



January 27, 2012

Mr. Gerold Noyes, P.E.  
Vermont Department of Environmental Conservation  
Waste Management Division  
103 S. Main Street, West Building  
Waterbury, Vermont 05671-0404

RE: 2011 Annual Monitoring Report  
Wheatley Site, Brookfield, Vermont (Site #94-1693)

Dear Gerold:

Waite Environmental Management, LLC (WEM) is pleased to present two copies of the *2011 Annual Monitoring Report* for the Wheatley Site in Brookfield, Vermont. A digital copy (\*.PDF) has been placed on the VT DEC ftp site. The report provides details and results of the October 2011 (4<sup>th</sup> Quarter) sampling event. This report has been prepared in accordance with the requirements and conditions described in the *State of Vermont Contract for Personal Services EC13-04*.

Do not hesitate to call me if you have any questions about the report or the work conducted. I can be reached at (802) 860-9400 or by email at [mwaite@waiteenv.com](mailto:mwaite@waiteenv.com).

Sincerely,

A handwritten signature in black ink, appearing to read "Miles E. Waite". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Miles E. Waite, Ph.D.  
Principal Hydrogeologist

Enclosure

# **2011 ANNUAL MONITORING REPORT**

for the

## **WHEATLEY SITE BROOKFIELD, VERMONT**

VT DEC Site #77-0087

January 27, 2012

*Prepared for:*

STATE OF VERMONT  
Vermont Department of Environmental Conservation  
Waste Management Division  
103 South Main Street, West Building  
Waterbury, Vermont 05671-0404

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## **1.0 INTRODUCTION**

The following *2011 Annual Monitoring Report* for the Wheatley Site in Brookfield, Vermont (see attached Site Location Map in Appendix A) was prepared by Waite Environmental Management, LLC (WEM) for the Vermont Department of Environmental Conservation (VT DEC). This report has been completed in accordance WEM's contract with State of Vermont (contract EC13-04) for environmental monitoring.

This report includes discussion of the results of groundwater monitoring conducted by WEM during 2011. Monitoring locations were at the Wheatley Farm Site, currently a residential property occupied by Mr. James Moorcroft. Work conducted during this year under contract EC13-04 and covered in this report include:

- Monitoring of four (4) groundwater monitoring wells during October 2011.

While the collection of two (2) indoor air samples from the Moorcroft residence is usually a task conducted at this site during October, air sampling was not conducted during 2011 as WEM was unable to make contact with Mr. Moorcroft prior to the sampling event to obtain access to the residence.

Monitoring is conducted in accordance with WEM's *Work Plan for Environmental Monitoring* ("Work Plan") [1], with the *Field/Lab Coordination Memorandum for Water Monitoring* ("FLCM-Water") [2], and the *Field/Lab Coordination Memorandum for Air Monitoring* ("FLCM-Air") [3].

## **2.0 GROUNDWATER SAMPLING**

Groundwater monitoring was conducted by WEM on October 28, 2011. The following four (4) monitoring wells were monitored: MW-S1, MW-S2, MW-PL1 and MW-PL2. All monitoring well locations are shown in the Site Plan in Appendix A. Details and results of the sampling event are described below.

WEM was unable to sample well MW-S3, which is typically sampled as part of the annual monitoring program, as the well has been destroyed. Sometime during the summer of 2010, the steel well guard to the well was knocked over by the horses that occupy the area and the PVC well was broken below grade. WEM has confirmed with the VT DEC that replacement of this well is not necessary, so there will be no further groundwater sampling in this portion of the Site.

### **2.1 Groundwater Level Measurement**

Prior to sampling on October 28, 2011, the water level in each monitoring well was measured with a water level probe. None of the wells were observed to be dry. Depth to groundwater ranged from 4.25 to 17.31 ft below top-of-casing (ft btoc).

Using top-of-casing elevation data, the measurements were converted into groundwater elevations. Elevation data from October 2011 are shown with historical measurements in Table 1.1 in Appendix B. Compared to the previous round of measurements in October 2010, there was an average decrease in groundwater elevation of 0.2 ft.

Groundwater elevations were also plotted to develop a groundwater elevation map (see Groundwater Elevation Map – October 2011 in Appendix A). As this map shows, the general direction of overburden groundwater flow was toward the west, or toward the Second Branch of the White River. The lateral hydraulic gradient between well MW-PL2 and MW-S2 was 0.016 ft/ft, or 1.6%. In the lower meadow in the vicinity of wells MW-S1 and MW-S2, the groundwater flow direction is southerly, also toward the River. The 2011 groundwater flow direction and gradient is typical for this Site.

## 2.2 Groundwater Sample Collection

Monitoring wells were purged and sampled using a low-flow methodology. This involved using a peristaltic pump (Geotech Geopump II) connected to dedicated high density polyethylene (HDPE) tubing within each well that extended to a pre-specified intake depth. The dedicated HDPE tubing was connected to disposable silicon tubing that ran through the head of the peristaltic pump; new silicon tubing was used for each well purged. The purge rate, as specified by site protocols, was 100 milliliters/minute (ml/min). Purge rates, purge volumes, and pump intake depths are shown in the field water collection sheets provided in Appendix C. During the purging process, the water level was monitored using a water level probe (Solinst) with a 0.25-inch probe, and geochemical parameters were measured using a water quality meter (Horiba U-22 Model U-22XD) with a flow cell connected to the outlet of the peristaltic pump. The following field geochemical parameters were monitored: dissolved oxygen, specific conductance, temperature, pH, turbidity, and redox potential. The water quality meter was calibrated in the morning prior to sampling.

Wells were allowed to purge until geochemical parameters stabilized, as specified by site protocols. Upon stabilization, the silicon tubing was disconnected from the water meter. Samples were then collected directly from the outlet of the peristaltic pump. Parameter measurements and sample times are shown in the field sheets in Appendix C. Stabilized parameter measurements are shown with historical data in Tables 1.2 through 1.7.

All samples were delivered by WEM to TestAmerica Laboratory (TA) of South Burlington, Vermont for analysis of volatile organic compounds via EPA Method 8260B. Results for PCE, TCE, cis-1,2-DCE and trans-1,2-DCE are discussed below.

Sampling proceeded as per protocol, and there were no deviations from the Work Plan or the FLCM-Water.

## 2.3 Discussion of Results

Validated laboratory analytical results are summarized in Table 2.0 in Appendix B. Full copies of the laboratory report and the data validation package are presented in the Data Validation Report [4]. Following is a detailed discussion of field and laboratory results.

### 2.3.1 Field Geochemical Parameters

Field geochemical parameter measurements are summarized in Tables 1.2 through 1.7 in Appendix B. Based on a comparison to historical water quality parameters (2002-2010), the following observations can be made from the October 2011 data:

- **Dissolved oxygen** readings were all within the range of historical measurements with no anomalies or clear trends.
- **Specific conductance** readings were all within the range of historical measurements with the exception of an elevated reading in MW-PL2.
- **pH** readings were generally lower than historical measurements for all wells. No clear decreasing trends are noted.
- **Turbidity** readings were slightly elevated compared to average readings but were within the range of historical measurements.
- **Redox (ORP)** readings were all within the range of historical measurements with no anomalies or clear trends.

### 2.3.2 Analytical Results

The analytical results from October 2011 indicate the following:

- **MW-PL1:** the target compound PCE was reported at a concentration of 5.1 micrograms per liter (ug/L). No other target compounds were reported above detection limits.
- **MW-PL2:** no target compounds were reported above detection limits.
- **MW-S1:** no target compounds were reported above detection limits.
- **MW-S2:** no target compounds were reported above detection limits.

The PCE concentration in MW-PL1 is just above the Vermont groundwater enforcement standard (“VGES”) [5] of 5.0 ug/L. This is the first event where the PCE detected at this well is above the VGES. PCE concentrations in MW-PL1 reported between 1997 and the present are shown in the graph presented in Appendix B, and are indicative of an increasing concentration trend between 2005-2011 as compared to data from 1999-2004. It should be noted that PCE has never been reported in any of the three other monitoring wells at this Site.

It should be mentioned that the non-target petroleum compound toluene that was reported in sample MW-S2 during 2005-06 was not present in the 2011 sample.

### 2.3.3 QA/QC Samples

As part of the quality assurance/quality control (QA/QC) program, WEM collected a field duplicate sample during the October 2011 sampling event. A duplicate “MW-PLX” was collected in conjunction with MW-PL1. These samples were analyzed by TA using the same method (EPA Method 8260B). According to the Data Validation Report [4], precision in the field duplicate pair was acceptable (less than 30 % RPD) for all target analytes greater than 2 times the quantitation limit.

WEM also collected a trip blank (TB-4) and a field blank (FB-6) during the October 2011 sampling event. No target compounds were reported in either of these samples, indicating that there were no spurious influences on sample quality.

## 2.4 Discussion of Data Validation

The laboratory data from the October 2011 groundwater sampling event were validated by Phoenix Chemistry Services, an independent data validator. The validation was performed in accordance with Tier III guidelines as described by the USEPA Region I. Details are presented in the Data Validation Report [4], the text of which is provided in Appendix D.

Results for the target VOCs were determined to be valid as reported for all groundwater samples collected from the Site on October 28, 2011 (sample delivery group SDG No. WHEA17). There were qualifications for a non-target compound (bromomethane).

