

# SVE Associates

Engineering

Surveying

Landscape Architecture

Planning

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

## Site Investigation Report

VT Yankee Nuclear Power Plant - Vernon, VT

(VT DEC Site # 99-2617)

Latitude 42 degrees, 46', 42.7" N

Longitude 72 degrees, 43' 26"

*USGS Brattleboro River Quad*

### Prepared For:

Vermont Yankee Nuclear Power Corp

P.O. 157

Vernon, VT 05454-0157

Contact: David Tkatch

(802) 258-5500

### Prepared By:

SVE Associates

28 Mechanic St.

Keene, NH 03431

Contact : Steven L. Brackett

(603) 355-1532

Nov. 15, 1999

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

28 Mechanic St., Keene, NH 03431 Phone: (603) 355-1532 Fax (603) 355-2969

P.O. Box 1818, Brattleboro, VT 05302-1818 Phone: (802) 257-0561 Fax (802) 257-0721

## EXECUTIVE SUMMARY

During the spring of 1999 an extensive environmental assessment was conducted of the Vermont Yankee Nuclear power plant by McLaren Hart, Inc. on behalf of Amergen, Inc., a potential purchaser of the property. During this investigation two areas of groundwater and soil contamination were documented. Both of these areas were located outside of the turbine building bay doors immediately to the south of the main transformers for the site. The contaminants encountered were tetrachloroethylene ("PCE") and a suite of #2 fuel oil compounds (naphthalene and BTEX). This contamination was non-radioactive.

Although possible sources of the PCE contamination were discussed to date no conclusive evidence has been found which explains this issue. On the other hand the naphthalene and BTEX contamination are clearly related to a 10,000 gallon #2 fuel oil tank that had formerly been located in this area. This tank was closed in December 1994. No evidence of contamination was reported at the time of closure time.

The McLaren Hart, Inc. report, dated May 18, 1999 indicates the presence of PCE, naphthalene and BTEX contamination but did not determine degree and extent of this contamination. Subsequent to the McLaren Hart, Inc. report SVE Associates was contracted to conduct a Site Investigation of the area, the objective of which was to determine degree and extent of soil and groundwater contamination and to assess the risk posed by this contamination to potential receptors. This report presents the results of this investigation.

## CONCLUSIONS:

Based on this work SVE has reached the following Conclusions:

The release of petroleum from the former 10,000 gallon # 2 fuel oil UST has contaminated the soil in the area in which it was formerly located, and has contaminated groundwater in a near surface overburden aquifer.

During one round of sampling free phase product was encountered in MW-1. Free product recovery was commenced immediately using sorbent pads. Since free product recovery began no additional free product has been encountered

The PCE contamination identified in the McLaren Hart, Inc. report was confirmed in the July 16, 1999 round of sampling but was found only in groundwater samples collected from MW-9 during the Oct. 25, 1999 sampling round. In any case, the extent of the PCE contamination is clearly limited to the area investigated and is very low in degree.

*how much?*

The onsite drinking water supply is sourced by four onsite drilled bedrock wells. VOC's , in concentrations exceeding drinking water standards, have not been found in any of the wells. Drinking water samples from one of these wells (the "COB" well - located approximately 750' downgradient from the former UST location), has been found to contain VOC's in concentrations below drinking water standards.

No evidence was found to indicate that the soil and groundwater contamination identified is a threat to any receptors.

In light of these Conclusions, SAE has the following Recommendations:

- Quarterly groundwater monitoring should begin in Dec. 1999 and should consist of the following:
- Measurement of groundwater depths and collection of groundwater samples from MW-1, MW-2, MW-3, MW-5, MW-6, MW-7, MW-8, and MW-9. (In the opinion of SVE MW-4 can be excluded from monitoring due to its distance, on gradient, from the contaminant plume).
- Each groundwater sample should be analyzed for the presence of PCE, BTEX, and naphthalene according to EPA Method 8021B.

*Yes  
all  
wells*

*8266*

After each sampling round a summary report should be prepared which describes the results of the monitoring. This report will include the groundwater analysis for the round as compared to historical trends, a groundwater contour map, and recommendations for future monitoring.

SVE anticipates that the frequency of monitoring will decrease in the future as the impact of seasonal changes in groundwater elevation fluctuations on groundwater quality are better understood.

*- include water supply results*

## SITE HISTORY

The site is currently owned by the Vermont Yankee Nuclear Power Corp. and has been since 1964. Prior to that the site was in agricultural uses.

## SITE ABUTTERS OWNERSHIP INFORMATION

A copy of Tax Map 36 for the Town of Vernon, VT is included in the Exhibits. This map shows the abutters of the Vermont Yankee site as well as the location of potential receptors. All of the abutting lots are served by onsite water and sewer systems. However, in the opinion of SVE Associates, none of these are potential receptors. The only potential receptors (as discussed below) are the adjacent building. However, for completeness the onsite water supply wells for the Vermont Yankee site are also shown.

### **Hazardous Materials Use, Storage and Disposal Practices**

Construction of the Vermont Yankee nuclear power plant began in 1966 and the site has been occupied by this facility, and this use since that time to the present.

Prior to construction of the Vermont Yankee nuclear power plant the site had been in agricultural use.

### **Known Hazardous Materials Releases**

Due to the complex and extensive nature of the site's use as an electrical generating facility there have been a variety of recorded hazardous materials uses at the site. The VT ANR, Sites Management Section Spills list, as well as VT Yankee records were reviewed to try to identify a source for the PCE contamination discussed in this report.

To date none of the recorded releases can be identified as the PCE source.

## MAPS

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

USGS Map - see Appendix

Site Plan - see Appendix

## MONITORING WELLS

### Monitoring Well Installation Procedure

Soil Boring Installation - Soil borings were installed by Soils Engineering using an Acker soil boring rig and 4.5" hollow stem augers.

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

### SAMPLING PROCEDURES

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

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

### FIELD SCREENING RESULTS

Sample #	Sample Description	Field Screening Result (ppm)
5-1	10-12', brown fine sand	0
5-2	15'- 17', brown medium sand	0
5-3	20'-22 ', brown medium sand	0
5-4	25'-27', brown medium sand	0
6-1	10-12', brown fine gravel	0
6-2	15'- 17', brown medium sand	0

6-3	20'-22', brown medium sand	85
6-4	25'-27', brown medium sand	23
7-1	10-12', brown fine sand	0
7-2	15'-17', brown medium sand	0
7-3	20'-22', brown medium sand	26
7-4	25'-27', brown medium sand	7
8-1	10-12', brown fine sand	0
8-2	15'-17', brown gravelly medium sand	34
8-3	20'-22', brown gravelly medium sand	98
8-4	25'-27', grey gravelly fine sand	32
9-1	10-12', brown fine sand	0
9-2	15'-17', brown medium sand	0
9-3	20'-22', brown medium sand	80
9-4	25'-27', grey gravelly fine sand	75

## GEOLOGY

The soil types encountered in the five new monitoring wells installed for this project are described in the Table above. These soils are consistent with what is referred to as Unit A in the McLaren Hart, Inc. report.

Bedrock Type – Bedrock was encountered in MW-2 at a depth of approximately 47' below ground surface. Bedrock below the Vermont Yankee site consist of the Vernon Dome granitic gneiss..

## GROUNDWATER SAMPLING

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

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

Groundwater depth readings were taken on July 17 and Oct. 25, 1999 and are presented in the Table below. The groundwater contour map presented in the appendices of this report is based on these readings.

