

**INITIAL INVESTIGATION OF
SUBSURFACE PETROLEUM CONTAMINATION AT
DUBOIS CONSTRUCTION**

JUNE 17, 1999

Site Location:

**Dubois Construction
Graves Road
Middlesex, VT**

**VTDEC SITE #98-2486
GI Project # 39941485**

Prepared For:

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I. INTRODUCTION

This report summarizes the initial investigation of suspected subsurface petroleum contamination at the Dubois Construction facility located on Graves Road in Middlesex, VT (see location map in Appendix A). This investigation was conducted by Griffin International, Inc. (Griffin) for Dubois Construction, (Dubois) to address petroleum contamination detected during an underground storage tank (UST) closure inspection in August 1998. The Vermont Department of Environmental Conservation (VTDEC) requested that this work be completed in a letter to Mr. Phil Scott of Dubois, from Mr. Chuck Schwer of the VTDEC, dated November 16, 1998. The site (VTDEC Site #98-2486) is owned by Dubois Construction of Middlesex, 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, 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 Dubois Construction* dated December 5, 1998. The Work Plan was approved by Phil Scott of Dubois in a telephone conversation with Griffin on March 3, 1999, and Chuck Schwer of the VTDEC in a letter dated March 10, 1999.

II. SITE BACKGROUND

A. Site History

Subsurface petroleum contamination was detected in soil at the Dubois site during the closure of (1) 10,000-gallon gasoline, (1) 10,000-gallon diesel, and (1) 4,000-gallon No. 2 fuel oil USTs. Tank closure activities were conducted on August 31, 1998. Details of the closure inspection are outlined in the Underground Storage Tank Permanent Closure Form, which was submitted to the VTDEC on September 8, 1998 by Griffin International [1]. Adsorbed petroleum contamination was detected in the vicinity of each of the former USTs, as measured with a photoionization detector (PID). Concentrations of volatile organic compounds (VOCs) measured with the PID in the vicinity of the 10,000-gallon gasoline and 10,000-gallon diesel UST exceeded Soil Guideline Thresholds set by the Waste Management Division of the VTDEC (as per *Agency Guidelines for Contaminated Soils and Debris* [August, 1996]). VOC concentrations detected in the soil samples collected for screening from the excavation for the 4,000-gallon No. 2 fuel oil UST were below VTDEC Soil Guideline Thresholds. The VTDEC standard for soils contaminated with No. 2 fuel oil is 10 ppm when measured with a PID. The maximum PID reading in the vicinity of the 4,000-gallon No. 2 fuel oil UST was 8 ppm. Because VOC readings in the vicinity of the No. 2 fuel oil UST were below VTDEC Guidelines, this location was not considered to have contributed to any significant soil and groundwater contamination at the site.

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, Dubois retained the services of Griffin.

B. Site Description

The Dubois facility is located on the northeast side of Graves Road in Middlesex, VT (see Site Location Map in Appendix A). The area surrounding the site is both commercial and residential. The site is bordered to the north by US Route 2 and Interstate 89. A residence is located approximately 700 feet to the southwest. The C. L. East trucking facility is located to the south. The immediate area to the west is owned by Dubois Construction and is used for storage of materials and equipment. The Winooski River is approximately 900 feet south of the site.

There are three buildings on the subject property, one houses a maintenance garage and office space, the second is a garage, and the third is used for storage. Portions of the site are paved, the remainder is unimproved.

C. Site Geologic Setting

According to the Surficial Geologic Map of Vermont [2], the site is underlain by recent alluvium, which are predominantly fluvial sands and gravel. Soils encountered during monitoring well installation consisted primarily of silt and silty sands overlying clay. Bedrock at the site is mapped as a Moretown member of the Missisquoi Formation [3].

Based on visual observation and review of the USGS topographic map [4], groundwater in the vicinity of the Dubois site would be expected to flow to the south toward the Winooski River, following topographic contours.

III. INVESTIGATIVE PROCEDURES

A. Monitoring Well Installation

On April 20, 1999, four monitoring wells were installed by T&K Drilling of Troy, New Hampshire using a hollow stem auger drilling rig. Drilling and well construction were directly supervised by a Griffin hydrogeologist. 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 PI-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 hydrogeologist (see the Well Logs in Appendix B).

The monitoring wells (MW-1, MW-2, MW-3, and MW-4) were installed to help better define groundwater flow direction and gradient and the degree and extent of suspected petroleum contamination at the site. MW-1 was installed south of the presumed source area (e.g. the former 10,000-gallon gasoline and 10,000-gallon diesel UST system) in a presumed downgradient direction. MW-2 was installed in the vicinity of the presumed source area. MW-3 was installed in the vicinity of the former 4,000-gallon No. 2 fuel oil UST location, in a presumed crossgradient direction of the former gasoline and diesel USTs. MW-4 was installed southwest of the presumed source area, in a presumed cross and downgradient direction from the former gasoline and diesel 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. 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.

MW-1

The boring for MW-1 was advanced to 15.1 feet below grade. Soils from the boring from MW-1 consisted of silt with sand from 0 to 2 feet below grade. Moist, lean clay with orange mottling was observed between 5 and 7 feet below grade and from 10 to 12 feet below grade. Wet, olive silt and gravel was observed from 15 to 15.1 feet below grade. Soil samples collected for PID screening had a maximum reading of 1 ppm, measured in the sample collected between 0 and 2 feet.

Groundwater was encountered at approximately 12 feet below grade. The screened section of the well was installed from 5 to 15 feet below the ground surface, at the point where refusal was met.