## 2.5 Recommendations

Based on the above information, overburden groundwater within a portion of the Site continues to show evidence of low levels of dissolved PCE. Given this condition, WEM recommends continuing the groundwater monitoring program as specified in the Work Plan and FLCM-Water. The next sampling event is scheduled for October 2012.

## **3.0 INDOOR AIR SAMPLING**

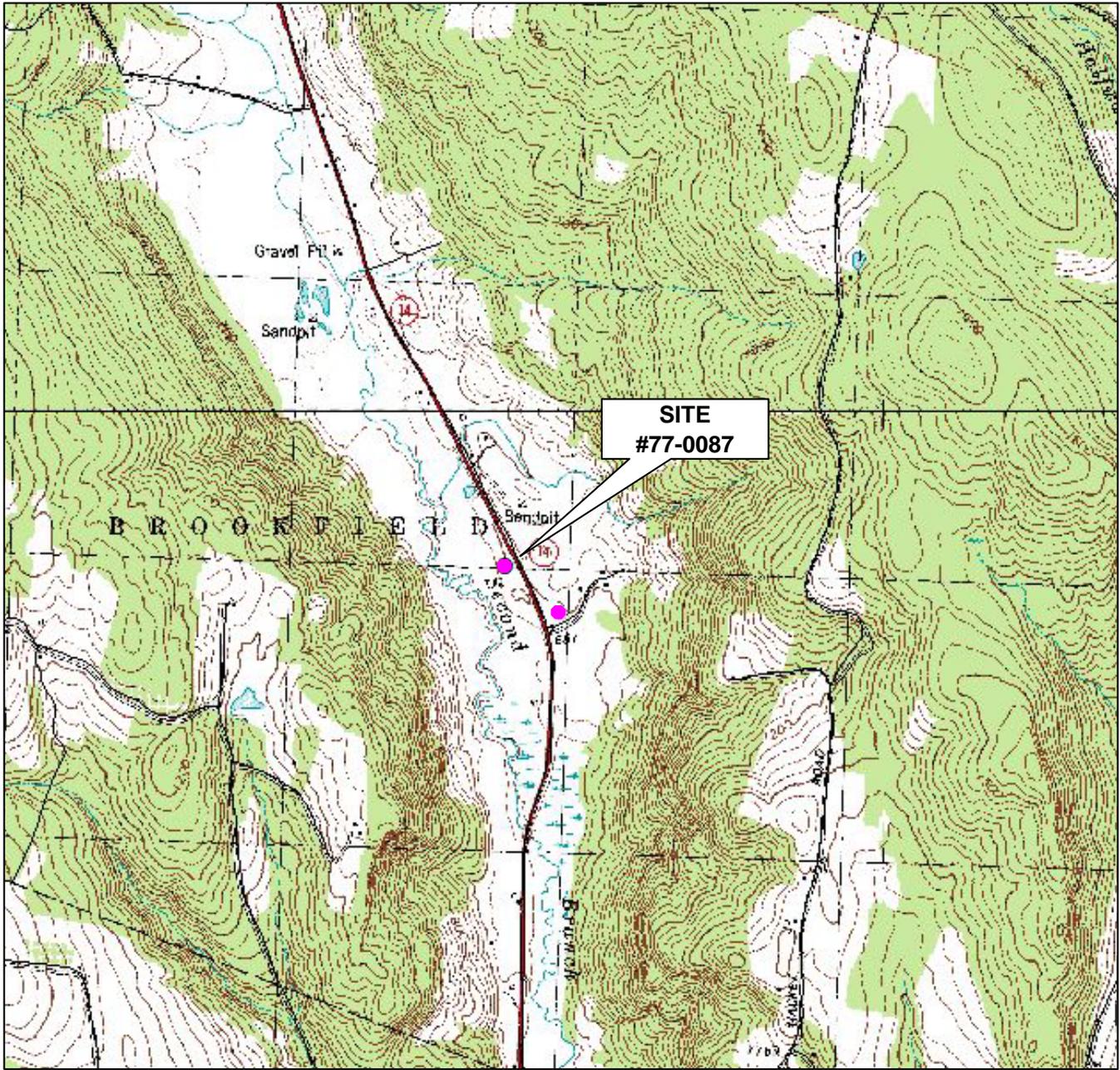
Monitoring of indoor air quality at two (2) locations inside the Moorcroft residence is typically conducted during the October monitoring event. This event did not occur in 2011, as WEM was unable to contact Mr. Moorcroft prior to the sampling event to ensure access to the sampling locations.

Due to the occasional presence of chlorinated VOCs in the indoor air, WEM recommends continuing the air sampling program as specified in the Work Plan and FLCM-Air. The next sampling event is scheduled for October 2012.

## **4.0 REFERENCES**

1. Waite Environmental Management, LLC, *Work Plan for Environmental Monitoring at the UniFirst Plant Site, Williamstown, Vermont, Wheatley Farm Site, Brookfield, Vermont, Bressett Site, Randolph, Vermont*, December 31, 2007.
2. Phoenix Chemistry Services, *Field/Lab Coordination Memorandum for Water Monitoring, UniFirst Plant Site, Williamstown, Vermont, Wheatley Farm Site, Brookfield, Vermont, Bressett Site, Randolph, Vermont*, April 2, 2004.
3. Phoenix Chemistry Services, *Field/Lab Coordination Memorandum for Air Monitoring, UniFirst Plant Site, Williamstown, Vermont, Wheatley Farm Site, Brookfield, Vermont, Bressett Site, Randolph, Vermont*, December 22, 2007.
4. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Bressett, Wheatley and UniFirst Sites, Randolph, Brookfield and Williamstown, VT, Organic Analyses Data, Volatile Organics in Water Samples, Sample Delivery Group Nos. BRES51, UNIF42, and WHEA17*, January 4, 2012.
5. State of Vermont, Agency of Natural Resources, Department of Environmental Conservation, *Chapter 12, Groundwater Protection Rule and Strategy*, February, 2005.

**APPENDIX A:**  
**FIGURES**



**LEGEND**

- Site
- State-Listed Hazardous Waste Site
- Roadway



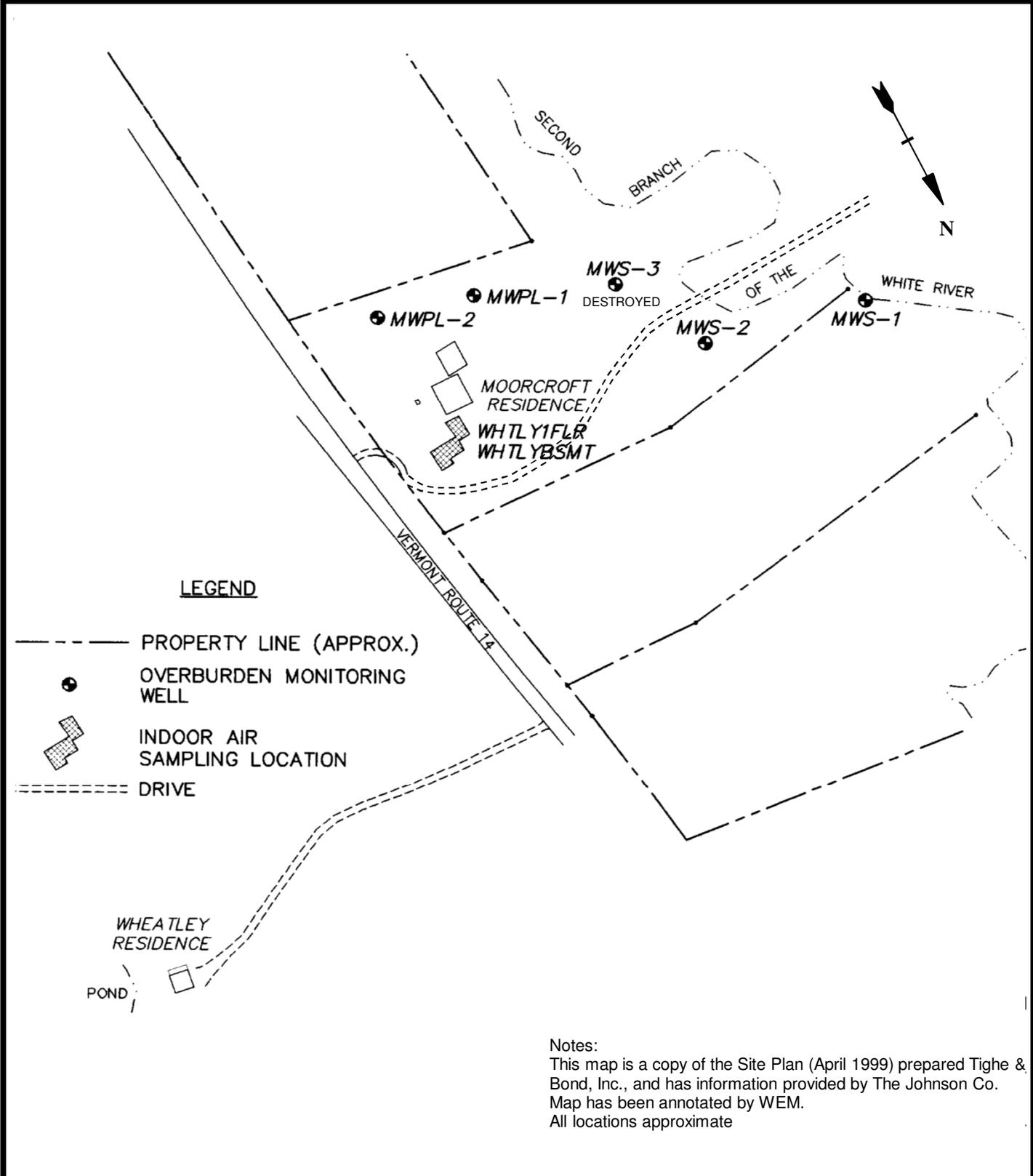
Map Source: *USGS Mapping 7.5 Minute Quadrangles: Brookfield (1983), Randolph Ctr (1983)*  
 Data Source: *Vermont DEC databases, updated 2006.*



