REMEDIAL INVESTIGATION

at the

COLT INDUSTRIES' FAIRBANKS-MORSE SITE

LOCATION

The Colt site is located along the flood plain of the Sleepers River just south of U.S. Route 2 and about 1 mile north of the confluences of the Sleepers with the Passumpsic River (Map 1).

BACKGROUND

The Fairbanks Morse Scale Company began operations in the mid 1800's at the site along the Sleepers River. Operations continued until the mid sixties, when they began to relocate to another part of St. Johnsbury.

By the early 1970's most manufacturing had been terminated or moved off site. However, the remaining building, Bldg. #45, was used for storage. Two 10,000 gallon above-ground fuel oil tanks were located to the south of that building.

In 1960 a break in the piping resulted in a loss of product to the ground. Remedial action initiated at that time included removal of spill debris from spill site. The material was set on a concrete pad to the north of existing building. The material was thin-spread on the pad with no further treatment.

In 1975, sheen was found on [illegible] River. An additional 800 cubic yards were removed south of bldg #45. The tanks were also removed in 1975. In October 1984, a report of an oil sheen at the Fairbanks Morse site was forwarded to John Miller of the Hazardous Waste Section of the Vermont AEC. A strong fuel oil odor was reported to have been associated with the sheen. In the spring and summer of 1985, the initial investigation consisted of digging a series of backhoe pits in the vicinity of the oil sheen. Visual inspection of the pits revealed that between seven and ten feet below the ground, a dark layer with a strong petroleum odor occurred. This was in the vicinity of the water table to three feet above the water table. Contamination did not appear to be present above that layer.

These investigations did not satisfy the AEC with respect to the characterization of the extent of contamination. September 17, 1985, a 6610a Order from the Vermont AEC was sent to Colt Industries requiring a remedial action plan for investigating the problem by December 2, 1985. An extension was granted to February 10, 1986.

The following presents data gathered subsequent to the 6610 Order. This describes the current information and interpretations thereof.

1. DATA REVIEW

On October 18, 1985, a total of eleven test pits were excavated at the Old Factory site. The approximate locations are shown on Site Plan #1 (attached) and logs are presented in the Appendix. In general, the area is covered with 1-10 feet of miscellaneous fill material underlain by native gray silty sand. The static level of the groundwater is generally 6-10 feet below the surface of the ground. A musty, organic odor was prevalent in most of the test pits in the saturated material (below the static water level), but not in the unsaturated material, strongly indicating that the source of the odor is a substance or substances dissolved in the groundwater. A total of seven soil and water samples were collected from the testpits and were subjected to analysis by gas chromatograph/mass spectrometer (EPA Method 624) for the presence of a variety of volatile organic compounds normally associated with hydrocarbon contamination (see Table 1). The outcome of this analysis was that none of the seven samples exhibited contamination above the detection limit for any of the compounds specified. However, the lab verbally confirmed the presence of a hydrocarbon "finger print" not dissimilar to diesel fuel. Based on these results, we theorized that there might still be hydrocarbon contamination present at the site, but that the lighter molecular weight organic compounds (those measured by EPA Method 624) could have been removed

over time by volatilization, leaving as residual contaminants hydrocarbons of higher molecular weight. In order to test this theory, we subjected remaining sample material to another method of analysis (EPA Method 625) for these heavier fractions. Once again, no evidence of contamination by priority pollutants in excess of the detection limits was found.

On December 3, with the aid of a backhoe, we installed a total of eight 2" PVC hand slotted monitoring wells at the factory site.

On December 10, the well locations and elevations were surveyed to facilitate calculation of groundwater flow directions. Four sites were surveyed in along the riverbank so that water levels along the river could be measured. This data and the measured water levels are shown on the attached Site Plan #2. Also displayed on this plan are calculated groundwater flow directions and gradients. Flow directions follow the expected pattern; flow is toward and to some degree with the river. The highest gradient was calculated between wells 6, 5, and 2. This is probably related to the nature of well 6. When it was installed, water was observed leaking out of the perched layer into the backhoe excavation. This could locally raise the water table explaining the higher gradient associated with well 6.

The relative simplicity of the wells installed precludes their use for in site hydraulic conductivity (permeability) measurements. Therefore, groundwater flow velocities can only be very approximately calculated. They are probably somewhere between 0.02 feet/day to 0.40 feet/day.

On December 10, when the water levels were measured, a sheen was observed emanating from two locations along the riverbank. The seepage at B-1 (see plan #2) was the same point where product had been found in the past. However, a sheen was also observed at R-4. This latter sheen matches well with calculated flow directions and volatile organic analysis on water from monitoring well #1.

Analyses of samples taken on October 18 showed almost no dissolved hydrocarbons, despite the visible sheen. Monitoring well #1 had a particularly strong smell, so a sample was taken from that point on December 10 and was analyzed by Oil Recovery Systems Lab in Greenville, New Hampshire using an extended EPA Method 602. This method analyzes for benzene, toluene, ethylbenzene and xylene (BTEX) at lower levels of detection than EPA Method 624. The method also picks up miscellaneous C4-C12 alphatic and C8-C12 aromatic hydrocarbons.

The sum of benzene, toluene, ethylbenzene, and xylene came to 13 micrograms/liter and the concentration of total hydrocarbons is 138 micrograms/liter see Table II. These values are relatively low in view of the fact that a visible sheen was observed when that sample was collected. Also noteworthy is that the other water samples that were taken in October where a noticeable sheen or odor was observed showed no detectable levels of organic compounds. This suggests that the petroleum product that is contaminating the site has a very low solubility. A Treatment system can be designed to take advantage of the properties of the pollutant. Such a system would separate product (sheen) and actual treatment of water could be held to a minimum because of the low solubility of this petroleum product.

2. REMEDIAL ACTION PLAN

The Remedial Action Plan which we propose consists of two parts, additional data gathering and remedial procedures.

Additonal data gathering will involve collecting water samples from all eight of the monitoring wells and analyzing them for total hydrocarbon content using the extended EPA Method 602 as previously described. This information would

be used in determining the extent of groundwater contamination on the factory site, and therefore the extent of remedial action which would be required.

