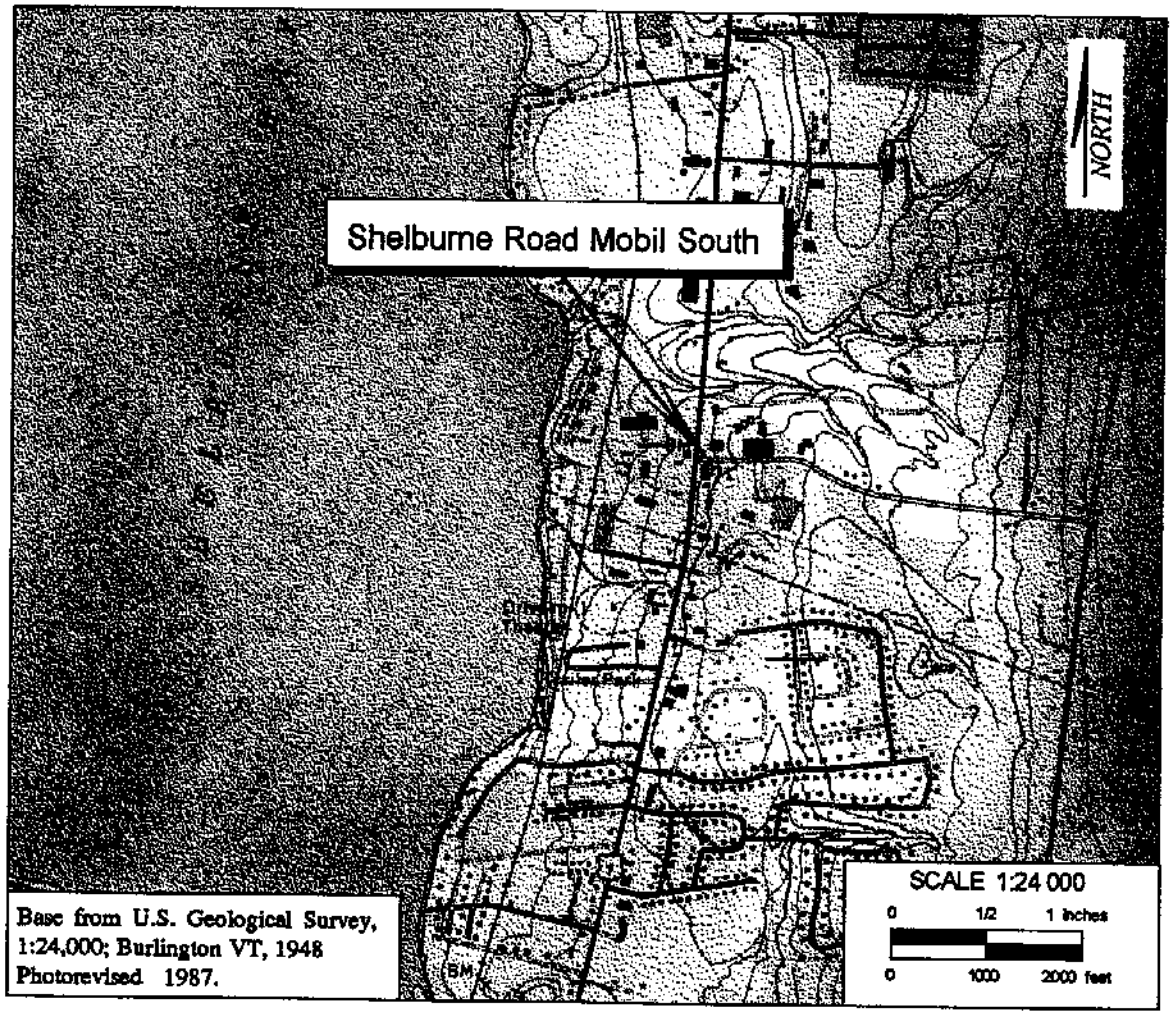
REPORT ON SITE INVESTIGATION
SHELBURNE ROAD MOBIL SOUTH
SOUTH BURLINGTON, VERMONT

September 1994



Jefferson P. Hoffer
Consulting Hydrogeologists

(802) 244 - 5573
P.O. Box 428, Waterbury, Vermont 05676

Report on Site Investigation
Shelburne Road Mobil South,
1830 Shelburne Road
South Burlington, Vermont

SMS Site #88-0307

September, 1994

Prepared For:

Carl Ruprecht, UST Manager
S.B. Collins, Inc.
54 Lower Welden Street
St. Albans, Vermont 05478
(802) 527 - 0116

Prepared By:

Jefferson P. Hoffer
Consulting Hydrogeologists
PO. Box 428
Waterbury, Vermont 05676
(802) 244 - 5573

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The discovery of free product in a leak-detection monitoring well (MW-3) at the Shelburne Road Mobil South prompted the closure and replacement of site USTs and piping in June of 1994. Site investigation activities following the UST closures have included a soil-gas survey, the bailing of free product from MW-3, and the installation and sampling of additional groundwater monitoring wells. MW-3 has been bailed on a regular basis since June 23, 1994. Product accumulation within MW-3 is presently ranging from 0.2 to 0.4 feet.

Groundwater occurs at a depth of one to five feet at the site, within a shallow zone of permeable fill materials and lacustrine silts, which are underlain by a nearly impermeable till. Site soils and the shallow perched zone of groundwater have been impacted by the release, and a plume of dissolved-phase contamination is migrating westward from the former UST area and pump island.

The site contamination, as presently defined, does not appear to pose a threat to surface waters, water supplies, or to nearby structures (i.e., vapor accumulation). Perhaps the greatest risk of exposure posed by site contamination exists for workers excavating the subsurface utilities in the area, particularly the utilities along Shelburne Road directly in front of the site.

Recommendations for further work at the site include the following.

- Continued bailing of MW-3 on a weekly basis.

- Monthly groundwater monitoring; including measurement of site groundwater levels, and sampling and analysis of all site wells for BTEX and MTBE.

- Installation of monitoring wells on the other side of Shelburne Road and Allen Road (see Figure 14) to define the downgradient extent of contamination.

- Notification of the Vermont Department of Transportation and owners of subsurface utilities in the vicinity of the site contamination.

2.0 BACKGROUND INFORMATION AND SITE SETTING

2.1 Background Information

This report summarizes an initial site investigation performed at the Shelburne Road Mobil South (site), a convenience store and automotive fueling station located at 1830 Shelburne Road (US Route 7) in South Burlington, Vermont. The property is owned by Jolley Associates, and the fueling operation is owned and maintained by S.B. Collins, Inc. (SBC). Figure 1 presents a site location map, and Figure 2 presents a site vicinity map. After the discovery of free product in a leak-detection monitoring well (MW-3) in May, 1994, SBC implemented the closure and replacement of all site underground storage tanks (USTs) and associated piping. During these site activities, which included extensive on-site excavating, only a limited amount of free product was found. The environmental aspects of UST closures and replacement UST installations are summarized in the June 14, 1994 site assessment report, which is included in Appendix A of this report. Figure 3 is a schematic diagram of the site illustrating the past and present UST locations.

This site investigation proceeded under the Sites Management Section's (SMS) "Expressway" program. Previous letter reports submitted to the SMS are enclosed in Appendix A, and include;

- May 12, 1994 letter to Chuck Schwer (SMS) from Jefferson P. Hoffer presenting a plan for UST closures.
- May 27, 1994 letter to E. Matt Germon (SMS) from Jefferson P. Hoffer discussing the status of a six-inch water well discovered during UST closures.
- June 14, 1994 letter to Carl Ruprecht (SBC) from Jefferson P. Hoffer presenting the site assessment associated with the site UST closures.
- July 11, 1994 letter to Carl Ruprecht (SBC) from Jefferson P. Hoffer summarizing free-product recovery efforts, results of a soil-gas survey, and proposed monitoring well locations.

This report presents the procedures and results of the well installation effort, and a round of groundwater monitoring. The report provides a discussion of the site hydrogeologic setting, the degree and extent of contamination, an evaluation of potential receptors, and recommendations for further efforts.

2.2 Site Setting

The site is located at the intersection of Shelburne Road and Allen Road, which comprise the western and northern boundaries of the site, respectively. To the east of the site is an undeveloped and forested lot owned by Jolley Associates. Pauline's Cafe and Restaurant (1834 Shelburne Road) is located just south of the site. A Nissan automobile dealership (1835 Shelburne Road) is located across Shelburne Road from the site, and includes a showroom, automobile parking areas, and a service garage.

Topography in the vicinity grades westward toward Shelburne Bay of Lake Champlain. Elevation at the site is about 180 feet above mean sea level, or about 80 feet higher than the lake elevation. According to Stewart's (1973) surficial geology map, the site is underlain by lacustrine and marine sands and gravels. A silt /clay unit is mapped further west, with the contact between the sand/gravel and silt/clay along Route 7. The sand/gravel unit in the vicinity of the site is typically thin, and is underlain by the silt/clay unit.

Surface water features present on the USGS topographic quadrangle of the vicinity are highlighted on Figure 1 and include small unnamed streams draining westward toward Lake Champlain, which is approximately 1800 feet west of the site. The nearest mapped stream is located about 800 feet north of the site. Wetlands, possibly indicative of shallow groundwater discharge zones, and a surface water drainageway, are present across Shelburne Road behind the Nissan dealership (see Figure 2).

A small drainage swale runs northward through the forested parcel just east (upslope) from the site. Water within this drainage swale enters the stormwater system when it reaches Allen Road. A stormwater diversion swale runs north/south on the eastern edge of the site, and drains northward toward a culvert/catch basin. Stormwater in the vicinity is collected in a catch basin on the northwest corner of site at the intersection of Allen Road and Shelburne Road and is directed to a discharge pipe just south of the Nissan garage (see Figure 2).

3.0 FIELD INVESTIGATION PROCEDURES

3.1 Monitoring Well Installations

Prior to the UST closures, twelve leak-detection monitoring wells existed at the site. All but four of these wells (MW-1, MW-2, MW-3, and MW-12) were destroyed during the UST closures. Six groundwater monitoring wells were installed at the site on July 15, 1994. Well locations are shown on Figure 4.

Drilling services were provided by Adams Engineering of Underhill, Vermont utilizing a "mini-rig" to drive (by vibration) a 2 3/8-inch sampling tube. This method allows for the continuous collection of soil samples, and provides a borehole large enough for the installation of 1.5-inch diameter monitoring wells.

At each of the six locations, continuous soil samples were collected to characterize the hydrostratigraphy and to screen samples for contamination using a photoionization detector (PID). Samples from distinct soil horizons were placed into plastic ziplock baggies for headspace analysis using the PID.

The wells were screened within the uppermost zone of saturation, which occurs in the shallow crushed stone and sand backfill immediately underlying the asphalt which covers most of the site. The monitoring wells were constructed using five foot sections of factory-slotted 1.5-inch diameter PVC screen (10-slot) and 1.5-inch diameter PVC riser. Wells were positioned so the top of the screen remains above the water table, in order to facilitate detection of free product, and to accommodate water table fluctuations. The well screens were backfilled with fine-grained (0.49 mm) pool-filter sand. Granular bentonite was placed from the top of the sandpack to the surface. Protective flush-mount covers were cemented or asphalted in place around each well at the conclusion of construction. At the time of installation, there was insufficient water present in the wells to allow development.

Well elevations were measured by Brooks Land Surveying of St. Albans, Vermont. The elevations are relative to an arbitrary on-site benchmark of 100.00 feet.

3.2 Groundwater Sampling and Analysis

A groundwater sampling event was performed on July 21, 1994. Samples were collected from the six new monitoring wells and MW-12. The wells were sampled using the Waterra Inertial Pump (WIP) system. The WIP system consists of a foot valve and tubing which is placed into the well and oscillated up and down to pump water to the surface through inertia. For collection of volatile organic samples, a sampling tube is inserted in the riser tubing. Water is siphoned from the riser tube to the sample container through the sampling tube.

Prior to the sampling event, the six wells were purged using the WIP system on July 19, 1994. Most of the wells went dry after the evacuation of about one well volume, and exhibited low recovery rates. As a result, it was apparent that the evacuation of three well volumes prior to sample collection would not be possible. During the July 21 sampling event, the six 1.5-inch diameter wells (and MW-12) were sampled with the WIP system. Samples were collected as the wells began to go dry. This sampling procedure is believed to be as accurate as is possible given the site conditions. The WIP foot valve was decontaminated between wells using an Alconox scrub/tap water rinse/methanol rinse/distilled water rinse. New WIP polyethylene tubing was used for each well.

Quality assurance/quality control samples included a trip blank supplied by the laboratory, a field/equipment blank, and a duplicate. The trip blank was transported to the site, handled the same as the other samples, and returned to the laboratory for analysis. A field/equipment blank was prepared using analyte-free water to gauge the effectiveness of the decontamination procedure and possible sample exposure to air-borne contaminants. The field/equipment blank was collected through the decontaminated WIP foot valve. The duplicate sample was collected from MW-104 and given a fictitious sample name on the chain-of-custody.

The groundwater sampling event was documented on a field data sheet and a laboratory chain-of-custody. Samples were analyzed for methyl-tert-butyl-ether (MTBE) and benzene, toluene, ethylbenzene, and xylenes (BTEX) using EPA SW-846 Method 8020 by Scitest Laboratory Services of Randolph, Vermont. The field data sheet, analytical reports, and chain-of-custody are included in Appendix B.

Purge water was contained and stored on-site in a 55-gallon drum. Prior to sampling, water level and PID well headspace measurements were taken in each well. Another round of water-level measurements was performed on August 25, 1994.

3.3 PID Measurements

A Photovac MicroTIP HL-2000, equipped with a 10.6 eV lamp and calibrated to respond to isobutylene, was utilized to measure soil sample and well headspaces and to monitor worker breathing space during the drilling procedure. The PID was calibrated according to the manufacturer's specifications prior to each day of operation.

3.4 Free Product

As discussed in the July 11, 1994 letter regarding site investigation efforts, free product is periodically bailed from MW-3. Prior to bailing, the amount of free product is measured with an ORS Interface Probe. The well is then bailed to dryness using a dedicated bailer. The well typically goes dry after the removal of about one well volume. The approximate amount of free product and water that is bailed during each effort is recorded. The free product and water derived from the bailing efforts is transferred to a 55-gallon drum on-site.

4.0 FIELD INVESTIGATION RESULTS

4.1 Hydrogeology

Surficial Geology

The stratigraphy encountered during the well installation efforts is consistent with observations during the UST closure excavations, and with the mapped surficial geology of the area. Soil samples collected during well construction efforts consisted of coarse angular gravels and silty sands (sub-base and fill materials), fine silty sands (native lacustrine sediments), and dense, dark gray silty sands with some angular gravel (till). The fill materials were generally 1.5 to 3.0 feet thick and were underlain by 3.5 to 6.0 feet of lacustrine silts. Till was encountered at depths ranging from 6.0 to 8.8 feet below ground surface. Soil mottling and sample moisture content indicated saturation at depths generally from 2.0 to 3.5 feet, within the fill and lacustrine silt. The till underlying the lacustrine silts was dry to slightly moist, suggesting that the overlying fill and silt/clay units form a small perched zone of saturation.

Soil boring/monitoring well construction logs for the six new wells are provided in Appendix C.

Groundwater Elevations and Flow Directions

Groundwater levels measured at the site are presented in Table 1. Figures 5 and 6 present groundwater elevation contour maps for July 21 and August 25, 1994, respectively. Water levels were generally higher on August 25 compared to July 21. Groundwater elevations indicate a westward flow direction, consistent with the topography, although a number of wells exhibit somewhat anomalous water levels. For instance, MW-1 and MW-2 exhibit water levels several feet higher than nearby wells. These wells are completed within the grass island in front of the site (the nearby wells are completed in paved areas). MW-105 also exhibited a significantly greater increase in water levels from July 21 to August 25 than the other wells. These anomalies result in non-uniform elevation contours, and may result from differences in well construction, modes of recharge, the influence of subsurface utilities at the site, slow equilibration of the new wells, or other factors.

4.2 Groundwater Sampling Results

Groundwater sampling results are summarized in Table 2. Isoconcentration maps are provided on Figures 7 through 11. High concentrations of BTEX compounds are present in wells downgradient (west) of the former USTs and the front pumps. The plume of dissolved BTEX compounds is generally confined between MW-101 and MW-106, where only trace (2 µg/L) concentrations of toluene were detected in both of these wells. The plume of dissolved MTBE (Figure 11) shows a much greater distribution at the site than BTEX compounds.

4.3 Soil Screening Results

PID measurements of soil headspace samples collected during well installation efforts are presented in Table 3. The highest readings were detected in samples from MW-103, MW-104, and MW-105. These wells exhibited elevated PID readings throughout the fill and the lacustrine deposits, and a decrease in PID readings with depth was exhibited in MW-103.

4.4 Free Product

Table 4 summarizes free product thicknesses and bailing records for MW-3. As of August 29, 1994, the amount of free product bailed from MW-3 totals almost four gallons. Included on Table 4 is a plot of product thickness verse time. The product thickness decreased from an initial measurement of over five feet to a relatively consistent thickness ranging from 0.1 to 0.4 feet. The product observed in MW-3 appears to be weathered gasoline, although no laboratory analysis have been performed.

Free product has not been detected in any other monitoring wells at the site.

5.0 DISCUSSION OF RESULTS

5.1 Hydrogeologic Setting

Based on the observations during the UST closure excavations and the monitoring well installations, the site stratigraphy can be generalized as follows;

0 to 3 feet of gravelly sub-base and sandy fill
3 to 6 feet of native lacustrine silt
6 to 8 feet transitional zone of weathered till between lacustrine silt and unweathered till
8 feet --> unweathered till

The depth to water at the site ranges from one to five feet. Observations during drilling and site excavating indicate that the underlying till is not saturated, thus a thin perched zone occurs within the overlying lacustrine silt and coarse non-native materials near the surface. The surface of the till provides the base for the overlying saturated zone. The topography of the till surface is irregular (due to natural conditions as well as tank and piping excavations) and probably influences groundwater movement at the site.

Most of the site is covered with asphalt, which minimizes infiltration. The grass islands along Shelburne and Allen Roads allow for infiltration in these locations. Other sources of infiltration include leaks from water, sewer, and stormwater mains. During the UST closures, the sewer line exiting the store was found to be leaking and was likely a contributor of water to the subsurface - the store's refrigerators and coolers generate significant volumes of condensate which is discharged to the sanitary sewer. Based on depth to product measurements in MW-3, there is an active fluctuation in groundwater elevations at the site. Depth to product measurements in MW-3 have shown a three foot variation, indicating that the shallow zone of saturation is responsive to precipitation events (or other fluctuations).

Due to the shallow depth to water, it is likely that buried utilities at the site play a role in groundwater movement. Water, wastewater, stormwater, and natural gas lines are present on the western edge of the site along Shelburne Road. Numerous on-site buried pipes include water, wastewater, electrical conduit, stormwater, and fuel lines. Backfill around these subsurface pipes may provide preferential pathways for groundwater movement and therefore contaminant migration.

5.2 Source, Degree, and Extent of Contamination

Source of Contamination

Based on the observations during the UST closures, it is difficult to pinpoint a discrete source or release area at the site. No holes in the removed USTs or piping were observed, and no discrete zones of elevated PID readings were detected in soils exposed during the closures. The presence of free product in MW-3 suggests that a release may have occurred near this location (i.e., from the pumps), although MW-3 may simply have provided a sump for migrating product to accumulate. The highest concentrations of dissolved-phase contaminants are present in MW-105, which is located between the former UST area and the pumps. It is possible that more than one discrete source of contamination existed at the site (i.e., leaks from the pumps or piping, overfilling at the tank ports, etc.).

Degree and Extent of Contamination

Free product has been detected solely in MW-3. No free product was observed in a test pit (four feet deep) excavated 10 feet from MW-3. During the UST closures, small amounts of free product were observed near the western extent of the former USTs, although no appreciable or recoverable volumes were found.

The extent of contamination as defined by PID screening of soil during the UST closures and the soil-gas survey (see Figures 1 and 2 of the July 11, 1994 report in Appendix A) was generally confirmed by the groundwater sampling results. The groundwater sampling results define a plume of dissolved-phase contaminants migrating westward from the former UST area and pumps. BTEX distribution is confined to the area between MW-101 and MW-106. MTBE is more widespread across the site. The highest concentrations of dissolved-phase contaminants are present in MW-105, which is just downgradient from the former USTs. Elevated concentrations of BTEX and MTBE in the wells along Shelburne Road (MW-1, MW-2, and MW-104) indicate that contamination has probably reached the property boundary, and likely extends beneath Shelburne Road. The numerous subsurface utilities (see Figure 12) along Shelburne Road may provide avenues for preferential groundwater flow and contaminant migration.

Vertical migration into the underlying till is believed to be minimal due the low permeability nature of the till, and the lack of saturation within the till as observed during excavating at the site.

5.3 Potential Receptors

The nearest downgradient surface water feature is a drainageway and wetlands located several hundred feet west of the site, behind the Nissan garage. This drainageway receives stormwater runnoff from the vicinity, and the presence of wetland-type vegetation suggests that the drainageway also acts a discharge zone for shallow groundwater. Based on the low permeability nature of the soils observed on-site, it appears unlikely that plume of dissolved-phase contamination at the site would reach this drainageway . However, this cannot be rule out, particularly due to the presence and potential influence of the many subsurface utilities, which may provide avenues for preferential flow.

Figure 13 presents the locations of nearby wells (from the State's water well inventory database). Based on the distance between the site and these wells, well construction, and the hydrogeologic setting, the potential for site contamination reaching these wells appears to be low.

Due to the shallow depth to groundwater and the absence of basements in the nearby structures, the risk of exposure to petroleum vapors in surrounding structures appears to be low.

Perhaps the greatest risk of exposure posed by site contamination exists for workers excavating the subsurface utilities in the area, particularly the utilities along Shelburne Road directly in front of the site. The intersection of Shelburne Road and Allen Road is presently targeted for reconstruction as part of a major transportation project involving Route 7.

5.4 Summary, Conclusions and Recommendations

Summary and Conclusions

The discovery of free product in a leak-detection monitoring well (MW-3) at the Shelburne Road Mobil South prompted the closure and replacement of site USTs and piping in June of 1994. Site investigation activities following the UST closures have included a soil-gas survey, the bailing of free product from MW-3, and the installation and sampling of additional groundwater monitoring wells. MW-3 has been bailed on a regular basis since June 23, 1994. Product accumulation within MW-3 is presently ranging from 0.2 to 0.4 feet. Groundwater occurs at a depth of one to five feet at the site, within a shallow zone of permeable fill materials and lacustrine silts, which are underlain by a nearly impermeable till. Site soils and the shallow perched zone of groundwater have been impacted by the release, and a plume of dissolved-phase contamination is migrating westward from the former UST area and pump island.

The site contamination, as presently defined, does not appear to pose a threat to surface waters, water supplies, or to nearby structures (i.e., vapor accumulation). Perhaps the greatest risk of exposure posed by site contamination exists for workers excavating the subsurface utilities in the area, particularly the utilities along Shelburne Road directly in front of the site.

Recommendations

Based on the existing data, the downgradient extent of dissolved-phase contamination has not been defined. Additional monitoring wells could be installed across Shelburne Road to see if contamination has reached this area. In addition, a monitoring well could be installed just north of the intersection of Allen Road and Shelburne Road, to detect contaminant movement along subsurface utilities in the vicinity. Proposed well locations are shown Figure 14.

Based on the limited amount of free product detected during the UST closures and monitoring well installations, it is difficult to determine if a more aggressive effort of product recovery (other than bailing of MW-3) is warranted. MW-3 bailing efforts should continue on a weekly basis.

Site monitoring wells should be sampled on a monthly basis and analyzed for BTEX and MTBE.

Since the most likely potential exposure of site contamination is to workers engaged in utility excavations, the owners of the subsurface utilities in the vicinity should be notified of the site contamination.

Recommendations are summarized as follows;

- Continued bailing of MW-3 on a weekly basis.

- Monthly groundwater monitoring; including measurement of site groundwater levels, and sampling and analysis of all site wells for BTEX and MTBE.

