Waite
Environmental Management, LLC.

February 6, 2008

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

RE: 2007 Annual Monitoring Report
Bressett Site, Randolph, Vermont (Site #77-0019)

Dear Gerold:

Waite Environmental Management, LLC (WEM) is pleased to present two copies of the *2007 Annual Monitoring Report* for the Bressett Site in Randolph, Vermont. The report provides details and results of the October 2007 (4th Quarter) sampling event, as well as summarizes the results from 1st, 2nd, and 3rd Quarters. This report has been prepared in accordance with the requirements and conditions described in the *State of Vermont Contract for Personal Services* EC13-04.

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

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

Sincerely,

Miles E. Waite, Ph.D.
Principal Hydrogeologist

Enclosure

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2007 ANNUAL MONITORING REPORT

for the

BRESSETT SITE
RANDOLPH, VERMONT

VT DEC Site #77-0019

February 6, 2008

Prepared for:

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

The following *2007 Annual Monitoring Report* for the Bressett Site in Randolph, Vermont (see attached Site Location Map in Appendix A) was prepared by Waite Environmental Management, LLC (WEM) for the Vermont Department of Environmental Conservation (VT DEC). This report has been completed in accordance WEM's contract with State of Vermont (contract EC13-04) for environmental monitoring.

This report includes discussion of the results of groundwater, drinking water, surface water, and indoor air sampling conducted by WEM during 2007. Monitoring locations were in the vicinity of the former Bressett Residence, Vermont Route 12, and Town Road #23. Events covered in this report include:

- Monitoring of eighteen (18) groundwater monitoring wells during May and October 2007.
- Monitoring of one (1) active supply well in May and October 2007.
- Monitoring of one (1) active supply spring/water system during May 2007.
- Monitoring of two (2) surface water locations in July 2007.
- Monitoring of indoor air at two (2) locations inside the former Bressett Residence in January 2007.

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

All results except those from 4th Quarter 2007, which are discussed in this report, have been previously reported by WEM [3, 4, 5].

2.0 GROUNDWATER SAMPLING

Groundwater monitoring well sampling was conducted by WEM from a total of fifteen (15) wells on May 1-2, 2007 and from fourteen (14) wells on October 10-11, 2007. Wells sampled included six paired monitoring wells (MW-3S/D, MW4-S/D, MW-101S/D, MW-102S/D, MW-103S/D, MW-104S/D) and three bedrock monitoring wells (BRW-1, BRW-2, BRW-3). In addition, groundwater elevation measurement was conducted on an additional three (3) wells (MW-1, MW-2S/D). Sampling was conducted in accordance site protocols as specified in WEM's Work Plan and the FLCM-Water. All wells were in the general vicinity of the former Bressett residence. All well locations are shown in the Site Plan in Appendix A. 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 May and October 2007 are shown with historical measurements in Table 1.1 in Appendix B. These data indicate the following:

- Groundwater elevation measurements in May 2007 were slightly higher (+0.11 ft) than measurements from spring 2002-06 measurements. No atypical measurements were noted.
- Groundwater elevation measurements in October 2007 were slightly lower (-0.35 ft) than measurements from fall 2002-06. No atypical measurements were noted.
- Well MW-103S was observed to be dry during October 2007, which is often the case for fall sampling.
- Groundwater elevations fluctuate slightly with the seasons, and are typically higher in April than in October, often by several feet. The May 2007 average elevation was 2.14 feet higher than the October 2007 average elevation.

Groundwater elevations were also plotted to develop groundwater elevation maps for each sampling event (see Appendix A). As these maps show, the general direction of groundwater flow (based on shallow well data) was toward the southwest. The lateral hydraulic gradient, as calculated between MW-2S and MW-102S, was 0.036 ft/ft in May 2007 and 0.031 ft/ft in October 2007. Vertical hydraulic gradients calculated between the paired wells (see Table 1.1) were generally upward, ranging from 0.004 to 0.24 ft/ft. Only paired wells MW-101S/D consistently has a measurable downward vertical gradient.

2.2 Groundwater Sample Collection

Overburden monitoring wells MW-101S/D, MW-102S/D, MW-103S/D, MW-104S/D were purged and sampled using a low-flow methodology. These monitoring wells were purged using a peristaltic pump (Geotech Geopump II) connected to dedicated high density polyethylene (HDPE) tubing within each well that extended to a pre-specified intake depth. The dedicated HDPE tubing was connected to disposable silicon tubing that ran through the head of the peristaltic pump; new silicon tubing was used for each well purged. Purge rates ranged between 75-300 milliliters/minute (ml/min). During the purging process, the water level was monitored using a water level probe (Solinst) with a 0.25-inch probe, and geochemical parameters were measured using a water quality meter (Horiba U-22 Model U-22XD) with a flow cell connected to the outlet of the peristaltic pump. The following field geochemical parameters were monitored: dissolved oxygen, specific conductance, temperature, pH, turbidity, and redox potential. Wells were allowed to purge until geochemical parameters stabilized, as specified by site protocols. Upon stabilization, the silicon tubing was disconnected from the water meter. Samples were then collected directly from the outlet of the peristaltic pump.

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

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

In all cases, the order of sample collection was as dictated by site protocols, and all samples were collected in pre-acidified sampling containers supplied by the laboratory and immediately placed on ice in a cooler. All samples were delivered by WEM to Test America laboratory (TA) of South Burlington, Vermont (formerly Severn-Trent Laboratories) 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 Discussion of Results

2.3.1 Field Geochemical Data

Field geochemical parameter measurements are summarized in Tables 1.2 through 1.7 in Appendix B. Based on these data, the geochemical parameter measurements from the monitoring wells in 2007 were generally within the historical range measured over the past three years. Anomalous measurements from May and October 2007 are discussed below:

- Dissolved Oxygen: many wells had slightly depressed measurements in October 2007. The only noticeable trend has been a decreasing DO content with time in wells MW-101D and MW-4D.
- Specific Conductance: many wells had slightly depressed measurements in May 2007. No clear trends were noted.
- pH: no anomalies or clear trends were noted.
- Turbidity: Measurements in MW-101S were elevated during both May and October 2007, continuing on an apparent a rising trend. Possible decreasing trends were noted in MW-3D and MW-101D. No other trends are noted.
- Redox: no anomalies or clear trends were noted.

2.3.2 Laboratory Data

Validated laboratory analytical results are summarized in Table 2.0 in Appendix B. Full copies of the laboratory reports are presented in the Data Validation Reports [7, 9] prepared by Phoenix Chemistry Service, on file at the VT DEC offices in Waterbury.

The analytical results for the target compounds of interest during May and October 2007 are described below:

PCE

- PCE was detected above reporting limits in wells MW-3S, MW-3D, MW-4D, MW-101S, MW-101D, and MW-102S during both May and October 2007. PCE was detected in MW-4S during October but was detected at a trace concentration (estimated below reporting limits) in May 2007.
- PCE was not detected above reporting limits in any of the following wells: MW-102D, MW-103S/D, MW-104S/D, BRW-1, BRW-2, or BRW-3 during either May or October 2007.
- PCE concentrations increased between May and October 2007 in wells MW-3S, MW-101S, and MW-102S. PCE decreased between May and October in MW-3D quite drastically. PCE was stable in MW-4S, MW-4D and MW-101D.
- With the exception of brief increasing trends in PCE concentrations in well MW-102S since 2005, PCE has generally been decreasing or stable with time.

TCE

- TCE was detected above reporting limits in wells MW-3S, MW-3D, MW-4D, MW-101D, and MW-102S during both May and October 2007. PCE was detected in MW-101S during October but was detected at a trace concentration (estimated below reporting limits) in May 2007.
- TCE was not detected above reporting limits in any of the following wells: MW-4S, MW-102D, MW-103S/D, MW-104S/D, BRW-1, BRW-2, or BRW-3 during either May or October 2007.
- TCE concentration decreased between May and October in well MW-3D quite drastically, falling below the VGES. There were no other significant changes in TCE concentrations between May and October 2007.

cis-1,2-DCE

- cis-1,2-DCE was detected above reporting limits in wells MW-3S, MW-3D, MW-101D, and MW-102S during both May and October 2007. In MW-101S, cis-1,2-DCE was detected at an estimated concentration below the reporting limit in May and above the reporting limit in October. In well MW-4D, cis-1,2-DCE was detected at an estimated concentration below reporting limit in May but not detected in October.
- cis-1,2-DCE was not detected above reporting limits in wells MW-4S, MW-102D, MW-103S/D, MW-104S/D, BRW-1, BRW-2, or BRW-3 during May or October 2007.
- cis-1,2-DCE concentration decreased between May and October in well MW-3D quite drastically. There were no other significant changes in cis-1,2-DCE concentrations between May and October 2007

trans-1,2-DCE

- trans-1,2-DCE was detected at estimated concentrations below the reporting limit in wells MW-3S, MW-101D, and MW-102S during both May and October 2007.
- 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-103S/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") [10] most of the reported PCE and TCE concentrations were above the 5.0 ug/L standard for each compound. Wells out of compliance with VGES for PCE and/or TCE during both the May and October 2007 events include: MW-3S/D, MW-4D, MW-101D, and MW-102S.

To compare the 2007 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 MW-3S, MW-4S, MW-4D, MW-101S, MW-101D, and MW-102D. PCE concentration in well MW-3D ended a brief rising trend with a drastic decrease in October 2007. While PCE in MW-102S has continued in an increasing trend since April 2005, the overall trend appears to be stable with time. The wells that are not shown in the graphs in Appendix C are generally steadily non-detect with time.

Regarding the distribution of VOC 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 2007 are shown in the maps in Appendix A. The downgradient extent of the plume increased slightly between May and October 2007, primarily due to the increase in VOCs in well MW-102S. However, the upgradient extent of the plume decreased between May and October due to the decrease in VOCs in MW-3D

2.3.3 QA/QC Samples

As part of the quality assurance/quality control (QA/QC) program, WEM collected field duplicate samples during the May and October 2007 sampling events. During May, sample "MW-X" was conducted in conjunction with MW-3D. During October, sample "MW-Y" was collected in conjunction with MW-3D, and "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 May and October sampling events, one field blank was prepared and one pre-containerized trip blank was added to the cooler and submitted for analysis by EPA Method 8260B. No target compounds were reported in any field blank or trip blank sample collected during 2007.

2.4 Discussion of Data Validation

The laboratory data from the May and October 2007 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 [7, 9] on file at the VT DEC offices in Waterbury. The text of the data validation report for the October 2007 sampling event is included in Appendix E.

Results for the target VOCs were determined to be valid as reported for all groundwater samples collected from the Site on May 1-2, 2007 (sample delivery group (SDG) No. BRES37) and on October 10-11, 2007 (SDG No. BRES39) with the following exceptions:

- May and October 2007 results for tetrachloroethene initially outside the calibration range in the original analyses of select samples were rejected (R) and replaced with the acceptable concentrations from the corresponding diluted samples.

- May and October 2007 results for cis-1,2-dichloroethene initially outside the calibration range in the original analyses of select samples were rejected (R) and replaced with the acceptable concentrations from the corresponding diluted samples.

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

2.5 Well Maintenance

The flooding of Howard Hill Brook in the summer caused serious damage to the area surrounding the former Bressett residence, including the culvert where the Brook travels westward underneath Route 12. In the process of fixing this culvert, fill material was placed over wells MW-104S/D. At the request of the VT DEC, WEM worked with Daly Contracting of South Royalton, Vermont to correct the problem. On October 10, 2007, a small excavator operated by Daly was used to remove the fill material and re-expose the wells. No permanent damage occurred. Also on October 10, Daly assisted WEM with re-installing the well guard for well MW-102S, which had been knocked over. The guard was re-cemented into the ground and a fencepost was placed in front of the well pair to prevent future damage. No permanent damage to the PVC well casing occurred.

2.6 Recommendations

Based on the above information, overburden groundwater at the Site continues to show evidence of chlorinated VOCs at concentrations that exceed applicable enforcement standards. Given these conditions, WEM recommends continuing the groundwater monitoring program as specified in the Work Plan and FLCM-Water. The next sampling event is scheduled for April 2008.

3.0 WATER SUPPLY SAMPLING

Water supply sampling was conducted by WEM from the water system at the former Bressett residence and from the active bedrock well at the former Shields residence on May 1, 2007. On October 11, 2007, only the Sheilds well was sampled, as the water system inside the former Bressett residence was non-functional due to springtime flooding of the basement. Also on October 11, WEM collected a sample from the "New Bowen Well" at the Bowen residence. This well was sampled at the request of Mr. Bowen after discussion with the VT DEC.

Sampling from the Sheilds Well was conducted in accordance with WEM's Work Plan and with the FLCM-Water. Sampling from the Bressett Spring was conducted in a different manner than specified in the FLCM-Water, at the request of the VT DEC. Instead of sampling directly from the spring tile, this spring was sampled at the pre-filter location upstream of the holding tank in the basement, and at the post-filter kitchen tap. Sampling from the Bowen Well is not part of the Work Plan or FLCM, and was a one-time event. All sampling locations are shown in the Site Plan in Appendix A. Details and results of the water supply sampling event are described below.

3.1 Water Supply Sample Collection

The Bressett Spring is the primary water supply for the former Bressett residence (currently owned by Margaret Hammond and vacant). 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 (assumed polyethylene) connects the spring to an approximately 300-gallon plastic holding tank in the basement of the residence. As of the Fall of 2006, a filter is present just upstream of the holding tank. The filters are "Taste & Odor Cartridges" manufactured by Campbell (model 1C9-30), and are diamond-wound polypropylene fibers over rolled, activated carbon batting and polypropylene core. 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 May 2007, WEM purged the system of at least 30 gallons and then collected one (1) sample directly from the kitchen tap with the filter installed (i.e. treated water) and then collected one (1) "pre-filter" sample from upstream of the holding tank (i.e. untreated water).

The Shields well is accessed via the hand-activated pump on the well head. During both May and October 2007 the well was purged of approximately 50 gallons prior to sampling. The sample was colleted directly from the hand pump discharge nozzle.

The New Bowen Well was sampled via the outdoor tap on the west side of the Bowen residence after allowing the well to purge of approximately 50 gallons.

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

3.2 Discussion of Results

Validated laboratory analytical results are summarized in Table 3.0 in Appendix B. Full copies of the laboratory reports are presented in Data Validation Reports prepared by Phoenix Chemistry Service [7, 9].

The analytical results indicate the following:

- The target compound PCE was reported at an estimated concentration of 0.53 ug/L in the Bressett kitchen tap sample in May 2007. No other target VOCs were detected above reporting limits.
- The target compound PCE was reported at an estimated concentration of 0.41 ug/L in the Bressett holding tank inflow "pre-filter" sample in May 2007. No other target VOCs were detected above reporting limits.
- No target VOCs were detected above reporting limits in the Shields Well during either May or October 2007.
- No target VOCs were detected above reporting limits in the New Bowen Well during October 2007.

The detection of PCE in the Bressett water system beginning in April 2006 when sampling began at the kitchen tap indicates that PCE is migrating into the water distribution system, likely through the polypropylene water line. Also, the presence of PCE at a higher concentration in the "treated water" compared the "untreated water" indicates that the filter needs to be replaced or that the filter is not capable of removing PCE to below detectable concentrations. While previous concentrations at the kitchen tap have been above the Vermont Action Level of 0.7 ug/L, the May 2007 concentrations were below this level.

3.2.1 QA/QC Samples

As part of the QA/QC program, WEM collected field duplicate samples during each sample event. In May and October 2007, "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 in either the May or October 2007 field duplicate pair, so precision could not be evaluated.

WEM also prepared field blanks and added pre-made trip blanks to the cooler during each day of water supply sampling in May and October 2007. 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 May and October 2007 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 [7, 9] on file at the VT DEC offices in Waterbury. The text of the data validation report for the October 2007 sampling event is provided in Appendix E.

Results for the target VOCs were determined to be valid as reported for all supply well samples collected from the Site on May 1, 2007 (sample delivery group SDG No. BRES37), and on October 11, 2007 (SDG No. BRES39). There were some FLCM compliance issues, but nothing that affected the validity of the water supply analytical data.

3.4 Recommendations

Due to presence of PCE in at the point of entry of the former Bressett residence and the continuing presence of chlorinated VOCs in the overburden aquifer as described in Section 2.0, WEM recommends continuing the supply well monitoring program. The Shields Well should continue to be sampled from the well head as specified in the FLCM. At the former Bressett residence, samples from the kitchen tap and pre-filter locations should be collected with evaluation of the effectiveness of the water treatment. If PCE is detected at the kitchen tap above the Vermont Action Level, a different treatment system may be merited. The FLCM should be modified to reflect the change in sampling routine.

4.0 SURFACE WATER SAMPLING

Surface water sampling was conducted by WEM on July 30, 2007. Sampling was conducted in accordance with WEM's Work Plan and the FLCM-Water. As dictated by the Work Plan, there had been at least 36 hours without precipitation prior to the collection of surface water samples (weather tracking data from Knapp State Airport in Barre, Vermont).

4.1 Surface Water Sample Collection

WEM collected two (2) surface water samples on July 30, 2007. Regular sampling locations, labeled as SW-1 and SW-2 in the Site Map in Appendix A, are along the Howard Hill Brook, and an unnamed tributary of the Ayers Brook. The unnamed tributary of the Ayers Brook (SW-1) was flowing at an approximate flow rate of 26 gallons per minute. This sample was collected by dipping the sample container directly into the pool of water. The Howard Hill Brook sample (SW-2) was also collected by dipping the container into the stream at the middle of the channel. The Brook was flowing at an approximate rate of 225 gpm. Flow rate at SW-1 was measured using a measuring cup below a 4-in diameter pipe placed in a narrow portion of the stream channel. Flow at SW-2 was measured upstream of the sample using a 5-gallon bucket placed under the edge of the culvert outfall that underlies Route 12.

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

4.2 Discussion of Results

Surface water sampling results from July 2007 are summarized in Table 4.0 in Appendix B. These results have been validated by an independent validator (see Section 4.3). A full copy of the laboratory report is presented in the data validation report [8] on file in Waterbury.

The laboratory results indicate that VOCs were <u>not</u> detected above reporting limits in either sample collected during the July 2007 sampling event. Based on results dating back to 2001 (see Table 4.0), target VOCs are not regularly detected at these two sampling locations.

4.2.1 QA/QC Samples

As part of the QA/QC program, WEM collected one (1) field duplicate sample (SW-X) on July 30, 2007. This sample was collected in conjunction with the sample SW-2 and analyzed by STL using the same method (EPA Method 8260B). No target compounds were detected in sample SW-2 or SW-X, so precision could not be evaluated in this field duplicate pair.

WEM also collected one (1) trip blank (TB-2) and one (1) field blank (FB-2) on July 30, 2007. No target compounds were reported in either sample.

4.3 Discussion of Data Validation

The laboratory data were validated by Phoenix Chemistry Services, an independent data validator. The validation was performed in accordance with Tier III guidelines as described by the USEPA Region I. Details are presented in the report [8] on file at the VT DEC offices in Waterbury.

Results for target compounds were determined to be valid as reported for all samples in SDG No. BRES38. There were qualifications for two non-target compounds (acetone and 2-butanone). While there was also a minor documentation issue, it did not directly affect the validity of the analytical data.