	Well Elevation	GW Elevation below Top of Casing	GW Elevation below datum
Oct. 25, 1999			
MW-5		18.54	
MW-6		18.53	
MW-7		18.83	
MW-8		18.41	
MW-9		18.57	

### INTERPRETATION OF LABORATORY RESULTS

The groundwater analytical results for the July 1999 and October 1999 round of groundwater monitoring are contained in the table below.

	benzene	toluene	ethylbenzene	xylene	tetrachloroethane	naphthalene	Alkyl - benzene s
7/26/99							
MW-1	< 10	< 10	70	50	< 10	980	920
MW-2	< 1	< 1	< 1	< 1	17	< 5	< 10
MW-3							
MW-4							
10/25/99							
	benzene	toluene	ethylbenzene	xylene	tetrachloroethane	naphthalene	Alkyl - benzene s
MW-5	< 1	< 1	< 1	< 1	< 2	< 5	< 1
MW-6	< 10	< 10	20	< 10	< 10	460	210
MW-7	< 10	< 10	30	40	< 10	560	310
MW-8	< 10	< 10	50	20	< 10	500	220
MW-9	< 1	< 1	< 1	< 1	6	< 5	< 1

*m.w.3 peaks in lab*

The compounds that are present in the groundwater of the site, and their relative proportions, are consistent with fuel oil contamination.

### PLUME DEFINITION

Extent of Plume - The groundwater contamination at the site is concentrated in the area of the former UST. The contaminant plume is shown on the contaminant isopleth map.

Migration Pathways - As discussed above the soils at this site consist of fine to medium, sands and gravels. The migration pathways at the site are the interstitial pore spaces in these soils. Since the soils are relatively homogenous it can be assumed that migration is relatively constant throughout each soil interval.

Potential for Natural Attenuation – In the opinion of SVE this site has characteristics which will positively influence the rate of natural attenuation.

The site's gravelly soils discourage adsorption and appear to have a moderate to high hydraulic conductivity. This in combination with the hydraulic gradient results in a moderate groundwater velocity in the area. Physical characteristics such as low soil adsorption and moderate groundwater velocity enhance the rate of natural attenuation.

### FREE PRODUCT

Free product was encountered in MW-1 during the July round of groundwater sampling. Free product recovery was commenced immediately using sorbent pads in MW-1. Since installing the sorbent pads no free product has been encountered. Although it is possible that all free product was removed quickly by the sorbent pads it is also probable that presence of free product is a function of the water table at the site, which has increased since July.

*about 1" for F.P. VT Yankee is monitoring*

### HYDROGEOLOGY

Depth to GW	GW Flow Direction	Hydraulic Gradient	Estimated K
19'	east	2%	$10^{-3}$ feet/sec

Utility corridors are not likely to influence contaminant migration at this site since these are at depths of no greater than 8' (based on a recent GPR survey) and the depth to groundwater is approximately 19'.

### CONTAMINANT FATE AND TRANSPORT

#### Rate of Migration

A seepage rate of 4.93 ft/day has been calculated as follows:

hydraulic conductivity =  $1 \times 10^{-3}$  ft/sec  
 porosity = 35%  
 hydraulic gradient = 2%

## RECEPTORS

	<u>Yes</u>	<u>No</u>	<u>Notes</u>
Wellhead Protection Areas		X	
Drinking water wells		X	
surface waters		X	
buildings with basements	X		
wetlands		X	
ecologically sensitive areas		X	
areas of direct soil contact		X	
utility corridors		X	

The area of contamination is directly adjacent to the footings for the turbine building of the VT Yankee Nuclear power plant. Although a portion of the turbine building does have a basement, the portion of the building adjacent to the area of contamination does not. This portion of the building is of "slab on grade" construction.

A visual inspection was conducted of the basement walls is that portion of the basement closest to the area of contamination (approximately 60' on-gradient). The walls were clearly without any open cracks or holes. VT Yankee staff indicated that a very serious effort is taken to be sure that there are no open cracks or holes in any of the walls of the plant, for fire safety purposes.

## CONCLUSIONS

- The release of petroleum from one, or more, of the former UST's has contaminated the soil in the area in which the UST's were formerly located, and has contaminated groundwater in a near surface overburden aquifer.
- PCE has been released into the site groundwater in the area of investigation. The McLaren Hart report suggests that this contamination may have been the result of drum storage in the impacted area. The level of PCE found is very low (just above drinking water standards). The pattern of PCE contamination in the site groundwater had not been consistent. It is the opinion of SVE that PCE levels in various wells must change seasonally with groundwater level changes. Quarterly groundwater monitoring will be necessary to fully understand the extent of PCE contamination of site groundwater
- The onsite drinking water supply is sourced by four onsite drilled bedrock wells. VOC's, in concentrations exceeding drinking water standards, have not been found in any of the wells. As indicted in the McLaren Hart report, VOC's have been detected in water samples from the COB well which is located approximately 750' down-gradient from the former source and contaminant plume. VOC's were present in

detectable quantities in a water sample collected from the site's bathroom tap on May 5, 1999 but were below drinking water standards. This level of contamination has been present in water samples from the COB well for a number of years; VT Yankee is complying with VT ANR - Water Supply Division's request that the COB well be monitored on a quarterly basis.

## RECOMMENDATIONS

- Quarterly groundwater monitoring should begin in Dec. 1999 and should consist of the following:
  - Measurement of groundwater depths and collection of groundwater samples from MW-1, MW-2, MW-3, MW-5, MW-6, MW-7, MW-8, and MW-9. (In the opinion of SVE MW-4 can be excluded from monitoring due to its distance, on gradient, from the contaminant plume).
  - Analysis of each of the groundwater samples for BTEX, MTBE and naphthalene according to EPA Method 8021B.
  - Preparation of a summary report that describes the results of the monitoring. This report will include the groundwater analysis for the round as compared to historical trends, a groundwater contour map, and recommendations for future monitoring.

SVE anticipates that the frequency of monitoring will decrease in the future as the impact of seasonal changes in groundwater elevation fluctuations on groundwater quality are better understood.

