

# Watershed Environmental Services

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September 18, 1995

Mr. Richard Spiese  
Acting Supervisor, Sites Management Section  
Vermont Agency of Natural Resources  
Department of Environmental Conservation  
Hazardous Materials Management Division  
103 South Main Street/West Office Building  
Waterbury, VT 05671-0404

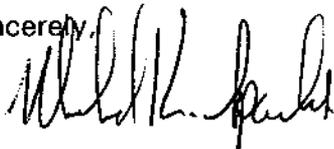
Re: Middlebury Ambulance Station (Site #95-1807)  
MVAA Tank Site Investigation and Groundwater Quality Report

Dear Richard:

Please find enclosed for your review my report on the findings of the subsurface investigation to determine the degree and extent of petroleum contamination at the Middlebury Volunteer Ambulance Association station site in Middlebury.

If you have any questions or comments regarding this report please contact me at 802-860-7385. Thank you for your attention.

Sincerely,



Michael K. Sparks, REM #5770  
Principal Hydrogeologist

enclosures

cc: George Murdoch, Middlebury Volunteer Ambulance Assoc.

*mks 9-18-95/winword/mvaa-wat.rpt*

SEP 25 10 51 AM '95

**MIDDLEBURY VOLUNTEER AMBULANCE ASSOCIATION  
AMBULANCE STATION SITE**

19 ELM STREET  
MIDDLEBURY, VERMONT

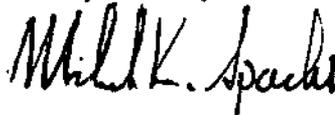
VTDEC Site #95-1807

RECEIVED  
MIDDLEBURY  
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**MVAA TANK SITE INVESTIGATION  
AND  
GROUNDWATER QUALITY REPORT**

*Prepared by:*



Michael K. Sparks, Principal Hydrogeologist

September 18, 1995

**Watershed Environmental Services**

P.O. Box 64947 Burlington, Vermont 05406

Office: 802-860-7385 FAX: 802-860-7385 \*51

# MVAA TANK SITE INVESTIGATION AND GROUNDWATER QUALITY REPORT

## 1.0 INTRODUCTION

On June 21, 1995 Watershed Environmental Services (WES) monitored the removal of 2000 gallon underground no.2 heating fuel oil storage tank from the premises of the Middlebury Volunteer Ambulance Association (MVAA) ambulance station site in Middlebury (see Site Map, Appendix 1, page 1). The site assessment completed in concert with the tank removal found that soils and possibly groundwater at the tank site had been impacted by fuel oil during use of the underground heating oil tank. Soil conditions indicated that the origin of the fuel oil release petroleum release is most likely from overfills/spills at the tank fill pipe. In addition to finding fuel oil contamination at the site, gasoline odors were detected in soils proximal to the tank site. The gasoline odors were suspected to originate at a nearby gas station, Lackards Mobil, which is in remediation for a leaky underground gasoline storage tank.

On July 18, 1995, the Vermont Department of Environmental Conservation (VTDEC) made a request for additional work to more fully characterize the extent of contamination at the MVAA site. The VTDEC's letter specified the work required and directed MVAA to have an environmental consultant prepare a work plan detailing the costs, methods and procedures to be implemented to complete this work. To this end, MVAA retained Watershed Environmental Services to prepare and implement a work plan consistent with the VTDEC's request for additional work.

On July 20, 1995 WES submitted to the VTDEC Sites Management Section a proposal entitled "Work Plan and Scope of Services, MVAA Tank Site Investigation, Revised Edition 7-20-95". This document detailed the rational, methods and procedures for testing necessary to determine the degree and extent of petroleum contamination at the Middlebury Volunteer Ambulance Association ambulance station site in Middlebury, VT (VTDEC Site #95-1807).

The site investigation work plan proposed by Watershed Environmental Services detailed the following activities:

1. Perform a review of the VTDEC files on the Lackard's Mobil tank site to ascertain the nature and degree of contamination at that property, determine if any evidence of off site migration of contamination has been documented, and gain insight into the direction of groundwater flow to aid in the siting of monitoring wells at the MVAA site.

## **MVA A TANK SITE INVESTIGATION AND GROUNDWATER QUALITY REPORT**

2. Complete a series of soil borings with continuous split-spoon soil sampling and PID (photoionization detector) screening to determine the severity and depth of contamination at the former fuel oil tank site and check for the presence of contamination up-gradient and down-gradient of the tank site. Upon completion of the soil boring activity, install monitoring wells to facilitate groundwater sampling.
3. Sample the groundwater monitoring well array and submit the samples to a certified laboratory for analysis via EPA Method 8020 (volatile aromatic hydrocarbons) and EPA Method 8100 (total petroleum hydrocarbons).
4. Complete a monitoring well point elevation survey and collect groundwater level measurements to facilitate preparation of a water table contour map for the site.
5. Prepare a summary report for submission to the VTDEC Sites Management Section discussing the findings of the site investigation and making recommendations for future action.

The soil boring and monitoring well installation phase of the work plan was initiated on July 27, 1995.

### **2.0 SOIL BORING AND MONITORING WELL INSTALLATION**

The soil boring and monitoring well installation was performed by Adams Engineering, Inc. of Underhill, VT. A total of four soil borings, all of which were equipped with monitoring wells, were completed at the site. The monitoring well array installed at the site includes an up-gradient monitoring well, a monitoring well installed in the foot print of the former tank excavation, and two down-gradient monitoring wells. A site map depicting the locations of the new monitoring wells is provided in Appendix 1 (page 2). The boring and well installation was completed utilizing a vibratory drilling machine and a 5-ft core barrel sampling tool to recover undisturbed soil samples. Driller's logs are provided in Appendix 1 (pages 3 and 4). The drilling and sampling tools were decontaminated (steam-cleaned) between borings.

During the soil boring operation WES monitored breathing zone air quality conditions (utilizing an H-Nu Systems PI-101 photoionization detector or PID with a 10.2 eV lamp) and screened the recovered soil samples for the presence of volatile organic compounds (PID vapors). Soil descriptions and the PID vapor screening results are provided in the attached Soil Boring Logs (see Appendix 1, pages 5-8). Unless noted otherwise, all PID vapor measurements provided in the Soil Boring

# MVAA TANK SITE INVESTIGATION AND GROUNDWATER QUALITY REPORT

Logs are sample bag (1 quart-size, self-sealing plastic bags) head-space vapor readings.