4.4 Recommendations

Due to the continuing presence of chlorinated VOCs in the overburden aquifer as described in Section 2.0, WEM recommends continuing the surface water monitoring program as specified in the Work Plan and FLCM-Water. The next sampling event is scheduled for July 2007.

5.0 INDOOR AIR SAMPLING

Indoor air sampling was conducted at the former Bressett residence by WEM on January 23, 2007. Sampling was conducted in accordance with WEM's Work Plan and with the *Field/Lab Coordination Memorandum for Air Monitoring* ("FLCM-Air") developed by Phoenix Chemistry Services dated April 2, 2004. Details and results of the air sampling event are described below.

Indoor air sampling was not conducted during the 3rd quarter 2007. The former Bressett residence is currently owned by Margaret Hammond, but has been unoccupied since late 2006 when Jeannie Taylor moved out. WEM communicated with VT DEC in preparation of the 3rd quarter indoor air sampling event and established that air sampling was not to be conducted.

5.1 Air Sample Collection

One day prior to the January 23 monitoring event, the two (2) "Allen Air model 5000 VOCARB" air treatment units were turned on by the realtor who has the property listed for sale. Each stand alone unit draws ambient air in from the bottom, treats it using activated carbon, and then discharges it through the top. One was placed in the 1st floor kitchen, and one was placed in the basement. Both units were in operation on low setting during the time of sampling.

A total of two (2) air samples were collected on January 23. The 1st floor sample ("BRST1FLR") was collected from the bedroom/craft room off the kitchen on the east side of the house, and the basement ("BRSTBSMT") sample was collected from the northeastern portion of the basement, halfway between the stair and the north wall. Other than a low final pressure reading in the duplicate sample (see Section 5.2.1), no significant problems were encountered during the sampling event, and all sampling procedures were in accordance with the *Work Plan*.

Samples were collected by WEM using 6-liter stainless steel Silco air canisters. The canisters were procured by WEM from TA Lab on the day prior to sampling. With each canister, a flow controller was utilized that had a pressure gauge. 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 sampling procedure at each site involved setting up the canister at the designated sampling location, attaching the flow controller, recording initial canister pressure, 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. Samples were allowed to run for approximately 4 hours.

All samples were delivered by WEM to TA for analysis of the four target volatile organic compounds: PCE, TCE, cis-1,2-DCE, and trans-1,2-DCE. The January 2007 analysis was by Method TO-14A/TO-15. Results, in parts per billion (ppbv), are discussed below. The reporting limit (practical quantitation limit) used by TA for these samples is 0.2 ppbv.

5.2 Discussion of Results

Air sampling results from January 2007 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 report is presented in the data validation report [6] on file in Waterbury.

The results indicate that one or more of the target compounds were reported in both of the indoor air samples collected in January 2007:

- PCE was detected above reporting limits in BRST1FLR (6.0 ppbv) and BRSTBSMT (10 ppbv).
- TCE was detected above reporting limits in BRSTBSMT (1.2 ppbv) and at an estimated concentration below reporting limit in BRST1FLR.
- cis-1,2-DCE was detected at estimated concentrations below reporting limits in both BRST1FLR and BRSTBSMT.
- trans-1,2-DCE was not detected above reporting limits in BRST1FLR or BRSTBSMT.

The Vermont Department of Health (DOH) has developed indoor air guidance levels of 1.0 ppbv for PCE and TCE (based on statewide study titled *Indoor Ambient Air Survey Results, Yearly Sampling Between 12/21/91 and 12/20/92*). The PCE concentrations detected on the 1st floor (6.0 ppbv) and the basement (10 ppbv) are all above the DOH guidance level. In addition, the TCE concentration detected in the basement (1.2 ppbv) is above the DOH guidance level. The cis-1,2-DCE concentrations are below applicable guidelines.

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. This compound has been detected during all of the prior sampling events. As the graphs in Appendix B indicate, contaminant concentrations have generally been steady with time. As is typical, the basement concentrations are higher than the 1st floor concentrations, suggesting that the source of the contaminants is migration into the basement from the ground under/surrounding the house. The house has a stone foundation.

5.2.1 QA/QC Samples

As part of the quality assurance/quality control (QA/QC) program, WEM collected one (1) field duplicate sample (FD2). This sample was collected in conjunction with the sample from the basement sample (BRSTBSMT) and analyzed by TA using the same method. Three target compounds were detected in both FD2 and BRSTBSMT, and all showed acceptable precision range (3.5 – 9.5 % difference).

It should be noted that the although the field reading for the regulator for FD-2 indicated that vacuum remained in the canister (#3555), the laboratory measured slight positive pressure (+0.1 inches Hg) in the canister. Any calculations using sampling rate for location FD-2 should be made using the duplicate canister, BRSTBSMT (#3244).

WEM also submitted one trip blank (TB1). 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 [6] on file at the VT DEC offices in Waterbury.

The findings of the validation effort resulted in no qualifications of sample results. While there were some documentation issues, these issues do not directly affect the validity of the analytical data.

5.4 Recommendations

Given the presence of VOCs in the overburden groundwater and historical indoor air sampling results, WEM recommends that air sampling continue as specified in the Work Plan and FLCM-Air. The 2008 sampling schedule will be January and July. Sampling will not be conducted if the house continues to be unoccupied. WEM also recommends continued evaluation of the air treatment units. If these units cannot reduce air concentrations to acceptable levels, then a sub-slab basement air control system, similar to those installed at several residences in Williamstown, should be installed to minimize the entry of soil vapor into the building.

6.0 REFERENCES

1. Waite Environmental Management, LLC, *Work Plan for Environmental Monitoring at the UniFirst Plant Site, Williamstown, Vermont, Wheatley Farm Site, Brookfield, Vermont, Bressett Site, Randolph, Vermont*, February 6, 2004.

2. Phoenix Chemistry Services, *Field/Lab Coordination Memorandum for Water Monitoring, UniFirst Plant Site, Williamstown, Vermont, Wheatley Farm Site, Brookfield, Vermont, Bressett Site, Randolph, Vermont*, April 2, 2004.

3. Waite Environmental Management, LLC, *1st Quarter 2007 Monitoring Report, Bressett Site, Randolph, Vermont*, May 8, 2007.

4. Waite Environmental Management, LLC, *2nd Quarter 2007 Monitoring Report, Bressett Site, Randolph, Vermont*, August 2, 2007.

5. Waite Environmental Management, LLC, *3rd Quarter 2007 Monitoring Report, Bressett Site, Randolph, Vermont*, November 5, 2007.

6. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Williamstown and Bressett Sites, Williamstown and Randolph, VT (Sample Delivery Group No. 118467)*, March 28, 2007

7. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, UniFirst and Bressett Sites, Williamstown and Randolph, VT, Organic Analyses Data, Volatile Organics in Water Samples, Sample Delivery Group Nos.BRES37 and UNIF28*, July 7, 2007.

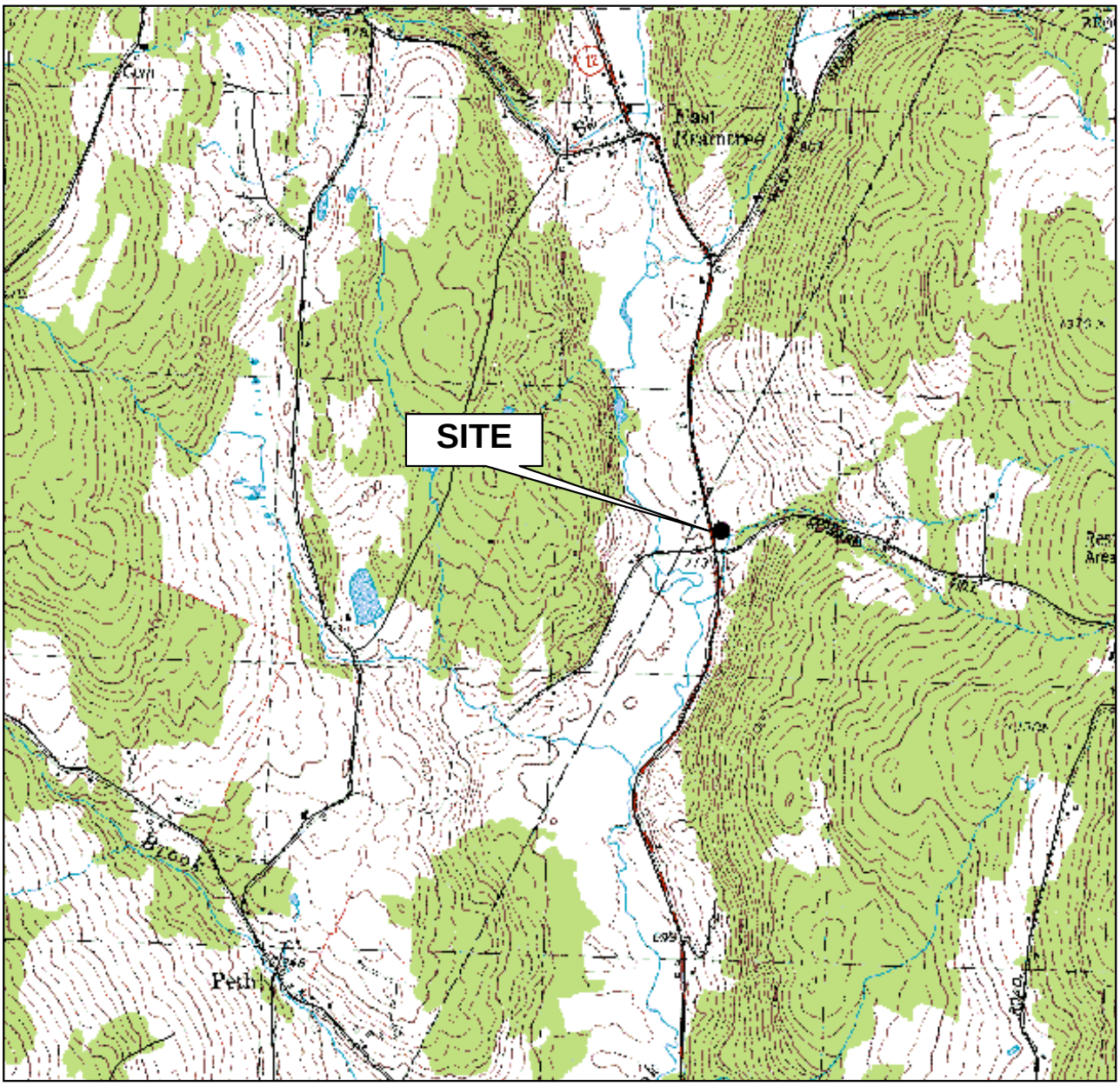
8. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Bressett and UniFirst Sites, Randolph and Williamstown, VT (Sample Delivery Group Nos. BRES38 and UNIF29)*, September 29, 2007.

9. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Bressett, Wheatley, and UniFirst Sites, Randolph, Brookfield, and Williamstown, VT, Organic Analyses Data, Volatile Organics in Water Samples, Sample Delivery Group Sample Delivery Group Nos. BRES39, UNIF30, UNIF31 , and WHEA13*, January 18, 2008.

10. State of Vermont, Agency of Natural Resources, Department of Environmental Conservation, *Chapter 12, Groundwater Protection Rule and Strategy*, January 20, 2000.

APPENDIX A:

FIGURES



N

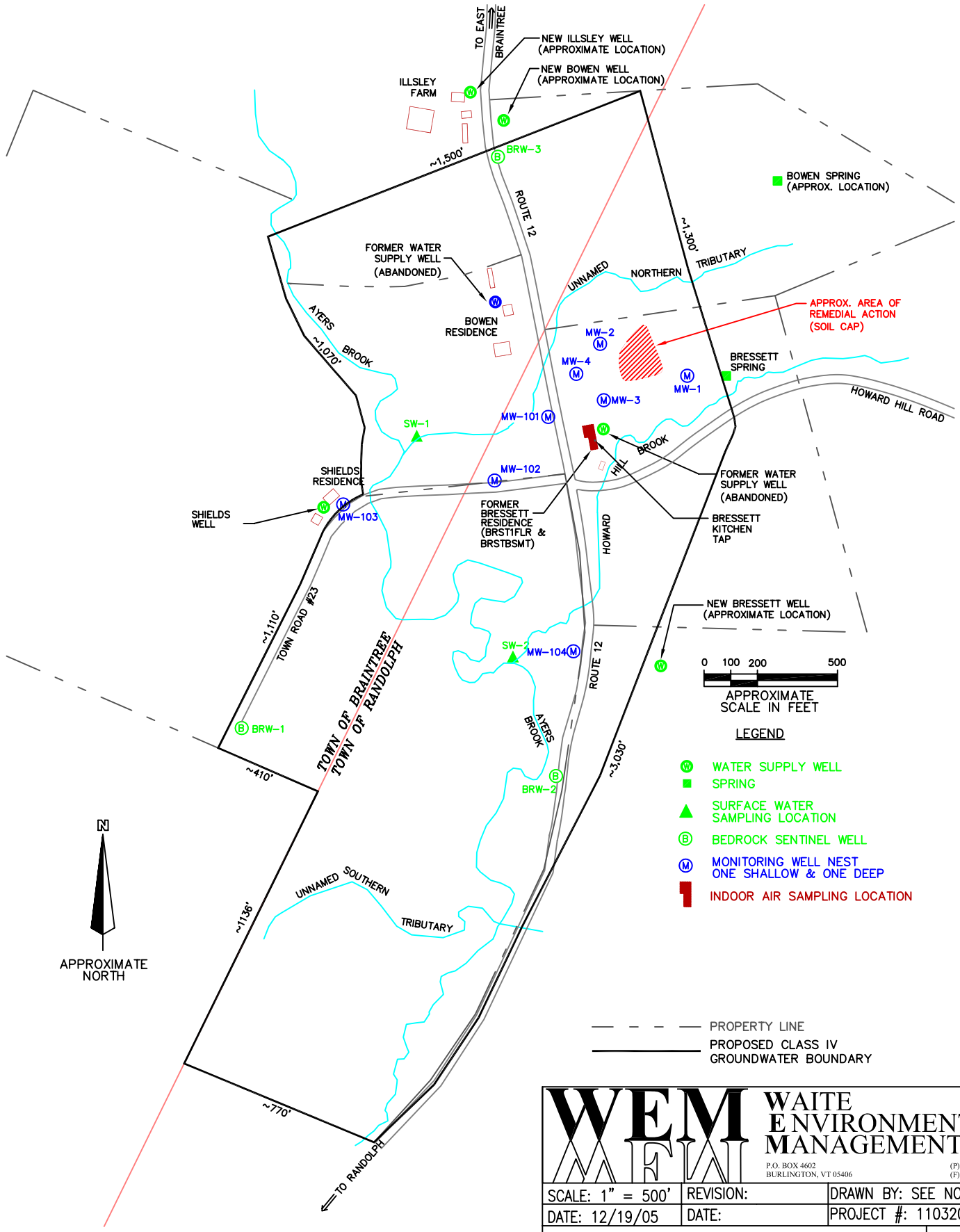
Map Source: *USGS Mapping 7.5 Minute Quadrangle: Randolph (1981)*

Waite Environmental Management, LLC

SITE LOCATION MAP

Bressett Site
Randolph, Vermont

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



NOTES:
1. MAP SOURCE IS "PLATE 1: SITE MAP, BRESSETT SITE, RANDOLPH, VERMONT" PREPARED BY THE JOHNSON COMPANY, INC. MAP DRAWN ON 4/25/00 BY TJK, MOST RECENTLY REVISED BY TJK ON 8/16/04. MAP TEXT WAS REVISED BY MEW OF WAITE ENVIRONMENTAL MGT ON 12/19/05.

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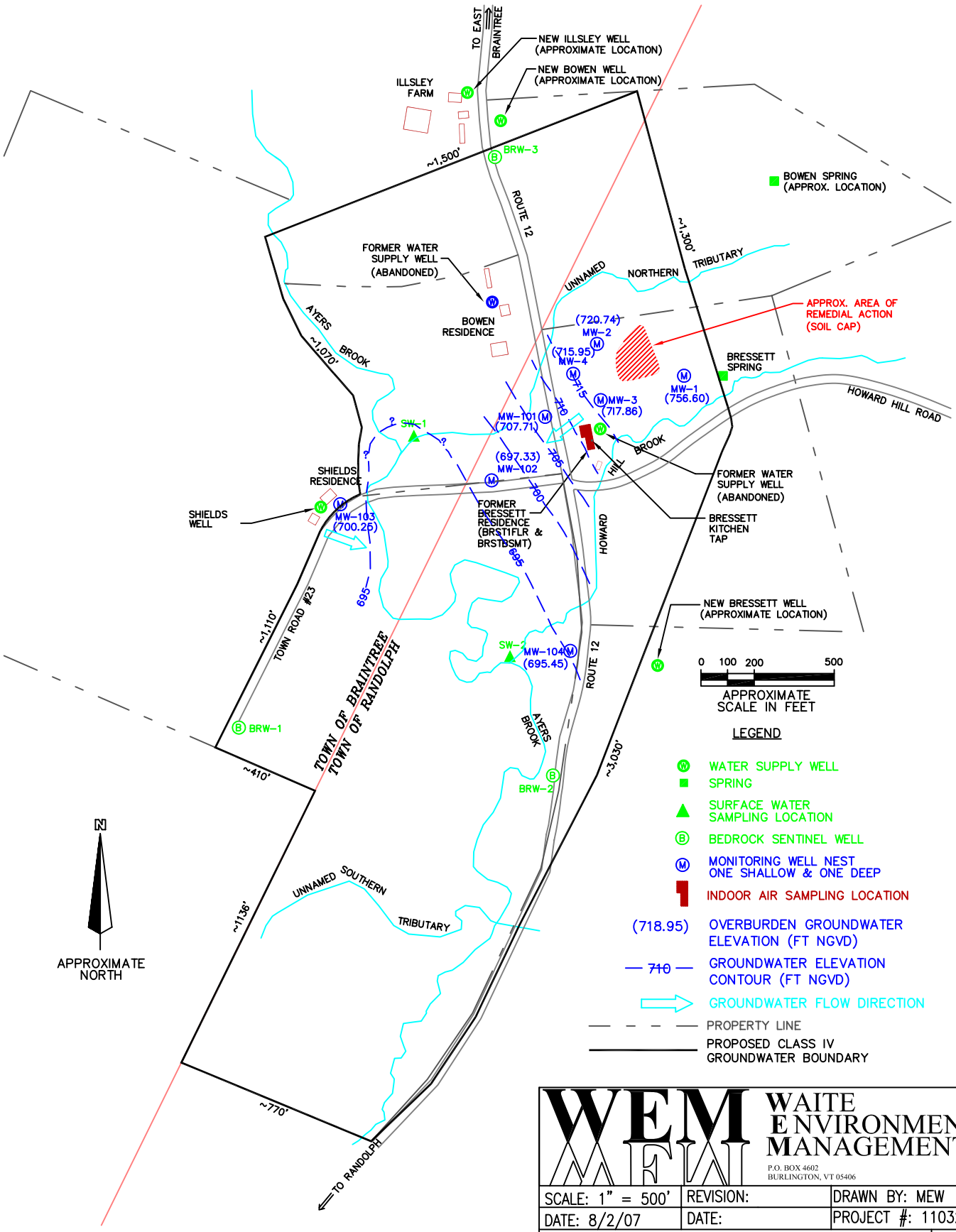
SCALE: 1" = 500'	REVISION:	DRAWN BY: SEE NOTE
DATE: 12/19/05	DATE:	PROJECT #: 110320012

SITE PLAN

BRESSETT SITE
RANDOLPH, VERMONT



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2. GROUNDWATER ELEVATIONS ARE FROM THE SHALLOW PAIRED WELL.
3. ELEVATIONS MEASURED BY WEM ON MAY 1-2, 2007.

