Waite
Environmental Management, LLC.

January 20, 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
Bressett Site, Randolph, Vermont (Site #77-0019)

Dear Gerold:

Waite Environmental Management, LLC (WEM) is pleased to present two copies of the *2011 Annual Monitoring Report* for the Bressett Site in Randolph, Vermont. The report provides details and results of the October 2011 (4th Quarter) sampling event, as well as summarizes the results from 1st, 2nd, and 3rd Quarters. This report has been prepared in accordance with the requirements and conditions described in the *State of Vermont Contract for Personal Services* EC13-04.

A digital copy of the report has been uploaded to the VT DEC's ftp site.

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.

Sincerely,

Miles E. Waite, Ph.D.
Principal Hydrogeologist

Enclosure

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2011 ANNUAL MONITORING REPORT

for the

BRESSETT SITE
RANDOLPH, VERMONT

VT DEC Site #77-0019

January 20, 2012

Prepared for:

STATE OF VERMONT
Vermont Department of Environmental Conservation
Waste Management Division
103 South Main Street, West Building
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TABLE OF CONTENTS

Section **Page**

1.0 INTRODUCTION 1

2.0 GROUNDWATER SAMPLING 2

2.1 GROUNDWATER MONITORING WELL REPLACEMENT 2
2.2 GROUNDWATER LEVEL MEASUREMENT 3
2.3 GROUNDWATER SAMPLE COLLECTION 4
2.4 DISCUSSION OF RESULTS 5
2.4.1 Field Geochemical Data 5
2.4.2 Laboratory Data 5
2.4.3 QA/QC Samples 7
2.5 DISCUSSION OF DATA VALIDATION 7
2.6 RECOMMENDATIONS 8

3.0 WATER SUPPLY SAMPLING 9

3.1 WATER SUPPLY SAMPLE COLLECTION 9
3.2 DISCUSSION OF RESULTS 10
3.2.1 QA/QC Samples 10
3.3 DISCUSSION OF DATA VALIDATION 10
3.4 RECOMMENDATIONS 11

4.0 SURFACE WATER SAMPLING 12

4.1 SURFACE WATER SAMPLE COLLECTION 12
4.2 DISCUSSION OF RESULTS 12
4.2.1 QA/QC Samples 13
4.3 DISCUSSION OF DATA VALIDATION 13
4.4 RECOMMENDATIONS 13

5.0 INDOOR AIR SAMPLING 14

5.1 AIR SAMPLE COLLECTION 14
5.2 DISCUSSION OF RESULTS 15
5.2.1 QA/QC Samples 16
5.3 DISCUSSION OF DATA VALIDATION 16
5.4 RECOMMENDATIONS 16

6.0 REFERENCES 17

LIST OF APPENDICES

Appendix A: Figures

Site Location Map
Site Plan
Groundwater Elevation Contour Map: April 2011
Groundwater Elevation Contour Map: October 2011
CVOC Concentration Contour Map: April 2011
CVOC Concentration Contour Map: October 2011

Appendix B: Tables

Table 1.1 Groundwater Elevation Measurements: 2010-2011
Table 1.2 Dissolved Oxygen Field Measurements: 2007-2011
Table 1.3 Specific Conductance Field Measurements: 2007-2011
Table 1.4 Temperature Field Measurements: 2007-2011
Table 1.5 pH Field Measurements: 2007-2011
Table 1.6 Turbidity Field Measurements: 2007-2011
Table 1.7 Redox Potential Field Measurements: 2007-2011
Table 2.0 Monitoring Well Results: 2008-2011
Table 3.0 Supply Well Results: 2007-2011
Table 4.0 Surface Water Quality Results: 2002-2011
Table 5.0 Indoor Air Quality Results: 2002-2011

Appendix C: Graphs

PCE in Groundwater: MW-3S & MW-3D
PCE in Groundwater: MW-101S & MW-101D
PCE in Groundwater: MW-4S & MW-4D
PCE in Groundwater: MW-102S & MW-102D
Indoor Air Summary: PCE in Voner 1st Floor
Indoor Air Summary: PCE in Voner Basement
Indoor Air Summary: TCE in Voner 1st Floor
Indoor Air Summary: TCE in Voner Basement

Appendix D: Field Data Sheets: 4TH Quarter

Appendix E: Data Validation Report: 4TH Quarter

1.0 INTRODUCTION

The following *2011 Annual Monitoring Report* for the Bressett Site in Randolph, 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, drinking water, surface water, and indoor air sampling conducted by WEM during 2011. Monitoring locations were in the vicinity of the former Bressett Residence, Vermont Route 12, and Town Road #23. Events covered in this report include:

- Sampling of thirteen (13) groundwater monitoring wells during April and fifteen (15) monitoring wells in October 2011.
- Sampling of one (1) active supply well in April and October 2011.
- Sampling of one (1) active spring water system during April and October 2011.
- Sampling of two (2) surface water locations in July 2011.
- Sampling of indoor air at two (2) indoor locations inside a residence in January and July 2011.
- Replacement of monitoring wells MW-103S/D with new wells MW-103RS/RD in May 2011.

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

All results except those from October (4th Quarter) 2011, which are discussed in this report, have been previously reported by WEM [4, 5, 6].

2.0 GROUNDWATER SAMPLING

Groundwater monitoring well sampling was conducted by WEM from a total of thirteen (13) wells on April 26-27, 2011 and from fifteen (15) wells on October 17-18, 2011. Wells sampled included six paired monitoring wells (MW-3S/D, MW4-S/D, MW-101S/D, MW-102S/D, MW-103RS/D, MW-104S/D) and three bedrock monitoring wells (BRW-1, BRW-2, BRW-3). In addition, groundwater elevation measurement was conducted on an additional three (2) wells (MW-1 and MW-2S). All wells are in the general vicinity of the former Bressett residence, as shown in the Site Plan in Appendix A.

Sampling was conducted in accordance site protocols as specified in WEM's Work Plan and the FLCM-Water with the exception of wells MW-103S and MW-103D in April 2011. These wells were buried during the summer of 2010 during bridge reconstruction work on Town Road #23, and could not be sampled. These wells were subsequently replaced in May 2011 with wells MW-103RS and MW-103RD and then sampled in October 2011.

Details and results of the sampling events are described below.

2.1 Groundwater Monitoring Well Replacement

On May 27, 2011 WEM oversaw the installation of replacement wells MW-103RS and MW-103RD. The original wells (MW-103S and MW-103D) were located on the west side of Town Road #23 in the swale next to the road. The road was widened during bridge replacement work in the summer of 2010 and the wells were buried and damaged beyond repair. The VT DEC decided it was necessary to replace the wells, so a location on the east side of the road was chosen, approximately 30 ft from the original well locations. The replacement wells are shown as MW-103R in the Site Plan in Appendix A. The location and method for well replacement were proposed in WEM's *Work Plan/Cost Estimate for Well Replacement, Bressett Site, Randolph, Vermont* dated February 1, 2011 and approved by the VT DEC.

The borings were advanced using direct push methods by Specialty Drilling and Investigation, Inc. (SDI) of Burlington, Vermont. Continuous soil samples were collected using a 1¾" O.D. x 48" long steel sampler lined with a clear soil tube. Soil samples were logged by a WEM geologist. Boring MW-103RD was overdrilled to a depth of 28 ft below grade (ft bg) in an effort to penetrate a gravel layer that was encountered during the drilling of the original well MW-103D by the Johnson Company in 1998. However, no gravel layer was encountered; the stratigraphy was observed to be fine sand with interbedded layers of silt to a depth of 16 ft bg, followed by lean clay to a depth of 28 ft. Saturated conditions were observed between a depth of 7-8 ft bg. The bottom till (coarse sand and gravel with sub-angular pebbles) that was encountered in the original well at 19-24 ft bg was not encountered. Boring MW-103RS was drilled to a depth of 9 ft bg through a similar stratigraphy, with the screened interval being within the fine sand and silt.

WEM used a IonScience Phocheck 2000 Ex (10.6 eV) photo-ionization detector (PID) to screen the soils for the presence of VOCs during drilling. A plastic bag headspace method was used, wherein a composite soil sample from the 4-foot sampler tube was placed into a reclosable plastic bag approximately ½ full, and was allowed to equilibrate for at least 2 minutes. After equilibration, the bag was cracked open and the PID probe inserted to obtain the measurement. The PID was calibrated in the field on the day of drilling to an isobutylene standard. VOCs were not detected above 0.0 parts per million (ppm), and no visual or olfactory evidence of VOC contamination was encountered.

Upon completion to depth, both borings were re-bored with 3" O.D. BW casing with a disposable tip and then fitted as groundwater monitoring wells. Well MW-103RD was constructed using 1.9-inch O.D. (0.75-inch I.D.) schedule 40 PVC pre-pack screen (screened interval 21-16 ft bg) with 0.75-inch I.D schedule 40 PVC riser to above grade. As the BW casing was pulled up, heaving of the sand was observed to a depth of 16 ft bg. Sandpack was added to the bore to a final height of 14 ft bg, followed by granular bentonite to a depth of 3 ft bg. Well MW-103RS was also constructed with 1.9-inch O.D. schedule 40 PVC pre-pack screen (screened interval 9-4 ft bg), 0.75-inch I.D schedule 40 PVC riser to above grade, sandpack to 4 ft bg, followed by granular bentonite to a depth to 2 ft. Both wells were finished with steel stick-up well guards that were cemented into the ground.

Both wells were developed on July 28, 2011 using a peristaltic pump with dedicated tubing. Approximately 1 gallon of very silty water was developed from MW-103RD with no indication of clearing. Approximately 500 ml of silty water was developed from MW-103RS before it was purged dry. Also on July 28, 2011, the top-of-casing (TOC) elevations of the replacement wells was surveyed by WEM using a Nikon NPL 32 total station; the TOC elevation of existing well MW-102D was used as a reference elevation. The new TOC elevation for well MW-103RD was measured as 708.10 ft (NVGD88), and the new TOC elevation for MW-103RS was measured at 707.06 ft.

2.2 Groundwater Level Measurement

Prior to sampling, the water level in each well was measured with a water level probe. Using top-of-casing elevation data, the measurements were converted into groundwater elevations. Elevation data from April and October 2011 are shown with historical measurements in Table 1.1 in Appendix B. These data indicate the following:

- Groundwater elevation measurements in April 2011 were higher than the previous springtime round of sampling, and were higher by an average of 0.75 ft than the typical springtime measurements from 2002-09.
- Groundwater elevation measurements in October 2011 were lower than the previous fall round of sampling, but were similar to fall measurements from 2002-09.
- Groundwater elevations fluctuate slightly with the seasons, and are typically higher in the spring than in the fall, often by several feet. The April 2011 average elevation (shallow wells only) was 2.85 feet higher than the October 2011 average elevation.

Groundwater elevations were also plotted to develop groundwater elevation maps for each sampling event (see Appendix A). As these maps show, the general direction of groundwater flow (based on shallow well data) was toward the southwest during both the spring and fall. The lateral hydraulic gradient, as calculated between MW-3S and MW-102S, was 0.039 ft/ft in April 2011 and 0.037 ft/ft in October 2011. Vertical hydraulic gradients calculated between the paired wells (see Table 1.1) were generally negligible except in paired well MW-101S/D which had a downward vertical gradient of 0.09 ft/ft in both April and October; this well pair consistently has a measurable downward vertical gradient. The replacement well pair MW-103RS/D also had a downward vertical gradient of 0.08 ft/ft during the first round of sampling in October.

2.3 Groundwater Sample Collection

Overburden monitoring wells MW-101S/D, MW-102S/D, MW-103RS/D, MW-104S/D were purged and sampled using a low-flow methodology. These monitoring wells were purged 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. Purge rates ranged between 20-300 milliliters/minute (ml/min). 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. 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.

Bedrock monitoring wells BRW-1, BRW-2, and BRW-3 were also purged and sampled using the low flow methodology as described above. However, the pump used was a submersible (Grundfos Redi-Flo II) with dedicated flexible tubing. The pump was decontaminated with Alconox and deionized water prior to use and after use in each well. Purge rates and pump intake depths were as dictated by the site protocols. With the higher purge rates, the flow cell for the water quality meter could not be utilized, so water samples were regularly collected in a glass jar in which the probes for the water quality meter were inserted. Upon stabilization, samples were collected directly from the outlet of the disposable tubing.

Overburden monitoring wells MW-3S, MW-4S, and MW4-D were purged using dedicated bailers and well MW-3D is purged with the combination of a peristaltic pump and a bailer. Purge volumes were calculated as three (3) times the volume of water in the well. Upon reaching the desired purge volume in each well, a small volume of the water was collected in a glass jar in which the probes for the water quality meter were inserted. Samples were then poured directly from the bailers into the sampling containers.

In all cases, the order of sample collection was as dictated by site protocols, and all samples were collected in pre-acidified sampling containers supplied by the laboratory and immediately placed on ice in a cooler. All samples were delivered by WEM to Test America laboratory (TA) of South Burlington, Vermont for analysis of volatile organic compounds via EPA Method 8260B. The following four target VOCs are monitored as part of this project: tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), and trans-1,2-dichloroethene (trans-1,2-DCE). Results, in micrograms per liter (ug/L), are discussed below.

2.4 Discussion of Results

2.4.1 Field Geochemical Data

Field geochemical parameter measurements are summarized in Tables 1.2 through 1.7 in Appendix B. The following observations were made based on comparison of the April and October 2011 data with historical data:

- **Dissolved Oxygen**: readings were generally elevated in April and October, with particularly high readings recorded at MW-3S and MW-4S (April) and MW-102S (October).
- **Specific Conductance**: April and October readings were within the range of historical measurements with no anomalies or clear trends noted.
- **pH**: April and October readings were within the range of historical measurements with no anomalies or clear trends noted.
- **Turbidity**: April and October readings were within the range of historical measurements with no anomalies or clear trends noted.
- **Redox**: April and October readings were within the range of historical measurements with no anomalies or clear trends noted.

Parameter measurements from new replacement well pair MW-103RS/D were compared to the old well pair MW-103S/D, and while there are not enough data to develop any clear trends, the new wells have a slightly elevated pH and noticeably elevated turbidity. In particular, while deep well MW-103D typically had a low to moderate turbidity, deep well MW-103RD is very turbid. This turbidity may be due to the fact that the well is new and more time and purging is needed to fully develop the well.

2.4.2 Laboratory Data

Validated laboratory analytical results are summarized in Table 2.0 in Appendix B. Full copies of the laboratory reports are presented in the Data Validation Reports [8, 11] prepared by Phoenix Chemistry Service, on file at the VT DEC offices in Waterbury.

The analytical results for the target compounds of interest during April and October 2011 are described below:

PCE

- PCE was detected above reporting limits in wells MW-3S, MW-3D, MW-4D, MW-101S, MW-101D, and MW-102S during both events. PCE was detected above the reporting limit in MW-4S during October but was estimated below the reporting limit in April 2011.
- PCE was not detected above reporting limits in any of the following wells: MW-102D, MW-103RS/D, MW-104S/D, BRW-1, BRW-2, or BRW-3.
- PCE concentrations increased between April and October 2011 in wells MW-3S and MW-102S, decreased in MW-3D, and were stable in MW-4S, MW-4D, MW-101S, and MW-101D.
- With the exception of brief increasing trend in PCE concentrations in well MW-102S between 2005 and 2007, PCE has generally been decreasing or stable with time.

TCE

- TCE was detected above reporting limits in wells MW-3S, MW-3D, MW-101S, MW-101D, and MW-102S during both events.
- TCE was not detected above reporting limits in any of the following wells: MW-4S, MW-4D, MW-102D, MW-103RS/D, MW-104S/D, BRW-1, BRW-2, or BRW-3 during either event.
- TCE increased between April and October 2011 in wells MW-3S and MW-102S, decreased in MW-3D, and was stable in MW-101S and MW-101D.
- TCE has generally been decreasing or stable with time.

cis-1,2-DCE

- cis-1,2-DCE was detected above reporting limits in wells MW-3S, MW-3D, MW-101D, and MW-102S during both events. cis-1,2-DCE was detected at a trace concentration (estimated below reporting limit) in well MW-101S during both April and October 2011.
- cis-1,2-DCE was not detected above reporting limits in wells MW-4S, MW-4D, MW-102D, MW-103RS/D, MW-104S/D, BRW-1, BRW-2, or BRW-3 during either event.
- cis-1,2-DCE increased between April and October 2011 in wells MW-3S and MW-102S, decreased in MW-3D, and was stable in MW-101S and MW-101D
- cis-1,2-DCE has generally been decreasing or stable with time.

trans-1,2-DCE

- trans-1,2-DCE was detected at estimated concentrations below the reporting limit in wells MW-3S, MW-3D, MW-101D, and MW-102S in both April and October 2011.
- trans-1,2-DCE was not detected above reporting limits in any of the following wells: MW-4S/D, MW-101S, MW-102D, MW-103RS/D, MW-104S/D, BRW-1, BRW-2, or BRW-3.
- No significant trends in trans-1,2-DCE concentrations were noted.

Compared to Vermont groundwater enforcement standard ("VGES") [12] most of the reported PCE and TCE concentrations were above the 5.0 ug/L standard for each compound. Wells out of compliance with VGES for PCE and/or TCE during both the April and October 2011 events include: MW-3S/D, MW-101D, and MW-102S. Well MW-4D was below the 5.0 ug/L standard for PCE in April, but just above in October.

