air compressor to shut down resulting in a series of system shutdowns due to freezing of the air and water lines. The vapor treatment process equipment was brought back online at approximately 1000 EST. After several hours of unsuccessful attempts to restart the rental air compressor, it was decided to leave the compressor off for the day and bring additional labor to the site for Sunday to thaw the air and water lines feeding the multiphase extraction pumps.

Sunday, 26 December: TerraTherm was onsite to thaw air and water lines that feed the multiphase extraction pumps. The rental air compressor was successfully brought back online and the extraction wells were fully functional by 2000 EST.

Wednesday, 29 December: An alarm was received at approximately 0930 EST notifying TerraTherm and Mc2 that one of the water circulation units was exceeding the pre-set pressure limits. After evaluation of all three units, it was determined that the water injection line to the smallest of the three water circulation units was frozen. TerraTherm thawed the injection line for future saline additions.

Thursday, 30 December: At approximately 0300 EST, the TerraTherm air compressor unit (which had been serviced by the vendor on 28 December and put back into service) shut down resulting in a shutdown of the multiphase extraction wells. Upon arrival at the site, the compressor was restarted, but continued to trip several times during the next couple hours. The rental air compressor was put back online to operate the multiphase extraction wells and the vendor returned to the site to troubleshoot the TerraTherm air compressor. The vendor identified a faulty temperature sensor that was installed during the 28 December vendor maintenance (discussed below). A new temperature sensor was installed and the TerraTherm air compressor was brought back online at approximately 2300 EST.

System Maintenance

Monday, 27 December: Several TerraTherm staff were onsite to perform preventative maintenance and calibration of the process equipment.

Tuesday, 28 December: Extraction wells were turned off from approximately 0800 to 1400 EST to perform maintenance by the vendor on the TerraTherm owned air compressor. During maintenance of the air compressor, the air and water lines feeding the multiphase extraction pumps were thawed.

Friday, 31 December: Maintenance (primarily calibration) of the newly installed Magnahelic gauge and pitot tube installed prior to the vapor carbon trailer were performed.

Other routine maintenance such as bag filter changes, gauge maintenance, flushing of lines, backwashing of carbon vessels, winterization, etc. continues to occur.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

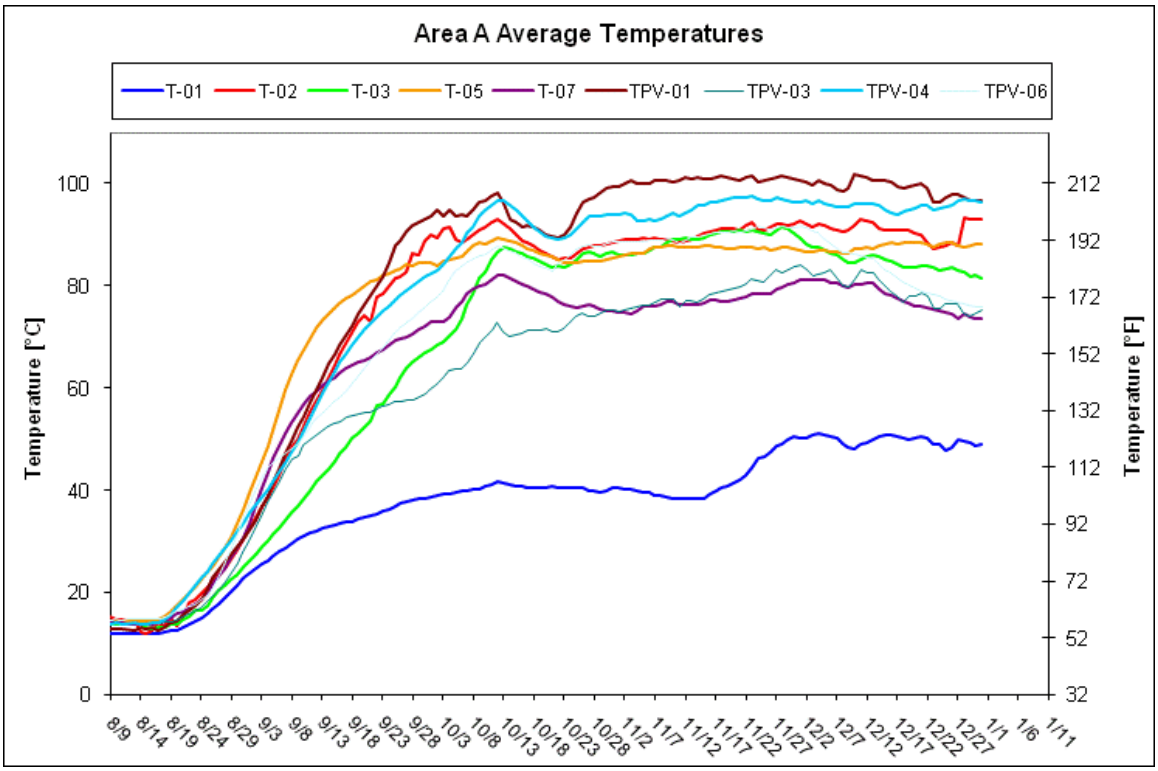


Figure 1. Average Temperature – Area A

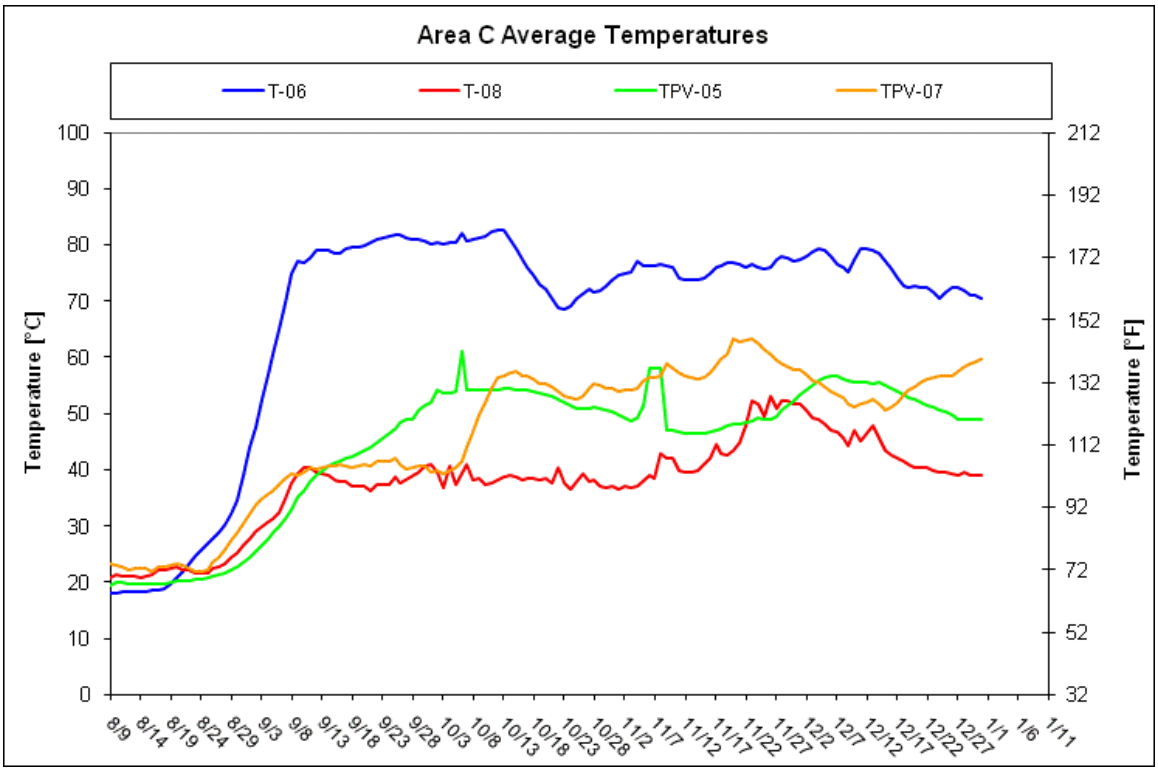


Figure 2. Average Temperature – Area C

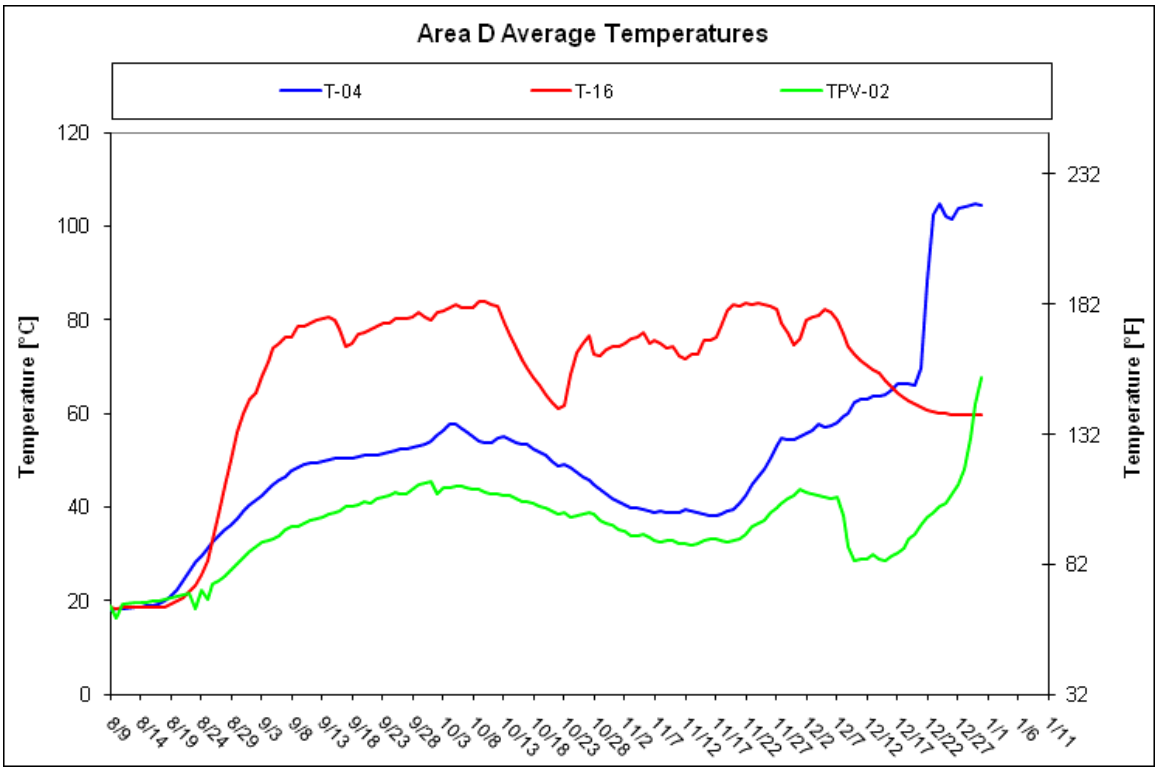


Figure 3. Average Temperature – Area D

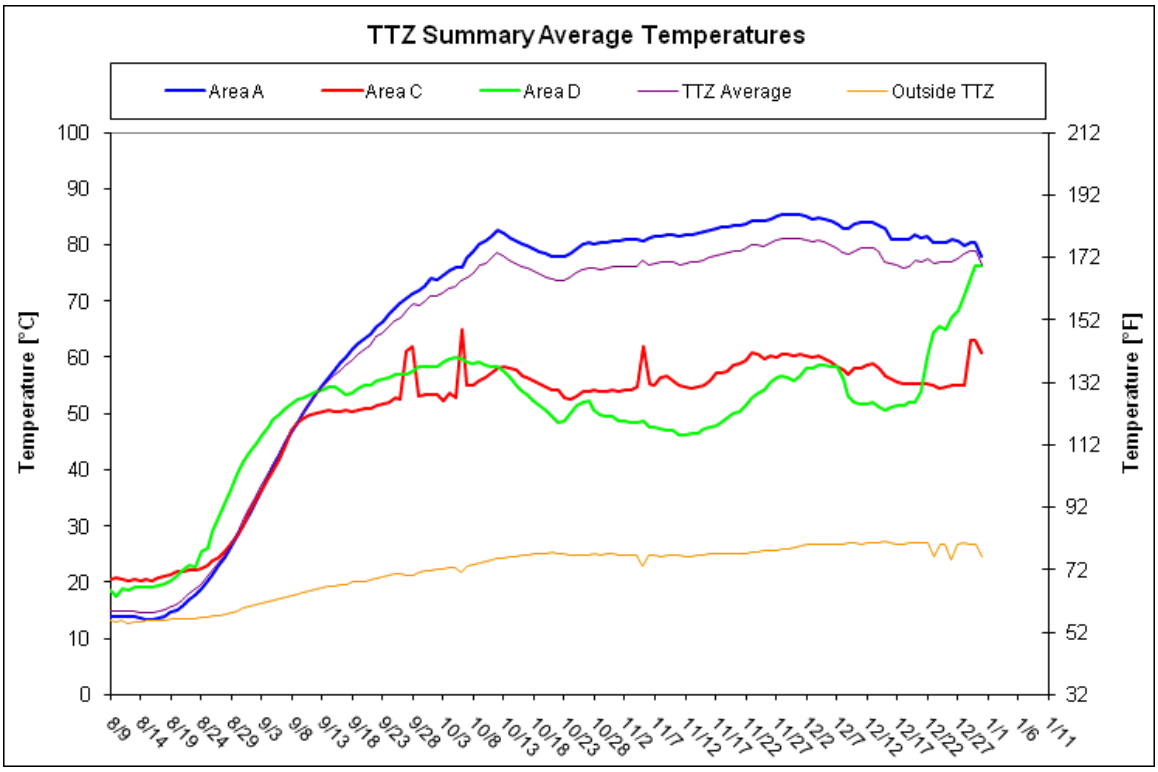


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

The pitot tube used to measure the non-condensable vapor data was malfunctioning and replaced on 31 December. Previously reported vapor flow rates are currently being evaluated and will be updated on the next progress report, if needed.

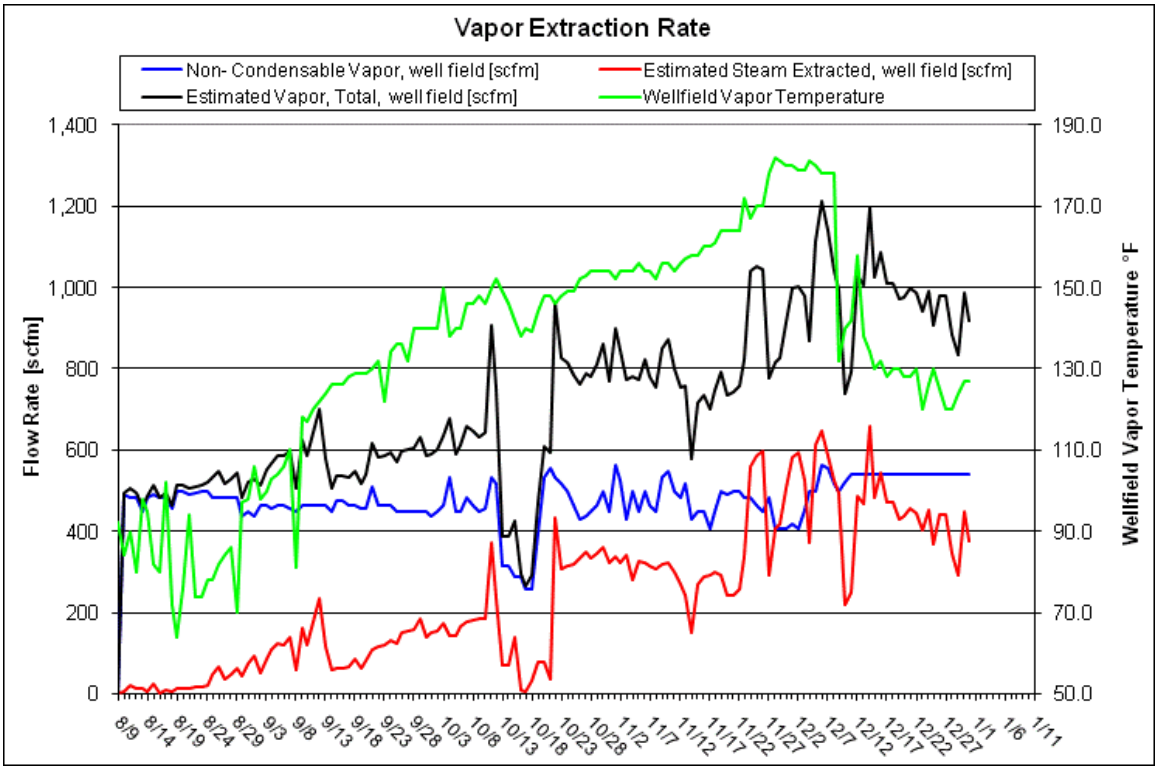


Figure 5. Vapor Extraction Rate and Temperature

4. Photo Ionization Detector (PID) and Destruction Removal Efficiency (DRE)

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

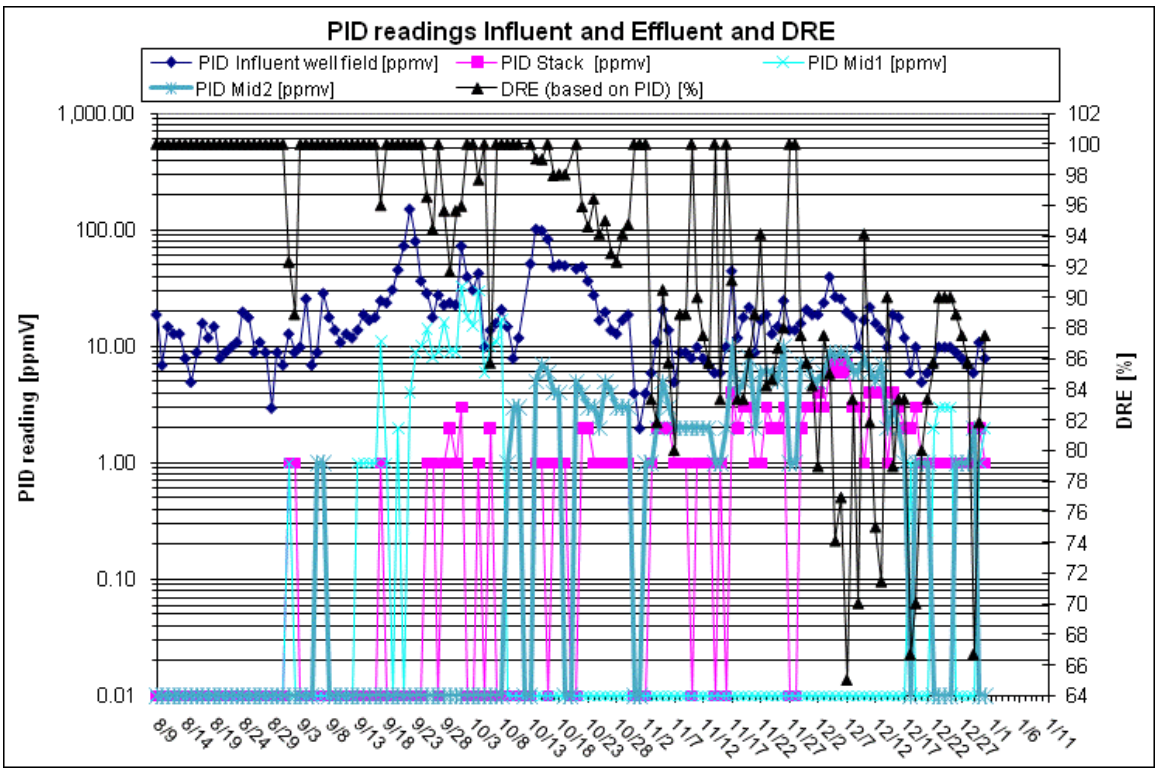


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

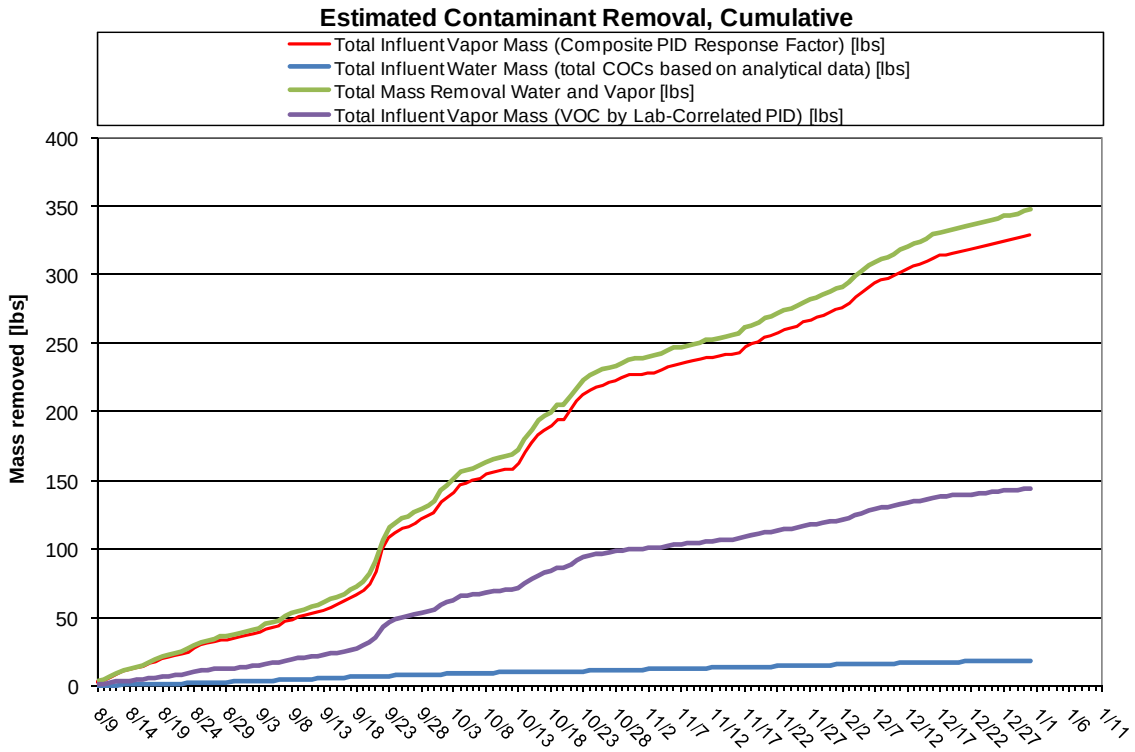


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 12/29/2010. The table below presents the concentrations in ppmV from the 9/29/10 through the most recent sampling event.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	9/29/10	10/8/10	10/21/10	10/27/10	11/3/10	11/10/10	11/17/10	11/23/10	12/1-2/2010	12/7/10	12/14/10	12/22/10	12/29/10
VEW 1	11						6.1	25	7.3	11	3.1	9.8	
VEW 2	7.4	5.2	21	16	8.1	6.8	5.3	13	10	19	2.8	5.2	
VEW 3	74	40					34	9.7	9.9	23		12.5	
VEW 4	13						NR	51	17	33	9.9	13.1	
VEW 5	75	53	70	65	7.6	24	29	77	35	51	27	24.2	
VEW 6	32	12	21	18	2.9	7.3	2.2						
VEW 7	16						0.0	20	2.4	7.7	3.5	9.6	
VEW 8	11						2.2						
VEW 9	151	29	137	56	39	25	33	105	25	59	24	12.4	
VEW 10	5.8						0.8					8.5	4.3
VEW 11	6.4						1.2					4.1	4.0
VEW 12	13						29	13	10	19	2.7	8.5	4.0
VEW 13	29	47	94	26	3.4	18	12	30	19	28	18	13.9	9.4
VEW 14	93	47	36	23	1.2	8.0	4.7					18.8	1.4
VEW 15	268	164	266	164	23	57	102	128	69	65	43	20.8	
VEW 16	15						2.5						
VEW 17	185	106	147	71	50	37	45	71	37	54	39	38.3	
VEW 18	13						6.5	13	13	7.9	11	6.8	
VEW 19	17	34	51	17	14	22	3.1						
VEW 20	42	61	51	20	2.7	24	11	47	15	12	7.9	9.9	3.6
VEW 21	177	108	69	41	22	41	25	60	31	25	23	14.7	
VEW 22	20		25	12	2.6	3.5	4.1						
VEW 23	19						5.7	87	48	39	20	15.4	
VEW 24	176	47	25	14	5.0	11	4.3						
VEW 25	8.5						7.5	36	12	19	6.3	6.9	
VEW 26	18						2.8						
VEW 27	5.3	9.8	13	8.9	1.3	7.8	0.0	2.8	5.6	6.8	2.3	5.5	
VEW 28	9.9						0.0	5.3	0.8	2.2	0.7	3.8	
VEW 29	29	26	25	6.5	5.3	6.7	0.0	12	15	15	4.2	5.0	4.5

NR = not recorded

7. Water Level

The figure below presents a water level contour map for the site. The digiPAM in TPV03 is malfunctioning and will be replaced by TerraTherm operators this week (data for TPV03 has been interpolated in the water level contour map below).

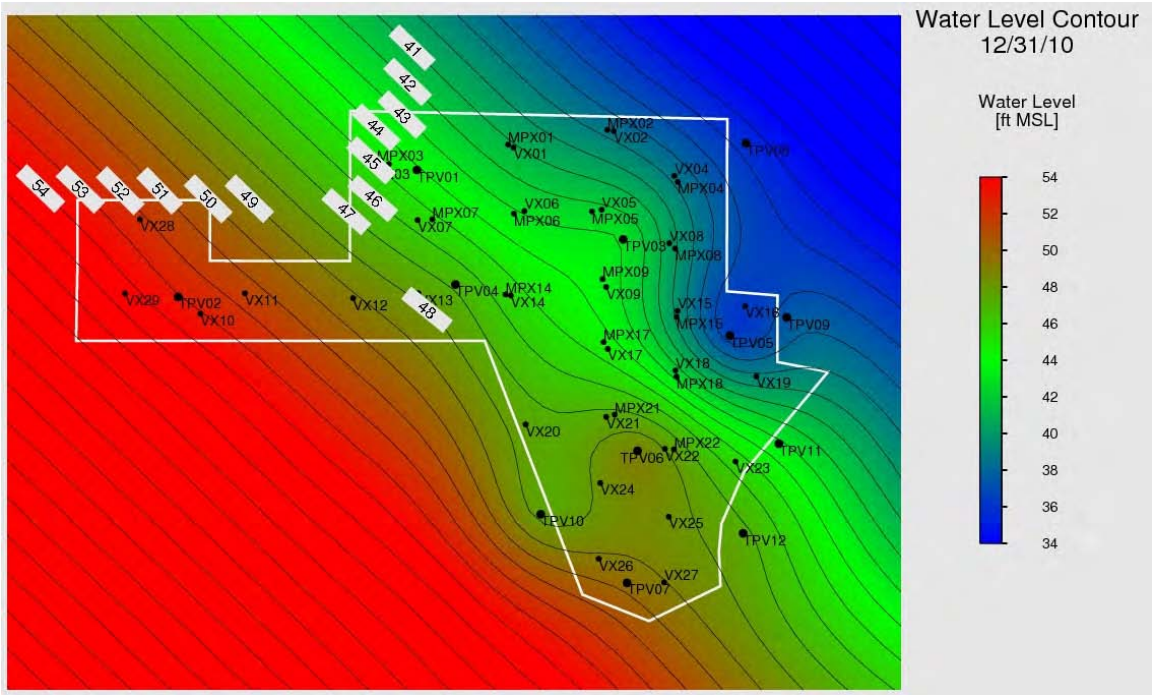


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

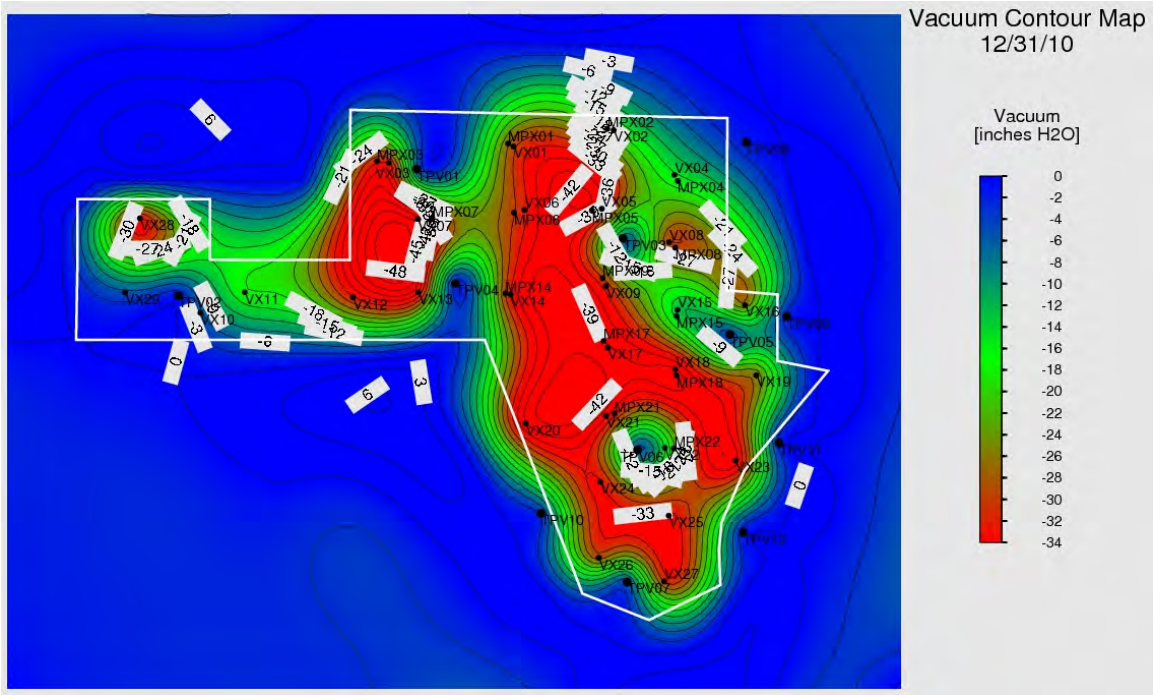


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,473,458 gallons of water since system startup while extracting a total of 1,775,798 gallons of water from the wellfield (as seen in Figure 10 below) plus an additional 302,340 gallons as condensate.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

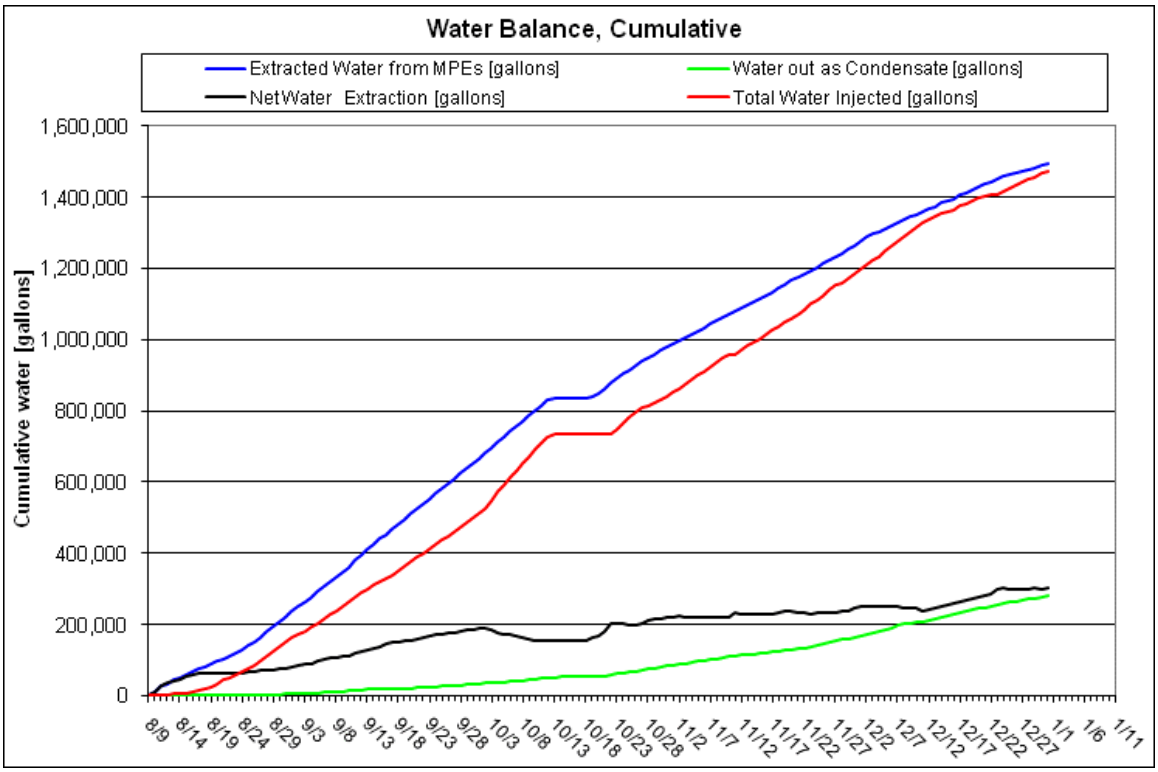


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

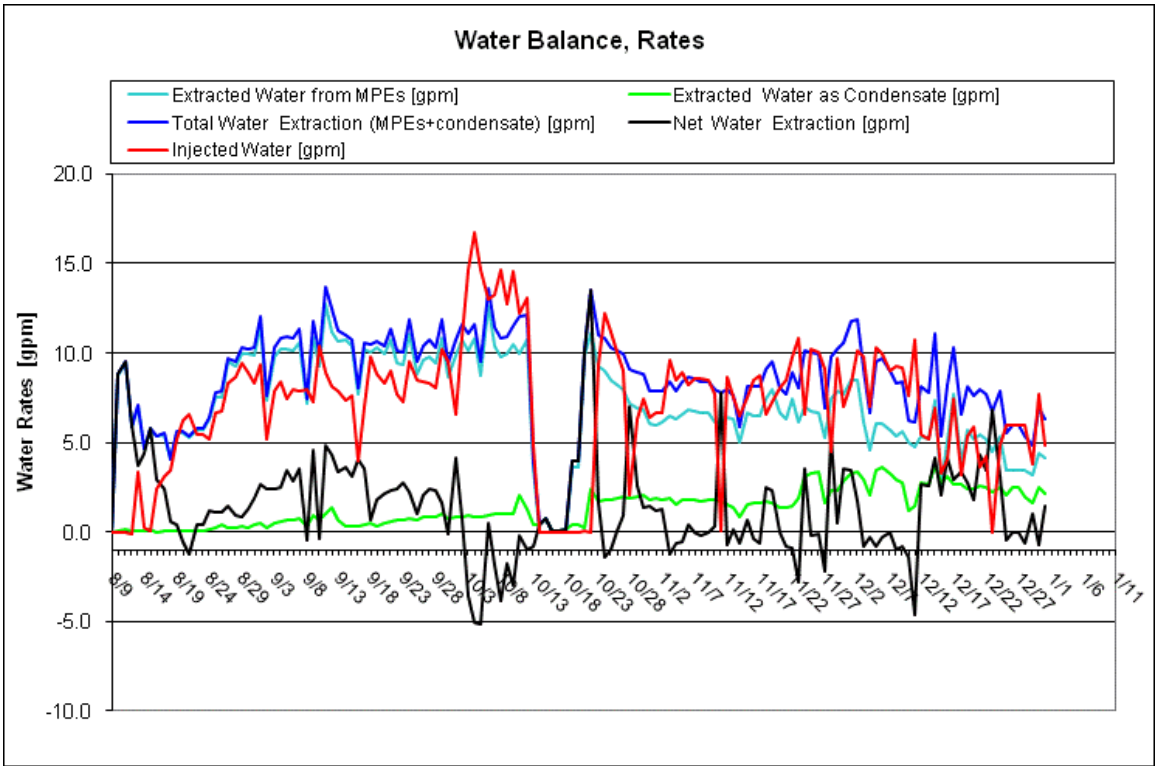


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

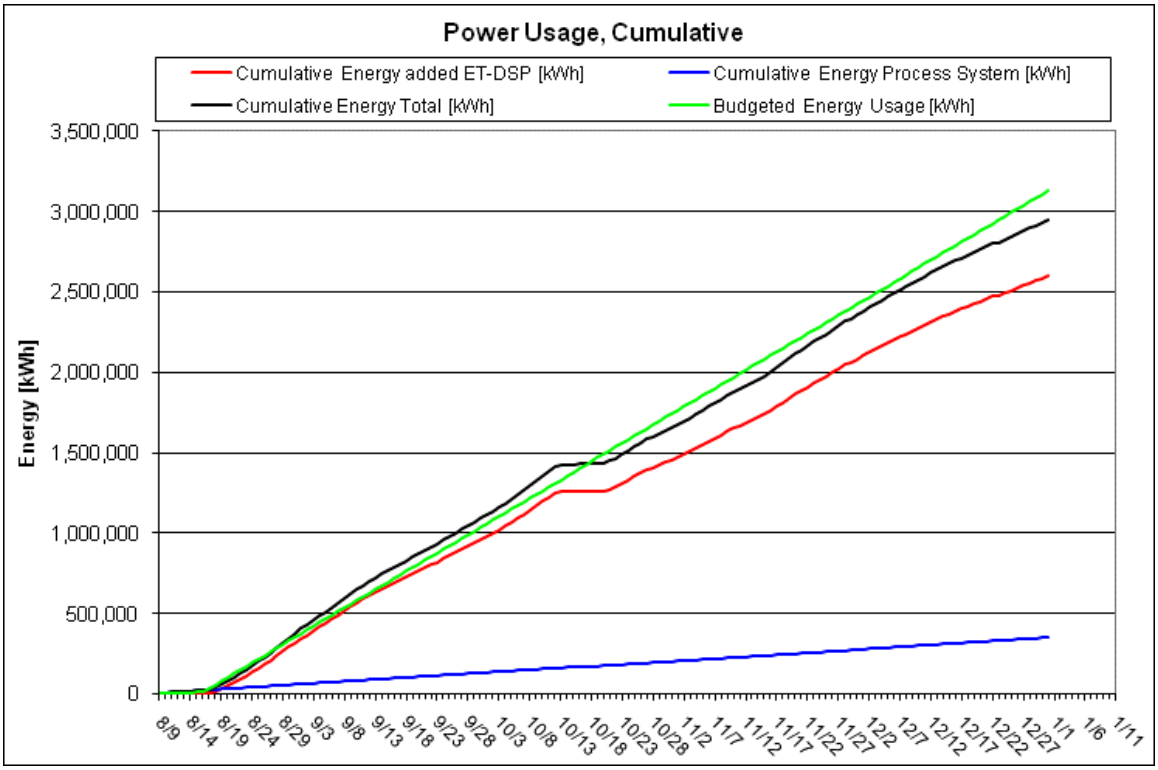


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Steam injection has continued at Steam Spears 6, 7 and 8 at a combined total pressure of 50 psi.

The following saline injection was made:

December 30 – 80 lbs

Incidents:

No safety or environmental compliance incidents were reported for the December 25 through 31, 2010 operational period.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged.

Progress Report

1/1/2011 through 1/7/2011
January 10, 2011
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from January 1 through January 7, 2011 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 1/7/2011		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/18/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	142	days
Energy used to date	3,051,840	kWh
Injected energy per soil volume to date	163	kWh/cy
Water contaminant removal last 7 days	0.6	lbs
Water contaminant removal to date	19.0	lbs
Vapor contaminant removal last 7 days	8	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	355	lbs
Average temperature Area A last 7 days	176	°F
Average temperature Area C last 7 days	135	°F
Average temperature Area D last 7 days	180	°F
Average power usage rate last 7 days	747	kW
Average total water extracted rate last 7 days	6.8	gpm
Average injected water rate last 7 days	5.9	gpm
Average vapor extraction rate (non condensable) last 7 days	489	scfm

System Shutdowns

January 4, 2011: Extraction from the wellfield was ceased at approximately 1100 EST due to the treatment plant not being able to accept water. The vacuum blowers were decreased approximately one hour later after receiving an update on the treatment plant from Nobis. Multiphase extraction pumps were turned back on at approximately 1300 EST. The treatment plant was fully operational at approximately 1700 EST. The speed of the vacuum blowers was increased shortly after 1700 EST.

January 5, 2011: The wellfield was shutdown at approximately 0730 EST for groundwater sampling and gauging. The wellfield was turned back on at approximately 1700 EST. While the system was down, multiphase extraction well 01 was pulled and converted to a top loading pump. Temperature sensors in TPV-01 & -03 were replaced.

January 7, 2011: Upon arrival, the process system was shutdown resulting in the freezing of several air and water lines. Lines specific to the vapor treatment equipment were thawed and brought back online by approximately 1100 EST. The water process equipment and wellfield were thawed and brought back online throughout the day. The entire system was operating by 1700 EST. The wellfield continued to shutdown multiple times during the day for approximately 10 minutes during each shutdown. After several hours of system evaluation, it was determined that the breaker that controlled the air compressor was faulty. The breaker was replaced that evening. We have had no shutdowns since the breaker was replaced.

System Maintenance

January 6, 2011: The speed of the vacuum blowers was reduced in an effort to maintain heat in the wellfield.

Other routine maintenance such as bag filter changes, gauge maintenance, flushing of lines, backwashing of carbon vessels, winterization, etc. continues to occur.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

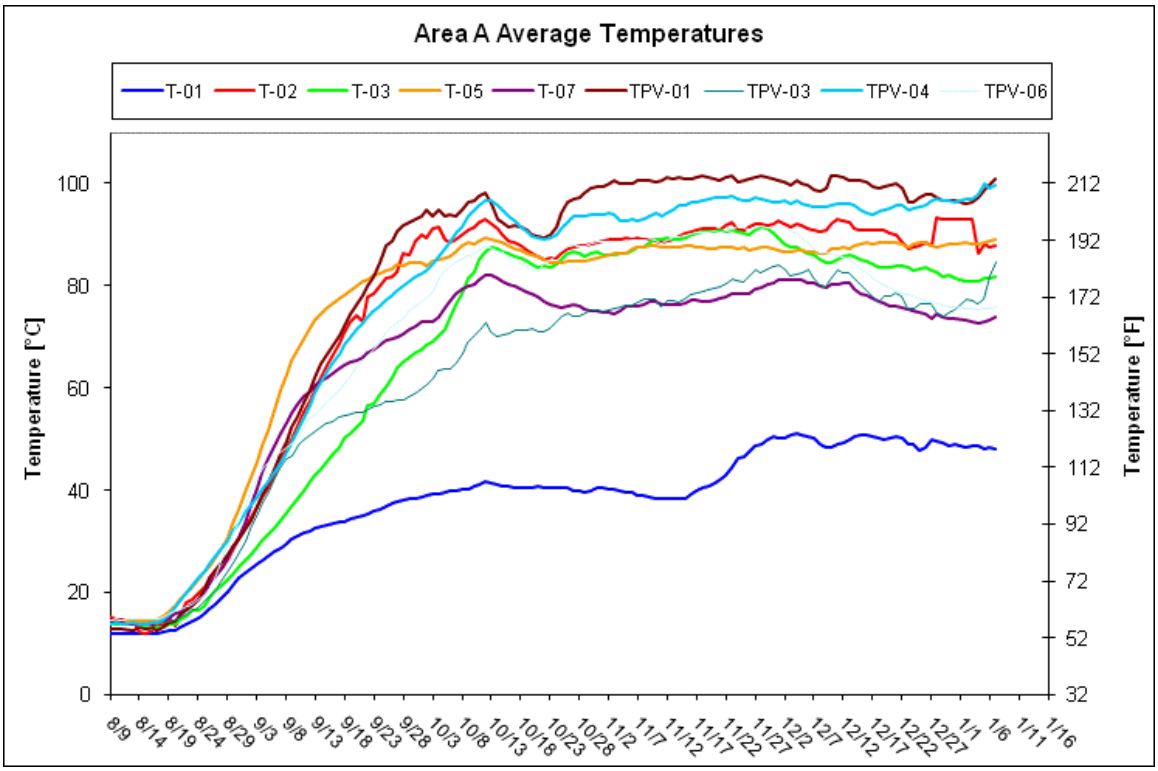


Figure 1. Average Temperature – Area A

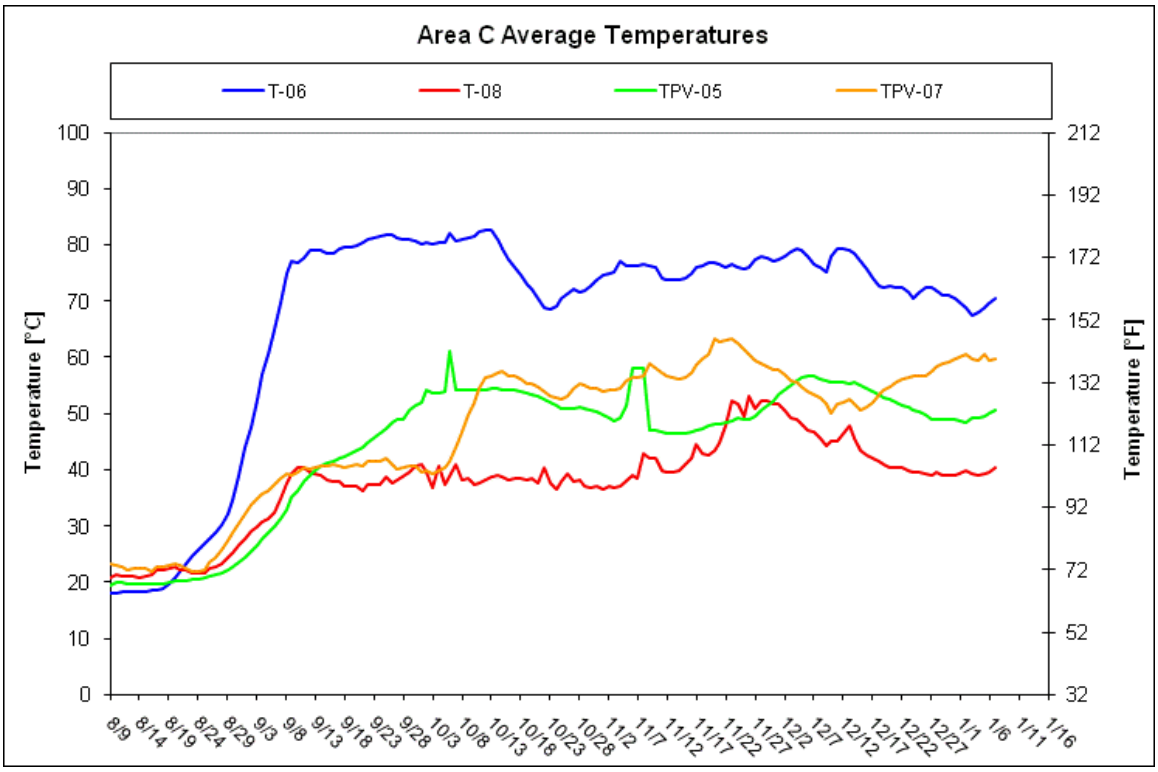


Figure 2. Average Temperature – Area C

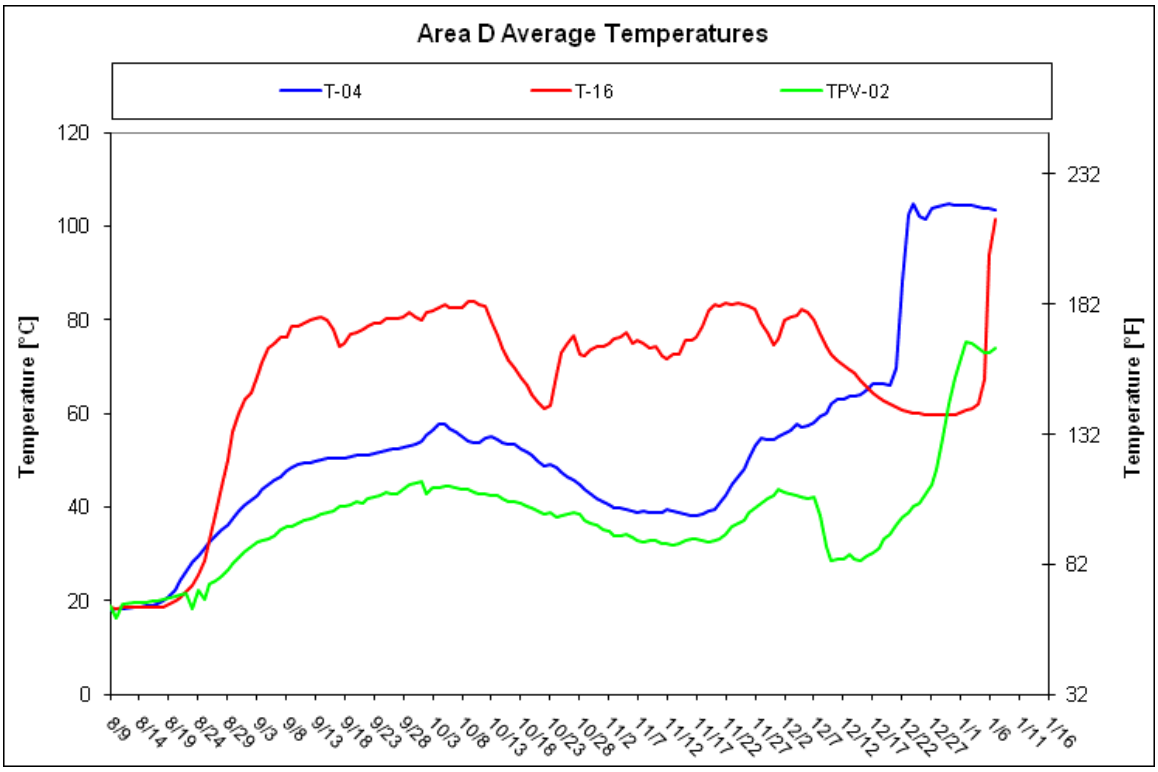


Figure 3. Average Temperature – Area D

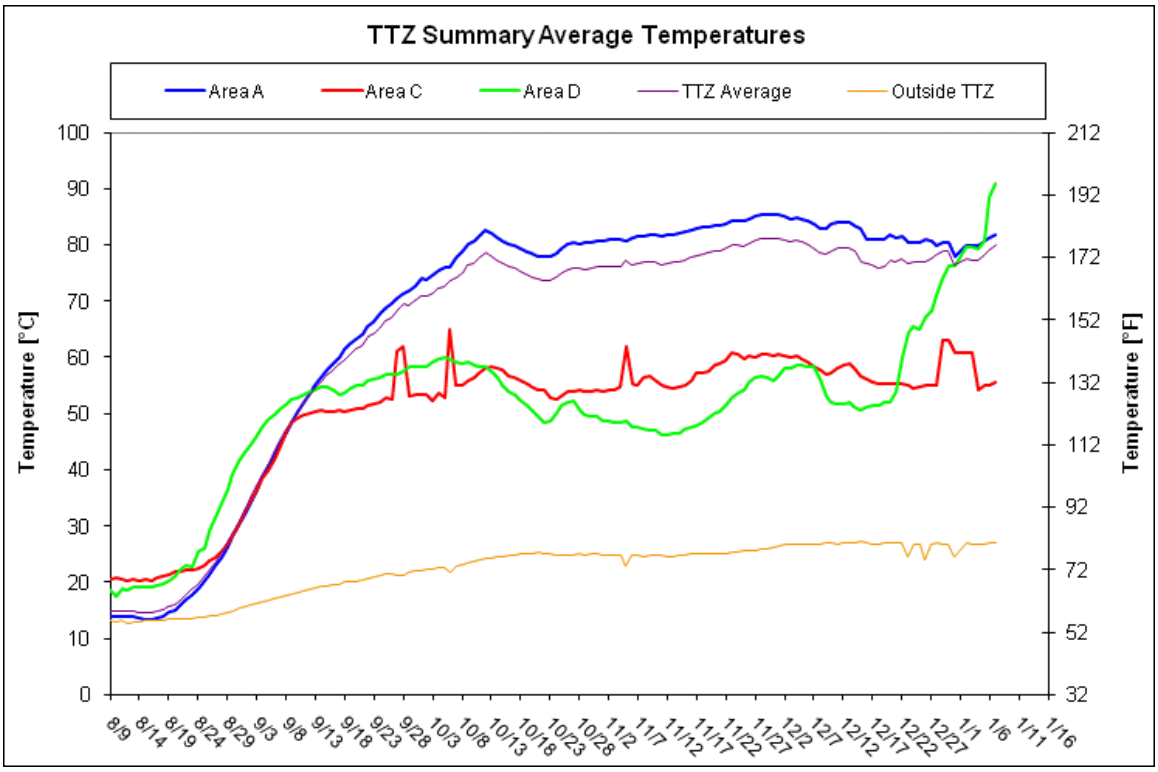


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

The pitot tube used to measure the non-condensable vapor data was malfunctioning and replaced on December 31. Previously reported vapor flow rates are currently being evaluated and will be updated on the next progress report, if needed.

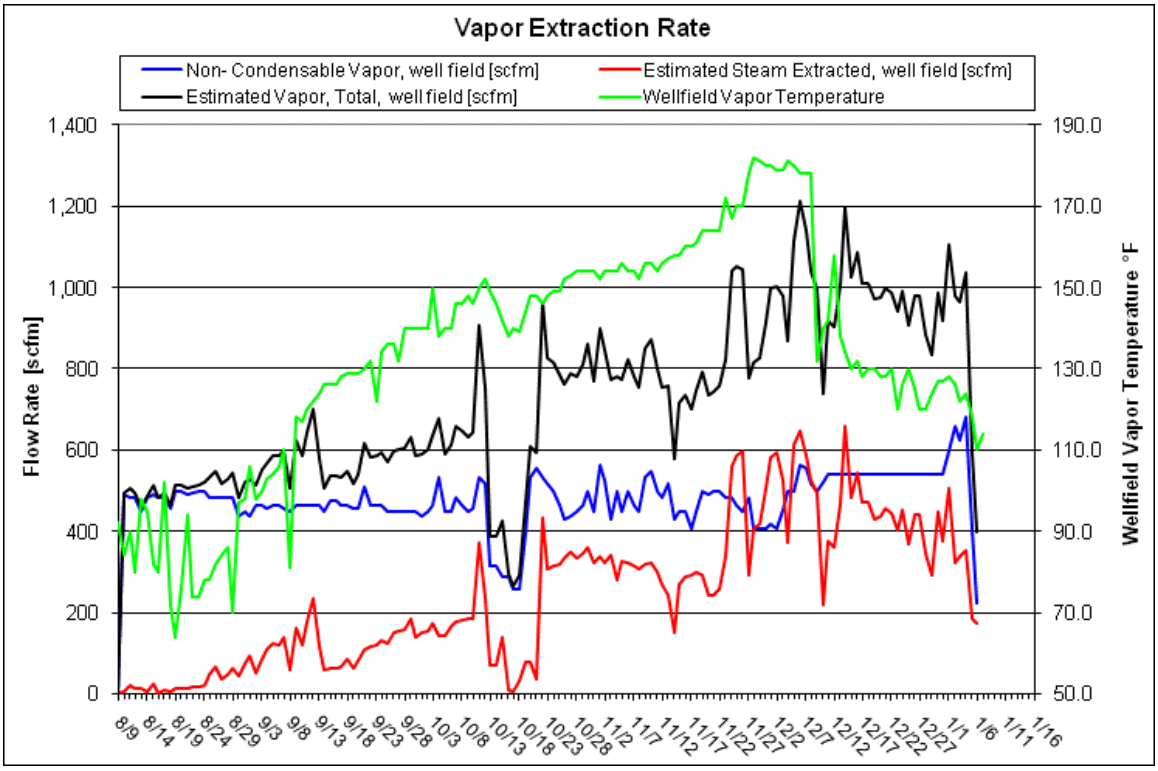


Figure 5. Vapor Extraction Rate and Temperature

4. Photo Ionization Detector (PID) and Destruction Removal Efficiency (DRE)

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

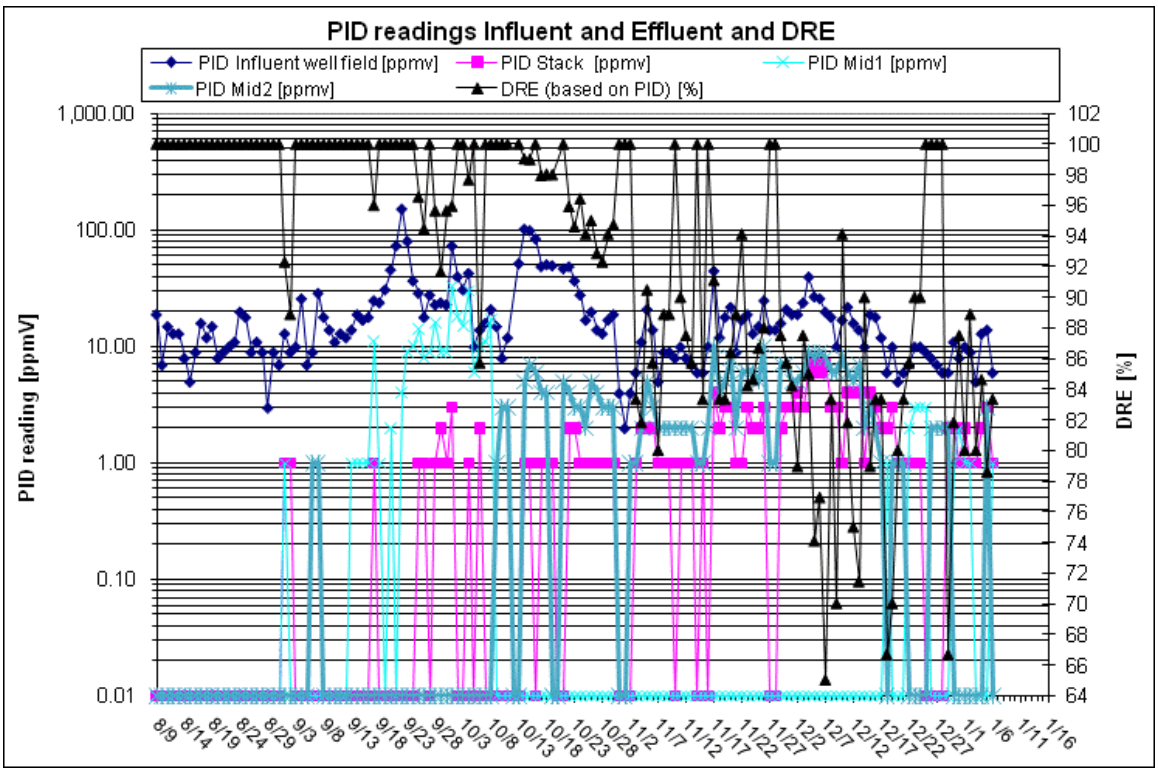


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

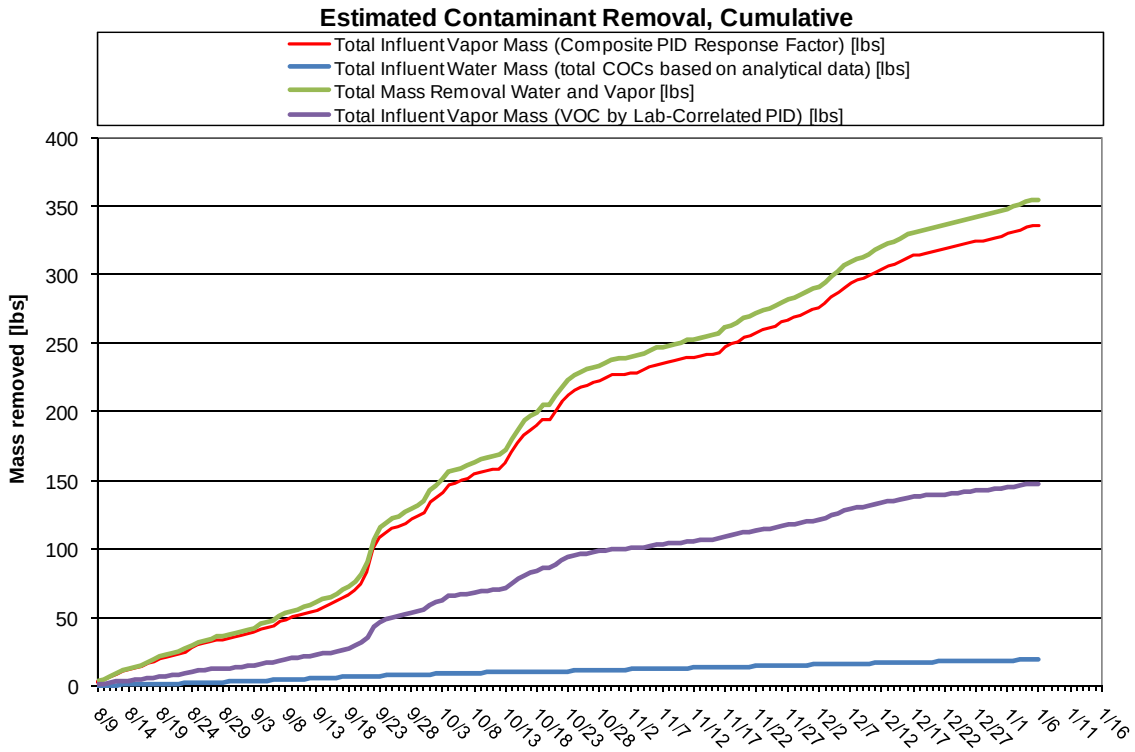


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 1/5/2011. We will send an updated table to the project team on 1/11/11 containing those data.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	9/29/10	10/8/10	10/21/10	10/27/10	11/3/10	11/10/10	11/17/10	11/23/10	12/1-2/2010	12/7/10	12/14/10	12/22/10	12/29/10
VEW 1	11						6.1	25	7.3	11	3.1	9.8	
VEW 2	7.4	5.2	21	16	8.1	6.8	5.3	13	10	19	2.8	5.2	
VEW 3	74	40					34	9.7	9.9	23		12.5	
VEW 4	13						NR	51	17	33	9.9	13.1	
VEW 5	75	53	70	65	7.6	24	29	77	35	51	27	24.2	
VEW 6	32	12	21	18	2.9	7.3	2.2						
VEW 7	16						0.0	20	2.4	7.7	3.5	9.6	
VEW 8	11						2.2						
VEW 9	151	29	137	56	39	25	33	105	25	59	24	12.4	
VEW 10	5.8						0.8					8.5	4.3
VEW 11	6.4						1.2					4.1	4.0
VEW 12	13						29	13	10	19	2.7	8.5	4.0
VEW 13	29	47	94	26	3.4	18	12	30	19	28	18	13.9	9.4
VEW 14	93	47	36	23	1.2	8.0	4.7					18.8	1.4
VEW 15	268	164	266	164	23	57	102	128	69	65	43	20.8	
VEW 16	15						2.5						
VEW 17	185	106	147	71	50	37	45	71	37	54	39	38.3	
VEW 18	13						6.5	13	13	7.9	11	6.8	
VEW 19	17	34	51	17	14	22	3.1						
VEW 20	42	61	51	20	2.7	24	11	47	15	12	7.9	9.9	3.6
VEW 21	177	108	69	41	22	41	25	60	31	25	23	14.7	
VEW 22	20		25	12	2.6	3.5	4.1						
VEW 23	19						5.7	87	48	39	20	15.4	
VEW 24	176	47	25	14	5.0	11	4.3						
VEW 25	8.5						7.5	36	12	19	6.3	6.9	
VEW 26	18						2.8						
VEW 27	5.3	9.8	13	8.9	1.3	7.8	0.0	2.8	5.6	6.8	2.3	5.5	
VEW 28	9.9						0.0	5.3	0.8	2.2	0.7	3.8	
VEW 29	29	26	25	6.5	5.3	6.7	0.0	12	15	15	4.2	5.0	4.5

NR = not recorded

7. Water Level

The figure below presents a water level contour map for the site.

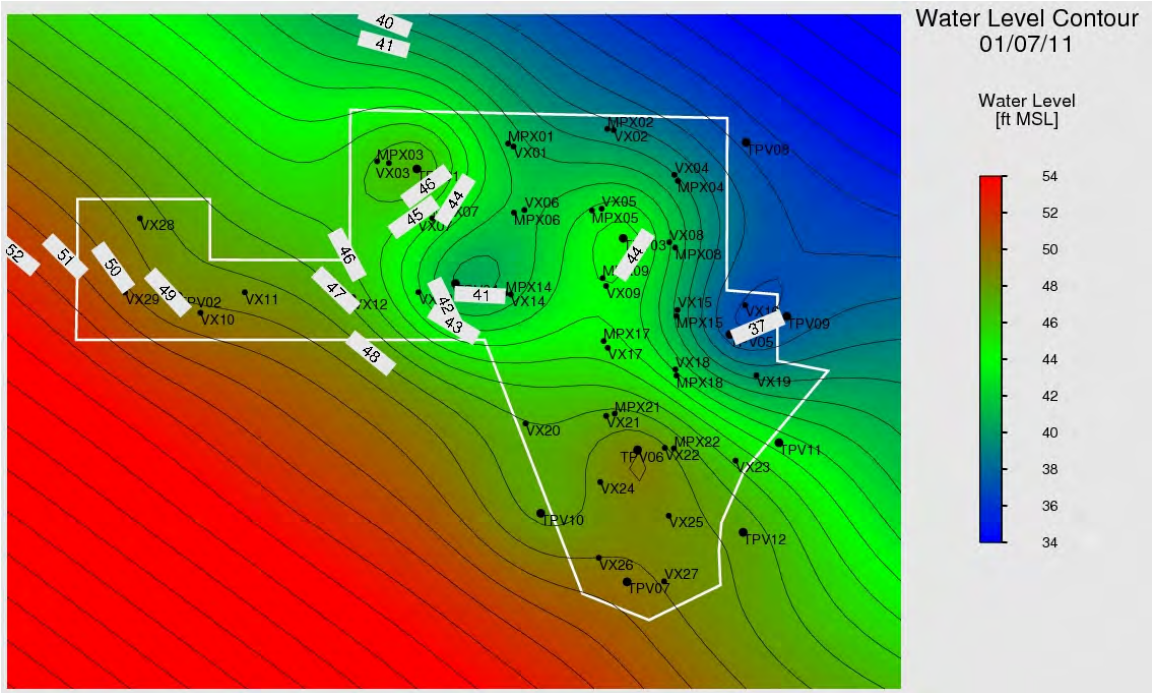


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site as of 1/8/11. Due to treatment system shutdown on 1/7/11, vacuum data were not recorded for this date.

