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**INITIAL INVESTIGATION OF
SUBSURFACE PETROLEUM CONTAMINATION AT
EXIT 8 MOBIL**

JUNE 28, 1999

Site Location:

**Exit 8 Mobil
Junction I-91 and Route 131
Ascutney, VT**

**VTDEC SITE #98-2524
GI Project # 29941477**

Prepared For:

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TABLE OF CONTENTS

I. INTRODUCTION.....	1
II. SITE BACKGROUND.....	1
A. Site History	1
B. Site Description.....	2
C. Site Geologic Setting	3
III. INVESTIGATIVE PROCEDURES.....	3
A. Monitoring Well Installation.....	3
B. Determination of Groundwater Flow Direction and Gradient.....	5
C. Groundwater Sample Collection and Analysis.....	6
D. Bailing of Free Phase Product.....	7
E. Assessment of Soil Stockpile.....	7
F. Sensitive Receptor Risk Assessment.....	8
IV. CONCLUSIONS	9
V. RECOMMENDATION.....	11
VI. REFERENCES.....	12

APPENDICES

A. MAPS

- 1) Site Location Map
- 2) Site Map
- 3) Groundwater Contour Map
- 4) Contaminant Concentration Map - Total BTEX
- 4) Contaminant Concentration Map - Total Targeted VOCs

B. WELL LOGS

C. LIQUID LEVEL MONITORING DATA

D. GROUNDWATER QUALITY SUMMARY DATA

E. LABORATORY ANALYSIS REPORTS

I. INTRODUCTION

This report summarizes the initial investigation of suspected subsurface petroleum contamination at the Exit 8 Mobil located at the Junction of I-91 and Route 131 in Ascutney, VT (see location map in Appendix A). This investigation was conducted by Griffin International, Inc. (Griffin) for Mr. Lionel Dawson to address petroleum contamination detected during an underground storage tank (UST) closure inspection in October 1998. The Vermont Department of Environmental Conservation (VTDEC) requested that this work be completed in a letter to Mr. Lionel Dawson, from Mr. Chuck Schwer of the VTDEC, dated December 29, 1998. The site (VTDEC Site #98-2524) is owned by Lionel Dawson of Springfield, VT.

Work conducted at the site included the installation of four groundwater monitoring wells, and the collection and laboratory analysis of groundwater samples from these monitoring wells. In addition, an assessment of the on-site stockpile of petroleum contaminated soils was made, and a sensitive receptor risk assessment was conducted to assess the risk that subsurface petroleum contamination at the site may pose to potentially sensitive receptors identified in the site vicinity. Work has been conducted in accordance with Griffin's *Work Plan and Cost Estimate for Subsurface Investigation at Exit 8 Mobil* dated February 10, 1999. The Work Plan was approved by Mr. Lionel Dawson in a telephone conversation with Griffin on April 16, 1999, and by Mr. Chuck Schwer of the VTDEC in a letter dated April 29, 1999.

II. SITE BACKGROUND

A. Site History

Subsurface petroleum contamination was detected in soil at the Exit 8 Mobil site during the closure of (1) 4,000-gallon gasoline, (2) 10,000-gallon gasoline, (1) 500-gallon No. 2 fuel oil, and (1) 500-gallon waste oil USTs. The USTs were of welded, single-walled steel construction. Tank closure activities were conducted on October 19 and 22, 1998. Details of the closure inspection are outlined in the Underground Storage Tank Permanent Closure Form, which was submitted to the VTDEC on October 27, 1998 by Griffin International [1]. The tanks were replaced with (1) 10,000-gallon gasoline and (1) 8,000-gallon gasoline USTs.

During the tank closure inspection no petroleum contamination above acceptable standards was noted with respect to the 500-gallon waste oil UST. Two soil samples were collected from the extent of excavation for this UST, and submitted for laboratory analysis by EPA Method 8260B for the presence of volatile organic compounds (VOCs) and EPA Method 8100 Modified for the presence of total petroleum hydrocarbons (TPH). None of the targeted compounds were detected at concentrations greater than their respective Vermont Groundwater Enforcement Standards (VGES). In accordance with the August 1996 *Agency Guidelines for Petroleum Contaminated Soil and Debris* (Vermont State Agency of Natural Resources, Waste Management Division)

these groundwater standards were utilized for evaluation of the soil sampling results because Vermont soil standards have not been established at this time. Results of these laboratory analyses can be found in the Underground Storage Tank Permanent Closure Form and UST Closure Letter Report, which was submitted to the VTDEC on October 27, 1998 by Griffin International (Griffin).

Adsorbed petroleum contamination was detected in the vicinity of the three gasoline USTs and the No. 2 fuel oil UST, as measured with a photoionization detector (PID). These concentrations exceed Soil Guideline Thresholds set by the Waste Management Division of the VTDEC (as per *Agency Guidelines for Contaminated Soils and Debris* [August, 1996]). Concentrations of volatile organic compounds (VOCs) measured with the PID in the vicinity of the gasoline USTs averaged 125 parts per million (ppm), with a peak reading of 300 ppm. The 4,000-gallon gasoline UST and a 10,000-gallon gasoline UST each had a 1.5-inch diameter hole in the bottom beneath the fill pipe.

VOC concentrations in the vicinity of the No. 2 fuel oil UST averaged 52 ppm, with a peak reading of 110 ppm. Nine holes were observed in the bottom of the No. 2 fuel oil UST during the tank removal inspection.

In compliance with a request from the VTDEC that additional work be conducted at this site in order to determine the degree and extent of petroleum contamination, Lionel Dawson retained the services of Griffin to conduct this initial site investigation.

B. Site Description

The Exit 8 Mobil site is located at the Junction of Interstate 91 and Route 131 in Ascutney, VT (see Site Location Map in Appendix A). I-91 borders the site to the west and southwest, and Route 131 borders the property to the southeast. The property is bounded to the north and northeast by a steeply sloping wooded ravine. Surface drainage from this ravine drains to Mill Brook, a tributary to the Connecticut River. The area is sparsely developed, the closest building is a Sunoco gas station, located approximately 400 feet southeast of the site.

There are two buildings on the subject property. The main building contains a convenience store and a garage currently used as storage space. A small shed is located behind the main building. The majority of the property in front of the building is paved. Some landscaped areas and lawn exist at the perimeter of the property and on an island between the building and Route 131 (see Site Map). The area behind the main building is unpaved.

C. Site Geologic Setting

According to the Surficial Geologic Map of Vermont [2], the site is underlain by well-sorted sands of glaciolacustrine origin. Soils encountered during monitoring well installation consisted of sand and gravel fill overlying silt and silty sands. Bedrock at the site is mapped as Devonian-aged, gray, quartzite, muscovite phyllite/schists of the Gile Mountain Formation and amphibolites and garnet amphibolites (the Standing Pond volcanic member of the Waits River Formation) [3].

Based on visual observation and review of the USGS topographic map [4], groundwater in the vicinity of Exit 8 Mobil would be expected to flow to the southeast toward Mill Brook, following topographic contours.

III. INVESTIGATIVE PROCEDURES

A. Monitoring Well Installation

On May 6, 1999, four monitoring wells were installed by M&W Soils Engineering of Charlestown, New Hampshire using a hollow stem auger drilling rig. Drilling and well construction were directly supervised by a Griffin geologist. Soil samples were collected at five foot intervals from each boring. Each soil sample was screened for volatile organic compounds (VOCs) using an HNu Model HW-101 PID equipped with a 10.2 eV bulb. Soils were screened using the Griffin Jar/Polyethylene Bag Headspace Screening Protocol, which conforms to state and industry standards. Contaminant concentrations and soil characteristics were recorded in detailed boring logs by the supervising Griffin geologist (see the Well Logs in Appendix B).

The monitoring wells (MW99-1, MW99-2, MW99-3, and MW99-4) were installed to help better define groundwater flow direction and gradient and the degree and extent of suspected petroleum contamination at the site. MW99-1 was to be installed in the vicinity of the former No. 2 fuel oil UST. Due to site constraints on the date of drilling (i.e., a small shed had been placed over the excavated area) this location could not be accessed, and MW99-1 was installed southwest of the former No. 2 fuel oil UST in a presumed crossgradient direction. MW99-2 was installed in the vicinity of the former gasoline UST system. MW99-3 and MW99-4 were installed in the presumed down and crossgradient directions of the former gasoline and No. 2 fuel oil USTs.