MW-2

The boring for MW-2 was advanced to 17 feet below grade. Soils from the boring consisted of silt from 0 to 2 feet below grade. Damp, gray/brown silt was observed between 2 and 4 feet below grade. Soils collected between 5 and 7 feet below grade consisted of moist, gray/brown sandy lean clay. A wet, gray/brown clay was observed from 10 to 11.5 feet below grade. Soils collected between 11.5 and 12 feet below grade consisted of a wet, dark gray, sandy silt with gravel. Soils between 15 and 17 feet below grade consisted of wet, gray brown, silty sands. Elevated VOC levels were detected using the PID. The maximum reading was 150 ppm at 2 to 4

feet below grade. Groundwater was encountered at 9.5 feet below grade. The screened section of the well was installed from 5 to 15 feet below grade.

MW-3

The boring for MW-3 was advanced to 17 feet below grade. Soils from the boring consisted of gravelly silt from 0 to 2 feet below grade. Moist, brown, sandy silt was observed between 5 and 7 feet below grade. Soils between 10 and 12 feet below grade consisted of wet, dark brown, silt with gravel. Wet, dark brown silt with sand was observed between 15 and 17 feet below grade. Low VOC levels were detected using the PID, a maximum reading of 7 ppm was measured between 0 and 2 feet below grade.

Groundwater was encountered at 9.5 feet below grade. The screened section of the well was installed from 5 to 15 feet below grade.

MW-4

The boring for MW-4 was advanced to 12.3 feet below grade. Soils from the boring consisted of silty sand from 0 to 2 feet below grade. A moist, gray lean clay with orange mottling was observed between 5 and 7 feet below grade. Soils between 10 and 12 feet below grade consisted of a wet, gray lean clay with orange mottling. Low VOC levels were detected in the soil samples collected from this boring. The maximum reading was 2 ppm at 5 to 7 feet below grade.

Groundwater was encountered at 9.5 feet below grade. The screened section of the well was installed from 5 to 12.3 feet below grade, at the depth at which refusal was met.

B. Determination of Groundwater Flow Direction and Gradient

Water table elevation measurements were collected from all monitoring wells on May 7, 1999 using a MMC interface probe. These measurements were subtracted from the top of casing elevations, which were determined relative to an arbitrary datum of 100 feet at the top of the casing for MW-3, to determine the water table elevation at each of the wells. Groundwater level data are recorded in Appendix C. No free phase petroleum product was observed in any of the monitoring wells gauged on May 7, 1999.

As displayed in the groundwater contour map included in Appendix A, the groundwater flow direction for May 7, 1999 appears to flow radially outward from the excavation for the former gasoline and diesel USTs. The area above the former tank pit is unpaved, and soils in the boring for MW2 consisted of silts overlying lean clay. It is possible that preferential recharge to the former tank pit is causing a mounding effect in the region, and flow moves outward from this high point of groundwater. The primary flow direction (that with the steepest gradient) appears

to be to the west at a hydraulic gradient of approximately 2%. Under the groundwater flow regime described, MW-1, MW-3, and MW-4 are located downgradient of the expected source area, and MW-2 is located in the vicinity of the source area. However, the predominant direction of groundwater flow is to the west; therefore MW-3 is downgradient of the source area, and MW-2 and MW-4 are crossgradient of the source area.

C. Groundwater Sample Collection and Analysis

Groundwater samples were collected from each monitoring well immediately following well gauging on May 7, 1999. Samples 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.

Concentrations of 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and naphthalene were detected in MW-2 and MW-3 at levels above their respective Vermont Groundwater Enforcement Standards (VGESs). Concentrations of ethylbenzene and xylenes were detected in MW-2 and MW-3 below their VGESs. A trace of MTBE below the method quantitation limit was detected in MW-3, however the quantitation limit was above the VGES for MTBE.

Naphthalene and 1,2,4-trimethylbenzene were detected in MW-1 at concentrations below their respective VGES. Naphthalene was detected in MW-4 below its VGES.

TPH analysis detected diesel range organic compounds in the groundwater samples collected from MW-2, MW-3, and MW-4.

A weak contaminant plume appears to be concentrated in the vicinity of the former 10,000-gallon gasoline and 10,000-gallon diesel UST system, where subsurface petroleum contamination was originally detected. The presence of xylene with respect to the nondetectable level of benzene in the groundwater samples collected from MW-2 and MW-3 may be characteristic of an older, weathered petroleum release. A trace of MTBE, below the method quantitation limit) was observed in the down gradient monitoring well MW-3. MTBE, being more soluble in water than other petroleum-related constituents, typically represents the leading edge of a dissolved petroleum plume. MTBE was not detected in any of the other three on-site monitoring wells.

The contaminant plume, as defined by total targeted VOC concentrations, appears to follow the predominant direction of groundwater flow, with high concentrations measured in MW-2 (source area) and in MW-3 (downgradient). Lower concentrations were measured in the crossgradient monitoring wells (MW-1 and MW-4), presumably due to contaminant diffusion from the source area.

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. Supply Well Sample Collection and Analysis

A supply well sample was collected from a sink in the Dubois offices on May 7, 1999. The sample was analyzed for the presence of VOCs per EPA Method 8021B.

None of the compounds targeted by this analysis were detected in the supply well sample collected on May 7, 1999. Results of the laboratory analyses are summarized in Appendix D. Laboratory report forms are presented in Appendix E.

E. Sensitive Receptor Risk Assessment

A receptor risk assessment was conducted to identify known and potential receptors of contamination detected at the Dubois 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/diesel UST system), groundwater flow direction, and contaminant concentration levels in groundwater.