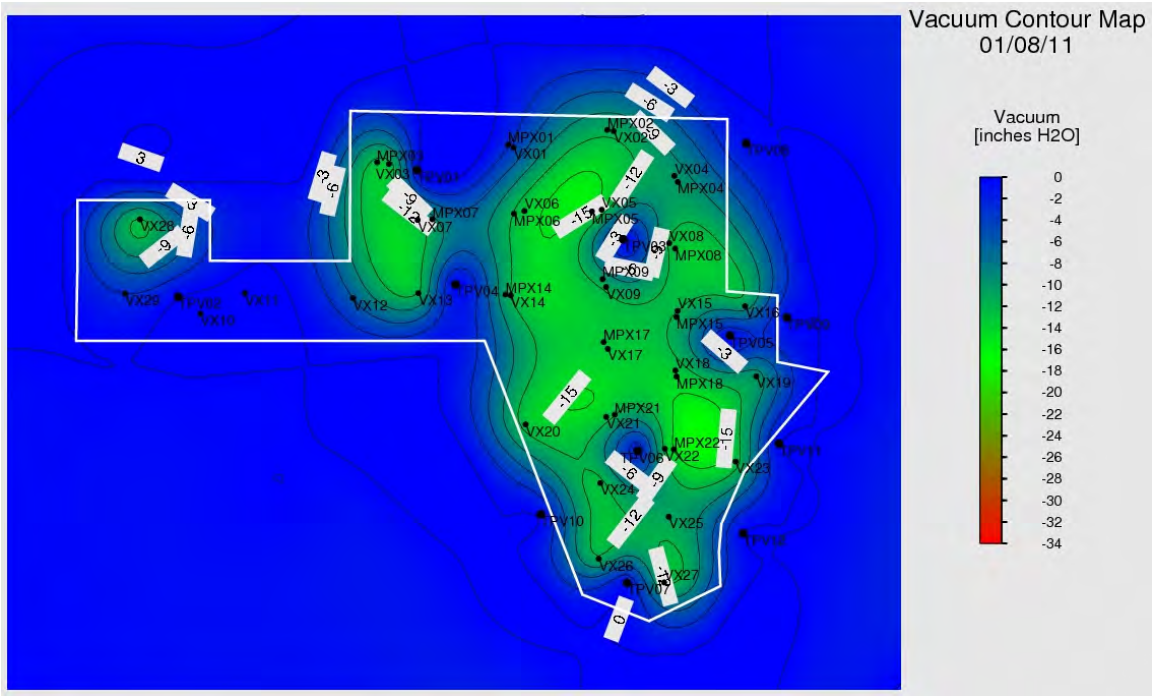


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,532,511 gallons of water since system startup while extracting a total of 1,844,425 gallons of water from the wellfield (as seen in Figure 10 below) plus an additional 311,914 gallons as condensate.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

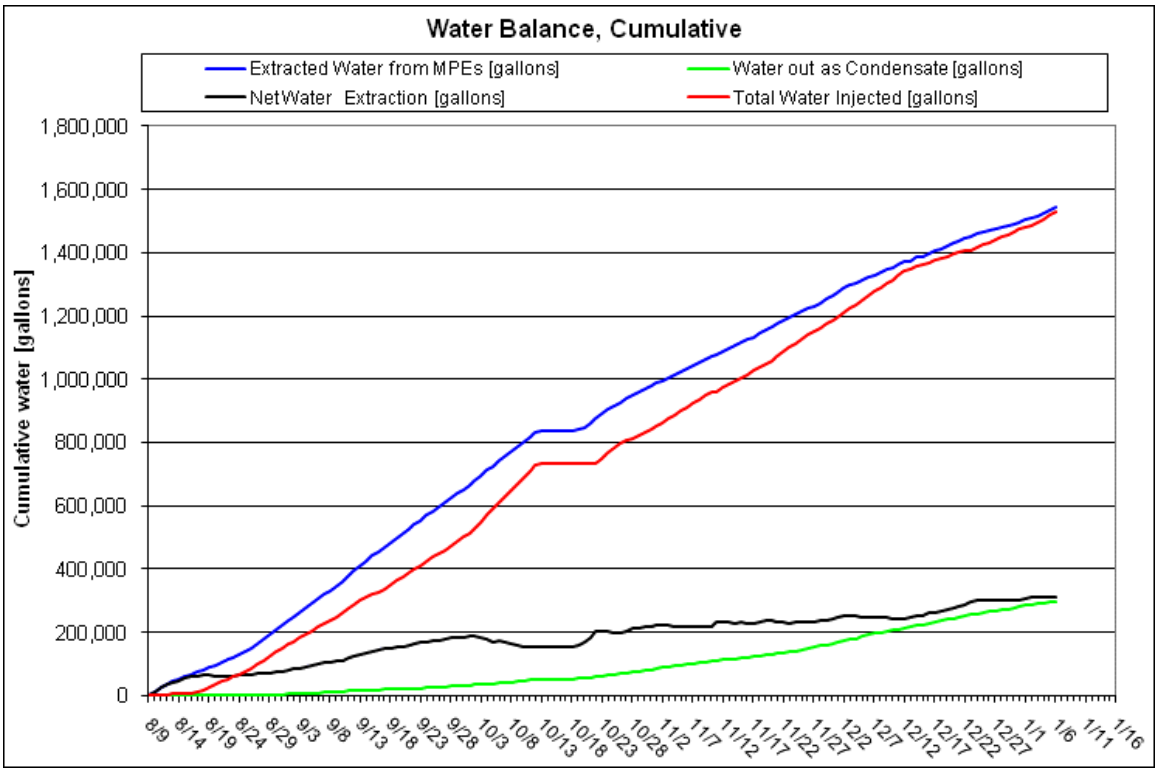


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

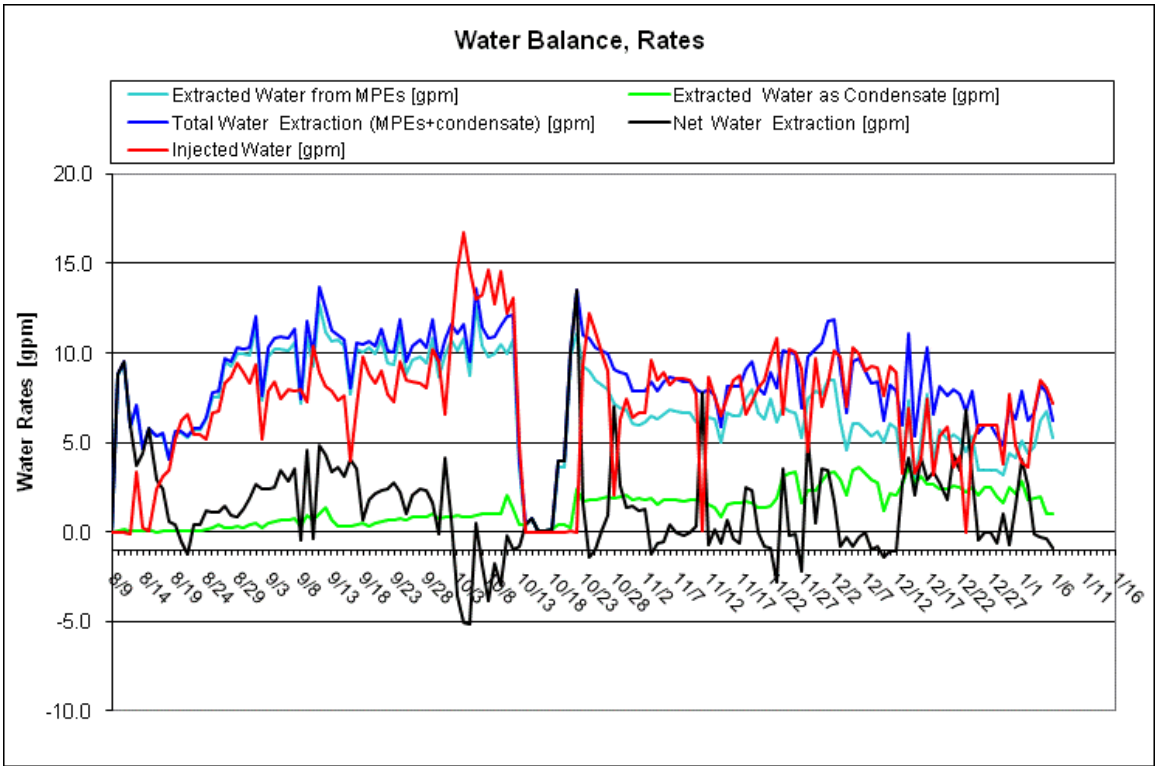


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

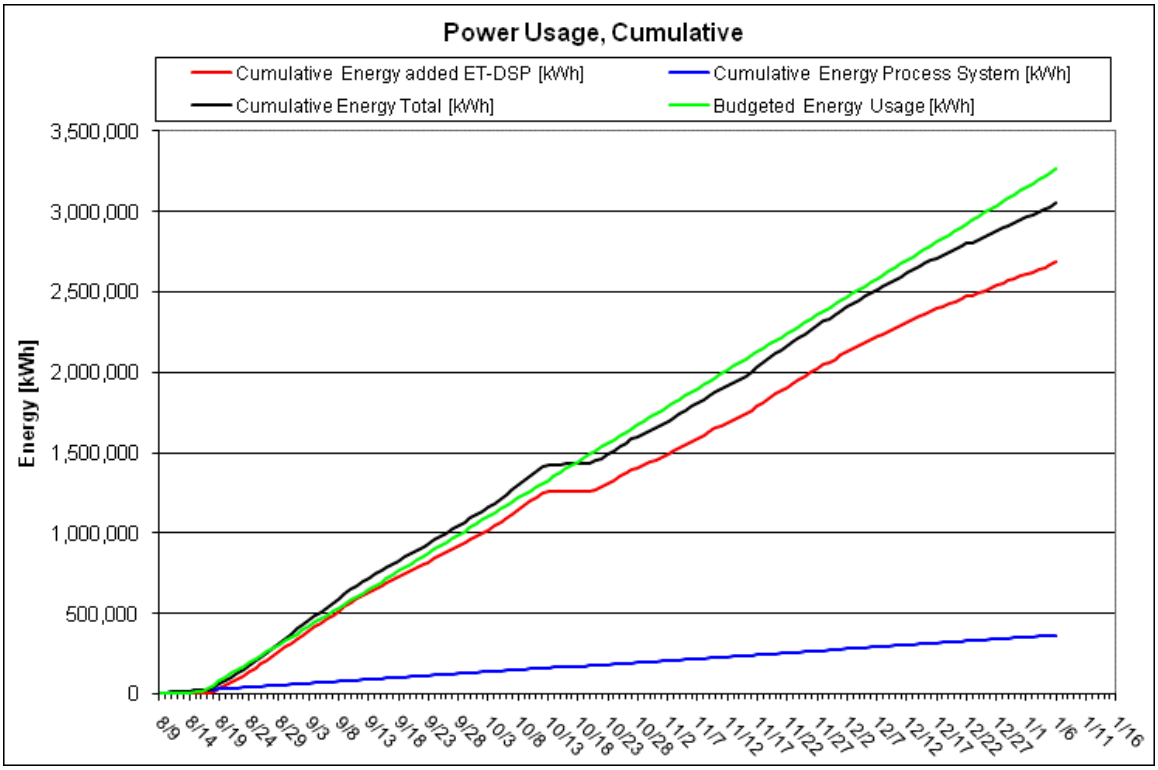


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Steam injection continued at Steam Spears 7, 8, and extraction well X-29 at a combined total pressure of 50 psi until 1/5/11. On 1/5/11, steam injection was moved to Steam Spears 3, 4, and 5 and continued at extraction well X-29 at a combined total pressure of 50 psi.

The following saline injection was made:

January 4, 2011 – 80 lbs

Incidents:

No safety or environmental compliance incidents were reported for the January 1 through 7, 2011 operational period.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged.

Progress Report

1/1/2011 through 1/7/2011
January 10, 2011
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from January 1 through January 7, 2011 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 1/7/2011		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/18/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	142	days
Energy used to date	3,051,840	kWh
Injected energy per soil volume to date	163	kWh/cy
Water contaminant removal last 7 days	0.6	lbs
Water contaminant removal to date	19.0	lbs
Vapor contaminant removal last 7 days	8	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	355	lbs
Average temperature Area A last 7 days	176	°F
Average temperature Area C last 7 days	135	°F
Average temperature Area D last 7 days	180	°F
Average power usage rate last 7 days	747	kW
Average total water extracted rate last 7 days	6.8	gpm
Average injected water rate last 7 days	5.9	gpm
Average vapor extraction rate (non condensable) last 7 days	489	scfm

System Shutdowns

January 4, 2011: Extraction from the wellfield was ceased at approximately 1100 EST due to the treatment plant not being able to accept water. The vacuum blowers were decreased approximately one hour later after receiving an update on the treatment plant from Nobis. Multiphase extraction pumps were turned back on at approximately 1300 EST. The treatment plant was fully operational at approximately 1700 EST. The speed of the vacuum blowers was increased shortly after 1700 EST.

January 5, 2011: The wellfield was shutdown at approximately 0730 EST for groundwater sampling and gauging. The wellfield was turned back on at approximately 1700 EST. While the system was down, multiphase extraction well 01 was pulled and converted to a top loading pump. Temperature sensors in TPV-01 & -03 were replaced.

January 7, 2011: Upon arrival, the process system was shutdown resulting in the freezing of several air and water lines. Lines specific to the vapor treatment equipment were thawed and brought back online by approximately 1100 EST. The water process equipment and wellfield were thawed and brought back online throughout the day. The entire system was operating by 1700 EST. The wellfield continued to shutdown multiple times during the day for approximately 10 minutes during each shutdown. After several hours of system evaluation, it was determined that the breaker that controlled the air compressor was faulty. The breaker was replaced that evening. We have had no shutdowns since the breaker was replaced.

System Maintenance

January 6, 2011: The speed of the vacuum blowers was reduced in an effort to maintain heat in the wellfield.

Other routine maintenance such as bag filter changes, gauge maintenance, flushing of lines, backwashing of carbon vessels, winterization, etc. continues to occur.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

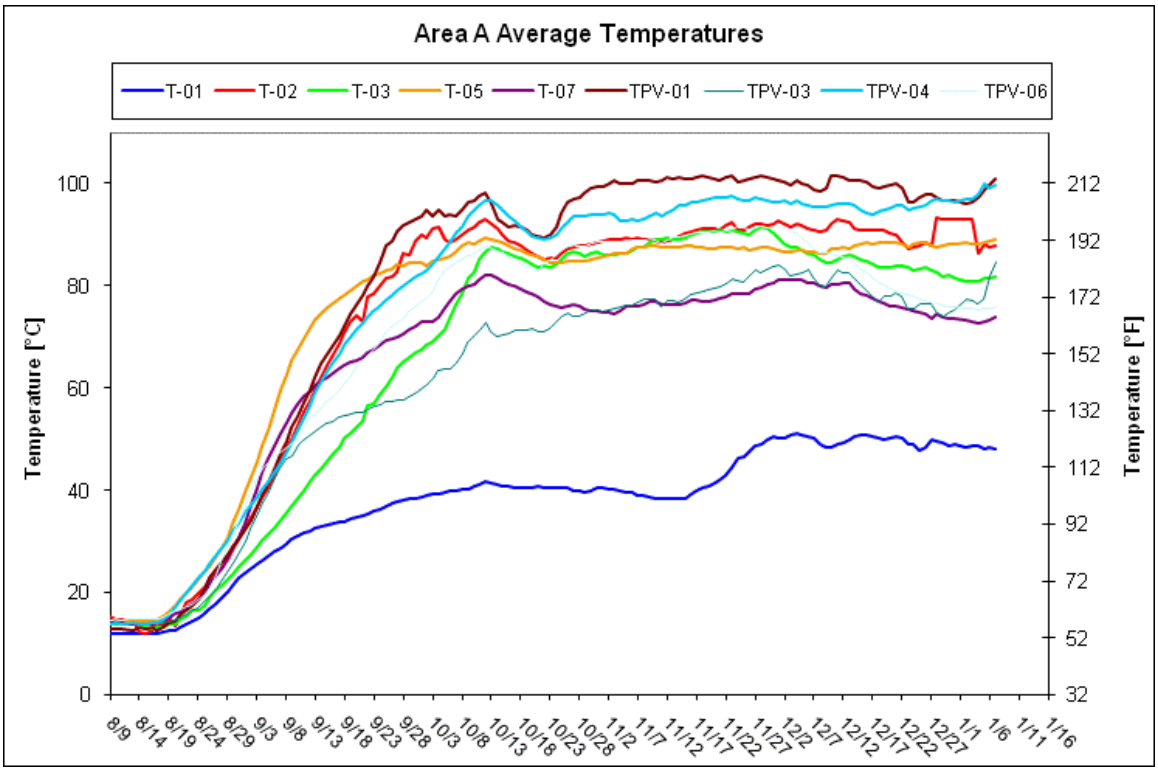


Figure 1. Average Temperature – Area A

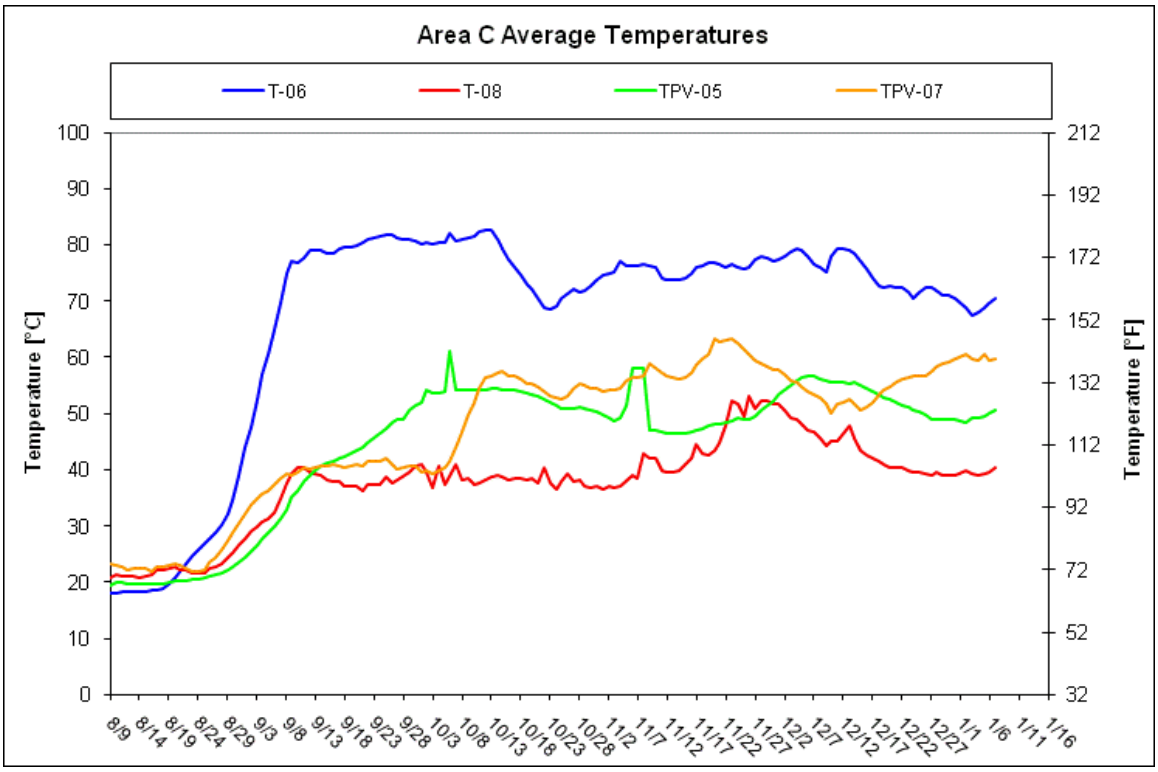


Figure 2. Average Temperature – Area C

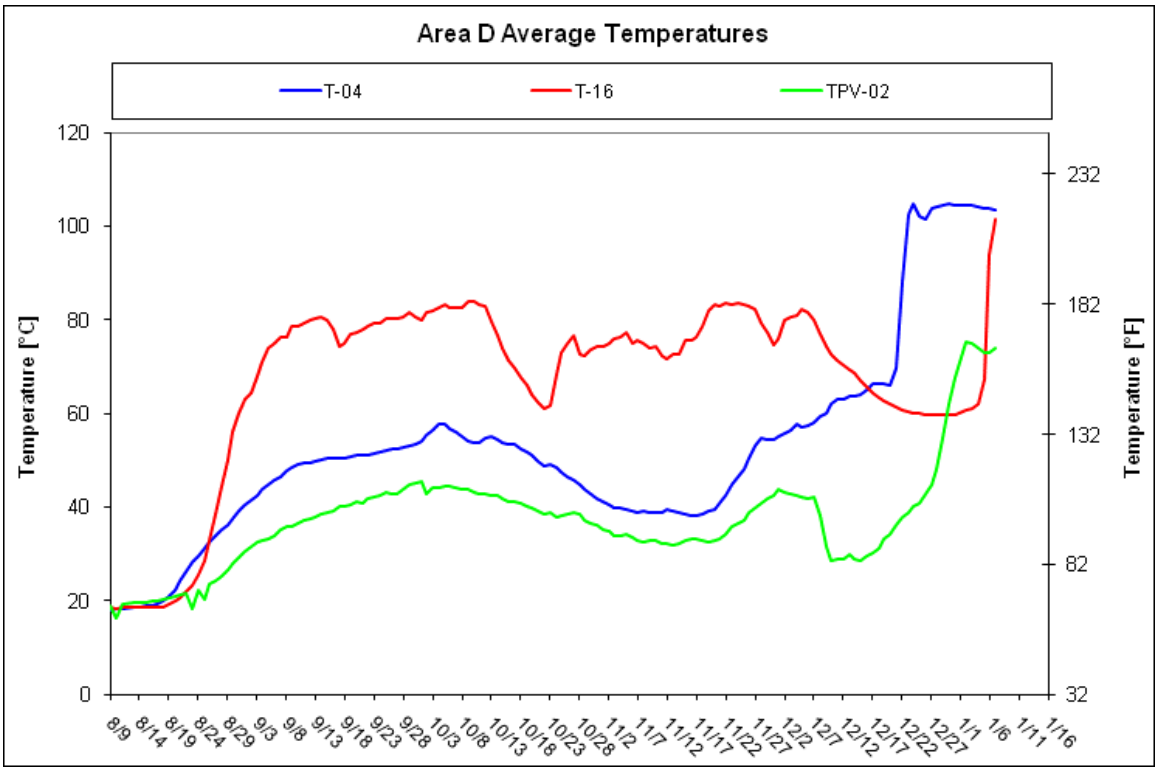


Figure 3. Average Temperature – Area D

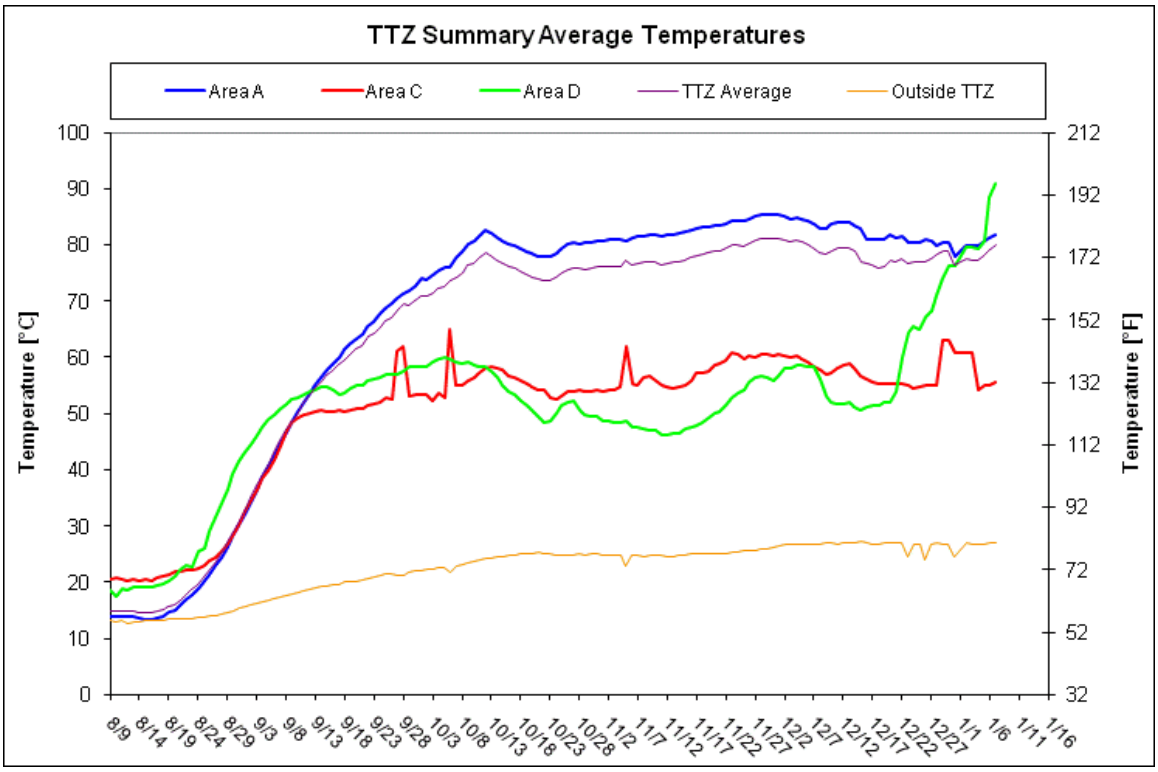


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

The pitot tube used to measure the non-condensable vapor data was malfunctioning and replaced on December 31. Previously reported vapor flow rates are currently being evaluated and will be updated on the next progress report, if needed.

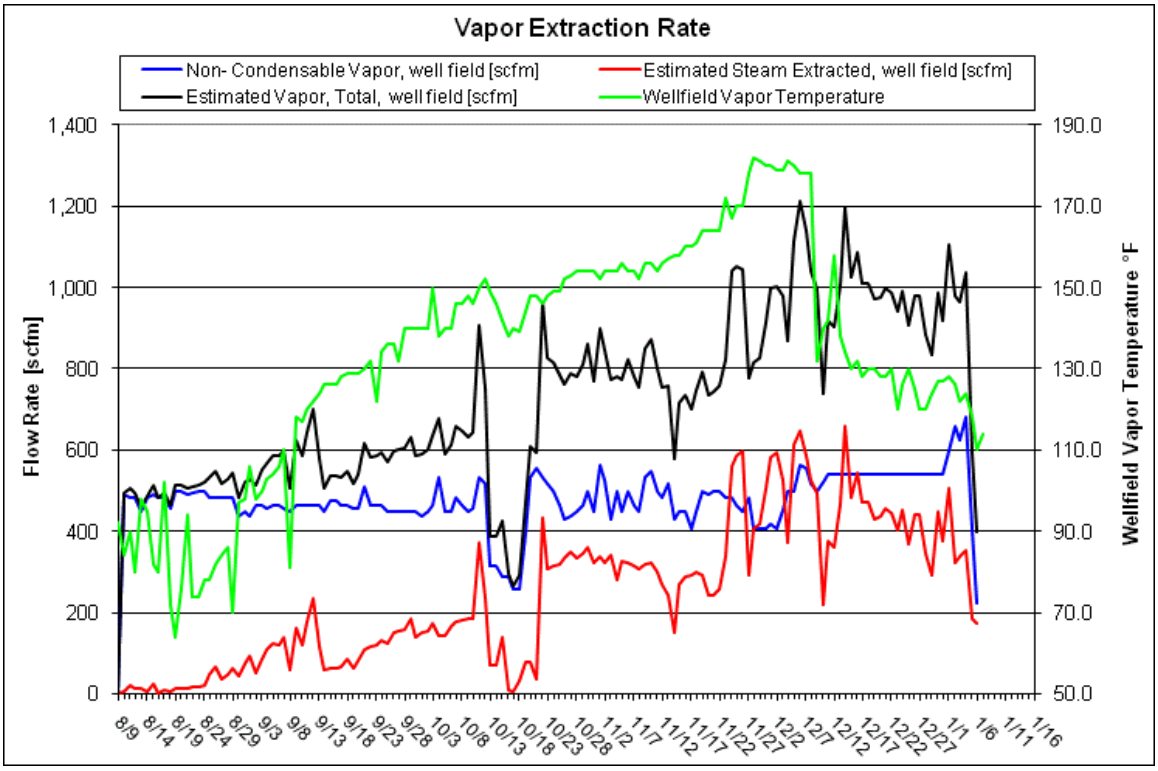


Figure 5. Vapor Extraction Rate and Temperature

4. Photo Ionization Detector (PID) and Destruction Removal Efficiency (DRE)

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

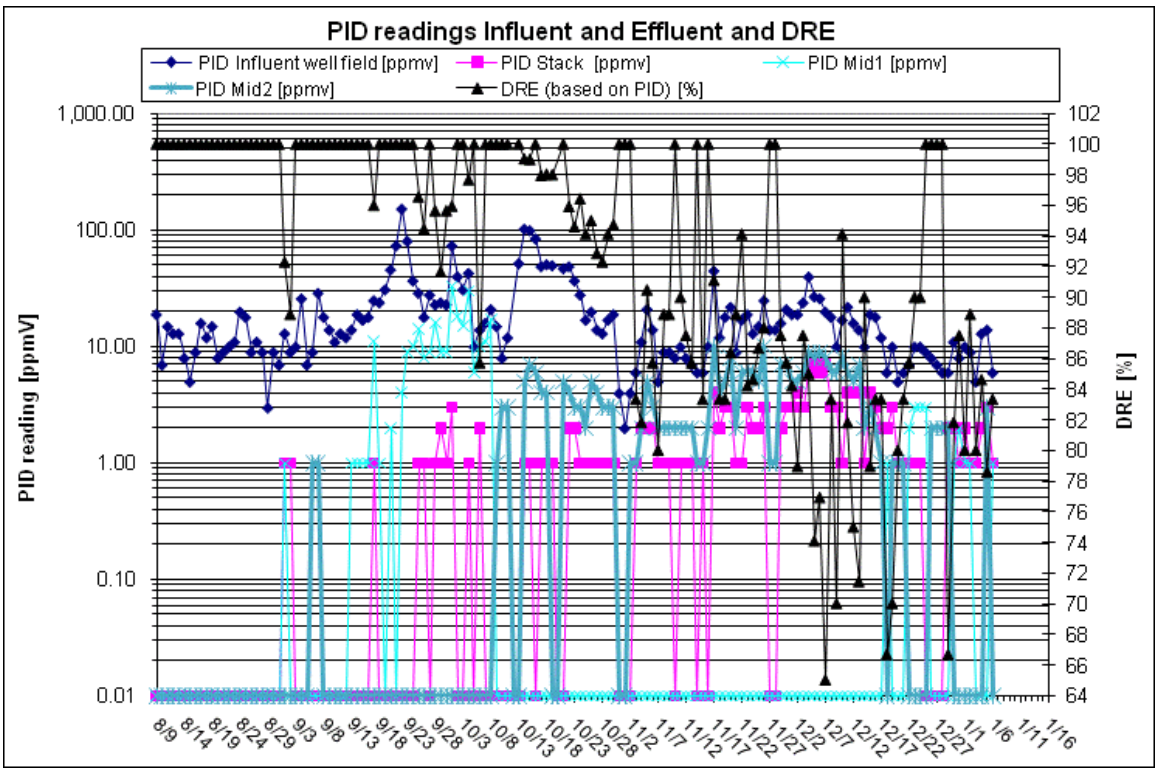


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

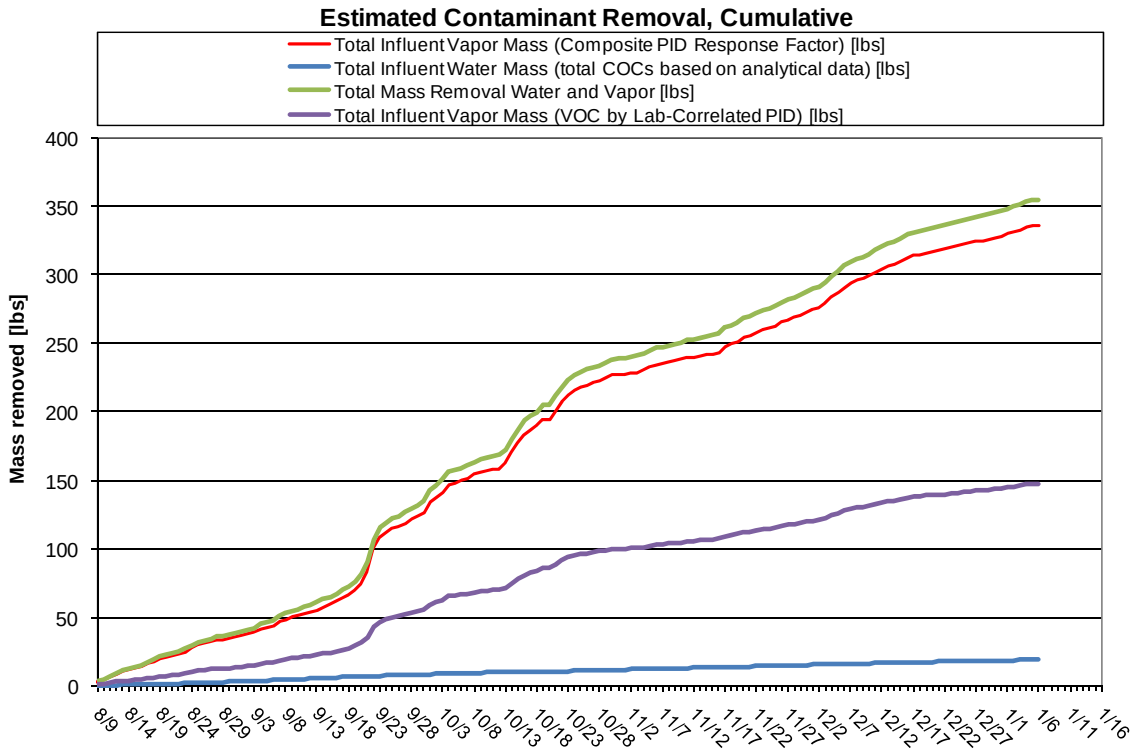


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 1/5/2011. The table below presents the concentrations in ppmV from the 9/29/10 through the most recent sampling event.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	9/29/10	10/8/10	10/21/10	10/27/10	11/3/10	11/10/10	11/17/10	11/23/10	12/1-2/2010	12/7/10	12/14/10	12/22/10	12/29/10	1/5/11
VEW 1	11						6.1	25	7.3	11	3.1	9.8		4.2
VEW 2	7.4	5.2	21	16	8.1	6.8	5.3	13	10	19	2.8	5.2		6.4
VEW 3	74	40					34	9.7	9.9	23		12.5		10.3
VEW 4	13						NR	51	17	33	9.9	13.1		15.4
VEW 5	75	53	70	65	7.6	24	29	77	35	51	27	24.2		49.8
VEW 6	32	12	21	18	2.9	7.3	2.2							9.1
VEW 7	16						0.0	20	2.4	7.7	3.5	9.6		21.6
VEW 8	11						2.2							8.4
VEW 9	151	29	137	56	39	25	33	105	25	59	24	12.4		47.8
VEW 10	5.8						0.8					8.5	4.3	
VEW 11	6.4						1.2					4.1	4.0	
VEW 12	13						29	13	10	19	2.7	8.5	4.0	
VEW 13	29	47	94	26	3.4	18	12	30	19	28	18	13.9	9.4	38.0
VEW 14	93	47	36	23	1.2	8.0	4.7					18.8	1.4	6.6
VEW 15	268	164	266	164	23	57	102	128	69	65	43	20.8		179.4
VEW 16	15						2.5							23.1
VEW 17	185	106	147	71	50	37	45	71	37	54	39	38.3		49.9
VEW 18	13						6.5	13	13	7.9	11	6.8		11.9
VEW 19	17	34	51	17	14	22	3.1							36.4
VEW 20	42	61	51	20	2.7	24	11	47	15	12	7.9	9.9	3.6	32.9
VEW 21	177	108	69	41	22	41	25	60	31	25	23	14.7		37.9
VEW 22	20		25	12	2.6	3.5	4.1							9.5
VEW 23	19						5.7	87	48	39	20	15.4		15.6
VEW 24	176	47	25	14	5.0	11	4.3							16.2
VEW 25	8.5						7.5	36	12	19	6.3	6.9		
VEW 26	18						2.8							11.1
VEW 27	5.3	9.8	13	8.9	1.3	7.8	0.0	2.8	5.6	6.8	2.3	5.5		11.7
VEW 28	9.9						0.0	5.3	0.8	2.2	0.7	3.8		4.1
VEW 29	29	26	25	6.5	5.3	6.7	0.0	12	15	15	4.2	5.0	4.5	47.7

NR = not recorded

7. Water Level

The figure below presents a water level contour map for the site.

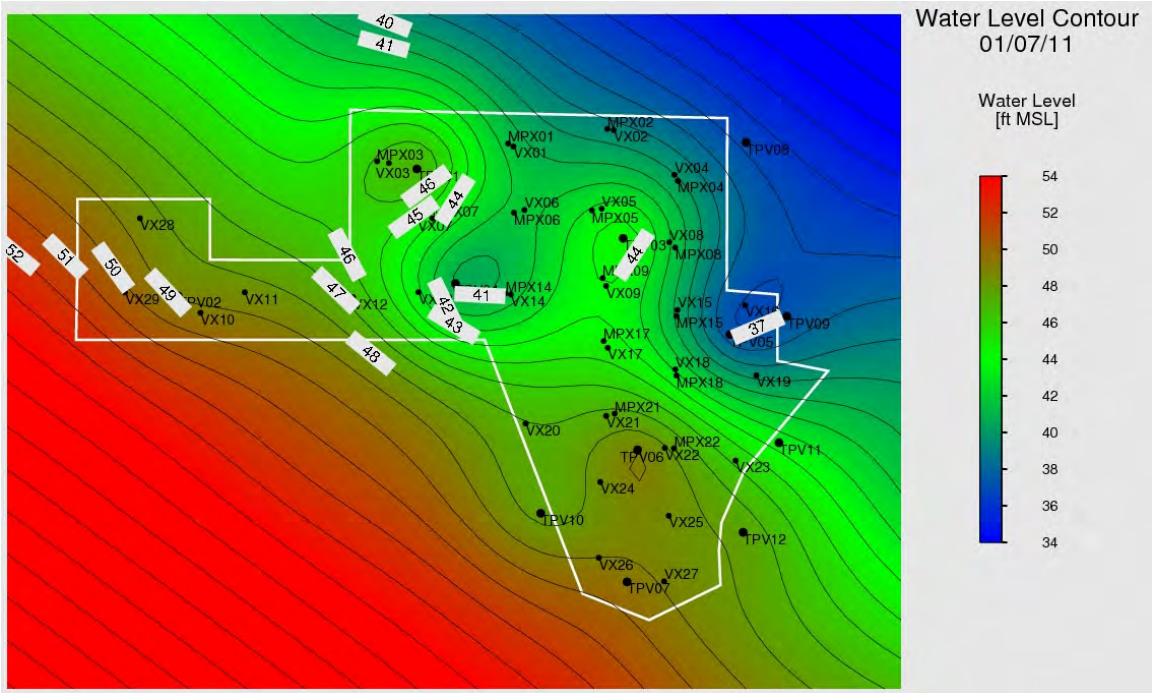


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site as of 1/8/11. Due to treatment system shutdown on 1/7/11, vacuum data were not recorded for this date.

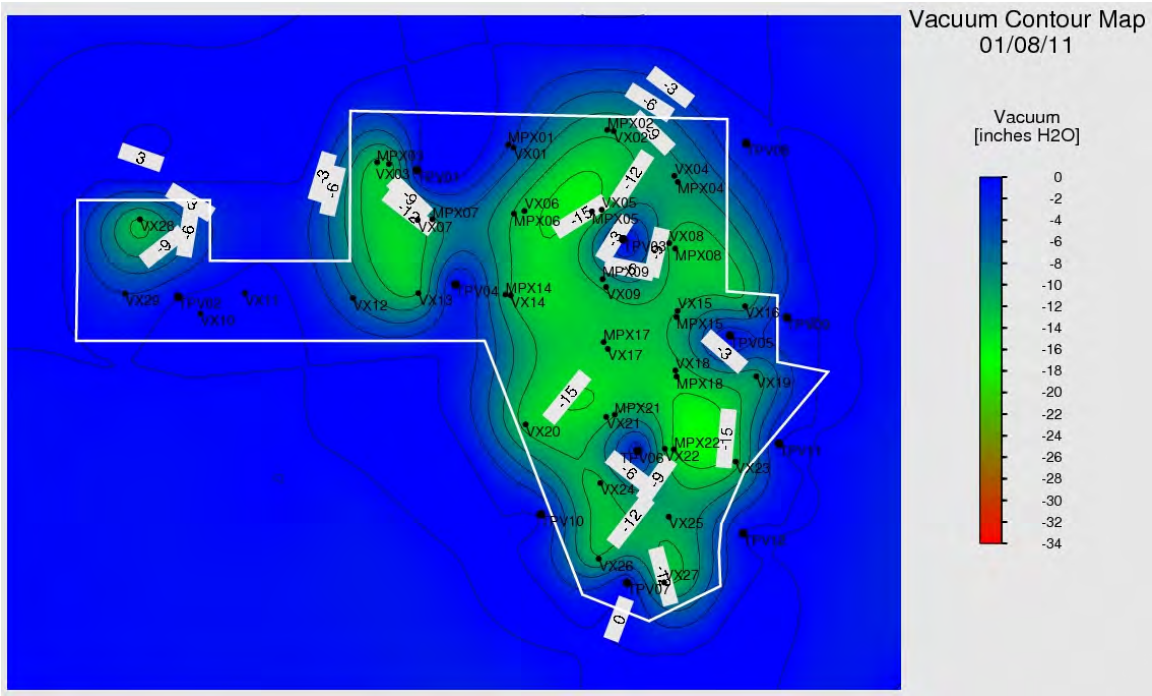


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,532,511 gallons of water since system startup while extracting a total of 1,844,425 gallons of water from the wellfield (as seen in Figure 10 below) plus an additional 311,914 gallons as condensate.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

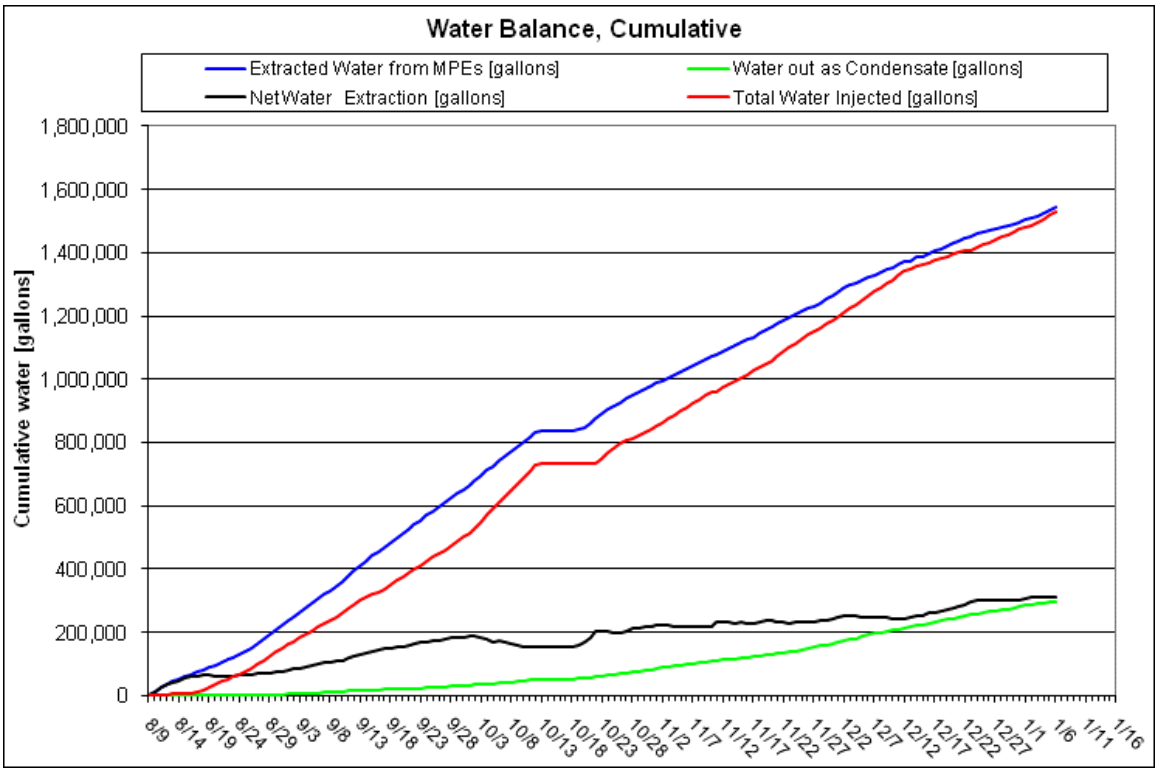


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

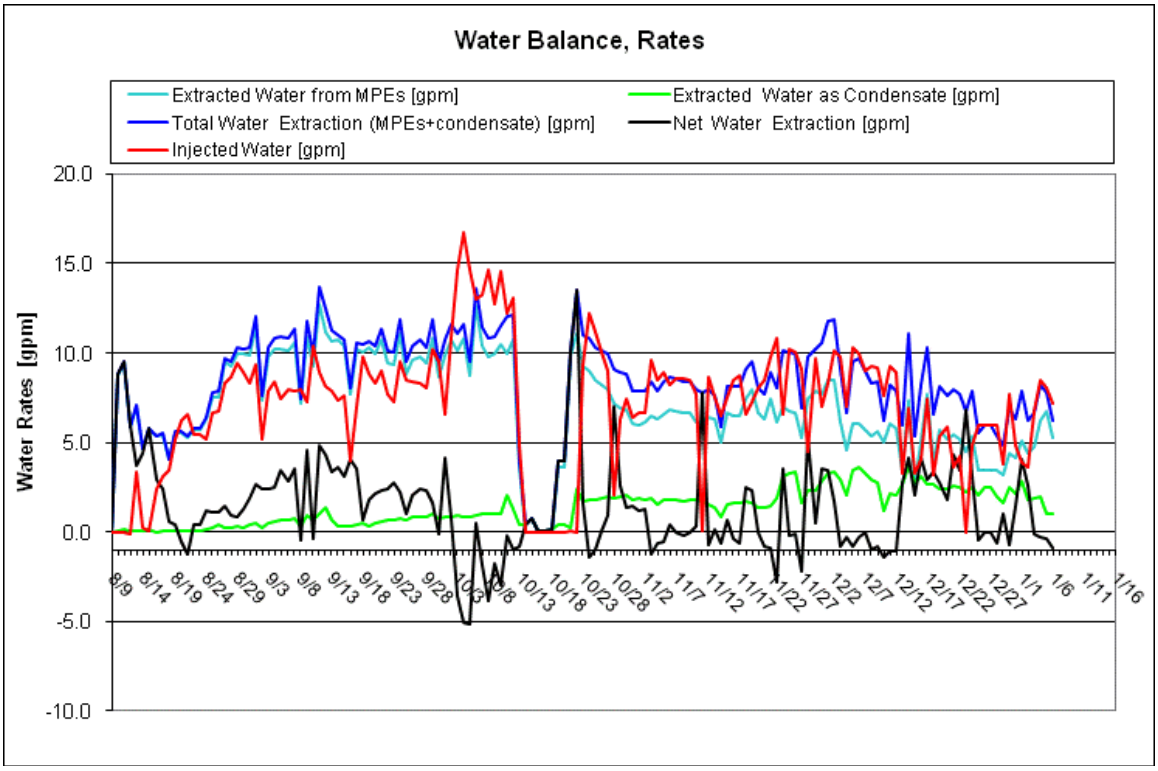


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

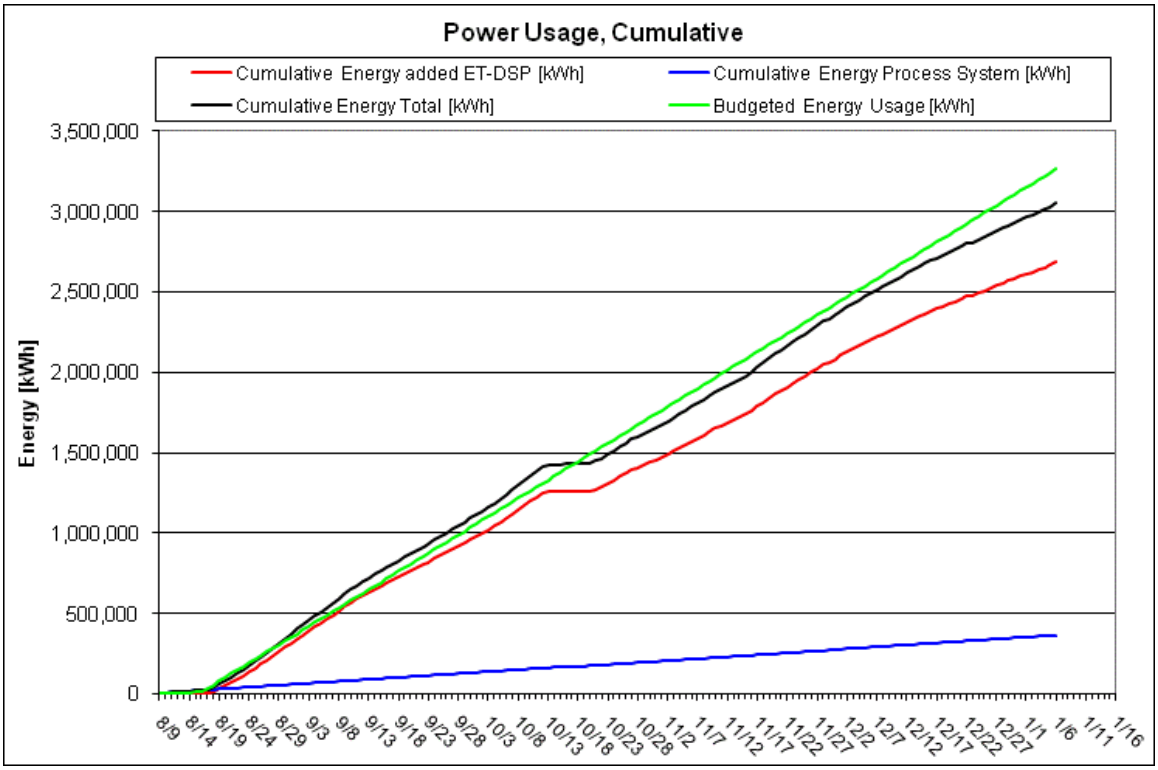


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Steam injection continued at Steam Spears 7, 8, and extraction well X-29 at a combined total pressure of 50 psi until 1/5/11. On 1/5/11, steam injection was moved to Steam Spears 3, 4, and 5 and continued at extraction well X-29 at a combined total pressure of 50 psi.

The following saline injection was made:

January 4, 2011 – 80 lbs

Incidents:

No safety or environmental compliance incidents were reported for the January 1 through 7, 2011 operational period.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged.

Progress Report

1/8/2011 through 1/14/2011
January 17, 2011
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from January 8 through January 14, 2011 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 1/14/2011		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/18/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	149	days
Energy used to date	3,207,040	kWh
Injected energy per soil volume to date	171	kWh/cy
Water contaminant removal last 7 days	0.8	lbs
Water contaminant removal to date	19.8	lbs
Vapor contaminant removal last 7 days	8	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	961	lbs
Average temperature Area A last 7 days	184	°F
Average temperature Area C last 7 days	136	°F
Average temperature Area D last 7 days	198	°F
Average power usage rate last 7 days	819	kW
Average total water extracted rate last 7 days	8.2	gpm
Average injected water rate last 7 days	6.2	gpm
Average vapor extraction rate (non condensable) last 7 days	364	scfm

System Shutdowns

Saturday, 8 January: A warning alarm for the cooling tower was received at approximately 0600 EST due to, what appeared to be chunks of ice, present in the discharge line. The line was heated and the ice melted. No system shutdown occurred.

Tuesday, 11 January: The wellfield was shutdown for approximately one half hour to modify a steam spear line so it could be connected to a vapor extraction well.

System Maintenance

Other routine maintenance such as bag filter changes, gauge maintenance, flushing of lines, backwashing of carbon vessels, winterization, etc. continues to occur.

Approximately nine gallons total of unidentified material was removed from the “trough” and oil water separator on 11 January. At this point, it has not been determined that this unidentified material is NAPL and therefore not counted for in the summary table on page 2.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

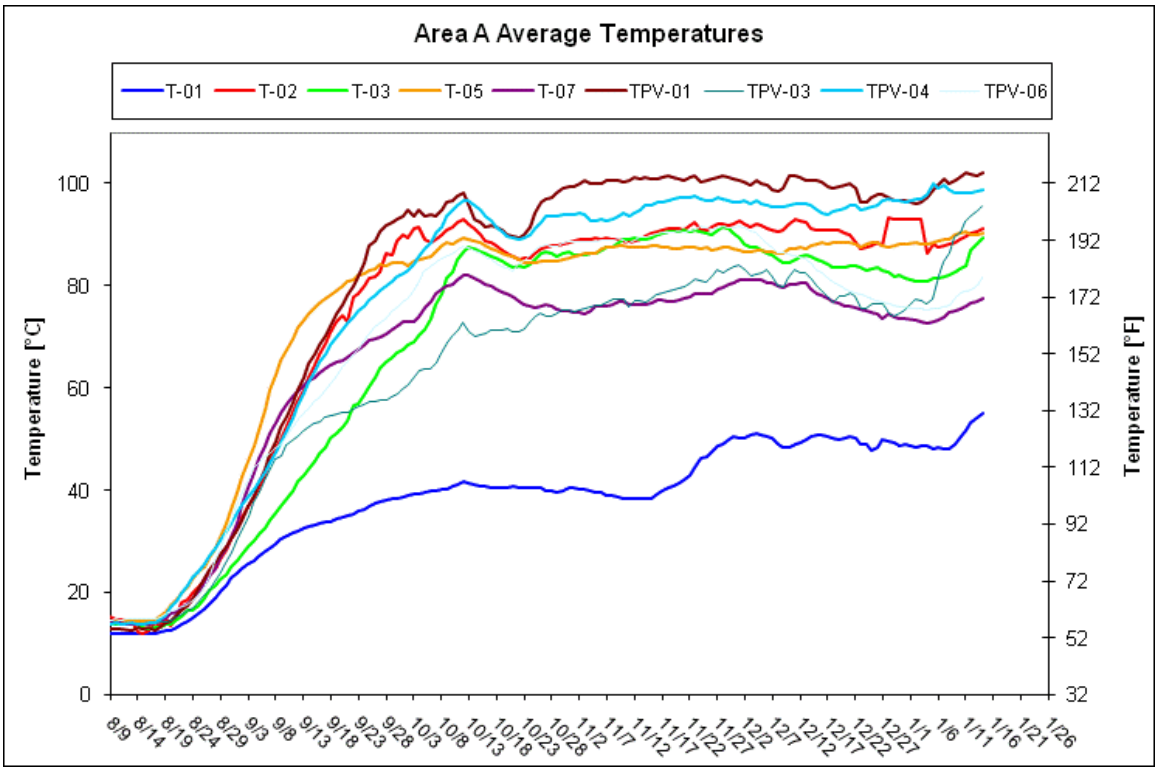


Figure 1. Average Temperature – Area A

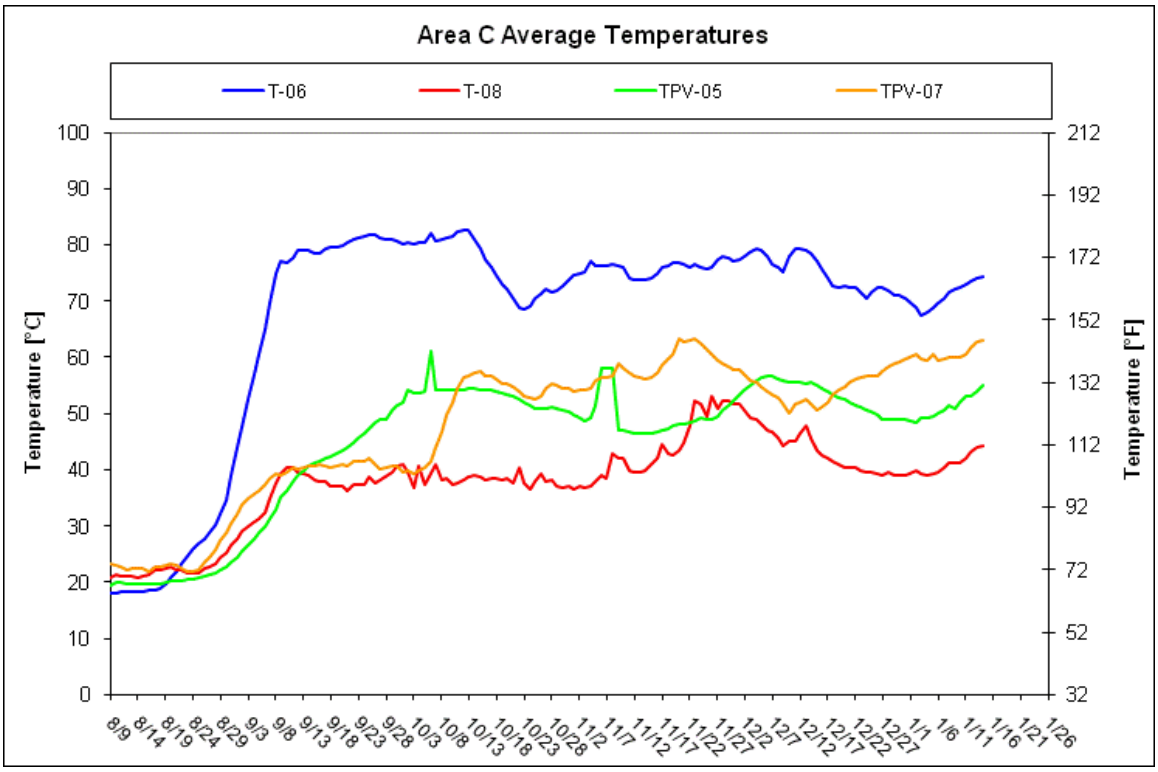


Figure 2. Average Temperature – Area C

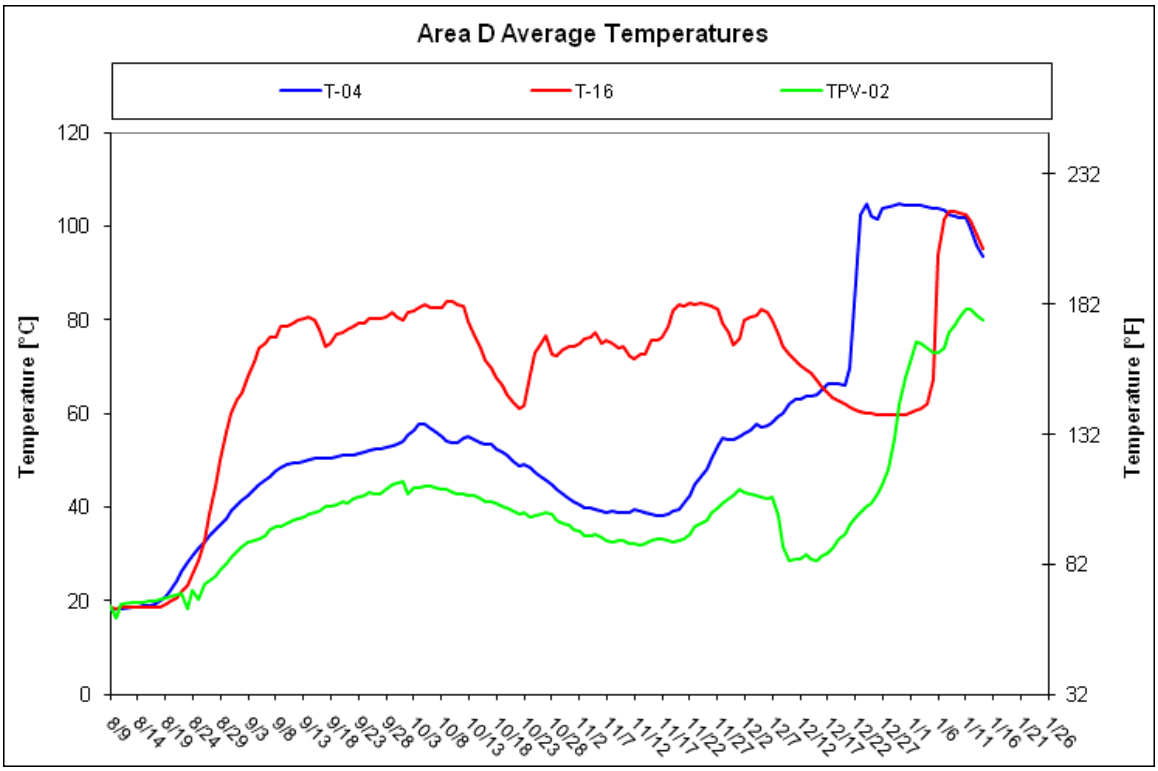


Figure 3. Average Temperature – Area D

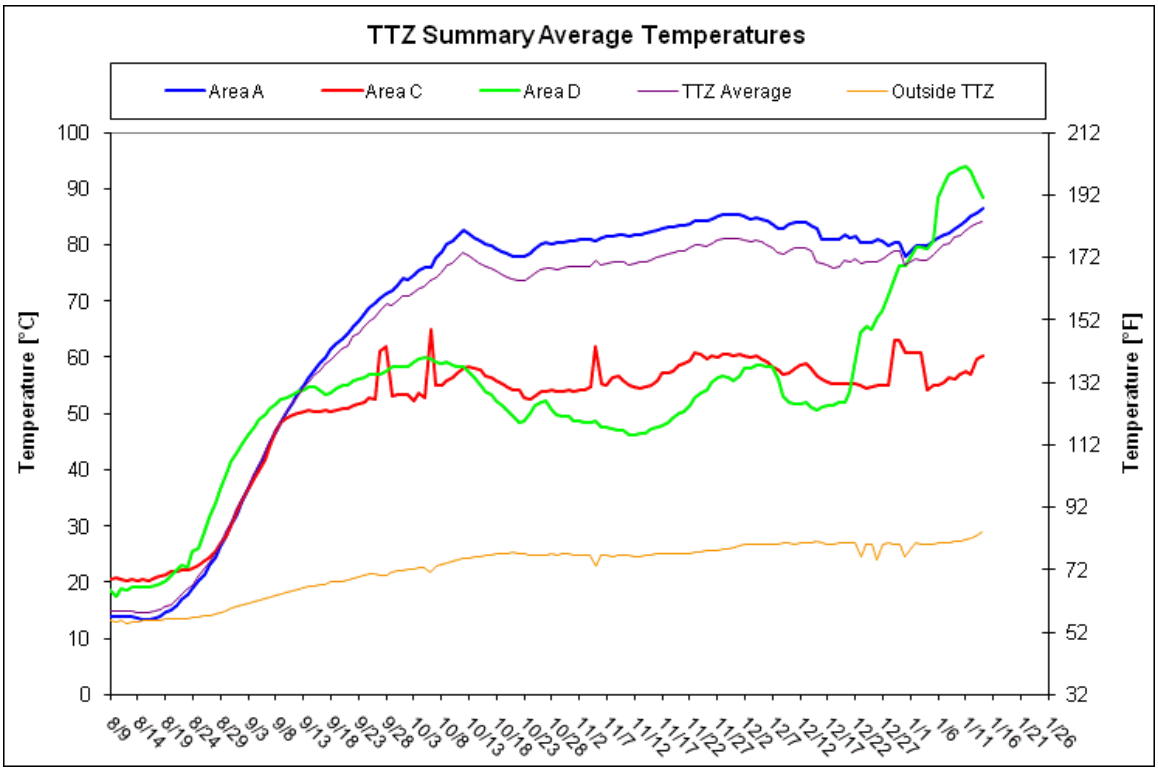


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment. As mentioned in the progress reports previously submitted (dated 27 December 2010 and 3 January 2011), the Magnehelic® gauge used to measure the non-condensable vapor flow rate from the wellfield was malfunctioning. Routine maintenance, which included replacing the solenoid valve to the vapor carbon trailer with a new solenoid valve, occurred during the week of 20 December 2010. Once the new valve was installed, the flow rate observed on the Magnehelic® gauge exceeded the scale of the gauge. A new gauge was ordered and was installed but resulted in similar flow readings that exceeded the scale of the gauge. To troubleshoot the gauge readings, a new pitot tube was ordered and installed. Using the new gauge and the new pitot tube, flow readings remained above the gauge's scale. A manometer was used to confirm the readings observed using the new pitot tube and Magnehelic® gauge. Subsequent discussions with the blower manufacturer also confirmed the readings on the Magnehelic® gauge. We have recalculated the actual wellfield flow rate based on the corrected gauge readings. This recalculated flow rate is shown in Figure 5 below. The blowers were then decreased to approximately 20 hertz – which coincides to a flow rate of approximately 360 scfm. Multiple readings have been obtained with the manometer to confirm the current Magnehelic® reading.

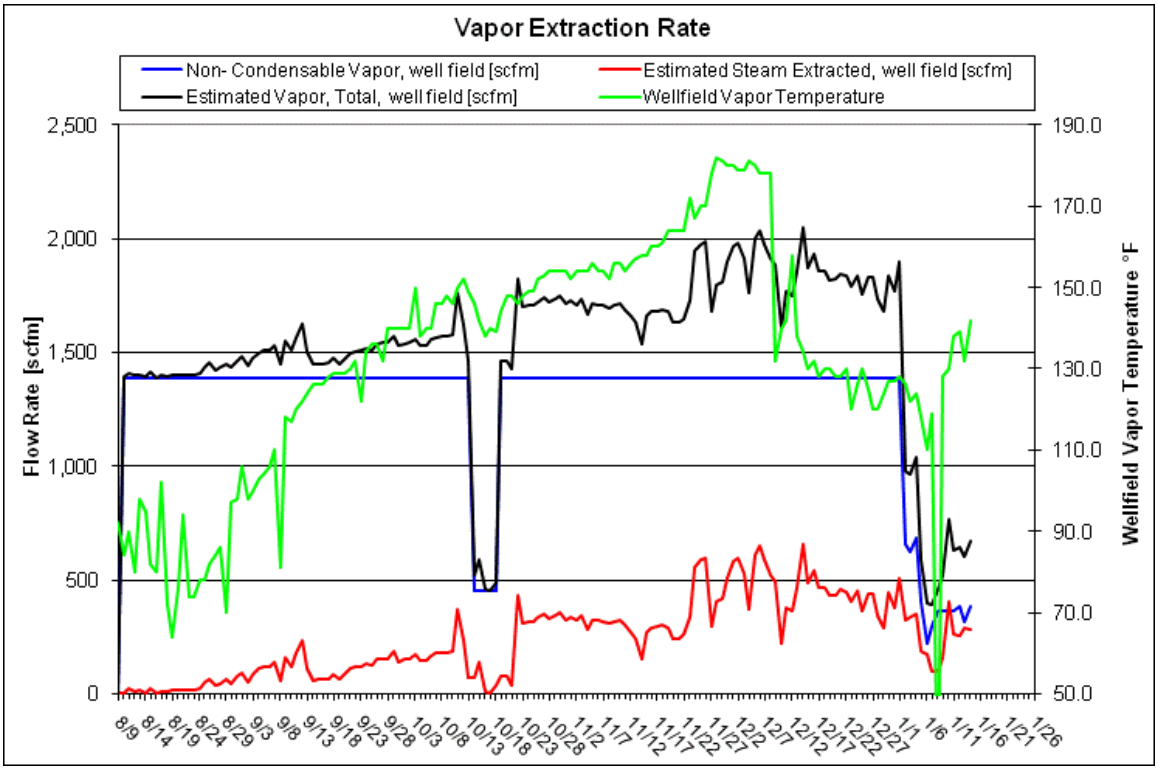


Figure 5. Vapor Extraction Rate and Temperature

4. Photo Ionization Detector (PID) and Destruction Removal Efficiency (DRE)

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

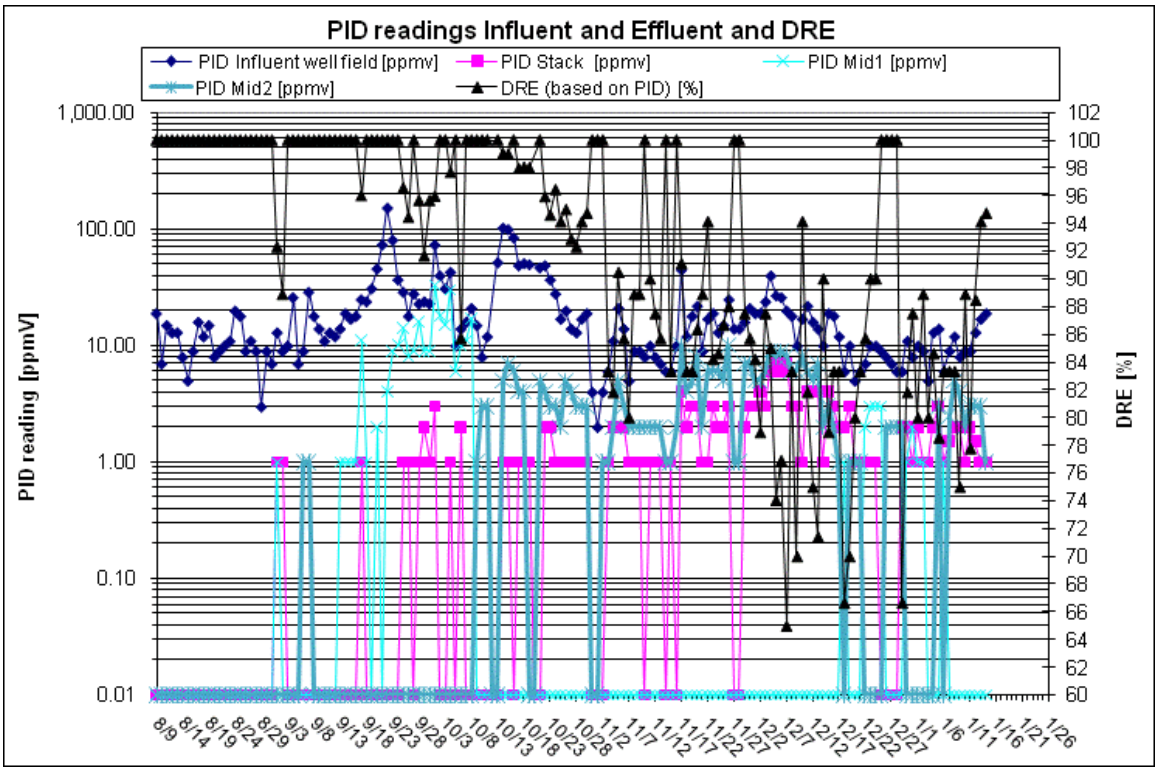


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date. The figure below has been updated to include the corrected wellfield vapor flow rate as discussed in Section 3 of this report.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

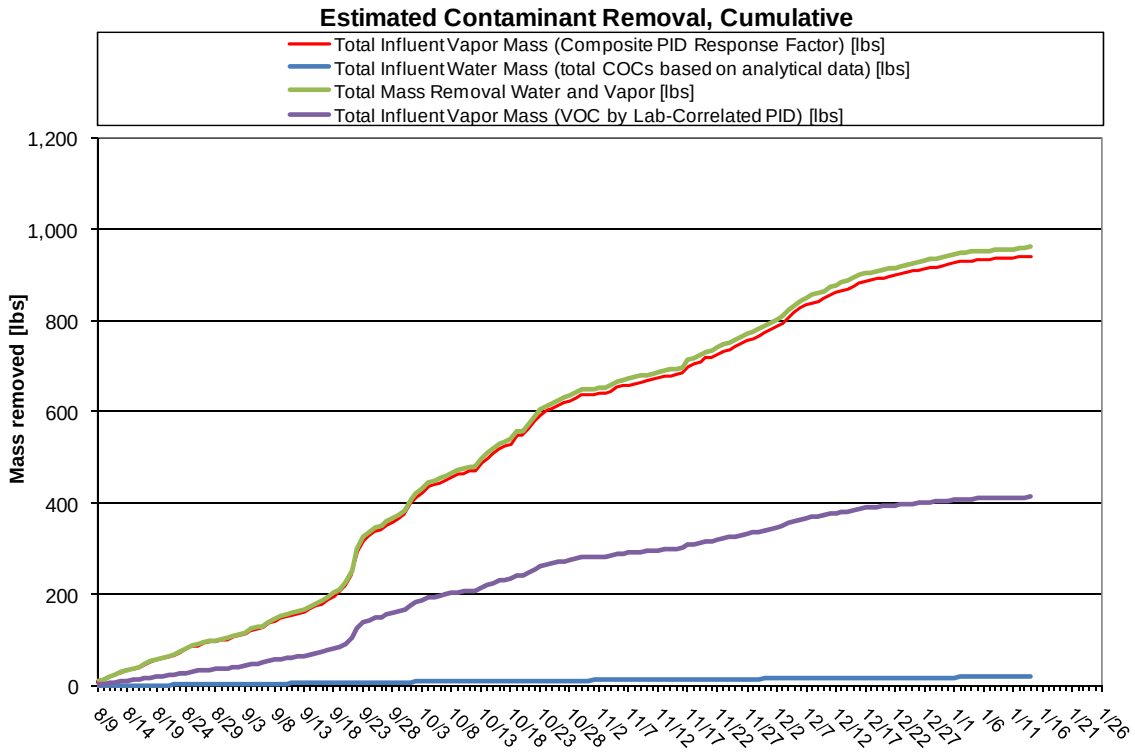


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

A round of PID readings was collected from select vapor extraction wells at the site on 1/13/2011. The table below presents the concentrations in ppmV from the 11/17/10 through the most recent sampling event.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	11/17/10	11/23/10	12/1-2/2010	12/7/10	12/14/10	12/22/10	12/29/10	1/5/11	1/13/11
VEW 1	6.1	25	7.3	11	3.1	9.8		4.2	0.0
VEW 2	5.3	13	10	19	2.8	5.2		6.4	5.0
VEW 3	34	9.7	9.9	23		12.5		10.3	7.0
VEW 4		51	17	33	9.9	13.1		15.4	20.0
VEW 5	29	77	35	51	27	24.2		49.8	218.0
VEW 6	2.2							9.1	88.0
VEW 7	0.0	20	2.4	7.7	3.5	9.6		21.6	4.0
VEW 8	2.2							8.4	3.0
VEW 9	33	105	25	59	24	12.4		47.8	24.0
VEW 10	0.8					8.5	4.3		
VEW 11	1.2					4.1	4.0		
VEW 12	29	13	10	19	2.7	8.5	4.0		
VEW 13	12	30	19	28	18	13.9	9.4	38.0	
VEW 14	4.7					18.8	1.4	6.6	
VEW 15	102	128	69	65	43	20.8		179.4	
VEW 16	2.5							23.1	6.0
VEW 17	45	71	37	54	39	38.3		49.9	25.0
VEW 18	6.5	13	13	7.9	11	6.8		11.9	5.0
VEW 19	3.1							36.4	11.0
VEW 20	11	47	15	12	7.9	9.9	3.6	32.9	
VEW 21	25	60	31	25	23	14.7		37.9	20.0
VEW 22	4.1							9.5	3.0
VEW 23	5.7	87	48	39	20	15.4		15.6	10.0
VEW 24	4.3							16.2	5.0
VEW 25	7.5	36	12	19	6.3	6.9			6.0
VEW 26	2.8							11.1	4.0
VEW 27	0.0	2.8	5.6	6.8	2.3	5.5		11.7	3.0
VEW 28	0.0	5.3	0.8	2.2	0.7	3.8		4.1	2.0
VEW 29	0.0	12	15	15	4.2	5.0	4.5	47.7	

7. Water Level

The figure below presents a water level contour map for the site.