We have geared our proposal for remedial action towards eliminating the sheen(s) from the river, and removing from the groundwater those hydrocarbons which produce the sheen. It is our belief that any remedial action geared solely towards blocking the movement of groundwater toward the river, such as a slurry wall, would be ineffective in the long term in that it would simply cause the groundwater to enter the river at some other point. We believe that to permanently eliminate the sheen, we must remove its source. We plan to do this by installing two or more recovery wells parallel to the riverbank. These wells would probably be constructed of vertical sections of 3.0' diameter corrugated steel culvert which would have a number of slots cut into them to admit groundwater. These wells would be installed with a backhoe and would be packed on the outside with sand. The actual number of these wells that would need to be installed would depend on the extent of contamination found in our sampling of the monitoring wells. When that has been assessed, optimum spacing and setback from the river can be calculated.

By pumping water from these recovery wells, we would create a localized depression in the groundwater table, thereby drawing contaminants towards the wells and away from the river. The Wells would be situated such that the outer perimeter of their radius of influence (the area in which the water table is depressed) ends just at the river's edge, thereby ensuring that minimal amounts of groundwater enter the river and, conversely, that minimal amounts of river water are drawn into the recovery well. Hand installed piezometers may be installed to confirm radii of influence for the recovery wells.

Water withdrawn from the wells would flow via buried plastic pipe to a separator, in this case a modified septic tank, through a drum of activated carbon, and into the river. This discharge will require a 1272 Order. Based on the data we currently have, we expect this discharge to contain hydrocarbons at or below the analytical detection limit. We will locate the septic tank, carbon canister, and pumps in the existing brick building beside the river. This will be ideal from a security point of view, and piping could be brought in and out of the building through existing openings.

As groundwater is drawn into the recovery wells, hydrocarbons will begin to accumulate as a floating layer in the wells

themselves. Our investigations indicate that product thickness on the water table is on the order of millimeters. We therefore expect only moderate product accumulation. Recovery of small quantities of product by mechanical means is difficult at best. We propose to use sorbent pads that will be replaced manually when they become saturated.

We expect operation of this system to continue through the hydrologic year, allowing the water table to fluxuate through its maximum and minimum. This should result in mobilization of free product from the soil. When product ceases to accumulate in the recovery wells and total dissolved hydrocarbons in the groundwater (using the analytical method described above) are below 100 ppb, the system will be shut down. We estimate that this will take something on the order of 18 months.

TABLE I

Soil and Water Analysis
from Fairbanks-Morse
St. Johnsbury, Vermont
October 18, 1985

(Analyses Performed by IEA)

SITE	SAMPLE TYPE	SAMPLE ID	624	625
TP 1	SOIL	SI[1]	N.D.	n/a
TP 2	WATER	W2	N.D.	N.D.
TP 3	SOIL	S2[2]	N.D.	n/a
TP 4	SOIL	S3	N.D.	n/a
TP 4	SOIL	S4[3]	N.D.	n/a
TP 8	WATER	W3	N.D.	n/a
RIVER	WATER	W1[4]	N.D.	n/a

NOTES:

1. Laboratory found hydrocarbons, possibly diesel fuel.
2. Same as Note 1, but greater quantities.
3. Same as 1 and 2, but highest concentration of hydrocarbons; quantitation not performed.
4. River sample collected just opposite of TP 1 and TP 2. Visible sheen, however, chromatagraph showed no peaks on 624 analysis.

TABLE II

Hydrocarbons in Water Ug/l
Fairbanks - Morse Site
St. Johnsbury, Vermont

(Analyses Performed by Oil Recovery Systems Lab)

I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	TOTAL BTEX
MW-1	12/10/85	12/14/85	ND	ND	1	12	13

I.D.	C4-C12 ALIPHATIC HYDROCARBONS	MISC AROMATICS C8-C12	TOTAL
MW-1	28	97	138

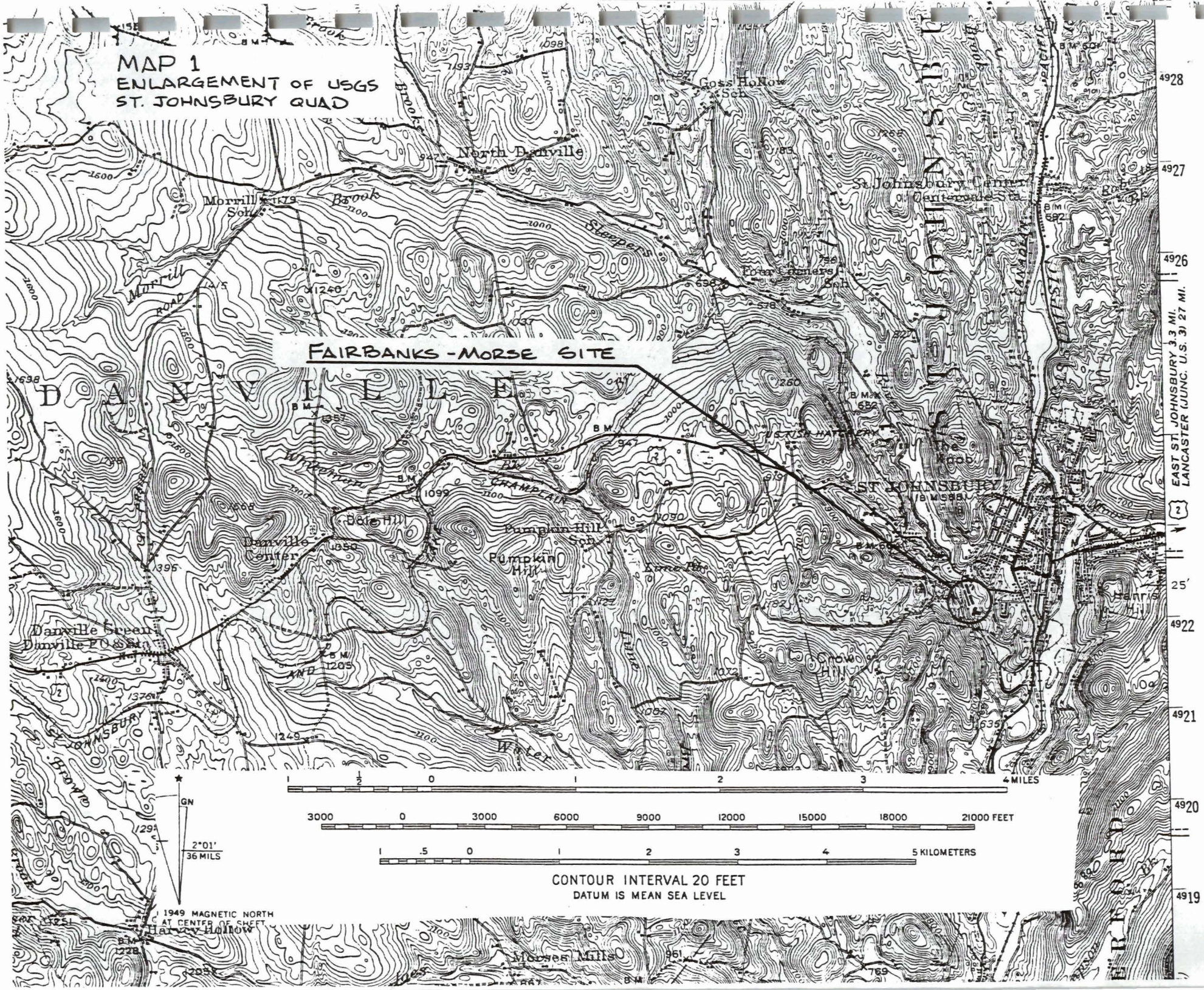
*NOTES:

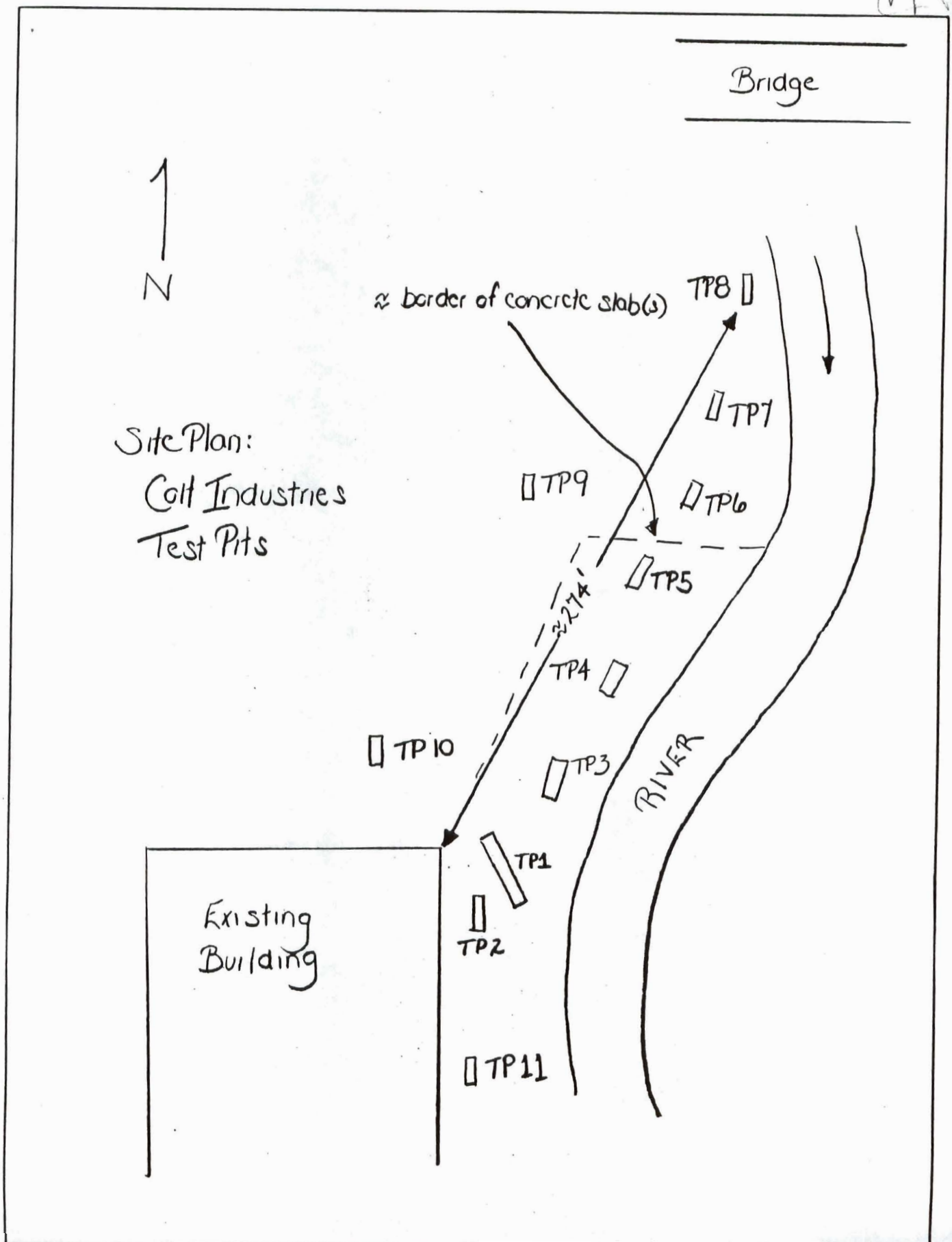
TOTAL = THE SUM OF THE TOTAL BTEX AND THE ABOVE PARAMETERS

ND = BELOW DETECTION LIMIT

CTS/jc

CLT9


MAP 1
ENLARGEMENT OF USGS
ST. JOHNSBURY QUAD
FAIRBANKS-MORSE SITE
North Danville
Goss Hollow Sch
St Johnsbury Center
Centervale Sta
Morrill Sch
Sleepers
Four Corners Sch
D A N V I L L E
ST JOHNSBURY
The Knob
Dole Hill
Danville Center
Pumpkin Hill Sch
Pumpkin Hill
Lime Pit
Crow Hill
Danville Green
Danville P.O. & Sta
Harvey Hollow
Morses Mills
Hanris Hill
EAST ST. JOHNSBURY 3.3 MI.
LANCASTER (JUNC. U.S. 3) 27 MI.
4928
4927
4926
4922
4921
4920
4919
1 ½ 0 1 2 3 4 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 FEET
1 .5 0 1 2 3 4 5 KILOMETERS
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL
GN
2°01'
36 MILS
1949 MAGNETIC NORTH
AT CENTER OF SHEET



Site Plan #1

THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering
MONTPELIER, VERMONT 05602

Scale NONE
Drawn by TMI
Checked
Dwg. No.

