

Type of Submittal	Petroleum Reimbursement Fund Phase
<input type="checkbox"/> Workscope/Budget	<input type="checkbox"/> Initial Response Action
<input checked="" type="checkbox"/> Technical Report	<input type="checkbox"/> Free Product
<input type="checkbox"/> Reimbursement Request	<input checked="" type="checkbox"/> Site Investigation
<input type="checkbox"/> Monitoring Result	<input type="checkbox"/> Corrective Action Plan
	<input type="checkbox"/> Remedial Design Plan
	<input type="checkbox"/> Remedial Implementation/Operations/Monitoring

Site Investigation Report

Exit 1, Canal St., Brattleboro, VT
(VT DEC Site # 97-2260)

Latitude 42 degrees, 50', 15"

Longitude 72 degrees, 34'

USGS Brattleboro Quad

Prepared For:

J.W. Sandri, Inc.

P.O. Box 1578

Greenfield, MA 01302-1578

Contact: Sharon Abbott

(800) 628-1900

Prepared By:

Stevens and Associates Engineering

28 Birge St.

Brattleboro, VT 05301

Contact : Steven L. Brackett

(802) 257-9329

Jan. 29, 1999

Recommended Risk Category		
<input type="checkbox"/> 1. Immediate Human Health Risk (Impacted Water Well, etc.)	<input type="checkbox"/> 4. Surface Water Impact (Actual Impact to Class B or potential impact to Class B)	<input checked="" type="checkbox"/> 7. Alternate Water Available/Low level Groundwater Contamination (<1000 x VGES)
<input type="checkbox"/> 2. Potential Human Health Risk (Residential well within 1000' or site within wellhead area)	<input type="checkbox"/> 5. No Alternate Water Available/No Existing Wells in Area	<input type="checkbox"/> 8. No VGES Violation/No Source Remaining
<input type="checkbox"/> 3. Free Product or Source Hazard	<input type="checkbox"/> 6. Alternate Water Available/High Level Groundwater Contamination (>1000 x VGES)	

STEVENS & ASSOCIATES ENGINEERING

Civil, Environmental & Structural Engineering

EXECUTIVE SUMMARY

On Oct. 6, 1997 three petroleum underground storage tanks were removed from this service station site. A Site Assessment Report prepared by J.W. Sandri of Vermont, Inc. indicated petroleum contamination of soil in the area from which the UST's had been removed. Based on this report Chuck Schwer of the VT DES, Sites Management Section, in a letter dated January 22, 1998 requested that a Site Investigation be conducted to determine the degree and extent of contamination, to assess the associated risk to potential receptors, and to determine whether there is a need for long term treatment or monitoring of soil and/or groundwater at the site.

Soil borings and monitoring wells were installed at the site on May 15, 1998 and Dec. 11, 1998. Groundwater samples collected from these wells indicate that a gasoline release has occurred in the area of the tank grave and has migrated close to the eastern property line of the site.

SAE found no evidence that this contamination posed a threat to any receptors other than the site soil and groundwater. In light of this fact SAE has concluded that the most appropriate alternative for remediating this contamination is monitoring of natural attenuation.

This study is discussed in more detail below.

SITE HISTORY

Ownership History

Gladys Page 1/15/58 until present Book 99, Page 541
- the site was originally leased to Sun Oil on 5/18/66
- the site is currently leased to Sandri until 2003

Hazardous Materials Use, Storage and Disposal Practices

The site has been used as a retail gasoline station, automotive service station and a convenience store since 1966. There is no evidence to indicate that past or present hazardous materials use, storage, or disposal practices have been improper.

Known Hazardous Materials Releases

There is no formal record of prior hazardous materials releases at the site.

MAPS

A tax map which shows the location of the source and the locations of any potential receptors is contained in the Appendix.

USGS Map - see Appendix

Site Plan - see Appendix

OWNERSHIP OF SITE AND ABUTTING SITES

Tax Map #	Owner	Address	Phone
8-34 (250 Canal St.)	Gladys Page (property is leased to Sandri until 2003)	7 Generous St. Brattleboro, VT 05301	(802) 254-9449
8-33 (248 Canal St.)	Gladys Page (property is leased to Burger King)	7 Generous St. Brattleboro, VT 05301	(802) 254-9449
8-35 (254 Canal St.)	Marcraft Realty	254 Canal St. Brattleboro, VT 05301	(802) 254-4549
8-32 (Rt. 5 ROW)	State of Vermont		

Soil Boring and Monitoring Well Installation

On May 21, 1998 two soil borings (SB-1 and SB-2) and one monitoring well ("MW-1") were installed at the site by T+K Drilling under the supervision of SAE staff. Both soil borings reached resistance in bedrock without encountering groundwater. Soil samples were collected from each of the soil borings and were field screened. The results are presented below. SB-1 and SB-2 were refilled and were grouted at the surface.