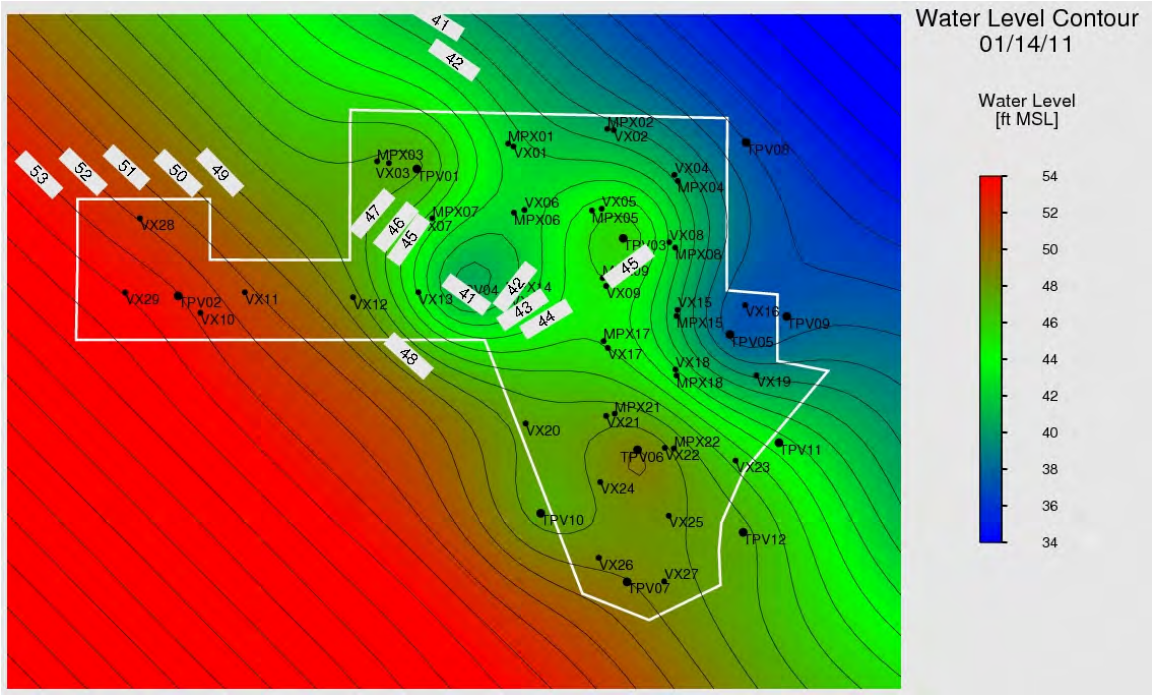


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site as of 1/14/11.

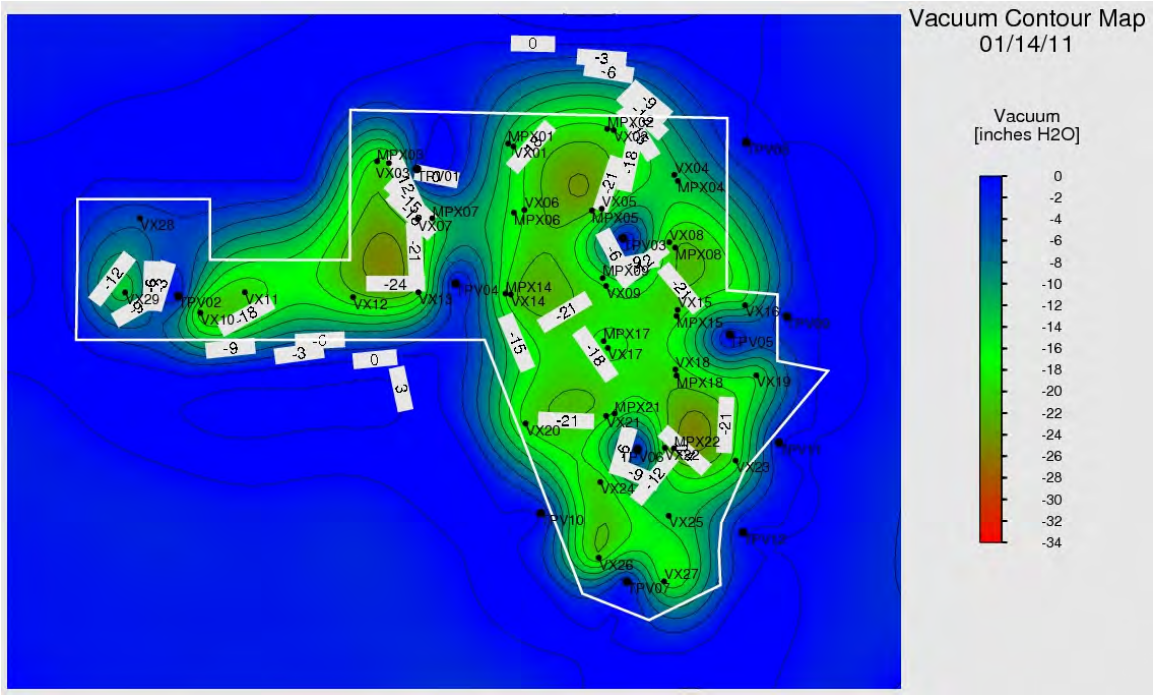


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,594,530 gallons of water since system startup while extracting a total of 1,926,876 gallons of water from the wellfield (as seen in Figure 10 below) plus an additional 332,346 gallons as condensate.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

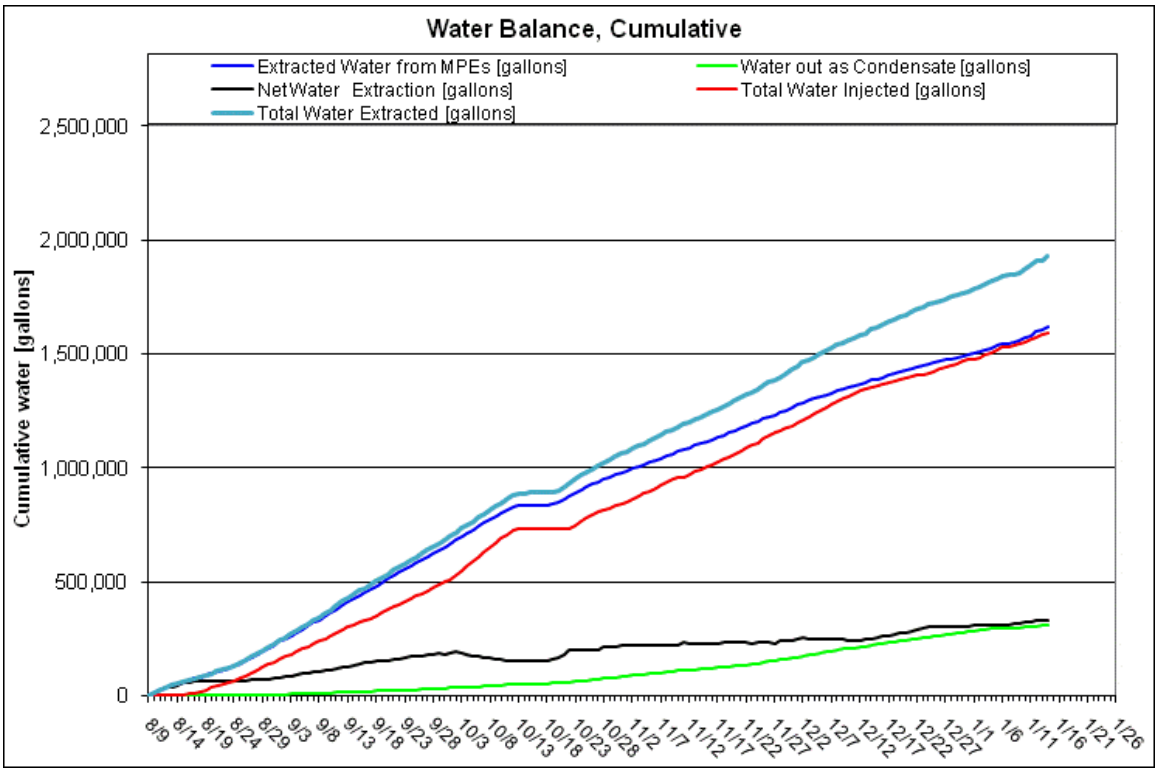


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

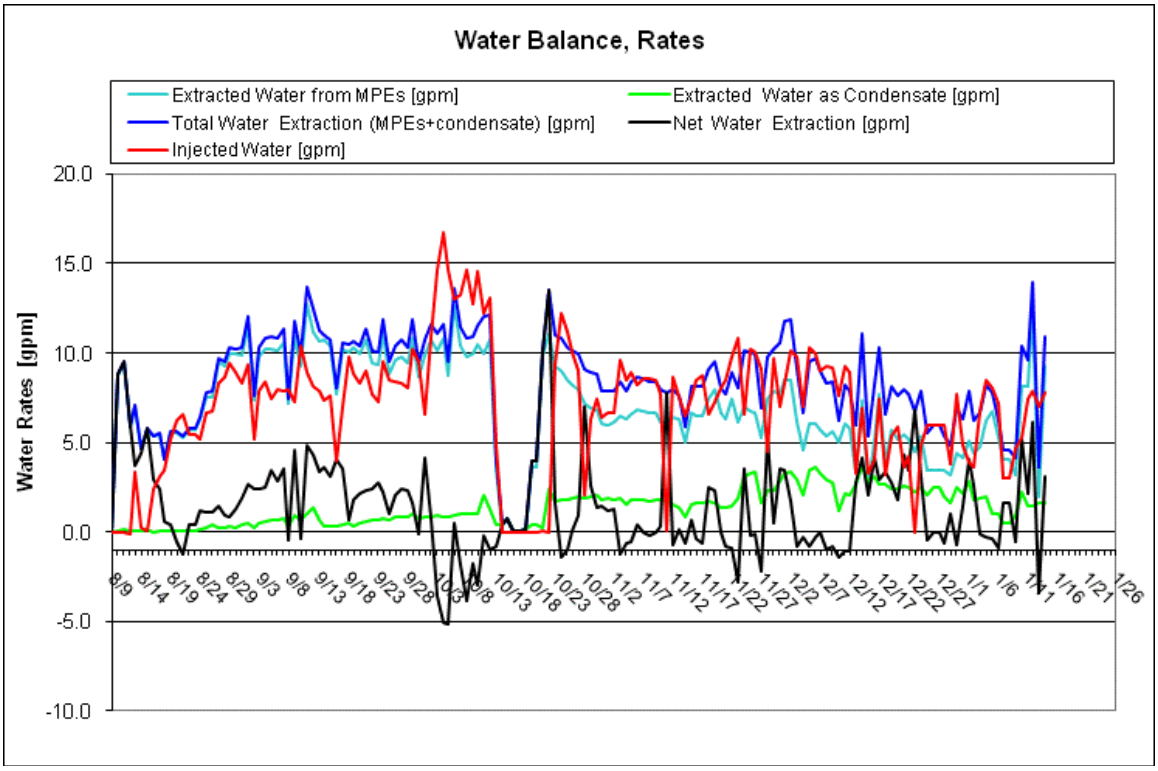


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

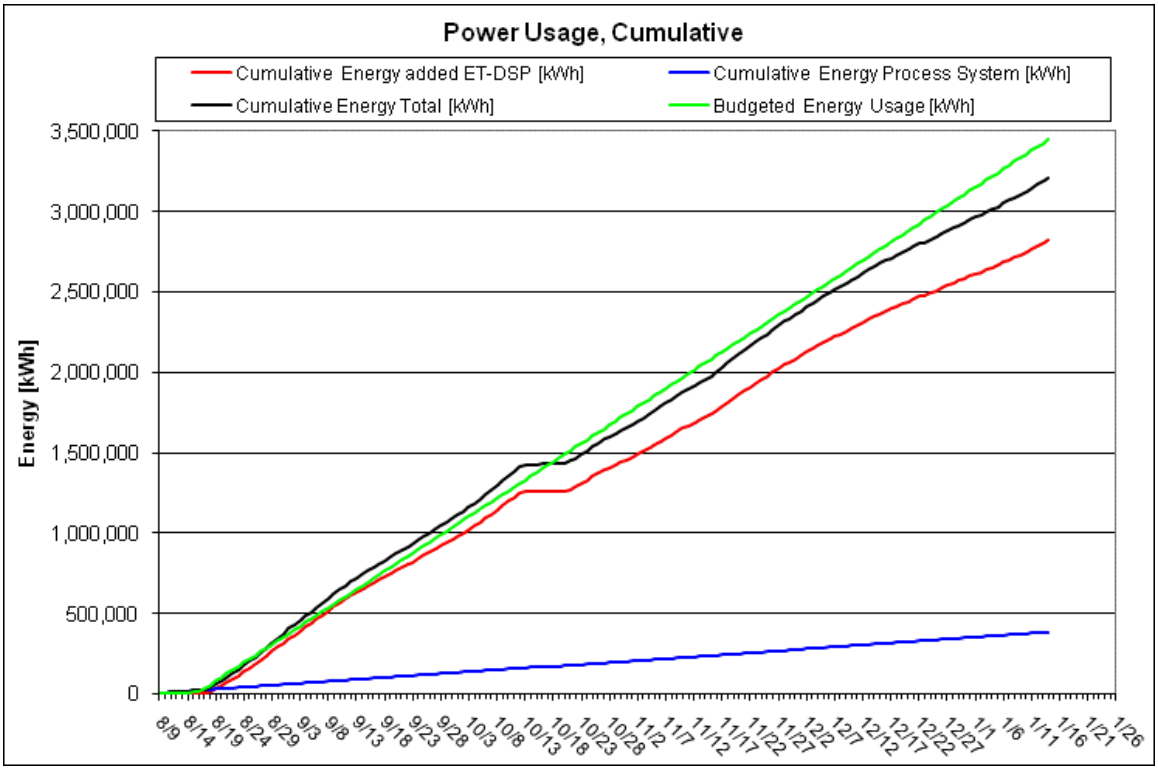


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Steam injection continued at Steam Spears 3 and 5. Steam injection was moved to extraction well X-20 and injection began to the deep electrodes at locations E29, E39, and E43.

The following saline injection was made:

January 10, 11, and 13, 2011 – 80 lbs

Incidents:

No safety or environmental compliance incidents were reported for the January 8 through 14, 2011 operational period.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged.

Progress Report

1/15/2011 through 1/21/2011
January 24, 2011
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from January 15 through January 21, 2011 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 1/21/2011		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/18/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	156	days
Energy used to date	3,350,880	kWh
Injected energy per soil volume to date	179	kWh/cy
Water contaminant removal last 7 days	0.9	lbs
Water contaminant removal to date	20.7	lbs
Vapor contaminant removal last 7 days	10	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	973	lbs
Average temperature Area A last 7 days	196	°F
Average temperature Area C last 7 days	170	°F
Average temperature Area D last 7 days	197	°F
Average power usage rate last 7 days	856	kW
Average total water extracted rate last 7 days	9.1	gpm
Average injected water rate last 7 days	9.2	gpm
Average vapor extraction rate (non condensable) last 7 days	303	scfm

System Shutdowns

There were no alarms or shutdowns during this operational period.

System Maintenance

Thursday, 20 January: Troubleshoot temperature – pressure – vacuum point -05 with Mc2. The monitoring point was not recording temperatures correctly. The TPV point was replaced on Saturday, 22 January.

Other routine maintenance such as snow removal, bag filter changes, gauge maintenance, flushing of lines, backwashing of carbon vessels, winterization, etc. continues to occur.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

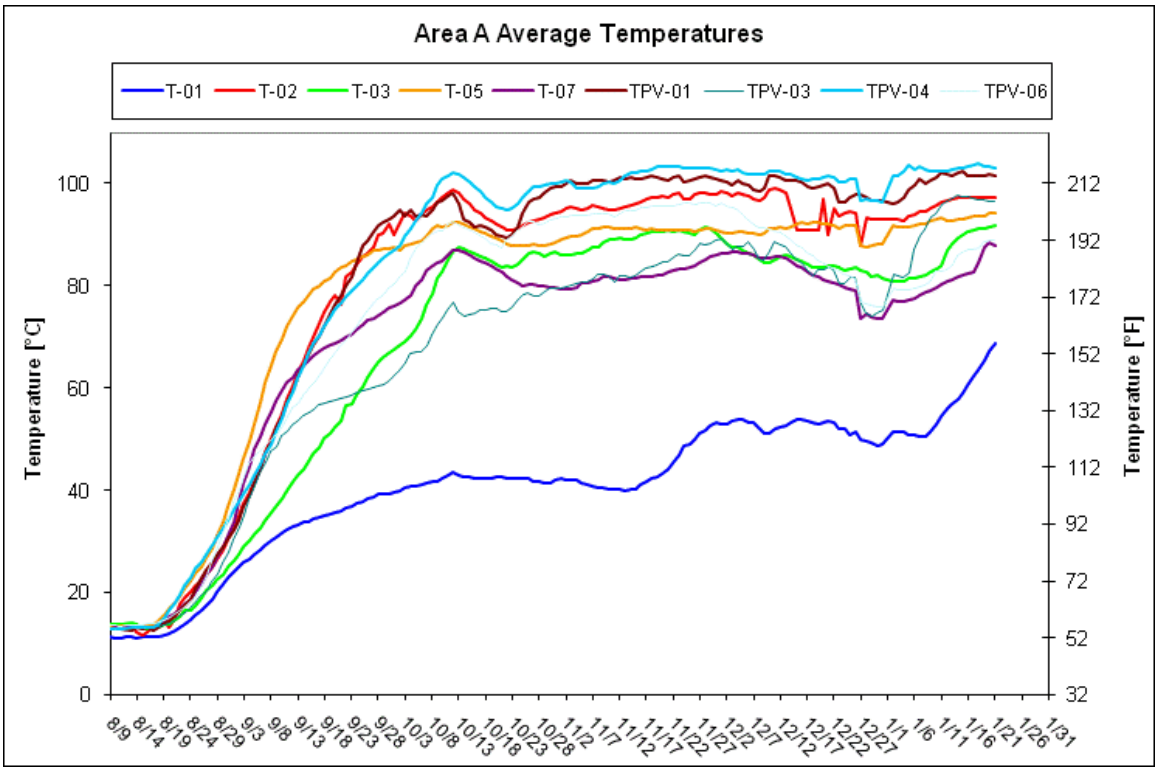


Figure 1. Average Temperature – Area A

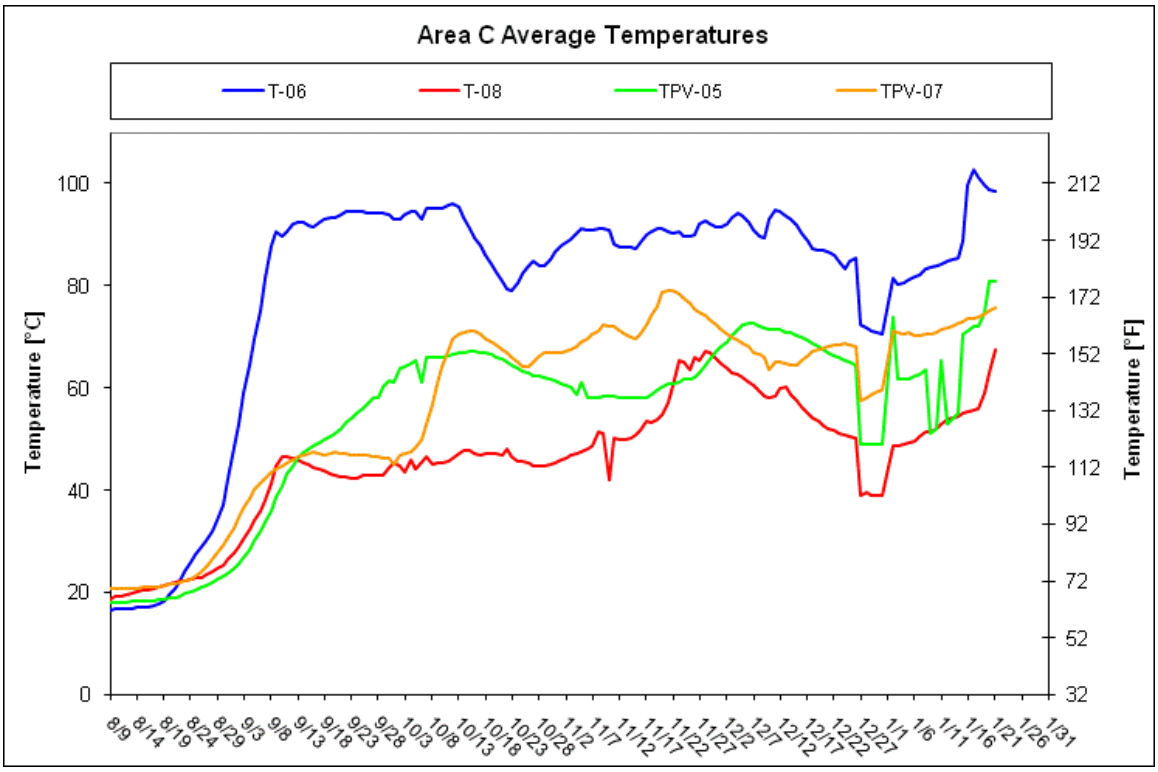


Figure 2. Average Temperature – Area C

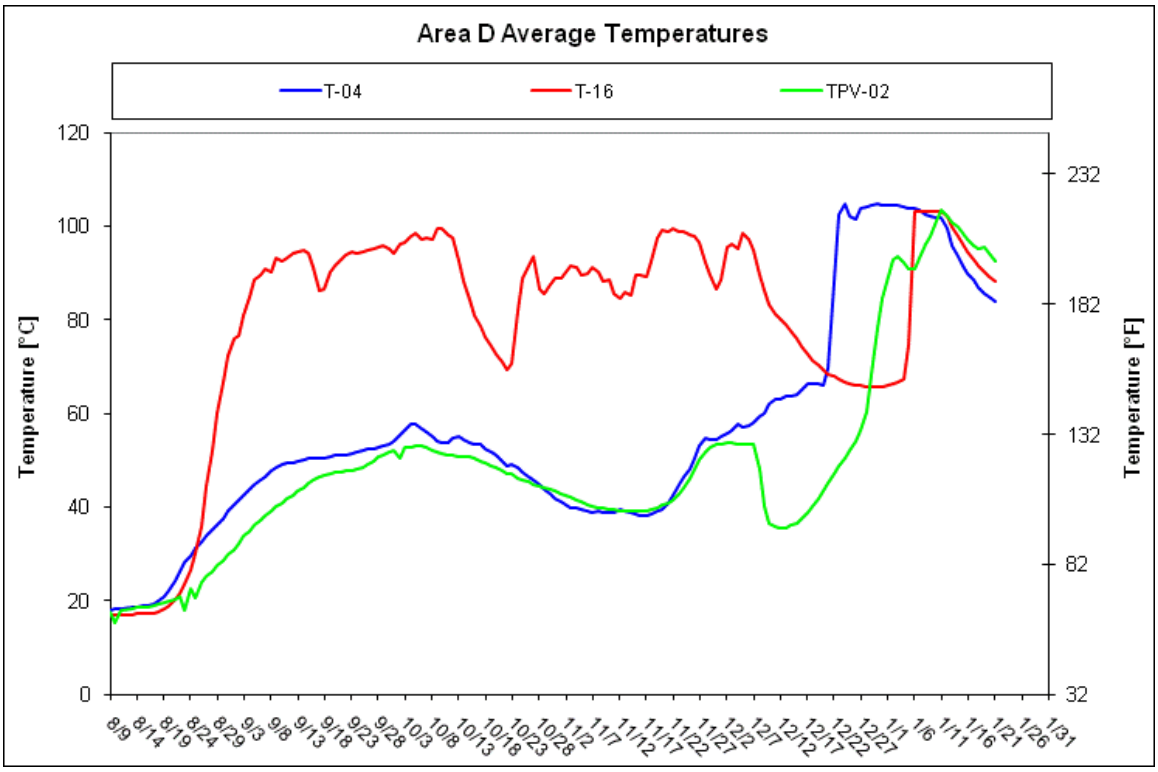


Figure 3. Average Temperature – Area D

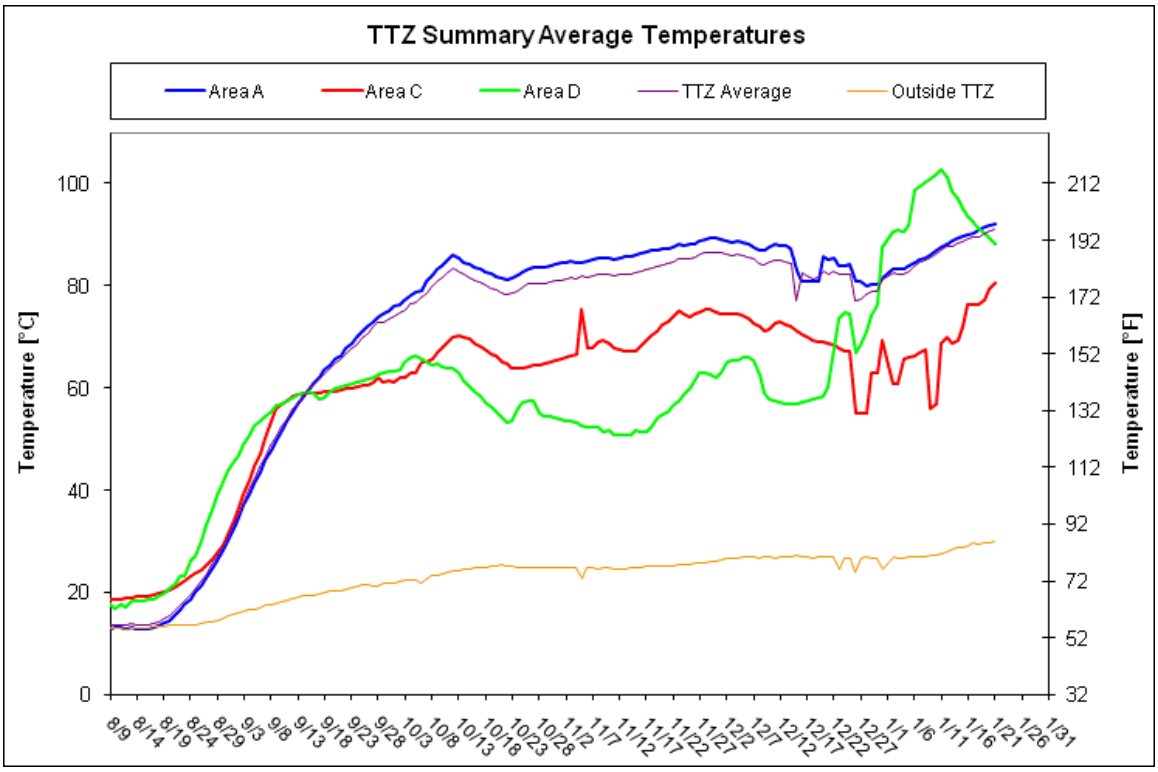


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

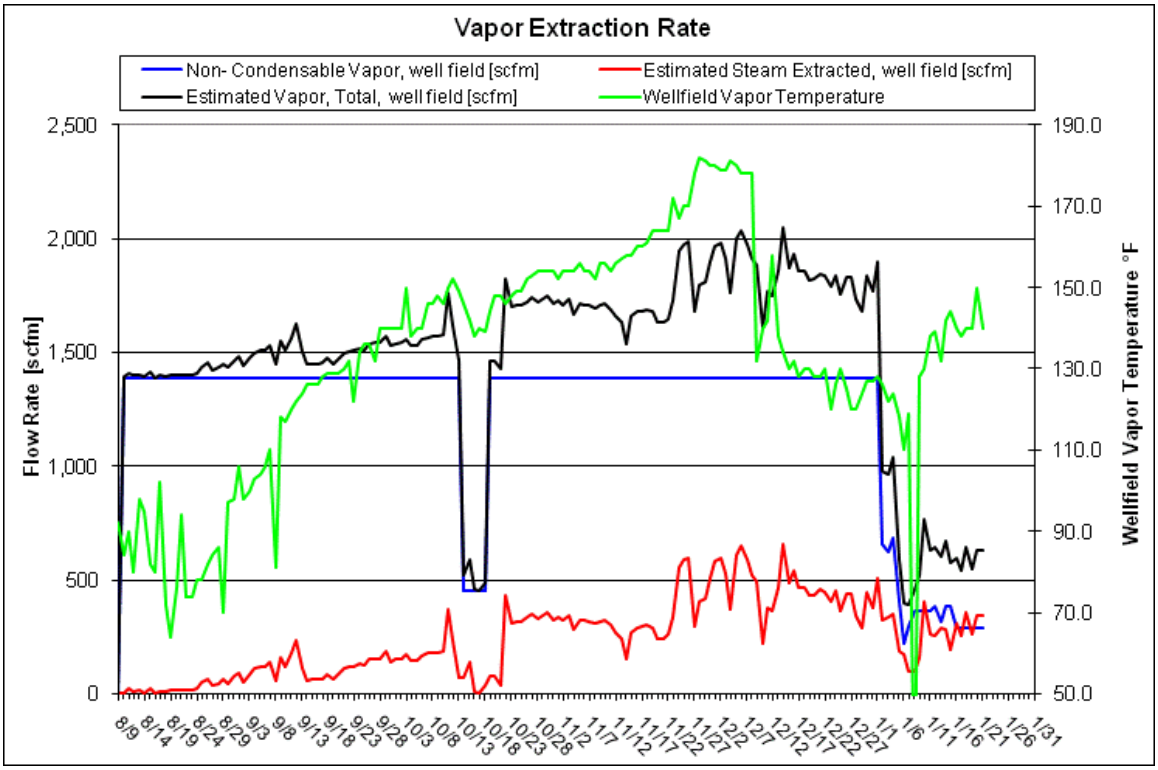


Figure 5. Vapor Extraction Rate and Temperature

4. Photo Ionization Detector (PID) and Destruction Removal Efficiency (DRE)

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

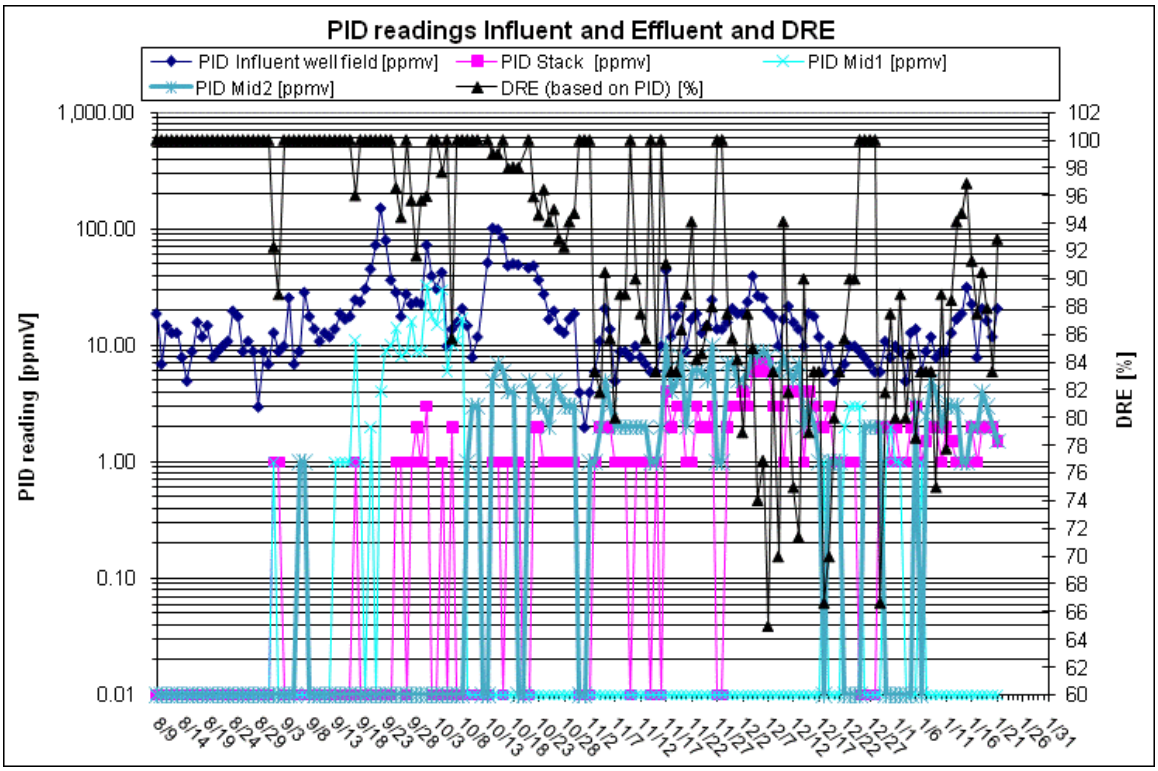


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

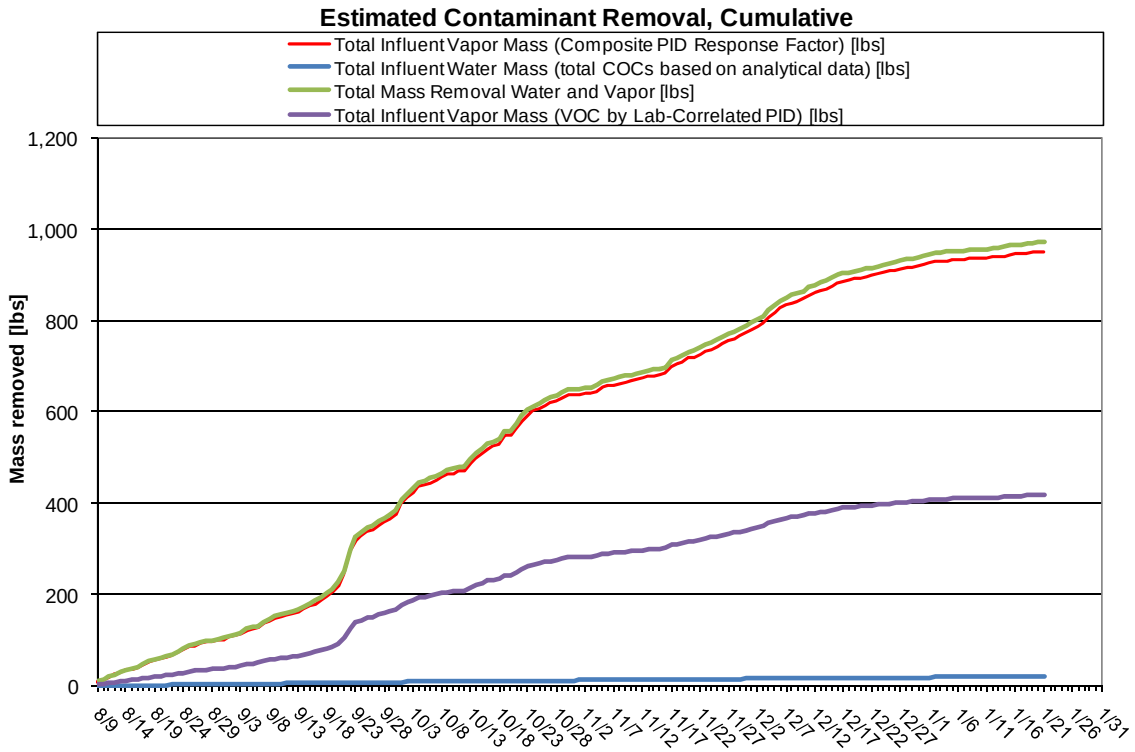


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

Two rounds of PID readings were collected from select vapor extraction wells at the site on 1/18/11 and 1/19/2011. The table below presents the concentrations in ppmV from the 11/17/10 through the most recent sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	11/17/10	11/23/10	12/1-2/2010	12/7/10	12/14/10	12/22/10	12/29/10	1/5/11	1/13/11	1/18/11	1/19/11
VEW 1	6.1	25	7.3	11	3.1	9.8		4.2	0.0		1.0
VEW 2	5.3	13	10	19	2.8	5.2		6.4	5.0		0.0
VEW 3	34	9.7	9.9	23		12		10.3	7.0		8.0
VEW 4	NR	51	17	33	9.9	13		15.4	20.0		58
VEW 5	29	77	35	51	27	24		49.8	218.0	0.0	22
VEW 6	2.2							9.1	88.0	0.2	2.0
VEW 7	0.0	20	2.4	7.7	3.5	9.6		21.6	4.0		0.0
VEW 8	2.2							8.4	3.0		7.0
VEW 9	33	105	25	59	24	12		47.8	24.0		32
VEW 10	0.8					8.5	4.3				3.0
VEW 11	1.2					4.1	4.0				2.0
VEW 12	29	13	10	19	2.7	8.5	4.0				6.0
VEW 13	12	30	19	28	18	14	9.4	38.0			8.0
VEW 14	4.7					19	1.4	6.6			1.0
VEW 15	102	128	69	65	43	21		179.4		3.6	9.0
VEW 16	2.5							23.1	6.0		3.0
VEW 17	45	71	37	54	39	38		49.9	25.0		
VEW 18	6.5	13	13	7.9	11	6.8		11.9	5.0		3.0
VEW 19	3.1							36.4	11.0		9.0
VEW 20	11	47	15	12	7.9	9.9	3.6	32.9			
VEW 21	25	60	31	25	23	15		37.9	20.0		9.0
VEW 22	4.1							9.5	3.0		2.0
VEW 23	5.7	87	48	39	20	15		15.6	10.0		5.0
VEW 24	4.3							16.2	5.0		3.0
VEW 25	7.5	36	12	19	6.3	6.9			6.0		6.0
VEW 26	2.8							11.1	4.0		2.0
VEW 27	0.0	2.8	5.6	6.8	2.3	5.5		11.7	3.0		3.0
VEW 28	0.0	5.3	0.8	2.2	0.7	3.8		4.1	2.0		0.0
VEW 29	0.0	12	15	15	4.2	5.0	4.5	47.7		0.6	71

7. Water Level

The figure below presents a water level contour map for the site. Troubleshooting will be performed on TPV01 to verify water level readings at this location.

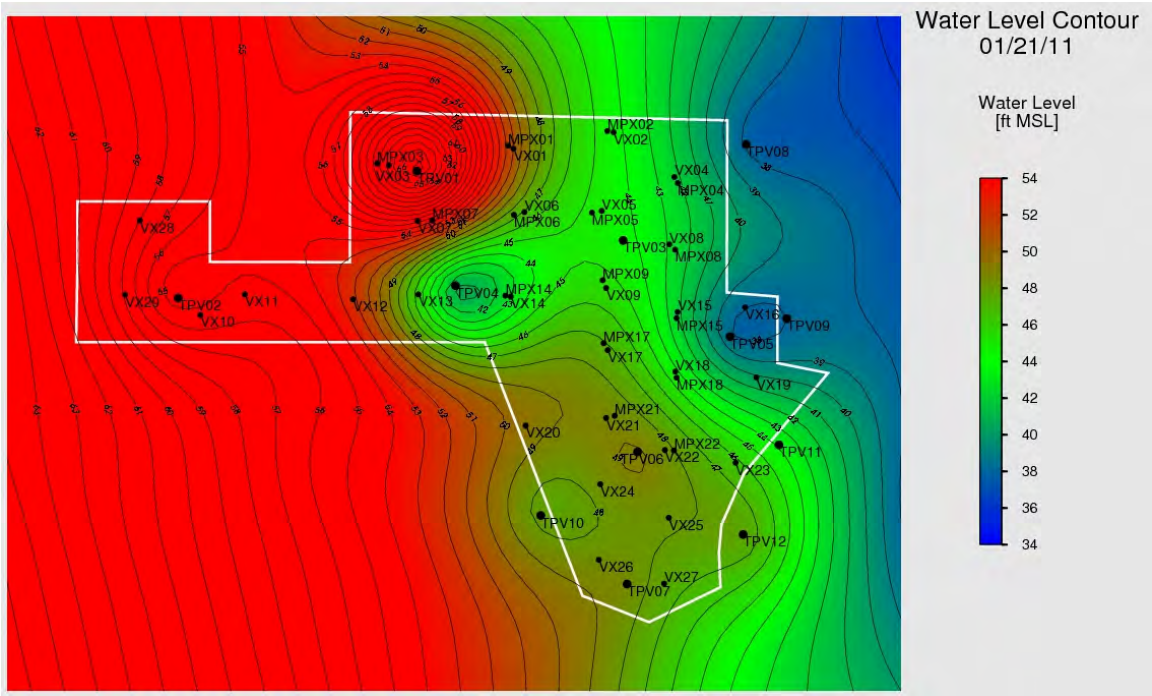


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

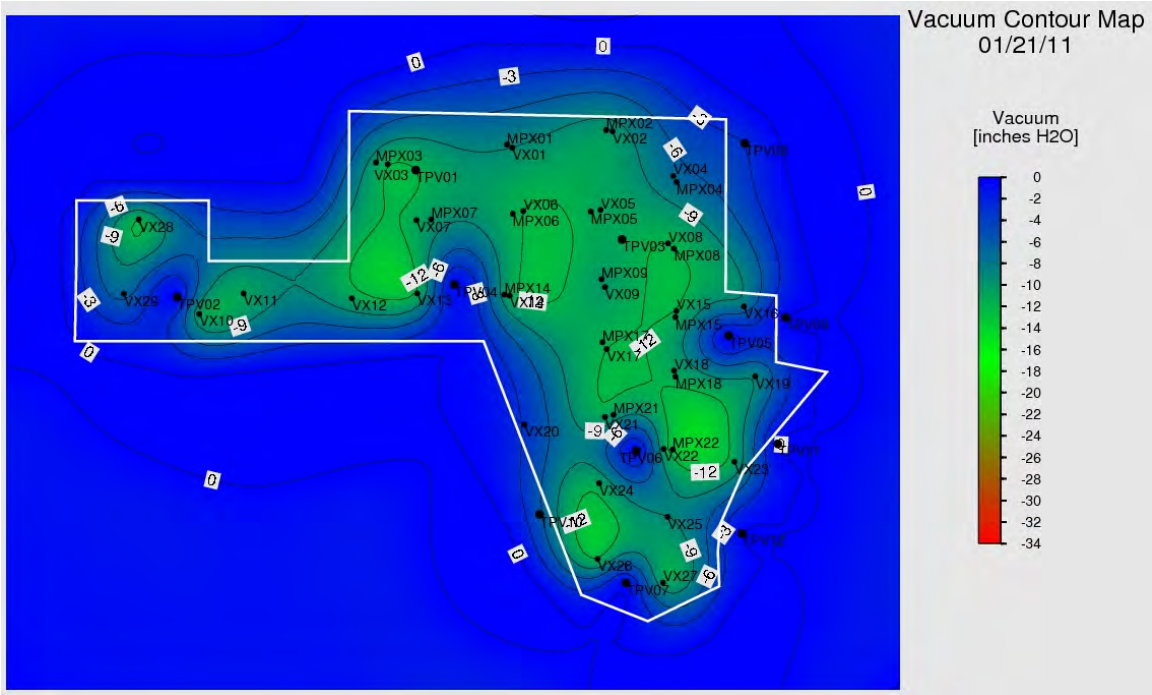


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,687,721 gallons of water since system startup while extracting a total of 2,018,881 gallons of water for a total net water extraction of 331,160 gallons.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

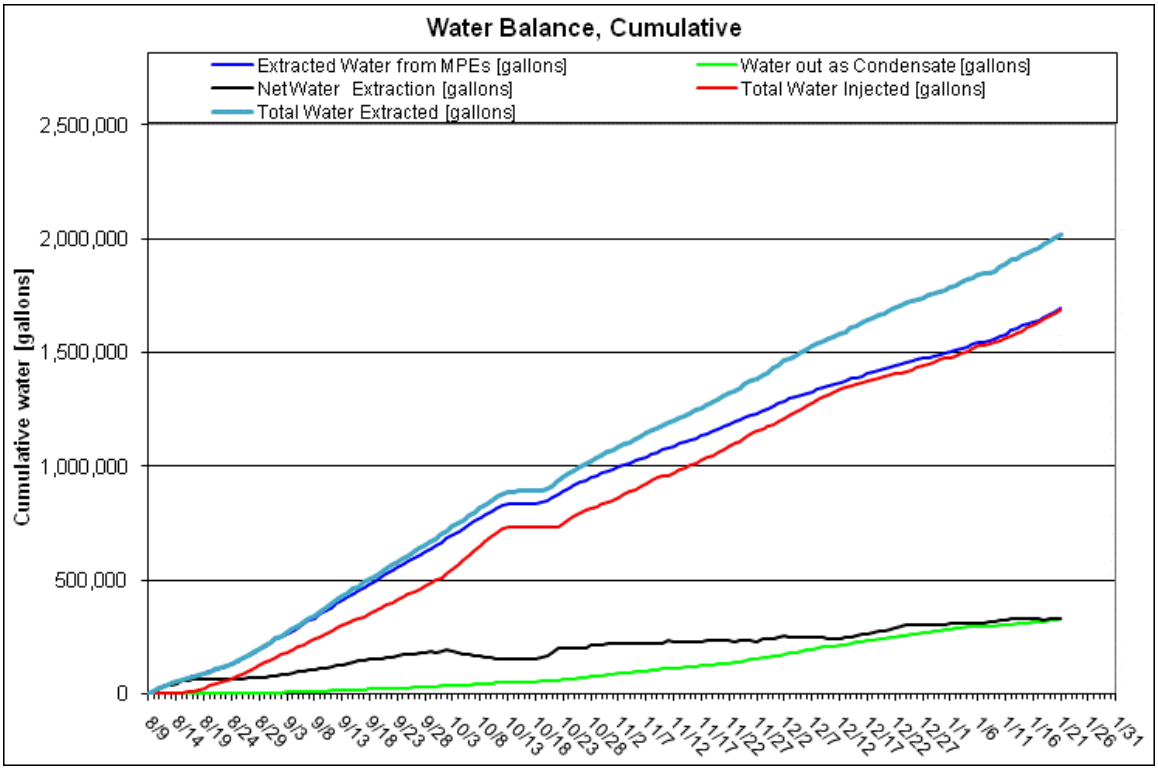


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

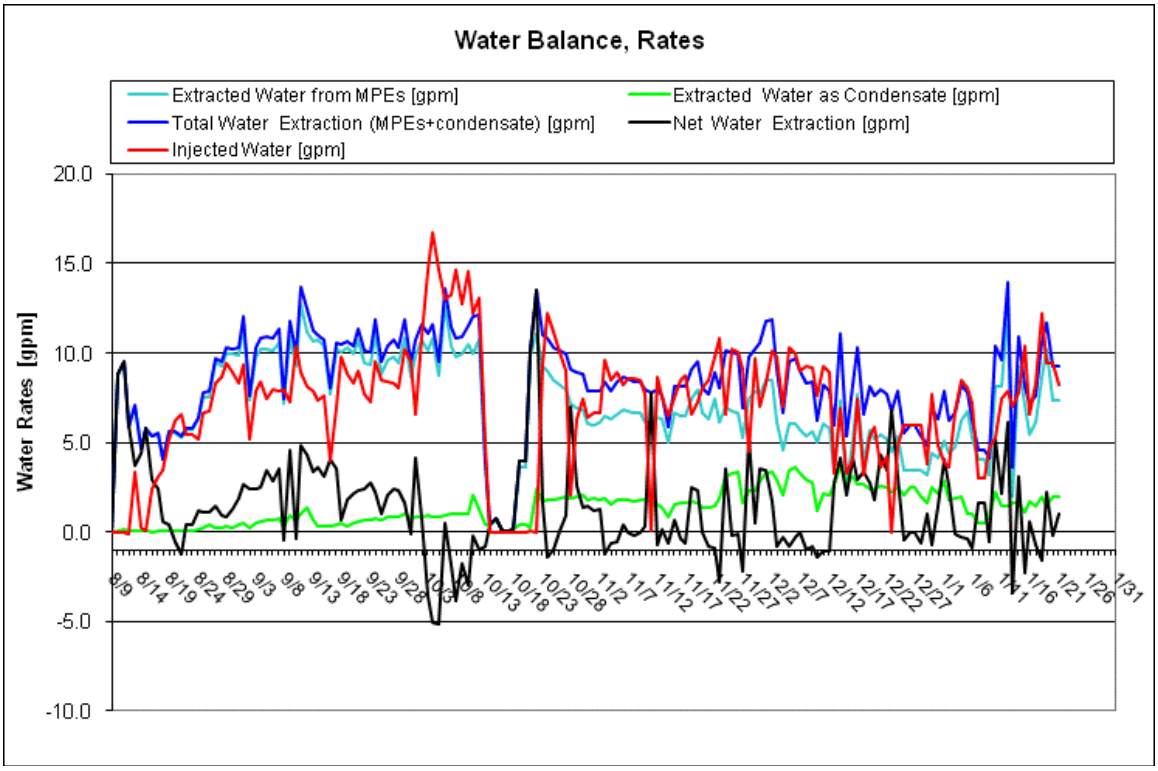


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

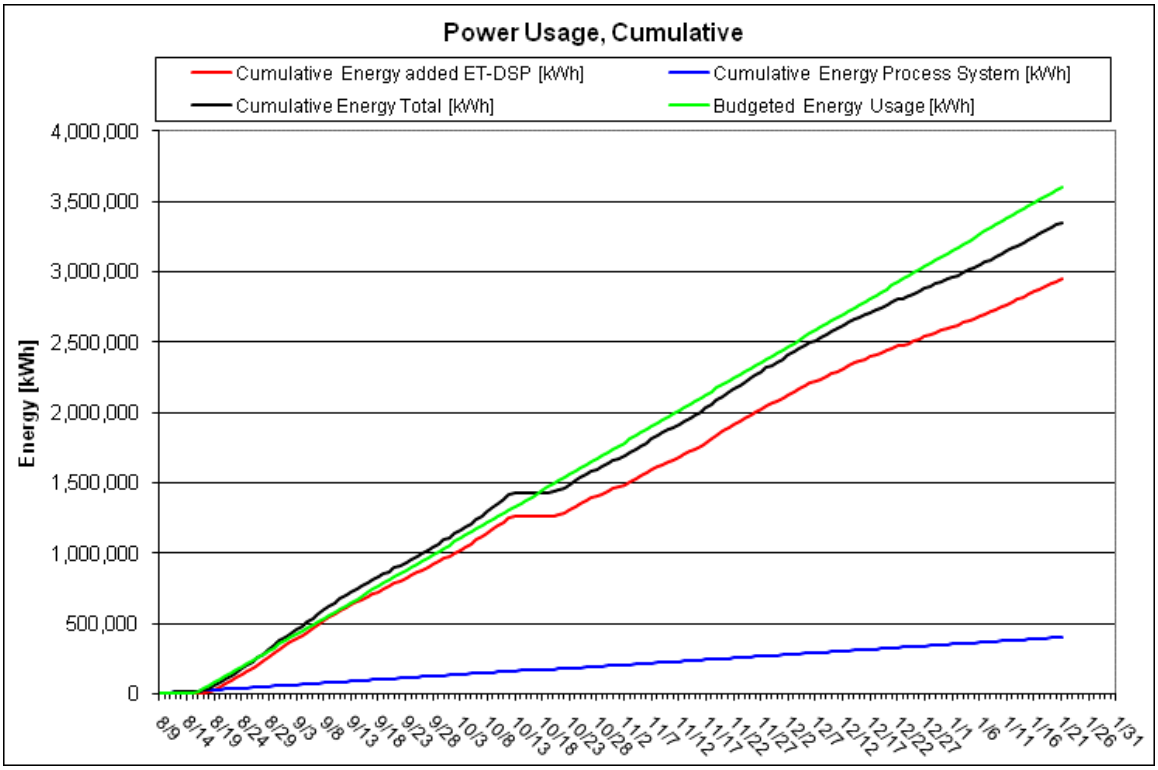


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Steam injection will continue at Steam Spears 3, 5, 10, 12, and 13.

The following saline injections were made:

January 17 and 20, 2011 – 80 lbs

Incidents:

No safety or environmental compliance incidents were reported for the January 15 through 21, 2011 operational period.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged.

Progress Report

1/22/2011 through 1/28/2011
January 31, 2011
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from January 22 through January 28, 2011 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 1/28/2011		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/18/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	163	days
Energy used to date	3,447,840	kWh
Injected energy per soil volume to date	184	kWh/cy
Water contaminant removal last 7 days	0.5	lbs
Water contaminant removal to date	21.1	lbs
Vapor contaminant removal last 7 days	11	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	1,086	lbs
Average temperature Area A last 7 days	199	°F
Average temperature Area C last 7 days	183	°F
Average temperature Area D last 7 days	186	°F
Average power usage rate last 7 days	577	kW
Average total water extracted rate last 7 days	5.2	gpm
Average injected water rate last 7 days	3.2	gpm
Average vapor extraction rate (non condensable) last 7 days	206	scfm

System Shutdowns

Monday, 24 January: It is estimated that the system shutdown at approximately 1730 EST based on totalizer readings at the treatment plant. After two days of troubleshooting, it was determined that a power surge caused the battery that operates the Programmable Logic Control (PLC) system to malfunction. As a result, no alarms were received by TerraTherm operators. The battery was replaced and the system was brought back online Thursday, 27 January. Two spare batteries are currently at the site.

System Maintenance

Other routine maintenance such as snow removal, bag filter changes, gauge maintenance, flushing of lines, backwashing of carbon vessels, winterization, etc. continues to occur.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

