40-85

HYDROGEOLOGICAL REPORT ON THE TOWN OF RYE SANITARY LANDFILL

June, 1985

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INTRODUCTION

The Town of Rye, New Hampshire initiated operation of a municipal landfill at the intersection of Lafayette Road and Breakfast Hill Road in 1976. For a short period of time, the landfill was operated without benefit of any linear and other presently accepted operational procedures. However, the operation was changed to lined trenchs which now cover the major portion of the site.

Operation as an active landfill was completed by July 1, 1985. During that time, both municipal trash and incinerator ash from Pease Air Force Base was deposited at the site. All the ash was deposited in areas where a natural silt liner has been placed prior to placing trash. The base of the landfill was lined with finer grained sediments to try to limit leachate to the site. A sample of the liner materials was provided to our Staff Hydrogeologist for analysis. The material is a fine sand with approximately thirty percent silt content.

Appendix H is a map prepared by John W. Durgin, P.E. depicting the original topography, proposed final topography and a proposed fence to cut down view of the operation from Lafayette Road (U.S. Rte. 1). By the time operations ceased most of the eastern portion of the property had been filled to capacity. However, the natural material in the west-southwest portion of the property had been used as a cover material and, therefore, constitutes a large area which should be filled as part of the site closure. Appendix B is a topographic map of the site prepared by DuBois & King, Inc. depicting the site topography as found during the summer of 1984. For comparison to the Durgin plan, DuBois & King, Inc.'s contours are labelled approximately 12 feet higher than those for Durgin (i.e., Durgin elevation 72 equals approximately DuBois & King, Inc.'s elevation 84).

The Town of Rye has used this site as a landfill as part of a lease agreement. In 1986, the lease will expire. At that time, the landfill will need to be closed in accordance with current state regulation. Accordingly, the Town of Rye contracted with DuBois & King, Inc. to perform an initial hydrogeologic study including groundwater monitoring. This report is the result of that study. Additionally, the Town has contracted with DuBois & King, Inc. to perform a second round of groundwater quality sampling, contingent of State concurrence, and prepare a final closure plan in accordance with State of New Hampshire requirements.

BEDROCK, SURFICIAL GEOLOGY, AND TEXTURAL VARIATION

A number of bedrock outcrops can be observed just to the west of the site. They show the underlying bedrock to be a fine-grained biotite gneiss which exhibits well-developed northeast-southwest foliation. The State geologic map identifies this unit as Zone G of the Rye Formation. The bedrock is fractured and intruded by many pegmatite and basalt dikes.

The surficial geology is composed of stratified sands and gravels. Bedding is very well developed, and the sediments are well sorted. These are typical glacial outwash materials.

The alternate layers of sands and gravels are the most obvious small-scale textural variation. This has the effect of creating a difference between horizontal and vertical permeabilities. There is also a large-scale textural variation with coarser materials at the north end of the pit and finer materials at the south end. This is accompanied by a greater degree of sorting in the south end. Large boulders are found all over the site but are especially evident in the northwest corner of the pit.

SEISMIC REFRACTION SURVEY

The first phase of the geophysical and geohydrologic study at the Rye, New Hampshire landfill was a seismic refraction survey of the site. The objective of the survey was to identify the depths to bedrock and other intervening layers so that the topography of the bedrock surface could be determined. This information was then used to site groundwater monitoring wells. Tests were performed utilizing a Bison Model 1570-B seismic timer. Vibration energy sources for the testing were generated by hammer impacts.

A total of eleven tests were conducted. The raw data from the tests is presented in Appendix c as travel times, time-travel plots, and bedrock depth calculations. In most cases, the time-distance profiles were straightforward and yielded good results. Test reversals were run to insure that the velocities obtained were correct and to determine the inclination of the bedrock surface.

In several test locations, problems were encountered due to background seismic noise. Testing on the eastern perimeter of the landfill was affected by vibration resulting from traffic on Route 1. This limitation was overcome by conducting tests in an open field on the east side of Route 1, across from the landfill.

Depths to bedrock were calculated for each seismic profile (see Appendix A). A transit survey was run along each seismic test line to establish bedrock elevations relative to a common benchmark. The resultant bedrock surface elevations are presented on in Appendix D - Rye, New Hampshire Landfill Seismic Study.

The overall bedrock topography is uneven and slopes to the east. A slight concavity is also evident as shown on the map. This is confirmed by bedrock outcroppings to the east and northeast of the site, and by test pit excavations performed in the landfill. It appears that the landfill is located in the upper reaches of a bedrock basin, quite close to a groundwater divide.

The seismic data shows no evidence of impeding soil strata such as glacial till overlying the bedrock. Additionally, the seismic velocities in the bedrock itself are relatively low which suggests that the rock is fractured. Judging from the soil material exposed around the landfill, the bedrock is probably overlain with coarse-grained, highly permeable materials throughout. The limited recharge area and fractured bedrock would explain the lack of groundwater on the bedrock surface over much of the landfill site.

SOIL BORING SURVEY AND MONITORING WELL INSTALLATION

A soil boring survey was performed at the Rye, New Hampshire landfill site to accurately access the hydrogeologic conditions at the site and to provide bore holes for groundwater monitoring wells. Soil boring and bedrock coring was performed by personnel from Soils Engineering, Inc. of Charlestown, New Hampshire.

The results of the seismic testing were used as a basis for locating borings/monitoring wells and were approved by the State of New Hampshire during an August 23, 1984 meeting. In general, monitoring wells are located in landfill sites such that one well is located up-gradient of the disposal area and three down-gradient. The seismic study showed that the underlying bedrock sloped in an easterly direction and since groundwater generally flows along the bedrock slope, the borings were located accordingly. Seven holes were bored to refusal and then cored an additional five to ten feet to verify bedrock. The boring logs are presented in Appendix E. The locations of the soil borings are shown on Map I.

Split-spoon samples were taken at five foot intervals in each of the bore holes. Evaluation of the samples showed that in six of the seven borings, the sediments were composed of sands and gravels of relatively high permeability. In boring 8A, located in the southern portion of the landfill, the sands and gravels were underlain by a thin layer of silty clay.

Bedrock contours generated from the boring logs are shown in Appendix F. Depth to bedrock measurements indicated a shallower bedrock profile than had been calculated from the results of seismic testing. This is due to velocity inversions which are not uncommon in stratified glacial sediments.