Water Supplies

Dubois and other buildings in the area are supplied by private supply wells, based on information provided in the UST closure report [1]. The Dubois supply well is located approximately 160 feet east-northeast and upgradient of the source area. Given the upgradient location of the supply well, its distance from the source area, and the lack of detectable VOC concentrations in a water sample submitted for laboratory analysis, this water source is not considered at risk of petroleum impact from the source area.

Buildings in the Vicinity

Three buildings are located on the subject property; a maintenance garage and office building, a second garage, and a storage building. The maintenance garage/office building is located down and cross gradient of the presumed area. The second garage and the storage building are located crossgradient of the source area. The on-site buildings are constructed on slab foundations, and the potential risk of vapor impact to these buildings is considered minimal.

The nearest residence to the subject site is located approximately 700 feet south of the subject property. Given that the groundwater flow appears to be predominantly to the west, based on the measured gradient, and its distance from the subject property, the residence is considered at minimal risk of petroleum impact.

Surface Water

The nearest surface water to the site is the Winooski River, which is located approximately 900 feet south of the Dubois site at its nearest point. The Winooski River is down and crossgradient of the source area, based upon the May 7, 1999 water table elevations. Given that the groundwater flow is predominantly to the west, and given the substantial distance of the river from the subject site, these surface waters are considered at minimal risk of petroleum impact.

IV. CONCLUSIONS

Based on the initial site investigation of petroleum contamination at the Dubois Construction site, the following conclusions are offered:

1. There has been an apparent release of gasoline and diesel fuel in the subsurface at the subject site.
2. Four shallow monitoring wells were installed at the site on April 20, 1999, to evaluate the degree and extent of subsurface petroleum contamination detected during the closure inspection of gasoline and diesel USTs in August 1998.
3. Low levels of adsorbed petroleum contamination (less than 7 ppm) were detected in soils collected from the boreholes for MW-1, MW-3, and MW-4.
4. Soils from the borehole for MW-2, located in the vicinity of the former 10,000-gallon gasoline and 10,000-gallon diesel UST had a maximum PID reading of 150 ppm.
5. Water table elevation data collected on May 7, 1999 indicate that groundwater in the overburden aquifer beneath the site flows radially outward from the excavation for the former gasoline and diesel USTs. The primary flow direction (that with the steepest gradient) appears to be to the west at a hydraulic gradient of approximately 2%.
6. The groundwater samples collected from MW-2 and MW-3 (located in source area and downgradient of the source area) were contaminated with petroleum related compounds. Concentrations of naphthalene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene were detected in both monitoring wells at levels above their respective VGESs.

7. TPH analysis detected diesel range organic compounds in the groundwater samples collected from MW-2, MW-3, and MW-4.
8. The downgradient extent of the contaminant plume has not been defined with the current well array.
9. No free product was present in the on-site wells on May 7, 1999.
10. The presence of xylenes, and the nondetectable concentrations of benzene in the groundwater samples collected from MW-2 and MW-3 is characteristic of an older, weathered petroleum release. This finding would be consistent with a potential historic release from the gasoline/diesel UST system removed from the site in August 1998.
11. Receptors in the vicinity of the site which have been identified as being at potential risk of impact from subsurface petroleum contamination are the Winooski River, and a residence located to the south of the source area. Risk to these receptors is considered minimal at this time, given their distance from the potential contaminant source, and given that groundwater flow is predominantly to the west.
12. With the apparent source removed (i.e., the former gasoline and diesel UST system), 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 Dubois site.

V. RECOMMENDATION

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

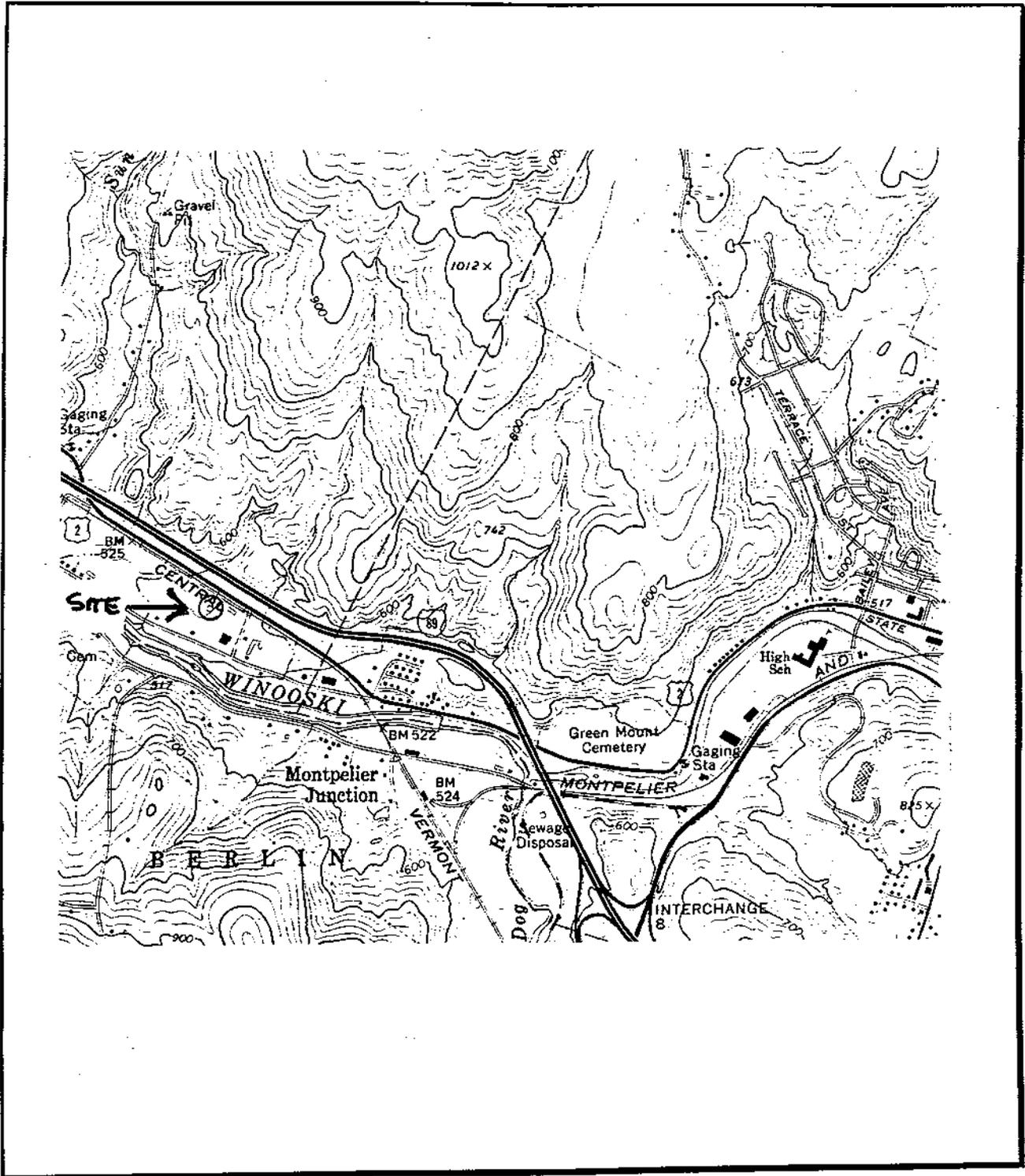
1. Because contaminant levels at the site were detected at concentrations greater than the VGES for several compounds, although they were quite low, follow-up groundwater sampling should be scheduled during the fall of 1999. If contaminant concentrations remain at current levels or indicate reduced levels at the next sampling round, the site should be considered for Sites Management Activity Completed (SMAC) status.