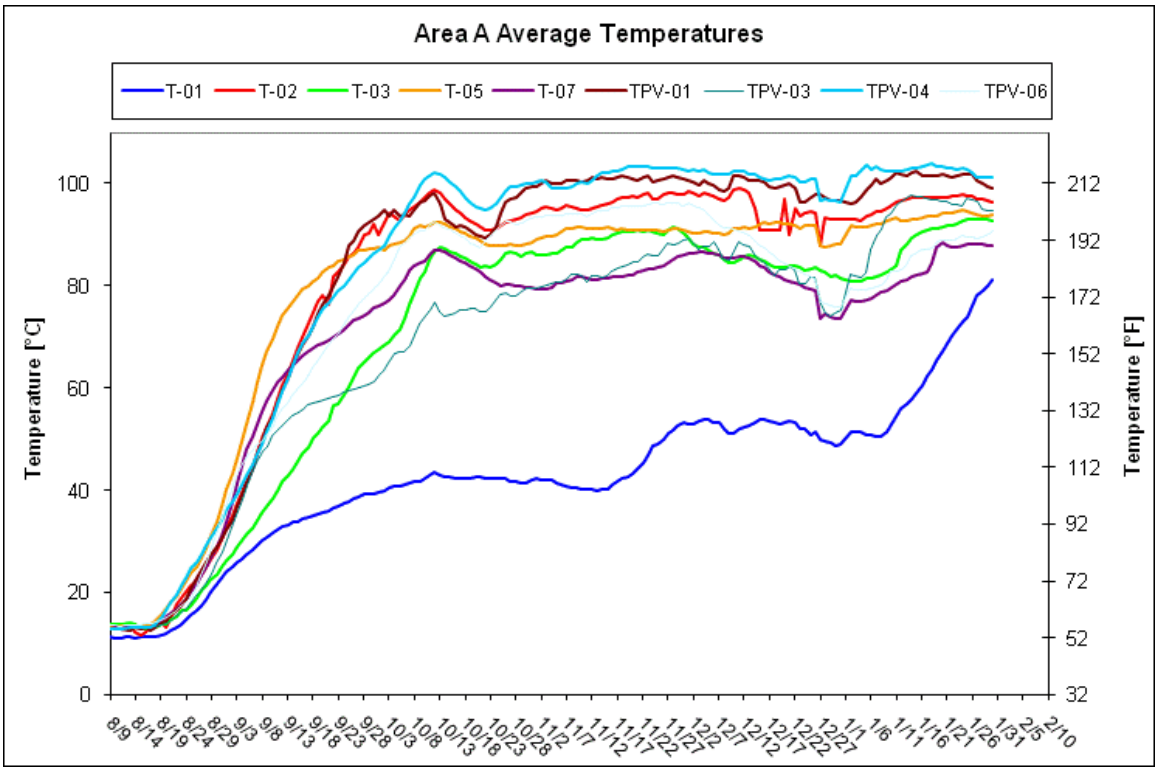


Figure 1. Average Temperature – Area A

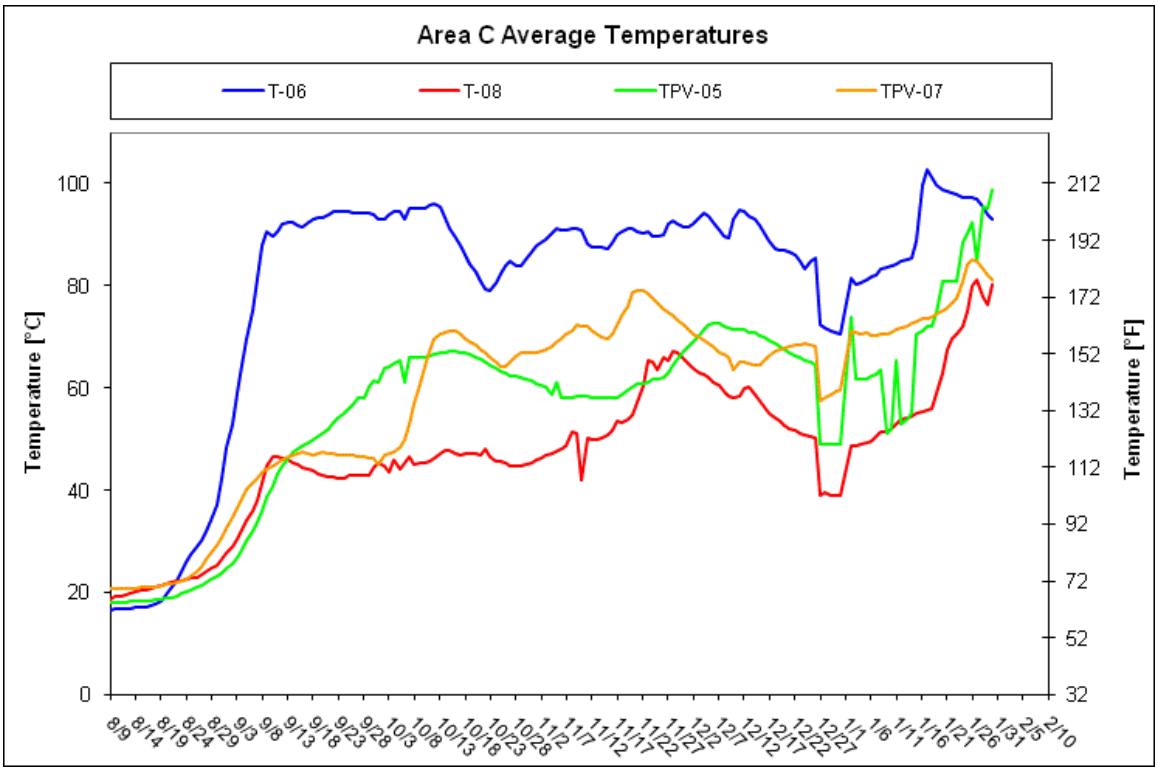


Figure 2. Average Temperature – Area C

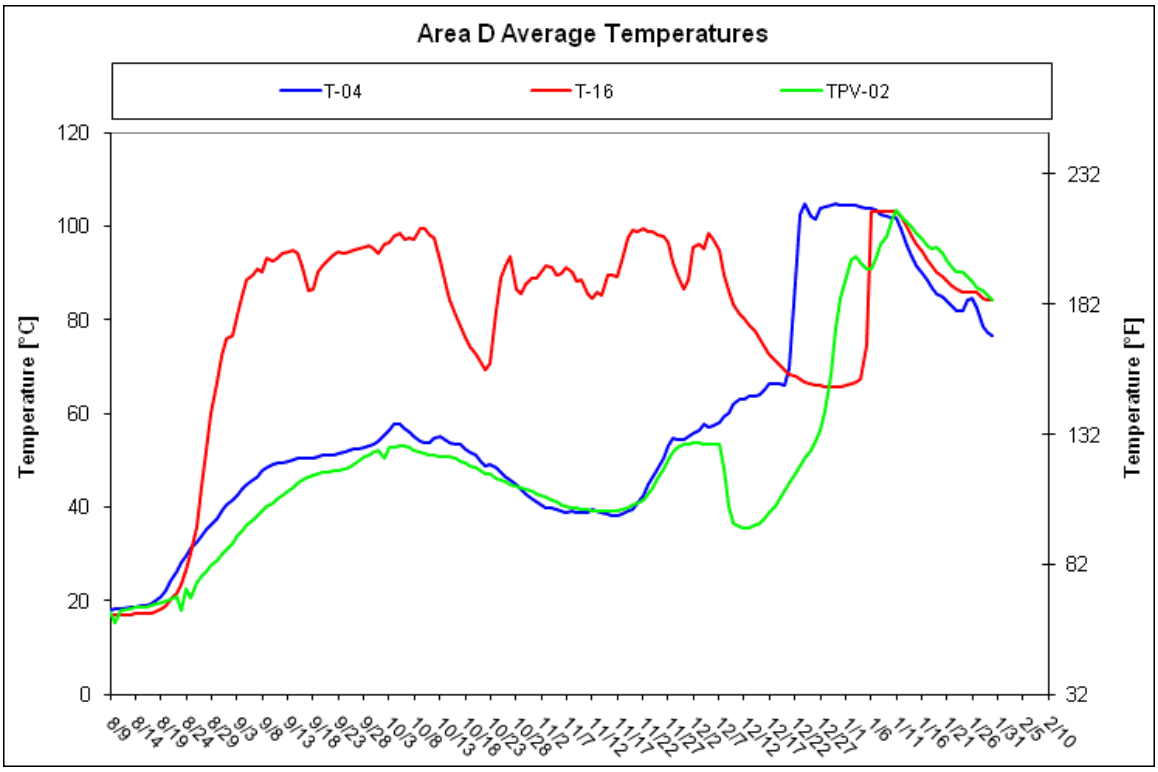


Figure 3. Average Temperature – Area D

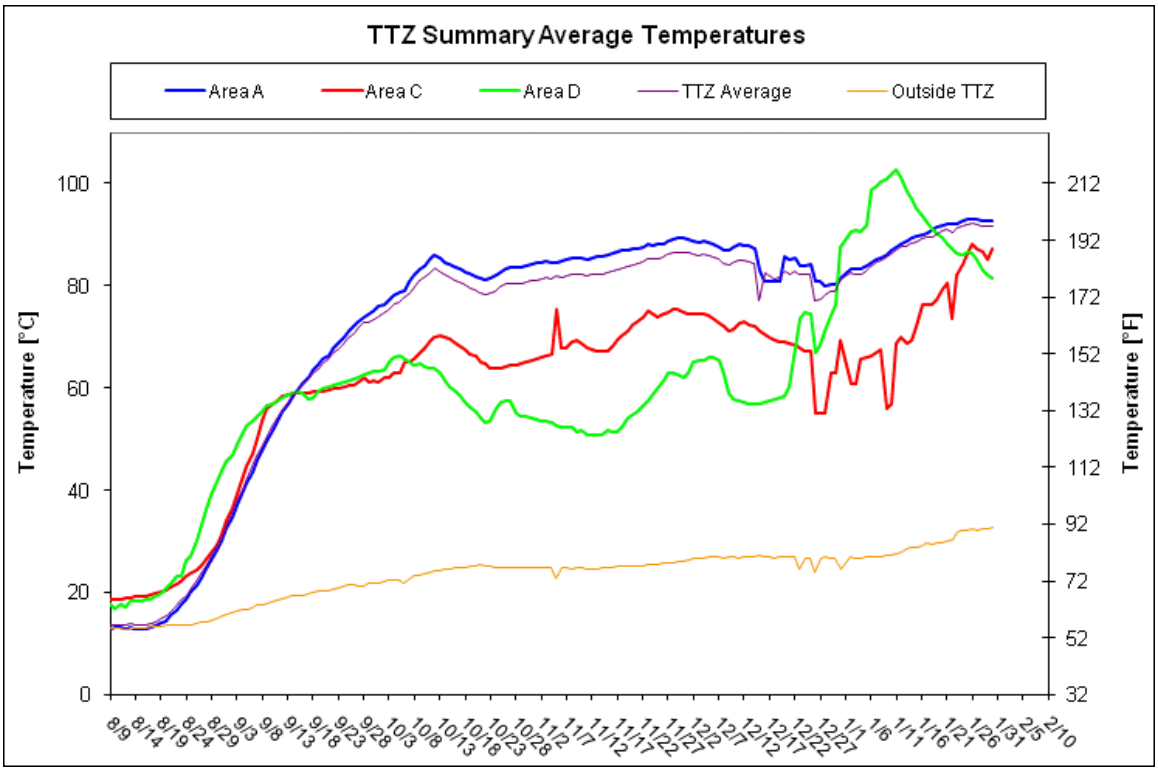


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

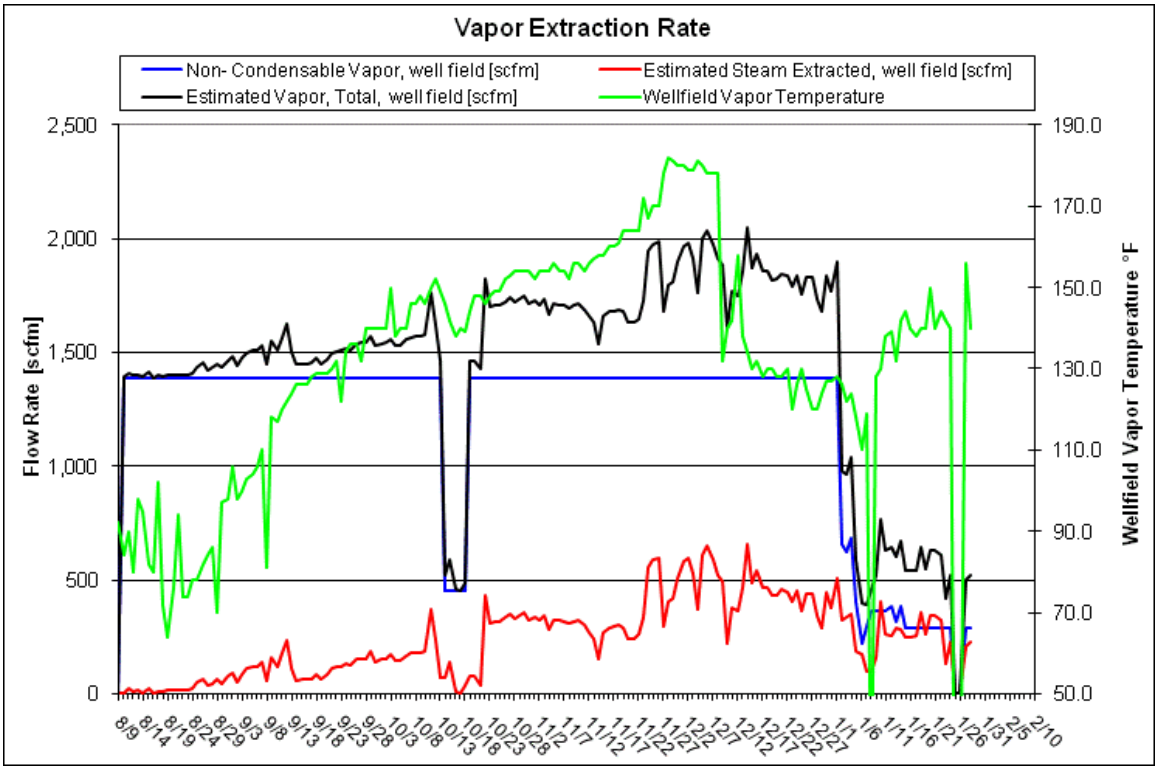


Figure 5. Vapor Extraction Rate and Temperature

4. Photo Ionization Detector (PID) and Destruction Removal Efficiency (DRE)

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

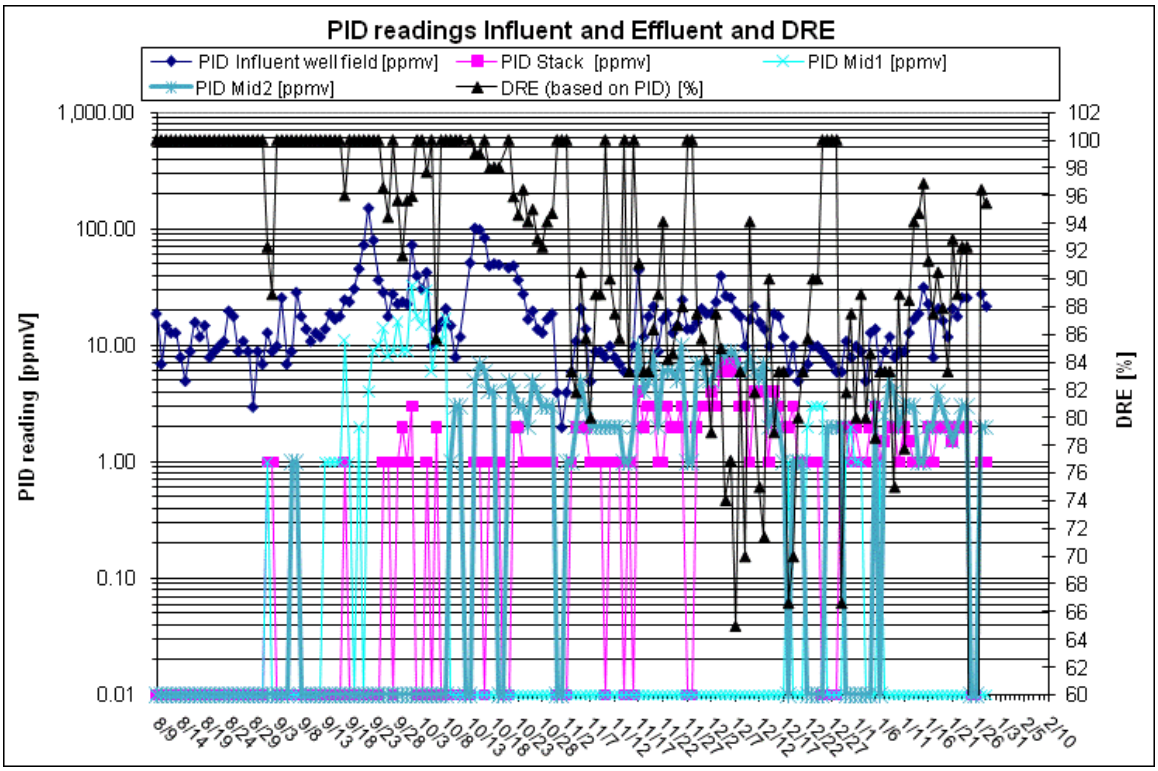


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

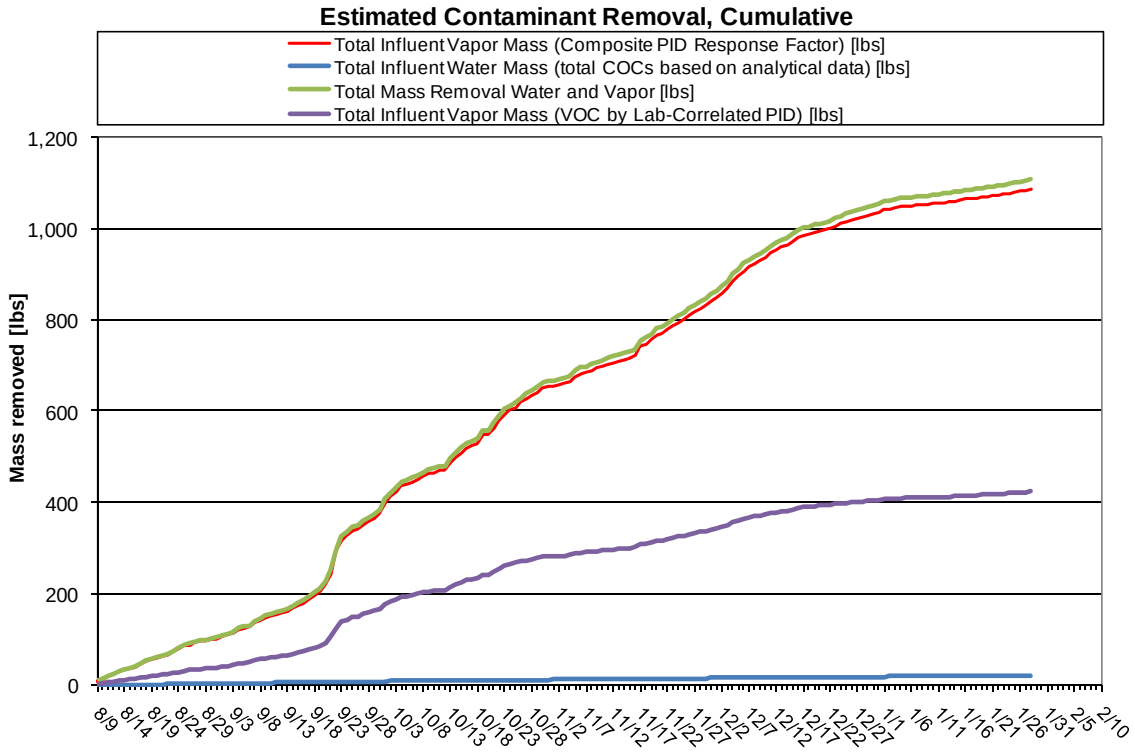


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

Two rounds of PID readings were collected from select vapor extraction wells at the site on 1/28/11. The table below presents the concentrations in ppmV from the 11/17/10 through the most recent sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	11/17/10	11/23/10	12/1-2/2010	12/7/10	12/14/10	12/22/10	12/29/10	1/5/11	1/13/11	1/18/11	1/19/11	1/28/11
VEW 1	6.1	25	7.3	11	3.1	9.8		4.2	0.0		1.0	
VEW 2	5.3	13	10	19	2.8	5.2		6.4	5.0		0.0	
VEW 3	34	9.7	9.9	23		12		10	7.0		8.0	
VEW 4	NR	51	17	33	9.9	13		15	20		58	165
VEW 5	29	77	35	51	27	24		50	218	0.0	22	31
VEW 6	2.2							9.1	88	0.2	2.0	
VEW 7	0.0	20	2.4	7.7	3.5	9.6		22	4.0		0.0	
VEW 8	2.2							8.4	3.0		7.0	
VEW 9	33	105	25	59	24	12		48	24		32	84
VEW 10	0.8					8.5	4.3				3.0	2.0
VEW 11	1.2					4.1	4.0				2.0	5.0
VEW 12	29	13	10	19	2.7	8.5	4.0				6.0	25
VEW 13	12	30	19	28	18	14	9.4	38			8.0	26
VEW 14	4.7					19	1.4	6.6			1.0	5.0
VEW 15	102	128	69	65	43	21		179		3.6	9.0	
VEW 16	2.5							23	6.0		3.0	30
VEW 17	45	71	37	54	39	38		50	25			
VEW 18	6.5	13	13	7.9	11	6.8		12	5.0		3.0	
VEW 19	3.1							36	11		9.0	42
VEW 20	11	47	15	12	7.9	9.9	3.6	33				41
VEW 21	25	60	31	25	23	15		38	20		9.0	65
VEW 22	4.1							9.5	3.0		2.0	
VEW 23	5.7	87	48	39	20	15		16	10		5.0	49
VEW 24	4.3							16	5.0		3.0	
VEW 25	7.5	36	12	19	6.3	6.9			6.0		6.0	
VEW 26	2.8							11	4.0		2.0	12
VEW 27	0.0	2.8	5.6	6.8	2.3	5.5		12	3.0		3.0	6.0
VEW 28	0.0	5.3	0.8	2.2	0.7	3.8		4.1	2.0		0.0	
VEW 29	0.0	12	15	15	4.2	5.0	4.5	48		0.6	71	9.0

7. Water Level

The figure below presents a water level contour map for the site. Multi-phase extraction was restarted at the site on 1/27/11.

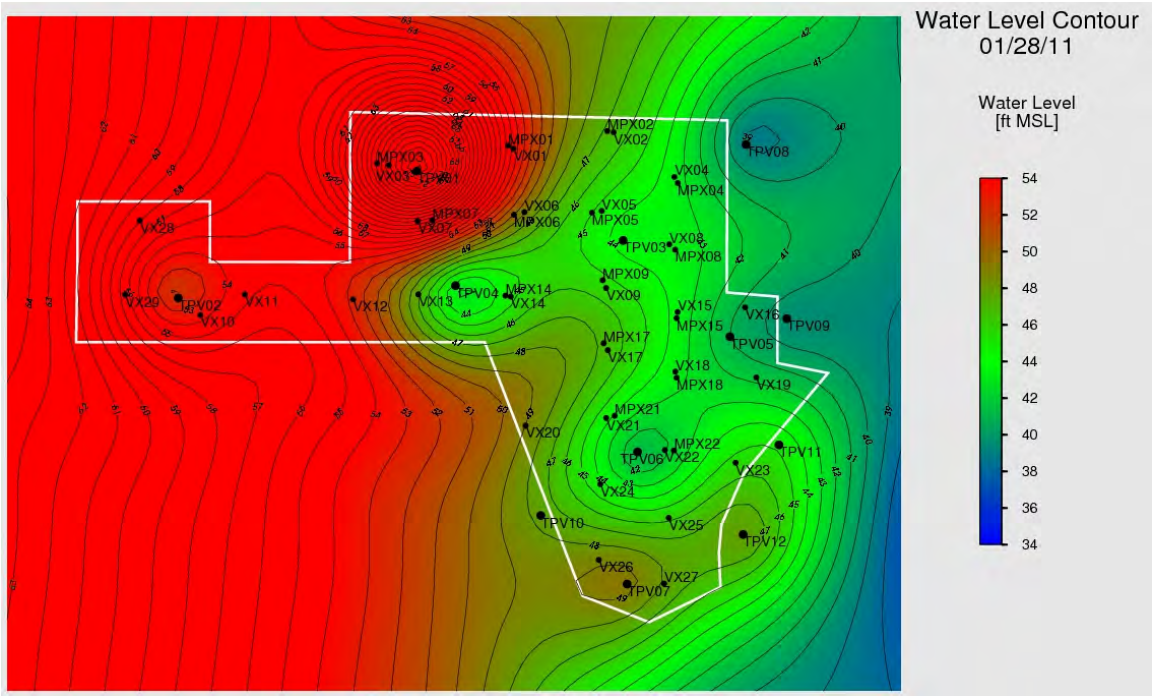


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site as of 1/27/11.

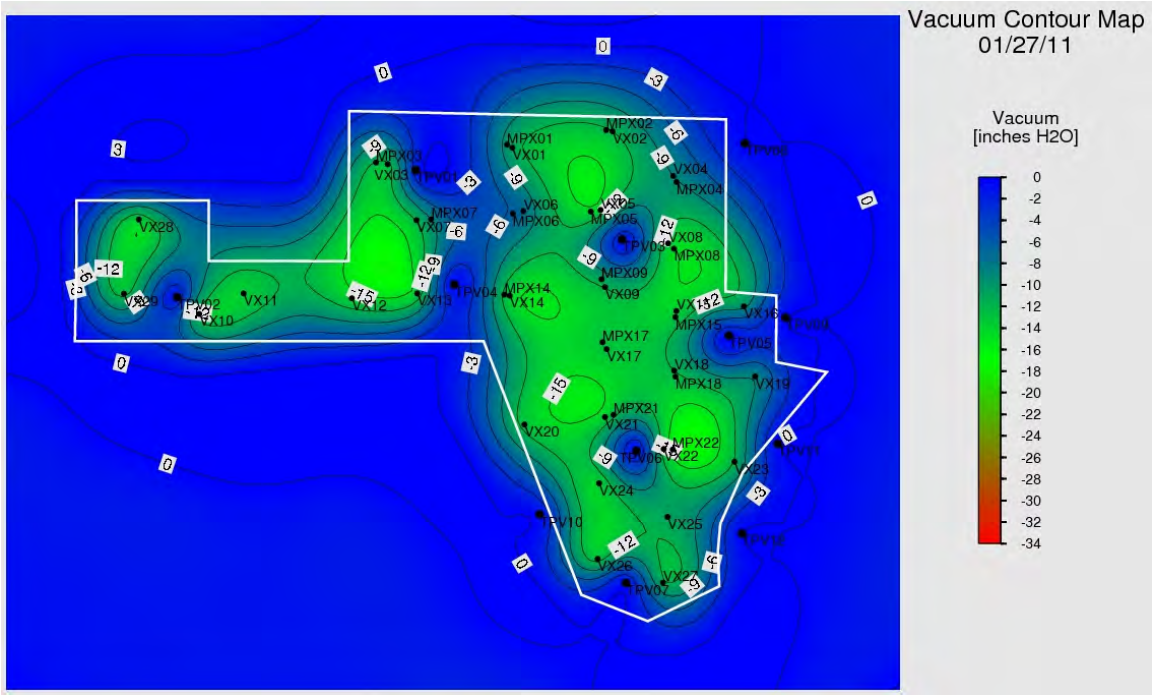


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,720,202 gallons of water since system startup while extracting a total of 2,071,169 gallons of water for a total net water extraction of 350,967 gallons.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

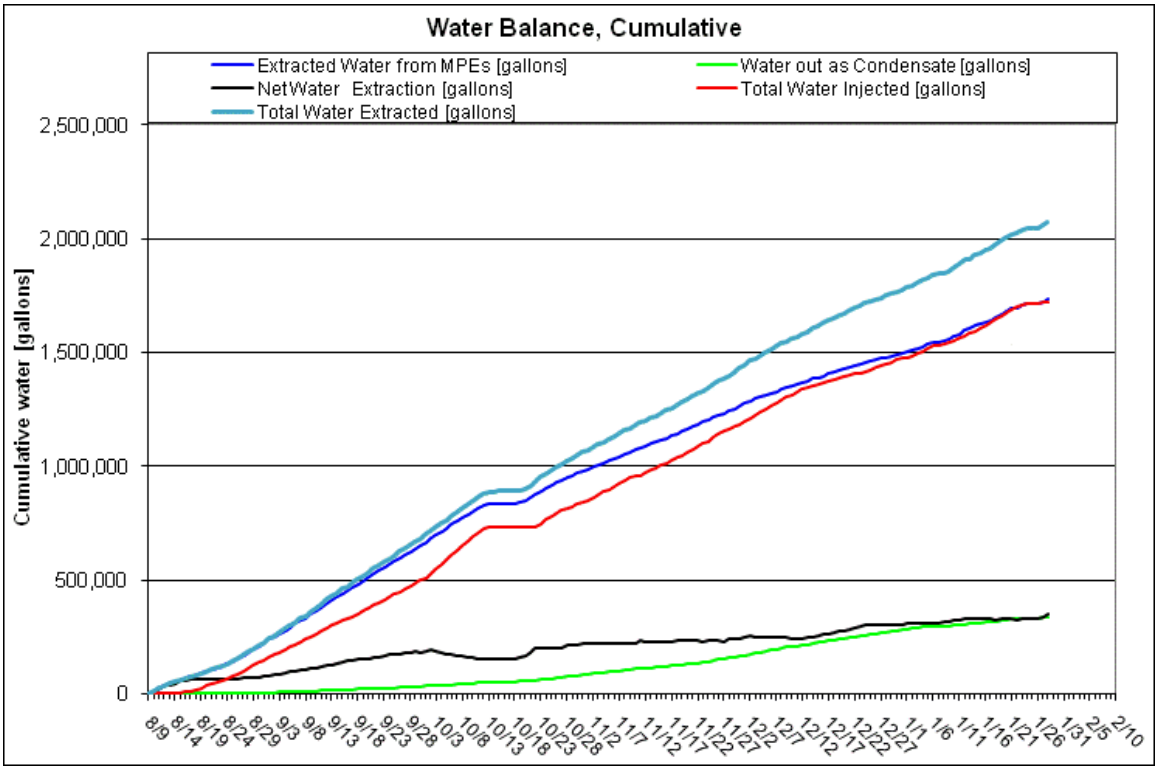


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

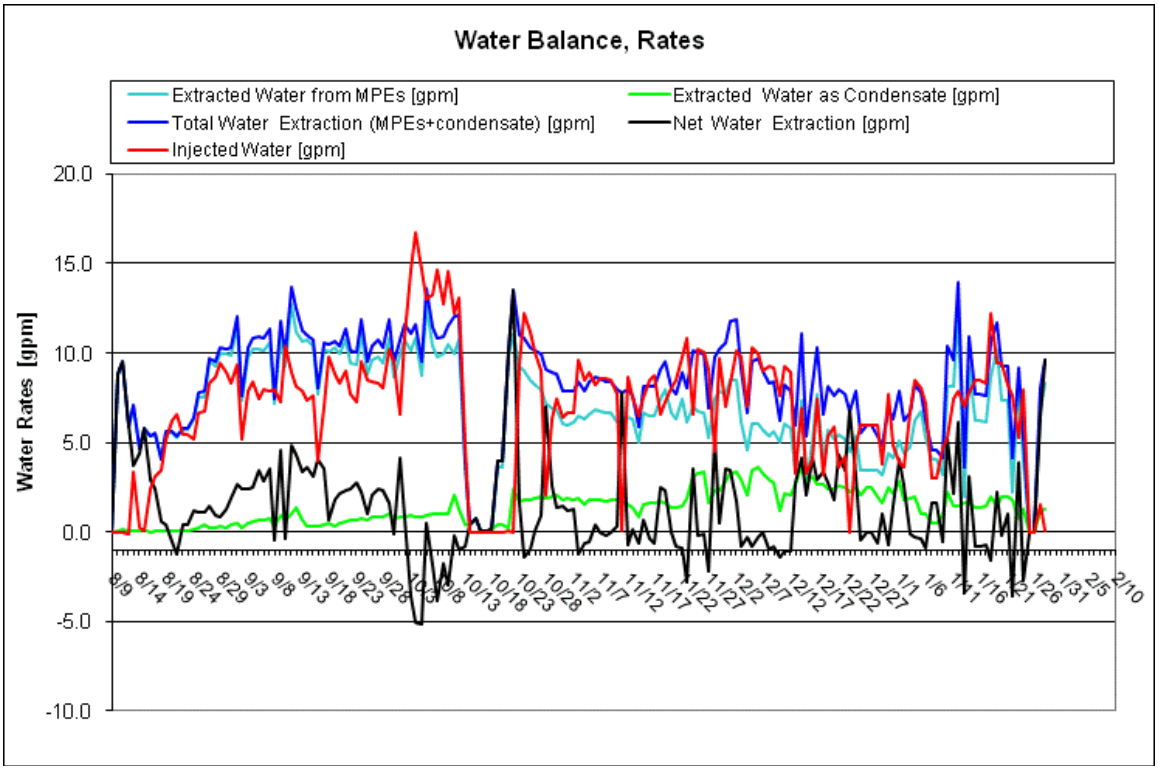


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

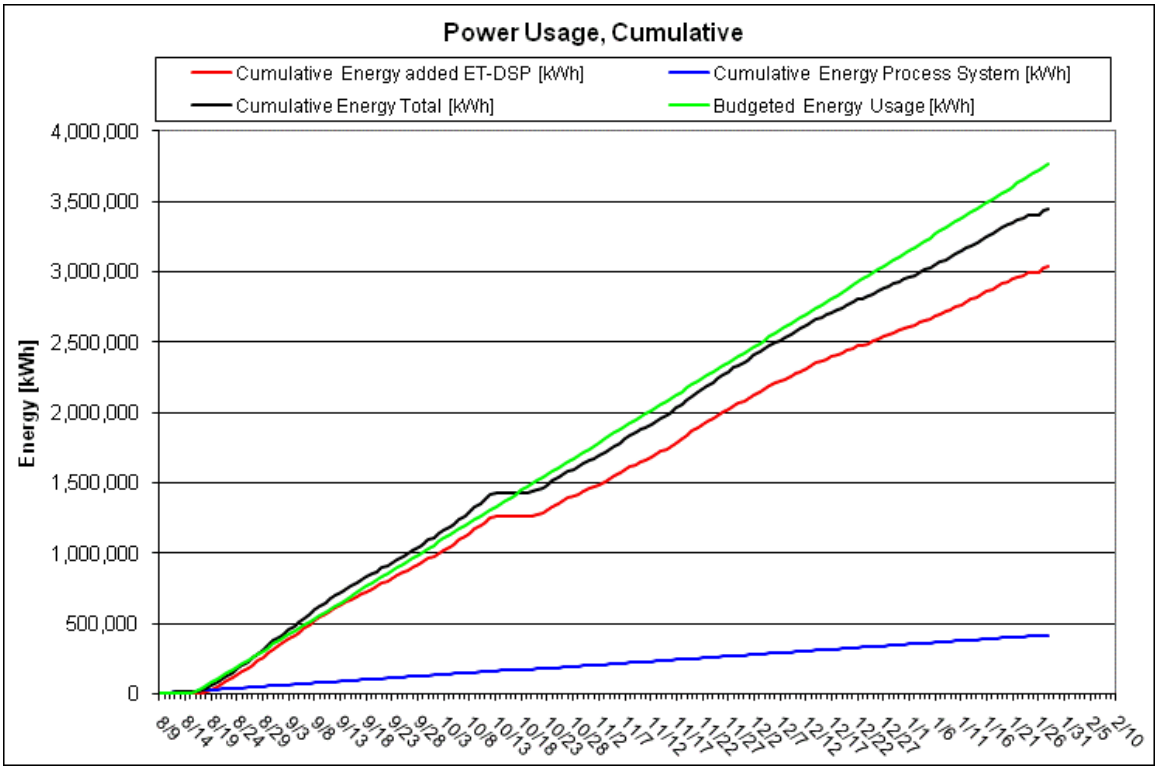


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Steam injection will continue at X-16, SP-10, SP-13, X-23, and X-27.

No saline injections were made.

Incidents:

No safety or environmental compliance incidents were reported for the January 22 through 28, 2011 operational period.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged.

Progress Report

1/29/2011 through 2/4/2011
February 7, 2011
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from January 29 through February 4, 2011 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 2/4/2011		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/18/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	170	days
Energy used to date	3,552,800	kWh
Injected energy per soil volume to date	189	kWh/cy
Water contaminant removal last 7 days	0.6	lbs
Water contaminant removal to date	21.7	lbs
Vapor contaminant removal last 7 days	12	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	1,121	lbs
Average temperature Area A last 7 days	199	°F
Average temperature Area C last 7 days	192	°F
Average temperature Area D last 7 days	175	°F
Average power usage rate last 7 days	625	kW
Average total water extracted rate last 7 days	6.3	gpm
Average injected water rate last 7 days	0.7	gpm
Average vapor extraction rate (non condensable) last 7 days	285	scfm

System Shutdowns

Sunday, 30 January: The vapor carbon trailer shutdown for approximately one hour due to a temporary loss of pressure which resulted from a frozen air line.

Monday, 31 January: The wellfield was shut down for approximately two hours to repair the air line on the downhole pump in extraction well -07.

System Maintenance

Other routine maintenance such as snow removal, bag filter changes, gauge maintenance, flushing of lines, backwashing of carbon vessels, winterization, etc. continues to occur.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

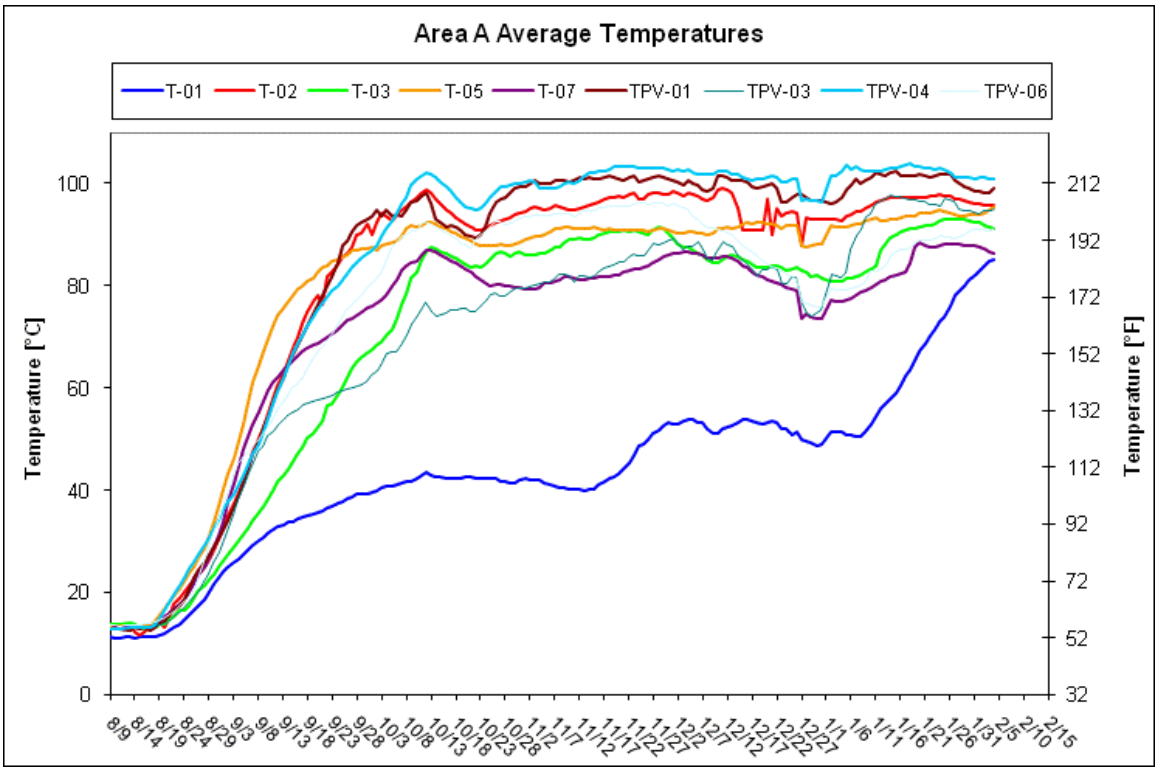


Figure 1. Average Temperature – Area A

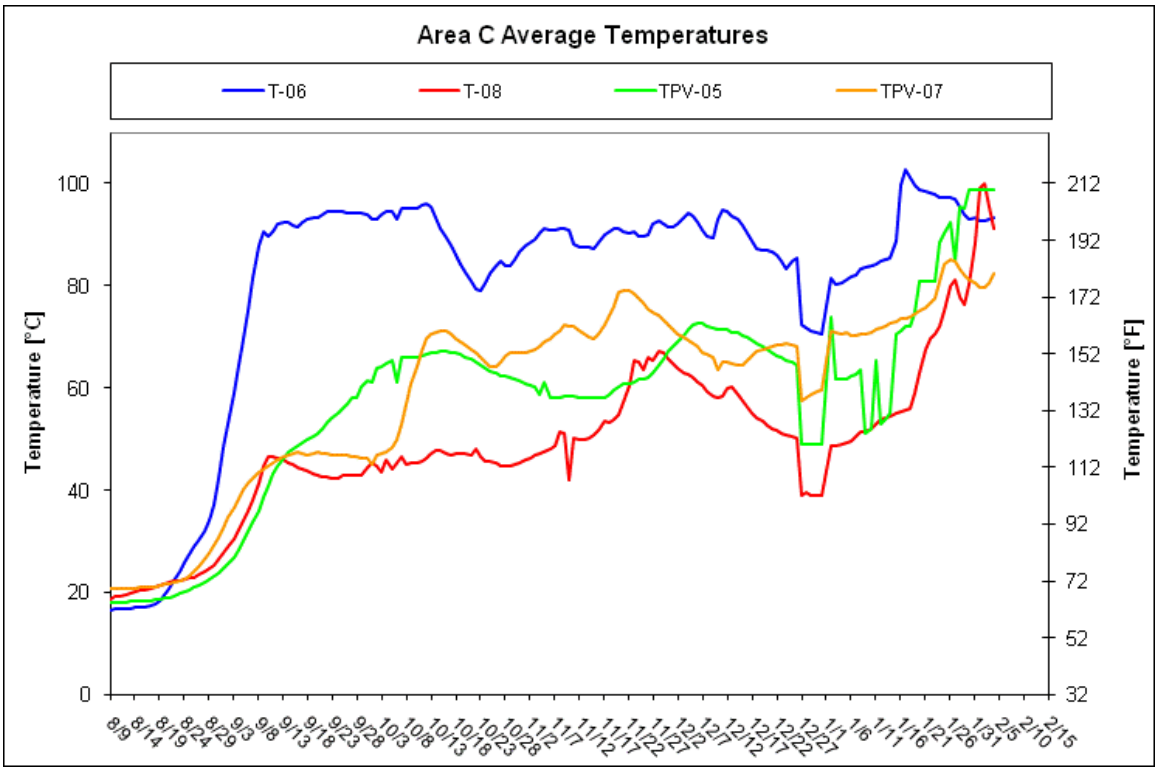


Figure 2. Average Temperature – Area C

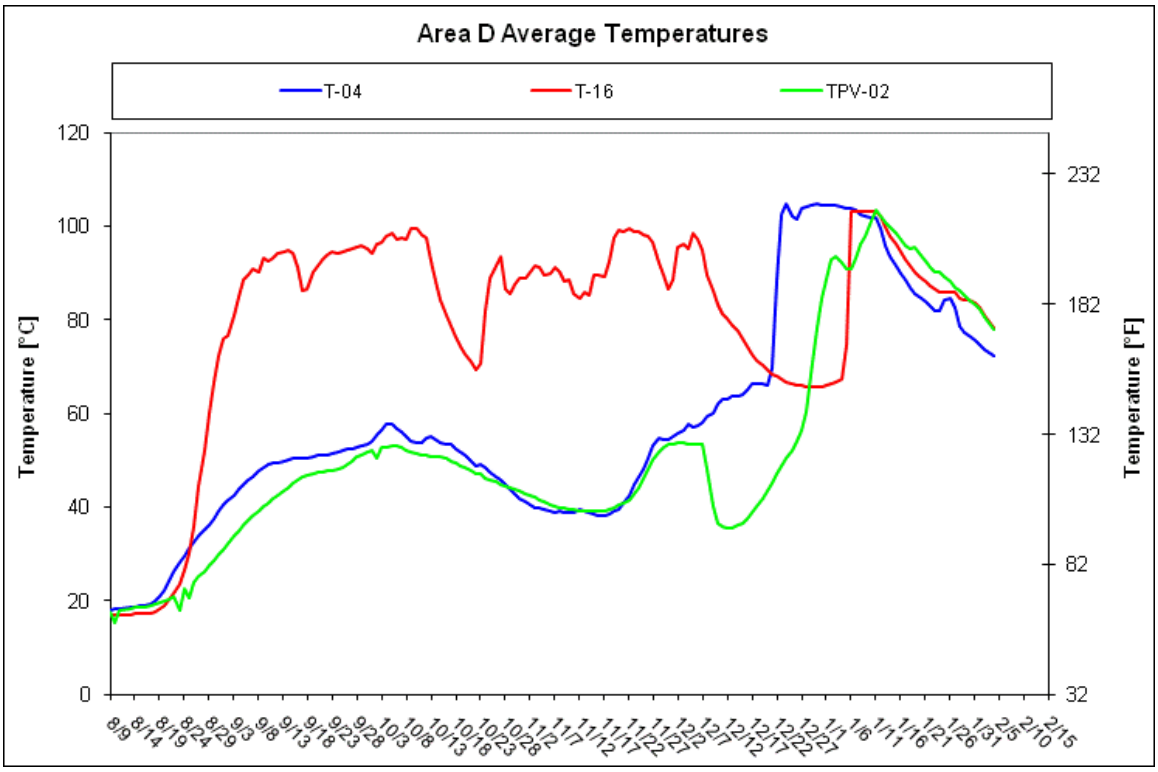


Figure 3. Average Temperature – Area D

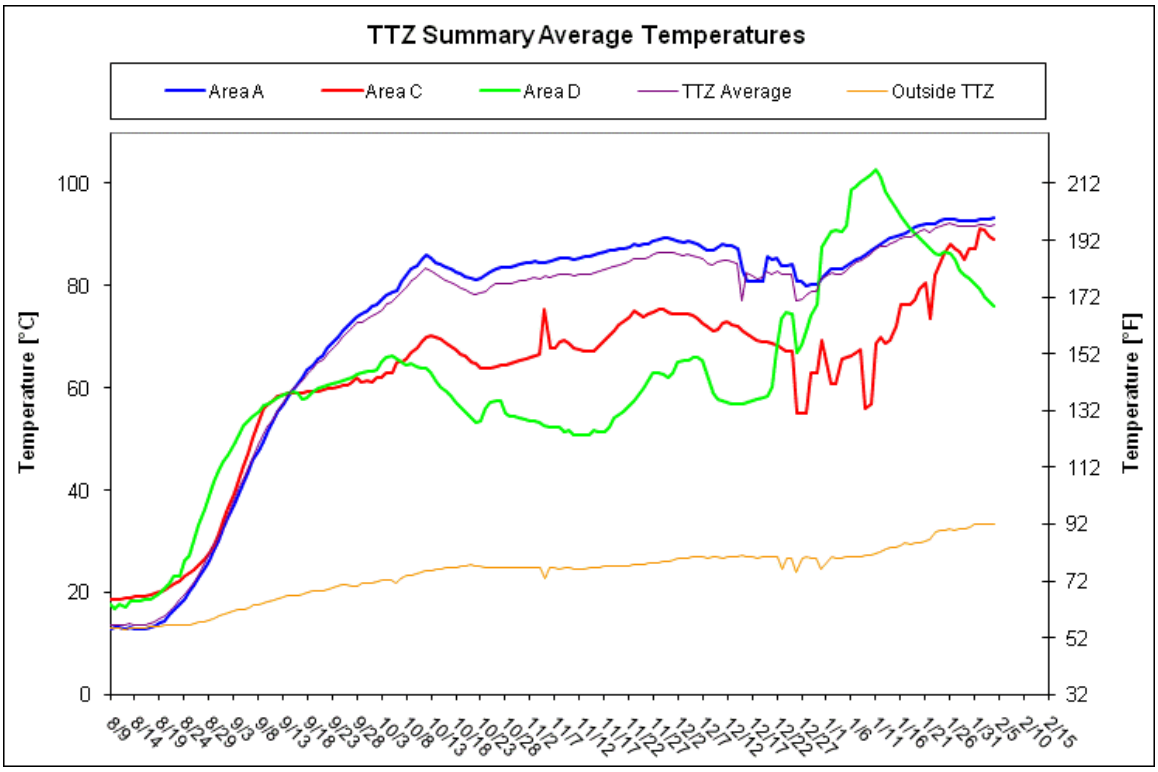


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

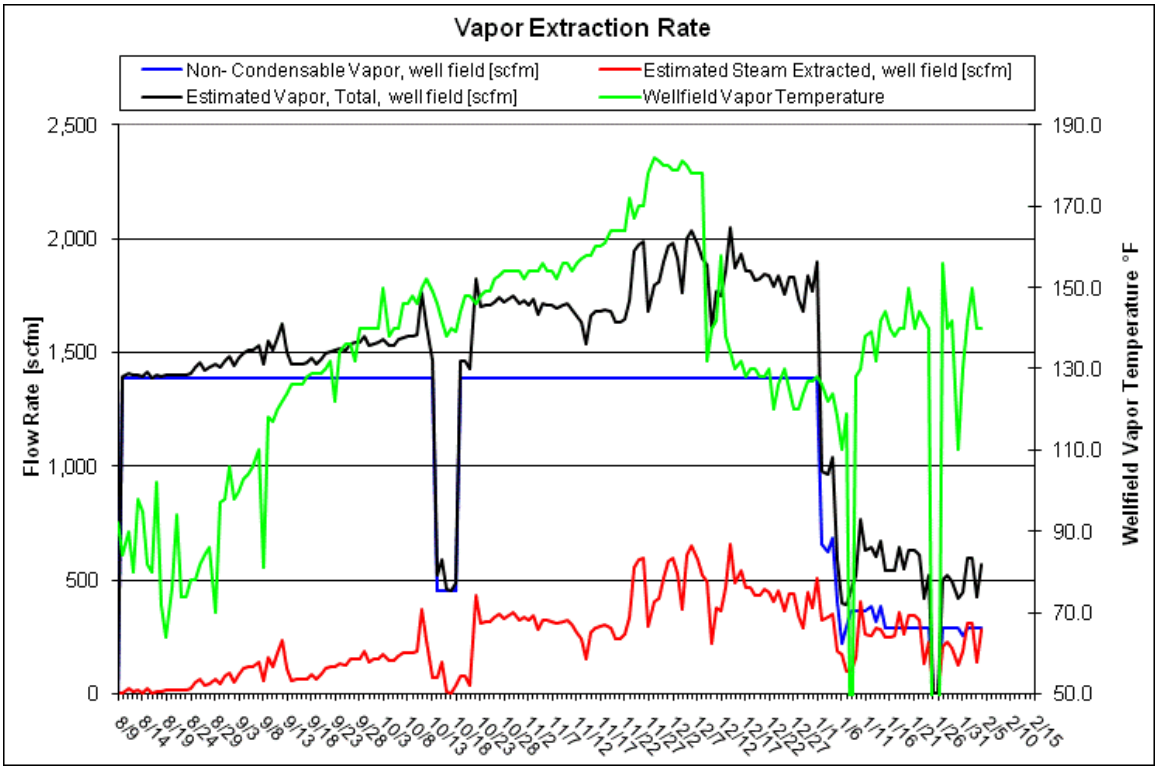


Figure 5. Vapor Extraction Rate and Temperature

4. Photo Ionization Detector (PID) and Destruction Removal Efficiency (DRE)

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

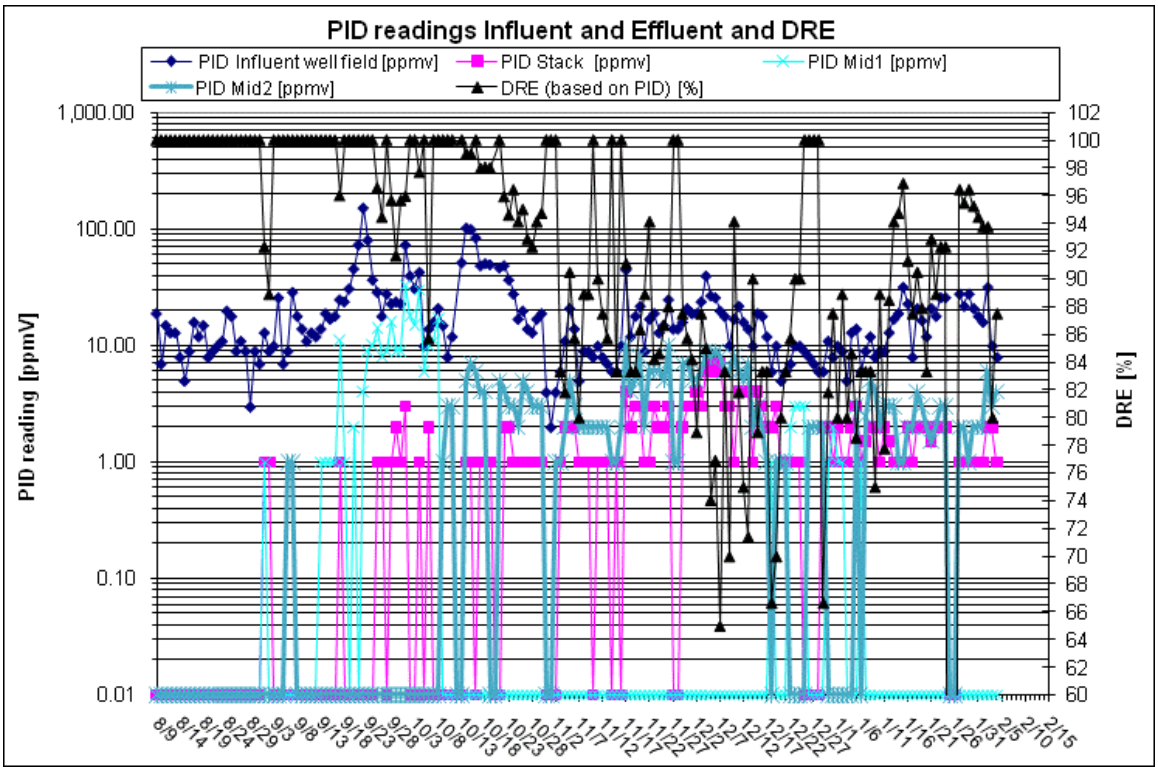


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

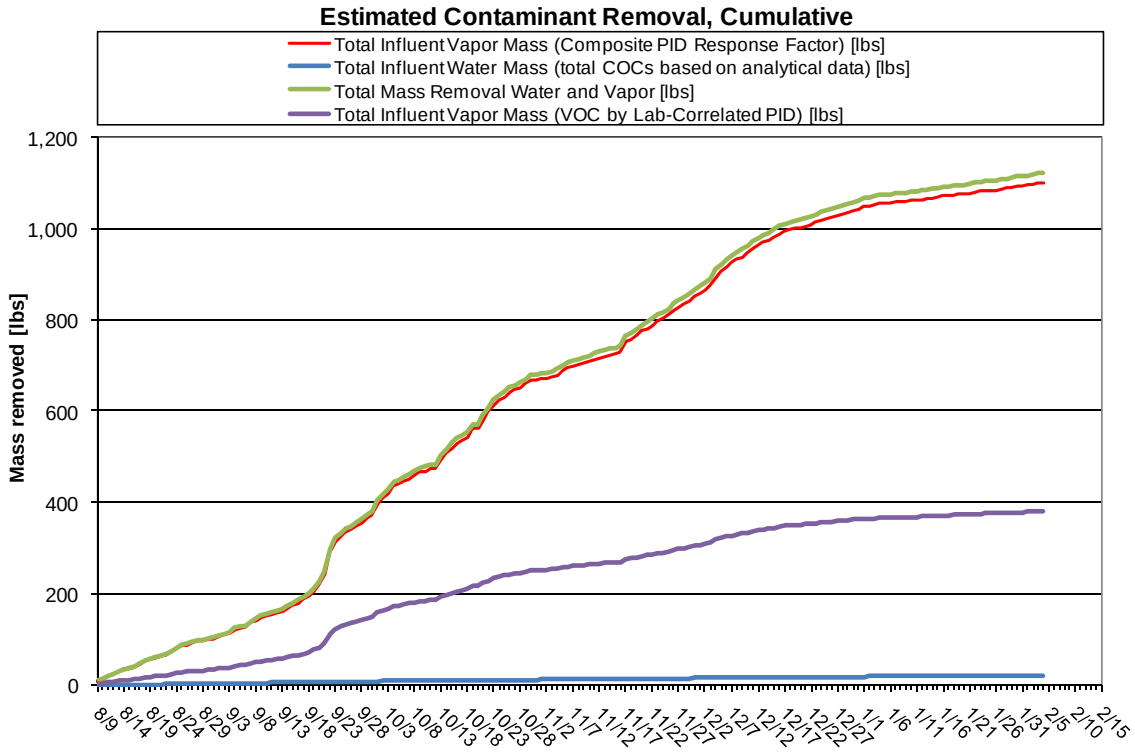


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

No PID readings were collected at the site during the week ending 2/4/11 due to a snow storm and snow removal activities. The table below presents the concentrations in ppmV from the 11/17/10 through the most recent sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	11/17/10	11/23/10	12/1-2/2010	12/7/10	12/14/10	12/22/10	12/29/10	1/5/11	1/13/11	1/18/11	1/19/11	1/28/11
VEW 1	6.1	25	7.3	11	3.1	9.8		4.2	0.0		1.0	
VEW 2	5.3	13	10	19	2.8	5.2		6.4	5.0		0.0	
VEW 3	34	9.7	9.9	23		12		10	7.0		8.0	
VEW 4	NR	51	17	33	9.9	13		15	20		58	165
VEW 5	29	77	35	51	27	24		50	218	0.0	22	31
VEW 6	2.2							9.1	88	0.2	2.0	
VEW 7	0.0	20	2.4	7.7	3.5	9.6		22	4.0		0.0	
VEW 8	2.2							8.4	3.0		7.0	
VEW 9	33	105	25	59	24	12		48	24		32	84
VEW 10	0.8					8.5	4.3				3.0	2.0
VEW 11	1.2					4.1	4.0				2.0	5.0
VEW 12	29	13	10	19	2.7	8.5	4.0				6.0	25
VEW 13	12	30	19	28	18	14	9.4	38			8.0	26
VEW 14	4.7					19	1.4	6.6			1.0	5.0
VEW 15	102	128	69	65	43	21		179		3.6	9.0	
VEW 16	2.5							23	6.0		3.0	30
VEW 17	45	71	37	54	39	38		50	25			
VEW 18	6.5	13	13	7.9	11	6.8		12	5.0		3.0	
VEW 19	3.1							36	11		9.0	42
VEW 20	11	47	15	12	7.9	9.9	3.6	33				41
VEW 21	25	60	31	25	23	15		38	20		9.0	65
VEW 22	4.1							9.5	3.0		2.0	
VEW 23	5.7	87	48	39	20	15		16	10		5.0	49
VEW 24	4.3							16	5.0		3.0	
VEW 25	7.5	36	12	19	6.3	6.9			6.0		6.0	
VEW 26	2.8							11	4.0		2.0	12
VEW 27	0.0	2.8	5.6	6.8	2.3	5.5		12	3.0		3.0	6.0
VEW 28	0.0	5.3	0.8	2.2	0.7	3.8		4.1	2.0		0.0	
VEW 29	0.0	12	15	15	4.2	5.0	4.5	48		0.6	71	9.0

7. Water Level

The figure below presents a water level contour map for the site.

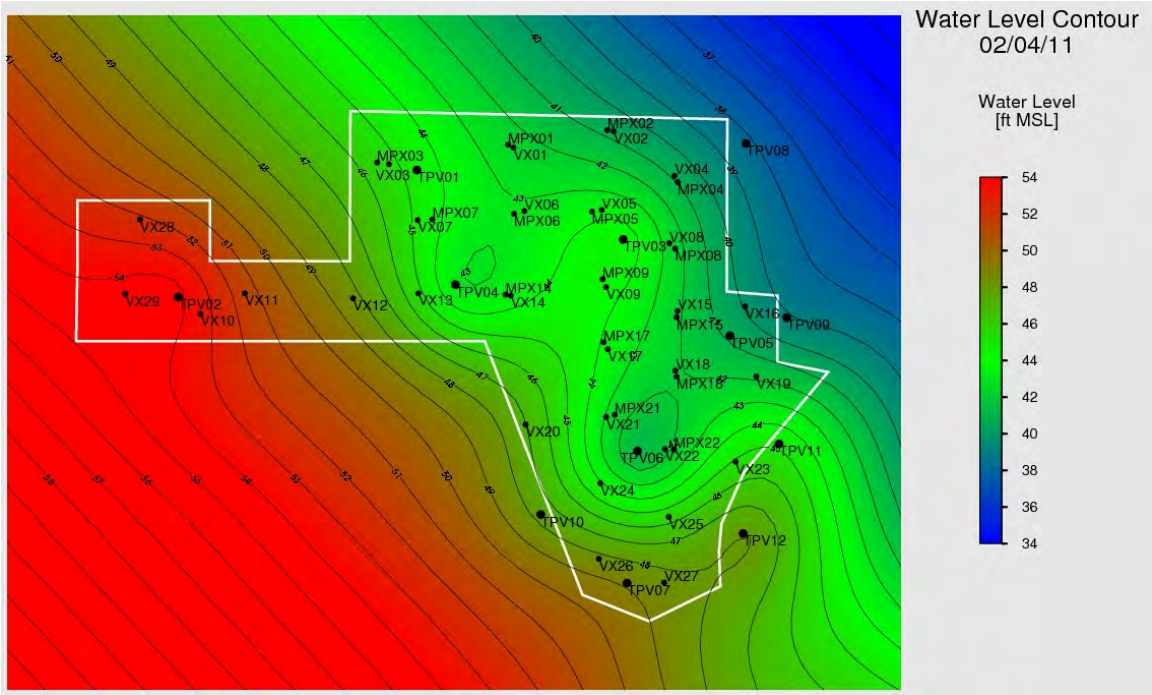


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site.

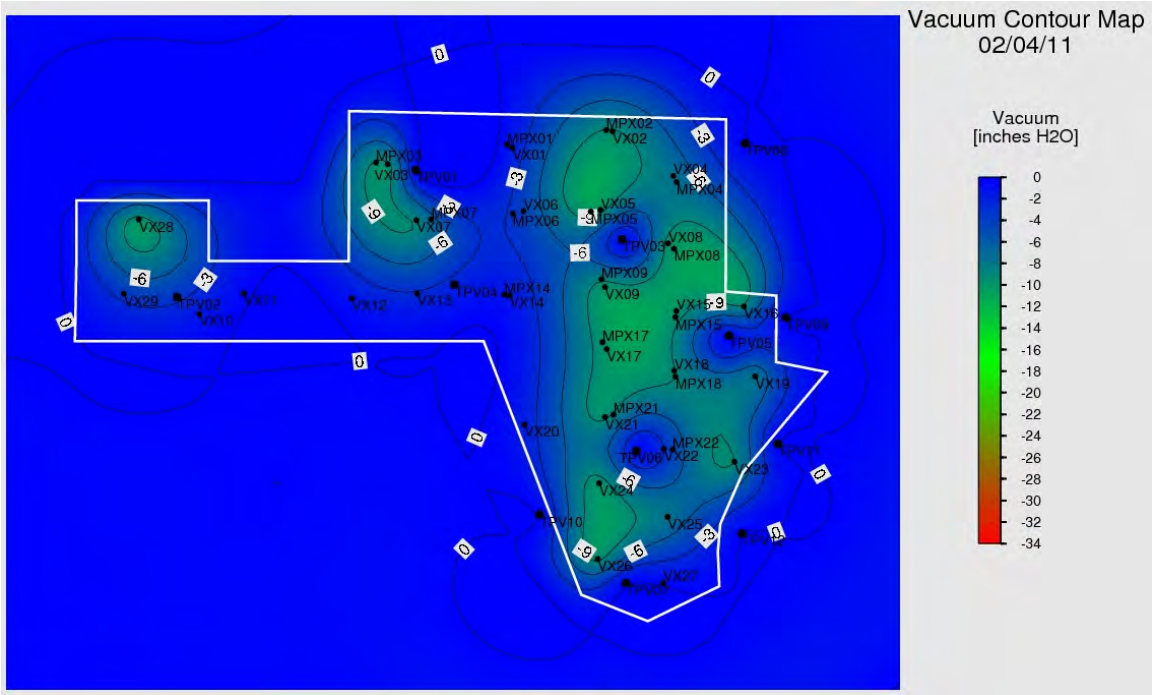


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,727,412 gallons of water since system startup while extracting a total of 2,130,379 gallons of water for a total net water extraction of 402,967 gallons.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

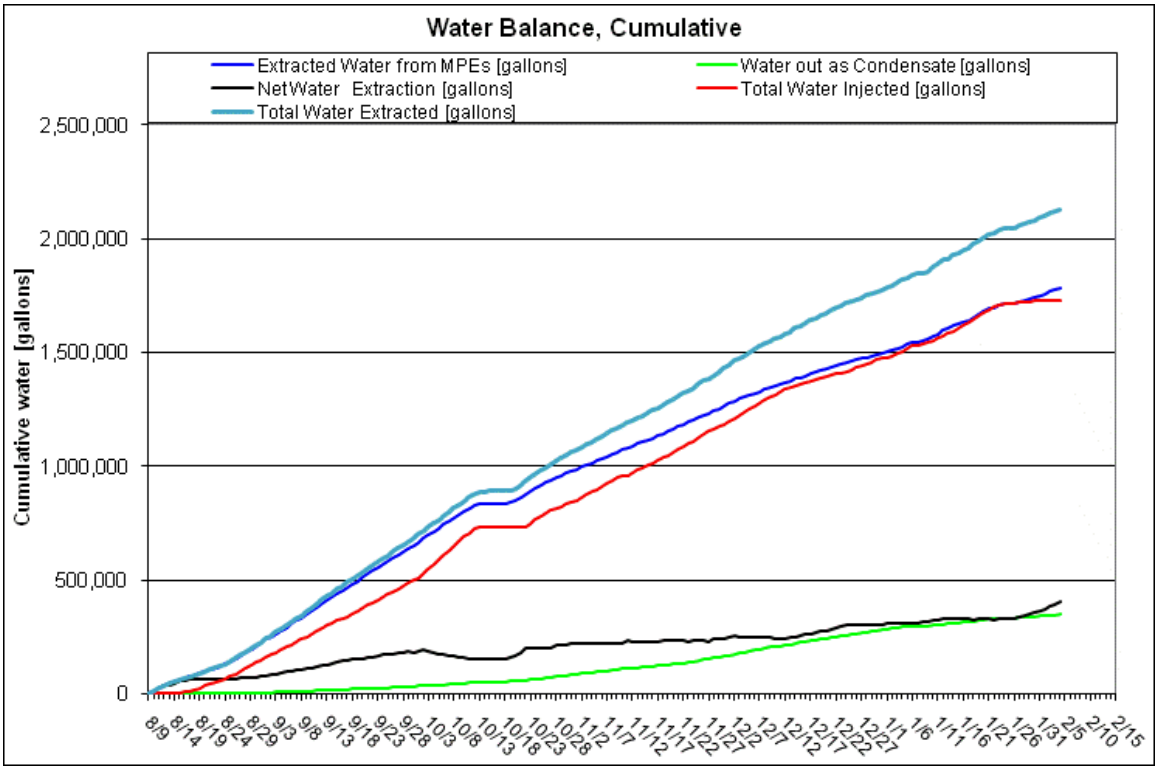


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

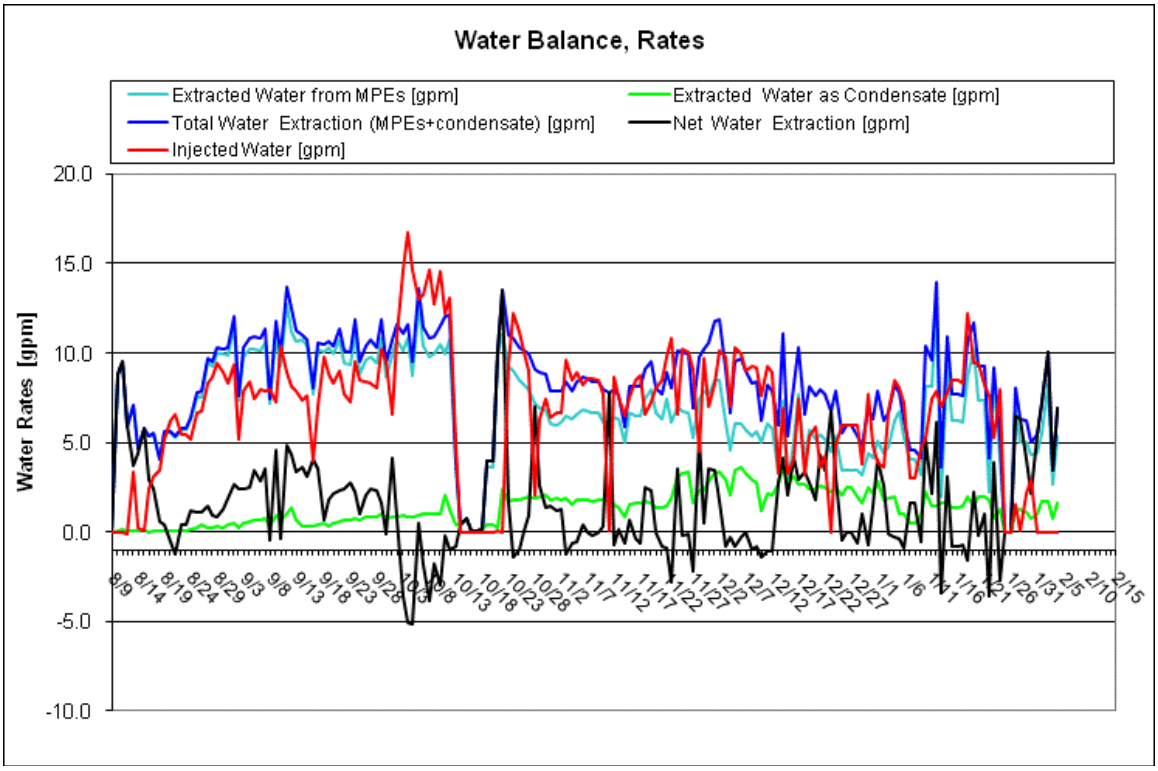


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

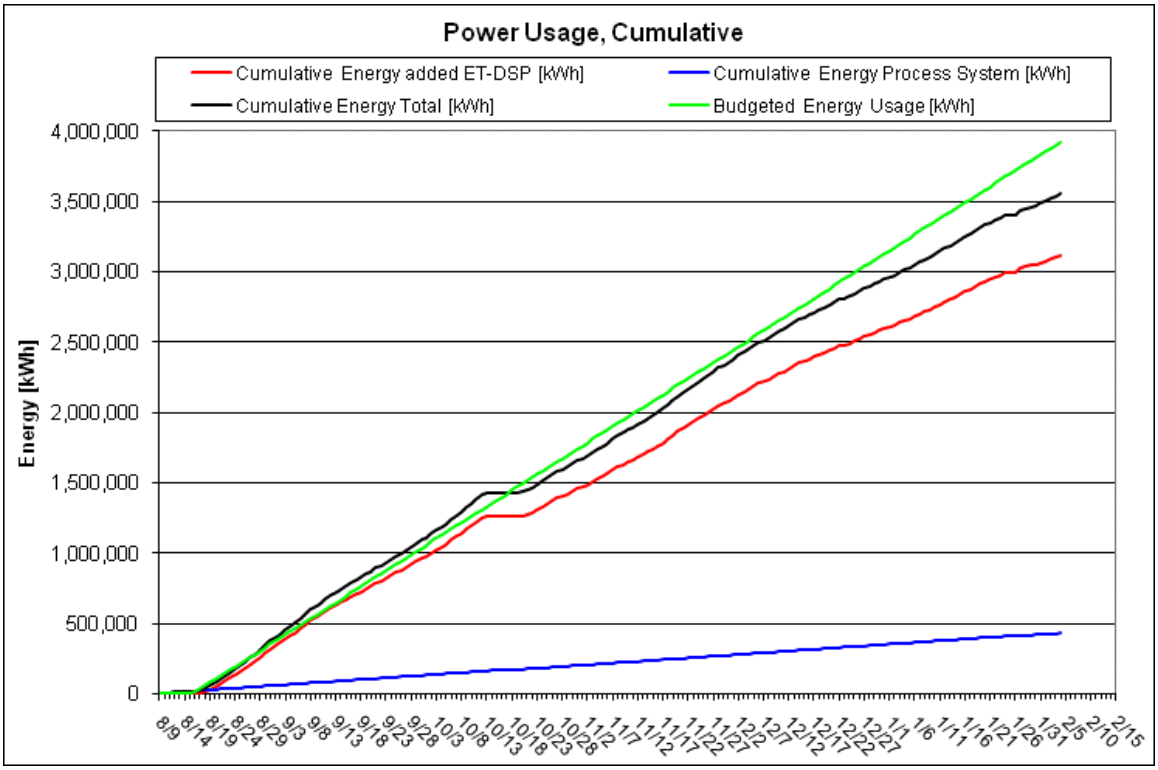


Figure 12. Cumulative Power Usage

11. Discussion

Optimization:

Steam injection will continue at X-22, X-27, X-17, X-6, and X-1.

No saline injections were made.

Operational Shut Down Activities:

Thursday, 3 February:

All Deep electrodes were shut down site wide

Friday, 4 February:

Shut down all electrodes in Area D (including shallow, mid)

Shut down all electrodes in the interior portion of Area B (including shallow, mid)

Shut down all mid electrodes inside of the building except at locations E24, E25, E26, E37, E38, E42 and E49 as they may communicate with mid electrodes in the outside portion of Area A

Shallow electrodes at E26, E38, and E37 remain operational

Incidents:

No safety or environmental compliance incidents were reported for the January 29 through February 4, 2011 operational period. Due to snow loading on the Former Valley Manufacturing Building Roof, all building access was restricted.

Performance Goal Attainment Issues or Concerns:

Due to heating system shutdown on 10/12/10, total operational duration will be prolonged.

Progress Report

2/5/2011 through 2/11/2011
February 14, 2011
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from February 5 through February 11, 2011 at the Groveland Wells Superfund Site in Groveland, MA. The following table provides a summary of the project operational status.

Table 1. Project Summary

Project summary as of 2/11/2011		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	178	days
Energy used to date	3,621,280	kWh
Injected energy per soil volume to date	192	kWh/cy
Water contaminant removal last 7 days	0.8	lbs
Water contaminant removal to date	22.5	lbs
Vapor contaminant removal last 7 days	7	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	1,129	lbs
Average temperature Area A last 7 days	199	°F
Average temperature Area C last 7 days	192	°F
Average temperature Area D last 7 days	161	°F
Average power usage rate last 7 days	408	kW
Average total water extracted rate last 7 days	8.1	gpm
Average injected water rate last 7 days	0.0	gpm
Average vapor extraction rate (non condensable) last 7 days	306	scfm

System Shutdowns

Thursday, 10 February: The process system shutdown for approximately 30 minutes for a High Level Alarm on the knockout pot.