On Dec. 11, 1998 SAE supervised the installation of two additional monitoring wells ("MW-2, MW-3") and two additional soil borings ("SB-3 and SB-4) at the site. Again SB-3 and SB-4 encountered resistance in ledge without reaching the groundwater table.

Monitoring Well Construction

Each well was constructed by installing 2" Sch 40 PVC machine slotted screen and solid riser, in appropriate lengths into 4.5" diameter soil borings. The annulus was filled with sorted filter sand to a depth of between .5' and 1' above the top of the screen. A bentonite seal 1' thick was placed on top of the filter sand, and then the balance of the annulus was filled with native soils. A locking cap was installed in the top of the 2" PVC riser and a 8" diameter aluminum road box was installed flush with the ground surface.

SOIL SAMPLING PROCEDURES

Soil Sampling - Soil samples were collected at intervals of no greater than five feet. Samples were collected at changes in lithology, at the water table and from any portion of the core which seemed to be stained. Samples were collected using a 2' diameter 24' split spoon sampler.

Field Screening- Field screening of soil samples for VOC's was conducted using a Gastech OVM Model 1314 calibrated to 400 ppm hexane. The OVM was calibrated on the day of use, both before and after field screening was conducted. Soil samples were placed in wide mouth glass jars, the mouths of which were then covered with aluminum foil. The sample jars were warmed to a consistent temperature as close to 70 degrees F as possible. The concentration of VOC's in the jar's headspace was then determined by inserting the probe of the Gastech® OVM through the aluminum foil membrane.

Table 1 - SOIL FIELD SCREENING RESULTS

Sample #	Sample Description	Field Screening Result
SB-1.1	3'-5' brown, medium grained gravel	0 ppm
SB-1.2	5'-7' soft phyllite	0 ppm
SB-2.1	3'-5' brown, medium grained gravel	0 ppm
SB-2.2	5'-7' soft phyllite	0 ppm

Sample #	Sample Description	Field Screening Result
MW-1.1	3'-5' brown, medium grained gravel	0 ppm
MW-1.2	5'-7' soft phyllite	26 ppm
MW -2.1	5'-7' soft phyllite	65 ppm
MW-2.2	10' -12' soft phyllite	0 ppm
MW-3.1	5'-7' soft phyllite	35 ppm
MW-3.2	10' -12' soft phyllite	0 ppm
SB-3.1	5'-7' soft phyllite	0 ppm
SB-4.1	5'-7' soft phyllite	0 ppm

GROUNDWATER MONITORING PROCEDURES

Groundwater Sampling - All monitoring wells were developed, and water samples collected using 2" diameter single check valve disposal bailers.

Groundwater Gauging - Groundwater elevation was measured from the ground surface using a Roctest® Water Elevation Meter. The meter has a probe attached to the end of a measured cable. The probe was lowered into the well and at the point that the probe reached groundwater an electric circuit was closed and a high frequency tone was emitted from the meter at the surface. The cable was marked in .01' increments.

GEOLOGY

Soil Type - The soil encountered during the installation of soil borings and monitoring wells at the site consisted of sandy gravel fill. A transitional zone of decomposing phyllite ledge, approximately 9' thick, exists between the gravel fill (above) and the competent phyllite ledge (below).

Bedrock Type- Bedrock in the area consists of phyllite with interbedded quartzite of the Waits River Formation (Devonian). It was encountered at shallow depths ranging from 3.5' to 6.5' at the site. The Site Assessment Report prepared by Sandri indicated that the bedrock was soft enough to excavate the top 5-6' during the installation of the new UST's. The softness of the bedrock was confirmed during the installation of soil borings. In fact, MW-1 was advanced approximately 5' into soft bedrock before encountering groundwater.

HYDROGEOLOGY

Rate and Direction of Groundwater Migration

The groundwater potentiometric map based on groundwater depths measured in MW-1, MW-2 and MW-3 on Dec. 29, 1998 indicate that groundwater is approximately 8' below existing grade and is migrating to the east.