The soil borings were completed with the installation of 1.5 inch diameter, schedule 40 PVC monitoring wells with F480 thread couplings and factory slotted 0.010' screen sections. All monitoring wells were completed to water quality-grade specifications including silica filter sand packs, bentonite seals, and steel well protectors. Well construction details are provided in the attached Soil Boring Logs (Appendix 1).

A discussion the rational for the soil boring/monitoring well siting and well construction and evaluation of the soil sampling results follows.

## 2.1 Soil Boring/Monitoring Well MW-1

Soil boring site MW-1 was located at the eastern boundary of the MVAA ambulance station property approximately 25 east of the former no.2 heating fuel oil underground storage tank (UST) site. This location was chosen to monitor soil and groundwater conditions up-gradient of the tank site (as inferred from the surface topography and water table contour maps reviewed in the VTDEC Lackard Mobil file).

PID screening of continuous core samples recovered from boring MW-1 yielded no detectable contamination. The soil profile at the site consisted of a veneer of road base gravels over a reworked glacial till. The glacial till at this location consists of fine sands containing some silt and clay and abundant pebbles and stones. Groundwater was observed at a depth of 9 feet below ground surface.

The soil boring was completed with the installation of a water quality-grade monitoring well device constructed with a screen section extending from 3 - 13 feet bgs.

## 2.2 Soil Boring/Monitoring Well MW-2

Soil boring MW-2 was sited within the foot print of the original tank excavation so as to determine the vertical extent of the fuel oil contaminated previously detected at this location (during the tank removal operation).

The core sampling at this location yielded evidence of fuel oil contamination (soil discoloration, fuel oil odors and elevated PID readings) extending from just below the surface (bgs) to a depth of 9 feet. PID soil vapor levels were found to increase with depth from surface to 8 feet bgs (up to 75 ppm) and then decrease with depth (dropping from 20 ppm to 1 ppm) to the 10 ft level. The water table was

## MVAA TANK SITE INVESTIGATION AND GROUNDWATER QUALITY REPORT

encountered at approximately 9.5 feet bgs. Boring into the water table encountered a compact till layer at 14 feet bgs; PID soil vapor levels were seen to increase at this level (up to 55 ppm). Notably, soils at the 14 - 15 ft interval had a fuel oil odor while the underlying soils exuded a slight gasoline odor.

To confirm the PID soil vapor screening results two soil samples, collected from the 5 - 8 ft. interval and the 15 - 16 ft interval, were submitted to the laboratory for volatile organic compound analysis via EPA Method 8020. The laboratory assays confirmed the presence of significant concentrations of BTEX compounds (Benzene, Toluene, Ethylbenzene and Xylene) at the 5 - 8 ft interval. Soils at this interval yielded a total BTEX concentration of 8510 ppb. However, the laboratory assay of soil recovered from the 15 - 16 ft interval yielded a total BTEX concentration of less than 200 ppb although more than 10 unidentified peaks (non-target compounds) were noted in the lab report. The individual laboratory reports and a summary table (Table 1) are provided in Appendix 2 (see pages 1, 9 and 10). The laboratory results suggest that the elevated PID concentrations detected in the zone of saturation (water table) are from shallower contaminated soils dragged down into the aquifer during the soil boring operation.

The boring was completed with the installation of a monitoring well equipped with a screen section extending from 5 ft to 15 ft below ground surface.

### 2.3 Soil Boring/Monitoring Well MW-3

Soil boring MW-3 was sited on the west side of the ambulance station building on the Richard Forgues property. The boring is approximately 55 feet due west of the tank site and was intended to determine if contamination has migrated off the MVAA site. From water table elevation data reviewed in the VTDEC Lackard Mobil site file, it was determined that the direction of groundwater flow in the area is to the west.

Except for a slight PID response of 0.4 ppm over the background vapor levels detected at 8.5 - 10 feet bgs, the soil samples recovered from boring MW-3 yielded no evidence of significant contamination. Soils on the Richard Forgues property were similar to those found at the MVAA site, consisting of a veneer of gravel over reworked glacial till.

The boring was completed with a monitoring well constructed with a 6 feet screen section extending from 4 ft to 10 ft below ground surface. Core barrel refusal at 10 feet prevented deeper extension of the monitoring well.

# MVAA TANK SITE INVESTIGATION AND GROUNDWATER QUALITY REPORT

## 2.4 Soil Boring/Monitoring Well MW-4

Soil boring MW-4 was sited at the southern end of the ambulance station building approximately 50 feet south-southeast of the tank site. This site was selected to screen for any contaminants that may be migrating off site in a southerly direction.

Soil core samples recovered from ground surface to a depth of 15 feet yielded no detectable PID vapors. Soils at this location appeared to have a higher percentage of silt and clays than those found in proximity of the tank site. The boring was completed with the installation of a monitoring well constructed with a screen section extending from 5 ft to 15 feet below ground surface.

## 3.0 GROUNDWATER QUALITY SAMPLING RESULTS

The monitoring well array was developed and sampled by Watershed Environmental Services (WES) on July 27, 1995. The results of the groundwater quality sampling are summarized in Table 2 (see Appendix 2, page 2). The individual laboratory report forms for the groundwater sample analyses are also included in Appendix 2.

All the water quality samples were collected in 40 ml VOA containers equipped with Teflon septa and stored in a cooler on ice until delivery to the laboratory. All samples were analyzed in the laboratory for purgeable aromatics (BTEX and MTBE) via EPA Method 8020 and for Total Petroleum Hydrocarbon (TPH) concentrations via modified EPA Method 8100.

### 3.1 Sampling Methodology and Procedures

Prior to sampling, the groundwater monitoring wells were developed with a peristaltic pump until the recovered groundwater was clear and sediment free. After development, the peristaltic pump was used to collect the record groundwater samples. Fresh neoprene tubing sections were used for each well development and sampling. A trip blank sample, consisting of a distilled water sample placed in a 40ml VOA vial, was prepared prior to the groundwater sampling and accompanied the samples until delivery to the laboratory. The trip blank sample was analyzed along with the groundwater samples by the laboratory as part of the sample handling QA/QC procedure. No contamination was detected in the trip blank sample (see Appendix 2, pages 8 and 14).

Monitoring well water level measurements were first taken on August 6, 1995. However, these measurements were discarded as they were considered to be inaccurate. There had been a heavy rain fall preceding the gauging event and it was later observed that the ambulance station's roof rain gutter discharges onto

## **MVAA TANK SITE INVESTIGATION AND GROUNDWATER QUALITY REPORT**

the recently disturbed ground of the former tank excavation site (formerly covered by asphalt) thus creating an abnormal high water table at this location. Later water level gauging on September 1, 1995, after a period of dry weather, yielded water level data believed to be more representative of the water levels at the site.