System Maintenance

Other routine maintenance such as snow removal, bag filter changes, gauge maintenance, flushing of lines, backwashing of carbon vessels, winterization, etc. continues to occur.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

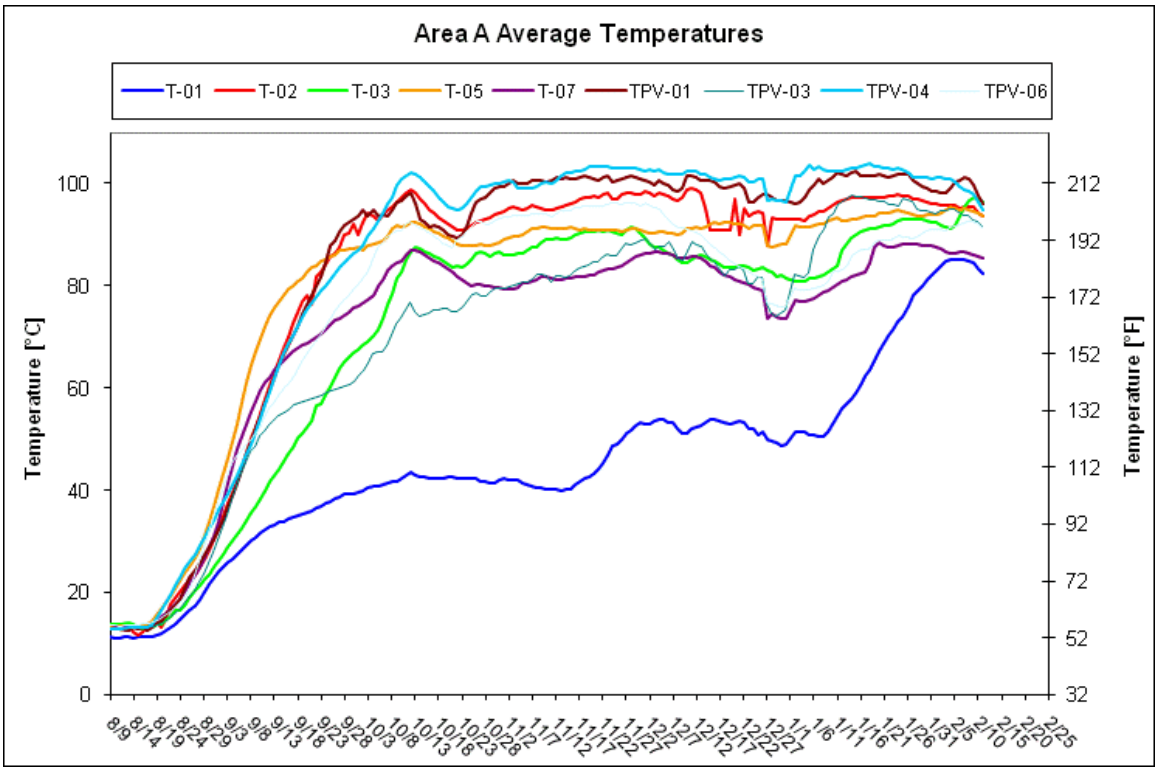


Figure 1. Average Temperature – Area A

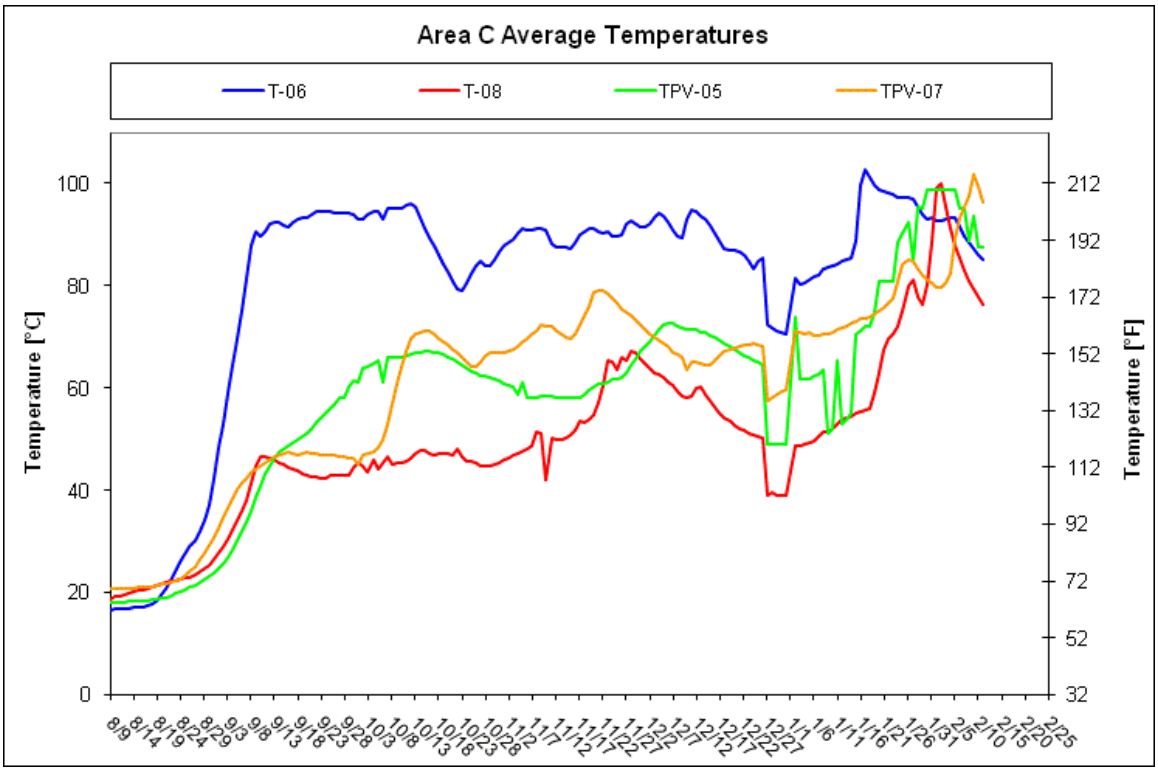


Figure 2. Average Temperature – Area C

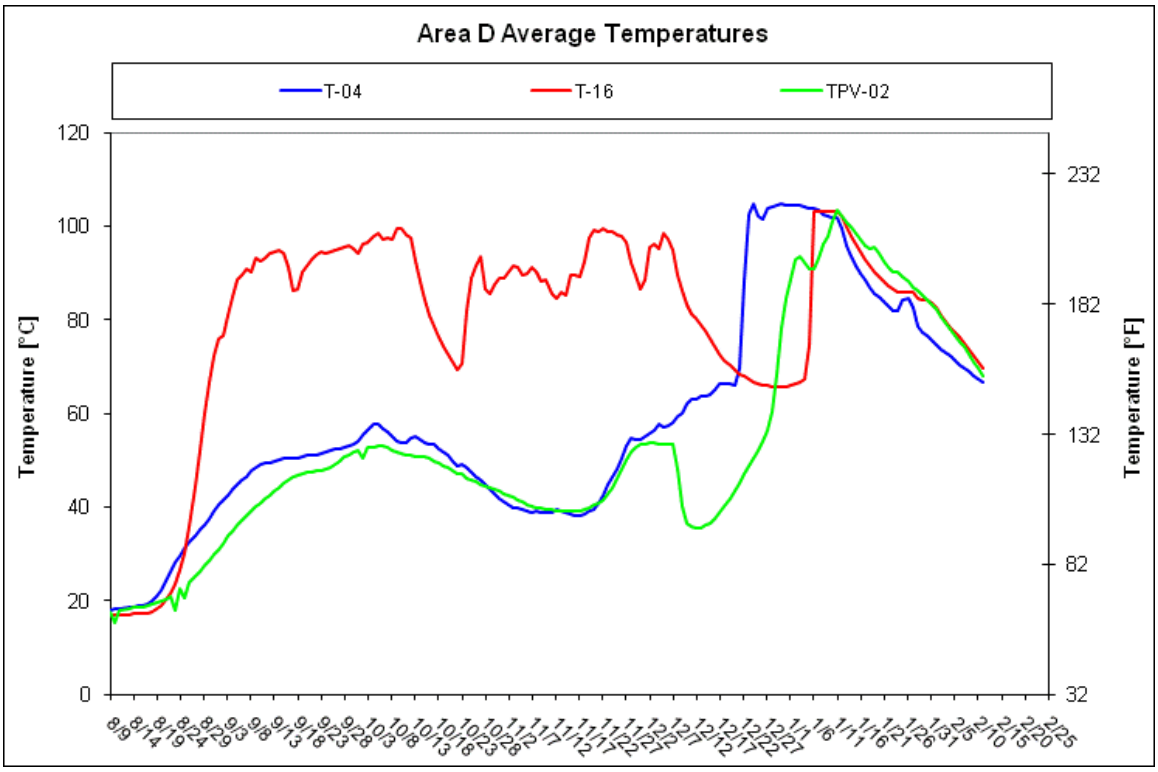


Figure 3. Average Temperature – Area D

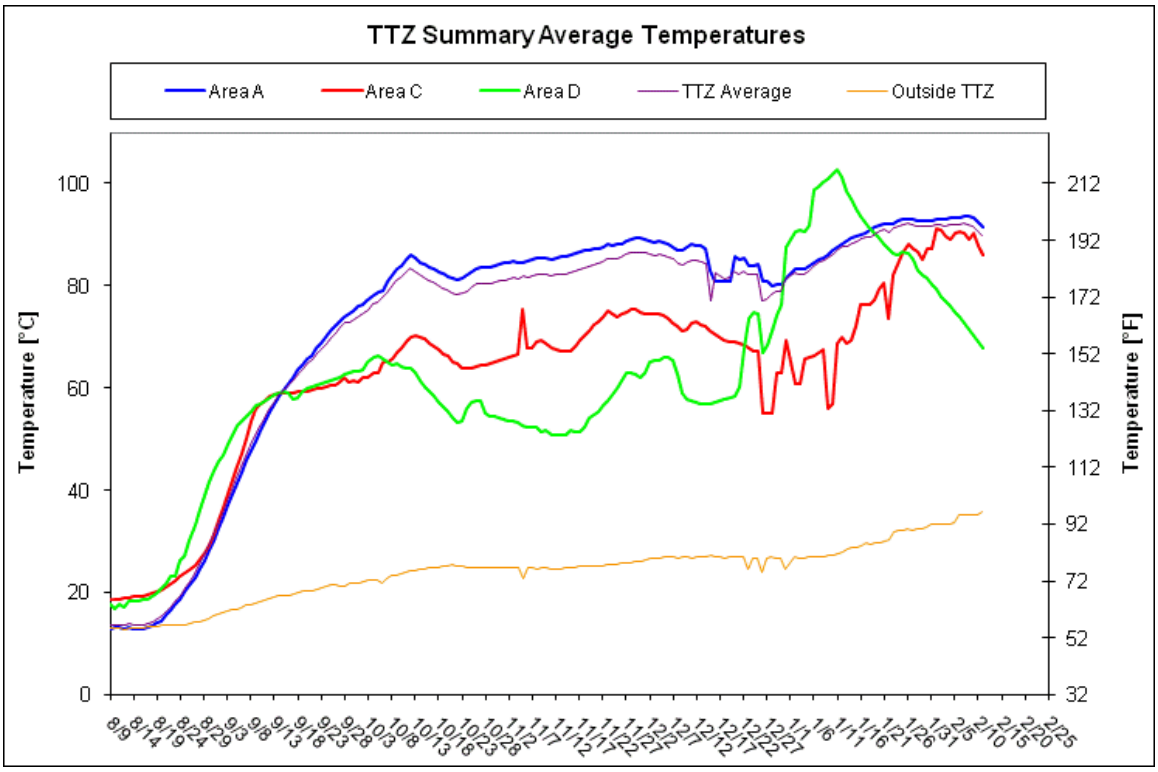


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

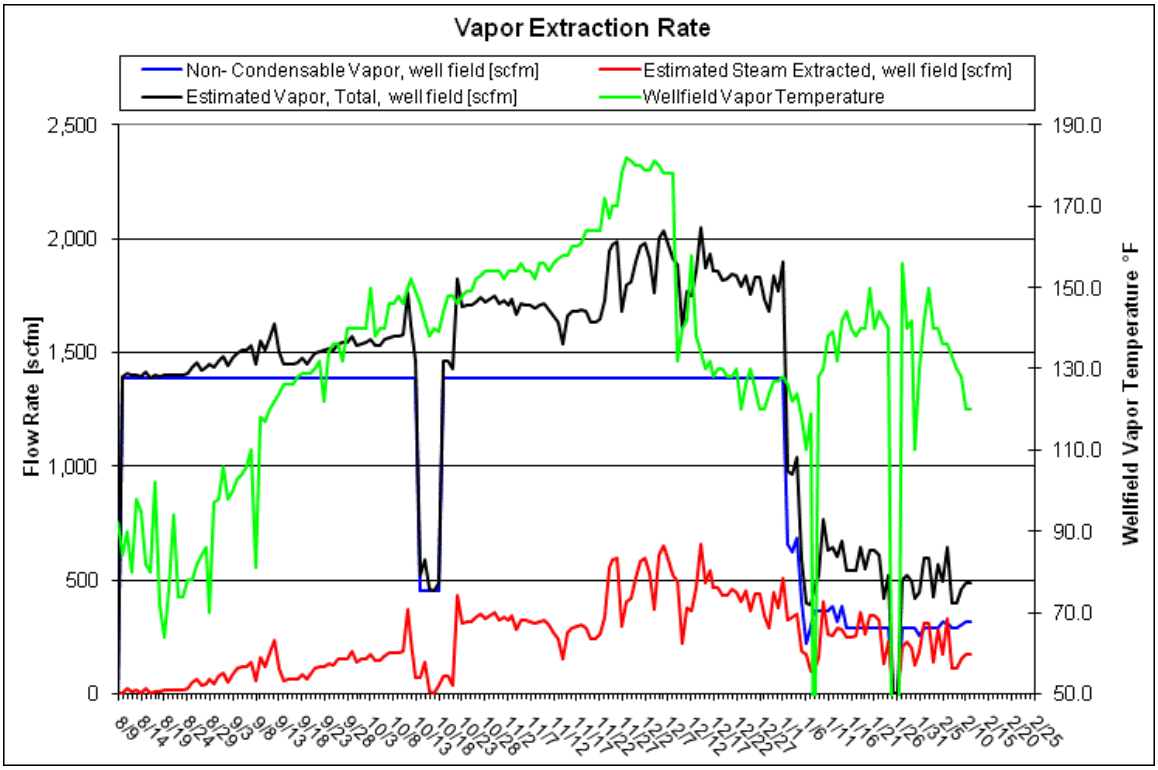


Figure 5. Vapor Extraction Rate and Temperature

4. Photo Ionization Detector (PID) and Destruction Removal Efficiency (DRE)

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

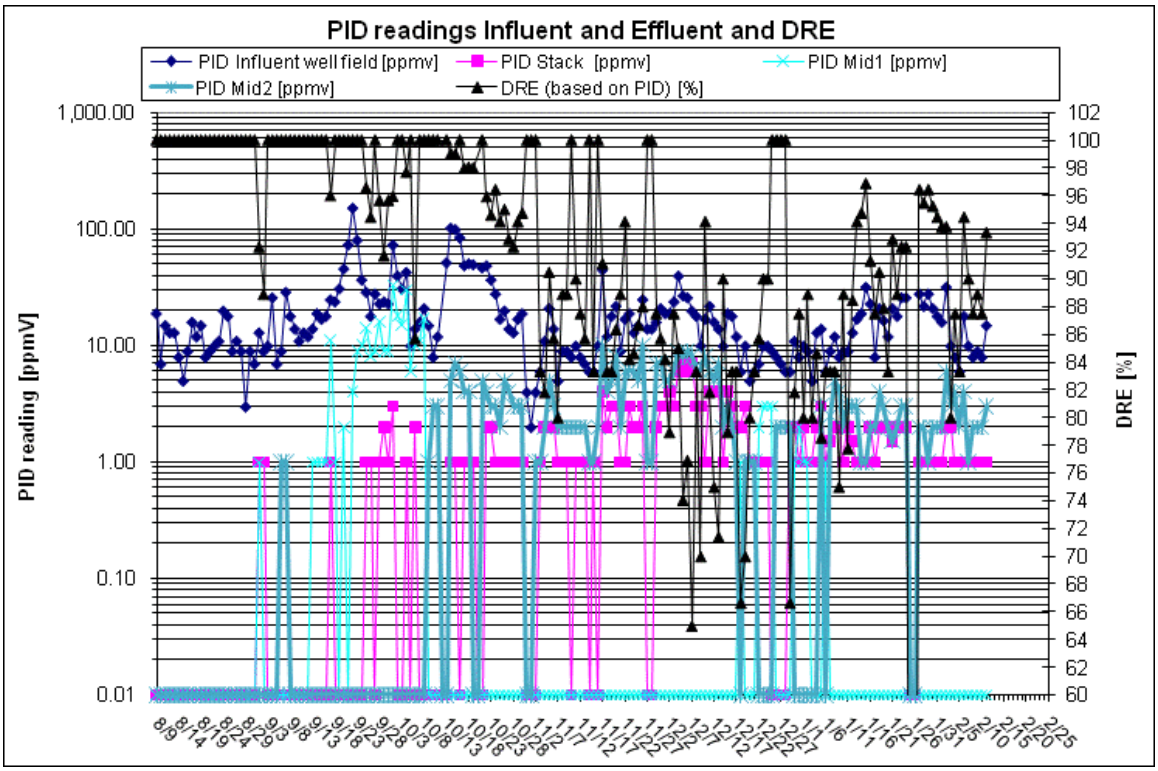


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

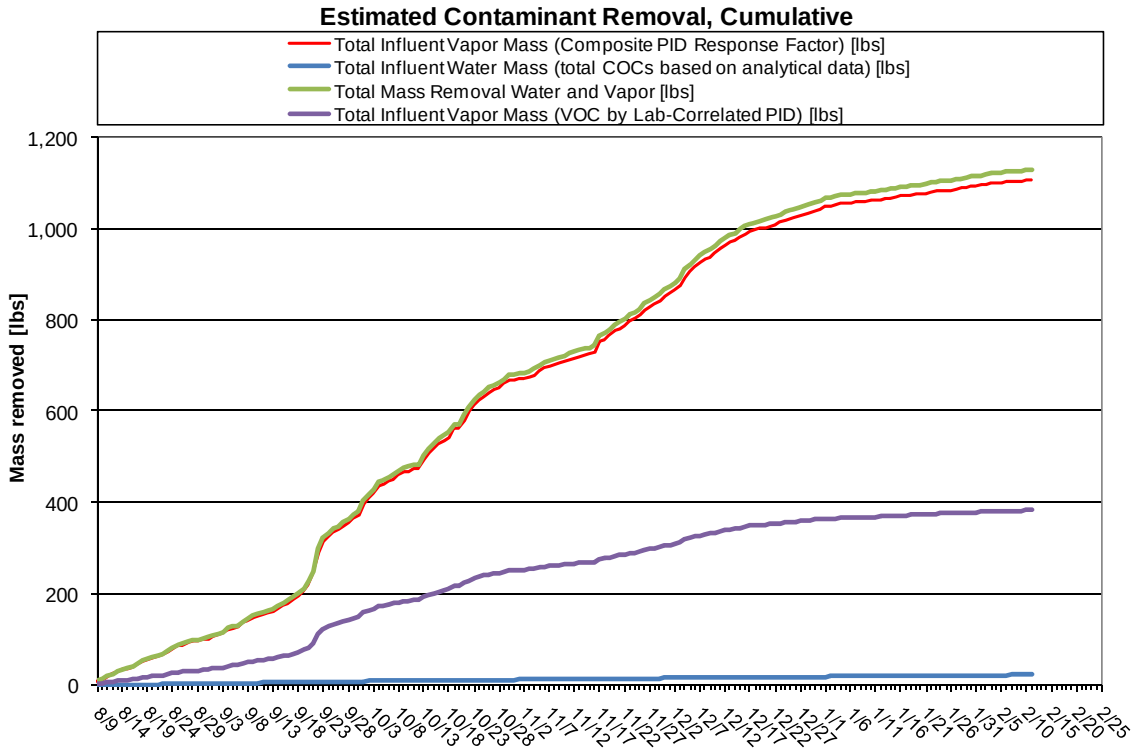


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

The table below presents the concentrations in ppmV from the 11/17/10 through the most recent sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	11/17/10	11/23/10	12/1-2/2010	12/7/10	12/14/10	12/22/10	12/29/10	1/5/11	1/13/11	1/18/11	1/19/11	1/28/11	2/7/11
VEW 1	6.1	25	7.3	11	3.1	9.8		4.2	0.0		1.0		
VEW 2	5.3	13	10	19	2.8	5.2		6.4	5.0		0.0		2.0
VEW 3	34	9.7	9.9	23		12		10	7.0		8.0		8.0
VEW 4	NR	51	17	33	9.9	13		15	20		58	165	40
VEW 5	29	77	35	51	27	24		50	218	0.0	22	31	4
VEW 6	2.2							9.1	88	0.2	2.0		
VEW 7	0.0	20	2.4	7.7	3.5	9.6		22	4.0		0.0		
VEW 8	2.2							8.4	3.0		7.0		
VEW 9	33	105	25	59	24	12		48	24		32	84	14
VEW 10	0.8					8.5	4.3				3.0	2.0	
VEW 11	1.2					4.1	4.0				2.0	5.0	
VEW 12	29	13	10	19	2.7	8.5	4.0				6.0	25	
VEW 13	12	30	19	28	18	14	9.4	38			8.0	26	
VEW 14	4.7					19	1.4	6.6			1.0	5.0	
VEW 15	102	128	69	65	43	21		179		3.6	9.0		4.0
VEW 16	2.5							23	6.0		3.0	30	2
VEW 17	45	71	37	54	39	38		50	25				
VEW 18	6.5	13	13	7.9	11	6.8		12	5.0		3.0		
VEW 19	3.1							36	11		9.0	42	18
VEW 20	11	47	15	12	7.9	9.9	3.6	33				41	
VEW 21	25	60	31	25	23	15		38	20		9.0	65	22
VEW 22	4.1							9.5	3.0		2.0		
VEW 23	5.7	87	48	39	20	15		16	10		5.0	49	1
VEW 24	4.3							16	5.0		3.0		
VEW 25	7.5	36	12	19	6.3	6.9			6.0		6.0		15
VEW 26	2.8							11	4.0		2.0	12	1
VEW 27	0.0	2.8	5.6	6.8	2.3	5.5		12	3.0		3.0	6.0	
VEW 28	0.0	5.3	0.8	2.2	0.7	3.8		4.1	2.0		0.0		
VEW 29	0.0	12	15	15	4.2	5.0	4.5	48		0.6	71	9.0	

7. Water Level

The figure below presents a water level contour map for the site.

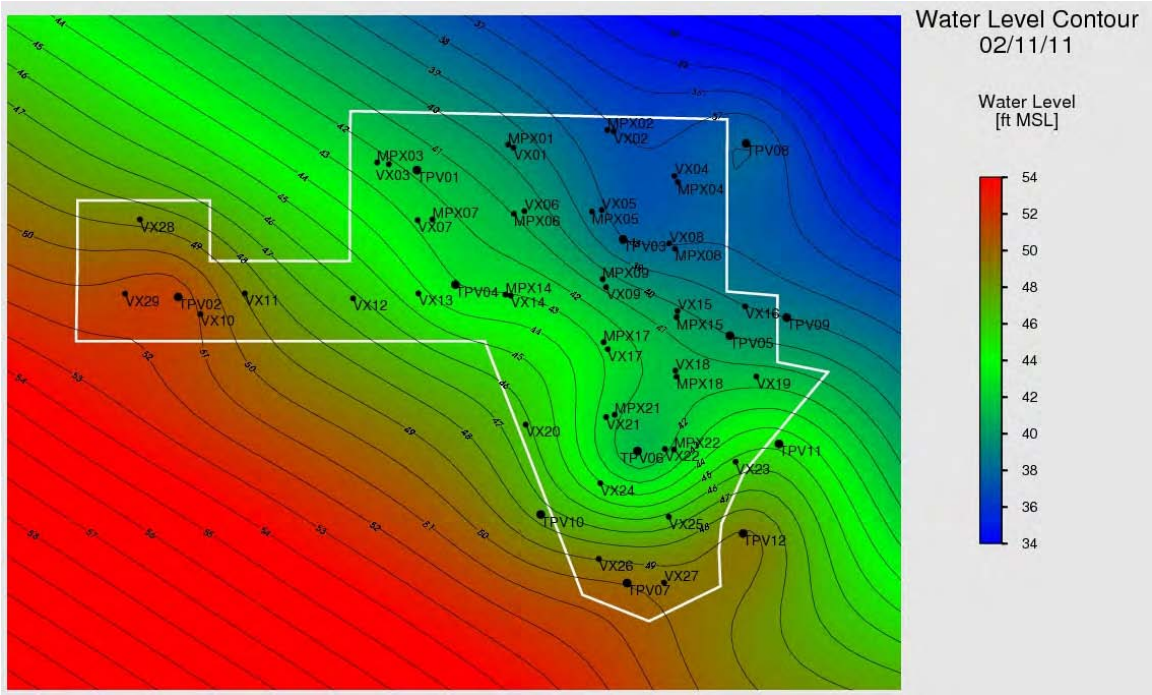


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site as of 2/9/11.

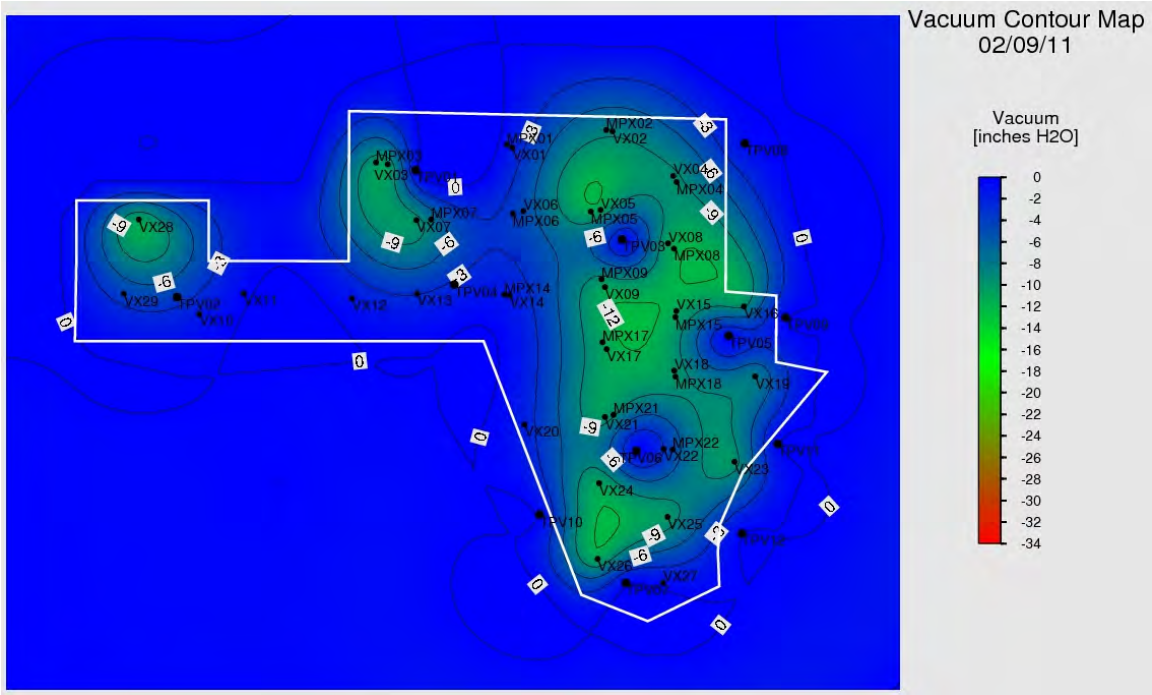


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,727,412 gallons of water since system startup while extracting a total of 2,212,041 gallons of water for a total net water extraction of 484,629 gallons.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

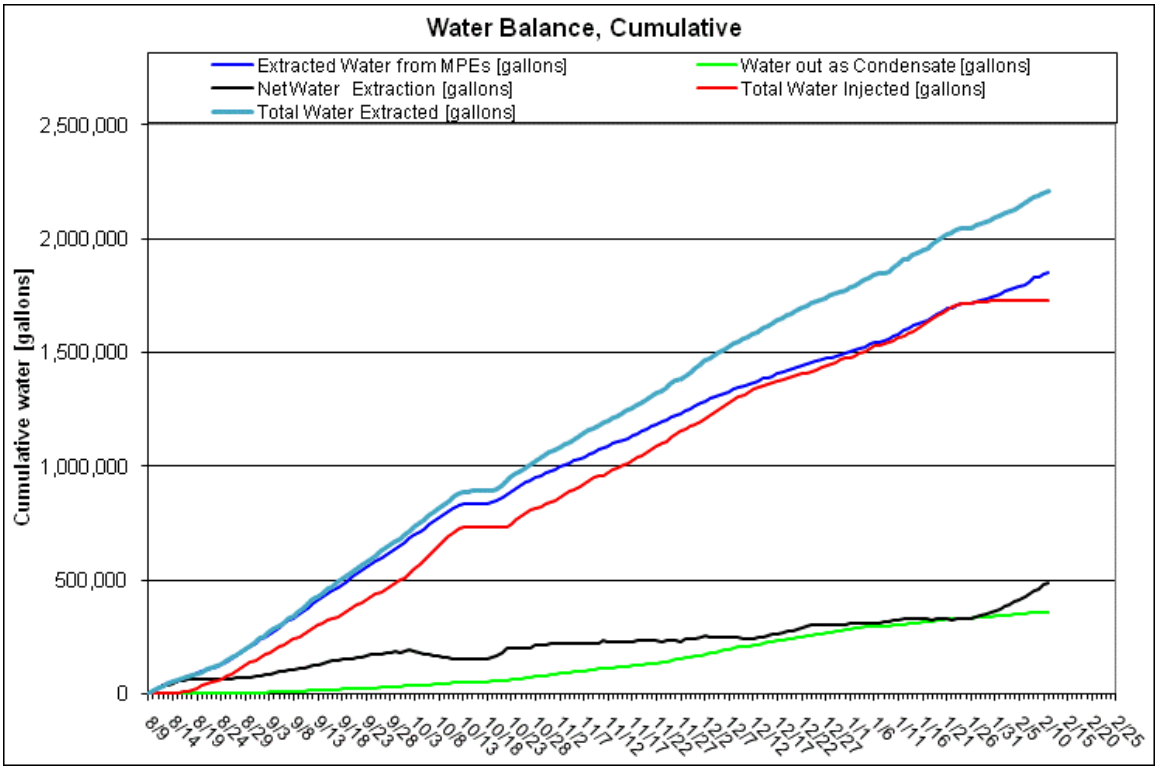


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

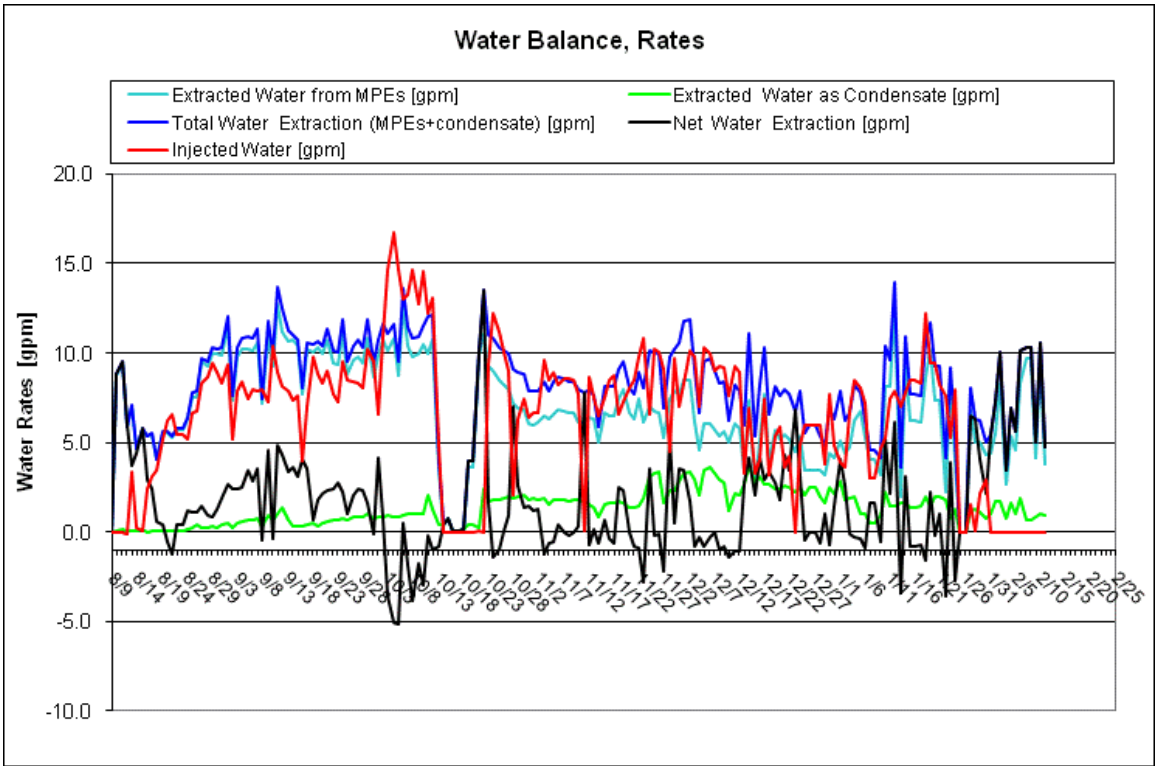


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

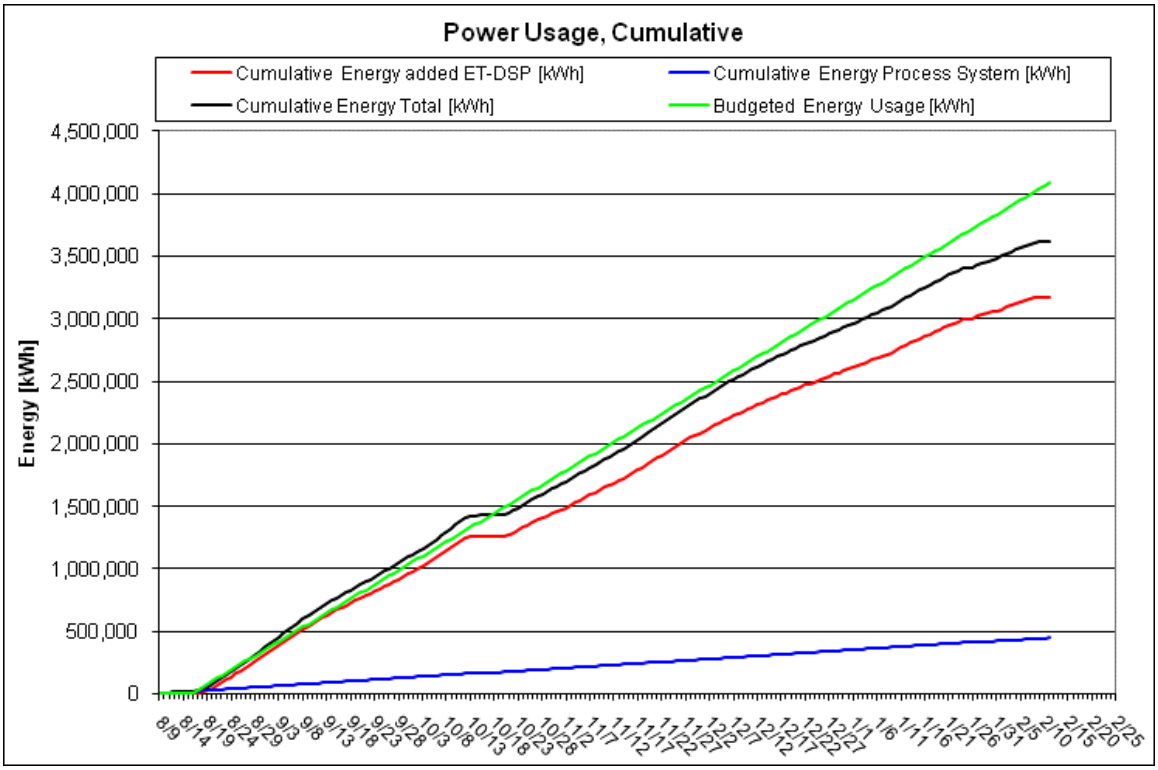


Figure 12. Cumulative Power Usage

11. Discussion

Operational Shut Down Activities:

Wednesday, 9 February:

All remaining electrodes were shut down site wide

Incidents:

No safety or environmental compliance incidents were reported for the February 5 through February 11, 2011 operational period. Due to snow loading on the Former Valley Manufacturing Building Roof, all building access was restricted.

Progress Report

2/12/2011 through 2/18/2011
February 22, 2011
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from February 12 through February 18, 2011 at the Groveland Wells Superfund Site located in Groveland, MA. The following table provides a summary of the projects operational status to date.

Table 1. Project Summary

Project summary as of 2/18/2011		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	185	days
Energy used to date	3,632,000	kWh
Injected energy per soil volume to date	192	kWh/cy
Water contaminant removal last 7 days	0.3	lbs
Water contaminant removal to date	22.7	lbs
Vapor contaminant removal last 7 days	12	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	1,142	lbs
Average temperature Area A last 7 days	191	°F
Average temperature Area C last 7 days	177	°F
Average temperature Area D last 7 days	146	°F
Average power usage rate last 7 days	64	kW
Average total water extracted rate last 7 days	3.1	gpm
Average injected water rate last 7 days	0.0	gpm
Average vapor extraction rate (non condensable) last 7 days	524	scfm

System Shutdowns

Wednesday, 16 February: The water treatment system shutdown for approximately 30 minutes due to a high level alarm on the primary knockout pot.

System Maintenance

Other routine maintenance such as snow removal, bag filter changes, and gauge maintenance continues to occur.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

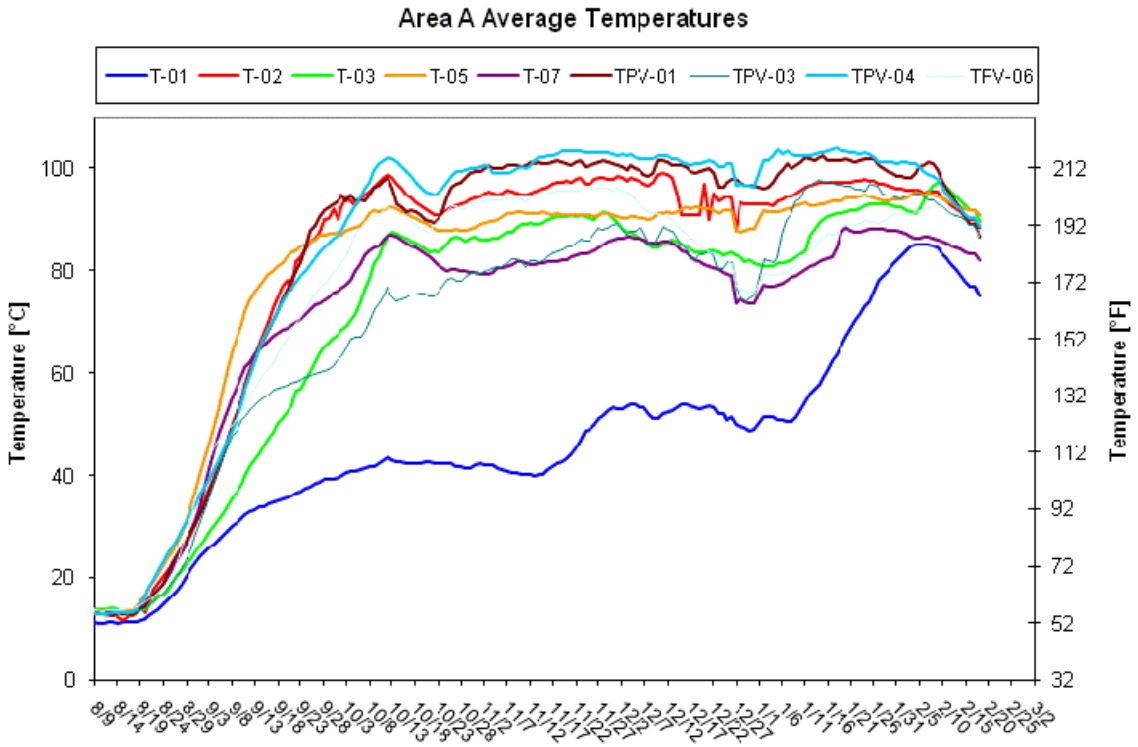


Figure 1. Average Temperature – Area A

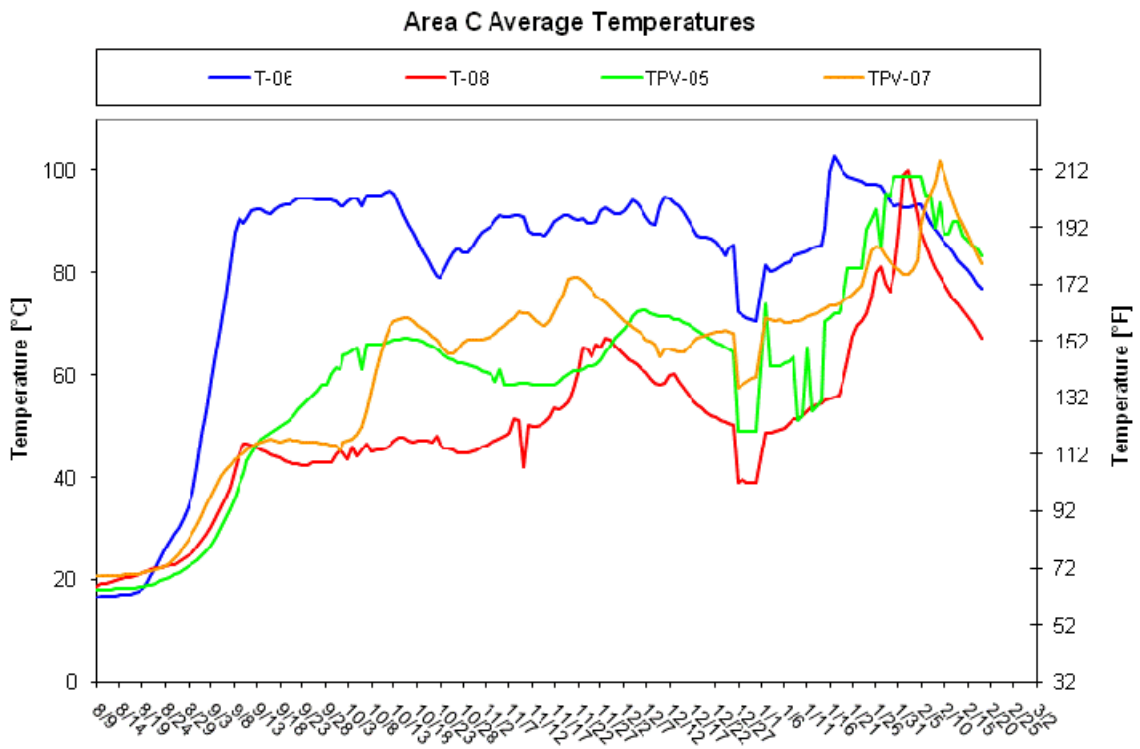


Figure 2. Average Temperature – Area C

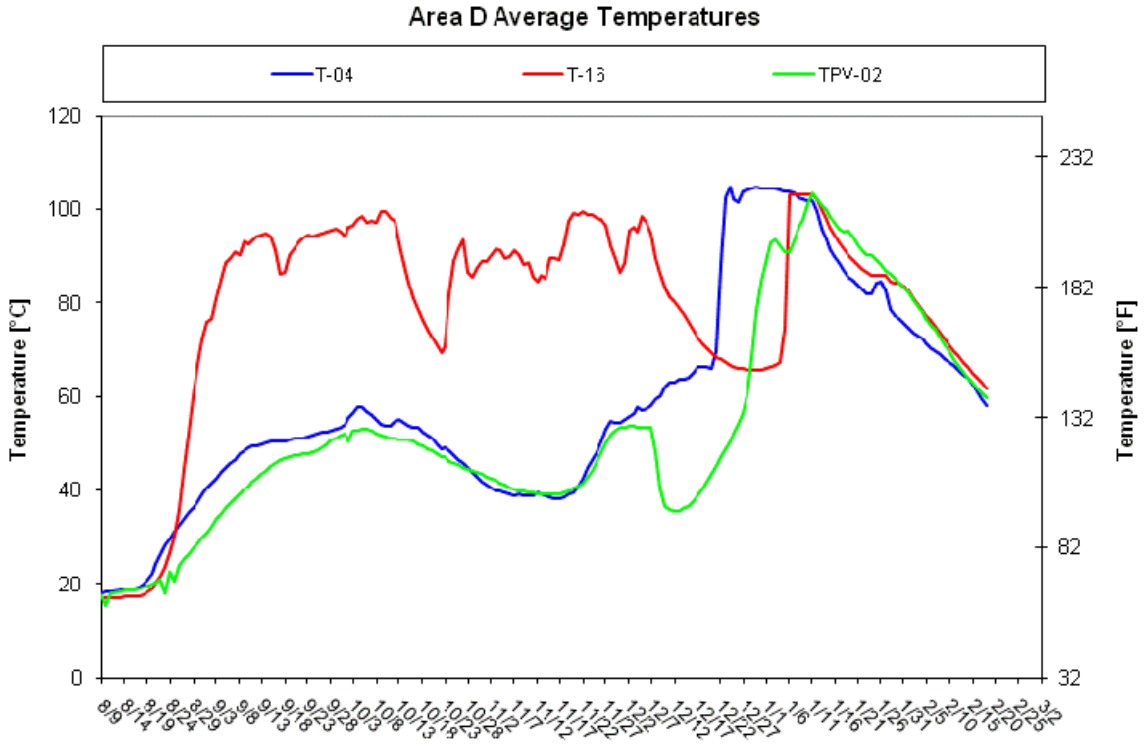


Figure 3. Average Temperature – Area D

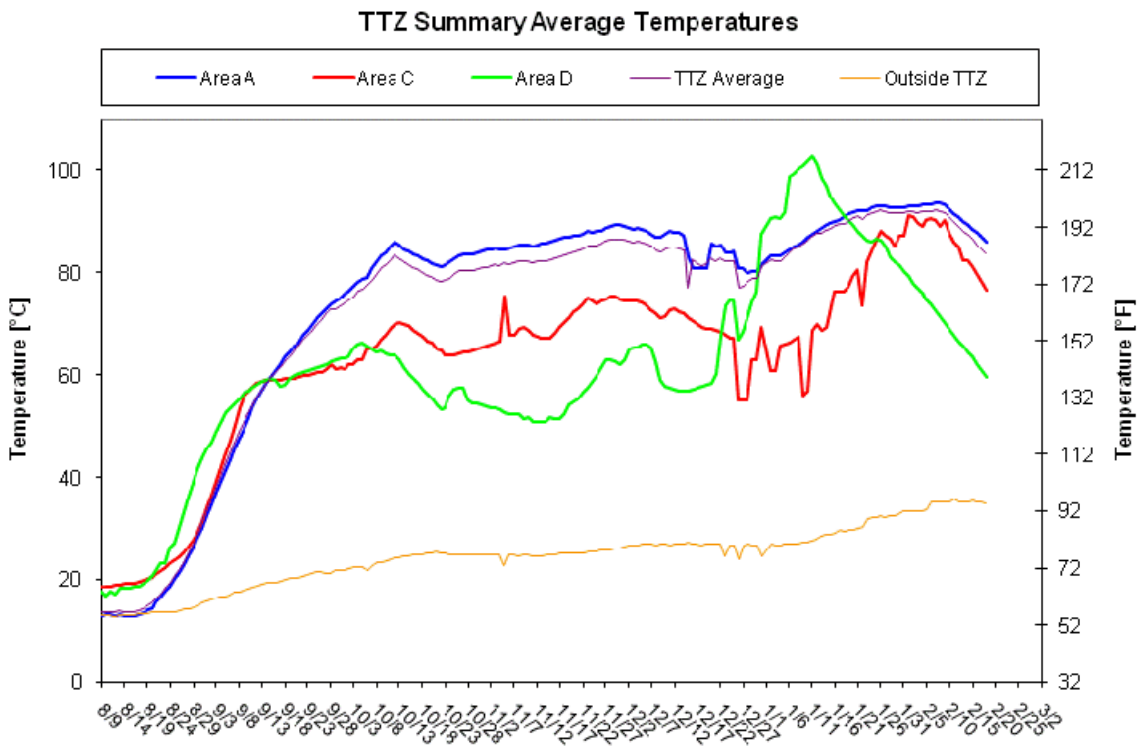


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

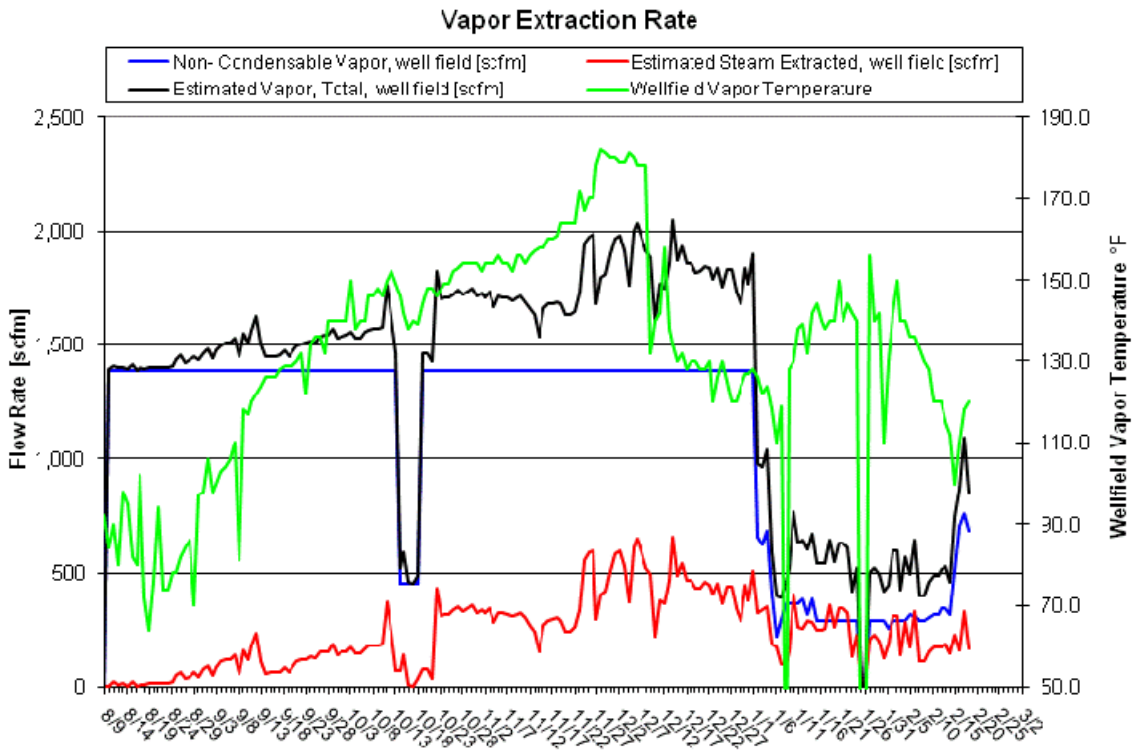


Figure 5. Vapor Extraction Rate and Temperature

4. Photo Ionization Detector (PID) and Destruction Removal Efficiency (DRE)

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

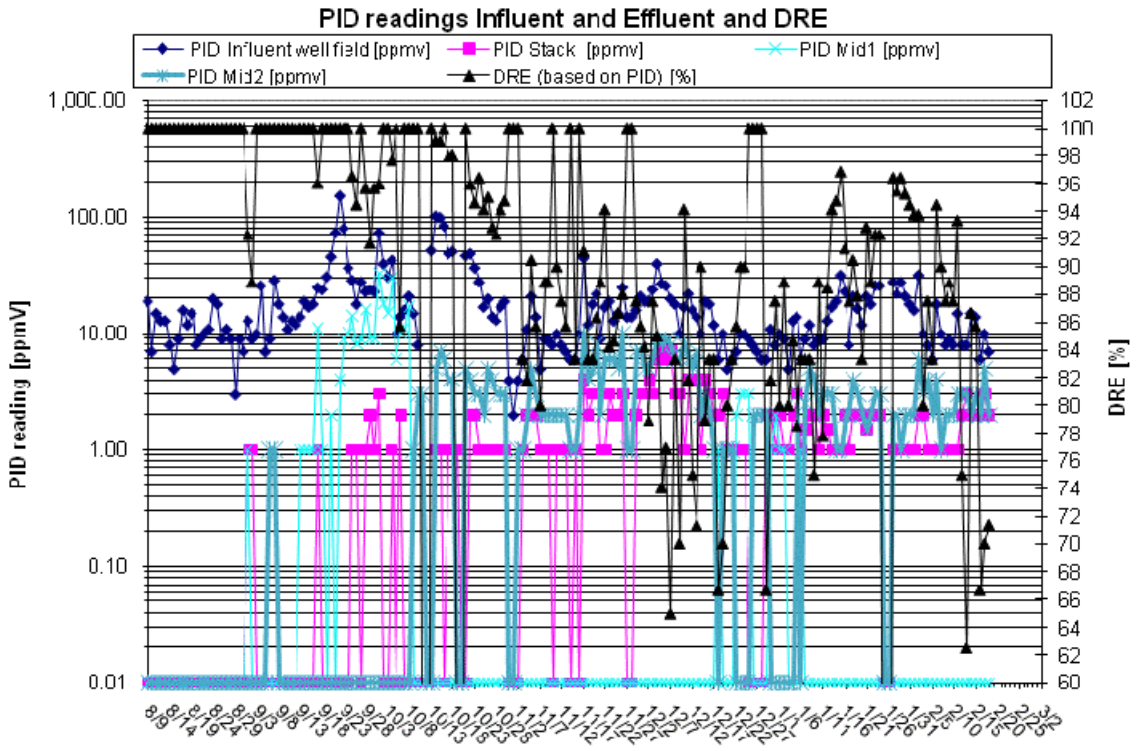


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

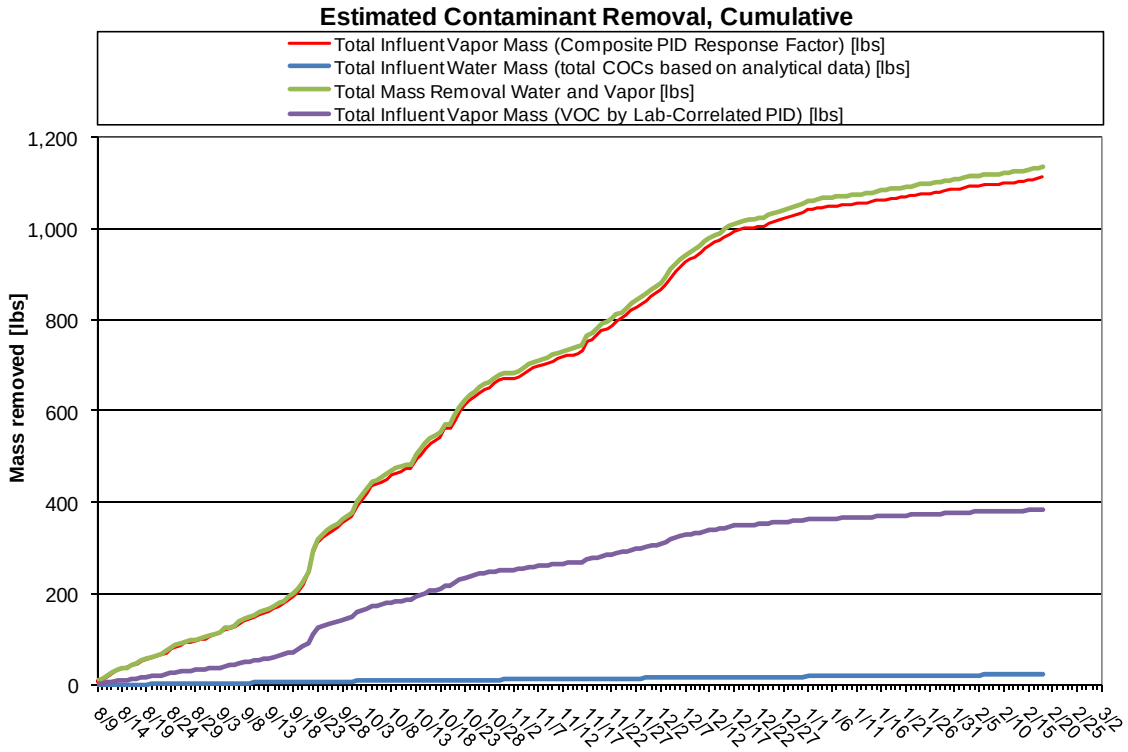


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

The table below presents the concentrations in ppmV from the 11/17/10 through the most recent sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	11/17/10	11/23/10	12/1-2/2010	12/7/10	12/14/10	12/22/10	12/29/10	1/5/11	1/13/11	1/18/11	1/19/11	1/28/11	2/7/11	2/16/11
VEW 1	6.1	25	7.3	11	3.1	9.8		4.2	0.0		1.0			0.0
VEW 2	5.3	13	10	19	2.8	5.2		6.4	5.0		0.0		2.0	0.1
VEW 3	34	9.7	9.9	23		12		10	7.0		8.0		8.0	2.4
VEW 4	NR	51	17	33	9.9	13		15	20		58	165	40	21
VEW 5	29	77	35	51	27	24		50	218	0.0	22	31	4	2.5
VEW 6	2.2							9.1	88	0.2	2.0			2.3
VEW 7	0.0	20	2.4	7.7	3.5	9.6		22	4.0		0.0			0.4
VEW 8	2.2							8.4	3.0		7.0			0.8
VEW 9	33	105	25	59	24	12		48	24		32	84	14	54
VEW 10	0.8					8.5	4.3				3.0	2.0		
VEW 11	1.2					4.1	4.0				2.0	5.0		
VEW 12	29	13	10	19	2.7	8.5	4.0				6.0	25		
VEW 13	12	30	19	28	18	14	9.4	38			8.0	26		
VEW 14	4.7					19	1.4	6.6			1.0	5.0		
VEW 15	102	128	69	65	43	21		179		3.6	9.0		4.0	
VEW 16	2.5							23	6.0		3.0	30	2	1.1
VEW 17	45	71	37	54	39	38		50	25					51
VEW 18	6.5	13	13	7.9	11	6.8		12	5.0		3.0			2.1
VEW 19	3.1							36	11		9.0	42	18	7.5
VEW 20	11	47	15	12	7.9	9.9	3.6	33				41		
VEW 21	25	60	31	25	23	15		38	20		9.0	65	22	11
VEW 22	4.1							9.5	3.0		2.0			1.0
VEW 23	5.7	87	48	39	20	15		16	10		5.0	49	1	0.5
VEW 24	4.3							16	5.0		3.0			3.7
VEW 25	7.5	36	12	19	6.3	6.9			6.0		6.0		15	2.1
VEW 26	2.8							11	4.0		2.0	12	1	1.8
VEW 27	0.0	2.8	5.6	6.8	2.3	5.5		12	3.0		3.0	6.0		1.1
VEW 28	0.0	5.3	0.8	2.2	0.7	3.8		4.1	2.0		0.0			0.1
VEW 29	0.0	12	15	15	4.2	5.0	4.5	48		0.6	71	9.0		

7. Water Level

The figure below presents a water level contour map for the site.

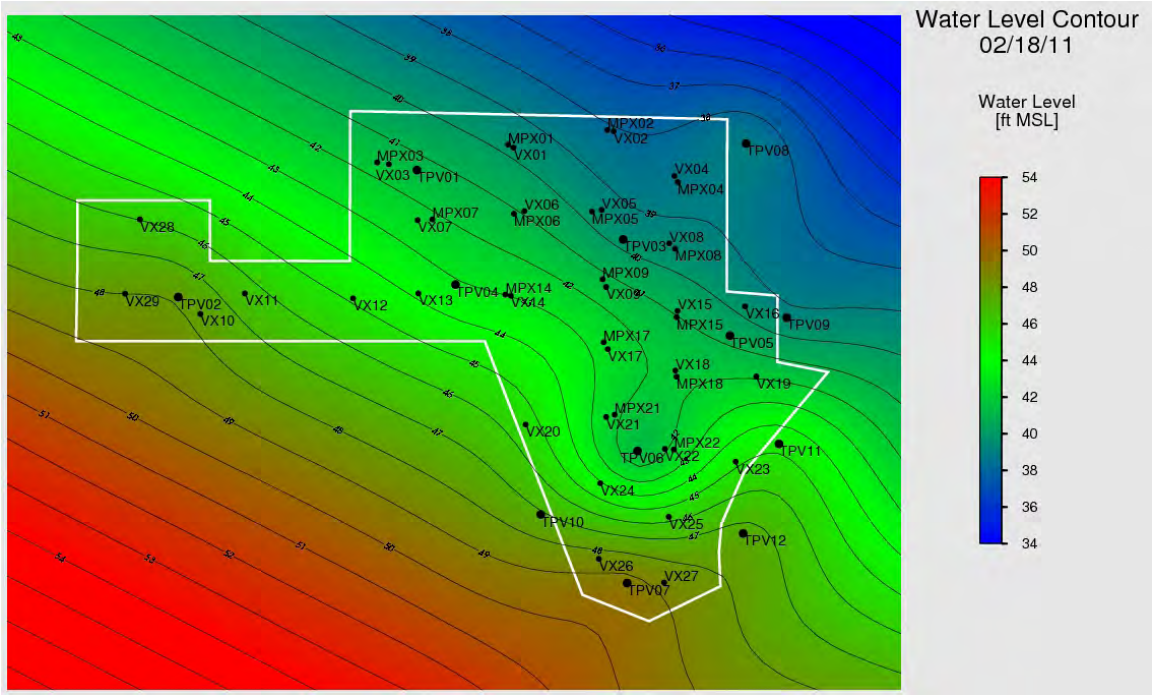


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site as of 2/18/11. No vacuum readings are being collected from inside of the Former Valley Manufacturing Building.

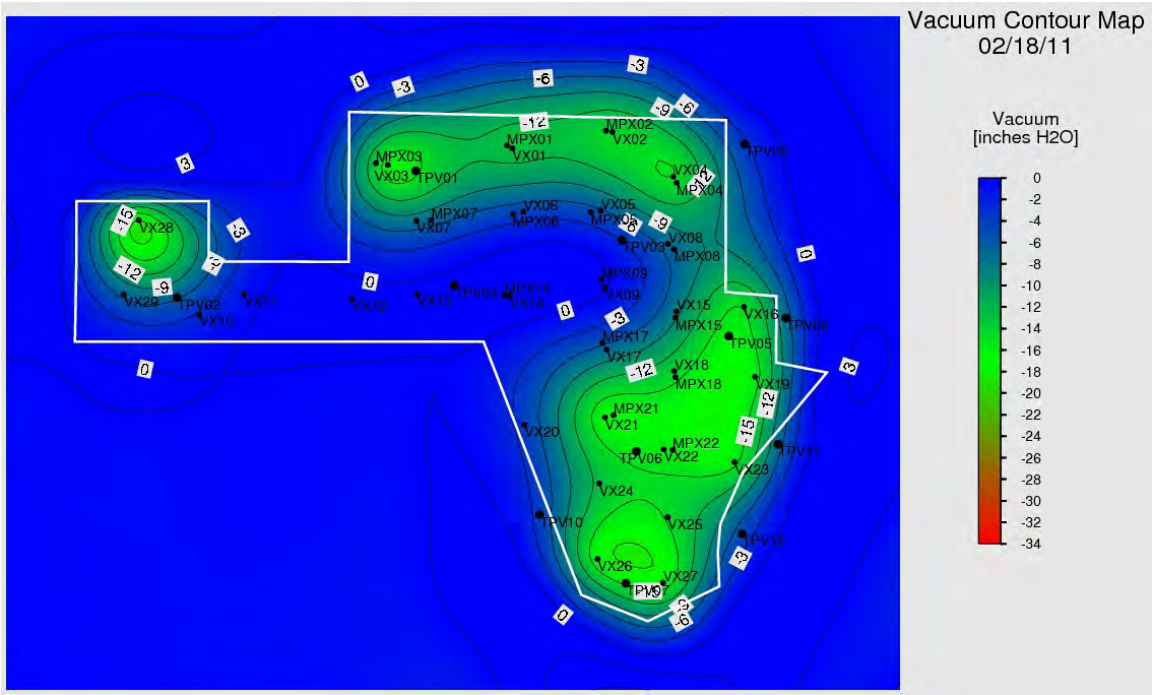


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,727,412 gallons of water since system startup while extracting a total of 2,242,889 gallons of water for a total net water extraction of 515,477 gallons.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

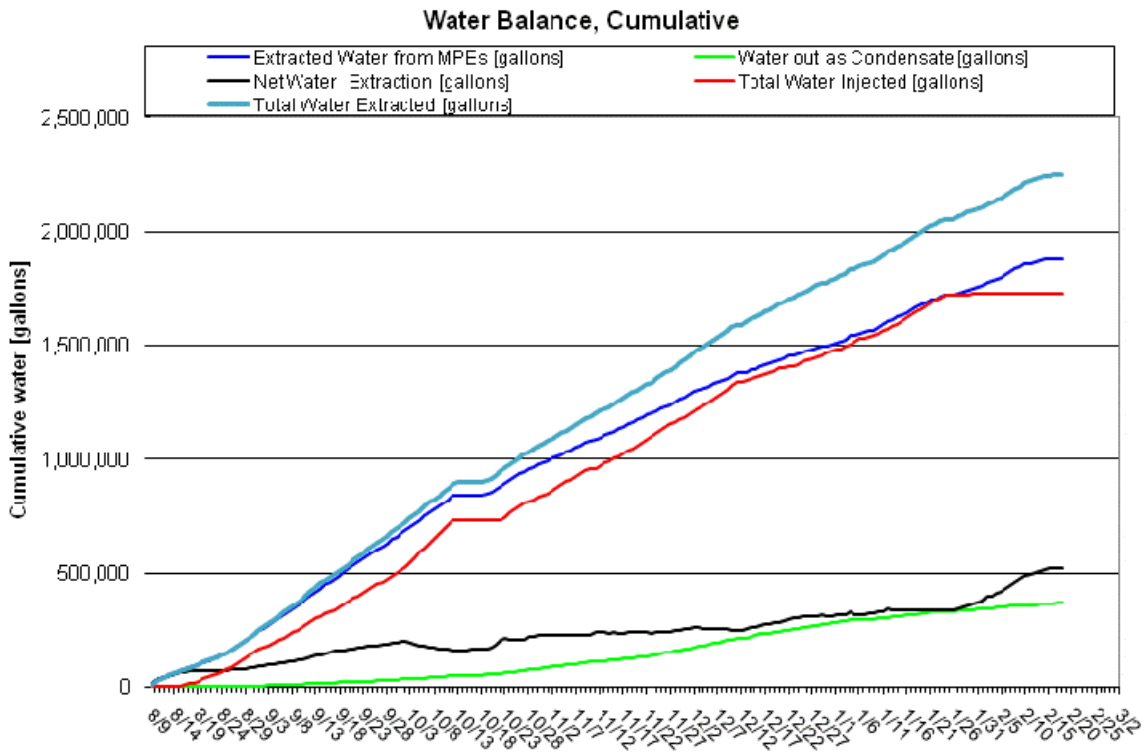


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

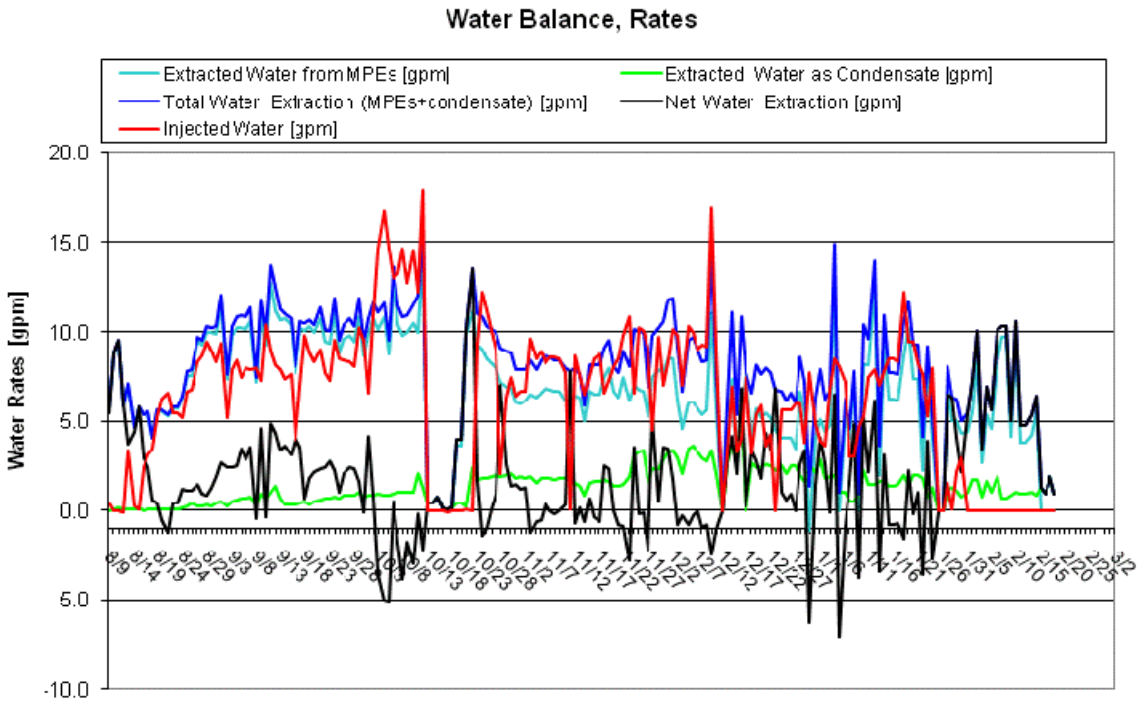


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

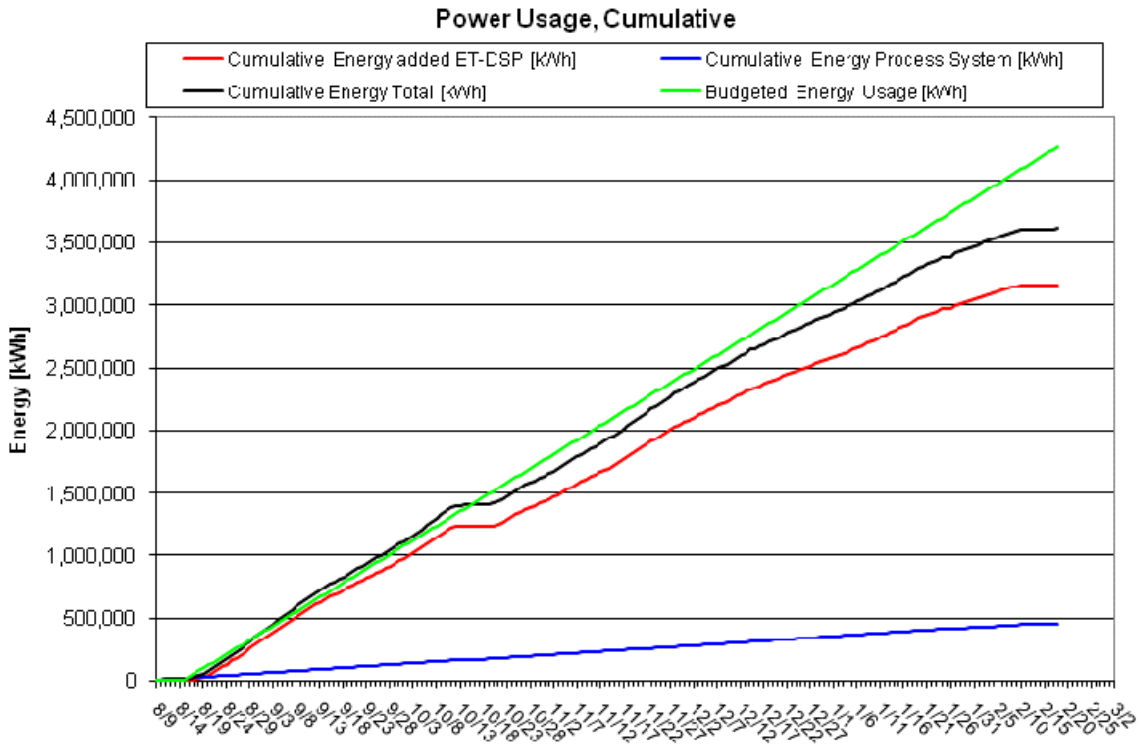


Figure 12. Cumulative Power Usage

11. Discussion

Operational Shut Down and Demobilization Activities:

On Monday, 14 February, the 15 multiphase extraction pumps were shutdown within the wellfield.