The monitoring wells were constructed of 2-inch diameter Schedule 40 PVC riser and 0.010-inch factory slotted, well screen. The length of the riser and the screened section of pipe varied depending on the depth of the well. The annulus between the well screen and the borehole was filled with a sand pack to just above the well screen. A bentonite seal was placed above the sand pack. The annulus between the riser and the borehole was filled with native backfill to just

below ground level. A second bentonite seal was placed above the backfill to prevent infiltration of surface water into the monitoring well. To complete the construction of each well, a road box was set in concrete at grade level. In addition, locking well caps were placed on the monitoring wells. Specific well construction details are displayed in the detailed well logs included in Appendix B.

MW99-1

The boring for MW99-1 was advanced to 25 feet below grade. Soils from the boring for MW99-1 consisted of sand and gravel fill from 0 to 4 feet below grade. Moist, olive brown silt was observed from 5 to 7 feet below grade. Moist brown silts were observed from 10 to 12 and 15 to 17 feet below grade. Wet silt with sand was observed from 20 to 22 feet below grade. Soil samples collected for PID screening had a maximum reading of 0.2 ppm, measured in the sample collected between 5 and 7 feet.

Groundwater was encountered at approximately 22 feet below grade. The screened section of the well was installed to 25 feet below the ground surface.

MW99-2

The boring for MW99-2 was advanced to 32 feet below grade. Soils from the boring consisted of sand and gravel fill from 0 to 4 feet below grade. Silty sand was observed from 5 to 7 and 10 to 12 feet below grade. Soils collected between 15 to 17 feet below grade consisted of moist, olive gray silt. Wet brown sandy silts were observed between 20 and 22 feet below grade. Wet brown silty sand was observed from 25 to 27 and 30 to 32 feet below grade. Elevated VOC levels were detected using the PID. The maximum reading was 320 ppm at 5 to 7 feet below grade.

Groundwater was encountered at 26 feet below grade. The screened section of the well was installed to 30 feet below grade.

MW99-3

The boring for MW99-3 was advanced to 32 feet below grade. Soils from the boring consisted of sand and gravel fill from 0 to 4 feet below grade. Dry olive gray silt was observed in the sample collected from 5 to 7 feet below grade. Soils collected between 10 and 12 feet below grade consisted of dry olive gray silts with sand. Moist brown silt was observed between 15 and 17 feet below grade. Wet olive gray silt was observed between 20 and 22 feet below grade. Soils collected between 25 and 27 feet below grade consisted of wet brown sandy silt. Wet brown silt with sand was observed between 30 and 32 feet below grade. Elevated VOC levels

were detected using the PID. A maximum reading of approximately 700 ppm was measured in the sample collected between 25 and 27 feet below grade.

Groundwater was encountered at 25 feet below grade, and the screened section of the well was installed to 30 feet below grade.

MW99-4

The boring for MW99-4 was advanced to 33 feet below grade. Soils from the boring consisted of sand and gravel fill from 0 to 4 feet below grade. Dry silty sand was observed from 5 to 7 feet below grade. Soils between 10 to 12 and 15 to 17 feet below grade consisted of a moist, olive gray silt. Soils collected between 20 and 22 feet below grade consisted of moist olive gray sandy silt. Silty sand was observed between 25 and 27 feet below grade. Soils between 30 and 32 feet below grade consisted of poorly graded sand with silt. Elevated VOC levels were detected in the soil samples collected from this boring. The maximum reading was 135 ppm at 15 to 17 feet below grade.

Groundwater was encountered at 27.5 feet below grade, and the screened section of the well was installed to 33 feet below grade.

B. Determination of Groundwater Flow Direction and Gradient

Water table elevation measurements were collected from all monitoring wells on May 28, 1999 using a Keck interface probe. These measurements were subtracted from the top of road box elevations, which were determined relative to an arbitrary datum of 100 feet at the top of the roadbox for MW99-3, to determine the water table elevation at each of the wells. Groundwater level data are recorded in Appendix C.

Approximately 0.88 foot of free phase petroleum product was observed in MW99-3 during the May 28, 1999 gauging event. The presence of this product was reported to Lynda Provencher of the VTDEC on June 2, 1999 [5]. Removal of free phase product from this monitoring well was initiated on June 7, 1999 and is discussed in a later section.

As displayed in the groundwater contour map included in Appendix A, the groundwater flow direction for May 28, 1999 appears to flow to the southeast at a hydraulic gradient of approximately 2.1%. Under the groundwater flow regime described, MW99-1 is located upgradient of the former gasoline UST system and cross gradient from the former No. 2 fuel oil UST. MW99-2, MW99-3, and MW99-4 are located downgradient of the expected source areas (i.e. the former gasoline UST system and the No. 2 fuel oil UST).

C. Groundwater Sample Collection and Analysis

Groundwater samples were collected from two of the on-site monitoring wells immediately following well gauging on May 28, 1999. MW99-1 was dry and could not be sampled. MW99-3 contained free product, and no samples were collected from that well. Samples from MW99-2 and MW99-4 were analyzed for the presence of VOCs per EPA Method 8021B, and for total petroleum hydrocarbons (TPH) via Method 8015 DRO (diesel range organics). Results of the laboratory analyses are summarized in Appendix D. Laboratory report forms are presented in Appendix E. Contaminant concentration maps are presented in Appendix A.

Concentrations of benzene, toluene, 1,2,4-trimethylbenzene, and MTBE were detected in MW99-2 at levels above their respective Vermont Groundwater Enforcement Standards (VGESs). Concentrations of ethylbenzene and xylenes were detected in MW99-2 below their VGESs. TPH analysis detected diesel range organic compounds in the groundwater sample collected from MW99-2.

None of the targeted compounds were detected in the sample collected from MW99-4.

As displayed in the two contaminant concentration maps in Appendix A, the free phase and dissolved contaminant plumes appear to be concentrated in the vicinity of the (2) former 10,000-gallon gasoline USTs and the (1) former 4,000-gallon gasoline UST, where subsurface petroleum contamination was detected in soils during the UST closure inspection. Adsorbed contamination encountered during the advancement of MW99-2, in the vicinity of these USTs, was relatively consistent from 5 feet to the end of exploration at 32 feet. Adsorbed contamination in the downgradient monitoring well, MW-3 was greatest at the water table/soil interface. The downgradient extent of the dissolved and free phase contaminant plumes has not been determined.

Adsorbed contamination was detected in the vicinity of the No. 2 fuel oil UST with a PID during the tank closure inspection in October 1998. VOC concentrations measured in soils from the excavation for this tank ranged from 0 to 110 ppm. Because MW99-1 could not be installed in the direct vicinity of the former No. 2 fuel oil UST due to site constraints on the day of drilling, the degree and extent of contamination to soil and groundwater from this source has not been determined.

All samples were collected according to Griffin's groundwater sampling protocol, which complies with industry and state standards. Results from the analyses of the trip blank and duplicate samples indicate that adequate quality assurance and control (QA/QC) were maintained during sample collection and analysis.

D. Bailing of Free Phase Product

Approximately 0.9 foot of free phase petroleum product was measured in MW99-3 during the gauging and sampling event on May 28, 1999. A site visit was conducted on June 7, 1999 in order to gauge and bail free product from the affected well. A thickness of 0.8 foot of product was measured in MW99-3 on that date, and 0.5 Liter of product was removed from the well. The liquid removed from the monitoring well was a pale yellow color and had a gasoline odor. A second site visit was made on June 23, 1999; 0.4 foot of product was measured in MW99-3, and 0.25 Liter of product was removed from the well. Bailing waste is containerized and stored on-site in a properly labeled 55-gallon drum located in the storage garage on the western corner of the station.

Regular site visits have been scheduled in order to monitor and bail free product from any affected wells at the Exit 8 Mobil site.

E. Assessment of Soil Stockpile

Approximately 350 cubic yards of petroleum contaminated soils were stockpiled on-site during the UST closure and replacement activities conducted in October 1998. The soils are located along the northwestern edge of the property, behind the on-site building. A wooded ravine drops off steeply behind the stockpile. The stockpile is placed on and covered with plastic; sections of the plastic covering are torn or missing.