Water table elevations were measured in each of the bore holes on November 6, 1984 using an electric well probe. Bore holes 3A, 2A, 8A and 7A were dry. Up-gradient well #1, contained water as well as the down-gradient wells 4A and 6A. Water table measurements were used to develop the groundwater contours shown in Appendix F. The contours show the groundwater table sloping in a south-southwesterly direction.

Monitoring wells were installed in the bore holes to allow subsequent water quality sampling and water table elevation determinations. The wells consist of 1 1/2-inch PVC, slotted the full depth of the water table. The bore hold anulli were backfilled with silica sand sealed with bentonite. Locking steel caps were cemented in place for security purposes. A diagram showing a typical monitoring well installation is presented in Appendix G.

WATER QUALITY

A groundwater sampling program has been initiated at the Rye, New Hampshire landfill. Water samples were obtained on November 6, 1984 from the monitoring wells located at the landfill site and analyzed for volatile organic compounds using a gas chromatograph (GC) screen, pH, specific conductivity, COD, chlorides, nitrate-nitrogen, iron and manganese. Three off-site water samples from downgradient private wells have been analyzed.

Sampling Procedure

These monitoring wells containing groundwater were purged of approximately ten well volumes prior to sample collection. Samples were obtained from the monitoring wells using an air squeeze pump, peristaltic pump, or PVC baler, as appropriate. All equipment was flushed with deionized water before and after each sample was collected.

At the time of sampling wells 1, 4A, 6A and 8A contained water. However, well 8A contained only three inches of water and a sample could not be sampled.

Sampling Results

The results of the water quality testing are presented in Appendix H, including sample results from the three nearby private wells. It is evident that the landfill has had a measurable impact on groundwater quality. High conductivity readings and the presence of elevated levels of iron and manganese (common leachate constituents) in wells 1, 4A and 6A show that contamination is occurring in the immediate vicinity of the site.

Volatile organic compounds were also detected in the on-site monitoring wells. These compounds are typically found in petroleum products and cleaning solvents and are relatively common at low levels in landfill leachate.

Of concern is the possibility that the leachate plume may be migrating off-site. Because of the high permeability of the on-site soils and the fractured state of the underlying bedrock, the contamination may not be restricted to the surficial deposits but migrated into the bedrock. This condition can provide a means for rapid migration of contaminated groundwater.

It is difficult to ascertain the full extent of leachate migration using the existing configuration of monitoring wells. The width of the plume at the eastern border of the landfill suggests that leachate has migrated under Route 1 and could possibly have advanced further. At this time, delineation of the plume boundaries can only be speculative. However, the off-site samples show no significant contamination has affected nearby drinking water sources.

CONCLUSIONS

The Rye Landfill at the junction of Breakfast Hill Road and U. S. Route 1 is producing a leachate which is presently degrading groundwater quality in the area of the landfill. The contamination is typical of landfill leachates with high iron, manganese, COD, specific conductance, and low levels of volatile organics. To date, this contamination has not been shown to affect private water supplies in the immediate vicinity.

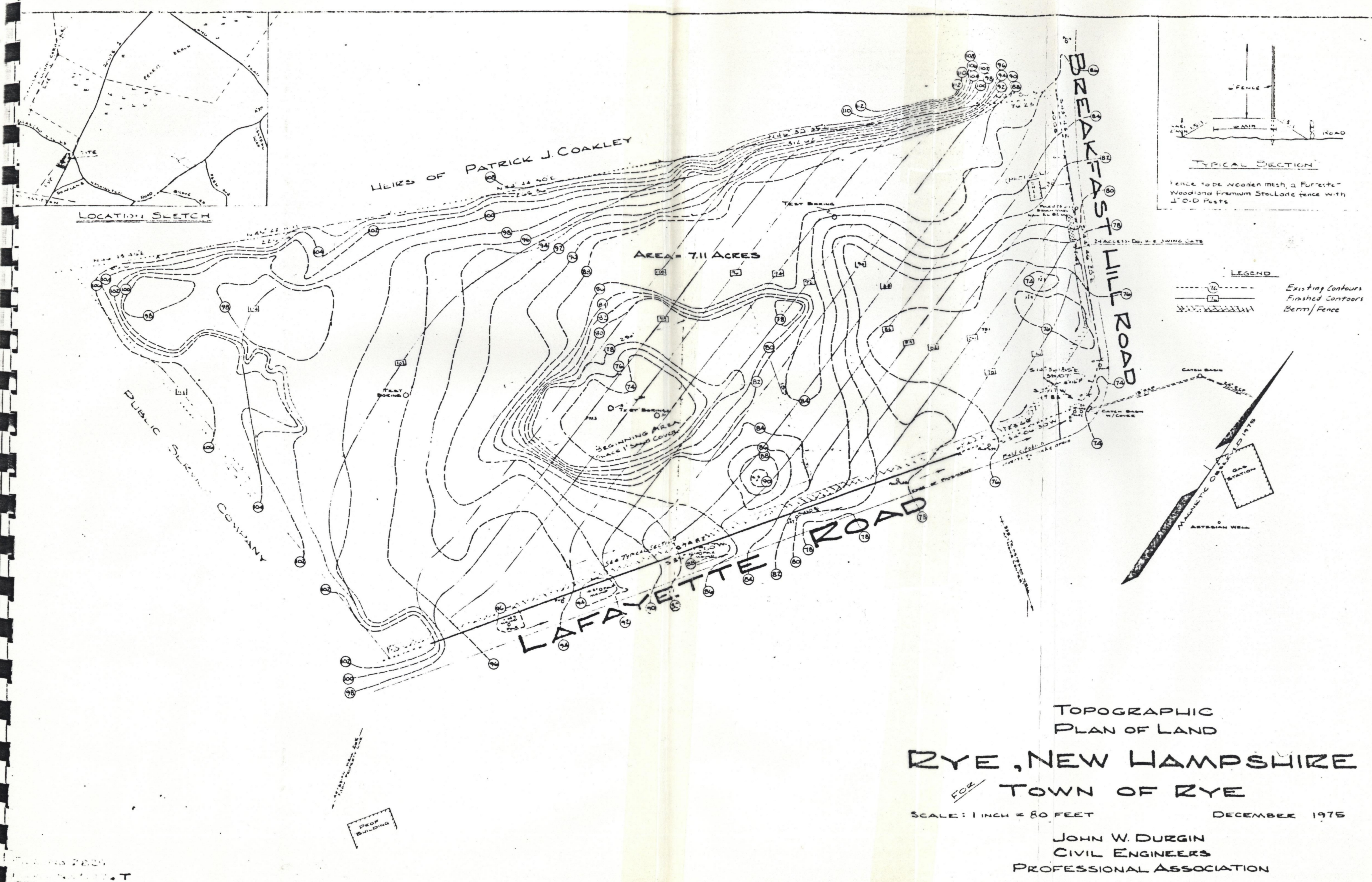
Water table gradients show that groundwater is flowing from the northwest to the southeast, diminishing the possibility that leachate from the Coakley site is responsible for contamination of groundwater at the Town of Rye site. The only way that the Coakley site might influence groundwaters in the Town of Rye Landfill is by flow through fractures in the bedrock. This is a slight possibility, with little possibility of confirmation.