072° 33' 00.0" W

072° 32' 00.0" W

072° 31' 00.0" W

072° 30' 00.0" W

042° 48' 00.0" N

042° 48' 00.0" N

# AREA MAP VERMONT YANKEE NUCLEAR POWER PLANT

042° 47' 00.0" N

042° 47' 00.0" N

042° 46' 00.0" N

042° 46' 00.0" N

042° 45' 00.0" N

042° 45' 00.0" N

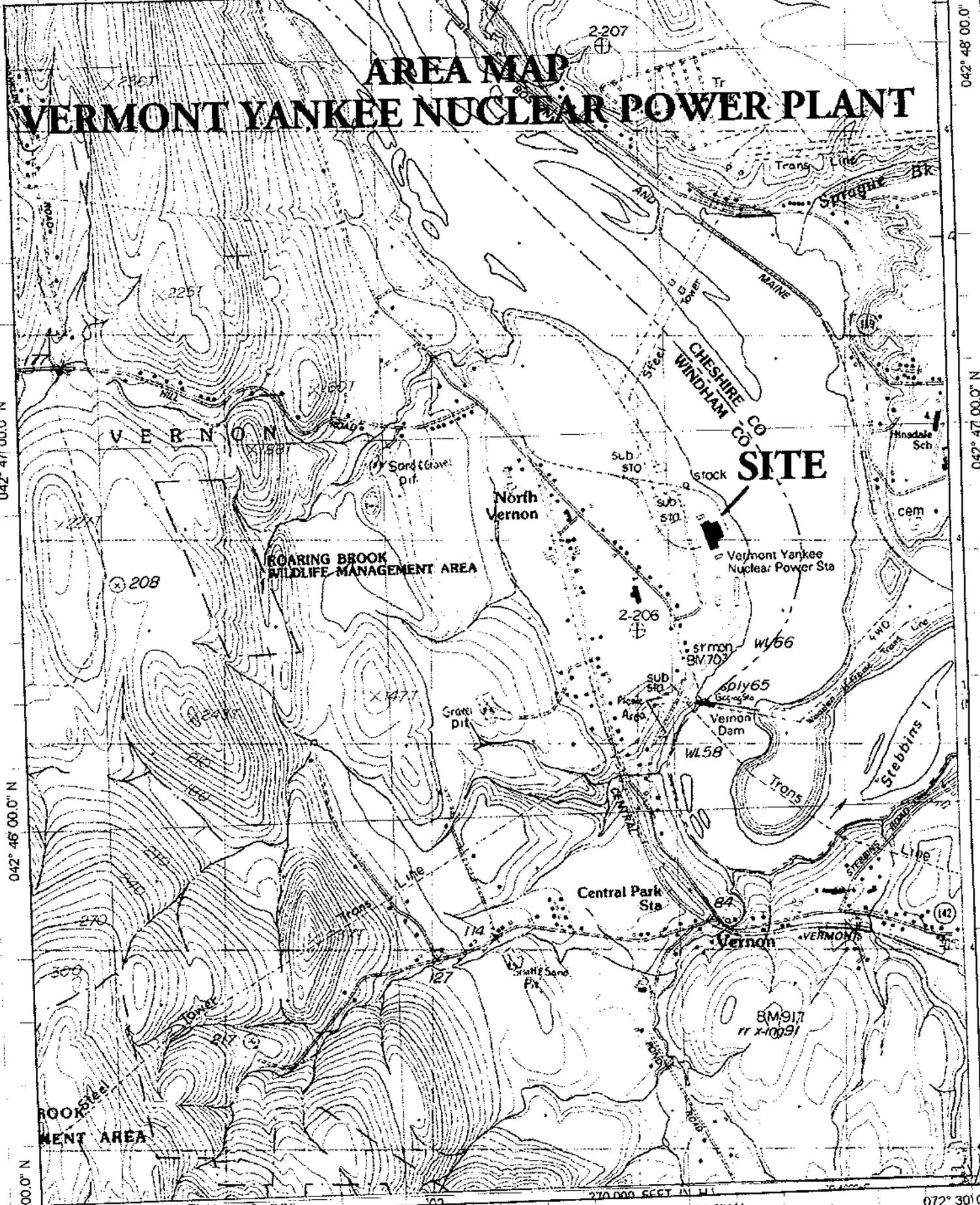
072° 33' 00.0" W

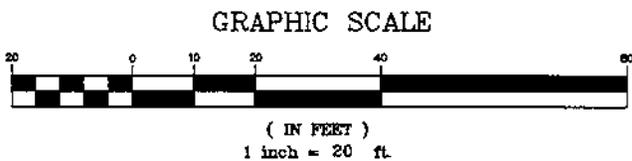
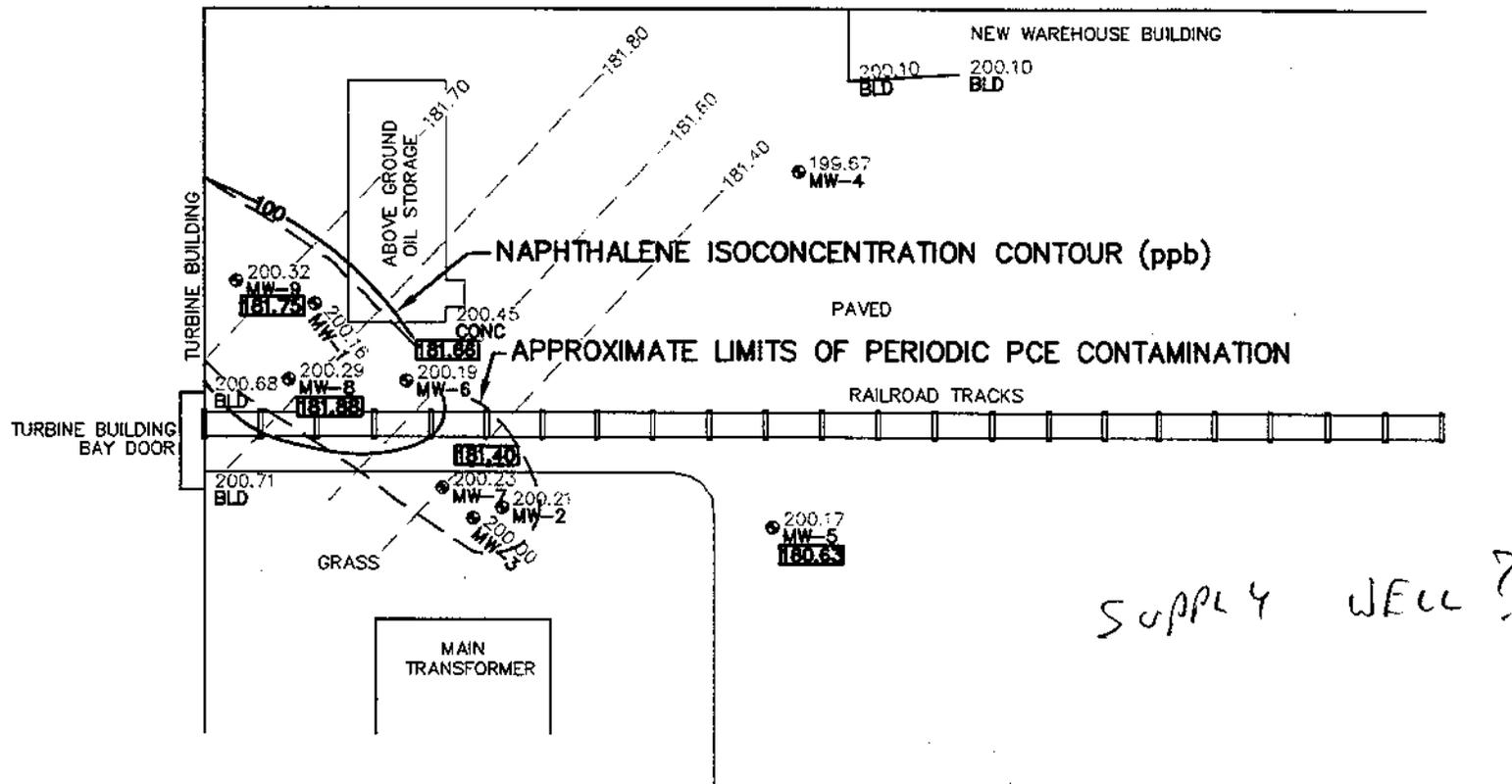
072° 32' 00.0" W

072° 31' 00.0" W

072° 30' 00.0" W

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CONTAMINANT ISOPLETH PLAN  
 PREPARED FOR  
**VERMONT YANKEE  
 NUCLEAR POWER PLANT**