The stockpiled soils were screened for VOCs on May 28, 1999 using a Photovac 2020 PID equipped with a 10.6 eV bulb. Six samples were collected from depths of approximately 6 to 12 inches within the stockpile. Screening results are presented below.

Soil Stockpile – VOC Screening Results

Sample ID	PID Reading (ppm)
SS1	5.1
SS2	623
SS3	4.2
SS4	0.0
SS5	0.0
SS6	377

Soils were screened using the Griffin Jar/Polyethylene Bag Headspace Screening Protocol, which conforms to state and industry standards.

F. Sensitive Receptor Risk Assessment

A receptor risk assessment was conducted to identify known and potential receptors of contamination detected at the Exit 8 Mobil site. A visual survey was conducted during monitoring well installation. Based on these observations, a determination of the potential risk to identified receptors was made based on proximity to the expected source area (i.e., the former gasoline and No. 2 fuel oil UST systems), groundwater flow direction, and contaminant concentration levels in groundwater.

Water Supplies

Exit 8 Mobil and other buildings in the area are serviced by a municipal water supply, owned by Country Estates Water Company of Ascutney, VT. The source of this water supply is two drilled wells located off of Route 5 in Ascutney near the Connecticut River. The wells are approximately 80 and 60 feet deep, respectively. According to Ms. Lisa DeGrasse of Country Estates Water Supply [6], the water system has a source area protection plan, and Exit 8 Mobil is outside of the range of their supply wells. Based on this information, and given the distance between Exit 8 Mobil and the water source, this water supply is at minimal risk of impact from groundwater contamination at the subject site.

Buildings in the Vicinity

Two buildings are located on the subject property; a garage/convenience store and a shed. Both buildings are in the vicinity of the former No. 2 fuel oil UST, and upgradient of the former gasoline UST system. The garage/convenience store is constructed on a slab foundation. The shed is standing on blocks, which sit directly on the ground surface.

The nearest building to the subject site is a Sunoco gas station located on the opposite side of Route 131, approximately 400 feet downgradient of the Ascutney Mobil. The Sunoco station is constructed on a slab foundation.

Environmental risk to buildings on the Exit 8 Mobil site and to the Sunoco station is considered minimal, given that the buildings do not have basements, which would allow the potential accumulation of petroleum vapors, and that they are serviced by a municipal water supply. Additionally, the depth to groundwater is more than 25 feet below grade, which also minimizes potential risks to the buildings via petroleum vapor migration. The majority of both the Exit 8 Mobil site and the Sunoco station property are paved, reducing the potential for exposure to the

petroleum compounds through dermal contact with soils or inhalation of vapors. Groundwater elevations are also much lower than the average depth of utility corridors (3 to 5 feet), which minimizes the potential for petroleum migration along utility corridors which may be located in the site vicinity.

Surface Water

The nearest surface water to the site is a small stream located in the ravine to the north and northeast of the site. This stream drains to Mill Brook, a tributary of the Connecticut River. Based on the surface topography of the site, surface water would be expected to drain to the northeast, into this ravine. The groundwater flow direction measured on May 28, 1999 indicates that groundwater is flowing to the southeast, toward Mill Brook. The risk of petroleum impact to these surface waters cannot be evaluated, based on currently available data, because the downgradient extent of contamination has not been defined.

IV. CONCLUSIONS

Based on the initial site investigation of petroleum contamination at the Exit 8 Mobil site, the following conclusions are offered:

1. There has been an apparent release(s) of gasoline and No. 2 fuel oil in the subsurface at the subject site. One 4,000-gallon gasoline, two 10,000-gallon gasoline, one 500-gallon No. 2 fuel oil, and one 500-gallon waste oil USTs were closed at the Exit 8 Mobil in October 1998. Adsorbed petroleum contamination greater than VTDEC acceptable thresholds was measured with a PID in the vicinity of the gasoline and No. 2 fuel oil USTs. Two of the gasoline USTs and the No. 2 fuel oil UST had visible holes in the bottom of the tanks. The duration of the release(s) is unknown.
2. Four shallow monitoring wells were installed at the site on May 6, 1999, to evaluate the degree and extent of subsurface petroleum contamination detected in October 1998.
3. Low levels of adsorbed petroleum contamination (less than 0.2 ppm) were detected in soils collected from the boring for MW99-1, located crossgradient of the former No. 2 fuel oil UST and upgradient of the former gasoline UST system.
4. Soils from the borings for MW99-2, MW99-3, and MW99-4, located down and crossgradient of the former gasoline and No. 2 fuel oil UST systems had elevated levels of adsorbed petroleum contamination. A maximum PID reading of 700 ppm was measured in the boring for MW99-3 between 25 and 27 feet below grade.

- workers
5. Adsorbed petroleum contamination was measured at depths of five feet or more below grade. The majority of the subject site is paved, limiting exposure to contamination by dermal contact with soils. Because the on-site building is constructed on a slab foundation, minimal vapor impact to the building from soils is expected. Additionally, the building is used for commercial purposes, and long-term exposure (i.e. more than 12 hours per day) to petroleum vapors is not expected to occur.
 6. Water table elevation data collected on May 28, 1999 indicate that groundwater in the overburden aquifer beneath the site flows to the southeast at a hydraulic gradient of approximately 2.1%.
 7. Depth to groundwater at the Exit 8 Mobil site is more than 25 feet below grade, as measured on May 28, 1999. This depth minimizes potential risks to the buildings via petroleum vapor migration from groundwater, and is below the average depth of utility corridors (3 to 5 feet), limiting potential petroleum migration along utility corridors which may be located in the site vicinity.
 8. Free phase petroleum product was present in MW99-3 on May 28, 1999.
 9. The groundwater samples collected from MW99-2 (located immediately downgradient of the former gasoline UST system) was impacted with petroleum related compounds. Concentrations of benzene, toluene, 1,2,4-trimethylbenzene, and MTBE were detected in this monitoring well at levels above their respective VGESs.
 10. TPH analysis detected diesel range organic compounds in the groundwater samples collected from MW99-2.
 11. The downgradient extent of the dissolved and free phase contaminant plume has not been defined with the current well array.
 12. Approximately 350 cubic yards of petroleum contaminated soils are stockpiled on-site. VOC measurements made during the stockpile screening on May 28, 1999 ranged from 0 to 623 ppm. Based on these results, monitoring of the soil stockpile should be conducted on an annual basis, until VOC concentrations are nondetectable (less than 1 ppm) as measured with a PID, and there is no remaining visual or olfactory evidence of petroleum contamination. In the meantime, torn sections of the plastic lining should be replaced, and monitored on a regular basis by representatives of Exit 8 Mobil. The pile should also be inspected periodically to ensure that contaminated soils are not eroding down the wooded ravine behind the soil pile and impacting non-contaminated areas.
 13. Receptors in the vicinity of the site which have been identified as being at potential risk of impact from subsurface petroleum contamination are nearby surface waters, the on-site

buildings, and a Sunoco station located to the east of the source area. Risk to the on-site buildings is considered minimal at this time, given that one is constructed on a slab foundation and serviced by municipal water supplies, while the other is a shed placed on blocks directly on the ground surface. Risk to the Sunoco station is also considered minimal, given that it is constructed on a slab foundation and is serviced by municipal water supplies. Risk to the nearby stream has not been defined, as the downgradient extent of the dissolved and free phase contaminant plume has not been determined.

14. With the apparent sources removed (i.e., the former gasoline and No. 2 fuel oil UST systems), and barring the identification of an additional source, it is expected that, over time, the natural processes of dilution, dispersion, and biodegradation will reduce dissolved contaminant concentrations present in groundwater beneath the Exit 8 Mobil site.