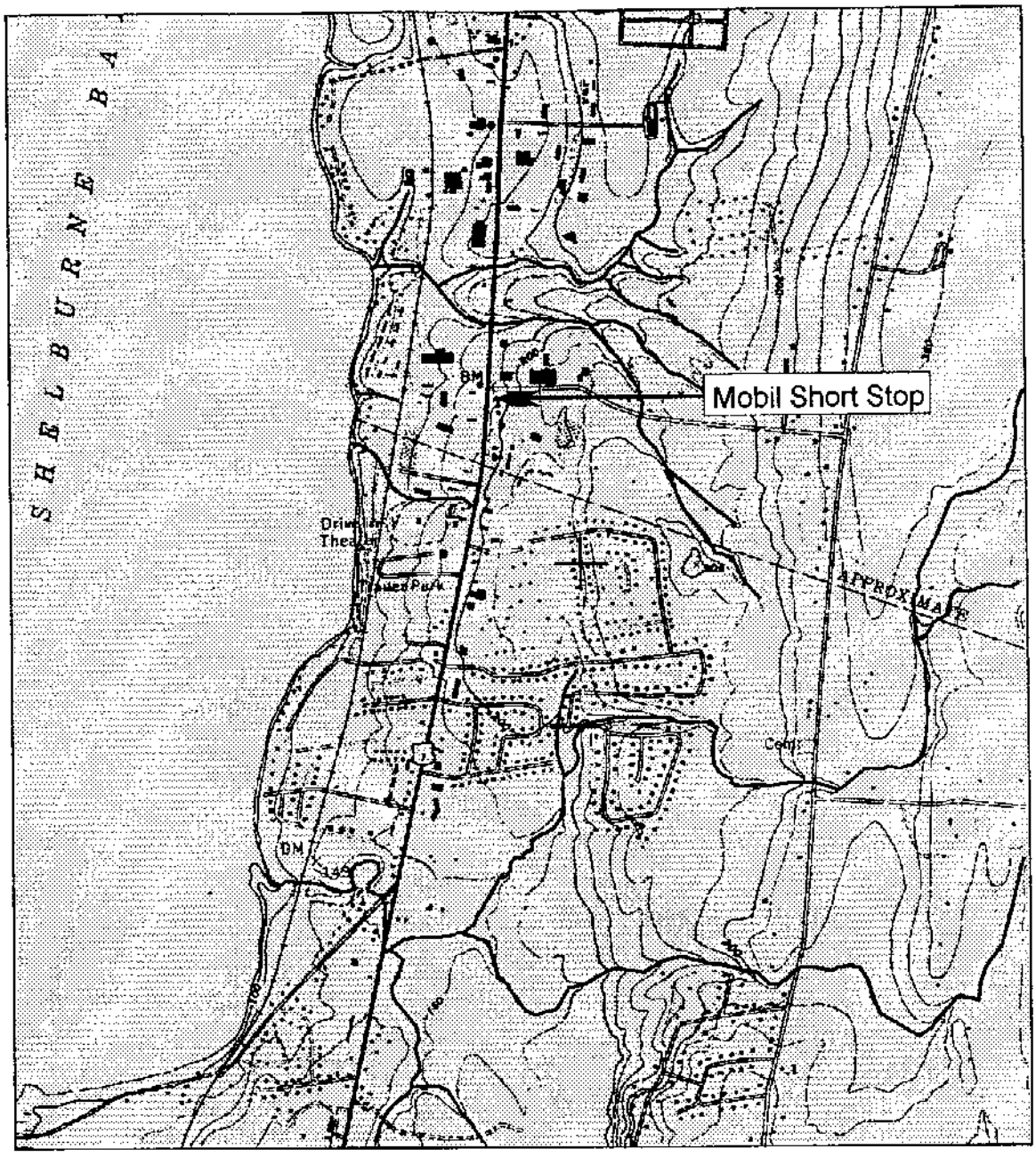
- Installation of monitoring wells on the other side of Shelburne Road and Allen Road (see Figure 14) to define the downgradient extent of contamination.

- Notification of the Vermont Department of Transportation and owners of subsurface utilities in the vicinity of the site contamination.

These efforts should be documented through periodic reports. Sampling frequencies and the need for further site investigation efforts (additional well installations or PID screening) should be addressed after completion of the above recommendations.

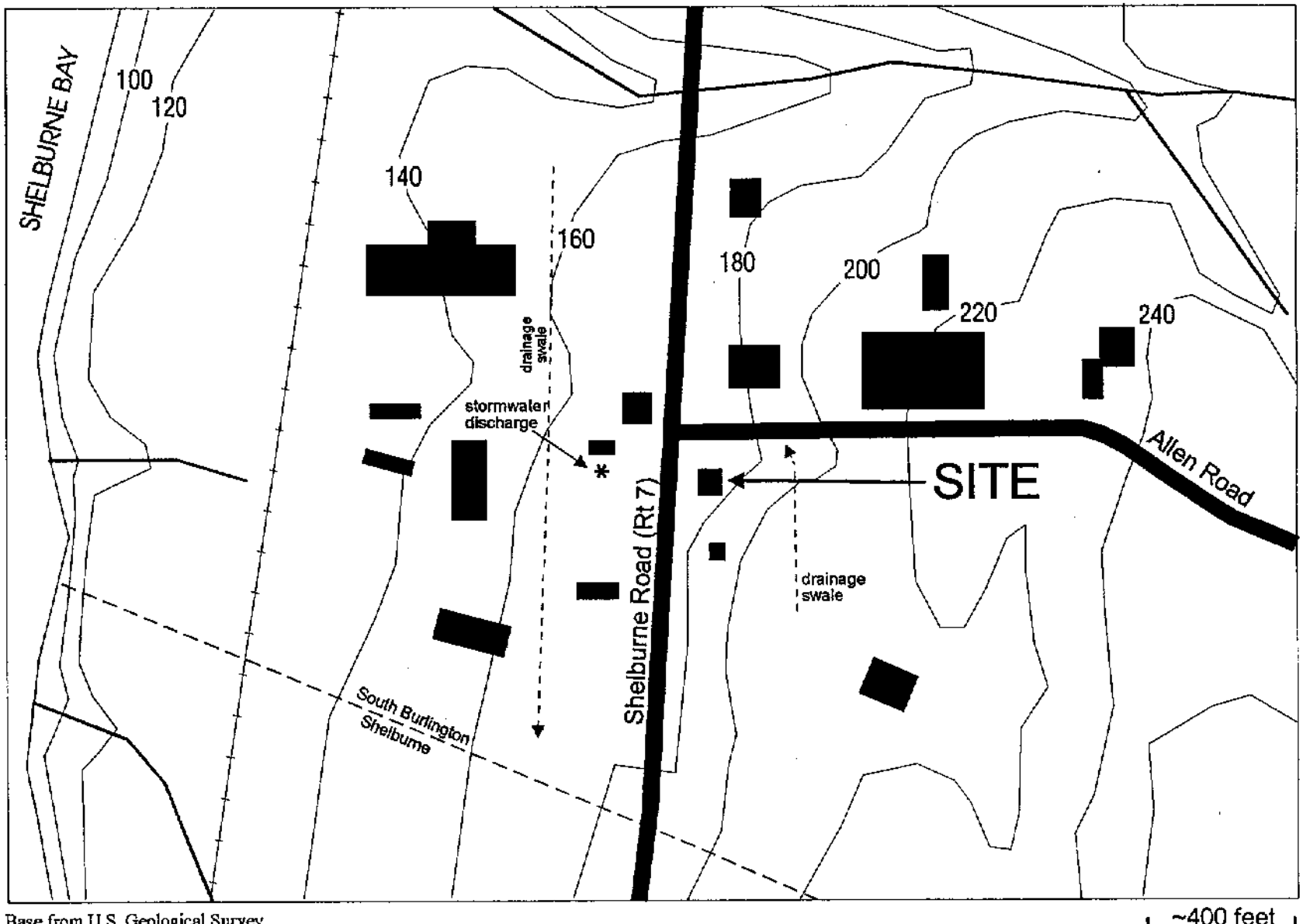
REFERENCES

Stewart, D.P., 1973, *Geology for Environmental Planning in the Burlington-Middlebury Region, Vermont*, Vermont Geological Survey, Water Resources Department, Environmental Geology No. 3.



Base from U.S. Geological Survey,
1:24,000, Burlington, Vermont, 1948,
Photorevised 1987.

FIGURE 1
Site location map, Shelburne Road Mobil South,
South Burlington, Vermont, SMS Site #88-0307.



Base from U.S. Geological Survey, 1:24,000, Burlington, Vermont, 1948, Photorevised 1987.

FIGURE 2
Site vicinity map, Shelburne Road Mobil South, South Burlington, Vermont, SMS Site #88-0307.

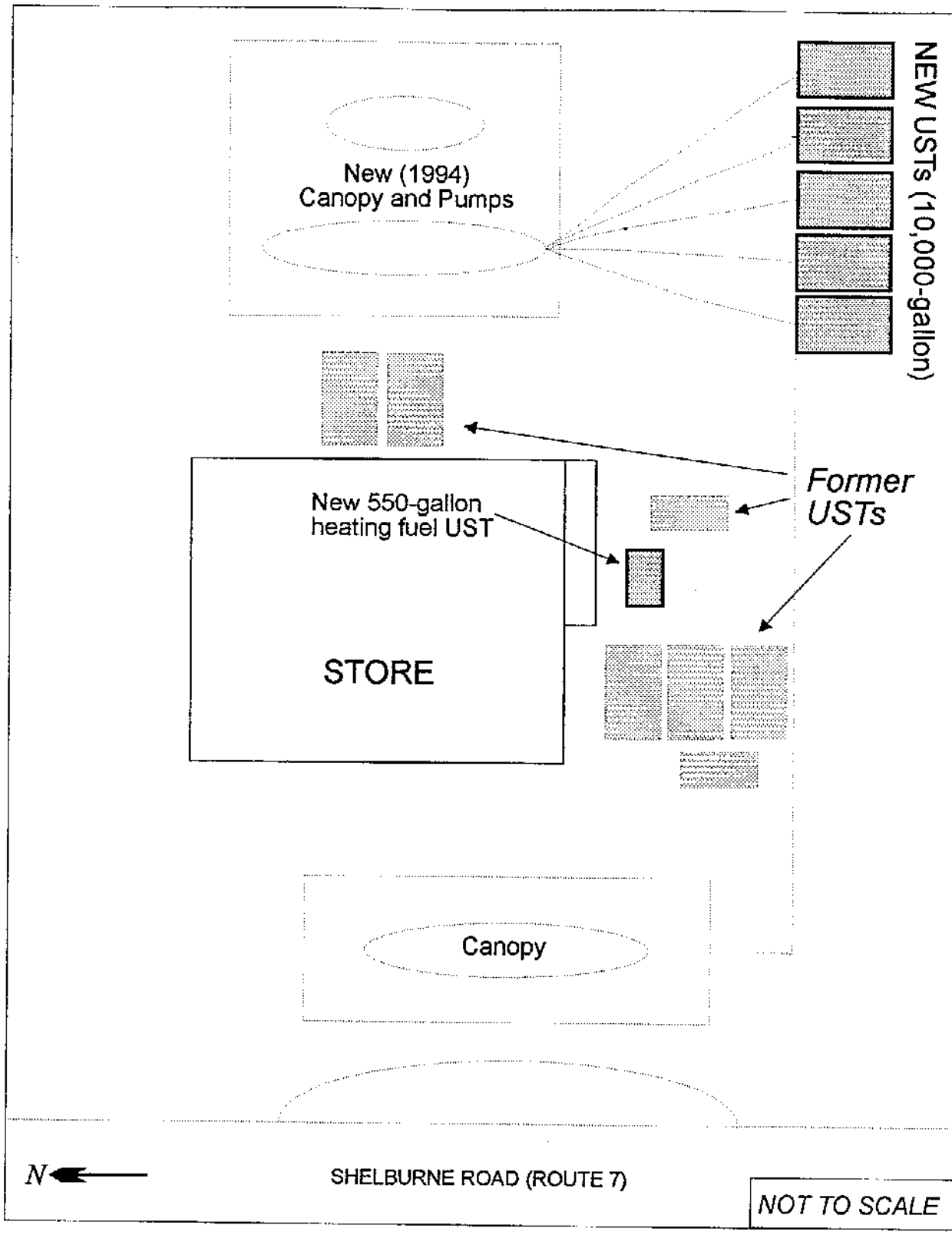


FIGURE 3
Site schematic illustrating past and present UST locations,
Shelburne Road Mobil South, South Burlington, Vermont, SMS Site #88-0307.

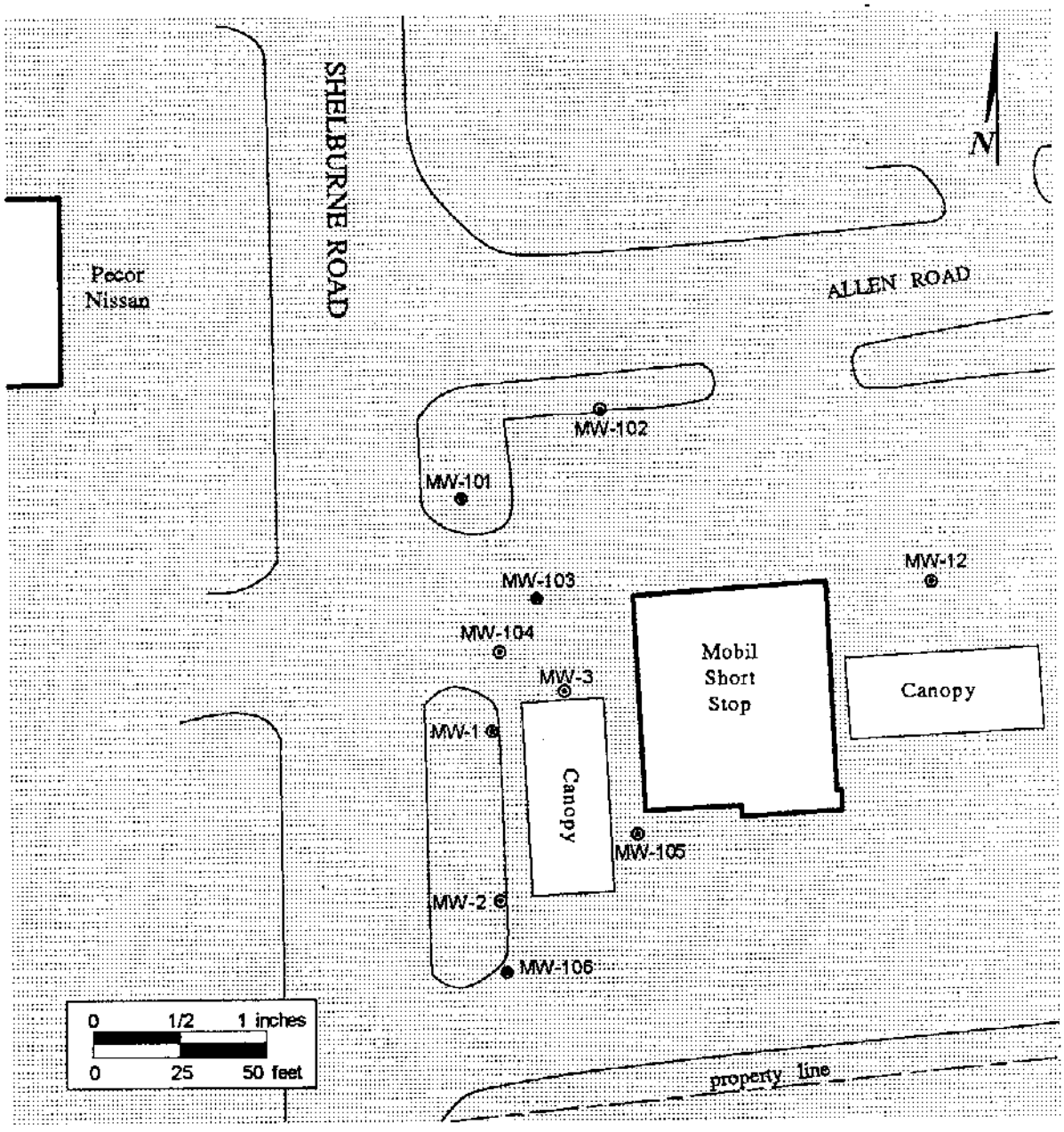


FIGURE 4
Site map showing monitoring well locations, Shelburne Road Mobil South, South Burlington, Vermont, SMS Site #88-0307.

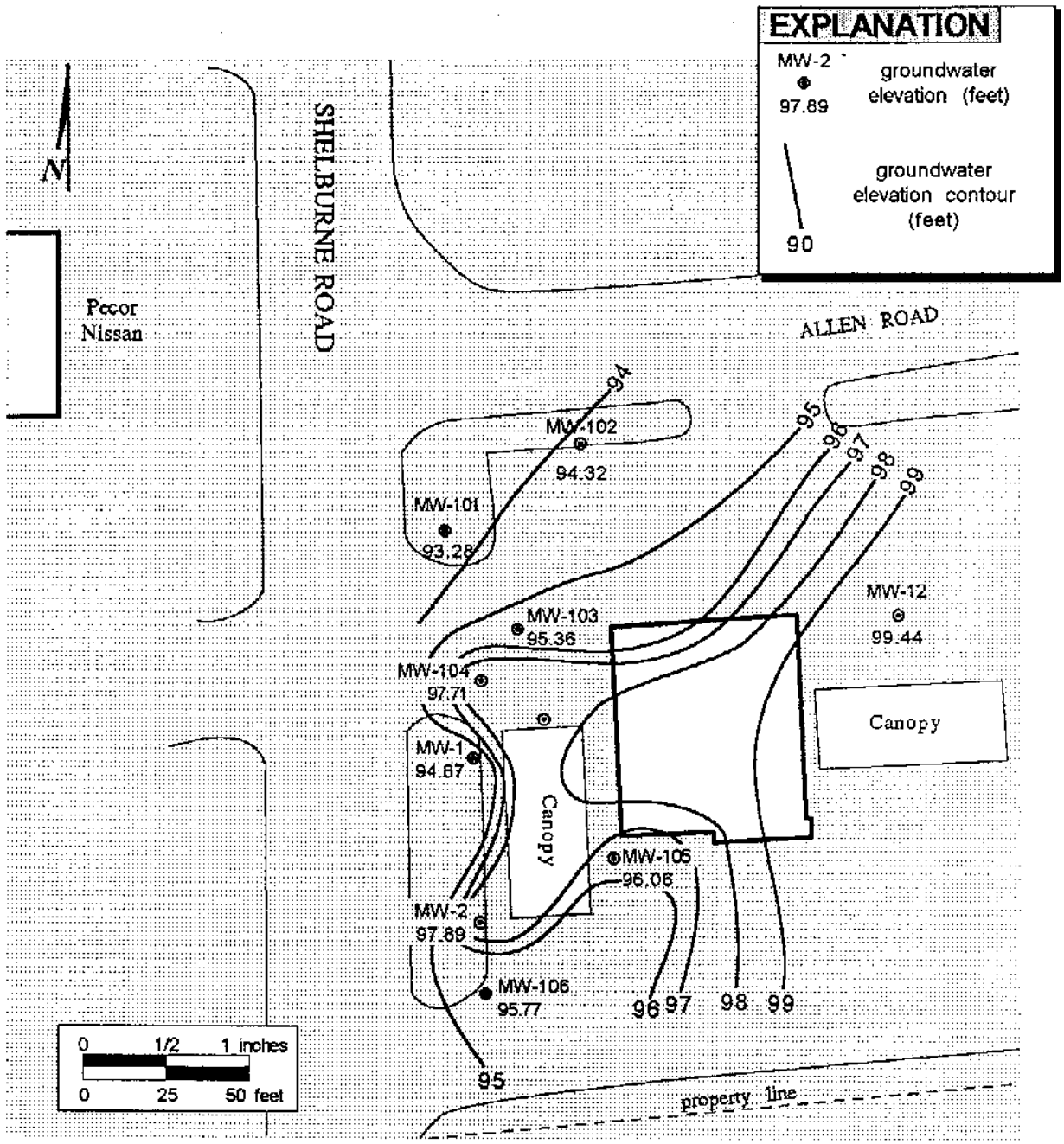


FIGURE 5
Groundwater elevations, July 21, 1994, Shelburne Road Mobil South, South Burlington, Vermont, SMS Site #88-0307.

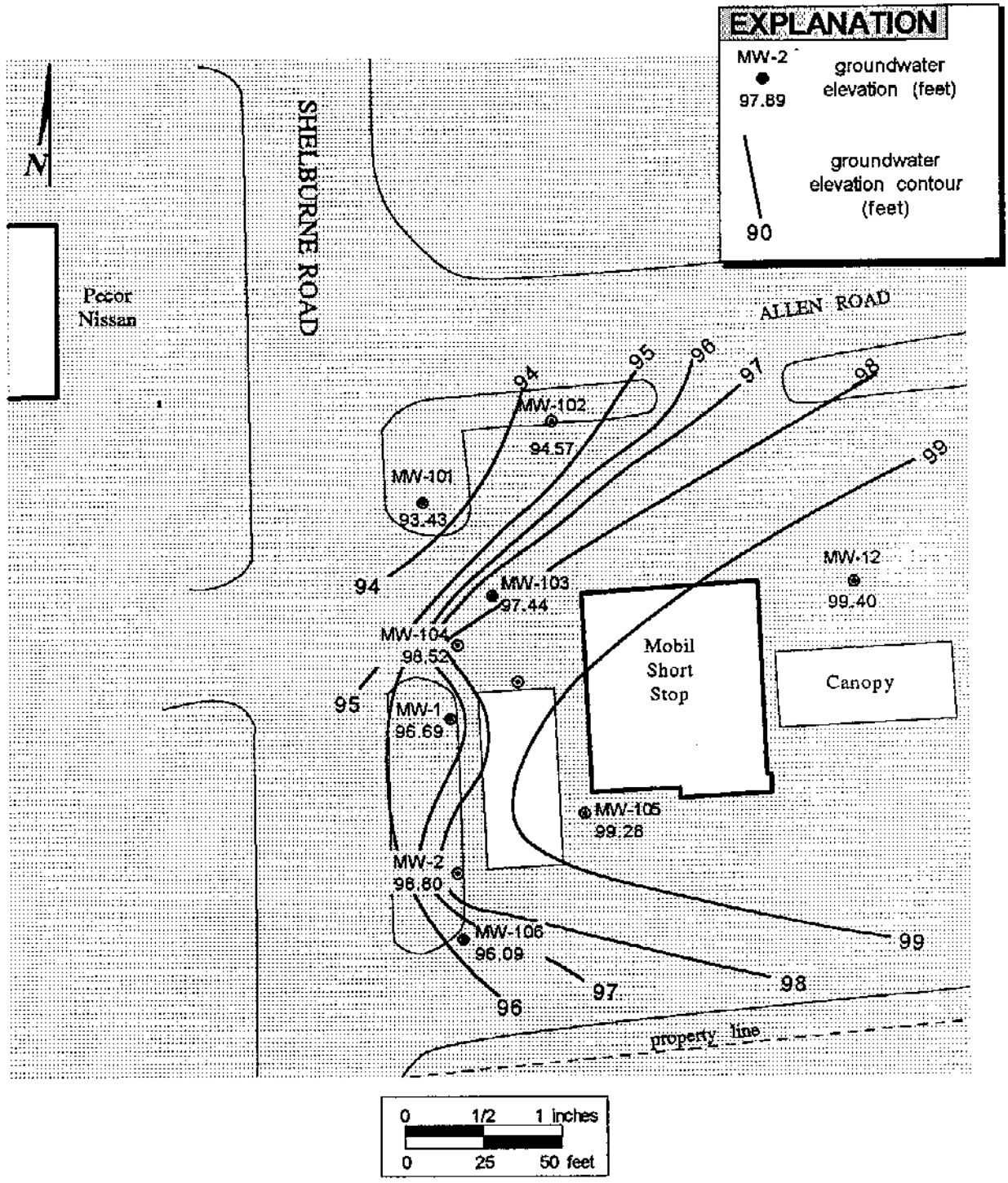


FIGURE 6
Groundwater elevations, August 25, 1994, Shelburne Road Mobil South, South Burlington, Vermont, SMS Site #88-0307.

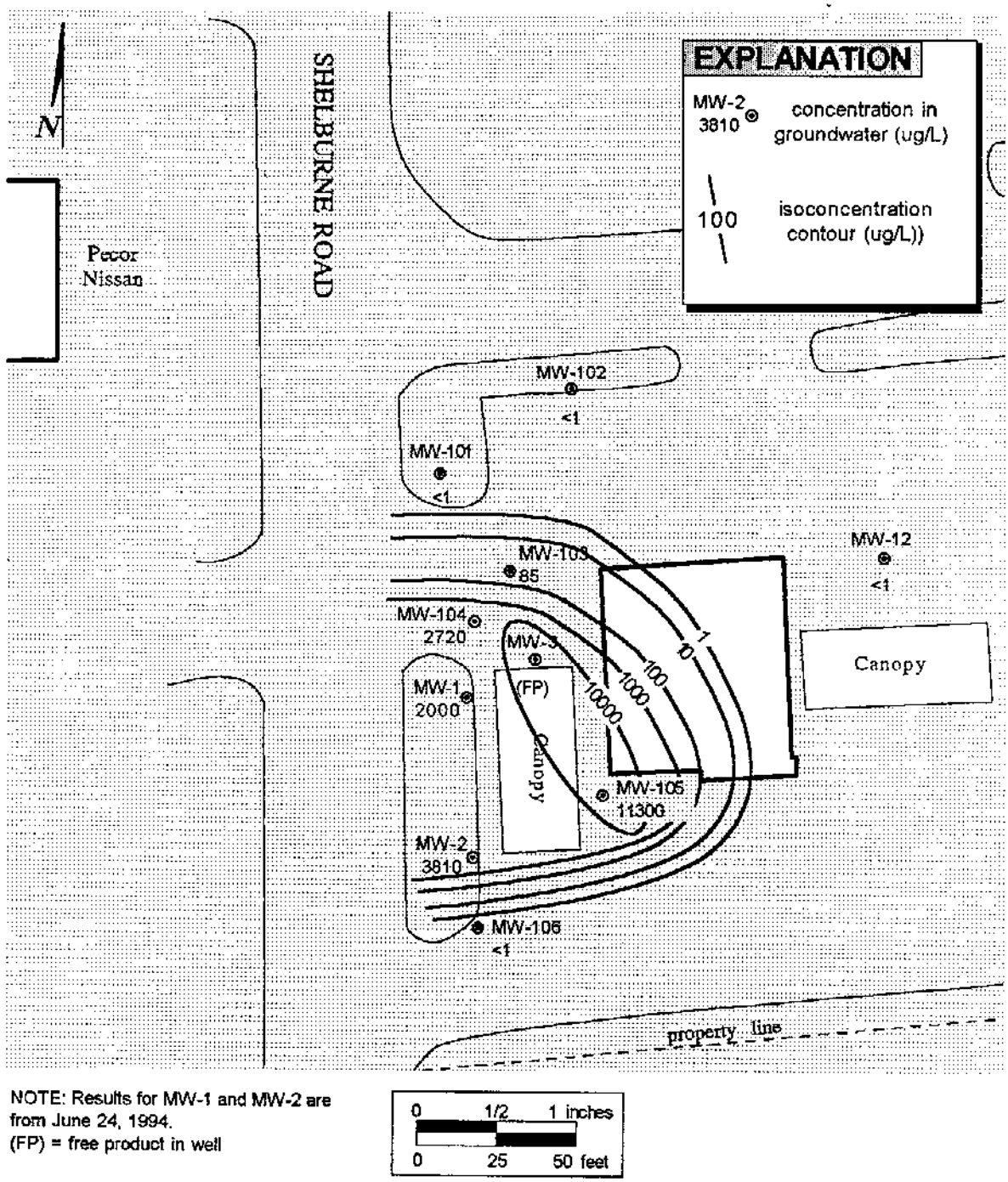


FIGURE 7
Isoconcentration map for benzene in groundwater, July 21, 1994,
Shelburne Road Mobil South,
South Burlington, Vermont, SMS Site #88-0307.