Table 2 - Groundwater Elevations

	MW-1	MW-2	MW-3
12/29/99	92.54	93.43	94.32

A seepage rate of 3.11 ft/day has been calculated as follows:

- hydraulic conductivity is estimated to be 3×10^{-4} ft/sec (equivalent to poorly sorted coarse sand - Freeze and Cherry, 1986, Table 2.2, pg. 29)

- porosity is estimated to be 25% (equivalent to poorly sorted coarse sand - Freeze and Cherry, 1986, Table 2.4, pg. 37)

- hydraulic gradient is estimated to be 3 %

$$S = 3 \times 10^{-4} \times .03 / .25$$

$$S = 3.11 \text{ ft/day}$$

CONTAMINANT FATE AND TRANSPORT

Extent of Plume - It appears that the downgradient limit of BTEX contamination of the site groundwater is between MW-1 (total BTEX = 4000 ppb) and MW-2 (total BTEX = 11 ppb). The downgradient limit of MTBE contamination is apparently at some point downgradient from MW-3. No free product was observed in any of the three monitoring wells installed

Migration Pathways - It appears that the primary migration pathway for groundwater in the area is through small fractures or partings within the soft, decomposing phyllite. Brattleboro town storm sewer lines and sanitary sewer lines run along the Canal St. ROW, across the front of the property, and adjacent to the plume of contaminated groundwater identified by MW-1, MW-2 and MW-3. It is possible that this utility corridor may provide a secondary migration pathway for contaminated groundwater.

LABORATORY RESULTS

The groundwater analytical results are contained in the table below.

	benzene	toluene	ethylbenzene	xylene	MTBE	naphthalene
MW-1	200	2800	400	600	37000	< 100
MW-2	< 1	< 1	3	< 1	380	7
MW-3	< 1	< 1	< 1	< 1	140	< 1

indicate that vapor phase contamination has not migrated to within 5' of the surface.

INTERPRETATION OF RESULTS

The groundwater results indicate that a gasoline release from the former UST's has impacted the quality of groundwater in the area between the former tank grave and the Burger King property line to the east. The level of groundwater contamination immediately downgradient of the tank grave is high, especially for MTBE. BTEX contamination is limited to the area around MW-1. Groundwater contamination in the area of MW-3 is limited to MTBE and is present at a level just above VGES for MTBE.

RECEPTORS

	<u>Yes</u>	<u>No</u>	<u>Notes</u>
Wellhead Protection Areas		X	
residential wells		X	
surface waters		X	
buildings with basements		X	
wetlands		X	
ecologically sensitive areas		X	
areas of direct soil contact		X	
utility corridors	X		see "Migration Pathways" above

ALTERNATIVES FOR REMEDIATION OF SOIL AND/OR GROUNDWATER CONTAMINATION AT THIS SITE

In the opinion of SAE neither the soil or groundwater contamination identified pose a risk to receptors other than site soil and groundwater. It appears that the area underlain by contaminated soil and/or groundwater is almost completely paved. The area which is not paved is the most downgradient portion of the pume. Field screening of soil samples

Given the low level of risk posed by this contamination it is the opinion of SAE that groundwater monitoring of natural attenuation is the most appropriate remedial action for this site.

CONCLUSIONS

Based on the information collected during this investigation SAE has reached the following Conclusions:

- The release of petroleum from one, or more, of the former UST's has contaminated the soil in the area in which the UST's were formerly located, as well as the groundwater in a near surface overburden aquifer.

- Although the Vermont Groundwater Enforcement Standard ("VGES") for MTBE is exceeded in the most downgradient well ("MW-3") SAE believes that the material decrease in MTBE and BTEX concentration from MW-1 to MW-3 indicates that MW-3 is very close to the downgradient limit of groundwater contamination.

- The land use of the site and abutting sites is commercial.

- Virtually the entire area of contaminated soil or groundwater is paved.

- There is no evidence of a threat to any receptors other than site soil and groundwater.

- In the opinion of SAE, based on the information which is currently available, there is no basis for either additional delineation of soil/groundwater contamination or for active remediation of the petroleum contamination of soil and groundwater identified in this study.

- Monitoring of natural attenuation is the most appropriate alternative for the remediation of the soil and groundwater contamination identified at the Exit 1 Sunoco during this study.

RECOMMENDATIONS:

In light of the Conclusions presented above, SAE has the following Recommendations:

- The soil and groundwater contamination identified at the Exit 1 Sunoco during this study should be remediated using natural attenuation.

- The process of natural attenuation should be monitored regularly. SAE recommends that monitoring should include MW-1, MW-2 and MW-3 and should be conducted quarterly. It should consist of measuring groundwater depth, purging of each monitoring well, collection of a groundwater sample from each monitoring well and analysis of each groundwater sample collected for the presence of BTEX, MTBE and naphthalene according to EPA Method 8021. A summary report, containing the analytical results for the round, comparison of these results to historical trends, and a current groundwater potentiometric map, should be prepared for submission to the VT ANR-Sites Management Section for each sampling round. Once the effects of seasonal fluctuations on groundwater contamination are understood it may be possible to reduce the groundwater monitoring scope of work.