V. RECOMMENDATION

Based upon the above conclusions, Griffin presents the following recommendations:

1. Because contaminant levels in groundwater at the site were detected at concentrations greater than the VGES for several compounds, follow-up groundwater sampling should be conducted at this site.
2. Because potential soil and groundwater contamination related to the former 500-gallon No. 2 fuel oil UST has not been defined, at least one additional monitoring well should be installed in the vicinity of the former UST location, and to the northeast of MW99-1 in order to determine if contamination related to this UST is present. Prior to the installation of this monitoring well, the shed should be relocated to the northeast several feet, in order to make the location of the former No. 2 fuel oil UST pit accessible to a drill rig.
3. Because free phase petroleum product has been observed in the downgradient monitoring well, and because the downgradient extent of the dissolved and free phase contaminant plume has not been determined, at least one additional monitoring well should be installed to better define the down-gradient extent of petroleum contamination emanating from the Exit 8 Mobil site.
4. Free phase petroleum product measured in MW99-3 should be bailed on a monthly basis. The frequency should be reduced if the volume of free phase petroleum product removed from the affected monitoring well appears to decrease.
5. The stockpiled soils located on-site should be monitored on an annual basis until contaminant levels decrease to nondetectable levels (less than 1 ppm) and there is no remaining evidence (olfactory or visual) of petroleum contamination. At that time, in

accordance with VTDEC guidelines (August 1996), the soils can be thin-spread on-site, with VTDEC approval.

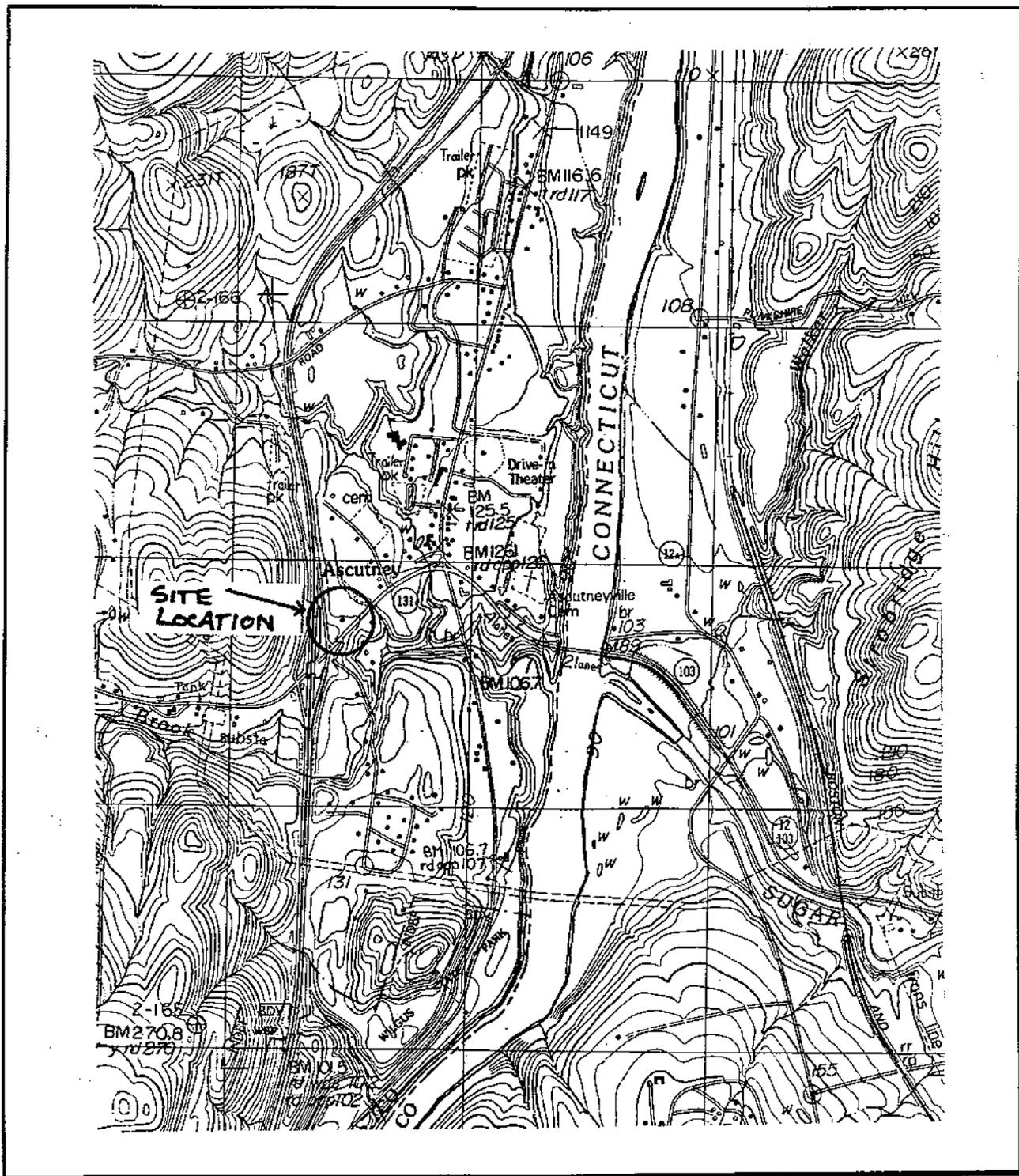
VI. REFERENCES

1. Griffin International Inc., September 8, 1998. UST Closure Letter Report from Willis Doe to Susan Thayer (VTDEC) re: Exit 8 Mobil UST Closure Inspection, UST Facility 8854714.
2. Doll, Charles G., ed., 1970, *Surficial Geologic Map of Vermont*, State of Vermont.
3. Doll, Charles G., ed., 1961, *Centennial Geologic Map of Vermont*, State of Vermont.
4. USGS 7.5 Minute Topographic Quadrangle Map. 1984. Mount Ascutney, Vermont-New Hampshire.
5. Telephone conversation between Elizabeth Stopford, Griffin International and Linda Provencher, VTDEC, June 7, 1999.
6. Telephone conversation between Elizabeth Stopford, Griffin International and Lisa DeGrasse, Country Estates Water System, June 18, 1999.

- ~~Need to do soil sampling directly adj. to former USIs; dg (b/t site & AS site)~~
- need vicinity map w/ all adjacent properties; receptors
- ~~soil stockpile location? plastic must be kept intact~~
- ~~impact to Ascutney Sunoco not evaluated in report - upgradient well at AS has sign. contamination which now appears to be migrating from Exit 8 Sunoco~~
- should also install mw on AS site for more info on dg extent.