To compare the 2011 results to historical groundwater results, PCE concentrations were plotted against time (see graphs in Appendix C). As these graphs show, long-term concentration trends are generally decreasing or stable with time for wells. The wells that are not shown in the graphs in Appendix C are generally steadily non-detect with time.

Regarding the distribution of CVOC contamination, the plume continues to extend in a general northeast/southwest orientation between wells MW-3S/D and MW-102S/D. The approximate limits of the plume during 2011 are shown in the maps in Appendix A. The dimensions have not changed significantly from previous years. It should also be noted that, like the predecessor wells MW-103S/D, replacement wells MW-103RS/D have no detectable CVOC contamination and continue to show that the plume of CVOC contamination does not extend to the Ayers Brook.

2.4.3 QA/QC Samples

As part of the quality assurance/quality control (QA/QC) program, WEM collected field duplicate samples during the April and October 2011 sampling events. During April, sample "MW-X" was conducted in conjunction with MW-3D. During October, sample "MW-Z" was collected in conjunction with MW-3D. Duplicate samples were analyzed by TA using the same method (EPA Method 8260B). In all cases precision in these field duplicate samples was acceptable (less than 30% RPD) for all target analytes greater than 2 times the quantitation limit.

During each day of sampling for the April and October sampling events, one field blank was prepared and one pre-containerized trip blank was added to the cooler and submitted for analysis by EPA Method 8260B. No target compounds were reported in any field blank or trip blank sample collected at the site during 2011.

2.5 Discussion of Data Validation

The laboratory data from the April and October 2011 sampling events 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 Reports [8, 11] on file at the VT DEC offices in Waterbury. The text of the data validation report for the October 2011 sampling event is included in Appendix E.

Results for target volatile organic compounds in groundwater collected from the Site during April and October 2011 were determined to be valid as reported for all samples with the following exception:

- On the basis of laboratory contamination, the April 2011 results for TCE in samples BRW-3, BRW-2, BRW-1, BRW-X, FB-1, and MW-104S were qualified as less than the reporting limit (U).

There were qualifications for non-target compound (acetone, carbon tetrachloride, chloromethane, etc.) as well as some documentation and compliance issues noted for both sample groups, but none that directly affected the validity of the groundwater data.

2.6 Recommendations

Based on the above information, overburden groundwater at the Site continues to show evidence of chlorinated VOCs at concentrations that exceed applicable enforcement standards. Given these conditions, WEM recommends continuing the groundwater monitoring program as specified in the Work Plan and FLCM-Water. The next sampling event is scheduled for April 2012.

3.0 WATER SUPPLY SAMPLING

Water supply sampling was conducted by WEM from the active bedrock well at the former Shields residence (now Hammond) and from the shallow spring that supplies the former Bressett residence (now Vonner) on April 28 and October 17, 2011. The water supply sampling locations are the bedrock well at the former Shields residence on Town Road #23 and the spring system in the former Bressett Residence on Route 12. Sampling locations are shown in the Site Plan in Appendix A.

In October-November 2009 the water line from the Bressett Spring was replaced with a new copper line, and the water holding tank in the basement of the residence was replaced, both part of an effort to stop the migration of PCE into the water system.

Sampling from the Sheilds Well was conducted in accordance with WEM's Work Plan and with the FLCM-Water. Sampling from the Bressett Spring was conducted in a different manner than specified in the FLCM-Water, as has been the case since 2006. Instead of sampling directly from the spring tile, this spring is now sampled from the kitchen tap; a pre-filter sample was also collected upstream from the kitchen tap during 2008-2011, but this routine ceased starting in October 2011. Details and results of the water supply sampling events are described below.

3.1 Water Supply Sample Collection

The Bressett Spring is the primary water supply for the former Bressett residence, currently owned and occupied Joe and Joanne Voner. The cement spring tile is located on the hill northeast of the house and extends above the ground surface covered by a cement top. A buried water line (former plastic, now copper) connects the spring to an approximately 300-gallon holding tank in the basement of the residence. A particulate filter is present downstream of the holding tank. It should be noted that this filter is now a standard string-wound filter and no longer an activated carbon "Taste & Odor Cartridge" that was formerly used to "treat" the water. The holding tank is connected to a float activated jet pump, which pumps water to a 30-gallon pressure tank, and then is distributed throughout the house.

In April 2011, WEM purged the system of at least 30 gallons and then collected one (1) sample directly from the kitchen tap with the filter installed and then collected one (1) "pre-filter" sample from upstream of the holding tank. In October 2011, WEM purged the system but only collected a sample from the kitchen tap.

The Shields well is accessed via the hand-activated pump on the well head. During both April and October 2011 the well was purged of approximately 50 gallons prior to sampling. The sample was colleted directly from the hand pump discharge nozzle.

All samples were delivered by WEM to TA. Water supply samples were submitted for analysis of volatile organic compounds via EPA Method 524.2. Results for PCE, TCE, cis-1,2-DCE and trans-1,2-DCE are discussed below.

3.2 Discussion of Results

Validated laboratory analytical results are summarized in Table 3.0 in Appendix B. Full copies of the laboratory reports are presented in Data Validation Reports prepared by Phoenix Chemistry Service [8, 11].

The analytical results indicate the following:

- No target VOCs were detected above reporting limits in the Bressett kitchen tap sample during either April or October 2011.
- No target VOCs were detected above reporting limits in the Bressett pre-filter sample during April 2011.
- No target VOCs were detected above reporting limits in the Shields Well during either April or October 2011.

Historical results indicate that the Shields well is regularly free of detectable VOCs. However, PCE was regularly detected at very low concentrations at the Bressett locations during 2006-08, attributed to diffusion or penetration into the buried polyethylene water pipe. The lack of PCE in the water supply during both 2011 sampling events is a result of the replacement of this buried water pipe with a new copper line in the fall of 2009. With the new piping and a conventional sediment filter in use, WEM does not see continued need for sampling upstream of the filter and recommends future sampling from the kitchen tap only.

3.2.1 QA/QC Samples

As part of the QA/QC program, WEM collected field duplicate samples during each sample event. During both April and October 2011, "Well-Z" was collected in conjunction with the Shields Well. Each sample was analyzed by TA using the same method (EPA Method 524.2). No target compounds were detected at concentrations greater then 2 times the quantitation limit in any sample, so precision could not be evaluated.

WEM also prepared field blanks and added pre-made trip blanks to the cooler during each day of water supply sampling in April and October 2011. All samples were submitted to TA for analysis by EPA Method 524.2. No target compounds were reported in any of these blank samples.

3.3 Discussion of Data Validation

The laboratory data from the April and October 2011 sampling events 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 Reports [8, 11] on file at the VT DEC offices in Waterbury. The text of the data validation report for the October 2011 sampling event is provided in Appendix E.

Results for target volatile organic compounds in supply well water collected from the Site during April and October 2011 were determined to be valid as reported for all samples.

There were some documentation and compliance issues noted for both sample groups, but none that directly affected the validity of the supply well data.

3.4 Recommendations

Due to former presence of PCE in at the point of entry of the former Bressett residence in 2006-2008 and the continuing presence of chlorinated VOCs in the overburden aquifer, WEM recommends continuing with the supply well monitoring program as specified in the *Work Plan* and *FLCM-Water* with the exception of reducing the water supply sampling at the former Bressett residence to a single sampling location only. The next water supply sampling event is scheduled to occur in April 2012.

4.0 SURFACE WATER SAMPLING

Surface water sampling was conducted by WEM on July 28, 2011. Sampling was conducted in accordance with WEM's *Work Plan* and with the *FLCM-Water*. As dictated by the *Work Plan*, there had been at least 36 hours without precipitation prior to the collection of surface water samples (weather tracking data from Knapp State Airport in Barre, Vermont).

Details and results of the water sampling event are described below.

4.1 Surface Water Sample Collection

WEM collected two (2) surface water samples on July 28, 2011. Regular sampling locations, labeled as SW-1 and SW-2 in the Site Map in Appendix A, are along the Howard Hill Brook, and an unnamed tributary of the Ayers Brook. The unnamed tributary of the Ayers Brook (SW-1) had only a trickle of flow measured at less than 1 gallon per minute (gpm). This sample was collected by dipping the sample container directly into the pool of water. The Howard Hill Brook sample (SW-2) was also collected by dipping the container into the stream at the middle of the channel. The Brook was flowing at an approximate rate of 75 gpm. Flow rate at SW-1 was measured using a measuring cup below a 4-in diameter pipe placed in a narrow portion of the stream channel. Flow at SW-2 was measured upstream of the sample by measuring the stream flow velocity and calculating the stream channel area in the culvert that underlies Route 12.

All samples were delivered by WEM to TA for analysis of volatile organic compounds via EPA Method 8260B on the day of sampling. Results for PCE, TCE, cis-1,2-DCE and trans-1,2-DCE are discussed below.

4.2 Discussion of Results

Surface water sampling results from July 2011 are summarized in Table 4.0 in Appendix B. These results have been validated by an independent validator (see Section 4.3). Full copies of the laboratory report are presented in the data validation report on file in Waterbury.

The laboratory results indicate that target VOCs were <u>not</u> reported above quantitation limits in either sample collected during the July 2011 sampling event. Based on results dating back to 2001, target VOCs are not regularly detected at these two sampling locations.

4.2.1 QA/QC Samples

As part of the QA/QC program, WEM collected one (1) field duplicate sample (SW-X) on July 28, 2011. This sample was collected in conjunction with the sample SW-2 and analyzed by TA using the same method (EPA Method 8260B). No target compounds were detected in sample SW-2 or SW-X, so precision could not be evaluated in this field duplicate pair.

WEM also submitted one (1) trip blank one (1) field blank (FB-1) as part of the July 2011 sampling event for analysis by EPA Method 8260B. No target compounds were reported in either sample.

4.3 Discussion of Data Validation

The laboratory data 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 report [9] on file at the VT DEC offices in Waterbury.

The findings of the validation effort resulted in no qualifications of sample results.

While there was some minor documentation issues, these issues do not directly affect the validity of the analytical data.

4.4 Recommendations

Due to the continuing presence of chlorinated VOCs in the overburden aquifer as described in Section 2.0, WEM recommends continuing the surface water monitoring program as specified in the Work Plan and FLCM-Water. The next sampling event is scheduled for July 2012.

5.0 INDOOR AIR SAMPLING

Indoor air sampling was conducted at the former Bressett residence by WEM on January 31 and July 29, 2011. Sampling was conducted in accordance with WEM's Work Plan and with the FLCM-Air. Details and results of the air sampling event are described below.

This is the second year of indoor air sampling since a vapor mitigation system has been installed in the basement of the residence that utilizes an airtight membrane over the fieldstone foundation walls combined with active depressurization of the basement space via a perforated pipe and fan system behind the membrane. The success of this work is discussed in Section 5.2.

5.1 Air Sample Collection

A total of two (2) air samples were collected from the residence on January 31 and July 29, 2011. The 1st floor sample ("BRST1FLR") was collected from the office off the kitchen on the east side of the house[1], and the basement ("BRSTBSMT") sample was collected from the northeastern portion of the basement, halfway between the stair and the north wall.

Samples were collected by WEM using 6-liter stainless steel Silco air canisters. The canisters and flow controllers were procured by WEM from TA prior to sampling. The flow controllers were all calibrated by TA to provide a flow rate that allowed a final canister pressure between -7.0 and -2.0 inches of Mercury (in Hg) below ambient pressure after a run time of approximately 4 hours. The cleanliness of each canister was individually certified by TA. Prior to use of the canisters, WEM reviewed the "Air Canister Cleaning Logs and Clean Canister Certification Report" and the "Mass Flow Controller Set Flow Rate & Leak Check Record" and did not find any problems.

The sampling procedure at each site involved setting up the canister at the designated sampling location, attaching a digital pressure gauge to measure initial pressure and comparing it to the pressure recorded by laboratory, attaching the flow controller, recording initial canister pressure from the analog pressure gauge, recording ambient pressure and temperature, and then opening the valve to initiate the sample collection. Ambient pressure values were obtained in the morning and afternoon from the Knapp State Airport, and ambient temperature was recorded using a digital thermometer or the thermostat in the sampling location. Samples were allowed to run for approximately 4 hours. Upon completion, a second digital pressure gauge measurement is made and recorded along with the analog pressure gauge measurement.

1 This room has previously been a bedroom and a "craft room" during previous sampling events.

No significant problems were encountered during either sampling event and all sampling procedures were in accordance with the *Work Plan* and acceptable final canister pressures were attained.

All samples were delivered by WEM to TA under chain-of-custody procedures for analysis of the four target volatile organic compounds: PCE, TCE, cis-1,2-DCE, and trans-1,2-DCE. Analysis was by Method TO-15 (Low Level). Results, in parts per billion (ppbv), are discussed below.

5.2 Discussion of Results

Air sampling results from January and July 2011 are summarized in Table 5.0 in Appendix B. These results have been validated by an independent validator (see Section 5.3). A full copy of the laboratory reports are presented in the data validation reports [7, 10] on file in Waterbury.

The results indicate that one or more of the target compounds were reported in both of the indoor air samples collected during January and July. During January, both the 1st floor and basement samples had reported concentrations of PCE, TCE, cis-1,2-DCE, and trans-1,2-DCE. During July, both the 1st floor and basement samples had reported concentrations of PCE. In addition, the July basement sample had reported concentrations of TCE and cis-1,2-DCE. The compound trans-1,2-DCE was not detected in either the basement sample or the 1st floor sample.

The Vermont Department of Health (DOH) has developed indoor air guidance levels of 1.0 ppbv for PCE and TCE (based on statewide study titled *Indoor Ambient Air Survey Results, Yearly Sampling Between 12/21/91 and 12/20/92*). The US EPA has developed risk-based guidelines (Region III RBCs for ambient air, 2002 table) that are used for cis-1,2-DCE and trans-1,2-DCE. Based on the January 2011 results, the PCE concentrations detected on the 1st floor and the basement are both <u>above the DOH guidance level</u>. Based on the July 2011 results, the PCE concentrations detected on the 1st floor and the basement are both <u>below the DOH guidance level.</u> The concentrations of TCE, cis-1,2-DCE and trans-1,2-DCE were below applicable guidelines during both sampling events.

Based on historical results dating back to 1997 (see graphs in Appendix B), the presence of target compounds inside the house, particularly PCE, is not unusual. However, the PCE concentrations reported in 2010 and July 2011 are all much lower than they have been historically, indicative that the vapor mitigation system that was installed in the basement in the fall of 2009 is working successfully to reduce indoor contaminant concentrations and provide safer conditions inside the residence. The increase in PCE back to pre-2009 levels during the January 2011 event cannot be explained, as the system appeared to be operating at the time of sampling.

5.2.1 QA/QC Samples

As part of the quality assurance/quality control (QA/QC) program, WEM collected field duplicate samples during both the January and July events. In both cases, the duplicate sample (FD-2) was collected in conjunction with the sample from the basement (BRSTBSMT). During both events, relative percent difference (RPD) values for all detected analytes were acceptable (<25 %RPD) in the field duplicate pair FD-2 and BRSTBSMT.

WEM also submitted one trip blank during each event for analysis by Method TO-15. No target compounds were reported in the trip blank.

5.3 Discussion of Data Validation

The laboratory data 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 reports [7, 10] on file at the VT DEC offices in Waterbury.

Results for target volatile organic compounds in air collected from the Site during January and July 2011 were determined to be valid as reported for all samples.

While there were some laboratory documentation issues noted in the reports, these issues did not directly affect the validity of the analytical data.

5.4 Recommendations

Given the presence of VOCs in the overburden groundwater and historical indoor air sampling results, WEM recommends that air sampling continue as specified in the Work Plan and FLCM-Air. The 2012 sampling schedule will be January and July.

6.0 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. Waite Environmental Management, LLC, *1st Quarter 2011 Monitoring Report, Bressett Site, Randolph, Vermont,* April 14, 2011.

5. Waite Environmental Management, LLC, *2nd Quarter 2011 Monitoring Report, Bressett Site, Randolph, Vermont,* August 8, 2011.

6. Waite Environmental Management, LLC, *3rd Quarter 2011 Monitoring Report, Bressett Site, Randolph, Vermont,* November 16, 2011.

7. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Williamstown and Bressett Sites, Williamstown and Randolph, VT, Organic Analysis Data, Selected Volatiles in Air Samples (Sample Delivery Group No. 200-3621, March 22, 2011.*

8. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Bressett and UniFirst Sites, Randolph and Williamstown, VT, Organic Analysis Data, Volatile Organics in Water Samples, Sample Delivery Group Nos. BRES49 and UNIF40, June 16, 2011.*

9. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Bressett and UniFirst Sites, Randolph and Williamstown, VT, Organic Analysis Data, Volatile Organics in Water Samples, Sample Delivery Group Nos. BRES50 and UNIF41, September 15, 2011.*

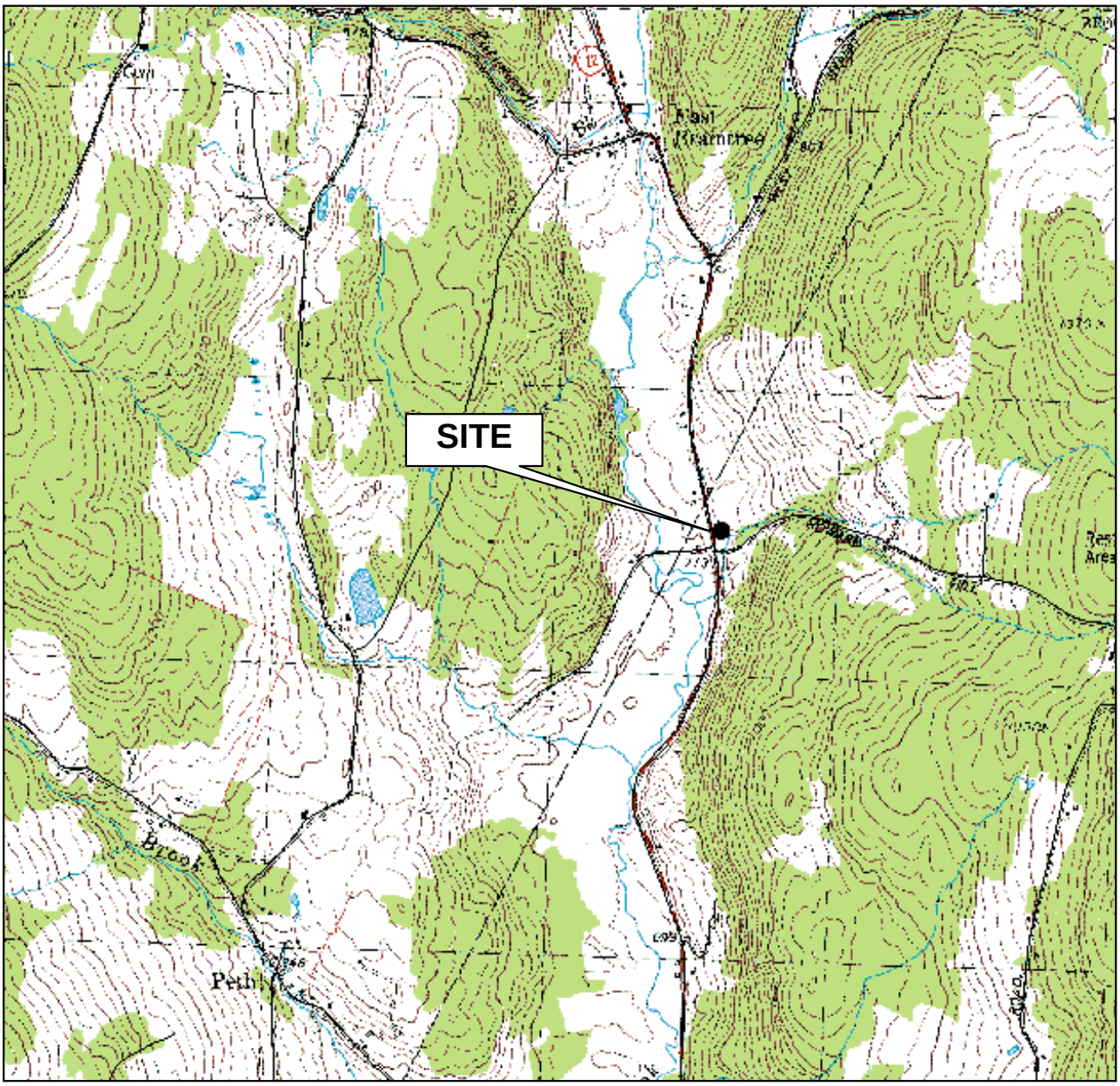
10. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Williamstown and Bressett Sites, Williamstown and Randolph, VT, Organic Analysis Data, Selected Volatiles in Air Samples (Sample Delivery Group No.200-6293), September 21, 2011.*

11. 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.

12. State of Vermont, Agency of Natural Resources, Department of Environmental Conservation, *Chapter 12, Groundwater Protection Rule and Strategy*, February, 2005.

APPENDIX A:

FIGURES



N

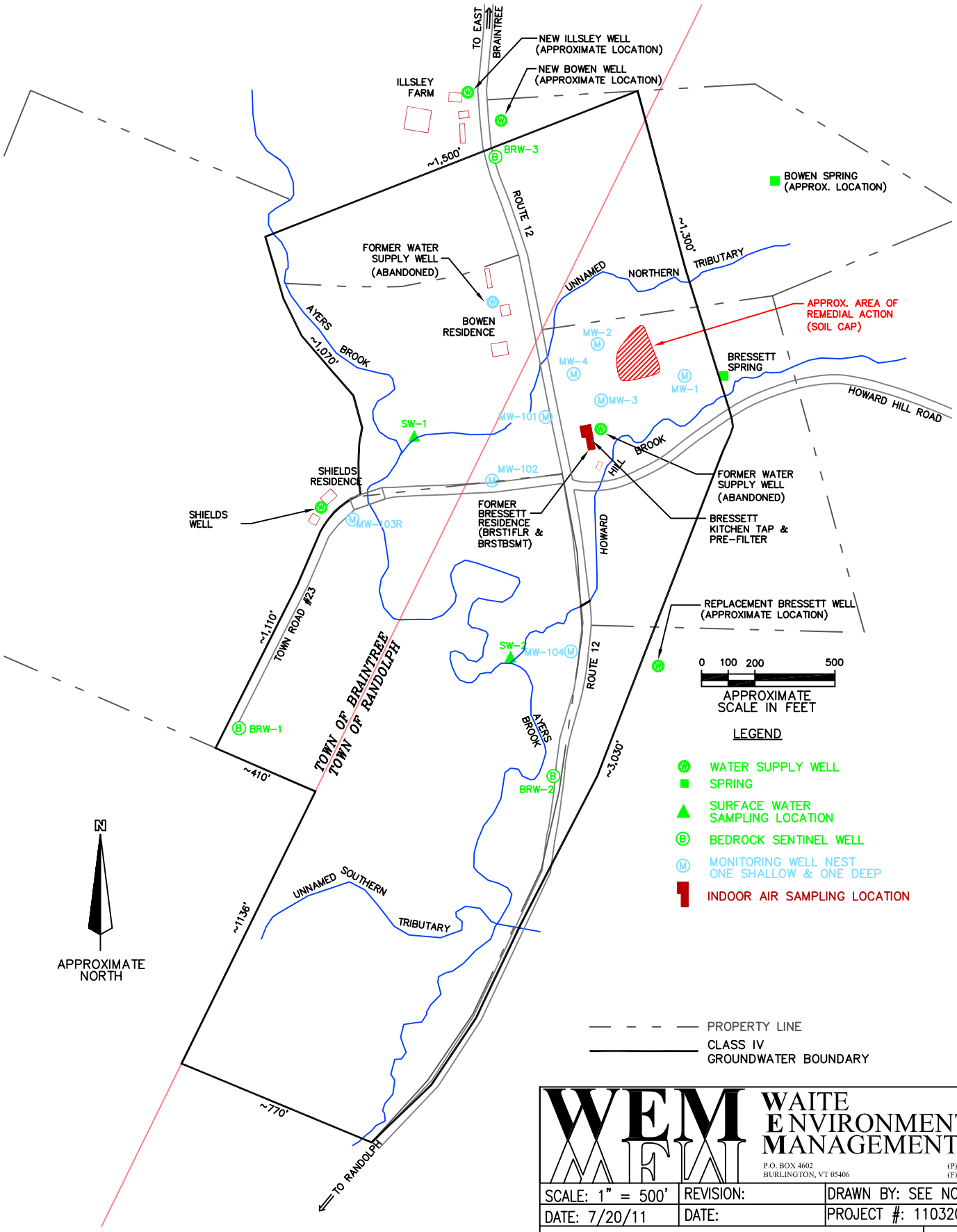
Map Source: *USGS Mapping 7.5 Minute Quadrangle: Randolph (1981)*

Waite Environmental Management, LLC

SITE LOCATION MAP

Bressett Site
Randolph, Vermont

Date: 01/04/05	Drawing No. 1	Scale: 1:24,000	By: MEW



NOTES:
1. MAP SOURCE IS "PLATE 1: SITE MAP, BRESSETT SITE, RANDOLPH, VERMONT" PREPARED BY THE JOHNSON COMPANY, INC. MAP HAS BEEN ANNOTATED BY WAITE ENVIRONMENTAL MGT.

WAITE ENVIRONMENTAL MANAGEMENT
P.O. BOX 4602
BURLINGTON, VT 05406
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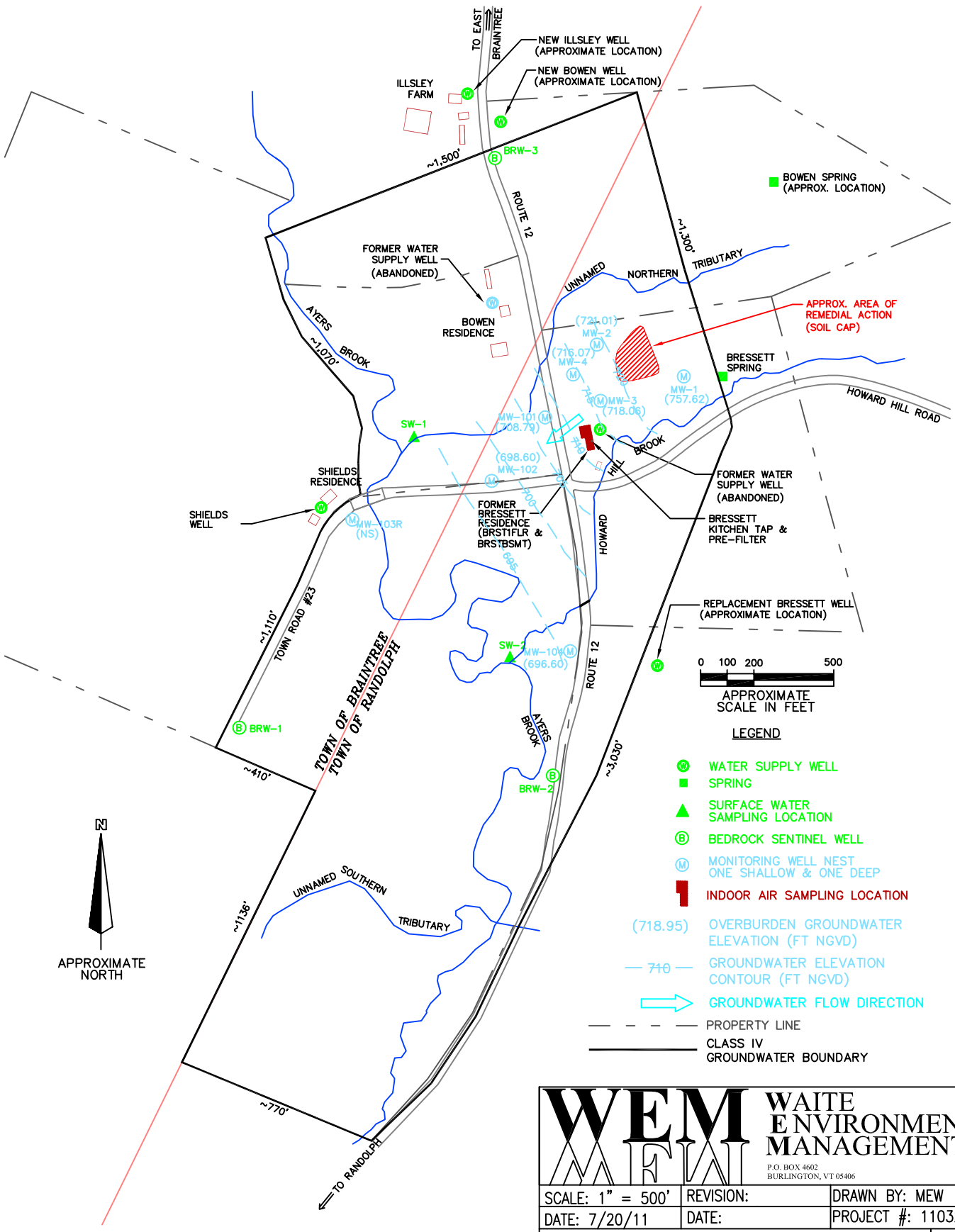
(F) 802-860-9440

SCALE: 1" = 500'	REVISION:	DRAWN BY: SEE NOTE
DATE: 7/20/11	DATE:	PROJECT #: 110320012

SITE PLAN

BRESSETT SITE
RANDOLPH, VERMONT



NOTES:
1. MAP SOURCE IS "PLATE 1: SITE MAP, BRESSETT SITE, RANDOLPH, VERMONT" PREPARED BY THE JOHNSON COMPANY, INC. MAP HAS BEEN REVISED BY WAITE ENVIRONMENTAL MGT.
2. GROUNDWATER ELEVATIONS ARE FROM THE SHALLOW PAIRED WELL.
3. ELEVATIONS MEASURED BY WEM ON APRIL 26-27, 2011.

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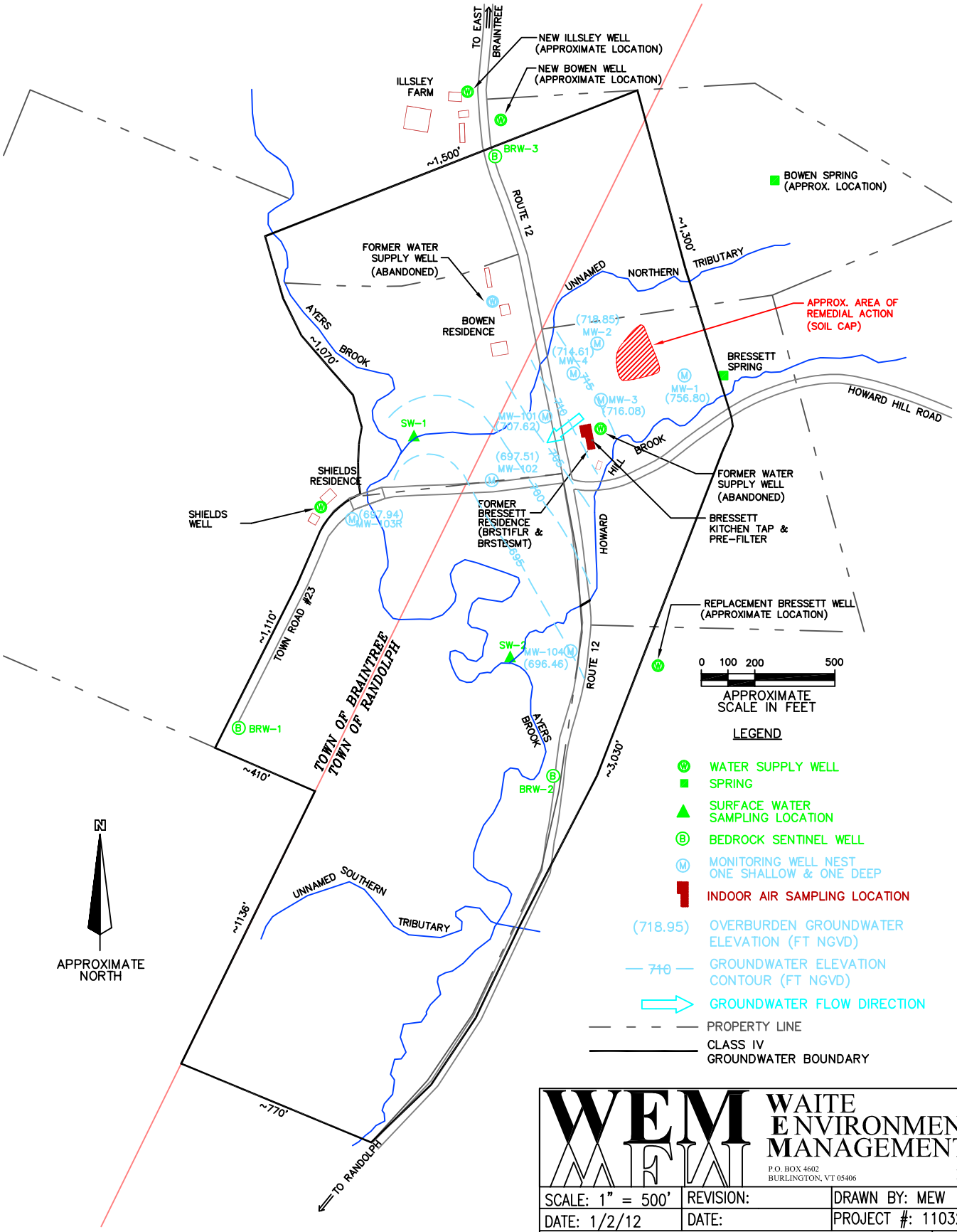
DATE: 7/20/11	DATE:	PROJECT #: 110320012

GROUNDWATER ELEVATION CONTOUR MAP
APRIL 2011
BRESSETT SITE
RANDOLPH, VERMONT



NOTES:
1. MAP SOURCE IS "PLATE 1: SITE MAP, BRESSETT SITE, RANDOLPH, VERMONT" PREPARED BY THE JOHNSON COMPANY, INC. MAP HAS BEEN REVISED BY WAITE ENVIRONMENTAL MGT.
2. GROUNDWATER ELEVATIONS ARE FROM THE SHALLOW PAIRED WELL.
3. ELEVATIONS MEASURED BY WEM ON OCTOBER 18, 2011.