Proper closure of the site with an impermeable cap should virtually eliminate leachate and resultant groundwater contamination. This conclusion is based on the facts that 1) a bedrock divide is believed to be just to the west-northwest of the site, 2) the overburden is coarse and ledge is fractured resulting in rainfall on up-gradient areas entering bedrock quickly, and 3) up-gradient monitoring wells contain no water making trash deposited in the groundwater unlikely.

DuBois & King, Inc. recommends that closure of the site, including an impermeable cap be completed as soon as feasible. In the meantime, the Town of Rye should use its personnel to rough grade the site thereby reducing overall closure costs.

APPENDIX A

JOHN W. DURGIN'S TOPOGRAPHIC MAP


Location Sketch
Heirs of Patrick J. Coakley
Area = 7.11 Acres
Public Service Company
Lafayette Road
Breakfast Hill Road
Test Boring
Beginning Area
Typical Section
Fence to be wooden mesh, a Forester Woodland Premium Stockade fence with 4' O-D Posts
Legend
Existing Contours
Finished Contours
Berm/Fence
Catch Basin
Gas Station
Artesian Well
Prof Building
Topographic
Plan of Land
Rye, New Hampshire
for Town of Rye
Scale: 1 inch = 80 feet
December 1975
John W. Durgin
Civil Engineers
Professional Association

APPENDIX B

DuBOIS & KING, INC.'S 1984 TOPOGRAPHIC MAP OF SITE

SDMS TEMPORARY PLACEHOLDER
US EPA NEW ENGLAND
SUPERFUND DOCUMENT MANAGEMENT SYSTEM

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THE PERMANENT PAGE WILL BE INSERTED BY THE PDF TEAM.

APPENDIX C

SEISMIC REFRACTION SURVEY DATA

Profile 1

Distance (Ft.) (Shock to Geophone)	Time (MS)
10	12.1
20	29.1
30	60.6
40	53.4
50	61.5
60	71.4
70	68.2
80	88.6
90	77.0
100	91.0

Reversal

10	12.1
20	21.0
30	30.1
40	38.8
50	52.6
60	61.8
70	69.8
80	76.0
90	91.0
100	92.2
110	95.0
120	96.0
130	99.0
140	95.0
150	100.0

Profile 2

Distance (Ft.)	Time (MS)
10	8.4
20	16.4
30	25.9
40	28.5
50	39.5
60	45.5
70	48.0
80	55.4
90	62.2
100	69.8
110	76.6
120	80.2
130	85.4
140	89.4
150	89.8

Reversal

10	7.3
20	16.1
30	35.1
60	41.0
70	47.4
80	49.8
90	52.6

Profile 3

Distance (Ft.)	Time (MS
10	6.5
20	11.3
30	14.8
40	20.7
50	24.1
60	32.3
70	45.0
80	51.8
90	41.8
100	34.2
110	41.8
120	41.8
150	47.0
190	43.4

Reversal

25	21.2
50	43.1
75	64.1
100	60.6
125	53.0
150	61.6
175	64.2

Profile 4

Distance (Ft.)	Time (MS)
20	17.1
30	28.1
40	34.7
50	44.8
60	37.4
70	35.4
80	41.0
90	42.2
100	44.2
110	50.6
120	44.2
130	46.2
140	50.6
150	55.0

Reversal

8	4.7
20	16.0
30	25.0
40	33.9
50	43.3
60	51.4
70	50.6
80	34.2
90	41.0
100	40.2
110	51.0
120	37.4
130	43.4
150	57.4

Profile 5

Distance (Ft.)	Time (MS)
10	9.2
20	15.3
30	19.5
40	22.3
50	22.1
60	24.1
70	26.3
80	24.7
90	26.1

Reversal

Distance (Ft.)	Time (MS)
10	7.9
20	-
30	17.5
40	27.3
50	27.9
60	29.1
70	27.7

Profile 7

Distance (Ft.)	Time (MS)
5	4.3
10	8.6
20	7.6
30	9.9
40	10.3
50	10.1
60	12.7
70	13.1
90	15.1
100	15.7

Reversal

5	4.2
10	8.5
25	10.3
40	13.5
50	15.0
60	15.8
70	13.8
80	14.9
90	19.1
100	18.5

Profile 8

Distance (Ft.)	Time (MS)
5	3.5
10	5.5
20	7.7
30	10.2
40	11.3
50	11.0
65	13.0
75	13.8
85	14.3
100	

No Reversal

Profile 9

Distance (Ft.)	Time (MS)
5	4.1
10	7.3
20	7.3
30	7.5
40	8.2
50	9.7
60	9.7
70	10.3
80	10.5
90	11.3
100	12.1

Reversal

Distance (Ft.)	Time (MS)
5	4.0
10	8.8
20	9.3
30	10.1
40	7.5
50	11.5
60	10.5
70	9.1
80	10.1
90	11.1
100	12.1

Profile 10

Distance (Ft.)	Time (MS)
10	4.3
25	19.8
40	29.1
55	37.4
70	47.4
85	37.8
100	39.8
125	45.8
150	45.4

No Reversal

Profile 11

Distance (Ft.)	Time (MS)
25	20.2
50	32.7
60	31.3
75	43.4, 28.6, 25.8
90	48.9, 44.6, 28.6
100	47.8, 41, 37.4