APPENDIX A

Maps

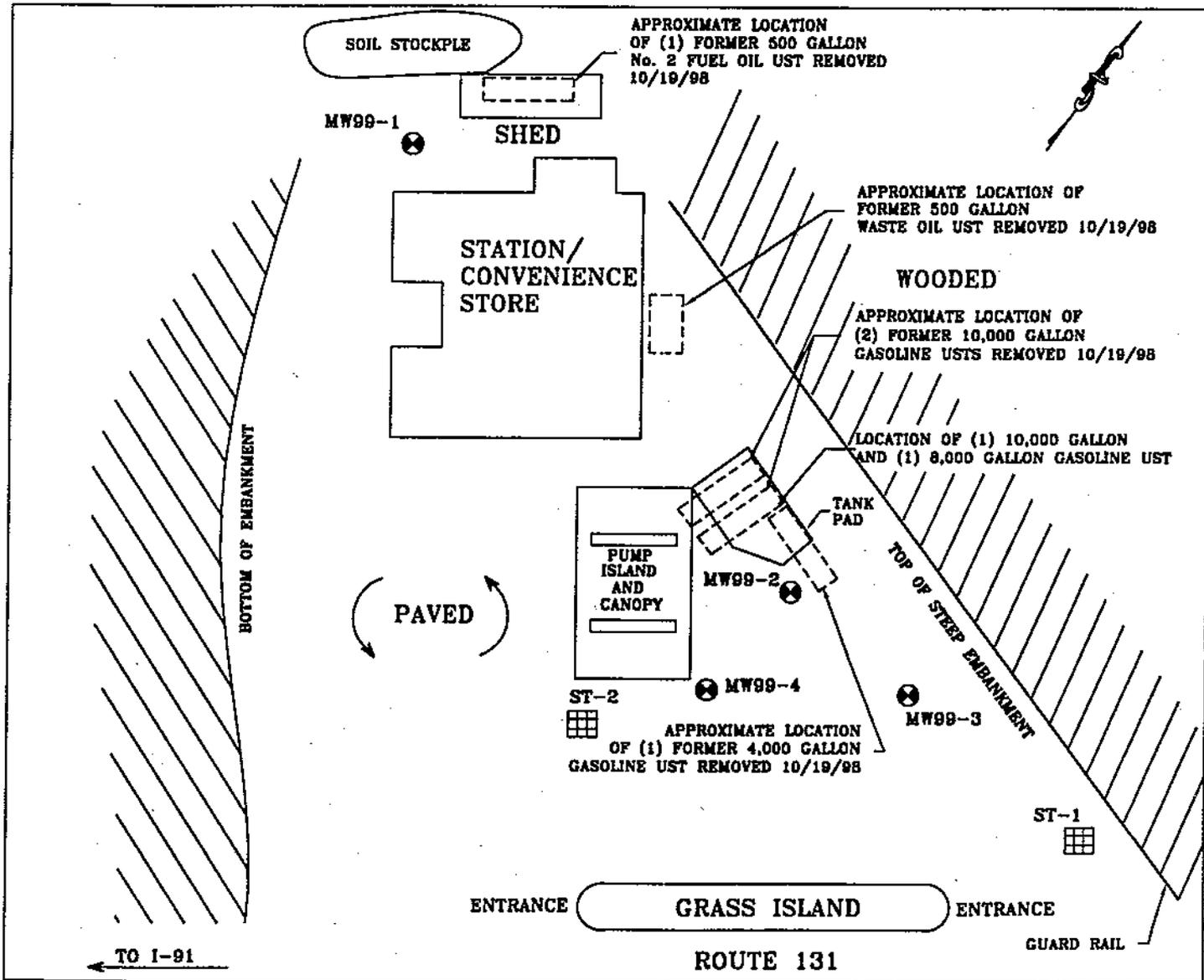


SITE LOCATION MAP – EXIT 8 MOBIL

Ascutney, Vermont

Source: Mount Ascutney, Vermont-New Hampshire, USGS 7.5-minute Topographic Quadrangle, 1984.





LEGEND

- MW MONITORING WELL
- ST STORM DRAIN

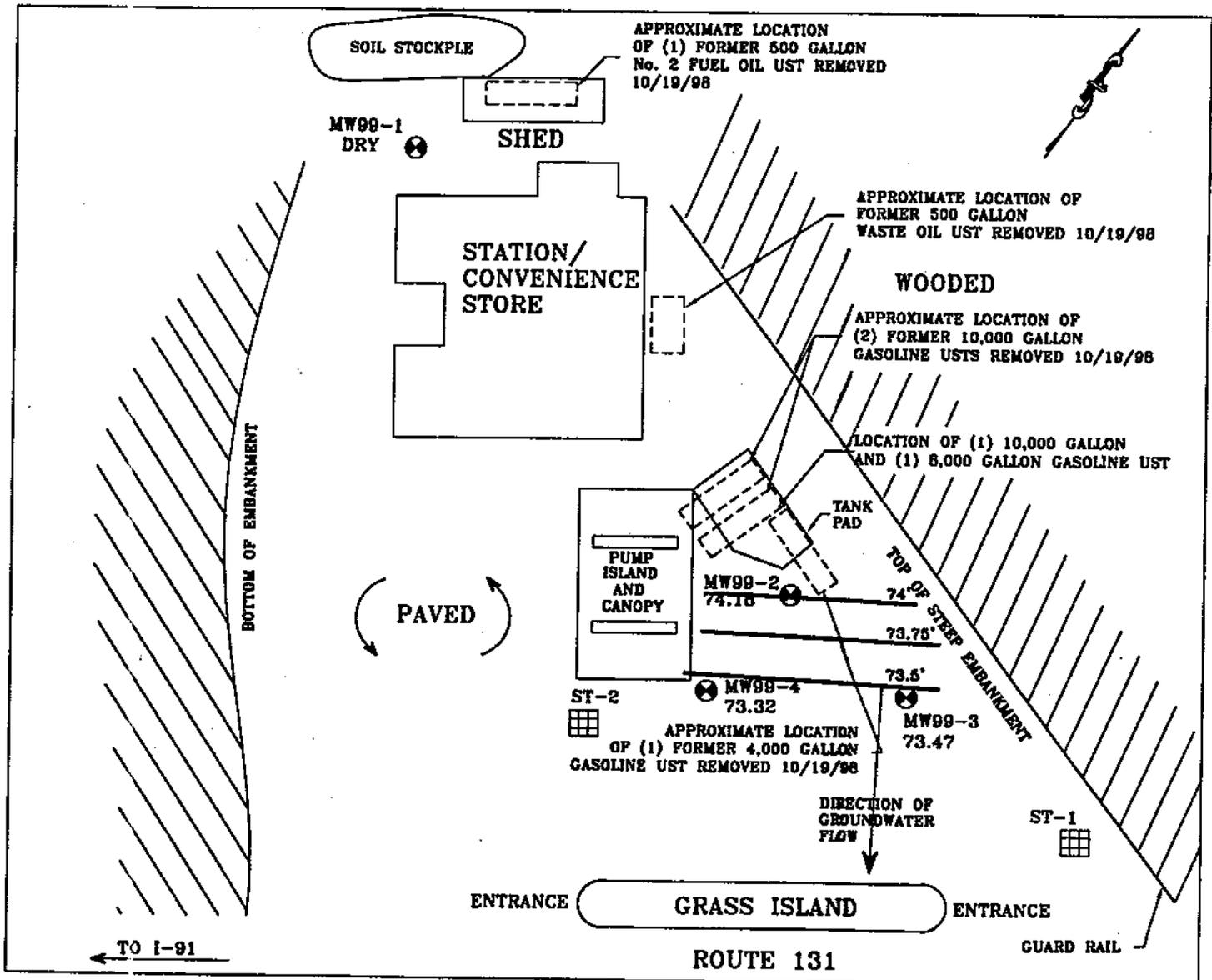


JOB# 29941477

EXIT 8 MOBIL
JUNCTION I-91 AND ROUTE 131
ASCUTNEY, VERMONT

SITE MAP

DATE: 6/14/99	DWG.#:1	SCALE: 1"=40'	DRN.:TG	APP.:BS
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LEGEND

