Waite-Heindel
Environmental Management

March 19, 2014
Revised: May 14, 2014

Mr. Gerold Noyes, P.E.
Vermont Department of Environmental Conservation
Waste Management Division
1 National Life Drive – Davis 1
Montpelier, VT 05620-3704

RE: 2013 Annual Monitoring Report
Bressett Site, Randolph, Vermont (Site #87-0009 / 77-0019)

Dear Gerold:

Waite-Heindel Environmental Management (WHEM) is pleased to present the *2013 Annual Monitoring Report* for the Bressett Site in Randolph, Vermont. The report provides details and results of the October 2013 (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 (*.PDF) of the report has been uploaded to the VT DEC's ftp site.

Do not hesitate to contact us if you have any questions about the report or the work conducted. Please contact Christopher Page at cpage@waiteenv.com or myself at mwaite@waiteenv.com.

Sincerely,

Miles E. Waite, Ph.D., P.G
Senior Hydrogeologist

Christopher M. Page
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Enclosure

2013 ANNUAL MONITORING REPORT

for the

BRESSETT SITE
RANDOLPH, VERMONT

VT DEC Site #87-0009 / 77-0019

March 19, 2014
Revised: May 14, 2014

Prepared for:

STATE OF VERMONT
Vermont Department of Environmental Conservation
Waste Management Division
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1.0 INTRODUCTION

The following *2013 Annual Monitoring Report* for the Bressett Site in Randolph, Vermont (see attached Site Location Map in Appendix A) was prepared by Waite-Heindel Environmental Management, LLC (WHEM) for the Vermont Department of Environmental Conservation (VT DEC). This report has been completed in accordance with Waite Environmental Management's (WHEM) 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 WHEM during 2013. 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 fourteen (14) groundwater monitoring wells in October 2013.
- Sampling of one (1) active supply well in April and October 2013.
- Sampling of one (1) active spring water system during April 2013.
- Sampling of indoor air at two (2) indoor locations inside a residence in February and August 2013.

Monitoring at these locations was conducted in accordance with Waite-Heindel Environmental Management's (WHEM) *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) 2013, which are discussed in this report, have been previously reported by WHEM [4, 5, 6].

2.0 GROUNDWATER SAMPLING

Groundwater monitoring well sampling was conducted by WHEM from a total of fourteen (14) wells on October 22-23, 2012. Wells sampled included six paired monitoring wells (MW-3S/D, MW4-S/D, MW-101S/D, MW-102S/D, MW-3RD, MW-104S/D) and three bedrock monitoring wells (BRW-1, BRW-2, BRW-3). In addition, groundwater elevation measurement was conducted on two (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 WHEM's Work Plan and the FLCM-Water with the exception of well MW-103RS October 2013. This well contained insufficient water for sampling, as has occurred in the past. MW-103RS and MW-103RD were installed in October 2011 to replace buried wells MW-103S and MW-103D.

Details and results of the sampling events are described below.

2.1 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 October 2013 are shown with historical measurements in Table 1.1 in Appendix B. These data indicate the following:

- The October 2013 average elevation (all wells) was 0.33 feet higher than the October 2012 average elevation, with the largest increases in elevation observed in the upper field wells (MW-2, MW-3S/D, and MW-4S/S).
- As water elevations increased only modestly from significant declines in 2012 data, October 2013 groundwater elevations remain towards the lower range of data collected from 2002-2012.

Groundwater elevations were also plotted to develop a groundwater elevation map for the October 2013 sampling event (see Appendix A). As this maps shows, the general direction of groundwater flow (based on shallow well data) was toward the southwest. The lateral hydraulic gradient, as calculated between MW-3S and MW-102S and 0.036 ft/ft in October 2013, comparable to past data. Vertical hydraulic gradients calculated between the paired wells (see Table 1.1) were generally negligible except in paired wells MW-101S/D and MW-103RS/D. MW-101S/D showed a downward vertical gradient of 0.08 ft/ft in October, a slight decrease from 0.09 ft/ft from 2011-2012. This well pair consistently has a measurable downward vertical gradient. Well pair MW-104S/D also had a downward vertical gradient of 0.03 ft/ft, while MW-3S/D showed an upward vertical gradient of 0.04 ft/ft.

2.2 Groundwater Sample Collection

Overburden monitoring wells MW-101S/D, MW-102S/D, MW-103RD, MW-104S/D, MW-3S/D and MW-4S/D were purged and sampled using a low-flow methodology. The low-flow methodology involves 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 (YSI 556 Multi-Probe Meter) 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[1], 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, BRW-3 and MW-103RD were also purged and sampled using the low-flow methodology as described above. However, the pump used was a submersible (GeoTech SS GeoSub) with dedicated flexible tubing. The pump was decontaminated with Alconox and de-ionized water prior to use and after use in each well. Purge rates and pump intake depths were as dictated by the site protocols. The SS GeoSub generally afforded much lower pumper rates than previous submersible pumps, so the flow-through cell was still utilized to monitor parameter stabilization, with a flow rate of approximately 200-320 ml/min in bedrock wells, and 75-100 ml/min in MW-103RD. Upon stabilization, samples were collected directly from the outlet of the disposable tubing.

In both 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 WHEM 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.

2.3 Purgewater Management

All purgewater generated during this event was containerized in 5-gallon pails with watertight caps and transported by WHEM to the UniFirst Plant site in Williamstown, Vermont, where the water was added into the groundwater treatment system. This was accomplished by pouring the purgewater into a sump present in the treatment shed that is connected to the activated carbon

[1] All low-flow parameters were recorded at 2-3 minute intervals, despite low pump rates in some wells. This is a deviation from the approved method (5-minute readings in slow wells), so not all field parameters may have fully stabilized at the time of sampling. Additionally, not all turbidity values equilibrated (+/- 10%) prior to sampling.

treatment train. This protocol was introduced in 2012 and will be followed on all future monitoring events, with no further disposal of purgewater on the ground as previously done.

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 October 2013 data with historical data:

- **Dissolved Oxygen**: readings were generally lower in October, with particularly low readings recorded at MW-103RD and BRW-2, likely due to the much lower flow-rates achieved with the GeoSub submersible. Previous submersible pumps (Grundfos RediFlow) could not achieve flow of less than 1-2L/min, increasing turbidity and DO values. Generally, values were within the range of historical measurements.
- **Specific Conductance**: October readings were within the range of historical measurements, except MW-4S which reported its lowest value to date. This decline in specific conductance is likely an anomaly of minimal concern.
- **pH**: October readings were within the range of historical measurements with no anomalies or clear trends noted.
- **Turbidity**: October readings were consistent with 2012, except in wells MW-102D (significantly decreased) and MW-3D (increase). As low-flow sampling has only been utilized for sampling these wells recently, long-term trends are still being established. It is likely that these changes in turbidity are related to the employment of low-flow-sampling, which yields much lower turbidity than sampling by bailer.
- **Redox**: 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. As with previous rounds, WHEM noted increased turbidity and pH relative to the old well pair—all other parameters are similar. Unfortunately, MW-103RS could not be sampled this round, as it was dry.

2.4.2 Laboratory Data

Validated laboratory analytical results are summarized in Table 2.0 in Appendix B and in the Data Validation Report [11] prepared by Phoenix Chemistry Service in Appendix E.

The analytical results for the target compounds of interest during October 2013 are described below:

PCE

- PCE was detected above reporting limits in wells MW-3S/D, MW-4D, MW-101S/D, and MW-102S during the October event. A trace (estimated below reporting limit) concentration was reported in MW-4S.

- 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 decreased (MW-3S/D, MW-4S/D, MW-102S) or remained stable between October 2012 and October 2013 in all but one well, MW-101S, which reported its highest concentration since April 2006 (9.0 ug/L). Levels in MW-101S appear to fluctuate, but with a slight downward trend over time.
- 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/D, MW-101S/D, and MW-102S during the October event.
- TCE was not detected above reporting limits in any of the following wells: MW-4S, MW-4D, MW-102D, MW-103RD, MW-104S/D, BRW-1, BRW-2, or BRW-3 during either event.
- TCE decreased between October 2012 and October 2013 in wells MW-3S/D and MW-101D, increased in MW-101S, and remained stable in all other wells.
- 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-101S/D and MW-102S in the October event.
- cis-1,2-DCE was not detected above reporting limits in wells MW-3D, MW-4S/D, MW-102D, MW-103RD, MW-104S/D, BRW-1, BRW-2, or BRW-3 during the event.
- cis-1,2-DCE decreased between October 2012 and 2013 in MW-3S and MW-101D, increased slightly in MW-101S and MW-102S, and remained stable in all other wells.
- cis-1,2-DCE has generally been decreasing or stable with time.

trans-1,2-DCE

- trans-1,2-DCE was detected above reporting limits in well MW-3S and at estimated (below reporting limits) concentrations below the reporting limit in wells MW-101D and MW-102S during the October event.
- trans-1,2-DCE was not detected above reporting limits in any of the following wells: MW-3D, 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 the October 2013 event include: MW-3S/D, MW-101S/D, and MW-102S. PCE levels in MW-4D have fallen after fluctuating around the VGES over the last several sampling rounds.

Trace (estimated below reporting limits) concentrations of Total Xylenes were reported in each of the bedrock (BRW-series) monitoring wells. These detections occurred in all wells that were sampled via the rental GeoSub SS pump, so it is likely that this low-level contamination was introduced by the pump and are not indicative of actual groundwater conditions.

To compare the 2013 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.

A significant decrease in PCE/TCE concentrations was observed in MW-3D in October 2012, as compared to historic data. The PCE/TCE concentrations in October 2013 are consistent with 2012 data, and well below historical levels in this well. This decline is likely due to the implementing of low-flow technique. A bend was observed in this well, making hand-bailing difficult and forcing the sampler to "shoot" the bailer past the bend to reach the bottom portion of the screened well. It is possible that the down-well sampling tubing did not descend past this bend, and the sample was therefore collected from closer to the top of the well screen rather than the well's bottom, as has historically been the case.

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 October 2013 are shown in the maps in Appendix A. The dimensions have not changed significantly from previous years, 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, WHEM collected field duplicate samples during the October 2013 event. During October, sample "MW-Z" was collected in conjunction with MW-101D. 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 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 2013.

2.5 Discussion of Data Validation

The laboratory data from the October 2013 sampling event were validated by Phoenix Chemistry Services, an independent data validator. The validation was performed in accordance with Tier III guidelines as described by the USEPA Region I. Details are presented in the Data Validation Report [11] in Appendix E.

Results for target volatile organic compounds in groundwater collected from the Site during October 2013 were determined to be valid as reported for all samples. While there were qualifications for non-target compounds bromomethane, acetone, and carbon tetrachloride, as well as some documentation and compliance issues noted for the sample group, these issues did not directly affected the validity of the groundwater data.

2.6 Well Maintenance

During August 2012, WHEM performed well box replacement for well BRW-2. The well box had been damaged beyond repair, likely by winter plowing, and required a new box set in concrete. The repairs appeared to be holding up as of the October 2013 round.

2.7 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, WHEM recommends continuing the groundwater monitoring program as specified in the Work Plan and FLCM-Water. The next groundwater sampling event is scheduled for October 2013. Prior to the next sampling event, monitoring well MW-103RD will be redeveloped to reduce sample siltation.

3.0 WATER SUPPLY SAMPLING

Water supply sampling was conducted by WHEM from the active bedrock well at the former Shields residence (now Hammond) residence (now Vonner) on April 13 and October 22, 2013. The shallow spring that supplies the former Bressett household was sampled on April 13, but by October 22 the home had been vacated, so no sampling occurred. 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. 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, owned and occupied by Joe and Joanne Vonner until September 2013. 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 (formerly 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 2013, WHEM purged the system of at least 30 gallons and then collected one (1) sample directly from the kitchen tap with the filter installed.

The Shields well is accessed via the hand-activated pump on the well head. During both April and October 2013 the well was purged of approximately 50 gallons prior to sampling. The sample was collected directly from the hand pump discharge nozzle.

All samples were delivered by WHEM 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 April 2013.
- No target VOCs were detected above reporting limits in the Shields Well during either April or October 2013.

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 2012 and 2013 sampling events is a result of the replacement of this buried water pipe with a new copper line in the fall of 2009. WHEM recommends discontinuing sampling at the Bressett tap so long as the home is unoccupied.

3.2.1 QA/QC Samples

As part of the QA/QC program, WHEM collected field duplicate samples during each sample event. During both April and October 2013, “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 than 2 times the quantitation limit in any sample, so precision could not be evaluated.

WHEM also prepared field blanks and added pre-made trip blanks to the cooler during each day of water supply sampling in April and October 2013. 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 2013 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]. The data validation report for October sampling is provided in Appendix E.

Results for target volatile organic compounds in groundwater collected from the Site during October 2013 were determined to be valid as reported for all samples. While there were qualifications for non-target compounds (vinyl chloride, bromomethane, methylene chloride, and carbon disulfide), as well as some documentation and compliance issues noted for the sample group, none of these issues 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, WHEM recommends continuing with the supply well monitoring program as specified in the *Work Plan* and *FLCM-Water* with the exception of removing the Bressett sample as long as the property is unoccupied. The next water supply sampling event is scheduled to occur in April 2014.

4.0 SURFACE WATER SAMPLING

In accordance with WHEM's *Work Plan* and with the *FLCM-Water*, surface water samples are now collected on a bi-annual basis on even years. Therefore, no surface water sampling was conducted in 2013. Sampling of surface water is scheduled to next occur in July of 2014.

5.0 INDOOR AIR SAMPLING

Indoor air sampling was conducted at the former Bressett residence by WHEM on February 13 and August 14, 2013. Sampling was conducted in accordance with WHEM'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.

This is the second annual report that uses revised indoor air guidance levels for the target compounds (PCE, TCE, cis-1,2-DCE, and trans-1,2-DCE). In the past, indoor air concentrations have been compared to Vermont Department of Health (VDOH) guidance levels that had been developed from a 1991-92 indoor ambient air survey. This has changed, and indoor air concentrations are now compared to the Target Indoor Air concentration shown in Table C.7. of

the VT DEC *Investigation and Remediation of Contaminated Properties (IROCP) Procedure* (April 2012), which has lower guidelines for PCE and TCE.

5.1 Air Sample Collection

A total of two (2) air samples were collected from the residence on February 13 and August 14, 2013. The 1st floor sample ("BRST1FLR") was collected from the office off the kitchen on the east side of the house[2], 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 WHEM using 6-liter stainless steel Silco air canisters. The canisters and flow controllers were procured by WHEM 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, WHEM 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.

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 WHEM 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 February and August 2013 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 [7,9] on file in Waterbury.

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

The results indicate that one or more of the target compounds were reported in both of the indoor air samples collected during February and August. During February, both the 1st floor and basement samples had reported concentrations of PCE and TCE. The basement also reported a low concentration of cis-1,2-DCE. During August, both the 1st floor and basement samples had reported concentrations of PCE. In addition, the August basement sample had reported concentrations of TCE. The compound trans-1,2-DCE was not detected in any samples collected in 2013, as was the case in 2010 and 2012.

Upon comparison to the Target Indoor Air guidelines (Table C.7, IROCP Procedure), the PCE concentration in the first floor was just above the guidance level (0.08 ppbv) in February but below the guidance in August, and the PCE concentration in the basement was above the guidance for PCE during both February and August. The TCE concentrations at both locations were below the guidance level (0.09 ppbv) during both occasions. The detection limits and detected concentrations of cis-1,2-DCE and trans-1,2-DCE were below applicable guidelines (EPA Regional Screening Level for indoor air).

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 since July 2011 are all much lower than they have been historically. February 2013 saw the lowest basement TCE and PCE levels on record for first quarter sampling. These data are 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. However, with the lower guidelines as described above, the PCE concentrations in the basement continue to exceed the guideline even with the system operational.

5.2.1 QA/QC Samples

As part of the quality assurance/quality control (QA/QC) program, WHEM collected field duplicate samples during both the February and August 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.

WHEM 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 [7,9] on file at the VT DEC offices in Waterbury.

Results for target volatile organic compounds in air collected from the Site during February and August 2012 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, WHEM recommends that air sampling continue as specified in the Work Plan and FLCM-Air. The 2014 sampling schedule will be January and July.

6.0 REFERENCES

1. Waite-Heindel Environmental Management, LLC, *Work Plan for Environmental Monitoring at the UniFirst Plant Site, Williamstown, Vermont, Wheatley Farm Site, Brookfield, Vermont, Bressett Site, Randolph, Vermont,* July 11, 2013.

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,* June 4, 2013.

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-Heindel Environmental Management, LLC, *1st Quarter 2013 Monitoring Report, Bressett Site, Randolph, Vermont,* June 25, 2013.

5. Waite-Heindel Environmental Management, LLC, *2nd Quarter 2013 Monitoring Report, Bressett Site, Randolph, Vermont,* August 8, 2013.

6. Waite-Heindel Environmental Management, LLC, *3rd Quarter 2013 Monitoring Report, Bressett Site, Randolph, Vermont,* November 14, 2013.

7. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Williamstown and Bressett Sites, Williamstown and Randolph, VT (Sample Delivery Group No. 200-15084 and 200-15275), May 15, 2013*

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. BRES55 and UNIF46, July 8, 2013*

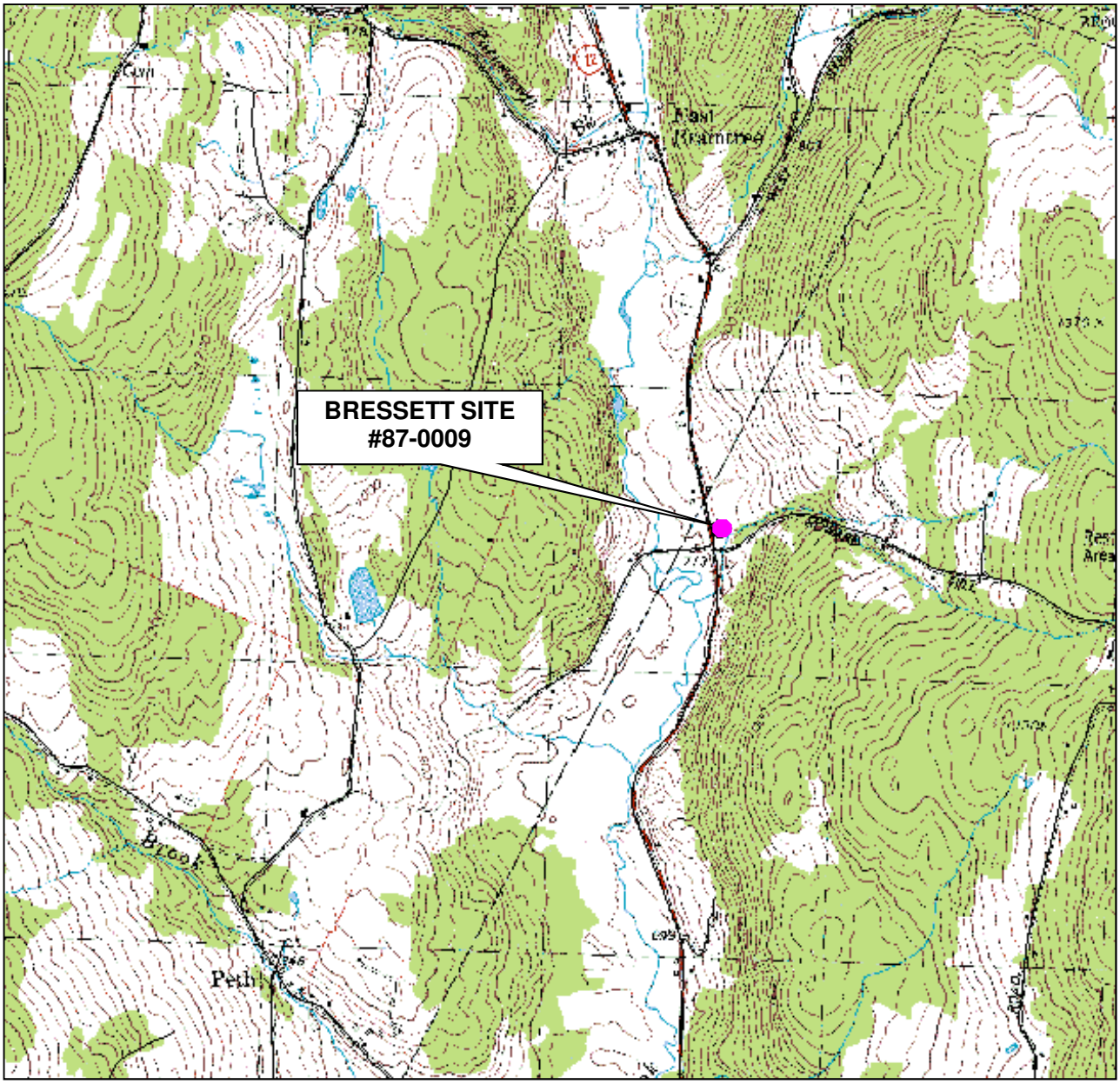
9. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Williamstown and Bressett Sites, Williamstown and Randolph, VT (Sample Delivery Group No. 200-17932), October 15, 2013*

11. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Bressett, Wheatley and UniFirst Sites, Randolph, Brookfield, and Williamstown, VT, Volatile Organics in Water Samples, Sample Delivery Group Nos. BRES56, UNIF47, WHEA19, and UNIF48, February 14, 2014.*

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

APPENDIX A:

FIGURES



LEGEND

State-Listed Hazardous Waste Site

N

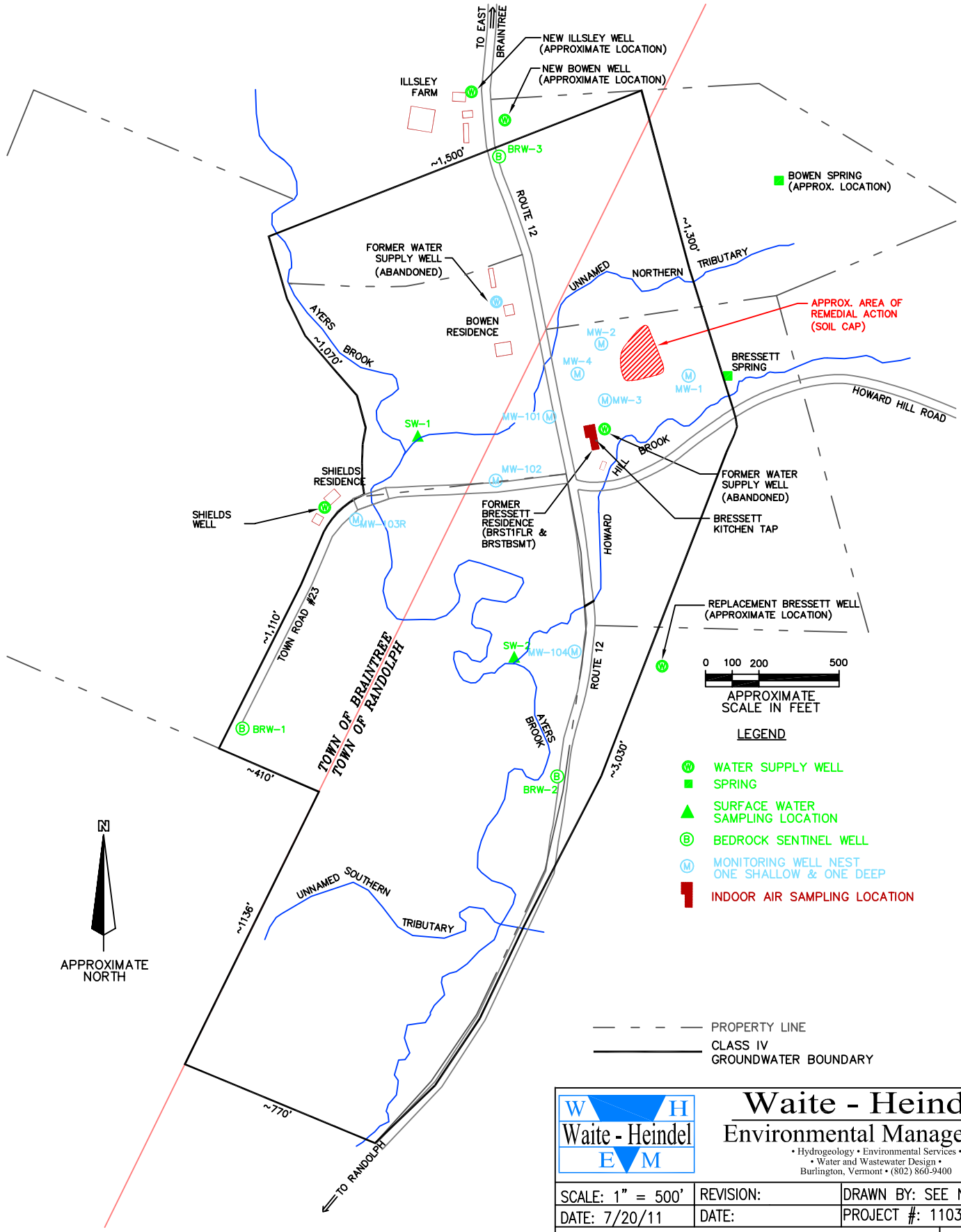
Map Source: *USGS Mapping 7.5 Minute Quadrangle: Randolph (1981)*

Waite - Heindel
Environmental Management

SITE LOCATION MAP

Bressett Site
Randolph, Vermont

Date: 12/15/12	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-HEINDEL ENVIRONMENTAL MGT.

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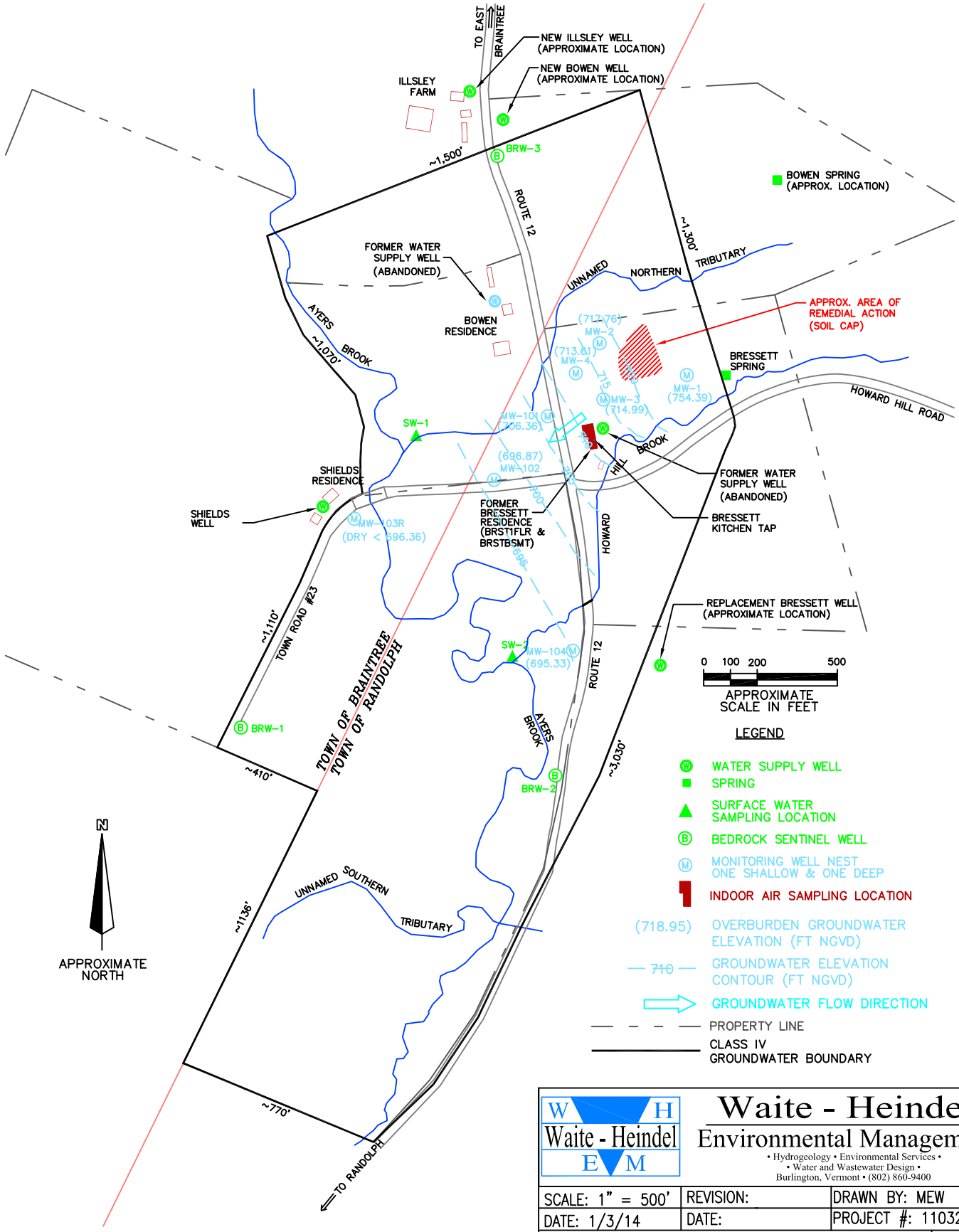
DATE: 7/20/11	DATE:	PROJECT #: 110320012

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-HEINDEL ENVIRONMENTAL MGT.
2. GROUNDWATER ELEVATIONS ARE FROM THE SHALLOW PAIRED WELL.
3. ELEVATIONS MEASURED BY WHEM ON OCTOBER 22, 2013.

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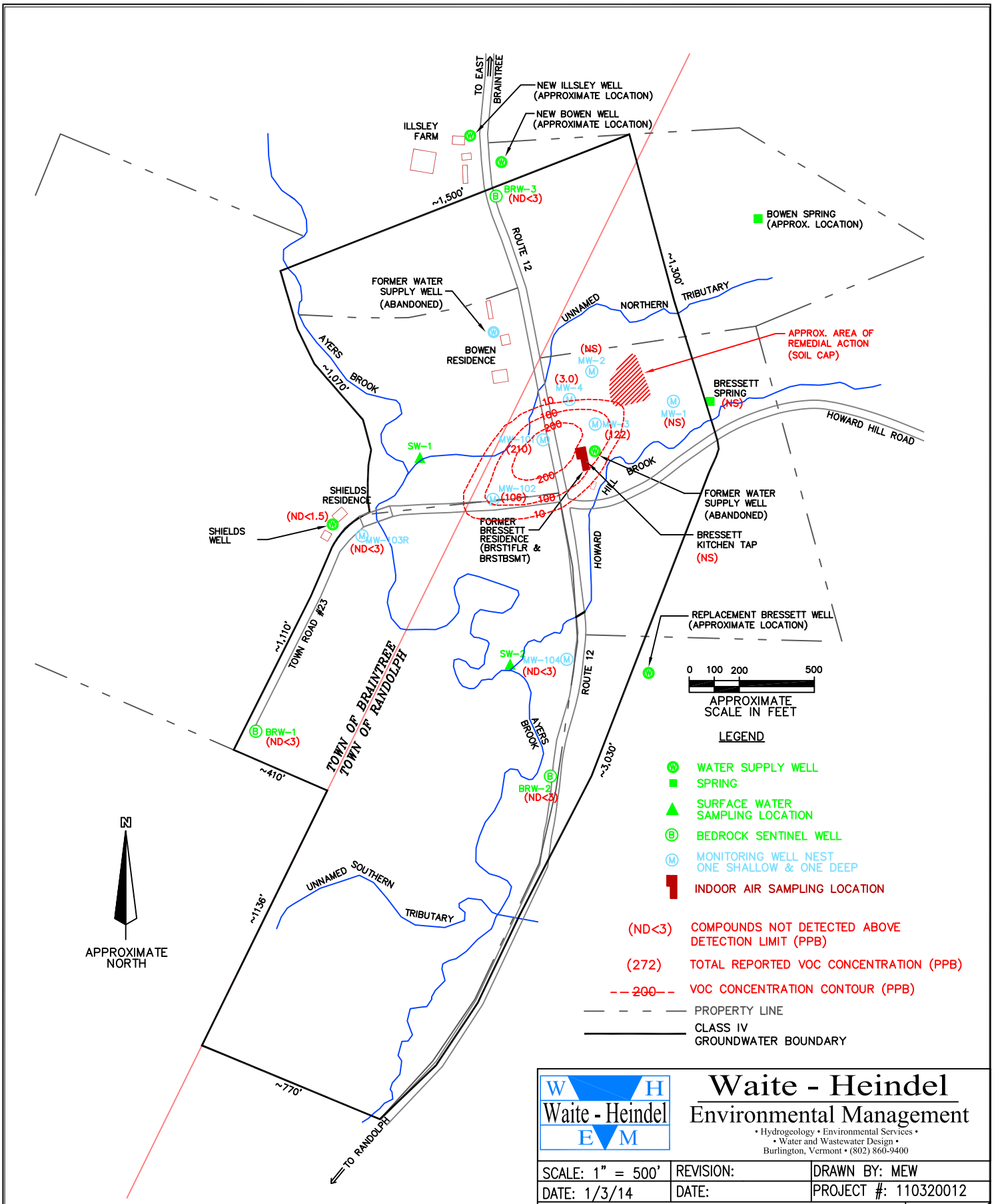
SCALE: 1" = 500'	REVISION:	DRAWN BY: MEW
DATE: 1/3/14	DATE:	PROJECT #: 110320012

GROUNDWATER ELEVATION CONTOUR MAP
OCTOBER 2013
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-HEINDEL 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: 1/3/14	DATE:	PROJECT #: 110320012

CVOC CONCENTRATION CONTOUR MAP
OCTOBER 2013
BRESSETT SITE
RANDOLPH, VERMONT

APPENDIX B:

TABLES

TABLE 1.1
Groundwater Elevation Measurements: 2010- 2012
Bressett Site, Randolph, Vermont

Location	Type	Units	Screen Center Elevation	Oct-10	Apr-11	Oct-11	Oct-12	Oct-13	Oct-12 Vertical Hydraulic Gradient (ft/ft)	Oct-13 Vertical Hydraulic Gradient (ft/ft)
MW-101D	Monitoring Well	FT	690.52	706.78	707.84	706.68	705.35	705.51	-0.09	-0.08
MW-101S	Monitoring Well	FT	701.03	707.83	708.79	707.62	706.28	706.36		
MW-102D	Monitoring Well	FT	674.76	697.63	698.55	697.52	696.83	696.75	-0.01	-0.01
MW-102S	Monitoring Well	FT	689.46	697.72	698.60	697.51	696.92	696.87		
MW-103D	Monitoring Well	FT	685.48	well destroyed						
MW-103S	Monitoring Well	FT	697.39	well destroyed						
MW-103RD	Monitoring Well	FT	687.50			697.12	694.99	695.01	NA	
MW-103RS	Monitoring Well	FT	697.76			697.94	696.36	DRY		
MW-104D	Monitoring Well	FT	676.26	695.73	696.62	696.43	695.76	694.89	-0.01	-0.03
MW-104S	Monitoring Well	FT	690.98	695.85	696.60	696.46	695.93	695.33		
MW-1	Monitoring Well	FT	755.60	756.80	757.62	755.98	755.14	754.39	NA	NA
MW-2D	Monitoring Well	FT	683.40	NA	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	FT	714.50	720.70	721.01	718.85	715.75	717.76		
MW-3D	Monitoring Well	FT	664.55	717.69	720.13	717.20	715.05	716.78	0.03	0.04
MW-3S	Monitoring Well	FT	714.09	715.36	718.06	716.08	713.47	714.99		
MW-4D	Monitoring Well	FT	689.82	714.09	716.05	714.27	712.02	713.28	0.00	-0.02
MW-4S	Monitoring Well	FT	711.44	714.02	716.07	714.61	712.02	713.61		
BRW-1	Monitoring Well	FT	659.30	704.13	708.56	704.83	701.78	702.26	NA	NA
BRW-2	Monitoring Well	FT	639.40	695.20	697.67	698.45	696.18	693.89	NA	NA
BRW-3	Monitoring Well	FT	678.00	722.17	725.95	723.44	716.18	717.18	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).