CHARRETTE

Project CLT-000 Site Old fac. off Western **TEST PIT** 1 Sh 1 of 11

Date 18 Oct 85 Location AVC Ground Elevation

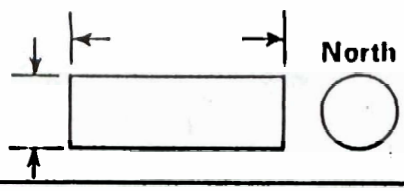
Total Depth Contractor

Equipment Used Logged by Jim McNamara

Remarks

Elev. Feet	Depth Feet	Sample Type & No.	Sample Depth Range	Soil & Rock Description & Comments
	0 – 3.5'			Brown silty sand, fill, no odor
	3.5' – 4.5'			Black sandy material (cinders?), little or no odor
	4.5' – 8.11'			Gray sand material (native?), strong odor, strongest on river side. Water coming in from both sides of hole @ ≈ 6.0', more from river. Water has little sheen. Took sample CLT-S1 @ ≈ 5.0'
	8.11' –			

Test Pit Plan



Groundwater		
Date	Time (Hours After Completion)	Depth (Feet)

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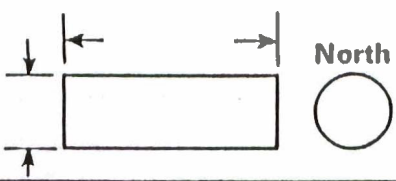
1913(1/81)

Project CKT-000 Site Old fac. off Weston TEST PIT 2 Sh 2 of 11
Date 18 Oct. 85 Location AVC: Ground Elevation
Total Depth Contractor
Equipment Used Logged by TJ McNamara
Remarks

El F	Depth Feet	Sample Type & No.	Sample Depth Range	Soil & Rock Description & Comments
	0			Loose silty-sandy fill.
	7.0'			
	9.0'			Black cinderlike material, odor, tarry feel.
	10.0'			Gray silty-sandy clay, took water sample CKT-W2.

Test Pit Plan



Groundwater		
Date	Time (Hours After Completion)	Depth (Feet)

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MONTPELIER, VERMONT 05602

ict CKT-000 Site Old Fac. off Western Ave. **TEST PIT** 3 Sh 3 of 11

Date 18 OCT. 85 Location Ground Elevation

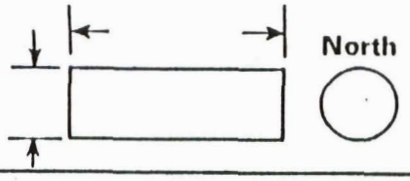
Total Depth Contractor

Equipment Used Logged by T. McNamara

Remarks

Elev. Feet	Depth Feet	Sample Type & No.	Sample Depth Range	Soil & Rock Description & Comments
	0			Loose sandy fill.
	10.0'			
	10.25'			Thin clay layer
				Gray silty sand, saturated, strong odor but different in character than TP1; TP2. Took sample CKT-S2 from ~~sandy silt~~ silty sand.

Test Pit Plan



Groundwater

Date	Time (Hours After Completion)	Depth (Feet)

THE JOHNSON COMPANY, INC.
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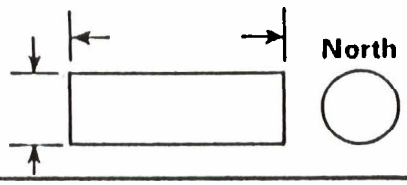
MONTPELIER, VERMONT 05602

1913 (1/81)

Project CKT-000 Site Old fac. off Western **TEST PIT** 4 Sh 4 of 11
Date 18 Oct. 85 Location Ave. Ground Elevation
Total Depth Contractor
Equipment Used Logged by T. McNamara
Remarks

Elev. feet	Depth feet	Sample Type & No.	Sample Depth Range	Soil & Rock Description & Comments
	0			Loose sandy fill and cinders.
	1.83'			
	5.08'			Brown Clay
	5.33'			Brown Silty sand.
				Gray silty sand, sample CKT-S3 taken @ 6.0'
				▼ Static H2O level @ 10.0'
				Soil sample CKT-S4 taken in saturated material

Test Pit Plan



Groundwater		
Date	Time (Hours After Completion)	Depth (Feet)

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Project CKT-000 Site Old fac. off Western Ave TEST PIT 5 Sh 5 of 11

Date 18 Oct. 85 Location Ground Elevation

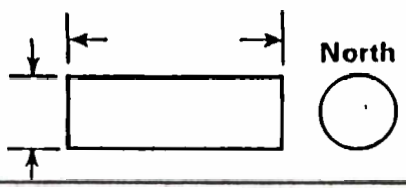
Total Depth Contractor

Equipment Used Logged by T J McNamara

Remarks

Elev. Feet	Depth Feet	Sample Type & No.	Sample Depth Range	Soil & Rock Description & Comments
	0			Fill (loose)
	3.0'			Gray silty sand w/strong odor

Test Pit Plan



Groundwater		
Date	Time (Hours After Completion)	Depth (Feet)

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1913

Project CKT-000 Site Old fac. off Western Ave TEST PIT 6 Sh 6 of 11

Date 18 Oct 85 Location Ave Ground Elevation

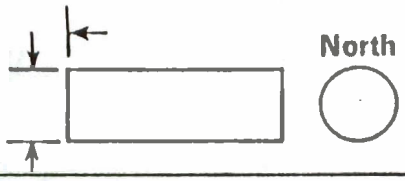
Total Depth Contractor

Equipment Used Logged by T J McNamara

Remarks

El F	Depth Feet	Sample Type & No.	Sample Depth Range	Soil & Rock Description & Comments
	0 0.25'			concrete slab.
	0.5'			fill
	0.75'			concrete slab
				gray silty sand, strong odor
	10.0'			

Test Pit Plan



Groundwater		
Date	Time (Hours After Completion)	Depth (Feet)

THE JOHNSON COMPANY, INC.
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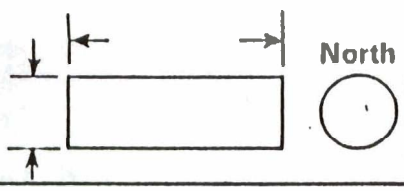
Project CKT-000 Site Old Fac. Site off TEST PIT #7 Sh 7 of 11
Date 18 Oct. 85 Location Western Ave. Ground Elevation
Total Depth Contractor
Equipment Used Logged by J.T. McNamara
Remarks

Elev. Feet	Depth Feet	Sample Type & No.	Sample Depth Range	Soil & Rock Description & Comments
				Concrete slab(s) underlain by fill.
			5.0'	
				gray silty sand, strong odor.