- MW 74.16 MONITORING WELL AND GROUNDWATER ELEVATION IN FEET
- ST STORM DRAIN
- GROUNDWATER CONTOUR LINE

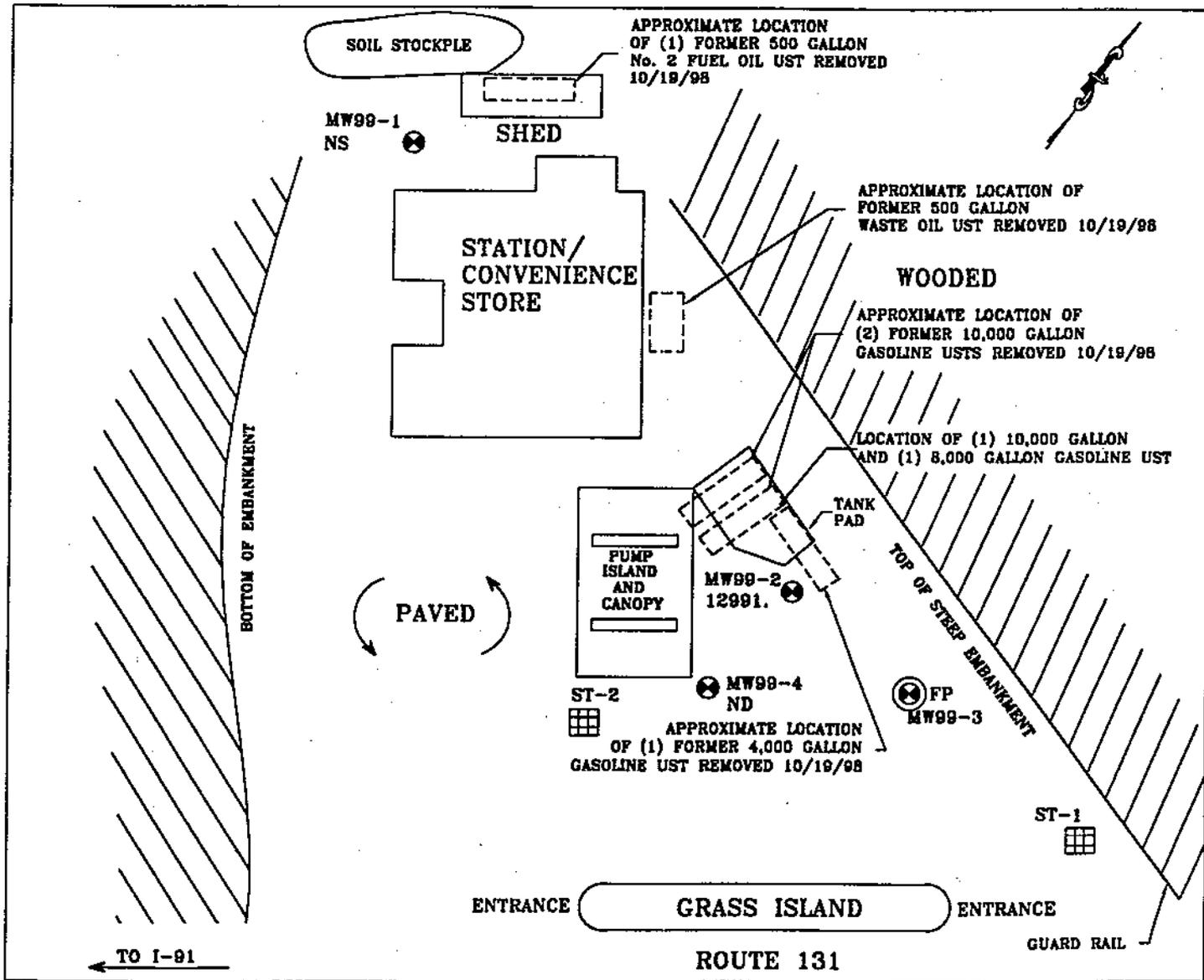


JOB# 28941477

EXIT 8 MOBIL
JUNCTION I-91 AND ROUTE 131
ASCUTNEY, VERMONT

GROUNDWATER CONTOUR MAP
 MEASUREMENT DATE: 5/28/99

DATE: 8/14/99	DWG.#:1	SCALE: 1"=40'	DRN.:TG	APP.:BS
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- LEGEND**
- MW 12991. MONITORING WELL AND CONTAMINANT CONCENTRATION IN ppb
 - ST STORM DRAIN
 - NS NOT SAMPLED
 - ND NOT DETECTED
 - FP FREE PRODUCT MEASURED IN WELL

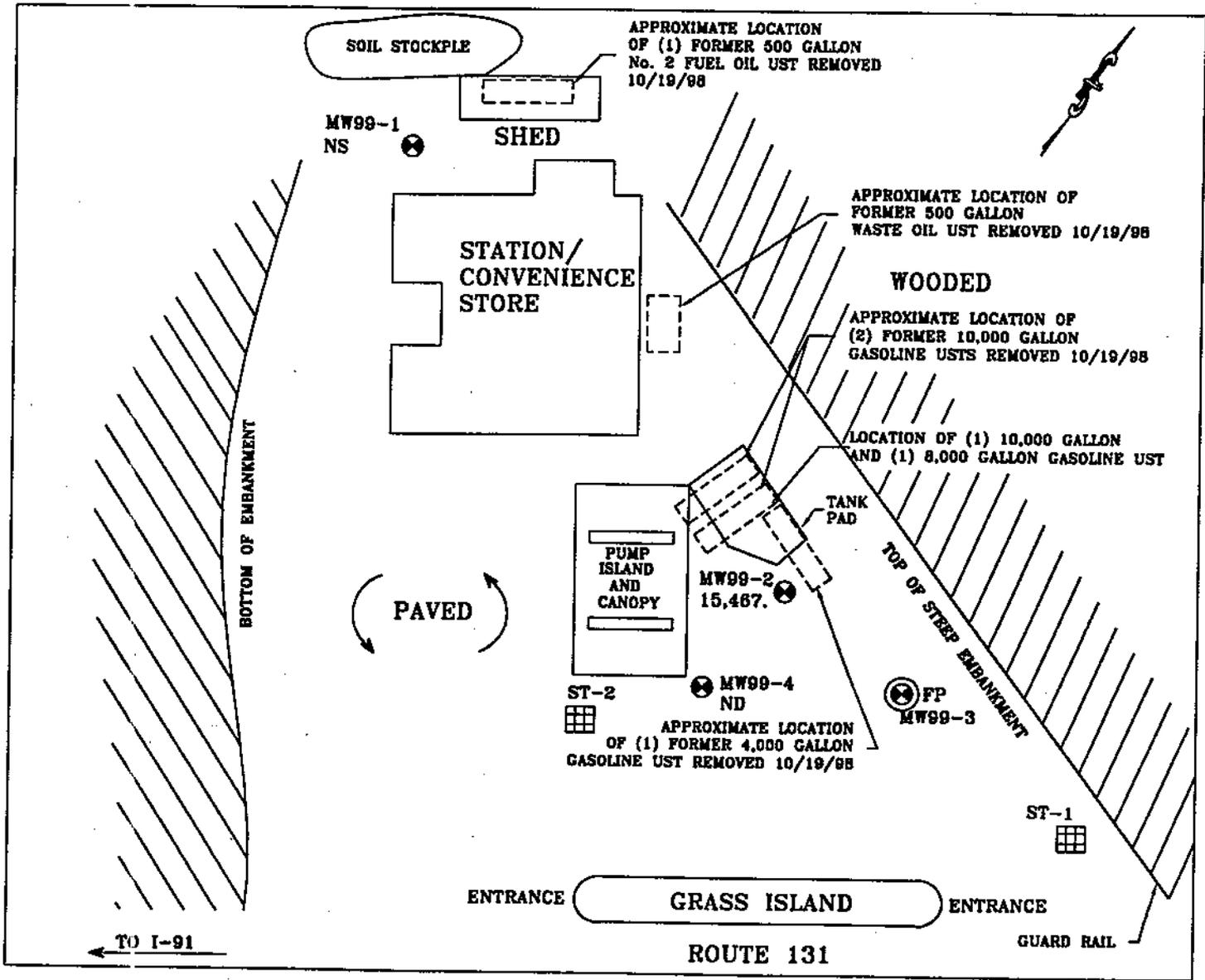


JOB# 29941477

EXIT 8 MOBIL
JUNCTION I-91 AND ROUTE 131
ASCUTNEY, VERMONT

CONTAMINANT CONCENTRATION MAP
 TOTAL BTEX CONCENTRATIONS SAMPLE DATE: 5/28/99

DATE: 6/14/99	DWG.#:1	SCALE: 1"=40'	DRN.:TG	APP.:BS
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- LEGEND**
- MW 15,467. MONITORING WELL AND CONTAMINANT CONCENTRATION IN ppb
 - ST STORM DRAIN
 - NS NOT SAMPLED
 - ND NOT DETECTED
 - FP FREE PRODUCT MEASURED IN WELL



JOB# 29941477

EXIT 8 MOBIL
JUNCTION I-91 AND ROUTE 131
ASCUTNEY, VERMONT

CONTAMINANT CONCENTRATION MAP
 METHOD 8021B TOTAL TARGETED VOC'S SAMPLE DATE: 5/28/99

DATE: 6/14/99	DWG.#:1	SCALE: 1"=40'	DRN.:TG	APP.:BS
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APPENDIX B

Well Logs

PROJECT 29941477 ASCUTNEY MOBIL

WELL NUMBER MW99-1

LOCATION ASCUTNEY VT

DATE DRILLED 5/6/99 TOTAL DEPTH OF HOLE 25'

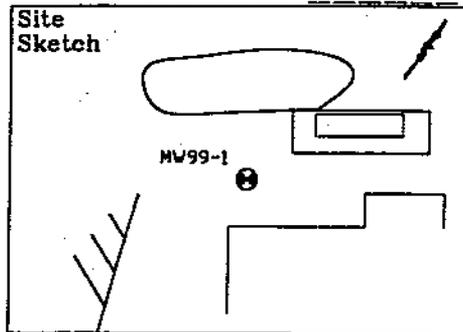
DIAMETER 4.25"

SCREEN DIA. 2" LENGTH 15' SLOT SIZE 0.010"