Waite Environmental Management, LLC

**SITE LOCATION MAP**  
**Wheatley Site / Moorcroft Residence**  
**Brookfield, Vermont**

Date: 03/31/09 | Drawing No. 1 | Scale: 1:24,000 | By: MEW



**LEGEND**

- PROPERTY LINE (APPROX.)
- OVERBURDEN MONITORING WELL
- ▤ INDOOR AIR SAMPLING LOCATION
- DRIVE

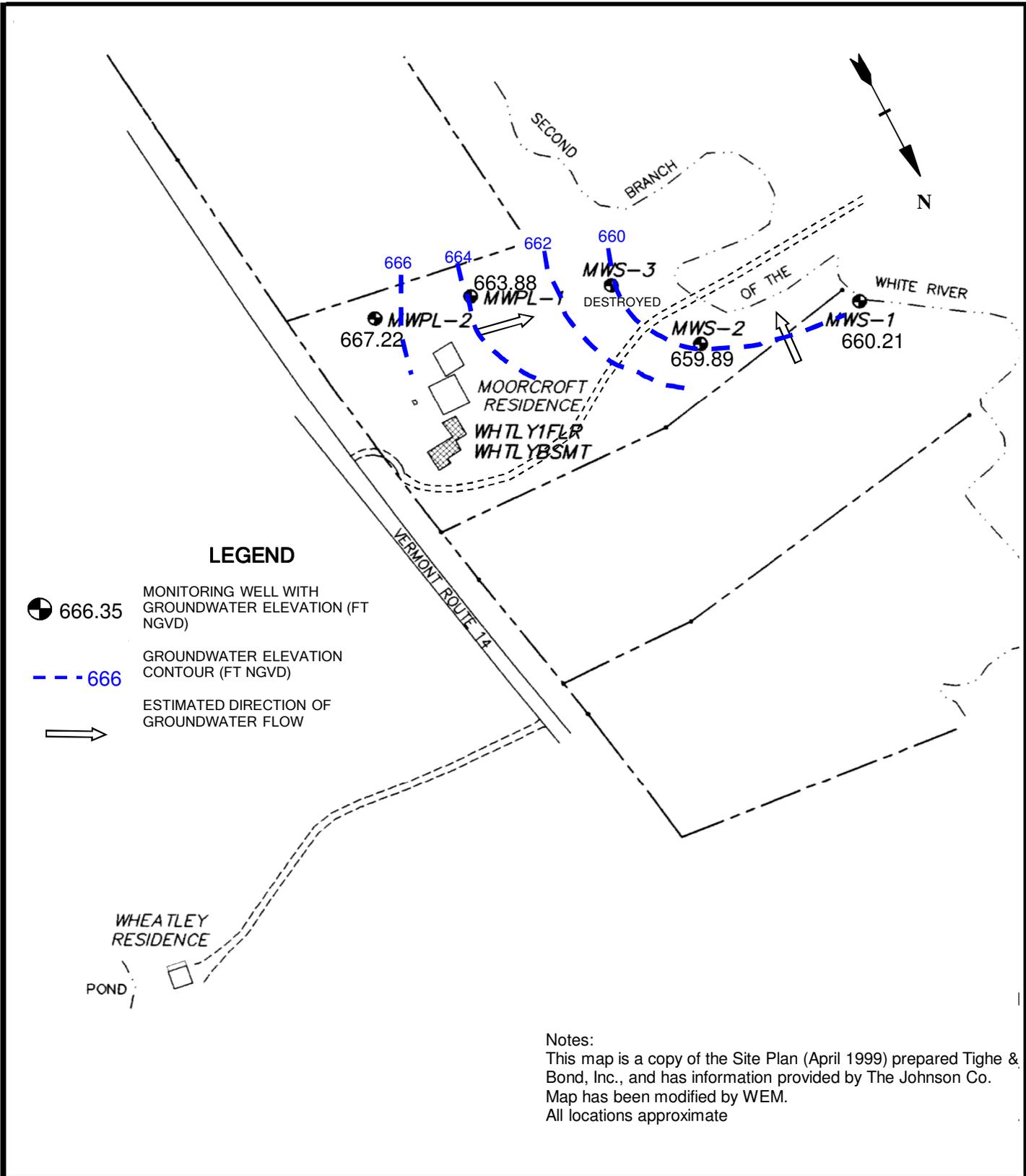
Notes:  
 This map is a copy of the Site Plan (April 1999) prepared Tighe & Bond, Inc., and has information provided by The Johnson Co. Map has been annotated by WEM.  
 All locations approximate



Waite Environmental Management, LLC

**SITE PLAN**  
**Wheatley Farm Site**  
**Brookfield, Vermont**

Date: 12/27/12	Drawing No.	Scale: 1" = 200'	By: MEW
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**LEGEND**

-  666.35 MONITORING WELL WITH GROUNDWATER ELEVATION (FT NGVD)
-  - - - 666 GROUNDWATER ELEVATION CONTOUR (FT NGVD)
-  ESTIMATED DIRECTION OF GROUNDWATER FLOW

Notes:  
 This map is a copy of the Site Plan (April 1999) prepared Tighe & Bond, Inc., and has information provided by The Johnson Co.  
 Map has been modified by WEM.  
 All locations approximate



Waite Environmental Management, LLC

**GROUNDWATER ELEVATION CONTOUR MAP**

**Oct-11**

**Wheatley Farm Site  
 Brookfield, Vermont**

Date: 01/02/12 | Drawing No. | Scale: 1" = 200' | By: MEW

**APPENDIX B:**  
**TABLES AND GRAPHS**



**TABLE 1.1**  
**Groundwater Elevation Measurements: 2003 - 2011**  
**Wheatley Site, Brookfield, Vermont**

Location	Type	Units	Oct-03	Oct-04	Oct-05	Apr-06	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10	Oct-11
MW-S1	Monitoring Well	FT	NS	659.95	660.74	660.77	661.89	662.07	660.35	659.62	660.68	660.21
MW-S2	Monitoring Well	FT	NS	658.93	660.62	659.42	660.79	661.23	660.32	659.30	660.46	659.89
MW-S3	Monitoring Well	FT	662.58	661.41	662.41	659.61	662.08	662.00	661.83	WELL DESTROYED		
MW-PL1	Monitoring Well	FT	663.70	663.06	663.87	663.99	663.56	663.88	663.81	662.26	664.07	663.88
MW-PL2	Monitoring Well	FT	666.37	666.08	665.58	666.10	666.35	665.91	666.91	666.24	666.59	667.22

Notes:

-All elevations in feet above NGVD; "NGVD" = National Geodetic Vertical Datum (1988).

-"Dry" = well dry during monitoring event; "NA" =not available; "NS" = not sampled.



**TABLE 1.2**  
**Dissolved Oxygen Field Measurements: 2003 - 2011**  
**Wheatley Site, Brookfield, Vermont**

Location	Type	Units	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10	Oct-11
MW-S1	Monitoring Well	mg/L	NA	3.33	0.48	0.29	0.00	0.00	0.00	3.42	3.94
MW-S2	Monitoring Well	mg/L	1.63	0.34	0.00	0.42	0.00	1.51	0.00	3.89	3.81
MW-S3	Monitoring Well	mg/L	1.38	0.36	0.04	0.19	0.00	0.00	WELL DESTROYED		
MW-PL1	Monitoring Well	mg/L	4.06	3.33	1.97	4.71	2.79	1.75	2.45	4.79	6.19
MW-PL2	Monitoring Well	mg/L	2.96	7.47	12.76	13.41	10.67	8.17	9.55	7.28	9.89

Notes:

- "Dry" = well dry during monitoring event; "NA" = not available; "NS" = not sampled.

- Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2003) and "2003 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2004).

- Data starting in 2004 collected by Waite Environmental Management.



**TABLE 1.3**  
**Specific Conductance Field Measurements: 2003 - 2011**  
**Wheatley Site, Brookfield, Vermont**

Location	Type	Units	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10	Oct-11
MW-S1	Monitoring Well	us/cm	NA	369	296	229	385	319	518	401	528
MW-S2	Monitoring Well	us/cm	210	268	257	138	273	222	346	255	310
MW-S3	Monitoring Well	us/cm	257	368	283	203	345	273	WELL DESTROYED		
MW-PL1	Monitoring Well	us/cm	349	498	391	292	509	448	744	574	749
MW-PL2	Monitoring Well	us/cm	287	401	400	215	399	376	661	528	750

Notes:

- All conductivity measurements in microsiemens per centimeter (us/cm).

-"Dry" = well dry during monitoring event; "NA" = not available; "NS" = not sampled..

-Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2003) and "2003 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2004).

-Data starting in 2004 collected by Waite Environmental Management.



**TABLE 1.4**  
**Temperature Field Measurements: 2003 - 2011**  
**Wheatley Site, Brookfield, Vermont**

Location	Type	Units	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10	Oct-11
MW-S1	Monitoring Well	deg C	NA	16.1	13.6	15.1	11.8	15.3	14.3	9.8	10.6
MW-S2	Monitoring Well	deg C	12.0	16.5	14.5	15.1	12.2	15.6	14.2	10.6	12.8
MW-S3	Monitoring Well	deg C	8.7	10.9	11.2	11.8	10.2	11.3	WELL DESTROYED		
MW-PL1	Monitoring Well	deg C	8.9	11.1	10.7	10.9	9.8	10.1	10.0	8.5	9.6
MW-PL2	Monitoring Well	deg C	8.8	10.7	11.0	10.8	10.0	10.7	9.8	9.2	9.2

Notes:

- All temperature measurements in degrees Celsius (deg C).

- "Dry" = well dry during monitoring event; "NA" = not available; "NS" = not sampled.

- Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2003) and "2003 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2004).

- Data starting in 2004 collected by Waite Environmental Management.



**TABLE 1.5**  
**pH Field Measurements: 2003 - 2011**  
**Wheatley Site, Brookfield, Vermont**

Location	Type	Units	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10	Oct-11
MW-S1	Monitoring Well	unitless	NA	7.25	8.09	8.22	7.65	NA	7.96	6.92	7.32
MW-S2	Monitoring Well	unitless	6.25	6.80	7.63	8.09	6.33	NA	6.71	6.00	6.66
MW-S3	Monitoring Well	unitless	8.24	8.67	9.44	8.41	8.26	NA	WELL DESTROYED		
MW-PL1	Monitoring Well	unitless	7.54	8.06	8.69	7.72	7.56	NA	6.31	6.10	6.20
MW-PL2	Monitoring Well	unitless	7.09	7.89	8.16	7.32	7.41	NA	6.43	6.20	6.59

Notes:

- "Dry" = well dry during monitoring event; "NA" = not available; "NS" = not sampled.

- Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2003) and "2003 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2004).

- Data starting in 2004 collected by Waite Environmental Management.



**TABLE 1.6**  
**Turbidity Field Measurements: 2003 - 2011**  
**Wheatley Site, Brookfield, Vermont**

Location	Type	Units	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10	Oct-11
MW-S1	Monitoring Well	NTU	NA	183	89	21.2	18.1	71.2	11.4	NA	119
MW-S2	Monitoring Well	NTU	2.0	81	47	17.0	4.9	0.0	0.0	NA	52.4
MW-S3	Monitoring Well	NTU	1.0	53	21	0.0	1.5	2.9	WELL DESTROYED		
MW-PL1	Monitoring Well	NTU	2.5	108	95	0.0	0.0	0.0	1.2	NA	44.3
MW-PL2	Monitoring Well	NTU	0.8	126	178	0.0	0.0	0.0	3.2	NA	80.7

Notes:

- All turbidity measurements in nephelometric turbidity units (NTU).
- "Dry" = well dry during monitoring event; "NA" = not available; "NS" = not sampled.
- Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2003) and "2003 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2004).
- Data starting in 2004 collected by Waite Environmental Management.



**TABLE 1.7**  
**Redox Potential Field Measurements: 2003 - 2011**  
**Wheatley Site, Brookfield, Vermont**

Location	Type	Units	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10	Oct-11
MW-S1	Monitoring Well	mV	NA	-72	-99	-159	-216	-182	-173	-187	-197
MW-S2	Monitoring Well	mV	-31	-43	-134	-123	-103	-50	-68	-62	-115
MW-S3	Monitoring Well	mV	-177	-220	-214	-168	-183	-205	WELL DESTROYED		
MW-PL1	Monitoring Well	mV	137	43	169	150	139	101	155	158	148
MW-PL2	Monitoring Well	mV	174	128	190	162	150	112	153	170	148

Notes:

-All redox potential measurements in millivolts (mV).

-"Dry" = well dry during monitoring event; "NA" = not available; "NS" = not sampled.

-Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2003) and "2003 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2004)..

-Data starting in 2004 collected by Waite Environmental Management.



**TABLE 2.0  
MONITORING WELL RESULTS: 2004-2011  
Wheatley Farm Site, Brookfield**

Location	Parameter <small>Method 8260</small>	Groundwater Enforcement Standard	Units	Oct-04	Oct-05	Apr-06	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10	Oct-11
MW-S1	PCE	5.0	ug/L	1.0 U								
	TCE	5.0	ug/L	1.0 U								
	cis-1,2-DCE	70.0	ug/L	1.0 U								
	trans-1,2-DCE	100.0	ug/L	1.0 U								
MW-S2	PCE	5.0	ug/L	1.0 U								
	TCE	5.0	ug/L	1.0 U								
	cis-1,2-DCE	70.0	ug/L	1.0 U								
	trans-1,2-DCE	100.0	ug/L	1.0 U								
MW-S3	PCE	5.0	ug/L	1.0 U								
	TCE	5.0	ug/L	1.0 U								
	cis-1,2-DCE	70.0	ug/L	1.0 U								
	trans-1,2-DCE	100.0	ug/L	1.0 U								
MW-PL1	PCE	5.0	ug/L	1.6	1.1	2.8	2.5	2.1	3.1	2.9	2.2	5.1
	TCE	5.0	ug/L	1.0 U	0.47 J							
	cis-1,2-DCE	70.0	ug/L	1.0 U								
	trans-1,2-DCE	100.0	ug/L	1.0 U								
MW-PL2	PCE	5.0	ug/L	1.0 U								
	TCE	5.0	ug/L	1.0 U								
	cis-1,2-DCE	70.0	ug/L	1.0 U								
	trans-1,2-DCE	100.0	ug/L	1.0 U								

Notes:

- "PCE" = tetrachlorethene; "TCE" = trichlorethene; "DCE" = dichloroethene.
- "U" = not detected above listed quantitation limit; "J" = reported concentration is an estimated value; "UJ" = reported quantitation limit is an estimated value.
- "Dry" = well dry during monitoring event; "NA" = not available.
- Data entered from the data validation report for each sampling event.
- Shaded cells indicate that the reported concentration is in excess of the Enforcement Standard.
- Groundwater Enforcement Standards referenced from Table 1, Chapter 12 - Groundwater Protection Rule and Strategy, February 2005.

**TABLE 3.0  
INDOOR AIR QUALITY RESULTS: 2003-2011  
Wheatley Farm Site, Brookfield, Vermont**

Owner	Location	Parameter Method T-014A	Guidance Level	Units	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10	Oct-11
Moorcroft	WHTLY1FLR	Tetrachloroethene	1.0	ppbv	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	<b>0.022</b>	<b>0.000</b>	NS
		Trichloroethene	1.0	ppbv	NS	0.5 U	0.2 U	0.2 U	<b>0.96</b>	NS	<b>2.0</b>	<b>0.100</b>	NS
		cis-1,2-Dichloroethene	9.3	ppbv	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	0.010 U	0.000 U	NS
		trans-1,2-Dichloroethene	18.4	ppbv	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	<b>0.014</b>	<b>0.010</b>	NS
	WHTLYBSMT	Tetrachloroethene	1.0	ppbv	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	<b>0.020</b>	0.000 U	NS
		Trichloroethene	1.0	ppbv	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	<b>0.017</b>	0.010 U	NS
		cis-1,2-Dichloroethene	9.3	ppbv	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	0.010 U	0.000 U	NS
		trans-1,2-Dichloroethene	18.4	ppbv	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	<b>0.028</b>	<b>0.010</b>	NS

Notes:

-“U” = not detected above listed quantitation limit; “J” = reported concentration is an estimated value; “UJ” = reported quantitation limit is an estimated value; “R” = the data are unusable (analyte may or may not be present).

-“NS” = Not Sampled (house unoccupied or access not obtained).

Bold values are reported above quantitation limit; shaded cells are in excess of the guidance level.