TURBINE BUILDING  
 BAY DOOR AREA

**SVE** Associates

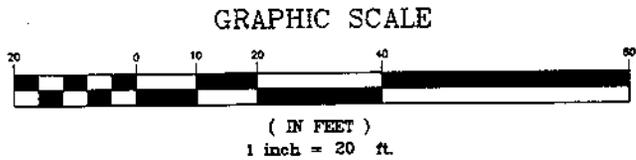
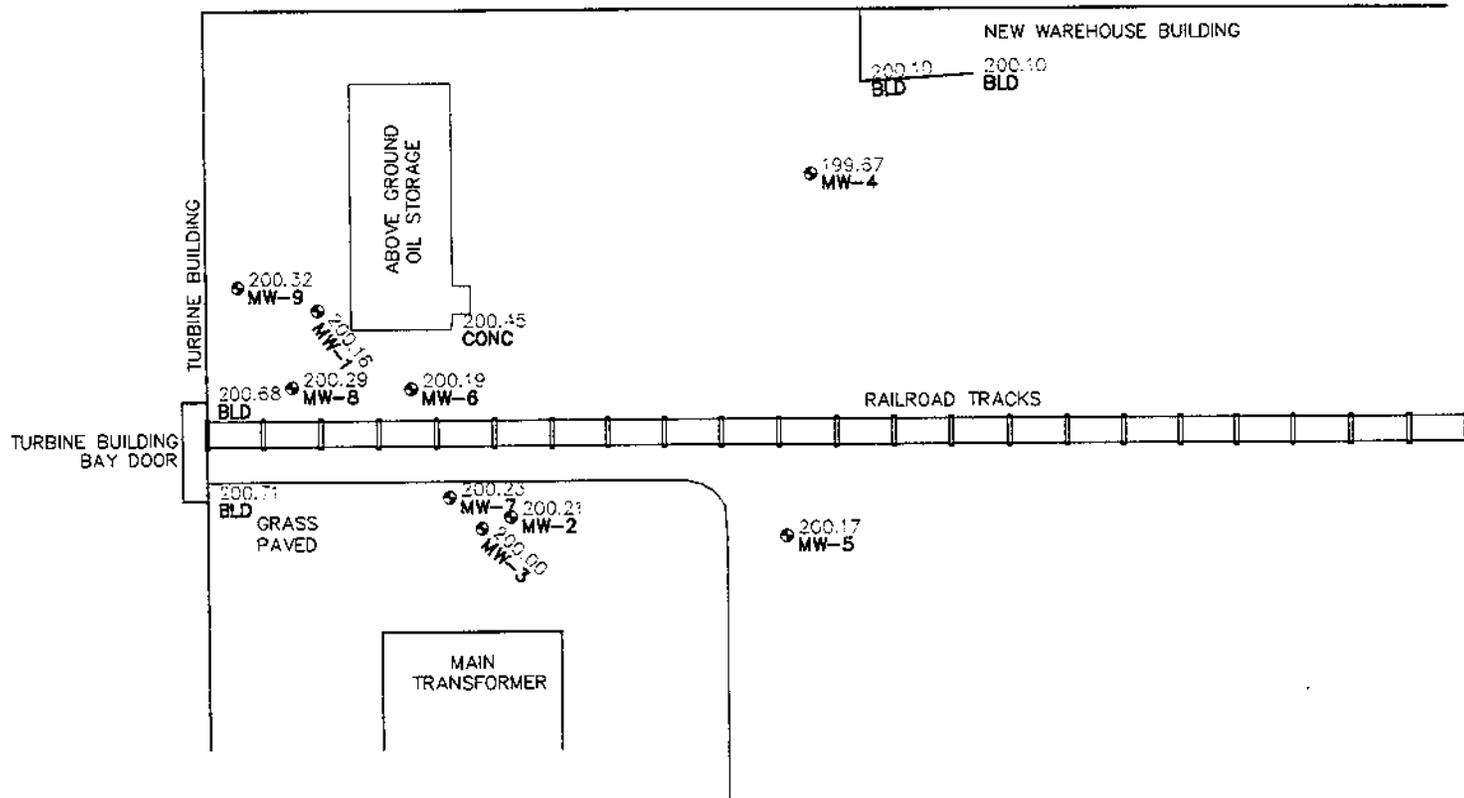
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Engineering      Surveying      Landscape Architecture      Planning  
 28 Mechanic St., Keene, NH 03431      Phone (603) 355-1532      Fax (603) 355-2969

DATE PLAN:  
11-17-1999  
 DATE SURVEY:  
7-14-1999  
 DESIGNED BY:  
N/A  
 DRAWN BY:  
BMM  
 CHECKED BY:  
SLB  
 SCALE:  
1"=20'

PROJ. NO.:  
1888M  
 CAD NO.:  
1888M01

SHEET  
2  
 OF  
2



SITE PLAN  
PREPARED FOR  
**VERMONT YANKEE  
NUCLEAR POWER PLANT**  
TURBINE BUILDING  
BAY DOOR AREA

© 1999

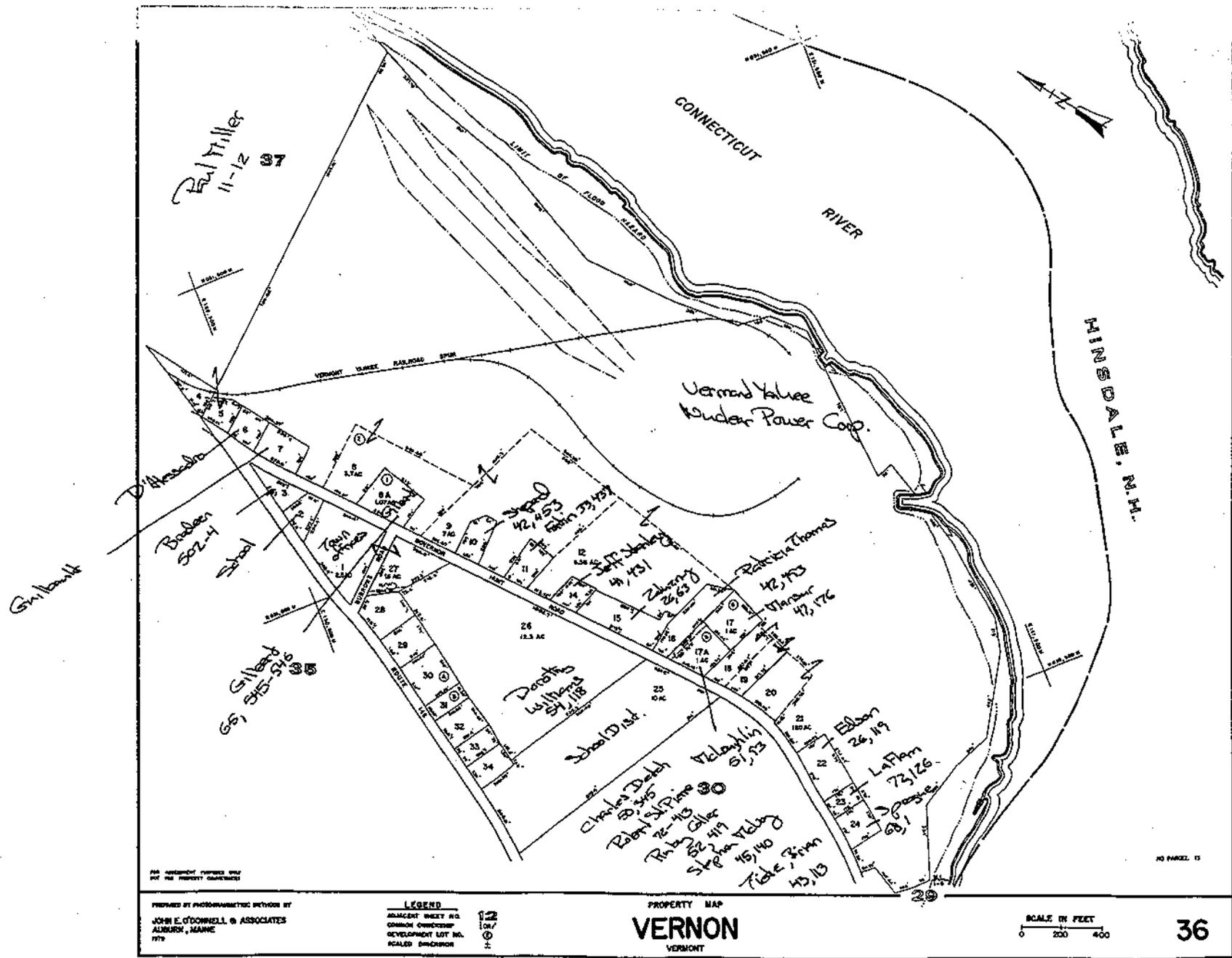
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1"=20'