### **3.2 Field Measurements and Observations**

The results of the water level gauging are tabulated on the attached Table 3 (see Appendix 3, page 2). Depths to the water table at the site as measured on September 1, 1995 ranged from 6 feet at well MW-3 at the western margin of the site to 8.1 feet at MW-2 at the former tank site.

Contouring of the water table elevations calculated for the groundwater monitoring wells indicates that groundwater flow is predominantly to west at a gradient of approximately 3% to 4%. The water table contouring indicates that monitoring well MW-3 is in a good position to intercept any dissolved phase contaminants migrating from the tank site.

Inspection of groundwater removed during the well development operation found no evidence of free phase product or petroleum sheens in ground water at any of the four monitoring well sites. Subsequent checks during the water level gauging performed on September 1, 1995 also found no evidence of free phase product in any of the monitoring wells.

### **3.3 Groundwater Sampling Results**

The groundwater quality sampling of the four monitoring wells installed at the MVAA site found that the fuel oil released at the former heating oil storage tank site has not caused a significant impact to groundwater. The results of the EPA Method 8020 assay found no detectable concentrations of Benzene in groundwater at the tank site (MW-2) nor in either the up-gradient (MW-1) or down-gradient monitoring wells (MW-3 and MW-4). Low levels of Toluene (8.7 ppb), Xylene (4.5 ppb) and Ethylbenzene (trace levels) were detected in groundwater at the tank site, however these levels are all well below the VTDEC Preventative Action Limits for these compounds. Although low levels of Toluene were detected in down-gradient wells MW-3 (3.4 ppb) and MW-4 (2.1 ppb), a comparable concentration of Toluene (3.2 ppb) was detected in groundwater in the up-gradient monitoring well MW-1. None of the other BTEX constituents detected in groundwater at well MW-2, namely Ethylbenzene and Xylene, were detected in either of the down-gradient monitoring wells. These results indicate that it is likely that groundwater at the MVAA site has been impacted, albeit to a very slight degree, by the petroleum release at the neighboring Lackard Mobil site.

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However, it is also clear that contaminants from the fuel oil release at the MVAA tank site have contributed to the minor degradation of groundwater quality at the site.

The results of the EPA Method 8100 assays found no detectable concentrations of Total Petroleum Hydrocarbons (TPH) in groundwater at any of the four monitoring well locations. The absence of detectable concentrations of TPH in any of the groundwater samples is further proof that the fuel oil contamination at the MVAA tank site is largely confined to soils in the unsaturated horizon. The results of the EPA Method 8020 and EPA Method 8100 assays are summarized in Table 2 located in Appendix 2 (page 2).

### **4.0 SENSITIVE RECEPTOR SURVEY**

The survey of potential sensitive receptors performed during the tank removal on July 21, 1995 and again during the soil boring and groundwater sampling of July 27, 1995 found that the only sensitive receptors with a potential for impact as result of the fuel oil release at the MVAA site are soil, groundwater, and the adjoining ambulance station building.

PID screening and laboratory analysis confirmed that soils at the former underground storage tank site have been significantly impacted by fuel oil released during operation of the tank. However, soil borings at the periphery of the site indicate that the soil contamination is not laterally extensive. The exact limits of the soil contamination were not determined, but given the absence of free product and moderate PID vapor levels at the release site, it is unlikely that the contamination extends much beyond the limits of the former tank excavation. Based on the absence of PID vapors in the up-gradient and down-gradient monitoring wells it is unlikely that petroleum vapors at the tank site threaten neighboring properties.

The water quality sampling results indicate that groundwater at the site has not been significantly impacted by contamination from the tank release. Although low levels of BTEX compounds were detected in groundwater, all of the compounds detected were well below the VTDEC Preventative Action Limits. In any case, there are no private or public water supply wells in the immediate vicinity of the site; all of the dwelling and businesses in the area are on the municipal water system. The closest known well to the site is approximately 1000 feet to the northwest. The closest surface water body to the site is Otter Creek, located approximately 1500 feet to the west. Given the low levels of contamination detected at the MVAA site, both of these receptors are considered to have a low potential for impact.

## **MVAA TANK SITE INVESTIGATION AND GROUNDWATER QUALITY REPORT**

The adjoining MVAA ambulance station building is the one potentially sensitive receptor most likely to be impacted by petroleum vapors in soils at the tank site. The primary concern is the potential for inhalation and exposure to volatile organic compounds resulting from the migration of vapors into the ambulance station's basement through cracks or pore spaces in the concrete foundation. However, thorough PID screening of the structure on July 21 and again on July 27 yielded no detectable vapor concentrations in the building.