Demobilization efforts continue at the site. To date, the wellfield has been shutdown including electrodes and multiphase extraction pumps. Associated tubing and pumps are currently being disconnected and pulled from the wellfield. The chiller and secondary bag filters have been disconnected and removed from the site. The rental weir tank has been removed from the site. The organoclay vessels, primary bag filters, heat exchanger, trough tank, and associated pumps have been taken offline.

Incidents:

No safety or environmental compliance incidents were reported for the February 12 through February 18, 2011 operational period. Due to snow loading on the Former Valley Manufacturing Building Roof, all building access is restricted.

Progress Report

2/19/2011 through 2/24/2011
February 28, 2011
In Situ Thermal Remediation
Groveland Wells Superfund Site, Groveland, MA

1. Summary

This report is intended to cover the period of In Situ Thermal Remediation operations from February 19 through February 23, 2011 (the last day of data collection at the site) at the Groveland Wells Superfund Site located in Groveland, MA. The process treatment system was shut down on February 24, 2011. The following table provides a final summary of the project's operational status.

Table 1. Project Summary

Project summary as of 2/23/2011		
Type	**Value**	**Unit**
TTZ soil volume	16,510	cy
Area	13590	ft2
Average depth	33	ft
Heat injection started	8/17/2010	
Projected days of operation	148	
Projected total energy usage	3,049,000	kWh
Days of operation	190	days
Energy used to date	3,639,520	kWh
Injected energy per soil volume to date	192	kWh/cy
Water contaminant removal last 7 days	0.1	lbs
Water contaminant removal to date	22.8	lbs
Vapor contaminant removal last 7 days	20	lbs
Volume of NAPL last 7 days	0.0	gal
Volume of NAPL to date	18.0	gal
Total contaminant removal to date	1,157	lbs
Average temperature Area A last 7 days	187	°F
Average temperature Area C last 7 days	170	°F
Average temperature Area D last 7 days	140	°F
Average power usage rate last 7 days	68	kW
Average total water extracted rate last 7 days	0.5	gpm
Average injected water rate last 7 days	0.0	gpm
Average vapor extraction rate (non condensable) last 7 days	683	scfm

System Shutdowns

Saturday, 19 February: Based on information received from the treatment plant, the site shutdown at approximately 2000 EST. No alarm was received by the operators. Prior to the alarm, the system was transferring approximately 1 gpm of water. It is believed that the pump downstream of the oil water separator/moisture knockout froze (as well as its piping and connections) and caused a high high at either the oil water separator or the primary moisture separator. The site was down for approximately 36 hours and brought back online Monday morning.

System Maintenance

Other routine maintenance such as snow removal, bag filter changes, gauge maintenance, flushing of lines, etc. continued to occur. Continued demobilization of equipment that was no longer in use.

2. Temperature

The average temperatures by monitoring point location for Areas A, C, and D are shown in the graphs below. Additionally, the average soil temperature for the entire treatment area is also shown in the graphs below.

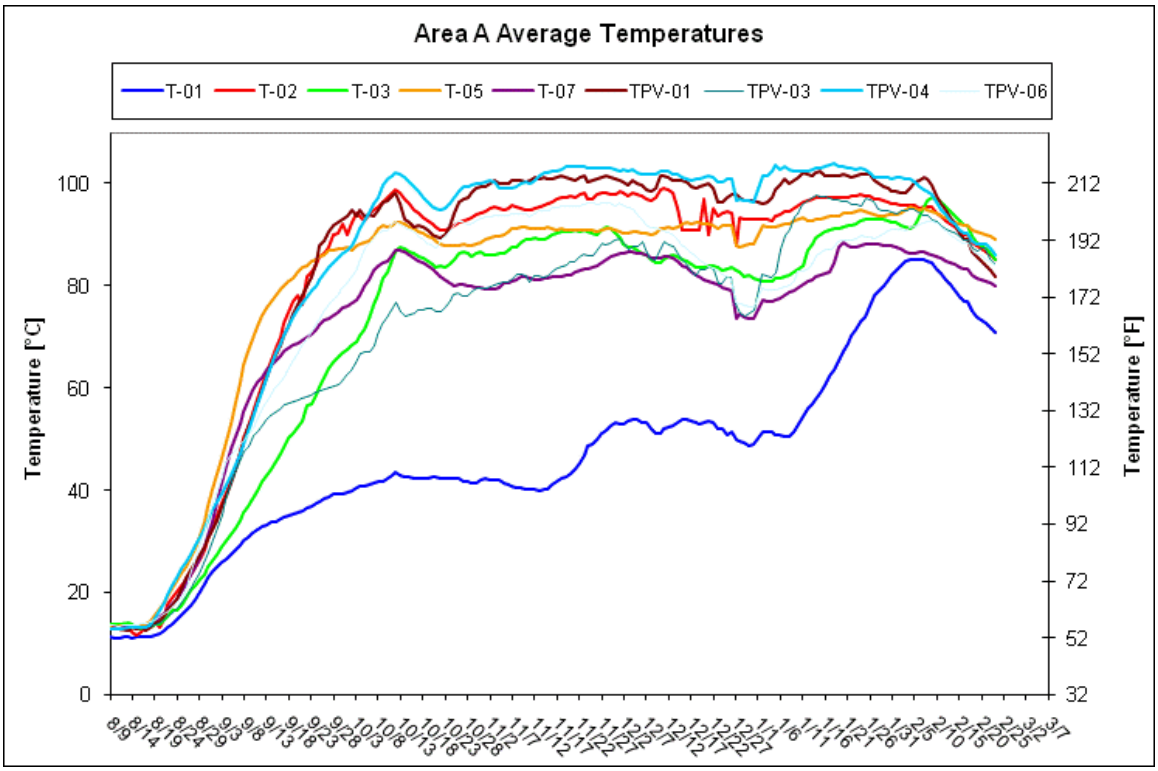


Figure 1. Average Temperature – Area A

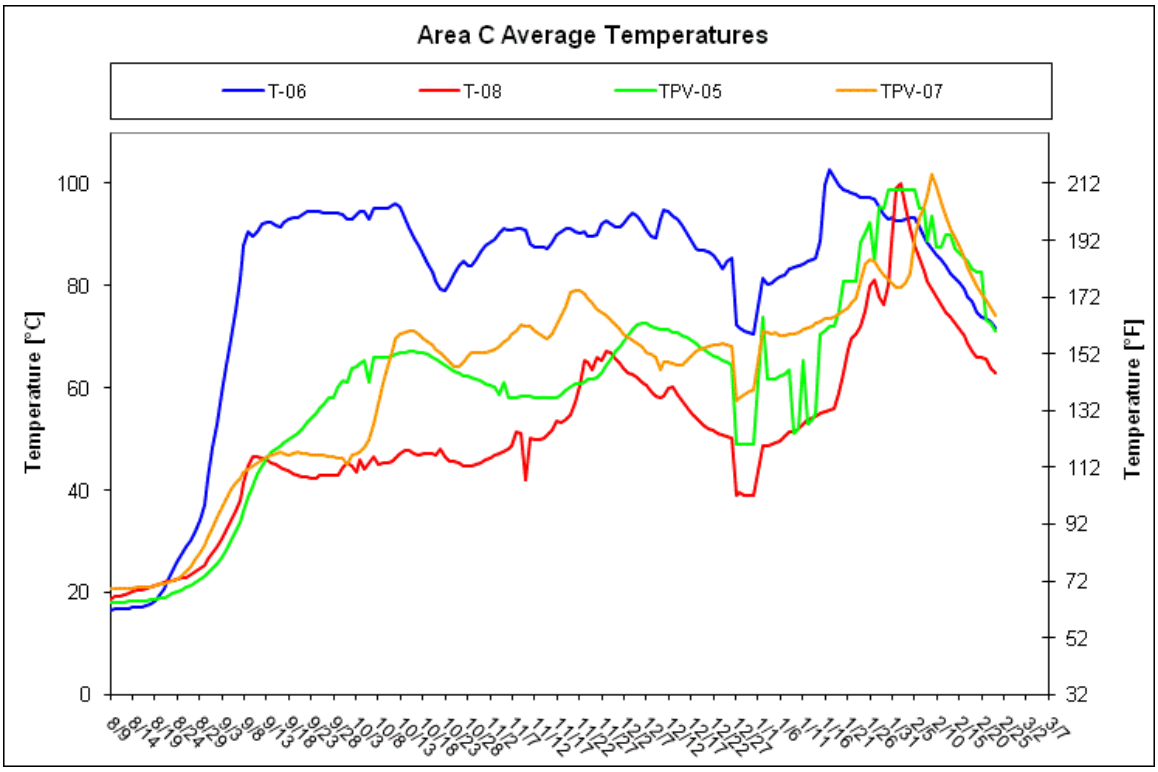


Figure 2. Average Temperature – Area C

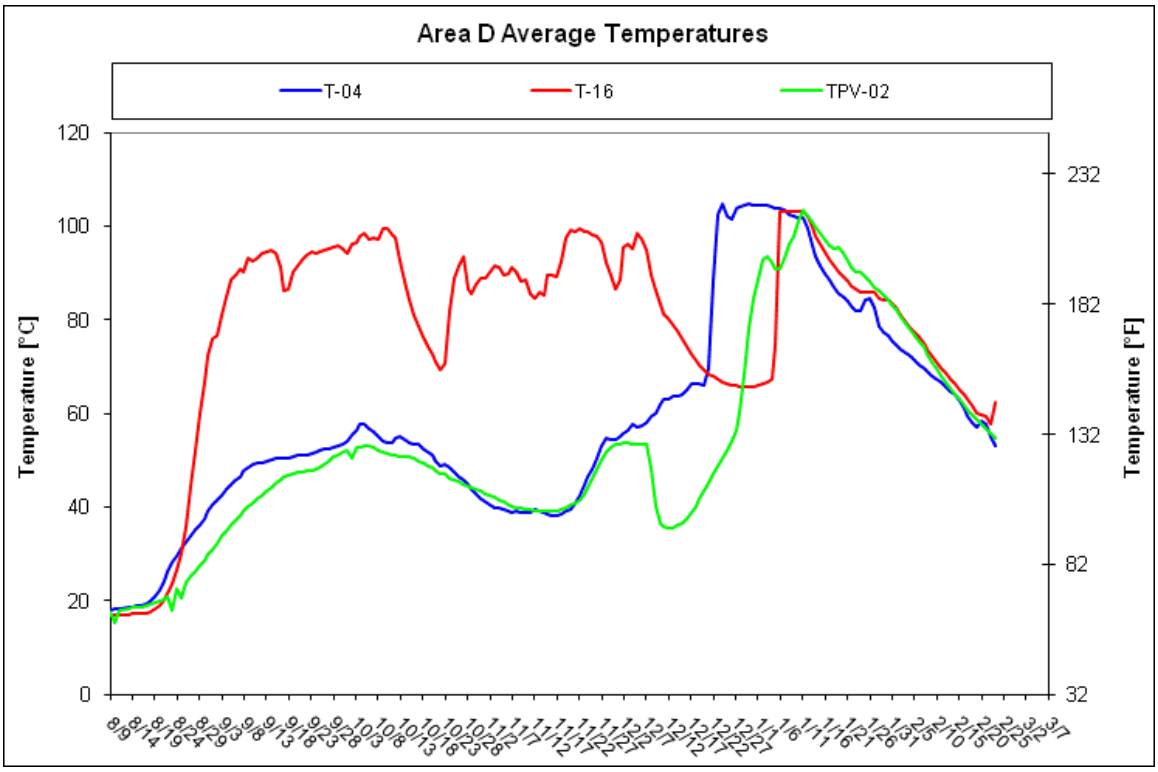


Figure 3. Average Temperature – Area D

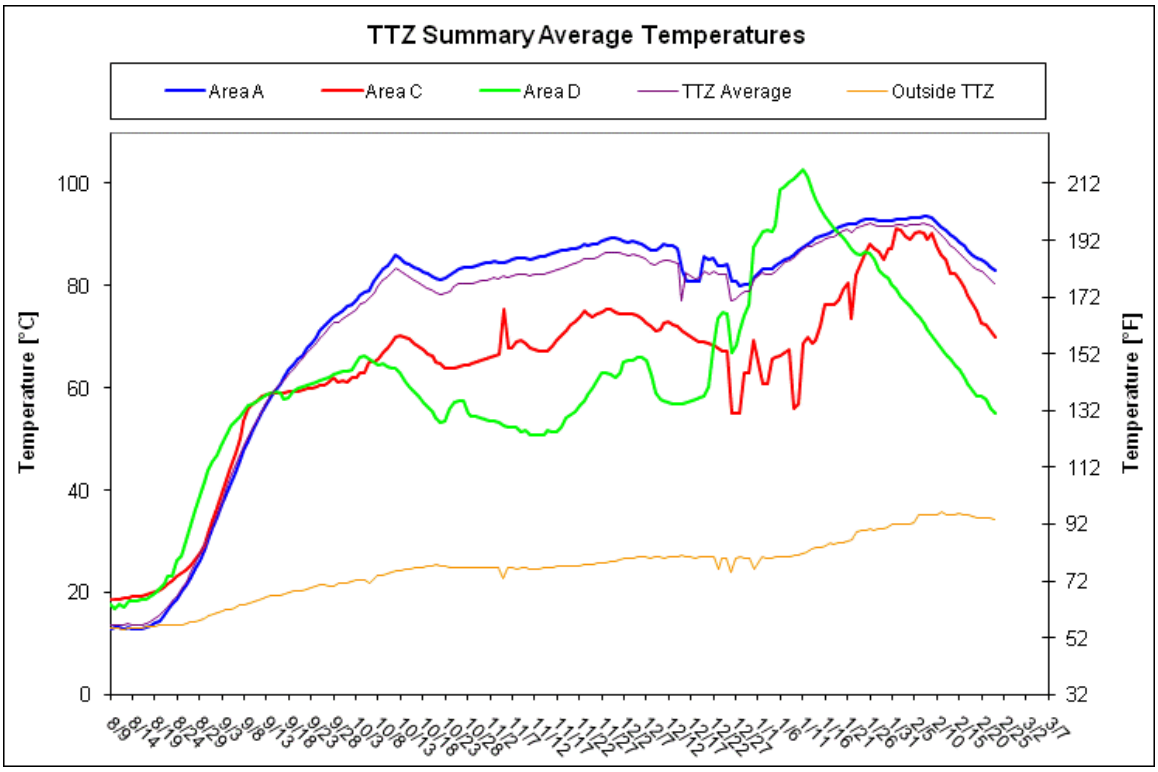


Figure 4. Average Temperature – Entire TTZ

3. Vapor Extraction and Temperature

The graph below shows the daily vapor extraction rate (scfm) from the site. The graph also shows the vapor temperature at the inlet of the process treatment equipment.

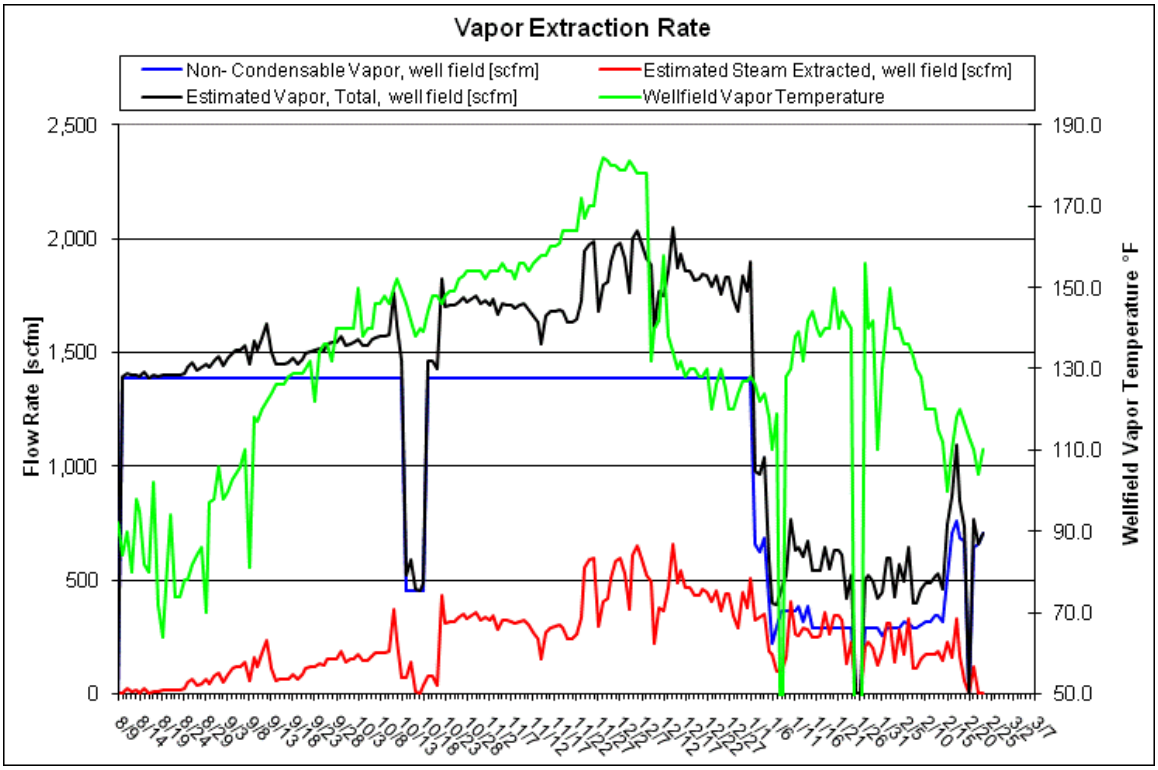


Figure 5. Vapor Extraction Rate and Temperature

4. Photo Ionization Detector (PID) and Destruction Removal Efficiency (DRE)

The following graph depicts the influent, midfluent and effluent PID readings and the DRE of the treatment system. Note that PID readings of 0.0 parts per million Volume (ppmV) are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of zero values. Due to the low influent concentrations and the sensitivity of the PID, carbon efficiency greater than 95% DRE may not be achieved.

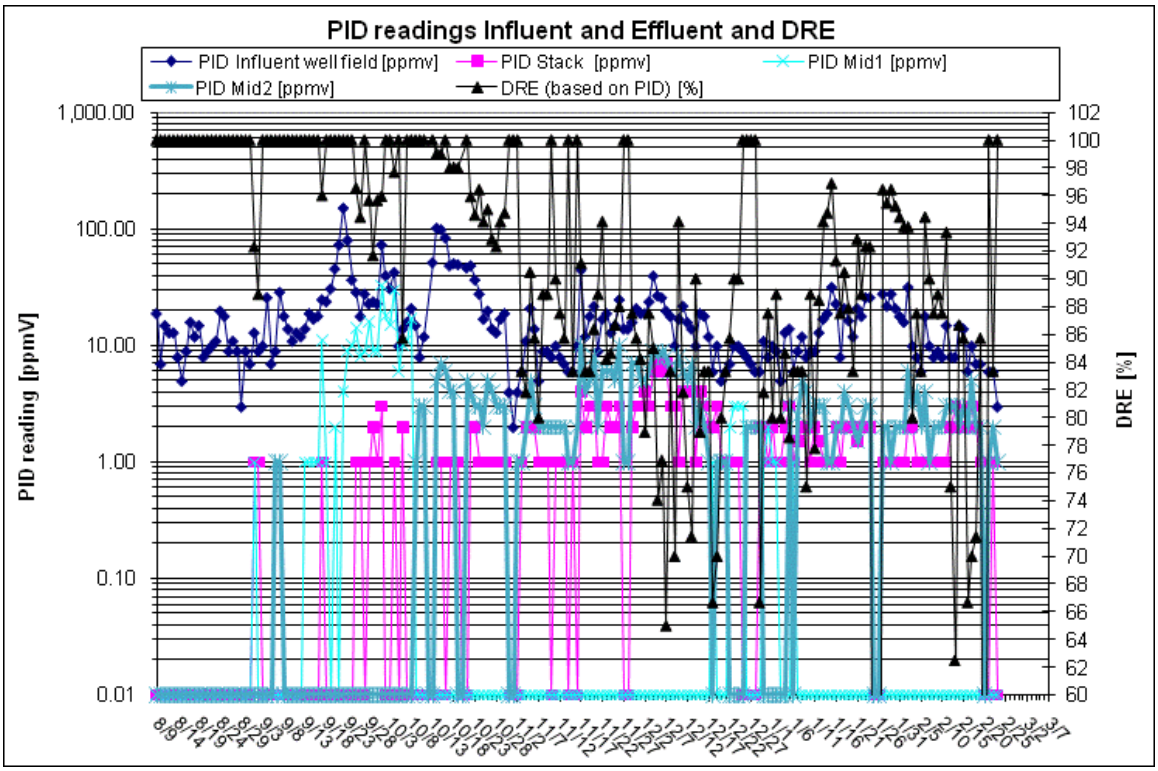


Figure 6. Influent, Midfluent and Effluent PID Readings and Calculated DRE

5. Contaminant Removal

The figure below presents total influent vapor mass removal calculated both by calibrating PID response factors based on analytical data received to date and also by developing a correlation between the PID data and analytical data collected on the same sampling date.

Calibrated PID response factors have been applied as a step function using the most recently received analytical data. A composite PID response factor for the VOC compounds identified in the laboratory results was calculated using published response factors for these individual constituents. The composite response factor has been applied to the influent PID readings to calculate the total mass removed and is shown in the figure below.

Additionally, a linear regression was calculated based on a comparison of the influent PID readings and the analytical data collected on the same day. Based on the best fit line for these data, the correlation between the PID readings and laboratory data was calculated and this correlation was applied to the PID readings to calculate the mass removed. This calculated mass removal is shown in the figure below as “VOC by lab-correlated PID”.

TerraTherm performed these alternative mass removal calculations in order to evaluate the most appropriate approach to calculating mass removal for this site. We will continue to evaluate both methods as more analytical data are received.

The total mass removed in extracted groundwater based on water analytical results is also shown below. This has been added to the total influent vapor mass based on a composite PID response factor to calculate the cumulative mass removed at the site to date. The graph will be updated as new analytical data are received.

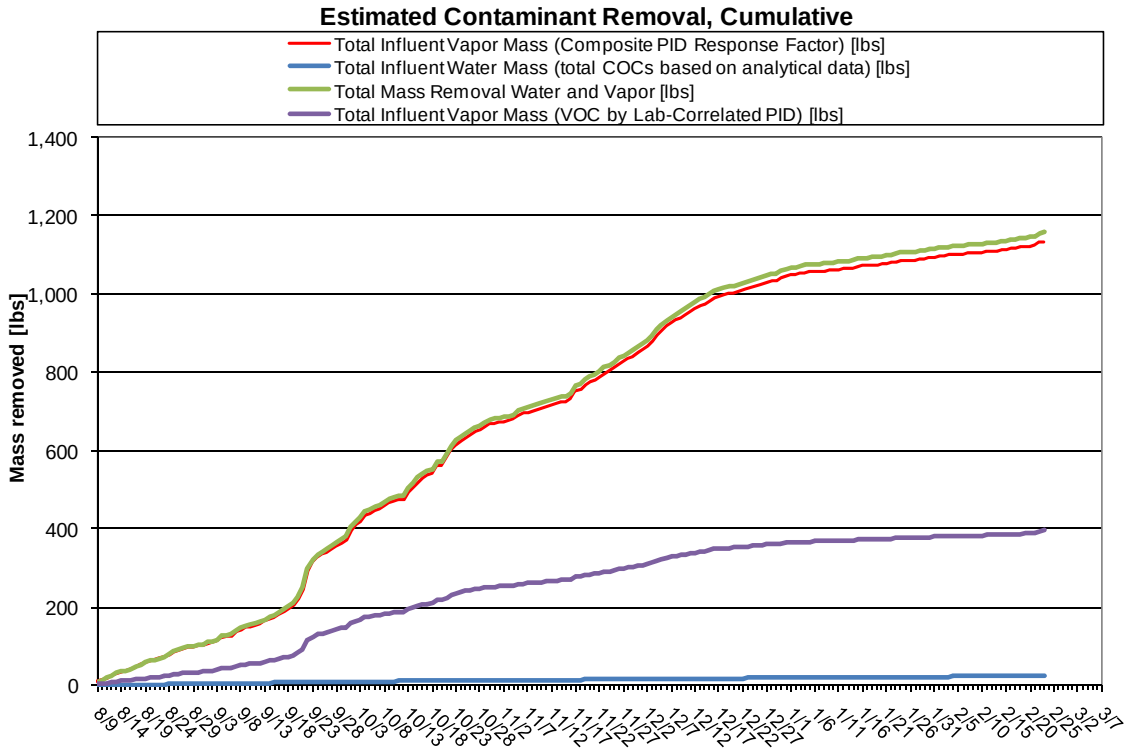


Figure 7. Mass Removal

6. PID Wellfield Vapor Monitoring

The table below presents the concentrations in ppmV from the 1/5/11 through the final PID wellfield vapor monitoring sampling events.

Table 2. PID Readings at the Extraction Wells (readings in ppmV)

	1/5/11	1/13/11	1/18/11	1/19/11	1/28/11	2/7/11	2/16/11	2/23/11	2/24/11
VEW 1	4.2	0.0		1.0			0.0		
VEW 2	6.4	5.0		0.0		2.0	0.1		
VEW 3	10	7.0		8.0		8.0	2.4		
VEW 4	15	20		58	165	40	21		
VEW 5	50	218	0.0	22	31	4	2.5	0.2	0.4
VEW 6	9.1	88	0.2	2.0			2.3		
VEW 7	22	4.0		0.0			0.4		
VEW 8	8.4	3.0		7.0			0.8		
VEW 9	48	24		32	84	14	54	9.7	15.1
VEW 10				3.0	2.0				
VEW 11				2.0	5.0				
VEW 12				6.0	25				
VEW 13	38			8.0	26				
VEW 14	6.6			1.0	5.0				
VEW 15	179		3.6	9.0		4.0			
VEW 16	23	6.0		3.0	30	2	1.1		
VEW 17	50	25					51	8.8	17.8
VEW 18	12	5.0		3.0			2.1		
VEW 19	36	11		9.0	42	18	7.5		
VEW 20	33				41				
VEW 21	38	20		9.0	65	22	11	6.1	7.6
VEW 22	9.5	3.0		2.0			1.0		
VEW 23	16	10		5.0	49	1	0.5		
VEW 24	16	5.0		3.0			3.7		
VEW 25		6.0		6.0		15	2.1		
VEW 26	11	4.0		2.0	12	1	1.8		
VEW 27	12	3.0		3.0	6.0		1.1		
VEW 28	4.1	2.0		0.0			0.1		
VEW 29	48		0.6	71	9.0				

7. Water Level

The figure below presents a water level contour map for the site.

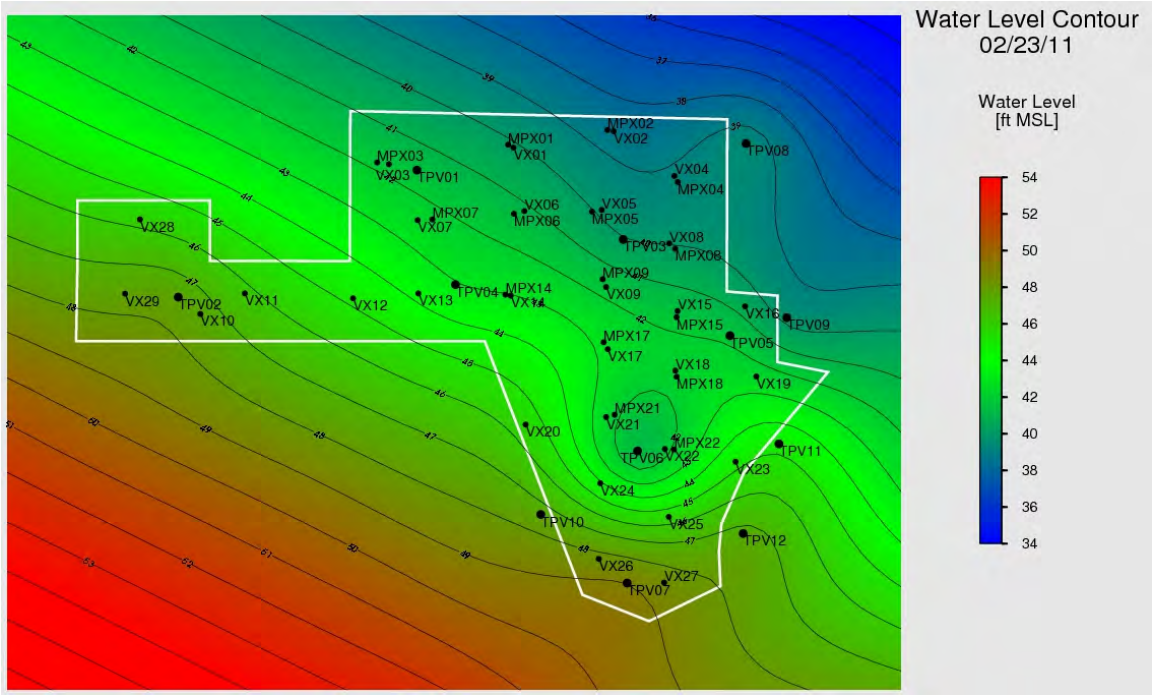


Figure 8. Water Level Contour Map

8. Vacuum Contour

The figure below presents a vacuum contour map for the site as of 2/23/11.

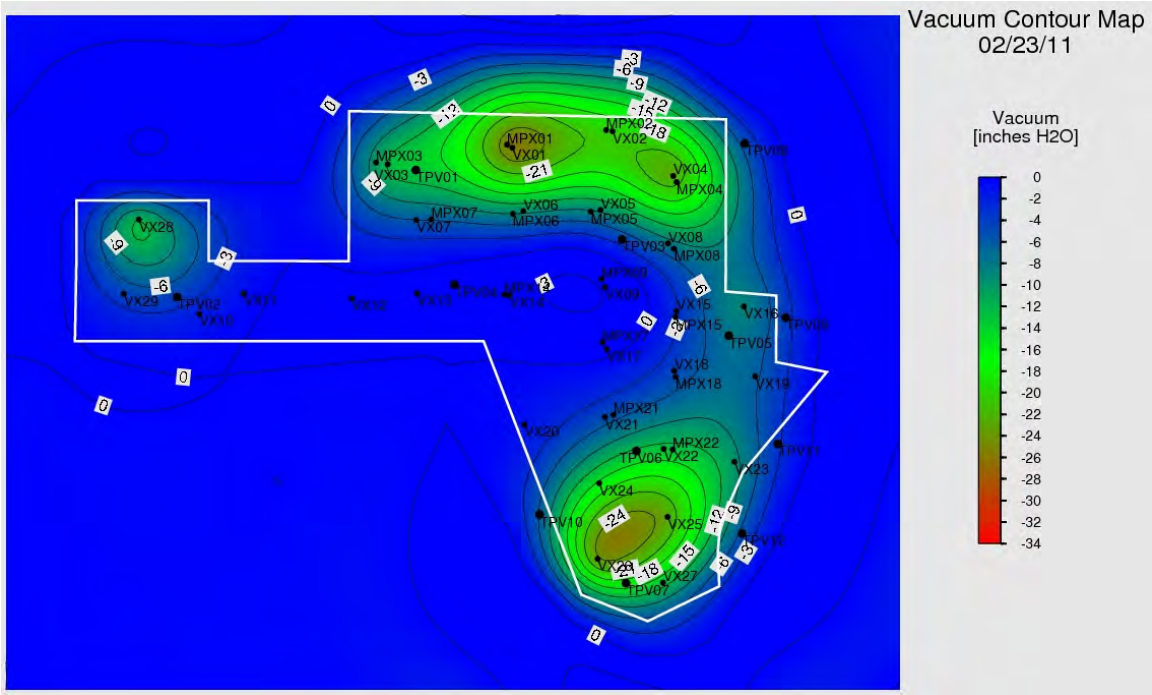


Figure 9. Vacuum Contour Map

9. Water Balance

Since heating system startup, we have had periods of increased water injection. Site hydraulic control has been maintained as we have injected a total of 1,727,412 gallons of water since system startup while extracting a total of 2,244,363 gallons of water for a total net water extraction of 516,951 gallons.

The figure below shows the cumulative extracted groundwater from the MPE wells, the condensate collected, the net water extraction, and the total water injected to the site.

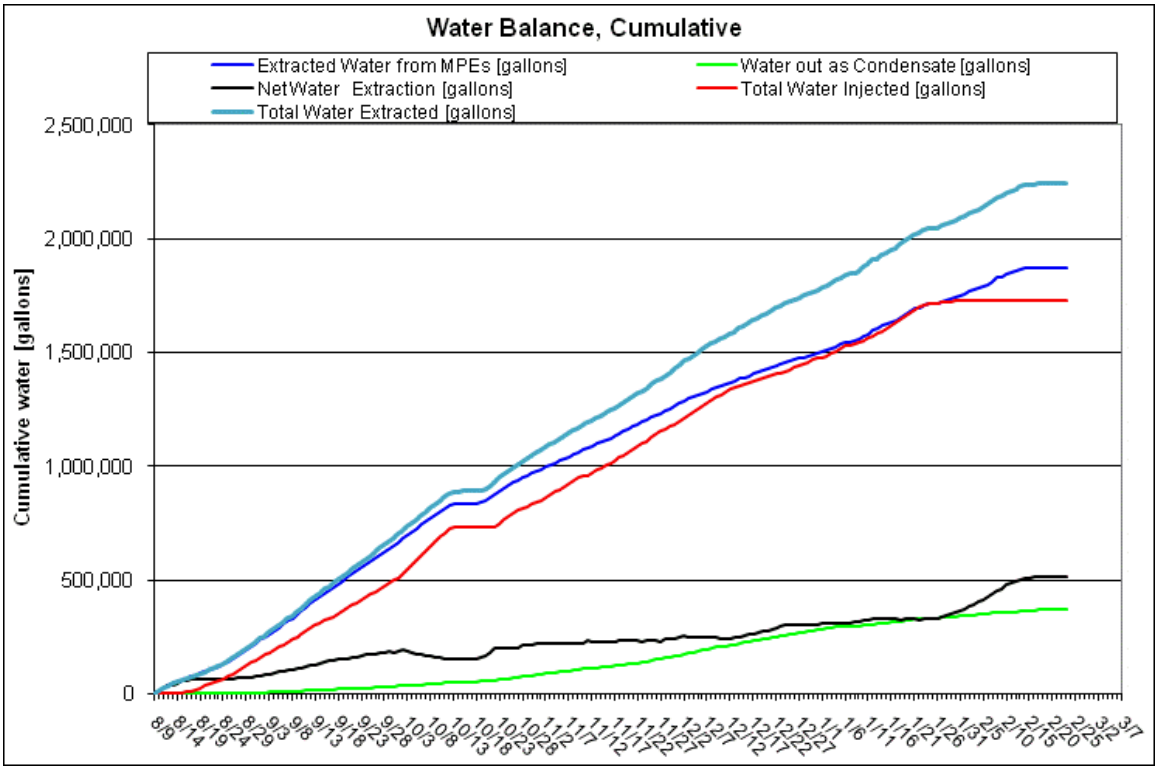


Figure 10. Liquid Condensate Production, Total Water Injected and Total Water Pumped to Date

The rates of extracted groundwater from the MPE wells, the condensate collected and the net water extraction from the site is shown in the figure below.

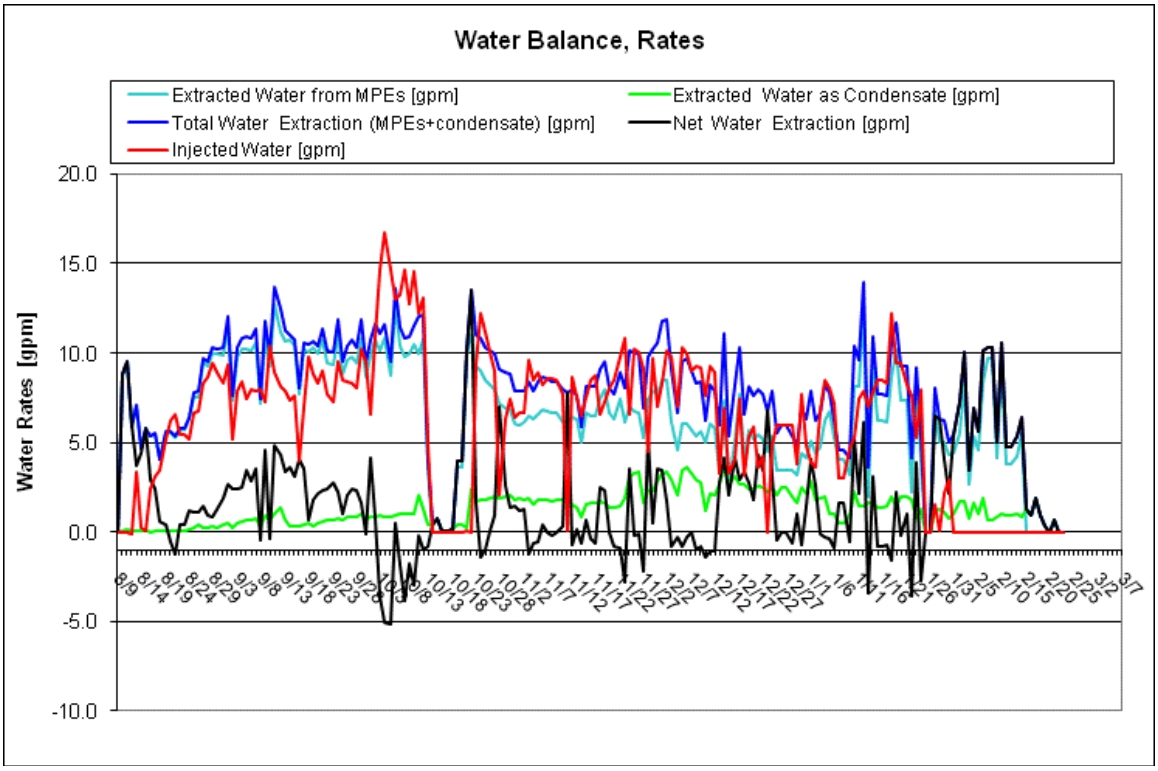


Figure 11. Liquid Condensate Production, Water Injection and Water Extraction Rates

10. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

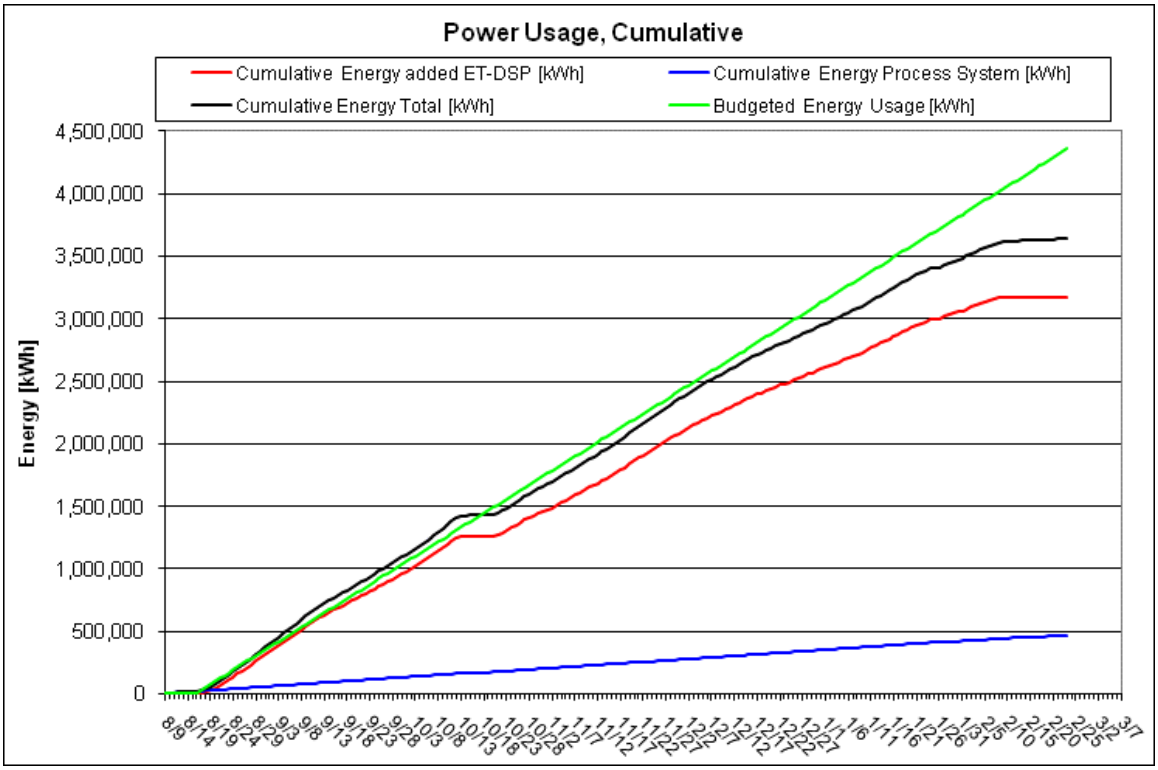


Figure 12. Cumulative Power Usage

11. Discussion

Operational Shut Down and Demobilization Activities:

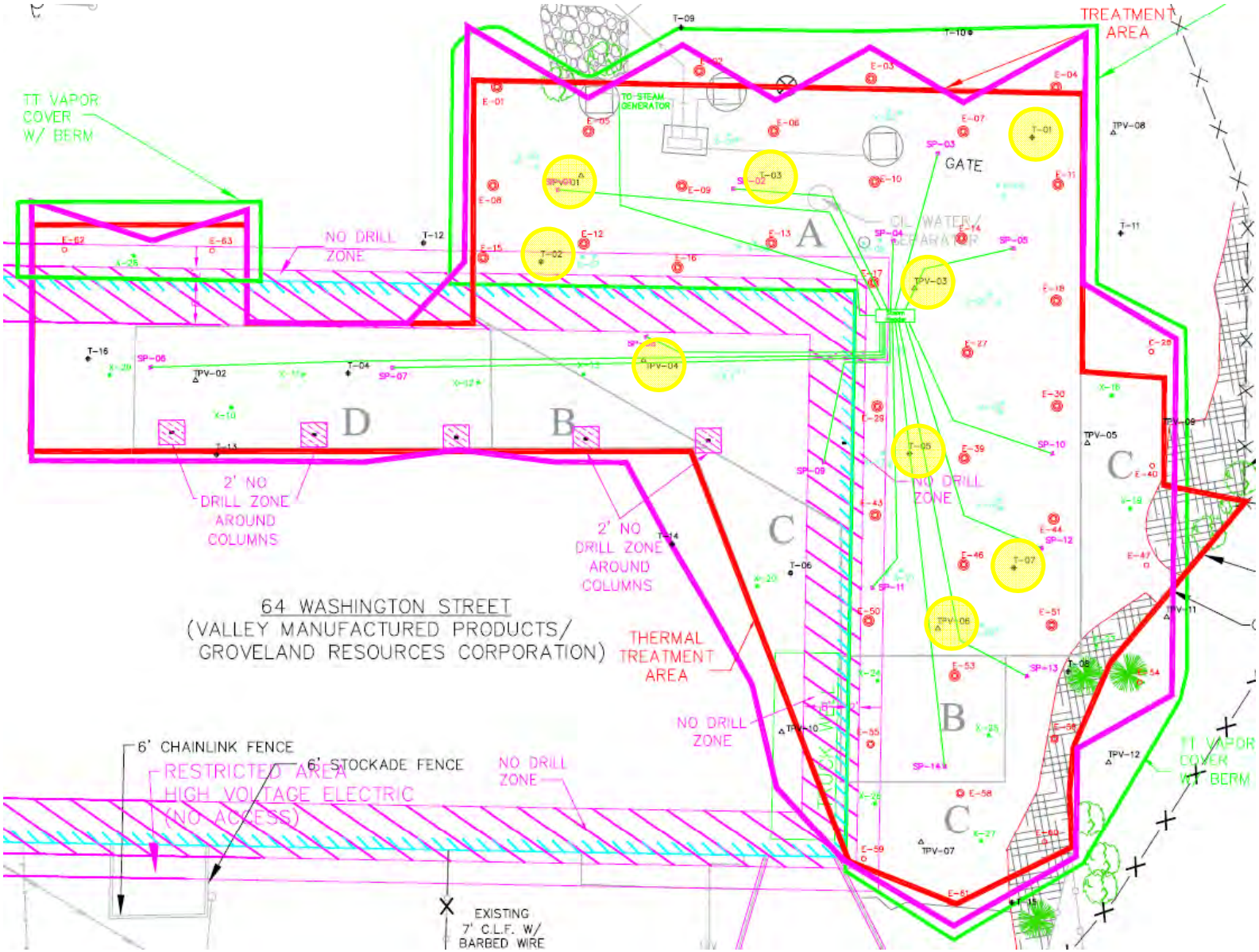
On Thursday, 24 February, the process treatment system was shutdown ending Phase 3 operations at the site.

Demobilization efforts continue at the site. Removal of insulation in the wellfield is complete with the exception of the interior portion of the Former Valley Manufacturing Building. Gauges, valves, hoses, and timer boxes have been removed from the wellfield. The generator has been removed from the site. Housekeeping and packing of materials and gauges for shipment to TerraTherm occurred during the week.

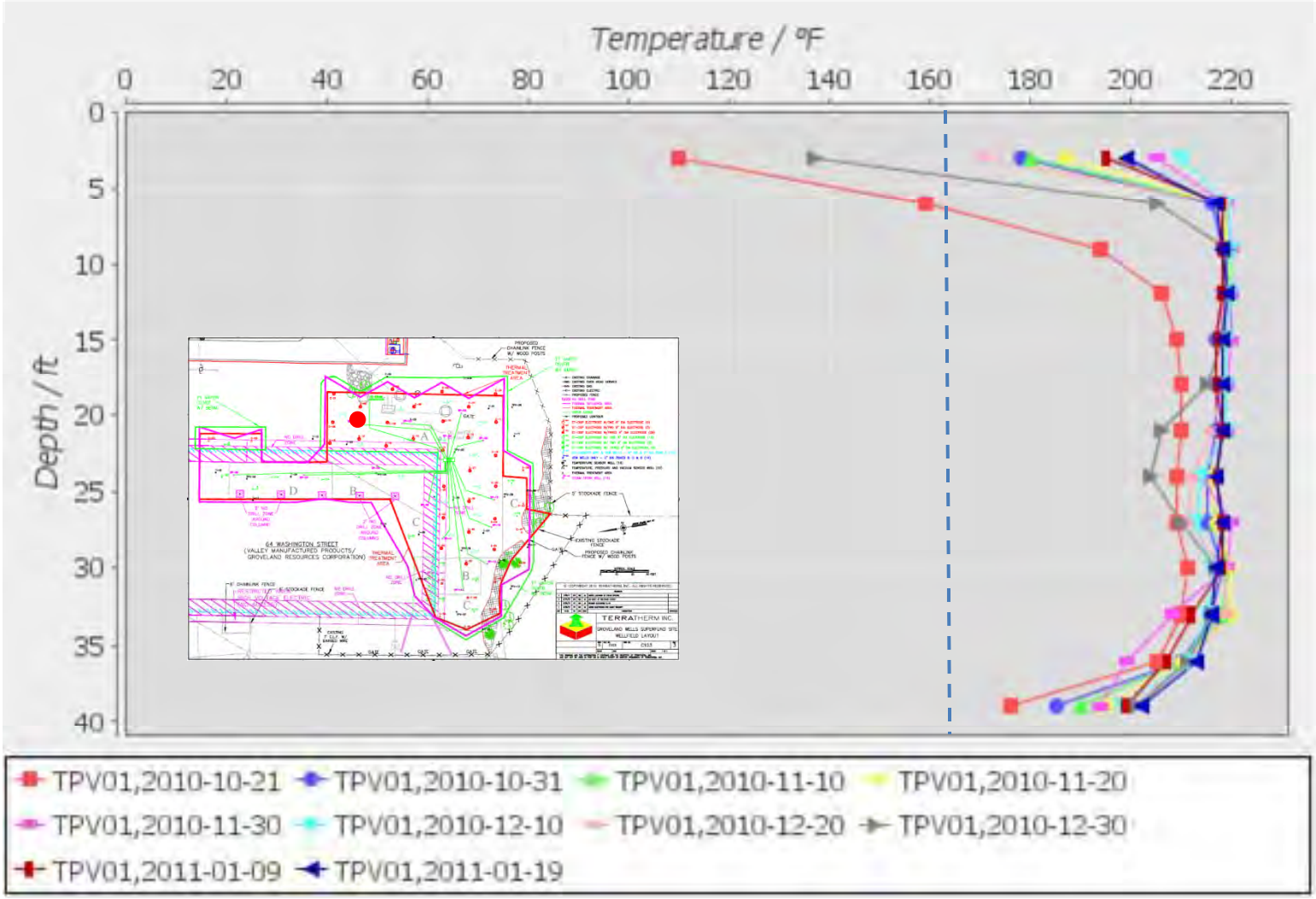
Incidents:

No safety or environmental compliance incidents were reported for the February 19 through February 24, 2011 operational period. Due to snow loading on the Former Valley Manufacturing Building Roof, all building access is restricted.

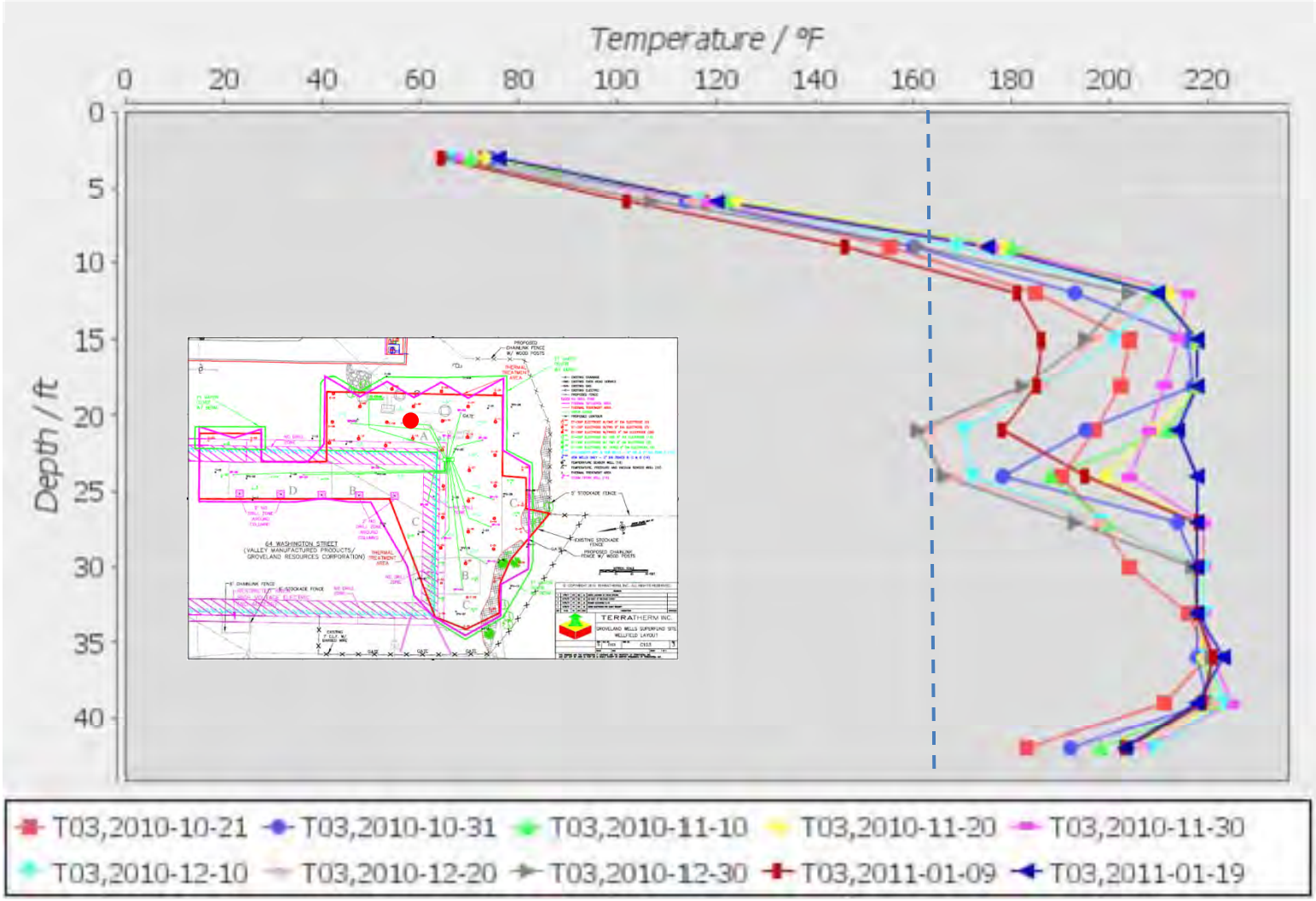
Area A – Temperature Monitoring Points



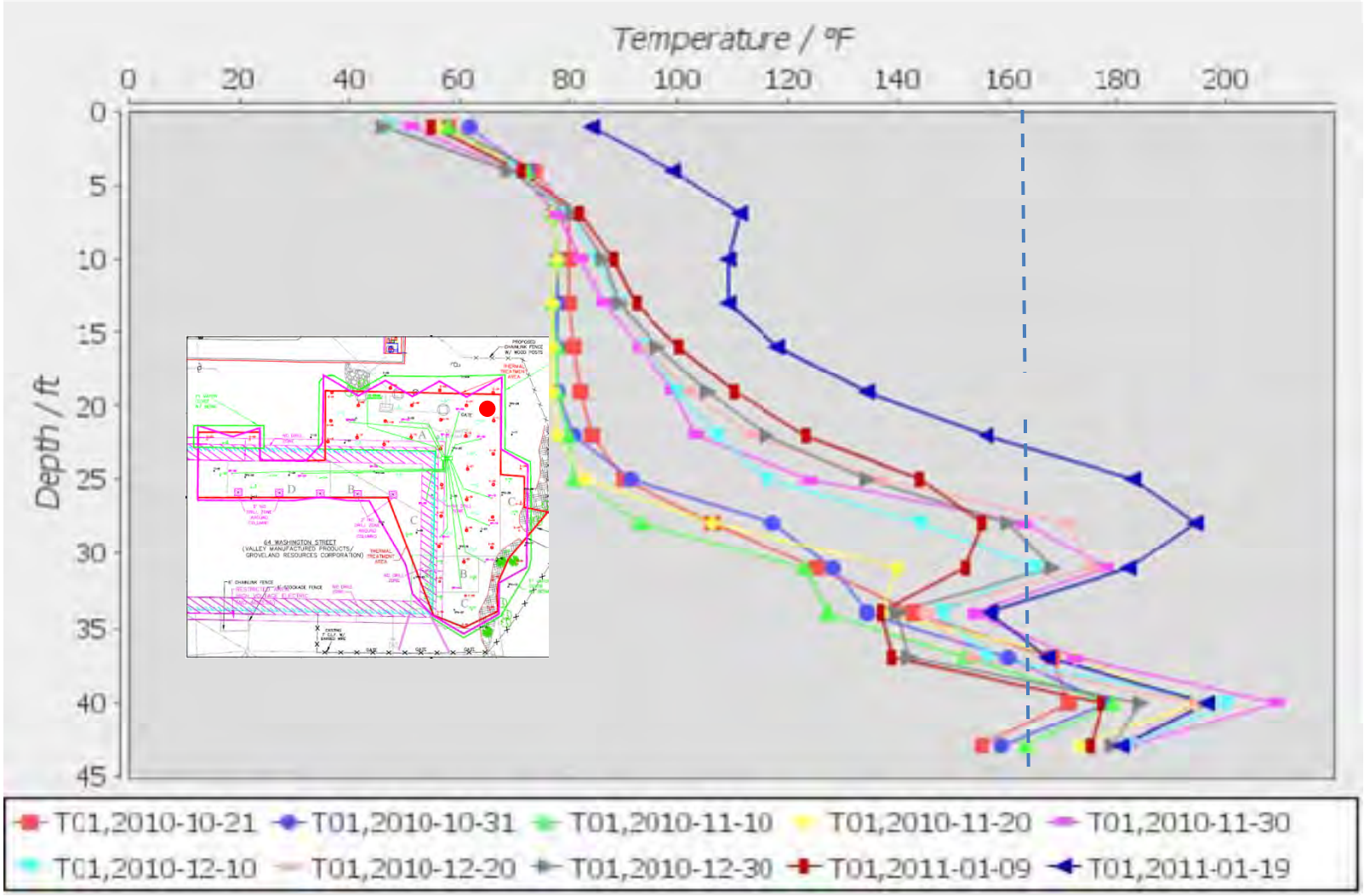
Area A – Temperature Monitoring Points Continued



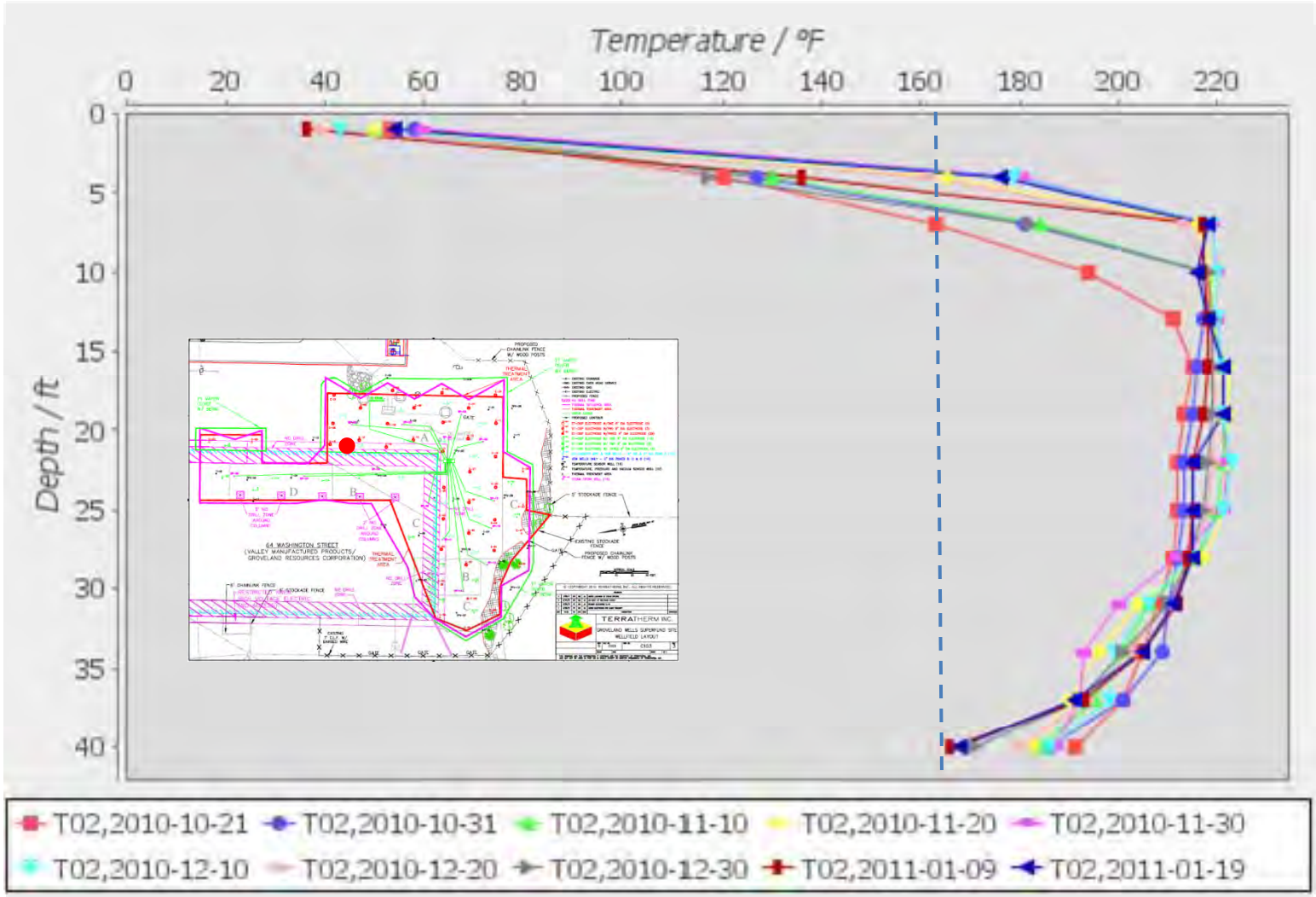
Area A – Temperature Monitoring Points Continued



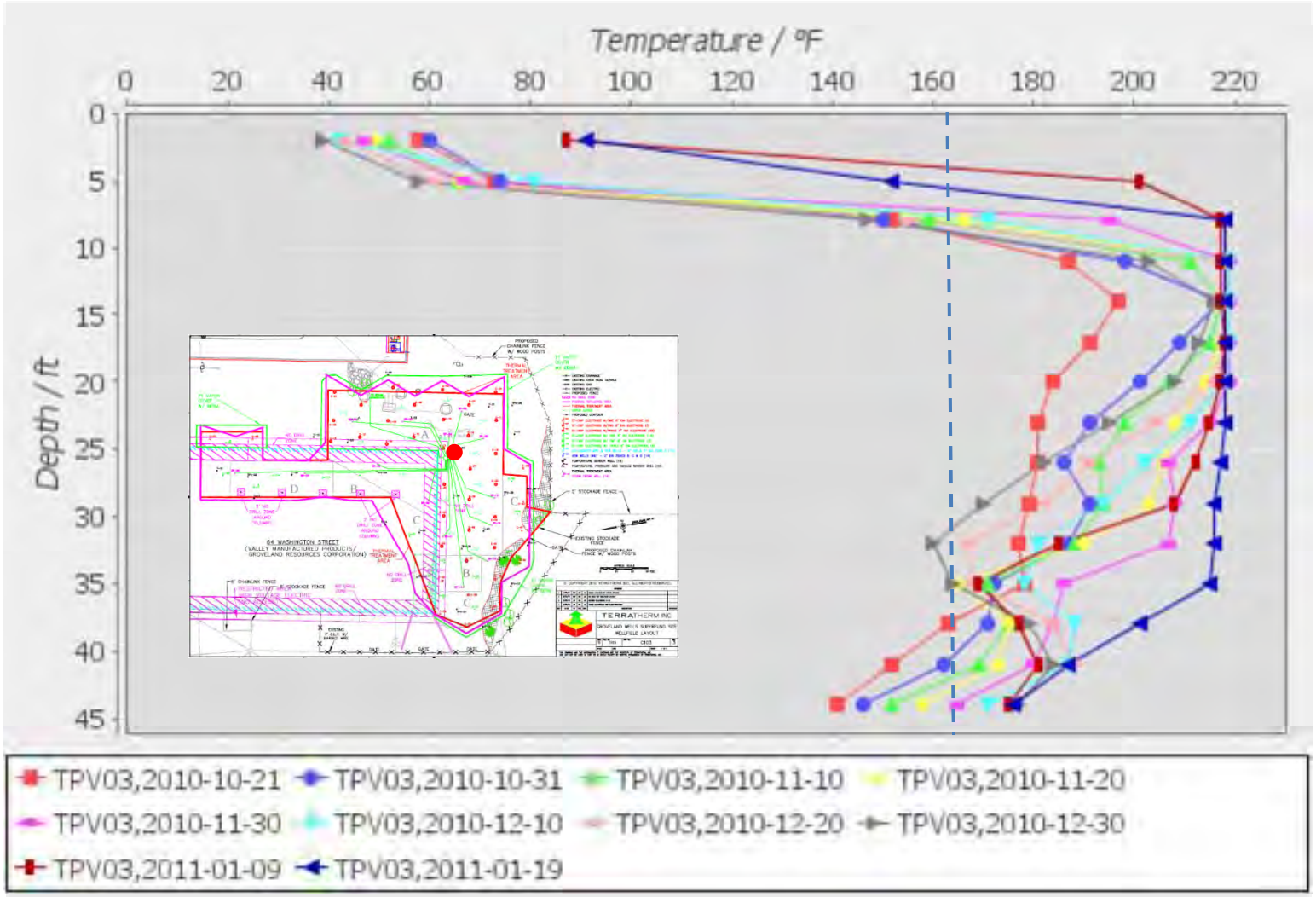
Area A – Temperature Monitoring Points Continued



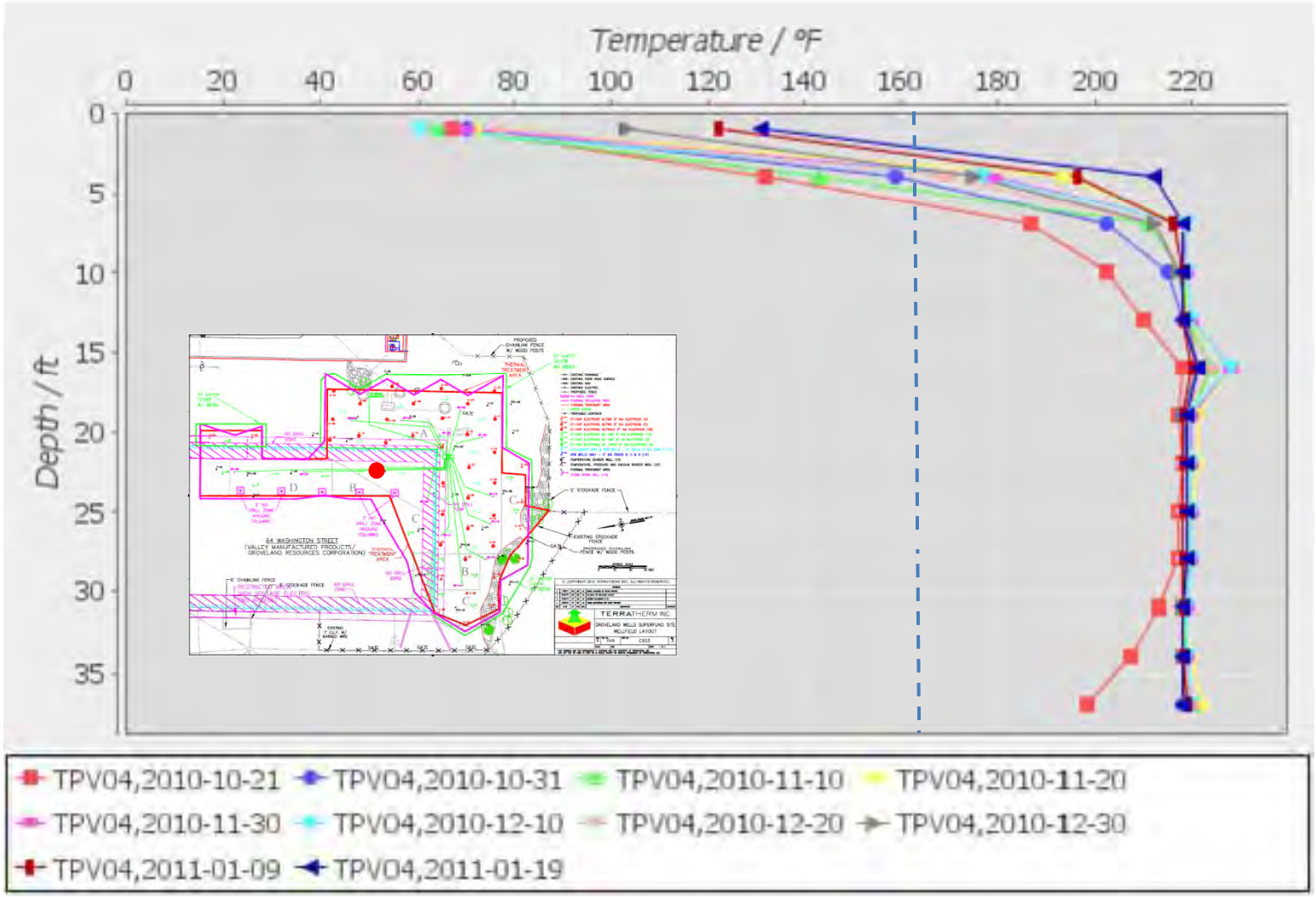
Area A – Temperature Monitoring Points Continued