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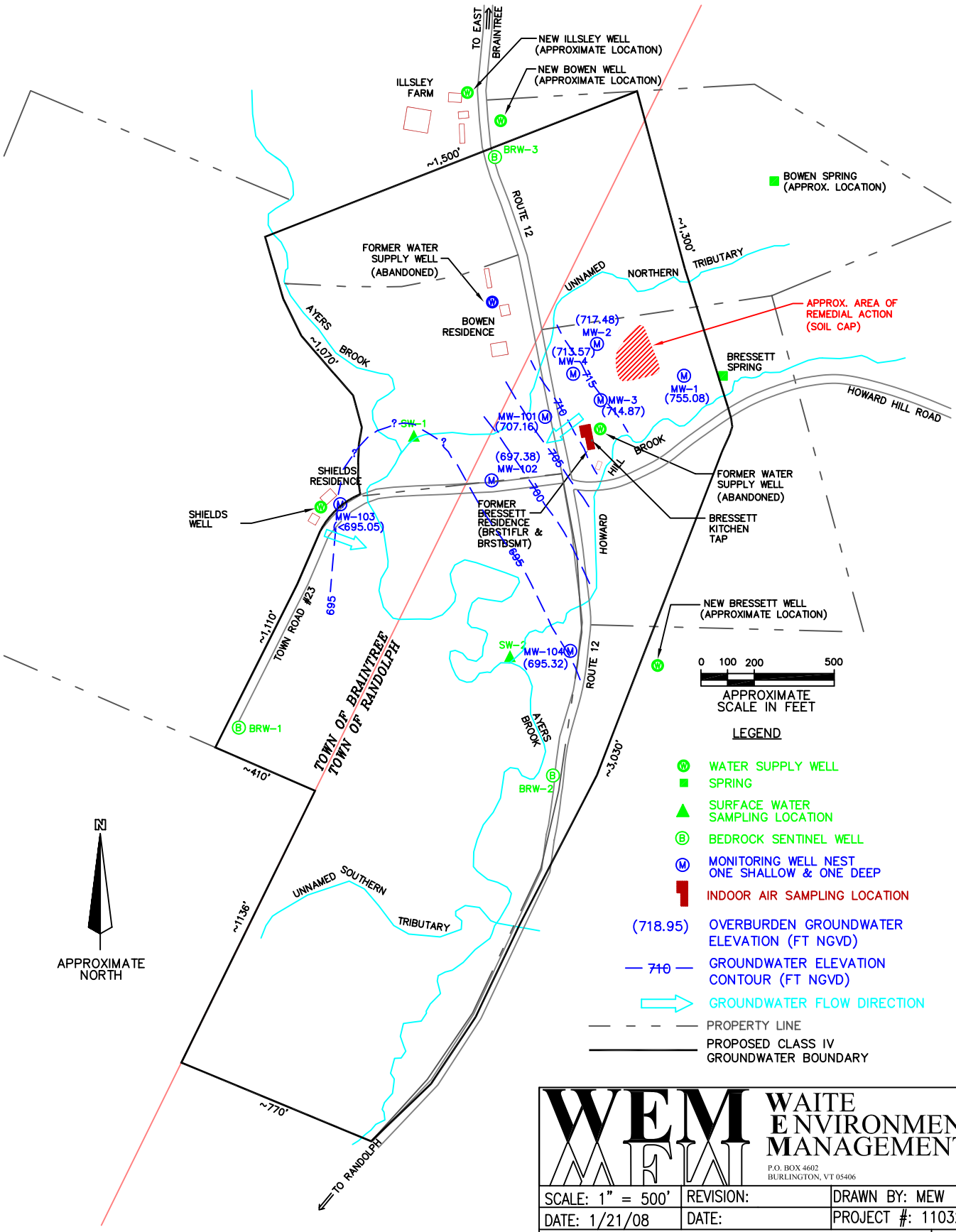
DATE: 8/2/07	DATE:	PROJECT #: 110320012

GROUNDWATER ELEVATION CONTOUR MAP
MAY 2007

BRESSETT SITE
RANDOLPH, VERMONT



NOTES:
1. MAP SOURCE IS "PLATE 1: SITE MAP, BRESSETT SITE, RANDOLPH, VERMONT" PREPARED BY THE JOHNSON COMPANY, INC. MAP DRAWN ON 4/25/00 BY TJK, MOST RECENTLY REVISED BY TJK ON 8/16/04. MAP TEXT WAS REVISED BY MEW OF WAITE ENVIRONMENTAL MGT ON 12/19/05.
2. GROUNDWATER ELEVATIONS ARE FROM THE SHALLOW PAIRED WELL.
3. ELEVATIONS MEASURED BY WEM ON OCTOBER 10-11, 2007.

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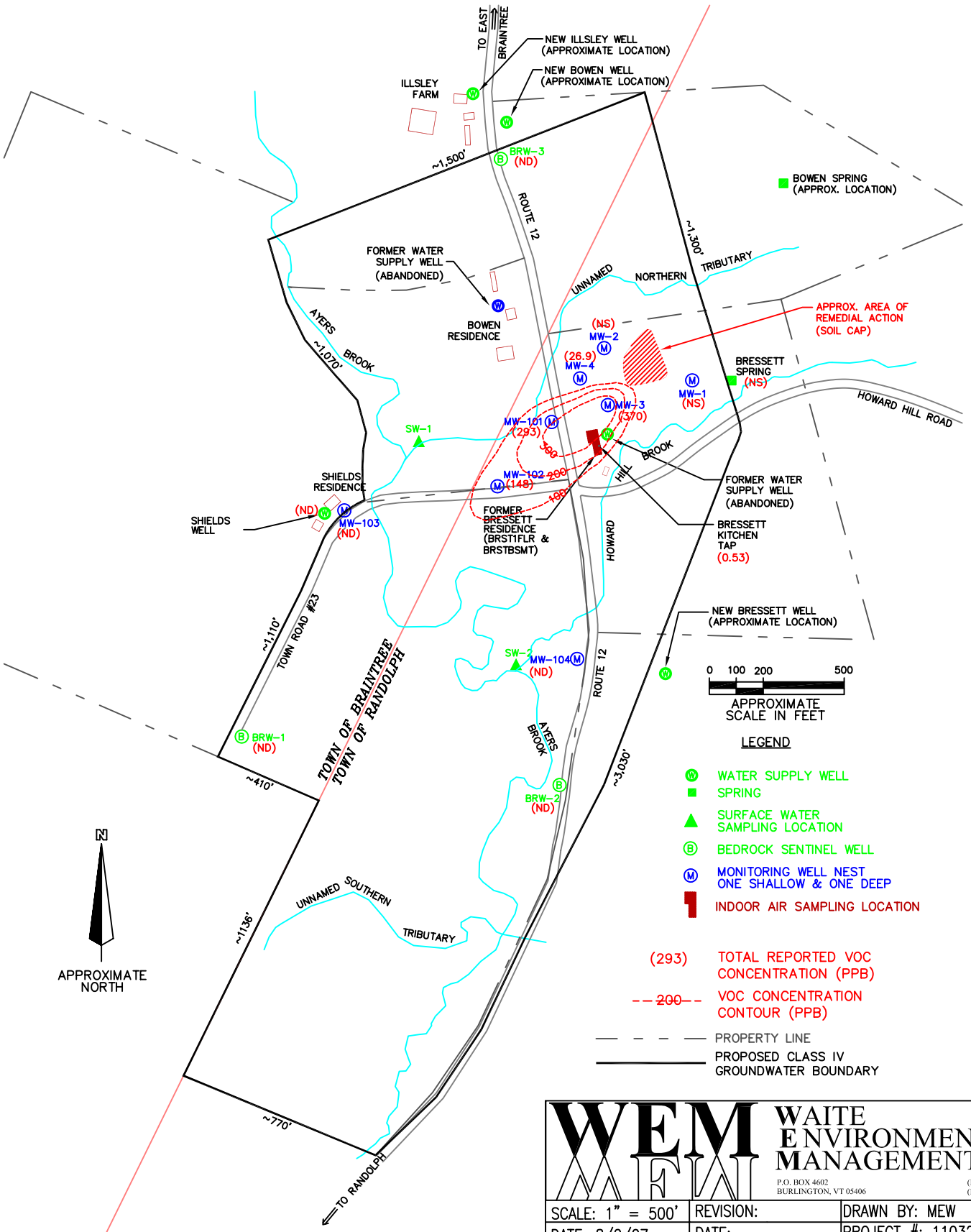
DATE: 1/21/08	DATE:	PROJECT #: 110320012

GROUNDWATER ELEVATION CONTOUR MAP
OCTOBER 2007
BRESSETT SITE
RANDOLPH, VERMONT



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2. TOTAL REPORTED VOC 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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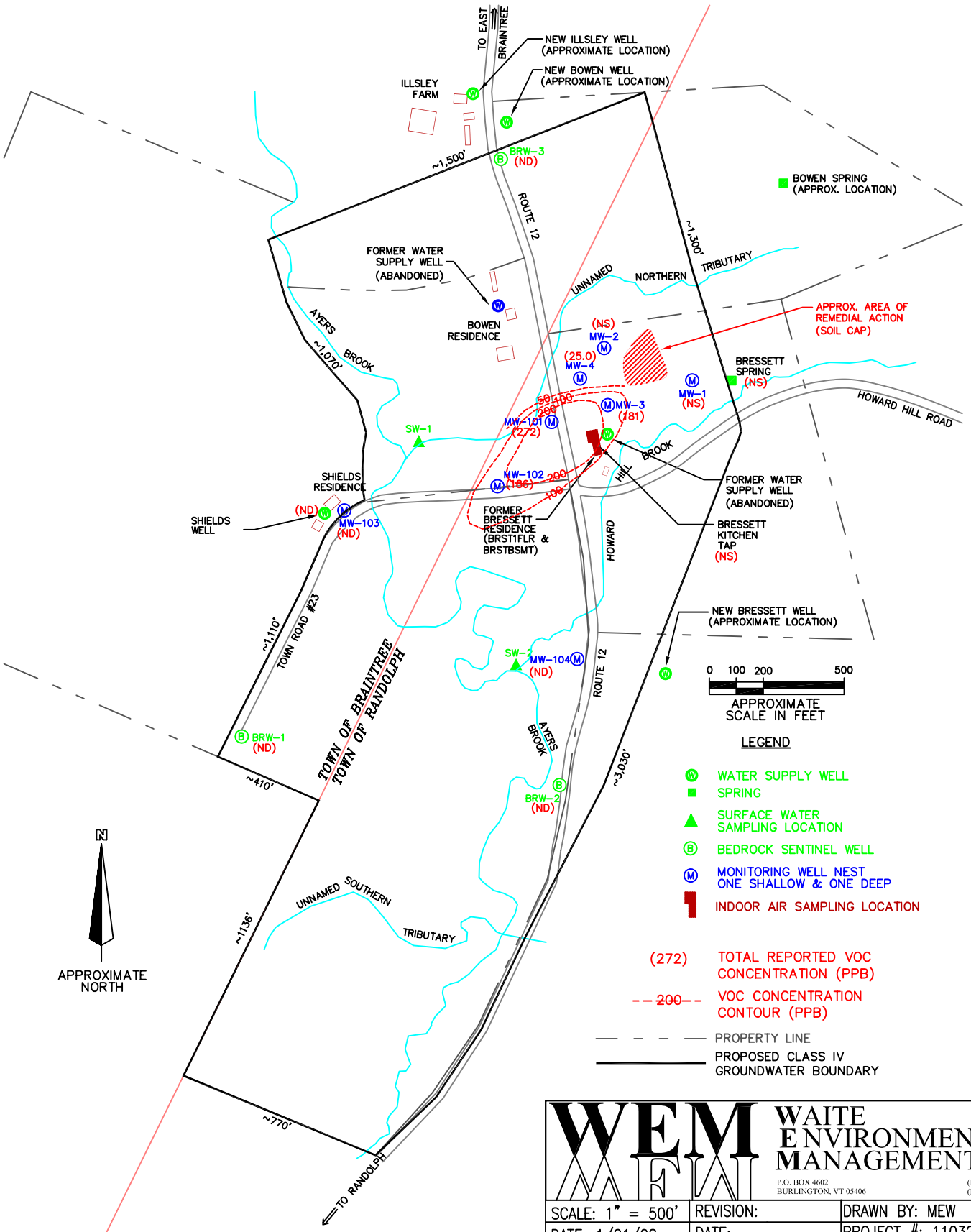
DATE: 8/2/07	DATE:	PROJECT #: 110320012

VOC CONCENTRATION CONTOUR MAP
MAY 2007
BRESSETT SITE
RANDOLPH, VERMONT



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2. TOTAL REPORTED VOC 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: 1/21/08	DATE:	PROJECT #: 110320012

VOC CONCENTRATION CONTOUR MAP
OCTOBER 2007
BRESSETT SITE
RANDOLPH, VERMONT

APPENDIX B:

TABLES

WEM

TABLE 1.1
Groundwater Elevation Measurements: 2006- 2007
Bressett Site, Randolph, Vermont

Location	Type	Units	Screen Center Elevation	Apr-06	Oct-06	May-07	Oct-07	Oct-06 Vertical Hydraulic Gradient (ft/ft)	Oct-07 Vertical Hydraulic Gradient (ft/ft)
MW-101D	Monitoring Well	FT	690.52	706.30	706.02	706.79	706.32	-0.13	-0.08
MW-101S	Monitoring Well	FT	701.03	707.43	707.35	707.71	707.16		
MW-102D	Monitoring Well	FT	674.76	697.48	697.01	697.41	697.44	0.01	0.004
MW-102S	Monitoring Well	FT	689.46	697.28	696.92	697.33	697.38		
MW-103D	Monitoring Well	FT	685.48	699.70	696.43	700.25	697.86	0.11	0.24
MW-103S	Monitoring Well	FT	697.39	698.22	695.09	700.25	< 695.05		
MW-104D	Monitoring Well	FT	676.26	695.20	695.24	695.63	695.20	0.01	-0.01
MW-104S	Monitoring Well	FT	690.98	695.28	695.09	695.45	695.32		
MW-1	Monitoring Well	FT	755.60	754.68	755.95	756.60	755.08	NA	NA
MW-2D	Monitoring Well	FT	683.40	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	FT	714.50	718.95	716.79	720.74	717.48		
MW-3D	Monitoring Well	FT	664.55	715.95	715.54	720.12	716.64	0.01	0.04
MW-3S	Monitoring Well	FT	714.09	716.09	714.84	717.86	714.87		
MW-4D	Monitoring Well	FT	689.82	712.81	713.32	715.51	713.37	-0.06	-0.01
MW-4S	Monitoring Well	FT	711.44	714.68	714.72	715.95	713.57		
BRW-1	Monitoring Well	FT	659.30	705.75	703.37	707.52	702.44	NA	NA
BRW-2	Monitoring Well	FT	639.40	697.37	698.19	696.86	694.29	NA	NA
BRW-3	Monitoring Well	FT	678.00	723.95	722.41	724.14	720.24	NA	NA

Notes:
-All elevations in feet above NGVD; "NGVD" = National Geodetic Vertical Datum (1988).
-"Dry" = well dry during monitoring event; "NA" = not applicable.
-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).
-Data starting in 2004 collected by Waite Environmental Management; refer to field data sheets for depth to water measurements.

WEM

TABLE 1.2
Dissolved Oxygen Field Measurements: 2003 - 2007
Bressett Site, Randolph, Vermont

Location	Type	Units	Apr-03	Oct-03	Apr-04	Oct-04	Apr-05	Oct-05	Apr-06	Oct-06	May-07	Oct-07
MW-101D	Monitoring Well	mg/L	5.96	3.90	3.12	2.55	6.31	1.65	0.00	0.92	2.76	0.67
MW-101S	Monitoring Well	mg/L	4.26	0.00	0.39	0.28	5.32	0.00	0.00	0.10	1.95	0.00
MW-102D	Monitoring Well	mg/L	1.73	0.00	0.39	0.30	5.19	0.00	0.00	0.00	1.78	0.00
MW-102S	Monitoring Well	mg/L	7.48	8.86	4.68	5.21	6.74	4.33	0.13	4.16	4.22	5.47
MW-103D	Monitoring Well	mg/L	0.00	0.00	0.71	0.31	5.25	0.00	0.00	0.00	1.46	0.00
MW-103S	Monitoring Well	mg/L	6.79	DRY	5.26	DRY	9.08	DRY	0.98	DRY	4.78	DRY
MW-104D	Monitoring Well	mg/L	6.91	0.00	0.65	0.70	5.52	0.00	0.00	0.05	2.25	0.00
MW-104S	Monitoring Well	mg/L	3.61	1.50	7.60	2.78	8.57	2.20	2.79	1.91	8.34	0.24
MW-1	Monitoring Well	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2D	Monitoring Well	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	mg/L	13.26	2.61	13.38	3.65	8.99	11.64	9.12	12.90	12.13	3.02
MW-3S	Monitoring Well	mg/L	11.61	7.61	11.46	11.05	11.73	11.87	10.12	11.91	11.85	9.15
MW-4D	Monitoring Well	mg/L	11.34	8.76	13.39	10.68	9.44	11.15	9.82	9.65	8.30	5.95
MW-4S	Monitoring Well	mg/L	12.41	8.26	10.75	9.68	11.17	10.06	11.09	9.14	11.60	9.91
BRW-1	Monitoring Well	mg/L	1.68	3.44	7.82	4.52	10.32	4.56	2.41	2.06	6.10	2.71
BRW-2	Monitoring Well	mg/L	0.00	0.00	6.08	1.95	8.86	0.00	0.00	0.48	3.43	0.53
BRW-3	Monitoring Well	mg/L	8.26	6.51	10.36	7.40	10.41	7.30	7.23	10.41	9.58	6.68

Notes:
-"Dry" = well dry during monitoring event; "NA" = not applicable.
-Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Bressett Site" (March 12, 2003) and "2003 Monitoring Report Summary, Bressett Site" (March 12, 2004).
-Data starting in 2004 collected by Waite Environmental Management.