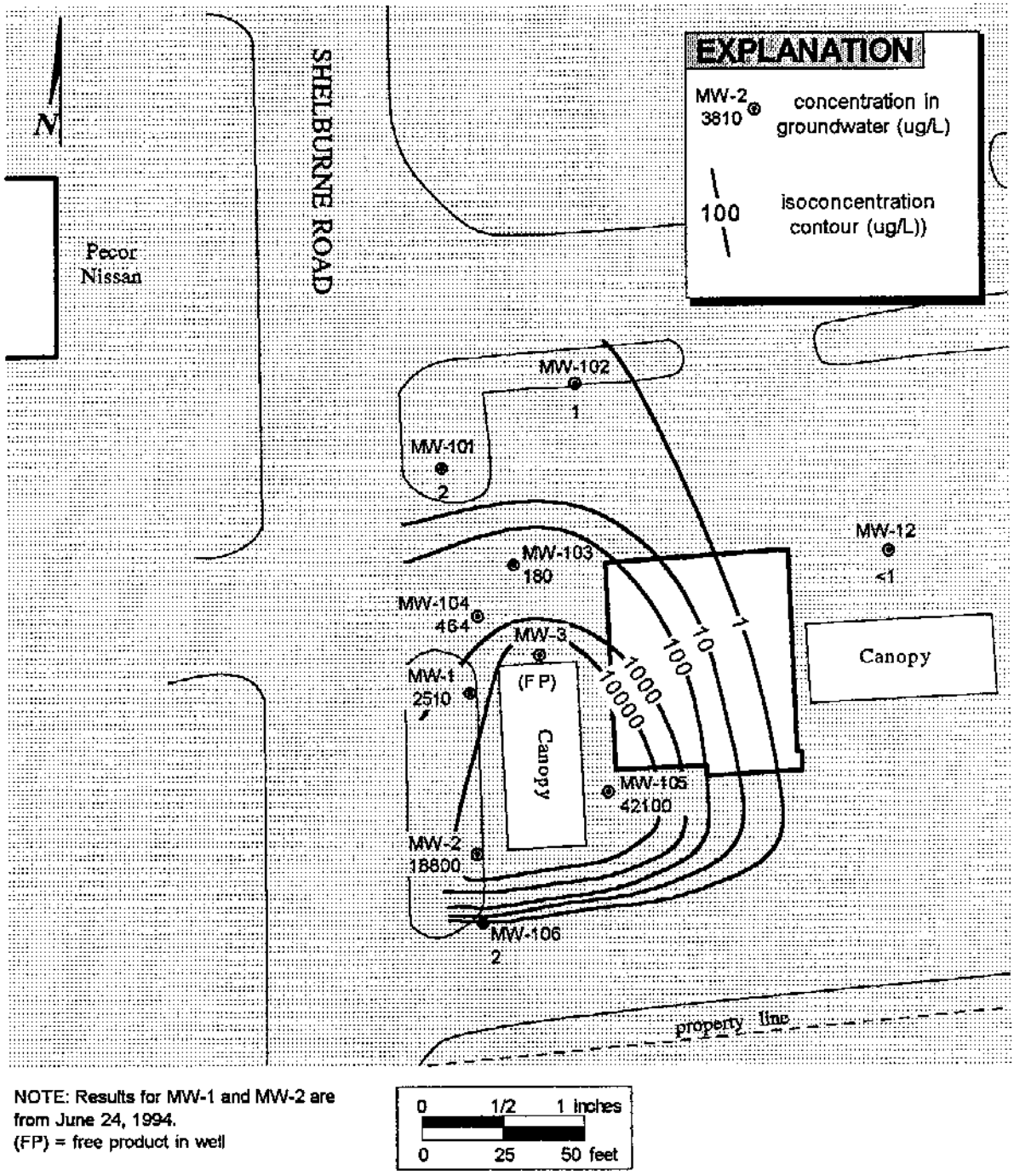


FIGURE 8
Isoconcentration map for toluene in groundwater, July 21, 1994,
Shelburne Road Mobil South,
South Burlington, Vermont, SMS Site #88-0307.

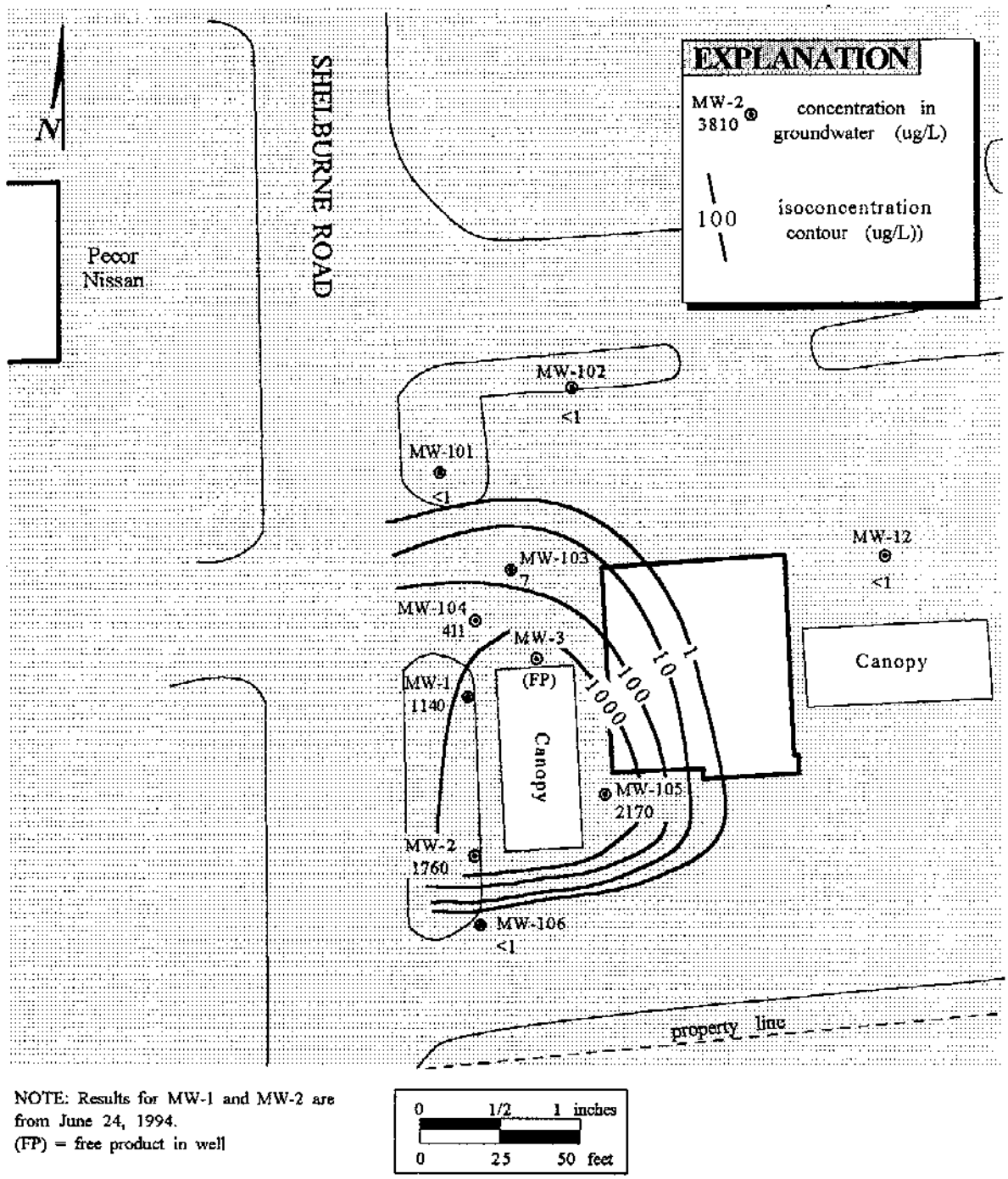


FIGURE 9
Isoconcentration map for ethylbenzene in groundwater, July 21, 1994,
Shelburne Road Mobil South,
South Burlington, Vermont, SMS Site #88-0307.

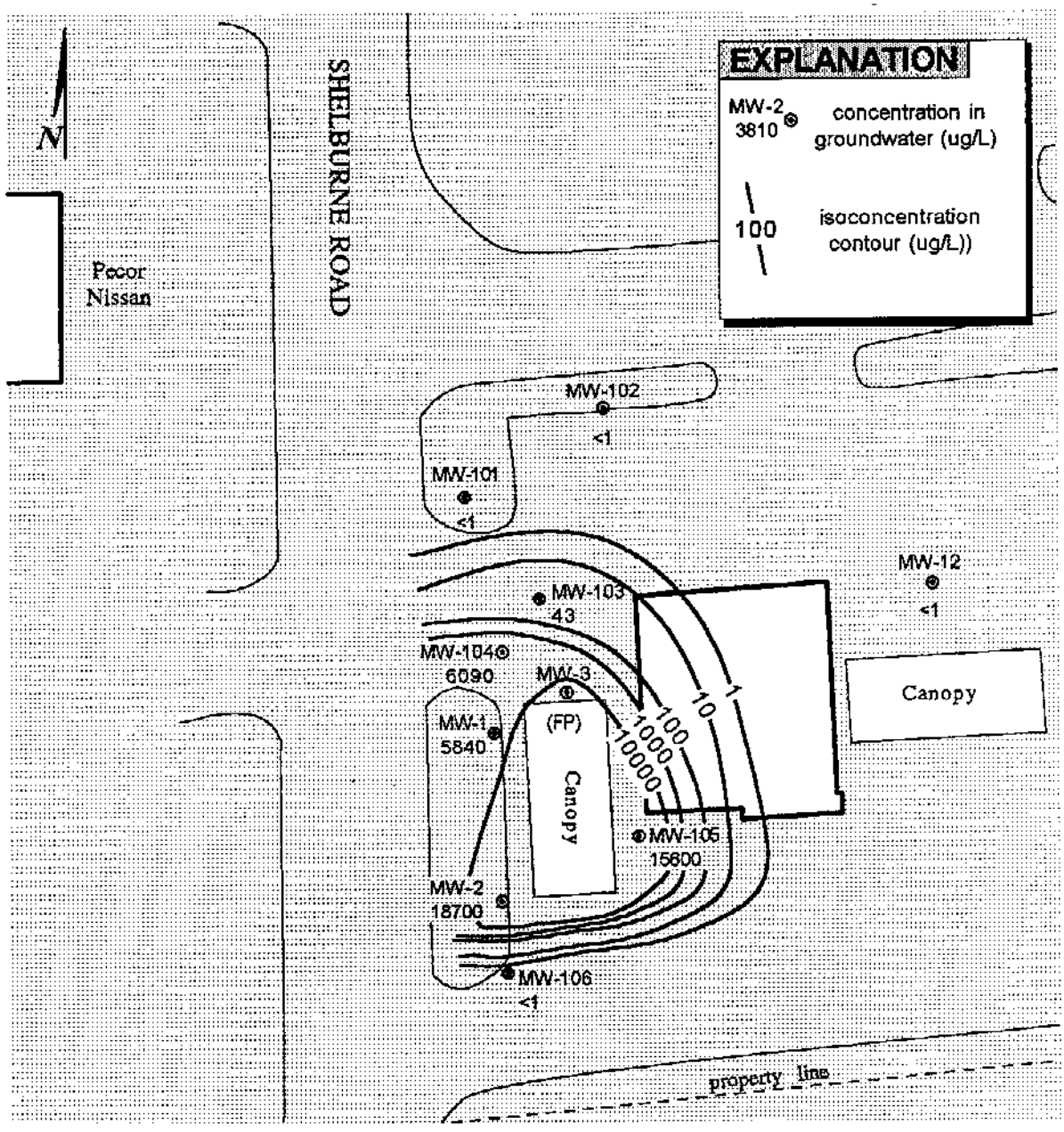


FIGURE 10
Isoconcentration map for xylenes in groundwater, July 21, 1994,
Shelburne Road Mobil South,
South Burlington, Vermont, SMS Site #88-0307.

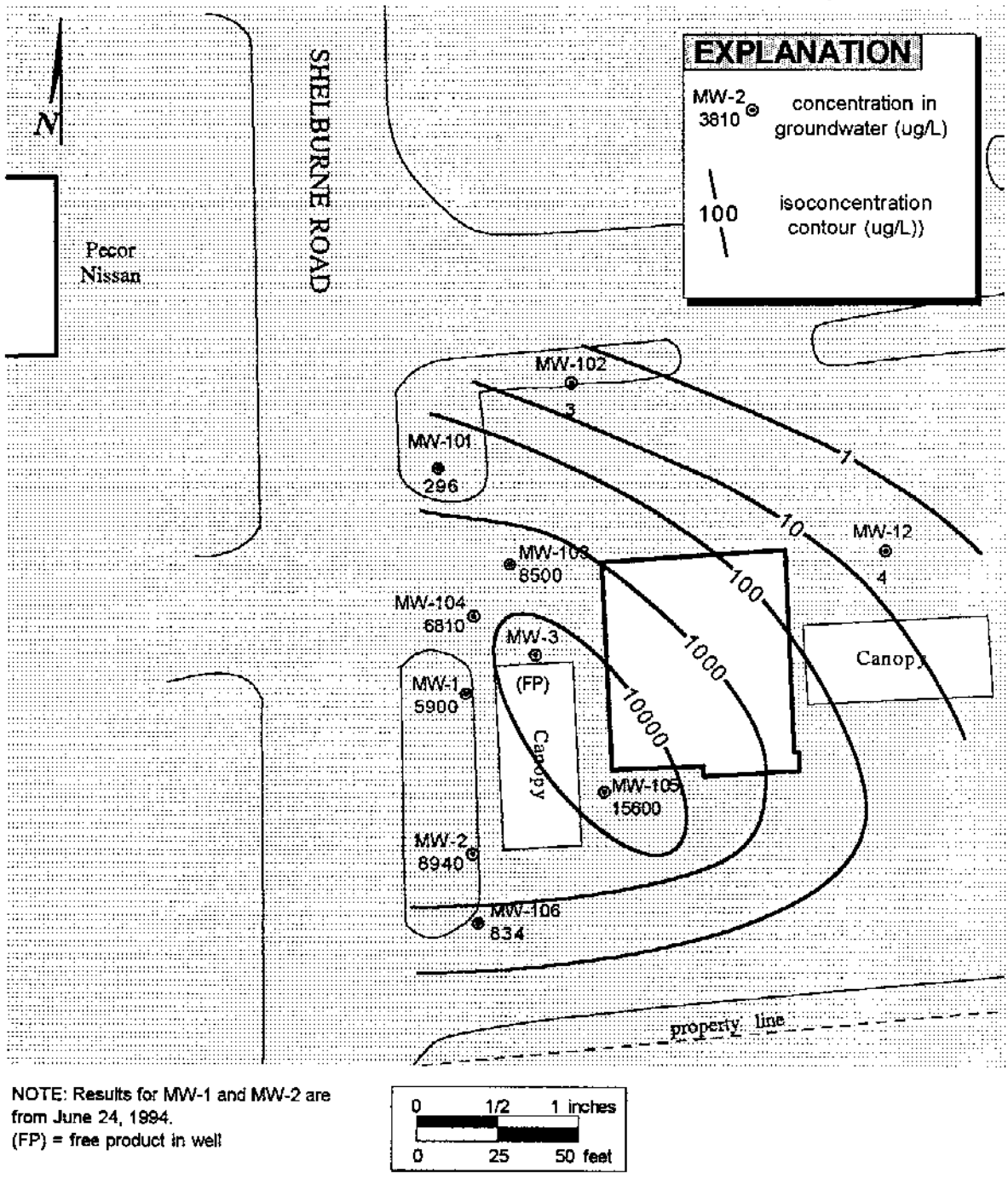


FIGURE 11
Isoconcentration map for MTBE in groundwater, July 21, 1994,
Shelburne Road Mobil South,
South Burlington, Vermont, SMS Site #88-0307.

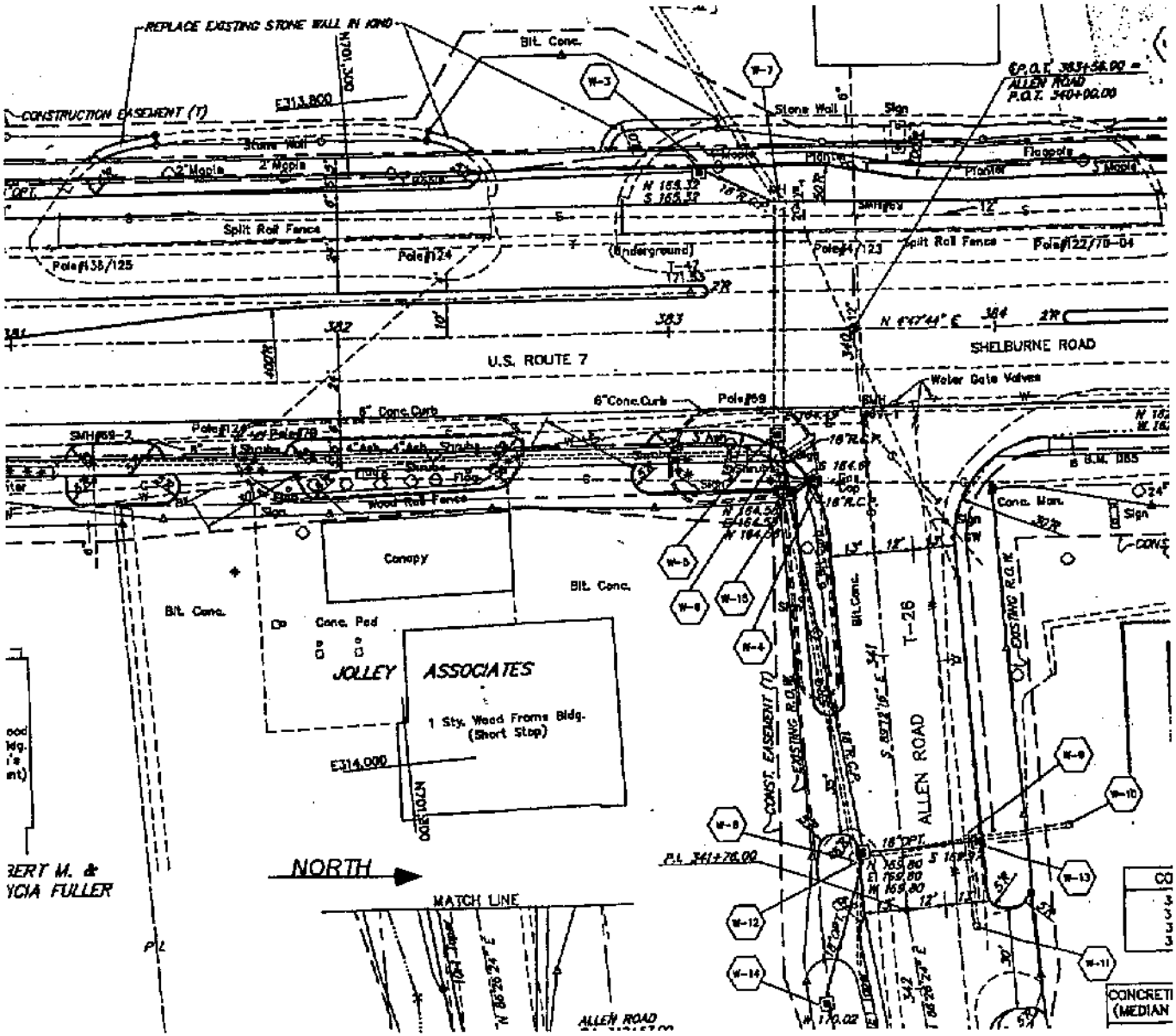
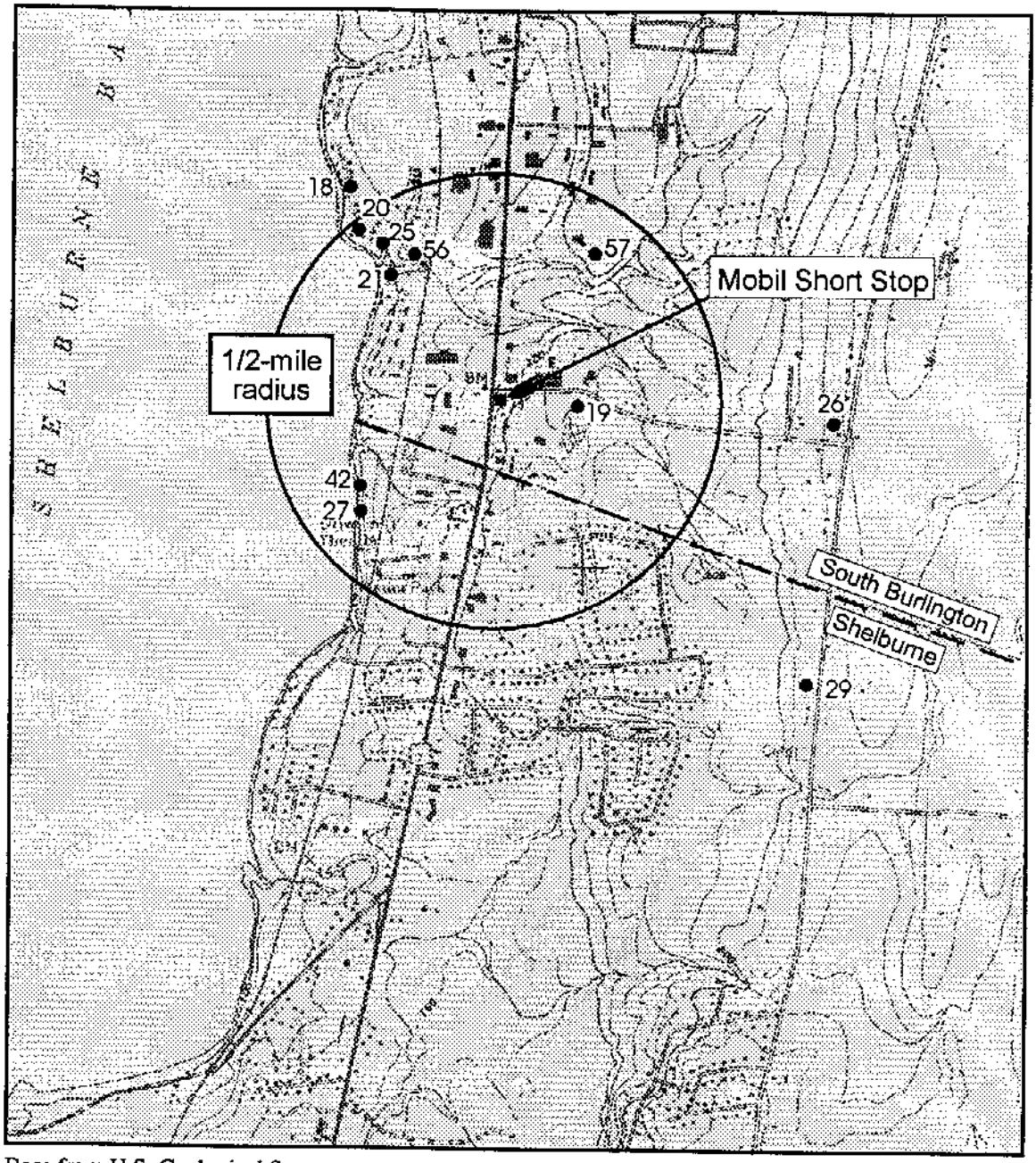


FIGURE 12
Site map with subsurface utilities,
Shelburne Road Mobil South, South Burlington, Vermont.



Base from U.S. Geological Survey,
1:24,000, Burlington, Vermont, 1948,
Photorevised 1987.