VI. REFERENCES

1. Griffin International Inc., September 8, 1998. UST Closure Letter Report from Robert Higgins to Susan Thayer (VTDEC) re: Dubois Construction UST Closure Inspection, UST Facility 1931.
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. 1946, photo-revised 1968. Montpelier, Vermont.

APPENDIX A

Maps



SITE LOCATION MAP - DUBOIS CONSTRUCTION

Middlesex, Vermont

Source: Montpelier, Vermont, USGS 7.5-minute Topographic Quadrangle, 1946, photorevised 1968.



BUILDING

SW

LEGEND

MW2 MONITORING WELL

SW1 SUPPLY WELL

SD1 STORM DRAIN

UTILITY POLE

(GRASS)

APPROXIMATE LOCATION OF FORMER 10,000 GAL. GASOLINE AND 10,000 GAL. DIESEL UST. REMOVED 8/31/98

MW2

MW4

SD2

SD1

MW1

EXISTING SEPTIC MOUND

MW3

GRASS

DUBOIS CONSTRUCTION

MAINTENANCE GARAGE/OFFICES

APPROXIMATE LOCATION OF FORMER 4,000 GAL. #2 FUEL OIL UST AND DISPENSER ISLAND. REMOVED 8/31/98

EXISTING 1,000 GALLON WASTE OIL UST

APPROXIMATE LOCATION OF EXISTING 3,000 GALLON No. 2 FUEL OIL UST

JOB #: 39941485



DUBOIS CONSTRUCTION

MIDDLESEX, VERMONT

SITE MAP

DATE: 5/20/99

DWG.#:2

SCALE: 1"=40'

DRN.:SB

APP.:BS

BUILDING

⊕ SW

LEGEND

⊕ MW2 MONITORING WELL (GW ELEVATION IN FEET)

⊕ SW1 SUPPLY WELL

▤ SD1 STORM DRAIN

⊂ UTILITY POLE

— GW CONTOUR IN FEET

(GRASS)

APPROXIMATE LOCATION OF FORMER 10,000 GAL. GASOLINE AND 10,000 GAL. DIESEL UST. REMOVED 8/31/98

GROUNDWATER FLOW DIRECTION

89.25' 89' MW2 89.36' 88.75' MW4 88.65'

SD2

MW1 88.86'

EXISTING SEPTIC MOUND

GROUNDWATER FLOW DIRECTION

GROUNDWATER FLOW DIRECTION

DUBOIS CONSTRUCTION MAINTENANCE GARAGE/OFFICES

APPROXIMATE LOCATION OF FORMER 4,000 GAL. #2 FUEL OIL UST AND DISPENSER ISLAND. REMOVED 8/31/98

MW3 88.06' GRASS

EXISTING 1,000 GALLON WASTE OIL UST

APPROXIMATE LOCATION OF EXISTING 3,000 GALLON No. 2 FUEL OIL UST

JOB #: 39941485



DUBOIS CONSTRUCTION

MIDDLESEX, VERMONT

GROUNDWATER CONTOUR MAP

MEASUREMENT DATE: 5/7/99

DATE: 5/20/99

DWG.#:2

SCALE: 1"=40'

DRN.:SB

APP.:BS

BUILDING

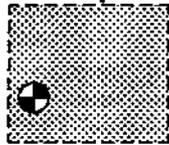
⊕ SW
ND

(GRASS)

APPROXIMATE LOCATION
OF FORMER 10,000 GAL.
GASOLINE AND 10,000
GAL. DIESEL UST.
REMOVED 8/31/98

606

MW2
144.



5.9

MW4
ND

606 = Total VOCs
in ppb

SD2

6.0

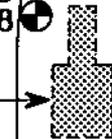
MW1
ND

EXISTING SEPTIC MOUND

640

MW3
58.8

GRASS



APPROXIMATE LOCATION
OF FORMER 4,000 GAL.
#2 FUEL OIL UST AND
DISPENSER ISLAND.
REMOVED 8/31/98

EXISTING 1,000 GALLON
WASTE OIL UST

SD1

DUBOIS CONSTRUCTION

MAINTENANCE GARAGE/OFFICES

APPROXIMATE
LOCATION OF
EXISTING 3,000
GALLON No. 2
FUEL OIL UST

LEGEND

⊙ MW2
MONITORING WELL
(BTEX CONCENTRATIONS IN ppb)

⊕ SW1
SUPPLY WELL

▤ SD1
STORM DRAIN

⊂ UTILITY POLE

ND NOT DETECTED



JOB #: 39941485

DUBOIS CONSTRUCTION

MIDDLESEX, VERMONT

BTEX CONCENTRATION MAP

SAMPLE DATE: 5/7/99

DATE: 5/20/99

DWG.#:2

SCALE: 1"=40'

DRN.:SB

APP.:BS

BUILDING

⊕ SW
ND



LEGEND

- MW2 MONITORING WELL (TOTAL TARGETED VOC'S IN ppb)
- ⊕ SW1 SUPPLY WELL
- ▤ SD1 STORM DRAIN
- ⌒ UTILITY POLE
- ND NOT DETECTED

(GRASS)

APPROXIMATE LOCATION OF FORMER 10,000 GAL. GASOLINE AND 10,000 GAL. DIESEL UST. REMOVED 8/31/98

MW2
606.

MW4
5.9

SD2

MW1
6.0

SD1

EXISTING SEPTIC MOUND

MW3
640.

GRASS

DUBOIS CONSTRUCTION

MAINTENANCE GARAGE/OFFICES

APPROXIMATE LOCATION OF FORMER 4,000 GAL. #2 FUEL OIL UST AND DISPENSER (ISLAND). REMOVED 8/31/98

EXISTING 1,000 GALLON WASTE OIL UST

APPROXIMATE LOCATION OF EXISTING 3,000 GALLON No. 2 FUEL OIL UST



JOB #: 39941485

DUBOIS CONSTRUCTION

MIDDLESEX, VERMONT

TOTAL TARGETED VOC CONCENTRATION MAP
(METHOD 8021B) SAMPLE DATE: 5/7/99

DATE: 5/20/99

DWG.#:2

SCALE: 1"=40'

DRN.:SB

APP.:BS

APPENDIX B

Well Logs

PROJECT DUBOIS CONSTRUCTION

LOCATION MIDDLESEX, VERMONT

DATE DRILLED 4/20/99 TOTAL DEPTH OF HOLE 15.1'

DIAMETER 4.25"

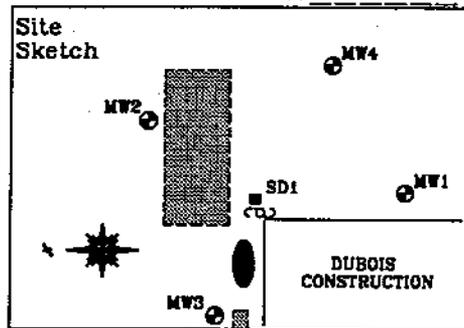
SCREEN DIA. 2" LENGTH 10.0' SLOT SIZE 0.010"

CASING DIA. 2" LENGTH 4.7' TYPE sch 40 pvc

DRILLING CO. T&K DRILLING METHOD HSA

DRILLER ALAN TOMMILA LOG BY C. WARD

WELL NUMBER MW1

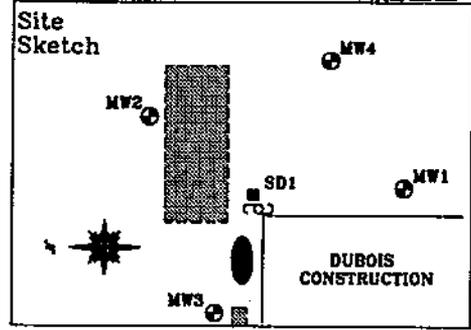


GRIFFIN INTERNATIONAL, INC

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 LOCKING WELL CAP				0
1	CONCRETE			SILT WITH SAND (ML)- 75% silt, 20% fine sand, 5% gravel, dry, brown.	1
2	NATIVE BACKFILL		0'-2' 1 ppm		2
3	BENTONITE				3
4	WELL RISER				4
5					5
6			5'-7' 5/9/9/13 0.4 ppm	LEAN CLAY (CL)- 100% clay and silt, moist, gray, with orange mottling.	6
7	SAND PACK				7
8					8
9					9
10	WELL SCREEN				10
11			10'-12' 4/6/7/9 0 ppm	LEAN CLAY (CL)- 100% silt and clay, moist, gray, with orange mottling.	11
12				12.0' WATER TABLE	12
13					13
14	BOTTOM CAP				14
15	UNDISTURBED NATIVE SOIL		15'-15.1' 50/1" 0 ppm	SILT AND GRAVEL (ML)- 75% silt, 55 fine sand, 20% fine gravel, wet, olive. BASE OF WELL AT 15' REFUSAL AT 15.1'	15
16					16
17					17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25