### **5.0 CONCLUSIONS**

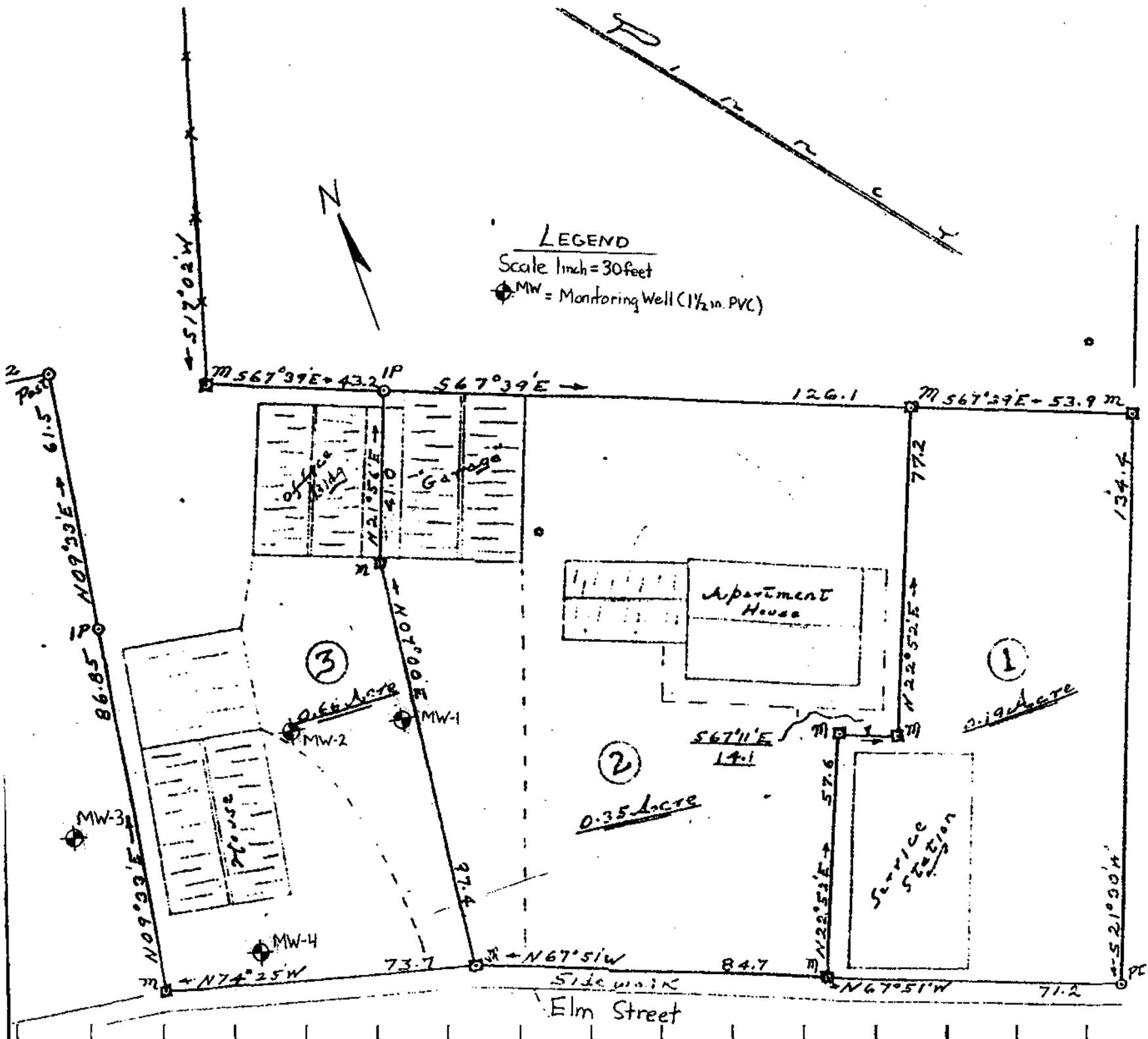
- PID vapor levels of up to 75 ppm and discolored soils were detected in the unsaturated zone in soil boring MW-2 drilled at the former location of the 2000 gallon no.2 heating oil tank at the Middlebury Volunteer Ambulance Association station property. However, laboratory analysis of soil and groundwater samples collected at this location indicate that the contamination is not extensive nor has it caused significant degradation of groundwater quality at the site. Despite the presence of moderately elevated PID vapor levels in soils at the tank site, the confirmatory laboratory assays found that the concentrations of individual contaminant constituents detected in the soils are below the VTDEC soil clean up standard of 20 times the Groundwater Enforcement Limit for the BTEX constituents.
- PID vapor screening and groundwater sampling at locations down-gradient of the tank site found no evidence of contaminant migration beyond the limits of the MVAA property.
- Although low levels of BTEX contaminants were detected in groundwater at the site, none of the individual contaminant constituents exceed the VTDEC Groundwater Quality Preventative Action Limits. The presence of low levels of Toluene at all the groundwater monitoring stations, including the up-gradient monitoring well, indicate that groundwater at the MVAA site has been impacted by an off site contaminant source. From the attitude of the water table, the neighboring Lackard Mobil site is the likely source of the Toluene contamination.
- The sensitive receptor survey of the site found that the adjoining ambulance station building is the only sensitive receptor exhibiting a potential for impact from vapors present in soils at the tank site although no evidence of vapor migration into the structure has been detected to date. Given that the fuel tank has been removed and no free phase product was detected at the site, it is unlikely that the structure will be significantly impacted in the future. However, to err on the side of caution, I recommend reconfiguring the existing groundwater monitoring well in the tank excavation (well MW-2) into a passive

## MVAA TANK SITE INVESTIGATION AND GROUNDWATER QUALITY REPORT

ventilation well as a means of lessening the potential for vapor migration into the adjoining basement and enhancing biologic degradation of the residual contamination. As noted in Section 3.1, the tank site now receives stormwater from the roof drain which should also accelerate contaminant attenuation.

- Given that the source of the fuel oil contamination detected at the tank site has been removed and that groundwater quality conditions at the tank site and perimeter monitoring stations are within the VTDEC Groundwater Quality Preventative Action Limits, I submit that aside from the recommendations given above, no other action is necessary at this site and recommend the site for closure.
- Lastly, as there is evidence that dissolved phase contamination is migrating from the Lackard Mobil site onto the MVAA property, I recommend that the VTDEC include MVAA monitoring well MW-1 as a sampling station in the ongoing groundwater monitoring program at the Lackard Mobil site. If the VTDEC concurs with this recommendation, MVAA would like to be copied on any correspondence between the VTDEC and Lackards Mobil that relates to off site soil and groundwater quality issues.





SITE PLAN  
 MVAA AMBULANCE STATION  
 Middlebury, Vermont  
 Watershed Environmental Services  
 P.O. Box 64947 Burlington, VT 05406

5 St. - H.S. Route No. 7

ADAMS ENGINEERING  
Gerard Adams  
RD #1, Box #3700, Underhill, VT 05489

July 28, 1995

Mr. Michael Sparks  
Watershed Environmental Services.

Well Logs: Middlebury Volunteer Ambulance Assoc.

Manways cemented in place; sampled with polyethylene (PE) lined 5' X 2.375" ID NQ sampler vibrated to depth, pulled & sample vibrated from casing in PE liner for examination; well with slip cap to create annulus & sandpack vibrated to depth in backfilled borehole left by sampler; bentonite slurry placed in open hole. Well developed with peristaltic pump using dedicated PE suction hose, slow recovery cloudy.

7/29/95 MW #1

SOILS WELL

- G Manway.
- 1' Top bentonite slurry.
- 1 > 5.0' Brown sand & gravel poor recovery cobble in tip.
- 2.0' Bottom Bentonite - top sand pack placed in open borehole.
- 3.0' Top well screen 2-5' X 1.5" X .010" slot Hi. Flo. screen, typ.
- 5.0 > 10.0' Spoil// (over) tan silt/clay few stones, more stones @ tip.
- 10 > 13.2' NQ refusal, silty sand 7 stones.
- 13.0' Bottom boring & well screen.

MW #2

- G Manway.
- 0 > -5.0' Brown sand & gravel backfill.
- 1' Top bentonite slurry.
- 3' Bottom Bentonite - top sand pack placed in open borehole.
- 5' Bottom sand pack top native gravelly collapsed soils.
- 5.0 > 10.0' Same over silt/clay few stones, caved in to -6.5'
- 5.3' Top well screen 2-5'.
- 10 > 14.1' Same//lt. gray silty sand & gravel.
- 14.1 > 16' Refusal, same.
- 15.3' Bottom boring & well screen, PVC point.