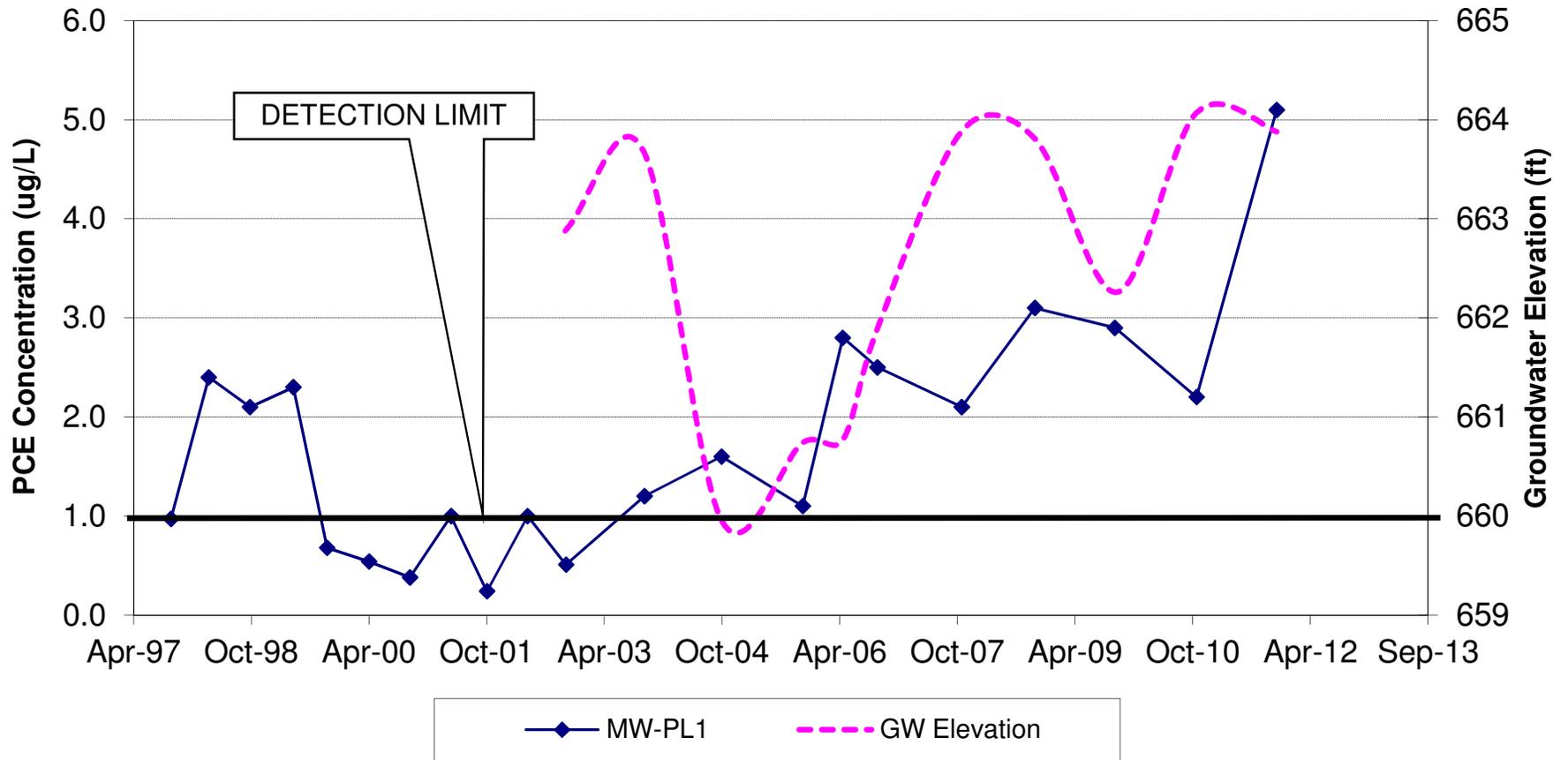
Data (qualified) from 2001-2003 was collected by Tighe & Bond and was entered from tabulated data from annual reports.

Data starting in 2004 collected by Waite Environmental Management.

Guidance level for tetrachloroethene and trichloroethene based on results of statewide indoor ambient air survey conducted by the Vermont Dept. Health in 1991-92.

Guidance level for cis- and trans-1,2-dichloroethene is based on the EPA Region III risk-based concentration for ambient air (2002 RBC table).

### PCE in Groundwater: MW-PL1 Wheatley Site, Brookfield, Vermont



Note:  
1) Concentrations shown below the detection limit are estimated (J).

**APPENDIX C:**  
**FIELD DATA SHEETS**





**UNIFIRST - WHEATLEY**  
**FIELD WATER COLLECTION SHEET**

**SAMPLING LOCATION** MW-51 Pump Intake Depth 9.8

Date 10/28/11 Pump Type peri

Sampler MW Well Diameter 3/4"

Weather pep cold Well Depth 10.8

Water Type SW Initial Depth to Water 4.98

Sampling Method baller low flow grab supply Traditional Purge Vol. / Rate 100 . 200 ml/min

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (mS/cm) / (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)	Notes
1132	4.98	200	10.3	52.3	6.97	-143	7.14	117	6.98
1135	4.22	200	10.6	52.2	7.16	-183	4.40	121	5.15
1140	4.02	200	10.6	52.2	7.24	-193	4.14	136	
1144	5.98	200	10.6	52.4	7.29	-196	4.03	119	
1147	5.98	200	10.6	52.8	7.32	-197	3.94	119	oomp h.f.
1152	5.77	200	10.6						
<b>SAMPLE COLLECTION</b>									
Final Measurements:		Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity	
		3950 ~ 1	10.6	52.8	7.32	-197	3.94	119	
Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #		
Sample	MW-51	WA	3	H2O	8260	1155			
As Required:									
Field Duplicate									
Field Blank									
MS/MSD									
General Notes:									

## UNIFIRST - WHEATLEY FIELD WATER COLLECTION SHEET

**SAMPLING LOCATION**

MW-52

Pump Intake Depth 10.8

Date

10/25/11

Pump Type peris'

Sampler

MW

Well Diameter 3/4

Weather

PC 1 coil

Well Depth 11.1

Water Type

SW

Initial Depth to Water 4.25

Sampling Method

bailler low flow grab

Traditional Purge Vol. / Rate 100-200 ml/min

**LOW FLOW PURGING DATA**

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (ms/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)	Notes
1201	4.25	200	11.5	30.8	6.91	-115	4.96	55.2	6.80
1204	4.44	200	12.1	29.9	6.88	-115	3.77	45.2	
1208	4.44	200	12.8	31.2	6.66	-115	3.74	44.2	
1212	4.45	200	12.8	31.0	6.10	-115	3.77	52.8	
1215	4.45	200	12.8	31.0	6.66	-115	3.77	56.0	
1218	4.45	200	12.8	31.0	6.66	-115	3.81	52.7	complete
1222	4.45	200	12.8	31.0	6.66	-115	3.81	52.7	

**SAMPLE COLLECTION**

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-52	LD4	3	140A	8260	1225	

Final Measurements:

Purge Volume 400.6 ml Temp. 12.8 Specific Cond. 31.0 pH 6.66 ORP -115 DO 3.81 Turbidity 52.7

As Required:

Field Duplicate							
Field Blank	FB-6	LD4	2	140A	8260	1235	
MSMSD	MW52	LD4	4	140A	8260	1238	

General Notes:

**APPENDIX D:**  
**DATA VALIDATION REPORT**

**DATA VALIDATION**

**FOR**

**UniFirst Project  
Bressett, Wheatley, and UniFirst Sites  
Randolph, Brookfield, and Williamstown, VT**

**ORGANIC ANALYSIS DATA  
Volatile Organics in Water Samples**

**Sample Delivery Group Nos. BRES51, UNIF42, and WHEA17**

**Chemical Analyses Performed by:**

**TestAmerica Burlington  
30 Community Drive Dr. Suite 11  
South Burlington, VT 05403**

**FOR**

**Mr. Gerold Noyes  
VT Department of Environmental Conservation  
Waste Management Division  
103 South Main Street, West Building  
Waterbury, VT 05676-0404**

**Data Validation Report by:**

**Phoenix Chemistry Services  
126 Covered Bridge Rd.  
N. Ferrisburg, VT 05473  
(802)-233-2473**

**January 4, 2012**

Reference #s 2011-1109-001, -1111-002, &-1121-001  
VOA Validation Report/BRES51\_UNIF42\_WHEA17/dhg

**EXECUTIVE SUMMARY**

Phoenix Chemistry Services (Phoenix) has completed the validation of the volatile organics analysis data prepared by TestAmerica Burlington (formerly STL Burlington) for 41 groundwater samples, 8 potable water samples, 1 performance evaluation (PE) sample, 6 field blanks (FB), and 3 trip blanks (TB) from the Bressett Site in Randolph, VT, the UniFirst Site in Williamstown, VT, and the Wheatley Farm site in Brookfield, VT. The laboratory reported the data under Sample Delivery Group (SDG) Nos. BRES51, UNIF42, and WHEA17, which were submitted as three data packages received by Phoenix on November 9, 11, and 21, 2010. These SDGs include the following samples:

Sample Identifier	Laboratory ID
<i>Method 8260B</i>	
<i>SDG No. BRES51</i>	
BRW-1	200-7553-1
BRW-2	200-7553-2
BRW-3	200-7553-3
TB-1	200-7553-4
MW-103RD	200-7602-1
TB-2	200-7602-2
MW-103RS	200-7602-3
MW-104S	200-7602-4
MW-104D	200-7602-5
MW-102D	200-7602-6
MW-102S	200-7602-7
MW-101S	200-7602-8
MW-101D	200-7602-9
MW-4S	200-7602-10
MW-4D	200-7602-11
MW-3S	200-7602-12
MW-3D	200-7602-13
MW-Z	200-7602-14
<i>SDG No. UNIF42</i>	
MW-25884	200-7555-1
BRW-Z	200-7555-2
FB-2	200-7555-3
TB-3	200-7603-1
PZ-101	200-7603-2
PZ-102	200-7603-3
W-2S	200-7603-4
MW-50	200-7603-5
W-19	200-7603-6
W-20	200-7603-7
MW-C	200-7603-8
W-1	200-7603-9

Sample Identifier	Laboratory ID
MW-D	200-7603-10
MW-E	200-7603-11
W-Z	200-7603-12
SP-4	200-7603-13
SP-3	200-7603-14
SS-2	200-7603-15
W-SEEP	200-7603-16
SS-1A	200-7603-17
SS-3	200-7603-18
SS-5	200-7603-19
SS-Z	200-7603-20
FB-4	200-7603-21
<i>SDG No. WHEA17</i>	
MW-PLX	200-7785-1
MW-PL1	200-7785-2
MW-PL2	200-7785-3
MW-S1	200-7785-4
MW-S2	200-7785-5
FB-6	200-7785-6
TB-4	200-7785-7
<i>Method 524.2</i>	
<i>SDG No. BRES51</i>	
BRESSETT KITCHEN TOP	200-7553-5
SHIELDS	200-7553-6
WELL Z	200-7553-7
FB-1	200-7553-8
<i>SDG No. UNIF42</i>	
WP-3	200-7603-22
WP-Z	200-7603-23
WP-5	200-7603-24
WP-7	200-7603-25
WP-8	200-7603-26
WP-13	200-7603-27
WP-23	200-7603-28
FB-5	200-7603-29

A cross-reference table of sample IDs was provided in the data packages. Sample “BRESSETT KITCHEN TAP” was incorrectly logged in as “BRESSETT KITCHEN TOP”; the validator has not corrected this minor error in any forms or reports.