No Reversal

Profile 6

Distance (Ft.)	Time (MS)
10	7.8
20	18.1
30	20.3
40	26.5
50	35.0
60	39.8
70	43.4

No Reversal

ANALYSIS - Profile # 1

- POOR DATA
TOO MUCH NOISE

$V_{1A} = 830$

$V_{1B} = 950$

$V_{2A} = 7000$

$V_{2B} = 7000$

$X_{cA} = 53.0$

$X_{cB} = 86.5$

$T_{iA} = 56.2$

$T_{iB} = 79.2$

$$V_1 = \frac{V_{1A} + V_{1B}}{2} = 890$$

$$D = \frac{X_c}{2}\sqrt{\frac{V_2 - V_1}{V_1 + V_2}} = 37.5 \; ?$$

ANALYSIS - Profile # 2

NOT Possible - POOR DATA
TOO MUCH NOISE

ANALYSIS Profile # 6

NOT Possible - POOR DATA
TOO MUCH NOISE

Analysis - Profile # 3

$V_{1A} = 1825$

$V_{1B} = 1150$

$V_{2A} = 14,000$

$V_{2B} = 1150$

$X_{cA} = 70.0$

$X_{cB} = 65.0$

$Ti_A = 33.0$

$Ti_B = 52.8$

$$V_1 = \frac{V_{1A} + V_{1B}}{2} = 1487.5 \text{ ft/sec}$$

$$\theta = 0.5\left[\sin^{-1}\frac{V_1}{V_{2B}} - \sin^{-1}\frac{V_1}{V_{2A}}\right] = -0.2^\circ$$

$$V_2 = 2\cos\theta\left[\frac{V_{2A}V_{2B}}{V_{2A}+V_{2B}}\right] = 14,482 \text{ ft/sec}$$

$$D_A = \frac{X_{cA}}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} + \frac{X_{cA}}{2}\sin\theta = \boxed{31.57 \text{ ft}}$$

$$D_B = \frac{X_{cB}}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} + \frac{X_{cA}}{2}\sin\theta = \boxed{29.32 \text{ ft}}$$

ANALYSIS - Profile # 4

V_{1A} = 1120

V_{1B} = 1200

V_{2A} = 10,000

V_{2B} = 18,000

X_{CA} = 42.0

X_{CB} = 52.0

Ti_A = 33.2

Ti_B = 40.8

$$V_1 = \frac{V_{1A} + V_{1B}}{2} = 1160 \text{ ft/sec}$$

$$\theta = 0.5\left[\sin^{-1}\frac{V_1}{V_{2B}} - \sin^{-1}\frac{V_1}{V_{2A}}\right] = -1.5^\circ$$

$$V_2 = 2\cos\theta\left[\frac{V_{2A}V_{2B}}{V_{2A}+V_{2B}}\right] = 12,857 \text{ ft/sec}$$

$$D_A = \frac{X_{CA}}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} + \frac{X_{CA}}{2}\sin\theta = \boxed{19.2 \text{ feet}}$$

$$D_B = \frac{X_{CB}}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} + \frac{X_{CB}}{2}\sin\theta = \boxed{23.75 \text{ feet}}$$

ANALYSIS Profile # 5

$V_{1A} = 1300$

$V_{1B} = 1230$

$V_{2A} = 8{,}000$

$V_{2B} = 30{,}000$

$X_{cA} = 26.5$

$X_{cB} = 39.5$

$Ti_A = 17.0$

$Ti_B = 26.4$

$$V_1 = \frac{V_{1A} + V_{1B}}{2} = 1265 \text{ ft/sec}$$

$$\Theta = 0.5\left[\sin^{-1}\frac{V_1}{V_{2B}} - \sin^{-1}\frac{V_1}{V_{2A}}\right] = -3.34°$$

$$V_2 = 2\cos\Theta\left[\frac{V_{2A}V_{2B}}{V_{2A}+V_{2B}}\right] = 12{,}568 \text{ ft/sec}$$

$$D_A = \frac{X_{cA}}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} + \frac{X_{cA}}{2}\sin\Theta = \boxed{11.2 \text{ ft}}$$

$$D_B = \frac{X_{cB}}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} + \frac{X_{cB}}{2}\sin\Theta = \boxed{16.6 \text{ ft}}$$

Analysis Profile # 7

$V_{1A} = 1150$

$V_{1B} = 1200$

$V_{2A} = 12{,}000$

$V_{2B} = 11{,}500$

$X_{cA} = 10.0$

$X_{cB} = 11.0$

$Ti_A = 7.1$

$Ti_B = 8.0$

$$V_1 = \frac{V_{1A} + V_{2B}}{2} = 1175 \text{ feet/sec}$$

$$\theta = 0.5\left[\sin^{-1}\frac{V_1}{V_{2B}} - \sin^{-1}\frac{V_1}{V_{2A}}\right] = 0.12^\circ$$

$$V_2 = 2\cos\theta\left[\frac{V_{2A}V_{2B}}{V_{2A} + V_{2B}}\right] = 11{,}745 \text{ ft/sec}$$

$$D_A = \frac{X_{cA}}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} + \frac{X_{cA}}{2}\sin\theta = \boxed{4.51 \text{ ft}}$$

$$D_B = \frac{X_{cB}}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} + \frac{X_{cB}}{2}\sin\theta = \boxed{4.50 \text{ ft}}$$

Analysis - Profile # 8

$V_1 = 1750$ (NO REVERSAL)

$V_2 = 11,800$

$X_c = 13.0$

$T_i = 6.3$

$$D = \frac{X_c}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} = 5.6$$

Depth = 5.6 ft

Analysis - Profile # 10

(NO REVERSAL)

$V_1 = 1450$

$V_2 = 11,800$

$X_c = 55$

$T_i = 33.0$

$$D = \frac{X_c}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} = 24.3 \text{ feet}$$

ANALYSIS - Profile # 9

$V_{1A} = 1350$

$V_{1B} = 1140$

$V_{2A} = 20{,}000$

$V_{2B} = 23{,}000$

$X_{cA} = 10.0$

$X_{cB} = 10.0$

$T_{iA} = 6.6$

$T_{iB} = 8.0$

$$V_1 = \frac{V_{1A} + V_{1B}}{2} = 1245 \text{ ft/sec}$$

$$\theta = 0.5\left[\sin^{-1}\frac{V_1}{V_{2B}} - \sin^{-1}\frac{V_1}{V_{2A}}\right] = -0.2^\circ$$

$$V_2 = 2\cos\theta\left[\frac{V_{2A}V_{2B}}{V_{2A}+V_{2B}}\right] = 21{,}395 \text{ ft/sec}$$

$$D_A = \frac{X_{cA}}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} + \frac{X_{cA}}{2}\sin\theta = \boxed{4.67 \text{ feet}}$$

$$D_B = \frac{X_{cB}}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} + \frac{X_{cB}}{2}\sin\theta = \boxed{4.8 \text{ feet}}$$

ANALYSIS - Profile #11

$V_1 = 1250$

$V_2 = 8000$

$X_c = 37.0$

$T_i = 25.1$

$$D = \frac{X_c}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}} = \boxed{15.8 \text{ ft}}$$

APPENDIX D

RYE, NEW HAMPSHIRE
LANDFILL SEISMIC STUDY

SDMS TEMPORARY PLACEHOLDER
US EPA NEW ENGLAND
SUPERFUND DOCUMENT MANAGEMENT SYSTEM

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617-918-1440

APPENDIX E

SOIL BORING LOGS

Soils Engineering Inc.