WEM

TABLE 1.3
Specific Conductance Field Measurements: 2003 - 2007
Bressett Site, Randolph, Vermont

Location	Type	Units	Apr-03	Oct-03	Apr-04	Oct-04	Apr-05	Oct-05	Apr-06	Oct-06	May-07	Oct-07
MW-101D	Monitoring Well	us/cm	546	806	739	855	591	669	784	509	462	771
MW-101S	Monitoring Well	us/cm	386	652	529	469	221	273	334	197	184	307
MW-102D	Monitoring Well	us/cm	223	308	297	354	238	272	319	198	205	340
MW-102S	Monitoring Well	us/cm	312	445	380	489	277	367	385	247	237	429
MW-103D	Monitoring Well	us/cm	241	256	213	285	148	230	237	157	135	268
MW-103S	Monitoring Well	us/cm	201	DRY	161	DRY	137	DRY	260	DRY	185	DRY
MW-104D	Monitoring Well	us/cm	438	302	262	317	201	213	278	149	116	280
MW-104S	Monitoring Well	us/cm	522	371	238	394	327	337	248	210	146	418
MW-1	Monitoring Well	us/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2D	Monitoring Well	us/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	us/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	us/cm	323	878	965	538	328	371	412	289	258	410
MW-3S	Monitoring Well	us/cm	372	981	512	639	361	519	534	374	299	549
MW-4D	Monitoring Well	us/cm	237	621	327	320	240	286	325	197	200	332
MW-4S	Monitoring Well	us/cm	163	528	186	236	144	189	121	74	61	145
BRW-1	Monitoring Well	us/cm	261	215	199	230	158	189	203	121	130	221
BRW-2	Monitoring Well	us/cm	348	320	298	377	255	299	312	193	226	343
BRW-3	Monitoring Well	us/cm	632	477	437	447	312	468	421	247	278	391

Notes:
- All conductivity meaurements in microsiemens per centimeter (us/cm).
-"Dry" = well dry during monitoring event; "NA" = not applicable.
-Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Bressett Site" (March 12, 2003) and "2003 Monitoring Report Summary, Bressett Site" (March 12, 2004).
-Data starting in 2004 collected by Waite Environmental Management.

WEM

TABLE 1.4
Temperature Field Measurements: 2003 - 2007
Bressett Site, Randolph, Vermont

Location	Type	Units	Apr-03	Oct-03	Apr-04	Oct-04	Apr-05	Oct-05	Apr-06	Oct-06	May-07	Oct-07
MW-101D	Monitoring Well	deg C	9.0	10.4	9.1	10.2	8.8	11.1	8.8	11.5	9.2	10.9
MW-101S	Monitoring Well	deg C	6.5	12.8	7.5	13.2	6.1	14.6	6.9	14.4	7.3	13.4
MW-102D	Monitoring Well	deg C	9.0	8.7	10.0	8.7	8.4	10.0	9.9	10.7	10.9	11.2
MW-102S	Monitoring Well	deg C	6.8	9.9	7.9	10.1	7.2	11.5	8.6	11.5	8.2	12.2
MW-103D	Monitoring Well	deg C	8.0	9.1	9.9	10.0	7.7	11.2	8.4	10.1	9.4	10.8
MW-103S	Monitoring Well	deg C	8.3	DRY	7.0	DRY	5.0	DRY	7.7	DRY	9.4	DRY
MW-104D	Monitoring Well	deg C	10.6	10.7	7.4	10.4	7.7	12.1	7.9	11.4	10.1	12.1
MW-104S	Monitoring Well	deg C	10.6	11.1	5.4	12.1	6.7	14.1	7.3	13.6	7.6	14.4
MW-1	Monitoring Well	deg C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2D	Monitoring Well	deg C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	deg C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	deg C	8.9	8.6	13.1	8.7	8.9	9.0	9.6	9.8	10.7	9.0
MW-3S	Monitoring Well	deg C	9.0	8.4	11.3	9.2	8.5	9.5	8.7	10.2	9.5	8.9
MW-4D	Monitoring Well	deg C	8.9	9.0	11.8	9.3	8.5	9.4	9.4	11.0	9.9	9.4
MW-4S	Monitoring Well	deg C	8.7	9.2	10.5	9.9	8.3	10.1	9.0	10.7	9.9	9.6
BRW-1	Monitoring Well	deg C	8.5	8.5	9.7	9.6	9.6	10.4	8.5	9.5	10.0	9.5
BRW-2	Monitoring Well	deg C	7.9	9.9	10.9	10.9	10.0	11.3	8.7	10.5	9.8	10.8
BRW-3	Monitoring Well	deg C	8.4	9.5	10.4	10.3	10.5	10.7	9.6	9.8	10.5	10.2

Notes:
- All temperature measurements in degrees Celsius (deg C).
-"Dry" = well dry during monitoring event; "NA" = not applicable.
-Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Bressett Site" (March 12, 2003) and "2003 Monitoring Report Summary, Bressett Site" (March 12, 2004).
-Data starting in 2004 collected by Waite Environmental Management.

WEM

TABLE 1.5
pH Field Measurements: 2003 - 2007
Bressett Site, Randolph, Vermont

Location	Type	Units	Apr-03	Oct-03	Apr-04	Oct-04	Apr-05	Oct-05	Apr-06	Oct-06	May-07	Oct-07
MW-101D	Monitoring Well	unitless	7.27	6.86	7.08	7.61	7.02	6.08	7.84	7.28	7.23	6.85
MW-101S	Monitoring Well	unitless	6.44	6.29	7.05	7.14	6.65	6.94	7.26	6.80	6.63	6.41
MW-102D	Monitoring Well	unitless	7.81	7.32	7.56	8.42	7.93	7.81	8.98	8.01	7.79	7.75
MW-102S	Monitoring Well	unitless	7.69	7.31	7.65	8.09	7.67	7.87	8.51	7.68	7.60	7.49
MW-103D	Monitoring Well	unitless	7.01	7.61	6.71	7.85	6.70	7.36	8.35	7.62	6.89	6.78
MW-103S	Monitoring Well	unitless	6.33	DRY	6.67	DRY	6.01	DRY	6.89	DRY	5.72	DRY
MW-104D	Monitoring Well	unitless	7.96	7.91	8.07	8.01	7.59	7.09	8.93	7.49	6.88	6.27
MW-104S	Monitoring Well	unitless	7.26	7.47	7.04	7.07	6.95	6.65	7.79	7.19	6.59	6.78
MW-1	Monitoring Well	unitless	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2D	Monitoring Well	unitless	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	unitless	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	unitless	7.68	7.40	7.40	7.95	7.50	7.59	8.47	6.09	7.56	7.48
MW-3S	Monitoring Well	unitless	7.45	7.28	7.25	7.65	7.31	5.41	8.21	7.55	7.27	7.31
MW-4D	Monitoring Well	unitless	7.89	7.60	7.63	8.31	7.45	5.02	8.32	7.82	7.47	7.47
MW-4S	Monitoring Well	unitless	6.80	7.41	7.47	8.46	7.50	6.70	8.62	7.96	7.31	7.76
BRW-1	Monitoring Well	unitless	7.45	8.21	7.91	8.36	7.36	7.58	8.52	7.79	7.44	7.51
BRW-2	Monitoring Well	unitless	7.31	8.12	7.75	8.14	6.98	7.43	7.98	7.61	7.10	7.25
BRW-3	Monitoring Well	unitless	6.74	7.91	7.59	7.97	6.76	8.19	7.81	7.86	7.17	7.02

Notes:
-"Dry" = well dry during monitoring event; "NA" = not applicable.
-Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Bressett Site" (March 12, 2003) and "2003 Monitoring Report Summary, Bressett Site" (March 12, 2004).
-Data starting in 2004 collected by Waite Environmental Management.

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TABLE 1.6
Turbidity Field Measurements: 2003 - 2007
Bressett Site, Randolph, Vermont

Location	Type	Units	Apr-03	Oct-03	Apr-04	Oct-04	Apr-05	Oct-05	Apr-06	Oct-06	May-07	Oct-07
MW-101D	Monitoring Well	NTU	0.60	3.30	0.0	0.0	29.7	> 1000	124	15.1	0.0	0.7
MW-101S	Monitoring Well	NTU	0.95	1.60	0.0	0.0	53.8	72.5	625	627	> 1000	> 1000
MW-102D	Monitoring Well	NTU	1.70	0.75	7.2	13.7	56.2	28.7	44.9	22.6	0.0	0.0
MW-102S	Monitoring Well	NTU	0.62	0.50	6.9	15.7	37.4	4.9	15.0	16.7	0.0	31.3
MW-103D	Monitoring Well	NTU	4.10	5.60	20.7	10.3	15.8	230	112	13.1	143	17.0
MW-103S	Monitoring Well	NTU	3.40	DRY	262	DRY	34	DRY	> 1000	DRY	82	DRY
MW-104D	Monitoring Well	NTU	301	400	> 1000	> 1000	> 1000	> 1000	> 1000	> 1000	> 1000	176
MW-104S	Monitoring Well	NTU	1.61	0.06	6.0	0.0	4.4	73.8	0.0	8.1	0.0	2.8
MW-1	Monitoring Well	NTU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2D	Monitoring Well	NTU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	NTU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	NTU	796	> 1000	> 1000	> 1000	> 1000	> 1000	> 1000	> 1000	788	132
MW-3S	Monitoring Well	NTU	275	742	92.4	212	271	> 1000	594	283	146	86.7
MW-4D	Monitoring Well	NTU	169	265	427	425	464	115	575	131	467	13.3
MW-4S	Monitoring Well	NTU	240	197	163	162	162	32	82.7	81.5	92.9	2.7
BRW-1	Monitoring Well	NTU	0.95	1.80	10.2	46.0	1.1	9.8	0.0	3.5	0.0	0.0
BRW-2	Monitoring Well	NTU	36.1	116	87.2	273	67	109	612	39.5	120	13
BRW-3	Monitoring Well	NTU	4.80	2.60	0.0	52.8	12.9	6.7	35.9	9.8	0.0	0.0

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

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TABLE 1.7
Redox Potential Field Measurements: 2003 - 2007
Bressett Site, Randolph, Vermont

Location	Type	Units	Apr-03	Oct-03	Apr-04	Oct-04	Apr-05	Oct-05	Apr-06	Oct-06	May-07	Oct-07
MW-101D	Monitoring Well	mV	132	210	126	105	146	85	24	69	109	113
MW-101S	Monitoring Well	mV	154	175	123	111	142	31	18	68	116	65
MW-102D	Monitoring Well	mV	-150	-167	82	-220	-86	-221	-199	-196	-180	-166
MW-102S	Monitoring Well	mV	88	162	78	79	84	-23	-3	57	40	42
MW-103D	Monitoring Well	mV	-31	-166	112	-218	-26	-217	-132	-215	-100	-235
MW-103S	Monitoring Well	mV	184	DRY	93	DRY	170	DRY	70	DRY	142	DRY
MW-104D	Monitoring Well	mV	-61	-48	-172	-139	17	-122	-97	-113	-16	26
MW-104S	Monitoring Well	mV	-76	130	180	89	133	64	52	19	155	-6
MW-1	Monitoring Well	mV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2D	Monitoring Well	mV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2S	Monitoring Well	mV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3D	Monitoring Well	mV	141	-31	139	196	158	150	20	192	149	74
MW-3S	Monitoring Well	mV	143	-10	160	167	167	162	57	103	151	63
MW-4D	Monitoring Well	mV	152	103	149	163	160	179	41	88	130	41
MW-4S	Monitoring Well	mV	190	110	171	105	151	200	43	78	120	26
BRW-1	Monitoring Well	mV	120	108	78	9	69	136	16	-53	-21	-2
BRW-2	Monitoring Well	mV	63	-192	36	-156	-75	-170	-133	-160	-127	-174
BRW-3	Monitoring Well	mV	128	143	128	95	268	36	80	81	169	145

Notes:
-All redox potential measurements in millivolts (mV).
-"Dry" = well dry during monitoring event; "NA" = not applicable.
-Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Bressett Site" (March 12, 2003) and "2003 Monitoring Report Summary, Bressett Site" (March 12, 2004).
-Data starting in 2004 collected by Waite Environmental Management.

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TABLE 2.0
MONITORING WELL RESULTS: 2005-2007
Bressett Site, Randolph, Vermont

Location	Parameter Method 8260B	Groundwater Enforcement Standard	Units	Apr-05	Oct-05	Apr-06	Oct-06	May-07	Oct-07
MW-3S	**PCE**	**5.0**	ug/L	**86**	**150**	**90**	**150**	**88**	**140**
	TCE	**5.0**	ug/L	**19**	**37**	**23**	**36**	**19**	**27**
	cis-1,2-DCE	**70.0**	ug/L	**17**	**36**	**15**	**29**	**8.1**	**13**
	trans-1,2-DCE	**100.0**	ug/L	0.54 J	0.97 J	0.50 J	0.84 J	0.84 J	0.63 J
MW-3D	**PCE**	**5.0**	ug/L	**77**	**110**	**180**	**240**	**300**	**49**
	TCE	**5.0**	ug/L	**9.3**	**15**	**22**	**23**	**35**	**4.1**
	cis-1,2-DCE	**70.0**	ug/L	**6.5**	**13**	**20**	**21**	**35**	**2.1**
	trans-1,2-DCE	**100.0**	ug/L	0.28 J	0.42 J	0.58 J	0.61 J	1.0 U	1.0 U
MW-4S	**PCE**	**5.0**	ug/L	**2.2**	**2.2**	0.92 J	**1.3** UJ	0.58 J	**1.1**
	TCE	**5.0**	ug/L	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
	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
MW-4D	**PCE**	**5.0**	ug/L	**22**	**21**	**19**	**17**	**24**	**22**
	TCE	**5.0**	ug/L	**3.3**	**2.8**	**2.0**	**2.0**	**2.6**	**2.0**
	cis-1,2-DCE	**70.0**	ug/L	**1.1**	0.74 J	0.38 J	0.29 J	0.34 J	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
MW-101S	**PCE**	**5.0**	ug/L	**18**	**17 J**	**9.2**	**7.5**	**4.1**	**7.2**
	TCE	**5.0**	ug/L	**6.7**	**3.8**	**1.8**	**1.7**	0.69 J	**1.5**
	cis-1,2-DCE	**70.0**	ug/L	**7.9**	**5.7**	**1.6**	**1.2**	0.39 J	**1.1**
	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
MW-101D	**PCE**	**5.0**	ug/L	**190**	**180 J**	**180**	**310**	**190**	**180**
	TCE	**5.0**	ug/L	**46**	**46**	**36**	**45**	**35**	**32**
	cis-1,2-DCE	**70.0**	ug/L	**88**	**75**	**71**	**110**	**68**	**60**
	trans-1,2-DCE	**100.0**	ug/L	**1.6**	**1.1**	6.0 U	0.96 J	0.81 J	0.77 J
MW-102S	**PCE**	**5.0**	ug/L	**54**	**77 J**	**77**	**120**	**110**	**140**
	TCE	**5.0**	ug/L	**11**	**13**	**13**	**19**	**18**	**21**
	cis-1,2-DCE	**70.0**	ug/L	**11**	**13**	**14**	**21**	**19**	**25**
	trans-1,2-DCE	**100.0**	ug/L	0.34 J	2.9 U	0.30 J	0.45 J	0.43 J	0.65 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
	TCE	**5.0**	ug/L	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
	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
MW-103S	**PCE**	**5.0**	ug/L	1.0 U	DRY	1.0 U	DRY	1.0 U	DRY
	TCE	**5.0**	ug/L	1.0 U	DRY	1.0 U	DRY	1.0 U	DRY
	cis-1,2-DCE	**70.0**	ug/L	1.0 U	DRY	1.0 U	DRY	1.0 U	DRY
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	DRY	1.0 U	DRY	1.0 U	DRY
MW-103D	**PCE**	**5.0**	ug/L	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
	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
	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

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TABLE 2.0
MONITORING WELL RESULTS: 2005-2007
Bressett Site, Randolph, Vermont

Location	Parameter Method 8260B	Groundwater Enforcement Standard	Units	Apr-05	Oct-05	Apr-06	Oct-06	May-07	Oct-07
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
	TCE	**5.0**	ug/L	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
	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
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
	TCE	**5.0**	ug/L	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
	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
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
	TCE	**5.0**	ug/L	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	0.24 J	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
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
	TCE	**5.0**	ug/L	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	0.29 J	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
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
	TCE	**5.0**	ug/L	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	0.34 J	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

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: 2004-2007
Bressett Site, Randolph, Vermont

Owner	Location	Parameter Method 524.2	Groundwater Enforcement Standard	Units	Apr-04	Oct-04	Apr-05	Oct-05	Apr-06	May-06	Oct-06	May-07	Oct-07
Taylor	**Bressett Spring**	**PCE**	**0.7**	ug/L	0.5 U	0.5 UJ	0.5 UJ	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			
		cis-1,2-DCE	**70.0**	ug/L	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U			
		trans-1,2-DCE	**100.0**	ug/L	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U			
Taylor	**Bressett Kitchen Tap**	**PCE**	**0.7**	ug/L					**2.8**	**2.0**	**2.7**	**0.53**	
		TCE	**5.0**	ug/L					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	
		trans-1,2-DCE	**100.0**	ug/L					0.5 U	0.5 U	0.5 U	0.5 U	
Taylor	**Bressett Holding Tank Inflow**	**PCE**	**0.7**	ug/L						**2.1**		**0.41 J**	
		TCE	**5.0**	ug/L						0.5 U		0.5 U	
		cis-1,2-DCE	**70.0**	ug/L						0.5 U		0.5 U	
		trans-1,2-DCE	**100.0**	ug/L						0.5 U		0.5 U	
Hammond	**Sheilds Well**	**PCE**	**0.7**	ug/L	0.5 U	0.5 UJ	0.5 UJ	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
		cis-1,2-DCE	**70.0**	ug/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U	0.5 U	0.5 U
		trans-1,2-DCE	**100.0**	ug/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U	0.5 U	0.5 U
Bowen	**Bowen Well**	**PCE**	**0.7**	ug/L									0.5 U
		TCE	**5.0**	ug/L									0.5 U
		cis-1,2-DCE	**70.0**	ug/L									0.5 U
		trans-1,2-DCE	**100.0**	ug/L									0.5 U
Illsley	**Illsley Well**	**PCE**	**0.7**	ug/L		0.5 UJ							
		TCE	**5.0**	ug/L		0.5 U							
		cis-1,2-DCE	**70.0**	ug/L		0.5 U							
		trans-1,2-DCE	**100.0**	ug/L		0.5 U							

Notes:
- "PCE" = tetrachlorethene; "TCE" = tricholorethene; "DCE" = dichloroethene.
- "U" = not detected above listed quantitation limit; "J" = reported concentration is an estimated value; "UJ" = reported quantitation limit is an estimated value.
- "Dry" = well dry during monitoring event; "NA" = not applicable; "NS" = no sample collected.
- Data from 2004- was collected by Waite Environmental Management and was entered from the data validation report for each sampling event.
- Data prior to 2004 was collected by previous environmental contractor.
- 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: 2001 - 2007
Bressett Site, Randolph, Vermont

Location	Parameter Method 8260B	Water Quality Standard	Units	Jul-01	Jul-02	Jul-03	Jul-04	Jul-05	Jul-06	Jul-07
SW-1	**PCE**	**0.8**	ug/L	DRY	1.0 U	DRY	1.0 U	1.0 U	1.0 U	1.0 U
	TCE	**2.7**	ug/L	DRY	1.0 U	DRY	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**NA**	ug/L	DRY	1.0 U	DRY	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**NA**	ug/L	DRY	1.0 U	DRY	1.0 U	1.0 U	1.0 U	1.0 U
SW-2	**PCE**	**0.8**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	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
	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
	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

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 (qualified) from 2001-2003 was collected by Tighe & Bond and was entered from tabulated data from annual reports.
- Data (qualified) from 2004- was collected by Waite Environmental Management and was entered from 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.