PROJ. NO.:  
1888M  
CAD NO.:  
1888M01

SHEET  
**1**  
OF  
**2**





# LABORATORY REPORT

Eastern Analytical, Inc. ID#: 17692

Client: SVE Associates- NH

Client Designation: Vermont Yankee

Sample ID:	COB	MW-1	MW-2
Analytical Type:	Sample	Sample	Sample
Matrix:	aqueous	aqueous	aqueous
Date Sampled:	7/16/99	7/16/99	7/16/99
Date Received:	7/21/99	7/21/99	7/21/99
Units:	µg/l	µg/l	µg/l
Date of Analysis:	7/22/99	7/26/99	7/26/99
Analyst:	VG	VG	VG
Method:	8260B	8260B	8260B
Dilution Factor:	1	10	1

Dichlorodifluoromethane	< 5	< 50	< 5
Chloromethane	< 2	< 20	< 2
Vinyl chloride	< 2	< 20	< 2
Bromomethane	< 2	< 20	< 2
Chloroethane	< 5	< 50	< 5
Trichlorofluoromethane	< 5	< 50	< 5
Diethyl ether	< 5	< 50	< 5
Acetone	< 10	< 100	< 10
1,1-Dichloroethene	2	< 10	< 1
Methylene chloride	< 5	< 50	< 5
Carbon disulfide	< 5	< 20	< 5
Methyl-t-butyl ether(MTBE)	< 10	< 10	< 10
trans-1,2-Dichloroethene	< 2	< 10	< 2
1,1-Dichloroethane	< 2	< 10	< 2
2,2-Dichloropropane	< 2	< 10	< 2
cis-1,2-Dichloroethene	< 2	< 10	< 2
2-Butanone(MEK)	< 10	< 100	< 10
Bromochloromethane	< 2	< 10	< 2
Tetrahydrofuran(THF)	< 10	< 100	< 10
Chloroform	< 2	< 10	< 2
1,1,1-Trichloroethane	< 2	< 10	< 2
Carbon tetrachloride	< 2	< 10	< 2
1,1-Dichloropropene	< 2	< 10	< 2
Benzene	< 1	< 10	< 1
1,2-Dichloroethane	< 2	< 10	< 2
Trichloroethene	< 2	< 10	< 2
1,2-Dichloropropane	< 2	< 10	< 2
Dibromomethane	< 2	< 10	< 2
Bromodichloromethane	< 2	< 10	< 2
4-Methyl-2-pentanone(MIBK)	< 10	< 100	< 10
cis-1,3-Dichloropropene	< 2	< 10	< 2
Toluene	< 1	< 10	< 1
trans-1,3-Dichloropropene	< 2	< 10	< 2
1,1,2-Trichloroethane	< 2	< 10	< 2
2-Hexanone	< 10	< 100	< 10
Tetrachloroethene	< 2	< 10	17
1,3-Dichloropropane	< 2	< 10	< 2
Dibromochloromethane	< 2	< 10	< 2
1,2-Dibromoethane	< 2	< 20	< 2
Chlorobenzene	< 2	< 10	< 2



# LABORATORY REPORT

Eastern Analytical, Inc. ID#: 17692

Client: SVE Associates- NH

Client Designation: Vermont Yankee

Sample ID:	COB	MW-1	MW-2
Analytical Type:	Sample	Sample	Sample
Matrix:	aqueous	aqueous	aqueous
Date Sampled:	7/16/99	7/16/99	7/16/99
Date Received:	7/21/99	7/21/99	7/21/99
Units:	µg/l	µg/l	µg/l
Date of Analysis:	7/22/99	7/26/99	7/26/99
Analyst:	VG	VG	VG
Method:	8260B	8260B	8260B
Dilution Factor:	1	10	1
1,1,1,2-Tetrachloroethane	< 2	< 10	< 2
Ethylbenzene	< 1	70	< 1
mp-Xylene	< 1	50	1
o-Xylene	< 1	< 10	< 1
Styrene	< 1	< 10	< 1
Bromoform	< 2	< 20	< 2
iso-Propylbenzene	< 1	30	< 1
Bromobenzene	< 2	< 10	< 2
1,1,2,2-Tetrachloroethane	< 2	< 10	< 2
1,2,3-Trichloropropane	< 2	< 10	< 2
n-Propylbenzene	< 1	50	< 1
2-Chlorotoluene	< 2	< 10	< 2
4-Chlorotoluene	< 2	< 10	< 2
1,3,5-Trimethylbenzene	< 1	210	< 1
tert-Butylbenzene	< 1	< 10	< 1
1,2,4-Trimethylbenzene	< 1	500	< 1
sec-Butylbenzene	< 1	20	< 1
1,3-Dichlorobenzene	< 1	< 10	< 1
p-isopropyltoluene	< 1	60	< 1
1,4-Dichlorobenzene	< 1	< 10	< 1
1,2-Dichlorobenzene	< 1	< 10	< 1
n-Butylbenzene	< 1	50	< 1
1,2-Dibromo-3-chloropropane	< 2	< 20	< 2
1,2,4-Trichlorobenzene	< 1	< 10	< 1
Hexachlorobutadiene	< 1	< 10	< 1
Naphthalene	< 5	980	< 5
1,2,3-Trichlorobenzene	< 1	< 10	< 1





# LABORATORY REPORT

Eastern Analytical, Inc. ID#: 18865

Client: SVE Associates- NH

Client Designation: Vermont Yankee

Sample ID:	VY 4.5	VY 4.6	VY 4.7	VY 4.8	VY 4.9
Analytical Type:	Sample	Sample	Sample	Sample	Sample
Matrix:	aqueous	aqueous	aqueous	aqueous	aqueous
Date Sampled:	10/25/99	10/25/99	10/25/99	10/25/99	10/25/99
Date Received:	10/27/99	10/27/99	10/27/99	10/27/99	10/27/99
Units:	µg/l	µg/l	µg/l	µg/l	µg/l
Date of Analysis:	11/5/99	11/5/99	11/5/99	11/5/99	11/5/99
Analyst:	JDS	JDS	JDS	JDS	JDS
Method:	8260B	8260B	8260B	8260B	8260B
Dilution Factor:	1	10	10	10	1

Dichlorodifluoromethane	< 5	< 50	< 50	< 50	< 5
Chloromethane	< 2	< 20	< 20	< 20	< 2
Vinyl chloride	< 2	< 20	< 20	< 20	< 2
Bromomethane	< 2	< 20	< 20	< 20	< 2
Chloroethane	< 5	< 50	< 50	< 50	< 5
Trichlorofluoromethane	< 5	< 50	< 50	< 50	< 5
Diethyl ether	< 5	< 50	< 50	< 50	< 5
Acetone	< 10	< 100	< 100	< 100	< 10
1,1-Dichloroethene	< 1	< 10	< 10	< 10	< 1
Methylene chloride	< 5	< 50	< 50	< 50	< 5
Carbon disulfide	< 5	< 20	< 20	< 20	< 5
Methyl-t-butyl ether(MTBE)	< 10	< 10	< 10	< 10	< 10
trans-1,2-Dichloroethene	< 2	< 10	< 10	< 10	< 2
1,1-Dichloroethane	< 2	< 10	< 10	< 10	< 2
2,2-Dichloropropane	< 2	< 10	< 10	< 10	< 2
cis-1,2-Dichloroethene	< 2	< 10	< 10	< 10	< 2
2-Butanone(MEK)	< 10	< 100	< 100	< 100	< 10
Bromochloromethane	< 2	< 10	< 10	< 10	< 2
Tetrahydrofuran(THF)	< 10	< 100	< 100	< 100	< 10
Chloroform	< 2	< 10	< 10	< 10	< 2
1,1,1-Trichloroethane	< 2	< 10	< 10	< 10	< 2
Carbon tetrachloride	< 2	< 10	< 10	< 10	< 2
1,1-Dichloropropene	< 2	< 10	< 10	< 10	< 2
Benzene	< 1	< 10	< 10	< 10	< 1
1,2-Dichloroethane	< 2	< 10	< 10	< 10	< 2
Trichloroethene	< 2	< 10	< 10	< 10	< 2
1,2-Dichloropropane	< 2	< 10	< 10	< 10	< 2
Dibromomethane	< 2	< 10	< 10	< 10	< 2
Bromodichloromethane	< 2	< 10	< 10	< 10	< 2
4-Methyl-2-pentanone(MIBK)	< 10	< 100	< 100	< 100	< 10
cis-1,3-Dichloropropene	< 2	< 10	< 10	< 10	< 2
Toluene	< 1	< 10	< 10	< 10	< 1
trans-1,3-Dichloropropene	< 2	< 10	< 10	< 10	< 2
1,1,2-Trichloroethane	< 2	< 10	< 10	< 10	< 2
2-Hexanone	< 10	< 100	< 100	< 100	< 10
Tetrachloroethene	< 2	< 10	< 10	< 10	6
1,3-Dichloropropane	< 2	< 10	< 10	< 10	< 2
Dibromochloromethane	< 2	< 10	< 10	< 10	< 2
1,2-Dibromoethane	< 2	< 20	< 20	< 20	< 2
Chlorobenzene	< 2	< 10	< 10	< 10	< 2