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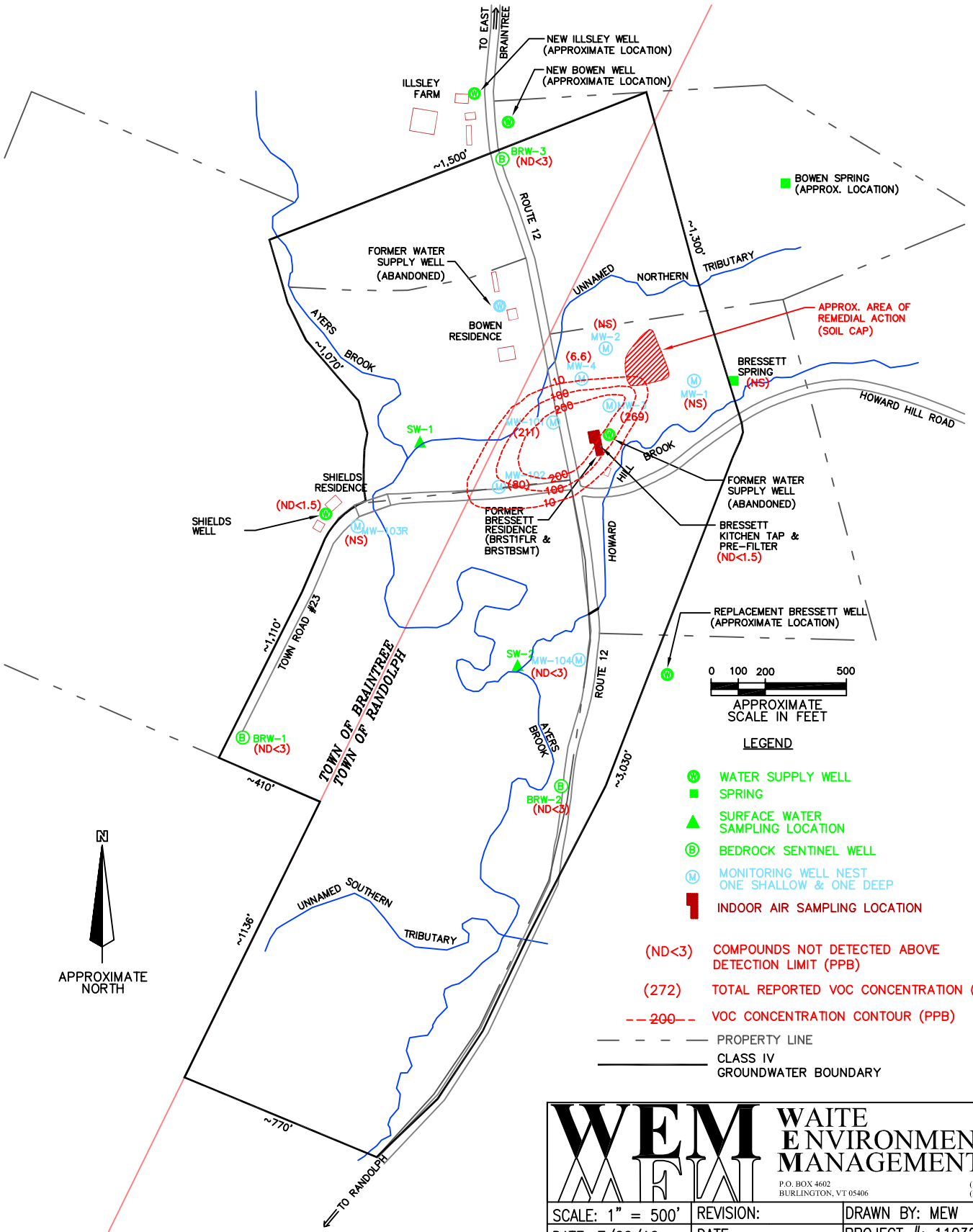
SCALE: 1" = 500'	REVISION:	DRAWN BY: MEW
DATE: 1/2/12	DATE:	PROJECT #: 110320012

GROUNDWATER ELEVATION CONTOUR MAP
OCTOBER 2011

BRESSETT SITE
RANDOLPH, VERMONT



NOTES:
1. MAP SOURCE IS "PLATE 1: SITE MAP, BRESSETT SITE, RANDOLPH, VERMONT" PREPARED BY THE JOHNSON COMPANY, INC. MAP HAS BEEN REVISED BY WAITE ENVIRONMENTAL MGT.
2. TOTAL REPORTED CHLORINATED VOLATILE ORGANIC COMPOUND (CVOC) CONCENTRATION IS CALCULATED AS THE SUM OF PCE, TCE, AND 1,2-DCE CONCENTRATIONS. FOR THE PAIRED WELLS, THE MAXIMUM CONCENTRATION IS USED.
3. ND = VOCs NOT DETECTED BY EITHER EPA METHOD 8260B OR 524.2; NS = NOT SAMPLED

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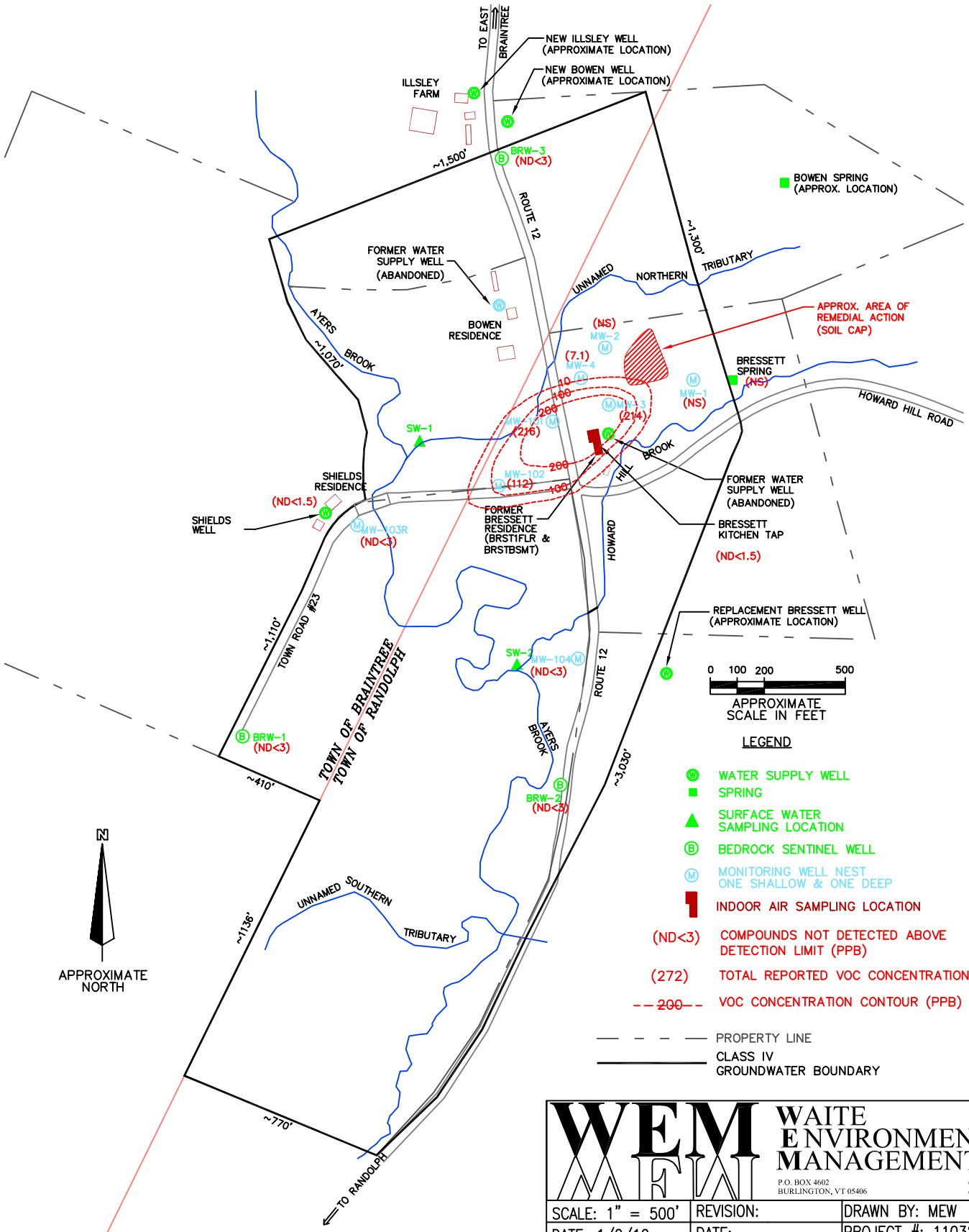
SCALE: 1" = 500'	REVISION:	DRAWN BY: MEW
DATE: 7/20/10	DATE:	PROJECT #: 110320012

CVOC CONCENTRATION CONTOUR MAP
APRIL 2011
BRESSETT SITE
RANDOLPH, VERMONT



NOTES:
1. MAP SOURCE IS "PLATE 1: SITE MAP, BRESSETT SITE, RANDOLPH, VERMONT" PREPARED BY THE JOHNSON COMPANY, INC. MAP HAS BEEN REVISED BY WAITE ENVIRONMENTAL MGT.
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3. ND = VOCs NOT DETECTED BY EITHER EPA METHOD 8260B OR 524.2; NS = NOT SAMPLED

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SCALE: 1" = 500'	REVISION:	DRAWN BY: MEW
DATE: 1/2/12	DATE:	PROJECT #: 110320012

CVOC CONCENTRATION CONTOUR MAP
OCTOBER 2011
BRESSETT SITE
RANDOLPH, VERMONT

APPENDIX B:

TABLES

WEM

TABLE 1.1
Groundwater Elevation Measurements: 2010- 2011
Bressett Site, Randolph, Vermont

Location	Type	Units	Screen Center Elevation	Apr-10	Oct-10	Apr-11	Oct-11	Oct-10 Vertical Hydraulic Gradient (ft/ft)	Oct-11 Vertical Hydraulic Gradient (ft/ft)
MW-101D	Monitoring Well	FT	690.52	706.82	706.78	707.84	706.68	-0.10	-0.09
MW-101S	Monitoring Well	FT	701.03	707.75	707.83	708.79	707.62		
MW-102D	Monitoring Well	FT	674.76	697.49	697.63	698.55	697.52	-0.01	0.00
MW-102S	Monitoring Well	FT	689.46	697.51	697.72	698.60	697.51		
MW-103D	Monitoring Well	FT	685.48	700.24	well destroyed				
MW-103S	Monitoring Well	FT	697.39	698.77	well destroyed				
MW-103RD	Monitoring Well	FT	687.50				697.12		-0.08
MW-103RS	Monitoring Well	FT	697.76				697.94		
MW-104D	Monitoring Well	FT	676.26	695.62	695.73	696.62	696.43	-0.01	0.00
MW-104S	Monitoring Well	FT	690.98	695.86	695.85	696.60	696.46		
MW-1	Monitoring Well	FT	755.60	756.33	756.80	757.62	755.98	NA	NA
MW-2D	Monitoring Well	FT	683.40	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	FT	714.50	720.43	720.70	721.01	718.85		
MW-3D	Monitoring Well	FT	664.55	717.91	717.69	720.13	717.20	0.05	0.02
MW-3S	Monitoring Well	FT	714.09	717.61	715.36	718.06	716.08		
MW-4D	Monitoring Well	FT	689.82	715.07	714.09	716.05	714.27	0.00	-0.02
MW-4S	Monitoring Well	FT	711.44	715.91	714.02	716.07	714.61		
BRW-1	Monitoring Well	FT	659.30	706.13	704.13	708.56	704.83	NA	NA
BRW-2	Monitoring Well	FT	639.40	696.18	695.20	697.67	698.45	NA	NA
BRW-3	Monitoring Well	FT	678.00	724.80	722.17	725.95	723.44	NA	NA

Notes:
-All elevations in feet above NGVD; "NGVD" = National Geodetic Vertical Datum (1988).
-"Dry" = well dry during monitoring event; "NA" = data not available.
-Negative sign ("-") indicates downward vertical gradient. Positive numbers indicate upward vertical gradients.
-Screen center elevations are from Tighe & Bond reports: "2002 Monitoring Report Summary, Bressett Site" (March 12, 2003) and "2003 Monitoring Report Summary, Bressett Site" (March 12, 2004).

WEM

TABLE 1.2
Dissolved Oxygen Field Measurements: 2007 - 2011
Bressett Site, Randolph, Vermont

Location	Type	Units	May-07	Oct-07	Apr-08	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11
MW-101D	Monitoring Well	mg/L	2.76	0.67	3.77	0.64	0.00	0.59	1.23	4.80	5.30	6.58
MW-101S	Monitoring Well	mg/L	1.95	0.00	6.31	0.00	0.00	0.00	0.00	3.29	4.14	4.60
MW-102D	Monitoring Well	mg/L	1.78	0.00	2.09	0.00	0.00	0.00	0.00	3.92	3.62	5.26
MW-102S	Monitoring Well	mg/L	4.22	5.47	6.49	5.50	1.61	4.05	4.93	7.69	8.35	10.00
MW-103D	Monitoring Well	mg/L	1.46	0.00	3.80	0.00	0.00	0.00	0.00	NA	NA	NA
MW-103S	Monitoring Well	mg/L	4.78	DRY	2.93	DRY	NA	DRY	NA	NA	NA	NA
MW-103RD	Monitoring Well	mg/L										4.55
MW-103RS	Monitoring Well	mg/L										8.78
MW-104D	Monitoring Well	mg/L	2.25	0.00	8.00	1.27	0.00	0.00	0.00	5.27	3.75	5.39
MW-104S	Monitoring Well	mg/L	8.34	0.24	11.95	3.31	0.19	1.89	3.04	4.39	10.29	6.53
MW-1	Monitoring Well	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2D	Monitoring Well	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	mg/L	12.13	3.02	5.16	2.75	1.06	0.13	2.41	7.16	8.86	8.28
MW-3S	Monitoring Well	mg/L	11.85	9.15	11.90	9.47	4.15	8.60	10.03	8.87	15.21	14.55
MW-4D	Monitoring Well	mg/L	8.30	5.95	8.95	9.22	4.10	6.56	7.22	7.68	12.52	11.76
MW-4S	Monitoring Well	mg/L	11.60	9.91	11.35	9.95	6.14	7.89	11.18	9.30	17.23	14.35
BRW-1	Monitoring Well	mg/L	6.10	2.71	13.66	3.20	2.35	1.31	3.01	4.49	7.10	8.64
BRW-2	Monitoring Well	mg/L	3.43	0.53	13.48	0.31	0.99	0.00	0.69	2.96	4.31	5.99
BRW-3	Monitoring Well	mg/L	9.58	6.68	10.89	6.13	6.45	6.42	7.84	6.05	9.03	11.33

Notes:
- All dissolved oxygen meaurements in milligrams/liter (mg/L).
-"Dry" = well dry during monitoring event; "NA" = data not available.
- All data shown collected by Waite Environmental Management.

WEM

TABLE 1.3
Specific Conductance Field Measurements: 2007 - 2011
Bressett Site, Randolph, Vermont

Location	Type	Units	May-07	Oct-07	Apr-08	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11
MW-101D	Monitoring Well	us/cm	462	771	839	611	920	960	NA	860	996	960
MW-101S	Monitoring Well	us/cm	184	307	273	203	990	378	NA	368	396	396
MW-102D	Monitoring Well	us/cm	205	340	356	271	892	374	NA	363	448	417
MW-102S	Monitoring Well	us/cm	237	429	444	331	488	NA	NA	413	497	462
MW-103D	Monitoring Well	us/cm	135	268	246	210	541	301	NA	NA	NA	NA
MW-103S	Monitoring Well	us/cm	185	DRY	204	DRY	NA	DRY	NA	NA	NA	NA
MW-103RD	Monitoring Well	us/cm										293
MW-103RS	Monitoring Well	us/cm										219
MW-104D	Monitoring Well	us/cm	116	280	295	227	914	284	NA	197	363	430
MW-104S	Monitoring Well	us/cm	146	418	399	309	336	NA	NA	366	458	311
MW-1	Monitoring Well	us/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2D	Monitoring Well	us/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	us/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	us/cm	258	410	426	333	352	NA	NA	378	473	440
MW-3S	Monitoring Well	us/cm	299	549	413	432	391	NA	NA	499	543	623
MW-4D	Monitoring Well	us/cm	200	332	324	254	292	541	NA	310	383	360
MW-4S	Monitoring Well	us/cm	61	145	82	103	113	371	NA	123	90	118
BRW-1	Monitoring Well	us/cm	130	221	166	177	478	248	NA	214	269	257
BRW-2	Monitoring Well	us/cm	226	343	256	265	611	362	NA	310	383	343
BRW-3	Monitoring Well	us/cm	278	391	270	280	405	NA	NA	353	428	431

Notes:
- All conductivity meaurements in microsiemens per centimeter (us/cm).
-"Dry" = well dry during monitoring event; "NA" = data not available.
-All data shown collected by Waite Environmental Management.