29● Water Resources Well # (By Town)

FIGURE 13
Nearby water supply wells (locations not verified),
Shelburne Road Mobil South, South Burlington, Vermont,
SMS Site #88-0307.

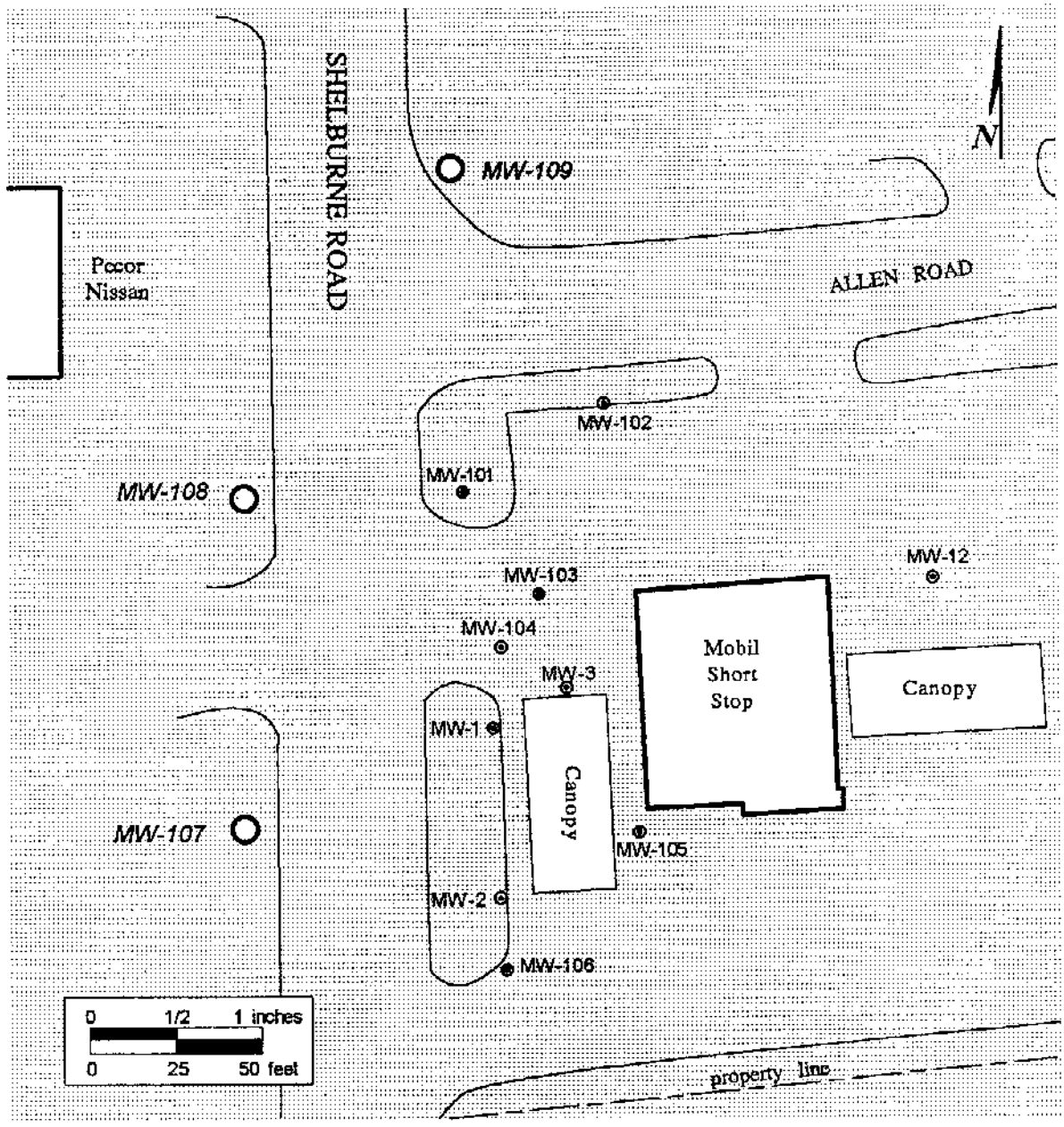


FIGURE 14
Proposed monitoring well locations, Shelburne Road Mobil South, South Burlington, Vermont, SMS Site #88-0307.

TABLE 1

Groundwater elevations,
Shelburne Road Mobil South, South Burlington, Vermont.

WELL ID	Elevation of Ground Surface (feet)	Top of Casing Elevation (feet)	July 19, 1994			July 21, 1994			August 25, 1994	
			PID* Reading (ppm)	Depth to Water from TOC (feet)	Groundwater Elevation (feet)	PID* Reading (ppm)	Depth to Water from TOC (feet)	Groundwater Elevation (feet)	Depth to Water from TOC (feet)	Groundwater Elevation (feet)
MW-1	100.66	100.54	5.5†	3.1†	97.56	NA	5.79	94.87	3.97	96.69
MW-2	101.42	101.23	280†	3.4†	98.02	NA	3.53	97.89	2.62	98.80
MW-3**	100.82	100.64	>2500†	5.99†	94.83	NA	4.7	96.12	2.69	98.13
MW-012	102.41	102.19	0.0	3.90	98.51	0.0	2.97	99.44	3.01	99.40
MW-101	98.70	98.41	0.0	5.21	93.49	0.1	5.42	93.28	5.27	93.43
MW-102	99.46	99.07	0.0	5.11	94.35	2.3	5.14	94.32	4.89	94.57
MW-103	99.80	99.41	480	2.53	97.27	230	4.44	95.36	2.36	97.44
MW-104	99.58	99.02	1340	1.67	97.91	520	1.87	97.71	1.06	98.52
MW-105	101.35	101.11	1750	5.15	96.20	1350	5.29	96.06	2.07	99.28
MW-106	101.01	100.64	0.0	5.25	95.76	43.5	5.24	95.77	4.92	96.09

TOC - Top of Casing
Elevations are relative to an on-site benchmark of 100.00 feet
* - PID readings taken with MicroTIP HL-2000, 10.6 eV bulb, calibrated to isobutylene
** - Depths to free product in MW-3 were 4.95' (6/24/94), 4.58' (7/21/94), and 2.29' (8/25/94)
† - Measurements for PID headspaces and depth to water for MW-1, MW-2, and MW-3 were obtained on June 24, 1994.
NA - Data not available

TABLE 2

Groundwater sampling results,
Shelburne Road Mobil South, South Burlington, Vermont.
(results in µg/L)

June 24, 1994

WELL ID	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE
MW-1	2000	2510	1140	5840	5900
MW-2	3810	18800	1760	18700	8940

July 21, 1994

WELL ID	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE
MW-101	<1	2	<1	<1	296
MW-102	<1	1	<1	<1	3
MW-103	85	180	7	43	8500
MW-104	2720/2210	464/614	411/656	6090/5530	6810/5800
MW-105	11300	42100	2170	15600	36700
MW-106	<1	2	<1	<1	834
MW-12	<1	<1	<1	<1	4
Trip Blank	<1	<1	<1	<1	<1
Field Blank	<1	<1	<1	<1	<1

Notes
<1 = below a detection limit of 1
2720/2210 = sample result/duplicate result

TABLE 3

PID soil sample headspace measurements during well installations,
Shelburne Road Mobil South, South Burlington, Vermont.

July 15, 1994

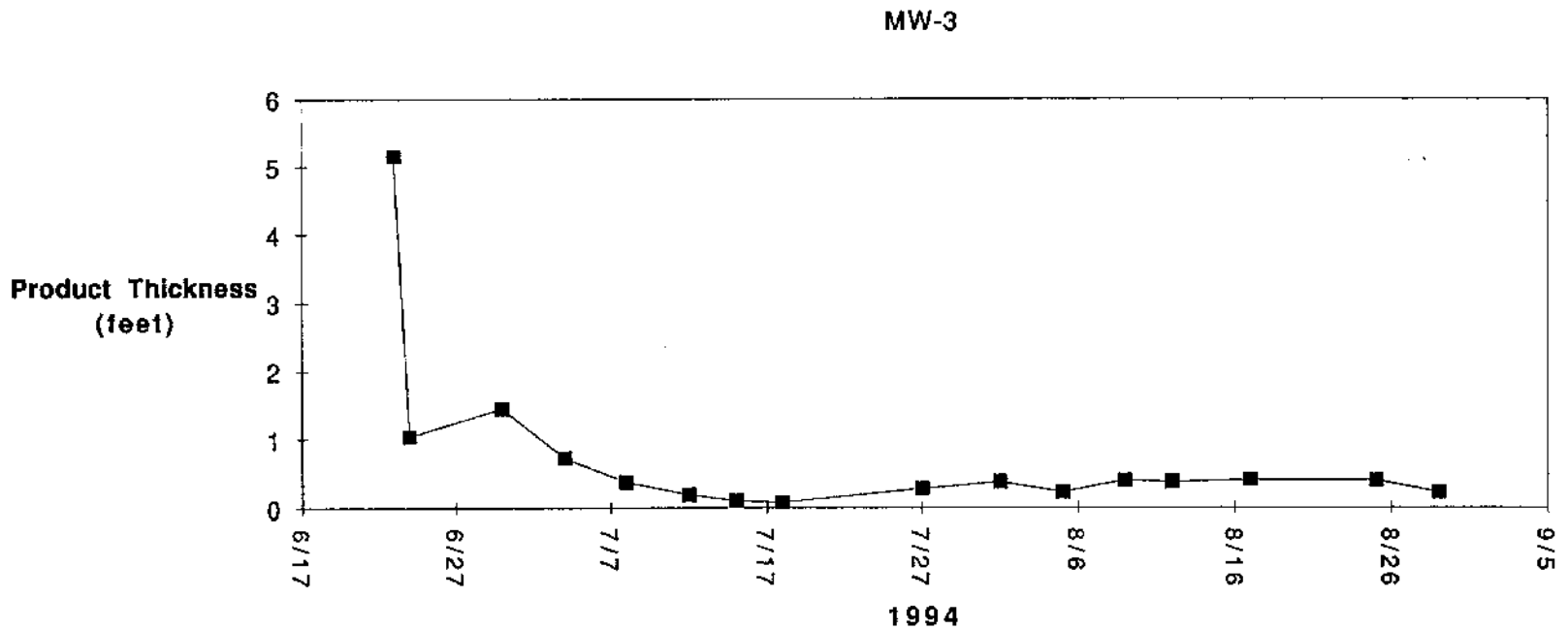
MW- 101		MW- 102		MW- 103		MW- 104		MW- 105		MW- 106	
Interval (ft)	**PID (ppm)**	**Interval (ft)**	**PID (ppm)**	**Interval (ft)**	**PID (ppm)**	**Interval (ft)**	**PID (ppm)**	**Interval (ft)**	**PID (ppm)**	**Interval (ft)**	**PID (ppm)**
0.0-1.8	6.5	0.0-1.0	1.4	0.0-1.0	NA	0.0-1.5	250	0.0-0.6	NA	0.0-1.5	7.5
1.8-2.9	6.5	1.0-1.5	1.3	1.0-1.9	450	1.5-2.5	130	0.6-2.0	650	1.5-3.0	3.6
2.9-4.7	6.7	1.5-6.0	0.3	1.9-5.3	311	2.5-7.2	380	2.0-3.1	2500	3.0-4.0	4.9
4.7-5.7	3.1			5.3-8.2	28.8	7.2-8.8	350			4.0-5.0	5.4
5.7-6.6	0.0									5.0-6.5	11.1

Depths recorded from the base of distinct soil layers, highest PID reading obtained for each soil layer is reported here
PID Readings taken with MicroTIP HL-2000, 10.6 eV bulb, calibrated to isobutylene

TABLE 4

Free product bailing log for MW-3,
Shelburne Road Mobil South, South Burlington, Vermont.

Date	6/23	6/24	6/30	7/4	7/8	7/12	7/15	7/18	7/27	8/1	8/5	8/9	8/12	8/17	8/25	8/29	
Depth to Product (ft.)	2.80	4.95	3.70	3.22	3.50	3.77	4.51	4.65	2.70	2.81	1.94	2.71	3.05	2.67	2.29	2.41	
Depth to Water (ft.)	7.95	5.99	5.15	3.95	3.87	3.96	4.62	4.73	2.98	3.18	2.17	3.11	3.42	3.08	2.69	2.64	
Product Thickness (ft.)	5.15	1.04	1.45	0.73	0.37	0.19	0.11	0.08	0.28	0.37	0.23	0.40	0.37	0.41	0.40	0.23	
																	TOTAL
Total Bailed (gals.)	1.00	0.75	0.75	0.50	1.00	0.75	0.40	0.30	0.33	0.75	1.00	0.75	1.00	0.80	0.75	1.00	11.83
Product Bailed (gals.)	1.00	0.25	0.50	0.25	0.60	0.15	0.10	0.05	0.10	0.19	0.10	0.10	0.15	0.10	0.10	0.10	3.84



APPENDIX A

Relevant Correspondence

July 11, 1994

Carl Ruprecht, UST Manager
S.B. Collins, Inc.
54 Lower Welden Street
St. Albans, VT 05478

Re: Site Investigation, Shelburne Road Mobil South, South Burlington, Vermont
(UST Facility ID #1117, SMS Site #88-0307)

Dear Carl:

This letter summarizes activities to date at the Shelburne Road Mobil South site, and presents a tentative plan for the installation of groundwater monitoring wells. Recent work efforts have included periodic removal of free product and water from monitoring well MW-3, a soil-gas survey, and groundwater sampling of MW-1 and MW-2. Data collected during these activities are presented below. In addition, I have included a proposed plan and locations for the installation of groundwater monitoring wells.

FREE PRODUCT

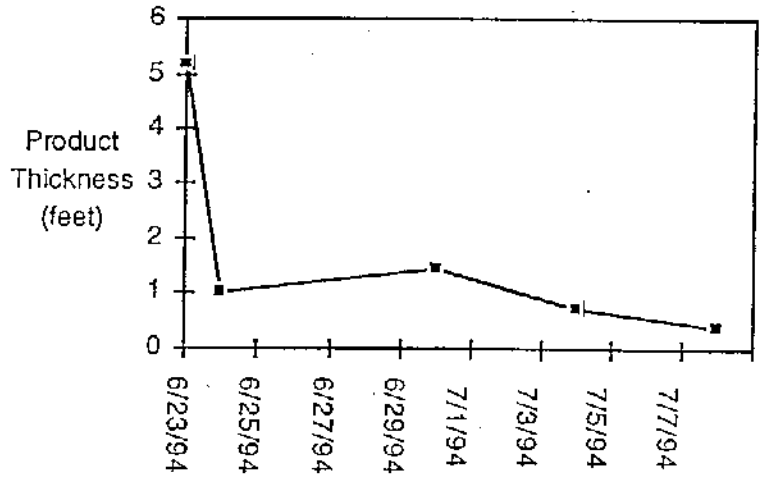
Free product has been periodically removed (by bailing) from MW-3 since June 23, 1994. MW-3 is a two-inch PVC well, with screen from the surface to a depth of eight feet. Prior to bailing, depth to product and depth to water measurements are taken. Typically, MW-3 is purged to dryness after removing 1.0 to 1.5 well volumes. Data for each removal event to date are presented below.

Date	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Total Bailed (gals)	Product Bailed (gals)
6/23/94	2.80	7.95	5.15	1.0	1.0
6/24/94	4.95	5.99	1.04	0.75	0.25
6/30/94	3.70	5.15	1.45	0.75	0.5
7/4/94	3.22	3.95	0.73	0.5	0.25
7/8/94	3.50	3.87	0.37	1.0	0.6

Jefferson P. Hoffer
Consulting Hydrogeologist

(802) 244 - 5573
P.O. Box 428, Waterbury, Vermont 05676

Product thickness verse time is graphed below.



We will continue to bail MW-3 on a regular basis as long as appreciable quantities of product are being removed.

SOIL-GAS SURVEY

A PID soil-gas survey was performed on June 20, 1994, to assist in the delineation of contamination at the site, and to optimize the siting of groundwater monitoring wells. Sampling efforts were concentrated in the vicinity of MW-3, and the inferred downgradient margins of the site (north and west). Sampling was also performed across Shelburne Road, in front of the Nissan Dealership. A total of 40 points were sampled.

Soil-gas measurements were taken with a MicroTIP HL-2000, equipped with a 10.6 eV bulb and calibrated to isobutylene. Sampling points were accessed by driving a 3/4-inch stainless-steel slam bar to a depth of approximately three feet below ground surface. The slam bar was retracted and replaced with a 24-inch stainless-steel sampling probe. An inert sealing clay was used to prevent ambient air from entering the probe hole around the sampling probe at the surface. New polyethylene tubing was then connected to the sampling port of the probe, and to the MicroTIP, and soil-gas readings were obtained. Two readings were recorded: the maximum measurement, and the reading after one minute. In general, readings peaked within 30 seconds and then stabilized or decreased. Results are presented on Table 1. Sampling locations and the maximum reading obtained at each location are shown on Figure 1, which includes 100 and 1000 ppm isoconcentration contours. These results generally confirm PID screening measurements taken during the tank closures, shown on Figure 2, which illustrates high PID readings in the vicinity of the former USTs, under the fuel pumps, and near MW-3. North of MW-3, soil-gas readings

decrease markedly (Figure 1). Measurements in the northwest corner of the site (near the intersection of Shelburne and Allen Roads) were generally low with the exception of a reading of 70.9. The 70.9 ppm reading may be anomalous, or may be indicative of preferential contaminant migration along subsurface utilities. A reading of 1986 ppm was obtained on the western margin of the paved entrance northeast of MW-3, suggesting that off-site migration near this location may have occurred. The soil-gas readings further south, in the vicinity of MW-2 and MW-1, show a marked decrease toward Shelburne Road, suggesting that off-site contaminant migration at these locations may not have occurred. No elevated readings were detected across Shelburne Road from the site.

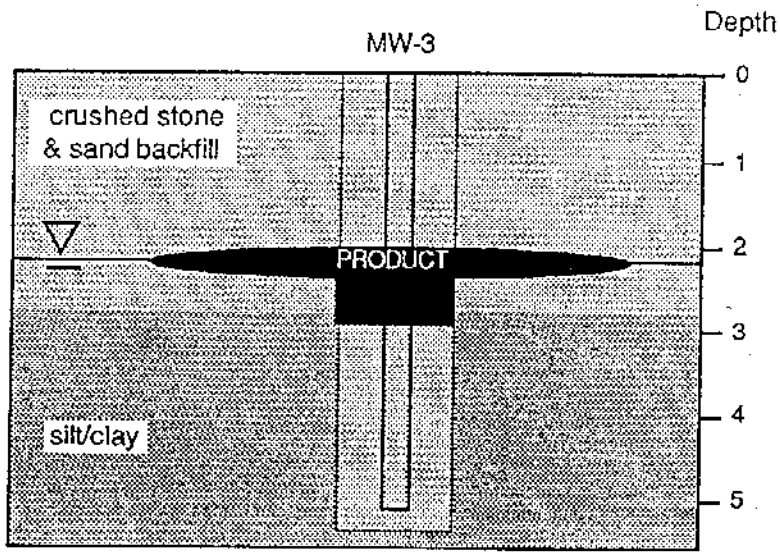
I should emphasize that a lack of elevated soil-gas readings does not conclusively indicate the absence of contamination.

GROUNDWATER SAMPLING

Groundwater samples were retrieved from MW-1 and MW-2 on June 24, 1994, and analyzed for BTEX compounds and MTBE using EPA Method 8020. Results are expected within a few days.

PROPOSED GROUNDWATER MONITORING WELLS

As observed during the UST and piping closures, the site soil profile includes two to four feet of crushed stone and sandy backfill, underlain by native lacustrine silts and clays, and glacial till. Both the fine-grained lacustrine sediments and the till are relatively impermeable. No indications of true water table conditions were observed during excavations at the site. The fill materials overlying native soils provide a permeable zone for the accumulation of shallow (perched) water and product. The existing on-site monitoring wells are essentially sumps which allow water and/or product to accumulate, as illustrated below.



Numerous subsurface utilities are present along the western margin of the site, and include water, wastewater, stormwater, natural gas, and telephone. Buried utilities servicing the Mobil store include water, wastewater, electrical conduits to the signs/lighting, and roof stormwater drains. These utilities and their surrounding backfill may serve as conduits for preferential flow of water and product at the site.

Due to the site conditions, it is somewhat challenging to decide where monitoring wells should be sited, and how they should be installed. The uppermost zone of saturation is within the shallow crushed stone and sand backfill underlying most of the site. The saturated portion of this layer is relatively thin, less than a foot in places. The underlying native soils are of low permeability, and have likely precluded very much vertical contaminant migration. The topography of the coarse backfill and the native soil interface likely controls groundwater flow and contaminant transport at the site.

Given the site conditions, I recommend using Adams Engineering's "mini-rig" (see my June 15, 1994 memo) to collect soil samples and install shallow monitoring wells. Continuous soil samples can be collected using 2 3/8-inch sampling tubes which are advanced by a vibratory driving mechanism. Continuous soil samples will reveal site stratigraphy and can be PID screened to assess the vertical distribution of contamination. This drilling technique allows the installation of 1.5-inch monitoring wells.

Proposed well locations are shown on Figure 3. Four of these wells (MW-105, 106, 107, and 108) are located where well guards were installed during the pouring of new concrete under the front canopy. Well MW-109 is sited as an upgradient well on the eastern perimeter of the site. Wells MW-101, 102, 103, and 104 are sited to assess potential downgradient contamination.

Please review this information and proposal and let me know how you wish to proceed.

Sincerely,

Jefferson P. Hoffer
Consulting Hydrogeologist

enc.