GENEROUS ST.

32
1.3 Ac

STREET

Burger King
33
0.95 Ac

34 Sandri
0.47 Ac

35
6.23 Ac

CANAL

M.L.

288'

163'

206.25'

206.25'

152'

248'

206.25'

101'

206.25'

250'

100'

100'

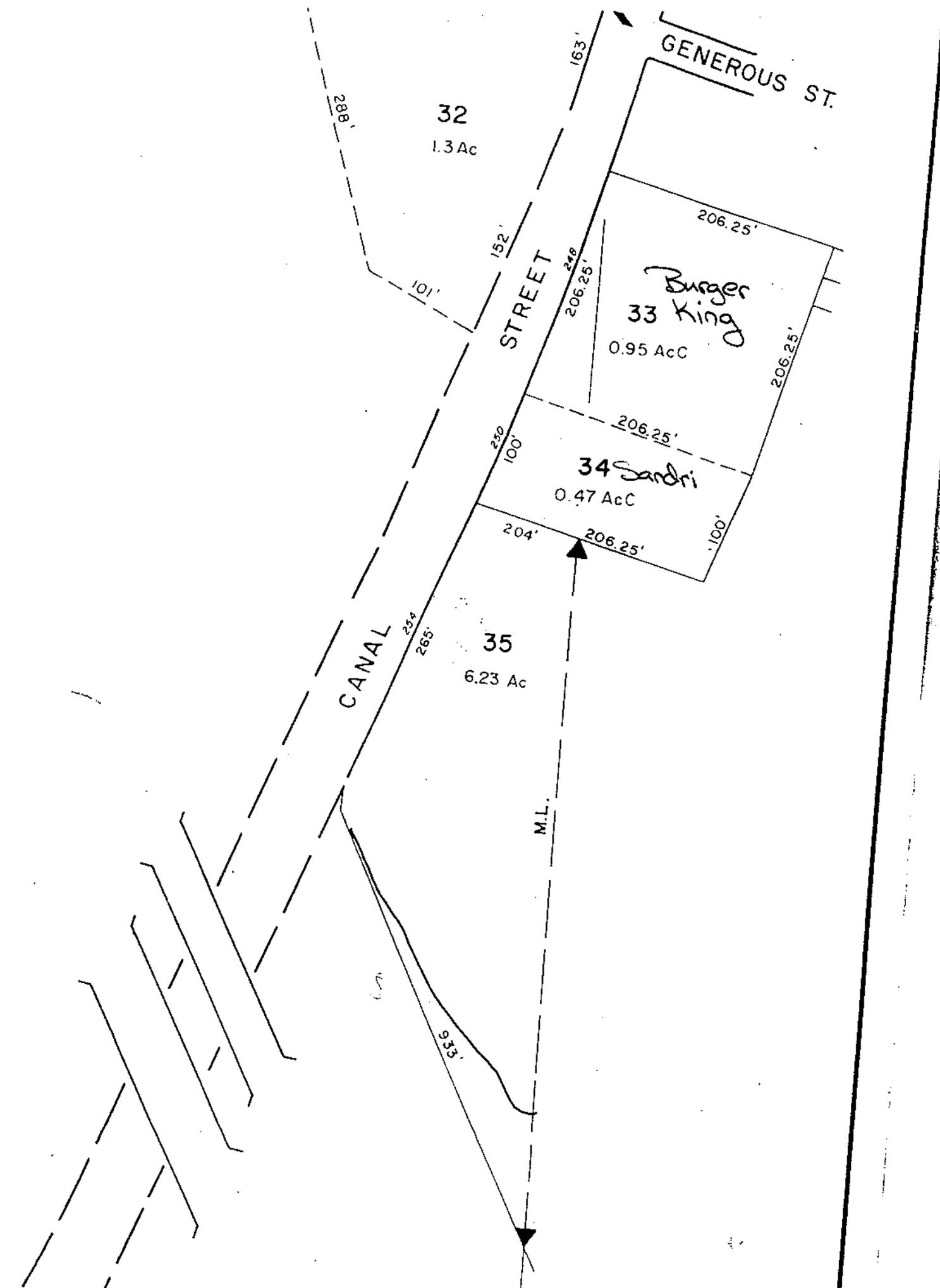
204'

206.25'

254'

265'

333'





T L E B O R O

SHELDON CO

Retreat Meadows

Brattleboro Retreat (Hospital)