Main St. Charlestown, N. H. 03603

SHEET	1 OF 1
DATE	9-27-84
HOLE NO.	B-1A
LINE & STA.	
OFFSET	

To: Dubois & King — ADDRESS: Concord, NH

PROJECT NAME: Landfill (Closed) — LOCATION: Rye, NH

REPORT SENT TO: Gary Sharon — PROJ. NO.:

SAMPLE SENT TO: Dubois & King — OUR JOB NO.: 2088-84

GROUND WATER OBSERVATIONS

Dry at Immed. Hours

at Hours

	CASING	SAMPLER	CORE BAR.
Type	H.S.A.	2"	
Size I. D.	3 3/8"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV.:
DATE STARTED: 9-27-84
DATE COMPL.: 9-28-84
BORING FOREMAN: M.Domingue
INSPECTOR:
SOILS ENGR.:

LOCATION OF BORING:

Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
							8.0'	Test Pit			
	10'-10'9"	SS	54	75/3"			13.5'	V/Den Br Coarse Sandy Gravel w/Cobbles & Boulders	1	9"	8"
							17.0'	Weathered Ledge - Oxidation			
							19'9"	Solid - Micaceous Ledge			
								Observation Well: Set 20' of 1½" PVC Pipe in Ground w/Last 10' of Slotted and Covered w/Filter Cloth. Ottawa Sand from 8'-19'9" Bentonite Seal @ 5' Depth 3" Steel Protective Casing Grouted In w/Lock			

GROUND SURFACE TO 19'9" USED 19'9" CASING: THEN

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Sample Type
D—Dry C—Cored W—Washed
UP—Undisturbed Piston
T—Test Pit ...

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

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense

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

SUMMARY
Earth Boring 19'9"
Rock Coring
Samples 1

Soils Engineering Inc.
Main St. Charlestown, N. H. 03603

SHEET 1 OF 1
DATE 9-27-84
HOLE NO. B-2A
LINE & STA.
OFFSET

TO Dubois & King ADDRESS Concord, NH
PROJECT NAME Landfill (Closed) LOCATION Rye, NH
REPORT SENT TO Gary Sharon PROJ. NO.
SAMPLE SENT TO Dubois & King OUR JOB NO. 2088-84

GROUND WATER OBSERVATIONS
.... at .... Hours
.... at .... Hours

	CASING	SAMPLER	CORE BAR.
Type	H.S.A.	2"	
Size I. D.	3 3/8"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV.
DATE STARTED 9-27-84
DATE COMPL. 9-28-84
BORING FOREMAN M. Domingue
INSPECTOR
SOILS ENGR.

LOCATION OF BORING:

Depth	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
									Test Pit Den Br Coarse Sandy Gravel w/Cobbles & Boulders			
								8.0'				
									Refusal			
10		10'	SS	50/Blows-No Penetr.				10.0'				
									Roller Bit			
15								15.0'				
									Observation Well: Set 15' of 1½" PVC Pipe in Ground w/Last 10' Slotted and Covered w/Filter Cloth. 18" Stickup Ottawa Sand from 9'-15' Bentonite Seal @ 3' Depth 3" Steel Protective Casing Grouted in w/Cap & Lock			

GROUND SURFACE TO 15.0' USED 15.0' CASING: THEN

Sample Type
D—Dry C—Cored W—Washed
UP—Undisturbed Piston
TP—Test Pit A—Auger V—Vane Test

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

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense

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

SUMMARY
Earth Boring 15.0'
Rock Coring
Samples

Soils Engineering Inc.
Main St. Charlestown, N. H. 03603

To: Dubois & King	ADDRESS: Concord, NH
PROJECT NAME: Landfill (Closed)	LOCATION: Rye, NH
REPORT SENT TO: Gary Sharon	PROJ. NO.
SAMPLE SENT TO: Dubois & King	OUR JOB NO. 2088-84

SHEET	1 OF 1
DATE	9-26-84
HOLE NO.	B-3A
LINE & STA.	
OFFSET	

GROUND WATER OBSERVATIONS

.... at .... Hours

.... at .... Hours

	CASING	SAMPLER	CORE BAR.
Type	H.S.A.	2"	
Size I. D.	3 3/8"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV.	
DATE STARTED	9-26-84
DATE COMPL.	9-26-84
BORING FOREMAN	M. Domingue
INSPECTOR	
SOILS ENGR.	

LOCATION OF BORING:

Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
	5'-6.0'	SS	40	62				No Topsoil	1	12"	12"
								V/Den Br Sandy Silty Coarse Gravel w/Cobbles & Boulders			
	10'-11'6"	SS	68	28	37				2	18"	18"
	14'-14'10"	SS	30	82/4"			14'10"	Refusal	3	10"	7"
								Roller Bit			
							19.0'	Rock V/Solid			
								Observation Well:			
								Set 19' of 1½" PVC Pipe in Ground w/Last 10' Slotted and Covered w/Filter Cloth. Ottawa Sand from 9'-19'. Bentonite Seal @ 6' Depth 12" Stick-up 3" Steel Protective Casing Grouted in w/Lock			

GROUND SURFACE TO 19.0' USED 19.0' "CASING: THEN

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Sample Type
D—Dry C—Cored W—Washed
U—Undisturbed Piston
T—Test Pit A—Auger V—Vane Test

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

Cohesionless Density	
0-10	Loose
10-30	Med. Dense
30-50	Dense

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

SUMMARY
Earth Boring 19.0'
Rock Coring
Samples 3

Soils Engineering Inc.