Findings of the validation effort resulted in the following qualifications of sample results:

- Results for bromomethane in samples MW-PLX, MW-PL1, MW-PL2, MW-S1, MW-S2, and FB-6 were qualified as estimated (UJ).
- Results for cis-1,2-dichloroethene in WP-3 and WP-Z were qualified as not detected at the

reporting limit (U).

- Results for chloromethane, vinyl chloride, and chloroethane in sample MW-4S were qualified as estimated (UJ).
- Results for tetrachloroethene in SS-3 and SS-Z were qualified as estimated (J).
- On the basis of suspected errors in the preparation of the performance evaluation sample (PES) vials, all results from the PES analyses are rejected (R) for this sampling round.
- The laboratory appropriately applied “J” qualifiers to the sample Form 1’s when the concentration of an analyte was less than the sample-specific PQL. The validator did not remove these qualifiers.
- All laboratory-specific qualifiers, such as the asterisk (\*), have been removed by the validator.

The Overall Evaluation of Data (Section XVI) summarizes the validation results. The validation findings and conclusions for each analytical parameter are detailed in the remaining sections of this report.

Documentation problems observed in the data packages are described in Section XVII.

This validation report shall be considered part of the data packages for all future distributions of the volatiles (8260B and 524.2) analysis data.

## INTRODUCTION

Analyses were performed according to SW-846 Method 8260B Low Level, as documented in TestAmerica SOP BR-MV-005r8, and SDWA Method 524.2 Rev. 4.1, as documented in TestAmerica SOP BR-MV-005r11, and in accordance with requirements in the Field/Laboratory Coordination Memorandum for Water Monitoring (FLCM), April 2, 2004. The target compound list for the Method 8260B analyses was limited to the OLM03.1 CLP target compound list, and the target compound list for Method 52.4.2 was limited to the OLM03.1 CLP target compound list plus methyl-*tert*-butyl ether (MTBE).

Tentative identification of non-target analyte peaks (i.e., tentatively identified compounds, or TICs) was not requested for these analyses.

Phoenix Chemistry Services' validation was performed in conformance with Tier III guidelines as defined by USEPA Region I in the "Region I EPA-NE Data Validation Manual: The Data Quality System", (12/96 Revision). The data were evaluated in accordance with the "Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses", December 1996. EPA's National Functional Guidelines for Organic Data Review (EPA 540/R-99/008, October, 1999) were also considered during the evaluation, and professional judgment was applied as necessary and appropriate.

The data validation process evaluates data on a technical basis for chemical analyses conducted under the CLP or other well-defined methods. Contract compliance is evaluated only in specific situations. Issues pertaining to contractual compliance are noted where applicable. It is assumed that the data package is presented in accordance with the CLP (CLP-like or SW-846) requirements. It is also assumed that the data package represents the best efforts of the laboratory and has already been subjected to adequate and sufficient quality review prior to submission for validation. In instances where SW-846 or other specific methods have been used for the analyses, the validation effort is modified to acknowledge the differences in methodology while maintaining the goals and quality objectives of the CLP.

Results of sample analyses are reported by the laboratory as either qualified or unqualified; various qualifier codes are used by the laboratory to denote specific information regarding the analytical results. During the validation process, laboratory data are verified against all available supporting documentation. Based on this evaluation, qualifier codes may be added, deleted, or modified by the data validator. Raw data is examined in detail to check calculations, compound identification, and/or transcription errors. Validated results are either qualified or unqualified; if results are unqualified, this means that the reported values may be used without reservation. Final validated results are annotated with the following codes, as defined in the EPA Region I Functional Guidelines:

- U - The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit. The sample quantitation limit accounts for sample specific dilution factors and percent solids corrections or sample sizes that deviate from those required by the method.
- J - The associated numerical value is an estimated quantity.
- UJ - The analyte was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.
- R - The data are unusable (analyte may or may not be present). Resampling and reanalysis is

necessary for verification. The R replaces the numerical value or sample quantitation limit. In some instances (e.g., a dilution) a result may be indicated as “rejected” to avoid confusion when a more quantitatively accurate result is available.

EB, TB, BB - An analyte that was identified in an aqueous equipment (field) blank, trip blank, or bottle blank that was used to assess field contamination associated with soil/sediment samples. These qualifiers are to be applied to soil/sediment sample results only.

These codes are assigned during the validation process and are based on the data review of the results. They are recorded in the Data Summary Table contained in Attachment A, the Organic Analysis Data Sheets (Form I) in Attachment B, and the spreadsheet summary files (Attachment C, submitted electronically) of this validation report.

All data users should note two facts. First, **the "R" qualifier means that the laboratory-reported value is completely unusable.** The analysis is invalid due to significant quality control problems, and provides no information as to whether the compound is present or not. Rejected values should not appear on data tables because they have no useful purpose under any circumstances. Second, **no analyte concentration is guaranteed to be accurate even if all associated quality control is acceptable.** While strict quality control conformance provides well-defined confidence in the reported results, any analytical result will always contain some error.

The user is also cautioned that the validation effort is based on the materials provided by the laboratory. Software manipulation, resulting in misleading raw data printouts, cannot be routinely detected during validation; unless otherwise stated in the report, these kinds of issues are outside the scope of this review.

## **Detailed Findings of Measurement Error Associated with the Analytical Analysis**

### **I. Preservation and Technical Holding Times (Sample Integrity)**

The samples for volatiles analysis in SDG Nos. BRES51, UNIF42, and WHEA17 were collected on October 13, 14, 19, and 20, 2009. All volatiles analyses were performed within the acceptable holding times for preserved water samples (14 days from collection), as required by Region 1. Although not provided in the case narrative (as required by the CLP SOW), the pH of the samples was measured at the time of analysis, and is recorded in the Sample Preparation sections of the data packages. All recorded sample pH values were <2. The FLCM requires that sample pH be checked at the time of receipt; however, the laboratory noted that the chain of custody records and field sample collection sheets indicate that the samples were appropriately preserved with HCl.

The cooler temperatures on receipt at the laboratory were checked and documented in the data packages, and were 6.1, 2.2, 4.1, 3.9, and 4.5 °C, which are within the acceptance range of 4 °C ±2 °C, with the marginally high exception of the cooler received on Oct. 17, 2011, at 6.1 °C. Since this cooler was delivered to the laboratory within two hours of the last sample collection, cooling had been properly initiated, and this temperature is acceptable.

### **II. GC/MS Instrument Performance Check (Tuning)**

The samples were analyzed on a single GC/MS system identified as instrument L. The tuning of this instrument was demonstrated with analysis of 4-bromofluorobenzene (BFB); tunes were analyzed for each shift (12-hour period) during which the samples or associated standards were analyzed. All eleven (11) BFB tunes were correctly calculated, within acceptance limits, and are reported accurately on the Form V summaries in the data packages.

### **III. Initial Calibration (IC)**

One IC (10/26/11) was performed on instrument L in support of the Method 8260B sample analyses, and one IC (9/28/11) was performed on instrument L in support of the method 524.2 sample analyses reported in these data packages. Documentation of all individual IC standards was present in the data packages and relative response factor (RRF) as well as percent relative standard deviation (%RSD) values were correctly calculated and accurately reported on the Form VI summaries.

One or more target compounds were manually integrated in the ICs and CCs performed for this data set. All manual integrations appear to have been properly performed, and are documented within the data packages, including the date and identification of the responsible analyst.

All % RSDs for all three ICs were below the maximum limit (30%) specified by Region I, and all RRF's were above the 0.05 minimum technical criterion, with the following exceptions:

Instrument	IC	Average RRF	
		acetone	2-butanone
L (8260B)	10/26/11	0.0394	0.0208
L (524.2)	9/28/11	0.0407	0.0217

Pursuant to the Region I validation document, results for acetone and 2-butanone in all samples in this data set warranted rejection (R) based on the low RRFs achieved. However, acetone and 2-butanone were spiked at a concentration of 5 µg/L in the matrix spikes, matrix spike duplicates, laboratory control samples, and laboratory control sample duplicates for both methods analyzed with this data set, and acceptable recoveries for both compounds were achieved in these analyses. Therefore, results for acetone and 2-butanone were not qualified on the basis of the low RRFs in the associated ICs on both instruments.