PROJECT DUBOIS CONSTRUCTION
 LOCATION MIDDLESEX, VERMONT
 DATE DRILLED 4/20/99 TOTAL DEPTH OF HOLE 17.0'
 DIAMETER 4.25"
 SCREEN DIA. 2" LENGTH 10.0' SLOT SIZE 0.010"
 CASING DIA. 2" LENGTH 4.6' TYPE sch 40 pvc
 DRILLING CO. T&K DRILLING METHOD HSA
 DRILLER ALAN TOMMILA LOG BY C. WARD

WELL NUMBER MW2

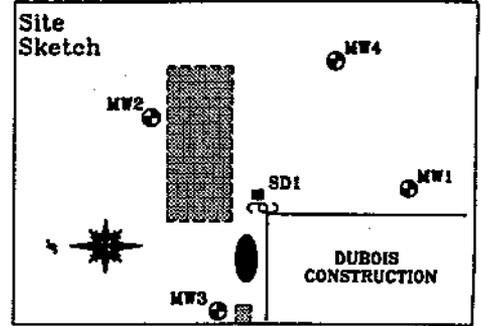


GRIFFIN INTERNATIONAL, INC

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	LOCKING WELL CAP			0
1	CONCRETE		0'-2'	SILT (ML)- 90% silt, 5% fine sand, 5% gravel, dry, brown.	1
2	NATIVE BACKFILL		0.1 ppm		2
3	BENTONITE		2'-4'	SILT (ML)- 90% silt, 5% fine sand, 5% fine gravel, damp, gray/brown.	3
4	WELL RISER		150 ppm		4
5	SAND PACK		5'-7'	SANDY LEAN CLAY (CL)- 70% silt and clay, 25% fine sand, 5% gravel, moist, gray/brown.	5
6	WELL SCREEN		4/4/7/5		6
7	BOTTOM CAP		120 ppm		7
8	UNDISTURBED NATIVE SOIL				8
9				9.5' WATER TABLE	9
10			10'-11.5'	SANDY LEAN CLAY (CL)- 70% silt and clay, 25% fine sand, 5% fine gravel, wet, gray/brown.	10
11			1/3/11/13		11
12			80 ppm	SILTY SAND WITH GRAVEL (SM)- 20% silt, 80% sand, 20% gravel, wet, dark gray.	12
13			11.5'-12'		13
14			130 ppm		14
15				SILTY SAND (SM)- 20% silt, 80% fine sand, wet, gray/brown.	15
16			15'-17'		16
17			6/3/4/4		17
18			2 ppm	BASE OF WELL AT 15' END OF EXPLORATION AT 17'	18
19					19
20					20
21					21
22					22
23					23
24					24
25					25

PROJECT DUBOIS CONSTRUCTION
 LOCATION MIDDLESEX, VERMONT
 DATE DRILLED 4/20/99 TOTAL DEPTH OF HOLE 17.0'
 DIAMETER 4.25"
 SCREEN DIA. 2" LENGTH 10.0' SLOT SIZE 0.010"
 CASING DIA. 2" LENGTH 4.7' TYPE sch 40 pvc
 DRILLING CO. T&K DRILLING METHOD HSA
 DRILLER ALAN TOMMILA LOG BY C. WARD

WELL NUMBER MW3



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
1	CONCRETE		0'-2'	GRAVELLY SILT (ML)- 70% silt, 10% sand, 20% gravel, dry, brown.	1
2	NATIVE BACKFILL		7 ppm		2
3	BENTONITE				3
4	WELL RISER				4
5	SAND PACK		5'-7'	SANDY SILT (ML)- 70% silt, 30% sand, 10% gravel, moist, brown.	5
6	WELL SCREEN		4/5/7/10		6
7	BOTTOM CAP		2 ppm		7
9				9.5' WATER TABLE	9
10	UNDISTURBED NATIVE SOIL		10'-12'	SILT WITH GRAVEL (ML)- 85% silt, 5% sand, 10% gravel, wet, dark brown.	10
11			7/35/17/5		11
12			3 ppm		12
15			15'-17'	SILT WITH SAND (ML)- 80% silt, 20% sand, wet, dark brown.	15
16			19/11/8/6		16
17			2 ppm		17
17				BASE OF WELL AT 15'	17
18				END OF EXPLORATION AT 17'	18
19					19
20					20
21					21
22					22
23					23
24					24
25					25

PROJECT DUBOIS CONSTRUCTION

LOCATION MIDDLESEX, VERMONT

DATE DRILLED 4/20/99 TOTAL DEPTH OF HOLE 12.3'

DIAMETER 4.25"

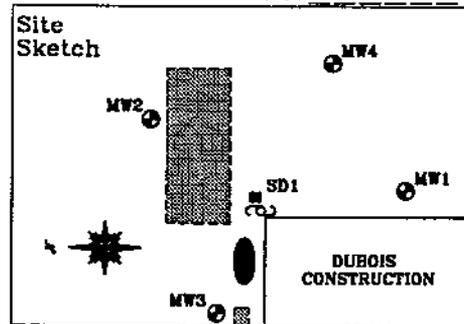
SCREEN DIA. 2" LENGTH 7.3' SLOT SIZE 0.010"

CASING DIA. 2" LENGTH 4.5' TYPE sch 40 pvc

DRILLING CO. T&K DRILLING METHOD HSA

DRILLER ALAN TOMMILA LOG BY C. WARD

WELL NUMBER MW4



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
1		CONCRETE		SILTY SAND (SM)- 30% silt, 70% fine sand, dry, yellow/brown.	1
2		NATIVE BACKFILL	0'-2' 0.8 ppm		2
3		BENTONITE			3
4					4
5		WELL RISER		LEAN CLAY (CL)- 100% clay, moist, gray, with orange mottling.	5
6			5'-7' 3/5/12/12 2 ppm		6
7		SAND PACK			7
8					8
9		WELL SCREEN		9.5' WATER TABLE	9
10					10
11		BOTTOM CAP	10'-12' 3/4/5/6 0.4 ppm	LEAN CLAY (CL)- 100% clay, wet, gray, with orange mottling.	11
12		UNDISTURBED NATIVE SOIL			12
13				BASE OF WELL AT 12.3' REFUSAL AT 12.3'	13
14					14
15					15
16					16
17					17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25