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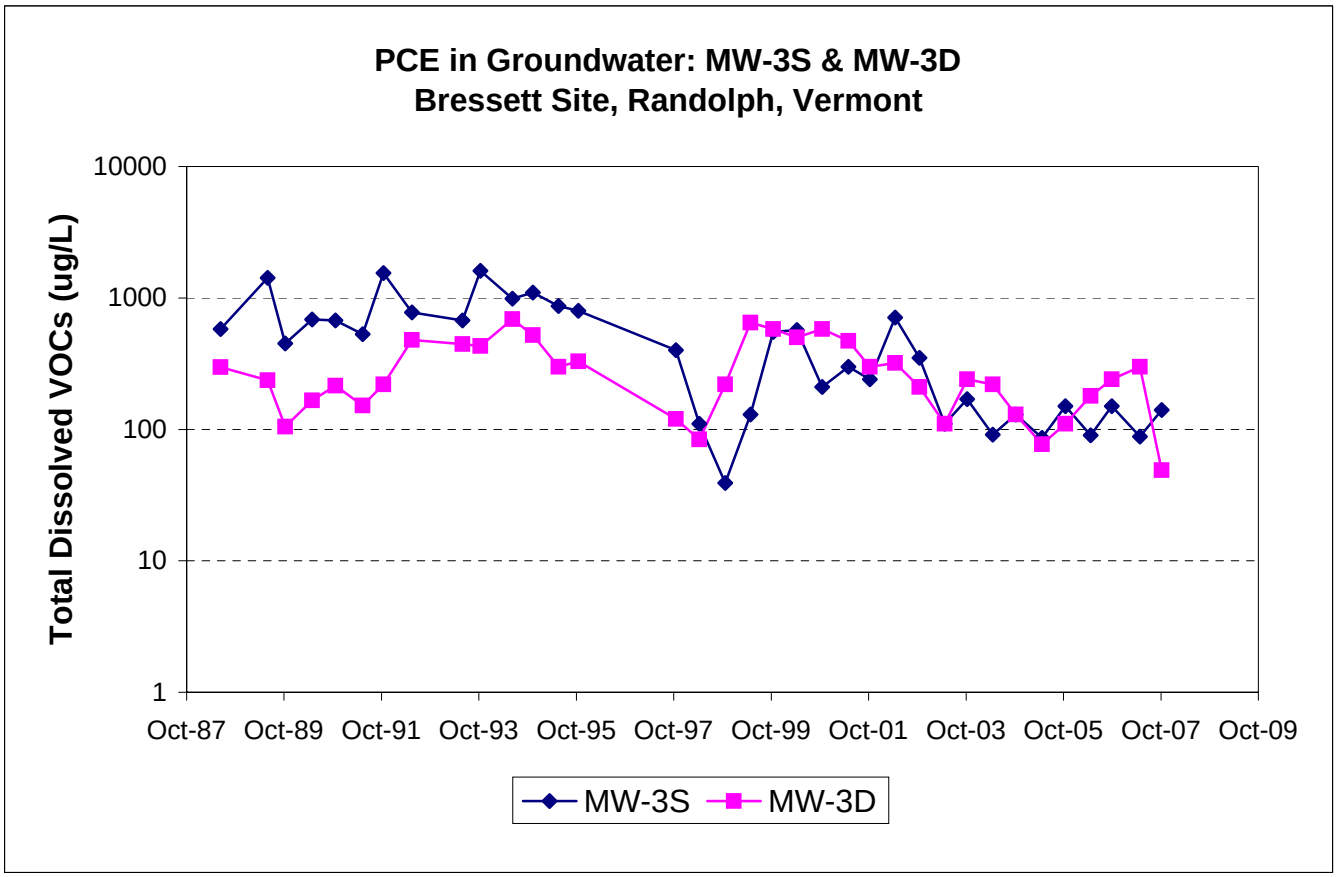
TABLE 5.0
INDOOR AIR QUALITY RESULTS: 1997-2007
Bressett Site, Randolph, Vermont

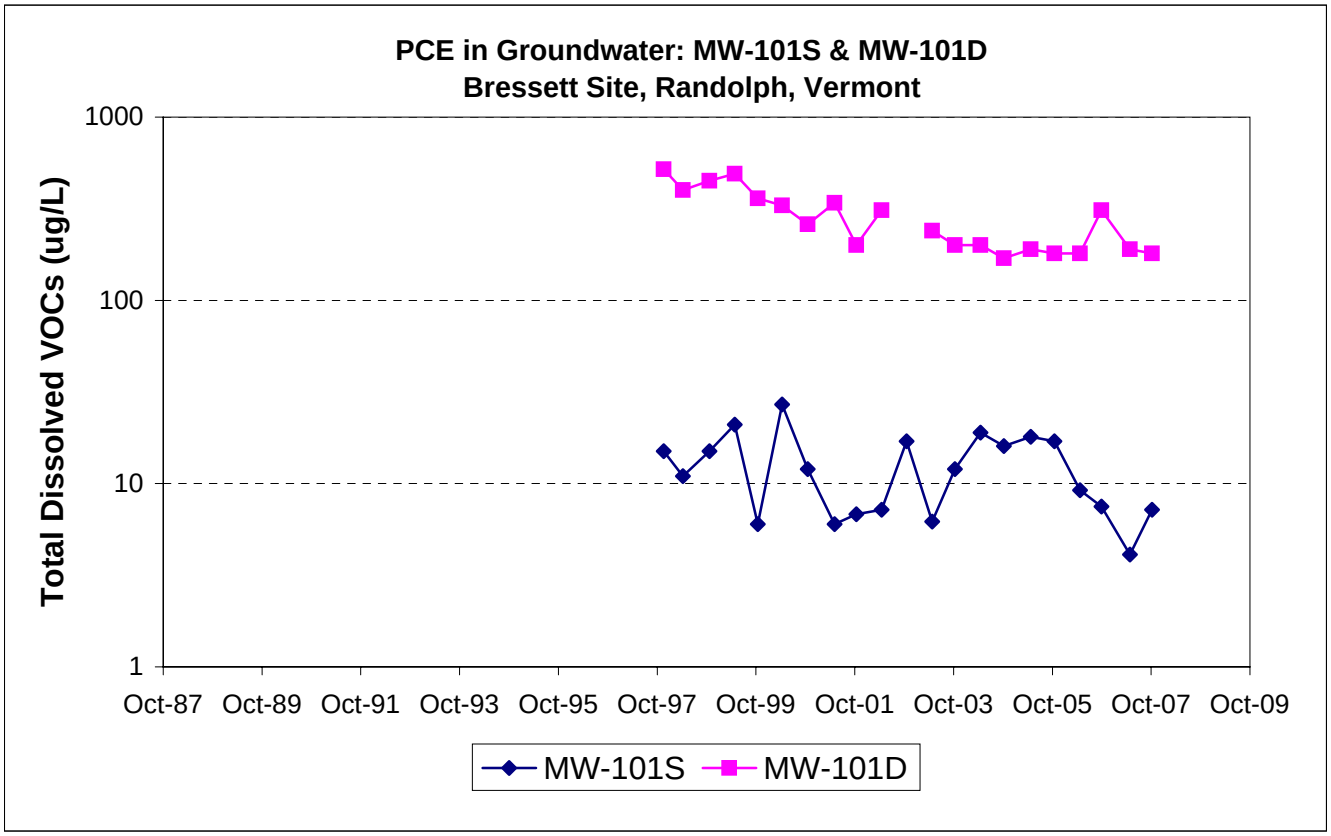
Owner	Location	Parameter Method T-014A	Guidance Level	Units	Oct-97	Jan-98	Jul-98	Jan-01	Jul-01	Jul-02	Feb-06	Jul-06	Jan-07
Taylor	BRST1FLR	Tetrachloroethene	1.0	ppbv	**3.07**	**1.76** J	1 U	**0.69**	2 U	0.5 U	**4.4**	**6.3** J	**6.0**
		Trichloroethene	1.0	ppbv	2.8 U	3 U	1 U	0.47 U	2 U	0.5 U	**0.53**	**0.58**	**0.71**
		cis-1,2-Dichloroethene	9.3	ppbv				0.47 U	2 U	0.5 U	**0.38**	**0.14** J	**0.49**
		trans-1,2-Dichloroethene	18.4	ppbv				0.47 U	2 U	0.5 U	0.20 U	0.20 U	0.20 U
	BRSTBSMT	Tetrachloroethene	1.0	ppbv	**6.47**	**5.72**	**10.7**	**4.8**	**6**	**1.2**	**9.7**	**22** J	**10**
		Trichloroethene	1.0	ppbv	3.1 U	2.9 U	**2.3** J	**0.5**	**0.53**	0.5 U	**1.2**	**1.6**	**1.2**
		cis-1,2-Dichloroethene	9.3	ppbv				0.35 U	0.42 U	0.5 U	**0.78**	**0.40**	**0.88**
		trans-1,2-Dichloroethene	18.4	ppbv				**0.33** J	0.42 U	0.5 U	0.20 U	0.20 U	0.20 U

Notes:
-"U" = not detected above listed quantitation limit; "J" = reported concentration is an estimated value; "UJ" = reported quantitation limit is an estimated value; "R" = the data are unusable (analyte may or may not be present).
-"NS" = Not Sampled (house unoccupied or access not obtained).
Bold values are reported above quantitation limit; shaded cells are in excess of the guidance level.
Data (qualified) from 1997-2002 was collected by others; data (qualified) starting in 2006 was collected by WEM.
Guidance level for tetrachloroethene and trichloroethene based on results of statewide indoor ambient air survey conducted by the Vermont Dept. Health in 1991-92.
Guidance level for cis- and trans-1,2,-dichloroethene is based on the EPA Region III risk-based concentration for ambient air (2002 RBC table).

APPENDIX C:

GRAPHS


PCE in Groundwater: MW-3S & MW-3D
Bressett Site, Randolph, Vermont
Total Dissolved VOCs (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
MW-3S
MW-3D


PCE in Groundwater: MW-101S & MW-101D
Bressett Site, Randolph, Vermont
Total Dissolved VOCs (ug/L)
1000
100
10
1
Oct-87
Oct-89
Oct-91
Oct-93
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Oct-97
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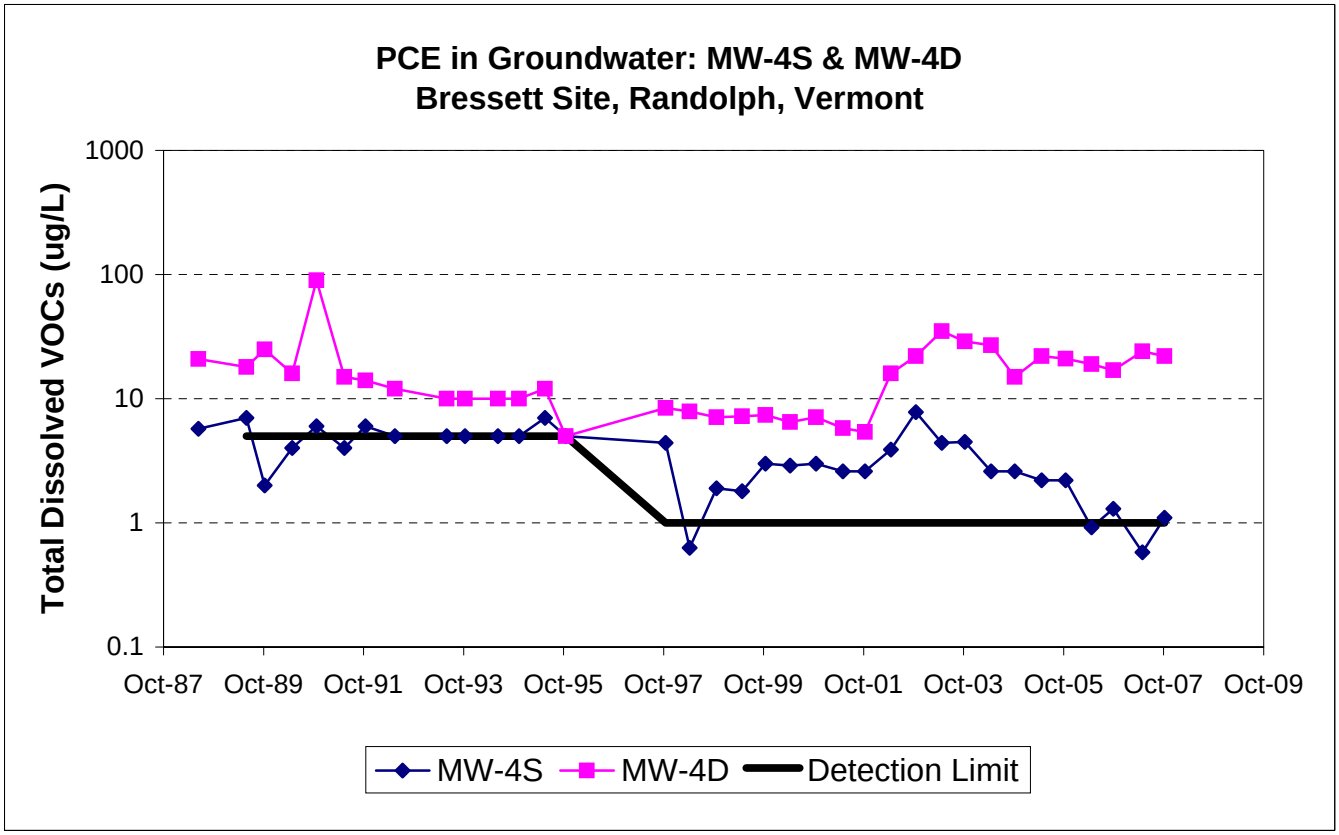
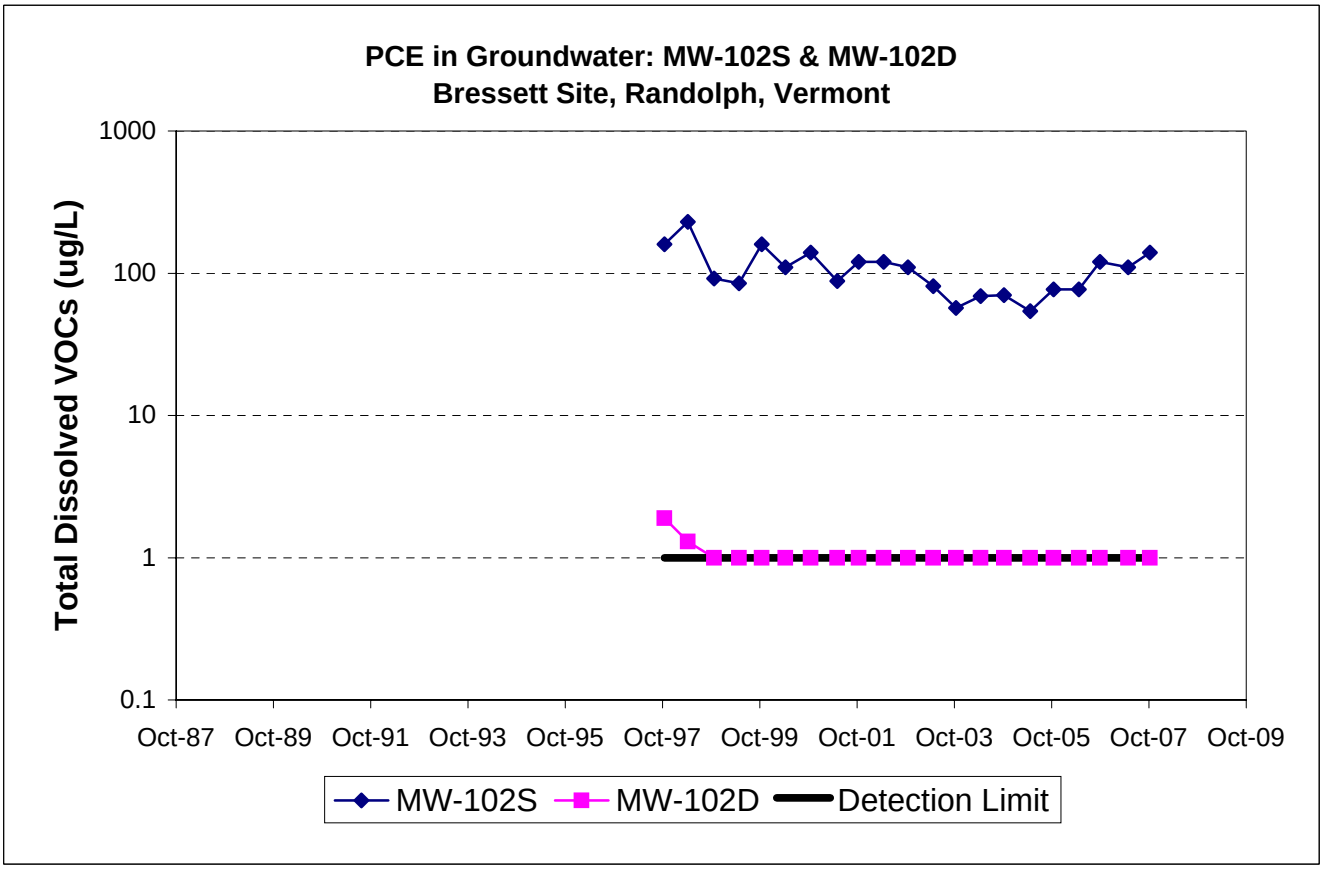
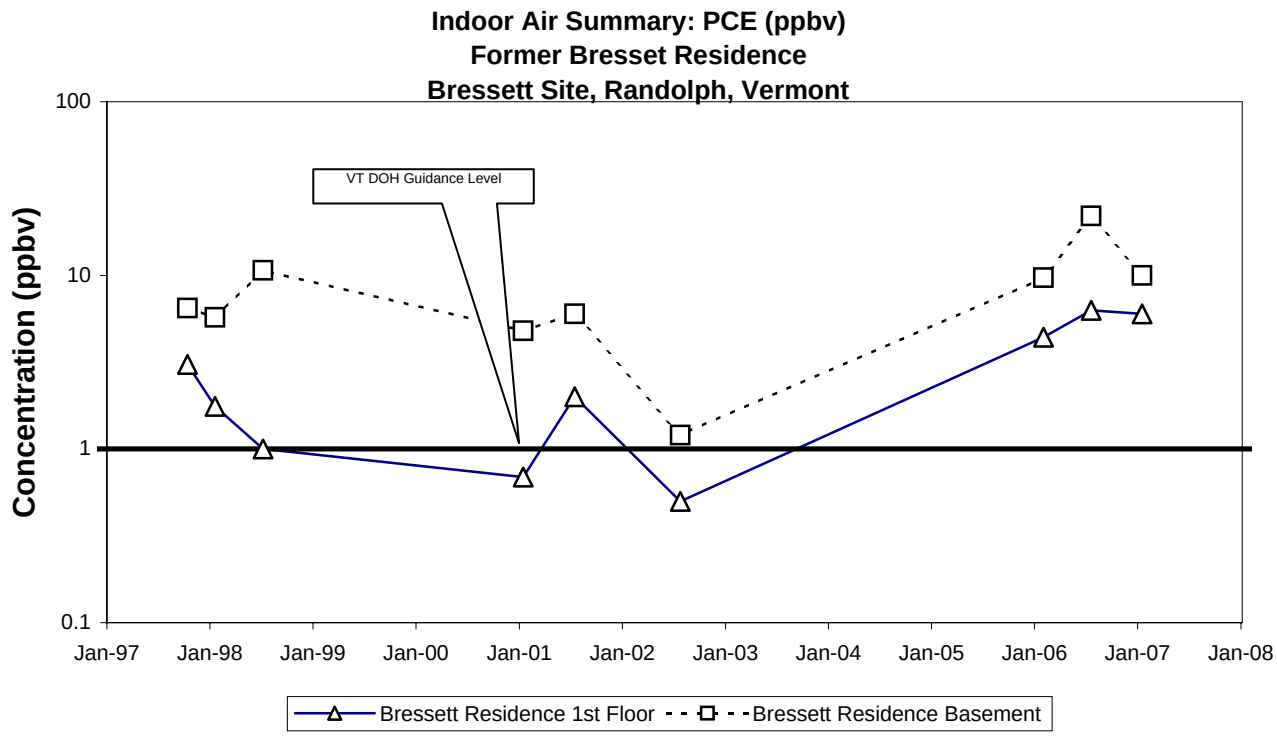
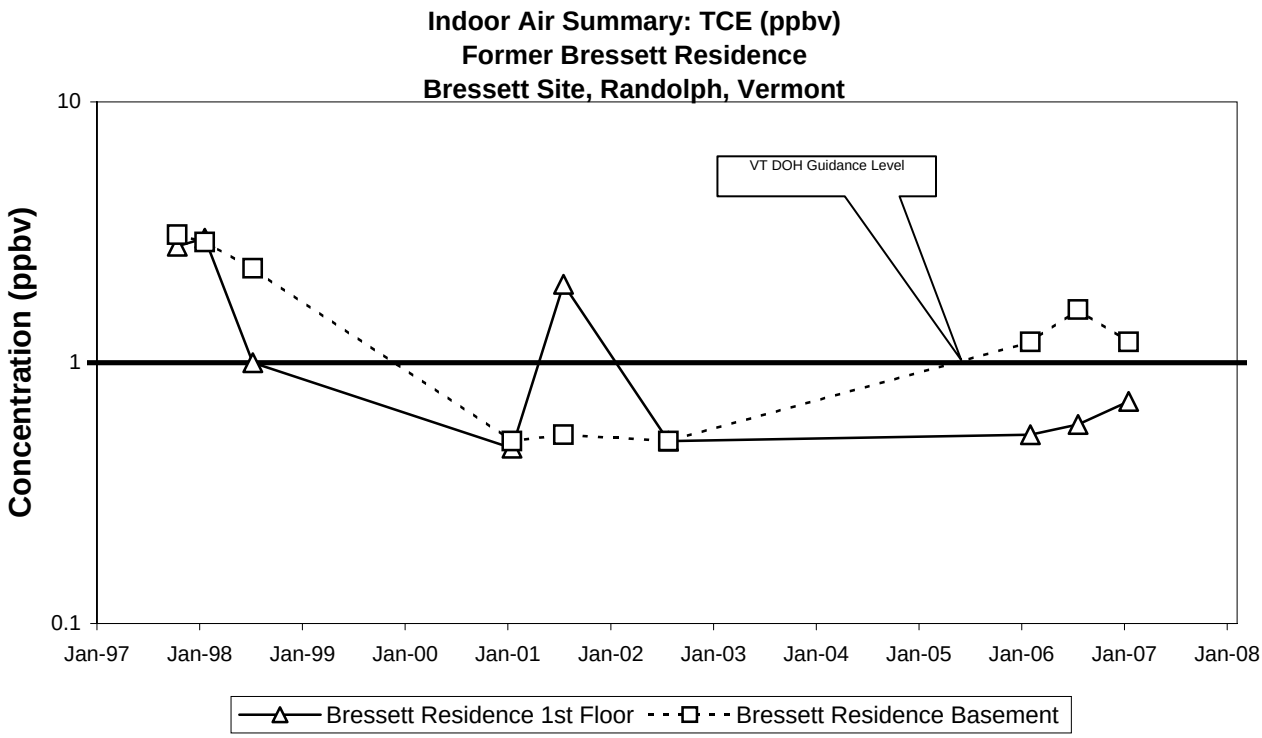
Oct-01
Oct-03
Oct-05
Oct-07
Oct-09
MW-101S
MW-101D