Test Pit Plan



Groundwater		
Date	Time (Hours After Completion)	Depth (Feet)

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Project CLT-000 Site Old Fac. Site off Western Ave. **TEST PIT** 8 Sh 8 of 11

Date 18 Oct. 85 Location Western Ave. Ground Elevation

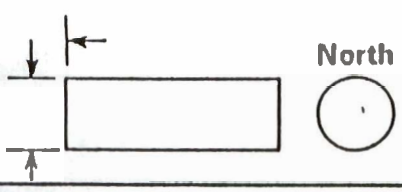
Total Depth Contractor

Equipment Used Logged by T.J. McNamara

Remarks

Elev. Feet	Depth Feet	Sample Type & No.	Sample Depth Range	Soil & Rock Description & Comments
	0			Concrete Slab
				Fill. Water @ 7.0' from river side, w/sheen. Took water sample CLT-W3
	7.0'			▼ Static H2O level.

Test Pit Plan



Groundwater		
Date	Time (Hours After Completion)	Depth (Feet)

THE JOHNSON COMPANY, INC.
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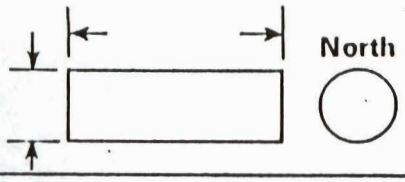
1913 (1/81)

Project CLJ-000 Site Old Fac Site off **TEST PIT** 9 Sh 9 of 11
Date 18 Oct 85 Location Western Ave Ground Elevation
Total Depth Contractor
Equipment Used Logged by J.J. McNamara
Remarks

Elev. Feet	Depth Feet	Sample Type & No.	Sample Depth Range	Soil & Rock Description & Comments
	0			Concrete slab
				Fill, no odor in unsaturated zone.
		6-7'		▼ Static H2O Trace odor in saturated zone.
	9.0'			
				Gray Silty Sand.

Test Pit Plan



Groundwater		
Date	Time (Hours After Completion)	Depth (Feet)

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1913 (7/81)

Project CKT-000 Site Old Fac. Site off **TEST PIT** 10 Sh 10 of 11

Date 18 Oct. 85 Location Western Ave. Ground Elevation

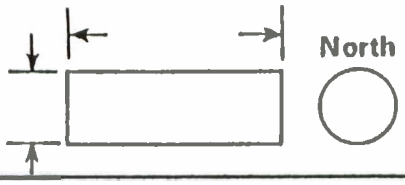
Total Depth Contractor

Equipment Used Logged by J. McNamara.

Remarks

Elev. Feet	Depth Feet	Sample Type & No.	Sample Depth Range	Soil & Rock Description & Comments
	0			Concrete Slab
				Fill.
	10.0'			
				Gray Silty sand (Saturated), odor.
				Note: Re excavation of precisting Test pit.

Test Pit Plan



Groundwater		
Date	Time (Hours After Completion)	Depth (Feet)

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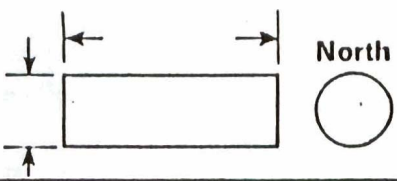
1913 (1/81)

Project CKT-000 Site Old Fac. Site off TEST PIT 11 Sh 11 of 11
Date 18 Oct. 85 Location Western Ave Ground Elevation
Total Depth Contractor
Equipment Used Logged by TJ McNamara
Remarks

Elev. Feet	Depth Feet	Sample Type & No.	Sample Depth Range	Soil & Rock Description & Comments
	0			fill, no odor, in unsaturated zone, with misc. cinders, clinkers, iron.
	8.0-9.0'			
	10.0			Gray silty sand (saturated) w/ more silt than previous holes, odor. ▽ Water from River side

Test Pit Plan



Groundwater		
Date	Time (Hours After Completion)	Depth (Feet)

THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering
MONTPELIER, VERMONT 05602

OH

Industrial & Environmental Analysts, Inc.
P.O. Box 626 • Essex Junction, Vermont 05452 • 802-878-5138

ANALYSIS REPORT

RECEIVED NOV 6 1985

Customer:	The Johnson Co., Inc.
Address:	5 State Street
City, State, Zip:	Montpelier, VT 05602
Attention:	Tim McNamara
Date:	4 November 1985
Date Samples Received:	18 October 1985
Customer Order Number:	

METHOD 624 ANALYSIS

OLD FAIRBANKS - MORSE FACTORY SITE

Please note enclosed sheets.

Signature Catherine N. Cutting

Offices and laboratories located in: Essex Junction, Vermont
Research Triangle Park, North Carolina

VOLATILE FRACTION

CLIENT SAMPLE NO. CLT-W1-18 October 1985

IEA SAMPLE NO. 752

NUMBER	COMPOUNDS	DETECTION LIMIT (µg/L)	CONCENTRATION (µg/L)
1	ACROLEIN	100	BDL*
2	ACRYLONITRILE- 603	100	BDL
3	BENZENE	10	BDL
4	Bis(CHLOROMETHYL) ETHER	10	BDL
5	BROMODICHLOROMETHANE	10	BDL
6	BROMOFORM	10	BDL
7	BROMOMETHANE	10	BDL
8	CARBON TETRACHLORIDE	10	BDL
9	CHLOROBENZENE	10	BDL
10	CHLOROETHANE	10	BDL
11	2-CHLOROETHYL VINYL ETHER	10	BDL
12	CHLOROFORM	10	BDL
13	CHLOROMETHANE	10	BDL
14	DIBROMOCHLOROMETHANE	10	BDL
15	DICHLORODIFLUOROMETHANE ? Freon?	10	BDL
16	1,1-DICHLOROETHANE	10	BDL
17	1,2-DICHLOROETHANE	10	BDL
18	1,1-DICHLOROETHYLENE	10	BDL
19	trans-1,2-DICHLOROETHYLENE	10	BDL
20	1,2-DICHLOROPROPANE	10	BDL
21	1,3-DICHLOROPROPENE	10	BDL
22	ETHYLBENZENE	10	BDL
23	METHYLENE CHLORIDE	10	BDL
24	1,1,2,2-TETRACHLOROETHANE	10	BDL
25	1,1,2,2-TETRACHLOROETHENE	10	BDL
26	TOLUENE	10	BDL
27	1,1,1-TRICHLOROETHANE	10	BDL
28	1,1,2-TRICHLOROETHANE	10	BDL
29	TRICHLOROETHYLENE	10	BDL
30	TRICHLOROFLUOROMETHANE	10	BDL
31	VINYL CHLORIDE	10	BDL