An ICV was analyzed immediately after each IC, as required, and recoveries were correctly calculated and accurately reported in the data packages. All percent differences (%D) in the submitted ICVs were within laboratory established control limits ( $\pm 25$  %D for Method 8260B and  $\pm 30$  %D for Method 524.2), and Region 1 limits for continuing calibrations ( $\pm 25$  %D).

#### **IV. Continuing Calibration (CC)**

Five continuing calibration (CC) standards were run in support of the Method 8260B sample analyses, and three CC standards were run in support of the Method 524.2 sample analyses reported in this data set. Documentation of the CC standards was present in the data packages and RRF as well as percent difference (%D) values were correctly calculated and accurately reported on the Form VII summaries within the data packages.

The maximum limit for %D in the CC standard allowed by Region 1 is  $\pm 25\%$ . All %D results were below this limit for the CC standards for both methods, with the single exception of bromomethane, which exhibited a -26.5 %D in the CC standard analyzed by Method 8260B on 11/3/11 at 13:30. All RRFs were above the 0.05 minimum criterion, with the exceptions of acetone and 2-butanone, in all CC standards for both methods (range: acetone, 0.0355 - 0.0409; 2-butanone, 0.0187 - 0.0223)

On the basis of the unacceptable %D value in the associated CC standard, results for bromomethane in samples MW-PLX, MW-PL1, MW-PL2, MW-S1, MW-S2, and FB-6 were qualified as estimated (UJ). For the reasons discussed in Section III, no results for acetone or 2-butanone were qualified on the basis of the low RRFs in the associated ICs, ICVs, and CCs.

It should be noted that negative % difference values will result in a low bias for positive detects, and a positive % difference will result in a high bias for positive detects.

#### **V. Blanks**

Results for eight (8) water-matrix laboratory method blanks (MBs) were reported in association with this set of samples. No target compounds were detected in any MB for either method, with the single exception of naphthalene, which was found below the reporting limit at 0.07 ug/L in the Method 524.2 method blank identified as MB 200-27040.

Four trip blanks (TBs) were reported in these SDGs. No target compounds were detected in any TB in this sample set. It should be noted that a trip blank for analysis by Method 524.2, which has lower detection limits, was not submitted with the water supply samples collected from the UniFirst or Bressett sites. However, the laboratory reports down to the method detection limit (MDL) for all analytes for Method 8260B, and for the Method 8260B analysis of the associated trip blanks, this concentration is below the quantitation limit for all Method 524.2 analytes, with the exception of methyl-tert-butyl-ether, which is included for analysis by Method 8260B for these samples.

Six field blanks (FBs) were reported in these SDGs; four were analyzed by Method 8260B and two by Method 524.2. No target analytes were detected in any FB, with the exception of FB-5, which was collected with the potable water samples at the UniFirst sites reported in SDG No. UNIF42. Methylene chloride (0.06), cis-1,2-dichloroethene (0.11), and chlorobenzene (0.10) were all reported in the analysis of FB-5 at concentrations below the quantitation limit. The laboratory investigated this analysis, and determined that the FB was analyzed immediately after a sample (the performance evaluation sample, WP-23) containing moderate to high concentrations of these analytes; methylene chloride was detected at 13 ug/L, cis-1,2-dichloroethene above the upper quantitation limit at 32 ug/L, and chlorobenzene above the upper limit also at 32 ug/L in the analysis of WP-23. It is the opinion of the department manager that these results represent instrument carryover that was overlooked at the time of analysis.

Six holding (storage) blanks (HBs) were reported in these SDGs. No target analytes were detected in any HB for either method.

Since naphthalene was not detected in any water supply sample, and methylene chloride was not detected in any ground water sample, no results for naphthalene or methylene chloride were qualified on the basis of laboratory contamination.

On the basis of laboratory contamination, results for methylene chloride, cis-1,2-dichloroethene, and chlorobenzene detected at concentrations within five-fold of those reported in FB-5 in all samples in this sample set analyzed on instrument L by either method were qualified as not detected at the reporting limit (U). Thus, results for cis-1,2-dichloroethene in WP-3 and WP-Z were qualified as not detected at the reporting limit (U).

## **VI. Surrogate Compounds**

Percent recoveries (%R) for all surrogate compounds in Method 8260B were correctly calculated, accurately reported on the Form II summaries within the data packages, and were within acceptance limits for all sample analyses.

No surrogate recoveries were reported for any Method 524.2 analysis. The laboratory SOP includes four surrogate compounds, and these were present in all sample analyses; however, they were reported in the same manner as internal standard compounds (on the Form VIII), and some were labeled as internal standards in the quantitation reports within the raw data sections of the data packages.

The surrogate compounds in the Method 524.2 sample analyses were evaluated from the Form VIII area responses, and were within the acceptance criteria established by the laboratory SOP ( $\pm 30$  % of the area response in the associated continuing calibration standard). The laboratory SOP also defines recovery criteria relative to the associated initial calibration ( $\pm 50$  % of the ion area for that analyte in the IC; it is not specified whether average area or from the mid-point).

## **VII. Internal Standards (IS)**

All IS areas and retention times (RT) were within the established QC limits for all reported sample analyses in these data packages.

### VIII. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Samples W-1, SS-5, MW-4S, and MW-S2 were used for the Method 8260B MS/MSD analyses in this data set. The spiking solutions contained all target compounds at 1 µg/L (except for the ketones at 5 µg/L). Percent recoveries (%R) and relative percent differences (%RPD) between paired recoveries were correctly calculated and accurately reported on the Form III summaries for the spiked analytes.

All recoveries were acceptable (range 85 – 135 %R; overall laboratory-derived control limits: 55 – 150 %R; Region 1 limits 60 – 140 %R) and reproducible (RPD range 0-23%; limit 30% RPD), with the following exceptions:

Parent Sample	Analyte	Native Conc. (ug/L)	% R (MS)	% R (MSD)	Laboratory Limits (%R)	% RPD
W-1	vinyl chloride	nd	124	a	85 - 120	a
	chloroethane	nd	133	a	80 - 125	a
	methylene chloride	nd	123	a	85 - 120	a
	trans-1,2-dichloroethene	nd	123	a	85 - 120	a
	chloroform	nd	121	a	85 - 120	a
	benzene	nd	122	a	85 - 120	a
	1,2-dichloroethane	nd	121	a	80 - 115	a
SS-5	1,1-dichloroethene	nd	a	121	85 - 120	a
	methylene chloride	nd	a	124	85 - 120	a
	trans-1,2-dichloroethene	nd	127	133	85 - 120	a
	cis-1,2-dichloroethene	nd	a	121	85 - 120	a
	1,1,2,2-tetrachloroethane	nd	a	122	85 - 120	a
MW-4S	chloromethane	nd	a	a	65 - 145	<b>36</b>
	vinyl chloride	nd	<b>151</b>	a	85 - 120	<b>40</b>
	chloroethane	nd	<b>171</b>	a	80 - 125	<b>36</b>
MW-S2	chloroethane	nd	a	132	80 - 125	a

a = acceptable    nd = not detected

On the basis of recoveries within Region 1 criteria, no qualifications were deemed necessary for recoveries of the analytes shown slightly above laboratory-established limits in the MS or MSD analyses of samples W-1, SS-5, and MW-S2. On the basis of recoveries above both laboratory upper limits and the Region 1 upper acceptance limit, and/or unacceptably poor precision in the associated MS and MSD analyses, results for chloromethane, vinyl chloride, and chloroethane in sample MW-4S were qualified as estimated (UJ).

Samples BRESSETT KITCHEN TOP and WP-8 were used for the Method 524.2 MS/MSD analyses in this data set. The spiking solution contained all target compounds at 1 µg/L (except for the ketones at 5 µg/L) for both MS/MSD pairs. Percent recoveries and relative percent differences between paired recoveries were correctly calculated and accurately reported on the Form III summaries for the spiked analytes.

All recoveries were acceptable (range 78 – 121 %R; limits: 70 – 130 %R) and reproducible (RPD range 0-22.3%; limit 30% RPD).

All analytes were spiked into the MS/MSD analyses; therefore non-spiked target compounds could not be evaluated against the parent samples to evaluate laboratory precision.

## IX. Field Duplicates

SDG Nos. BRES51, UNIF42, and WHEA17 contained five groundwater and two potable water field duplicate pairs, which were identified by the field sampler as follows:

Field Sample	Field Duplicate
Groundwater	
MW-3D	MW-Z
MW-25884	BRW-Z
MW-D	W-Z
SS-3	SS-Z
MW-PL1	MW-PLX
Water Supply	
SHIELDS	WELL Z
WP-3	WP-Z

Tetrachloroethene was detected at greater than twice the quantitation limit in MW-D, W-Z, MW-3D, MW-Z, MW-PL1, MW-PLX, and SS-3, and just above the quantitation limit in SS-Z. Trichloroethene was detected at greater than twice the quantitation limit in MW-D, W-Z, MW-3D, and MW-Z, and cis-1,2-dichloroethene and total 1,2-dichloroethene were detected at greater than twice the quantitation limit in MW-3D and MW-Z. Carbon disulfide was detected at greater than twice the quantitation limit in WP-Z, and at just less than twice the quantitation limit in WP-3. No other target compounds greater than 2 times the quantitation limit were detected in any of the remaining samples, so precision could not be evaluated for any other detected and non-detected analytes in these field duplicate pairs.