PCE in Groundwater: MW-4S & MW-4D
Bressett Site, Randolph, Vermont
Total Dissolved VOCs (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
MW-4S
MW-4D
Detection Limit


PCE in Groundwater: MW-102S & MW-102D
Bressett Site, Randolph, Vermont
Total Dissolved VOCs (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
MW-102S
MW-102D
Detection Limit



Notes:
1) Non-detectable values (i.e. detection limits) are graphed as positive values.



Notes:
1) Non-detectable values (i.e. detection limits) are graphed as positive values.

APPENDIX D:

FIELD DATA SHEETS: OCTOBER 2007

WEM Waite Environmental Management, LLC.

SITE: Bresse #

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-103S	Pump Intake Depth	—
Date	10/10/09	Pump Type	—
Sampler	MW	Well Diameter	3/4"
Weather	cl & cool	Well Depth	8.02
Water Type	(gw) sw supply	Initial Depth to Water	dry
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1100										WELL DRY, NO SAMPLE

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:									

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample								
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

SITE: Bresse

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-103D	Pump Intake Depth	18.5
Date	10/10/07	Pump Type	peri.
Sampler	mw	Well Diameter	3/4"
Weather	cl. 1 cool	Well Depth	20.2
Water Type	(gw) sw supply	Initial Depth to Water	6.26
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	200 ml/min 100 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1108	6.02	200								began
1114	10.61	200	11.40	263	6.11	-115	0.0	81.8		slowed to 100 ml/min
1117	13.37	100	11.47	251	6.28	-186	0.0	65.1		
1121	13.77	100	11.11	264	6.63	-215	0.0	33.3		
1124	13.82	100	10.90	266	6.76	-225	0.0	15.0		
1128	13.96	100	10.86	267	6.83	-231	0.0	15.9		
1132	14.01	100	10.83	268	6.78	-235	0.0	17.0		purging complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	2.32	10.83	268	6.78	-235	0.0	17.0		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-103D	VOA	3	HCl	8260	1135	UF-1	
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

added trip blank TB-1 to cooler

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC

SITE: Breseth

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-104S	Pump Intake Depth	6.4
Date	10/10/07	Pump Type	peri.
Sampler	MW	Well Diameter	3/4"
Weather	cl. & cool	Well Depth	8.88
Water Type	(gw) sw supply	Initial Depth to Water	1.99
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	300 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C) within 3%	Specific Cond. (us/cm) within 3%	pH 1 pH unit	ORP (mv) 10 mv	DO (mg/L) within 10%	Turbidity (NTU) within 10%		Notes
1200	1.99	306		418						begin
1202	2.01	300	14.40	~~6.7~~	6.78	-35	0.51	8.7		
1205	2.02	300	14.42	418	6.79	-27	0.34	5.6		
1209	2.02	300	14.39	419	6.79	-18	0.28	3.2		
1213	2.02	300	14.37	418	6.79	-10	0.24	2.2		
1217	2.02	300	14.37	418	6.78	-6	0.24	2.8		complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	3 L	14.37	418	6.78	-6	0.24	2.8		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-104S	VOA	3	HCl	8260B	1220	UF-1	
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Project #110320012

WEM Waite Environmental Management, LLC.

SITE: Bennett

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-104D	Pump Intake Depth	20.4'
Date	10/10/07	Pump Type	peri
Sampler	MW	Well Diameter	3/4
Weather	cl & cool	Well Depth	22.89
Water Type	gw sw supply	Initial Depth to Water	2.14
Sampling Method	bailer low flow grab	Traditional Purge Vol. (bailer)	75 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1225	2.14	75*								began
1228	4.42	75	12.54	290	6.93	5	6.96	404		
1233	7.14	75	12.41	279	6.46	4	0.0	925		
1236	8.95	75	12.43	280	6.38	6	0.0	>1000		
1240	10.49	75	12.15	279	6.21	12	0.0	574		
1243	12.00	75	12.10	279	6.18	19	0.0	294		
1248	13.35	75	12.11	280	6.22	26	0.0	195		
1250	14.02	75	12.16	286	6.27	26	0.0	176		complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	1.6 L	12.16	280	6.27	26	0.0	176		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-104D	VOA	3	HCl	8260B	1255	UF-1	
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes: * slowest rate achievable

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

SITE: Bressett
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-102D	Pump Intake Depth	28.8
Date	10/10	Pump Type	peri.
Sampler	mr	Well Diameter	3/4
Weather	61.8 cool	Well Depth	30.8
Water Type	(gw) sw supply	Initial Depth to Water	8.17
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	100 n/a/ic

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1318	8.17	100								begin
1322	10.91	100	11.47	338	7.10	-94	0.0	21.9		
1326	11.20	100	11.69	338	7.41	-124	0.0	16.7		
1330	11.41	100	11.49	340	7.59	-145	0.0	10.3		
1334	11.59	100	11.42	340	7.67	-157	0.0	9.0		
1338	11.71	100	11.27	340	7.73	-163	0.0	10.7		
1342	11.80	100	11.20	340	7.75	-166	0.0	10.0		complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	2.1 L	11.20	340	7.75	-166	0.0	10.0		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-102D	VOA	3	HCl	8260B	1345	UF-1	
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Waite Environmental Management, LLC.

SITE: Bressett

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-101S	Pump Intake Depth	11.9
Date	10/10/07	Pump Type	peri.
Sampler	MK	Well Diameter	3/4"
Weather	cl & cool	Well Depth	14.26
Water Type	(gw) sw supply	Initial Depth to Water	5.72
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	150 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1357	5.72	150								began
1401	7.12	150	13.64	310	6.85	57	0.77	333		
1405	7.18	150	13.49	310	6.59	55	0.0	71000		
1409	7.20	150	13.45	308	6.47	59	0.0	71000		
1413	7.16	150	13.48	308	6.44	63	0.0	71000		
1417	7.16	150	13.38	307	6.41	64	0.0	71000		
1421	7.16	150	13.38	307	6.41	65	0.0	71000		

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	3.0 L	13.38	307	6.41	65	0.0	71000		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-101S	VOA	3	HCl	8260B	1425	UF-1	
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Project #110320012

WEM Waite Environmental Management, LLC.

SITE: Bresnit

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-102S	Pump Intake Depth	11.9
Date	10/10/07	Pump Type	peri
Sampler	MW	Well Diameter	3/4
Weather	Cl. & cool	Well Depth	12.9
Water Type	(gw) sw supply	Initial Depth to Water	8.04
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	150 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg.C) within 3%	Specific Cond. (us/cm) within 3%	pH 1 pH unit	ORP (mv) 10 mv	DO (mg/L) within 10%	Turbidity (NTU) within 10%		Notes
1442	8.04	150								begin
1445	8.71	150	12.37	380	7.49	21	5.24	132		
1449	8.60	150	12.35	415	7.49	28	5.13	80.6		
1453	8.60	150	12.29	423	7.49	35	5.28	51.3		
1457	8.60	150	12.35	425	7.48	42	5.39	49.3		
1501	8.60	150	12.14	427	7.53	47	5.46	32.8		
1509	8.60	150	12.23	429	7.49	42	5.47	31.3		complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	3.8 L	12.23	429	7.49	42	5.47	31.3		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-102S	VOA	3	HCl	8260B	1510		
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

SITE: Brosse II

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-101D			Pump Intake Depth	22.5'
Date	10/10/07			Pump Type	peri
Sampler	MW			Well Diameter	3/4
Weather	cld cool			Well Depth	24.8
Water Type	(gw)	sw	supply	Initial Depth to Water	6.65
Sampling Method	bailer	(low flow)	grab	Traditional Purge Vol. (bailer)	200 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1523	6.65	200								begin
1526	8.07	200	11.65	825	6.93	125	2.02	45.8		
1530	8.25	200	11.39	819	7.00	117	1.24	37.1		
1534	8.36	200	11.25	810	6.98	115	1.11	28.3		
1538	8.35	200	11.07	801	6.85	115	1.00	23.5		
1542	8.37	200	11.00	789	6.84	114	0.90	23.1		
1546	8.38	200	10.98	778	6.84	113	0.86	24.5		
1550	8.38	200	10.87	771	6.85	113	0.67	24.3		

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	6.1 L	10.87	771	6.85	113	0.67	24.3		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-101D	VOA	3	HCl	8260B	1555	UF-1	
As Required:								
Field Duplicate	MW-Z	VOA	3	HCl	8260B	"1630"		blind
Field Blank	FB-1	VOA	2	HCl	8260B	1610		STC water
MS/MSD								

General Notes:

WEM Waite Environmental Management, LLC.

SITE: Brassett

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	BRW-3	Pump Intake Depth	72'
Date	10/11/07	Pump Type	Redi-Flo Submers.
Sampler	MW	Well Diameter	2"
Weather	cl Drool	Well Depth	80.8
Water Type	(gw) sw supply	Initial Depth to Water	11.09
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	3 L/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
0900	11.09	3								3 gpm
0902	14.68	3	11.07	478	6.16	166	7.30	28.6		
0907	16.21	3	10.09	382	6.67	152	6.82	23.0		
0911	17.26	3	10.12	384	6.79	154	6.76	0.0		
0917	17.69	3	10.02	389	6.96	148	6.67	0.0		
0923	17.49	3	10.12	390	7.06	146	6.69	0.0		
0928	17.45	3	10.19	391	7.02	145	6.68	0.0		Complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	83L	10.19	391	7.02	145	6.68	0.0		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	BRW-3	VOA	3	HCl	8260B	0935	UF-2	
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes: ~~added trip blank TB-2 to cooler~~ (MW) (same cooler as TB-1)

VT DEC Site #

WEM Waite Environmental Management, LLC.

SITE: Bresseth

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	BRW-2	Pump Intake Depth	75'
Date	10/11/07	Pump Type	Rediflo
Sampler	MW	Well Diameter	2"
Weather	cl & cool	Well Depth	101.5
Water Type	(gw) sw supply	Initial Depth to Water	11.61
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	1 L/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1003	11.61	1								Began
1005	12.48	1	12.06	354	7.30	-166	1.89	101		Sulfur odor
1010	13.18	1	10.48	348	7.29	-171	1.16	10.9		
1014	19.22	1	10.17	347	7.28	-174	1.01	38.6		
1020	25.38	1	10.61	346	7.22	-169	0.52	30.3		
1024	29.92	1	10.51	344	7.23	-168	0.51	14.5		
1028	31.95	1	10.81	343	7.25	-174	0.53	13.1		Complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	22L	10.81	343	7.25	-174	0.53	13.1		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	BRW-2	VOA	3	HCl	8260B	1035	UF-2	
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

SITE: Brassett

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	BRW-1	Pump Intake Depth	40.0
Date	10/11/07	Pump Type	Redi-flo
Sampler	MW	Well Diameter	2"
Weather	Cl & cool	Well Depth	80.8
Water Type	(gw) sw supply	Initial Depth to Water	15.14
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	2 L/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C) within 3%	Specific Cond. (us/cm) within 3%	pH 1 pH unit	ORP (mv) 10 mv	DO (mg/L) within 10%	Turbidity (NTU) within 10%		Notes
1105	15.14	2								begin
1108	17.52	2	9.72	228	7.82	-21	4.12	0.0		
1112	18.10	2	9.15	220	7.61	-13	3.36	0.0		
1116	18.29	2	9.38	219	7.50	-6	2.97	0.0		
1121	18.94	2	9.50	220	7.46	-2	2.78	0.0		
1127	19.01	2	9.53	221	7.47	-2	2.67	0.0		
1131	19.00	2	9.54	221	7.51	-2	2.71	0.0		

SAMPLE COLLECTION

	Purge Volume	Temp	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	46 L	9.54	221	7.51	-2	2.71	0.0		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	BRW-1	VOA	3	HCl	8260B	1135	UF-2	
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Project #110320012

VT DEC Site #

SITE: Brush

WEM Waite Environmental Management, LLC

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-4S	Pump Intake Depth	—
Date	10/11/07	Pump Type	—
Sampler	MW	Well Diameter	2
Weather	Cl & Cool	Well Depth	24.20
Water Type	(gw) sw supply	Initial Depth to Water	20.62
Sampling Method	(bailer) low flow grab	Traditional Purge Vol.	2 gal

SAMPLE COLLECTION	Purge Volume (ml / (gal))	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)	Filtered (y/n)	NOTES
Final Measurements:	2.0	9.61	145	7.76	26	9.91	2.7		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-4S	VOA	3	HCl	8260B	1250	UF-2	
As Required:								
Field Duplicate								
Field Blank								
MS/MSD	MW-4S	VOA	4	HCl	8260B	1250		

General Notes:

SAMPLING LOCATION	MW-4D	Pump Intake Depth	—
Date	10/11/07	Pump Type	—
Sampler	MW	Well Diameter	2
Weather		Well Depth	46.80
Water Type	(gw) sw supply	Initial Depth to Water	20.90
Sampling Method	(bailer) low flow grab	Traditional Purge Vol.	13 gal

SAMPLE COLLECTION	Purge Volume (ml / (gal))	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)	Filtered (y/n)	NOTES
Final Measurements:	13	9.41	332	7.47	41	5.95	10.3		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-4D	VOA	3	HCl	8260B	1320	UF-2	
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

SITE: Bressett

WEM Waite Environmental Management, LLC.