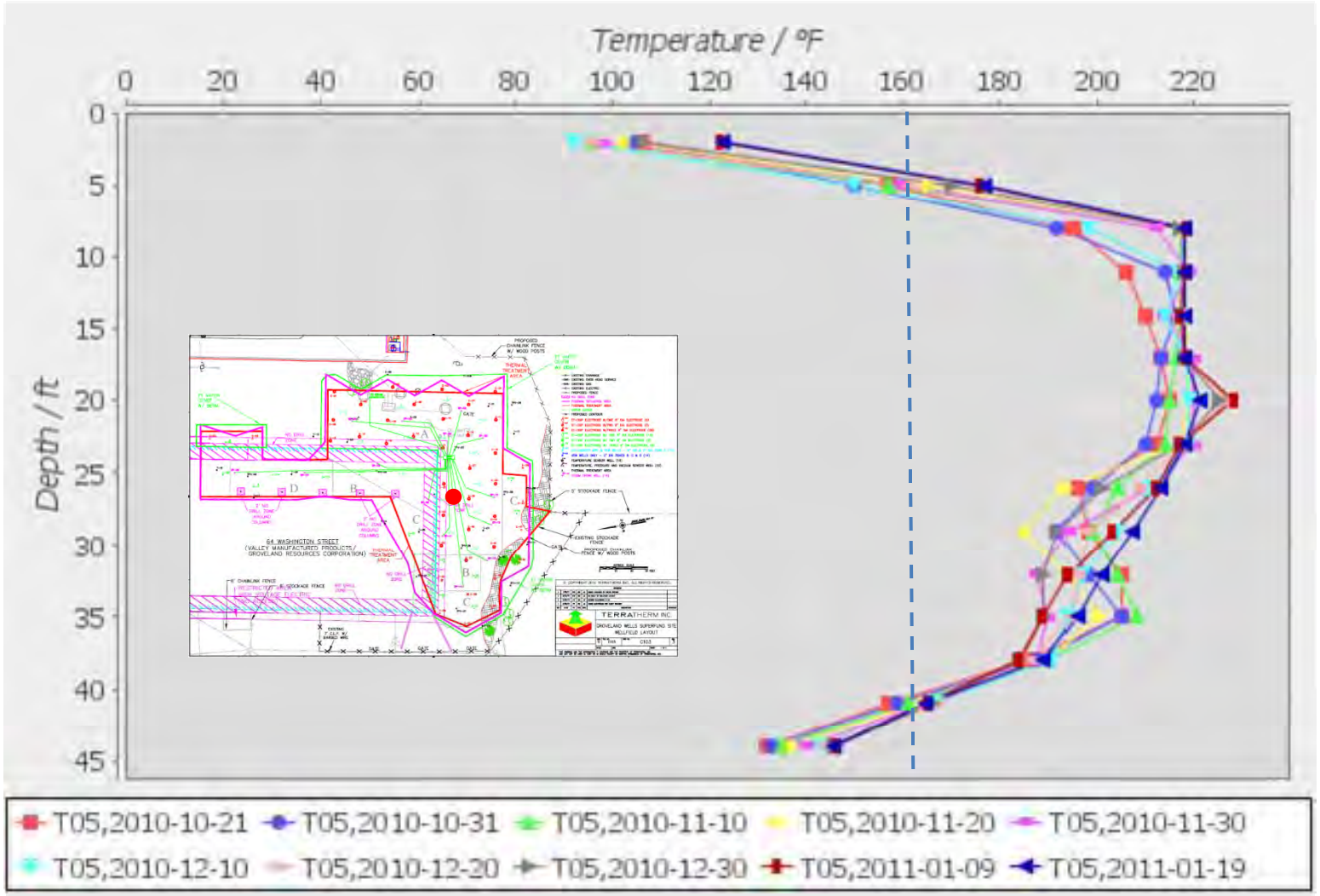
Area A – Temperature Monitoring Points Continued



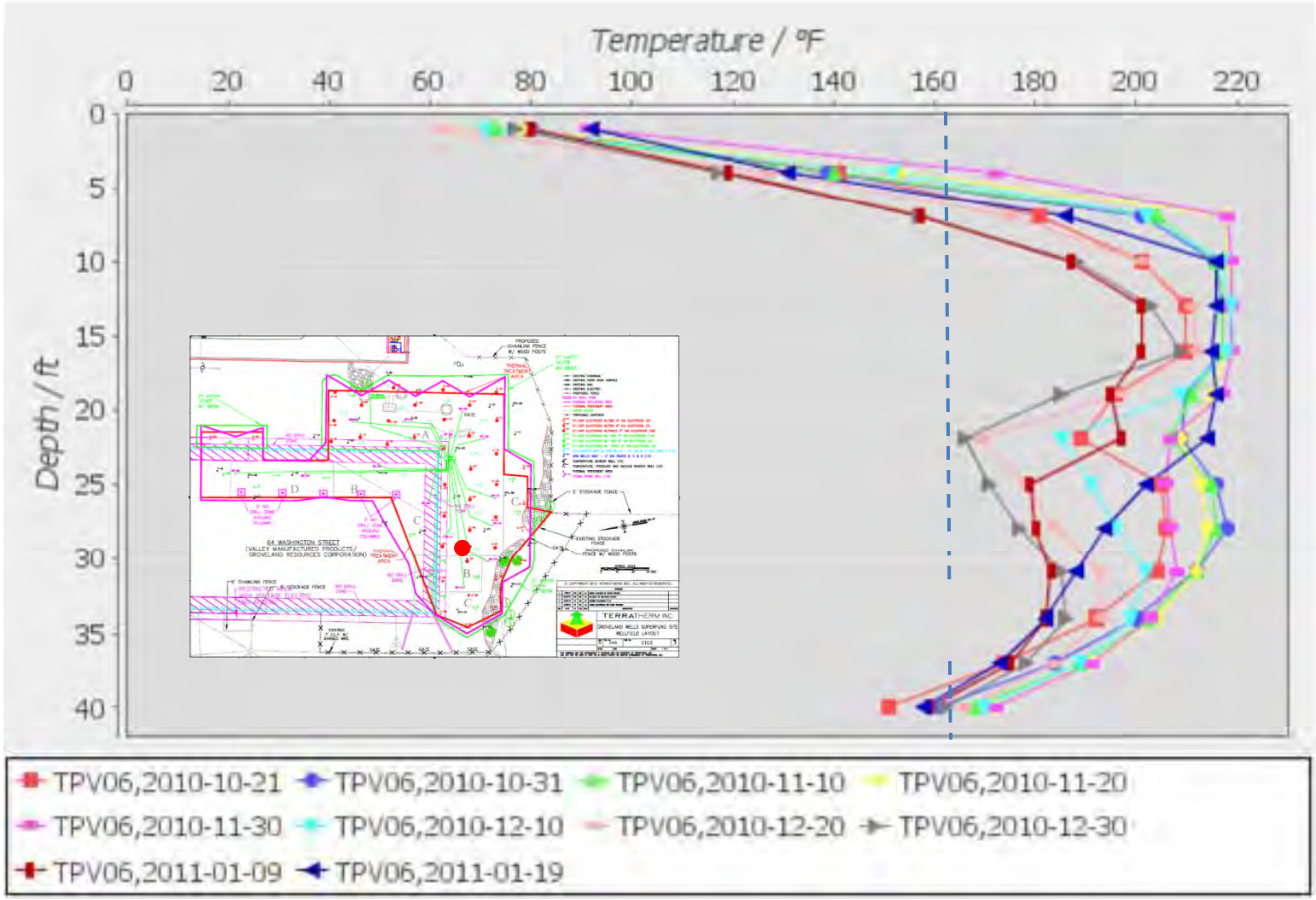
Area A – Temperature Monitoring Points Continued



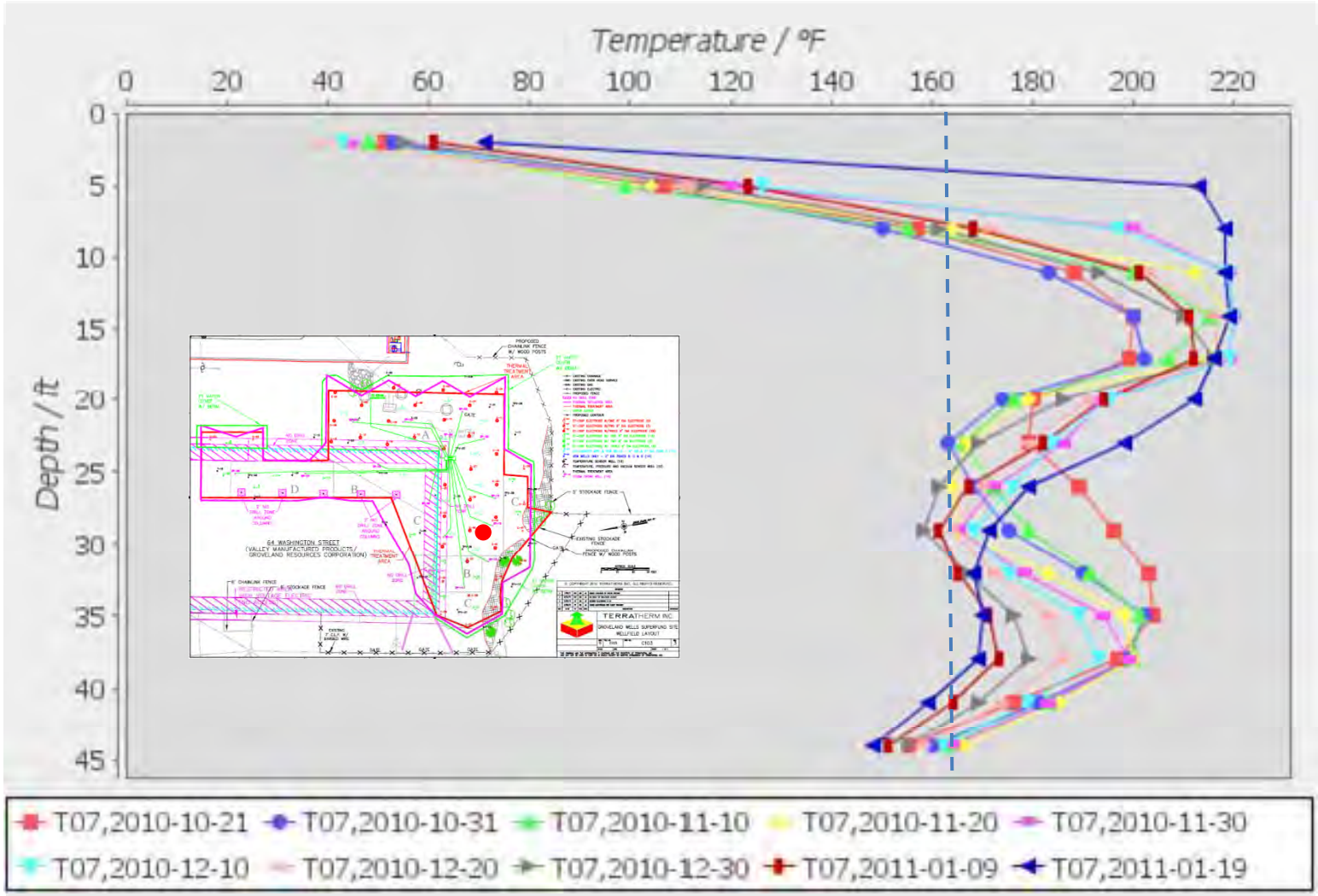
Area A – Temperature Monitoring Points Continued



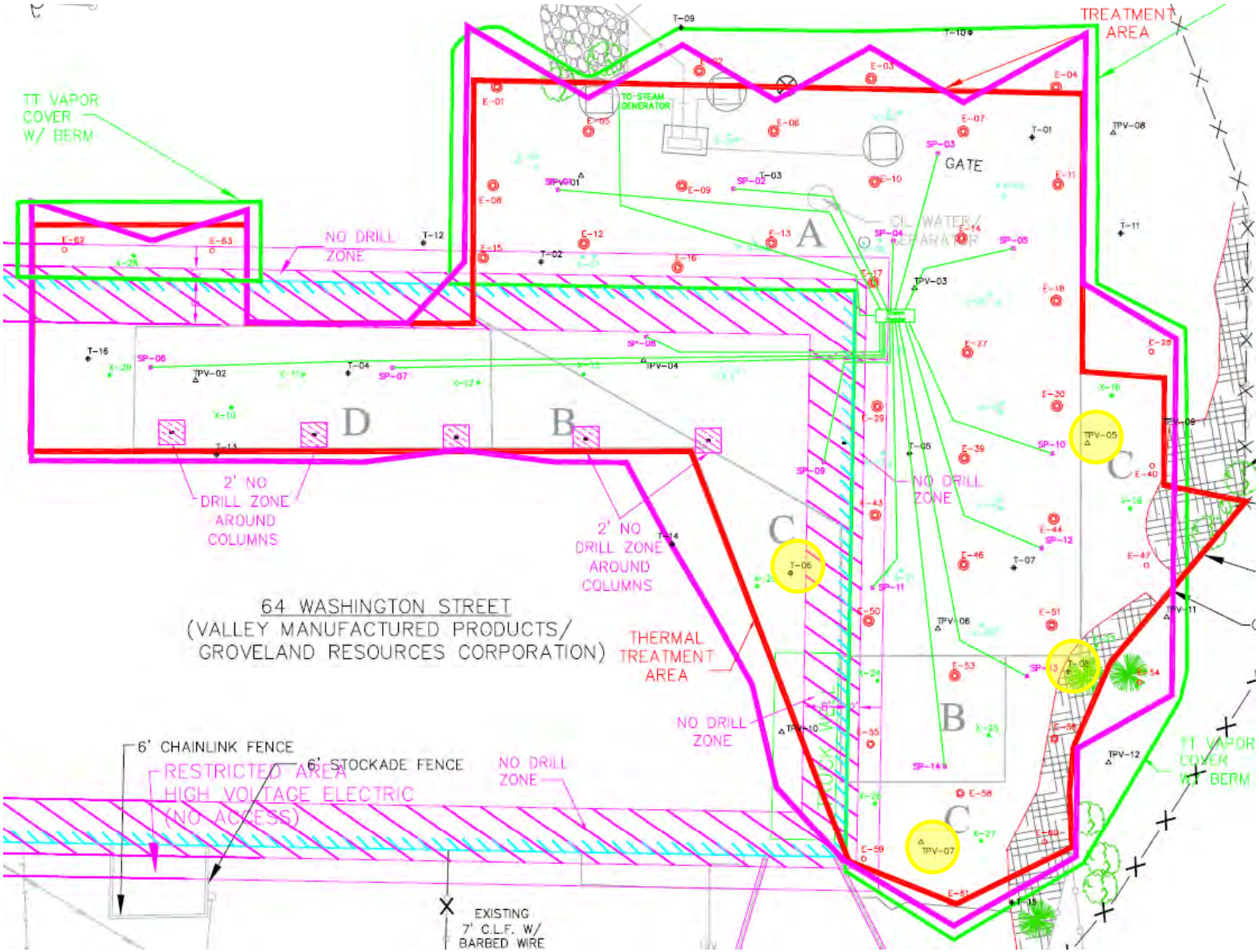
Area A – Temperature Monitoring Points Continued



Area A – Temperature Monitoring Points Continued



Area C – Temperature Monitoring Points



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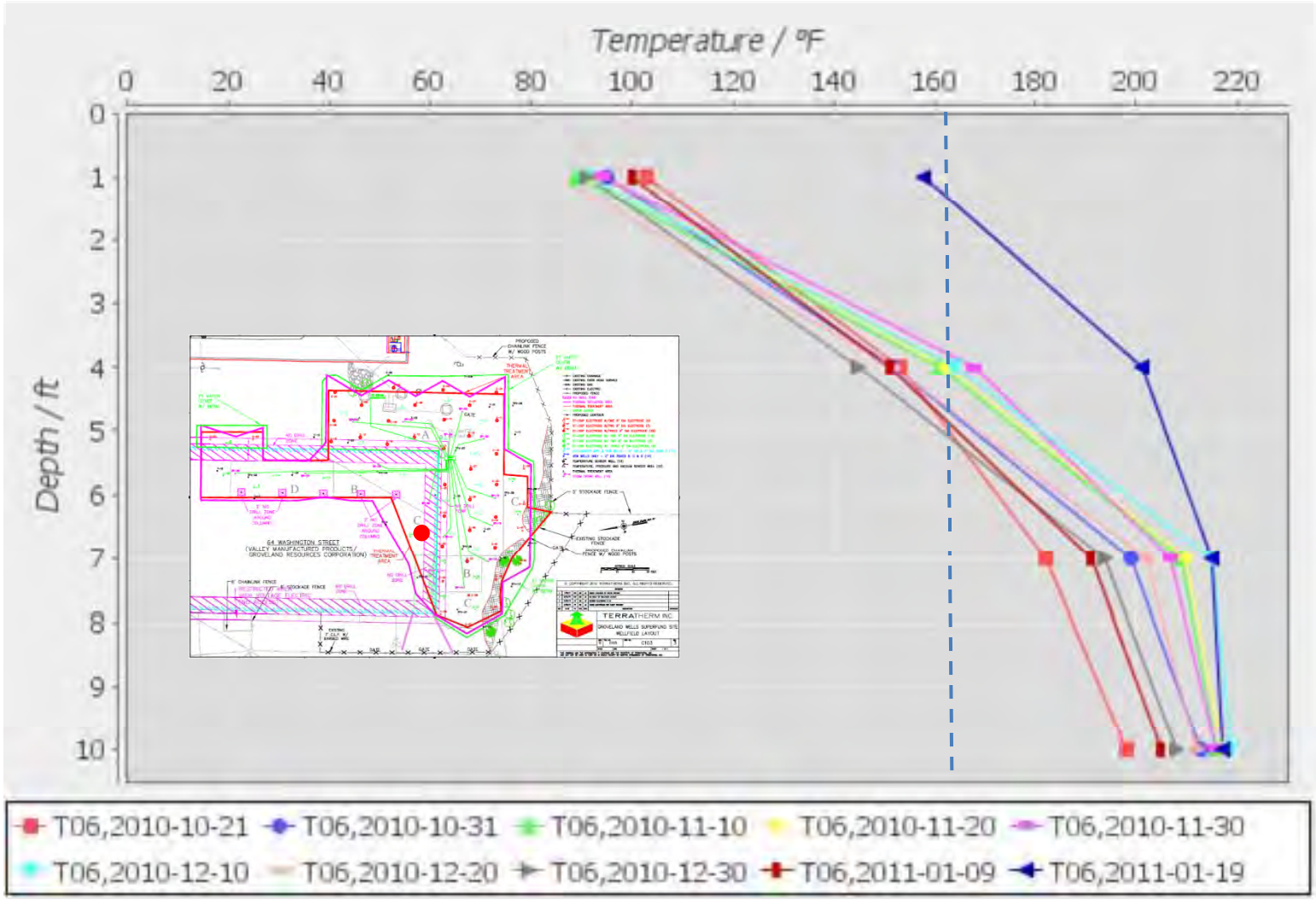
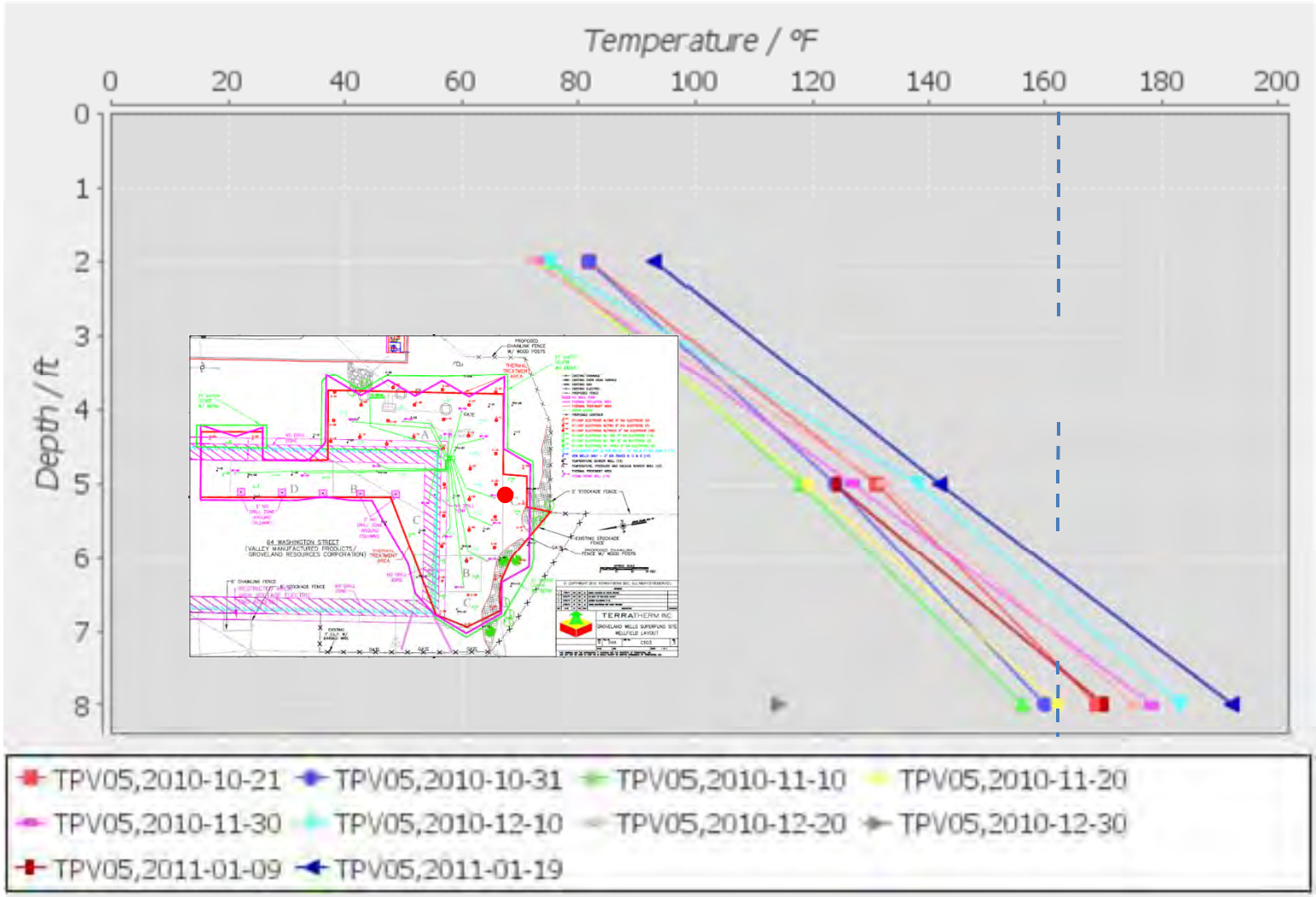
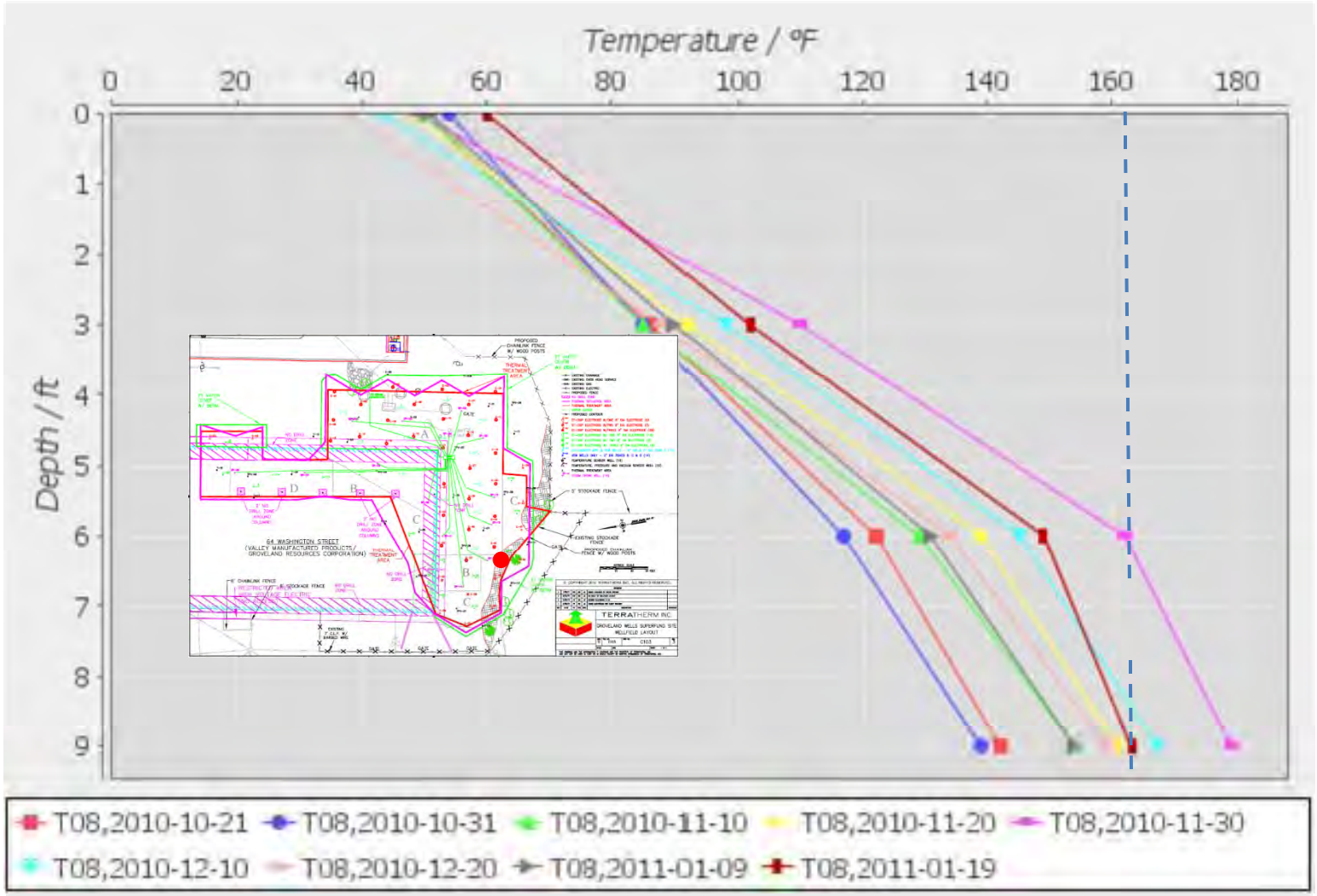


Area C – Temperature Monitoring Points Continued

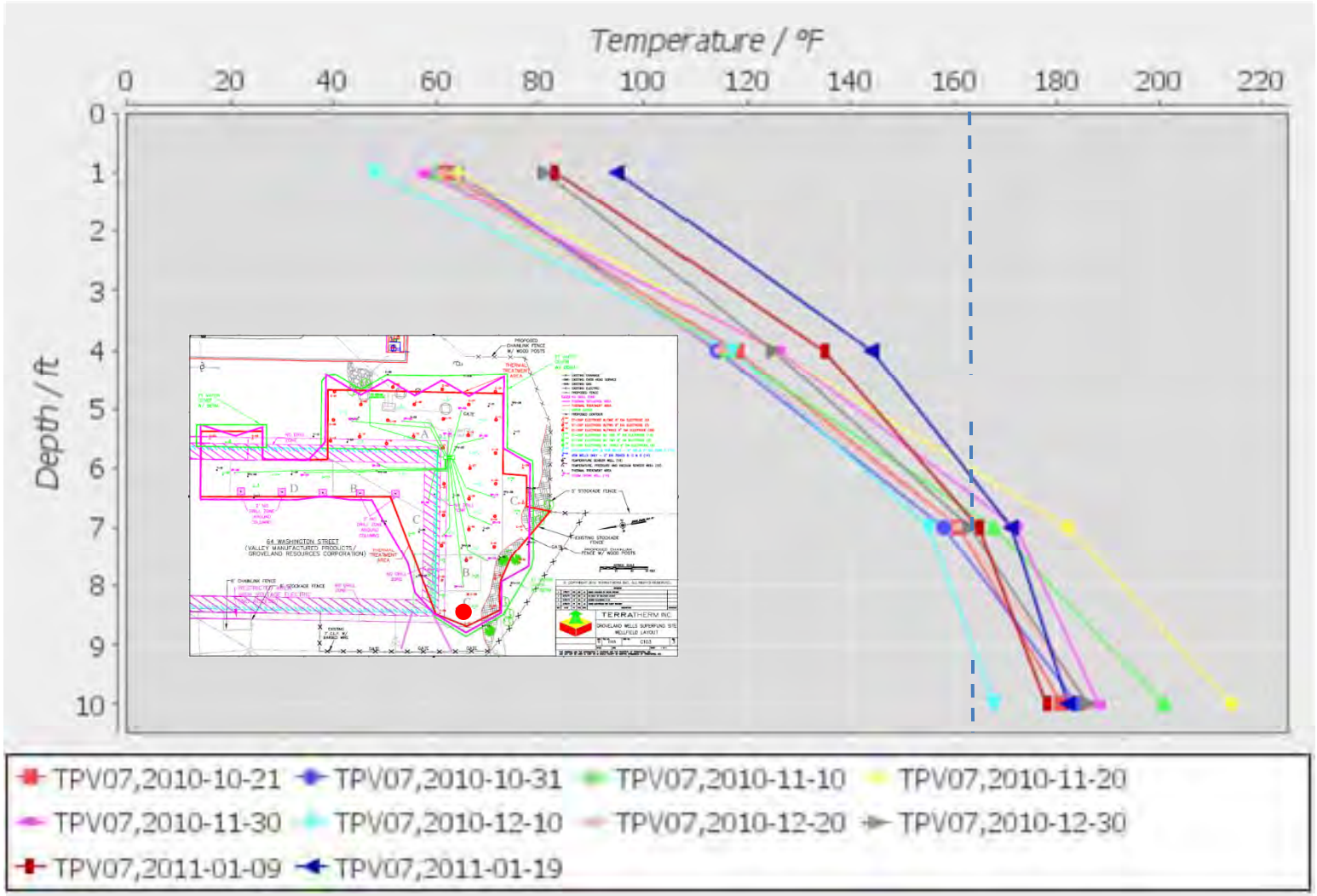


Problems with TPV-05. Currently trouble shooting.

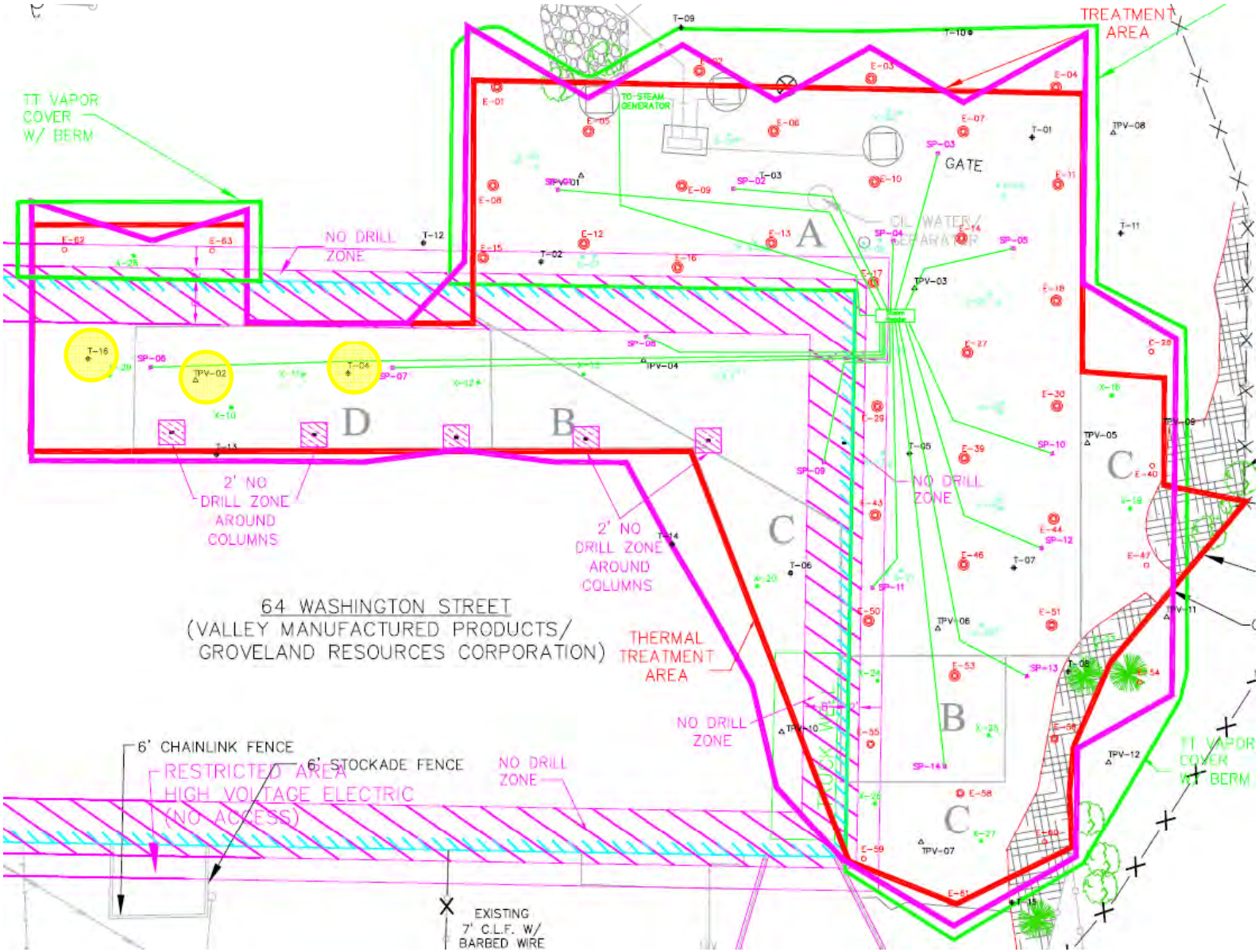
Area C – Temperature Monitoring Points Continued



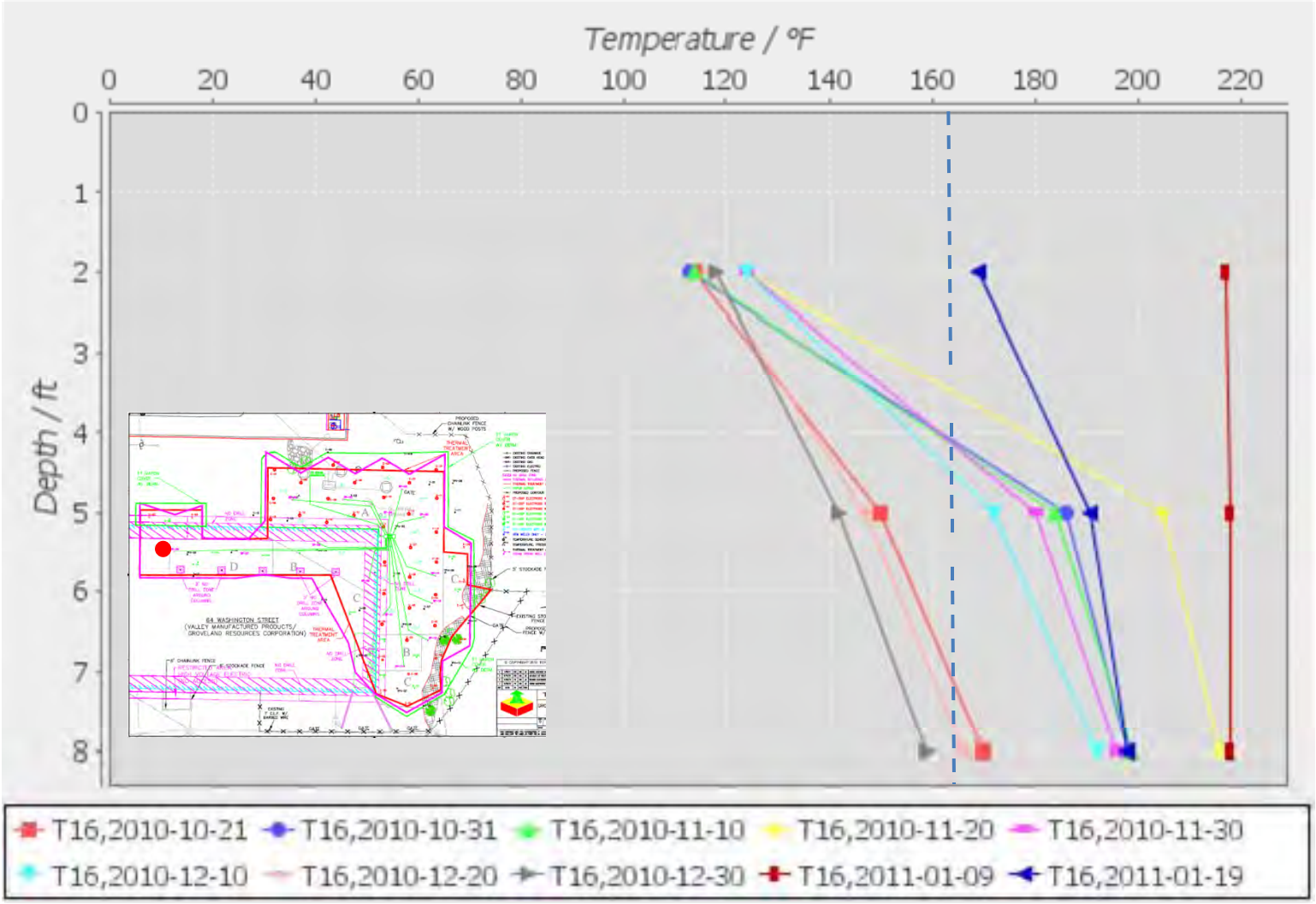
Area C – Temperature Monitoring Points Continued



Area D – Temperature Monitoring Points

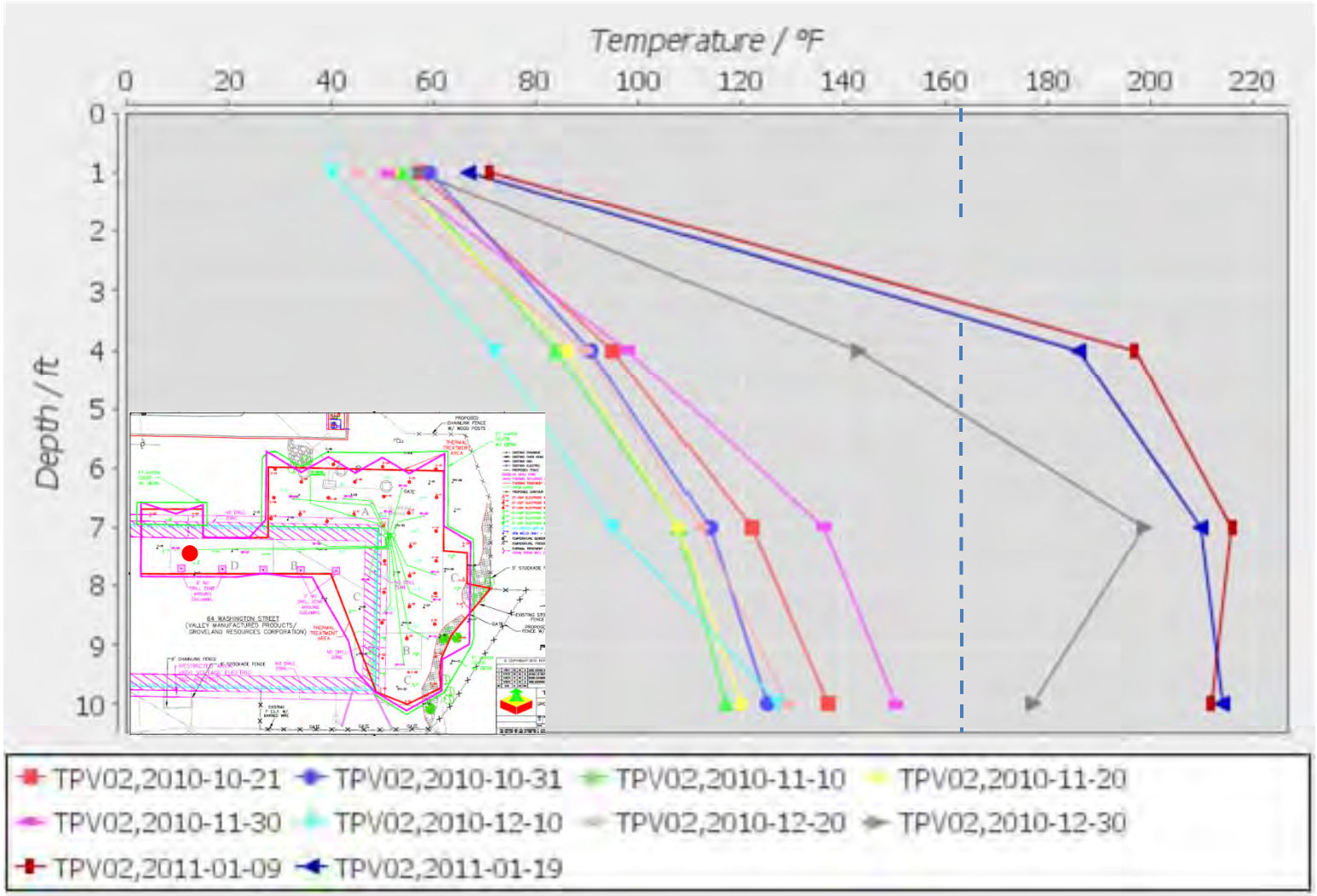


Area D – Temperature Monitoring Points Continued



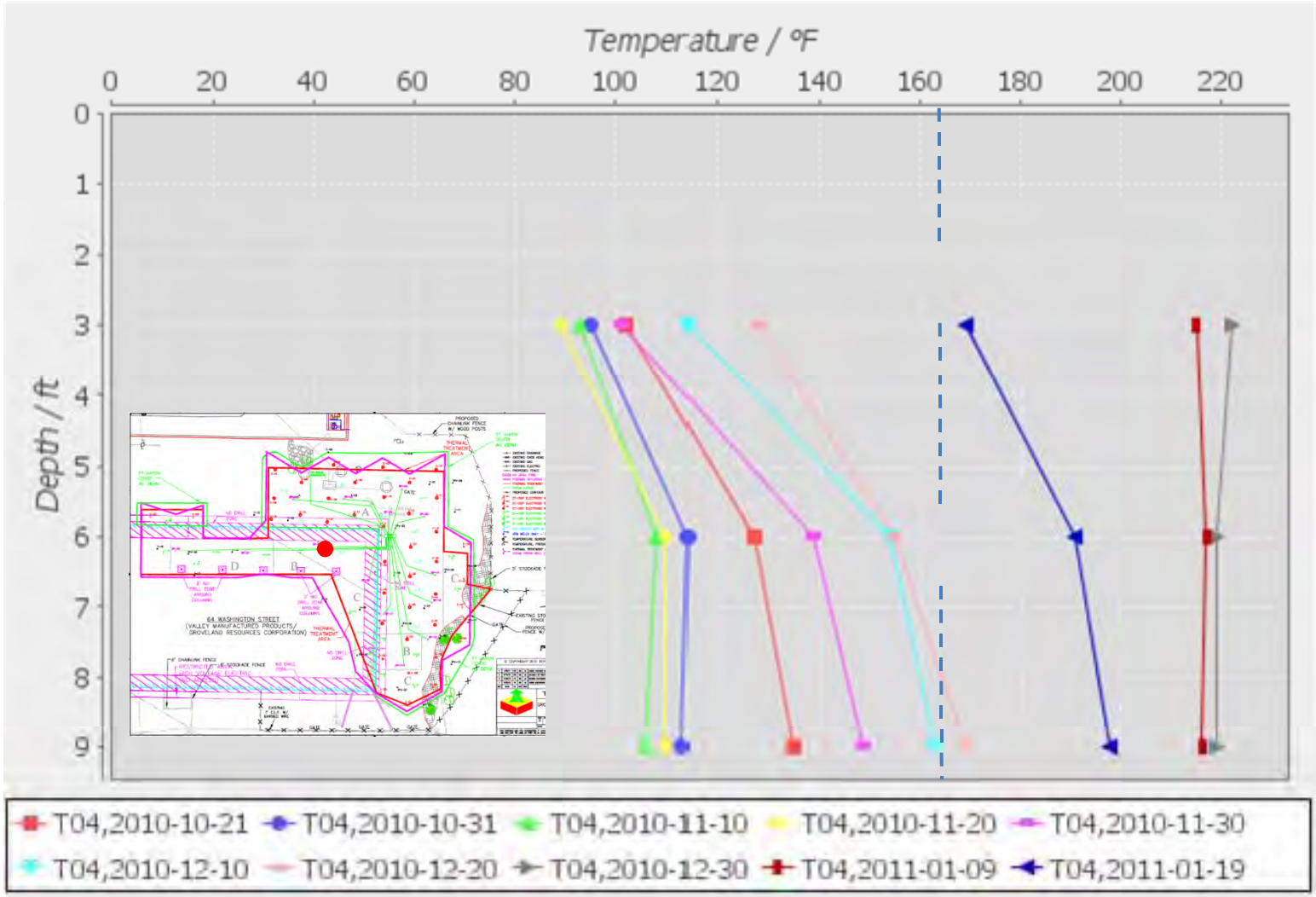
- Surface insulation added ~12/15 to reduce heat losses
- Addition of steam (12/22) effective at heating treatment interval

Area D – Temperature Monitoring Points Continued



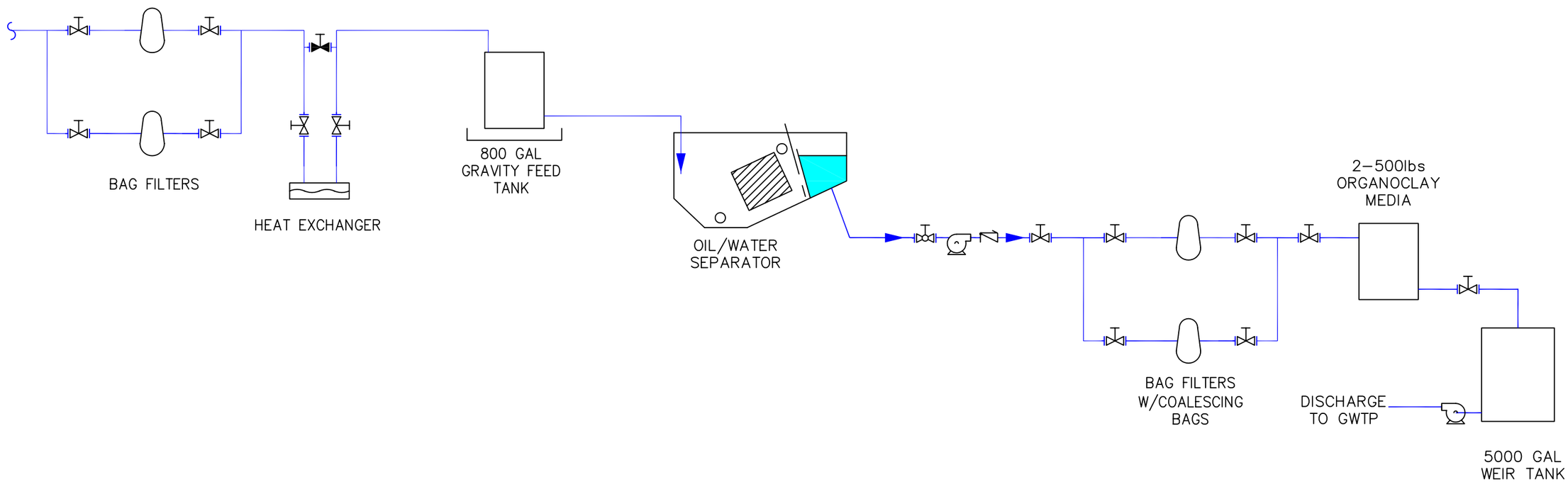
- Surface insulation added ~12/15 to reduce heat losses
- Addition of steam (12/22) effective at heating treatment interval

Area D – Temperature Monitoring Points Continued



- Surface insulation added ~12/15 to reduce heat losses
- Addition of steam (12/22) effective at heating treatment interval

APPENDIX G



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REVISIONS

REV	DATE	BY	CHK	ENG	DESCRIPTION	APPROVED
0	10/19/10	DC				

TERRATHERM INC.

GROVELAND SUPERFUND SITE
PROCESS FLOW DIAGRAM
PROPOSED MODIFICATIONS TO LIQUID
TREATMENT TRAIN

SIZE	FILE NO.	DWG NO.	REV
D			0

SCALE | DNS | SHEET 1 OF 1

THIS DRAWING AND THE INFORMATION IT CONTAINS ARE THE PROPERTY OF TERRATHERM, INC.
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APPENDIX H

TerraTherm, Inc.
10 Stevens Rd.
Fitchburg, MA 01420
Phone: (978) 343-0300
Fax: (978) 343-2727

November 24, 2010

Ms. Diane Baxter
Sr. Project Manager
Nobis Engineering, Inc.

Via email: dbaxter@nobisengineering.com

Re: Work Plan for Steam Spear Operations - Groveland Wells Superfund Site Subcontract 09-NH-80037-005 at the Groveland Wells Superfund Site, Groveland MA

Dear Diane,

Please find attached the Work Plan prepared by the project team for the proposed steam spear installation and steam injection operations at the Groveland Wells Superfund Site in Groveland, MA.

Please do not hesitate to contact me if you have any questions.

Sincerely,

TerraTherm, Inc.

Devon Phelan
Project Manager

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McMILLAN-McGEE CORP.

4895 – 35B Street SE
Calgary, AB T2B 3M9 CANADA
Phone (403) 279-7948
Fax: (403) 272-7201

November 24, 2010

Scope of Work

Re: Steam Spear Operations – Groveland Wells Superfund Site

This scope of work (SOW) was prepared in response to the planned installation of steam spears at the Groveland Wells Superfund Site located at 62 Washington Street, Groveland, Massachusetts (the Site). The purpose of the steam spears is to reach the target temperature (90°C) in the ground surface to 10 feet (ft) below ground surface (bgs) vadose zone and to provide additional heating to other deeper locations in the treatment zone where temperatures are lagging. To extract the remaining mass in the subsurface, 14 strategically placed steam spears will be installed to a depth of approximately 10 ft bgs as shown in Appendix A Figure 3.

The depth interval found between 0 to 10 ft bgs in the vadose zone at the Site has proven difficult to heat. We believe the primary reasons for this phenomenon are as follows:

1. The soil in the upper 10 feet is significantly more resistive than was designed for as evidenced by the low current output at the shallow electrodes, despite the high voltage (346 V) applied to these electrodes; and

2. The soil in the upper 10 feet is significantly more permeable than was presented during the design phase as evidenced by the lack of response to the shallow injection of saline solution to the electrodes in Area D. We believe that the saline solution is essentially flowing vertically out of this shallow permeable zone instead of migrating horizontally to increase the conductivity of the soil in the shallow zone. We have seen this heat transfer at depth at several of the monitoring locations, such as TPV02 (Area D) which is shown in Figure 1 below:

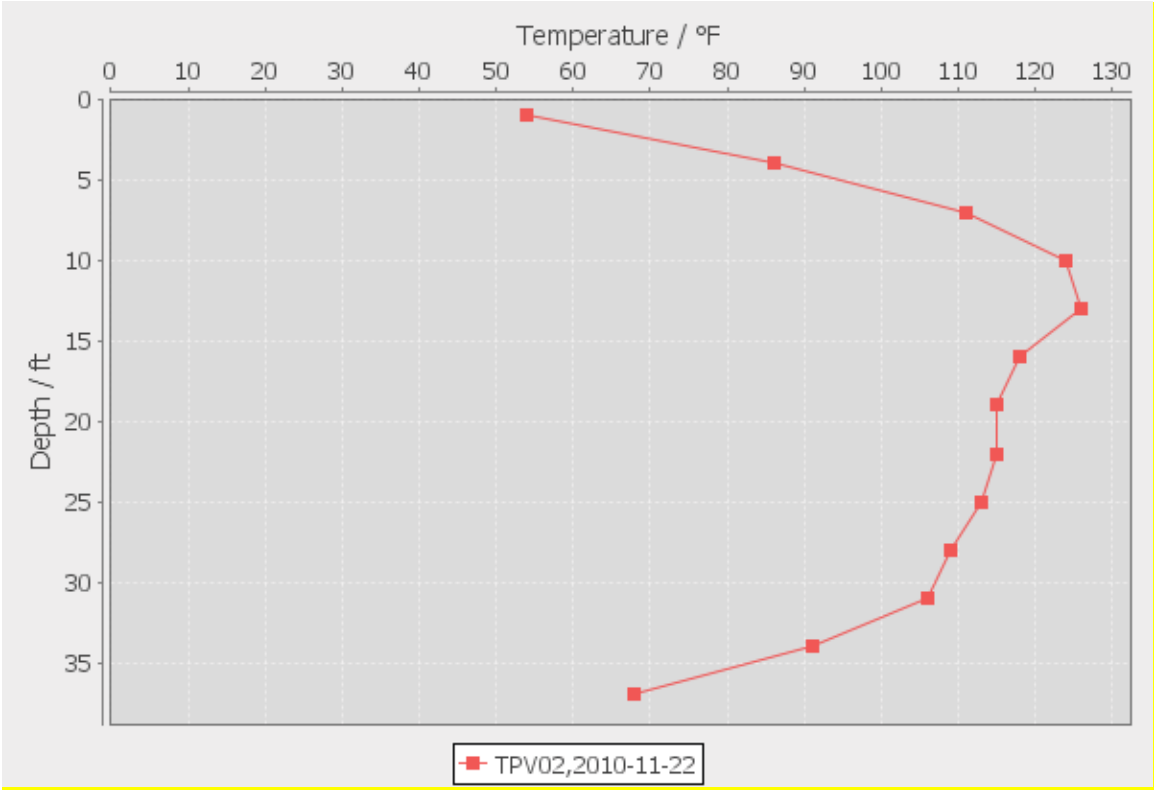


Figure 1: TPV-02 Temperature by Depth

The electrodes in Area D near this temperature monitoring location have been installed between 3 to 9.5 ft bgs. The heated zone extends from surface to 10 ft bgs and TPV-02 monitors temperature to a depth of 37 ft bgs. Figure 1 shows an increase in subsurface temperatures below the treatment zone in Area D, suggesting that there is high permeability and groundwater flux in this area.

In addition, there are several locations in the treatment zone where temperatures are lagging. This appears to be due to a zone of higher than expected permeability (vadose zone) and resistivity and the inability to deliver sufficient energy to the subsurface. These areas will be targeted with steam injection through the electrode hoses.

The combination of the above factors has resulted in portions of the treatment zone that are much more amenable to a remedial strategy using steam as opposed to a resistive heating technology. These high permeability and electrically resistive areas were not presented in the initial design and were not accounted for in the modeling process.

Of fundamental importance to the path forward is the requirement to achieve remedial temperatures in a rapid manner and to remove the contaminant mass in the subsurface from 0 to 10 ft bgs and other permeable and cool zones from 20 to 25 ft bgs.

The following actions are to be taken to enhance operations at the site:

1. The steam generator will be inspected by a licensed Massachusetts District Engineering Inspector.

2. Once the steam generator has been inspected, steam will be injected into the return hoses of targeted electrodes in the shallow zones at the site until the steam spears are ready for operation (which is anticipated to begin the week of 12/6/10).

3. Steam spears will be installed in areas where the target temperature has not been reached from ground surface to 10 ft bgs.

4. Vapor extraction and multi-phase extraction wells may be utilized for steam injection in areas where deeper zones are lagging in temperature.

Summary of Operation

Heating operations began at the Site on August 17th, 2010. Since heating system startup, the following challenges have been encountered:

1. High permeability layers (discovered during operation) in which there is high groundwater flow based on the high recharge rate of the monitoring wells;

2. The vadose zone (0 to 10 ft bgs) in certain areas remains difficult to heat and is at lower temperatures than the target treatment temperature;

3. Areas of high resistance where electrode powers are very low (<1 kW).

The target treatment temperature goal for the Site is 90°C in the vadose zone. The target treatment temperature has been achieved in certain areas within Areas A, B and C; however, Area D and the 0 to 10 ft bgs zone of Areas A, B, and C remain below the desired treatment temperature.

We are proposing to install 14 steam spears in the 0 to 10 ft bgs zone. A steam generator is currently on site. Once the steam boiler has been inspected, the plan is to inject into the return hoses of the shallow electrodes in Area D until the steam spears are ready for operation.

There are also middle and deep electrodes that may have steam injected into the bottom water injection hose. These electrodes are producing low power and are believed to be in highly resistive areas. The decision to inject steam into these electrodes will be made based on the success of injecting steam into the shallow electrodes in Area D.

Summary of Work at Groveland Wells

The following is a list of the items to be installed at the Site:

1. Fourteen ¾" carbon steel steam spears to a depth of 10 ft bgs (see Appendix A Figure 3);

2. One 3" carbon steel steam header (air tight to 100 psi) to distribute steam to each steam spear.

The purpose of the steam spears is to inject steam in the vadose zone from 0 – 10 ft bgs to reach the target treatment temperature of 90°C. Steam injection operations will operate eight to 24 hours a day until the target temperatures are reached. Saline injection will also occur during this time to increase the power of the electrodes. Saline injection will focus on the low power electrodes in the vadose zone and electrodes in highly resistive zones.

The steam spears will be installed using a small Geoprobe Drill Rig capable of maneuvering around the system piping on the treatment area. The drilling method will be 3" augers and the steam spears will be installed open hole. The drilling schedule is approximately 2 to 3 days to install the wells. The steam spears will be installed to 10 ft bgs and will have sand placed around the screen that extends from 5 to 10 ft on the steam spear. The well will be completed using two feet of high temperature grout to surface. See Appendix A Figure 2 for the steam spear well completion. The steam spear will have an approximate one-foot stick up and will be completed with a steam regulator at surface, which will be connected to the steam header using one-inch steam rated hose (rated for 406°F and 250 psi). The steam header will be centrally located in the well field layout as shown in Appendix A Figure 3.

Steam may also be injected into selected electrodes and vapor extraction and MPE wells to augment steam injection in the shallow zones as well as target deeper intervals that are lagging.

Heating Plan

In order to achieve the target temperature in the vadose zone, steam must be injected into the subsurface as this high permeable layer is proving difficult to heat with ERH. Steam injection operations will continue until target treatment temperatures have been reached at the lagging locations.

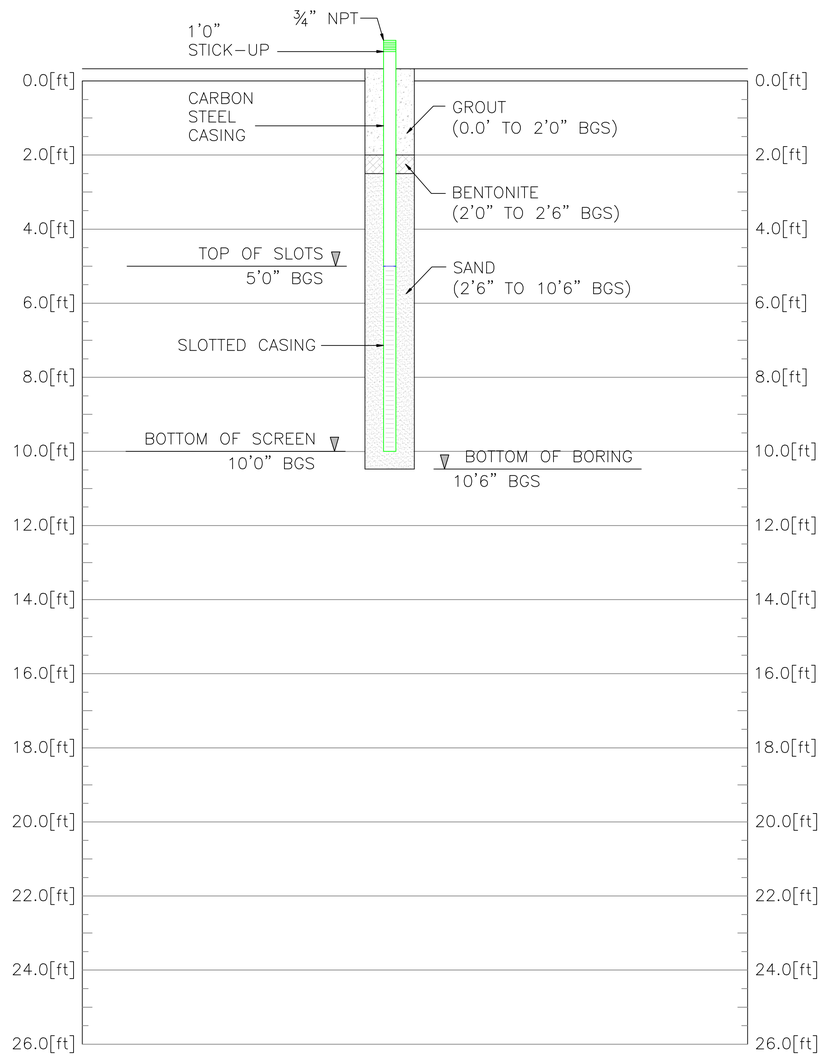
Observations and Path Forward

The path forward for Groveland Wells Superfund Site is to inject steam into 14 strategically placed steam spears, selected electrodes, and selected vapor extraction and MPE wells and achieve the 90°C target temperature in the vadose zone and the boiling temperature beneath the water table.

Appendix A

Figure 2: Steam Spear Well Completion

STEAM SPEAR WELL
(QUANTITY - 14)



GENERAL NOTES:

1. MATERIAL TYPES:
   - A. GROUT:
     - HIGH TEMPERATURE PORTLAND
   - B. SAND:
     - FILTER SIL TYPE #1 OR EQUIVALENT
   - C. BENTONITE:
     - MEDIUM CHIPS BENTONITE

STEAM SPEAR WELL:

A. MIN. BORING DIAMETER 3''

B. ¾"–1'' CASING WITH 5' OF SCREEN

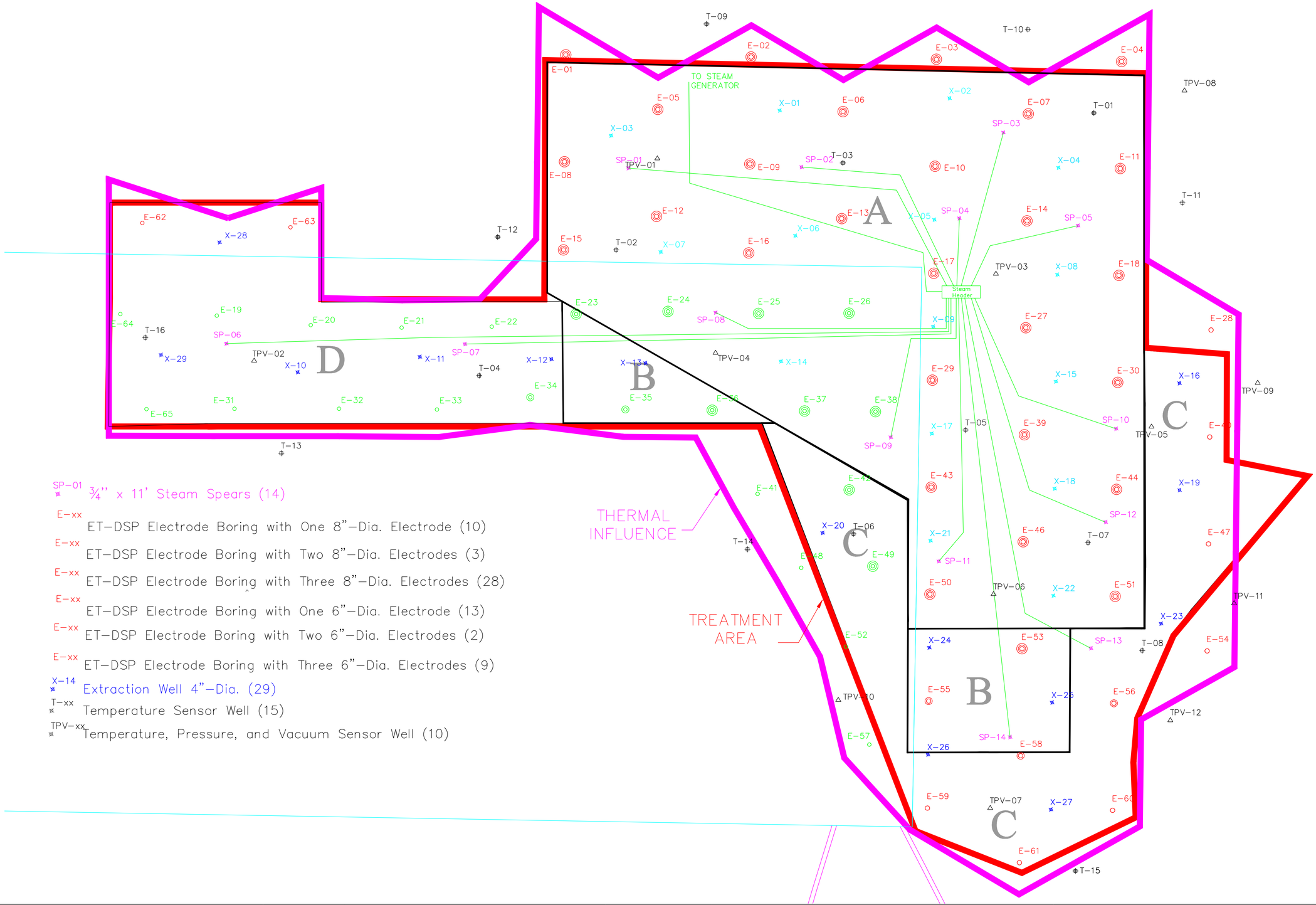
MCMILLAN-MCGEE CORP.
CREATORS OF ET-DSP™
ELECTROMAGNETIC SYSTEMS & SERVICES FOR THE ENERGY & ENVIRONMENTAL INDUSTRIES
4899-35S ST. SE CALGARY, ALBERTA T2B 3M9
PH:403.569.5100 FAX: 403.572.7551

LPE						
	A	-	-	PP	-	
DATE	REV.	DATE (D/M/Yr)	DESCRIPTION	DRAWN BY	ORG/ ENGR	Aproved Dist
	DRAWING NUMBER:			SCALE: NOT TO SCALE		

WELL COMPONENTS

GROVELAND, MA

Figure 3: Steam Spear Well Field Layout



SP-01 ¾" x 11' Steam Spears (14)

E-xx ET-DSP Electrode Boring with One 8"-Dia. Electrode (10)

E-xx ET-DSP Electrode Boring with Two 8"-Dia. Electrodes (3)

E-xx ET-DSP Electrode Boring with Three 8"-Dia. Electrodes (28)

E-xx ET-DSP Electrode Boring with One 6"-Dia. Electrode (13)

E-xx ET-DSP Electrode Boring with Two 6"-Dia. Electrodes (2)

E-xx ET-DSP Electrode Boring with Three 6"-Dia. Electrodes (9)

X-14 Extraction Well 4"-Dia. (29)

T-xx Temperature Sensor Well (15)

TPV-xx Temperature, Pressure, and Vacuum Sensor Well (10)

TERRATHERM INC.