*BDL - BELOW DETECTION LIMIT

VOLATILE FRACTION

CLIENT SAMPLE NO. CLT-W2-18 October 1985

IEA SAMPLE NO. 753

NUMBER	COMPOUNDS	DETECTION LIMIT (µg/L)	CONCENTRATION (µg/L)
1	ACROLEIN	100	BDL*
2	ACRYLONITRILE	100	BDL
3	BENZENE	10	BDL
4	Bis(CHLOROMETHYL) ETHER	10	BDL
5	BROMODICHLOROMETHANE	10	BDL
6	BROMOFORM	10	BDL
7	BROMOMETHANE	10	BDL
8	CARBON TETRACHLORIDE	10	BDL
9	CHLOROBENZENE	10	BDL
10	CHLOROETHANE	10	BDL
11	2-CHLOROETHYL VINYL ETHER	10	BDL
12	CHLOROFORM	10	BDL
13	CHLOROMETHANE	10	BDL
14	DIBROMOCHLOROMETHANE	10	BDL
15	DICHLORODIFLUOROMETHANE	10	BDL
16	1,1-DICHLOROETHANE	10	BDL
17	1,2-DICHLOROETHANE	10	BDL
18	1,1-DICHLOROETHYLENE	10	BDL
19	trans-1,2-DICHLOROETHYLENE	10	BDL
20	1,2-DICHLOROPROPANE	10	BDL
21	1,3-DICHLOROPROPENE	10	BDL
22	ETHYLBENZENE	10	BDL
23	METHYLENE CHLORIDE	10	BDL
24	1,1,2,2-TETRACHLOROETHANE	10	BDL
25	1,1,2,2-TETRACHLOROETHENE	10	BDL
26	TOLUENE	10	BDL
27	1,1,1-TRICHLOROETHANE	10	BDL
28	1,1,2-TRICHLOROETHANE	10	BDL
29	TRICHLOROETHYLENE	10	BDL
30	TRICHLOROFLUOROMETHANE	10	BDL
31	VINYL CHLORIDE	10	BDL

*BDL - BELOW DETECTION LIMIT

VOLATILE FRACTION

CLIENT SAMPLE NO. CLT-W3-18 October 1985

IEA SAMPLE NO. 754

UMBER	COMPOUNDS	DETECTION LIMIT (µg/L)	CONCENTRATION (µg/L)
1	ACROLEIN	100	BDL*
2	ACRYLONITRILE	100	BDL
3	BENZENE	10	BDL
4	Bis(CHLOROMETHYL) ETHER	10	BDL
5	BROMODICHLOROMETHANE	10	BDL
6	BROMOFORM	10	BDL
7	BROMOMETHANE	10	BDL
8	CARBON TETRACHLORIDE	10	BDL
9	CHLOROBENZENE	10	BDL
10	CHLOROETHANE	10	BDL
11	2-CHLOROETHYL VINYL ETHER	10	BDL
12	CHLOROFORM	10	BDL
13	CHLOROMETHANE	10	BDL
14	DIBROMOCHLOROMETHANE	10	BDL
15	DICHLORODIFLUOROMETHANE	10	BDL
16	1,1-DICHLOROETHANE	10	BDL
17	1,2-DICHLOROETHANE	10	BDL
18	1,1-DICHLOROETHYLENE	10	BDL
19	trans-1,2-DICHLOROETHYLENE	10	BDL
20	1,2-DICHLOROPROPANE	10	BDL
21	1,3-DICHLOROPROPENE	10	BDL
22	ETHYLBENZENE	10	BDL
23	METHYLENE CHLORIDE	10	BDL
24	1,1,2,2-TETRACHLOROETHANE	10	BDL
25	1,1,2,2-TETRACHLOROETHENE	10	BDL
26	TOLUENE	10	BDL
27	1,1,1-TRICHLOROETHANE	10	BDL
28	1,1,2-TRICHLOROETHANE	10	BDL
29	TRICHLOROETHYLENE	10	BDL
30	TRICHLOROFLUOROMETHANE	10	BDL
31	VINYL CHLORIDE	10	BDL

*BDL - BELOW DETECTION LIMIT

VOLATILE FRACTION

CLIENT SAMPLE NO. CLT-S1-18 October 1985

IEA SAMPLE NO. 755

NUMBER	COMPOUNDS	DETECTION LIMIT (µg/kg)	CONCENTRATION (µg/kg)
1	ACROLEIN	200	BDL*
2	ACRYLONITRILE	200	BDL
3	BENZENE	20	BDL
4	Bis(CHLOROMETHYL) ETHER	20	BDL
5	BROMODICHLOROMETHANE	20	BDL
6	BROMOFORM	20	BDL
7	BROMOMETHANE	20	BDL
8	CARBON TETRACHLORIDE	20	BDL
9	CHLOROBENZENE	20	BDL
10	CHLOROETHANE	20	BDL
11	2-CHLOROETHYL VINYL ETHER	20	BDL
12	CHLOROFORM	20	BDL
13	CHLOROMETHANE	20	BDL
14	DIBROMOCHLOROMETHANE	20	BDL
15	DICHLORODIFLUOROMETHANE	20	BDL
16	1,1-DICHLOROETHANE	20	BDL
17	1,2-DICHLOROETHANE	20	BDL
18	1,1-DICHLOROETHYLENE	20	BDL
19	trans-1,2-DICHLOROETHYLENE	20	BDL
20	1,2-DICHLOROPROPANE	20	BDL
21	1,3-DICHLOROPROPENE	20	BDL
22	ETHYLBENZENE	20	BDL
23	METHYLENE CHLORIDE	20	BDL
24	1,1,2,2-TETRACHLOROETHANE	20	BDL
25	1,1,2,2-TETRACHLOROETHENE	20	BDL
26	TOLUENE	20	BDL
27	1,1,1-TRICHLOROETHANE	20	BDL
28	1,1,2-TRICHLOROETHANE	20	BDL
29	TRICHLOROETHYLENE	20	BDL
30	TRICHLOROFLUOROMETHANE	20	BDL
31	VINYL CHLORIDE	20	BDL