CASING DIA. 2" LENGTH 9.5' TYPE sch 40 pvc

DRILLING CO. M+W SOILS DRILLING METHOD HSA

DRILLER M.H., C.C., W.M. LOG BY LAURIE REED



GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0		ROAD BOX			0
1		LOCKING WELL CAP			1
2		CONCRETE		SAND AND GRAVEL FILL	2
3		BENTONITE			3
4		NATIVE BACKFILL			4
5					5
6		WELL RISER	5'-7'- 3,2,2,3 0.2 ppm	SILT (ML)- 100% silt, moist, olive brown	6
7		BENTONITE			7
8					8
9					9
10			10'-12'- 3,3,3,3 ND	SILT (ML)- 95% silt, 5% fine sand, moist, brown	10
11					11
12					12
13		WELL SCREEN			13
14					14
15					15
16			15'-17'- 1,2,1,2 ND	SILT (ML)- 95% silt, 5% fine sand, moist, brown, clay interbeds	16
17					17
18		SAND PACK			18
19					19
20			20'-22'- 1,2,3,4 ND	SILT W/SAND (ML)- 70% silt, 30% fine sand, wet, brown	20
21					21
22				22.0' WATER TABLE	22
23					23
24		BOTTOM CAP			24
25		UNDISTURBED NATIVE SOIL			25
26				BASE OF WELL AT 25'	26
27					27
28					28
29					29

PROJECT 29941477 ASCUTNEY MOBIL

LOCATION ASCUTNEY VT

DATE DRILLED 5/6/99 TOTAL DEPTH OF HOLE 30'

DIAMETER 4.25"

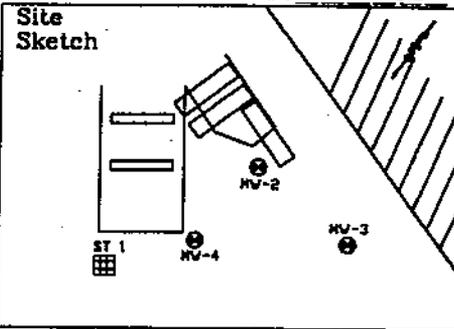
SCREEN DIA. 2" LENGTH 10' SLOT SIZE 0.010"

CASING DIA. 2" LENGTH 19.5' TYPE sch 40 pvc

DRILLING CO. M+W SOILS DRILLING METHOD HSA

DRILLER M.H. C.C. W.M. LOG BY LAURIE REED

WELL NUMBER MW 99-2



GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0		ROAD BOX			0
1		LOCKING WELL CAP			1
2		CONCRETE		SAND AND GRAVEL FILL	1
3		BENTONITE			2
4					3
5		NATIVE BACKFILL			4
6				SILTY SAND (SM)- 20% Silt, 75% Fine, med & coarse sand, 5% gravel, moist, olive brown, strong petroleum odor	5
7		WELL RISER	5'-7'- 1,1,1,1 320 ppm		6
8					7
9					8
10					9
11			10'-12' 2,3,4,4 125 ppm	SILTY SAND (SM)- 20% Silt, 75% fine sand, 5% fine gravel, dry, brown, moderate petroleum odor	10
12					11
13					12
14					13
15					14
16			15'-17' 1,3,3,3 200 ppm	SILT (ML)- 95% Silt, 5% fine sand, moist, olive gray, moderate petroleum odor	15
17		BENTONITE			16
18					17
19					18
20		SAND PACK			19
21			20'-22' 1,3,2,1 >200 ppm	SANDY SILT (ML)- 50% Silt, 50% fine sand, wet brown, petroleum odor	20
22		WELL SCREEN			21
23					22
24			25'-27' 1,2,3,2 25 ppm	SILTY SAND (SM)- 20% Silt, 80% fine sand, wet, brown, mild petroleum odor	23
25					24
26				26.0' WATER TABLE	25
27					26
28					27
29		BOTTOM CAP			28
30					29
31			30'-32' 2,4,4,3 200 ppm	SILTY SAND (SM)- 15% Silt, 85% fine sand, wet, brown, petroleum odor	30
32		UNDISTURBED NATIVE SOIL			31
				BASE OF WELL AT 30' END OF EXPLORATION AT 32'	32

PROJECT 29941477 ASCUTNEY MOBIL

LOCATION ASCUTNEY, VT

DATE DRILLED 5/6/99 TOTAL DEPTH OF HOLE 32'

DIAMETER 4.25"

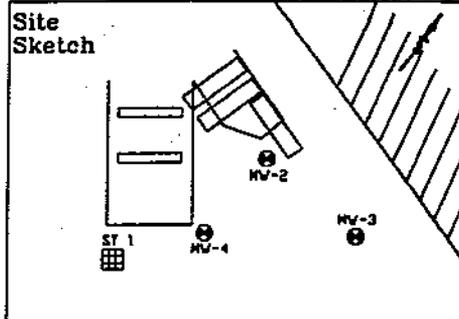
SCREEN DIA. 2" LENGTH 10' SLOT SIZE 0.010"

CASING DIA. 2" LENGTH 19.5' TYPE sch 40 pvc

DRILLING CO. M+W SOILS DRILLING METHOD HSA

DRILLER M.H. C.C., W.M. LOG BY LAURIE REED

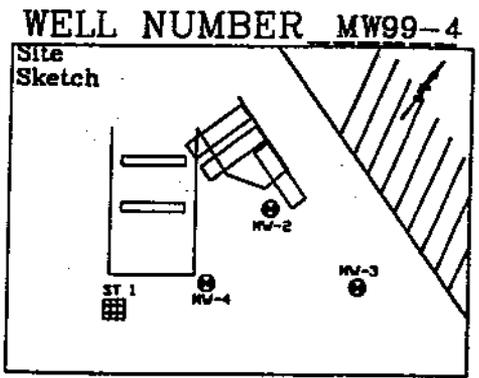
WELL NUMBER MW99-3



GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0		ROAD BOX			0
0		LOCKING WELL CAP			0
0-2		CONCRETE			0-2
0-4		NATIVE BACKFILL	0'-4'	SAND AND GRAVEL FILL	0-2
4-6		BENTONITE			4-6
5-7			5'-7' 4,5,6,6 ND	SILT (ML)- 100% Silt, dry, olive gray	6-8
10-12		WELL RISER	10'-12' 7,11,13,7 2.0 ppm	SILT W/SAND (ML)- 80% Silt, 20% fine sand, dry, olive gray, slight petroleum odor	10-12
15-17			15'-17' 2,3,3,3 3.5 ppm	SILT (ML) 100% Silt, moist, brown, no odor	16-18
20-22		SAND PACK	20'-22' 1,2,2,3 19 ppm	SILT (ML) 100% Silt, wet, olive gray	20-22
24		WELL SCREEN 0.10" SLOTTED SCREEN 2" DIAM. PVC		25' WATER TABLE	24
25-27			25'-27' 1,1,2,3 ±700 ppm	SANDY SILT (ML)- 50% Silt, 50% fine sand, wet, brown, strong petroleum odor	26-28
30-32		BOTTOM CAP	30'-32' 3,2,3,5 210 ppm TOP 6.0 ppm BOTTOM	SILT W/SAND (ML)- 80% Silt, 20% fine sand, wet, brown, strong petroleum odor at top of sample, mild at bottom	30-32
30-32		UNDISTURBED NATIVE SOIL		BASE OF WELL AT 30' END OF EXPLORATION AT 32'	34-36
36					36
38					38
40					40
42					42
44					44
46					46
48					48
50					50

PROJECT 29941477 ASCUTNEY MOBIL
 LOCATION ASCUTNEY, VT
 DATE DRILLED 5/8/99 TOTAL DEPTH OF HOLE 33'
 DIAMETER 4.25"
 SCREEN DIA. 2" LENGTH 10' SLOT SIZE 0.010"
 CASING DIA. 2" LENGTH 22.5' TYPE sch 40 pvc
 DRILLING CO. M+W SOILS DRILLING METHOD HSA
 DRILLER M.H., C.C., W.M. LOG BY LAURIE REED



GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0		ROAD BOX			
0		LOCKING WELL CAP			
0-2		CONCRETE			0
2-4		NATIVE BACKFILL	0'-4'	SAND AND GRAVEL FILL	2
4-6		BENTONITE			4
6-8			6'-7' 4,6,7,8 2.0 ppm	SILTY SAND (SM)- 50% Fine to medium sand, 40% silt, 10% fine gravel, dry, brown, no odor	6
8-10					8
10-12		WELL RISER	10'-12' 2,2,3,4 18.0 ppm	SILT (ML)- 95% Silt, 5% fine sand, moist, olive gray	10
12-14					12
14-16			15'-17' 2,1,2,3 135 ppm	SILT (ML)- 95% Silt, 5% fine sand, moist to wet, olive gray & brown, moderate petroleum odor	14
16-18					16
18-20		BENTONITE			18
20-22		SAND PACK	20'-22' 2,2,3,4 40 ppm	SANDY SILT (ML) 60% Silt, 40% fine sand, dry, brown sand, moist, olive gray silt	20
22-24					22
24-26		WELL SCREEN 0.10" SLOTTED SCREEN 2" DIAM PVC	25'-27' 6,6,6,6 25 ppm	SILTY SAND (SM) 80% Fine sand, 20% silt, wet, brown	24
26-28					26
28-30				27.5' WATER TABLE	28
30-32		BOTTOM CAP	30'-32' 3,3,4,4 0.5 ppm	POORLY GRADED SAND W/SILT (SP/SM)- 90% fine sand, 10% silt, wet, brown	30
32-34		UNDISTURBED NATIVE SOIL		BASE OF WELL AT 33'	32
34-36					34
36-38					36
38-40					38
40-42					40
42-44					42
44-46					44
46-48					46
48-50					48
50					50

APPENDIX C

Liquid Level Monitoring Data

Exit 8 Mobil
Junction I-91 and Route 131
Ascutney, VT

Summary of Liquid Level Data

Sample Date: 5/28/99

Well I.D.	Well Depth btoc	Top of Roadbox Elevation	Depth To Product btorb	Depth To Water btorb	Product Thickness	Specific Gravity Of Product	Water Equivalent	Corrected Depth To Water	Corrected Water Table Elevation
MW99-1	-	103.23	-	Dry	-	-	-	-	Dry
MW99-2	-	102.15	-	27.97	-	-	-	27.97	74.18
MW99-3	-	100.00	26.42	27.30	0.88	0.88	0.77	26.53	73.47
MW99-4	-	102.00	-	28.68	-	-	-	28.68	73.32

All Values Reported in Feet

btorb - Below Top of Roadbox

Elevations determined relative to top of road box of MW99-3, which was arbitrarily set at 100'

nm - not measured

Site surveyed by Griffin International, May 19, 1999

APPENDIX D

Groundwater Quality Summary Data

Exit 8 Mobil
Junction I-91 and Route 131
Ascutney, VT

Groundwater Quality Summary
Sample Date: May 28, 1999

PARAMETER	MW99-1	MW99-2	MW99-3	MW99-4	VGES
Benzene	Not	3,580.	Not	ND(1)	5
Toluene	Sampled	6,440.	Sampled	ND(1)	1,000
Ethylbenzene	Well	151.	Free Product	ND(1)	700
Xylenes	Dry	2,820.	in Well	ND(1)	10,000
Total BTEX		12,991.		ND	-
1,3,5 Trimethyl Benzene		ND(100)		ND(1)	4
1,2,4 Trimethyl Benzene		346.		ND(1)	5
Napthalene		ND(100)		ND(1)	20
MTBE		2,130.		ND(10)	40
Total Targeted VOCs		15,467.		ND	-
TPH (mg/L)		11.4		ND(0.40)	-

TBQ(): Trace below quantitation limit (quantitation limit)

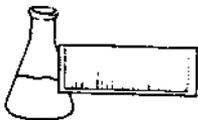
ND(): Not detected (detection limit)

NT: Not tested

All values in ug/L (ppb) unless noted

Analysis by EPA Method 8021B, except for TPH by EPA Method 8015 DRO

VGES = Vermont Groundwater Enforcement Standards (Vermont Groundwater Protection Rule and Strategy, 11/15/97)



ENDYNE, INC.

Laboratory Services

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

REPORT OF LABORATORY ANALYSIS

CLIENT: Griffin International

ORDER ID: 2531

PROJECT NAME: Ascutney Mobil/#29941477

REF.#: 139,163 - 139,166

REPORT DATE: June 9, 1999

DATE SAMPLED: May 28, 1999

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

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

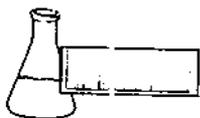
Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

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

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

enclosures



ENDYNE, INC.

Laboratory Services

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

EPA METHOD 8021B--PURGEABLE AROMATICS

CLIENT: Griffin International

DATE RECEIVED: June 1, 1999

PROJECT NAME: Ascutney Mobil/#29941477

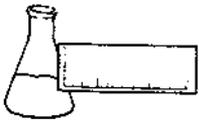
REPORT DATE: June 9, 1999

CLIENT PROJ. #: 29941477

ORDER ID: 2531

Ref. #:	139,163	139,164	139,165	139,166	
Site:	Trip Blank	MW99-2	MW99-4	Duplicate	
Date Sampled:	5/28/99	5/28/99	5/28/99	5/28/99	
Time Sampled:	6:48	10:48	10:33	10:33	
Sampler:	Steve	Steve	Steve	Steve	
Date Analyzed:	6/8/99	6/9/99	6/5/99	6/8/99	
UIP Count:	0	>10	0	0	
Dil. Factor (%):	100	1	100	100	
Surr % Rec. (%):	90	93	94	94	
Parameter	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)	
MTBE	<10	2,130.	<10	<10	
Benzene	<1	3,580.	<1	<1	
Toluene	<1	6,440.	<1	<1	
Ethylbenzene	<1	151.	<1	<1	
Xylenes	<1	2,820.	<1	<1	
1,3,5 Trimethyl Benzene	<1	<100	<1	<1	
1,2,4 Trimethyl Benzene	<1	346.	<1	<1	
Naphthalene	<1	<100	<1	<1	

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



ENDYNE, INC.

Laboratory Services

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

LABORATORY REPORT

CLIENT: Griffin International

ORDER ID: 2531

PROJECT: Ascutney Mobil/#29941477

DATE RECEIVED: June 1, 1999

REPORT DATE: June 11, 1999

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. Different groups of analyses may be reported under separate cover.

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

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

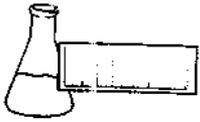
Blank contamination was not observed at levels affecting the analytical results.

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

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

enclosures



LABORATORY REPORT

CLIENT: Griffin International
PROJECT: Ascutney Mobil/#29941477
REPORT DATE: June 11, 1999

ORDER ID: 2531
DATE RECEIVED: June 1, 1999
SAMPLER: Steve
ANALYST: 917

Ref. Number: 139164 Site: MW99-2 Date Sampled: May 28, 1999 Time: 10:48 AM

<u>Parameter</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>	<u>Analysis Date</u>
TPH 8015 DRO	11.4	mg/L	SW 8015B	6/5/99

Ref. Number: 139165 Site: MW99-4 Date Sampled: May 28, 1999 Time: 10:33 AM

<u>Parameter</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>	<u>Analysis Date</u>
TPH 8015 DRO	< 0.40	mg/L	SW 8015B	6/5/99

CHAIN-OF-CUSTODY RECORD

21941471 5:397
2019

Project Name: <u>Ascutney Mobil</u>	Reporting Address: <u>P.O. Box 943</u>	Billing Address: <u>Same As Reporting</u>
Site Location: <u>Ascutney, VT</u>	<u>20 COMMERCE ST. Williston VT</u>	
Endyne Project Number: <u>1531</u>	Company: <u>GRIFFIN</u>	Sampler Name: <u>Steve</u>
	Contact Name/Phone #: <u>BETH STAFFORD</u>	Phone #: <u>(802) 365-4288</u>

Lab #	Sample Location	Matrix	G R A B	C O M P	Date/Time	Sample Containers		Field Results/Remarks	Analysis Required	Sample Preservation	Rush
						No.	Type/Size				
139163	Trip Blank	H ₂ O	X		5/28/99	2	40ml		80213	Hcl	
139164	MW99-2				10:42	4			80213/8015	Hcl	DRO
139165	MW99-4				10:35	4			80213/8015	Hcl	DRO
139166	DUP MW99-4				10:35	2			80213	Hcl	

Relinquished by: Signature <u>[Signature]</u>	Received by: Signature <u>Stacy Benjamin</u>	Date/Time <u>6/1/99</u>
Relinquished by: Signature <u>Stacy Benjamin</u>	Received by: Signature <u>Alicia Floraci</u>	Date/Time <u>6/1/99 10:45</u>

New York State Project: Yes No

Requested Analyses

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