WEM

TABLE 1.4
Temperature Field Measurements: 2007- 2011
Bressett Site, Randolph, Vermont

Location	Type	Units	May-07	Oct-07	Apr-08	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11
MW-101D	Monitoring Well	deg C	9.2	10.9	7.9	12.4	10.7	9.5	10.8	11.9	11.9	12.1
MW-101S	Monitoring Well	deg C	7.3	13.4	6.6	14.5	9.6	11.3	9.2	13.5	9.9	13.7
MW-102D	Monitoring Well	deg C	10.9	11.2	6.4	13.0	12.1	9.0	10.6	10.5	10.7	11.7
MW-102S	Monitoring Well	deg C	8.2	12.2	6.3	13.1	11.1	10.0	11.0	11.1	11.9	12.2
MW-103D	Monitoring Well	deg C	9.4	10.8	7.3	12.0	8.2	9.6	7.9	NA	NA	NA
MW-103S	Monitoring Well	deg C	9.4	DRY	6.5	DRY	NA	DRY	NA	NA	NA	NA
MW-103RD	Monitoring Well	deg C										13.2
MW-103RS	Monitoring Well	deg C										15.2
MW-104D	Monitoring Well	deg C	10.1	12.1	7.2	16.7	18.2	10.4	9.4	10.9	7.9	11.2
MW-104S	Monitoring Well	deg C	7.6	14.4	6.5	13.8	7.4	11.5	7.9	11.6	6.1	12.2
MW-1	Monitoring Well	deg C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2D	Monitoring Well	deg C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	deg C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	deg C	10.7	9.0	9.1	9.3	9.0	8.0	9.7	8.2	11.8	8.7
MW-3S	Monitoring Well	deg C	9.5	8.9	7.8	9.8	9.4	8.4	9.4	8.5	10.7	8.9
MW-4D	Monitoring Well	deg C	9.9	9.4	8.2	9.9	9.0	9.0	10.8	8.1	11.4	9.0
MW-4S	Monitoring Well	deg C	9.9	9.6	7.6	11.4	9.2	8.4	10.5	9.0	11.9	9.6
BRW-1	Monitoring Well	deg C	10.0	9.5	8.9	8.8	9.2	9.3	9.3	9.1	8.8	9.4
BRW-2	Monitoring Well	deg C	9.8	10.8	9.4	11.0	9.8	10.0	9.7	11.7	9.1	10.9
BRW-3	Monitoring Well	deg C	10.5	10.2	9.7	10.3	9.6	10.1	10.0	10.5	9.8	10.4

Notes:
- All temperature measurements in degrees Celsius (deg C).
-"Dry" = well dry during monitoring event; "NA" = data not available.
-All data shown collected by Waite Environmental Management.

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TABLE 1.5
pH Field Measurements: 2007 - 2011
Bressett Site, Randolph, Vermont

Location	Type	Units	May-07	Oct-07	Apr-08	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11
MW-101D	Monitoring Well	unitless	7.23	6.85	7.18	NA	6.97	7.04	6.91	6.09	7.51	7.49
MW-101S	Monitoring Well	unitless	6.63	6.41	6.76	NA	6.61	6.49	6.19	5.68	7.00	7.08
MW-102D	Monitoring Well	unitless	7.79	7.75	8.23	NA	7.94	7.99	7.94	6.79	7.80	8.16
MW-102S	Monitoring Well	unitless	7.60	7.49	7.85	NA	7.64	7.62	7.57	6.42	7.84	8.14
MW-103D	Monitoring Well	unitless	6.89	6.78	7.68	NA	7.41	7.62	7.29	NA	NA	NA
MW-103S	Monitoring Well	unitless	5.72	DRY	6.71	NA	NA	DRY	NA	NA	NA	NA
MW-103RD	Monitoring Well	unitless										8.16
MW-103RS	Monitoring Well	unitless										7.12
MW-104D	Monitoring Well	unitless	6.88	6.27	8.29	NA	7.86	6.98	7.45	6.09	7.78	7.63
MW-104S	Monitoring Well	unitless	6.59	6.78	7.24	NA	7.06	7.17	7.00	5.79	7.58	7.41
MW-1	Monitoring Well	unitless	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2D	Monitoring Well	unitless	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	unitless	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	unitless	7.56	7.48	7.65	NA	7.49	7.63	7.41	6.45	8.04	8.05
MW-3S	Monitoring Well	unitless	7.27	7.31	7.51	NA	7.29	7.40	7.18	6.25	7.79	7.82
MW-4D	Monitoring Well	unitless	7.47	7.47	7.33	NA	7.16	7.63	7.26	6.39	7.67	8.01
MW-4S	Monitoring Well	unitless	7.31	7.76	6.44	NA	7.32	7.37	7.20	6.25	7.90	7.49
BRW-1	Monitoring Well	unitless	7.44	7.51	7.57	NA	7.63	7.61	7.70	6.95	7.99	7.48
BRW-2	Monitoring Well	unitless	7.10	7.25	7.28	NA	7.34	7.28	7.48	7.05	7.61	7.33
BRW-3	Monitoring Well	unitless	7.17	7.02	7.20	NA	7.39	7.14	7.37	6.46	6.80	6.63

Notes:
-"Dry" = well dry during monitoring event; "NA" = data not available.
-All data shown collected by Waite Environmental Management.

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TABLE 1.6
Turbidity Field Measurements: 2007 - 2011
Bressett Site, Randolph, Vermont

Location	Type	Units	May-07	Oct-07	Apr-08	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11
MW-101D	Monitoring Well	NTU	0.0	0.7	366	806	> 1000	> 1000	> 1000	NA	> 1000	> 1000
MW-101S	Monitoring Well	NTU	> 1000	> 1000	> 1000	> 1000	122	330	> 1000	NA	> 1000	> 1000
MW-102D	Monitoring Well	NTU	0.0	0.0	42.0	49.3	53.4	164	151	NA	569	171
MW-102S	Monitoring Well	NTU	0.0	31.3	47.0	105	21.4	20.9	139	NA	0.2	178
MW-103D	Monitoring Well	NTU	143	17.0	104	27.9	40.0	63.3	144	NA	NA	NA
MW-103S	Monitoring Well	NTU	82	DRY	> 1000	DRY	NA	DRY	NA	NA	NA	NA
MW-103RD	Monitoring Well	NTU										> 1000
MW-103RS	Monitoring Well	NTU										112
MW-104D	Monitoring Well	NTU	> 1000	176	690	154	15.7	> 1000	598	NA	585	210
MW-104S	Monitoring Well	NTU	0.0	2.8	16.3	47.8	8.0	7.0	49.5	NA	0.0	103
MW-1	Monitoring Well	NTU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2D	Monitoring Well	NTU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	NTU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	NTU	788	132	533	> 1000	> 1000	> 1000	> 1000	NA	> 1000	> 1000
MW-3S	Monitoring Well	NTU	146	86.7	413	498	281	567	806	NA	445	584
MW-4D	Monitoring Well	NTU	467	13.3	152	650	684	> 1000	> 1000	NA	> 1000	461
MW-4S	Monitoring Well	NTU	92.9	2.7	209	323	373	268	495	NA	546	459
BRW-1	Monitoring Well	NTU	0.0	0.0	NA	0.0	8.6	0.0	13.0	NA	0.0	0.0
BRW-2	Monitoring Well	NTU	120	13	NA	2.2	41.1	67.9	98.6	NA	27.2	71.7
BRW-3	Monitoring Well	NTU	0.0	0.0	NA	6.1	19.6	9.8	16.7	NA	0.0	0.0

Notes:
-All turbidity measurements in nephelometric turbidity units (NTU).
-"Dry" = well dry during monitoring event; "NA" = data not available.
-All data shown collected by Waite Environmental Management.

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TABLE 1.7
Redox Potential Field Measurements: 2007 - 2011
Bressett Site, Randolph, Vermont

Location	Type	Units	May-07	Oct-07	Apr-08	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11
MW-101D	Monitoring Well	mV	109	113	138	132	116	185	115	119	73	35
MW-101S	Monitoring Well	mV	116	65	138	138	120	164	146	132	92	52
MW-102D	Monitoring Well	mV	-180	-166	-181	-185	-190	-172	-203	-214	-215	-237
MW-102S	Monitoring Well	mV	40	42	94	92	66	97	10	29	-27	-58
MW-103D	Monitoring Well	mV	-100	-235	-150	-160	-157	-138	-141	NA	NA	NA
MW-103S	Monitoring Well	mV	142	DRY	103	DRY	NA	DRY	NA	NA	NA	NA
MW-103RD	Monitoring Well	mV										-239
MW-103RS	Monitoring Well	mV										38
MW-104D	Monitoring Well	mV	-16	26	-134	-50	-119	-26	-121	-15	-178	-129
MW-104S	Monitoring Well	mV	155	-6	131	77	74	106	53	156	26	-35
MW-1	Monitoring Well	mV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2D	Monitoring Well	mV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	mV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	mV	149	74	196	129	153	217	176	110	87	48
MW-3S	Monitoring Well	mV	151	63	203	145	148	211	152	99	97	57
MW-4D	Monitoring Well	mV	130	41	204	137	146	200	152	89	94	44
MW-4S	Monitoring Well	mV	120	26	230	141	142	212	143	142	85	49
BRW-1	Monitoring Well	mV	-21	-2	-2	19	-13	38	-44	-53	-45	-58
BRW-2	Monitoring Well	mV	-127	-174	-128	-148	-136	-157	-184	-235	-231	-234
BRW-3	Monitoring Well	mV	169	145	179	162	132	246	163	69	57	40

Notes:
-All redox potential measurements in millivolts (mV).
-"Dry" = well dry during monitoring event; "NA" = data not available.
-All data shown collected by Waite Environmental Management.

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TABLE 2.0
MONITORING WELL RESULTS: 2008-2011
Bressett Site, Randolph, Vermont

Location	Parameter Method 8260B	Groundwater Enforcement Standard	Units	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11
MW-3S	**PCE**	**5.0**	ug/L	**110**	**54**	**79**	**61**	**95**	**52**	**100**
	TCE	**5.0**	ug/L	**21**	**9.4**	**16**	**11**	**22**	**12**	**27**
	cis-1,2-DCE	**70.0**	ug/L	**9.0**	**2.7**	**5.4**	**3.4**	**8.9**	**3.5**	**13.0**
	trans-1,2-DCE	**100.0**	ug/L	0.64 J	1.9 U	0.68 J	2.1 U	0.61 J	0.35 J	0.76 J
MW-3D	**PCE**	**5.0**	ug/L	**210**	**97**	**220**	**150**	**220**	**210**	**170**
	TCE	**5.0**	ug/L	**25**	**9.8**	**22**	**22**	**25**	**24**	**19**
	cis-1,2-DCE	**70.0**	ug/L	**23**	**9.2**	**24**	**26**	**32**	**33**	**24**
	trans-1,2-DCE	**100.0**	ug/L	**1.4**	3.8 U	**1.4**	**1.1**	1.6 J	2.1 J	0.98 J
MW-4S	**PCE**	**5.0**	ug/L	**1.2**	0.79 J	**2.1**	0.66 J	**1.0**	0.82 J	**1.5**
	TCE	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**70.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-4D	**PCE**	**5.0**	ug/L	**13**	**15**	**11**	**9.0**	**6.9**	**4.6**	**5.1**
	TCE	**5.0**	ug/L	0.90 J	0.92 J	1.0 U	0.42 J	0.29 J	1.0 U	1.0 U
	cis-1,2-DCE	**70.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-101S	**PCE**	**5.0**	ug/L	**8.2**	**6.2**	**6.9**	**5.0**	**3.0**	**5.7**	**6.8**
	TCE	**5.0**	ug/L	**1.7**	**1.0**	**1.4**	**1.2**	0.78 J	**1.2**	**1.3**
	cis-1,2-DCE	**70.0**	ug/L	**1.6**	0.47 J	0.75 J	0.82 J	1.0 U	0.53 J	0.57 J
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 J	1.0 U
MW-101D	**PCE**	**5.0**	ug/L	**170**	**140**	**150**	**140**	**140**	**140**	**140**
	TCE	**5.0**	ug/L	**31**	**30**	**31**	**28**	**31**	**29**	**32**
	cis-1,2-DCE	**70.0**	ug/L	**52**	**47**	**47**	**39**	**43**	**41**	**43**
	trans-1,2-DCE	**100.0**	ug/L	**1.9**	1.3 J	3.4 J	**3.1**	0.93 J	1.3 J	0.97 J
MW-102S	**PCE**	**5.0**	ug/L	**100**	**89**	**70**	**66**	**68**	**61**	**76**
	TCE	**5.0**	ug/L	**17**	**13**	**11**	**9.8**	**12**	**9.1**	**15**
	cis-1,2-DCE	**70.0**	ug/L	**22**	**14**	**13**	**11**	**15**	**10**	**20**
	trans-1,2-DCE	**100.0**	ug/L	0.85 J	0.73 J	0.73 J	2.6 U	0.57 J	0.45 J	0.67 J
MW-102D	**PCE**	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	TCE	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**70.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-103S	PCE	5.0	ug/L	DRY	1.0 U	DRY	1.0 U			
	TCE	5.0	ug/L	DRY	1.0 U	DRY	1.0 U	WELL DESTOYED		
	cis-1,2-DCE	70.0	ug/L	DRY	1.0 U	DRY	1.0 U			
	trans-1,2-DCE	100.0	ug/L	DRY	1.0 U	DRY	1.0 U			
MW-103D	PCE	5.0	ug/L	1.0 U	1.0 U	1.0 U	1.0 U			
	TCE	5.0	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	WELL DESTOYED		
	cis-1,2-DCE	70.0	ug/L	1.0 U	1.0 U	1.0 U	1.0 U			
	trans-1,2-DCE	100.0	ug/L	1.0 U	1.0 U	1.0 U	1.0 U			
MW-103RS	**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-103RD	**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

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TABLE 2.0
MONITORING WELL RESULTS: 2008-2011
Bressett Site, Randolph, Vermont

Location	Parameter Method 8260B	Groundwater Enforcement Standard	Units	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11
MW-104S	**PCE**	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	TCE	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**70.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-104D	**PCE**	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	TCE	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**70.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
BRW-1	**PCE**	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	TCE	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**70.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
BRW-2	**PCE**	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	TCE	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**70.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
BRW-3	**PCE**	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	TCE	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**70.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:
- "PCE" = tetrachlorethene; "TCE" = tricholorethene; "DCE" = dichloroethene.
- "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).
- "Dry" = well dry during monitoring event; "NA" = not applicable; "NS" = not sampled.
- 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 Strategey, December 2000.

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TABLE 3.0
SUPPLY WELL RESULTS: 2007-2011
Bressett Site, Randolph, Vermont

Owner	Location	Parameter Method 524.2	Groundwater Enforcement Standard	Units	Oct-07	Apr-08	Jul-08	Oct-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11
Voner	**Bressett Kitchen Tap**	**PCE**	**0.7**	ug/L			**1.3**	**0.69**	0.5 U	0.7 U	0.5 U	0.5 U	0.5 U	0.5 U
		TCE	**5.0**	ug/L			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
		cis-1,2-DCE	**70.0**	ug/L			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
		trans-1,2-DCE	**100.0**	ug/L			0.5 U	0.5 U	0.5 U	0.7 U	0.5 U	0.5 U	0.5 U	0.5 U
Voner	**Bressett Holding Tank / Bressett Pre-Filter**	**PCE**	**0.7**	ug/L			**0.78**	**0.47 J**	0.5 U	0.7 U	0.5 U	0.5 U	0.5 U	
		TCE	**5.0**	ug/L			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	
		cis-1,2-DCE	**70.0**	ug/L			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	
		trans-1,2-DCE	**100.0**	ug/L			0.5 U	0.5 U	0.5 U	0.7 U	0.5 U	0.5 U	0.5 U	
Hammond	**Sheilds Well**	**PCE**	**0.7**	ug/L	0.5 U	0.5 U		0.5 U	0.5 U	0.7 U	0.5 U	0.5 U	0.5 U	0.5 U
		TCE	**5.0**	ug/L	0.5 U	0.5 U		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
		cis-1,2-DCE	**70.0**	ug/L	0.5 U	0.5 U		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
		trans-1,2-DCE	**100.0**	ug/L	0.5 U	0.5 U		0.5 U	0.5 U	0.7 U	0.5 U	0.5 U	0.5 U	0.5 U
Bowen	**Bowen Well**	**PCE**	**0.7**	ug/L	0.5 U									
		TCE	**5.0**	ug/L	0.5 U									
		cis-1,2-DCE	**70.0**	ug/L	0.5 U									
		trans-1,2-DCE	**100.0**	ug/L	0.5 U									

Notes:
- "PCE" = tetrachlorethene; "TCE" = tricholorethene; "DCE" = dichloroethene.
- "U" = not detected above listed quantitation limit; "J" = reported concentration is an estimated value; "UJ" = reported quantitation limit is an estimated value; "R' = data are unusable
- "Dry" = well dry during monitoring event; "NA" = not applicable; "NS" = no sample collected.
- All data have been qualified based on the data validation report for each sampling event.
- Shaded cells indicate that the reported concentration is in excess of the Enforcement Standard.
- Enforcement Standard for PCE is the Vermont Action Level, taken from the Vermont Department of Health Drinking Water Guidance, December 2002.
- Enforcement Standard for TCE, cis-1,2-DCE, and trans-1,2-DCE is the Federal Maximum Contaminant Level (MCL), December 2002.

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TABLE 4.0
SURFACE WATER QUALITY RESULTS: 2002 - 2011
Bressett Site, Randolph, Vermont

Location	Parameter Method 8260B	Water Quality Standard	Units	Jul-02	Jul-03	Jul-04	Jul-05	Jul-06	Jul-07	Jul-08	Jul-09	Jul-10	Jul-11
SW-1	**PCE**	**0.8**	ug/L	1.0 U	DRY	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	TCE	**2.7**	ug/L	1.0 U	DRY	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**NA**	ug/L	1.0 U	DRY	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**NA**	ug/L	1.0 U	DRY	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
SW-2	**PCE**	**0.8**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	TCE	**2.7**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**NA**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**NA**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:
- "PCE" = tetrachlorethene; "TCE" = tricholorethene; "DCE" = dichloroethene.
-"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).
-"Dry" = well dry during monitoring event; "NA" = not applicable; "NS" = not sampled.
- All data are qualified based on the data validation report for each sampling event.
- Water Quality Standard referenced from Appendix C of "Vermont Water Quality Standards" (water and organisms) effective July 2, 2000.