# LABORATORY REPORT

Eastern Analytical, Inc. ID#: **18865**

Client: **SVE Associates- NH**

Client Designation: **Vermont Yankee**

Sample ID:	VY 4.5	VY 4.6	VY 4.7	VY 4.8	VY 4.9
<b>Analytical Type:</b>	Sample	Sample	Sample	Sample	Sample
<b>Matrix:</b>	aqueous	aqueous	aqueous	aqueous	aqueous
<b>Date Sampled:</b>	10/25/99	10/25/99	10/25/99	10/25/99	10/25/99
<b>Date Received:</b>	10/27/99	10/27/99	10/27/99	10/27/99	10/27/99
<b>Units:</b>	µg/l	µg/l	µg/l	µg/l	µg/l
<b>Date of Analysis:</b>	11/5/99	11/5/99	11/5/99	11/5/99	11/5/99
<b>Analyst:</b>	JDS	JDS	JDS	JDS	JDS
<b>Method:</b>	8260B	8260B	8260B	8260B	8260B
<b>Dilution Factor:</b>	1	10	10	10	1
1,1,1,2-Tetrachloroethane	< 2	< 10	< 10	< 10	< 2
Ethylbenzene	< 1	<b>20</b>	<b>30</b>	<b>50</b>	< 1
mp-Xylene	< 1	< 10	<b>40</b>	<b>20</b>	< 1
o-Xylene	< 1	< 10	< 10	< 10	< 1
Styrene	< 1	< 10	< 10	< 10	< 1
Bromoform	< 2	< 20	< 20	< 20	< 2
iso-Propylbenzene	< 1	<b>20</b>	<b>20</b>	<b>10</b>	< 1
Bromobenzene	< 2	< 10	< 10	< 10	< 2
1,1,2,2-Tetrachloroethane	< 2	< 10	< 10	< 10	< 2
1,2,3-Trichloropropane	< 2	< 10	< 10	< 10	< 2
-Propylbenzene	< 1	<b>20</b>	<b>20</b>	<b>20</b>	< 1
2-Chlorotoluene	< 2	< 10	< 10	< 10	< 2
4-Chlorotoluene	< 2	< 10	< 10	< 10	< 2
1,3,5-Trimethylbenzene	< 1	<b>40</b>	<b>80</b>	<b>60</b>	< 1
tert-Butylbenzene	< 1	< 10	< 10	< 10	< 1
1,2,4-Trimethylbenzene	< 1	<b>120</b>	<b>180</b>	<b>130</b>	< 1
sec-Butylbenzene	< 1	< 10	< 10	< 10	< 1
1,3-Dichlorobenzene	< 1	< 10	< 10	< 10	< 1
p-isopropyltoluene	< 1	<b>10</b>	<b>10</b>	<b>10</b>	< 1
1,4-Dichlorobenzene	< 1	< 10	< 10	< 10	< 1
1,2-Dichlorobenzene	< 1	< 10	< 10	< 10	< 1
n-Butylbenzene	< 1	< 10	< 10	< 10	< 1
1,2-Dibromo-3-chloropropane	< 2	< 20	< 20	< 20	< 2
1,2,4-Trichlorobenzene	< 1	< 10	< 10	< 10	< 1
Hexachlorobutadiene	< 1	< 10	< 10	< 10	< 1
Naphthalene	< 5	<b>460</b>	<b>560</b>	<b>500</b>	< 5
1,2,3-Trichlorobenzene	< 1	< 10	< 10	< 10	< 1



M & W Soils Engineering Inc.  
Main St. Charlestown, NH 03603

SHEET 1 OF 1  
DATE 10/7/99  
HOLE NO. MW-5  
LINE & STA.  
OFFSET

TO S.V.E. ASSOCIATES ADDRESS BRATTLEBORO, VT  
PROJECT NAME VT YANKEE LOCATION VERNON, VT  
REPORT SENT TO STEVE BRACKETT PROJ. NO.  
SAMPLES RETAINED BY S.V.E. ASSOCIATES OUR JOB NO. 7911-99

GROUND WATER OBSERVATIONS		CASING SAMPLER CORE BAR		SURFACE ELEV.	
AT 24'	AT IMMEDIATELY	HOURS	Type HSA	SS	DATE STARTED 10/7/99
			Size I. D. 4 1/4"	1 1/2"	DATE COMPL. 10/7/99
			Hammer Wt. 140#	BIT	BORING FORMAN M.H. & W.M.
			Hammer Fall 30"		INSPECTOR S. BRACKETT
					SOILS ENGR.

LOCATION OF BORING AS MARKED ON PAVEMENT

Depth	SAMPLE DEPTHS FROM-TO	TYPE OF SAMPLE	Blows per 6" on sampler	MOISTURE DENSITY OR CONSIST.	STRATA CHANGE ELEV.	FIELD SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, cond., hardness, Drilling time, seams and ect.	SAMPLE		
							NO.	PEN.	REC.
					4 1/2"	ASPHALT			
5'				DENSE	6"	BROWN FINE GRAVEL AND CRUSHED STONE			
10'	10' - 12'	SS	4 5 6 5	MED. DENSE		BROWN FINE SAND - TRACE OF FINE GRAVEL	1	24"	6"
15'	15' - 17'	SS	7 8 7 8				2	24"	9"
20'	20' - 22'	SS	3 2 2 2		19'+/-		3	24"	20"
25'	25' - 27'	SS	4 4 5 5	LOOSE - WET		BROWN MEDIUM TO COARSE SAND	4	24"	21"
30'					30"	SET 2" WELL AT 27" TOP OF WELL AT 17" SAND TO 14" BENTONITE TO 12"  MATERIALS USED: 10' OF 2" PVC 0.010" SLOT SCREEN, 20' OF 2" PVC SOLID, 50# OF BENTONITE CHIPS, 150# OF SAND, 40# OF CEMENT MIX, 1 2" GRIPPER, 1 2" PVC CAP, 1 6" CAST IRON MANHOLE, 2 55 GALLON DRUMS W/LIDS			

GROUND SURFACE TO 30'

USED HSA CASING THEN

Sample Type  
D-Dry C-Cored W-Washed  
UP-Unfinished Piston  
TP-Test Pit A-Auger V-Vane Tes  
UT-Undisturbed Thinwall

Proportions Used  
trace 0 to 10%  
little 10 to 20%  
some 20 to 35%  
and 35 to 50%