Precision in the field duplicate pairs MW-3D and MW-Z, MW-D and W-Z, MW-PL1, and MW-PLX, and SS-3 and SS-Z was acceptable (less than 30 % RPD) for all target analytes greater than 2 times the quantitation limit, with the following exceptions:

The relative percent difference (RPD) for tetrachloroethene in SS-3 and SS-Z was 51.4 %RPD. On the basis of unacceptable precision in the field duplicate pair, results for tetrachloroethene in SS-3 and SS-Z were qualified as estimated (J).

## X. Sensitivity Check

The aqueous method detection limit (MDL) study for Method 8260B submitted for this project was begun on 11/30/10 and completed on 1/14/11, and the MDL and limit of quantitation (LOQ) verification studies were completed on 2/8/11, which is slightly more than one year prior to the sample analyses in this data set. All analytes had calculated and verified MDLs below the method quantitation limits in the studies.

The aqueous MDL and the MDL verification studies for Method 524.2 submitted for this project were completed on 1/11/11 and 1/14/11, which is also slightly more than one year prior to the sample analyses in this data set. All analytes had calculated and verified MDLs below the method quantitation limits in the MDL study.

More recent verification studies have not been requested for either method. All of the laboratory control samples and the MS and MSD analyses analyzed with the samples for both methods were spiked at 1 µg/L (ketones at 5 µg/L), as required by the FLCM. Recoveries within or above Region 1 acceptance criteria (60 – 140 %R) were obtained for all target analytes in all spiked analyses (except as noted). In addition, the low standard of the initial calibrations for both methods supports the reporting limit for the sample analyses.

## XI. Performance Evaluation (PE) Samples/Accuracy Check

Five zero blind PE samples (commonly known as laboratory control sample, LCS) and duplicate (LCSD) pairs, and three LCS and LCSD pairs were prepared and analyzed by the laboratory at 1 µg/L (ketones at 5 µg/L) in support of the Method 8260B and Method 524.2, respectively, sample analyses in this data set. Laboratory established control limits are 55 – 150 %R overall for Method 8260B, and 70 - 130 % for each analyte for Method 524.2; the Region 1 control limits are 60 – 140 %R. A 30 %RPD limit is shown on the Form III summaries for Method 8260B analyses, and a 20 %RPD limit is shown on the Form III summaries for the Method 524.2 paired analyses.

Percent recoveries were correctly calculated and accurately reported on Form III summaries in the data packages, and were acceptable (85 – 132 %R for Method 8260B, and 83 - 117 %R for Method 524.2) and reproducible (0 - 18 %RPD across both methods) with the following exceptions in the Method 8260B LCS and LCSD analyses:

Batch ID (date)	Analyte	LCS %R	LCSD %R	Laboratory Limits (%R)	% RPD
Method 8260B					
200-27669 (10/27/11)	bromomethane	167	164	55 - 150	a
	methylene chloride	a	124	85 - 125	a
	1,2-dichloroethane	a	116	80 - 115	a
200-27759 (10/28/11)	1,1-dichloroethene	a	121	85 - 120	a
	methylene chloride	a	127	85 - 120	a
200-28201 (11/3/11)	methylene chloride	124	127	85 - 120	a

a = acceptable

No reanalysis was performed for the recoveries above the upper acceptance limits in the LCS/LCSD pairs analyzed for Method 8260B. Since all other recoveries were within Region 1 limits, no results were qualified for the slightly high recoveries of methylene chloride, 1,2-dichloroethane, and 1,1,-dichloroethene in the LCS or LCSD analyses on 10/27/11, 10/28/11, and 11/3/11 for Method 8260B.

Since bromomethane was not detected in associated samples, no results warranted qualification on the basis of recoveries above both laboratory and Region 1 limits in the associated LCS and LCSD samples analyzed on 10/27/11 on instrument L for Method 8260B.

One external single-blind PES sample for Method 524.2 was submitted with the samples in this sampling round. The validator noted numerous disagreements with the vendor's reported concentrations, and requested that the laboratory investigate these anomalous results. The validator interviewed the field sampler regarding the shipping and handling of the PES, and could find no indication that any problems were encountered. The laboratory reported that they could not find any errors in the analyses performed. However, the sample was submitted in triplicate, and the laboratory analyzed all three vials, one at a

dilution, and determined that although two of the vials showed good agreement in the reported concentrations of spiked analytes, the third vial exhibited significantly lower concentrations of the spiked analytes than the other two vials. The vendor has been asked to investigate the preparation of these three vials, but has not yet responded.

On the basis of suspected errors in the preparation of the PES vials, all results from these analyses are rejected (R) for this sampling round.

## **XII. Target Compound Identification**

Reported target compounds were correctly identified with supporting spectra present for all samples in these data packages. All analytes in both methods are reported on the calibration summary forms and in the raw data for calibration samples, spiked analyses, and field samples; however, the spiked analysis summary forms and the sample Form 1s present only the requested target compound list.

## **XIII. Compound Quantitation and Reported Quantitation Limits**

Target compound quantitation and practical quantitation limits (PQLs) were accurately reported on the Form I summaries. Based on screen results, dilution analyses were initially performed for samples MW-101D, MW-3S, MW-3D, and MW-Z to bring results for tetrachloroethene within the upper half of the calibration range for Method 8260B. All dilutions were less than 4-fold, so a full-strength analysis was not required. Also on the basis of screen results, sample WP-23 was initially analyzed at a dilution to bring the result for chlorobenzene within the upper half of the calibration range for Method 524.2. A full-strength analysis was performed and submitted only for sample WP-23; the results for both analyses have been previously rejected.

One or more manual integrations were performed on field samples and spiked analyses. The manual integrations appear to be correctly performed, are initialed by the analyst, and are accurately reported with the final area listed on the tabular report and the before and after ion chromatograms included in the data packages.

“E” qualifiers were appropriately applied by the laboratory to sample Form I results when concentrations of target analytes were greater than the instrument calibration range. “D” qualifiers were appropriately applied by the laboratory to positive results from diluted sample analyses. The validator removed all laboratory-applied “D” and “E” qualifiers.

The laboratory appropriately applied “J” qualifiers to the sample Form I’s when the concentration of an analyte was less than the sample-specific PQL. The validator did not remove these qualifiers.

The values and associated qualifiers that the validator has judged to be acceptable are presented on the Form 1s in Attachment B, and in the “Validated\_Value” and “Validator\_Qualifier” columns, respectively, in both the Data Summary Table in Attachment A and the spreadsheet summary file submitted electronically as Attachment C. The Data Summary Table presents all non-detect results for which the result or qualifier was changed during validation, and all positive results, whether or not the value or qualifier was changed as a result of the validation. All results, positive and non-detect, are listed in the spreadsheet summary. If a value or qualifier was changed, this is indicated by the “Y” (for yes) notation in the “Validator\_Change” column in the Data Summary Table and spreadsheet summary; if the value or qualifier was not changed during the validation effort, this field is marked with an “N” to indicate

“no change”. Sample-specific quantitation limits are given in the summaries (“PQL” or “High Limit”), and may also be found on the laboratory-generated Form I for each sample (Attachment B).

All laboratory-specific qualifiers, such as the asterisk (\*), have been removed by the validator. This is not noted as a validation change.

#### **XIV. Tentatively Identified Compounds (TICs)**

Evaluation of unidentified, non-target analyte peaks was not requested or performed for these samples.

#### **XV. System Performance**

The analytical systems appear to have been operating well at the time of these analyses based on the evaluation of the available raw data.

#### **XVI. Overall Evaluation of Data**

Results for volatile organic compounds were determined to be valid as reported for all samples in SDG Nos. BRES51, UNIF42, and WHEA17, with the following exceptions:

- On the basis of the unacceptable %D value in the associated CC standard, results for bromomethane in samples MW-PLX, MW-PL1, MW-PL2, MW-S1, MW-S2, and FB-6 were qualified as estimated (UJ).
- On the basis of laboratory contamination, results for cis-1,2-dichloroethene in WP-3 and WP-Z were qualified as not detected at the reporting limit (U).
- On the basis of recoveries above both laboratory upper limits and the Region 1 upper acceptance limit, and/or unacceptably poor precision in the associated MS and MSD analyses, results for chloromethane, vinyl chloride, and chloroethane in sample MW-4S were qualified as estimated (UJ).
- On the basis of unacceptable precision in the field duplicate pair, results for tetrachloroethene in SS-3 and SS-Z were qualified as estimated (J).
- On the basis of suspected errors in the preparation of the PES vials, all results from these analyses are rejected (R) for this sampling round.
- The laboratory appropriately applied “J” qualifiers to the sample Form I’s when the concentration of an analyte was less than the sample-specific PQL. The validator did not remove these qualifiers.
- All laboratory-specific qualifiers, such as the asterisk (\*), have been removed by the validator.

Documentation problems observed in the data packages are described in Section XVII.

## **XVII. Documentation**

Chain-of-custody (COC) and internal chain of custody (ICOC) records were present and completed accurately, with the following exceptions:

- Sample “BRESSETT KITCHEN TAP” was incorrectly logged in as “BRESSETT KITCHEN TOP”; the validator has not corrected this minor error in any forms or reports.

Data presentation was acceptable.

This validation report should be considered part of the data packages for all future distributions of the volatiles (8260B and 524.2) analysis data.