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28 August, 1998

Mr. Matthew Moran
Department of Environmental Conservation
Waste Management Division
103 South Main Street, West Building
Waterbury, Vermont 05671-0404

Re: *Initial Site Investigation Report, Wolcott Store Property, Wolcott VT (SMS Site # 93-1475)*

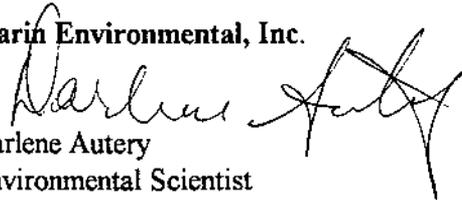
Dear Mr. Moran:

Enclosed please find the completed report for the Initial Site Investigation at the above-referenced property.

Please call me at (802)655-0011 if you have any questions or comments regarding this report.

Sincerely,

Marin Environmental, Inc.


Darlene Autery
Environmental Scientist

cc: Mr. Gene Pushee, Bradford Oil Co. (previously transmitted report)
Mr. and Mrs. Fred Martin

ref: 98026C02.doc

WASTE MANAGEMENT
DIVISION

OCT 2 10 14 AM '98



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INITIAL SITE INVESTIGATION REPORT

WOLCOTT STORE
SMS SITE # 93-1475
Vermont Route 15
Wolcott, VT

25 August, 1998

Prepared for:

Bradford Oil Company
P.O. Box 394
Bradford, Vermont 05033

Contact: Mr. Eugene Pushee
Phone: 802-255-0860

Prepared by:

Marin Environmental, Inc.
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Marin Project #: VT980026
Marin Document #: 98026RO1.doc

WASTE MANAGEMENT
DIVISION

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TABLE OF CONTENTS

EXECUTIVE SUMMARY		<u>Page</u>
		<i>i</i>
1.0	INTRODUCTION	1
	1.1 Site Location and Physical Setting	1
	1.2 Site History	1
	1.3 Objectives and Scope of Work	2
2.0	INVESTIGATIVE PROCEDURES AND RESULTS	3
	2.1 Monitoring Well Installation	3
	2.2 Soil-Screening Results	4
	2.3 Determination of Ground-Water Flow Direction and Gradient	4
	2.4 Ground-Water Sampling and Analysis	5
	2.5 Soil Stockpile Monitoring	7
3.0	SENSITIVE RECEPTOR SURVEY AND RISK ASSESSMENT	8
	3.1 Sensitive Receptor Survey	8
	3.2 Risk Assessment	8
4.0	CONCLUSIONS	10
5.0	RECOMMENDATIONS	11
6.0	REFERENCES	12

Tables	Table 1	Ground-Water Elevation Calculations
	Table 2	Summary of VOC Analytical Results
	Table 3	Soil Stockpile Screening Results

APPENDIX A:

Figures	Figure 1	Site Location Map
	Figure 2	Site Map
	Figure 3	Ground-Water Contour Map
	Figure 4	Contaminant Distribution Map - BTEX
	Figure 5	Contaminant Distribution Map - MTBE

APPENDIX B: Well Construction Logs

APPENDIX C: Laboratory Report Forms

EXECUTIVE SUMMARY

Marin Environmental, Inc. (Marin) has conducted an initial site investigation at the Wolcott Store, in Wolcott, Vermont and has concluded the following:

- Petroleum releases from former underground storage tank (UST) systems at the site appear to have resulted in an impact to the overburden and shallow bedrock ground water in the vicinity of the former UST systems.
- The distribution of dissolved-phase petroleum in ground water suggests that the former gasoline USTs, diesel UST, and pump island locations are sources of contamination.
- Adsorbed-phase soil contamination in the vicinity of the former USTs and pump island may represent a continuing source of ground-water contamination.
- Gasoline compounds were detected at levels above Vermont Groundwater Enforcement Standards (VGESs) in all three on-site monitoring wells.
- The downgradient extent of petroleum contamination has not been defined.
- The gasoline additive, methyl-tertiary butyl ether (MTBE), was detected in all three on-site monitoring wells and the on-site supply well. The presence of MTBE in ground water beneath the site suggests that gasoline was released after 1980.
- MTBE was detected at 2.5 ppb in the on-site drinking-water supply well. This bedrock well, which is approximately 140 feet deep, is located 70 feet southeast (downgradient) of the former diesel UST and 60 feet southwest (cross-gradient) of the former gasoline USTs.
- A bedrock water supply well located on the abutting property to the west may be threatened by on-site contamination due to its proximity to the site and the nature of groundwater flow along bedrock fractures.
- Based on visual observations, no evidence of contamination was noted in the Lamoille River, located approximately 100 feet south (downgradient) of the former USTs; although, the highest contaminant concentrations in ground water were observed in MW-3, located within 40 feet of the river.
- The highest PID readings were measured at the bottom of each soil boring, which were apparently terminated on bedrock.
- There were no positive background PID readings in the first floor of the store; however, PID readings of 0.1 ppm to 0.4 ppm were noted in the store's basement.
- PID measurements of the soil stockpile, located at R.R. Godfrey's pit in Hardwick, averaged 8.4 ppm. The polyethylene cover of the soil stockpile is in very poor condition.

EXECUTIVE SUMMARY

On the basis of the results of this investigation, **Marin** recommends that further work be performed to determine the extent of the residual contamination and the risk posed to sensitive receptors.

1. Notify the on-site well users of the low level MTBE contamination detected in the on-site bedrock supply well.
2. Resample the on-site supply well and sample the abutters supply well, and analyze the samples for gasoline volatile organic compounds (VOCs) by EPA Method 8021B.
3. Obtain well completion reports for all supply wells within 1,000 feet of the site. Evaluate the susceptibility of each well and assess the potential risk.
4. Install three additional overburden soil borings/monitoring wells, one upgradient and two downgradient, to more adequately define the extent of the dissolved-phase gasoline plume in the shallow overburden aquifer.
5. Install at least one shallow bedrock monitoring well to evaluate the possible impacts to the underlying bedrock formation.
6. Sample the existing and newly installed monitoring wells, and analyze the samples for gasoline VOCs by EPA Method 8021B and polynuclear aromatic hydrocarbons (PAHs) by EPA method 8100.
7. Install two piezometers along the northern stream bank of the Lamoille River as a means of obtaining water table measurements and groundwater samples. Water level measurements should be obtained to determine if the river is a contributing source to the groundwater aquifer or if it is being replenished by the local aquifer. Groundwater samples should be collected for analysis of gasoline VOCs by EPA Method 8021B and PAHs by EPA method 8100.
8. Monitor the off-site soil stockpile in May, 1999 to confirm that the petroleum concentrations are declining.
9. Replace the soil stockpile cover, during the next site visit.
10. Using a PID, monitor the ambient air quality of the on-site basement, and abutters' basements for the possible presence of VOCs.
11. Upon completion of the work described above, evaluate the appropriateness of long-term monitoring or active remediation of the site.
12. Complete a report summarizing the findings of the additional work outlined above, including time-series graphs for water-quality analytical results from each location and figures showing contaminant distribution

1.0 INTRODUCTION

This report details the results of an initial site investigation conducted at the Wolcott Store property located in Wolcott, Vermont (Figure 1, Appendix A). This report has been prepared by Marin Environmental, Inc. (Marin) under the direction of Bradford Oil, owner of the three former underground storage tanks (USTs) at the site. The site investigation was initiated, at the Vermont Department of Environmental Conservation (VT DEC) request for additional work, following the discovery of subsurface petroleum contamination encountered during the removal of three USTs on 10 September 1993.

1.1 Site Location and Physical Setting

The Wolcott Store Property, located on the west side of Route 15 in Wolcott ($44^{\circ} 32' 50''$ N / $72^{\circ} 27' 44''$ W), is occupied by a two-story, wood-framed structure, which currently serves as a convenient store and retail gasoline station with residential apartments on the second floor (Figure 2, Appendix A). The majority of the site, including the former UST locations, is paved. The ground surface is generally flat with an average elevation of about 700 feet above mean sea level (amsl). The Lamoille River, which borders the site on the south, is located approximately 100 feet south of the former USTs (USGS 1986).