APPENDIX C

Liquid Level Monitoring Data

Dubois Construction
Graves Road
Middlesex, VT

Summary of Liquid Level Data
Measurement Date: May 7, 1999

Well I.D.	Well Depth btoc	Top of Casing Elevation	Depth To Product btoc	Depth To Water btoc	Product Thickness	Specific Gravity Of Product	Water Equivalent	Corrected Depth To Water	Corrected Water Table Elevation
MW1	14.5	99.06	-	10.20	-	-	-	-	88.86
MW2	14.5	98.45	-	9.09	-	-	-	-	89.36
MW3	14.5	100.00	-	11.94	-	-	-	-	88.06
MW4	11.6	98.13	-	9.48	-	-	-	-	88.65

All Values Reported in Feet

btoc - Below Top of Casing

nm - not measured

Site surveyed by Griffin International, May 7, 1999

Elevations determined relative to top of casing of MW3, which was arbitrarily set at 100'

APPENDIX D

Groundwater Quality Summary Data

Dubois Construction
Graves Road
Middlesex, VT

Groundwater Quality Summary
Sample Date: May 7, 1999

PARAMETER	MW1	MW2	MW3	MW4	Supply Well	VGES
Benzene	ND(1)	ND(10)	ND(10)	ND(1)	ND(1)	5
Toluene	ND(1)	ND(10)	ND(10)	ND(1)	ND(1)	1,000
Ethylbenzene	ND(1)	46.7	30.1	ND(1)	ND(1)	700
Xylenes	ND(1)	96.9	28.7	ND(1)	ND(1)	10,000
Total BTEX	ND	144.	58.8	ND	ND	-
1,3,5 Trimethyl Benzene	ND(1)	63.0	42.2	ND(1)	ND(1)	4
1,2,4 Trimethyl Benzene	1.8	318.	484.	ND(1)	ND(1)	5
Napthalene	4.2	81.0	55.0	5.9	ND(1)	20
MTBE	ND(10)	ND(100)	TBQ(100)	ND(10)	ND(10)	40
Total Targeted VOCs	6.0	606.	640.	5.9	ND	-
TPH (mg/L)	ND(0.40)	4.71	2.13	0.44	NT	-

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)

Dubois Construction
Graves Road
Middlesex, VT

Quality Assurance and Control Samples
Sample Date: May 7, 1999

PARAMETER	Trip Blank	Duplicate (MW-3)	VGES
Benzene	ND(1)	ND(10)	5
Toluene	ND(1)	ND(10)	1,000
Ethylbenzene	ND(1)	29.1	700
Xylenes	ND(1)	27.3	10,000
Total BTEX	ND	56.4	
1,3,5 Trimethyl Benzene	ND(1)	39.7	4
1,2,4 Trimethyl Benzene	ND(1)	490.	5
Napthalene	ND(1)	53.1	20
MTBE	ND(10)	TBQ(100)	40
Total Targeted VOCs	ND	639.	
TPH (mg/L)	NT	1.74	-

Analysis by EPA Method 8021B

All Values Reported in ug/l (ppb)

ND() = None detected (detection limit)

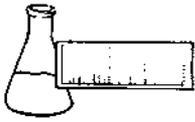
TBQ() = Trace below quantitation (detection limit)

NT: Not tested

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

APPENDIX E

Laboratory Analysis Reports



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: 2271

PROJECT NAME: Dubois Constr./#39941485

REF.#: 138,146 - 138,152

REPORT DATE: May 20, 1999

DATE SAMPLED: May 7, 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: May 10, 1999

PROJECT NAME: Dubois Constr./#39941485

REPORT DATE: May 20, 1999

CLIENT PROJ. #: #39941485

ORDER ID: 2271

Ref. #:	138,146	138,147	138,148	138,149	138,150
Site:	Trip Blank	Supply Well	MW #4	MW #3	MW #2
Date Sampled:	5/7/99	5/7/99	5/7/99	5/7/99	5/7/99
Time Sampled:	7:15	11:09	10:27	10:46	10:54
Sampler:	DT	DT	DT	DT	DT
Date Analyzed:	5/17/99	5/17/99	5/17/99	5/18/99	5/17/99
UIP Count:	0	0	7	>10	>10
Dil. Factor (%):	100	100	100	10	10
Surr % Rec. (%):	90	94	106	104	103
Parameter	Conc. (ug/L)				
MTBE	<10	<10	<10	TBQ <100	<100
Benzene	<1	<1	<1	<10	<10
Toluene	<1	<1	<1	<10	<10
Ethylbenzene	<1	<1	<1	30.1	46.7
Xylenes	<1	<1	<1	28.7	96.9
1,3,5 Trimethyl Benzene	<1	<1	<1	42.2	63.0
1,2,4 Trimethyl Benzene	<1	<1	<1	484.	318.
Naphthalene	<1	<1	5.9	55.0	81.0