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ELECTROMAGNETIC SYSTEMS & SERVICES FOR THE ENERGY & ENVIRONMENTAL INDUSTRIES
4592-358 ST. SE CALGARY, ALBERTA T2B 3N8
PH:403.569.9100 FAX:403.273.7301

LPE

DATE

PROFESSIONAL SEAL

REV.	DATE (D/M/Yr)	DESCRIPTION	DRAWN BY	ORG/ ENGR	APPR BY
B	22/11/10	Location and quantity changes	CK	–	–
A	10/11/10	Submital for Review	PP	–	–

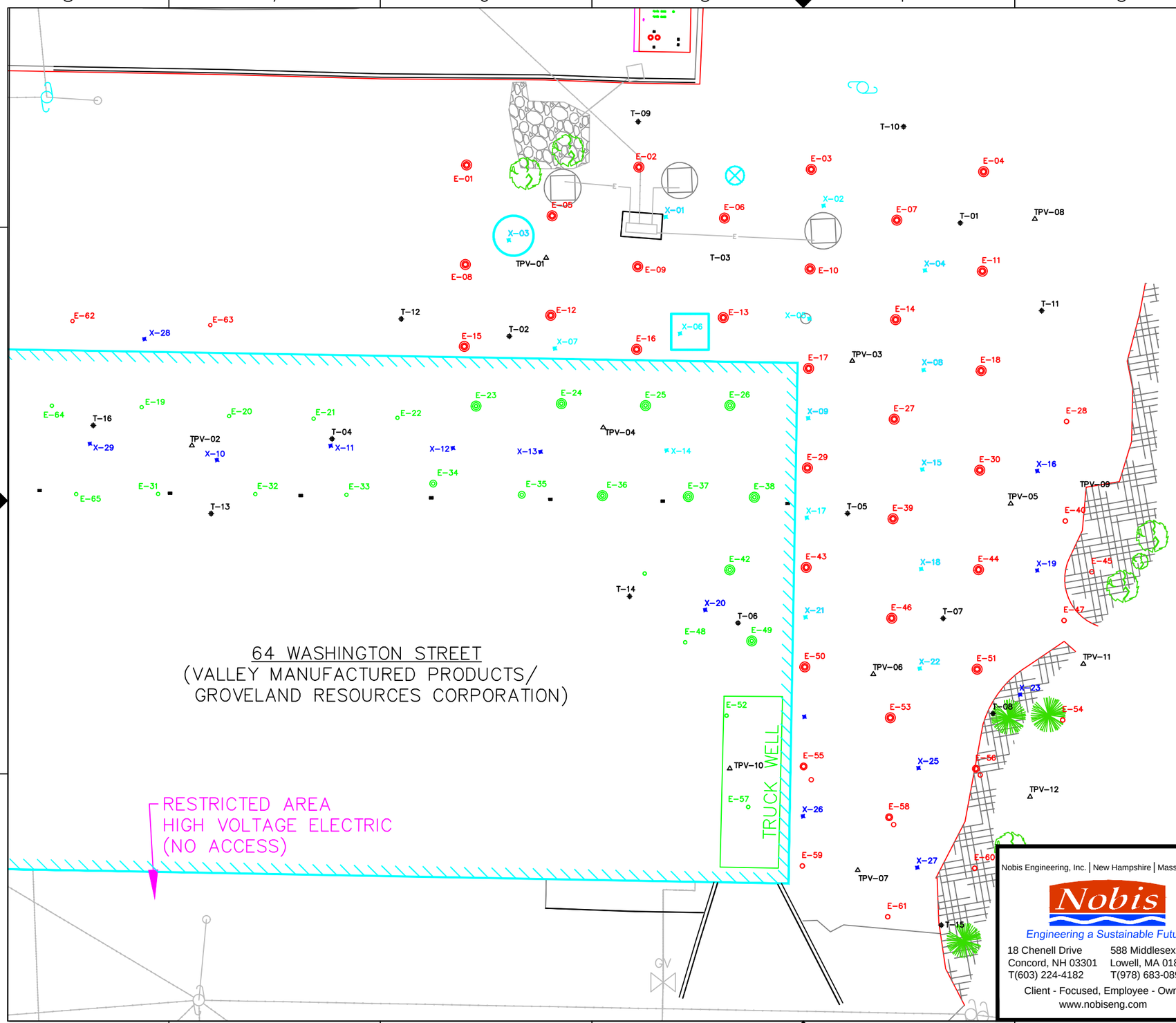
DRAWING NUMBER:

SCALE: NOT TO SCALE

Well Field Layout for
Steam Spear Installation

Groveland Wells Superfund Site
64 Washington St. Groveland, MA

APPENDIX I



—D— EXISTING DRAINAGE
—OHS— EXISTING OVER HEAD SERVICE
—GAS— EXISTING GAS
—E— EXISTING ELECTRIC
—74— PROPOSED CONTOUR

EXTRACTION WELL LEFT IN PLACE (X-03)

EXTRACTION WELL INITIALLY LEFT IN PLACE LATER ABANDONED BY NOBIS (X-06)

WELLS AND ELECTRODES ABANDONED IN ACCORDANCE WITH MASSDEP PROTOCOLS:

E-xx ET-DSP ELECTRODE W/ONE 8" DIA ELECTRODE (7)
E-xx ET-DSP ELECTRODE W/TWO 8" DIA ELECTRODE (3)
E-xx ET-DSP ELECTRODE W/THREE 8" DIA ELECTRODE (28)
E-xx ET-DSP ELECTRODE W/ ONE 6" DIA ELECTRODE (15)
E-xx ET-DSP ELECTRODE W/ TWO 6" DIA ELECTRODE (2)
E-xx ET-DSP ELECTRODE W/ THREE 6" DIA ELECTRODE (9)
X-xx CO-LOCATED MPE & VEW WELLS – 4" DIA & 2" DIA ZONE A (13)
X-xx VEW WELLS ONLY – 2" DIA ZONES B, C & D (14)
X-xx STEAM INJECTION POINTS – (14)
T-xx TEMPERATURE SENSOR WELL (16)
TPV-xx TEMPERATURE, PRESSURE AND VACUUM SENSOR WELL (12)

NOTE: FIGURE BASED ON FIGURE C112 BY TERRATHERM, INC.

STATE PLANE NAD 27

APPROX. SCALE
0 10 20 30 FEET

Nobis Engineering, Inc. | New Hampshire | Massachusetts

Nobis
Engineering a Sustainable Future

18 Chenell Drive
Concord, NH 03301
T(603) 224-4182

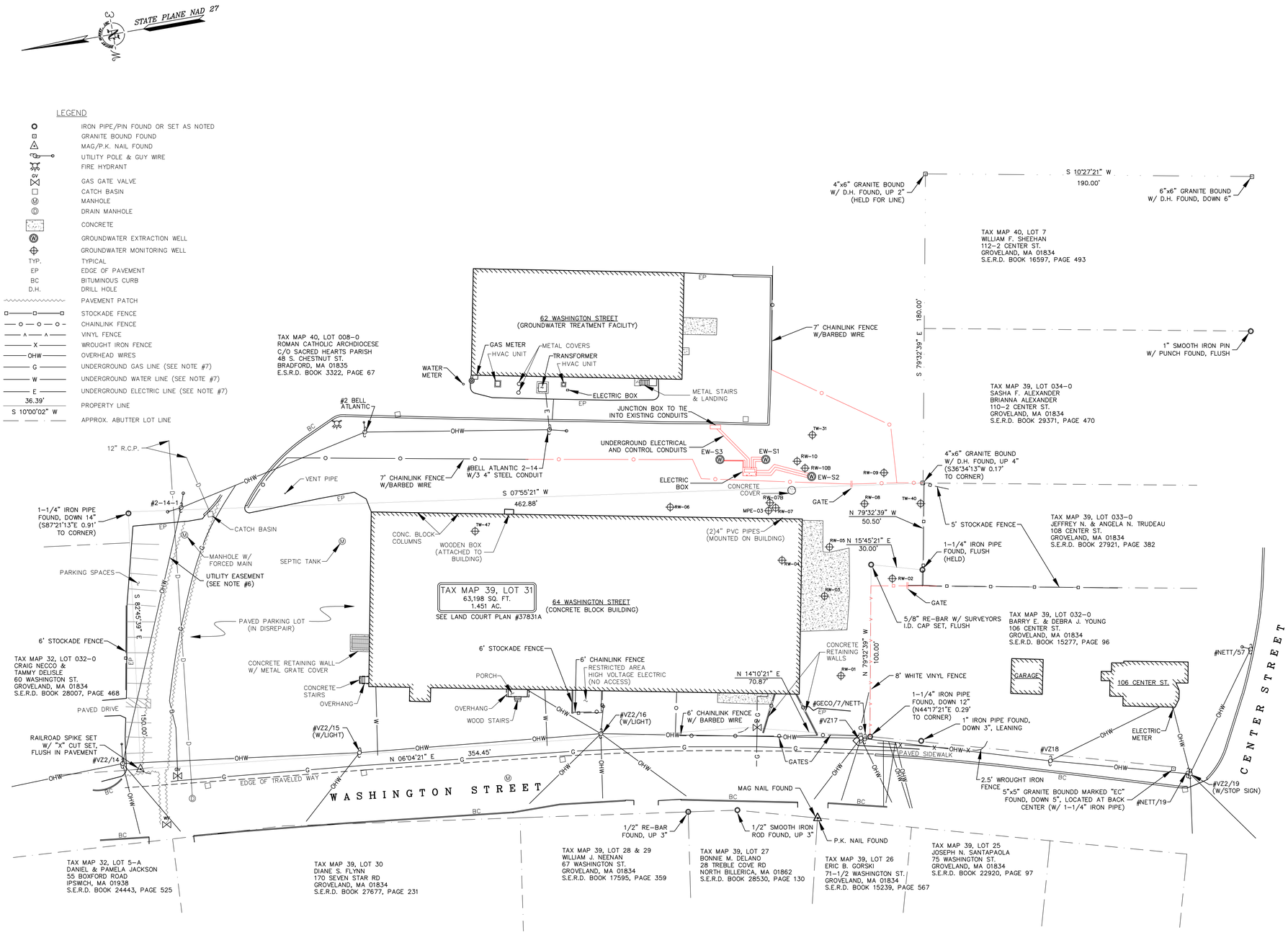
588 Middlesex Street
Lowell, MA 01851
T(978) 683-0891

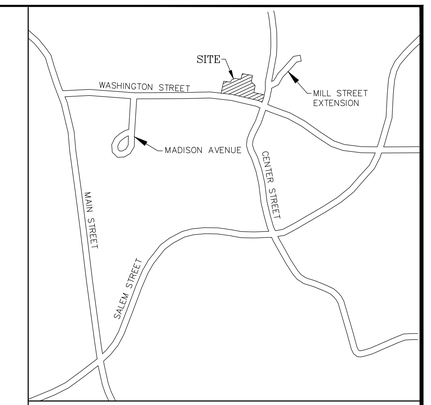
Client - Focused, Employee - Owned
www.nobiseng.com

FIGURE 1

ISTT DEMOBILIZATION
WELLFIELD LAYOUT
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

DRAWN BY: JH	APPROVED BY: LS
PROJECT NO. 80037	DATE: SEPTEMBER, 2011





Location Map (n.t.s.)

NOTES:

1. BASE PLAN FROM PLAN OF LAND OF VALLEY SCREW PRODUCTS CO., INC.; TAX MAP 39 LOT 31; 64 WASHINGTON ST, GROVELAND, MA BY DOUCET SURVEY, INC., JULY 15, 2011.
2. REFERENCE: TAX MAP 39, LOT 31
3. TOTAL PARCEL AREA: 63,198 SQ. FT. OR 1.451 AC.
4. OWNER OF RECORD: TAX MAP 39, LOT 031-0
   VALLEY SCREW PRODUCTS CO., INC.
   C/O DONALD MILLARD, JR.
   6 HUCKLEBERRY HILL
   LINCOLN, MA 01773
   S.E.R.D. BOOK 5423, PAGE 178
   LAND COURT PLAN #37831A
   CERTIFICATE OF TITLE #44222
5. FIELD SURVEY PERFORMED BY J.A.G. & M.W.F. ON 05/09 USING A SPECTRA PRECISION FOCUS 10 TOTAL STATION WITH A TRIMBLE TSC2 DATA COLLECTOR AND A SOKKIA B20 AUTO LEVEL, AND BY J.A.G. & R.K.M. ON 07/11 USING A LEICA 705 TCR TOTAL STATION WITH A RANGER TDS DATA COLLECTOR. TRAVERSE ADJUSTMENT BASED ON LEAST SQUARE ANALYSIS.

   GPS FIELD SURVEY PERFORMED BY J.A.G. ON 05/09 USING A TRIMBLE 5700 & 5800 SURVEY GRADE GPS UNIT WITH A TRIMBLE DATA COLLECTOR.
6. HORIZONTAL DATUM BASED ON MA STATE PLANE NAD 83 PER AN OPUS DERIVED GPS SOLUTION, AND THEN CONVERTED TO NAD 27 USING THE PROGRAM CORPSCON VERSION 6.0.1, WHICH IS AVAILABLE ON THE U.S. ARMY CORPS OF ENGINEERS' WEBSITE. ACCORDING TO CORPSCON "TECHNICAL DOCUMENTATION AND OPERATING INSTRUCTIONS", "THE ACCURACY OF TRANSFORMATIONS BETWEEN NAD 27 AND NAD 83 (1986) ARE TYPICALLY 12-18 cm".
7. UTILITY EASEMENT IN FAVOR OF NEW ENGLAND TELEPHONE AND TELEGRAPH COMPANY AND GROVELAND MUNICIPAL LIGHT DEPARTMENT GRANTED AT E.S.R.D. BOOK 15905, PAGE 458. (NO WIDTH STATED)
8. OBSERVED UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON MARKINGS (BY OTHERS) AND SURFACE EVIDENCE.
9. THIS PARCEL IS SUBJECT TO "SITE ACCESS" RIGHTS AND OTHER TERMS AND CONDITIONS AS SET FORTH IN LAND COURT DOCUMENT #259917.
10. NUMEROUS MONITORING WELLS EXIST ON/ADJACENT TO TAX MAP 39, LOT 31 AND ARE NOT SHOWN HEREON.
11. ALL LOCATIONS SURVEYED EXCEPT RED ITEMS. THESE LOCATIONS ARE APPROXIMATE.

NO.	DATE	DESCRIPTION	BY

NOTE:
ALL ELECTRIC, GAS, TEL. WATER, SEWER AND DRAIN SERVICES ARE SHOWN IN SCHEMATIC FASHION, THEIR LOCATIONS ARE NOT PRECISE OR NECESSARILY ACCURATE. NO WORK WHATSOEVER SHALL BE UNDERTAKEN ON THIS SITE USING THIS PLAN TO LOCATE THE ABOVE SERVICES. CONSULT WITH THE PROPER AUTHORITIES CONCERNED WITH THE SUBJECT SERVICE LOCATIONS FOR INFORMATION REGARDING SUCH. CALL DIG-SAFE AT 1-888-DIG-SAFE.

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

I certify that this survey plat is not a subdivision pursuant to this title (Subdivision Control Law Section 81X) and that the lines of streets and ways shown are those of public or private streets or ways already established and that no new ways are shown.

I hereby certify that this plan conforms to the rules and regulations of the registry of deeds.

_____ P.L.S. #45709

_____ DATE

The certifications shown hereon are intended to meet registry of deed requirements and are not a certification to title or ownership of property shown. Owners of adjoining properties are according to current town assessors records.

Nobis Engineering, Inc. | New Hampshire | Massachusetts
Nobis
Engineering a Sustainable Future
18 Chenell Drive, Concord, NH 03301, T(603) 224-4182
588 Middlesex Street, Lowell, MA 01851, T(978) 683-0891
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FIGURE 2

FINAL SITE CONDITIONS
GROVELAND WELLS SUPERFUND SITE
GROVELAND, MASSACHUSETTS

DRAWN BY:	JH	APPROVED BY:	LS
PROJECT NO.	80012	DATE:	SEPTEMBER, 2011

APPENDIX J

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Demobilization Status Report

Prepared By: Lauren Soós	**Date Prepared:** 3/9/2011

ISTT Demobilization Activities – Completed through 3/4/2011	**Responsible**	**Status**
Demobilize ISTT Process and Wellfield Piping		
Exterior wellfield water extraction and air lines	TerraTherm	Complete
Exterior vapor extraction piping and manifolds	TerraTherm	Ongoing
Exterior thermal insulation cap removal	TerraTherm	Complete
Interior wellfield water extraction and air lines	TerraTherm	Not Started
Interior vapor extraction piping and manifolds	TerraTherm	Not Started
Interior thermal insulation cap removal	TerraTherm	Not Started
Power, data communication, and water injection and return hoses	TerraTherm	Not Started
Decontaminate piping	TerraTherm	Ongoing
Demobilize ISTT Process Equipment		
Disconnect and disassemble process equipment	TerraTherm	Complete
Remove downhole groundwater extraction pumps from multiphase extraction wells	TerraTherm	Complete
Demobilize rental equipment	TerraTherm	Ongoing
Demobilize ET-DSP equipment	TerraTherm	Not Started
Demobilize transformer	TerraTherm	Not Started
Process and handle IDW (vapor carbon, organoclay, and bag filters)	TerraTherm	Ongoing
Decontaminate process equipment	TerraTherm	Ongoing
Demobilize ISTT Wellfield		
Abandon electrodes	TerraTherm	Not Started
Abandon shallow vapor extraction wells	TerraTherm	Not Started
Abandon (select) multiphase extraction wells*	TerraTherm	Not Started
Abandon sensor wells	TerraTherm	Not Started
Site Restoration		
Restore exterior of GWTP	TerraTherm	Not Started
Remove concrete vapor cap	TerraTherm	Not Started
Transport and dispose of IDW	Nobis Team	Not Started
Restore permanent Site fencing	Nobis Team	Not Started
Replace 106 Center Street wood stockade fencing	Nobis Team	Not Started
Replace 106 Center Street trees and other vegetation	Nobis Team	Not Started
Subcontractors Onsite: TerraTherm		

Planned Demobilization Activities for Week of 3/14/2011:	
• Continue decontamination of wellfield piping (vapor extraction lines). • Demobilize additional rental process equipment (knockout pots, blowers). • Demobilize two out of the three water circulation units. • Discontinue electrical service (ISTT operations only, does not effect GWTP).	
Confirmation Sampling Schedule	
Confirmation Groundwater Sampling • #1 – 6 weeks after ISTT completion – week of March 21st • #2 – 12 weeks after ISTT completion – week of May 2nd • #3 – 6 months after ISTT completion – mid-August Confirmation Soil Sampling • Week of April 4th	
Action Items:	**Lead Person(s)**
1. Discontinue electrical Service	Nobis/TerraTherm
2. Evaluate which multiphase extraction wells to remain in Source Area*	Project Team
3. Evaluate Valley Building; determine whether/when it is safe to re-enter	Nobis
Next Project Status Conference Call: March 15, 2011 at 1:00 pm	
Next Project Status Meeting: March 22, 2011 at 1:00 pm *Status meeting planned to review demobilization progress and confirmation groundwater sampling activities.*	

Notes:
***** *Nobis/EPA/MassDEP to determine whether to retain some MPE wells for future use or whether to abandon all as stipulated in subcontract agreement. Decision to be made following receipt of data from 1st confirmation groundwater sampling event. (Receipt of preliminary data anticipated by April 1, 2011.)*

Applicable Site Photographs:

Date: 3/2/2011	**Location:** ISTT Process Equipment Area, Looking West

Description: TerraTherm has disconnected and disassembled process equipment in preparation of shipping process equipment offsite.

Date: 3/2/2011	**Location:** ISTT Wellfield, Looking West

Description: TerraTherm has disassembled extraction wellheads, disconnected extraction piping, and continues to decontaminate wellfield extraction piping.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Demobilization Status Report

Prepared By: Lauren Soós	**Date Prepared:** 3/15/2011

ISTT Demobilization Activities – Completed through 3/4/2011	**Responsible**	**Status**	**Estimated WE Completion**
Demobilize ISTT Process and Wellfield Piping			
Exterior wellfield water extraction and air lines	TerraTherm	Complete	-
Exterior vapor extraction piping and manifolds	TerraTherm	Complete	-
Exterior thermal insulation cap removal	TerraTherm	Complete	-
Interior wellfield water extraction and air lines	TerraTherm	Not Started	4/1/11
Interior vapor extraction piping and manifolds	TerraTherm	Not Started	4/1/11
Interior thermal insulation cap removal	TerraTherm	Not Started	4/1/11
Power, data communication, and water injection and return hoses	TerraTherm	Not Started	4/1/11
Demobilize ISTT Process Equipment			
Disconnect and disassemble process equipment	TerraTherm	Complete	-
Remove downhole groundwater extraction pumps from multiphase extraction wells	TerraTherm	Complete	-
Demobilize rental equipment	TerraTherm	Ongoing	3/18/11
Demobilize ET-DSP equipment	TerraTherm	Ongoing	3/18/11
Demobilize transformer	TerraTherm	Ongoing	3/18/11
Process and handle IDW (vapor carbon, organoclay, and bag filters)	TerraTherm	Ongoing	4/1/11
Decontaminate process equipment	TerraTherm	Complete	-
Demobilize ISTT Wellfield			
Abandon electrodes	TerraTherm	Not Started	TBD, pending confirmation sampling
Abandon shallow vapor extraction wells	TerraTherm	Not Started	
Abandon (select) multiphase extraction wells*	TerraTherm	Not Started	
Abandon sensor wells	TerraTherm	Not Started	
Site Restoration			
Restore exterior of GWTP	TerraTherm	Not Started	4/08/11
Remove concrete vapor cap	TerraTherm	Not Started	TBD
Transport and dispose of IDW	Nobis Team	Not Started	TBD
Restore permanent Site fencing	Nobis Team	Not Started	TBD
Replace 106 Center Street wood stockade fencing	Nobis Team	Not Started	TBD
Replace 106 Center Street trees and other vegetation	Nobis Team	Not Started	TBD
Subcontractors Onsite: TerraTherm, Groveland Electric and Light Department			
Planned Demobilization Activities for Week of 3/14/2011:			

- Demobilize additional rental process equipment (knockout pots, blowers, and cooling tower).
- Prepare other process equipment for off-Site shipment
- Demobilize ET-DSP equipment.

Confirmation Sampling Schedule	
Confirmation Groundwater Sampling 1. 6 weeks after ISTT completion – week of March 21st 2. 12 weeks after ISTT completion – week of May 2nd 3. 6 months after ISTT completion – mid-August *Confirmation Soil Sampling* • Week of April 4th	
Action Items:	**Lead Person(s)**
1. Evaluate which multiphase extraction wells to remain in Source Area*	Project Team
Next Project Status Meeting: March 22, 2011 at 1:00 pm – *review demobilization progress and confirmation groundwater sampling activities.*	
Next Project Status Conference Call: March 29, 2011 at 1:00 pm	

Notes:
***** *Nobis/EPA/MassDEP to determine whether to retain some MPE wells for future use or whether to abandon all as stipulated in subcontract agreement. Decision to be made following receipt of data from 1st confirmation groundwater sampling event. (Receipt of preliminary data anticipated by April 1, 2011.)*

Applicable Site Photographs:

Date: 3/9/2011	**Location:** ISTT Wellfield Area, Looking Southwest

Description: TerraTherm has disconnected and disassembled extraction well piping throughout the exterior wellfield.

Date: 3/9/2011	**Location:** ISTT Wellfield, Looking West

Description: TerraTherm decontaminates extraction conveyance by steam cleaning. Decontamination fluids are captured in the liquid extraction system containment area and treated using the oil water separator and GWTP.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Demobilization Status Report

Prepared By: Lauren Soós	**Date Prepared:** 3/22/2011

ISTT Demobilization Activities – Completed through 3/18/2011	**Responsible**	**Status**	**Estimated WE Completion**
Demobilize ISTT Process and Wellfield Piping			
Exterior wellfield water extraction and air lines	TerraTherm	Complete	
Exterior vapor extraction piping and manifolds	TerraTherm	Complete	
Exterior thermal insulation cap removal	TerraTherm	Complete	
Interior wellfield water extraction and air lines	TerraTherm	Complete	
Interior vapor extraction piping and manifolds	TerraTherm	Complete	
Interior thermal insulation cap removal	TerraTherm	Ongoing	4/1/11
Power, data communication, and water injection and return hoses	TerraTherm	Not Started	4/1/11
Demobilize ISTT Process Equipment			
Disconnect and disassemble process equipment	TerraTherm	Complete	
Remove downhole groundwater extraction pumps from multiphase extraction wells	TerraTherm	Complete	
Demobilize rental equipment	TerraTherm	Ongoing	3/25/11
Demobilize ET-DSP equipment	TerraTherm	Complete	
Demobilize transformer	TerraTherm	Complete	
Process and handle IDW (vapor carbon, organoclay, and bag filters)	TerraTherm	Ongoing	4/1/11
Decontaminate process equipment and piping	TerraTherm	Ongoing	4/1/11
Demobilize ISTT Wellfield			
Abandon electrodes	TerraTherm	Not Started	TBD, pending confirmation sampling
Abandon shallow vapor extraction wells	TerraTherm	Not Started	
Abandon (select) multiphase extraction wells*	TerraTherm	Not Started	
Abandon sensor wells	TerraTherm	Not Started	
Site Restoration			
Restore exterior of GWTP	TerraTherm	Not Started	4/08/11
Remove concrete vapor cap	TerraTherm	Not Started	TBD
Transport and dispose of IDW	Nobis Team	Not Started	TBD
Restore permanent Site fencing	Nobis Team	Not Started	TBD
Replace 106 Center Street wood stockade fencing	Nobis Team	Not Started	TBD
Replace 106 Center Street trees and other vegetation	Nobis Team	Not Started	TBD
Subcontractors Onsite: TerraTherm, Groveland Electric Light Department			

Planned Demobilization Activities for Week of 3/21/2011:	
• Demobilize additional rental process equipment (blowers) • Prepare process equipment for off-Site shipment • Process and stage IDW • Dispose of interior thermal insulation cap • Confirmation groundwater sampling	
Confirmation Sampling Schedule	
Confirmation Groundwater Sampling • #1 – 6 weeks after ISTT completion – week of March 21st – Ongoing • #2 – 12 weeks after ISTT completion – week of May 2nd • #3 – 6 months after ISTT completion – mid-August Confirmation Soil Sampling • Week of April 4th	
Action Items:	**Lead Person(s)**
1. Evaluate which multiphase extraction wells to remain in Source Area*	Project Team
Next Project Status Conference Calls: March 22, and March 29, 2011 at 1:00 pm	

Notes:
***** *Nobis/EPA/MassDEP to determine whether to retain some MPE wells for future use or whether to abandon all as stipulated in subcontract agreement. Decision to be made following receipt of data from 1st confirmation groundwater sampling event. (Receipt of preliminary data anticipated by April 1, 2011.)*

Applicable Site Photographs:

Date: 3/14/2011	**Location:** ISTT Process Equipment Area, Looking South

Description: Groveland Electric Light Department removed electrical equipment used during the ISTT operations.

Date: 3/16/2011	**Location:** GWTP North Parking Lot, Looking Northwest

Description: TerraTherm demobilized various liquid and vapor extraction system process equipment (cooling tower, knockout pots, and duct heater).

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Demobilization Status Report

Prepared By: Lauren Soós	**Date Prepared:** 3/29/2011

ISTT Demobilization Activities – Completed through 3/25/2011	**Responsible**	**Status**	**Estimated WE Completion**
Demobilize ISTT Process and Wellfield Piping			
Exterior wellfield water extraction and air lines	TerraTherm	Complete	
Exterior vapor extraction piping and manifolds	TerraTherm	Complete	
Exterior thermal insulation cap removal	TerraTherm	Complete	
Interior wellfield water extraction and air lines	TerraTherm	Complete	
Interior vapor extraction piping and manifolds	TerraTherm	Complete	
Interior thermal insulation cap removal	TerraTherm	Complete	
Power, data communication, and water injection and return hoses	McMillan-McGee	Complete	
Demobilize ISTT Process Equipment			
Disconnect and disassemble process equipment	TerraTherm	Complete	
Remove downhole groundwater extraction pumps from multiphase extraction wells	TerraTherm	Complete	
Demobilize rental equipment	TerraTherm	Complete	
Demobilize ET-DSP equipment	TerraTherm	Complete	
Demobilize transformer	TerraTherm	Complete	
Process and handle IDW (vapor carbon, organoclay, and bag filters)	TerraTherm	Ongoing	4/1/11
Decontaminate process equipment and piping	TerraTherm	Complete	
Demobilize ISTT Wellfield			
Abandon electrodes	TerraTherm	Not Started	TBD, pending confirmation soil sampling
Abandon shallow vapor extraction wells	TerraTherm	Not Started	
Abandon (select) multiphase extraction wells*	TerraTherm	Not Started	
Abandon sensor wells	TerraTherm	Not Started	
Remove concrete vapor cap	TerraTherm	Not Started	
Site Restoration			
Restore exterior of GWTP	TerraTherm	Not Started	4/08/11
Transport and dispose of IDW	Nobis Team	Not Started	TBD
Restore permanent Site fencing	Nobis Team	Not Started	TBD
Replace 106 Center Street wood stockade fencing	Nobis Team	Not Started	TBD
Replace 106 Center Street trees and other vegetation	Nobis Team	Not Started	TBD
Subcontractors Onsite: TerraTherm, Resource Options (Subcontractor to McMillan-McGee)			

Planned Demobilization Activities for Week of 3/28/2011:

- Process and stage IDW
- Restore the exterior of the GWTP
- Prepare for confirmation soil sampling event
- Evaluate which multiphase extraction wells to remain in Source Area

Confirmation Sampling Schedule

Confirmation Groundwater Sampling

- #1 – 6 weeks after ISTT completion – week of March 21st – Complete
- #2 – 12 weeks after ISTT completion – week of May 2nd
- #3 – 6 months after ISTT completion – early-August

Confirmation Soil Sampling

- Begin week of April 4th

Action Items:	Lead Person(s)
1. Evaluate which multiphase extraction wells to remain in Source Area – *Nobis/EPA/MassDEP to determine whether to retain some MPE wells for future use or whether to abandon all as stipulated in subcontract agreement. Decision to be made following receipt of data from 1st confirmation groundwater sampling event. (Receipt of preliminary data anticipated by April 1, 2011.)*	Project Team

Next Project Status Conference Call: April 5, 2011 at 1:00 pm

Next Project Status Conference Call or Meeting: April 12, 2011 at 1:00 pm (alternate time if on site meeting) – ISTT Demobilization Status and Confirmation Soil Sampling

Applicable Site Photographs:

Date: 3/21/2011	**Location:** ISTT Wellfield, RW-06

Description: Nobis Engineering conducted the first confirmation groundwater sampling event.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Demobilization Status Report

Prepared By: Lauren Soós	**Date Prepared:** 4/5/2011

ISTT Demobilization Activities – Completed through 4/1/2011	**Responsible**	**Status**	**Estimated WE Completion**
Demobilize ISTT Process and Wellfield Piping			
Exterior wellfield water extraction and air lines	TerraTherm	Complete	
Exterior vapor extraction piping and manifolds	TerraTherm	Complete	
Exterior thermal insulation cap removal	TerraTherm	Complete	
Interior wellfield water extraction and air lines	TerraTherm	Complete	
Interior vapor extraction piping and manifolds	TerraTherm	Complete	
Interior thermal insulation cap removal	TerraTherm	Complete	
Power, data communication, and water injection and return hoses	McMillan-McGee	Complete	
Demobilize ISTT Process Equipment			
Disconnect and disassemble process equipment	TerraTherm	Complete	
Remove downhole groundwater extraction pumps from multiphase extraction wells	TerraTherm	Complete	
Demobilize rental equipment	TerraTherm	Complete	
Demobilize additional TerraTherm-owned process equipment	TerraTherm	Ongoing	4/8/2011
Demobilize ET-DSP equipment	TerraTherm	Complete	
Demobilize transformer	TerraTherm	Complete	
Process and handle IDW (vapor carbon, organoclay, and bag filters)	TerraTherm	Ongoing	4/8/2011
Decontaminate process equipment and piping	TerraTherm	Complete	
Remove and dispose of various debris	TerraTherm	Ongoing	4/8/2011
Demobilize ISTT Wellfield			
Abandon electrodes	TerraTherm	Not Started	TBD, pending confirmation soil sampling
Abandon shallow vapor extraction wells	TerraTherm	Not Started	
Abandon multiphase extraction wells	TerraTherm	Not Started	
Abandon sensor wells	TerraTherm	Not Started	
Remove concrete vapor cap	TerraTherm	Not Started	
Site Restoration			
Restore exterior of GWTP	TerraTherm	Ongoing	4/08/2011
Transport and dispose of IDW	Nobis Team	Not Started	TBD
Restore permanent Site fencing	Nobis Team	Not Started	TBD, pending removal of concrete vapor cap
Replace 106 Center Street wood stockade fencing	Nobis Team	Not Started	
Replace 106 Center Street trees and other vegetation	Nobis Team	Not Started	
Subcontractors Onsite: TerraTherm			

Planned Demobilization Activities for Week of 4/4/2011:	
• Continue to process and stage IDW • Continue to restore the exterior of the GWTP • Demobilize carbon trailer and other TerraTherm-owned equipment • Conduct confirmation soil sampling event • Evaluate which multiphase extraction wells to remain in Source Area	
Confirmation Sampling Schedule	
Confirmation Groundwater Sampling • #1 – 6 weeks after ISTT completion – week of March 21st – Complete • #2 – 12 weeks after ISTT completion – week of May 2nd • #3 – 6 months after ISTT completion – early-August Confirmation Soil Sampling • Week of April 4th – Ongoing	
Action Items:	**Lead Person(s)**
1. Evaluate which multiphase extraction wells to remain in Source Area – *Nobis/EPA/MassDEP to determine whether to retain some MPE wells for future use or whether to abandon all as stipulated in subcontract agreement. Decision to be made following receipt of data from 1st confirmation groundwater sampling event. Preliminary data was delivered to the Project Team on March 30th. A conference call to discuss the data is planned for April 5th at 9 am.*	Project Team
Next Project Status Conference Call: Tuesday, April 5, 2011, at 1:00 pm	
Next Project Status Conference Call or Meeting: Wednesday, April 13, 2011, at 1:00 pm – ISTT Demobilization Progress and Confirmation Soil Sampling	

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Demobilization Status Report

Prepared By: Lauren Soós	**Date Prepared:** 4/12/2011

ISTT Demobilization Activities – Completed through 4/1/2011	**Responsible**	**Status**	**Estimated WE Completion**
Demobilize ISTT Process and Wellfield Piping			
Exterior wellfield water extraction and air lines	TerraTherm	Complete	
Exterior vapor extraction piping and manifolds	TerraTherm	Complete	
Exterior thermal insulation cap removal	TerraTherm	Complete	
Interior wellfield water extraction and air lines	TerraTherm	Complete	
Interior vapor extraction piping and manifolds	TerraTherm	Complete	
Interior thermal insulation cap removal	TerraTherm	Complete	
Power, data communication, and water injection and return hoses	McMillan-McGee	Complete	
Demobilize ISTT Process Equipment			
Disconnect and disassemble process equipment	TerraTherm	Complete	
Remove downhole groundwater extraction pumps from multiphase extraction wells	TerraTherm	Complete	
Demobilize rental equipment	TerraTherm	Complete	
Demobilize additional TerraTherm-owned process equipment	TerraTherm	Complete	
Demobilize ET-DSP equipment	TerraTherm	Complete	
Demobilize transformer	TerraTherm	Complete	
Process and handle IDW (vapor carbon, organoclay, and bag filters)	TerraTherm	Complete	
Decontaminate process equipment and piping	TerraTherm	Complete	
Remove and dispose of general refuse debris	TerraTherm	Ongoing	4/15/2011
Demobilize ISTT Wellfield			
Abandon electrodes	TerraTherm	Not Started	TBD, pending confirmation soil sampling
Abandon shallow vapor extraction wells	TerraTherm	Not Started	
Abandon multiphase extraction wells – *with the exception of MPE-03 which will be converted into a Source Area groundwater monitoring well per the request of MassDEP*	TerraTherm	Not Started	
Abandon sensor wells	TerraTherm	Not Started	
Remove concrete vapor cap	TerraTherm	Not Started	
GWTP Restoration – Items to be completed under Task Order 12			
Conduct initial test on EW-S1, -S2, and -S3 conveyance – *Extraction well line held pressure and leak detection system appeared to operate normally.*	Nobis Team	Complete	
Restart EW-S1, -S2, and -S3	Nobis Team	Not Started	TBD, pending the cooling of

			groundwater to temperatures compatible with pump motor and pipeline
Sludge press	Nobis Team	Ongoing	4/22/2011
Carbon change out (PDU and vapor phase)	Nobis Team	Not Started	4/22/2011
Filter media change out	Nobis Team	Not Started	4/22/2011
Site Restoration			
Restore exterior of GWTP	TerraTherm	Complete	
Transport and dispose of IDW	Nobis Team	Not Started	TBD
Restore permanent Site fencing	Nobis Team	Not Started	TBD, pending removal of concrete vapor cap
Replace 106 Center Street wood stockade fencing	Nobis Team	Not Started	
Replace 106 Center Street trees and other vegetation	Nobis Team	Not Started	

Subcontractors Onsite: TerraTherm, Seaboard Drilling, Geologic Drilling

Planned Demobilization Activities for Week of 4/11/2011:

- Dispose of general refuse
- Continue confirmation soil sampling event
- Press sludge

Confirmation Sampling Schedule

Confirmation Groundwater Sampling

- #1 – 6 weeks after ISTT completion – week of March 21st – Complete
- #2 – 12 weeks after ISTT completion – week of May 2nd
- #3 – 6 months after ISTT completion – early-August

Confirmation Soil Sampling

- April 4th to April 19th – Ongoing

Action Items:	**Lead Person(s)**
1. Evaluate which multiphase extraction wells to remain in Source Area – *THIS ITEM IS COMPLETE. Nobis/EPA/MassDEP conducted a conference call on April 5th to determine whether to retain some MPE wells for future use or whether to abandon all as stipulated in subcontract agreement. MassDEP requested the use of MPE-03 as a Source Area groundwater monitoring well. All other MPE wells will be abandoned in accordance with the contract requirements. This decision was documented in an email from Diane Baxter to EPA and MassDEP dated April 5th and later discussed with the project team during the Project Status Conference Call.*	Project Team – THIS ITEM IS COMPLETE

Next Project Status Conference Call or Meeting: Wednesday, April 13, 2011, at 1:00 pm – ISTT Demobilization Progress and Confirmation Soil Sampling

Next Project Status Conference Call: Tuesday, April 19, 2011, at 1:00 pm

Applicable Site Photographs:

Date: 4/5/2011	**Location:** ISTT Wellfield, Looking East

Description: ISTT wellfield with the liquid and vapor extraction conveyance, electrode power and water injection and return hoses, steam injection lines, and data communication lines removed.

Date: 4/5/2011	**Location:** Property Line, Looking South

Description: Buds present on maple trees located within the ISTT wellfield and vapor cover limits.

Date: 4/5/2011	**Location:** GWTP Exterior

Description: TerraTherm restored the exterior of the GWTP, which was the former location of where the ISTT liquid extraction system connected to the GWTP influent.

Date: 4/5/2011	**Location:** North of GWTP, Looking Northwest

Description: TerraTherm's vapor carbon trailer was demobilized from the Site.

Date: 4/5/2011	**Location:** ISTT Wellfield, Looking Northeast

Description: Nobis conducted hot soil sampling at confirmation soil boring, CSB-01.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Demobilization Status Report

Prepared By: Lauren Soós	**Date Prepared:** 4/18/2011

ISTT Demobilization Activities – Completed through 4/15/2011	**Responsible**	**Status**	**Estimated WE Completion**
Demobilize ISTT Process and Wellfield Piping			
Exterior wellfield water extraction and air lines	TerraTherm	Complete	
Exterior vapor extraction piping and manifolds	TerraTherm	Complete	
Exterior thermal insulation cap removal	TerraTherm	Complete	
Interior wellfield water extraction and air lines	TerraTherm	Complete	
Interior vapor extraction piping and manifolds	TerraTherm	Complete	
Interior thermal insulation cap removal	TerraTherm	Complete	
Power, data communication, and water injection and return hoses	McMillan-McGee	Complete	
Demobilize ISTT Process Equipment			
Disconnect and disassemble process equipment	TerraTherm	Complete	
Remove downhole groundwater extraction pumps from multiphase extraction wells	TerraTherm	Complete	
Demobilize rental equipment	TerraTherm	Complete	
Demobilize additional TerraTherm-owned process equipment	TerraTherm	Complete	
Demobilize ET-DSP equipment	TerraTherm	Complete	
Demobilize transformer	TerraTherm	Complete	
Process and handle IDW (vapor carbon, organoclay, and bag filters)	TerraTherm	Complete	
Decontaminate process equipment and piping	TerraTherm	Complete	
Remove and dispose of general refuse debris	TerraTherm	Complete	
Demobilize ISTT Wellfield			
Abandon electrodes	TerraTherm	Not Started	Scheduled 5/9 to 5/27
Abandon shallow vapor extraction wells	TerraTherm	Not Started	
Abandon multiphase extraction wells – *with the exception of MPE-03 which will be converted into a Source Area groundwater monitoring well per the request of MassDEP*	TerraTherm	Not Started	
Abandon sensor wells	TerraTherm	Not Started	
Remove concrete vapor cap	TerraTherm	Not Started	
GWTP Restoration – Items to be completed under Task Order 12			
Conduct initial test on EW-S1, -S2, and -S3 conveyance – *Extraction well line held pressure and leak detection system appeared to operate normally.*	Nobis Team	Complete	
Restart EW-S1, -S2, and -S3	Nobis Team	Not Started	TBD, pending the cooling of

			groundwater to temperatures compatible with pump motor and pipeline
Sludge press	Nobis Team	Ongoing	4/22/2011
Carbon change out (PDU and vapor phase)	Nobis Team	Not Started	4/22/2011
Filter media change out	Nobis Team	Not Started	4/22/2011
Site Restoration			
Restore exterior of GWTP	TerraTherm	Complete	
Transport and dispose of IDW	Nobis Team	Not Started	TBD
Restore permanent Site fencing	Nobis Team	Not Started	TBD, pending removal of concrete vapor cap
Replace 106 Center Street wood stockade fencing	Nobis Team	Not Started	
Replace 106 Center Street trees and other vegetation	Nobis Team	Not Started	

Subcontractors Onsite: TerraTherm, Seaboard Drilling

Planned Demobilization Activities for Week of 4/18/2011:

- Finish processing sludge (TO12)
- Begin GWTP PDU and vapor phase carbon change out (TO12)
- Begin Filter media change out (TO12)

Confirmation Sampling Schedule

Confirmation Groundwater Sampling

- #1 – 6 weeks after ISTT completion – week of March 21st – COMPLETE
- #2 – 12 weeks after ISTT completion – week of May 2nd
- #3 – 6 months after ISTT completion – early-August

Confirmation Soil Sampling

- April 4th to April 19th – COMPLETE

Next Project Status Conference Call: Tentatively scheduled for Tuesday, May 3, 2011, at 1:00 pm – Review of the confirmation soil sampling analytical results.

Applicable Site Photographs:

Date: 4/11/2011	**Location:** GWTP

Description: GWTP restoration includes the processing of sludge. This photograph shows the consistency of sludge following the use of the sludge press.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Demobilization Status Report

Prepared By: Lauren Soós	**Date Prepared:** 4/25/2011

ISTT Demobilization Activities – Completed through 4/22/2011	**Responsible**	**Status**	**Estimated WE Completion**
Demobilize ISTT Process and Wellfield Piping			
Exterior wellfield water extraction and air lines	TerraTherm	Complete	
Exterior vapor extraction piping and manifolds	TerraTherm	Complete	
Exterior thermal insulation cap removal	TerraTherm	Complete	
Interior wellfield water extraction and air lines	TerraTherm	Complete	
Interior vapor extraction piping and manifolds	TerraTherm	Complete	
Interior thermal insulation cap removal	TerraTherm	Complete	
Power, data communication, and water injection and return hoses	McMillan-McGee	Complete	
Demobilize ISTT Process Equipment			
Disconnect and disassemble process equipment	TerraTherm	Complete	
Remove downhole groundwater extraction pumps from multiphase extraction wells	TerraTherm	Complete	
Demobilize rental equipment	TerraTherm	Complete	
Demobilize additional TerraTherm-owned process equipment	TerraTherm	Complete	
Demobilize ET-DSP equipment	TerraTherm	Complete	
Demobilize transformer	TerraTherm	Complete	
Process and handle IDW (vapor carbon, organoclay, and bag filters)	TerraTherm	Complete	
Decontaminate process equipment and piping	TerraTherm	Complete	
Remove and dispose of general refuse debris	TerraTherm	Complete	
Demobilize ISTT Wellfield			
Abandon electrodes	TerraTherm	Not Started	Scheduled 5/9 to 5/27
Abandon shallow vapor extraction wells	TerraTherm	Not Started	
Abandon multiphase extraction wells – *with the exception of MPE-03 which will be converted into a Source Area groundwater monitoring well per the request of MassDEP*	TerraTherm	Not Started	
Abandon sensor wells	TerraTherm	Not Started	
Remove concrete vapor cap	TerraTherm	Not Started	
Site Restoration			
Restore exterior of GWTP	TerraTherm	Complete	
Transport and dispose of IDW	Nobis Team	Ongoing	5/13/2011
Restore permanent Site fencing	Nobis Team	Not Started	TBD, pending removal of concrete vapor cap

ISTT Demobilization Activities – Completed through 4/22/2011	**Responsible**	**Status**	**Estimated WE Completion**
Replace 106 Center Street wood stockade fencing	Nobis Team	Not Started	TBD, pending removal of vapor cap
Replace 106 Center Street trees and other vegetation	Nobis Team	Not Started	
GWTP Restoration – Items to be completed under Task Order 12			
Conduct initial test on EW-S1, -S2, and -S3 conveyance	Nobis Team	Complete	
Restart EW-S1, -S2, and -S3	Nobis Team	Not Started	TBD, pending the cooling of GW to temperatures compatible with pump motor and pipeline
Sludge press	Nobis Team	Complete	
Carbon change out (PDU and vapor phase)	Nobis Team	Complete	
Filter media change out – *Repairs needed to filter bed laterals. Repairs currently underway.*	Nobis Team	Ongoing	4/27/2011
Miscellaneous Repairs – GWTF equipment	Nobis Team	Ongoing	5/30/2011
Removal/disposal/recycling of inoperable equipment	Nobis Team	Awaiting direction from Govt. Equip Dept	5/30/2011

Subcontractors Onsite: None

Planned Activities for Week of 4/25/2011:

- Finish filter repairs and media change out & sample wastes for characterization (TO12)
- Sample ISTT operations IDW (liquid and solid waste drums and soil boxes) for waste characterization

Confirmation Sampling Schedule

Confirmation Groundwater Sampling

- #1 – 6 weeks after ISTT completion – week of March 21st – COMPLETE
- #2 – 12 weeks after ISTT completion – week of May 2nd
- #3 – 6 months after ISTT completion – early-August

Confirmation Soil Sampling

- April 4th to April 19th – COMPLETE

Next Project Status Conference Call: Tentatively scheduled for Tuesday, May 3, 2011, at 1:00 pm – Review of the confirmation soil sampling analytical results.

Applicable Site Photographs:

Date: 4/21/2011	**Location:** GWTP

Description: Corrosion damage observed on the mixed media filters backwash laterals. Laterals are being replaced with Schedule 80 PVC.

Date: 4/21/2011	**Location:** GWTP

Description: Confined space entry rescue set up performed by Weston Solutions during the repairs to the mixed media filters.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Demobilization Status Report

Prepared By: Lauren Soós	**Date Prepared:** 5/2/2011

ISTT Demobilization Activities – Completed through 4/29/2011	**Responsible**	**Status**	**Estimated WE Completion**
Demobilize ISTT Process and Wellfield Piping			
Exterior wellfield water extraction and air lines	TerraTherm	Complete	
Exterior vapor extraction piping and manifolds	TerraTherm	Complete	
Exterior thermal insulation cap removal	TerraTherm	Complete	
Interior wellfield water extraction and air lines	TerraTherm	Complete	
Interior vapor extraction piping and manifolds	TerraTherm	Complete	
Interior thermal insulation cap removal	TerraTherm	Complete	
Power, data communication, and water injection and return hoses	McMillan-McGee	Complete	
Demobilize ISTT Process Equipment			
Disconnect and disassemble process equipment	TerraTherm	Complete	
Remove downhole groundwater extraction pumps from multiphase extraction wells	TerraTherm	Complete	
Demobilize rental equipment	TerraTherm	Complete	
Demobilize additional TerraTherm-owned process equipment	TerraTherm	Complete	
Demobilize ET-DSP equipment	TerraTherm	Complete	
Demobilize transformer	TerraTherm	Complete	
Process and handle IDW (vapor carbon, organoclay, and bag filters)	TerraTherm	Complete	
Decontaminate process equipment and piping	TerraTherm	Complete	
Remove and dispose of general refuse debris	TerraTherm	Complete	
Demobilize ISTT Wellfield			
Abandon electrodes	TerraTherm	Not Started	Beginning 5/16/2011 to ~6/3/2011
Abandon shallow vapor extraction wells	TerraTherm	Not Started	
Abandon multiphase extraction wells – *with the exception of MPE-03 which will be retained for conversion into a Source Area groundwater monitoring well by MassDEP*	TerraTherm	Not Started	
Abandon sensor wells	TerraTherm	Not Started	
Remove concrete vapor cap	TerraTherm	Not Started	5/13/2011
Site Restoration			
Restore exterior of GWTP	TerraTherm	Complete	
Transport and dispose of IDW	Nobis Team	Ongoing	5/13/2011
Restore permanent Site fencing	Nobis Team	Not Started	TBD, pending well abandonment and vapor cap

ISTT Demobilization Activities – Completed through 4/29/2011	**Responsible**	**Status**	**Estimated WE Completion**
			removal
Replace 106 Center Street wood stockade fencing	Nobis Team	Not Started	TBD, pending well abandonment and vapor cap removal
Replace 106 Center Street trees and other vegetation	Nobis Team	Not Started	
GWTP Restoration – Items to be completed under Task Order 12			
Conduct initial test on EW-S1, -S2, and -S3 conveyance	Nobis Team	Complete	
Restart EW-S1, -S2, and -S3	Nobis Team	Not Started	TBD, pending the cooling of GW to temperatures compatible with pump motor and pipeline
Sludge press	Nobis Team	Complete	
Carbon change out (PDU and vapor phase)	Nobis Team	Complete	
Filter media change out – *Repairs to filter bed laterals are currently underway. GWTP was brought partially online (treating water from Extraction Well S4 only) on 4/30 while operating Filter B. Repairs to Filter A and Filter C should be completed this week.*	Nobis Team	Ongoing	5/6/2011
Miscellaneous repairs – GWTP equipment	Nobis Team	Ongoing	5/30/2011
Removal/disposal/recycling of inoperable equipment	Nobis Team	Awaiting direction from Govt. Equip Dept	5/30/2011

Subcontractors Onsite: None

Planned Activities for Week of 5/2/2011:

- Sample ISTT operations IDW (liquid and solid waste drums and soil boxes) for waste characterization
- Conduct 2nd confirmation groundwater sampling event
- Finish filter repairs (TO12)
- Return GWTP to "Normal" operation
- Sample GWTP media and sludge wastes for characterization (TO12)

Confirmation Sampling Schedule

Confirmation Groundwater Sampling

- #1 – 6 weeks after ISTT completion – week of March 21st – COMPLETE
- #2 – 12 weeks after ISTT completion – week of May 2nd – Ongoing
- #3 – 6 months after ISTT completion – early-August

Confirmation Soil Sampling

- April 4th to April 19th – COMPLETE

Next Project Status Conference Call: This week – date & time to be determined.

Applicable Site Photographs:

Date: 4/29/2011	**Location:** GWTP

Description: Gravel observed within mixed media filter backwash laterals. The integrity of the laterals was confirmed. Repairs are currently underway to remove gravel from laterals and return the mixed media filters to normal use.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Demobilization Status Report

Prepared By: Lauren Soós	**Date Prepared:** 5/9/2011

ISTT Demobilization Activities – Completed through 5/6/2011	**Responsible**	**Status**	**Estimated WE Completion**
Demobilize ISTT Process and Wellfield Piping			
Exterior wellfield water extraction and air lines	TerraTherm	Complete	
Exterior vapor extraction piping and manifolds	TerraTherm	Complete	
Exterior thermal insulation cap removal	TerraTherm	Complete	
Interior wellfield water extraction and air lines	TerraTherm	Complete	
Interior vapor extraction piping and manifolds	TerraTherm	Complete	
Interior thermal insulation cap removal	TerraTherm	Complete	
Power, data communication, and water injection and return hoses	McMillan-McGee	Complete	
Demobilize ISTT Process Equipment			
Disconnect and disassemble process equipment	TerraTherm	Complete	
Remove downhole groundwater extraction pumps from multiphase extraction wells	TerraTherm	Complete	
Demobilize rental equipment	TerraTherm	Complete	
Demobilize additional TerraTherm-owned process equipment	TerraTherm	Complete	
Demobilize ET-DSP equipment	TerraTherm	Complete	
Demobilize transformer	TerraTherm	Complete	
Process and handle IDW (vapor carbon, organoclay, and bag filters)	TerraTherm	Complete	
Decontaminate process equipment and piping	TerraTherm	Complete	
Remove and dispose of general refuse debris	TerraTherm	Complete	
Demobilize ISTT Wellfield			
Abandon electrodes	TerraTherm	Not Started	5/20/2011
Abandon shallow vapor extraction wells	TerraTherm	Not Started	
Abandon multiphase extraction wells – *with the exception of MPE-03 which will be retained for conversion into a Source Area groundwater monitoring well by MassDEP*	TerraTherm	Not Started	
Abandon sensor wells	TerraTherm	Not Started	
Remove concrete vapor cap	TerraTherm	Not Started	5/13/2011
Site Restoration			
Restore exterior of GWTP	TerraTherm	Complete	
Characterize, transport and dispose of IDW	Nobis Team	Ongoing	5/20/2011
Restore permanent Site fencing	Nobis Team	Not Started	TBD, pending well abandonment and vapor cap

ISTT Demobilization Activities – Completed through 5/6/2011	**Responsible**	**Status**	**Estimated WE Completion**
			removal
Replace 106 Center Street wood stockade fencing	Nobis Team	Not Started	TBD, pending well abandonment and vapor cap removal
Replace 106 Center Street trees and other vegetation	Nobis Team	Not Started	
GWTP Restoration – Items to be completed under Task Order 12			
Conduct initial test on EW-S1, -S2, and -S3 conveyance	Nobis Team	Complete	
Restart EW-S1, -S2, and -S3	Nobis Team	Not Started	TBD, pending the cooling of GW to temperatures compatible with extraction equipment
Sludge press	Nobis Team	Complete	
Carbon change out (PDU and vapor phase)	Nobis Team	Complete	
Filter media change out – *Following repairs to the filter laterals, filter bed A was brought online on May 3rd (bed B was previously brought online). Repairs to filter bed C will be completed during the week of 5/13, at which time the GWTP will return to normal operation.*	Nobis Team	Ongoing	5/13/2011
Characterization and off-site disposal of pressed sludge, spent carbon, and spent filter media from multimedia filter beds.	Nobis Team	Ongoing	Wastes sampled 5/4, results pending, disposal by 5/20/11
Miscellaneous repairs – GWTP equipment	Nobis Team	Ongoing	5/30/2011
Removal/disposal/recycling of inoperable equipment	Nobis Team	Awaiting direction from Govt. Equip Dept	5/30/2011

Subcontractors Onsite: None

Planned Activities for Week of 5/9/2011:

- Perform concrete vapor cover removal
- Complete characterization of TO12 and TO37 IDW
- Continue miscellaneous repairs to the GWTP equipment (TO12)
- Continue the removal and disposal or recycling of inoperable GWTP equipment (TO12)

Confirmation Sampling Schedule

Confirmation Groundwater Sampling

- #1 – 6 weeks after ISTT completion – week of March 21st – COMPLETE

ISTT Demobilization Activities – Completed through 5/6/2011	**Responsible**	**Status**	**Estimated WE Completion**
• #2 – 12 weeks after ISTT completion – week of May 2nd – COMPLETE • #3 – 6 months after ISTT completion – early-August Confirmation Soil Sampling • April 4th to April 19th – COMPLETE			
Next Project Status Conference Call: Tuesday, May 17th at 1:00 pm EST			

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Demobilization Status Report

Prepared By: Lauren Soós	**Date Prepared:** 5/16/2011

ISTT Demobilization Activities – Completed through 5/13/2011	**Responsible**	**Status**	**Estimated WE Completion**
Demobilize ISTT Process and Wellfield Piping			
Exterior wellfield water extraction and air lines	TerraTherm	Complete	
Exterior vapor extraction piping and manifolds	TerraTherm	Complete	
Exterior thermal insulation cap removal	TerraTherm	Complete	
Interior wellfield water extraction and air lines	TerraTherm	Complete	
Interior vapor extraction piping and manifolds	TerraTherm	Complete	
Interior thermal insulation cap removal	TerraTherm	Complete	
Power, data communication, and water injection and return hoses	McMillan-McGee	Complete	
Demobilize ISTT Process Equipment			
Disconnect and disassemble process equipment	TerraTherm	Complete	
Remove downhole groundwater extraction pumps from multiphase extraction wells	TerraTherm	Complete	
Demobilize rental equipment	TerraTherm	Complete	
Demobilize additional TerraTherm-owned process equipment	TerraTherm	Complete	
Demobilize ET-DSP equipment	TerraTherm	Complete	
Demobilize transformer	TerraTherm	Complete	
Process and handle IDW (vapor carbon, organoclay, and bag filters)	TerraTherm	Complete	
Decontaminate process equipment and piping	TerraTherm	Complete	
Remove and dispose of general refuse debris	TerraTherm	Complete	
Demobilize ISTT Wellfield			
Abandon electrodes	TerraTherm	Not Started	Will begin on 5/17/2011, potentially wrapping up by 5/20/2011
Abandon shallow vapor extraction wells	TerraTherm	Not Started	
Abandon multiphase extraction wells – *with the exception of MPE-03 which will be retained for conversion into a Source Area groundwater monitoring well by MassDEP*	TerraTherm	Not Started	
Abandon sensor wells	TerraTherm	Not Started	
Remove concrete vapor cover	TerraTherm	Complete	
Site Restoration			
Restore exterior of GWTP	TerraTherm	Complete	
Characterize, transport and dispose of IDW	Nobis Team	Ongoing	IDW sampled on 5/4, results pending, disposal by 5/27/11

ISTT Demobilization Activities – Completed through 5/13/2011	**Responsible**	**Status**	**Estimated WE Completion**
Restore permanent Site fencing	Nobis Team	Not Started	TBD, pending well abandonment and vapor cap removal
Replace 106 Center Street wood stockade fencing	Nobis Team	Not Started	TBD, pending well abandonment and vapor cap removal
Replace 106 Center Street trees and other vegetation	Nobis Team	Not Started	
GWTP Restoration – Items to be completed under Task Order 12			
Conduct initial test on EW-S1, -S2, and -S3 conveyance	Nobis Team	Complete	
Restart EW-S1, -S2, and -S3 – last week the groundwater temperatures were measured to be 162°F.	Nobis Team	Not Started	TBD, pending the cooling of GW to ~100°F
Sludge press	Nobis Team	Complete	
Carbon change out (PDU and vapor phase)	Nobis Team	Complete	
Filter media change out – *Repairs to filter bed C were completed on 5/11, at which time the GWTP returned to normal operation.*	Nobis Team	Complete	
Characterization and off-site disposal of pressed sludge, spent carbon, and spent filter media from multimedia filter beds.	Nobis Team	Ongoing	IDW sampled on 5/4, results pending, disposal by 5/27/11
Miscellaneous repairs – GWTP equipment	Nobis Team	Ongoing	5/30/2011
Removal/disposal/recycling of inoperable equipment	Nobis Team	Awaiting direction from Govt. Equip Dept	5/30/2011
Subcontractors Onsite: TerraTherm, East Coast Excavation			
Planned Activities for Week of 5/16/2011:			
• Complete characterization and disposal of TO12 and TO37 IDW • Begin ISTT well (electrode, extraction, and sensor well) abandonments • Continue miscellaneous repairs to the GWTP equipment (TO12) • Continue the removal and disposal or recycling of inoperable GWTP equipment (TO12)			
Confirmation Sampling Schedule			
Confirmation Groundwater Sampling • #1 – 6 weeks after ISTT completion – week of March 21st – COMPLETE • #2 – 12 weeks after ISTT completion – week of May 2nd – COMPLETE • #3 – 6 months after ISTT completion – early-August Confirmation Soil Sampling • April 4th to April 19th – COMPLETE			

Applicable Site Photographs:	
Date: 5/10/2011	**Location:** ISTT Wellfield, Looking East
Description: TerraTherm, and its subcontractor, mobilized an excavator to remove the concrete vapor cover within the ISTT wellfield.	

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Demobilization Status Report

Prepared By: Lauren Soós	**Date Prepared:** 5/25/2011

ISTT Demobilization Activities – Completed through 5/20/2011	**Responsible**	**Status**	**Estimated WE Completion**
Demobilize ISTT Process and Wellfield Piping			
Exterior wellfield water extraction and air lines	TerraTherm	Complete	
Exterior vapor extraction piping and manifolds	TerraTherm	Complete	
Exterior thermal insulation cap removal	TerraTherm	Complete	
Interior wellfield water extraction and air lines	TerraTherm	Complete	
Interior vapor extraction piping and manifolds	TerraTherm	Complete	
Interior thermal insulation cap removal	TerraTherm	Complete	
Power, data communication, and water injection and return hoses	McMillan-McGee	Complete	
Demobilize ISTT Process Equipment			
Disconnect and disassemble process equipment	TerraTherm	Complete	
Remove downhole groundwater extraction pumps from multiphase extraction wells	TerraTherm	Complete	
Demobilize rental equipment	TerraTherm	Complete	
Demobilize additional TerraTherm-owned process equipment	TerraTherm	Complete	
Demobilize ET-DSP equipment	TerraTherm	Complete	
Demobilize transformer	TerraTherm	Complete	
Process and handle IDW (vapor carbon, organoclay, and bag filters)	TerraTherm	Complete	
Decontaminate process equipment and piping	TerraTherm	Complete	
Remove and dispose of general refuse debris	TerraTherm	Complete	
Demobilize ISTT Wellfield			
Abandon electrodes	TerraTherm	Complete	MPE-06 retained until a the status of RW-07 is determined
Abandon shallow vapor extraction wells	TerraTherm	Complete	
Abandon multiphase extraction wells – *with the exception of MPE-03 which will be retained for conversion into a Source Area groundwater monitoring well by MassDEP*	TerraTherm	Complete	
Abandon sensor wells	TerraTherm	Complete	
Remove concrete vapor cover	TerraTherm	Complete	
Site Restoration			
Restore exterior of GWTP	TerraTherm	Ongoing	Additional repairs identified
Characterize, transport and dispose of IDW	Nobis Team	Ongoing	disposal anticipated by 6/3/11

ISTT Demobilization Activities – Completed through 5/20/2011	**Responsible**	**Status**	**Estimated WE Completion**
Rough Surface Grading Valley Property, restoration of TerraTherm office trailer location	TerraTherm	Not Started	5/30
Restore permanent Site fencing	Nobis Team	Not Started	June/July 2011
Replace 106 Center Street wood stockade fencing	Nobis Team	Not Started	June/July 2011
Complete Grading and seeding of Valley Property	Nobis Team	Beginning procure-ment	June/July 2011
Replace 106 Center Street trees and other vegetation			
Evaluate RW-07 and abandon it or MPE-06			
Install conduit for electrical and communication lines to EW-S1, -S-2, and -S-3.			
Complete electrical and communications connections to EW-S1, -S-2, and -S-3 and re-program SCADA to integrate wells.	Nobis Team	Beginning procure-ment	June/July 2011
GWTP Restoration – Items to be completed under Task Order 12			
Conduct initial test on EW-S1, -S2, and -S3 conveyance	Nobis Team	Complete	
Restart EW-S1, -S2, and -S3 – last week the groundwater temperatures were measured to be 162°F.	Nobis Team	Not Started	TBD, pending the cooling of GW to ~100°F
Sludge press	Nobis Team	Complete	
Carbon change out (PDU and vapor phase)	Nobis Team	Complete	
Filter media change out – *Repairs to filter bed C were completed on 5/11, at which time the GWTP returned to normal operation.*	Nobis Team	Complete	
Characterization and off-site disposal of pressed sludge, spent carbon, and spent filter media from multimedia filter beds.	Nobis Team	Ongoing	IDW sampled on 5/4, results pending, disposal by 5/27/11
Miscellaneous repairs – GWTP equipment	Nobis Team	Ongoing	5/30/2011
Removal/disposal/recycling of inoperable equipment	Nobis Team	Awaiting direction from Govt. Equip Dept	5/30/2011

Subcontractors Onsite: TerraTherm

Planned Activities for Week of 5/23/2011:

- Continue miscellaneous repairs to the GWTP equipment (TO12)
- Continue the removal and disposal or recycling of inoperable GWTP equipment (TO12)

Confirmation Sampling Schedule

Confirmation Groundwater Sampling

- #1 – 6 weeks after ISTT completion – week of March 21st – COMPLETE
- #2 – 12 weeks after ISTT completion – week of May 2nd – COMPLETE
- #3 – 6 months after ISTT completion – early-August

ISTT Demobilization Activities – Completed through 5/20/2011	**Responsible**	**Status**	**Estimated WE Completion**
Confirmation Soil Sampling • April 4th to April 19th – COMPLETE			

Applicable Site Photographs:

Date: 5/17/2011	**Location:** ISTT Well Field

Description: TerraTherm, and its subcontractor Geosearch, abandoning a MPE location.

Date: 5/18/2011	**Location:** ISTT Well Field

Description: TerraTherm, and its subcontractor Geosearch, abandoning an electrode location.

Applicable Site Photographs:

Date: 5/19/2011	**Location:** ISTT Well Field

Description: Typical surface seal at ground surface.

Date: 5/19/2011	**Location:** ISTT Well Field

Description: Typical grout seal inside the Valley Building.

Groveland Wells Numbers 1 and 2 Superfund Site
Groveland, Massachusetts

Remedial Action
EPA Task Order No. 0037-RA-RA-0132

ISTT Demobilization Status Report

Prepared By: Adam Roy	**Date Prepared:** 6/10/2011

ISTT Demobilization Activities – Completed through 6/10/2011	**Responsible**	**Status**	**Estimated WE Completion**
Demobilize ISTT Process and Wellfield Piping			
Exterior wellfield water extraction and air lines	TerraTherm	Complete	
Exterior vapor extraction piping and manifolds	TerraTherm	Complete	
Exterior thermal insulation cap removal	TerraTherm	Complete	
Interior wellfield water extraction and air lines	TerraTherm	Complete	
Interior vapor extraction piping and manifolds	TerraTherm	Complete	
Interior thermal insulation cap removal	TerraTherm	Complete	
Power, data communication, and water injection and return hoses	McMillan-McGee	Complete	
Demobilize ISTT Process Equipment			
Disconnect and disassemble process equipment	TerraTherm	Complete	
Remove downhole groundwater extraction pumps from multiphase extraction wells	TerraTherm	Complete	
Demobilize rental equipment	TerraTherm	Complete	
Demobilize additional TerraTherm-owned process equipment	TerraTherm	Complete	
Demobilize ET-DSP equipment	TerraTherm	Complete	
Demobilize transformer	TerraTherm	Complete	
Process and handle IDW (vapor carbon, organoclay, and bag filters)	TerraTherm	Complete	
Decontaminate process equipment and piping	TerraTherm	Complete	
Remove and dispose of general refuse debris	TerraTherm	Complete	
Demobilize ISTT Wellfield			
Abandon electrodes	TerraTherm	Complete	MPE-06 retained until a the status of RW-07 is determined
Abandon shallow vapor extraction wells	TerraTherm	Complete	
Abandon multiphase extraction wells – *with the exception of MPE-03 which will be retained for conversion into a Source Area groundwater monitoring well by MassDEP*	TerraTherm	Complete	
Abandon sensor wells	TerraTherm	Complete	
Remove concrete vapor cover	TerraTherm	Complete	
Site Restoration			
Restore exterior of GWTP	TerraTherm	Complete	
Characterize, transport and dispose of IDW	Nobis Team	Complete	
Rough Surface Grading Valley Property, restoration of TerraTherm office trailer location	TerraTherm	Complete	
Restore permanent Site fencing	Nobis Team	Not Started	June/July 2011
Replace 106 Center Street fencing	Nobis Team	Not Started	June/July 2011

ISTT Demobilization Activities – Completed through 6/10/2011	**Responsible**	**Status**	**Estimated WE Completion**
Complete Grading and seeding of Valley Property	Nobis Team	Procure-ment ongoing	June/July 2011
Complete landscaping/restoration of 106 Center Street			
Evaluate RW-07 and abandon it or MPE-06			
Install conduit for electrical and communication lines to EW-S1, -S-2, and -S-3.			
Complete electrical and communications connections to EW-S1, -S-2, and -S-3 and re-program SCADA to integrate wells.	Nobis Team	Procure-ment ongoing	June/July 2011
GWTP Restoration – Items to be completed under Task Order 12			
Conduct initial test on EW-S1, -S2, and -S3 conveyance	Nobis Team	Complete	
Restart EW-S1, -S2, and -S3 – last week the groundwater temperatures were measured to be 162°F.	Nobis Team	Not Started	TBD, pending the cooling of GW to ~100°F
Sludge press	Nobis Team	Complete	
Carbon change out (PDU and vapor phase)	Nobis Team	Complete	
Filter media change out – *Repairs to filter bed C were completed on 5/11, at which time the GWTP returned to normal operation.*	Nobis Team	Complete	
Characterization and off-site disposal of pressed sludge, spent carbon, and spent filter media from multimedia filter beds.	Nobis Team	Complete	5/31/11
Miscellaneous repairs – GWTP equipment	Nobis Team	Complete	
Removal/disposal/recycling of inoperable equipment	Nobis Team	Complete	6/10/2011
Subcontractors Onsite: TerraTherm			
Planned Activities for Week of 6/13/2011:			
• None			
Confirmation Sampling Schedule			
Confirmation Groundwater Sampling • #1 – 6 weeks after ISTT completion – week of March 21st – COMPLETE • #2 – 12 weeks after ISTT completion – week of May 2nd – COMPLETE • #3 – 6 months after ISTT completion – early-August Confirmation Soil Sampling • April 4th to April 19th – COMPLETE			

Applicable Site Photographs:

Date: 6/8/2011	**Location:** Former location of TerraTherm job trailer.

Description: Restoration of the area where the TerraTherm job trailer was located.

Date: 6/9/11	**Location:** ISTT well field, south of the Valley Building.

Description: The ground surface condition following rough grading activities performed by TerraTherm.

Applicable Site Photographs:

Date: 6/09/11	**Location:** ISTT well field, southeast of the Valley building.

Description: TerraTherm performing rough grading activities southeast of the Valley Building.

Date: 6/9/11	**Location:** ISTT well field, east of the Valley building.

Description: Rough grading of the ground surface east of the Valley building.

Applicable Site Photographs:

Date: 6/09/11	**Location:** Inside the Valley building.

Description: Ceiling tile material bagged and labeled stored inside the Valley building.

Date: 6/9/11	**Location:** Groundwater treatment plant building.

Description: Repair of damaged bricks on the groundwater treatment plant below the overhead door of the peroxide storage room.