Drinking water for the store and apartments is provided by a drilled bedrock well approximately 140 feet deep. Drinking water for the private residence abutting the site to the west is also provided by a bedrock well. A storage warehouse of Buck's Furniture Complex abuts the site to the east. Domestic wastewater disposal for the site and surrounding properties is provided by individual on-site septic systems. The site's wastewater disposal system is located between the store and the Lamoille River.

Native surficial materials in the vicinity of the Wolcott Store property are mapped as fluvial sands and gravel (Stewart and MacClintock, 1970). Bedrock in the area is mapped as the Moretown Member of the Missisquoi Formation, which is composed primarily of quartzite and quartz plagioclase granulite of Ordovician age (Doll, 1961). Bedrock outcrops were observed on the north side of Route 15, directly opposite of the site.

1.2 Site History

The property was purchased by Fred and Sally Martin from Donald and Ethel Williams in 1983. According to Mrs. Martin, the site has been used as a retail gasoline station since the 1920's.

Automotive servicing has also been performed at the site in the on-site garage, which currently serves as storage.

Evidence of a petroleum release was discovered during the removal of two 4,000-gallon gasoline USTs and a 1,000 gallon diesel UST on 22 September 1993. The three USTs were located on the north side of the Wolcott Store building in two separate areas as shown on Figure 2, Appendix A. A UST closure assessment conducted at the site by Bradford Oil indicated that the removed USTs and associated piping appeared to be in good condition at the time of removal, although residual contamination was present.

Soil screening performed by Bradford Oil, with a portable photoionization detector (PID), and soil samples submitted for laboratory analysis indicated that elevated contaminant concentrations were present in the vicinity of the diesel UST and the gasoline USTs. PID readings of soil samples collected from the area of the diesel tank ranged from 80 to 230 parts per million (ppm). PID readings of more than 10 ppm for diesel-contaminated soil are considered indicative of significant contamination requiring further investigation. Peak PID readings taken from the gasoline UST excavation measured 150 ppm. Approximately 300 cubic yards of contaminated soils were subsequently excavated and transported off-site to R.R. Godfrey's pit in Hardwick for treatment by polyencapsulation.

The VT DEC requested further investigation at the Wolcott Store site in order to evaluate the degree and extent of soil and ground-water contamination, and the risks posed by any identified contamination to sensitive receptors such as streams, drinking-water supplies, and building indoor air quality. As such, Marin began an initial site investigation at the request of Bradford Oil Company.

1.3 Objectives and Scope of Work

The objectives of this initial site investigation were to:

- Evaluate the degree and extent of petroleum contamination in soil and ground water;
- Qualitatively assess the risks to environmental and public health via relevant sensitive receptors and potential contaminant migration pathways;
- Assess the condition of the soil stockpile generated during the removal of three USTs from the site; and,
- Identify potentially appropriate monitoring and/or remedial actions based on the site conditions.

To accomplish these objectives, **Marin** has:

- Supervised the installation of three ground water monitoring wells, to evaluate the degree and extent of petroleum contamination, and the local ground-water flow direction.
- Collected and submitted ground-water samples from the three on-site monitoring wells, and an on-site supply well for laboratory analysis of volatile petroleum compounds and total petroleum hydrocarbons.
- Identified sensitive receptors in the area, and assessed the risk posed by the contamination to these potential receptors.
- Assessed the condition of the soil stockpile cover and screened the stockpile for the continued presence or absence of volatile organic compounds.
- Prepared this summary report, which details the work performed, qualitatively assesses risks, provides conclusions and offers recommendations for further action.

2.0 INVESTIGATIVE PROCEDURES AND RESULTS

2.1 Monitoring Well Installation

On 15 May 1998, **Marin** supervised the installation of three monitoring wells (MW-1, MW-2, and MW-3), to evaluate the degree and extent of petroleum contamination, and the local ground-water flow direction. MW-1 was installed 25 feet north of the former 1,000-gallon diesel tank location. MW-2 was installed on the east side of the store; 90 feet south (hydrologically downgradient) of the former diesel tank location and 40 feet south of the former gasoline tanks. MW-3 was installed about 80 feet south (downgradient) of the former diesel tank and 20 feet west of the on-site water supply. Approximate monitoring well locations and site features are shown on Figure 2, Appendix A.

Soils encountered in the borings consisted of sands and silty-sands. Each boring encountered refusal presumably on top of bedrock, at depths between 12.5 and 18 feet bgs. Ground water was encountered in each boring ranging from 8 feet bgs in the furthest upgradient well (MW-1) to 15.5 feet bgs in the downgradient well, (MW-2). Slight petroleum odors were detected in MW-2. Strong diesel odors were detected in MW-1 at approximately 8 feet bgs. Petroleum odors increased with depth in MW-3 starting from about 11 feet bgs.

The monitoring wells were installed by Adams Engineering of Underhill, Vermont using vibratory drilling techniques. Continuous soil samples were collected using a five-foot polyethylene-lined core barrel with a 2.375-inch inner diameter and 4.0 inch outer diameter. The soil samples were screened for

the possible presence of volatile organic compounds (VOCs) with a photoionization detector (PID) and logged for lithology by a Marin geologist. All down-hole drilling and sampling equipment was decontaminated during use as appropriate.

Monitoring wells were installed in soil borings by vibrating a 1.5-inch diameter PVC well point into the open hole left by the core barrel. A 10 foot section of 0.010-inch slot high-flow screen was placed such that approximately five feet of screen extended above the apparent water table. Solid 1.5-inch diameter PVC riser extended from the top of screen to approximately 0.5 feet bgs. Clean quartz #1 filter sand was placed in the annulus around the well to at least one foot above the top of the screened interval. A bentonite seal, approximately 1.0 foot thick, was set above the sand pack and the remainder of the annular space was backfilled with native material. Each completed monitoring well was protected by a flush-mounted steel roadbox cemented into place. Each well casing was topped with a water-tight compression cap. Monitoring wells were developed by means of a peristaltic pump after installation. Monitoring-well construction details are included on the soil-boring and well-construction logs in Appendix B.

2.2 Soil-Screening Results

The highest PID readings obtained during the soil boring program were observed in samples collected at the bottom of each boring; 147 parts per million (ppm) at 16 feet bgs in MW-3, 6.2 ppm at 12.5 bgs in MW-1, and 2.7 ppm at 18 feet bgs in MW-2. PID readings on soil samples collected within the upper 12 feet of each boring were 0.0 ppm. The presence of the highest PID readings at the bottom of each boring, which all apparently terminated on top of bedrock, suggests petroleum contamination may extend into the underlying bedrock. Soil screening results are summarized on each of the boring logs provided in Appendix B.

Marin field personnel screened soil samples from each boring for the possible presence of volatile organic compounds (VOCs) using a PE PhotoVac Model 2020 portable photoionization detector (PID). The PID was field calibrated on the same day as soil boring with an isobutylene standard gas to a benzene reference.

2.3 Determination of Ground-Water Flow Direction and Gradient

Ground water in the unconfined surficial aquifer directly beneath the site appears to be flowing in a southeasterly direction, toward the Lamoille River. The average gradient of the local ground-water table

on 26 May 1998 was about five percent. Water-level measurements and elevation calculations for 26 May 1998 are presented in Table 1. The ground-water contour map in Figure 3 was prepared using this data.

The sand deposits comprising the shallow soil aquifer at the site typically exhibit effective porosities of about 0.3 to 0.4 and hydraulic conductivities of about 1.3 to 134 feet per day (Driscoll, 1986). Assuming Darcian flow, these estimates combine with the calculated ground-water gradient of five percent to yield an estimated range of ground-water flow velocities in the surficial aquifer of between 0.19 to 19 feet per day.

TABLE 1. Ground-Water Elevation Data
Monitoring Date: 26 May 1998

Well I. D.	Top of Casing Elevation *	Depth to Water (feet, bgs)	Ground Water Elevation
MW-1	99.09	8.24	90.85
MW-2	100.00	15.45	84.55
MW-3	99.63	12.06	87.57

*Top of casing (TOC) and ground water elevations are relative to an arbitrary site datum of 100.00 feet

2.4 Ground-Water Sampling and Analysis

Contaminant distribution suggests that the former diesel UST is the primary source area, but that the former pump island and former gasoline USTs may also be contributing to petroleum contamination observed on site. Current information also indicates that the downgradient extent of contamination has not been identified and that the on-site bedrock supply well has been impacted by a gasoline release.