West Brattleboro

INTERCHANGE 2

Brattleboro

Brattleboro Quad
25000

Site →

FORT DUMMER STATE PARK

Guilford

BM 141.2
br 141
wt 138

BM 1344
x dr 133

BM 1265
y rd 132

153



LABORATORY REPORT

Eastern Analytical, Inc. ID#: 15341

Client: Stevens & Associates

Client Designation: Exit One Sunoco

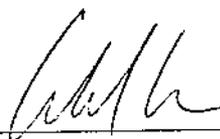
Volatile Organic Compounds

Client ID:	Exit 1.22	Exit 1.23
Matrix:	aqueous	aqueous
Date Received:	12/30/98	12/30/98
Date Analyzed:	1/7/99	1/6/99
Analyst:	VG	VG
Units:	ug/L	ug/L
Method:	8021B mod	8021B mod

MTBE	380	140
Benzene	< 1	< 1
Toluene	< 1	< 1
Ethylbenzene	3	< 1
m,p-Xylene	1	< 1
o-Xylene	< 1	< 1
Naphthalene	7	< 1

* 8021B mod: Samples were analyzed by GC/MS method 8260B.

Approved By Clifford Chase, Volatile Organics Supervisor

 1/11/99



LABORATORY REPORT

Eastern Analytical, Inc. ID#: 12679

Client: Stevens & Associates

Client Designation: Exit 4/Exit 1 VT

Volatile Organic Compounds

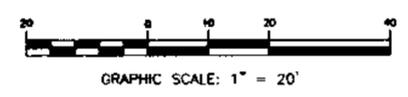
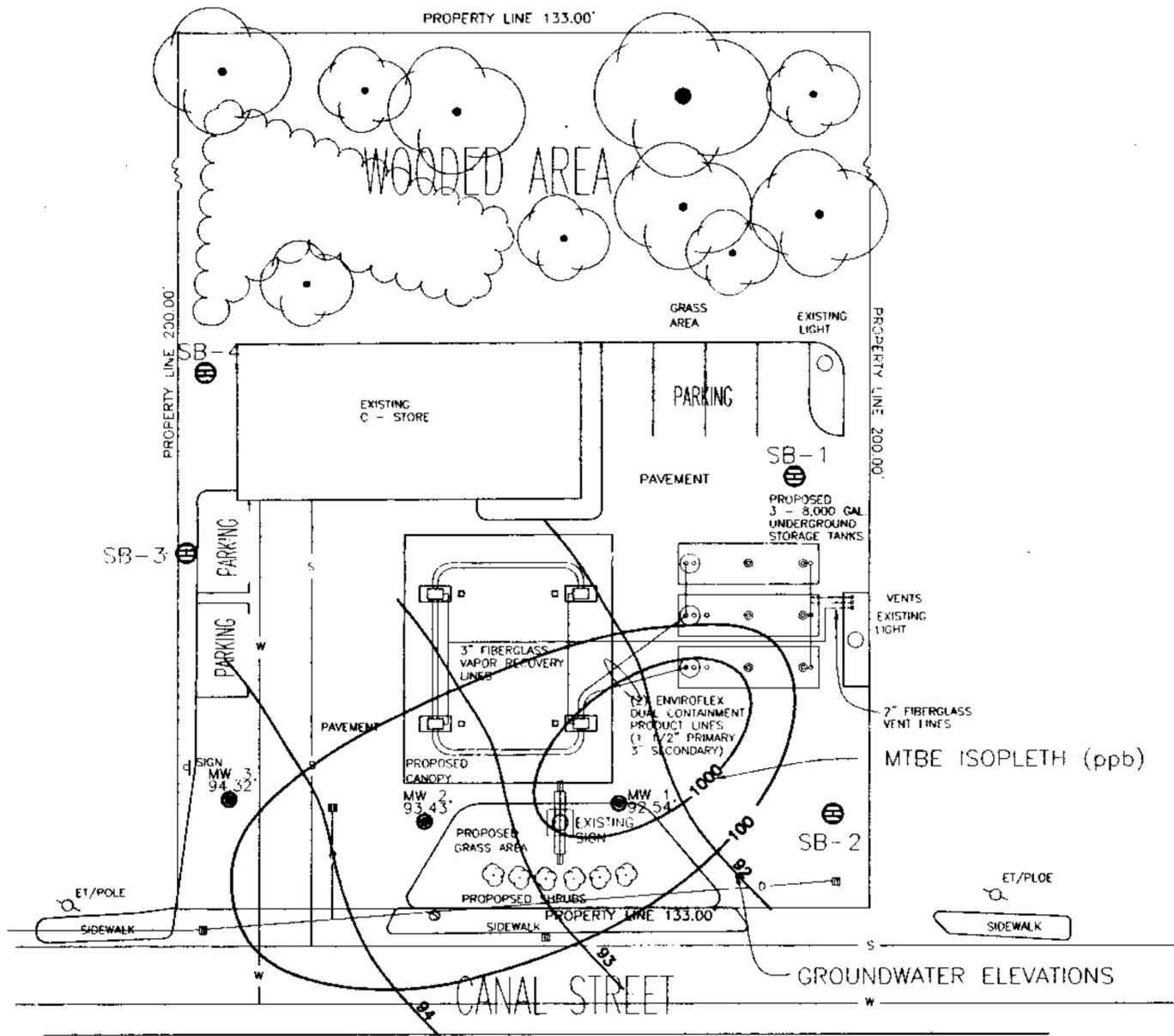
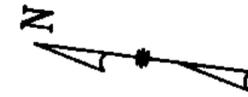
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Client ID:				
Matrix:	aqueous	aqueous	aqueous	aqueous
Date Received:	5/29/98	5/29/98	5/29/98	5/29/98
Date Analyzed:	6/4/98	6/5/98	6/5/98	6/4/98
Analyst:	VG	VG	VG	VG
Units:	ug/L	ug/L	ug/L	ug/L
Method:	8021	8021	8021	8021
Dilution Factor:	10	1	1	100
MTBE	200	20	< 10	37,000
Benzene	140	< 1	< 1	200
Toluene	40	< 1	< 1	2,800
Ethylbenzene	10	< 1	< 1	400
m,p-Xylene	40	< 1	< 1	400
o-Xylene	< 10	2	< 1	200
Naphthalene	< 10	< 1	< 1	< 100