MW #3

- G Manway.
- 1' Top bentonite slurry.
- 1 > 5.0' Gravel fill//tan silt.
- 2.5' Bottom Bentonite - top sand pack placed in open borehole.
- 5.0 > 10.0' Same//silty sand & gravel.
- 6.0' Top well screen 2-5'.
- 10' Bottom sand pack top native soils.
- 10.0' Bottom boring & well screen.

MW #4

- G Manway.

- 0 > -4.9' Grass//top soil//tan silt/clay.
- 1' Top bentonite slurry.
- 2.8' Bottom Bentonite - top sand pack placed in open borehole.
- 4.8' Top well screen 2-5'.
- 14.8' Bottom boring, sand pack, & well screen.

Samples not logged.

G. Adams  
*G. Adams*

# SOIL BORING LOG

**MVAA TANK SITE INVESTIGATION  
MIDDLEBURY VOLUNTEER AMBULANCE ASSOCIATION  
19 ELM STREET  
MIDDLEBURY, VT**

Conducted on July 27, 1995  
Inspector: Mike Sparks, Hydrogeologist  
Driller: Adams Engineering, Inc.  
PID: H-Nu Systems PI-101 with 10.2 eV lamp

STATION MW-1		
Location: 25 ft east (up-gradient) of former fuel oil UST site		
Sample Interval	PID Reading	Sample Description
Surface	0.4 ppm (background)	Asphalt
0 - 1.0 ft	0.4 ppm	Auger spoils: asphalt over gravel
1.0 ft - 5.0 ft	0.5 ppm	Split-spoon: poor recovery; rock fragments and sand fill
5.0 ft - 10.0 ft	0.4 ppm	Split-spoon: Brown fine sandy reworked glacial till - silty with trace clay, abundant pebbles and stones; wet at 9 ft
10.0 ft - 15.0 ft	0.4 ppm	Split-spoon: Moist, brown fine sandy till (reworked) with some silt, trace clay and abundant pebbles, moderately compact Wet, brown coarse to medium coarse sand with some pebbles, moderately well sorted, moderately loose Wet, brown silty gravels with abundant stones and rocks
10.0 ft - 12.0 ft		
12.0 ft - 13.0 ft		
13.0 ft - 13.2 ft		
<b>Well Completion</b>		
1.5 inch sch. 40 PVC with F480 thread, flush-coupled		
10 ft section 0.010 screen		
Screen interval: 3.0 ft - 13.0 ft		
Sand pack: 2.0 ft - 13.0 ft.		
Bentonite seal: 1.0 ft - 2.0 ft		
Well protector: Steel, flush mount		

**SOIL BORING LOGS**

<b>STATION MW-2</b>		
<b>Location: Center of former fuel oil UST excavation at east side of ambulance station</b>		
<b>Sample Interval</b>	<b>PID Reading</b>	<b>Sample Description</b>
Surface	0.4 ppm (background)	New lawn and top soil
0 - 5.0 ft	15 ppm	Split-spoon: fill, sandy clay silt and gravels, dry slight fuel oil and gasoline odor
5.0 ft - 10.0 ft	75 ppm (5 - 8 ft) 20 ppm (8 - 9 ft) 1 ppm (9 - 10 ft)	Split-spoon: brown - medium gray reworked till, silty fine sands, trace clay, with abundant pebbles and stones, moist (wet at 9.5 ft)
10.0 ft - 15.0 ft	3 ppm 55 ppm 25 ppm	Split-spoon:
10.0 ft - 14.0 ft		Medium gray till, wet, no odor
14.0 ft - 15.0 ft		Blue gray till, compact, wet, slight fuel oil odor
15.0 ft - 20.0 ft		Split-spoon: Blue gray pebbly medium sand with trace silt, slight gasoline odor
<b>Well Completion</b>		
1.5 inch sch. 40 PVC with F480 thread, flush-coupled		
10 ft section 0.010 screen		
Screen interval: 5.0 ft - 15.0 ft		
Sand pack: 3.0 ft - 15.0 ft		
Bentonite seal: 1.0 ft - 3.0 ft		
Well protector: Steel, flush mount		

<b>STATION MW-3</b>		
<b>Location: edge of gravel drive 15 feet west of west side of ambulance station building</b>		
<b>Sample Interval</b>	<b>PID Reading</b>	<b>Sample Description</b>
Surface	0.6 ppm (background)	Gravel driveway
0 - 1.0 ft	0.6 ppm	Gravel fill
1.0 ft - 5.0 ft	0.6 ppm	Split-spoon: Dark brown silty clay loam, very compact over brown granular very fine sandy till with abundant pebbles and stones, compact, moist at 4 feet
5.0 ft - 10.0 ft	0.6 ppm 1.0 ppm	Split-spoon:
5.0 ft - 8.5 ft		Brown pebbly, silty very fine sand till, moist, no odor
8.5 ft - 10.0 ft		Brown clay silt till with abundant pebbles, wet, no odor
10.0 ft - 15.0 ft	0.6 ppm	Split-spoon: refusal at 10.2 feet
10.0 ft - 10.2 ft		Brown gravelly till, wet, compact, no odor
<b>Well Completion</b>		
1.5 inch sch. 40 PVC with F480 thread, flush-coupled		
6 ft section 0.010 screen		
Screen interval: 4.0 ft - 10.0 ft		
Sand pack: 2.5 ft - 10.0 ft		
Bentonite seal: 1.0 ft - 2.5 ft		
Well protector: Steel, flush mount		

**SOIL BORING LOGS**

<b>STATION MW-4</b>		
<b>Location: 12 feet south of south end of ambulance station building</b>		
<b>Sample Interval</b>	<b>PID Reading</b>	<b>Sample Description</b>
Surface	0.6 ppm (background)	Lawn
0 - 0.8 ft	0.6 ppm	Top soil, sandy loam
0.8 ft - 5.0 ft	0.6 ppm	Split-spoon: Brown clay silt and silty clay, some pebbles, dense, compact, dry, no odor
5.0 ft - 10.0 ft	0.6 ppm	Split-spoon: Brown silty clay and clay silts, compact, moderately dense, dry, no odor
5.0 ft - 8.5 ft		
8.5 ft - 10.0 ft		
10.0 ft - 15.0 ft	0.6 ppm	Split-spoon: Brown silty very fine sandy till with abundant pebbles and stones, moderately compact, moist
10.0 ft - 14.0 ft		
14.0 ft - 15.0 ft		
<b>Well Completion</b> 1.5 inch sch. 40 PVC with F480 thread, flush-coupled 10 ft section 0.010 screen Screen interval: 5.0 ft - 15.0 ft Sand pack: 2.7 ft - 15.0 ft Bentonite seal: 1.0 ft - 2.7 ft Well protector: Steel, flush mount		