WEM Waite Environmental Management, LLC.

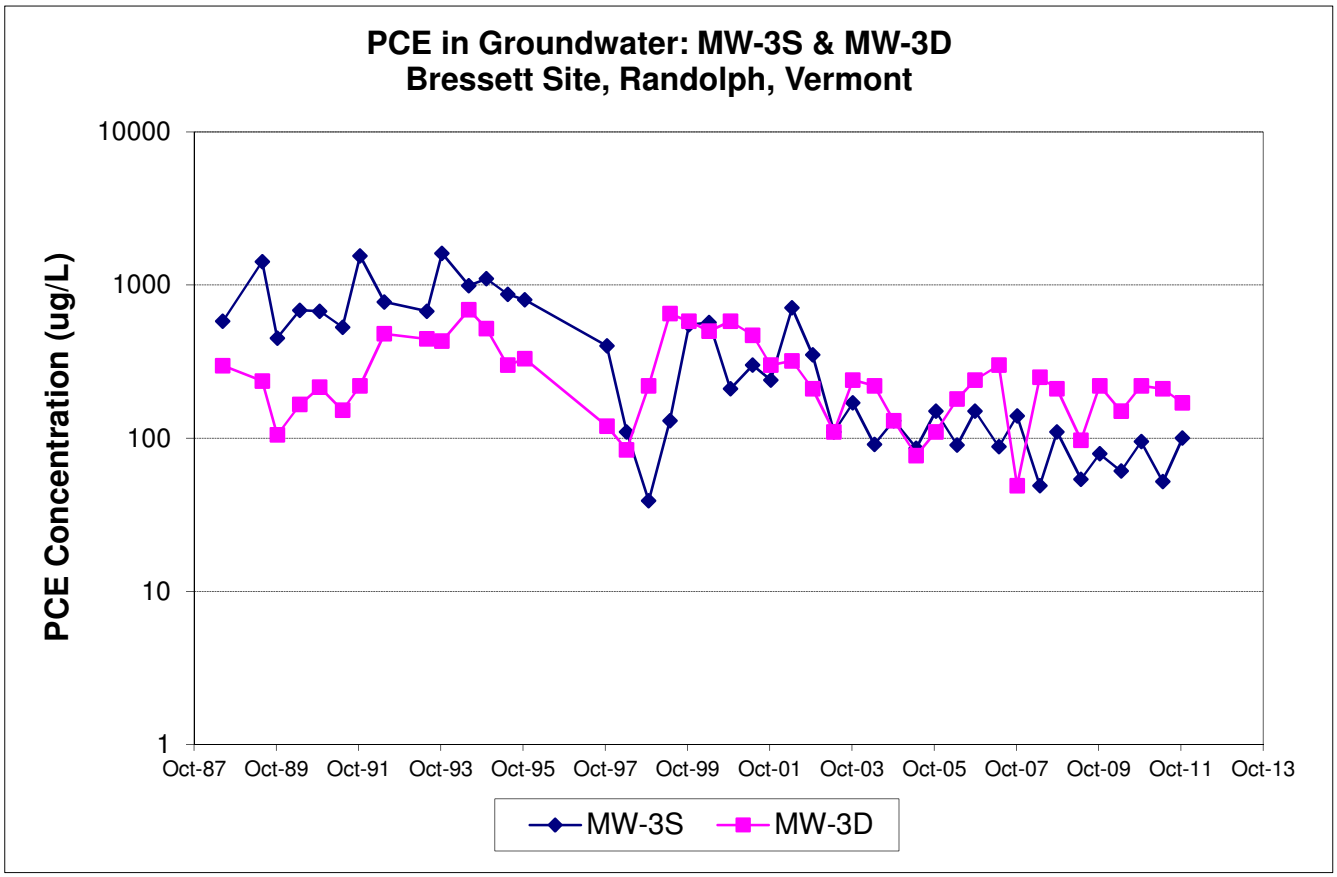
TABLE 5.0
INDOOR AIR QUALITY RESULTS: 2002-2011
Bressett Site, Randolph, Vermont

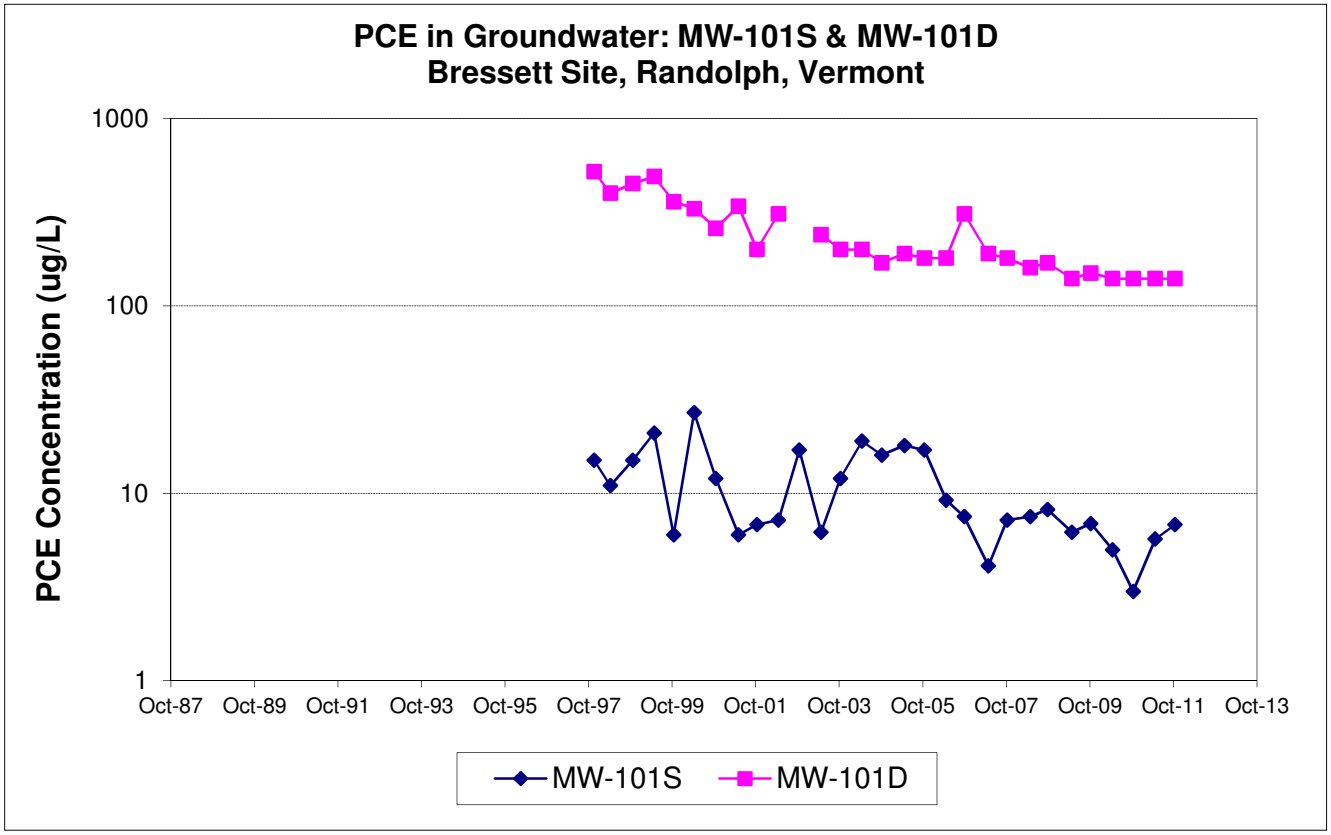
Current Owner	Location	Parameter Method T-014A	Guidance Level	Units	Jul-02	Jul-06	Jan-07	Jul-08	Jan-09	Jul-09	Feb-10	Jul-10	Jan-11	Jul-11
Vonner	BRST1FLR	Tetrachloroethene	1.0	ppbv	0.5 U	**6.3** J	**6.0**	**2.8**	**1.8**	**3.4**	**0.27**	**0.034** J	**1.3**	**0.041**
		Trichloroethene	1.0	ppbv	0.5 U	**0.58**	**0.71**	**0.19**	**0.22**	**0.20**	**0.034**	0.010 UJ	**0.19**	0.010 U
		cis-1,2-Dichloroethene	9.3	ppbv	0.5 U	**0.14** J	**0.49**	**0.040**	**0.13**	**0.055**	**0.025**	0.010 UJ	**0.16**	0.010 U
		trans-1,2-Dichloroethene	18.4	ppbv	0.5 U	0.20 U	0.20 U	0.010 U	**0.013**	0.010 U	0.010 U	0.010 U	**0.015**	0.010 U
	BRSTBSMT	Tetrachloroethene	1.0	ppbv	**1.2**	**22** J	**10**	**4.4**	**2.6**	**9.1**	**0.82** J	**0.21** J	**4.8**	**0.24**
		Trichloroethene	1.0	ppbv	0.5 U	**1.6**	**1.2**	**0.30**	**0.33**	**0.55**	**0.084**	**0.029** J	**0.65**	**0.035**
		cis-1,2-Dichloroethene	9.3	ppbv	0.5 U	**0.40**	**0.88**	**0.055**	**0.18**	**0.14** J	**0.067**	0.010 UJ	**0.53**	**0.015**
		trans-1,2-Dichloroethene	18.4	ppbv	0.5 U	0.20 U	0.20 U	**0.011**	**0.018**	**0.016** J	0.010 U	0.010 U	**0.047**	0.010 U

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 1997-2002 was collected by others; data (qualified) starting in 2006 was collected by WEM.
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).

APPENDIX C:

GRAPHS


PCE in Groundwater: MW-3S & MW-3D
Bressett Site, Randolph, Vermont
PCE Concentration (ug/L)
10000
1000
100
10
1
Oct-87
Oct-89
Oct-91
Oct-93
Oct-95
Oct-97
Oct-99
Oct-01
Oct-03
Oct-05
Oct-07
Oct-09
Oct-11
Oct-13
MW-3S
MW-3D