140 lb. wt. x 30"-fall an 2" O.D. Sampler  
Cohesionless Density  
0-10 Loose  
10-30 Med. Dense  
30-50 Dense  
50+ Very Dense  
Cohesive Consistency  
0-4 Soft 30 + Hard  
4-8 M/Stiff  
8-15 Stiff  
15-30 V-Stiff

summary  
EARTH BORING 30'  
ROCK CORING  
SAMPLES 4  
HOLENO. MW-5

M & W Soils Engineering Inc.  
Main St. Charlestown, NH 03603

SHEET 1 OF 1  
DATE 10/8/99  
HOLE NO. MW-6  
LINE & STA.  
OFFSET

TO S.V.E. ASSOCIATES  
PROJECT NAME VT YANKEE  
REPORT SENT TO STEVE BRACKETT  
SAMPLES RETAINED BY S.V.E. ASSOCIATES  
ADDRESS BRATTLEBORO, VT  
LOCATION VERNON, VT  
PROJ. NO.  
OUR JOB NO. 7911-99

GROUND WATER OBSERVATIONS		CASING	SAMPLER	CORE BAR	SURFACE ELEV.
AT 20'	AT IMMEDIATELY	Hours	Type HSA	SS	DATE STARTED 10/8/99
AT	AT	Hours	Size I. D. 4 1/4"	1 1/2"	DATE COMPL 10/8/99
			Hammer Wt. 140#	BIT	BORING FORMAN M.H. & W.M.
			Hammer Fall 30"		INSPECTOR S. BRACKETT
					SOILS ENGR.

LOCATION OF BORING AS MARKED, NORTH END OF OIL TANK

Depth	SAMPLE DEPTHS FROM-TO	TYPE OF SAMPLE	Blows per 6" on sampler		MOISTURE DENSITY OR CONSIST.	STRATA CHANGE ELEV.	FIELD SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, cond., hardness, Drilling time, seams and ect.	SAMPLE		
								NO.	PEN	REC
						4 1/2"	ASPHALT			
					MED. DENSE	2'	CRUSHED STONE			
5'					DENSE		BROWN FINE GRAVELS			
10'	10' - 12'	SS	8	7		10'+/-		1	24"	15"
			5	5						
					MED. DENSE		BROWN FINE TO MEDIUM SANDS			
15'	15' - 17'	SS	3	2				2	24"	12"
			2	4		16'				
					MED. DENSE		BROWN FINE GRAVELS (FUEL ODOR)			
20'	20' - 22'	SS	4	3		20'		3	24"	16"
			3	2						
					LOOSE TO MED. DENSE - WET		BROWN MEDIUM SANDS			
25'	25' - 27'	SS	5	5		25'		4	24"	21"
			5	6						
30'							NO BEDROCK TO DEPTH SET 2" WELL AT 25'6" TOP OF WELL AT 15'6" SAND TO 13' BENTONITE TO 11'			
							<b>MATERIALS USED:</b> 10' OF 2" PVC 0.010" SLOT SCREEN, 15' OF 2" PVC SOLID, 50# OF BENTONITE CHIPS, 250# OF SAND, 40# OF CEMENT MIX, 1 2" GRIPPER, 1 2" PVC CAP, 1 6" CAST IRON MANHOLE			

GROUND SURFACE TO 27'

USED HSA CASING THEN

Sample Type

D-Dry C-Cored W-Washed  
UP-Unfinished Piston  
TP-Test Pit A-Auger V-Vane Tes  
UT-Undisturbed Thinwall

Proportions Used

trace 0 to 10%  
little 10 to 20%  
some 20 to 35%  
and 35 to 50%

140 lb. wt. x 30"-fall an 2" O.D. Sampler  
Cohesionless Density  
0-10 Loose  
10-30 Med. Dense  
30-50 Dense  
50+ Very Dense

Cohesive Consistency  
0-4 Soft 30 + Hard  
4-8 M/Stiff  
8-15 Stiff  
15-30 V-Stiff

summary

EARTH BORING 27'  
ROCK CORING  
SAMPLES 4  
HOLENO. MW-6

M & W Soils Engineering Inc.  
Main St. Charlestown, NH 03603

SHEET 1 OF 1  
DATE 10/8/99  
HOLE NO. MW-7  
LINE & STA.  
OFFSET

TO S.V.E. ASSOCIATES  
PROJECT NAME VT YANKEE  
REPORT SENT TO STEVE BRACKETT  
SAMPLES RETAINED BY S.V.E. ASSOCIATES  
ADDRESS BRATTLEBORO, VT  
LOCATION VERNON, VT  
PROJ. NO.  
OUR JOB NO. 7911-99

GROUND WATER OBSERVATIONS		CASING SAMPLER CORE BAR		SURFACE ELEV.	
AT 21'	AT 1/2 HOURS	Type HSA	SS	DATE STARTED	10/8/99
AT	AT HOURS	Size I. D. 4 1/4"	1 1/2"	DATE COMPL.	10/8/99
		Hammer Wt. 140#	BIT	BORING FORMAN	M.H. & W.M.
		Hammer Fall 30"		INSPECTOR	S. BRACKETT
				SOILS ENGR.	

LOCATION OF BORING AS MARKED IN PAVEMENT

Depth	SAMPLE DEPTHS FROM-TO	TYPE OF SAMPLE	Blows per 6" on sampler	MOISTURE DENSITY OR CONSIST.	STRATA CHANGE ELEV.	FIELD SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, cond., hardness, Drilling time, seams and ect	SAMPLE		
							NO.	PEN	REC
5'					5"	ASPHALT			
						MED. DENSE CRUSHED STONE			
					3"				
						VERY DENSE BROWN FINE GRAVEL			
10'	10' - 12'	SS	8 7		8' +/-		1	24"	5"
			5 5	LOOSE		BROWN MEDIUM SAND			
15'	15' - 17'	SS	2 2				2	24"	19"
			1 2						
20'	20' - 22'	SS	5 7		20'	SAME MATERIAL	3	24"	21"
			7 6						
25'	25' - 27'	SS	3 4			MED. DENSE WET BROWN MEDIUM TO COARSE SANDS	4	24"	20"
			6 6		25'6"				
30'						NO BEDROCK TO DEPTH			
						SET 2" WELL AT 25'6"			
						TOP OF WELL AT 15'6"			
						SAND TO 13' BENTONITE TO 10'11"			
						<b>MATERIALS USED:</b> 10' OF 2" PVC 0.010" SLOT SCREEN, 15' OF 2" PVC SOLID, 50# OF BENTONITE CHIPS, 250# OF SAND, 40# OF CEMENT MIX, 1 2" GRIPPER, 1 2" PVC CAP, 1 6" CAST IRON MANHOLE			

GROUND SURFACE TO 27'

USED HSA CASING THEN

Sample Type  
D-Dry C-Cored W-Washed  
UP-Unfinished Piston  
TP-Test Pit A-Auger V-Vane  
UT-Undisturbed Thinwall

Proportions Used  
trace 0 to 10%  
little 10 to 20%  
some 20 to 35%  
and 35 to 50%

140 lb. wt. x 30"-fall an 2" O.D. Sampler  
Cohesionless Density  
0-10 Loose  
10-30 Med. Dense  
30-50 Dense  
50+ Very Dense  
Cohesive Consistency  
0-4 Soft 30 + Hard  
4-8 M/Stiff  
8-15 Stiff  
15-30 V-Stiff

summary  
EARTH BORING 27'  
ROCK CORING  
SAMPLES 4  
HOLE NO. MW-7

M & W Soils Engineering Inc.  
Main St. Charlestown, NH 03603

SHEET 1 OF 1  
DATE 10/12/99  
HOLE NO. MW-8  
LINE & STA.  
OFFSET

TO S.V.E. ASSOCIATES  
PROJECT NAME VT YANKEE  
REPORT SENT TO STEVE BRACKETT  
SAMPLES RETAINED BY S.V.E. ASSOCIATES  
ADDRESS BRATTLEBORO, VT  
LOCATION VERNON, VT  
PROJ. NO.  
OUR JOB NO. 7911-99

GROUND WATER OBSERVATIONS		CASING	SAMPLER	CORE BAR	SURFACE ELEV.
AT 24'	AT 1/2 HOURS	Type HSA	SS		DATE STARTED 10/12/99
		Size I. D. 4 1/4"	1 1/2"		DATE COMPL. 10/12/99
		Hammer Wt.	140#	BIT	BORING FORMAN M.H. & W.M.
AT	AT HOURS	Hammer Fall	30"		INSPECTOR S. BRACKETT
					SOILS ENGR.