**MVAA TANK SITE INVESTIGATION  
Middlebury, VT**

**TABLE 1  
SOIL BORING MW-2 SOIL SAMPLING RESULTS  
EPA METHOD 8020 COMPOUNDS - PURGEABLE AROMATICS  
JULY 27, 1995 SAMPLING EVENT**

PARAMETER	SAMPLE INTERVAL / CONCENTRATION	
	5 ft.- 8 ft.	15 ft.- 16 ft.
Benzene (ug/kg)	<1000	<200
Ethylbenzene (ug/kg)	>0<1000	<200
Toluene (ug/kg)	3130	<200
Xylene (ug/kg)	4380	<200
MTBE (ug/kg)	<10000	<2000
Total BTEX (ug/kg)	8510	<200

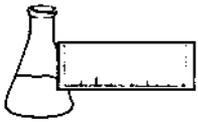
*mvaa-wat.xls sheet 3*

**MVAA TANK SITE INVESTIGATION**  
**Middlebury, VT**

**TABLE 2**  
**GROUNDWATER QUALITY SAMPLING RESULTS**  
**JULY 27, 1995 SAMPLING EVENT**

EPA Method 8020	PARAMETER	STATION / CONCENTRATION				
		MW-1	MW-2	MW-3	MW-4	Trip Blank
	Benzene (ug/L)	<1	<1	<1	<1	<1
	Ethylbenzene (ug/L)	<1	>0<1	<1	<1	<1
	Toluene (ug/L)	3.2	8.7	3.4	2.1	<1
	Xylene (ug/L)	<1	4.5	<1	<1	<1
	MTBE (ug/L)	<10	<10	<10	<10	<10
	Total BTEX (ug/L)	3.2	13.2	3.4	2.1	<1
<b>TPH via EPA Method 8100</b>	<b>TPH (mg/L)</b>	<1	<1	<1	<1	<1

*mvaa-wat.xls sheet 2*



**ENDYNE, INC.**

Laboratory Services

32 James Brown Drive  
Williston, Vermont 05495  
(802) 879-4333  
FAX 879-7103

**REPORT OF LABORATORY ANALYSIS**

**CLIENT:** Watershed Environmental Services  
**PROJECT NAME:** MVAA-Middlebury  
**REPORT DATE:** August 9, 1995  
**DATE SAMPLED:** July 27, 1995

**PROJECT CODE:** WSES1634  
**REF.#:** 77,705 - 77,711

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. Chain of custody indicated water samples were preserved with HCl.

All samples were prepared and analyzed by requirements outlined in the referenced method and within the specified holding times. All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced method. Blank contamination was not observed at levels affecting the analytical results.

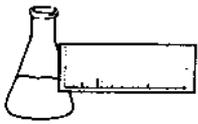
Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate recovery data was determined to be within laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.  
Laboratory Director

enclosures



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**LABORATORY REPORT**

**EPA METHOD 8020--PURGEABLE AROMATICS**

CLIENT: Watershed Environmental Services  
PROJECT NAME: MVAA-Middlebury  
REPORT DATE: August 9, 1995  
DATE SAMPLED: July 27, 1995  
DATE RECEIVED: July 28, 1995  
DATE ANALYZED: August 3, 1995

PROJECT CODE: WSES1634  
REF.#: 77,705  
STATION: MW-1  
TIME SAMPLED: 10:45 a.m.  
SAMPLER: Mike Sparks

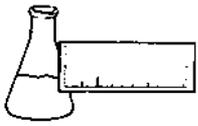
<u>Parameter</u>	<u>Detection Limit (ug/L)</u>	<u>Concentration (ug/L)</u>
Benzene	1	ND <sup>1</sup>
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	ND
Toluene	1	3.2
Xylenes	1	ND
MTBE	10	ND

Bromobenzene Surrogate Recovery: 103%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

**NOTES:**

1 None detected



LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: Watershed Environmental Services  
PROJECT NAME: MVAA-Middlebury  
REPORT DATE: August 9, 1995  
DATE SAMPLED: July 27, 1995  
DATE RECEIVED: July 28, 1995  
DATE ANALYZED: August 4, 1995

PROJECT CODE: WSES1634  
REF.#: 77,706  
STATION: MW-2  
TIME SAMPLED: 3:45 p.m.  
SAMPLER: Mike Sparks

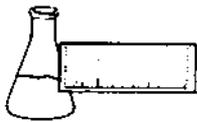
<u>Parameter</u>	<u>Detection Limit (ug/L)</u>	<u>Concentration (ug/L)</u>
Benzene	1	ND <sup>1</sup>
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	TBQ <sup>2</sup>
Toluene	1	8.7
Xylenes	1	4.5
MTBE	10	ND

Bromobenzene Surrogate Recovery: 89%

NUMBER OF UNIDENTIFIED PEAKS FOUND: >10

NOTES:

- 1 None detected
- 2 Trace below quantitation limit



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LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: Watershed Environmental Services  
PROJECT NAME: MVAA-Middlebury  
REPORT DATE: August 9, 1995  
DATE SAMPLED: July 27, 1995  
DATE RECEIVED: July 28, 1995  
DATE ANALYZED: August 3, 1995

PROJECT CODE: WSES1634  
REF.#: 77,707  
STATION: MW-3  
TIME SAMPLED: 6:00 p.m.  
SAMPLER: Mike Sparks

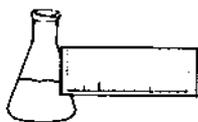
<u>Parameter</u>	<u>Detection Limit (ug/L)</u>	<u>Concentration (ug/L)</u>
Benzene	1	ND <sup>1</sup>
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	ND
Toluene	1	3.4
Xylenes	1	ND
MTBE	10	ND

Bromobenzene Surrogate Recovery: 113%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 None detected



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LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: Watershed Environmental Services  
PROJECT NAME: MVAA-Middlebury  
REPORT DATE: August 9, 1995  
DATE SAMPLED: July 27, 1995  
DATE RECEIVED: July 28, 1995  
DATE ANALYZED: August 3, 1995