PCE in Groundwater: MW-101S & MW-101D
Bressett Site, Randolph, Vermont
PCE Concentration (ug/L)
1000
100
10
1
Oct-87
Oct-89
Oct-91
Oct-93
Oct-95
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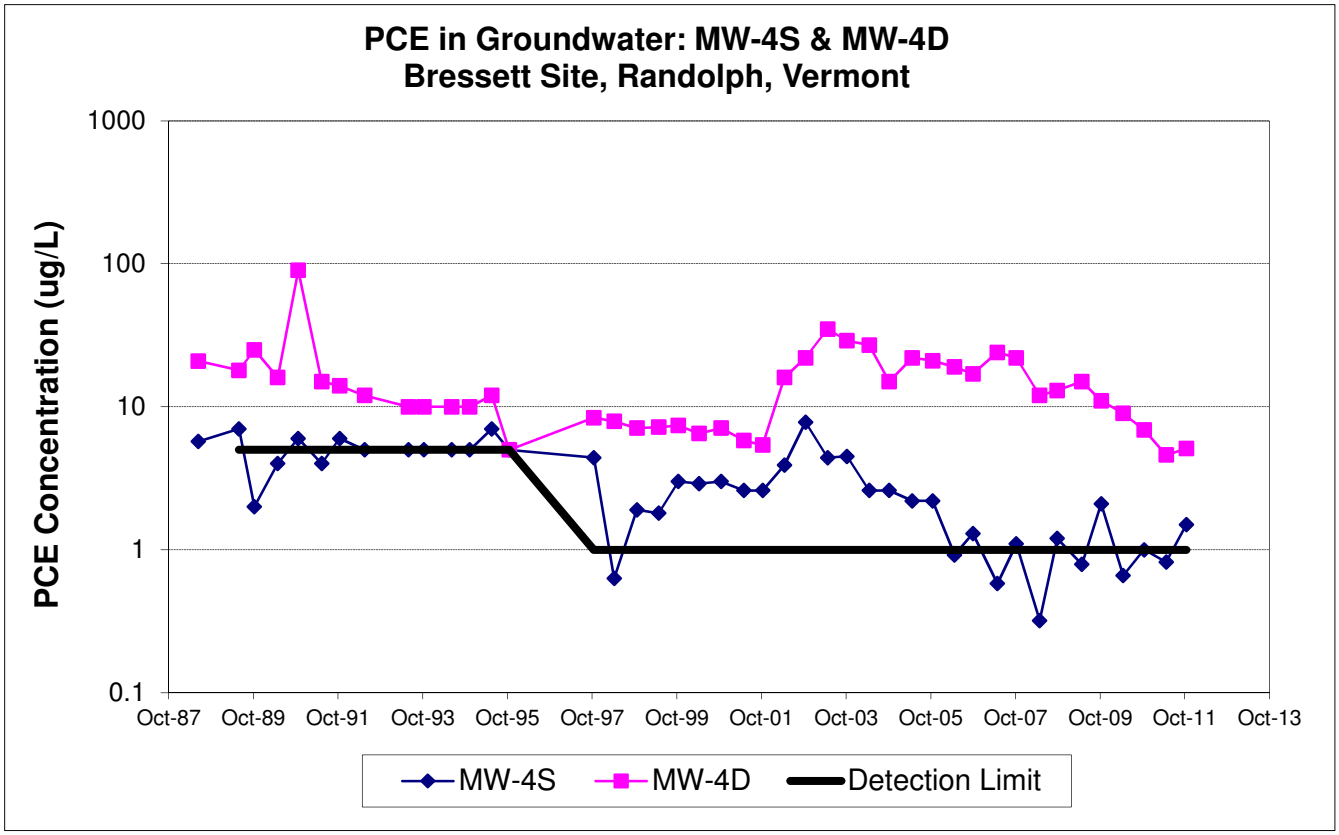
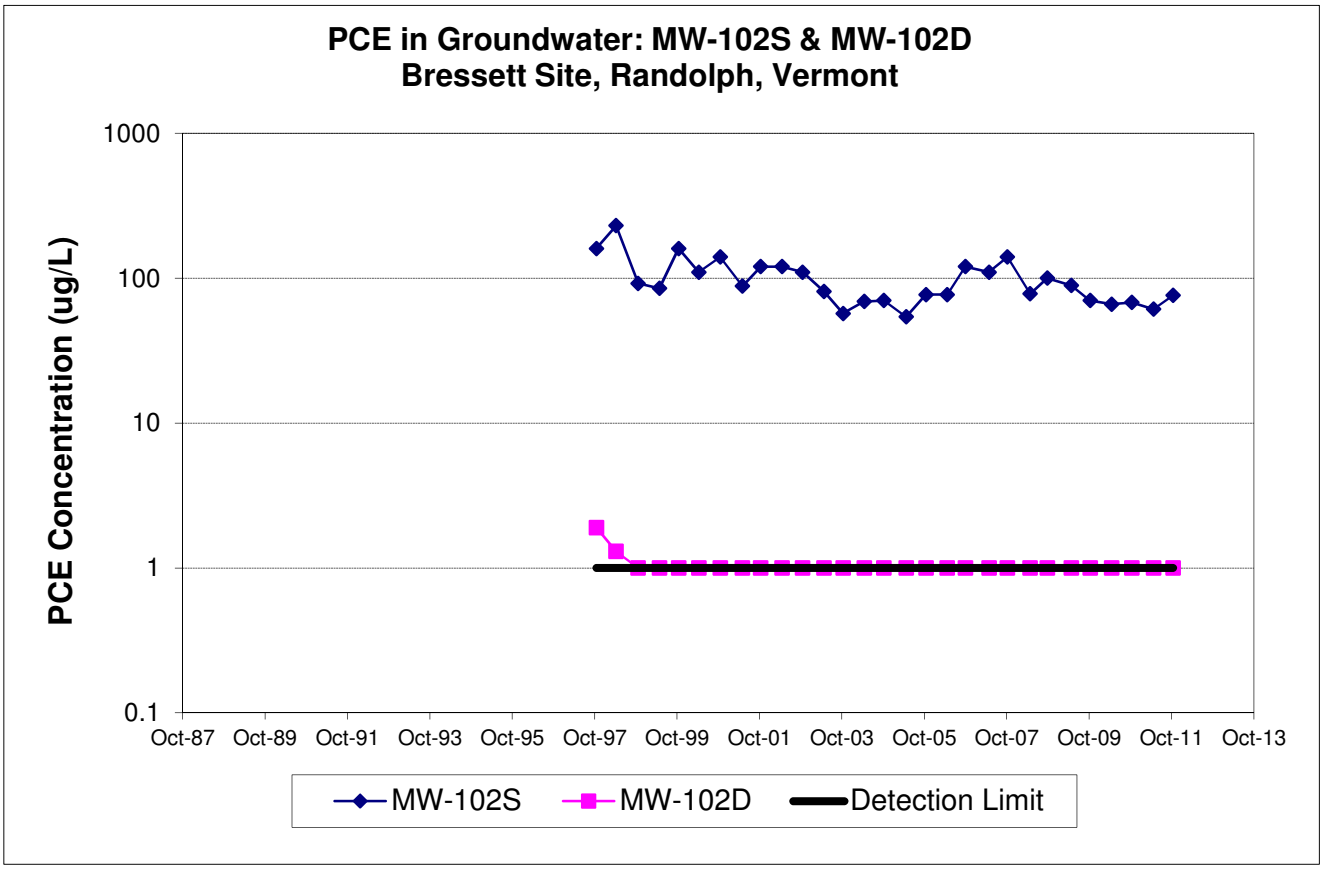
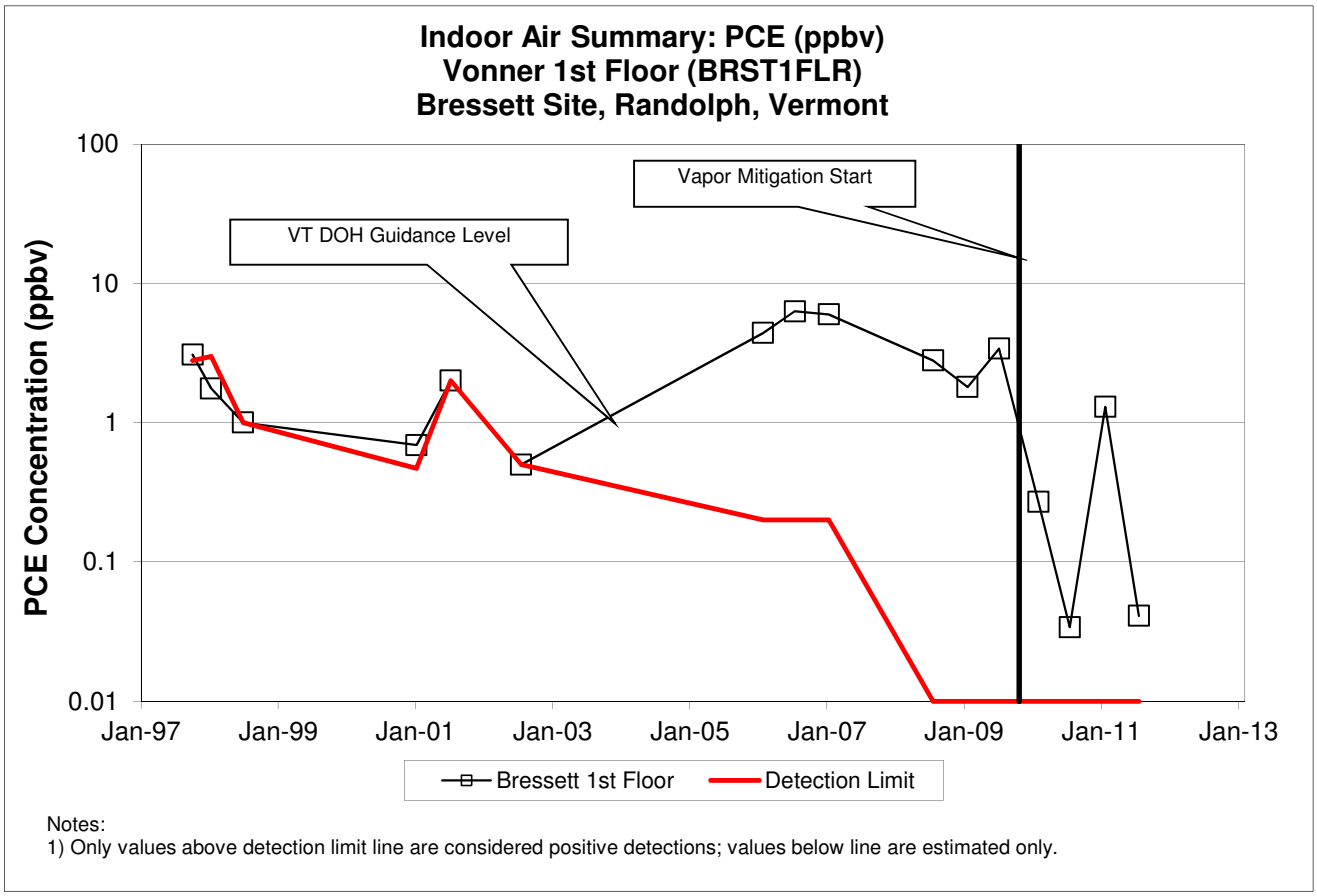
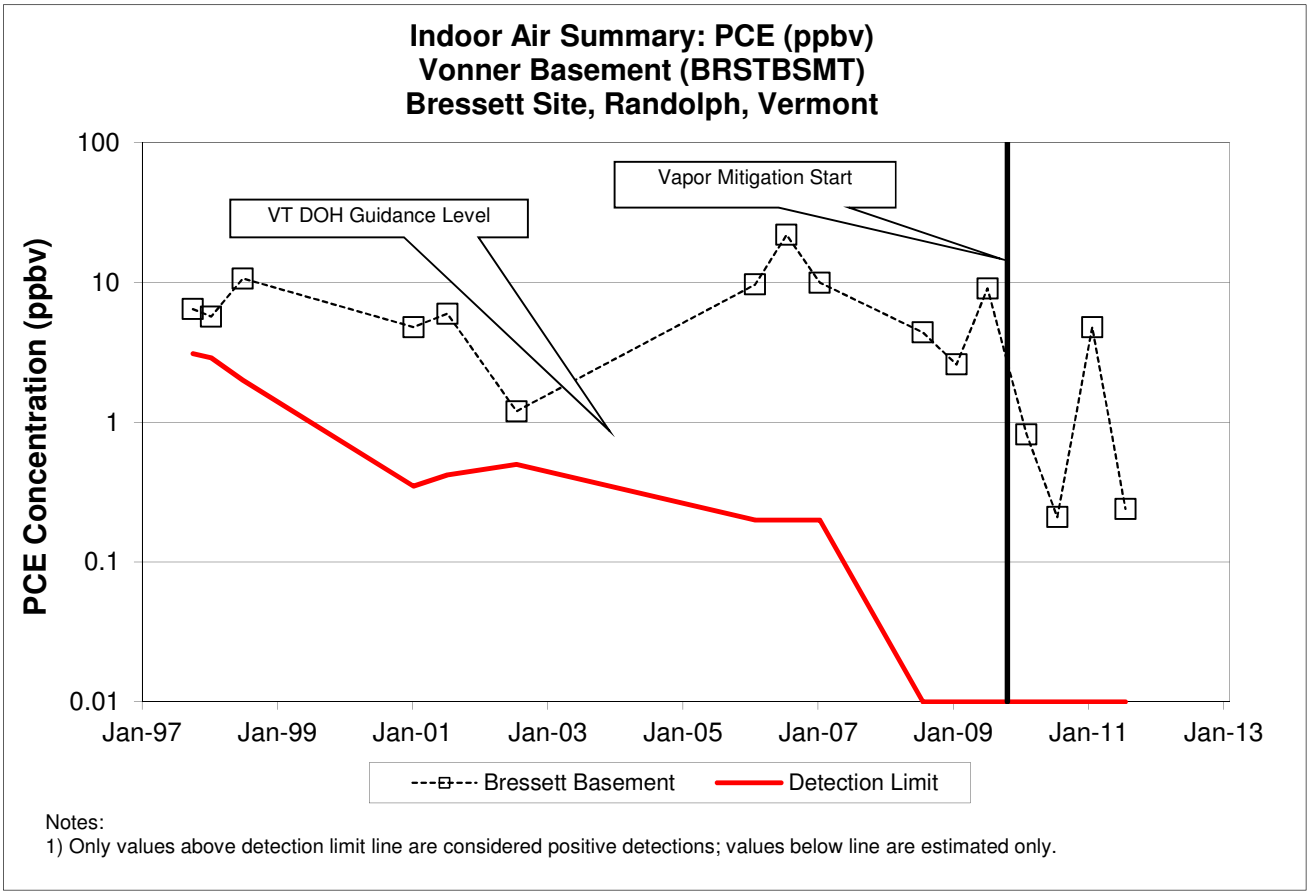
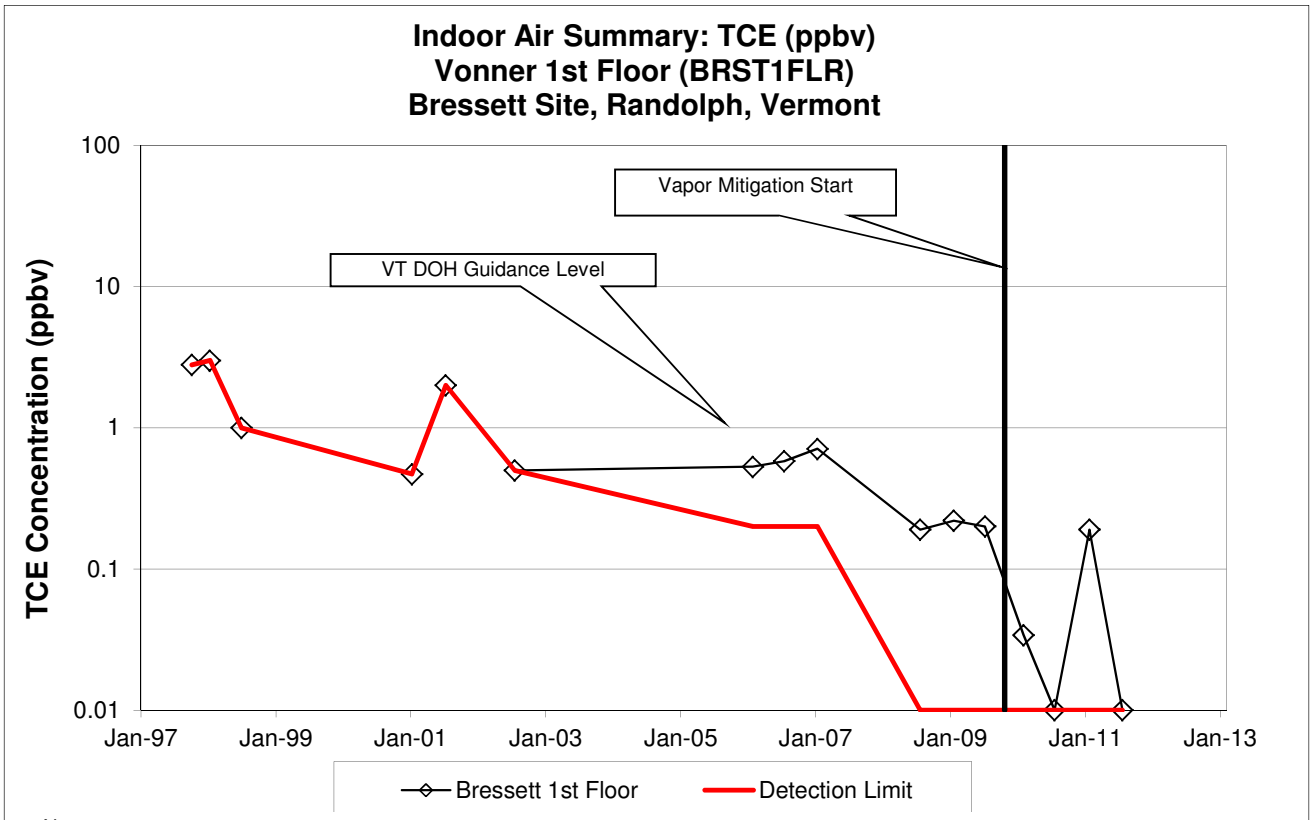
Oct-99
Oct-01
Oct-03
Oct-05
Oct-07
Oct-09
Oct-11
Oct-13
MW-101S
MW-101D


PCE in Groundwater: MW-4S & MW-4D
Bressett Site, Randolph, Vermont
PCE Concentration (ug/L)
1000
100
10
1
0.1
Oct-87
Oct-89
Oct-91
Oct-93
Oct-95
Oct-97
Oct-99
Oct-01
Oct-03
Oct-05
Oct-07
Oct-09
Oct-11
Oct-13
MW-4S
MW-4D
Detection Limit

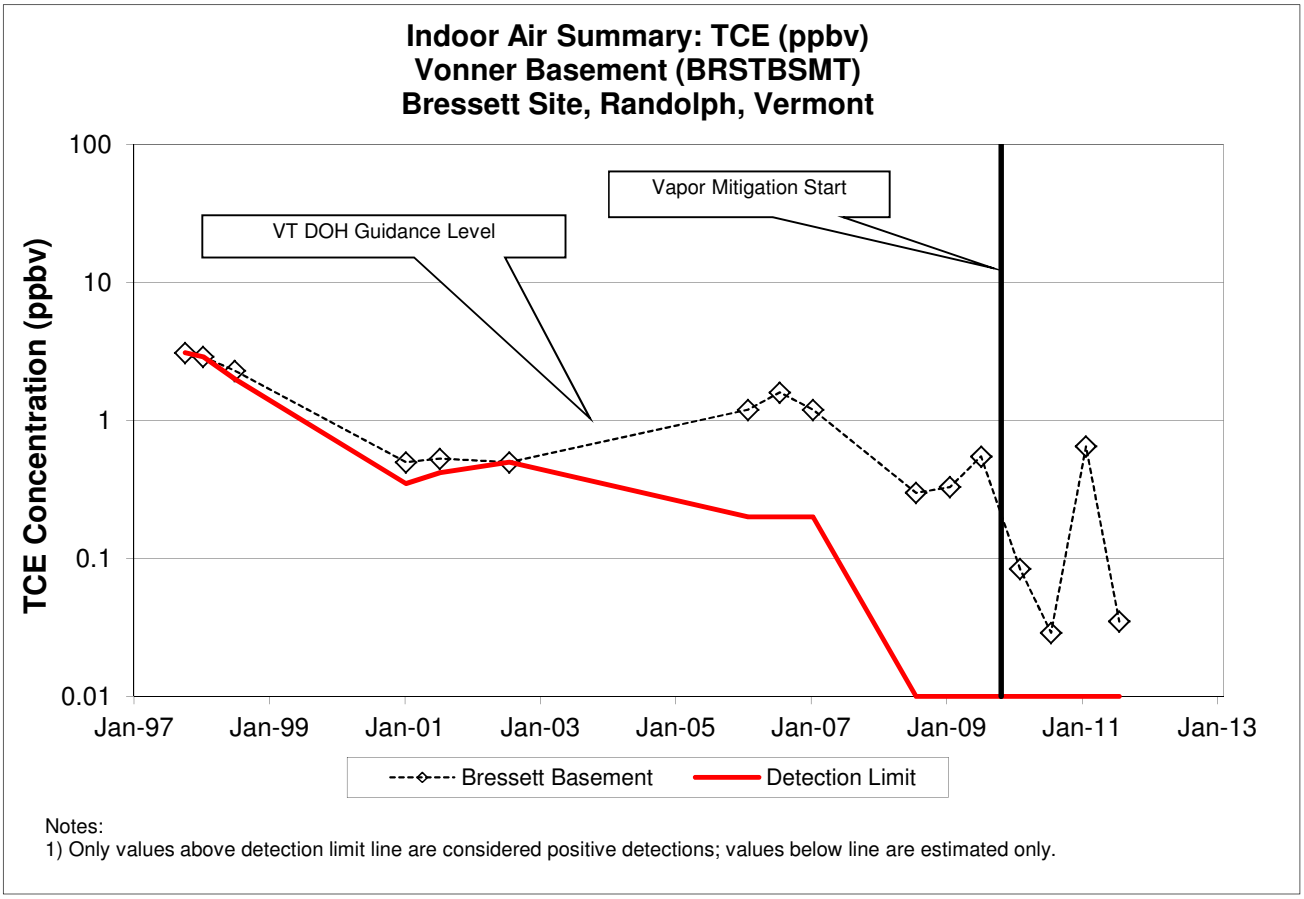

PCE in Groundwater: MW-102S & MW-102D
Bressett Site, Randolph, Vermont
PCE Concentration (ug/L)
1000
100
10
1
0.1
Oct-87
Oct-89
Oct-91
Oct-93
Oct-95
Oct-97
Oct-99
Oct-01
Oct-03
Oct-05
Oct-07
Oct-09
Oct-11
Oct-13
MW-102S
MW-102D
Detection Limit


Indoor Air Summary: PCE (ppbv)
Vonner 1st Floor (BRST1FLR)
Bressett Site, Randolph, Vermont
PCE Concentration (ppbv)
100
10
1
0.1
0.01
Jan-97
Jan-99
Jan-01
Jan-03
Jan-05
Jan-07
Jan-09
Jan-11
Jan-13
Vapor Mitigation Start
VT DOH Guidance Level
Bressett 1st Floor
Detection Limit
Notes:
1) Only values above detection limit line are considered positive detections; values below line are estimated only.


Indoor Air Summary: PCE (ppbv)
Vonner Basement (BRSTBSMT)
Bressett Site, Randolph, Vermont
PCE Concentration (ppbv)
100
10
1
0.1
0.01
Jan-97
Jan-99
Jan-01
Jan-03
Jan-05
Jan-07
Jan-09
Jan-11
Jan-13
Vapor Mitigation Start
VT DOH Guidance Level
Bressett Basement
Detection Limit
Notes:
1) Only values above detection limit line are considered positive detections; values below line are estimated only.



Notes:
1) Only values above detection limit line are considered positive detections; values below line are estimated only.



Notes:
1) Only values above detection limit line are considered positive detections; values below line are estimated only.