LOCATION OF BORING AS MARKED, ON PAVEMENT

Depth	SAMPLE DEPTHS FROM-TO	TYPE OF SAMPLE	Blows per 6" on sampler	MOISTURE DENSITY OR CONSIST.	STRATA CHANGE ELEV.	FIELD SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, cond., hardness, Drilling time, seams and ect.	SAMPLE		
							NO.	PEN	REC
					5"	ASPHALT			
				MED. DENSE	2"	CRUSHED STONE			
5'				MED. DENSE		BROWN FINE GRAVEL			
					8"				
10'	10' - 12'	SS	11 9				1	24"	16"
			8 7	MED. DENSE		BROWN FINE SAND WITH AN OCCASIONAL COBBLE (SLIGHT FUEL ODOR)			
15'	15' - 17'	SS	6 6				2	24"	0"
			6 6						
20'	20' - 22'	SS	8 7				3	24"	6"
			4 4	WET		SAME MATERIAL			
25'	25' - 26'6"	SS	23 31		24"	(SAMPLE #4 - ROCK IN SHOE) GREY GRAVELLY SILTS AND SANDS	4	18"	0"
			32	DENSE					
30'					28"	NO BEDROCK TO DEPTH			
						SET 2" WELL AT 28' TOP OF WELL AT 18' SAND TO 16' BENTONITE TO 14'			
						MATERIALS USED: 10' OF 2" PVC 0.010" SLOT SCREEN, 20' OF 2" PVC SOLID, 50# OF BENTONITE CHIPS, 250# OF SAND, 40# OF CEMENT MIX, 1 2" GRIPPER, 1 2" PVC CAP, 1 6" CAST IRON MANHOLE			

GROUND SURFACE TO 28' USED HSA CASING THEN

<b>Sample Type</b> D-Dry C-Cored W-Washed UP-Unfinished Piston TP-Test Pit A-Auger V-Vane Tes UT-Undisturbed Thinwall	<b>Proportions Used</b> trace 0 to 10% little 10 to 20% some 20 to 35% and 35 to 50%	140 lb. wt. x 30"-fall an 2" O.D. Sampler <b>Cohesionless Density</b> 0-10 Loose 10-30 Med. Dense 30-50 Dense 50+ Very Dense	<b>Cohesive Consistency</b> 0-4 Soft 30 + Hard 4-8 M/Stiff 8-15 Stiff 15-30 V-Stiff	summary
				EARTH BORING 28' ROCK CORING SAMPLES 4 HOLE NO. MW-8

M & W Soils Engineering Inc.  
Main St. Charlestown, NH 03603

SHEET 1 OF 1  
DATE 10/12/99  
HOLE NO. MW-9  
LINE & STA.  
OFFSET

TO S.V.E. ASSOCIATES  
PROJECT NAME VT YANKEE  
REPORT SENT TO STEVE BRACKETT  
SAMPLES RETAINED BY S.V.E. ASSOCIATES  
ADDRESS BRATTLEBORO, VT  
LOCATION VERNON, VT  
PROJ. NO.  
OUR JOB NO. 7911-99

GROUND WATER OBSERVATIONS		CASING	SAMPLER	CORE BAR	SURFACE ELEV.
AT 25'	AT 1/2 HOURS	HSA	SS		DATE STARTED 10/12/99
		Type			DATE COMPL. 10/12/99
		Size I. D.	4 1/4"	1 1/2"	BORING FORMAN M.H. & W.M.
		Hammer Wt.		140#	INSPECTOR S. BRACKETT
		Hammer Fall		30"	SOILS ENGR.

LOCATION OF BORING AS MARKED, IN PAVEMENT

Depth	SAMPLE DEPTHS FROM-TO	TYPE OF SAMPLE	Blows per 6" on sampler	MOISTURE DENSITY OR CONSIST.	STRATA CHANGE ELEV.	FIELD SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, cond., hardness, Drilling time, seams and ect.	SAMPLE		
							NO.	PEN.	REC.
5'					3 1/2"	ASPHALT			
				MED. DENSE		CRUSHED STONE			
					3'				
10'				MED. DENSE		BROWN FINE GRAVEL			
	10' - 12'	SS	11 9	9 8	6'				1 24" 22"
15'									
	15' - 17'	SS	4 11	8 13					2 24" 20"
20'									
	20' - 22'	SS	18 17	18 15	20'+/-				3 24" 20"
25'				DENSE - WET		GREY GRAVELLY SILTS AND SANDS WITH COBBLES			
	25' - 27'	SS	13 9	10 10	24'+/-				4 24" 23"
30'				MED. DENSE WET		BROWN FINE SANDS			
					28'				
						NO BEDROCK TO DEPTH			
						SET 2" WELL AT 28' TOP OF WELL AT 18' SAND TO 15'6" BENTONITE TO 13'5"			

GROUND SURFACE TO 28' USED HSA CASING THEN

Sample Type D-Dry C-Cored W-Washed UP-Unfinished Piston TP-Test Pit A-Auger V-Vane UT-Undisturbed Thinwall	Proportions Used trace 0 to 10% little 10 to 20% some 20 to 35% and 35 to 50%	140 lb. wt. x 30"-fall an 2" O.D. Sampler Cohesionless Density 0-10 Loose 10-30 Med. Dense 30-50 Dense 50+ Very Dense	Cohesive Consistency 0-4 Soft 30 + Hard 4-8 M/Stiff 8-15 Stiff 15-30 V-Stiff	summary
				EARTH BORING 28' ROCK CORING SAMPLES 4 HOLE NO. MW-9

# SVE ASSOCIATES

28 MECHANIC ST.  
 KEENE, NH 03431  
 PHONE 603-355-1532  
 FAX 603-355-2969  
 svek@top.monad.net

# LETTER OF TRANSMITTAL

TO

*Grard Noyes*  
*ANR/SMS*

DATE <i>Dec 9 12/7</i>	JOB NO.
ATTENTION	
RE:	

WE ARE SENDING YOU  Attached  Under separate cover via \_\_\_\_\_ the following items:

- Shop drawings       Prints       Plans       Samples       Specifications  
 Copy of letter       Change order       \_\_\_\_\_

COPIES	DATE	NO.	DESCRIPTION
<i>1</i>	<i>12/7</i>		<i>UY Site Investigation Report</i>

THESE ARE TRANSMITTED as checked below:

- For approval       Approved as submitted       Resubmit \_\_\_\_\_ copies for approval  
 For your use       Approved as noted       Submit \_\_\_\_\_ copies for distribution  
 As requested       Returned for corrections       Return \_\_\_\_\_ corrected prints  
 For review and comment       \_\_\_\_\_  
 FOR BIDS DUE \_\_\_\_\_ 19 \_\_\_\_\_       PRINTS RETURNED AFTER LOAN TO US

REMARKS \_\_\_\_\_

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COPY TO \_\_\_\_\_

SIGNED: *[Signature]*