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-3S			Pump Intake Depth	—
Date	10/11/07			Pump Type	—
Sampler	MW			Well Diameter	~~24.47~~ 2"
Weather	cl & cool			Well Depth	27.30
Water Type	(gw)	sw	supply	Initial Depth to Water	24.47
Sampling Method	(bailer)	low flow	grab	Traditional Purge Vol.	1.5 gal

SAMPLE COLLECTION	Purge Volume (ml / (gal))	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)	Filtered (y/n)	NOTES
Final Measurements:	1.5	8.93	549	7.31	63	9.15	86.7		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-3S	VOA	3	Hcl	8260B	1340	UF-2	
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

SAMPLING LOCATION	MW-3D			Pump Intake Depth	—
Date	10/11/07			Pump Type	—
Sampler	MW			Well Diameter	2"
Weather	cl & cool			Well Depth	74.6
Water Type	(gw)	sw	supply	Initial Depth to Water	21.86
Sampling Method	(bailer)	low flow	grab	Traditional Purge Vol.	25 gal

SAMPLE COLLECTION	Purge Volume (ml / (gal))	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)	Filtered (y/n)	NOTES
Final Measurements:	25	8.95	410	7.48	74	3.02	132		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-3D	VOA	3	Hcl	8260B	14:30	UF-2	
As Required:								
Field Duplicate	MW-Y	"	"	"	"	15:00		blind
Field Blank	FB-3	"	2	"	"	14:40		STL Water
MS/MSD								

General Notes:

APPENDIX E:

DATA VALIDATION REPORT: OCTOBER 2007

DATA VALIDATION

FOR

UniFirst Project
Bressett and UniFirst Sites
Randolph and Williamstown, VT

ORGANIC ANALYSIS DATA
Volatile Organics in Water Samples

Sample Delivery Group Nos. BRES39, UNIF30, UNIF31, and WHEA13

Chemical Analyses Performed by:

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

FOR

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

Data Validation Report by:

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

January 18, 2008

Reference #s 2007-1109-001, -1115 -001, -1128-001, & -1129-001
VOA Validation Report/BRES39_UNIF30-31_WHEA13/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 36 groundwater samples, 11 potable water samples, 1 performance evaluation (PE) sample, 7 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. BRES39, UNIF30, UNIF31, and WHEA13, which were submitted as four data packages received by Phoenix on November 9, 15, 28, and 29, 2007. These SDGs include the following samples:

Sample Identifier	Laboratory ID
Method 8260B	
SDG No. BRES39	
MW-103D	727783
MW-104S	727784
MW-104D	727785
MW-102D	727786
MW-101S	727787
MW-102S	727788
MW-101D	727789
MW-Z	727790
FB-1	727791
TB-1	727792
BRW-3	727793
BRW-2	727794
BRW-1	727795
MW-4S	727796
MW-4D	727797
MW-3S	727798
MW-3D	727799
MW-Y	727800
FB-3	727801
SDG No. UNIF30	
MW-103D	727783
MW-104S	727784
MW-104D	727785
MW-102D	727786
MW-101S	727787
MW-102S	727788
MW-101D	727789
MW-Z	727790
FB-1	727791
SDG No. WHEA13	
MW-PLX	730406
MW-PL2	730407

Sample Identifier	Laboratory ID
MW-PL1	730408
MW-S3	730409
MW-S1	730410
MW-S2	730411
FB-6	730412
TB-5	730413
VHBLK01	730414
TB-1	727792
BRW-3	727793
BRW-2	727794
BRW-1	727795
MW-4S	727796
MW-4D	727797
MW-3S	727798
Method 524.2	
SDG No. BRES39	
SHIELDS	727803
WELL Z	727804
FB-2	727805
BOWEN NEW WELL	727806
VHBLK02	727807
SDG No. UNIF31	
WP-5	730395
WP-7	730396
WP-8	730397
WP-13	730398
WP-20	730399
WP-3	730400
WP-Z	730401
FB-7	730402
TB-6	730403

A cross-reference table of sample IDs was provided in the data packages. The laboratory noted that sample BOWEN NEW WELL was received, but not listed on the chain of custody (COC), and that sample TB-2 was listed on the COC but not received. No trip blank was analyzed with the Method 524.2 samples collected on 10/11/07 at the Bressett site; the laboratory Sample Receipt document indicates that no trip blank was received in the cooler with the Method 524.2 samples; however, this is not discussed in the Case Narrative. The trip blank identified as TB-1, received on the same day, was logged in and analyzed with the Method 8260B samples.

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

- Results for tetrachloroethene in the original analyses of samples MW-101D, MW-102S, MW-3S, MW-D, and MW-Z, and results for cis-1,2-dichloroethene and total 1,2-dichloroethene in the original analyses of samples MW-101D and MW-Z, were rejected (R) and replaced with the acceptable concentrations from the corresponding diluted samples (MW-101DDL, MW-102SDL,

MW-3SDL, MW-DDL, and MW-ZDL).

- Results for all other analytes in samples MW-101DDL, MW-102SDL, MW-3SDL, MW-DDL, and MW-ZDL were rejected (R).

- The laboratory applied "E" and "D" qualifiers to the sample Form I's as appropriate. The validator removed all laboratory-applied "E" and "D" qualifiers.

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

The 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 STL SOP 8260B, and SDWA Method 524.2 Rev. 4.1, as documented in STL SOP 524.2, and in accordance with requirements in the Field/Laboratory Coordination Memorandum for Water Monitoring (FLCM), April 2, 2004. The target compound list for the Method 8260B analyses was limited to the OLM03.1 CLP target compound list, and the target compound list for Method 52.4.2 was limited to the OLM03.1 CLP target compound list plus methyl-*tert*-butyl ether (MTBE).

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

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

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

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

U - The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit. The sample quantitation limit accounts for sample specific dilution factors and percent solids corrections or sample sizes that deviate from those required by the method.

J - The associated numerical value is an estimated quantity.

UJ - The analyte was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

R - The data are unusable (analyte may or may not be present). Resampling and reanalysis is

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

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

These codes are assigned during the validation process and are based on the data review of the results. They are recorded on the Data Summary Forms contained in Attachment A and the Organic Analysis Data Sheets (Form I) in Attachment B 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. BRES39, UNIF30, UNIF31, and WHEA13 were collected on October 10-12, 15, 29, and 30, 2007. 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 within two days after receipt at the laboratory, and is recorded in the Sample Preparation sections of the data packages. All recorded sample pH values were <2. The field sample collection sheets also note that the samples were appropriately preserved with HCl.

The cooler temperatures on receipt at the laboratory were checked and documented in the data packages, and were 4.9, 2.9, 3.9, 3.6, and 4.9^{o}C, which are within the acceptable range of 4 ^{o}C ±2°C, for the field samples.

II. GC/MS Instrument Performance Check (Tuning)

The samples were analyzed on two GC/MS systems identified as instruments L and M. 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 sixteen (16) 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)

Four ICs (10/11/07, 1017/07, 1018/07, and 1030/07) were performed on instrument L in support of the Method 8260B sample analyses and two ICs (10/1/07 and 11/4/07) were 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.

Some target compounds were manually integrated in the ICs performed on instrument L. All of 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.

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

Instrument	IC	Average RRF	
		acetone	2-butanone
L (8260B)	10/11/07	0.035	0.019
	10/17/07	0.038	0.018
	10/19/07	0.032	0.016
Instrument	IC	Average RRF	

		acetone	2-butanone
L (8260B)	10/30/07	0.039	0.020
M (524.2)	10/1/07	>0.05	0.025
L (524.2)	11/4/07	0.041	0.019

Pursuant to the Region I validation document, results for 2-butanone in all samples and for acetone in all samples analyzed on instrument L in this data set warranted rejection (R) based on the low RRFs achieved. However, acetone and 2-butanone were spiked at a concentration of 5 µg/L in the matrix spikes, matrix spike duplicates (with the exception of sample SS-5, spiked at 50 ug/L), laboratory control samples, and laboratory control sample duplicates analyzed with this data set, and acceptable or high recoveries for both compounds were achieved in these analyses. Therefore, results for acetone and 2-butanone were not qualified on the basis of the low RRFs in the associated ICs on both instruments.

An ICV was analyzed immediately after each IC, as required, and recoveries were correctly calculated and accurately reported in the data packages, with the exceptions that the ICVs shown on the instrument run logs for the Method 524.2 analyses were not submitted with the data packages. All recoveries in the submitted ICVs were within (76 - 119 % recovery overall) laboratory established control limits (75 – 125 % recovery), with the exception that in the ICVs analyzed on instrument L on 10/19/07 and 10/30/07, acetone was recovered below (69 and 74 % recovery, respectively) the lower control limit. For the reasons discussed in the previous paragraph, no results for acetone were qualified on the basis of the slightly low recoveries in the ICVs analyzed on instrument L on 10/19/07 and 10/30/07.

IV. Continuing Calibration (CC)

Six continuing calibration (CC) standards were run on instrument L in support of the Method 8260B sample analyses, and two CC standards were run on instrument L in support of the Method 524.2 sample analyses reported in this data set. Two CC standards were run on instrument M 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.

All RRFs were above the 0.05 minimum criterion, with the exceptions of acetone and 2-butanone, in the CC standards as shown:

Instrument	CC	RRF	
		acetone	2-butanone
L (8260B)	10/151/07 20:04	0.034	0.018
	10/16/07 09:07	0.031	0.018
	10/17/07 12:18	0.044	0.021
	10/19/07 10:17	0.030	0.017
	10/22/07 10:56	0.040	0.020
	11/6/0714:27	0.043	0.021
L (524.2)	11/5/07 12:50	0.044	0.020
	11/6/07 01:44	0.042	0.019
M (524.2)	10/22/07 09:08	>0.05	0.023
	10/24/07 08:40	>0.05	0.022

For the reasons discussed in Section III, no results for acetone or 2-butanone were qualified on the basis of the low RRFs in the associated ICs and CCs.

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 on both instruments. The Form 7 for the CC analyzed on instrument L on 10/22/07 has flags to indicate that the %D for acetone and 2-butanone are outside of the upper control limit; however, the results for both compounds round to 25%D, and on that basis no results warrant qualification for the marginally high %D in this CC standard.

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 ten (10) water-matrix laboratory method blanks (MBs) were reported in association with this set of samples. No target analytes were detected in any MB.

Five trip blanks (TBs) were reported in these SDGs. No target analytes were detected in any TB.

Seven field blanks (FBs) were reported in these SDGs. No target analytes were detected in any FB.

Six holding (storage) blanks (HBs) were reported in these SDGs. No target analytes were detected in any HB. The HB stored with the samples received on 10/16/07 in SDG No. UNIF30 is not listed in the cross-reference table in the Case Narrative; however, it was logged in, analyzed, and reported with the associated samples.

VI. Surrogate Compounds

Percent recoveries (%R) for all four surrogate compounds in both analytical methods were correctly calculated, accurately reported on the Form II summaries within the data packages, and were within acceptance limits for all sample analyses, with the exception of the Method 524.2 HB identified as VHBLK01, associated with the samples in SDG No. UNIF31. Two surrogates (1,2-dichloroethane-d_4 and toluene-d_8), were recovered above (137 % and 131 %R, respectively) the upper control limit (130%R) in the reanalysis on 11/6/07, which was not included in the data package, but which followed, as required, the reanalyses of the matrix spike and duplicate samples. The surrogates were within acceptance limits in the original analysis on 11/5/07, which was submitted in the data package. The raw data for the reanalysis of VHBLK01 should be appended to the data package for UNIF31.

No results warrant qualification on the basis of the high surrogate recoveries in the HB identified as VHBLK01 associated with the Method 524.2 samples in SDG No. UNIF31.

VII. Internal Standards (IS)

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

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

Samples MW-4S, SS-5, and W-1 were used for the Method 8260B MS/MSD analyses in this data set. The spiking solutions contained all target compounds at 1 µg/L (except for the ketones at 5 µg/L) for all MS/MSD pairs, except sample SS-5, which was spiked at 10 ug/L (ketones at 50 ug/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 80 – 140 %R; overall laboratory-derived control limits: 60 – 145 %R) and reproducible (RPD range 0-30%; limit 30% RPD), with the following exceptions:

Recoveries above (120 -140%R) the upper laboratory-derived control limits, but within Region 1 limits (60 – 140 %R) were reported in either or both the MS and MSD analyses of sample MW-4S for chloromethane, vinyl chloride, methylene chloride, 1,1-dichloroethane, 1,2-dichloroethane, and tetrachloroethene. Bromomethane was recovered above (150 %R) both the laboratory limit (145 %R) and the Region 1 limit in sample MW-4SMSD.

Recoveries above (120 – 130 %R) the upper laboratory-derived control limits, but within Region 1 limits (60 – 140 %R) were reported in either or both the MS and MSD analyses of sample W-1 for 1,1-dichloroethene, methylene chloride, trans-1,2-dichloroethene, 1,1-dichloroethane, cis-1,2-dichloroethene, chloroform, 1,1,1-trichloroethane, benzene, 1,2-dichloroethane, 1,2-dichloropropane, toluene, ethylbenzene, m,p-xylene, and o-xylene. Recovery of tetrachloroethene was reported as 0%R in sample W-1MS, and as -200%R in W-1MSD. However, the native concentration of tetrachloroethene in samples W-1 was 31 ug/L, which is more than four times greater than the spiking concentration of 1.0 ug/L.

Recoveries above (120 – 130 %R) the upper laboratory-derived control limits, but within Region 1 limits (60 – 140 %R) were reported in either or both the MS and MSD analyses of sample MW-S2 for chloromethane and 1,2-dichloroethane.

On the basis of recoveries within the Region 1 upper limit, no results warrant qualification on the basis of recoveries above the laboratory-derived upper control limits but below 140%R in samples MW-4S, W-1, and MW-S2. Since bromomethane was not detected in sample MW-4S, the result for bromomethane does not warrant qualification on the basis of its unacceptably high recovery in the associated MSD analysis. On the basis of the native concentration being more than four times the spiking level, the result for tetrachloroethene in sample W-1 does not warrant qualification on the basis of its unacceptably low recoveries in the associated MS and MSD analyses.

Samples SHIELDS and WP-8 were used for the Method 524.2 MS/MSD analyses in this data set. The spiking solution contained all target compounds at 1 µg/L (except for the ketones at 5 µg/L) for both MS/MSD pairs. Percent recoveries (%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 84 – 130 %R; overall limits: 70 – 130 %R) and reproducible (RPD range 0-15%; limit 40% RPD), with the following exceptions:

Recoveries above (150 and 160 %R, respectively) the laboratory and the Region 1 upper control limits were reported for bromomethane in the MS and MSD analyses of sample SHIELDS. Recovery above (140 %R) the laboratory upper limit, but marginally within the Region 1 upper control limit, was reported for chloroethane in sample SHIELDSMSD.

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

IX. Field Duplicates

SDG Nos. BRES39, UNIF30, UNIF31, and WHEA13 contained six groundwater and two potable water field duplicate pairs, which were identified in the field sampling notes as follows.

Field Sample	Field Duplicate
Groundwater	
MW-101D	MW-Z
MW-3D	MW-Y
MW-E	W-Z
W-SEEP	SS-Z
MW-PL1	MW-PLX
MW-25884	BRW-X
Potable Water	
SHIELDS	WELL-Z
WP-3	WP-Z

Precision in the field duplicate pairs MW-101D and MW-Z, MW-3D and MW-Y, and MW-E and W-Z was acceptable (less than 30 % RPD) for all target analytes greater than 2 times the quantitation limit. No target compounds greater than 2 times the quantitation limit were detected in any of the remaining samples, so precision could not be evaluated in these field duplicate pairs.

X. Sensitivity Check

The aqueous MDL for Method 8260B submitted for this project was begun on 11/7/07 and the MDL verification studies were completed on 11/21/07, which is just after the time period in which these samples were being analyzed. The previous MDL was completed on 6/13/06, which is slightly more than one year prior to the sample analyses in this data set. All analytes had calculated, verified MDLs below the method quantitation limits in both MDL studies.

The aqueous MDL for Method 524.2 submitted for this project was begun on 9/23/07 and the MDL verification studies were completed on 10/26/07, which is just prior to or during the time period in which these samples were being analyzed. All analytes had calculated, verified MDLs below the method quantitation limits in the MDL study.

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, 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. In addition, the low standard of the initial calibrations for both methods supports the reporting limit for the sample analyses.

XI. Performance Evaluation (PE) Samples/Accuracy Check

Five zero blind PE sample (commonly known as laboratory control sample, LCS) and duplicate

(LCSD) pairs were prepared and analyzed by the laboratory at 1 µg/L (ketones at 5 ug/L) on instrument L in support of the Method 8260B sample analyses in this data set. Laboratory established control limits are 60 – 145%R overall, and the Region 1 control limits are 60 – 140 %R. Percent recoveries were correctly calculated and accurately reported on Form III summaries in the data packages, and were acceptable (82 – 120 %R overall) for the LCS and LCSD pairs analyzed on 10/15/07, 10/16/07, 10/17/07, and 10/19/07, with the following exceptions:

Bromomethane was recovered at 160 %R in the LCSD analysis identified as LA101607LCSD, and chloromethane, chloroethane, and acetone were recovered above laboratory and Region 1 upper control limits in LA101707LCS.

For the LCS/LCSD pair analyzed on 10/22/07, identified as LA102207LCS and LA102207LCSD, all analytes in the LCS analysis were within both laboratory and Region 1 control limits, with the single exception of 1,1-dichloroethene, which was marginally above (115.7 %R) the laboratory upper control limit (115 %R). More than one-half of the analytes were above the laboratory upper control limits in the LCSD analysis; however, only acetone was above (144 %R) the Region 1 upper control limit.

Reproducibility between all Method 8260B LCS and LCSD pairs was acceptable (0 – 21 % RPD).

Two zero blind PE sample (commonly known as laboratory control sample, LCS) and duplicate (LCSD) pairs were prepared and analyzed by the laboratory at 1 µg/L (ketones at 5 ug/L) on instrument L and two on instrument M in support of the Method 524.2 sample analyses in this data set. Percent recoveries were correctly calculated and accurately reported on Form III summaries in the data packages, and were acceptable (78 – 130 %R overall); laboratory established control limits are 60 – 145 %R overall.

Since bromomethane, chloromethane, chloroethane, and acetone were not detected in any associated sample analysis, no results warrant qualification on the basis of the unacceptably high recoveries in either the LA101607LCSD or the LA101707LCS analyses. For all other compounds, on the basis of professional judgment, no results warrant qualification on the basis of the recoveries above laboratory established control limits but within Region 1 control limits in the Method 8260B and Method 524.2 LCS and LCSD pairs.

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).

An acceptance range for the combined m- & p-xylene isomers was not established by the vendor; however, the total xylenes result was well within its acceptance range.

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. Tetrachloroethene was detected above the calibration range in the original analyses of samples MW-101D, MW-102S, MW-3S, MW-D, and MW-Z; these samples were reanalyzed at an

appropriate dilution to bring tetrachloroethene within the upper half of the calibration range, and both sets of analyses were reported in the data package.

Results for tetrachloroethene initially outside the calibration range in the original analyses of samples MW-101D, MW-102S, MW-3S, MW-D, and MW-Z were rejected (R) and replaced with the acceptable concentrations from the corresponding diluted samples (MW-101DDL, MW-102SDL, MW-3SDL, MW-DDL, and MW-ZDL). Results for cis-1,2-dichloroethene initially outside the calibration range, and results for total 1,2-dichloroethene based on the cis- isomer, in the original analyses of samples MW-101D and MW-Z were rejected (R) and replaced with the acceptable concentrations from the corresponding diluted samples (MW-101DDL and MW-ZDL).

Results for all other analytes in samples MW-101DDL, MW-102SDL, MW-3SDL, MW-DDL, and MW-ZDL were rejected (R) because acceptable results for these compounds were taken from the original analyses (MW-101D, MW-102S, MW-3S, MW-D, and MW-Z).

"E" qualifiers were appropriately applied by the laboratory to sample Form I results when concentrations of target analytes were greater than the instrument calibration range. "D" qualifiers were properly applied by the laboratory to positive results from diluted sample analyses. The validator removed all laboratory-applied "E" and "D" qualifiers. An "X" has been drawn across the entire Form I for the diluted analyses noted above.

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 on the Data Summary Forms in Attachment A and on the Form 1s in Attachment B.

The Data Summary Forms (DSFs) in Attachment A list all individual sample analytes affected by the applied qualifications. All positive results are listed on these forms, whether or not the value or qualifier was changed as a result of the validation. Where no result is listed, the compound was not detected and the PQL was not qualified. Sample-specific quantitation limits may be found on the laboratory-generated Form I for each sample (Attachment B) or may be calculated for waters from the information on the DSFs as follows: unadjusted PQL (far left column) multiplied by the concentration/dilution factor (DF).