APPENDIX D:

FIELD DATA SHEETS: 4TH QUARTER

WEM Waite Environmental Management, LLC.

UNIFIRST – BRENNETT
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	BRW-3	Pump Intake Depth	72'
Date	10/17/11	Pump Type	Grundfos
Sampler	MW	Well Diameter	2"
Weather	sunny & cool	Well Depth	80.8'
Water Type	(gw) sw supply	Initial Depth to Water	7.87
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. / Rate	3 L/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C) within 3%	Specific Cond. (ms/m) / (us/cm) within 3%	pH 1 pH unit	ORP (mv) 10 mv	DO (mg/L) within 10%	Turbidity (NTU) within 10%		Notes
1045	7.87	3								started
1048	12.28	3	11.6	47.0	5.81	86	12.27	152		
1053	12.70	3	10.6	43.8	6.27	53	11.58	40.6		
1058	12.93	3	10.2	44.3	6.35	41	11.61	14.5		
1103	13.22	3	10.3	43.3	6.46	41	11.55	6.7		
1106	13.27	3	10.3	43.5	6.56	40	11.22	0.0		
1110	13.39	3	10.4	43.1	6.63	46	11.33	0.8		

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity	
Final Measurements:	60 L	10.4	43.1	6.63	40	11.33	0.0	

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	BRW-3	VOA	3	HCl	8260B	1115	
As Required:							
Field Duplicate							
Field Blank							
MS/MSD							

General Notes: added trip blank "TB-1" to cooler; TA provided VOAs

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

UNIFIRST - BRESSETT
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	BRW-2	Pump Intake Depth	75'
Date	10/17/11	Pump Type	Grundfos
Sampler	MC	Well Diameter	2"
Weather	Sunny & cool	Well Depth	101.51
Water Type	(gw) sw supply	Initial Depth to Water	7.45
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. / Rate	600 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (ms/m) / (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1135	7.45	600								began
1139	12.13	600	10.0	35.5	7.00	-239	7.79	129		sulfur odor
1144	13.30	600	10.6	33.9	7.12	-243	6.31	127		
1148	15.40	600	10.6	34.5	7.24	-241	6.61	90.6		
1153	18.33	600	10.6	34.4	7.28	-245	5.88	65.1		
1157	19.24	600	11.0	34.3	7.30	-239	5.87	78.4		
1200	20.14	600	10.9	34.3	7.33	-234	5.99	71.7		complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	12 L	10.9	34.3	7.33	-234	5.99	71.7		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	BRW-2	VOA	3	HCl	8260B	1205		
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

UNIFIRST -BRESSETT
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	BRW-1		
Date	10/17/11		
Sampler	MW		
Weather	pc & cool		
Water Type	(gw)	sw	supply
Sampling Method	bailer	(low flow)	grab

Pump Intake Depth	40'
Pump Type	Grundfos
Well Diameter	2"
Well Depth	80.8
Initial Depth to Water	12.75
Traditional Purge Vol. / Rate	2 L/min.

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (ms/m) / (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1203	12.75	2								begin
1305	14.10	2	9.5	25.9	7.47	-52	10.11	67.8		
1310	14.22	2	9.1	25.0	7.43	-56	8.95	12.1		
1315	14.92	2	9.2	25.0	7.43	-58	8.58	0.0		
1320	15.08	2	9.3	25.1	7.46	-59	8.67	0.0		
1325	15.20	2	9.4	25.7	7.48	-58	8.64	0.0		complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity	
Final Measurements:	32 L	9.4	25.7	7.48	-58	8.64	0.0	

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	BRW-1	VOA	3	HCl	8260B	1330	
As Required:							
Field Duplicate							
Field Blank							
MS/MSD							

General Notes: 1

WEM Waite Environmental Management, LLC.

UNIFIRST - BARRETT
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-103RD	Pump Intake Depth	21.1
Date	10/18/11	Pump Type	peri
Sampler	[illegible]	Well Diameter	3/4"
Weather	pc & rain	Well Depth	23.1
Water Type	(gw) sw supply	Initial Depth to Water	10.98
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. / Rate	na

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (ms/m) (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
0835	10.98	100								sugar
0838	13.82	100	12.6	32.3	7.67	-121	8.31	>1000		
0841	14.42	75	12.8	31.7	7.70	-158	6.97	>1000		chocolate milk is4
0844	14.56	75	12.9	31.4	7.74	-186	5.77	>1000		
0847	14.74	75	13.1	31.3	7.83	-205	5.17	>1000		
0852	14.93	75	13.1	30.6	7.98	-222	4.85	>1000		
0855	15.04	75	13.1	29.7	8.12	-230	4.74	>1000		
0858	15.06	75	13.2	29.7	8.13	-234	4.63	>1000		
0900	15.06	75	13.2	29.3	8.16	-239	4.55	>1000		

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	2.2L	13.2	29.3	8.16	-239	4.55	>1000		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-103RD	VOA	3	HCl	8260	0905	
As Required:							
Field Duplicate							
Field Blank							
MS/MSD							

General Notes: ////
Added trip blank TB-2 to cooler

WEM Waite Environmental Management, LLC.

UNIFIRST - BRESSETT
FIELD WATER COLLECTION SHEET

(5)

SAMPLING LOCATION	MW-103RS	Pump Intake Depth	10.8
Date	10/18	Pump Type	peri
Sampler	ML	Well Diameter	3/4
Weather	pc & cool	Well Depth	11.8
Water Type	(gw) sw supply	Initial Depth to Water	9.12
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. / Rate	na

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (ms/m) / (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
0923	9.12	75								began
0928	9.90	75	15.4	21.7	7.53	4	10.36	283		much clearer than 103RD
0932	10.12	75	15.3	21.9	7.39	18	8.90	192		
0935	10.23	75	15.2	21.9	7.30	24	8.71	174		
0938	10.29	75	15.2	21.9	7.21	29	8.71	165		
0941	10.33	75	15.2	22.0	7.15	33	8.84	125		
0944	10.37	75	15.2	21.9	7.12	38	8.78	112		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	1.5 L	15.2	21.9	7.12	38	8.78	112		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-103RS	VOA	3	HCl	8260	0945		
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

UNIFIRST - BRESSETT
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-1045	Pump Intake Depth	6.4
Date	10/18/11	Pump Type	peri
Sampler	MW	Well Diameter	3/4"
Weather	pc 1 cool	Well Depth	8.9
Water Type	(gw) sw supply	Initial Depth to Water	0.85
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. / Rate	100 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (ms/m) / (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1008	0.85	100								begin
1011	0.85	100	12.6	31.7	7.34	-31	11.82	195		
1015	0.85	100	12.4	31.3	7.36	-39	8.07	129		
1018	0.85	100	12.3	31.2	7.38	-36	7.13	110		
1021	0.85	100	12.3	31.2	7.40	-35	6.67	104		
1023	0.85	100	12.2	31.1	7.41	-35	6.53	103		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	2L	12.2	31.1	7.41	-35	6.53	103		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-1045	VOA	3	HCl	8260	1025	
As Required:							
Field Duplicate							
Field Blank							
MS/MSD							

General Notes: (

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

UNIFIRST – BRESSETT
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-104D	Pump Intake Depth	20.4
Date	10/18/11	Pump Type	peri
Sampler	MW	Well Diameter	3/4
Weather	pc & cool	Well Depth	22.9
Water Type	(gw) sw supply	Initial Depth to Water	0.91
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. / Rate	slowest possible

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (ms/m) / (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1032	0.91	75								began
1037	3.98	75	11.8	41.3	7.39	-115	8.49	165		
1040	5.82	75	11.5	42.1	7.45	-115	6.81	152		
1043	7.22	75	11.3	42.5	7.50	-116	6.06	140		
1046	8.72	75	11.3	42.9	7.56	-121	5.57	145		
1048	9.38	75	11.3	43.0	7.59	-123	5.43	185		
1051	10.12	75	11.2	42.9	7.62	-128	5.46	218		
1053	10.99	75	11.2	43.0	7.63	-129	5.39	210		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	1.5 L	11.2	43.0	7.63	-129	5.39	210		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-104D	VOA	3	HCl	8260	1055		
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

UNIFIRST - BRESSETT
FIELD WATER COLLECTION SHEET

(8)

SAMPLING LOCATION	MW-102D	Pump Intake Depth	28.8
Date	10/18/11	Pump Type	peri
Sampler	ML	Well Diameter	3/4"
Weather	pc & cool	Well Depth	30.8
Water Type	(gw) sw supply	Initial Depth to Water	8.09
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. / Rate	75

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C) within 3%	Specific Cond. (ms/m) / (us/cm) within 3%	pH 1 pH unit	ORP (mv) 10 mv	DO (mg/L) within 10%	Turbidity (NTU) within 10%		Notes
1131	8.09	75								begin
1136	9.84	75	12.3	42.2	7.96	-164	7.55	174		
1139	9.89	75	12.2	42.0	8.01	-184	6.44	153		
1142	10.02	75	12.2	42.0	8.04	-191	6.24	143		
1145	10.04	75	12.2	41.9	8.09	-203	5.90	120		
1148	10.06	75	11.9	41.9	8.16	-224	5.61	136		
1151	10.06	75	11.9	41.7	8.17	-228	5.46	155		
1154	10.06	75	11.7	41.7	8.20	-233	5.29	165		
1157	10.06	75	11.7	41.7	8.16	-237	5.26	171		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	1.8L	11.7	41.7	8.16	-237	5.26	171		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-102D	VOA	3	HCl	8260	1200	
As Required:							
Field Duplicate							
Field Blank							
MS/MSD							

General Notes:

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

UNIFIRST - BRESSETT
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-102S	Pump Intake Depth	11.9
Date	10/18/11	Pump Type	peri.
Sampler	MW	Well Diameter	3/4
Weather	pc & cool	Well Depth	12.9
Water Type	gw sw supply	Initial Depth to Water	7.91
Sampling Method	bailer low flow grab	Traditional Purge Vol. / Rate	75

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C) within 3%	Specific Cond. (ms/m) / (us/cm) within 3%	pH 1 pH unit	ORP (mv) 10 mv	DO (mg/L) within 10%	Turbidity (NTU) within 10%		Notes
1207	7.91	75								begin
1210	8.20	75	12.1	41.9	8.26	-192	6.50	420		
1213	8.20	75	12.2	455	8.10	-110	8.07	494		
1217	8.20	75	12.2	46.2	8.10	-89	9.17	347		
1220	8.20	75	12.2	46.4	8.11	-77	9.48	269		
1223	8.20	75	12.2	46.5	8.12	-71	9.68	258		
1226	8.20	75	12.2	46.3	8.13	-65	9.82	223		
1229	8.20	75	12.2	46.2	8.13	-60	9.96	193		
1232	8.20	75	12.2	46.2	8.14	-58	10.00	175		complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	2.1L	12.2	46.2	8.14	-58	10.00	175		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-102S	VOA	3	HCl	8260	1235		
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

UNIFIRST - BRESSETT
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-101S	Pump Intake Depth	11.9
Date	10/18/11	Pump Type	peri
Sampler	MW	Well Diameter	3/4"
Weather	pc & cool	Well Depth	14.3
Water Type	gw / sw / supply	Initial Depth to Water	5.26
Sampling Method	bailer / low flow / grab	Traditional Purge Vol. / Rate	75

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (ms/m) / (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1254	5.26	75								begin
1258	5.95	75	13.8	39.1	7.58	20	8.87	933		cloudy
1302	5.80	75	13.8	39.6	7.34	32	6.28	>1000		
1305	5.85	75	13.8	39.7	7.26	37	5.56	>1000		
1308	5.92	75	13.7	39.6	7.19	42	5.13	>1000		
1311	5.90	75	13.7	39.6	7.13	47	4.82	>1000		
1314	5.90	75	13.7	39.6	7.09	50	4.67	>1000		
1317	5.90	75	13.7	39.6	7.08	52	4.60	>1000		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	1.82	13.7	39.6	7.08	52	4.60	>1000		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-101S	VOA	3	HCl	8260	1320		
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

UNIFIRST -BRESSETT
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-101D	Pump Intake Depth	22.5'
Date	10/18/11	Pump Type	peri
Sampler	ML	Well Diameter	3/4"
Weather	pc & cool	Well Depth	24.8'
Water Type	(gw) sw supply	Initial Depth to Water	6.29
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. / Rate	75

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (ms/m) / (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1327	6.29	75								begin
1332	7.15	75	12.4	94.8	7.40	44	12.24	>1000		
1335	7.15	75	11.9	96.0	7.43	38	9.11	>1000		
1338	7.15	75	12.0	96.0	7.44	35	7.56	>1000		
1341	7.15	75	11.9	96.3	7.47	35	7.13	>1000		
1344	7.15	75	12.1	96.1	7.48	34	6.72	>1000		
1347	7.15	75	12.1	96.0	7.49	35	6.58	>1000		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	1.6 L	12.1	96.0	7.49	35	6.58	>1000		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-101D	VOA	3	HCl	8260	1350	
As Required:							
Field Duplicate							
Field Blank							
MS/MSD							

General Notes:

WEM Project #110320012

VT DEC Site #

UNIFIRST - BRESSETT

WEM Waite Environmental Management, LLC

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-4S	Pump Intake Depth	
Date	10/18/11	Pump Type	
Sampler	ML	Well Diameter	2"
Weather	pc cool	Well Depth	24.2
Water Type	gw / sw / supply	Initial Depth to Water	19.58
Sampling Method	bailer / low flow / grab	Traditional Purge Vol.	2.5 gal

SAMPLE COLLECTION	Purge Volume (ml / gal)	Temp. (deg C)	Specific Cond. (ms/m) / (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)	Filtered (y/n)	NOTES
Final Measurements:	2.5	9.6	11.8	7.49	49	14.35	459		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-4S	VOA	3	HCl	8260	1440	
As Required:							
Field Duplicate							
Field Blank							
MS/MSD	MW-4S	"	4	HCl	8260	1440	

General Notes:

SAMPLING LOCATION	MW-4D	Pump Intake Depth	
Date	10/18/11	Pump Type	
Sampler		Well Diameter	2"
Weather		Well Depth	46.8
Water Type	gw / sw / supply	Initial Depth to Water	20.0
Sampling Method	bailer / low flow / grab	Traditional Purge Vol.	13

SAMPLE COLLECTION	Purge Volume (ml / gal)	Temp. (deg C)	Specific Cond. (ms/m) / (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)	Filtered (y/n)	NOTES
Final Measurements:	13	9.0	36.0	8.01	44	11.74	461		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-4D	VOA	3	HCl	8260	1510	
As Required:							
Field Duplicate							
Field Blank							
MS/MSD							

General Notes:

UNIFIRST - BRESSETT

WEM Waite Environmental Management, LLC

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-3S		
Date	10/18/11		
Sampler	MW		
Weather	PS cool		
Water Type	(gw)	sw	supply
Sampling Method	(bailer)	low flow	grab

Pump Intake Depth	—
Pump Type	—
Well Diameter	2"
Well Depth	27.3
Initial Depth to Water	23.24
Traditional Purge Vol.	20

SAMPLE COLLECTION	Purge Volume (ml / (gal))	Temp. (deg C)	Specific Cond. (ms/m) / (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)	Filtered (y/n)	NOTES
Final Measurements:	26	8.7	62.3	7.82	57	14.55	584		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-3S	VOA	3	HCl	8260	1530		
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

SAMPLING LOCATION	MW-3D		
Date	10/18/11		
Sampler			
Weather			
Water Type	(gw)	sw	supply
Sampling Method	(bailer)	low flow	grab

Pump Intake Depth	—
Pump Type	—
Well Diameter	2"
Well Depth	74.6
Initial Depth to Water	21.30
Traditional Purge Vol.	26

SAMPLE COLLECTION	Purge Volume (ml / (gal))	Temp. (deg C)	Specific Cond. (ms/m) / (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)	Filtered (y/n)	NOTES
Final Measurements:	26	8.7	44.0	8.05	48	8.28	>1000		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-3D	VOA	3	HCl	8260	1616		
As Required:								
Field Duplicate	MW-Z	"	3	"	"	1700		blind
Field Blank	FB-3	"	2	"	"	1620		
MS/MSD								

General Notes: 2:05 began purging w/ peri @ 600 ml/min → 15 gal purge by 1535

APPENDIX E:

DATA VALIDATION REPORT: 4TH QUARTER

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, 20101. These SDGs include the following samples:

Sample Identifier	Laboratory ID
Method 8260B	
SDG No. BRES51	
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
SDG No. UNIF42	
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
SDG No. WHEA17	
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
Method 524.2	
SDG No. BRES51	
BRESSETT KITCHEN TOP	200-7553-5
SHIELDS	200-7553-6
WELL Z	200-7553-7
FB-1	200-7553-8
SDG No. UNIF42	
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 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 ^{o}C, which are within the acceptance range of 4 ^{o}C ±2 ^{o}C, with the marginally high exception of the cooler received on Oct. 17, 2011, at 6.1 ^{o}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 (±25 %D for Method 8260B and ±30 %D for Method 524.2), and Region 1 limits for continuing calibrations (±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 ±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 (±30 % of the area response in the associated continuing calibration standard). The laboratory SOP also defines recovery criteria relative to the associated initial calibration (±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	**36**
	vinyl chloride	nd	**151**	a	85 - 120	**40**
	chloroethane	nd	**171**	a	80 - 125	**36**
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 ug/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.