Main St. Charlestown, N. H. 03603

SHEET	1 OF 1
DATE	9-19-84
HOLE NO.	B-4A
LINE & STA.	
OFFSET	

TO: Dubois & King — ADDRESS: Concord, NH

PROJECT NAME: Landfill (Closed) — LOCATION: Rye, NH

REPORT SENT TO: Gary Sharon — PROJ. NO.:

SAMPLE SENT TO: Dubois & King — OUR JOB NO.: 2088-84

GROUND WATER OBSERVATIONS

12'2" - Immed.after setting well 9-20-84
15'6" at 9-21-84 Hours
17'8" 9-24-84
18.0' 9-25-84
at Hours

	CASING	SAMPLER	CORE BAR.
Type	H.S.A.	2"	
Size I. D.	3 3/8"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV.:
DATE STARTED: 9-19-84
DATE COMPL.: 9-20-84
BORING FOREMAN: M.Domingue
INSPECTOR:
SOILS ENGR.:

LOCATION OF BORING: Next to Rt #1 - Breakfast Hill

Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
								No Topsoil			
								Silty Sandy Gravel w/Many Boulders & Cobbles			
	10'-11'6"	SS	76	58	28		10.0'	Test Pit	1	18"	12"
	15'	SS	100 Blows-No Penetr.					V/Den Br Silty Coarse Gravel w/Many Boulders & Cobbles			
							20.0'	Refusal			
								Roller Bit			
							23.0'				
								Cored w/1 5/8" ID - Broken Barrel @ 28' Depth			
							28.0'				
	Depths	Times						Observation Well: Set 26'3" of 1½" PVC Pipe in Ground w/Last 15' Slotted & Covered w/Filter Cloth. 2' Stick-up - 3" Steel Protective Casing Grouted in w/Lock - Ottawa Sand from 15'-26'3" - Bentonite Seal @ 5' Depth			
	23'-24'	15 min.									
	24'-25'	25 min.									
	25'-26'	40 min. - 6" Recovery									
	26'-27'	31 min.									
	27'-28'	41 min.									

GROUND SURFACE TO 23.0' USED 23.0' CASING: THEN Cored 5.0'

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Sample Type
D—Dry C—Cored W—Washed
UP—Undisturbed Piston
TP—Test Pit ...

Proportions Used			
trace	0	to	10%
little	10	to	20%

Cohesionless Density	
0-10	Loose
10-30	Med. Dense

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

SUMMARY
Earth Boring 23.0'
Rock Coring 5.0'
Samples 1

Soils Engineering Inc.

Main St. Charlestown, N. H. 03603

SHEET 1 OF 2	DATE 9-20-84
HOLE NO. B-6A	LINE & STA.
OFFSET	

[illegible] Dubois & King — ADDRESS Concord, NH

[PROJ]ECT NAME Landfill (Closed) — LOCATION Rye, NH

[REP]ORT SENT TO Gary Sharon — PROJ. NO.

[SAM]PLE SENT TO Dubois & King — OUR JOB NO. 2088-84

GROUND WATER OBSERVATIONS

36'9" at 9-24-84 36 Hours

36'5" - Immed. After Instal Well

36'9" at 9-25-84 Hours

	CASING	SAMPLER	CORE BAR.
Type	H.S.A.	2"	
Size I. D.	3 3/8"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV.

DATE STARTED 9-20-84

DATE COMPL. 9-24-84

BORING FOREMAN M. Domingue

INSPECTOR

SOILS ENGR.

[L]OCATION OF BORING: Next to Rt #1 - Breakfast Hill

Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
								No Topsoil			
								Test Pit Done Next to Boring			
	10'-11'6"	SS	28	24	17			Den. Br Silty Sandy Coarse Gravel w/Cobbles & Small Boulders	1	18"	10"
	15'-16'6"	SS	18	28	56				2	18"	6"
	20'-21'6"	SS	28	52	91				3	18"	12"
	25'-26'6"	SS	38	54	57				4	18"	Lost
	30'-31'6"	SS	48	38	39	Moist			5	18"	13"
							38'6"				
	35'6"-36'	SS	149/6"					Cored from 38'6"-39'4" - Core Barrell Plugged - Ledge V/Soft	6	6"	2"

GROUND SURFACE TO 43'6" USED 43'6" "CASING: THEN Cored 8"

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Sample Type: D—Dry C—Cored W—Washed UP—Undisturbed Piston TP—Test Pit A—Auger V—Vane Test

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

Cohesionless Density	
0-10	Loose
10-30	Med. Dense
30-50	Dense

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

SUMMARY

Earth Boring 43'6"

Rock Coring 8"

Samples 7

HOLE NO. B-6A

Soils Engineering Inc.

Main St. Charlestown, N. H. 03603

SHEET	2 OF 2
DATE	9-20-84
HOLE NO.	B-6A
LINE & STA.	
OFFSET	

[TO] Dubois & King — ADDRESS Concord, NH

[PR]OJECT NAME Landfill (Closed) — LOCATION Rye, NH

[REP]ORT SENT TO Gary Sharon — PROJ. NO.

[SAM]PLE SENT TO Dubois & King — OUR JOB NO. 2088-84

GROUND WATER OBSERVATIONS		CASING	SAMPLER	CORE BAR.
36'9" 9/24/84 at 36 Hours	Type	H.S.A.	2"	
[3]'5" - After Instal.Well	Size I. D.	3 3/8"	1 3/8"	
36'9" at 9-25-84 Hours	Hammer Wt.		140#	BIT
	Hammer Fall		30"	

SURFACE ELEV.	
DATE STARTED	9-20-84
DATE COMPL.	9-24-84
BORING FOREMAN	M.Domingue
INSPECTOR	
SOILS ENGR.	

[L]OCATION OF BORING: Next to Rt #1 - Breakfast Hill

Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
							41'8"	Br Clay & Decaying Rock			
								Roller Bit to 43'6" - V/Soft Ledge - Difficult to Flush			
	41'4"-41'8"	SS	84				43'6"	Out - No Return of Water	7	4"	4"
								OBSERVATION WELL:			
								Set 42' of 1½" PVC Pipe in Ground w/10' Slotted and Covered w/Filter Cloth - Ottawa Sand from 35'-42'			
								Bentonite Seal @ 7' Depth			
								1' Stick-up			
								1 - 3" Steel Protective Casing Grouted in w/Lock			

GROUND SURFACE TO 43'6" USED 43'6" CASING: THEN Cored 8"

Sample Type
D—Dry C—Cored W—Washed
U—Undisturbed Piston

Proportions Used	
trace	0 to 10%
little	10 to 20%

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4 Soft	30 + Hard
10-30	Med. Dense	4-8 M/Stiff	

SUMMARY
Earth Boring 43'6"
Rock Coring 8"
Samples 7

Soils Engineering Inc.

Main St. Charlestown, N. H. 03603

SHEET 1 OF 2	
DATE 9-24-84	
HOLE NO. B-7A	
LINE & STA.	
OFFSET	

...O Dubois & King — ADDRESS Concord, NH

...JECT NAME Landfill (Closed) — LOCATION Rye, NH

...ORT SENT TO Gary Sharon — PROJ. NO.