TABLE 1.2
Dissolved Oxygen Field Measurements: 2007 - 2013
Bressett Site, Randolph, Vermont

Location	Type	Units	Oct-07	Apr-08	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11	Oct-12	Oct-13
MW-101D	Monitoring Well	mg/L	0.67	3.77	0.64	0.00	0.59	1.23	4.80	5.30	6.58	2.11	3.33
MW-101S	Monitoring Well	mg/L	0.00	6.31	0.00	0.00	0.00	0.00	3.29	4.14	4.60	0.00	0.85
MW-102D	Monitoring Well	mg/L	0.00	2.09	0.00	0.00	0.00	0.00	3.92	3.62	5.26	0.00	0.65
MW-102S	Monitoring Well	mg/L	5.47	6.49	5.50	1.61	4.05	4.93	7.69	8.35	10.00	6.40	6.43
MW-103D	Monitoring Well	mg/L	0.00	3.80	0.00	0.00	0.00	0.00					
MW-103S	Monitoring Well	mg/L	DRY	2.93	DRY	NA	DRY	NA					
MW-103RD	Monitoring Well	mg/L									4.55	0.00	0.10
MW-103RS	Monitoring Well	mg/L									8.78	DRY	DRY
MW-104D	Monitoring Well	mg/L	0.00	8.00	1.27	0.00	0.00	0.00	5.27	3.75	5.39	0.00	1.30
MW-104S	Monitoring Well	mg/L	0.24	11.95	3.31	0.19	1.89	3.04	4.39	10.29	6.53	4.58	5.46
MW-1	Monitoring Well	mg/L	NA	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	NA
MW-2S	Monitoring Well	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	mg/L	3.02	5.16	2.75	1.06	0.13	2.41	7.16	8.86	8.28	1.64	5.61
MW-3S	Monitoring Well	mg/L	9.15	11.90	9.47	4.15	8.60	10.03	8.87	15.21	14.55	11.54	9.09
MW-4D	Monitoring Well	mg/L	5.95	8.95	9.22	4.10	6.56	7.22	7.68	12.52	11.76	6.39	3.98
MW-4S	Monitoring Well	mg/L	9.91	11.35	9.95	6.14	7.89	11.18	9.30	17.23	14.35	9.59	9.07
BRW-1	Monitoring Well	mg/L	2.71	13.66	3.20	2.35	1.31	3.01	4.49	7.10	8.64	2.11	2.80
BRW-2	Monitoring Well	mg/L	0.53	13.48	0.31	0.99	0.00	0.69	2.96	4.31	5.99	0.91	0.20
BRW-3	Monitoring Well	mg/L	6.68	10.89	6.13	6.45	6.42	7.84	6.05	9.03	11.33	4.54	6.56

Notes:
- All dissolved oxygen meaurements in milligrams/liter (mg/L).
-"Dry" = well dry during monitoring event; "NA" = data not available; blank -= well not present
- In October 2013, monitoring wells MW-3S, MW-3D, MW-4D, MW-101S/D, MW-102S/D, MW-103RD, and MW-104S/D were purged at 100 ml/min or slower, with readings collected every 2-3 minutes rather than 5 minutes as outlined in the work plan; therefore, parameters may not have stabilized accordingly in these wells.

TABLE 1.3
Specific Conductance Field Measurements: 2007 - 2013
Bressett Site, Randolph, Vermont

Location	Type	Units	Oct-07	Apr-08	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11	Oct-12	Oct-13
MW-101D	Monitoring Well	us/cm	771	839	611	920	960	NA	860	996	960	698	693
MW-101S	Monitoring Well	us/cm	307	273	203	990	378	NA	368	396	396	296	352
MW-102D	Monitoring Well	us/cm	340	356	271	892	374	NA	363	448	417	274	286
MW-102S	Monitoring Well	us/cm	429	444	331	488	NA	NA	413	497	462	309	329
MW-103D	Monitoring Well	us/cm	268	246	210	541	301	NA					
MW-103S	Monitoring Well	us/cm	DRY	204	DRY	NA	DRY	NA					
MW-103RD	Monitoring Well	us/cm									293	201	204
MW-103RS	Monitoring Well	us/cm									219	DRY	DRY
MW-104D	Monitoring Well	us/cm	280	295	227	914	284	NA	197	363	430	306	254
MW-104S	Monitoring Well	us/cm	418	399	309	336	NA	NA	366	458	311	322	307
MW-1	Monitoring Well	us/cm	NA	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	NA
MW-2S	Monitoring Well	us/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	us/cm	410	426	333	352	NA	NA	378	473	440	264	267
MW-3S	Monitoring Well	us/cm	549	413	432	391	NA	NA	499	543	623	442	447
MW-4D	Monitoring Well	us/cm	332	324	254	292	541	NA	310	383	360	222	235
MW-4S	Monitoring Well	us/cm	145	82	103	113	371	NA	123	90	118	122	62
BRW-1	Monitoring Well	us/cm	221	166	177	478	248	NA	214	269	257	166	167
BRW-2	Monitoring Well	us/cm	343	256	265	611	362	NA	310	383	343	448	350
BRW-3	Monitoring Well	us/cm	391	270	280	405	NA	NA	353	428	431	328	277

Notes:
- All conductivity meaurements in microsiemens per centimeter (us/cm).
-"Dry" = well dry during monitoring event; "NA" = data not available.;blank = well not present-
- In October 2013, monitoring wells MW-3S, MW-3D, MW-4D, MW-101S/D, MW-102S/D, MW-103RD, and MW-104S/D were purged at 100 ml/min or slower, with readings collected every 2-3 minutes rather than 5 minutes as outlined in the work plan; therefore, parameters may not have stabilized accordingly in these wells.

TABLE 1.4
Temperature Field Measurements: 2007- 2013
Bressett Site, Randolph, Vermont

Location	Type	Units	Oct-07	Apr-08	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11	Oct-12	Oct-13
MW-101D	Monitoring Well	deg C	10.9	7.9	12.4	10.7	9.5	10.8	11.9	11.9	12.1	12.9	11.07
MW-101S	Monitoring Well	deg C	13.4	6.6	14.5	9.6	11.3	9.2	13.5	9.9	13.7	12.2	13.70
MW-102D	Monitoring Well	deg C	11.2	6.4	13.0	12.1	9.0	10.6	10.5	10.7	11.7	9.6	9.32
MW-102S	Monitoring Well	deg C	12.2	6.3	13.1	11.1	10.0	11.0	11.1	11.9	12.2	10.3	10.86
MW-103D	Monitoring Well	deg C	10.8	7.3	12.0	8.2	9.6	7.9	NA	NA	NA	NA	NA
MW-103S	Monitoring Well	deg C	DRY	6.5	DRY	NA	DRY	NA	NA	NA	NA	NA	NA
MW-103RD	Monitoring Well	deg C									13.2	11.0	11.47
MW-103RS	Monitoring Well	deg C									15.2	DRY	DRY
MW-104D	Monitoring Well	deg C	12.1	7.2	16.7	18.2	10.4	9.4	10.9	7.9	11.2	11.6	9.86
MW-104S	Monitoring Well	deg C	14.4	6.5	13.8	7.4	11.5	7.9	11.6	6.1	12.2	11.6	11.62
MW-1	Monitoring Well	deg C	NA	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	NA
MW-2S	Monitoring Well	deg C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	deg C	9.0	9.1	9.3	9.0	8.0	9.7	8.2	11.8	8.7	9.8	8.90
MW-3S	Monitoring Well	deg C	8.9	7.8	9.8	9.4	8.4	9.4	8.5	10.7	8.9	9.6	9.76
MW-4D	Monitoring Well	deg C	9.4	8.2	9.9	9.0	9.0	10.8	8.1	11.4	9.0	8.9	10.07
MW-4S	Monitoring Well	deg C	9.6	7.6	11.4	9.2	8.4	10.5	9.0	11.9	9.6	8.8	10.63
BRW-1	Monitoring Well	deg C	9.5	8.9	8.8	9.2	9.3	9.3	9.1	8.8	9.4	10.7	9.62
BRW-2	Monitoring Well	deg C	10.8	9.4	11.0	9.8	10.0	9.7	11.7	9.1	10.9	12.1	10.33
BRW-3	Monitoring Well	deg C	10.2	9.7	10.3	9.6	10.1	10.0	10.5	9.8	10.4	11.6	9.95

Notes:
- All temperature measurements in degrees Celsius (deg C).
-"Dry" = well dry during monitoring event; "NA" = data not available; blank = well not present
- In October 2013, monitoring wells MW-3S, MW-3D, MW-4D, MW-101S/D, MW-102S/D, MW-103RD, and MW-104S/D were purged at 100 ml/min or slower, with readings collected every 2-3 minutes rather than 5 minutes as outlined in the work plan; therefore, parameters may not have stabilized accordingly in these wells.

TABLE 1.5
pH Field Measurements: 2007 - 2013
Bressett Site, Randolph, Vermont

Location	Type	Units	Oct-07	Apr-08	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11	Oct-12	Oct-13
MW-101D	Monitoring Well	unitless	6.85	7.18	NA	6.97	7.04	6.91	6.09	7.51	7.49	7.12	6.83
MW-101S	Monitoring Well	unitless	6.41	6.76	NA	6.61	6.49	6.19	5.68	7.00	7.08	6.49	6.23
MW-102D	Monitoring Well	unitless	7.75	8.23	NA	7.94	7.99	7.94	6.79	7.80	8.16	8.19	7.81
MW-102S	Monitoring Well	unitless	7.49	7.85	NA	7.64	7.62	7.57	6.42	7.84	8.14	7.72	7.43
MW-103D	Monitoring Well	unitless	6.78	7.68	NA	7.41	7.62	7.29					
MW-103S	Monitoring Well	unitless	DRY	6.71	NA	NA	DRY	NA					
MW-103RD	Monitoring Well	unitless									8.16	8.20	7.81
MW-103RS	Monitoring Well	unitless									7.12	DRY	DRY
MW-104D	Monitoring Well	unitless	6.27	8.29	NA	7.86	6.98	7.45	6.09	7.78	7.63	7.45	7.05
MW-104S	Monitoring Well	unitless	6.78	7.24	NA	7.06	7.17	7.00	5.79	7.58	7.41	7.23	7.23
MW-1	Monitoring Well	unitless	NA	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	NA
MW-2S	Monitoring Well	unitless	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	unitless	7.48	7.65	NA	7.49	7.63	7.41	6.45	8.04	8.05	7.70	7.52
MW-3S	Monitoring Well	unitless	7.31	7.51	NA	7.29	7.40	7.18	6.25	7.79	7.82	7.26	7.04
MW-4D	Monitoring Well	unitless	7.47	7.33	NA	7.16	7.63	7.26	6.39	7.67	8.01	7.67	7.22
MW-4S	Monitoring Well	unitless	7.76	6.44	NA	7.32	7.37	7.20	6.25	7.90	7.49	7.19	6.33
BRW-1	Monitoring Well	unitless	7.51	7.57	NA	7.63	7.61	7.70	6.95	7.99	7.48	7.90	7.39
BRW-2	Monitoring Well	unitless	7.25	7.28	NA	7.34	7.28	7.48	7.05	7.61	7.33	7.67	7.27
BRW-3	Monitoring Well	unitless	7.02	7.20	NA	7.39	7.14	7.37	6.46	6.80	6.63	7.49	7.18

Notes:
-"Dry" = well dry during monitoring event; "NA" = data not available; blank = well not present
- In October 2013, monitoring wells MW-3S, MW-3D, MW-4D, MW-101S/D, MW-102S/D, MW-103RD, and MW-104S/D were purged at 100 ml/min or slower, with readings collected every 2-3 minutes rather than 5 minutes as outlined in the work plan; therefore, parameters may not have stabilized accordingly in these wells.

TABLE 1.6
Turbidity Field Measurements: 2007 - 2013
Bressett Site, Randolph, Vermont

Location	Type	Units	Oct-07	Apr-08	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11	Oct-12	Oct-13
MW-101D	Monitoring Well	NTU	0.7	366	806	> 1000	> 1000	> 1000	NA	> 1000	> 1000	497	471.9
MW-101S	Monitoring Well	NTU	> 1000	> 1000	> 1000	122	330	> 1000	NA	> 1000	> 1000	205	67.25
MW-102D	Monitoring Well	NTU	0.0	42.0	49.3	53.4	164	151	NA	569	171	606	68.71
MW-102S	Monitoring Well	NTU	31.3	47.0	105	21.4	20.9	139	NA	0.2	178	4.4	5.2
MW-103D	Monitoring Well	NTU	17.0	104	27.9	40.0	63.3	144					
MW-103S	Monitoring Well	NTU	DRY	> 1000	DRY	NA	DRY	NA					
MW-103RD	Monitoring Well	NTU									> 1000	> 1000	> 1000
MW-103RS	Monitoring Well	NTU									112	DRY	DRY
MW-104D	Monitoring Well	NTU	176	690	154	15.7	> 1000	598	NA	585	210	54.2	58.9
MW-104S	Monitoring Well	NTU	2.8	16.3	47.8	8.0	7.0	49.5	NA	0.0	103	6.9	4.2
MW-1	Monitoring Well	NTU	NA	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	NA
MW-2S	Monitoring Well	NTU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	NTU	132	533	> 1000	> 1000	> 1000	> 1000	NA	> 1000	> 1000	16.4	51.16
MW-3S	Monitoring Well	NTU	86.7	413	498	281	567	806	NA	445	584	0.0	2.08
MW-4D	Monitoring Well	NTU	13.3	152	650	684	> 1000	> 1000	NA	> 1000	461	0.0	1.0
MW-4S	Monitoring Well	NTU	2.7	209	323	373	268	495	NA	546	459	0.0	1.69
BRW-1	Monitoring Well	NTU	0.0	NA	0.0	8.6	0.0	13.0	NA	0.0	0.0	0.5	0.8
BRW-2	Monitoring Well	NTU	13	NA	2.2	41.1	67.9	98.6	NA	27.2	71.7	100	118
BRW-3	Monitoring Well	NTU	0.0	NA	6.1	19.6	9.8	16.7	NA	0.0	0.0	10.4	5.8

Notes:
-All turbidity measurements in nephelometric turbidity units (NTU).
-"Dry" = well dry during monitoring event; "NA" = data not available; blank = well not present
- In October 2013, monitoring wells MW-3S, MW-3D, MW-4D, MW-101S/D, MW-102S/D, MW-103RD, and MW-104S/D were purged at 100 ml/min or slower, with readings collected every 2-3 minutes rather than 5 minutes as outlined in the work plan; therefore, parameters may not have stabilized accordingly in these wells.