The Vermont Groundwater Enforcement Standard (VGES)¹ for benzene was exceeded in the samples collected from MW-1 (26.6 parts per billion - ppb) and MW-3 (33.5 ppb). The highest methyl-tertiary butyl ether (MTBE) concentrations, which exceed the corresponding VGES, were detected in samples collected from MW-2 (536 ppb) and MW-3 (109 ppb). Low levels of MTBE were also detected in MW-1 (8.2 ppb) and the on-site water supply (2.5 ppb).

¹ The Vermont DEC has established Groundwater Enforcement Standards (VGESs) for five petroleum related VOCs as follows: benzene - 5 ppb; toluene - 1,000 ppb; ethylbenzene - 700 ppb; xylenes - 10,000 ppb; and MTBE, a gasoline additive - 40 ppb.

The highest total BTEX (benzene, toluene, ethylbenzene, and xylenes) concentrations were detected in the samples collected from MW-1 and MW-3 at 109.2 and 164.3 ppb, respectively. No BTEX compounds were detected in MW-2 or the on-site water supply. Total petroleum hydrocarbons (TPH) were detected in the samples collected from MW-1 and MW-3 at 0.66 and 1.01 parts per million (ppm), respectively. TPH was not detected in the on-site supply well or the MW-2 samples.

Laboratory report forms are included in Appendix C. Ground-water analytical results are summarized below in Table 2. Contamination contours which were determined using these data, are presented on the Contaminant Distribution Maps provided as Figures 4 and 5.

Ground-water samples were collected from the three on-site monitoring wells and one supply well on 26 May 1998. Each monitoring well was purged and then sampled using the dedicated bailer and dropline. Purge water was discharged directly to the ground in the vicinity of each well. A trip blank and a duplicate sample were collected during the sampling event for quality assurance/quality control (QA/QC) purposes. All field procedures were conducted in accordance with **Marin** standard protocols.

The ground-water samples were submitted to Endyne, Inc. of Williston, Vermont, where they were analyzed for the possible presence of benzene, toluene, ethylbenzene, xylenes (BTEX) and methyl-tertiary butyl ether (MTBE) by EPA Method 8020 and total petroleum hydrocarbons (TPH) by modified EPA Method 8100. Analytical results from the QA/QC samples indicate that adequate QA/QC was maintained during sample collection and analysis. Analytical results for the blind field duplicate sample collected from MW-3 were within nine percent of the original sample results. QA/QC sample results are summarized on Table 2.

TABLE 2. Ground-Water Analytical Results

Monitoring Date: 26 May 1998

SAMPLE I. D.	Benzene	Ethyl benzene	Toluene	Xylenes	Total BTEX	MTBE	TPH (ppm)
MW-1	26.6	41.5	4.3	36.8	109.2	8.2	0.66
MW-2	ND<10	ND<10	ND<10	ND<10	ND	536	ND<0.4
MW-3	33.5	10.2	42.7	77.9	164.3	103	1.01
On-site Supply Well	ND<1	ND<1	ND<1	ND<1	ND	2.5	ND<0.4
Dup. MW-3	31.4	9.3	40.0	76.3	157	109	1.10
Trip Blank	ND<1	ND<1	ND<1	ND<1	ND	ND<1	NA
VGES/VHA	5	700	1,000	10,000	---	40	---

Results reported as parts per billion (ppb), unless noted otherwise.

NA = Sample not analyzed for specified compound. ND = Compound not detected above indicated detection limit.

TBQ = Compound detected at trace levels below quantitation limit indicated.

VGES = Vermont Groundwater Enforcement Standard. VHA = Vermont Health Advisory for drinking water.

TPH = Total petroleum hydrocarbons. MTBE = Methyl-tertiary butyl ether

2.5 SOIL STOCKPILE MONITORING

On 13 August 1998, Marin field personnel visited R.R. Godfrey's Pit in Hardwick to assess the condition of the soil stockpile generated during the removal of the USTs from the site in 1993. Marin's objectives were to observe the condition of the polyethylene cover and to monitor the possible presence of volatile organic compounds (VOCs). Soil PID readings ranged from 0.0 ppm to 24.1 ppm with an average reading of 8.4 ppm (Table 3). The cover was observed to be in very poor condition.

**TABLE 3.
PID Soil Screening Results**

Sample Location	Depth (ft)	PID Reading (ppm)
S-1	2.0	9.1
S-2	2.0	8.0
S-3	2.0	2.3
S-4	2.0	3.8
S-5	2.0	2.8
S-6	2.0	8.7
S-7	2.0	12.2
S-8	2.0	24.1
S-9	2.0	10.1
S-10	2.0	16.8
S-11	2.0	2.4
S-12	2.0	0.0
Average		8.4

Twelve soil samples were collected from the pile from a depth of about two feet. Soil samples were placed in resealable bags, which were then sealed and agitated. Bag headspace was then screened for the possible presence of VOCs using a PE PhotoVac Model 2020 portable photoionization detector (PID).

3.0 SENSITIVE RECEPTOR SURVEY AND RISK ASSESSMENT

3.1 Sensitive Receptor Survey

Marin conducted a survey to identify sensitive receptors in the vicinity of the Wolcott Store property. The following sensitive receptors were identified in the vicinity of the site:

- The bedrock drinking water supply well which serves the on-site store and apartments, located approximately 70 feet southeast (down gradient) of the former diesel UST and 60 feet southwest (cross gradient) of the former gasoline USTs.
- The bedrock drinking water supply well which serves the residence abutting the property to the west.
- The Lamoille River, located approximately 120 feet south of the former diesel UST (down gradient) and 100 feet (side gradient) of the former gasoline USTs.
- The Wolcott Store building, constructed on a stone foundation, located adjacent to and down gradient from the former USTs.
- The abutting residence to the north and an abutting warehouse building to the south (Buck's Furniture) include basements.

3.2 Risk Assessment

Marin assessed the risks that the residual subsurface contamination poses to the receptors identified above. In general, human exposure to petroleum related contamination is possible through inhalation, ingestion, or direct contact; while impacts to environmental receptors are due either to a direct release or contaminant migration through one receptor to another or along a preferential pathway.

The findings of our risk assessment indicate that the residual subsurface petroleum contamination at the site has impacted the on-site bedrock water supply well, and threatens other nearby supply wells, the Lamoille River, and ambient air in basements of the on-site and nearby buildings.

Methyl-tertiary butyl ether (MTBE), a gasoline additive, was detected at 2.5 ppb in the on-site supply well, which is an indication of contaminant migration into the underlying bedrock formation. On-site contamination may pose a threat to other private bedrock water supplies in the immediate vicinity, primarily the private supply well located approximately 100 feet west of the site. The site is underlain by metamorphic bedrock consisting of quartzite and granulite. Although shallow groundwater flow in the surficial aquifer has been determined to be to the southeast; ground-water flow in metamorphic bedrock is controlled by the inherent fracture system, which often behaves independently of ground-water flow in the surficial aquifer. Although bulk mass transport of ground-water flow in bedrock should follow the slope of topography and shallow groundwater flow, a component of flow could be influenced by other factors such as: the hydraulic conductivity of the fracture(s), the complexity and orientation of fractures, seasonal variations in water table, and individual water use and pumping rates.

Although visual observations of the Lamoille River did not reveal evidence of petroleum contamination (i.e. sheens), the risk to the Lamoille River has not been adequately evaluated, because the downgradient extent of ground-water contamination has not yet been determined. Available information indicates that petroleum contamination has migrated to within 40 feet of the river based on ground-water analytical results from MW-3.

Ambient air in the store was measured by field personnel for the possible presence of volatile organic compounds (VOCs) using a PE PhotoVac Model 2020 portable photoionization detector (PID). There were no positive background readings in the first floor of the store; however, PID readings of 0.1 ppm to 0.4 ppm were noted in the basement, which is constructed on a stone foundation.