Ref. #:	138,151	138,152			
Site:	MW #1	Duplicate			
Date Sampled:	5/7/99	5/7/99			
Time Sampled:	10:58	10:46			
Sampler:	DT	DT			
Date Analyzed:	5/18/99	5/18/99			
UIP Count:	>10	>10			
Dil. Factor (%):	100	10			
Surr % Rec. (%):	103	103			
Parameter	Conc. (ug/L)	Conc. (ug/L)			
MTBE	<10	TBQ <100			
Benzene	<1	<10			
Toluene	<1	<10			
Ethylbenzene	<1	29.1			
Xylenes	<1	27.3			
1,3,5 Trimethyl Benzene	<1	39.7			
1,2,4 Trimethyl Benzene	1.8	490.			
Naphthalene	4.2	53.1			

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

39941485

CHAIN-OF-CUSTODY RECORD

2-Orig 31715

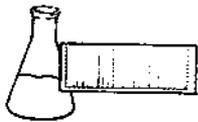
Project Name: DUBOIS CONSTRUCTION	Reporting Address: GRIFFIN	Billing Address: GRIFFIN
Site Location: MONTPELIER		
Endyne Project Number: 2271	Company: BETH STOPFORD	Sampler Name: DON TOURANGELO
	Contact Name/Phone #: BETH STOPFORD	Phone #:

Lab #	Sample Location	Matrix	G R A B	C O M P	Date/Time	Sample Containers		Field Results/Remarks	Analysis Required	Sample Preservation	Rush
						No.	Type/Size				
138146	TRIP BLANK	H ₂ O	X		5-7-99 07:15	2	40ml		8021B	HCC	
138147	SUPPLY WCLL	↓	↓		11:09	2	40ml		8021B	↓	
138148	MW #4	↓	↓		10:27	3	40ml		8021B/30	↓	
138149	MW #3	↓	↓		10:46	↓	↓		↓	↓	
138150	MW #2	↓	↓		10:54	↓	↓		↓	↓	
138151	MW #1	↓	↓		10:58	↓	↓		↓	↓	
138152	DUPLICATE	↓	↓		10:46	↓	↓		↓	↓	

Relinquished by: Signature <i>[Signature]</i>	Received by: Signature <i>[Signature]</i>	Date/Time 5-10-99 10:35
Relinquished by: Signature <i>[Signature]</i>	Received by: Signature <i>[Signature]</i>	Date/Time 5/10/99 10:35

 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	TCLP (Specify: volatiles, semi-volatiles, metals, pesticides, herbicides)										
30	Other (Specify): 8015 DRO										



ENDYNE, INC.

Laboratory Services

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

LABORATORY REPORT

CLIENT: Griffin International
PROJECT: Dubois Constr. #39941485
REPORT DATE: May 25, 1999

ORDER ID: 2271
DATE RECEIVED: May 10, 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.

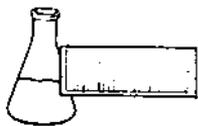
Blank contamination was not observed at levels affecting the analytical results.

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: Dubois Constr. #39941485
REPORT DATE: May 25, 1999

ORDER ID: 2271
DATE RECEIVED: May 10, 1999
SAMPLER: DT
ANALYST: 820

Ref. Number: 138148 Site: MW #4 Date Sampled: May 7, 1999 Time: 10:27 AM

<u>Parameter</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>	<u>Analysis Date</u>
TPH 8015 DRO	0.44	mg/L	SW 8015B	5/21/99

Ref. Number: 138149 Site: MW #3 Date Sampled: May 7, 1999 Time: 10:46 AM

<u>Parameter</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>	<u>Analysis Date</u>
TPH 8015 DRO	2.13	mg/L	SW 8015B	5/21/99

Ref. Number: 138150 Site: MW #2 Date Sampled: May 7, 1999 Time: 10:54 AM

<u>Parameter</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>	<u>Analysis Date</u>
TPH 8015 DRO	4.71	mg/L	SW 8015B	5/21/99

Ref. Number: 138151 Site: MW #1 Date Sampled: May 7, 1999 Time: 10:58 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	5/21/99

Ref. Number: 138152 Site: Duplicate Date Sampled: May 7, 1999 Time: 10:46 AM

<u>Parameter</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>	<u>Analysis Date</u>
TPH 8015 DRO	1.74	mg/L	SW 8015B	5/21/99

39941485

CHAIN-OF-CUSTODY RECORD

2-019 01710

Project Name: <u>DeBois Construction</u>	Reporting Address: <u>GRIFFIN</u>	Billing Address: <u>GRIFFIN</u>
Site Location: <u>MONTPELIER</u>		
Endyne Project Number: <u>2271</u>	Company: <u>BETH STAPARD</u>	Sampler Name: <u>Don Tourangeau</u>
	Contact Name/Phone #: <u>BETH STAPARD</u>	Phone #:

Lab #	Sample Location	Matrix	G R A B	C O M P	Date/Time	Sample Containers		Field Results/Remarks	Analysis Required	Sample Preservation	Rush
						No.	Type/Size				
138146	TRIP BLANK	H ₂ O	X		5-7-99 07:15	2	40ml		8031B	HIC	
138147	SUPPLY WELL				11:09	2	40ml		8021B		
138148	MW #4				10:27	3	40ml		8021B/30		
138149	MW #3				10:46						
138150	MW #2				10:54						
138151	MW #1				10:58						
138152	DUPLICATE				10:46						

Relinquished by: Signature <u>[Signature]</u>	Received by: Signature <u>[Signature]</u>	Date/Time <u>5-10-99 10:35</u>
Relinquished by: Signature <u>[Signature]</u>	Received by: Signature <u>[Signature]</u>	Date/Time <u>5/10/99 10:35</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	TCIP (Specify: volatiles, semi-volatiles, metals, pesticides, herbicides)										
30	Other (Specify): <u>8015 DRO</u>										