TABLE 1.7
Redox Potential Field Measurements: 2007 - 2013
Bressett Site, Randolph, Vermont

Location	Type	Units	Oct-07	Apr-08	Sep-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11	Oct-12	Oct-13
MW-101D	Monitoring Well	mV	113	138	132	116	185	115	119	73	35	110	88
MW-101S	Monitoring Well	mV	65	138	138	120	164	146	132	92	52	127	95.4
MW-102D	Monitoring Well	mV	-166	-181	-185	-190	-172	-203	-214	-215	-237	-170	-146.4
MW-102S	Monitoring Well	mV	42	94	92	66	97	10	29	-27	-58	-6	13.7
MW-103D	Monitoring Well	mV	-235	-150	-160	-157	-138	-141					
MW-103S	Monitoring Well	mV	DRY	103	DRY	NA	DRY	NA					
MW-103RD	Monitoring Well	mV									-239	-169	-165
MW-103RS	Monitoring Well	mV									38	DRY	DRY
MW-104D	Monitoring Well	mV	26	-134	-50	-119	-26	-121	-15	-178	-129	-142	-120
MW-104S	Monitoring Well	mV	-6	131	77	74	106	53	156	26	-35	89	2.5
MW-1	Monitoring Well	mV	NA	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	NA
MW-2S	Monitoring Well	mV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	mV	74	196	129	153	217	176	110	87	48	181	89.1
MW-3S	Monitoring Well	mV	63	203	145	148	211	152	99	97	57	195	98.4
MW-4D	Monitoring Well	mV	41	204	137	146	200	152	89	94	44	183	85.5
MW-4S	Monitoring Well	mV	26	230	141	142	212	143	142	85	49	199	124.6
BRW-1	Monitoring Well	mV	-2	-2	19	-13	38	-44	-53	-45	-58	-62	-6.4
BRW-2	Monitoring Well	mV	-174	-128	-148	-136	-157	-184	-235	-231	-234	-150	-154
BRW-3	Monitoring Well	mV	145	179	162	132	246	163	69	57	40	113	158

Notes:
-All redox potential measurements in millivolts (mV).
-"Dry" = well dry during monitoring event; "NA" = data not available; blank = well not present
- In October 2013, monitoring wells MW-3S, MW-3D, MW-4D, MW-101S/D, MW-102S/D, MW-103RD, and MW-104S/D were purged at 100 ml/min or slower, with readings collected every 2-3 minutes rather than 5 minutes as outlined in the work plan; therefore, parameters may not have stabilized accordingly in these wells.

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TABLE 2.0
MONITORING WELL RESULTS: 2008-2013
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	Oct-12	Oct-13
MW-3S	**PCE**	**5.0**	ug/L	**110**	**54**	**79**	**61**	**95**	**52**	**100**	**84**	**84**
	TCE	**5.0**	ug/L	**21**	**9.4**	**16**	**11**	**22**	**12**	**27**	**25**	**25**
	cis-1,2-DCE	**70.0**	ug/L	**9.0**	**2.7**	**5.4**	**3.4**	**8.9**	**3.5**	**13.0**	**11**	**11**
	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	1.2 J	**1.2**
MW-3D	**PCE**	**5.0**	ug/L	**210**	**97**	**220**	**150**	**220**	**210**	**170**	**9.5**	**9.5**
	TCE	**5.0**	ug/L	**25**	**9.8**	**22**	**22**	**25**	**24**	**19**	**1.0**	**1.0**
	cis-1,2-DCE	**70.0**	ug/L	**23**	**9.2**	**24**	**26**	**32**	**33**	**24**	1.0 U	1.0 U
	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	1.0 U	1.0 U
MW-4S	**PCE**	**5.0**	ug/L	**1.2**	0.79 J	**2.1**	0.66 J	**1.0**	0.82 J	**1.5**	**0.7**	0.74 J
	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	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	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	1.0 U	1.0 U
MW-4D	**PCE**	**5.0**	ug/L	**13**	**15**	**11**	**9.0**	**6.9**	**4.6**	**5.1**	**3.0**	**1.0**
	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	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	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	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**	**9.0**	**9.0**
	TCE	**5.0**	ug/L	**1.7**	**1.0**	**1.4**	**1.2**	0.78 J	**1.2**	**1.3**	1.9 J	**1.9**
	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	1.5 J	**1.5**
	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 J	1.0 J	1.0 U
MW-101D	**PCE**	**5.0**	ug/L	**170**	**140**	**150**	**140**	**140**	**140**	**140**	**140**	**140**
	TCE	**5.0**	ug/L	**31**	**30**	**31**	**28**	**31**	**29**	**32**	**31**	**31**
	cis-1,2-DCE	**70.0**	ug/L	**52**	**47**	**47**	**39**	**43**	**41**	**43**	**38**	**38**
	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	0.99 J	0.99 J
MW-102S	**PCE**	**5.0**	ug/L	**100**	**89**	**70**	**66**	**68**	**61**	**76**	**76**	**75**
	TCE	**5.0**	ug/L	**17**	**13**	**11**	**9.8**	**12**	**9.1**	**15**	**12**	**14**
	cis-1,2-DCE	**70.0**	ug/L	**22**	**14**	**13**	**11**	**15**	**10**	**20**	**13**	**16**
	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	0.48 J	0.58 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	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	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	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	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	DRY	DRY
	TCE	**5.0**	ug/L							1.0 U	DRY	DRY
	cis-1,2-DCE	**70.0**	ug/L							1.0 U	DRY	DRY
	trans-1,2-DCE	**100.0**	ug/L							1.0 U	DRY	DRY
MW-103RD	**PCE**	**5.0**	ug/L							1.0 U	1.0 U	1.0 U
	TCE	**5.0**	ug/L							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
	trans-1,2-DCE	**100.0**	ug/L							1.0 U	1.0 U	1.0 U

TABLE 2.0
MONITORING WELL RESULTS: 2008-2013
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	Oct-12	Oct-13
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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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: 2008-2013
Bressett Site, Randolph, Vermont

Owner	Location	Parameter (Method 524.2)	Groundwater Enforcement Standard	Units	Jul-08	Oct-08	Apr-09	Oct-09	Apr-10	Oct-10	Apr-11	Oct-11	Apr-12	Oct-12	Apr-13	Oct-13
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	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	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	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	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	**Shields Well**	**PCE**	**0.7**	ug/L		0.5 U	0.5 U	0.7 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
		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	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	0.5 U	0.5 U
		trans-1,2-DCE	**100.0**	ug/L		0.5 U	0.5 U	0.7 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
Bowen	**Bowen Well**	**PCE**	**0.7**	ug/L												
		TCE	**5.0**	ug/L												
		cis-1,2-DCE	**70.0**	ug/L												
		trans-1,2-DCE	**100.0**	ug/L												

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 - 2012
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	Aug-12
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	DRY
	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	DRY
	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	DRY
	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	DRY
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	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	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	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	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.

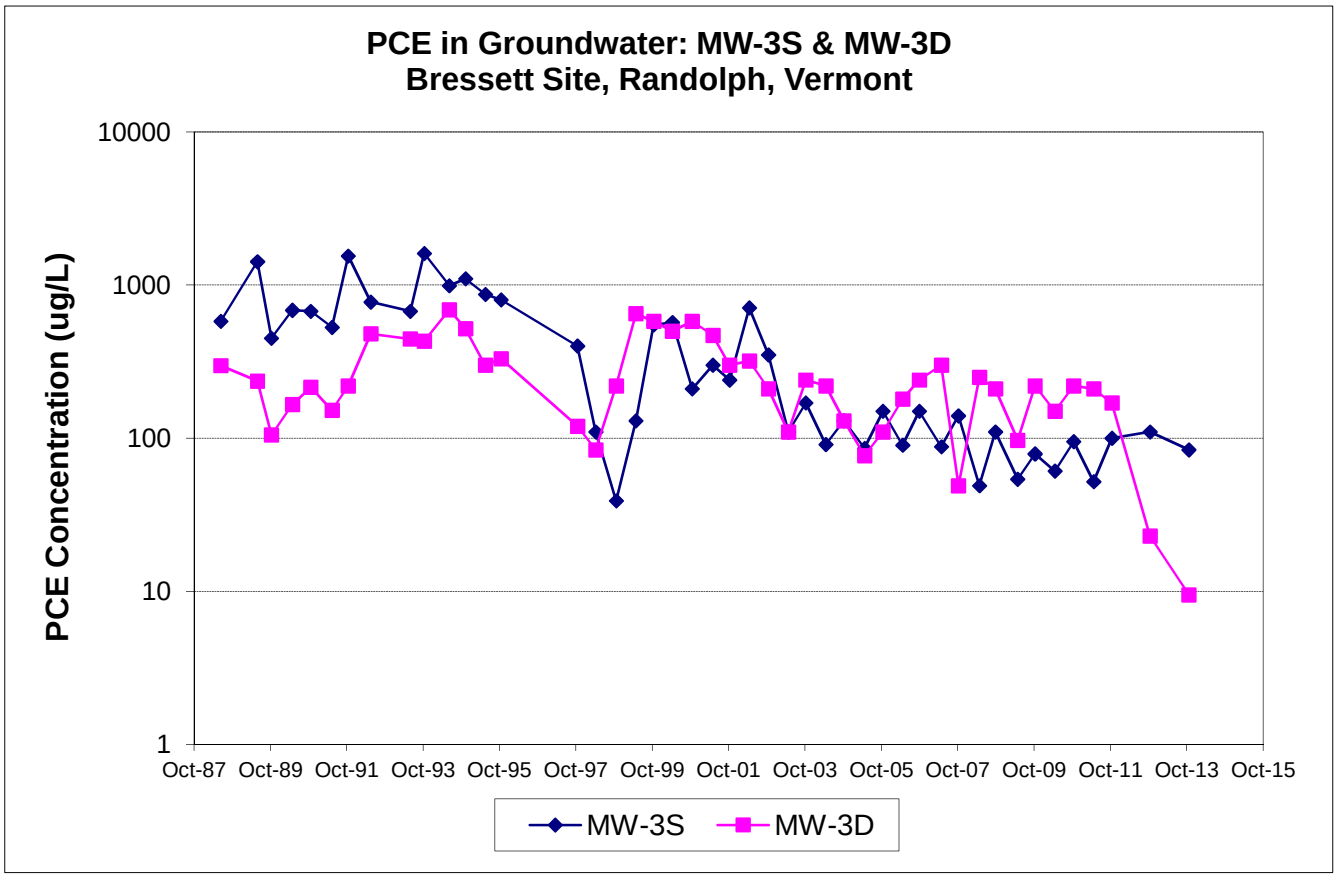
TABLE 5.0
INDOOR AIR QUALITY RESULTS: 2008-2013
Bressett Site, Randolph, Vermont

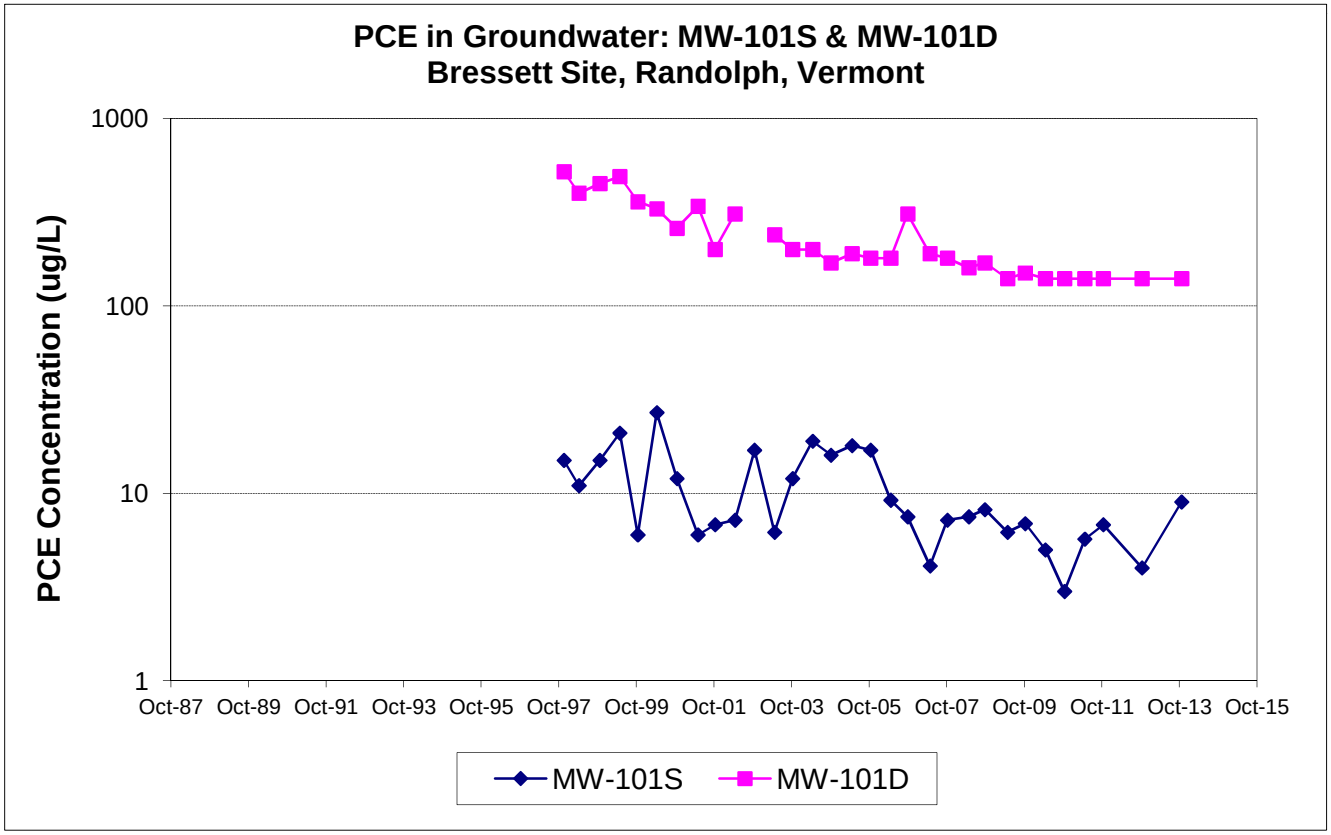
Current Owner	Location	Parameter (Method T-014A)	Guidance Level	Units	Jul-08	Jan-09	Jul-09	Feb-10	Jul-10	Jan-11	Jul-11	Jan-12	Aug-12	Feb-13	Aug-13
Vonner	BRST1FLR	Tetrachloroethene	0.08	ppbv	**2.8**	**1.8**	**3.4**	**0.27**	**0.034** J	**1.3**	**0.041**	**0.13**	**0.041**	**0.15**	**0.071**
		Trichloroethene	0.09	ppbv	**0.19**	**0.22**	**0.20**	**0.034**	0.010 UJ	**0.19**	0.010 U	**0.018**	0.010 U	**0.019**	0.010 U
		cis-1,2-Dichloroethene		ppbv	**0.040**	**0.13**	**0.055**	**0.025**	0.010 UJ	**0.16**	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
		trans-1,2-Dichloroethene	15.9	ppbv	0.010 U	**0.013**	0.010 U	0.010 U	0.010 U	**0.015**	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
	BRSTBSMT	Tetrachloroethene	0.08	ppbv	**4.4**	**2.6**	**9.1**	**0.82** J	**0.21** J	**4.8**	**0.24**	**0.32**	**0.16**	**0.19**	**0.11**
		Trichloroethene	0.09	ppbv	**0.30**	**0.33**	**0.55**	**0.084**	**0.029** J	**0.65**	**0.035**	**0.037**	**0.027**	**0.025**	**0.015**
		cis-1,2-Dichloroethene		ppbv	**0.055**	**0.18**	**0.14** J	**0.067**	0.010 UJ	**0.53**	**0.015**	**0.020**	0.010 U	**0.017**	0.010 U
		trans-1,2-Dichloroethene	15.9	ppbv	**0.011**	**0.018**	**0.016** J	0.010 U	0.010 U	**0.047**	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U

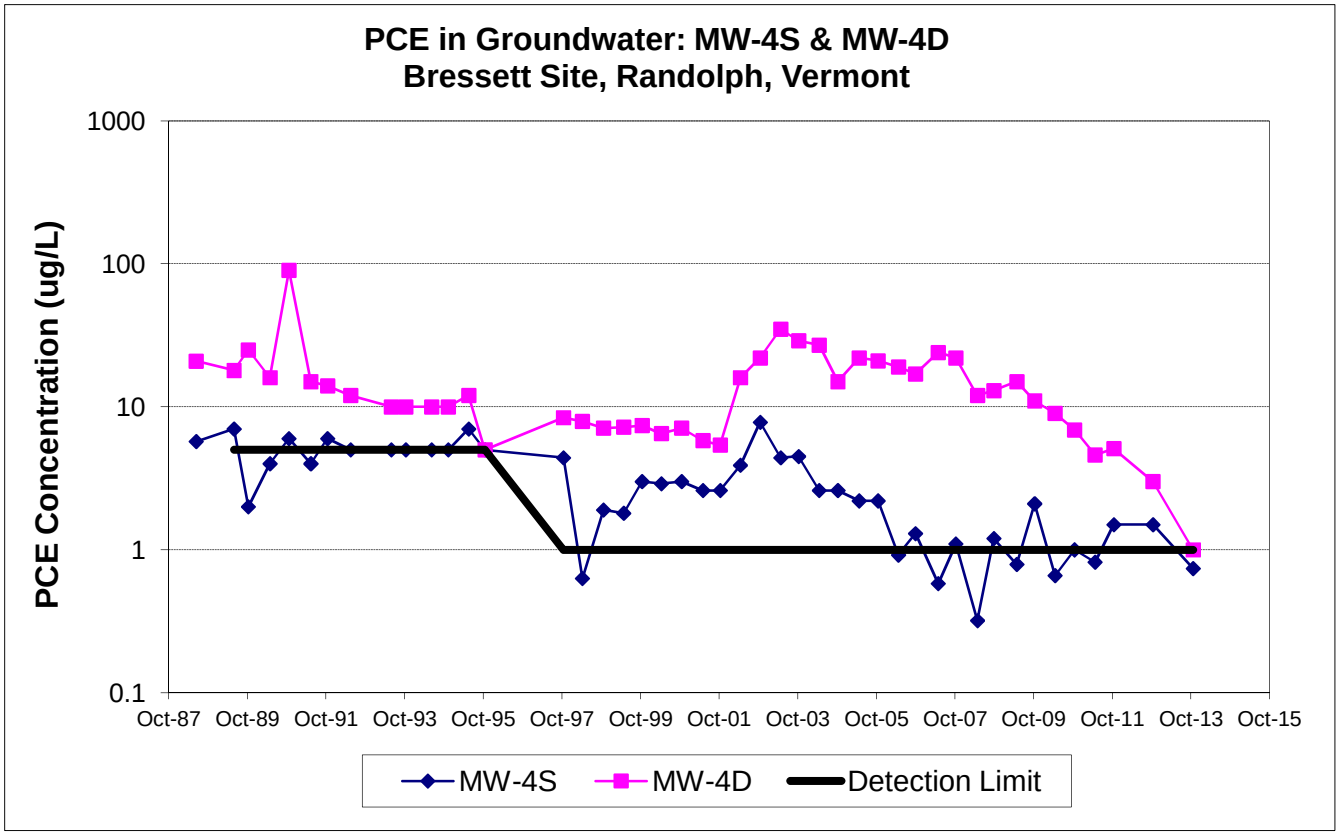
Notes:
-"U" = not detected above listed quantitation limit; "J" = reported concentration is an estimated value; "UJ" = reported quantitation limit is an estimated value; "R" = the data are unusable (analyte may or may not be present).
-"NS" = Not Sampled (house unoccupied or access not obtained).
-Bold values are reported above quantitation limit; shaded cells are in excess of the guidance level.
-Guidance levels for tetrachloroethene and trichloroethene are Target Indoor Air concentrations from Table C.7 of VT ANR Investigation and Remediation of Contaminated Properties Procedure, April 2012.
These values have been converted from ug/m3 to ppbv using the formula: concentration (ppbv) = concentration (ug/m3) * 24.46/MW @ 25 dec C.
-Guidance level for trans-1,2,-dichloroethene is based on the EPA Regional Screening Level (RLS) for residential indoor air (May 2013). There is no EPA RSL for cis-1,2-dichloroethene.

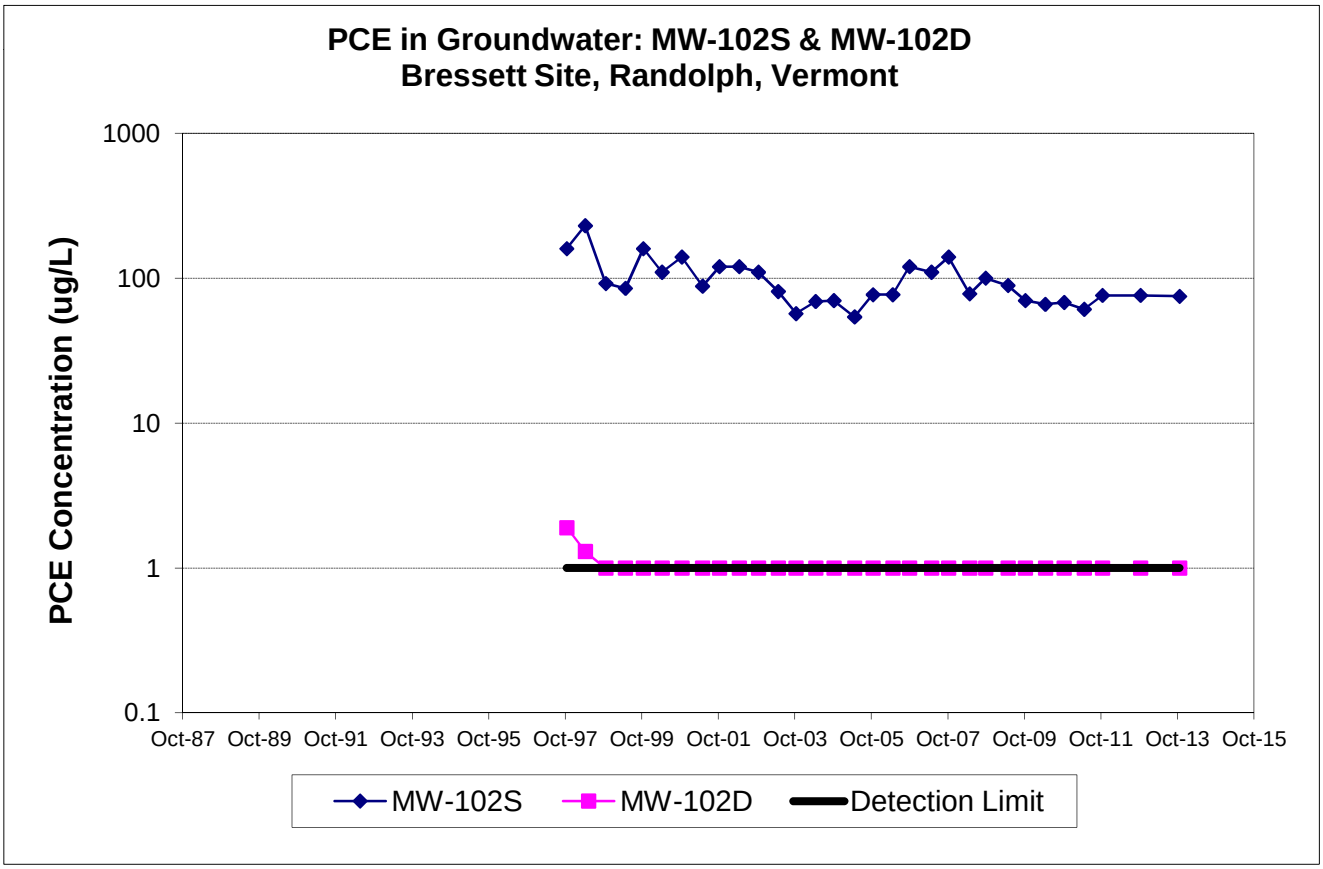
APPENDIX C:

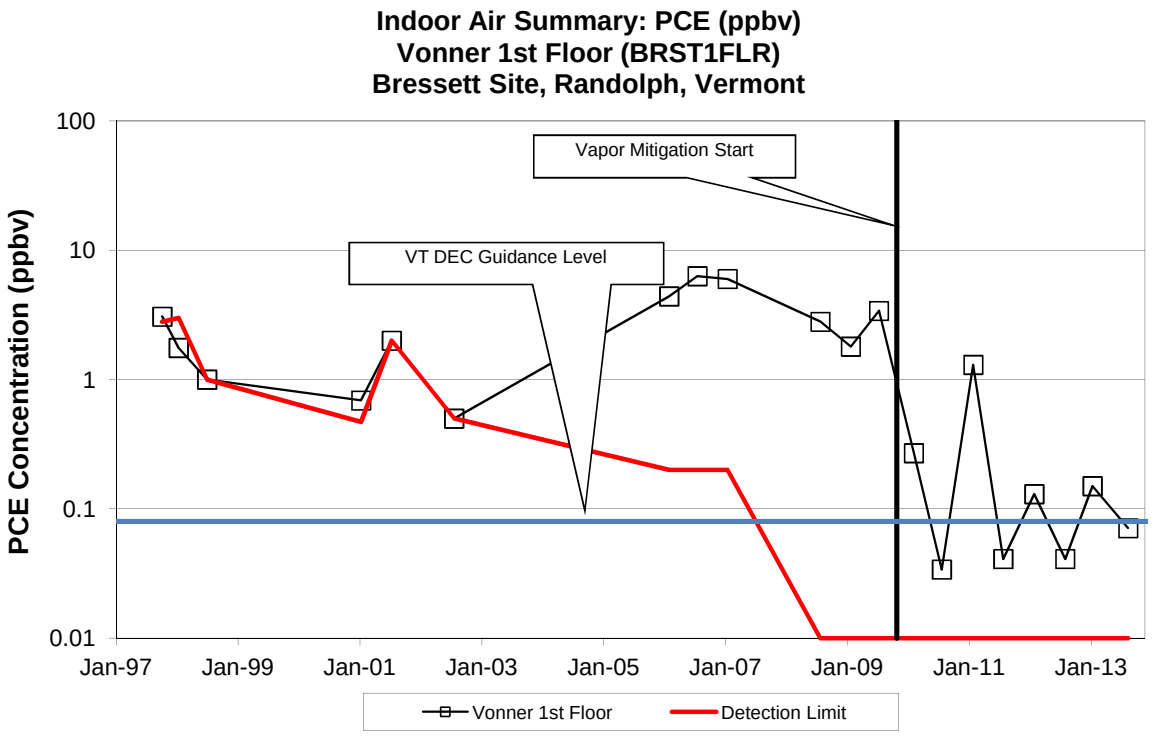
GRAPHS


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
Oct-15
MW-3S
MW-3D

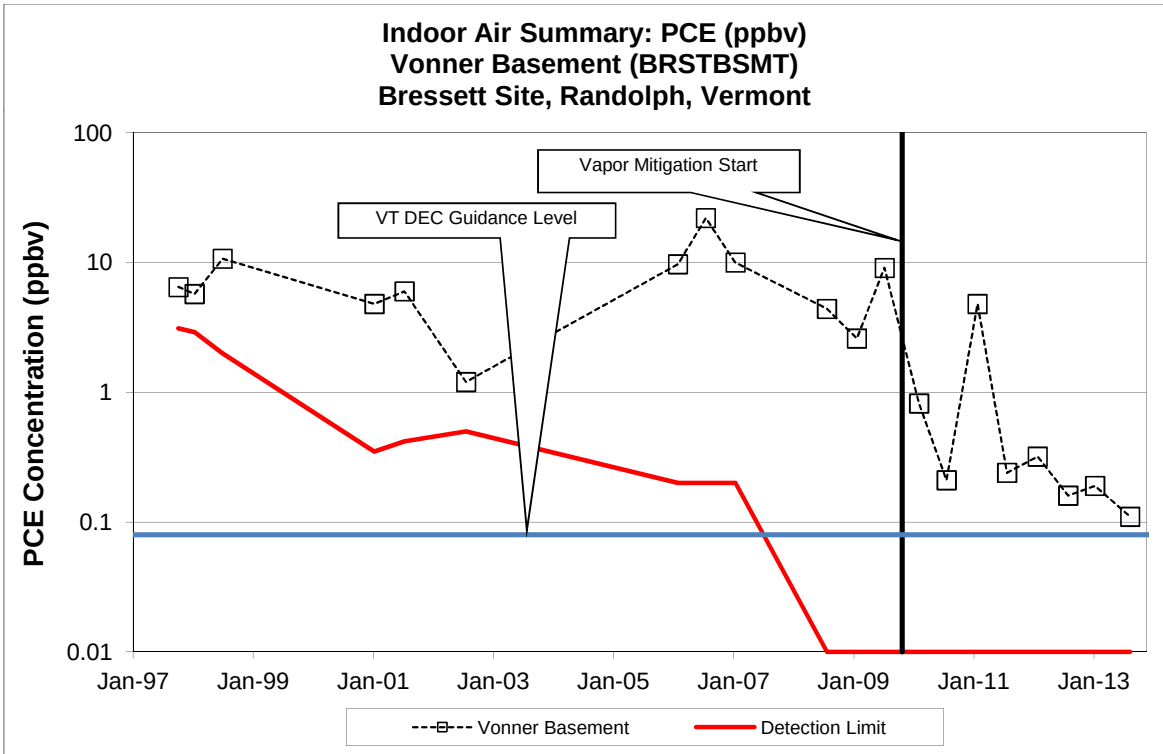

PCE in Groundwater: MW-101S & MW-101D
Bressett Site, Randolph, Vermont
PCE Concentration (ug/L)
1000
100
10
1
Oct-87
Oct-89
Oct-91
Oct-93
Oct-95
Oct-97
Oct-99
Oct-01
Oct-03
Oct-05
Oct-07
Oct-09
Oct-11
Oct-13
Oct-15
MW-101S
MW-101D


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
Oct-15
MW-4S
MW-4D
Detection Limit

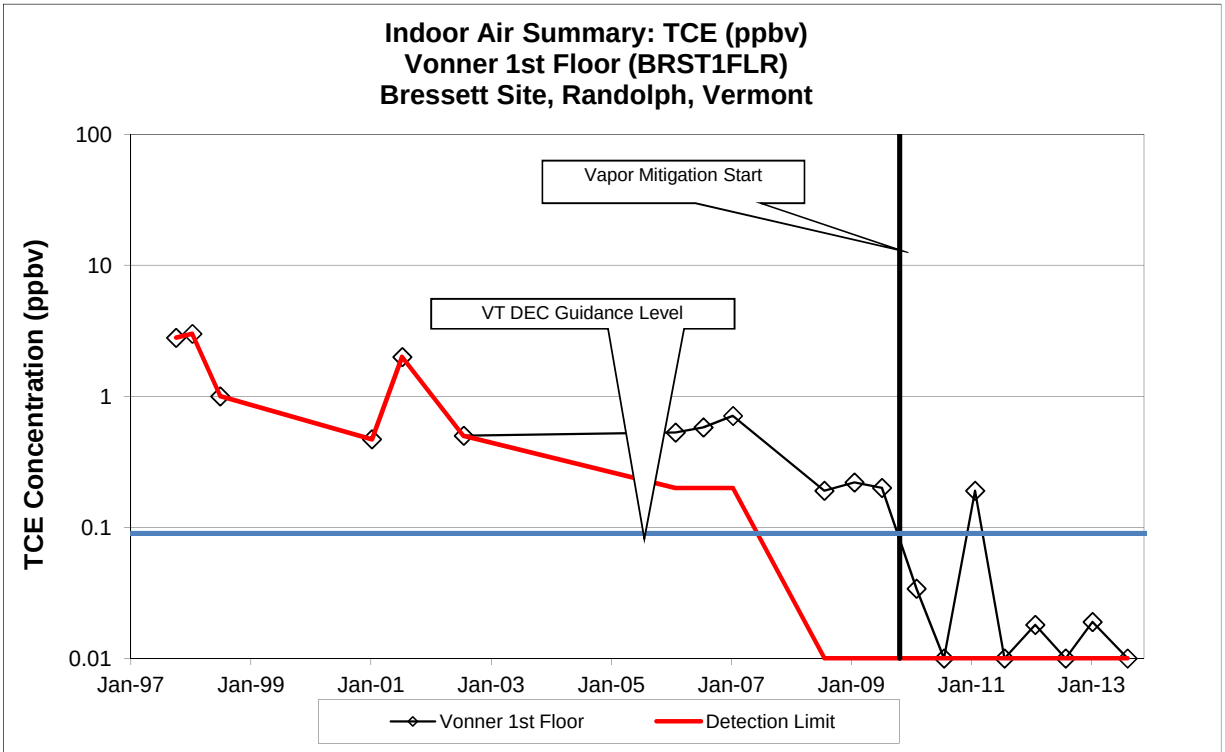

PCE in Groundwater: MW-102S & MW-102D
Bressett Site, Randolph, Vermont
PCE Concentration (ug/L)
1000
100
10
1
0.1
Oct-87
Oct-89
Oct-91
Oct-93
Oct-95
Oct-97
Oct-99
Oct-01
Oct-03
Oct-05
Oct-07
Oct-09
Oct-11
Oct-13
Oct-15
MW-102S
MW-102D
Detection Limit



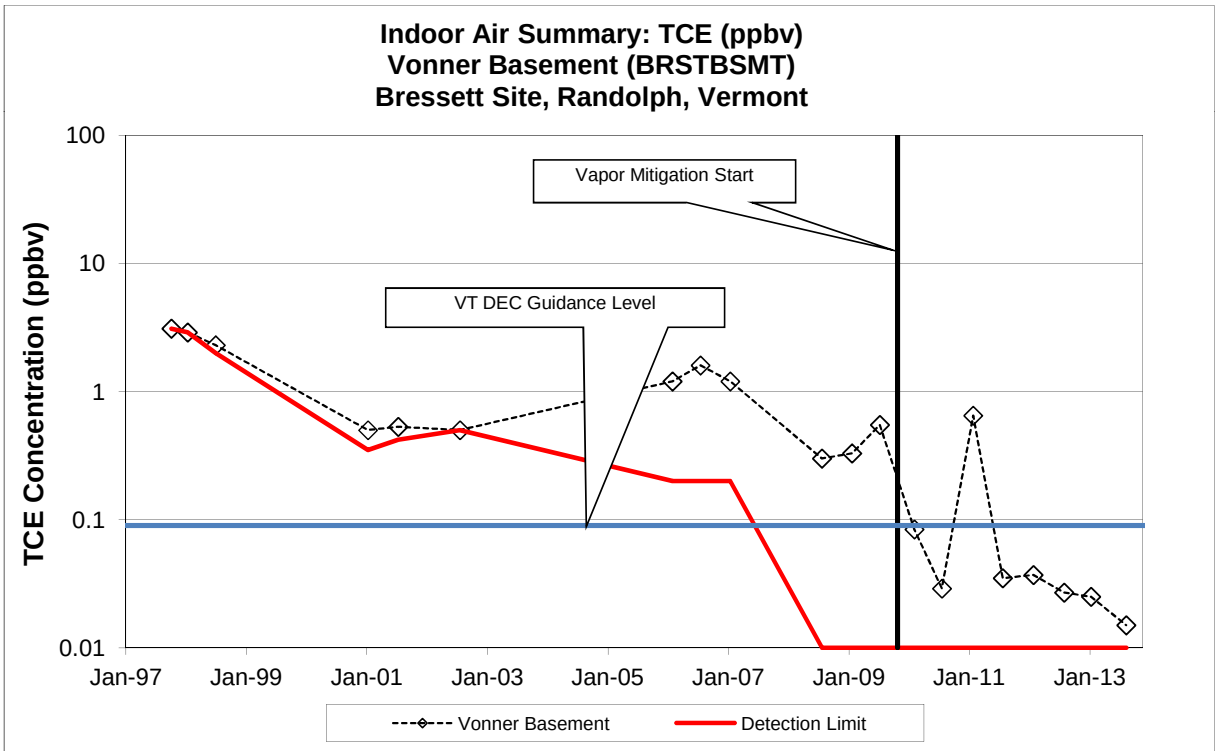
Notes:
1) Only values above detection limit line are considered positive detections; values below line are estimated only.