*BDL - BELOW DETECTION LIMIT

VOLATILE FRACTION

CLIENT SAMPLE NO. CLT-S2-18 October 1985

IEA SAMPLE NO. 756

NUMBER	COMPOUNDS	DETECTION LIMIT (µg/ kg)	CONCENTRATION (µg/kg)
1	ACROLEIN	200	BDL*
2	ACRYLONITRILE	200	BDL
3	BENZENE	20	BDL
4	Bis(CHLOROMETHYL) ETHER	20	BDL
5	BROMODICHLOROMETHANE	20	BDL
6	BROMOFORM	20	BDL
7	BROMOMETHANE	20	BDL
8	CARBON TETRACHLORIDE	20	BDL
9	CHLOROBENZENE	20	BDL
10	CHLOROETHANE	20	BDL
11	2-CHLOROETHYL VINYL ETHER	20	BDL
12	CHLOROFORM	20	BDL
13	CHLOROMETHANE	20	BDL
14	DIBROMOCHLOROMETHANE	20	BDL
15	DICHLORODIFLUOROMETHANE	20	BDL
16	1,1-DICHLOROETHANE	20	BDL
17	1,2-DICHLOROETHANE	20	BDL
18	1,1-DICHLOROETHYLENE	20	BDL
19	trans-1,2-DICHLOROETHYLENE	20	BDL
20	1,2-DICHLOROPROPANE	20	BDL
21	1,3-DICHLOROPROPENE	20	BDL
22	ETHYLBENZENE	20	BDL
23	METHYLENE CHLORIDE	20	BDL
24	1,1,2,2-TETRACHLOROETHANE	20	BDL
25	1,1,2,2-TETRACHLOROETHENE	20	BDL
26	TOLUENE	20	BDL
27	1,1,1-TRICHLOROETHANE	20	BDL
28	1,1,2-TRICHLOROETHANE	20	BDL
29	TRICHLOROETHYLENE	20	BDL
30	TRICHLOROFLUOROMETHANE	20	BDL
31	VINYL CHLORIDE	20	BDL

*BDL - BELOW DETECTION LIMIT

VOLATILE FRACTION

CLIENT SAMPLE NO. CLT-S3-18 October 1985

IEA SAMPLE NO. 757

NUMBER	COMPOUNDS	DETECTION LIMIT (µg/kg)	CONCENTRATION (µg/kg)
1	ACROLEIN	400	BDL*
2	ACRYLONITRILE	400	BDL
3	BENZENE	40	BDL
4	Bis(CHLOROMETHYL) ETHER	40	BDL
5	BROMODICHLOROMETHANE	40	BDL
6	BROMOFORM	40	BDL
7	BROMOMETHANE	40	BDL
8	CARBON TETRACHLORIDE	40	BDL
9	CHLOROBENZENE	40	BDL
10	CHLOROETHANE	40	BDL
11	2-CHLOROETHYL VINYL ETHER	40	BDL
12	CHLOROFORM	40	BDL
13	CHLOROMETHANE	40	BDL
14	DIBROMOCHLOROMETHANE	40	BDL
15	DICHLORODIFLUOROMETHANE	40	BDL
16	1,1-DICHLOROETHANE	40	BDL
17	1,2-DICHLOROETHANE	40	BDL
18	1,1-DICHLOROETHYLENE	40	BDL
19	trans-1,2-DICHLOROETHYLENE	40	BDL
20	1,2-DICHLOROPROPANE	40	BDL
21	1,3-DICHLOROPROPENE	40	BDL
22	ETHYLBENZENE	40	BDL
23	METHYLENE CHLORIDE	40	BDL
24	1,1,2,2-TETRACHLOROETHANE	40	BDL
25	1,1,2,2-TETRACHLOROETHENE	40	BDL
26	TOLUENE	40	BDL
27	1,1,1-TRICHLOROETHANE	40	BDL
28	1,1,2-TRICHLOROETHANE	40	BDL
29	TRICHLOROETHYLENE	40	BDL
30	TRICHLOROFLUOROMETHANE	40	BDL
31	VINYL CHLORIDE	40	BDL

*BDL - BELOW DETECTION LIMIT

VOLATILE FRACTION

CLIENT SAMPLE NO. CLT-S4-18 October 1985

IEA SAMPLE NO. 758

NUMBER	COMPOUNDS	DETECTION LIMIT (µg/kg)	CONCENTRATION (µg/kg)
1	ACROLEIN	400	BDL*
2	ACRYLONITRILE	400	BDL
3	BENZENE	40	BDL
4	Bis(CHLOROMETHYL) ETHER	40	BDL
5	BROMODICHLOROMETHANE	40	BDL
6	BROMOFORM	40	BDL
7	BROMOMETHANE	40	BDL
8	CARBON TETRACHLORIDE	40	BDL
9	CHLOROBENZENE	40	BDL
10	CHLOROETHANE	40	BDL
11	2-CHLOROETHYL VINYL ETHER	40	BDL
12	CHLOROFORM	40	BDL
13	CHLOROMETHANE	40	BDL
14	DIBROMOCHLOROMETHANE	40	BDL
15	DICHLORODIFLUOROMETHANE	40	BDL
16	1,1-DICHLOROETHANE	40	BDL
17	1,2-DICHLOROETHANE	40	BDL
18	1,1-DICHLOROETHYLENE	40	BDL
19	trans-1,2-DICHLOROETHYLENE	40	BDL
20	1,2-DICHLOROPROPANE	40	BDL
21	1,3-DICHLOROPROPENE	40	BDL
22	ETHYLBENZENE	40	BDL
23	METHYLENE CHLORIDE	40	BDL
24	1,1,2,2-TETRACHLOROETHANE	40	BDL
25	1,1,2,2-TETRACHLOROETHENE	40	BDL
26	TOLUENE	40	BDL
27	1,1,1-TRICHLOROETHANE	40	BDL
28	1,1,2-TRICHLOROETHANE	40	BDL
29	TRICHLOROETHYLENE	40	BDL
30	TRICHLOROFLUOROMETHANE	40	BDL
31	VINYL CHLORIDE	40	BDL