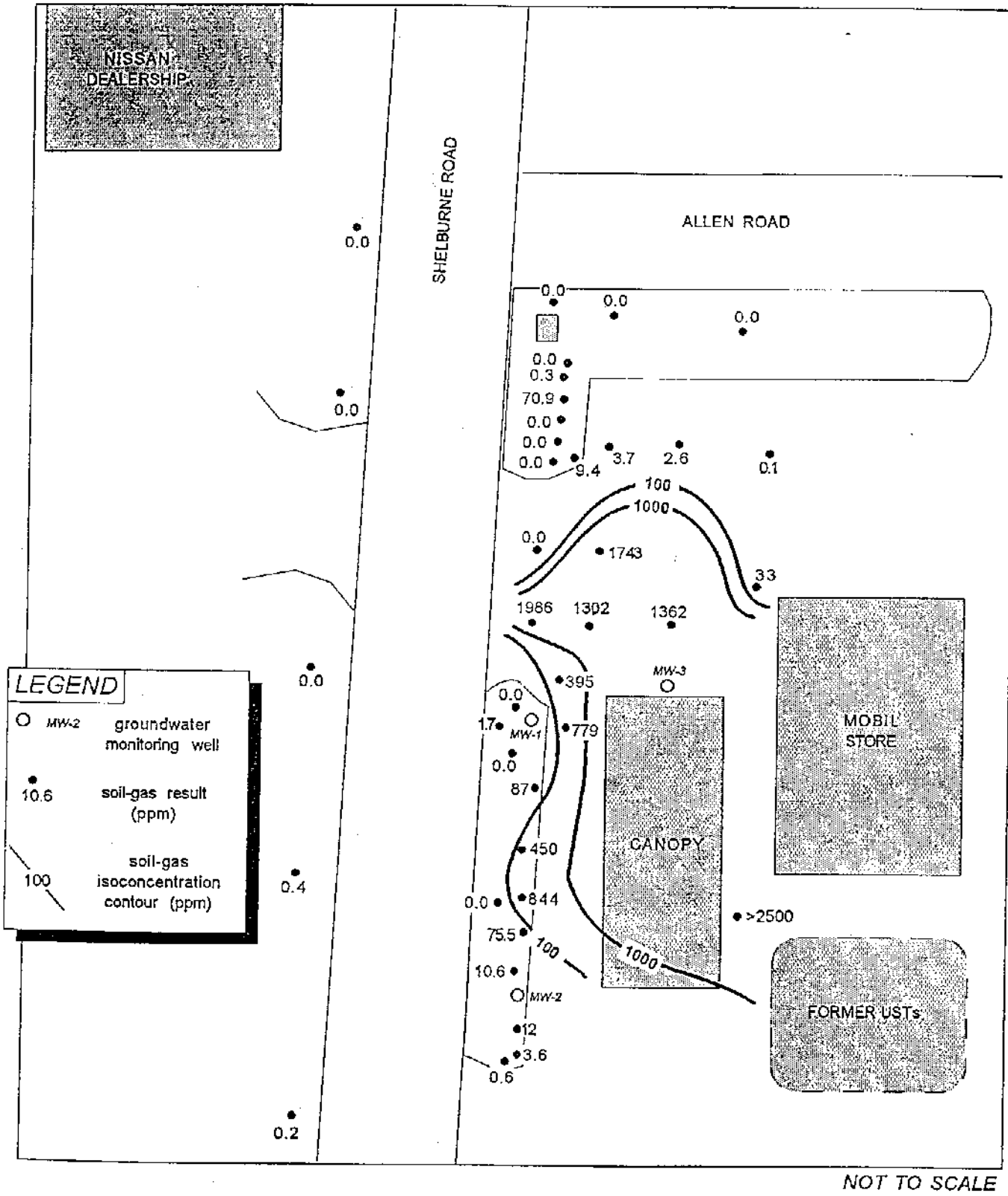
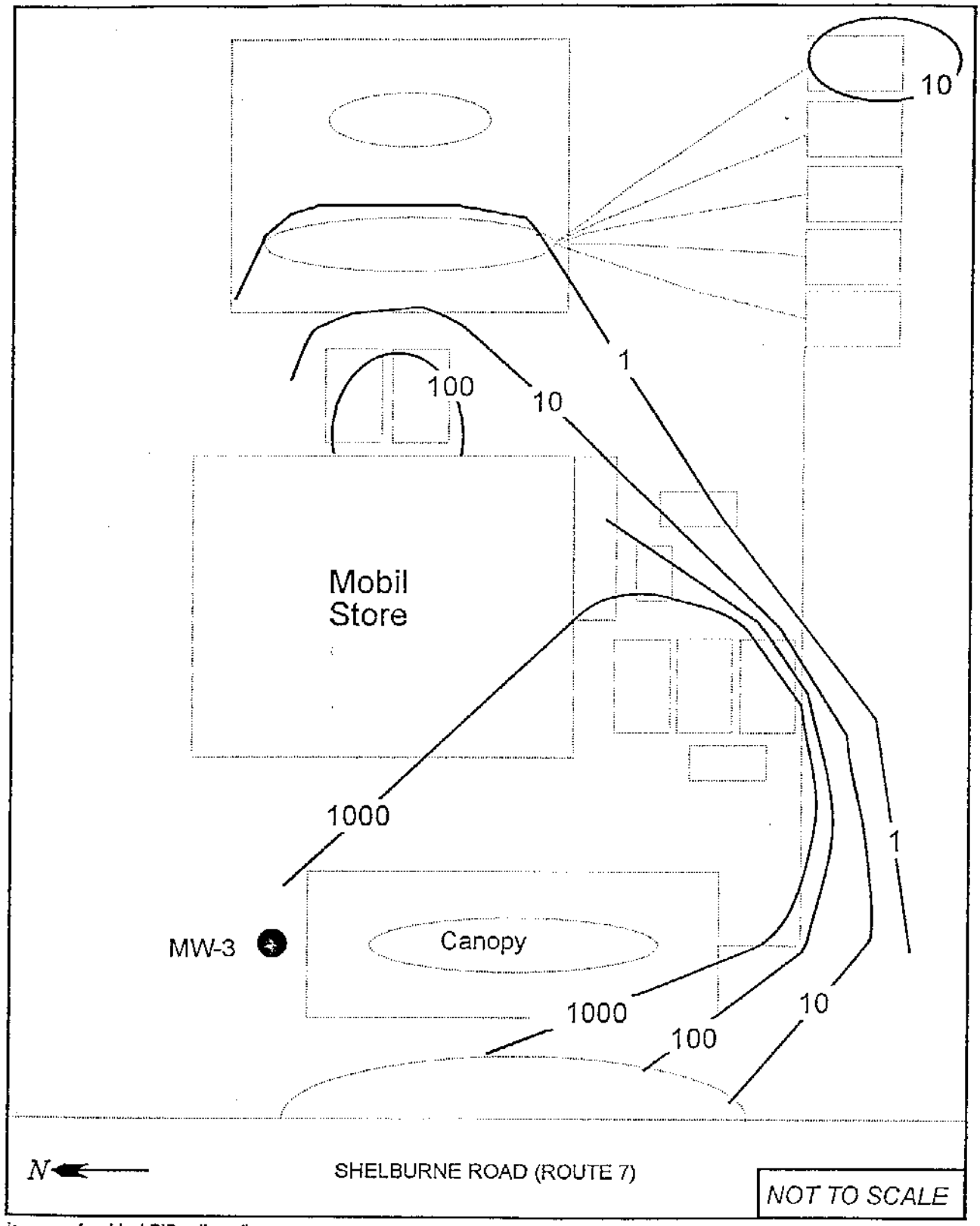


FIGURE 1
PID soil-gas survey results, June 20, 1994,
Shelburne Road Mobil South, South Burlington, Vermont.



isocons of ambient PID soil readings,
MicroTIP HL-2000 calib. to Isobutylene

FIGURE 2
Isoconcentration map of PID measurements of soil measured during UST closures, Shelburne Road Mobil South, South Burlington, Vermont.

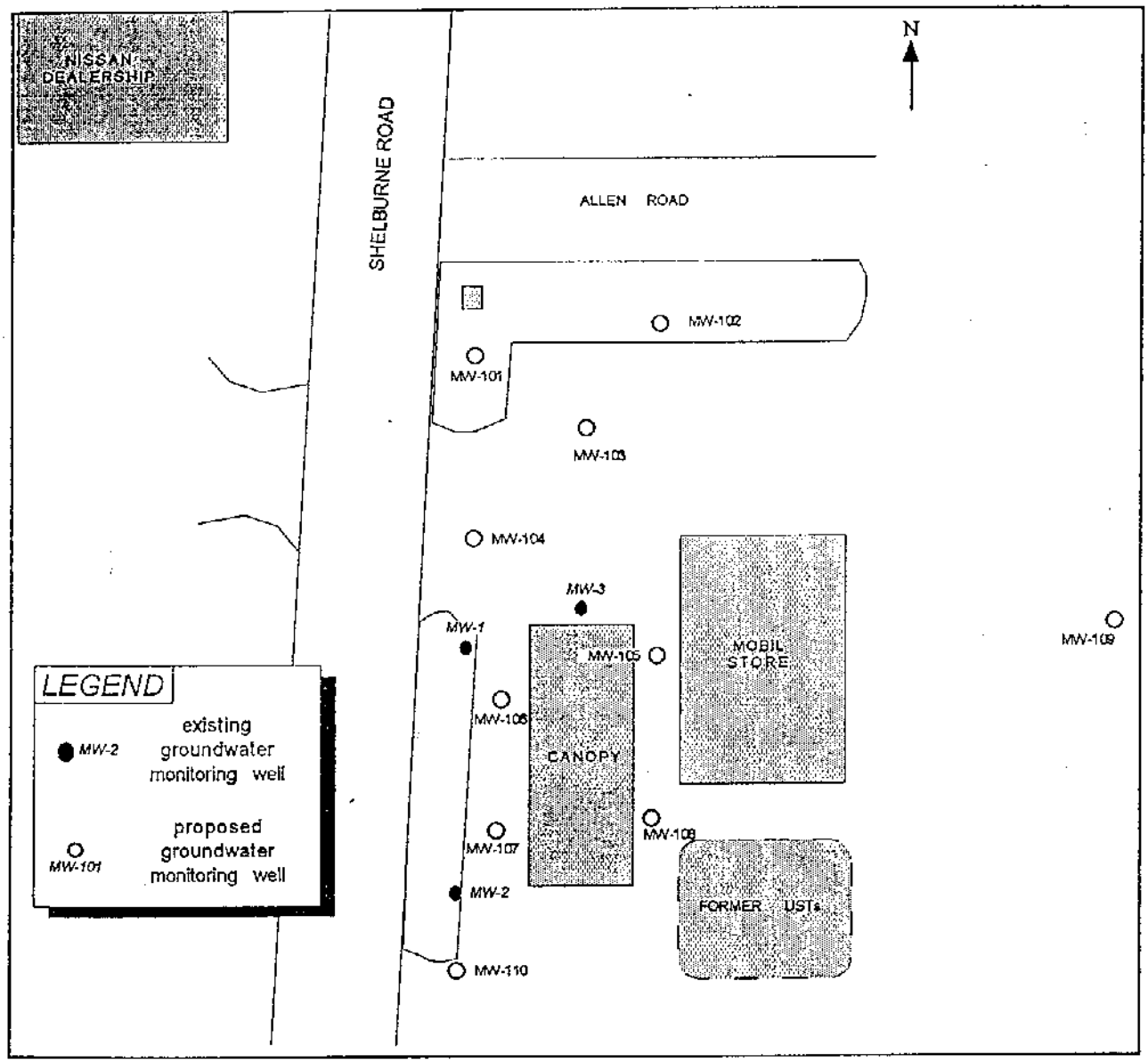


FIGURE 3
Proposed monitoring well locations, Shelburne Road Mobil South, South Burlington, Vermont.

June 14, 1994

Carl Ruprecht, UST Manager
S.B. Collins, Inc.
54 Lower Welden Street
St. Albans, VT 05478

Re: UST Closures, Mobil Short Stop South, South Burlington, Vermont
UST Facility ID #1117, SMS Site #88-0307

Dear Carl:

This letter presents the site assessment associated with the closure of seven USTs at the Mobil Short Stop South, South Burlington, Vermont.

GENERAL SITE INFORMATION/BACKGROUND INFORMATION

The site USTs, pumps, and piping had been scheduled for routine replacement in 1995. Upon discovery of two feet of free product in a site monitoring well this Spring, an accelerated schedule of site work was initiated. A brief chronology of correspondence and site activities relevant to this site assessment is presented below.

- May 5, 1994, Letter from Carl Ruprecht to Chuck Schwer, Sites Management Section (SMS), notifying the SMS that over two feet of free product was discovered in site monitoring well MW-3 and that S.B. Collins intended to promptly remove/replace existing tanks, pumps, and piping.

Jefferson P. Hoffer
Consulting Hydrogeologists

(802) 244 - 5573
P.O. Box 428, Waterbury, Vermont 05676

- May 27, 1994, Letter from Jefferson P. Hoffer to Matt Germon (SMS) regarding the status of a 6-inch bedrock water supply well present at the site.

- June 1, 1994, Commenced removal of 4,000 gallon heating oil UST.

- June 2, 1994, Commenced removal of four gasoline USTs (one 4,000 gallon, and three 10,000 gallon).

- June 6, 1994, Commenced removal/replacement of front pumps and piping.

Figure 1 presents a site location map, and a site vicinity map is provided on Figure 2. A site sketch showing the locations of the closed and replacement USTs is given on Figure 3. The site is situated in a high-traffic, developed portion of Shelburne Road (Route 7). The site is bordered on the west by Shelburne Road, Allen Road to the north, a forested and undeveloped lot to the east owned by Jolley & Associates, and small businesses to the south. A Nissan auto dealership is located across Shelburne Road from the site, and includes a showroom near the road, and a garage in the back.

The results of groundwater sampling performed last November on site wells MW-2 and MW-14 are presented on Table 1. The free product recently detected in MW-3 is believed to be weathered gasoline, although no laboratory analyses have been performed. Site topography and depth to water measurements in the site monitoring wells suggest that shallow groundwater flow is westward (or northwestward) toward Shelburne Road.

Topography in the vicinity grades westward toward Shelburne Bay of Lake Champlain. Elevation at the site is about 180 feet above mean sea level, or about 80 feet higher than the lake elevation. According to Stewart's (1973) surficial geology map, the site is underlain by lacustrine and marine sands and gravels. A silt /clay unit is mapped further west, with the contact between the sand/gravel and silt/clay along Route 7. The sand/gravel unit in the vicinity of the site is typically thin, and is underlain by the silt/clay unit.

Mapped surface water features are highlighted on Figure 1 and include small unnamed streams draining westward toward the lake, which is approximately 1800 feet west of the site, and drains toward the lake. The nearest mapped stream is located about 800 feet north of the site. Wetlands, possibly indicative of shallow groundwater discharge zones, and a surface water diversion swale, are present across Shelburne Road behind the Nissan dealership. In addition, a small drainage swale runs northward through the forested parcel just east (upslope) from the site. Water within this drainage swale enters the stormwater

system when it reaches Allen Road. Stormwater runoff on the site drains generally westward, toward stormwater catch basins along Route 7. A diversion swale runs north/south on the eastern edge of the site, and drains northward toward a culvert/catch basin. Stormwater in the vicinity is collected in a catch basin on the northwest corner of site at the intersection of Allen Road and Shelburne Road and is directed to a discharge pipe just south of the Nissan Garage (see Figure 2).

POTENTIAL RECEPTORS

Nearby water supply wells identified in the State's water well inventory database (for South Burlington and Shelburne) are shown on Figure 4. Well logs for these wells were included in the May 12, 1994 letter to Chuck Schwer. Based on the distance between the site and these wells, well construction, and the hydrogeologic setting, the potential for site contamination reaching these wells is low.

No basements are present on-site (the status of nearby buildings is unknown). There are numerous buried utilities in the vicinity, particularly along Shelburne Road. A six-inch water well, located near the former kerosene/diesel pumps, was apparently used at the site until about 10 years ago. The status of this well is discussed below.

Numerous buried utilities are present in the vicinity and include water, wastewater, stormwater, electric, gas, phone, and TV cable. Water, sewer, wastewater, and gas pipelines are present on the western edge of the site in the Route 7 (Shelburne Road) right of way.

CONTAMINATED SOIL/GROUNDWATER

Due to the likelihood of encountering contaminated soil and groundwater at the site, a tentative plan for soil/groundwater handling during the UST removals was presented in the May 12, 1994 letter to Chuck Schwer. The letter included a proposed soil guideline concentration to distinguish soils requiring excavation/treatment from those which could be backfilled. Through telephone conversations with Matt Germon (SMS), it was decided to limit soil excavation and to concentrate on the removal/containment of any free product encountered.

Soil screening during the site activities was perfonned with a Photovac MicroTIP HL-2000 (PID), equipped with a 10.6 eV lamp and calibrated to respond to isobutylene. The instrument was calibrated prior to each day's usage. Readings were taken in two manners, by either placing the PID near recently exposed soil (referred to as ambient readings), or by placing soil into glass jars and measuring the headspace (headspace readings).

As further discussed below, only a limited amount of free product was encountered. Where possible, any free product which was found was removed using sorbent pads.

KEROSENE/DIESEL UST REMOVALS

The 10,000-gallon diesel and kerosene tanks were excavated and removed on May 17, 1994 (Photos 1 - 6). No evidence was found of significant contamination such as free product, sheens, or holes in the tanks. PID screening did show evidence of some contamination. The maximum soil headspace reading was 216 ppm for soils immediately underlying the kerosene tank. Some elevated ambient readings were detected (generally 10 to 20 ppm) in soils underneath the former pump island, near the water well.

Soils surrounding both tanks included a fine/medium sand backfill, overlain by about two feet of crushed stone. Shallow water drained from the crushed stone into the tank excavations. Water also entered the excavations from a culvert-pipe underdrain along the eastern edge of the store from a depth of 4 feet. Soils underlying the former pump islands included about two feet of crushed stone, underlain by two feet of fine/medium sand backfill. A reddish-gray silty clay was present at a depth of about four feet under the former pump islands. This silty clay is apparently native soil. Water perched on top of the clay seeped into the excavation. Since the excavation for the two tanks and pump islands remained open for a few days, the pit gradually filled up with water. A slight sheen developed on the water surface in places, although there were no indications or obvious source seeps within the excavation.

Both tanks and piping were in relatively good shape, and no obvious holes or breaks were observed.

WATER WELL

A six-inch water well was exposed during the excavation of the former pump islands (Photos 7, 8). This well has reportedly been off-line since the mid 1980's. The well was completed about four feet below grade, and had a one-inch copper line running to the building. When the well was exposed, it was covered with a "sanitary cap", although its condition was deteriorated. The well cap was removed and the pump was pulled, which was a 3/4 HP pump set on 120 feet of galvanized pipe. The static level in the six-inch well was measured to be about 50 feet below ground surface. A borehole video survey was performed on the well to ascertain construction details. Although the water present in the well was turbid, it was possible to inspect the casing to a depth of about 85 feet, and the rock borehole to the well's apparent total depth of 130 feet.

A water sample was collected from the six-inch well by dropping a bailer into the water column to a depth of about 100 feet below ground surface. The sample was collected on May 20, 1994, and analyzed by EPA Method 8020. Results were as follows.

Parameter	Result
Benzene	<1 µg/L
Toluene	1 µg/L
Ethylbenzene	<1 µg/L
Xylenes	3 µg/L
MTBE	1 µg/L

The detected concentrations are extremely low and may or may not reflect concentrations within the bedrock aquifer. It is likely that low levels of contamination are present in the shallow groundwater perched at the surface. Whether or not this water had been entering the well through the cap, or entering the bedrock through the annular space is unknown. The low levels of contamination may have been introduced into the well while removing the well cap and/or pump, or introduced during sampling.

A well drilling contractor (Chevalier Well Drilling) was retained to perforate the casing and grout the borehole/casing. Chevalier attempted to perforate the casing on July 6, 1994. The perforating tool couldn't be lowered more than 15 feet due to the non-plumbness of the casing. According to Claude Chevalier, the well was apparently installed with a cable-tool rig and was out of alignment. There was also indications of excessive rust and expansion which decreased the inside area of the casing. As a result, it was also not possible to insert a casing-pulling tool. The borehole was simply grouted via tremie pipe with benseal, a high solids bentonite slurry.

REPLACEMENT TANK EXCAVATION

Digging for the replacement USTs began on May 18, 1994 in the southeast corner of the paved portion of the site. Crushed stone was present to a depth of two feet, and was water-bearing from about 1.5 feet. A PID headspace sample of this water yielded a reading of 3.0 ppm. Beneath the crushed stone, a black-stained medium/fine sand was encountered (Photo 9). The sandy material emitted a faint petroleum odor and showed ambient PID readings of 20 to 30 ppm. A headspace sample of this sample yielded 108 ppm. A portion of this material was mixed with clean water and shaken, and no sheen or free product was visible.

Additional excavating was performed about 20 feet west of the original area to probe the soil at this location. At the new location (Photo 10), the crushed stone was underlain by a blue/gray silt containing sub-rounded to rounded pebbles and boulders (till). There was no perched water in this vicinity, and no readings above background were detected with the PID. As a result, it was decided to move the new UST excavation to the west to avoid contaminated soil.

As digging proceeded, headspace readings were measured and were generally less than 3 to 4 ppm. Closer to the original excavation in the southeast corner, readings up to 25 to 50 ppm were detected. In addition, some water entered the excavation from the east. All soil exhibiting a headspace above 10 ppm was temporarily stockpiled on the southeast portion of the site. As the excavation continued, each bucket dug from the pit was surveyed with the PID. Readings remained below one ppm as the excavation proceeded. The clean (<1 ppm) soils removed from the excavation were transported off site and used as fill at a project at Dorset Park in South Burlington. Soils exhibiting elevated PID readings remained on site. PID readings were generally below 1 ppm or non detect. A generalized soil profile of the southern wall of the excavation is as follows.

0 - 18", crushed stone
18 - 24", mixed yellowish brown fine/medium sands, saturated in the last few inches
24" - 14', dark gray and purplish gray glacial till - silt with lenses of fine sand and silty sand containing 10 to 45% rock fragments (gravel to boulders), very firm and dense, generally dry with some zones of saturation in sandy lenses.

(see Photos 11-20)

The till was encountered from a depth averaging two feet, and was extremely hard and therefore difficult to excavate. The till is nearly impermeable, and apparently created a small perched zone within portions of the crushed stone and sandy fill overlying it. No true water table was encountered to the excavated depth of about 15 feet. The excavation remained open for about a week with little or no accumulation of water, with the exception of precipitation and the inflow of some water from the overlying fill materials.

The northern wall of the excavation differed slightly in that a greater amount of fill (crushed stone and sand) was present to a depth of about 3 to 4 feet, and some of the lacustrine silt/clay unit was exposed. The boundary between the silt/clay unit and the till was transitional, with evidence of a weathered zone. Hydraulically, both the silt/clay unit and the transition zone were similar to the till in that they were dry and relatively impermeable to water flow.

4,000-GALLON HEATING OIL TANK REMOVAL

The northwest portion of the new UST excavation exposed the 4,000-gallon heating fuel UST and its sandy backfill material (Photos 17, 18). Shallow perched water began to enter the excavation from a drainage pipe running north/south from the corner of the store building. This drainage pipe is an extension of the pipe excavated along the eastern edge of the store during removal of the kerosene and diesel tanks. This drainage pipe apparently receives stormwater runnoff from the roof of the store. No PID readings above background were detected in the sandy backfill underneath and alongside the fuel heating oil tank. The tank was in good shape and no holes or significant corrosion pitting was observed.

GASOLINE UST/PIPING REMOVAL

Excavation of the four gasoline USTs (one 4,000 and three 10,000), associated piping, and the front pump islands commenced on June 1, 1994 (Photos 21- 24). The 4,000 gallon tank was removed first. Soils overlying and surrounding the 4,000 gallon tank were the sandy backfill materials found elsewhere on site. Sands directly overlying the tank were dry, although perched water entered the excavation from the crushed stone just west of the excavation. Water and a small amount of free product entered the excavation from the western wall, near monitoring wells MW-14 and MW-15. The water and free product were apparently perched within the crushed stone and sandy backfill material within two feet of the surface. Ambient PID readings were in the 500 to 1500 ppm range, and headspaces exceeded the instruments maximum (2500 ppm).

The 4,000 gallon gasoline tank was in good shape with no visible signs of holes or corrosion pitting.

A shovel was used to remove the top layer of crushed stone just north of the 4,000 gallon gas tank excavation. Water and free product was encountered one to two feet below grade (Photo 35).

After removal of the 4,000 gallon UST, the three 10,000 gallon USTs were excavated and removed (Photos 25 - 32). Soil overlying and surrounding the tanks showed ambient PID readings in the 500 to 1500 ppm range. Precipitation and perched water accumulated within the excavation. Perched water entered the excavation from the overlying crushed stone. Sheens and a small amount of free product accumulated on the water surface. All three tanks were in shape, with no signs of holes or corrosion pitting.

During removal of the southernmost 10,000 UST, the site sewer line was exposed and was found to be leaking. The store's refrigerators and coolers discharge a significant volume of condensation waters to the sewer. Thus a large portion of the shallow perched water encountered during the tank excavations may have originated from the sewer line. The leaking portion of the sewer line was replaced during the backfilling of the excavation.

During removal of the middle 10,000 gallon UST, the excavator ruptured a small hole in the western corner of the tank. As the tank was removed, a small amount of free product was released and entered the pit (photo 29).

The surface layer of concrete surrounding the pump island was removed to allow excavation/removal of the lines and pumps. Soils surrounding the piping and underneath the pumps showed elevated ambient PID readings (300 to 1000 ppm). There were no holes, breaks, other obvious signs of release sources.

The area near MW-3 (where free product was found) contained black staining directly underneath the concrete. Headspace readings for these black-stained soils (crushed stone and sand) were over 2000 ppm (Photos 33 - 37). The staining was present within the first few inches of the crushed stone. A test pit was excavated just west of the northern most pump, about 10 feet from MW-3, with the following profile.

0 - 8", crushed stone
8-24", brown medium/fine sand (fill)
24-48", weathered reddish brown clay and silty clay, dry, mottled

Ambient PID readings were in the 100 to 300 ppm range throughout the depth of the test pit. No water or free product was encountered (Photo 39, 40).

SUMMARY

Along with the presence of free product in MW-3, soil vapor measurements and visual observations during the UST and piping removals indicate that releases of petroleum products have occurred at the site. Figure 5 presents an generalized isoconcentration map of ambient PID readings of soil, illustrating the horizontal distribution of contamination detected during the site assessment. These soil PID readings show that contamination is distributed fairly uniformly around the former gasoline USTs, piping, and pump island. Shallow water was found within the crushed stone and first several inches of the sandy backfill surrounding the gasoline USTs. A limited amount of free product was present on the water surface in a number of areas (Photo 35), although there was no obvious pockets or sources of the free product. The staining in soils near the northern pump suggests former accumulations of product in this vicinity.

The native soils exposed at the site include a dense glacial till and a lacustrine silt/clay unit. Both of these units are relatively impermeable, and no indications of true water table conditions were found. The water encountered during the site excavations originated from within the overlying fill materials, crushed stone and a fine/medium sand. These coarse materials provide a permeable zone for water to accumulate. It was anticipated that the backfill sands surrounding the tanks would be saturated and water-bearing, although observations during excavating suggested that majority of water was perched within a thin saturated zone in the crushed stone fill.

Since the active portions of the site are covered with asphalt, the source of much of this water appears to have been from the leaking sewer, and stormwater from roof drains. The monitoring wells on the site apparently created higher permeability sumps for water to accumulate (as well as free product in MW-3).

Since no obvious holes or breaks were found in the USTs or piping, it is difficult to pinpoint the source area(s). Based on the surface topography, water (and contamination) flow within the shallow saturated zone appears to be west and northwestward, as confirmed by soil PID readings.

SITE INVESTIGATION

Site investigation efforts are needed at the site to determine the degree and extent of contamination. Most of the site monitoring wells were destroyed during the UST pulls. Site wells MW-1, MW-2, and MW-3 were undisturbed and should be utilized as sampling points. Bail down tests should be performed on MW-3 to measure the inflow of free product at this location. Potential receptors should be more comprehensively defined, and the degree of risk posed by site contamination should be evaluated.

If you have any questions concerning this site assessment, please contact me.