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.



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

Waite-Heindel Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	BRW-3	Pump Intake Depth	72'
Date	10/22/13	Pump Type	[illegible] 2600
Sampler	MW/CD	Well Diameter	2"
Weather	rain & cool	Well Depth	80.8
Water Type	gw sw supply	Initial Depth to Water	14.15
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)	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%		
0929	14.15	320								oxygen @ 6.00
0931	14.75	320	9.81	284	6.99	157	7.21	62		
0934	14.68	320	9.88	284	7.11	157	6.81	54		
0937	14.68	320	9.94	283	7.15	156	6.49	39		
0940	14.68	320	9.96	281	7.16	157	6.61	17		
0943	14.68	320	9.94	279	7.17	157	6.65	8.2		
0946	14.68	320	9.94	278	7.17	157	6.50	6.0		
0949	14.68	320	9.95	277	7.18	158	6.56	5.8		[illegible]

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity
Final Measurements:	2.7 G	9.95	277	7.18	158	6.56	5.8

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	BRW-3	VOA	3	HCl	8260	0950	
Additional							
Additional							
Field Duplicate							
MS/MSD							
Field Blank							

General Notes:

WEM Project #110320012

VT DEC Site #

Waite-Heindel Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	BRW-2	Pump Intake Depth	75'
Date	10/22/13	Pump Type	Geosub
Sampler	MV/CP	Well Diameter	2"
Weather	cool / rain	Well Depth	101.5
Water Type	(gw) sw supply	Initial Depth to Water	12.01
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%		
1026	12.01	320								begin
1027	12.85	320	10.02	281	6.71	-120	1.08	77		sulfur odor
1030	12.60	320	9.92	327	6.88	-137	0.50	82		
1033	13.35	320	10.26	334	7.07	-146	0.37	80		
1036	14.48	320	10.44	343	7.17	-148	0.27	91		
1040	15.10	320	10.34	348	7.23	-151	0.24	104		
1043	15.40	320	10.22	349	7.26	-157	0.21	118		
1046	15.71	320	10.33	350	7.27	-154	0.20	118		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	1.56	10.33	350	7.27	-154	0.20	118		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	BRW-2	VOA	3	HCl	8260	1050	
Additional							
Additional							
Field Duplicate							
MS/MSD							
Field Blank							

General Notes:

Waite-Heindel Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	BRW-1	Pump Intake Depth	40
Date	10/22/13	Pump Type	Geosub
Sampler	MW/CP	Well Diameter	2"
Weather	cool/rain	Well Depth	80.8
Water Type	gw / sw / supply	Initial Depth to Water	15.32
Sampling Method	bailer / low flow / grab	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%		
1116	1532	200								start
1119	1559	200	9.77	175	7.50	-43	4.22	16		
1122	1580	200	9.39	172	7.41	-33	3.17	9.2		
1125	1593	200	9.44	170	7.38	-25	2.90	3.6		
1128	1598	200	9.51	168	7.38	-18	2.83	1.4		
1131	1602	200	9.55	167	7.38	-14	2.84	1.1		
1135	1604	200	9.59	167	7.38	-9.2	2.82	0.8		
1138	1604	200	9.62	167	7.39	-6.4	2.80	0.8		

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity
Final Measurements:	2.0	9.62	167	7.39	-6.4	2.80	0.8

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	BRW-1	VOA	3	HCl	8260	1140	
Additional							
Additional							
Field Duplicate							
MS/MSD							
Field Blank							

General Notes:

Waite-Heindel Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-103RD			Pump Intake Depth	21.1
Date	10/22/12			Pump Type	peri
Sampler	MW/CP			Well Diameter	3/4"
Weather	cool / rain			Well Depth	23.1
Water Type	gw	sw	supply	Initial Depth to Water	13.09
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)	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%		
1224	13.09	100								began
1228	16.05	75	11.27	212	7.95	-61.5	1.89	>1000		cloudy
1231	16.12	75	11.32	212	7.74	-109.5	0.48			
1234	16.41		11.39	212	7.72	-132.7	0.22			
1237	16.57		11.62	209	7.79	-149.4	0.15			
1240	16.65		11.69	208	7.80	-156.7	0.13			
1243	16.71		11.50	206	7.81	-161.7	0.11			
1246	16.80		11.47	204	7.81	-165.0	0.10			complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	2.0L	11.47	204	7.81	-165	0.10			

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-103RD	VOA	3	HCl	8260	1248	
Additional							
Additional							
Field Duplicate							
MS/MSD							
Field Blank							

General Notes:

Waite-Heindel
Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-104D	Pump Intake Depth	204
Date	10/23/13	Pump Type	peri
Sampler	CP	Well Diameter	3/4
Weather	cloudy, cold	Well Depth	22.9
Water Type	gw / sw / supply	Initial Depth to Water	2.45
Sampling Method	bailer / low flow / grab	Traditional Purge Vol. / Rate	start: 60-100 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%		
0906	10.00	60	9.80	254	7.21	-123.3	2.94	92.17		silty, lt sulphur OD
0909	12.50	↓	16.18	251	6.96	-121.6	1.12	88.80		
0912	15.35		16.18	249	6.90	-114.1	1.08	76.61		
0916	17.80		9.91	251	6.97	-113.6	1.31	60.81		
0920	19.5		9.86	254	7.05	-119.7	1.30	58.88		
		well purged by @		0920.						

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	1,500 ml	9.86	254	7.05	-119.7	1.30	58.88		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-104D	VOA	3	HCl	8260B	0930	
Additional							
Additional							
Field Duplicate							
MS/MSD							
Field Blank							

General Notes: containerized purge vol.

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Waite-Heindel
Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-104S			Pump Intake Depth	6.4
Date	10/23/13			Pump Type	per.
Sampler	CP			Well Diameter	3/4
Weather	cold, cloudy			Well Depth	8.9
Water Type	GW	sw	supply	Initial Depth to Water	1.98
Sampling Method	bailer	low flow	grab	Traditional Purge Vol. / Rate	100

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%		
0935	1.98	160								began
0937	—	160	11.03	303	7.01	-42.7	5.76	6455		~~clear, lt sulph. od~~ lt silty
0940	2.07	160	11.02	305	7.03	-41.7	5.72	42.16		
0943	2.06	160	11.23	306	7.05	-28.4	5.32	21.89		clear lt sulph od
0946	2.06	160	11.43	307	7.05	-17.3	5.41	7.66		
0949	2.06	160	11.34	306	7.05	-7.4	5.35	6.12		
0951	2.06	160	11.60	307	7.05	-0.2	5.43	5.00		
0953	2.06	160	11.62	307	7.05	2.5	5.46	4.18		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity	
Final Measurements:	2,500ml	11.62	307	7.05	2.5	5.46	4.18	

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-104S	VOA	3	HCl	8260B	0955	
Additional							
Additional							
Field Duplicate							
MS/MSD							
Field Blank							

General Notes: ~~containerized~~ purge w/.

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VT DEC Site #

Waite-Heindel
Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-102D	Pump Intake Depth	28.8
Date	10/23/13	Pump Type	peri
Sampler	cp	Well Diameter	3/4
Weather	cold, cloudy	Well Depth	30.8
Water Type	(gw) sw supply	Initial Depth to Water	8.86
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%		
1051	8.86	100	~~10.~~							begin
1054	—	100	10.14	286	7.44	-93.0	3.01	50.81		highly cloudy, N.O.
1057	14.50	100	9.69	287	7.61	-118.0	1.00	41.56		
1100	14.55	100	9.88	286	7.68	-131.5	0.81	48.16		
1103	14.68	100	9.42	286	7.78	-144.3	0.67	68.68		
1106	14.57	100	9.34	285	7.79	-146.9	0.66	63.00		
1108	14.55	100	9.32	286	7.81	-146.4	0.65	68.71		end, complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity	
Final Measurements:	2,000ml	9.32	286	7.81	-146.4	0.65	68.71	

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-102D	VOA	3	HCl	8260B	1110	
Additional							
Additional							
Field Duplicate							
MS/MSD							
Field Blank							

General Notes: (autoviscized) gauge valves

WEM Project #110320012

VT DEC Site #

Waite-Heindel
Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-102S	Pump Intake Depth	119
Date	10/23/13	Pump Type	per.
Sampler	[illegible]	Well Diameter	3/4
Weather	cold, cloudy	Well Depth	12.9
Water Type	gw sw supply	Initial Depth to Water	8.55
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%		
1122	8.55	100								begin
1125	9.33	100	10.78	329	7.50	-9.9	7.07	74.34		
1128	9.32	100	10.85	328	7.42	-7.3	6.23	57.64		
1131	9.32	100	10.87	328	7.41	-7.9	6.31	24.35		
1134	9.32	100	10.85	329	7.43	7.0	6.32	11.13		clearing
1137	9.32	100	10.86	327	7.43	11.8	6.34	9.81		
1139	9.32	100	10.86	329	7.43	13.7	6.43	5.15		complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity	
Final Measurements:	2.0 gal	10.86	329	7.43	13.7	6.43	5.15	

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-102S	VOA	3	HCl	8260B	1140	
Additional							
Additional							
Field Duplicate							
MS/MSD							
Field Blank							

General Notes: Containerized purgewater

WEM Project #110320012

VT DEC Site #

Waite-Heindel
Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-101S			Pump Intake Depth	11.9
Date	12/23/13			Pump Type	peri
Sampler	cl			Well Diameter	3/4
Weather	cloudy, cold			Well Depth	14.3
Water Type	gw	sw	supply	Initial Depth to Water	6.52
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%		
1209	6.52	75/100								began - took a minute (+/-) to get H2O
1213	8.02	100	13.90	308	6.67	60.8	3.28	95.73		to pump
1216	8.11	100	13.72	344	6.31	78.7	2.09	109.2		
1219	8.16	100	13.74	351	6.24	87.5	0.80	93.64		cloudy/silty
1222	8.18	100	13.70	352	6.23	91.1	0.77	64.40		
1225	8.18	100	13.70	352	6.22	93.0	0.84	68.39		
1227	8.18	100	13.70	352	6.23	95.4	0.85	67.25		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity	
Final Measurements:	2,500 ml	13.70	352	6.23	95.4	0.85	67.25	

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-101S	VOA	3	HCl	8260B	1229	
Additional							
Additional							
Field Duplicate							
MS/MSD							
Field Blank							

General Notes: contaminated purge water

WEM Project #110320012

VT DEC Site #

Waite-Heindel
Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-101D	Pump Intake Depth	223'
Date	10/23/13	Pump Type	peri
Sampler	vl	Well Diameter	3/4
Weather	cold cloudy	Well Depth	24.8
Water Type	(gw) sw supply	Initial Depth to Water	7.46
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%		
1236	7.46	~~75~~ 100								hyen
1238	9.20	100	11.61	685	6.79	80.1	4.41	424.2		silty
1241	9.31	100	11.46	~~680~~ 695	6.81	83.9	3.37	390.7		
1244	9.28	100	11.26	699	6.82	85.4	3.37	359.9		
1247	9.30	100	11.11	698	6.83	87.0	3.41	485.7		
1250.	9.30	100	11.07	693	6.83	88.1	3.33	471.9		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	2,000 l	11.07	693	6.83	88.1	3.33	471.9		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-101D	VOA	3	HCl	8260B	1252	
Additional							
Additional							
Field Duplicate	MW-Z	VOA	3	HCl	8260B	1215	
MS/MSD							
Field Blank							

General Notes: containerized purge H2O

WEM Project #110320012

VT DEC Site #

Waite-Heindel
Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-4S			Pump Intake Depth	23.3
Date	10/23/13			Pump Type	pen
Sampler	CP			Well Diameter	2"
Weather	cold, cloudy			Well Depth	24.3
Water Type	GW	SW	supply	Initial Depth to Water	20.58
Sampling Method	bailer	low flow	grab	Traditional Purge Vol. / Rate	200

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%		
1401	20.88	200								begin
1404	21.26	200	11.10	71	7.18	85.8	4.68	6.45		clear
1407	21.20	200	10.82	61	6.59	104.6	9.42	4.03		
1410	21.19	200	10.52	58	6.42	114.2	9.55	2.64		
1413	21.20	200	10.46	58	6.31	122.9	9.25	2.14		
1416	21.20	200	10.63	60	6.31	125.2	9.18	1.77		
1418	21.20	200	10.63	62	6.33	124.6	9.07	1.69		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity	
Final Measurements:	3,000	10.63	62	6.33	124.6	9.07	1.69	

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-4S	VOA	3	HCl	8260B	1401	
Additional							
Additional							
Field Duplicate							
MS/MSD	MW-4S	"	"	"	"	"	
Field Blank							

General Notes: contaminated purge water

WEM Project #110320012

VT DEC Site #

Waite-Heindel
Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-40			Pump Intake Depth	45'
Date	~~[illegible]~~ 10/23/13			Pump Type	peri
Sampler	CP			Well Diameter	2"
Weather	cool, sunny			Well Depth	47.1
Water Type	gw	sw	supply	Initial Depth to Water	20.99
Sampling Method	bailer	low flow	grab	Traditional Purge Vol. / Rate	~~200~~ 100

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%		
1435	20.99	~~200~~ 100								bg
1439	22.78	~~200~~ 100	10.96	229	7.04	101.8	~~101.8~~ 44.0	~~60.7~~ 60.7		
1442	23.29	~~200~~ 100	10.42	232	7.15	96.7	3.82	2.22		clear
1445	23.48	~~200~~ 100	10.47	233	7.22	93.7	3.82	1.83		
1448	23.80	100	10.45	234	7.19	92	3.85	1.83		
1451	~~23.97~~	100	10.12	234	7.20	87.9	3.92	1.60		
1453	23.97	100	10.11	235	7.21	87.0	3.94	1.10		
1455	23.07	100	10.07	235	7.22	85.5	3.98	1.02		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity	
Final Measurements:	2,500	10.07	235	7.22	85.5	3.98	1.02	

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-40	VOA	3	HCl	8260B	1457	
Additional							
Additional							
Field Duplicate							
MS/MSD							
Field Blank							

General Notes:

WEM Project #110320012

VT DEC Site #

Waite-Heindel
Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-35			Pump Intake Depth	45'
Date	10/23/13			Pump Type	perc
Sampler	CW			Well Diameter	2"
Weather	cold, sunny			Well Depth	274
Water Type	(gw)	sw	supply	Initial Depth to Water	24.35
Sampling Method	bailer	low flow	grab	Traditional Purge Vol. / Rate	100

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%		
1516	24.35	100	[illegible]							bag
1518	24.45	100	10.73	430	7.10	84.4	14.20	1.82		clear
1521	24.53	100	10.25	438	7.05	88.5	9.65	2.35		
1524	24.58	100	10.00	427	7.07	92.5	9.49	2.23		
1527	24.62	100	9.87	432	7.03	94.9	9.27	2.02		
1530	24.68	100	9.81	441	7.06	96.7	9.19	2.10		
1532	24.72	100	9.76	447	7.04	98.4	9.09	2.08		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity	
Final Measurements:	2,800 L	9.76	447	7.04	98.4	9.09	2.08	

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-35	VOA	3	HCl	8260B	1534	
Additional							
Additional							
Field Duplicate							
MS/MSD							
Field Blank							

General Notes: contaminated purge water

WEM Project #110320012

VT DEC Site #

Waite-Heindel
Environmental Management

UNIFIRST
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-30	Pump Intake Depth	32'
Date	10/23/13	Pump Type	perl
Sampler	CP	Well Diameter	2"
Weather	warm sunny	Well Depth	~~74~~ 75'
Water Type	(gw) sw supply	Initial Depth to Water	21.72
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. / Rate	100

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%		
1553	21.72	100								begin
1556	22.65	100	8.50	282	7.63	89.3	6.17	23.10		clear
1559	22.91	100	8.31	274	7.57	90.3	5.92	12.57		
1602	23.02	100	9.07	270	7.53	89.8	5.51	9.10		
1605	23.25	100	8.92	268	7.52	89.4	5.55	6.42		
1608	23.22	100	8.90	267	7.52	89.1	5.60	4.60		
1610	23.22	100	8.90	267	7.52	89.1	5.61	~~6.00~~ 5.16		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity	
Final Measurements:	2,300	8.90	267	7.52	89.1	5.61	5.16	

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-30	VOA	3	HCl	8260B	1612	
Additional							
Additional							
Field Duplicate							
MS/MSD							
Field Blank	FB-3	"	2	"	8260B	~~1622~~ 1620	

General Notes:

WEM Project #110320012

VT DEC Site #

APPENDIX E:

DATA VALIDATION REPORT: 4TH QUARTER

Phoenix Chemistry Services

February 14, 2014

Mr. Gerold Noyes
VT Department of Environmental Conservation
Waste Management and Prevention Division
1 National Life Drive - Davis 1
Montpelier, VT 05620-3704

Reference #s: 2013-1119-001, -1129-001, and -1223 -001

Dear Gerold,

Attached please find the results of the data validation of Sample Delivery Group (SDG) Nos. BRES56, UNIF47, UNIF48, and WHEA19 from the Environmental Monitoring work at the Bressett Site, in Randolph, the UniFirst Site in Williamstown, and the Wheatley Farm site in Brookfield, VT. No air samples were collected for this sampling round; the water samples in these SDGs were collected on October 22, 23, 24, and 25, 2013. A second sample, identified in this report as WP-5 (resample) was collected on November 26, 2013 to confirm the result above the Vermont Action Limit for tetrachloroethene. The laboratory analyses were performed by TestAmerica Burlington (formerly STL Burlington) of South Burlington, VT.