...PLE SENT TO Dubois & King — OUR JOB NO. 2088-84

GROUND WATER OBSERVATIONS		CASING	SAMPLER	CORE BAR.
37'4" at after Bailing Hours	Type	H.S.A.	2"	
	Size I. D.	3 3/8"	1 3/8"	
	Hammer Wt.		140#	BIT
at Hours	Hammer Fall		30"	

SURFACE ELEV.
DATE STARTED 9-24-84
DATE COMPL. 9-25-84
BORING FOREMAN M. Domingue
INSPECTOR
SOILS ENGR.

...CATION OF BORING:

Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
								No Topsoil Test Pit			
	10'-11'6"	SS	16	27	27		10.0'		1	18"	12"
	15'-16'6"	SS	19	29	42			V/Den Br Coarse Sandy Silty Gravel w/Cobbles & Boulders (Layered)	2	18"	7"
	20'-21'6"	SS	37	27	18		24.0'		3	18"	8"
	25'-26'6"	SS	15	21	32		28.0'	Den Br Layers of Fine-Coarse Sand & Gravel	4	18"	15"
	30'-31'6"	SS	18	28	38		35.0'	Den Br Silty Fine Sand	5	18"	15"
	35-35'8"	SS No Penetration	8/6"-50 Blows			Wet	35'6"	Stiff Gray Layers of Clay, Silt & Sand	6	6"	6"
								Roller Bit from 35'6"-42'- Fractured & Weathered Rock			

GROUND SURFACE TO 42.0' USED 42.0' "CASING: THEN

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Sample Type	Proportions Used	Cohesionless Density	Cohesive Consistency	SUMMARY
D—Dry C—Cored W—Washed	trace 0 to 10%	0-10 Loose	0-4 Soft 30 + Hard	Earth Boring 42.0'
U—Undisturbed Piston	little 10 to 20%	10-30 Med. Dense	4-8 M/Stiff	Rock Coring
				Samples 6

Soils Engineering Inc.

Main St. Charlestown, N. H. 03603

SHEET 2 OF 2

DATE 9-24-84

HOLE NO. B-7A

LINE & STA.

OFFSET

TO Dubois & King ADDRESS Concord, NH

PROJECT NAME Landfill (Closed) LOCATION Rye, NH

REPORT SENT TO Gary Sharon PROJ. NO.

SAMPLE SENT TO Dubois & King OUR JOB NO. 2088-84

GROUND WATER OBSERVATIONS

37'4" at after Bailing Hours

at Hours

	CASING	SAMPLER	CORE BAR.
Type	H.S.A.	2"	
Size I. D.	3 3/8"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV.

DATE STARTED 9-24-84

DATE COMPL. 9-25-84

BORING FOREMAN M.Domingue

INSPECTOR

SOILS ENGR.

LOCATION OF BORING:

Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
								OBSERVATION WELL: Set 40' of 1½" PVC Pipe w/ Last 12' Slotted & Covered w/Filter Cloth - 12" Stick-up Ottawa Sand from 32'-44' Bentonite Seal @ 5' Depth 3" Steel Protective Casing Grouted in w/Lock			

GROUND SURFACE TO 42.0' USED 42.0' CASING: THEN

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Sample Type
D—Dry C—Cored W—Washed
UP—Undisturbed Piston

Proportions Used		
trace	0 to	10%
little	10 to	20%

Cohesionless Density	
0-10	Loose
10-30	Med. Dense

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

SUMMARY

Earth Boring 42.0'

Rock Coring

Samples 6

Soils Engineering Inc.

Main St. Charlestown, N. H. 03603

SHEET 1 OF 1	DATE 9-26-84
HOLE NO. B-8A	LINE & STA.
OFFSET	

...Dubois & King ADDRESS Concord, NH

...JECT NAME Landfill (Closed) LOCATION Rye, NH

...ORT SENT TO Gary Sharon PROJ. NO.

...PLE SENT TO Dubois & King OUR JOB NO. 2088-84

GROUND WATER OBSERVATIONS

Dry at Immed. Hours after setting casing

at Hours

	CASING	SAMPLER	CORE BAR.
Type	H.S.A.	2"	
Size I. D.	3 3/8"	1 3/8"	
Hammer Wt.		140#	BIT
Hammer Fall		30"	

SURFACE ELEV.
DATE STARTED 9-26-84
DATE COMPL. 9-26-84
BORING FOREMAN M. Domingue
INSPECTOR
SOILS ENGR.

...CATION OF BORING:

Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
								Test Pit			
	10'-11'6"	SS	18	38	38		10.0'		1	18"	18"
								Den Br Silty Fine Sand w/ Gray Silt & Clay Layers - (Sand Layers Moist)			
								Den Br Coarse Sandy Gravel w/Cobbles-Clay Layers			
	15'	SS	50 Blows	-			15.0'				
		No Penetration									
								Soft Micaceous Ledge - Roller Bit			
							20.0'				
								OBSERVATION WELL: Set 20' of 1½" PVC Pipe in Ground w/Last 10' Slotted & Covered w/Filter Cloth - 12" Stick-up - Ottawa Sand from 14'-20' - Bentonite Seal @ 6' Depth - 3" Steel Protective Casing Grouted in w/Lock.			

GROUND SURFACE TO 20.0' USED 20.0' CASING: THEN

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Sample Type
D—Dry C—Cored W—Washed
U—Undisturbed Piston

Proportions Used
trace 0 to 10%
little 10 to 20%

Cohesionless Density
0-10 Loose
10-30 Med. Dense

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

SUMMARY
Earth Boring 20.0'
Rock Coring
Samples 1

APPENDIX F

BORING LOCATIONS, BEDROCK AND WATER TABLE CONTOURS

SDMS TEMPORARY PLACEHOLDER
US EPA NEW ENGLAND
SUPERFUND DOCUMENT MANAGEMENT SYSTEM

THIS PAGE SERVES AS A TEMPORARY IMAGE IN THIS DOCUMENT.