4.0 CONCLUSIONS

Based on the results of the site investigation described above, Marin concludes the following:

- Petroleum releases from former underground storage tank (UST) systems at the site appear to have resulted in an impact to the overburden and shallow bedrock ground water in the vicinity of the former UST systems.
- The distribution of dissolved-phase petroleum in ground water suggests that the former gasoline USTs, diesel UST, and pump island locations are sources of contamination.
- Adsorbed-phase soil contamination in the vicinity of the former USTs and pump island may represent a continuing source of ground-water contamination.
- Gasoline compounds were detected at levels above Vermont Groundwater Enforcement Standards (VGESs) in all three on-site monitoring wells.
- The downgradient extent of petroleum contamination has not been defined.
- The gasoline additive, methyl-tertiary butyl ether (MTBE), was detected in all three on-site monitoring wells and the on-site supply well. The presence of MTBE in ground water beneath the site suggests that gasoline was released after 1980.
- MTBE was detected at 2.5 ppb in the on-site drinking-water supply well. This bedrock well, which is approximately 140 feet deep, is located 70 feet southeast (downgradient) of the former diesel UST and 60 feet southwest (cross-gradient) of the former gasoline USTs.
- A bedrock water supply well located on the abutting property to the west may be threatened by on-site contamination due to its proximity to the site and the nature of groundwater flow along bedrock fractures.
- Based on visual observations, no evidence of contamination was noted in the Lamoille River, located approximately 100 feet south (downgradient) of the former USTs; although, the highest contaminant concentrations in ground water were observed in MW-3, located within 40 feet of the river.
- The highest PID readings were measured at the bottom of each soil boring, which were apparently terminated on bedrock.
- There were no positive background PID readings in the first floor of the store; however, PID readings of 0.1 ppm to 0.4 ppm were noted in the store's basement.
- PID measurements of the soil stockpile, located at R.R. Godfrey's pit in Hardwick, averaged 8.4 ppm. The polyethylene cover of the soil stockpile is in very poor condition.

5.0 RECOMMENDATIONS

On the basis of the results of this investigation, **Marin** recommends that further work be performed to determine the extent of the residual contamination and the risk posed to sensitive receptors.

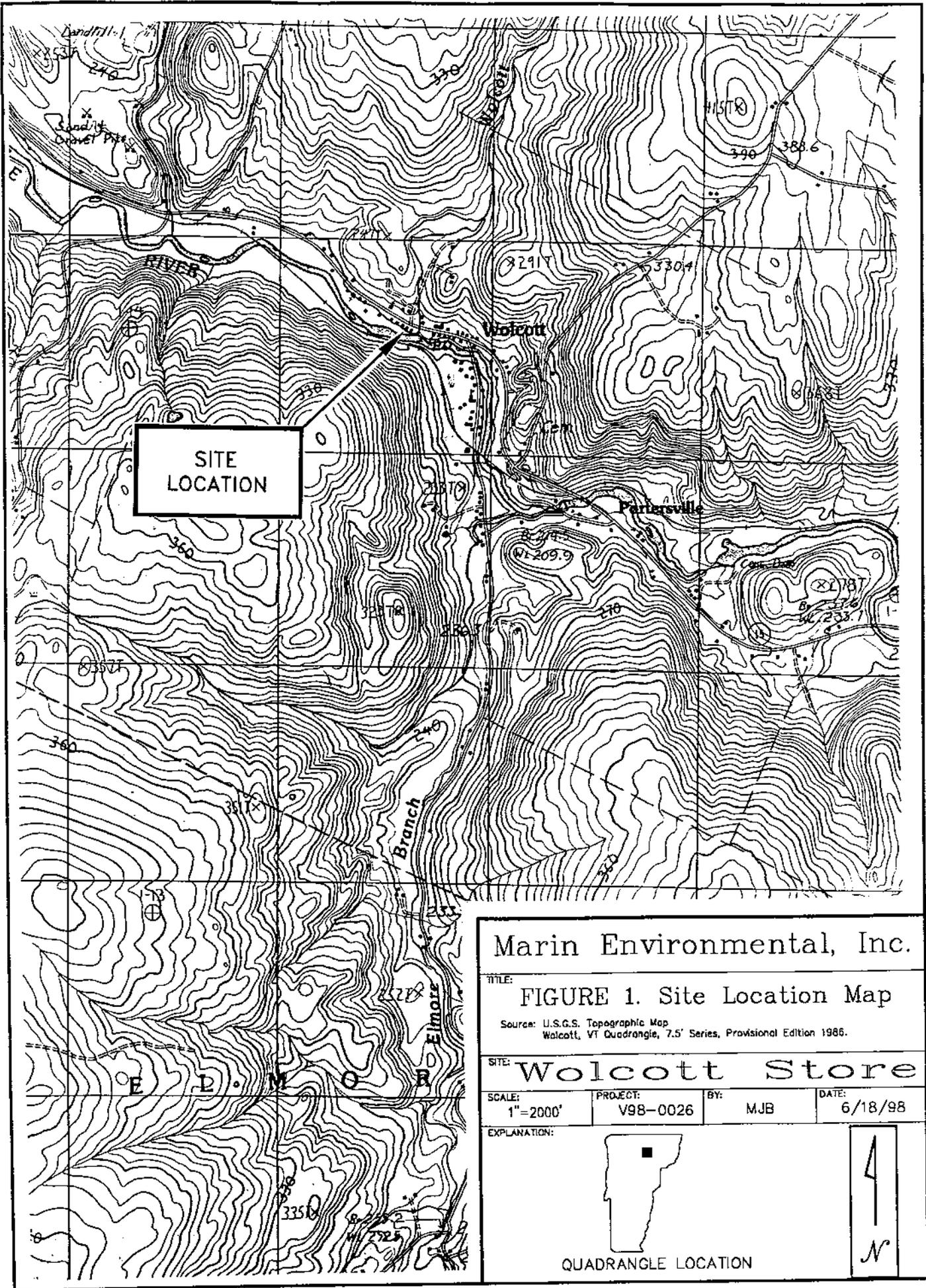
1. Notify the on-site well users of the low level MTBE contamination detected in the on-site bedrock supply well. ✓
2. Resample the on-site supply well and sample the abutters supply well, and analyze the samples for gasoline volatile organic compounds (VOCs) by EPA Method 8021B. ✓
3. Obtain well completion reports for all supply wells within 1,000 feet of the site. Evaluate the susceptibility of each well and assess the potential risk. ✓
4. Install three additional overburden soil borings/monitoring wells, one upgradient and two downgradient, to more adequately define the extent of the dissolved-phase gasoline plume in the shallow overburden aquifer. *Hmm... locations?*
5. Install at least one shallow bedrock monitoring well to evaluate the possible impacts to the underlying bedrock formation. ?
6. Sample the existing and newly installed monitoring wells, and analyze the samples for gasoline VOCs by EPA Method 8021B and polynuclear aromatic hydrocarbons (PAHs) by EPA method 8100. ?
7. Install two piezometers along the northern stream bank of the Lamoille River as a means of obtaining water table measurements and groundwater samples. Water level measurements should be obtained to determine if the river is a contributing source to the groundwater aquifer or if it is being replenished by the local aquifer. Groundwater samples should be collected for analysis of gasoline VOCs by EPA Method 8021B and PAHs by EPA method 8100. ✓
8. Monitor the off-site soil stockpile in May, 1999 to confirm that the petroleum concentrations are declining. ✓
9. Replace the soil stockpile cover, during the next site visit. ✓
10. Using a PID, monitor the ambient air quality of the on-site basement, and abutters' basements for the possible presence of VOCs. ✓
11. Upon completion of the work described above, evaluate the appropriateness of long-term monitoring or active remediation of the site.
12. Complete a report summarizing the findings of the additional work outlined above, including time-series graphs for water-quality analytical results from each location and figures showing contaminant distribution.