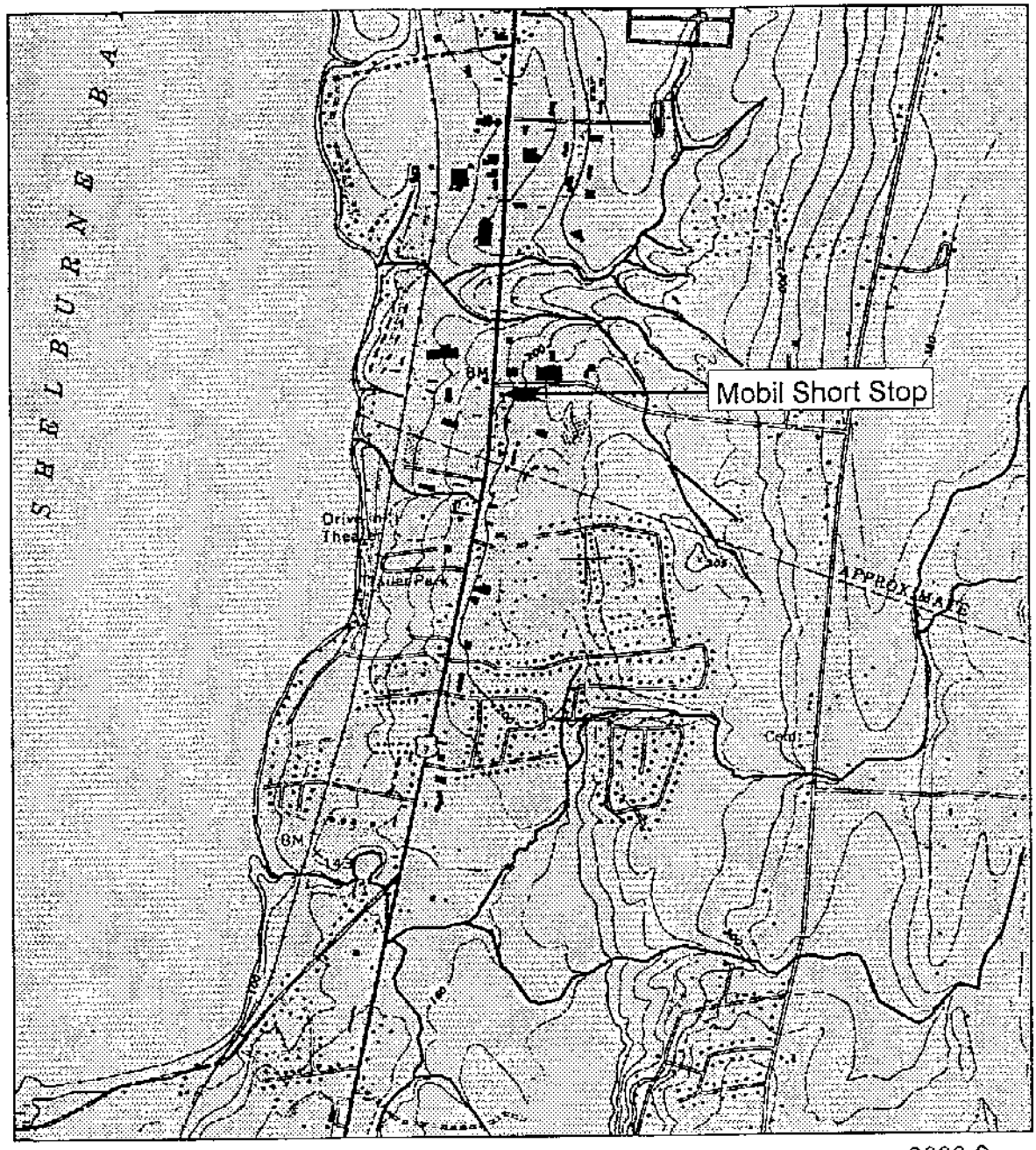
Sincerely,

Jefferson P. Hoffer
Consulting Hydrogeologist

enc.

REFERENCE CITED

Stewart, D.P., 1973, *Geology for Environmental Planning in the Burlington-Middlebury Region, Vermont*, Vermont Geological Survey, Water Resources Department, Environmental Geology No. 3.



Basemap: USGS Topographic Quad,
Burlington, VT, 1987

FIGURE 1
Site location map, Mobil Short Stop,
1830 Shelburne Road, South Burlington, Vermont,
UST Facility ID #1117, SMS Site #88-0307.

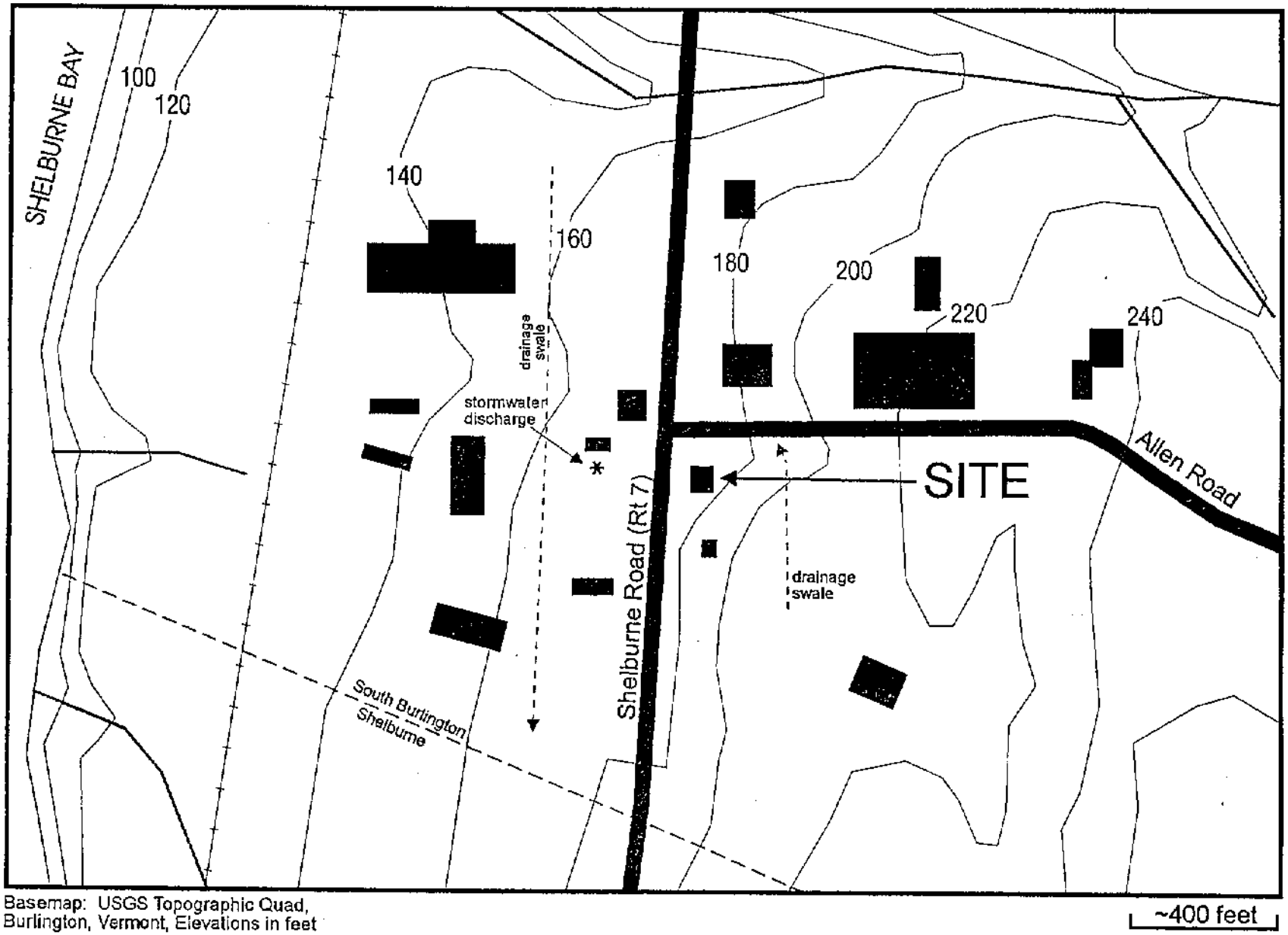
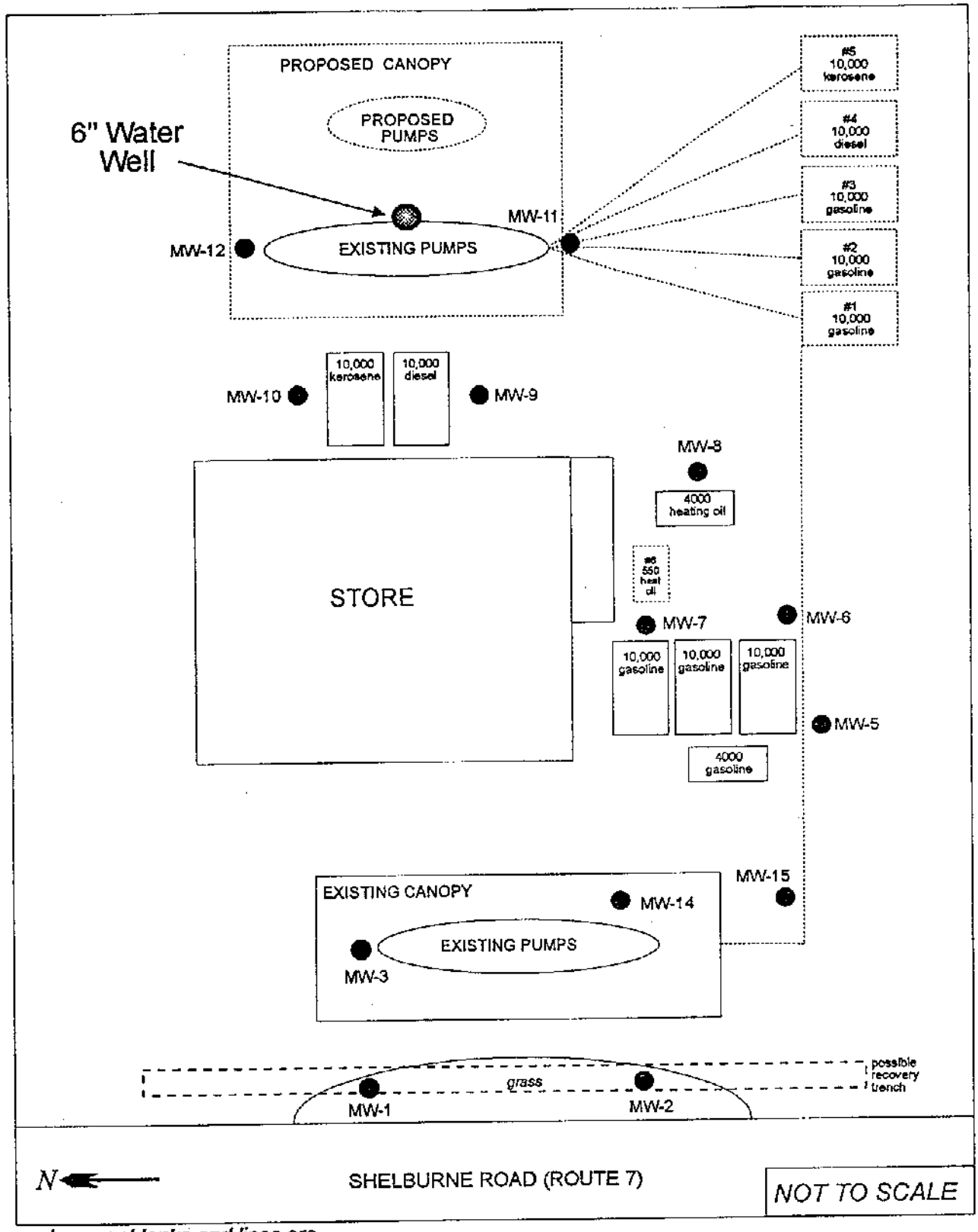


FIGURE 2
Site vicinity map, Mobil Short Stop, 1830 Shelburne Road,
South Burlington, Vermont, UST Facility ID #1117, SMS Site #88-0307.



replacement tanks and lines are represented by dashed lines

FIGURE 3
Site sketch showing locations of removed and replacement USTs,
Mobil Short Stop South, South Burlington, Vermont,
UST Facility ID #1117, SMS Site #88-0307.

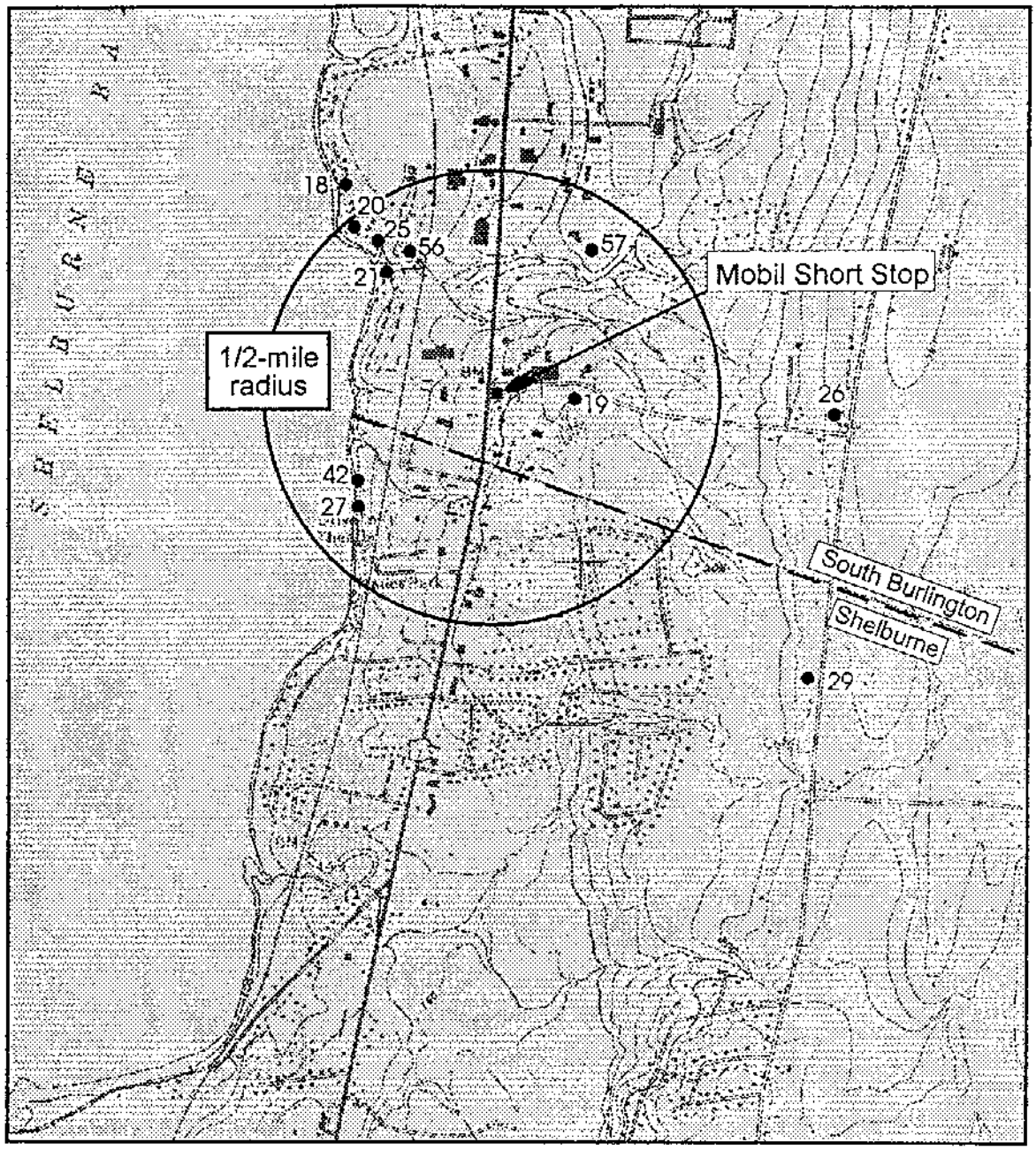


FIGURE 4
Nearby water supply wells (locations not verified),
Mobil Short Stop South, South Burlington, Vermont
UST Facility ID # 1117, SMS Site #88-0307.

TABLE 1

Groundwater sampling results, November 18, 1993,
Mobil Short Stop, South Burlington, Vermont.

November 18, 1993
Results in µg/L

	MW-2	MW-14
MTBE	99	15,700
Benzene	4	10,800
Toluene	3	17,300
Ethylbenzene	4	9,040
Xylenes	<1	32,700

<1 = below a detection limit of1

May 27, 1994

E. Matt Germon, Environmental Engineer
Sites Management Section
Department of Environmental Conservation
103 South Main Street/West Office
Waterbury, VT 05671-0404

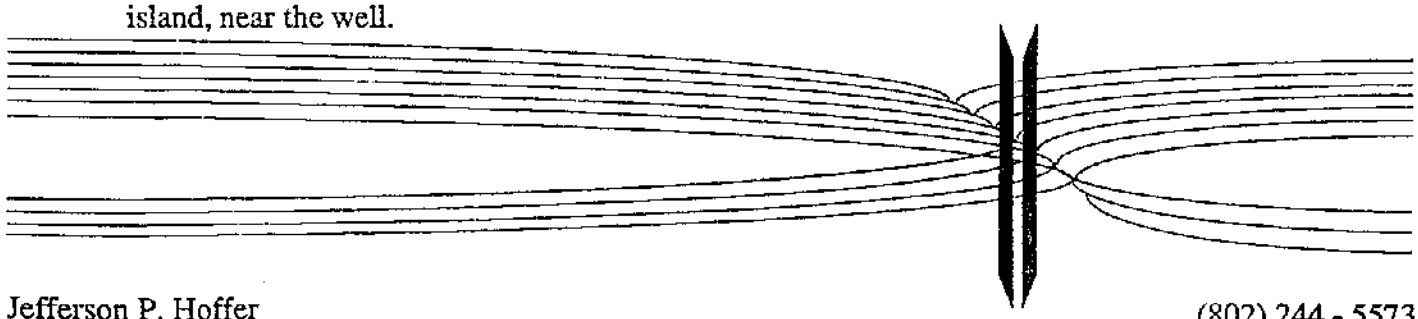
Re: S.B. Collins, Inc., Mobil Short Stop, South Burlington (Site #88-0307)

Dear Matt:

As we have discussed, a six-inch water well was uncovered at the above referenced site during recent site excavations. This well has reportedly been off-line since the mid 1980's. The well is completed four feet below grade, and had a one-inch copper line running to the building. When we excavated the well, a "sanitary cap" was in place, although its condition was deteriorated. We removed the well cap and pulled the pump, which was a 3/4 HP pump set on 120 feet of galvanized pipe. The static level in the six-inch well is about 50 feet below ground surface. During a borehole video survey, it appeared that the well is cased to a depth of about 85 feet, and the total depth is 130 feet.

As shown on the enclosed figure, the well is situated where the diesel and kerosene pumps were located. Soils overlying the well included sandy backfill materials which were present around the tanks, piping, and pumping islands. Directly overlying the well was a native clay, starting from a depth of about two feet. The sandy backfill material in the vicinity was saturated (water) from a depth of about 2 feet below grade. There is an apparent zone of saturation within the sandy materials, probably perched on the underlying native clay (and till as was found during the excavating for the new tanks).

During excavation of the diesel and kerosene tanks (which are located in the inferred downgradient direction from the six-inch well), no visual evidence of significant contamination such as free product, sheens, or holes in the tanks was found. PID screening of the surrounding soils did show evidence of some contamination. The maximum soil headspace reading was 216 ppm (on a MicroTIP HL-2000 calibrated to isobutylene) for soils immediately underlying the kerosene tank. Some elevated PID readings were detected (generally 10 to 20 ppm) in soils underneath the former pump island, near the well.



Jefferson P. Hoffer
Consulting Hydrogeologist

(802) 244 - 5573
P.O. Box 428, Waterbury, Vermont 05676

A water sample was collected from the six-inch well by dropping a bailer into the water column to a depth of about 100 feet. The sample was collected on May 20, 1994, and analyzed by EPA Method 8020. Results are as follows.

Parameter	Result
Benzene	<1 µg/L
Toluene	1 µg/L
Ethylbenzene	<1 µg/L
Xylenes	3 µg/L
MTBE	1 µg/L

The detected concentrations are extremely low and may or may not reflect concentrations within the bedrock aquifer. It is likely that low levels of contamination are present in the shallow groundwater perched at the surface. Whether or not this water has been entering the well through the cap, or entering the bedrock through the annular space is unknown. We may have introduced these low levels of contamination into the well while removing the well cap and/or pump, or they may have been introduced during sampling. In either case, since there are no adjacent bedrock water supply wells (see enclosed Figure 2), these detected concentrations do not appear to pose a signficant threat. As a result, I would recommend abandoning the well.

Abandonment options include simply grouting the well with a cement and/or bentonite grout, pulling the casing and grouting the well, or perforating the well casing and grouting. The latter two alternatives would involve the use of a drilling rig, and would therefore be more costly. We have obtained cost estimates from Chevalier Well Drilling for each of these options. The estimated costs are enclosed and are summarized below.

Option 1	Tremie Grout	$750 (benseal)
	Tremie Grout	$1000 (neat cement)
Option 2	Pull Casing/Grout	$3200 (benseal)
	Pull Casing/Grout	$3450 (neat cement)
Option 3	Perforate Casing/Grout	$2150 (benseal)
	Perforate Casing/Grout	$2400 (neat cement)

Since a bentonite slurry would provide a better hydraulic seal, I would recommend its use over a neat cement grout. I am also comfortable with simply grouting the well rather than pulling or perforating the casing.

S.B. Collins is in the process of installing new pumps and a canopy in the vicinity of the well, so we would like to act quickly, perhaps grouting the well next Tuesday or Wednesday. Please call myself or Carl Ruprecht (527 - 0116) with your recommendations/approval as soon as possible.

Sincerely,

Jefferson P. Hoffer
Consulting Hydrogeologist
enc.
cc: Carl Ruprecht, S.B. Collins, Inc.

CHEVALIER DRILLING CO., INC.

P.O. BOX 164
HIGHGATE SPRINGS, VT 05460
802-868-7709 OR 1-800-248-4082

5/26/94

Carl Ruprect
S.B. Collins
St. Albans, Vt. 05478
Fax 802-527-0115

PROPOSAL #1

Tremie-grout 130' well in S. Burlington with Ben-Seal	$ 750.00
or	
Tremie-grout 130' well in S. Burlington with neat cement	$1000.00

PROPASAL #2

Pull 90' casing and grout hole with Ben-Seal	$3200.00
or	
Pull 90' casing and grout with neat cement	$3450.00

PROPOSAL #3

Perforate casing and tremie-grout with Ben-Seal	$2150.00
or	
Perforate casing and tremie-grout with neat cement	$2400.00

Submitted by,

Claude Chevalier

May 12, 1994

Chuck Schwer, Supervisor
Sites Management Section
Department of Environmental Conservation
103 South Main Street/West Office
Waterbury, VT 05671-0404

Re: S.B. Collins, Inc., Mobil Short Stop, South Burlington (Site #88-0307)

Dear Mr. Schwer:

As stated in Carl Ruprecht's May 5, 1994 letter to you, free product was recently discovered in a monitoring well (2.0 feet in well MW-3) at the above referenced site, which is also referred to as Shelburne Mobil South. S.B. Collins is planning to remove and replace the site USTs during the next few weeks. I've been retained to perform the necessary site assessment associated with the closure of the existing USTs, as well as to evaluate soil/groundwater contamination which may be encountered during the excavations for the replacement USTs and piping. I will be on site during the existing tank removals, and during the initial excavations necessary for the replacement tanks. This letter presents a tentative plan for the site assessment portion of proposed activities at the site.

SITE SETTING AND POTENTIAL RECEPTORS

Figure 1 presents a site location map. A site sketch showing existing UST locations and proposed replacement USTs is provided on Figure 2. The site is situated in a high-traffic, developed portion of Shelburne Road (Route 7). The site is bordered on the west by Shelburne Road, Allen Street to the north, a forested and undeveloped lot to the east (owned by Jolley & Associates), and small businesses to the south. A Nissan auto dealership is located across Shelburne Road.

The degree of contamination at the site is uncertain. The results of groundwater sampling for wells MW-2 and MW-14 performed last November are summarized on Table 1. The free product recently detected in MW-3 is believed to be weathered gasoline, although no laboratory analyses have been performed. Site topography and water-level measurements suggest the groundwater flow direction is westward (or northwestward).

Jefferson P. Hoffer
Consulting Hydrogeologist

(802) 244 - 5573
P.O. Box 428, Waterbury, Vermont 05676

According to Stewart's (1973) surficial geology map, the site is underlain by lacustrine and marine sands and gravels. A silt /clay unit is mapped further west, with the contact between the sand/gravel and silt/clay along Route 7. The sand/gravel unit in the vicinity of the site is typically thin, and is underlain by the silt/clay unit.

Mapped surface water features are highlighted on Figure 1 and include small unnamed streams draining westward toward Lake Champlain, which is approximately 1800 feet west of the site. The nearest stream is located about 800 feet north of the site. Wetlands, possibly indicative of shallow groundwater discharge zones, are present across Shelburne Road behind the Nissan dealership.

Stormwater runoff at the site drains generally westward, toward stormwater catch basins along Route 7. A diversion swale runs north/south on the eastern edge of the site, and drains northward toward a culvert/catch basin.

Nearby water supply wells identified in the State's water well inventory database (for South Burlington and Shelburne) are shown on Figure 3. Well logs for these wells are enclosed. Based on the distance between the site and these wells, well construction, and the hydrogeologic setting, the potential for site contamination reaching these wells is low.