PROJECT CODE: WSES1634  
REF.#: 77,708  
STATION: MW-4  
TIME SAMPLED: 7:00 p.m.  
SAMPLER: Mike Sparks

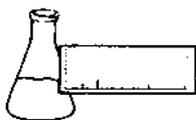
<u>Parameter</u>	<u>Detection Limit (ug/L)</u>	<u>Concentration (ug/L)</u>
Benzene	1	ND <sup>1</sup>
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	ND
Toluene	1	2.1
Xylenes	1	ND
MTBE	10	ND

Bromobenzene Surrogate Recovery: 96%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 None detected



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LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: Watershed Environmental Services  
PROJECT NAME: MVAA-Middlebury  
REPORT DATE: August 9, 1995  
DATE SAMPLED: July 27, 1995  
DATE RECEIVED: July 28, 1995  
DATE ANALYZED: August 4, 1995

PROJECT CODE: WSES1634  
REF.#: 77,709  
STATION: Trip Blank  
TIME SAMPLED: 10:00 a.m.  
SAMPLER: Mike Sparks

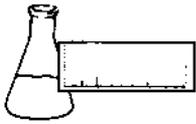
<u>Parameter</u>	<u>Detection Limit (ug/L)</u>	<u>Concentration (ug/L)</u>
Benzene	1	ND <sup>1</sup>
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	ND
Toluene	1	ND
Xylenes	1	ND
MTBE	10	ND

Bromobenzene Surrogate Recovery: 105%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 None detected



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LABORATORY REPORT

EPA METHOD 8020 COMPOUNDS -- PURGEABLE AROMATICS

CLIENT: Watershed Environment Services  
PROJECT NAME: MVAA-Middlebury  
REPORT DATE: August 15, 1995  
SAMPLER: Mike Sparks  
DATE SAMPLED: July 27, 1995  
DATE RECEIVED: July 28, 1995

PROJECT CODE: WSES1634  
ANALYSIS DATE: August 3, 1995  
STATION: MW-2 5'-8'  
REF.#: 77,710  
TIME SAMPLED: 12:45 p.m.

<u>Parameter</u>	<u>Detection Limit (ug/kg)</u>	<u>Concentration As Received (ug/kg)</u>
Benzene	1,000	ND <sup>1</sup>
Chlorobenzene	1,000	ND
1,2-Dichlorobenzene	1,000	ND
1,3-Dichlorobenzene	1,000	ND
1,4-Dichlorobenzene	1,000	ND
Ethylbenzene	1,000	TBQ
Toluene	1,000	3,130.
Total Xylenes	1,000	4,380.
MTBE	10,000	ND

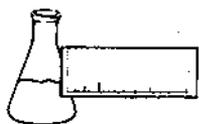
NUMBER OF UNIDENTIFIED PEAKS FOUND: >10

BROMOBENZENE SURROGATE RECOVERY: 104.%

PERCENT SOLIDS: 90.%

NOTES:

1 None detected



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LABORATORY REPORT

EPA METHOD 8020 COMPOUNDS -- PURGEABLE AROMATICS

CLIENT: Watershed Environment Services  
PROJECT NAME: MVAA-Middlebury  
REPORT DATE: August 15, 1995  
SAMPLER: Mike Sparks  
DATE SAMPLED: July 27, 1995  
DATE RECEIVED: July 28, 1995

PROJECT CODE: WSES1634  
ANALYSIS DATE: August 3, 1995  
STATION: MW-2 15'-16'  
REF.#: 77,711  
TIME SAMPLED: 12:45 p.m.

<u>Parameter</u>	<u>Detection Limit (ug/kg)</u>	<u>Concentration As Received (ug/kg)</u>
Benzene	200	ND <sup>1</sup>
Chlorobenzene	200	ND
1,2-Dichlorobenzene	200	ND
1,3-Dichlorobenzene	200	ND
1,4-Dichlorobenzene	200	ND
Ethylbenzene	200	ND
Toluene	200	ND
Total Xylenes	200	ND
MTBE	2,000	ND

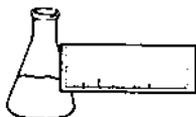
NUMBER OF UNIDENTIFIED PEAKS FOUND: >10

BROMOBENZENE SURROGATE RECOVERY: 102.%

PERCENT SOLIDS: 91.%

NOTES:

1 None detected



EPA METHOD 8020 LABORATORY REPORT

MATRIX SPIKE AND DUPLICATE LABORATORY CONTROL DATA

CLIENT: Watershed Environmental Services  
PROJECT NAME: MVAA-Middlebury  
REPORT DATE: August 9, 1995  
DATE SAMPLED: July 27, 1995  
DATE RECEIVED: July 28, 1995  
DATE ANALYZED: August 3, 1995

PROJECT CODE: WSES1634  
REF.#: 77,705  
STATION: MW-1  
TIME SAMPLED: 10:45 a.m.  
SAMPLER: Mike Sparks

<u>Parameter</u>	<u>Sample(ug/L)</u>	<u>Spike(ug/L)</u>	<u>Dup1(ug/L)</u>	<u>Dup2(ug/L)</u>	<u>Avg % Rec</u>
Benzene	ND <sup>1</sup>	10	9.3	9.3	93%
Toluene	3.2	10	11.5	11.3	82%
Ethylbenzene	ND	10	8.6	8.4	85%
Xylenes	ND	30	25.0	24.5	82%

NOTES:

1 None detected



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**CHAIN-OF-CUSTODY RECORD**

15006

77705 - 77716

Project Name: <i>MVAA - Middlebury</i> Site Location: <i>Middlebury, VT</i>	Reporting Address: <i>Watershed Env. Svc. P.O. Box 6497 Rutland, VT 05406</i>	Billing Address: <i>Same</i>
Endyne Project Number: <i>WSES/634</i>	Company: <i>Watershed Env. Svc.</i> Contact Name/Phone #: <i>Mike Sparks 860-7385</i>	Sampler Name: <i>Mike Sparks</i> Phone #: <i>860-7385</i>

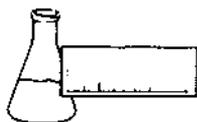
Lab #	Sample Location	Matrix	G R A B	C O M P	Date/Time	Sample Containers		Field Results/Remarks	Analysis Required	Sample Preservation	Rush
						No.	Type/Size				
77705	MW-1	Water			7/27/95 10:45a	2	40ml VCM		8020 TPH via 8100	HCl	No
77706	MW-2				3:45 p						
77707	MW-3				6 pm						
77708	MW-4				7 pm						
77709	Trip Blank				10am						
77710	MW-2 5'-8'	Soil		✓	12:15pm	1	250ml amber		8020	No	No
77711	MW-2 15'-16'	↓		✓	12:15pm	1	glass		8020		