The data packages were received on November 19 and 29, and December 23, 2013, and responses and revisions for issues identified during the validation were received on January 29, 2014. The validation has been performed by Phoenix Chemistry Services, to the extent possible according to the Tier III guidelines as defined by USEPA Region I, as presented in "Region I EPA-NE Data Validation Manual and Functional Guidelines for Evaluating Environmental Analyses", December, 1996. The EPA's National Functional Guidelines for Organic Data Review (EPA 540/R-99/008, October, 1999), and the Field/Laboratory Coordination Memorandum for Water Monitoring (FLCM), June 25, 2013 were also considered during the evaluation, and professional judgment was applied as necessary and appropriate. Data qualifiers have been applied in the final validation report as necessary and appropriate, in accordance with these guidelines.

Electronic copies of these reports are being submitted to Waite Environmental Management and TestAmerica Burlington, as well as to your attention. Attachment D of this report contains the requested revisions (quantitation reports) as well as selected supplemental documents supplied by the laboratory in response to issues identified during the validation. The year-end quality assurance summary report for air and water analyses will be submitted soon under separate cover.

Thank you for this opportunity to provide data validation services to the Waste Management Division. We look forward to continuing to work with you. If there are any questions or concerns about the material in this report, please do not hesitate to contact me for help and clarification.

Sincerely,

Deborah H. Gaynor, Ph.D.
Principal, Phoenix Chemistry Services

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. BRES56, UNIF47, WHEA19, and UNIF48

Chemical Analyses Performed by:

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

FOR

Mr. Gerold Noyes
Department of Environmental Conservation
Waste Management and Prevention Division
1 National Life Dr – Davis 1
Montpelier, VT 05620-3704

Data Validation Report by:

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

February 14, 2014

Reference #s 2013-1119-001, 1129-001, &-1223-001
VOA Validation Report/BRES56_UNIF47_WHEA19_UNIF48/dpd/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 40 groundwater samples, 9 potable water samples, 1 performance evaluation (PE) sample, 6 field blanks (FB), and 5 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. BRES56, UNIF47, WHEA19, and UNIF48, which were submitted as four data packages received by Phoenix on November 19, November 29, and December 23, 2013, and revisions received on January 29, 2014. These SDGs include the following samples:

Table 1. Sample Identifications

Sample Identifier	Laboratory ID
Method 8260B	
SDG No. BRES56	
BRW-3	200-19070-5
BRW-2	200-19070-6
BRW-1	200-19070-7
MW-103RD	200-19070-8
MW-104S	200-19104-3
MW-104D	200-19104-2
MW-102D	200-19104-4
MW-102S	200-19104-5
MW-101S	200-19104-6
MW-101D	200-19104-7
MW-Z	200-19104-12
FB-3	200-19104-13
MW-4S	200-19104-8
TB-2	200-19104-1
MW-4D	200-19104-9
MW-3S	200-19104-10
MW-3D	200-19104-11
SDG No. UNIF47	
W-19	200-19119-4
PZ-101	200-19119-2
PZ-102	200-19119-3
W-25	200-19119-5
MW-50	200-19119-6
W-Z	200-19119-9
FB-5	200-19119-11
MW-C	200-19119-8
W-1	200-19143-1
MW-E	200-19119-10
W-20	200-19119-7
MW-D	200-19143-2

Sample Identifier	Laboratory ID
SS-2	200-19119-20
W-SEEP	200-19119-22
SS-Z	200-19119-26
SS-5	200-19119-21
TB-3A	200-19119-1
SP-4	200-19119-25
MW-25884	200-19071-2
BRW-Z	200-19071-1
FB-2	200-19071-3
SS-1A	200-19119-23
SP-MW3	200-19119-24
SDG No. WHEA19	
TB-4	200-19142-1
MW-PLX	200-19142-4
MW-PL2	200-19142-3
MW-PL1	200-19142-2
MW-S1	200-19142-5
MW-S2	200-19142-6
FB-6	200-19142-7
Method 524.2	
SDG No. BRES56	
SHIELDS	200-19070-3
WELL Z	200-19070-2
FB-1	200-19070-4
TB-1	200-19070-1
SDG No. UNIF47	
WP-7	200-19119-14
WP-5	200-19119-13
WP-3	200-19119-17
WP-Z	200-19119-12
WP-8	200-19119-15
WP-13	200-19119-16
FB-4	200-19119-18
TB-3B	200-19119-19
WP-23	200-19119-27
SDG No. UNIF48	
WP-5 (resample)	200-19748-1

Sample WP-5 was originally properly collected and analyzed, and the sample results were received on November 19, 2013. The field engineer alerted the Project Manager that the sample exhibited a result above the Vermont Action Limit for tetrachloroethene. The Project Manager agreed that the result should be confirmed, and a second sample was collected on Nov. 26, 2013, and submitted for analysis. Due to the unusual nature of this sample collection, field quality control samples (trip blank and field blank) were inadvertently not included with this sample. The results of both analyses are included in this sample set, and distinguished by the parenthetical suffix “(resample)” for the confirmation sample.

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

- Results for vinyl chloride, bromomethane, methylene chloride, and carbon disulfide in all samples analyzed by Method 524.2 were qualified as estimated (J, UJ).

- Results for carbon disulfide in all samples analyzed by Method 8260B were qualified as estimated (UJ).

- Results for bromomethane in all samples analyzed by Method 8260B, and in the Method 524.2 analyses, results for bromomethane in TB-1, FB-1, WELL-Z, SHIELDS, and WP-5 (resample); for chloromethane in samples SS-5, SS-Z, MW-D, TB-4, FB-6, W-1, MW-PL1, MW-PL2, MW-PLX, MW-S1, and MW-S2; and for trans-1,3-dichloropropene in samples W-1, MW-PL1, MW-PL2, MW-PLX, MW-S1, and MW-S2 were qualified as estimated (UJ).

- Results for acetone in MW-103RD, MW-104D, MW-50, MW-C, MW-D, MW-E, SP-MW3, SS-1A, SS-2, SS-5, W-20, W-25, W-SEEP, FB-5, FB-6, MW-PLX, and MW-S1, and for methylene chloride in FB-1, WP-8, and FB-4 were qualified as less than the reporting limit (U).

- The result for bromomethane in W-1, for carbon tetrachloride and acetone in SHIELDS and MW-4S, and for bromomethane in W-1 were qualified as estimated (UJ).

- Non-detected results for carbon tetrachloride in samples TB-2, FB-3, BRW-3, BRW-2, BRW-1, MW-103RD, FB-2, BRW-Z, and MW-25884 were qualified as estimated (UJ).

- Results for acetone in FB-4,TB-3B, WP-Z, WP-5, WP-7, WP-13, WP-3, and WP-8 were qualified as estimated (UJ).

- 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.

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 <u>part of the data packages</u> 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), June 25, 2013. 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 524.2 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 and the spreadsheet summary files (Attachment B, 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. BRES56, UNIF47, and WHEA19 were collected on October 22, 23, 24, and 25, 2013. A confirmation sample for volatiles analysis in SDG No. UNIF48 was collected on November 26, 2013. 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 screening, and is recorded in the Sample Preparation sections of the data packages. Vial preservation with hydrochloric acid is noted by the field sampler in all field sheets. All recorded sample pH values were <2.

The cooler temperatures on receipt at the laboratory were checked and documented in the data packages, and were 2.4, 4.0, 1.0, and 5.6 ^{o}C, which are within the acceptance range of 4 ^{o}C ±2 ^{o}C, with the exception of the cooler received on Nov. 26, 2013, at 11.2 ^{o}C. Although not noted in the data package, this cooler was received at an elevated temperature due to the sampling taking place less than two hours before the cooler temperature was measured at sample receipt, and the temperature was still dropping, which is acceptable.

The samples collected at the Bressett site on 10/22/13 (laboratory identifiers 200-19070-1 through 200-19070-8) were delivered to the laboratory on the same day as collected, as recorded on the chain of custody document, which was properly signed by the field sampler and the laboratory technician receiving the samples. However, these samples were incorrectly logged in as received on 10/23/13. The summary forms showing the date of receipt for these samples are incorrect, as are the entries in the electronic data deliverable in the "Receive Date" column for these eight samples. A revision has not been requested, but the laboratory has been notified of this error. A note indicating the correct receipt date has been added to the spreadsheet of validated results in a column labeled "Comments".

II. GC/MS Instrument Performance Check (Tuning)

The samples were analyzed on two GC/MS systems identified as instrument L and instrument CHL. The tuning of these instruments 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 ten (10) 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 (10/31/13) was performed on instrument CHL in support of the Method 8260B sample analyses, and one IC (11/4/13) 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.

No target compounds were manually integrated in the ICs and CCs performed for this data set.

All % RSDs for both 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:

Table 2. Initial Calibration Exceedances

Instrument	IC	Average RRF
		2-butanone
CHL (8260B)	10/31/13	0.0241
L (524.2)	11/4/13	0.0282

Pursuant to the Region I validation document, results for 2-butanone in all samples analyzed by Method 8260B, and for 2-butanone in all samples analyzed by Method 524.2 in this data set warranted rejection (R) based on the low RRFs achieved. However, 2-butanone was 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 this compound were achieved in these analyses. Therefore, results for 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 as percent differences (%D) in the data packages. All percent differences 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), with the exceptions of vinyl chloride, bromomethane, methylene chloride, and carbon disulfide, which exhibited 32.4 %D, 65.7 %D, 31.4 %D and 41.7 %D, respectively, in the Method 524.2 ICV. As presented in the Case Narratives, carbon disulfide was inadvertently not included in the spiking solution used for all Method 8260B independent spiked analyses (ICV, laboratory control samples, and matrix spikes) in this sample set.

On the basis of the unacceptably high percent difference results in the associated ICV, results for vinyl chloride, bromomethane, methylene chloride, and carbon disulfide in all samples analyzed by Method 524.2 were qualified as estimated (J, UJ). On the basis of inability to assess method accuracy due to the omission of carbon disulfide from the independent spiking solution, all results for carbon disulfide in samples analyzed by Method 8260B were qualified as estimated (UJ).

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 analyzed by 8260B with the following exceptions:

- bromomethane exhibited a -27.4, -48.5, -36.1, -26.3, and -48.0 %D in the CC standards analyzed on 11/1/13 at 07:24, on 11/1/13 at 15:51, on 11/2/13 at 07:07, on 11/6/13 at 08:26, and on 11/6/13 at 15:13;
- chloromethane exhibited a -26.3, and -45.7 %D in the CC standards analyzed on 11/6/13

at 08:26, and on 11/6/13 at 15:13;

- trans-1,3-dichloropropene exhibited -33.8 %D in the CC standard analyzed on 11/6/13 at 15:13.

All RRFs were above the 0.05 minimum criterion with the exception of 2-butanone in all CC standards for 8260B (range: 2-butanone, 0.0216 - 0.0243).

All %D results were below ±25% for the CC standards analyzed by 524.2 with the following exceptions:

- bromomethane exhibited a -44.3, and -54.2 %D in the CC standards analyzed on 11/5/13 at 08:53, and 12/4/13 at 09:16;
- 2-butanone with -31.1%, 2-hexanone at -30.6%, carbon tetrachloride at -32.0%, and trans-1,3-dichloropropene at -38.6%D in the CC standard analyzed on 11/5/13 at 08:53.

All RRFs were above the 0.05 minimum criterion with the exception of 2-butanone in all CC standards for 524.2 (range: 2-butanone, 0.0194 - 0.0282).

On the basis of the unacceptable %D value in the associated CC standards, results for bromomethane in all samples analyzed by Method 8260B and in the Method 524.2 analyses, results for bromomethane in TB-1, FB-1, WELL-Z, SHIELDS, and WP-5 (resample); for 2-butanone, 2-hexanone, and carbon tetrachloride in samples TB-1, FB-1, WELL-Z, and SHIELDS; for chloromethane in samples SS-5, SS-Z, MW-D, TB-4, FB-6, W-1, MW-PL1, MW-PL2, MW-PLX, MW-S1, and MW-S2, and for trans-1,3-dichloropropene in samples W-1, MW-PL1, MW-PL2, MW-PLX, MW-S1, MW-S2, TB-1, FB-1, WELL-Z, and SHIELDS were qualified as estimated (UJ). For the reasons discussed in Section III, no results for 2-butanone were qualified on the basis of the low RRFs in the associated ICs 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 five (5) water-matrix laboratory method blanks (MBs) were reported in support of the Method 8260B, and three MBs were reported in support of the Method 524.2 sample analyses. No target compounds were detected in any MB for either method with the following exceptions:

Table 3. Method Blank (MB) Detections

Method Blank ID	Analyte	Concentration (ug/L)	Reporting limit (ug/L)	Action limit (ug/L)
Method 524.2				
MB 200-63821	chloromethane	0.0972	0.50	See MB 200-63609
	methylene chloride	0.115	0.50	See MB 200-63654
MB-200-63837	methylene chloride	0.102	0.50	See MB 200-63654
MB 200-65463	methylene chloride	0.0903	0.50	See MB 200-63654
	acetone	1.18	5.0	11.8
Method 8260B				
MB 200-63609	chloromethane	0.120	1.0	0.60
MB 200-63654	methylene chloride	0.21	1.0	2.1

Five trip blanks (TBs) were reported in these SDGs; three for Method 8260B analysis and two for Method 524.2 analysis. No target compounds were detected in any TB in this sample set.

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 following exceptions:

Table 4. Field Blank (FB) Detections

Field Blank ID	Analyte	Concentration (ug/L)	Reporting limit (ug/L)	Action limit (ug/L)
Method 524.2				
FB-1	methylene chloride	0.13	0.50	See MB 200-63654
FB-4	methylene chloride	0.11	0.50	See MB 200-63654
Method 8260B				
FB-5	acetone	1.7	5.0	17
FB-6	acetone	1.6	5.0	see FB-5

Five holding (storage) blanks (HBs) were reported in these SDGs; three were analyzed by Method 8260B and two by Method 524.2. No target analytes were detected in any HB for either method with the following exceptions: trans-1,3-dichloropropene was detected below the reporting limit in the holding blank for Method 524.2 identified as 200-19748-2 at 0.11 ug/L. Acetone was detected below the reporting limit at 1.1 ug/L in the holding blank analyzed by Method 8260B identified as 200-19071-4,.

Since chloromethane and trans-1,3-dichloropropene were not detected in any water supply sample, nor in any ground water sample, no results for chloromethane or trans-1,3-dichloropropene were qualified on the basis of laboratory contamination. Acetone and methylene chloride were detected in method blanks (MBs), field blanks (FBs), and holding (storage) blanks (HBs). The levels of these compounds detected in the field blanks are considered field contamination, and those detected in the storage blanks are attributed to the laboratory storage environment. However, the water used for field blanks and storage blanks was supplied by the laboratory, and methylene chloride and acetone were seen to be ubiquitous contaminants in laboratory blanks at similar concentrations as reported in field blanks. The validator suspects contamination of laboratory water as the source of contamination in the field and storage blanks. Because acetone and methylene chloride are recognized as common laboratory contaminants, the action limit for these analytes is 10x the highest amount found in associated blanks.

On the basis of suspected laboratory contamination exhibited in method, field, and storage blanks, results for acetone in MW-103RD, MW-104D, MW-50, MW-C, MW-D, MW-E, SP-MW3, SS-1A, SS-2, SS-5, W-20, W-25, W-SEEP, FB-5, FB-6, MW-PLX, and MW-S1 were qualified as less than the reporting limit (U). Although the result for acetone in FB-5 was higher than the highest concentration in all associated method blanks, it was qualified as less than the reporting limit (U) because this result is attributed to suspected laboratory contamination. On the basis of laboratory contamination, results for methylene chloride in FB-1, WP-8, and FB-4 were qualified as less than 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.

Surrogate recoveries were reported for Method 524.2 analysis in the surrogate summary reports in the data summary sections of the data packages. 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) in 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 (±30 % 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 with a single exception: in the matrix spike duplicate analysis of sample SHIELDS, the 133% recovery of the internal standard 1,2-dichloroethane-d_4 was above of the upper acceptance limit established by the laboratory SOP (70-130% response of the opening CCV). The validator notes that potable water samples should not exhibit matrix effects in a Method 524.2 analysis; however, since this is a quality control (QC) sample, no qualification was required.