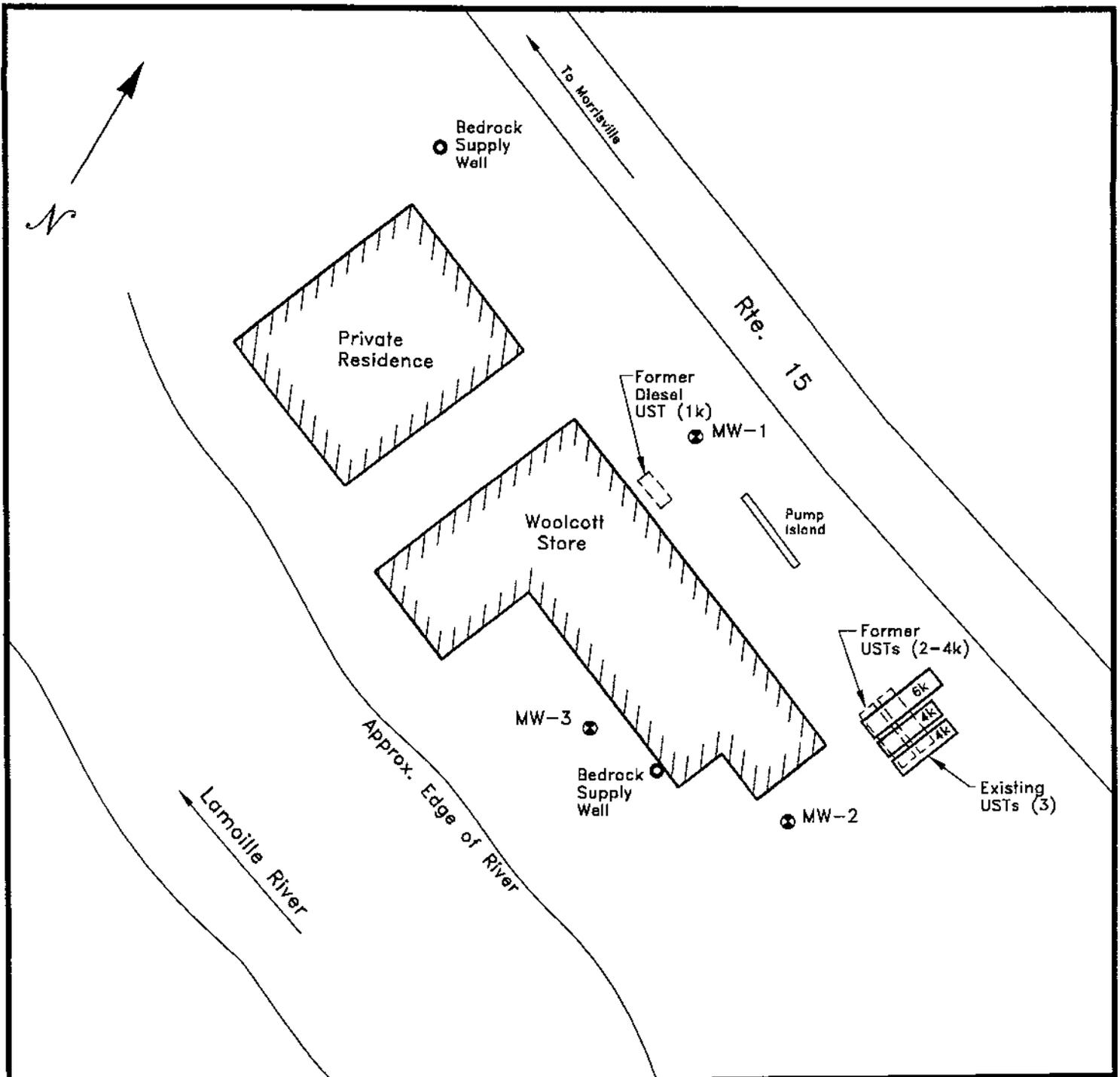
6.0 REFERENCES

- Doll, C.G. and others, 1961. *Centennial Geologic Map of Vermont*, Office of the State Geologist.
- Domenico, P.A., and Schwartz, F.W., 1990. *Physical and Chemical Hydrogeology*, John Wiley and Sons, New York, 824 p.
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- Fetter, C.W., 1994. *Applied Hydrogeology, 3rd Ed.*, Prentice Hall, Englewood Cliffs, New Jersey, 691 p.
- Stewart, D.P. and MacClintock, P., 1970. *Surficial Geologic Map of Vermont*, Office of the State Geologist.
- USGS, 1986. Wolcott, VT Quadrangle . U.S. Geological Survey. 7.5 minute series (topographic).

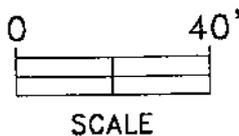
APPENDIX A

Figures

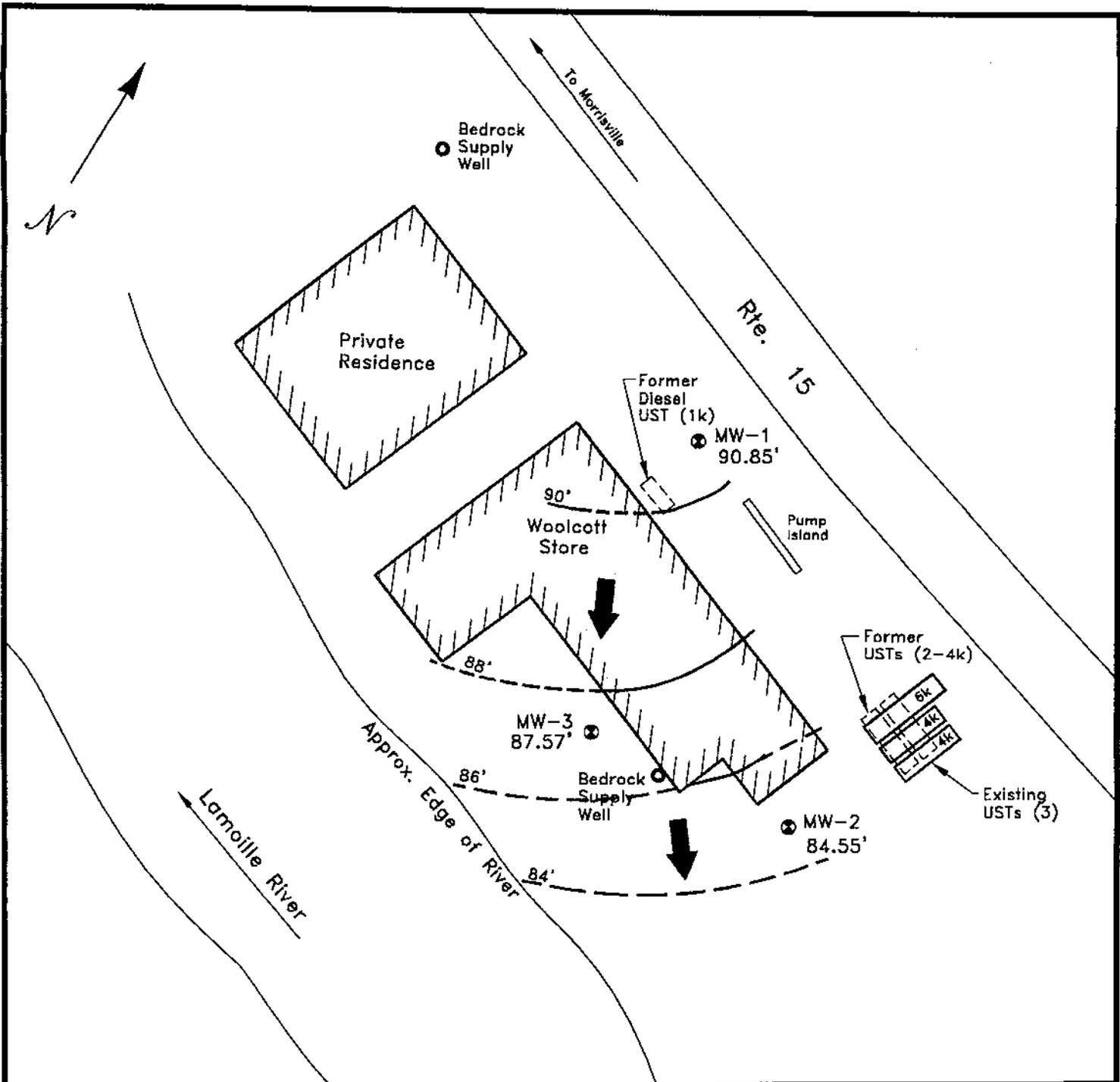




ALL LOCATIONS ARE APPROXIMATE



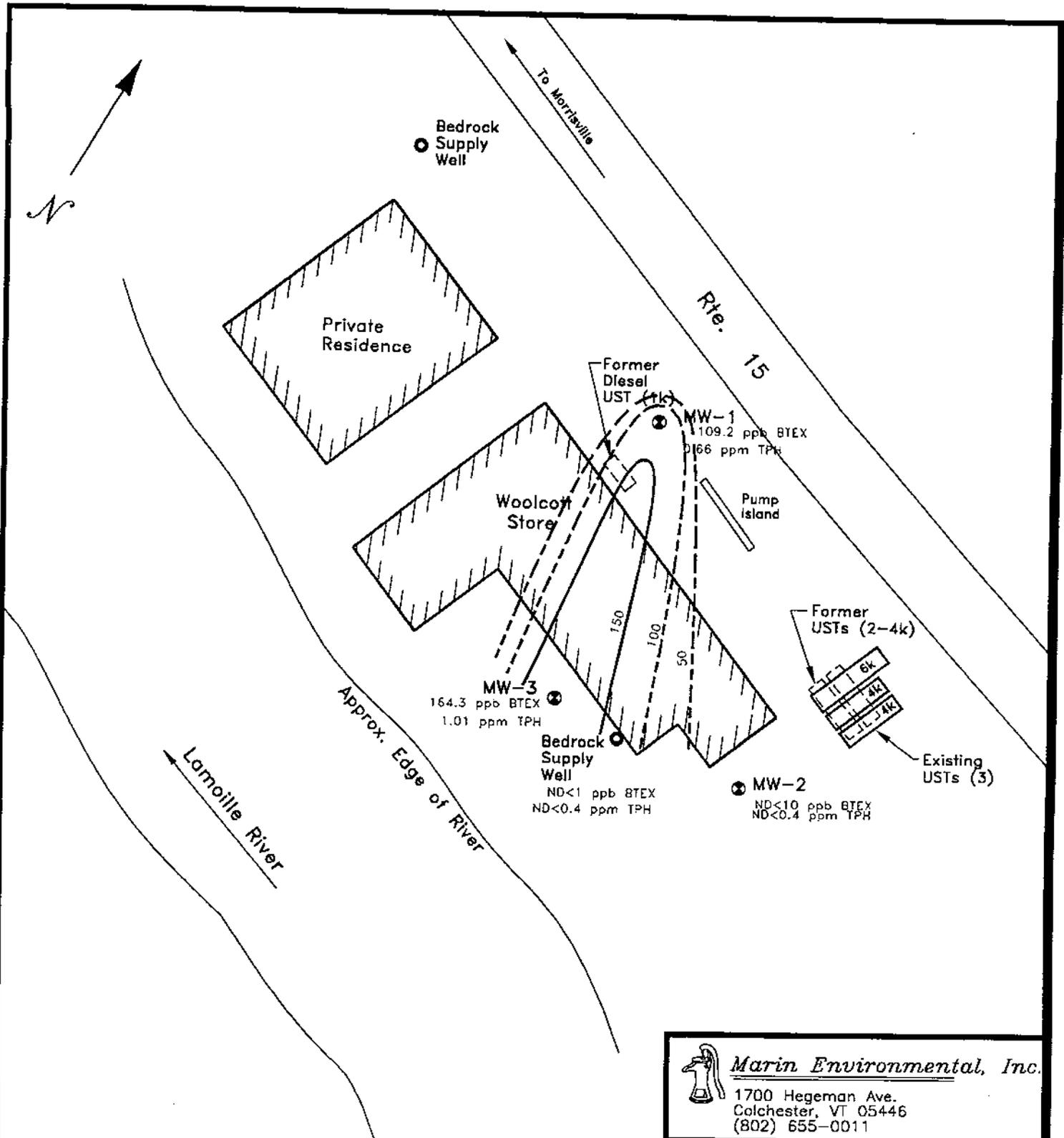
 Marin Environmental, Inc. 1700 Hegeman Ave. Colchester, VT 05446 (802) 655-0011	
SITE: WOLCOTT STORE WOLCOTT, VT	
TITLE: FIGURE 2. SITE MAP With Monitoring Well Locations	
LEGEND:  Monitoring Well	
DRAWN BY: MJB	DATE: AUG 98
APPROVED BY: JG	FILE No.: 980026



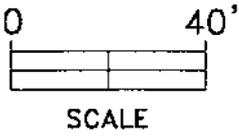
ALL LOCATIONS ARE APPROXIMATE



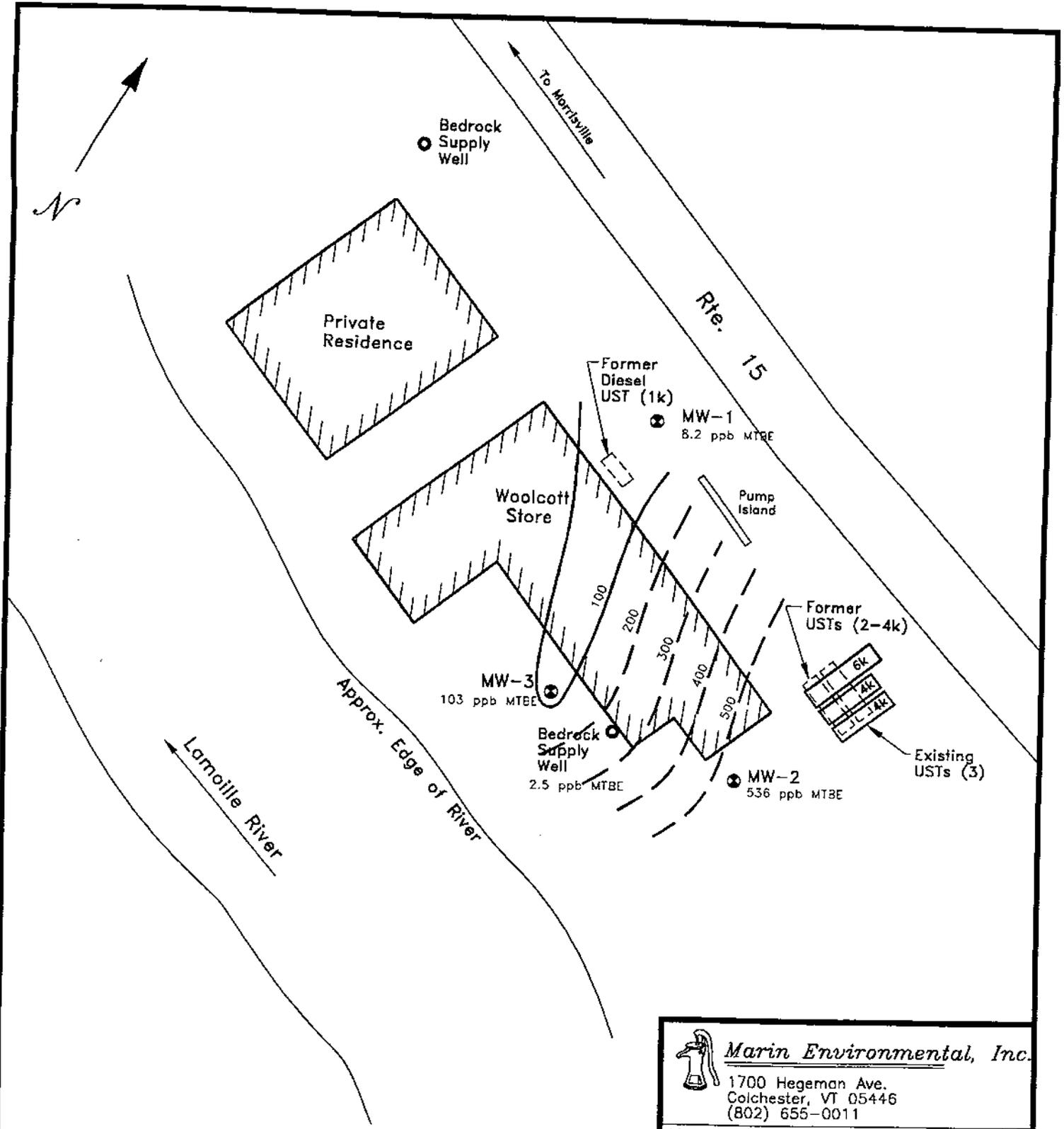
 Marin Environmental, Inc. 1700 Hegeman Ave. Colchester, VT 05446 (802) 655-0011	
SITE: WOLCOTT STORE WOLCOTT, VT	
TITLE: FIGURE 3. GROUND-WATER CONTOUR MAP MONITORING DATE: 26 JUNE 1998	
LEGEND: <ul style="list-style-type: none">  Ground-Water Contour  Monitoring Well  Approx. Ground-Water Flow 	
DRAWN BY: MJB	DATE: AUG 98
APPROVED BY: JG	FILE No.: 980026



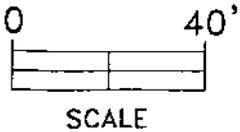
ALL LOCATIONS ARE APPROXIMATE



 Marin Environmental, Inc. 1700 Hegeman Ave. Colchester, VT 05446 (802) 655-0011	
SITE: WOLCOTT STORE WOLCOTT, VT	
TITLE: FIGURE 4. CONTAMINANT DISTRIBUTION MAP-BTEX MONITORING DATE: 26 JUNE 1998	
LEGEND: <ul style="list-style-type: none">  Total BTEX Contour  Monitoring Well ND None Detected 	
DRAWN BY: MJB	DATE: AUG 98
APPROVED BY: JG	FILE No.: 980026



ALL LOCATIONS ARE APPROXIMATE



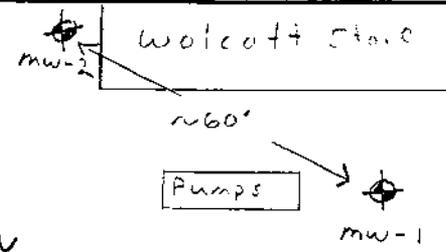
 Marin Environmental, Inc. 1700 Hegeman Ave. Colchester, VT 05446 (802) 655-0011	
SITE: WOLCOTT STORE WOLCOTT, VT	
TITLE: FIGURE 5. CONTAMINANT DISTRIBUTION MAP-MTBE MONITORING DATE: 26 JUNE 1998	
LEGEND: <ul style="list-style-type: none"> — Total MTBE Contour ⊕ Monitoring Well ND None Detected 	
DRAWN BY: MJB	DATE: AUG 98
APPROVED BY: JG	FILE No.: 980026

APPENDIX B
Well Construction Logs

Marin Environmental, Inc.

SITE NAME: Wolcott Store
 LOCATION: Wolcott, VT
 JOB NO. VT980026
 DATE: 5/15/98

BORING NO: MW-1
 TOTAL DEPTH: 12.5 feet
 DEPTH TO WATER: 2 feet



DRILLING METHOD: Vibrator
 BORING DIAMETER: 2.5"

FIELD SUPERVISOR: Jay Gonyaw
 CONTRACTOR: Adams Engineering
 DRILLERS: Jerry Adams

Depth	SN	BLOW COUNTS PER 6"					Rec.	SAMPLE DESCRIPTION COMMENTS	WELL DETAIL	PID (ppm)
		0-6	6-12	12-18	18-24	24-30				
						39"	Dry, light brown Medium SAND No petroleum odor		0.0	
5'	SS#1 SS#2					34"	moist, Dark Brown/Grey Coarse SAND Petroleum odor		0.0	
	SS#3					32"	wet Dark Brown Medium SAND		0.0	
10'	SS#4 SS#5					36"	Wet, Dark Brown Coarse SAND No Petroleum odor		0.0	
							wet Grey/Brown Fine SAND/S-11 w Petroleum odor		6.2	
15'							Boring terminated at 12.5' refusal			
20'										
25'										
30'										
35'										
40'										

		BLOW COUNT		MATERIALS USED	SIZE TYPE	QUANTITY
		6-4	VERY LOSE	WELL SCREEN	1.5" PVC	10'
AND	33-50%	4-10	LOOSE	SLOT SIZE	.010 PVC	
SOME	20-33%	10-30	MEDIUM	RISER	1.5" PVC	2.5'
LITTLE	10-20%	30-50	DENSE	GRADED SAND	#0 + #1	
TRACE	0-10%	> 50	VERY DENSE	BENTONITE PELLETS		
				BENTONITE GROUT	Grout	

Marin Environmental, Inc.

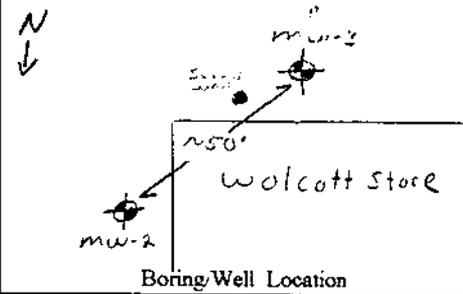
SITE NAME: <i>Wolcott Store</i> LOCATION: <i>Wolcott, VT</i> JOB NO. <i>VT 980022</i> DATE: <i>1/15/98</i>	BORING NO: <i>MW-2</i> TOTAL DEPTH: <i>18 feet</i> DEPTH TO WATER: <i>15.5 feet</i>	
DRILLING METHOD: <i>Vibratory</i>	FIELD SUPERVISOR: <i>Jay Gonyaw</i>	
BORING DIAMETER: <i>2.5"</i>	CONTRACTOR: <i>Adams Engineering</i>	
DRILLERS: <i>Jerry Adams</i>		Boring Well Location

Depth	SN	BLOW COUNTS PER 6"					Rec.	SAMPLE DESCRIPTION COMMENTS	WELL DETAIL	PID (ppm)
		0	6	12	18	24				
							<i>14"</i>	<i>Hard pack GRAVEL Dry, No petroleum odors</i>		
	<i>SS#1</i>									<i>0.0</i>
<i>5'</i>							<i>10"</i>	<i>Moist. Dark Brown, Coarse SAND No petroleum odor</i>		
	<i>SS#2</i>									<i>0.0</i>
<i>10'</i>	<i>SS#3</i>						<i>40"</i>	<i>moist. Medium SAND - No Petro. odor</i>		<i>0.0</i>
	<i>SS#4</i>							<i>moist. medium/Fine SAND - No Petro odor</i>		<i>0.0</i>
	<i>SS#5</i>							<i>moist. Fine SAND/silt - No Petro odor</i>		<i>0.0</i>
	<i>SS#6</i>						<i>32"</i>	<i>moist. Fine SAND/silt - Brown - No odor</i>		<i>0.5</i>
<i>15'</i>	<i>SS#7</i>							<i>wet Dark Brown/grey SAND, slight Petro odor</i>		<i>1.1</i>
	<i>SS#8</i>							<i>wet light Brown Coarse SAND slight Petro odor</i>		<i>2.7</i>
<i>20'</i>								<i>Boring terminated at 18'; refusal</i>		
<i>25'</i>										
<i>30'</i>										
<i>35'</i>										
<i>40'</i>										

		BLOW COUNT		MATERIALS USED	SIZE TYPE	QUANTITY
		0-4	VERY LOOSE	WELL SCREEN	<i>1.5" PVL</i>	<i>10'</i>
AND	33-50%	4-10	LOOSE	SLOT SIZE	<i>.010 PVL</i>	
SOME	20-33%	10-30	MEDIUM	RISER	<i>1.5" PVL</i>	<i>8'</i>
LITTLE	16-20%	30-50	DENSE	GRADED SAND	<i>#1 + #0</i>	
TRACE	0-10%	> 50	VERY DENSE	BENTONITE PELLETS		
				BENTONITE GROUT	<i>Grout</i>	

Marin Environmental, Inc.