Relinquished by: Signature <i>Mike Sparks</i>	Received by: Signature <i>Rosee Bean</i>	Date/Time <i>7/28/95 4:50 P.M.</i>
Relinquished by: Signature	Received by: Signature	Date/Time

New York State Project: Yes \_\_\_ No

**Requested Analyses**

1	pH	6	TKN	11	Total Solids	16	Metals (Specify)	21	EPA 624	26	EPA 8270 B/N or Acid
2	Chloride	7	Total P	12	TSS	17	Coliform (Specify)	22	EPA 625 B/N or A	27	EPA 8010/8020
3	Ammonia N	8	Total Diss. P	13	TDS	18	COD	23	EPA 418.1	28	EPA 8080 Pest/PCB
4	Nitrite N	9	BOD <sub>5</sub>	14	Turbidity	19	BTEX	24	EPA 608 Pest/PCB		
5	Nitrate N	10	Alkalinity	15	Conductivity	20	EPA 601/602	25	EPA 8240		
29	TCLP (Specify: volatiles, semi-volatiles, metals, pesticides, herbicides)										
30	Other (Specify):										



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**REPORT OF LABORATORY ANALYSIS**

**CLIENT:** Watershed Environmental Services  
**PROJECT NAME:** MVAA-Middlebury  
**DATE REPORTED:** August 23, 1995  
**DATE SAMPLED:** July 27, 1995

**PROJECT CODE:** WSES1635  
**REF. #:** 77,712-77,716

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody record.

Chain of custody indicated sample preservation with HCl.

All samples were prepared and analyzed by requirements outlined in the referenced methods and within the specified holding times.

All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced methods.

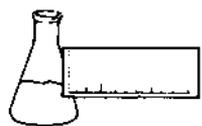
Blank contamination was not observed at levels affecting the analytical results.

Analytical method precision and accuracy were monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Reviewed by,

for  
**Harry B. Locker, Ph.D.**  
Laboratory Director

enclosures



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**LABORATORY REPORT**

**TOTAL PETROLEUM HYDROCARBONS (TPH) BY MODIFIED EPA METHOD 8100**

DATE: August 23, 1995  
CLIENT: Watershed Environmental Services  
PROJECT: MVAA-Middlebury  
PROJECT CODE: WSES1635  
COLLECTED BY: Mike Sparks  
DATE SAMPLED: July 27, 1995  
DATE RECEIVED: July 28, 1995

<u>Reference #</u>	<u>Sample ID</u>	<u>Concentration (mg/L)<sup>1</sup></u>
77,712	MW-1; 10:45 a.m.	ND <sup>2</sup>
77,713	MW-2; 3:45 p.m.	ND
77,714	MW-3; 6:00 p.m.	ND
77,715	MW-4; 7:00 p.m.	ND
77,716	Trip Blank; 10:00 a.m.	ND

**Notes:**

- 1 Method detection limit is 1.0 mg/L.
- 2 None detected.

CHAIN-OF-CUSTODY RECORD

15006

Project Name: <i>MVAA - Middlebury</i> Site Location: <i>Middlebury, VT</i>	Reporting Address: <i>Watershed Env. Svc. PO Box 64947 Burlington, VT 05406</i>	Billing Address: <i>Same</i>
Endyne Project Number: <i>WBS/1635</i>	Company: <i>Watershed Env. Svc.</i> Contact Name/Phone #: <i>Mike Sparks 860-7385</i>	Sampler Name: <i>Mike Sparks</i> Phone #: <i>860-7385</i>

Lab #	Sample Location	Matrix	G R A B	C O M P	Date/Time	Sample Containers		Field Results/Remarks	Analysis Required	Sample Preservation	Rush
						No.	Type/Size				
<i>77.712</i>	<i>MW-1</i>	<i>Water</i>			<i>7/27/95</i> <i>10:45 a</i>	<i>2</i>	<i>40 mL UM</i>		<i>8020</i> <i>TPH via 8100</i>	<i>HCl</i>	<i>No</i>
<i>77.713</i>	<i>MW-2</i>				<i>3:45 p</i>						
<i>77.714</i>	<i>MW-3</i>				<i>6 pm</i>						
<i>77.715</i>	<i>MW-4</i>				<i>7 pm</i>						
<i>77.716</i>	<i>Trip Blank</i>				<i>10am</i>						
	<i>MW-2 5'-8'</i>	<i>Soil</i>		<input checked="" type="checkbox"/>	<i>12:15pm</i>	<i>1</i>	<i>250 mL amber</i>		<i>8020</i>	<i>No</i>	<i>No</i>
	<i>MW-2 15'-16'</i>	<i>↓</i>		<input checked="" type="checkbox"/>	<i>12:15pm</i>	<i>1</i>	<i>glass</i>		<i>8020</i>	<i>1</i>	<i>1</i>

Relinquished by: Signature <i>[Signature]</i>	Received by: Signature <i>[Signature]</i>	Date/Time <i>7/28/95 4:50 P.M.</i>
Relinquished by: Signature	Received by: Signature	Date/Time

New York State Project: Yes \_\_\_ No

Requested Analyses

1	pH	6	TKN	11	Total Solids	16	Metals (Specify)	21	EPA 624	26	EPA 8270 B/N or Acid
2	Chloride	7	Total P	12	TSS	17	Coliform (Specify)	22	EPA 625 B/N or A	27	EPA 8010/8020
3	Ammonia N	8	Total Diss. P	13	TDS	18	COD	23	EPA 418.1	28	EPA 8080 Pest/PCB
4	Nitrite N	9	BOD <sub>5</sub>	14	Turbidity	19	BTEX	24	EPA 608 Pest/PCB		
5	Nitrate N	10	Alkalinity	15	Conductivity	20	EPA 601/602	25	EPA 8240		
29	TCLP (Specify: volatiles, semi-volatiles, metals, pesticides, herbicides)										
30	Other (Specify):										

**MVAA TANK SITE INVESTIGATION**  
**Middlebury, VT**

**TABLE 3**  
**MONITORING WATER LEVEL MEASUREMENTS**  
**AS MEASURED ON SEPTEMBER 1, 1995**

STATION	TOC ELEVATION	WATER LEVEL	WATER ELEVATION
MW-1	98.11	8.01	90.1
MW-2	98.12	8.14	89.98
MW-3	93.72	6.04	87.68
MW-4	96.31	6.4	89.91

*Note: Benchmark elevation 100 ft.*

All measurements in decimal feet below top of casing (TOC)

*mvaa-wat.xls sheet 1*