Approved By Clifford Chase, Volatile Organics Supervisor

Clifford Chase 6/12/98

LEGEND

	EXISTING
CATCH BASIN	■
SEWER MANHOLE	○
SIGN POST	▽
UTILITY POLE	⊙
MONITORING WELL	●
OVERHEAD UTILITY	—OHU—
SOIL BORINGS	⊕



GENERAL NOTES:

1. ELEVATION DATUM WAS ASSUMED. DWG PREPARED BY SANDRI P.O. BOX 780 GREENFIELD, MA 01302
2. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE. CONTRACTOR TO VERIFY EXACT LOCATION OF ALL UNDERGROUND UTILITIES.

LOCUS

LOCATION PLAN

**Stevens & Associates
ENGINEERING**
Consulting in Civil, Sanitary
& Structural Engineering

28 Stage Street, Brattleboro,
VT 05301 (802) 257-9329

**EXIT ONE
SUNOCO**
CANAL STREET
BRATTLEBORO, VT.

**J.W. SANDRI
OF VERMONT, INC.**
P.O. BOX 1578
GREENFIELD, MA 01302

DATE:	REVISION:

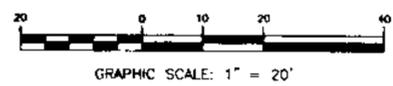
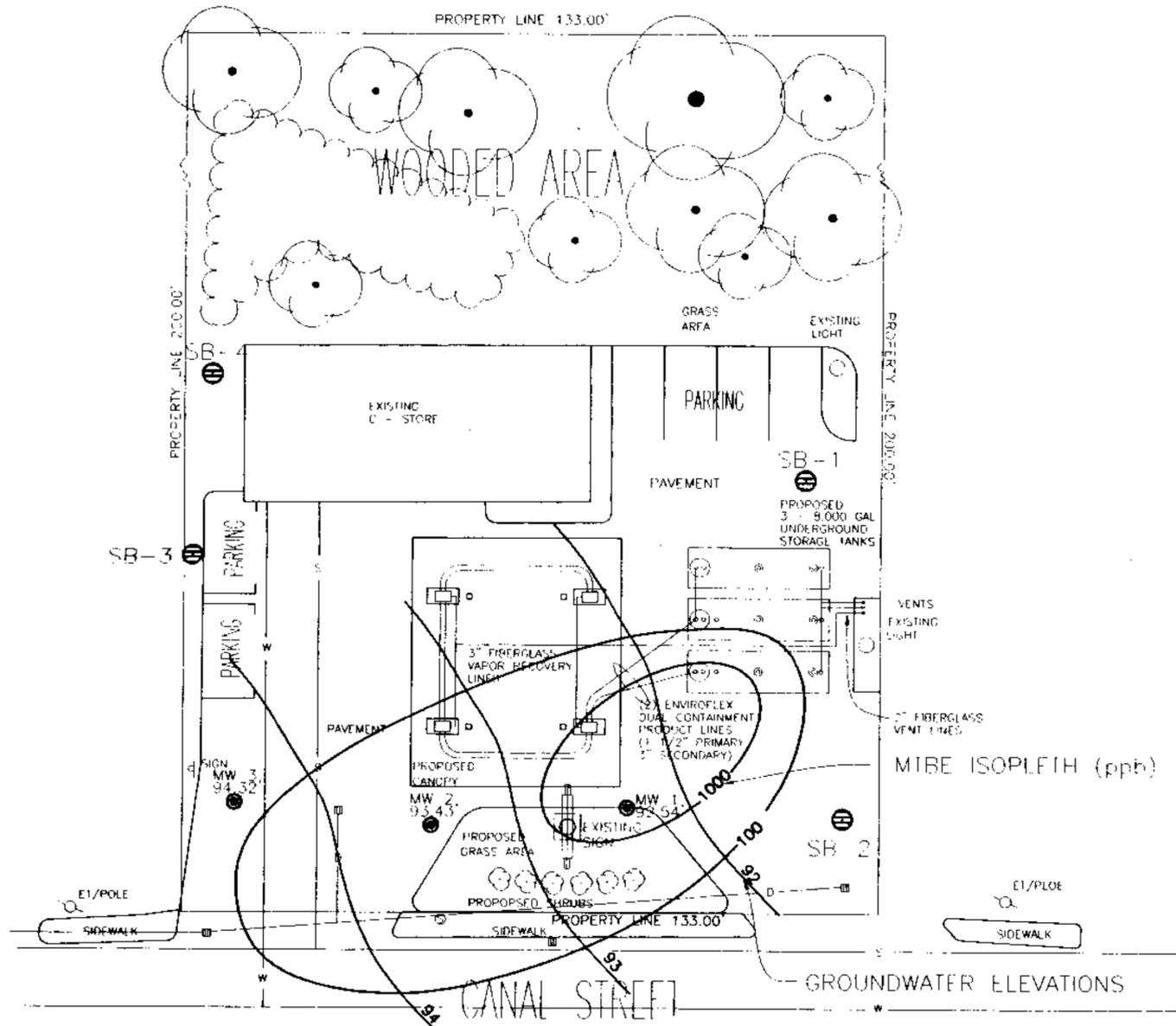
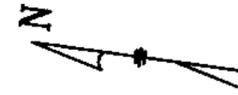
**EXISTING SITE
PLAN**

DES. BY	SB
OWN. BY	PRP
CHKD. BY	
SCALE	1" = 20'
DATE	8/19/98
PROJECT NO.	98-006
DWG. NO.	

C-1

LEGEND

	EXISTING
CATCH BASIN	■
SEWER MANHOLE	⊙
SIGN POST	▼
UTILITY POLE	⊗
MONITORING WELL	⊕
OVERHEAD UTILITY	—OHU—
SOIL BORINGS	●



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LOCUS

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**EXIT ONE
SUNOCO**
CANAL STREET
BRATTLEBORO, VT.

**J.W. SANDRI
OF VERMONT, INC.**
P.O. BOX 1578
GREENFIELD, MA. 01302

DATE:	REVISION:

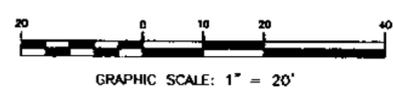
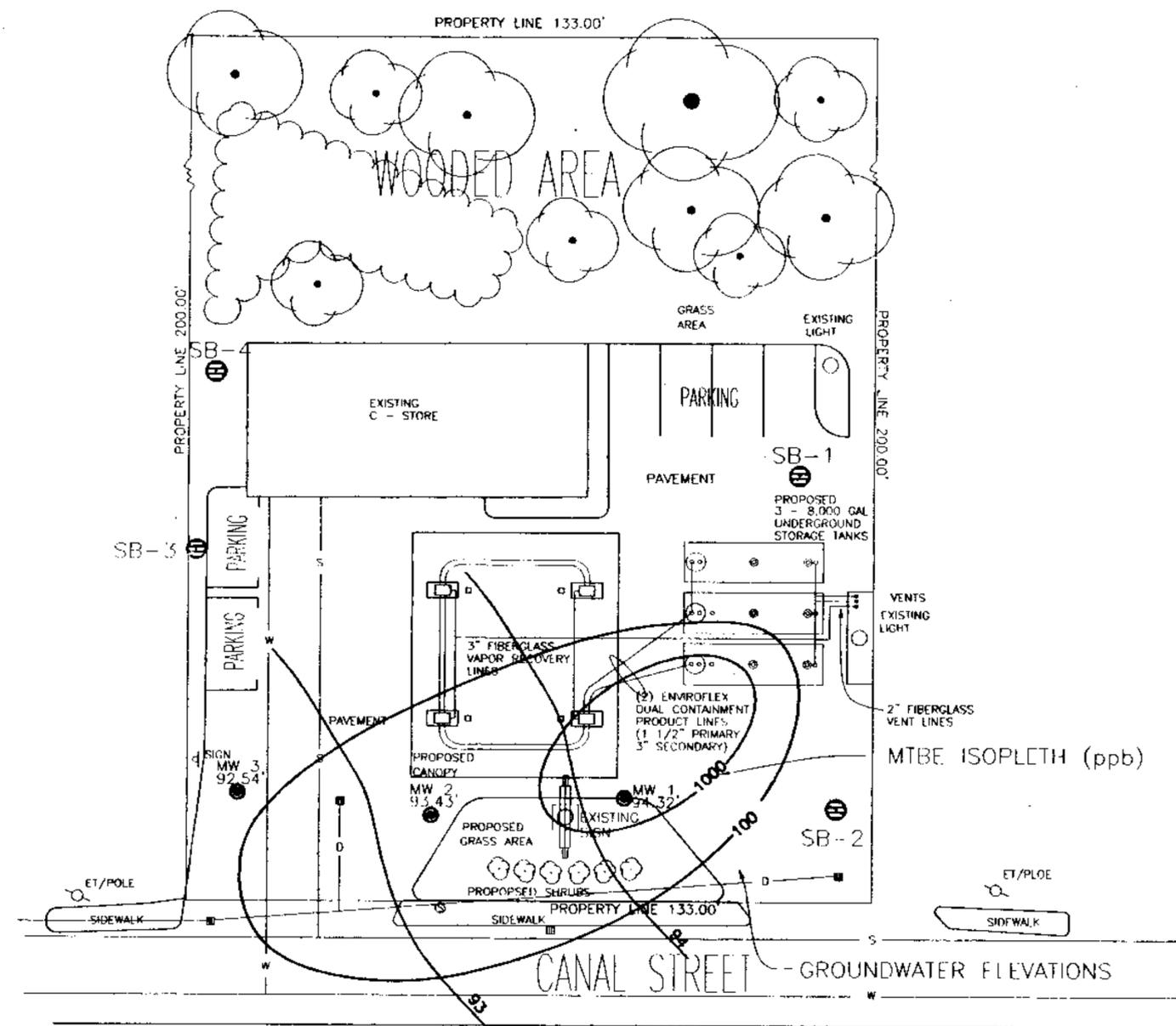
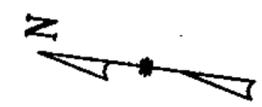
**EXISTING SITE
PLAN**

DES. BY	SB
DWN. BY	PRP
CHKD. BY	
SCALE	1" = 20'
DATE	8/19/98
PROJECT NO.	98-006
DWG. NO.	

C-1

LEGEND

	EXISTING
CATCH BASIN	■
SEWER MANHOLE	⊙
SIGN POST	⋈
UTILITY POLE	⊕
MONITORING WELL	⊗
OVERHEAD UTILITY	—OHU—
SOIL BORINGS	●



GENERAL NOTES:

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- UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE. CONTRACTOR TO VERIFY EXACT LOCATION OF ALL UNDERGROUND UTILITIES.

LOCUS

LOCATION PLAN

STEVENS & ASSOCIATES ENGINEERING
 Consulting in Civil, Sanitary & Structural Engineering

28 Birge Street, Brattleboro, VT 05301 (802) 257-9329

EXIT ONE SUNOCO
 CANAL STREET
 BRATTLEBORO, VT.

J.W. SANDRI OF VERMONT, INC.
 P.O. BOX 1578
 GREENFIELD, MA. 01302

DATE	REVISION

EXISTING SITE PLAN

DES. BY	SB
DWN. BY	PRP
CHKD. BY	
SCALE	1" = 20'
DATE	6/19/98
PROJECT NO.	98-006
DWG. NO.	

C-1

Table 2 - Groundwater Elevations

	MW-1	MW-2	MW-3
12/29/99	94.32	93.43	92.54

A seepage rate of 3.11 ft/day has been calculated as follows:

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$$S = 3 \times 10^{-4} \cdot 0.03 / 0.25$$

$$S = 3.11 \text{ ft/day}$$

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Extent of Plume - It appears that the downgradient limit of BTEX contamination of the site groundwater is between MW-1 (total BTEX = 4000 ppb) and MW-2 (total BTEX = 11 ppb). The downgradient limit of MTBE contamination is apparently at some point downgradient from MW-3. No free product was observed in any of the three monitoring wells installed

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LABORATORY RESULTS

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MW-3	< 1	< 1	< 1	< 1	140	< 1

FEB 3 9 45 AM '99
 66 MW 1 6 0 03