SITE NAME: Wolcott Store		BORING NO: mw-3	
LOCATION: Wolcott, VT		TOTAL DEPTH: 16 feet	
JOB NO: VT980026		DEPTH TO WATER:	
DATE: 5/15/98		FIELD SUPERVISOR: Jay Gonyaw	
DRILLING METHOD vibratory		CONTRACTOR: Adams Engineering	
BORING DIAMETER 2.5"		DRILLERS: Jerry Adams	

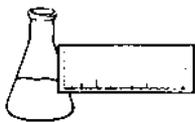


Depth	SN	BLOW COUNTS PER 6"					Rec.	SAMPLE DESCRIPTION/COMMENTS	WELL DETAIL		PID (ppm)
		0-6	6-12	12-18	18-24	24-30			Left	Right	
							30"	Dry, Medium/Fine SAND No petroleum odor			0.0
5'	SS#1 SS#2						12"	Dry, organic debris Dry, Grey Fine SAND - No Petru. odor Dry light brown medium SAND			0.0
10'	SS#3 SS#4						30"	Dry, light Brown Fine SAND No Petroleum odor			0.0
	SS#5						Σ	wet, Brown Coarse SAND Slight Petroleum odor			0.8
15'	SS#6						18"	wet, grey Coarse GRAVEL Strong Petroleum odor			147
								Boring terminated at 16' upon refusal			
20'											
25'											
30'											
35'											
40'											

		BLOW COUNT	MATERIALS USED	SIZE/TYPE	QUANTITY
AND	33-50%	0-4	VERY LOSE	WELL SCREEN	1.5" PVC 10'
SOME	20-33%	4-10	LOOSE	SLOT SIZE	.010 PVC
LITTLE	10-20%	10-30	MEDIUM	RISER	1.5" PVC 6'
TRACE	0-10%	30-50	DENSE	GRADED SAND	#1 + #0
		> 50	VERY DENSE	BENTONITE PELLETS	
			BENTONITE GROUT	GROUT	

APPENDIX C

Laboratory Report Forms



ENDYNE, INC.

Laboratory Services

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

REPORT OF LABORATORY ANALYSIS

CLIENT: Marin Environmental
PROJECT NAME: Wolcott Store
REPORT DATE: June 5, 1998
DATE SAMPLED: May 26, 1998

PROJECT CODE: GWVT1919
REF.#: 121,710 - 121,715

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. Chain of custody indicated sample preservation 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.

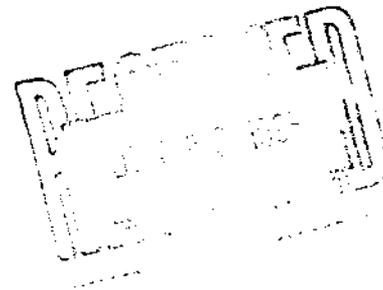
Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

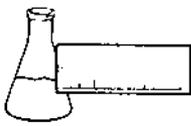
Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate recovery data was determined to be within laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

enclosures





EPA METHOD 602--PURGEABLE AROMATICS

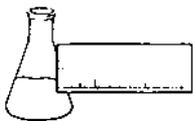
CLIENT: Marin Environmental
 PROJECT NAME: Wolcott Store
 CLIENT PROJ. #: VT980026

DATE RECEIVED: May 29, 1998
 REPORT DATE: June 5, 1998
 PROJECT CODE: GWVT1919

Ref. #:	121,710	121,711	121,712	121,713	121,714
Site:	Duplicate	Trip Blank	MW-1	MW-2	MW-3
Date Sampled:	5/26/98	5/26/98	5/26/98	5/26/98	5/26/98
Time Sampled:	NI	7:00	9:30	9:40	10:00
Sampler:	J.G.	J.G.	J.G.	J.G.	J.G.
Date Analyzed:	6/4/98	6/3/98	6/3/98	6/4/98	6/3/98
UIP Count:	>10	0	>10	0	>10
Dil. Factor (%):	100	100	100	10	100
Surr % Rec. (%):	81	88	96	87	82
Parameter	Conc. (ug/L)				
Benzene	31.4	<1	26.6	<10	33.5
Chlorobenzene	<1	<1	<1	<10	<1
1,2-Dichlorobenzene	<1	<1	<1	<10	<1
1,3-Dichlorobenzene	<1	<1	<1	<10	<1
1,4-Dichlorobenzene	<1	<1	<1	<10	<1
Ethylbenzene	9.3	<1	41.5	<10	10.2
Toluene	40.0	<1	4.3	<10	42.7
Xylenes	76.3	<1	36.8	<10	77.9
MTBE	109.	<1	8.2	536.	103.

Ref. #:	121,715				
Site:	Supply Well				
Date Sampled:	5/26/98				
Time Sampled:	10:15				
Sampler:	J.G.				
Date Analyzed:	6/3/98				
UIP Count:	0				
Dil. Factor (%):	100				
Surr % Rec. (%):	91				
Parameter	Conc. (ug/L)				
Benzene	<1				
Chlorobenzene	<1				
1,2-Dichlorobenzene	<1				
1,3-Dichlorobenzene	<1				
1,4-Dichlorobenzene	<1				
Ethylbenzene	<1				
Toluene	<1				
Xylenes	<1				
MTBE	2.5				

Note: UIP = Unidentified Peaks TBQ = Trace Below Quantitation NI = Not Indicated



ENDYNE, INC.

Laboratory Services

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

REPORT OF LABORATORY ANALYSIS

CLIENT: Marin Environmental
PROJECT NAME: Wolcott Store/VT980026
DATE REPORTED: June 19, 1998
DATE SAMPLED: May 26, 1998

PROJECT CODE: GWVT1920
REF. #: 121,716 - 121,720

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.

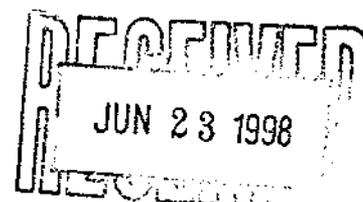
Blank contamination was not observed at levels affecting the analytical results.

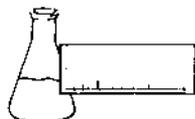
Analytical method precision and accuracy were monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

enclosures





LABORATORY REPORT

TOTAL PETROLEUM HYDROCARBONS (TPH) BY MODIFIED EPA METHOD 8100

- FID Method
- DRO

DATE: June 19, 1998
CLIENT: Marin Environmental
PROJECT: Wolcott Store/VT980026
PROJECT CODE: GWVT1920
COLLECTED BY: JG
DATE SAMPLED: May 26, 1998
DATE RECEIVED: May 29, 1998

Reference #	Sample ID	Concentration (mg/L) ¹
121,716	Duplicate	1.10
121,717	MW-1; 0700	0.66
121,718	MW-2; 0940	ND ²
121,719	MW-3; 1000	1.01
121,720	Supply Well; 10:15	ND

Notes:

- 1 Values quantitated based on the response of #2 Fuel Oil. Method detection limit is 0.4 mg/L.
- 2 None detected



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

171710-720 GWVT 1919

CHAIN-OF-CUSTODY RECORD

25752

VT980026

Project Name: Site Location:	Wolcott Storage Colchester, VT	Reporting Address:	1700 Haganan Ave Colchester, VT	Billing Address:	
Endyne Project Number:	GWVT 1919	Company:	Marin Env	Sampler Name:	J.G.
		Contact Name/Phone #:	J. Goyeau 657-0011	Phone #:	

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				
121710	Duplicate	H ₂ O	✓		5/26/98	1	4000 75		19,30	HCl	
121711	Trip Blank				10700	2					
121712	mw-1				0930	4			30		
121713	mw-2				0940	4			30		
121714	mw-3				1000	4			30		
121715	supply well				11015	4			30		
Cool											

Relinquished by: Signature	Received by: Signature	Date/Time
	J. Wadsworth	5/29/98 3:40 PM
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 ₅	14	Turbidity	19	BTEX <u>with SE</u>	24	EPA 608 Pest/PCB		
5	Nitrate N	10	Alkalinity	15	Conductivity	20	EPA 601/602	25	EPA 8240		
29	TCIP (Specify: volatiles, semi-volatiles, metals, pesticides, herbicides)										
30	Other (Specify): TPF by mod. 8/00										

+ 6