No basements are present on-site (the status of nearby buildings is unknown). There are numerous buried utilities in the vicinity, particularly along Shelburne Road. There is reportedly an old water well at the site, located under the shed which is between the two rear pumps. This well is not being used at the site, and information on its construction (i.e., drilled or dug) is unknown. The status of this well will be investigated during site activities.

UST REMOVALS/REPLACEMENT

As shown on Figure 2, there are presently seven USTs at the site, and six replacement USTs are proposed. The lack of space at the site presents difficulties regarding soil (clean or contaminated) storage at the site. S.B. Collins intends to remove the diesel and kerosene tanks as a first step. The next step would be to excavate for the installation of the new kerosene and diesel tanks. After these installations, excavations for the remaining new tanks and lines would begin. The final portion would include the removal of the existing gasoline and heating fuel tanks. Where possible, soil deemed clean from the new tank excavations will be used to reclaim excavations of the existing tanks. Present site information suggests that the area targeted for the new USTs is upgradient from the existing USTs and piping. As a result, it is anticipated that the UST and piping excavations will not encounter contaminated soil/groundwater. Nonetheless, PID screening will be performed to assess potential contamination. S.B. Collins is currently making arrangements to stockpile soil in the wooded area just east of the developed portion of the

site. Off-site options for both contaminated and clean soil disposal/storage are also being evaluated.

It is anticipated that a large volume of contaminated soil may be encountered during the removal of the existing USTs. As a result, it is desired to set a site-specific guideline concentration prior to initiating work. Since there are no drinking water supplies nearby, it is proposed that a soil headspace concentration of 50 ppm be used to distinguish soil requiring excavation/treatment from those which can be backfilled. The 50 ppm concentration is based on the response of an HNU (10.2 eV) calibrated to benzene. I plan to utilize a MicroTIP HL-2000 (10.6 eV) calibrated to benzene. I have performed bench and field-scale experiments comparing the responses of these two instruments to gasoline-contaminated soils. Data from these experiments is shown on Table 2 and Figure 4. Based on these experiments, a 50 ppm reading on the HNU (10.2 eV calibrated to benzene) is equivalent to slightly above 100 ppm on the MicroTIP for gasoline-contaminated soils. These levels (50 ppm for the HNU, 100 ppm for the MicroTIP) are proposed to distinguish soil requiring excavation/treatment from those which can be backfilled at the site.

Depending upon the site stratigraphy, significant volumes of contaminated groundwater may be encountered during the tank excavations. Removal of this water may be necessary to allow the installation of the new USTs, and removal/closure of the existing USTs. We are presently evaluating options for the storage/treatment of this water including off-site treatment (i.e, wastewater treatment plant) or on-site treatment and discharge to stormwater/wastewater sewer systems. The amount of water generated will be determined by the water-bearing nature of the site soils. The depth to water at the site is on the order of two feet below grade. If silts and clays are predominant, water volumes may be minimal. If sand and gravels are present to depths greater than a few feet, larger volumes of water may be generated. Backfill around the existing tanks is likely to be fairly coarse-grained and therefore water bearing.

We are also exploring the possibility of installing a groundwater recovery trench during UST and piping removal/replacement. We envision a trench located between MW-1 and MW-2, and extending in both directions. Depending upon the degree of contamination encountered, as well as the stratigraphy, a groundwater recovery trench may be part of remedial efforts at the site. These remedial efforts could be more cost effective and timely if a remediation system (or portions of) is installed during the UST removals/replacement. Obviously, the decision to proceed with the design/installation of a remedial effort will depend upon the conditions encountered. We would appreciate your consideration of this concept.

We are also tentatively planning to dig some test pits in the vicinity of the proposed replacement USTs/piping to evaluate subsurface conditions.

We would appreciate your timely review of these issues. Please contact me at 244 - 5573 or Carl Ruprecht at 527-0116 if you would like to discuss these issues or possibly schedule a meeting and/or site visit.

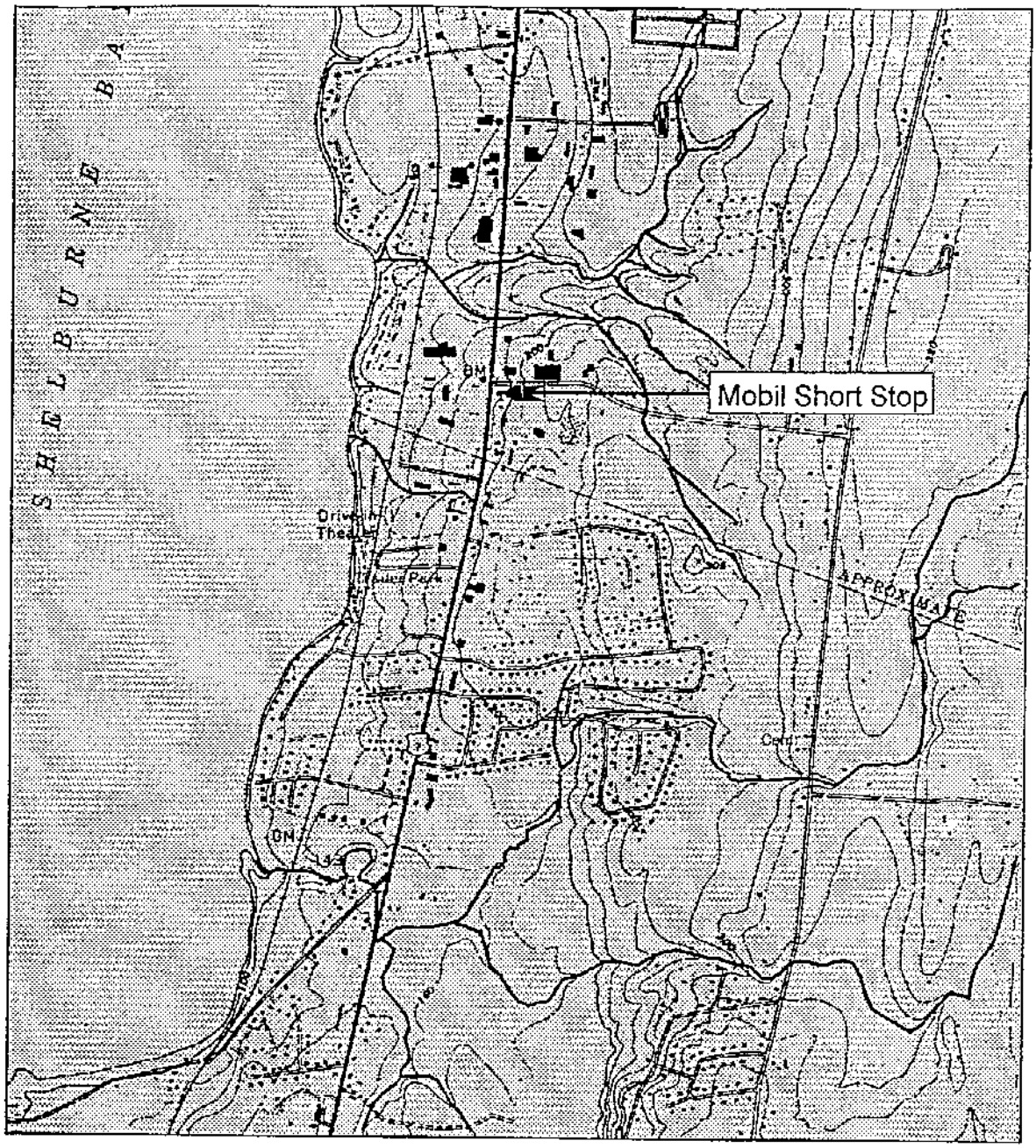
Sincerely,

Jefferson P. Hoffer
Consulting Hydrogeologist

enc.
cc: Carl Ruprecht, S.B. Collins, Inc.

REFERENCE CITED

Stewart, D.P., 1973, *Geology for Environmental Planning in the Burlington-Middlebury Region, Vermont*, Vermont Geological Survey, Water Resources Department, Environmental Geology No. 3.



Basemap: USGS Topographic Quad,
Burlington, VT, 1987

FIGURE 1
Site location map, Mobil Short Stop,
1830 Shelburne Road, South Burlington, Vermont.

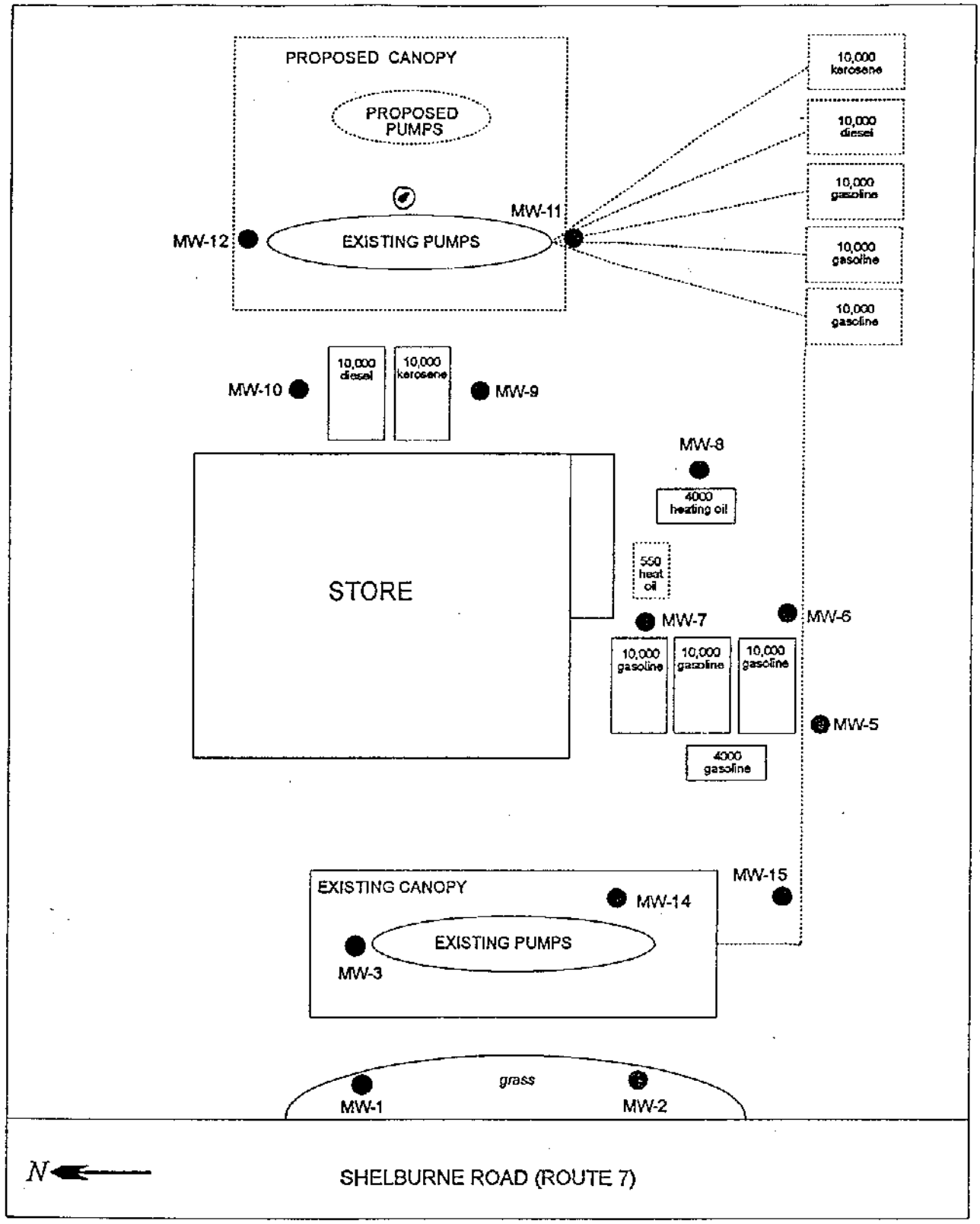
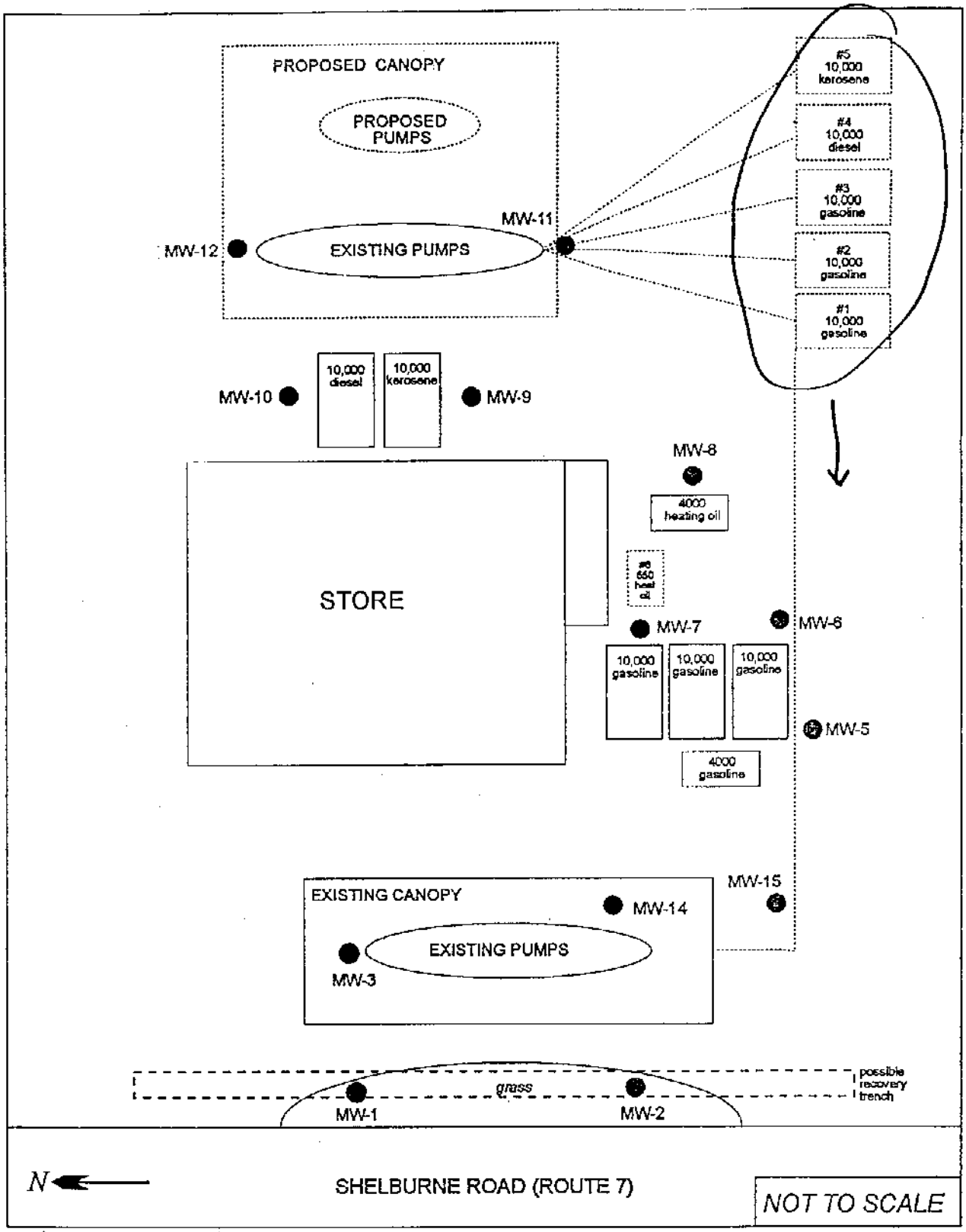


FIGURE 2
Site sketch of existing and proposed replacement USTs,
Mobil Short Stop, South Burlington, Vermont.



replacement tanks and lines are represented by dashed lines

FIGURE 2
Site sketch of existing and proposed replacement USTs,
Mobil Short Stop, South Burlington, Vermont.

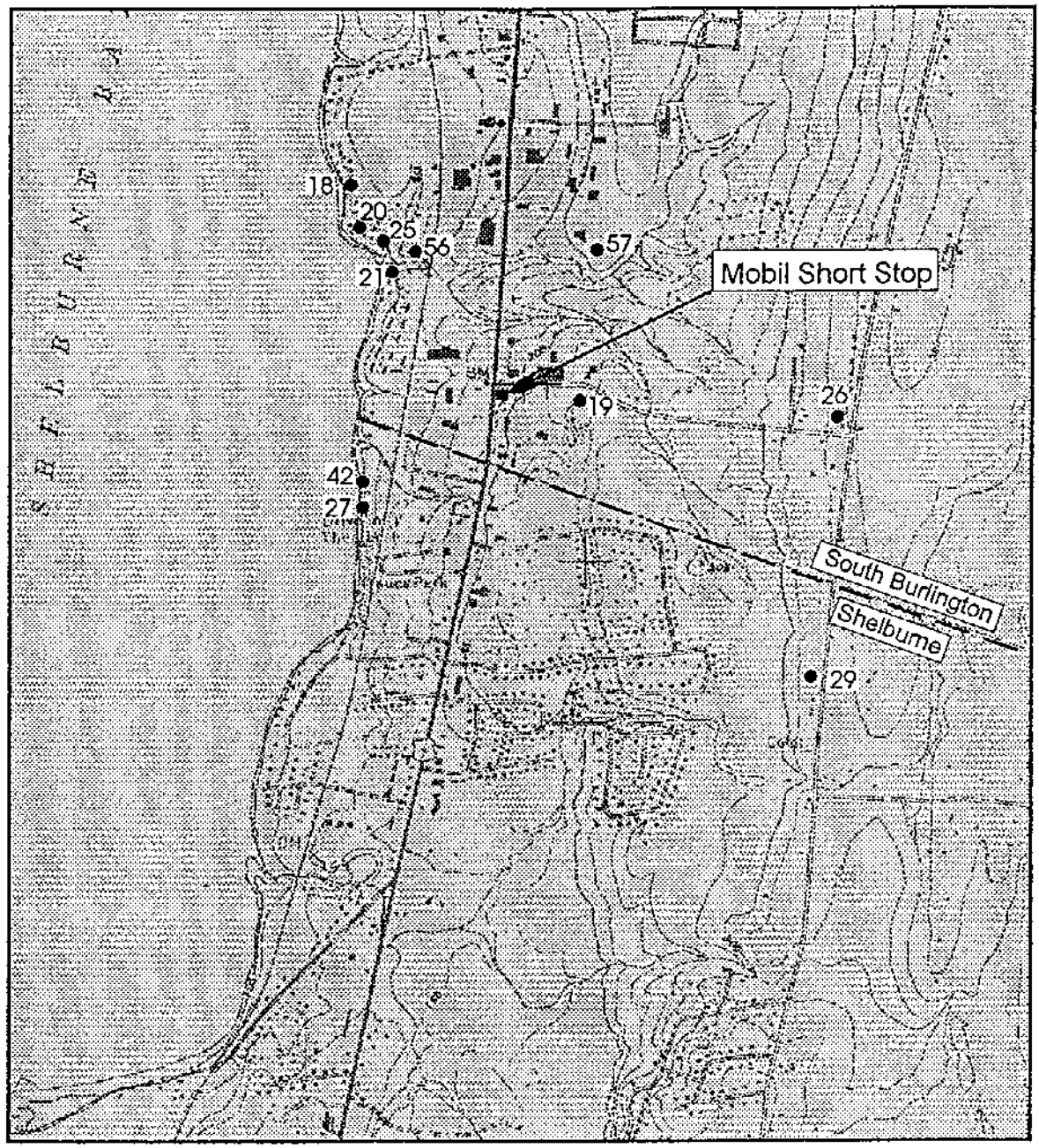


FIGURE 3
Nearby water supply wells,
Mobil Short Stop, South Burlington, Vermont.

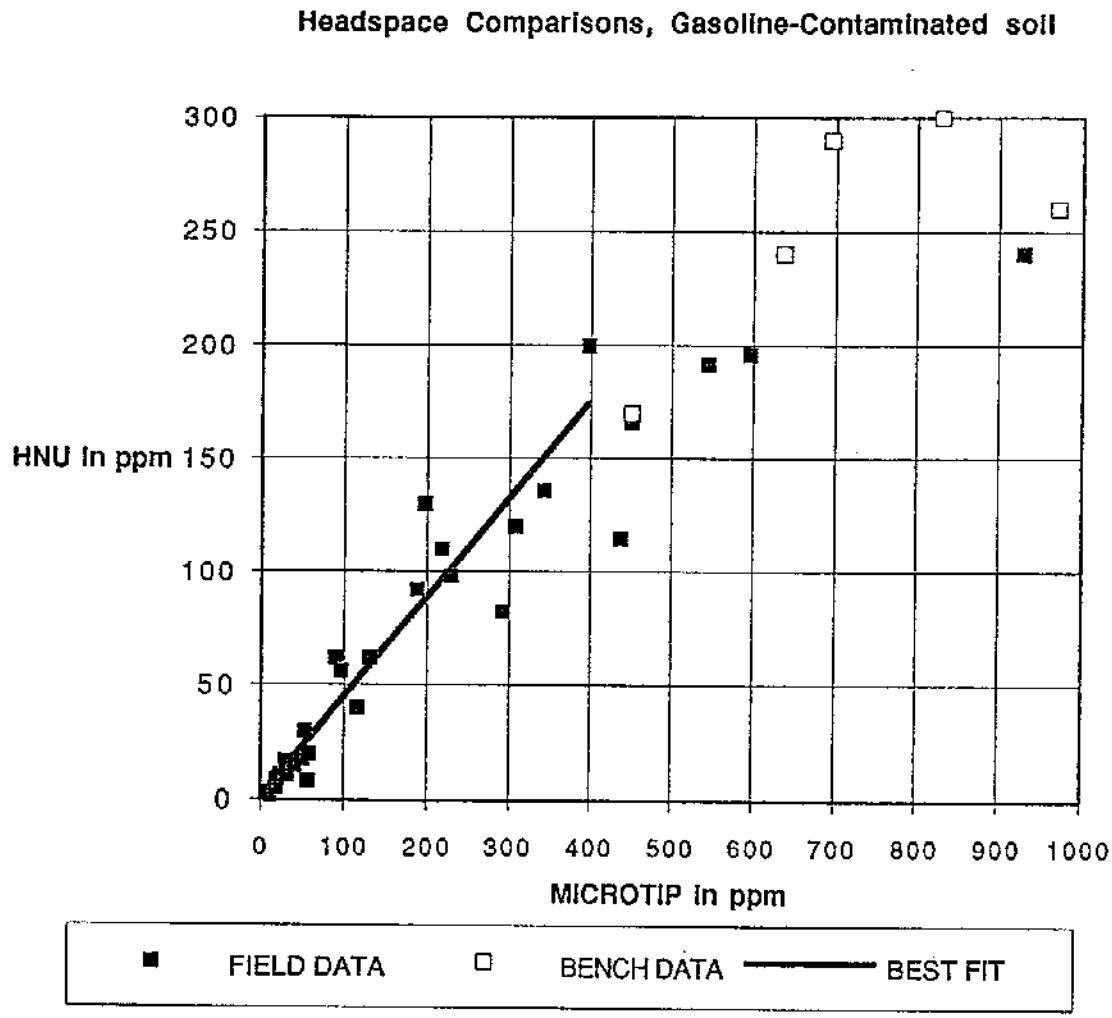


FIGURE 4
Comparison of HNU verse MicroTIP responses
to gasoline-contaminated soil.

TABLE 1

Groundwater sampling results,
Mobil Short Stop, South Burlington, Vermont.

November 18, 1993
Results in µg/L

	MW-2	MW-14
MTBE	99	15,700
Benzene	4	10,800
Toluene	3	17,300
Ethylbenzene	4	9,040
Xylenes	<1	32,700

TABLE 2

Results of field and bench-scale comparison of HNU/MicroTIP response to gasoline-contaminated soil.