*BDL - BELOW DETECTION LIMIT

BASE/NEUTRAL FRACTION

CLIENT SAMPLE NO. CLT-625 Soil

IEA SAMPLE NO. 181-162-1

NUMBER	COMPOUNDS	DETECTION LIMIT (µg/kg)	CONCENTRATION (µg/kg)
1	ACENAPHTHENE	100	BDL*
2	ACENAPHTHYLENE	50	BDL
3	ANTHRACENE	50	BDL
4	BENZIDINE	50	BDL
5	BENZO (a) ANTHRACENE	50	BDL
6	BENZO (a) PYRENE	50	BDL
7	BENZO (b) FLUORANTHENE	50	BDL
8	BENZO (ghi) PERYLENE	100	BDL
9	BENZO (k) FLUORANTHENE	50	BDL
10	BIS(2-CHLOROETHOXY)METHANE	50	BDL
11	BIS(2-CHLOROETHYL)ETHER	50	BDL
12	BIS(2-CHLOROISOPROPYL)ETHER	50	BDL
13	BIS(2-ETHYLHEXYL)PHTHALATE	50	BDL
14	4-BROMOPHENYL PHENYL ETHER	50	BDL
15	BENZYL BUTYL PHTHALATE	50	BDL
16	2-CHLORONAPHTHALENE	50	BDL
17	4-CHLOROPHENYL PHENYL ETHER	50	BDL
18	CHRYSENE	50	BDL
19	DIBENZO (a,h) ANTHRACENE	100	BDL
20	1,2 DICHLOROBENZENE	50	BDL
21	1,3 DICHLOROBENZENE	50	BDL
22	1,4 DICHLOROBENZENE	50	BDL
23	3,3'-DICHLOROBENZIDINE	50	BDL
24	DIETHYL PHTHALATE	50	BDL
25	DIMETHYL PHTHALATE	50	BDL
26	DI-N-BUTYL PHTHALATE	50	BDL
27	2,4-DINITROTOLUENE	50	BDL
28	2,6-DINITROTOLUENE	50	BDL
29	DI-N-OCTYL PHTHALATE	50	BDL
30	FLUORANTHENE	50	BDL
31	FLUORENE	50	BDL
32	HEXACHLOROBENZENE	50	BDL
33	HEXACHLOROBUTADIENE	50	BDL
34	HEXACHLOROCYCLOPENTADIENE	50	BDL
35	HEXACHLOROETHANE	50	BDL
36	INDENO(1,2,3-cd)PYRENE	100	BDL
37	ISOPHORONE	50	BDL
38	NAPHTHALENE	50	BDL
39	NITROBENZENE	50	BDL
40	N-NITROSODIMETHYLAMINE	50	BDL
41	N-NITROSO-DI-N-PROPYLAMINE	50	BDL
42	N-NITROSODIPHENYLAMINE	50	BDL
43	PHENANTHRENE	50	BDL
44	PYRENE	50	BDL
45	1,2,4-TRICHLOROBENZENE	50	BDL

*BDL - BELOW DETECTION LIMIT

RECEIVED DEC 18 1985

CLT Test Results

GROUNDWATER TECHNOLOGY LABORATORY
ANALYTICAL & CONSULTING SERVICES
Division of Oil Recovery Systems, Inc.
4 Mill St., Greenville, NH 03048
Tel: (603) 878-2500

Laboratory Test Results

12/16/85
Report No. MA-2461-1
Submitted to: Chris Stone
Johnson Co.
5 State St.
Montpelier, VT. 05602

Sample Identification:
The attached report covers water sample 20162 taken by C. Stone using 40 ml septum-capped glass vials at site # MA-2461, St Johnsbury, Vermont.

Method:
Analysis was performed for purgeable aromatic priority pollutants and xylenes by purge and trap gas chromatography with flame ionization detection as per EPA Method 602. Quantification was performed on a very polar open tubular fused silica capillary column which fractionates aliphatics (up to C12)away from volatile aromatics. Qualitative confirmation was performed for all samples on a dissimilar column. Chromatographic conditions are referenced in GTL Method Code 103. Hexane is used as a calibration standard for the aliphatic hydrocarbons and miscellaneous aromatics, if reported.

Minimum Detection Limit (MDL) at 5 times background is 0.5 ppb for all parameters. The level for reliable quantitation for the summed groups such as aliphatics is 20 ppb. Samples diluted in order to maintain the calibrated range are so indicated by a footnote giving the factor by which the MDL is raised.

Sampling and sample handling and preservation are specified by this laboratory to be as per EPA Method 602. Any irregularities are referenced in the attached quality assurance report.

Results:
Results are reported in ppb (ug/1).

Prepared by:
Eileen Foley
Analytical Program Manager

S. Bourbeau
Analyst

GROUNDWATER TECHNOLOGY LABORATORY

ANALYTICAL & CONSULTING SERVICES
Division of Oil Recovery Systems, Inc.
4 Mill St., Greenville, NH 03048
Tel: (603) 878-2500

HYDROCARBONS IN WATER ug/L (ppb)
REPORT NO. MA-2461-1

Sample I.D.		DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	TOTAL BTEX
20162	MW-1	12/10/85	12/14/85	ND	ND	1	12	13

*NOTES:

ND = BELOW DETECTION LIMIT

TOTAL BTEX = THE SUM OF BENZENE, TOLUENE, ETHYL BENZENE, AND XYLENES, ROUNDED TO THREE SIGNIFICANT FIGURES.

GROUNDWATER TECHNOLOGY LABORATORY

ANALYTICAL & CONSULTING SERVICES
Division of Oil Recovery Systems, Inc.
4 Mill St., Greenville, NH 03048
Tel: (603) 878-2500

HYDROCARBONS IN WATER ug/1
REPORT NO. MA-2461-1

weathered to fuel oil

SAMPLE NO.	I.D.	C4-C12 ALIPHATIC HYDROCARBONS	MISC AROMATICS C8-C12	TOTAL
20162	MW-1	28	97	138

*NOTES:

TOTAL = THE SUM OF THE TOTAL BTEX AND THE ABOVE PARAMETERS.

ND = BELOW DETECTION LIMIT

GROUNDWATER TECHNOLOGY LABORATORY

ANALYTICAL & CONSULTING SERVICES
Division of Oil Recovery Systems, Inc.
4 Mill St., Greenville, NH 03048
Tel: (603) 878-2500

Quality Assurance Documentation

Statement of Sample Integrity:
The samples in this data set meet the Groundwater Technology Laboratory criteria for physical integrity as per GTL Method Code 103 throughout the sampling, handling and analytical process.

Quality Assurance Specifications:
The data in this set conforms to the GTL Quality Assurance program and provisions specified in EPA Method 602 including daily calibration with freshly made standards, blanks before trace level samples, surrogate spikes, spikes in untested matrices, a minimum of 10% duplicates and a minimum of 6% reference samples traceable to the U.S. EPA.

Certification:
The data in this report have been checked for accuracy and completeness.

Respectfully Submitted,

Michael D. Webb

Michael D. Webb EMF
Technical Director