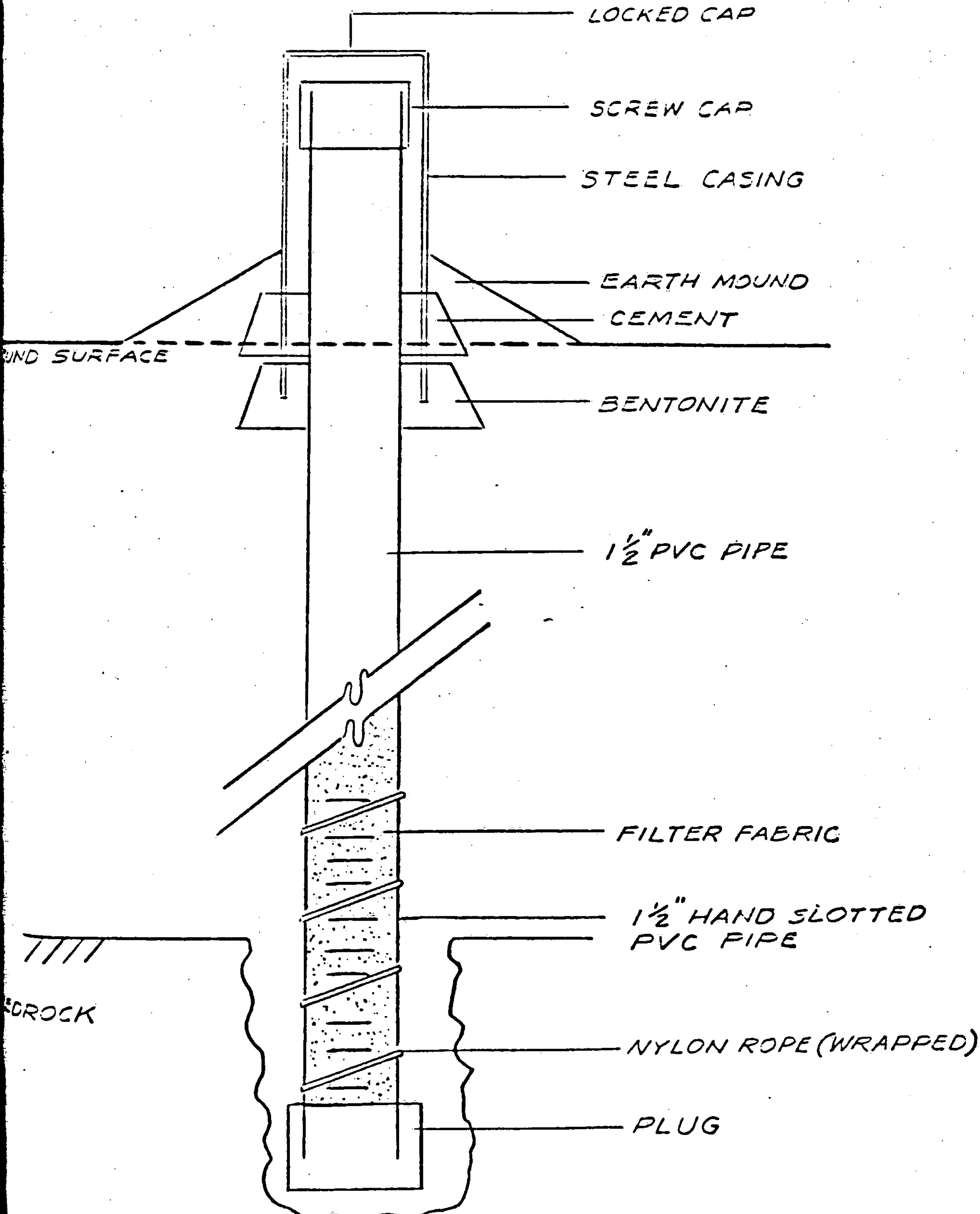
THE PERMANENT PAGE WILL BE INSERTED BY THE PDF TEAM.

APPENDIX G

TYPICAL MONITORING WELL DESIGN

APPENDIX

TYPICAL MONITORING WELL DESIGN



APPENDIX H

WATER QUALITY RESULTS SUMMARY

RYE CF

WATER QUALITY RESULTS SUMMARY

Parameter	Off-Site Wells: Breakfast Hill	Off-Site Wells: Home Center	Off-Site Wells: Sherwin Wash Rd.	On-Site Wells: Test Well #1	On-Site Wells: Test Well #4A	On-Site Wells: Test Well #6A	Safe Limit
pH (Su)	7.7	8.65	8.05	6.95	6.55	6.7	6.5-8.5
Conductivity (umhos/cm)	340	390	320	1,140	820	1,700	NS
COD	16.0	4.3	6.1	30.7	51.4	101	NS
Chlorides	69.5	44.0	48.5	148	25.0	245	250
Nitrate-N	5.44	0.29	0.19	0.21	1.33	0.78	10.0
Iron	<0.22	0.11	0.46	0.72	64.1	35.9	0.3
Manganese	<0.01	0.03	0.07	18.9	9.03	7.94	0.05
Methylene Chloride	NT	NT	NT	0.017	0.012	0.004	0.15*
Acetone	NT	NT	NT	0.022	0.024	0.014	NS
THF	NT	NT	NT	ND	0.031	0.018	NS
Benzene	NT	NT	NT	0.004	0.004	0.005	0.035*
Toluene	NT	NT	NT	ND	0.005	ND	NS
Ethyl Benzene	NT	NT	NT	ND	0.004	0.007	NS
Xylene	NT	NT	NT	ND	0.010	0.010	0.620*

All results are reported in mg/l unless otherwise noted.
NS - No standard set
ND - None detected
NT - None tested
* - Based on SNARLS per Ws 302.08(a)(2)

JAN 2? 1985

DuBois & King inc.

ENGINEERING & ENVIRONMENTAL SERVICES

Route 66
Randolph, Vermont 05060
(802) 728-3376

WATER & WASTEWATER LABORATORY

Job No: 46501

Lab Sample No: 17-85

NAME: Rye Landfill ADDRESS: Rye, NH	SAMPLE COLLECTION POINT SOURCE: DISTRIBUTION: OTHER:
DATE OF SAMPLE: TIME:	SAMPLED BY: Steve LaFrance
DATE RECEIVED: 1/16/85	ANALYZED BY: RJM & SRH
REMARKS: Three water samples for analysis.	

RESULTS (Expressed in milligrams/liter (mg/l) except when noted)

Test Parameter	#1-Breakfast Hill	#2-Home Center	#3-Sherwin Wash Rd.
pH (Su)	7.7	8.65	8.05
Conductivity(umhos/cm)	340	390	320
Nitrate-N	5.44	0.29	0.19
COD	16.0	4.3	6.1
Iron	<0.02	0.11	0.46
Manganese	<0.01	0.03	0.07
Chlorides	69.5	44.0	48.5

Respectfully submitted,

Ronald J. MacBruce
Assistant Laboratory Director

APPENDIX I

APPROXIMATE 1,000 FOOT RADIUS
AROUND THE LANDFILL SITE

APPROXIMATE 1,000-FOOT RADIUS AROUND THE LANDFILL SITE