XIV. Tentatively Identified Compounds (TICs)

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

XV. System Performance

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

XVI. Overall Evaluation of Data

Results for volatile organic compounds were determined to be valid as reported for all samples in SDG Nos. BRES39 and UNIF30, with the following exceptions:

- Results for tetrachloroethene initially outside the calibration range in the original analyses of samples MW-101D, MW-102S, MW-3S, MW-D, and MW-Z, and results for cis-1,2-dichloroethene initially outside the calibration range, and results for total 1,2-dichloroethene based on the cis- isomer, in the original analyses of samples MW-101D and MW-Z, were rejected (R) and replaced with the acceptable concentrations from the corresponding diluted samples (MW-101DDL, MW-102SDL, MW-3SDL, MW-DDL, and MW-ZDL).

- Results for all other analytes in samples MW-101DDL, MW-102SDL, MW-3SDL, MW-DDL, and MW-ZDL were rejected (R) because acceptable results for these compounds were taken from the original analyses (MW-101D, MW-102S, MW-3S, MW-D, and MW-Z).

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

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

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.

- Improper edits were noted on some of the instrument run logs. All corrections should be made by making a single line through the edit, adding the correct information, and recording the editor's initials and the date.

- Sample BOWEN NEW WELL was received by the laboratory but not listed on the COC.

- Sample TB-2 was listed on the COC but not received by the laboratory. The groundwater collection field notes indicate that TB-2 was discarded by the sampler because only a single cooler was used; however, two coolers were received on 10/12/07 from the Bressett site sample collection. No trip blank was received with the Method 524.2 samples collected on 10/11/07 at the Bressett site.

These issues do not directly affect the validity of the analytical data, but could be problematic if the results were to be used in a litigation situation.

Data presentation was acceptable, with the following observations:

- The laboratory noted that the containers received for sample FB-1 did not list a time of collection; however, the COC did list the collection time, and this was used for sample log-in. The time on the COC is the same as the time on the field sample collection sheet.

- The ICVs listed on the instrument run logs for the Method 524.2 initial calibrations were not included in the data package.

- The HB stored with the samples received on 10/16/07 in SDG No. UNIF30 is not listed in the cross-reference table in the Case Narrative; however, it was logged in, analyzed, and reported with the associated samples.

- The raw data for the reanalysis on 11/6/07 of the HB VHBLK01 for SDG No. UNIF31 was not included in the data package; the raw data for the original analysis was present. The raw data for the reanalysis should be appended to the data package; this report was requested from the laboratory and received on January 18, 2008.

- In the data package for SDG No. BRES39, several pages are out of order for the analysis of LA101707LCSD; all pages are present.

- In the data package for SDG No. UNIF30, the quantitation report for LA101907LCSD is not present; the quantitation report for LA101907LCS is present twice. Pages 416 – 417 should be discarded, and the correct quantitation report should be inserted in their place. This report was requested from the laboratory and received on January 18, 2008.

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.

The Johnson Company ENVIRONMENTAL SCIENCE AND ENGINEERING SOLUTIONS

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February 29, 2008

Mr. Gerold Noyes
Waste Management Division, Sites Management Section
Vermont Department of Environmental Conservation
103 South Main Street/West Building
Waterbury, Vermont 05671-0404

Re: Comments on February 1, 6 and 11, 2008 Draft Annual Reports for the UniFirst Plant Site, Wheatley Farm Site and Bressett Site
VT Hazardous Waste Site Nos. 770087, 941693 and 770019

Dear Gerold:

On behalf of UniFirst, we have the following comments on the reports referenced above. We would appreciate incorporation of these changes into the final reports, or a detailed explanation of the technical grounds for not accepting them.

Overall comments:
The reports represent values to be Vermont Groundwater Enforcement Standards (VGES) when they are not. The contractor has confused Vermont Action Levels (VALs) with VGES. This issue is important, as VALs have no legally binding status. Vermont Health Advisories (but not VALs) can in some instances, due to rule and statute, cause changes in the legally binding Vermont Groundwater Enforcement Standards, but this is not true of VALs.

The VGES for tetrachloroethene (PCE) is 5.0 ppb. The Vermont Department of Health has issued a Vermont Action Level for PCE in drinking water of 0.7 ppb. The VAL of 0.7 ppb is not a "Vermont Health Advisory". All tables, graphs and text should be revised to indicate this. For instance, Table 3 of the Bressett Report indicates a VGES of 0.7 ppb and has a footnote citing the source. When the VAL is cited, the VGES should be described in the same paragraph or notations. The bold demarcation of PCE concentrations in groundwater greater than 0.7 ppb but less than 5 ppb should be removed from all tables.

Guidance levels for cis- and trans-1, 2,-dichloroethene in air are cited in the summary tables based on the EPA Region III risk-based concentration for ambient air (2002 RBC table). These levels have no standing in Vermont. We recommend that the EPA Region III numbers not be used at all. If they are referenced, then it should be made clear in the text that there in fact is no applicable Vermont standard, guideline or screening value for that compound.

Comments on February 1, 2007: *2007 Annual Monitoring Report* for the UniFirst Plant Site in Williamstown, Vermont.

Section 2.1, Page 2, second paragraph: Please clarify that it was the SP-3 springhouse roof which collapsed, not SP-4.

The contour map of total VOCs in Groundwater for October 2007 does not include all of the available data and the contours do not fit the data as detailed below:

- The total VOC results for spring SP-4 (5.7 ppb), Seep-1A (4 ppb), Seep SS-2 (ND) and W-Seep (J0.38 ppb) should be included on the map.
- The contour lines should then be adjusted to fit the data.
- In particular, the contours in the vicinity of SP-4 should be adjusted to fit the 5.7 ppb VOC, instead of indicating concentrations on the order of 20 ppb.
- Additionally, the non-detect value at SS-2 should be used to close the contours in that direction.

A map with corrected contours overlaid upon all the data is attached.

The graphs of water quality should indicate when the sampling location was changed, in particular for SP-3.

As mentioned in comments previously submitted in response to previous reports:

> The detection limits are not shown on the water quality graphs and non-detect and estimated results are not identified as such. This gives the reader an inaccurate impression that PCE and other contaminants were detected in cases when in actuality they were not. It was agreed at the July meeting that this distinction would be provided in future reports, similar to those presented for the air quality data.
>
> The graph of SS-3 indicates a 15 ppb concentration of PCE circa 2003-2004. This point does not appear to be correct as SS-3 was dry in April 2003, PCE was not detected in October 2003, and PCE was reported present at an estimated 13 ppb in April 2004.
>
> The potential impact on the air samples from sources of indoor air contamination at the time of sampling should be included in the executive summary and conclusions. These include at a minimum: the cabinet containing unknown chemicals in the High School Physics Room and the carpet cleaning adjacent to the Elementary School AV Room.

February 6, 2008: *2007 Annual Monitoring Report* for the Bressett Site in Randolph, Vermont

The high turbidity observed in MW-101S may be due to the approximately 1.4 feet of drawdown created by the purging. This amount of drawdown exceeds that specified by the EPA low stress method and therefore the FLCM. A narrower diameter tubing should be used for future monitoring events to reduce the sample rate and drawdown.

WEM reiterates the protocol of turning the Vocarb units on prior to sampling. The units were on low power, not on high power as they should be. An evaluation of these units' efficiency under normal use cannot be made in the conditions under which the data were collected.

WEM recommends installation of a subslab depressurization system in the house. In the same report, WEM notes that the basement is subject to flooding. One might wonder how well a depressurization system would work while under water.

February 11, 2008: *2007 Annual Monitoring Report* for the Wheatley Site in Brookfield, Vermont.

No comments except the general comments provided above

We look forward to your responses regarding these comments.

Sincerely,
THE JOHNSON COMPANY, INC.

By: _____
Donald M. Maynard, P.E., C.G.
Senior Scientist/Engineer

Attachment

CC: Phoenix, WEM, Test America, U1st, GPH, Harvard Projects

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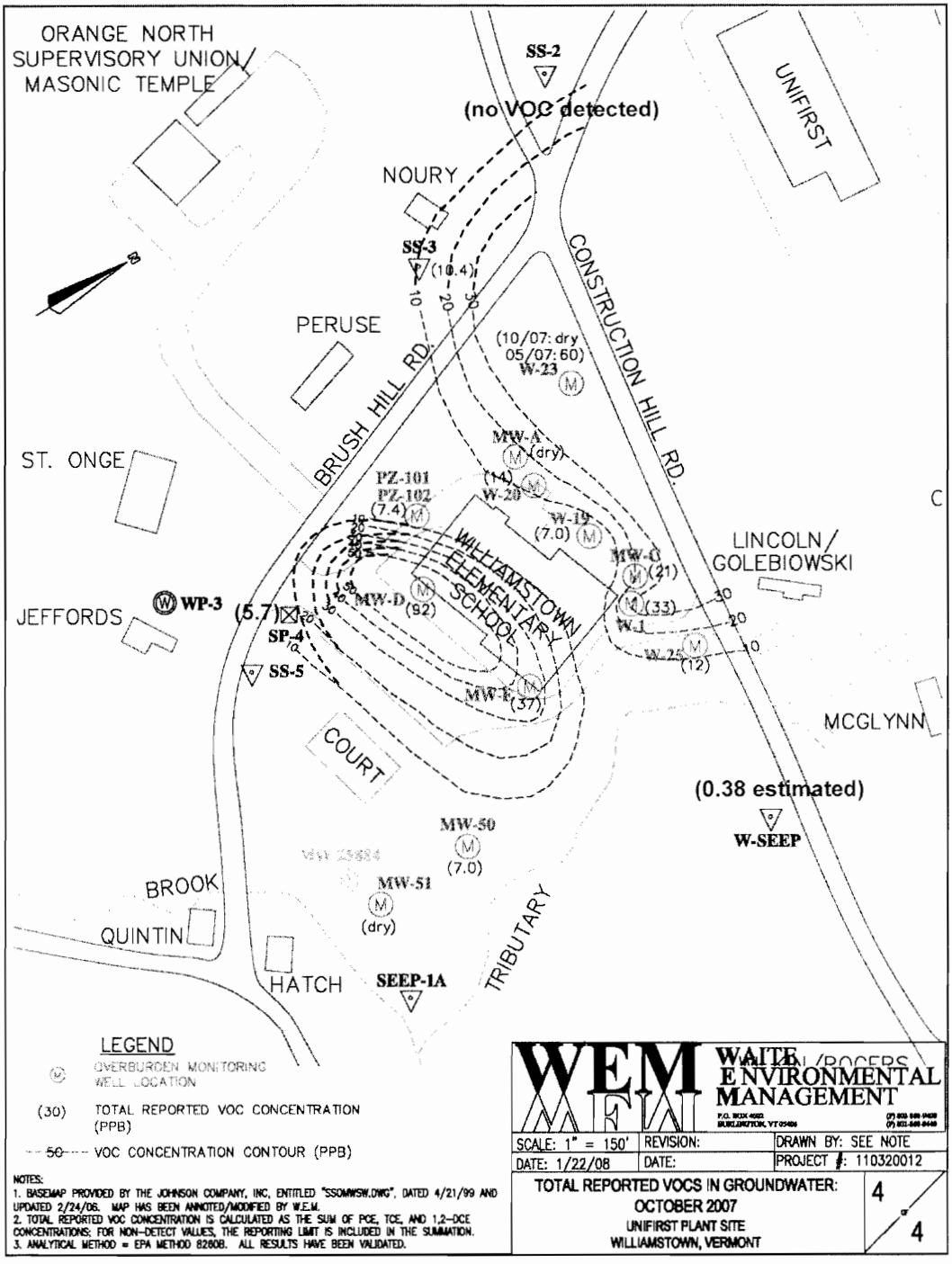

NOTES:
1. BASEMAP PROVIDED BY THE JOHNSON COMPANY, INC, ENTITLED "SSOMWSW.DWG", DATED 4/21/99 AND UPDATED 2/24/06. MAP HAS BEEN ANNOTED/MODIFIED BY W.E.M.
2. TOTAL REPORTED VOC CONCENTRATION IS CALCULATED AS THE SUM OF PCE, TCE, AND 1,2-DCE CONCENTRATIONS; FOR NON-DETECT VALUES, THE REPORTING LIMIT IS INCLUDED IN THE SUMMATION.
3. ANALYTICAL METHOD = EPA METHOD 8260B. ALL RESULTS HAVE BEEN VALIDATED.

Revised by The Johnson Company to include all available data 02/29/08

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AGENCY OF NATURAL RESOURCES

April 11, 2008

Response to The Johnson Company letter dated February 29, 2008 Concerning the UniFirst Environmental Monitoring Program 2007 Annual Report for the Williamstown, VT Plant site and Randolph, VT Bressett sites

The Sites Management Section has reviewed Mr. Maynard's, The Johnson Company, comments on the three 2007 annual monitoring reports prepared on behalf of the State by Waite Environmental Management (WEM). These comments are addressed below in the order presented in the February 29 letter.

Williamstown UniFirst Plant Site

The Vermont Action Level (VAL) for PCE is 0.7 µg/L. Although it is not the legally enforceable Vermont Groundwater Enforcement Standard (VGES), it is a level that has been established by the Vermont Department of Health for public water supplies for this chemical of concern. It represents their risk assessment of this chemical based on an excess cancer risk of one in one million. At an earlier request from The Johnson Company listing both the VAL and VGES was eliminated from all water samples except for the water supply samples. The 0.7 µg/L concentration for PCE is identified as the VAL in the foot note of Table 3.0.

Listing the VAL is relevant for water supplies. In fact the water supply spring, SP-3, was disconnected and the former Manning residence connected to municipal water due to persistent PCE values above the VAL, but mostly below the VGES.

Mr. Maynard is correct, there is no applicable Vermont indoor air standard, guideline or screening value for cis- and trans-1,2-dichloroethene. The State of Vermont does not have the time or resources to implement regulatory or guidance values for all chemicals that exist in the environment. The State routinely looks to the EPA for guidance when the State does not have its own guidance or regulation in place. Table 5.1 cites EPA Region III risk-based guidance numbers instead. These numbers are identified correctly as coming from the EPA and are relevant. If and when appropriate State values are implemented these will be used instead.

The SMS received clarification from WEM of the status of the SP-3 and SP-4 water sample locations.

> "SP-3 has a wooden spring house that has collapsed. It is a shallow (4-ft deep) concrete basin in the woods next to the stream. To sample it, I just lower a dedicated bailer into the water. SP-4 is like a monitoring well, as there is a 2" PVC riser that is within a well box at the edge of the school parking lot. I've never known the details of the spring, but I assume that it is a buried concrete tile with a cover that has a hole in it to allow for the PVC pipe. To sample it I use a dedicated bailer without purging. The only problem I've

over

had with it is that I've had to replace the well box twice due to winter plowing damage." [1]

The contour map, Figure 4, of total VOCs includes only monitor well data and has been prepared this way for a number of years. Mr. Maynard is now asking that total VOC data from seeps and springs be added and has prepared another VOC contour map using those results. This map is included with the comments letter and represents an alternative to that prepared by WEM. To some extent contaminant level contouring is a result of judgment exercised by the map preparer; individual groundwater professionals may produce differing maps with the same data. In this case Mr. Maynard wishes to change the dataset also. The following comment was received from WEM regarding this.

> "I've always use strictly the monitoring wells for the VOC contour map. I believe this was what Tighe & Bond also did. I'm not sure I agree with Don's suggestion to use the seep data to close out the contours around MW-D. Why would there be a hot spot at MW-D that is separate from the up gradient plume? I am more inclined to believe that there is a preferential conduit that is bringing an arm of the up gradient plume onto the south side of the school building. If we had good data for W-23 and MW-A, it may be more obvious that the contamination on the hill north of the school is making it to the south side of the school. Maybe you could suggest either deepening W-23 and MW-A or else additional monitoring wells to further evaluate the source of increasing PCE concentrations at MW-D?"[2]

WEM will be asked to show detection limits on water quality graphs in a similar manner to those depicted on the air quality graphs.

The comment about the accuracy of the graph of SS-3 has been raised before. This graph shows total VOCs not PCE. The footnote states that the reported concentration is the sum of PCE, TCE and 1,2-DCE and includes detection limits. Since 26 years of data are shown, the horizontal time scale is unavoidably difficult to interpret.

The comment regarding the potential impact of indoor air contamination at the time of sampling has been raised before. The Johnson Company is asking WEM to speculate on the contents of a closed cabinet in the High School Physics Room. A chemical use inventory on every sample date at every sample location would be necessary to attempt to rule out spurious contaminant influences. This has not been requested and would be intrusive to the property owners, who we are already imposing on to sample every 6 months. If WEM observes conditions (use of cleaning materials, paints, solvents, etc.) that might result in detections for the contaminants of concern, it has been agreed that these should be reported in the field data sheet. The 1st Quarter 2008 report contains a new air sampling check list to record field observations at the time of sampling for each air sample collected.

<u>Randolph UniFirst Bressett Site</u>

WEM will be asked to slow their purging procedure to reduce the drawdown and turbidity.

We agree that the limited data collected may not be sufficient to prove or disprove the efficacy of the Vocarb air purifiers to remove ppb level VOCs from the indoor air. Nevertheless, based on the data available, the Vocarb units do not appear to be clearly significant in removing VOCs present in the building. If UniFirst wishes to submit a rigorous sampling program, which controls Vocarb operation, location, building access,

[1] 4/8/08 e-mail from Miles Waite, PhD, Waite Environmental Management, to Gerold Noyes, PE, Sites Management Section.

[2] Ibid.

etc. the SMS will certainly review such an assessment. We should note however that it has not been documented in any literature or operating guides for the Vorcarb submitted to the State by UniFirst, that these units are indeed even capable of removing VOCs to ppb level. In addition the operation of the Vocarb air purifiers is unfortunately not under our control.

A sub-slab depressurization system was recommended by the UniFirst contractor, Turner Building Science, as the best long term mitigation system for VOC infiltration. We agree that a high water table would make such a system more difficult to install and operate. The flooding, which occurred last July, does not make the task easier. We should note that the flood was the first one since this property became a site and we do not have any site history suggesting that this is a regular occurrence. Nevertheless these conditions do not alter the State's belief that the indoor air contamination present in the building should be mitigated if the house comes habitable again.

Brookfield UniFirst Wheatly site

No comment received except general comments applicable to the above two sites.

As before, The Johnson Company comments letter and this response will be appended to the UniFirst 2007 annual reports for the Plant and Bressett sites.

Gerold Noyes, P.E.
Environmental Engineer
Sites Management Section

CC: George Desch, SMS Supervisor,
Jack Badey, UniFirst
Greg Bibler, Esq., Goodwin Proctor LLP
Tim Cosgrave, Harvard Project Services
Don Maynard, PE, The Johnson Company
Miles Waite, PhD, Waite Environmental Management
Deb Gaynor, PhD, Phoenix Chemistry Services
Ron Pentkowski, Test America Lab
Scot Kline, Esq., Office of the Attorney General, Chief, Environmental Protection Section

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