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

Samples SS-5, MW-4S, W-1, and MW-S2 were used for the Method 8260B MS/MSD analyses in this data set, and samples WP-8, and SHIELDS were used for the Method 524.2 MS/MSD analyses. The spiking solutions for both methods 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 61 – 128 %R; overall laboratory-established control limits: 15 – 200 %R; Region 1 limits 60 – 140 %R) and reproducible (range 0-28%; limit 30% RPD), with the following exceptions:

Table 5. Matrix Spike/Matrix Spike Duplicate Exceedances

Parent Sample	Analyte	Native Conc. (ug/L)	% R (MS)	% R (MSD)	Laboratory Limits (%R)	% RPD
SHIELDS	carbon tetrachloride	nd	a	a	70 - 130	**32**
MW-4S	chloroethane	nd	79	a	80 - 130	a
	acetone	nd	a	a	80 - 130	**34**
W-1	bromomethane	nd	**0**	a	60-120	nc
	carbon tetrachloride	nd	69	a	75-120	a
	trans-1,3-dichloropropene	nd	61	78	80-120	a
	dibromochloromethane	nd	78	a	80-125	a
	bromoform	nd	75	78	80-120	a
	tetrachloroethene	20	a	-5	80-120	a
MW-S2	chloroethane	nd	**377**	**450**	80-130	a

nd = not detected a = acceptable nc = not calculable
Results exceeding both laboratory and Region I limits are shown in **boldface**.

Since tetrachloroethene was spiked at a concentration less than four times the native concentration in sample W-1, no qualifications were necessary on the basis of the unacceptable recoveries of tetrachloroethene in the associated MSD analysis. No qualifications were deemed necessary for recoveries of the analytes shown outside laboratory-established limits but within Region 1 limits in the MS and/or MSD analyses of samples MW-4S and W-1. Since chloroethane was not detected in sample MW-S2, it was not necessary to qualify the result for chloroethane in MW-S2.

On the basis of unacceptable (0 %) recovery in the associated MS analysis but the acceptable recovery in the MSD analysis, the result for bromomethane in W-1 was qualified as estimated (UJ). On the basis of poor precision in the associated MS and MSD analyses, results for carbon tetrachloride and acetone in SHIELDS and MW-4S, and for bromomethane in W-1 were qualified as estimated (UJ).

All analytes, with the exception of carbon disulfide, were spiked into the MS/MSD analyses; therefore non-spiked target compounds could not be evaluated against the parent samples to evaluate laboratory precision. As previously discussed, carbon disulfide was inadvertently not included when the spiking solution was prepared for the ICV, laboratory control samples, and the MS/MSD analyses associated with this sample set. All results for carbon disulfide were previously qualified on the basis of the inability to evaluate method accuracy for this analyte.

IX. Field Duplicates

SDG Nos. BRES56, UNIF47, WHEA19, and UNIF48 contained four groundwater and two potable water field duplicate pairs, which were identified by the field sampler as follows:

Table 6. Field Duplicate Identifications

Field Sample	Field Duplicate
Groundwater	
MW-101D	MW-Z
MW-25884	BRW-Z
MW-C	W-Z
MW-PL2	MW-PLX
Water Supply	
SHIELDS	WELL-Z
WP-3	WP-Z

Tetrachloroethene were detected at greater than twice the quantitation limit in MW-101D, MW-Z, MW-C, and W-Z; trichloroethene was detected at greater than twice the quantitation limit in MW-101D and MW-Z, and above the quantitation limit in MW-C, W-Z, WP-3, and WP-Z; and cis-1,2-dichloroethene was detected at greater than twice the quantitation limit in MW-101D and MW-Z.

Trichloroethene, tetrachloroethene, cis-1,2-dichloroethene and total 1,2-dichloroethene were detected below the quantitation limit in MW-25884 and BRW-Z; cis-1,2-dichloroethene was detected below the quantitation limit in WP-3 and WP-Z; trans-1,2-dichloroethene was detected below the quantitation limit in MW-101D and MW-Z; cis-1,2-dichloroethene was detected below the quantitation limit in samples WP-3 and WP-Z; xylenes (total) were detected below the quantitation limit in MW-25884; and acetone was detected below the quantitation limit in MW-C and MW-PLX. . Carbon disulfide was detected at the quantitation limit in WP-Z and just below the quantitation limit in WP-3. No other

target compounds greater than 2 times the quantitation limit were detected in these samples, so precision could not be evaluated for any other analytes in these field duplicate pairs.

Precision in the field duplicate pairs MW-101D and MW-Z, MW-25884 and BRW-Z, MW-C, and W-Z, MW-PL2 and MW-PLX, SHIELDS and WELL-Z, and WP-3 and WP-Z was acceptable (less than 30 % RPD) for all target analytes greater than 2 times the quantitation limit.

X. Sensitivity Check

The aqueous MDL and verification studies submitted for Method 8260B were performed from November, 2010 through January, 2011, and verified in December, 2010 and February, 2011. The Limit of Quantitation (LOQ) values are verified on a quarterly basis, and checked during on-site assessments performed by NELAP and Department of Defense assessors. All project analytes in this study had calculated MDL values below the method quantitation limits and verified, acceptable LOQ values.

The aqueous MDL and the MDL verification studies for Method 524.2 submitted for this project were completed on 2/1/13, which is less 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.

New Method 820B MDL studies have been performed, but have not been fully reviewed and released by the laboratory. Current 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.

On the basis of acceptable recoveries in low-concentration laboratory control samples, and the low standard of the initial calibrations at the reporting limit, sensitivity for both methods was deemed acceptable for the purposes of this monitoring program.

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 15 – 200 %R (overall) for Method 8260B, and 70 - 130 %R for each analyte for Method 524.2; the Region 1 control limits are 60 – 140 %R. The laboratory limit of 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; the Region 1 limit for paired aqueous analyses is 30 %RPD.

Percent recoveries were correctly calculated and accurately reported on Form III summaries in the data packages, and were acceptable (64 – 128 %R for Method 8260B, and 71 - 128 %R for Method 524.2) and reproducible (0 - 29 %RPD across both methods) with the following exceptions:

Table 7. LCS/LCSD Exceedances

Batch ID (date)	Analyte	LCS %R	LCSD %R	Laboratory Limits (%R)	% RPD
Method 524.2					
200-63837 (11/5/13)	acetone	a	(a)	70 - 130	**32**
	carbon tetrachloride	a	a	70 - 130	25
	chloromethane	a	a	70 - 130	24
	trans-1,3-dichloropropene	a	a	70 - 130	24
200-65463 (12/4/13)	bromomethane	**175**	**163**	70 - 130	a
Method 8260B					
200-63609 (11/1/13 am)	carbon tetrachloride	**58**	**58**	75 - 120	a
	trans-1,3-dichloropropene	76	76	80 - 120	a
200-63643 (11/1/13 pm)	methylene chloride	123	a	80 - 120	a
200-63654 (11/2/13)	chloromethane	121	a	65 - 120	a
	methylene chloride	121	a	80 - 120	a
200-63819 (11/6/13 am)	chloromethane	a	**143**	65 - 120	a
200-63866 (11/6/13 pm)	chloromethane	136	a	65 - 120	a
	bromomethane	**142**	126	60 - 120	a

a = acceptable (a) see discussion in text below
Results exceeding both laboratory and Region I limits are shown in **boldface**.

No reanalysis was performed for the recoveries above the upper acceptance limits in any of the LCS/LCSD pairs. For Method 8260B, since the reported recoveries were within Region 1 limits, no results were qualified for the recoveries slightly above laboratory control limits for methylene chloride and chloromethane in the LCS or LCSD analyses on 11/1/13, 11/2/13, and 11/6/13, or for the recoveries slightly below the lower laboratory control limit for trans-1,3-dichloropropene in the LCS and LCSD analyses on 11/1/13.

The validator requested that the laboratory Quality Assurance Officer review the manual integration performed for acetone in LCSD 200-63837. In an email response, the laboratory concurred with the validator's opinion that this integration was improperly or inconsistently performed, and agreed to review this integration and retrain all analysts. The original integration would have produced a recovery of 141 %R, which is above laboratory and Region I limits. A revision was not provided in response to these concerns.

Since bromomethane and chloromethane were not detected in associated samples, no results required qualification on the basis of recoveries above both laboratory and Region 1 limits in the associated LCS and LCSD analyses on 12/4/13 (bromomethane) for method 524.2 and on 11/6/13 (am and pm, chloromethane) and on 11/6/13 (pm, bromomethane) for Method 8260B.

Carbon tetrachloride recoveries were below both laboratory established control limits and Region 1 limits for the LCS and LCSD samples analyzed on 11/1/13 (am) for Method 8260B. Non-detected results for carbon tetrachloride in samples TB-2, FB-3, BRW-3, BRW-2, BRW-1, MW-103RD, FB-2, BRW-Z, and MW-25884 were qualified as estimated (UJ) on the basis of the unacceptably low recoveries in the associated LCS and LCSD analyses.

On the basis of the unacceptable precision in the associated LCS and LCSD sample analyses on

11/5/13, results for acetone in FB-4, TB-3B, WP-Z, WP-5, WP-7, WP-13, WP-3, and WP-8 were qualified as estimated (UJ). Since the relative percent differences were below the Region 1 limit of 30 %RPD, no results were qualified for the reported precision above the laboratory acceptance limit (20 %RPD) for carbon tetrachloride, chloromethane, and trans-1,3-dichloropropene in this LCS and LCSD pair.

As previously discussed, carbon disulfide was inadvertently not included when the spiking solution was prepared for the ICV, LCS/LCSD, and MS/MSD analyses associated with this sample set. All results for carbon disulfide were previously qualified on the basis of the inability to evaluate method accuracy for this analyte.

One external single-blind PES sample for Method 524.2 was submitted with the samples in this sampling round.

The results of the PES are summarized in Appendix C. All spiked compounds were within the vendor's published QC Performance Acceptance Limits (three standard deviations). One target analyte not added by the vendor, chloroform, was reported in the analysis of the PES, at a concentration below the quantitation limit (0.26 ug/L). The validator requested that the laboratory investigate the false positive result for chloroform. The laboratory confirmed the detection for chloroform in the PES and also noted that it confirmed that the associated method blank was non-detect for this compound. Chloroform was also reported at 0.13 ug/L in sample WP-5, and at 1.0 ug/L in sample WP-13; however, per Region 1 guidelines, since this analyte was not detected in any laboratory blank analysis, no qualifications were applied on the basis of the false positive reported in the PES analysis.

XII. Target Compound Identification

Reported target compounds were correctly identified with supporting spectra present for all samples in these data packages.

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 (1.3- to 1.8-fold) were initially performed for samples MW-101D, MW-D, and MW-Z to bring results for tetrachloroethene within the upper half of the calibration range for Method 8260B. Based on the reported result, the 1.3-fold dilution performed on MW-D was probably not necessary, but because the concentration on-column was in the upper half of the calibration range and the dilution was less than 4-fold, the requirements of the FLCM were satisfied, and no full-strength analysis was performed.

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 with the following exception; the re-integration of acetone in LCSD 200-63837 was deemed by the validator to appear to be done in order to minimize the response and bring the recovery into the laboratory limits. At the validator's request, the laboratory reviewed automated and manual integrations for acetone in this data set, and agreed that this particular integration was improper. The laboratory stated that they would discuss the inconsistencies in the integrations with the analysts and retrain analysts on how to properly and consistently handle these situations.

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 that the validator has judged to be acceptable are presented in the "Validated_Value" column in the Data Summary Table in Attachment A and in the spreadsheet summary files submitted electronically as Attachment B. The final qualifiers based on the validation effort are presented in the "Validator_Qualifier" column in the Data Summary Table and in the spreadsheet summary files. All results, positive and non-detect, are listed in the these summaries, whether or not the value or qualifier was changed as a result of the validation; if a value or qualifier was changed, this is indicated by the "Y" (for yes) notation in the column "Validator_Change" in the Data Summary Table. Sample-specific (practical) quantitation limits (PQL) are given in the summaries.

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, with the exceptions noted within this report.

XVI. Overall Evaluation of Data

Results for volatile organic compounds were determined to be valid as reported for all samples in SDG Nos. BRES56, UNIF47, WHEA19, and UNIF48, with the following exceptions:

- On the basis of the unacceptably high percent difference results in the associated ICV, results for vinyl chloride, bromomethane, methylene chloride, and carbon disulfide in all samples analyzed by Method 524.2 were qualified as estimated (J, UJ).

- On the basis of inability to assess method accuracy due to the omission of carbon disulfide from the independent spiking solution, all results for carbon disulfide in samples analyzed by Method 8260B were qualified as estimated (UJ)

- On the basis of the unacceptable %D value in the associated CC standards, results for bromomethane in all samples analyzed by Method 8260B, and in the Method 524.2 analyses, results for bromomethane in TB-1, FB-1, WELL-Z, SHIELDS, and WP-5 (resample); for chloromethane in samples SS-5, SS-Z, MW-D, TB-4, FB-6, W-1, MW-PL1, MW-PL2, MW-PLX, MW-S1, and MW-S2; and for trans-1,3-dichloropropene in samples W-1, MW-PL1, MW-PL2, MW-PLX, MW-S1, and MW-S2 were qualified as estimated (UJ).

- On the basis of suspected laboratory contamination exhibited in method, field, and storage blanks, results for acetone in MW-103RD, MW-104D, MW-50, MW-C, MW-D, MW-E, SP-

MW3, SS-1A, SS-2, SS-5, W-20, W-25, W-SEEP, FB-5, FB-6, MW-PLX, and MW-S1 were qualified as less than the reporting limit (U). On the basis of laboratory contamination, results for methylene chloride in FB-1, WP-8, and FB-4 were qualified as less than the reporting limit (U).

- On the basis of unacceptable (0 %) recovery in the associated MS analysis but the acceptable recovery in the MSD analysis, the result for bromomethane in W-1 was qualified as estimated (UJ). On the basis of poor precision in the associated MS and MSD analyses, results for carbon tetrachloride and acetone in SHIELDS and MW-4S, and for bromomethane in W-1 were qualified as estimated (UJ).

- Non-detected results for carbon tetrachloride in samples TB-2, FB-3, BRW-3, BRW-2, BRW-1, MW-103RD, FB-2, BRW-Z, and MW-25884 were qualified as estimated (UJ) on the basis of the unacceptably low recoveries in the associated LCS and LCSD analyses.

- On the basis of the unacceptable precision in the associated LCS and LCSD sample analyses, results for acetone in FB-4, TB-3B, WP-Z, WP-5, WP-7, WP-13, WP-3, and WP-8 were qualified as estimated (UJ).

- Although chloroform was reported below the quantitation limit as a false positive in the PES, and was also reported at 0.13 ug/L in sample WP-5, and at 1.0 ug/L in sample WP-13, per Region 1 guidelines, since this analyte was not detected in any laboratory blank analysis, no qualifications were applied on the basis of the false positive in the PES analysis.

- 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.

Data presentation was acceptable, with the following exceptions:

- The samples collected at the Bressett site on 10/22/13 (laboratory identifiers 200-19070-1 through 200-19070-8) were delivered to the laboratory on the same day as collected, as recorded on the chain of custody document, which was properly signed by the field sampler and the laboratory technician receiving the samples. However, these samples were incorrectly logged in as received on 10/23/13. The summary forms showing the date of receipt for these samples are incorrect, as are the entries in the electronic data deliverable in the "Receive Date" column for these eight samples. A note indicating the correct receipt date has been added to the spreadsheet of validated results in a column labeled "Comments".

- The validator requested that the laboratory Quality Assurance Officer review the manual integration performed for acetone in LCSD 200-63837. In an email response, the laboratory concurred with the validator's opinion that this integration was improperly or inconsistently performed, and agreed to review this integration and retrain all analysts. The original integration would have produced a recovery of 141 %R, which is above laboratory and Region I limits. A revision was not provided in response to these concerns.

- Trichloroethene does not appear on the raw data quantitation report for either sample in SDG No. UNIF48, although the ion chromatograms were included for manual integrations in both samples, and it does appear on the Form 1's. At the validator's request, the laboratory investigated this reporting error, and the omissions were attributed to a "software glitch". On January 29, 2014, the laboratory submitted corrected reports (included in Attachment D).

- Total ion chromatograms for instrument CHL do not show integration marks, which are necessary for a full evaluation of the chromatographic system. The laboratory responded to the validator's concerns by saying they were using a new data software system and this feature had not been enabled. They were making the necessary change and stated that chromatograms showing the integration marks would be included in future data submissions.

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

From:	Chris Page
To:	Noyes, Gerold
Cc:	"Miles Waite"
Subject:	Unfirst: Bresset Site: JCO edits
Date:	Wednesday, May 14, 2014 3:18:50 PM

Hello Gerold,

Edits have been made to the text and table footnotes re: measurement intervals (2-3 minutes v. 5 minutes). This was an oversight on our part that we will correct going forward. Additionally, it may make sense to rent one of these fantastic new YSI flow-cells from GeoTech, which is only ~100-120ml (need to check for exact volume) rather than the larger 300ml unit that we use, at least for the Bressett site where most wells are purged at <100ml. Then we could continue to take 2-3 minute measurements and the flow cell would be well-purged with each measurement, even at <100ml/min. There is a danger that taking readings at 5 minutes will purge some of these wells dry, which yields even poorer field data due to DO spikes from pulling in air and may increase turbidity through pump startup/stop, so the smaller flow cell may make for a better all-around option.

I don't think it would be necessary for sampling at the UniFirst site, as very few of those wells are purged at a very low rate or go dry.

Additionally, we will endeavor to redevelop MW-103RD prior to the October 2013 GW monitoring round (perhaps during Summer air sampling, while waiting for samples to collect?).

Best regards,

Chris Page
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