Field Data

MicroTIP (ppm)	HNU (ppm)
8.8	3
11.7	2
17.6	5
18.7	9
23	10.8
30.3	17
31.1	10.8
40	15
48.8	17.5
53	30
56.8	8
56.9	20
89.8	62
96.2	56
116	40
131	62
188	92
197	130
218	110
228	98
292	82
308	120
342	136
397	200
437	115
450	166
544	192
596	196
929	240

Bench Data

MicroTIP (ppm)	HNU (ppm)
450	170
637	240
830	300
971	260
695	290

NOTES:

Photovac MicroTIP HL-2000 (10.6 eV) calibrated to benzene

HNU PI-101 (10.2 eV) calibrated to benzene

APPENDIX B

Monitoring Well Logs

SOIL BORING/MONITORING WELL CONSTRUCTION LOG

Well/Boring ID: MW-102

Project Name: S.B. Collins/Shelburne Rd. South	**WELL CONSTRUCTION**
Site: Mobil Short Stop South	Total Depth Drilled: 6.0' BGS
Project Number: 04-07	Screen Type/Interval: 1.5" PVC, 10-slot from 1 to 6' BGS
Driller: Adams Engineering	Sandpack Type/Interval: 0.49mm Pool Filter Sand from 0.5 to 6.0' BGS
Drilling Method: 2 3/8" Hollow Barrel Sampler	Riser Type/Interval: 1.5" PVC from 1 to 6' BGS
Geologist: T. Schmalz	Seal Type/Interval: Benseal granular bentonite, 0.5 - 1.0 ' BGS
Sampling Method: 2 3/8" Hollow Sampler	Measuring Point/Stickup: top of PVC Casing, flushmount
Date/Time Started: 7/15/93 1325	Water Level/Date/Time: 5.11', 7/19/94,1342
Date/Time Completed: 7/15/94 1415	Elevation of Top of PVC: 99.07
Weather: 70°, cloudy, intermittent rain	Well Development: Waterra Inertial Pump
Surface Conditions: level lawn	

Sample Run Depth (feet)	Sample Recovery (feet)	Sample Description (color, texture, etc.)	PID Reading (ppm)*
1.0 - 5.0	2.0	0.5' Brown GRAVELLY SILT WITH SAND,	1.4
		1.5' Light brown and gray SILT, stiff, moist	1.3
5.0 - 6.0	1.0	1.0' same (as above)	0.3

GENERALIZED GEOLOGIC LOG and OTHER OBSERVATIONS

0.0-1.0 Asphalt and underbed material, augered through asphalt

1.0-1.5 Light brown fill material, sandy silt and

m to c angular gravel

1.5-6.0 Stiff lacustrine ssands and silty clay, moist, some gravel, top of weathered till at 6' BGS

NOTES:

* Peak Headspace Reading, Photovac MicroTIP HL-2000, calibrated to isobutylene

BGS - Below Ground Surface, BTOC - Below Top of Casing, f - fine, m - medium, c - coarse

SOIL BORING/MONITORING WELL CONSTRUCTION LOG

Well/Boring ID: MW-103

Project Name: S.B. Collins/Shelburne Rd. South	**WELL CONSTRUCTION**
Site: Mobil Short Stop South	Total Depth Drilled: 8.4' BGS
Project Number: 04-07	Screen Type/Interval: 1.5" PVC, 10-slot from 1 to 6' BGS
Driller: Adams Engineering	Sandpack Type/Interval: 0.49mm Pool Filter Sand from 0.5 to 6.0' BGS
Drilling Method: 2 3/8" Hollow Barrel Sampler	Riser Type/Interval: 1.5" PVC from 0.0 to 1.0' BGS
Geologist: T. Schmalz	Seal Type/Interval: Benseal granular bentonite, 0.5 - 1.0' BGS
Sampling Method: 2 3/8" Hollow Sampler	Measuring Point/Stickup: top of PVC Casing, flushmount
Date/Time Started: 7/15/93 1035	Water Level/Date/Time: 2.53', 7/19/94, 1348
Date/Time Completed: 7/15/94 1130	Elevation of Top of PVC: 99.41
Weather: 70°, cloudy, intermittent rain	Well Development: Waterra Inertial Pump
Surface Conditions: asphalt	

Sample Run Depth (feet)	Sample Recovery (feet)	Sample Description (color, texture, etc.)	PID Reading (ppm)*
1.0 - 5.0	3.8	0.9' Gray SILTY SAND, f to m sand	450.0
		2.9' Red-brown SANDY SILT, tough, slightly moist	311.0
5.0 - 8.4	3.4	0.5' same (as above)	
		2.9' Gray to dark gray SANDY SILT, stiff, becoming SILT with depth	28.8

GENERALIZED GEOLOGIC LOG and OTHER OBSERVATIONS

0.0-1.0 Asphalt and underbed material

1.0-1.9 Construction fill and asphalt underbed, moist

1.9-5.3 Lacustrine silts and sands, wet

5.3-8.4 Additional lacustrine deposits, becoming weathered till with depth, stiff, wet

NOTES:

* Peak Headspace Reading, Photovac MicroTIP HL-2000, calibrated to isobutylene

BGS - Below Ground Surface, BTOC - Below Top of Casing, f - fine, m - medium, c - coarse

SOIL BORING/MONITORING WELL CONSTRUCTION LOG

Well/Boring ID: MW-104

Project Name: S.B. Collins/Shelburne Rd. South	**WELL CONSTRUCTION**
Site: Mobil Short Stop South	Total Depth Drilled: 8.8' BGS
Project Number: 04-07	Screen Type/Interval: 1.5" PVC, 10-slot from 1 to 6' BGS
Driller: Adams Engineering	Sandpack Type/Interval: 0.49mm Pool Filter Sand from 0.5 to 6.0' BGS
Drilling Method: 2 3/8" Hollow Barrel Sampler	Riser Type/Interval: 1.5" PVC from 0 to 1' BGS
Geologist: T. Schmalz	Seal Type/Interval: Benseal granular bentonite, 0.5 - 1.0' BGS
Sampling Method: 2 3/8" Hollow Sampler	Measuring Point/Stickup: top of PVC Casing, flushmount
Date/Time Started: 7/15/93 0925	Water Level/Date/Time: 1.67', 7/19/94, 1351
Date/Time Completed: 7/15/94 1020	Elevation of Top of PVC: 99.02
Weather: 70°, cloudy, intermittent rain	Well Development: Waterra Inertial Pump
Surface Conditions: level asphalt	

Sample Run Depth (feet)	Sample Recovery (feet)	Sample Description (color, texture, etc.)	PID Reading (ppm)*
1.0 - 5.0	3.0	0.5' Asphalt and underbed material (from surface)	150-250
		1.5' Dark gray SILTY SAND, moist, f to m sand	130.0
		0.5' Red and gray SILT WITH SAND, slightly plastic, tough	380.0
5.0 - 8.8	3.8	2.2' same (as above)	380.0
		1.6' Gray to gray brown GRAVELLY SILT WITH SAND, moist	350

GENERALIZED GEOLOGIC LOG and OTHER OBSERVATIONS

0.0-1.5 Asphalt and underbed material, augered to 1.0'
1.5-2.5 Dark gray lacustrine deposits, moist, f to m sand
2.5-7.2 Red and gray lacustrine silts and sands, slightly plastic, tough, moist
7.2-8.8 Gray to gray brown silts and sands
top of till at 8.5 feet (approx)

NOTES:

* Peak Headspace Reading, Photovac MicroTIP HL-2000, calibrated to isobutylene

BGS - Below Ground Surface, BTOC - Below Top of Casing, f - fine, m - medium, c - coarse

SOIL BORING/MONITORING WELL CONSTRUCTION LOG

Well/Boring ID: MW-105

Project Name: S.B. Collins/Shelburne Rd. South	**WELL CONSTRUCTION**
Site: Mobil Short Stop South	Total Depth Drilled: 7.5' BGS
Project Number: 04-07	Screen Type/Interval: 1.5" PVC, 10-slot from 1 to 6' BGS
Driller: Adams Engineering	Sandpack Type/Interval: 0.49mm Pool Filter Sand from 0.5 to 6.0' BGS
Drilling Method: 2 3/8" Hollow Barrel Sampler	Riser Type/Interval: 1.5" PVC from 0.0 to 1.0' BGS
Geologist: T. Schmalz	Seal Type/Interval: Benseal granular bentonite, 0.5 - 1.0' BGS
Sampling Method: 2 3/8" Hollow Sampler	Measuring Point/Stickup: top of PVC Casing, flushmount
Date/Time Started: 7/15/93 1630	Water Level/Date/Time: 5.15', 7/19/94, 1356
Date/Time Completed: 7/15/94 1715	Elevation of Top of PVC: 101.11
Weather: 70°, cloudy, intermittent rain	Well Development: Waterra Inertial Pump
Surface Conditions: level concrete	

Sample Run Depth (feet)	Sample Recovery (feet)	Sample Description (color, texture, etc.)	PID Reading (ppm)*
0.6 - 4.6	2.5	1.4' Gray to dark gray SILTY SAND, gasoline odor	650.0
		1.1' Dark brown SILTY GRAVEL WITH SAND	1870, 2500
4.6 - 7.5	2.9	2.9' Dark gray SILT, tough, moist	

GENERALIZED GEOLOGIC LOG and OTHER OBSERVATIONS

0.0-0.6 Open hole (casing), set into concrete by SBC

0.6-2.0 Moist, dark gray/gray lacustrine sediments, gasoline odor

2.0-3.1 Moist, brown lacustrine gravels and silts, gasoline odor

3.1-6.0 Tough, slightly moist silts, top of weathered till and lacustrine seds.

NOTES:

* Peak Headspace Reading, Photovac MicroTIP HL-2000, calibrated to isobutylene

BGS - Below Ground Surface, BTOC - Below Top of Casing, f - fine, m - medium, c - coarse

SOIL BORING/MONITORING WELL CONSTRUCTION LOG

Well/Boring ID: MW-106

Project Name: S.B. Collins/Shelburne Rd. South	**WELL CONSTRUCTION**
Site: Mobil Short Stop South	Total Depth Drilled 7.5' BGS
Project Number: 04-07	Screen Type/Interval: 1.5" PVC, 10-slot from 1 to 6' BGS
Driller: Adams Engineering	Sandpack Type/Interval: 0.49mm Pool Filter Sand from 0.5 to 6.0' BGS
Drilling Method: 2 3/8" Hollow Barrel Sampler	Riser Type/Interval: 1.5" PVC from 0.0 to 1.0' BGS
Geologist: T. Schmalz	Seal Type/Interval: Benseal granular bentonite, 0.5 - 1.0' BGS
Sampling Method: 2 3/8" Hollow Sampler	Measuring Point/Stickup: top of PVC Casing, flushmount
Date/Time Started: 7/15/93 1450	Water Level/Date/Time: 5.25', 7/19/94, 1358
Date/Time Completed: 7/15/94 1630	Elevation of Top of PVC: 100.64
Weather: 70°, cloudy, intermittent rain	Well Development: Waterra Inertial Pump
Surface Conditions: level crushed stone	

Sample Run Depth (feet)	Sample Recovery (feet)	Sample Description (color, texture, etc.)	PID Reading (ppm)*
1.0 - 5.0	3.0	0.5' Crushed stone and silty sand, fill	7.5
		1.5' Brown SANDY SILT WITH GRAVEL, moist	3.6
		1.0' Brown SILT WITH SAND, moist	4.9
5.0 -7.5	2.5	1.0' Dark brown SANDY SILT, wet	5.4
		1.5' Gray to dark gray SANDY SILT, moist	11.1

GENERALIZED GEOLOGIC LOG and OTHER OBSERVATIONS

0.0-1.5 Asphalt underbed and fill, wet (rain)

1.5-3.0 Moist gravel and sandy silts (lacustrine)

3.0-4.0 Moist, brown sands and gravel, lacustrine

4.0-5.0 Moist, dark brown lacustrine silts and sands, becoming more silt rich with depth

5.0-7.5 Dark gray/gray silt and sand, becoming tougher with depth to top of weathered till at 6-6.5 feet

NOTES:

* Peak Headspace Reading, Photovac MicroTIP HL-2000, calibrated to isobutylene

BGS - Below Ground Surface, BTOC - Below Top of Casing, f - fine, m - medium, c - coarse

SOIL BORING/MONITORING WELL CONSTRUCTION LOG

Well/Boring ID: MW-101

Project Name: S.B. Collins/Shelburne Rd. South	**WELL CONSTRUCTION**
Site: Mobil Short Stop South	Total Depth Drilled: 6.6' BGS
Project Number: 04-07	Screen Type/Interval: 1.5" PVC, 10-slot from 1.6 to 6.6' BGS
Driller: Adams Engineering	Sandpack Type/Interval: 0.49mm Pool Filter Sand from1.0 to 6.6' BGS
Drilling Method: 2 3/8" Hollow Barrel Sampler	Riser Type/Interval: 1.5" PVC from 0.0 to 2.0' BGS
Geologist: T. Schmalz	Seal Type/Interval: Benseal granular bentonite, 0.5 - 2.0' BGS
Sampling Method: 2 3/8" Hollow Sampler	Measuring Point/Stickup: top of PVC casing, flushmount
Date/Time Started: 7/15/93, 1150	Water Level/Date/Time: 5.21', 7/19/94, 1345
Date/Time Completed: 7/15/94, 1245	Elevation of Top of PVC: 98.41
Weather: 70°, cloudy, intermittent rain	Well Development: Waterra Inertial Pump
Surface Conditions: level lawn	

Sample Run Depth (feet)	Sample Recovery (feet)	Sample Description (color, texture, etc.)	PID Reading (ppm)*
0.0 - 4.0	4.0	1.8' Brown, SANDY SILT WITH GRAVEL, dry	6.5
		1.1' Brown GRAVELLY SILT WITH SAND, angular gravel	6.5
		1.1' Brown SANDY SILT, roots & organics	6.7
4.0-6.6	2.4	0.5' same (as above)	6.7
		1.0' Brown to dark gray SANDY SILT	3.1
		0.9' Dark gray and brown SILT, stiff	0.0

GENERALIZED GEOLOGIC LOG and OTHER OBSERVATIONS

0.0 - 1.8' Topsoil, large organic (roots, humic materials) component
1.8 - 4.7' Lacustrine sediments, brown, with roots and other organic material
4.7 - 5.7' Weathered till, dense, dark gray color, saturated
5.7 - 6.6' Till, very dense and stiff, dry to slightly moist

NOTES:

* Peak Headspace Reading, Photovac MicroTIP HL-2000, calibrated to isobutylene

BGS - Below Ground Surface, BTOC - Below Top of Casing, f - fine, m - medium, c - coarse

APPENDIX C

Groundwater Sampling Data and Analytical Results

SCITEST
LABORATORY SERVICES

P.O. Box 339
Randolph, Vermont 05060-0339
(802) 728-6313
(802) 728-6044 (FAX)

LABORATORY REPORT

CLIENT:	SB Collins, Inc.- Carl Ruprecht	LABORATORY NO:	4-1608
ADDRESS:	54 Lower Welden St. St. Albans, VT 05676	PROJECT NO:	70249
SITE:	Shelburne Mobil South	DATE OF SAMPLE:	7/21/94
ATTENTION:	Carl Ruprecht	DATE OF RECEIPT:	7/22/94
MATRIX:	Ground Water	DATE OF ANALYSIS:	8/2-6/94
		DATE OF REPORT:	8/9/94

Results
(Results expressed in micrograms per liter (ug/L))

PARAMETER	Trip Blank	MW-101	MW-102	MW-106	MW-105
Methyl Tertiary Butyl Ether	BPQL	296	3	834	36700
Benzene	BPQL	BPQL	BPQL	BPQL	11300
Toluene	BPQL	2	1	2	42100
Ethylbenzene	BPQL	BPQL	BPQL	BPQL	2170
Total Xylenes	BPQL	BPQL	BPQL	BPQL	15600
Chlorobenzene	BPQL	BPQL	BPQL	BPQL	< 200
1,2-Dichlorobenzene	BPQL	BPQL	BPQL	BPQL	< 200
1,3-Dichlorobenzene	BPQL	BPQL	BPQL	BPQL	< 200
1,4-Dichlorobenzene	BPQL	BPQL	BPQL	BPQL	< 200
Surrogate % Recovery	93%	91%	89%	84%	88%

EPA Method 8020.
BPQL = Below Practical Quantitation Limit; 1 ppb.

c. Jeff Hoffer
PO Box 428
Waterbury, VT 05676

Respectfully submitted,

SCITEST, INC.

Joann Sibbald for/
Roderick J. Lamothe
Laboratory Director

LABORATORY REPORT

CLIENT:	SB Collins, Inc.- Carl Ruprecht	LABORATORY NO:	4-1608
ADDRESS:	54 Lower Welden St. St. Albans, VT 05676	PROJECT NO:	70249
SITE:	Shelburne Mobil South	DATE OF SAMPLE:	7/21/94
ATTENTION:	Carl Ruprecht	DATE OF RECEIPT:	7/22/94
MATRIX:	Ground Water	DATE OF ANALYSIS:	8/2-6/94
		DATE OF REPORT:	8/9/94

Results
(Results expressed in micrograms per liter (ug/L))

PARAMETER	MW-103	MW-104	MW-012	MW-013	FB-10
Methyl Tertiary Butyl Ether	8500	6810	4	5800	BPQL
Benzene	85	2720	BPQL	2210	BPQL
Toluene	180	464	BPQL	614	BPQL
Ethylbenzene	7	411	BPQL	656	BPQL
Total Xylenes	43	6090	BPQL	5530	BPQL
Chlorobenzene	BPQL	< 20	BPQL	< 200	BPQL
1,2-Dichlorobenzene	BPQL	< 20	BPQL	< 200	BPQL
1,3-Dichlorobenzene	BPQL	< 20	BPQL	< 200	BPQL
1,4-Dichlorobenzene	BPQL	< 20	BPQL	< 200	BPQL
Surrogate % Recovery	93%	85%	96%	104%	86%

EPA Method 8020.
BPQL = Below Practical Quantitation Limit; 1 ppb.

c: Jeff Hoffer
PO Box 428
Waterbury, VT 05676

SCITEST
LABORATORY SERVICES

GROUNDWATER SAMPLING DATA SHEET

LOCATION: Shelby
DATE: 7/21/94

SAMPLE METHOD: Waterra
SAMPLING TEAM: T. Schmalz

WELL ID	PID Head Space (ppm)	Depth to Water (ft)	Total Well Depth (ft)	Water Column (ft)	3 Well Volumes* (gals)	Total Purged (gals)	Sample Time	Sample Type	Chain-of-Custody Number	Chain-of-Custody Time	Remarks
TB-01	NA →					→	0800	TB	TB-01	0800	
MW-101	0.1	5.42	~7.0'	1.58'	0.44	—	1000	Sample	MW-101	1000	
MW-102	2.3	5.14	~6.0'	0.86'	0.24	—	1025	↓	MW-102	1025	
MW-106	43.5	6.24	~6.0'	0.76'	0.21	—	1040	↓	MW-106	1040	
MW-105	1350	5.29	~6.0'	0.71'	0.195	—	1050	↓	MW-105	1050	
MW-103	230	4.44	~6.0'	1.56'	0.43	—	1110	↓	MW-103	1110	
MW-104	520	1.87	~6.0'	4.13'	1.14		1140	↓	MW-104	1140	
MW-012	0.0	2.97	~8.20	5.23'	1.44			↓	MW-012	1220	
MW-~~104~~ 013	520	1.87	6.0'	4.13	1.14		1140	Dup.	MW-013	1230	
FB-10	NA →					→	1230	FB	FB-10	1230	

* *(1.5" = 0.092 gals/ft, 2" = 0.16 gals/ft, 4" = 0.65 gals/ft, 6"=1.5 gals/ft)*

REMARKS _____

SCITEST
LABORATORY SERVICES

P.O. Box 339
Randolph, Vermont 05060-0339
(802) 728-6313
(802) 728-6044 (FAX)

LABORATORY REPORT

CLIENT:	Carl Ruprecht	LABORATORY NO:	4-1311
ADDRESS:	SB Collins	PROJECT NO:	70249
	54 Lower Welden	DATE OF SAMPLE:	6/24/94
	St. Albans, VT 05474	DATE OF RECEIPT:	6/24/94
		DATE OF ANALYSIS:	7/8/94
SITE:	Shelburne Road Mobil South, S. Burlington, VT	DATE OF REPORT:	7/12/94

Results
(Results expressed in micrograms per liter (ug/L))

PARAMETER	MW 1	MW 2	Trip Blank
Methyl Tertiary Butyl Ether	5900	8940	BPQL
Benzene	2000	3810	BPQL
Toluene	2510	18800	BPQL
Ethylbenzene	1140	1760	BPQL
Total Xylenes	5840	18700	BPQL
Chlorobenzene	< 100	< 100	BPQL
1,2-Dichlorobenzene	< 100	< 100	BPQL
1,3-Dichlorobenzene	< 100	< 100	BPQL
1,4-Dichlorobenzene	< 100	< 100	BPQL
Surrogate % Recovery	97%	95%	97%

EPA Method 602.
BPQL = Below Practical Quantitation Limit; 1 ppb.

c: Jeff Hoffer

Respectfully submitted,

SCITEST, INC.

Roderick J. Lamothe
Laboratory Director

Scitest, Inc.

Route 66 Professional Center, Randolph, Vermont 05060
Phone:(802)728-6313 Fax:(802)728-6044

CHAIN OF CUSTODY RECORD

Sheet 1 of 1

Project Name/Location: Shelburne Road Mobil/South, So. Burlington VT

Company Name: Carl Ruprecht S.B. Collins, Inc.

Company Address: 54 Lower Welden St. Albans VT 05474

Project Number:

P.O. Number:

Phone: 527-0116

Fax:

Project Manager: Jeff Hoffer 244 5573

Scitest Acct #:

Sample Number	Sampling Date	Sampling Time	Client Sample I.D.	Containers (number/type)	Matrix/ Source	Analysis Requested
TB-1				2 40mL VOAs	Water	BTEX/MTBE EPA Method 8020
MW-1	6/24/94	0800	MW-1	2 40mL VOAs	Water	↓
MW-2	6/24/94	0815	MW-2	2 40mL VOAs	Water	↓
					HCl Preserved	

Sampler's Signature:

Additional Comments: Please send copy of results to Jeff Hoffer

Reviewed By: Date:

Number	Relinquished By	Date	Time	Accepted By	Date	Time
1	[signature]	6/24/94	10:50			
2						
3						

Turn-Around-Time: [X] Normal [ ] Rush Due Date

Lab Number:

GROUNDWATER SAMPLING DATA SHEET

LOCATION: Shelburne Mobil/South SAMPLE METHOD: Disp. Poly Bailer

DATE: 6/24/94 SAMPLING TEAM: Jeff Hatter

WELL ID	PID Head Space (ppm)	Depth to Water (ft)	Total Well Depth (ft)	Water Column (ft)	3 Well Volumes* (gals)	Total Purged (gals)	Sample Time	Sample Type	Chain-of-Custody Number	Chain-of-Custody Time	Remarks
TB-1								Trip	TB-1	6/14/94	3pm
MW-1	5.5	3.1	7.0			1.2	0800	MS	MW-1	0800	Silty Black Sample Condition Green on Purge H2O
MW-2	280	3.4	7.0			1.0		S	MW-2	0815	Slightly Silty Brown Green on Purge H2O

* *(1.5" = 0.092 gals/ft, 2" = 0.16 gals/ft, 4" = 0.65 gals/ft, 6"=1.5 gals/ft)*

REMARKS

SCITEST
LABORATORY SERVICES

P.O. Box 339
Randolph, Vermont 05060-0339
(802) 728-6313
(802) 728-6044 (FAX)

LABORATORY REPORT

CLIENT: Jeff Hoffer
ADDRESS: P.O. Box 428
Waterbury, VT 05676

SITE: Mobil, Shelburne Rd South
ATTENTION: Carl Ruprecht

LABORATORY NO: 4-0999
PROJECT NO: 70249
DATE OF SAMPLE: 5/20/94
DATE OF RECEIPT: 5/20/94
DATE OF ANALYSIS: 5/20/94
DATE OF REPORT: 5/20/94

Results
(Results expressed in micrograms per liter (ug/L))

PARAMETER	Water Well
Methyl Tertiary Butyl Ether	1
Benzene	BPQL
Toluene	1
Ethylbenzene	BPQL
Total Xylenes	3
Chlorobenzene	BPQL
1,2-Dichlorobenzene	BPQL
1,3-Dichlorobenzene	BPQL
1,4-Dichlorobenzene	BPQL
Surrogate % Recovery	95%

EPA Method 8020
BPQL = Below Practical Quantitation Limit, 1 ppb

Respectfully submitted,

SCITEST, INC.

Roderick J. Lamothe
Laboratory Director

GROUNDWATER SAMPLING DATA SHEET

LOCATION: Socastelburne mobil South
DATE: 5/19

SAMPLE METHOD: Teflon Bailer
SAMPLERS J. H. Holder

WELL ID	PID Head Space (ppm)	Depth to Water (ft)	Total Well Depth (ft)	Water Column (ft)	3 Well Volumes* (gals)	Total Purged (gals)	Sample Time	Sample Type	Chain-of-Custody Number	Chain-of-Custody Time	Remarks
W-1	0 0	50'	130'	----	----	----	10:00	Sample	W-1	1000	clear - slight odor

* *(1.5" = 0.092 gals/ft, 2" = 0.16 gals/ft, 4" = 0.65 gals/ft, 6"=1.5 gals/ft)*

REMARKS _____

Report [illegible] to [illegible] SB Collins to Jeff Hoffer

Scitest, Inc.
Route 66 Professional Center, Randolph, Vermont 05060
Phone:(802)728-6313 Fax:(802)728-6044

CHAIN OF CUSTODY RECORD

Sheet 1 of 1

Project Name/Location: SB Collins/Shelburne Road Mobil South

Company Name: Jeff Hoffer Consulting Hydrogeologist

Company Address: POB 428 Waterbury VT 05676

Project Number:

P.O. Number:

Phone: 802 244 5573

Fax:

Project Manager: JPH

Scitest Acct #:

Sample Number	Sampling Date	Sampling Time	Client Sample I.D.	Containers (number/type)	Matrix/ Source	Analysis Requested
W-1	5/20/94	10:00	Water Well	2 (40mL Voa)	Water	BTEX/MTBE 8020

Sampler's Signature: [signature]

Additional Comments:

Number	Relinquished By	Date	Time	Accepted By	Date	Time
1	[signature]	1/30		Kathleen Dugan	5/20	11:30
2						
3						

Turn-Around-Time: [ ] Normal ? [ ] Rush ? Due Date Tues. 5/24/94

Reviewed By: Date:

Lab Number: