102nd Street Landfill Site

Niagara Falls, New York

Final Close Out Report

Operable Units 1 & 2

Volume 4
Appendices E-N

Prepared for:
Occidental Chemical Corporation
Olin Corporation

Olin

Prepared by:
IT Corporation
Greenville, SC

the igroup

August 13, 1999
Revision 0

APPENDIX E

TEMPORARY COFFERDAM DESIGN REPORT

Project 330-02-10
February 1996

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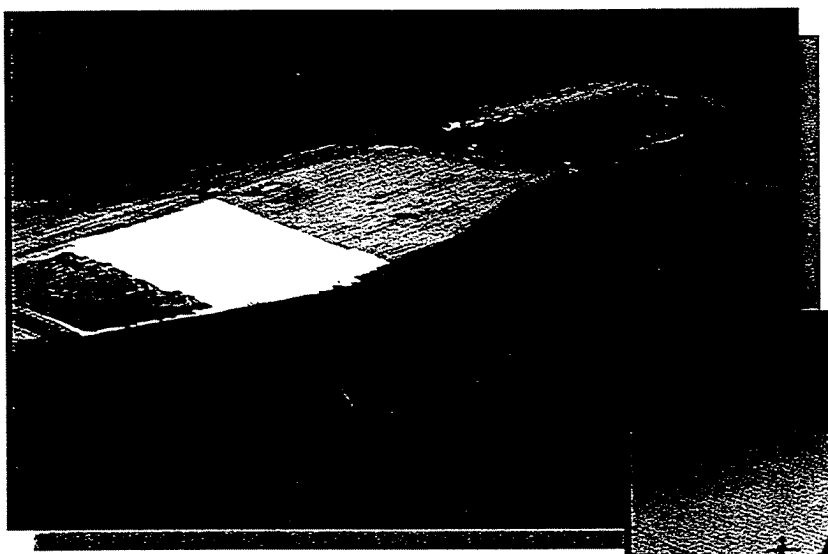
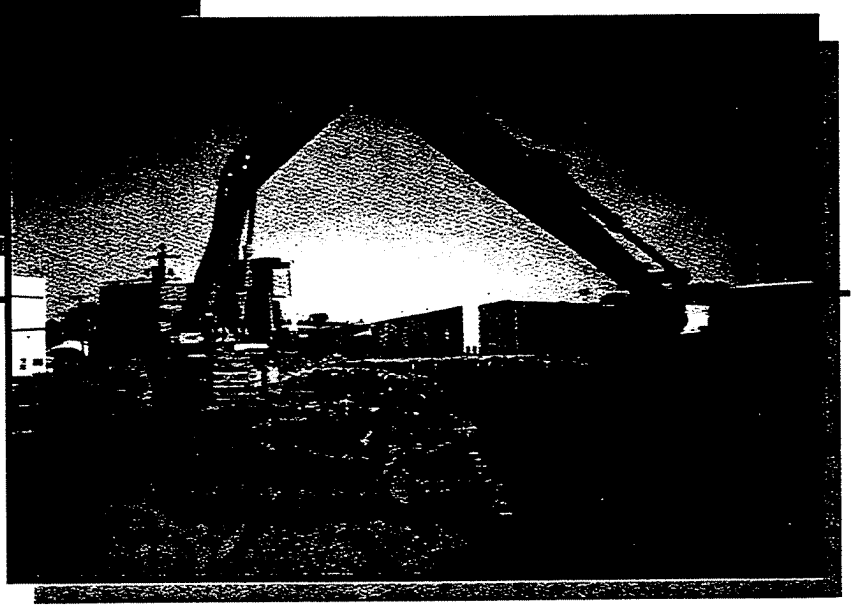
ENVIRONMENTAL TECHNOLOGIES CORPORATION

- ORIGINAL -

Temporary Cofferdam Design Report

102nd Street Landfill
Niagara Falls, New York
Remedial Action





Submitted By:

Smith Environmental
800 Canonie Drive
Porter, Indiana 46304

Phone: 219-926-8651
Fax: 219-926-7169

Submitted To:

OXY
OxyChem

Olin
CORPORATION

FLUOR DANIEL

Temporary Cofferdam Design Report

102nd Street Landfill Site
Niagara Falls, New York
Remedial Action

Smith Environmental Technologies Corporation
800 Canonie Drive
Porter, IN 46304

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PROPOSAL NO. 330-02-10
FEBRUARY 19, 1996

TEMPORARY COFFERDAM DESIGN REPORT
102nd STREET LANDFILL
NIAGARA FALLS, NEW YORK

REMEDIAL ACTION
FOR
OCCIDENTAL CHEMICAL CORPORATION
AND
OLIN CORPORATION

SUBMITTED BY:

SMITH ENVIRONMENTAL
TECHNOLOGIES CORPORATION
800 CANONIE DRIVE
PORTER, INDIANA 46304

PHONE: 219-926-8651
FAX: 219-926-7169

DESIGNED BY:

CHIA CHANG
NEW YORK PROFESSIONAL ENGINEER
LICENSE NO. 060564-1
EXPIRES: 8-31-96

CHECKED BY:

TIMOTHY HARRINGTON
NEW YORK PROFESSIONAL ENGINEER
LICENSE NO. 062728-1
EXPIRES: 9-30-96

SMITH
ENVIRONMENTAL TECHNOLOGIES CORPORATION

PROFESSIONAL ENGINEER'S CERTIFICATION

Chia Chang

New York PE 060564-1

Professional Engineer's Number
Expires: 8-31-96

Smith Environmental Technologies Corporation

Firm

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TABLE 1

NIAGARA RIVER OFFSHORE BORINGS DATA FOR TEMPORARY COFFERDAM ANALYSIS (STANDARD PENETRATION TESTS)
(Information from Bid Documents, Volume 3, Section 5)

Phase Area	Approximate Distance Between Temporary Cofferdam and the Shoreline (ft)	Approximate Distance Between Soil Borings and the Shoreline (ft)	Borings Drilled in the Phase Area	River Bottom Elevation	Total Boring Depth Below River Bottom (ft)	Water Depth (ft) at Time of Drilling (10/92)	Loose Silty Sand Alluvium Layer Thickness Below River Bottom (ft)	Average Thickness of Silty Sand Layer to be used in the Cofferdam Analysis (ft)	Standard Penetration Resistance, blows/ft (Sum of #2 and #3 6" penetration blows)	ϕ Angle	Clay Layer Thickness Below Loose Silty Sand Alluvium (ft)	Standard Penetration Resistance (blows/ft) (Sum of #2 and #3 6" Penetration Blows)	Average Thickness of Clay Layer in the Cofferdam Soil Profile (ft)	Field Vane Shear Test					
														Test No.	Depth Below River Bottom (ft)	River Water Depth (ft)	Ultimate Undisturbed Undrained Shear Strength (psf)	Ultimate Remolded Undrained Shear Strength (psf)	Sensitivity
A	260 to 280	190 to 250	SW-1 SW-34 SW-35 SW-39 SW-39A	565.05 561.15 561.24 561.06 561.06	20.0 12.0 10.0 12.5 12.0	-- 2.5 2.0 3.0 3.0	15.8 6.2 7.0 8.5 8.2	9.1	4-13-8-4-2-16 8-5-2 11-5-3-6 34 9-7-2-9	Many layers with blow counts of 4 or less are in a very loose state. The ϕ angle for these layers are about 20°. Some layers are in a loose or medium dense state. The ϕ angle will be slightly higher than 20°	4.2 5.8 3.0 4.0 3.8	20-73 5-12-12 30 236 17-258	4.2	--	--	--	--	--	--
B	200 to 260	170 to 240	SW-30 SW-31 SW-32 SW-33 SW-33A SW-38 SW-38A	560.87 560.96 561.16 561.26 561.26 560.95 560.95	22.0 18.0 14.0 12.0 16.0 18.0 18.0	2.5 2.5 2.5 2.5 2.5 2.5 3.0	16.2 13.8 9.5 7.5 16.0 10.0 12.0	12.1	3-3-4-3-7-18-8-10 5-1-2-19-26-3 12-6-5-25-10 21 5-5-3-0-11-17-16-32 -- 6-3-3-13-17-8		5.8 4.2 4.5 4.5 0 10 6.0	3-52-62 19-61 4-18 25 -- 13-20 3-12-54	5.0	--	--	--	--	--	--
C	120 to 260	170 to 230	SW-26 SW-27 SW-27A SW-28 SW-28A SW-29 SW-37 SW-37A	561.34 561.25 561.25 561.37 561.37 561.47 561.26 561.26	20.0 21.0 22.0 24.0 22.5 20.0 23.0 22.0	3.7 3.0 3.0 2.5 2.5 2.2 2.5 2.5	16.0 16.5 16.7 18.0 18.5 16.5 18.5 19.0	17.5	3-3-13-5-3-3-2-7 8 3-2-14-11-11-2-3-8-1 3-1-1-5-7-5-6-3-6 -- 4-3-4-7-3-2-5-5 -- 5-4-7-21-2-2-3-2-4-5		4.0 4.5 5.3 6.0 4.0 3.5 4.5 3.0	0-0 -- 1-1-1 -- -- 3-0 -- 0	4.4	VS-2b VS-3a VS-3b VS-3c VS-3d VS-4a VS-4c	19.5 19.5 20.5 21.5 22.5 18.5 20.5	2.5 2.5 2.5 2.5 2.5 3.0 3.0	179.2 249.8 293.2 266.1 271.5 173.8 238.9 See Average	97.7 168.3 228.1 203.6 211.7 152.0 206.3	1.83 1.48 1.28 1.31 1.28 1.14 1.16
														Average 238.9 psf, C = ½ x 238.9 = 120 psf or 0.12 ksf					
D	90 to 150	50 to 100	SW-21 SW-22 SW-22A SW-23 SW-23A SW-24 SW-25 SW-36 SW-36A	560.88 561.02 561.02 561.36 561.36 561.28 561.01 561.21 561.21	14.0 18.0 18.0 20.0 20.0 20.0 20.0 18.0 18.0	3.0 3.0 2.7 2.3 2.5 2.9 3.0 2.4 2.8	10.0 14.0 13.2 16.0 15.5 16.0 16.2 14.0 14.0	14.3	4-2-4-6-3 3-5 7-7-3-4-1-4-4 5 2-3-2-23-3-2-4-5 4-4-19-10-4-2-3-3 2-1-2-9-1-3-3-3 -- 4-2-6-3-1-2-7		4.0 4.0 4.8 4.0 4.5 4.0 3.8 4.0 4.0	4-9 26 6-12 43 10-37 1-26 1-1 40 7-14	4.1	--	--	--	--	--	--
E	0 to 100	20 to 40	SW-19 SW-20	559.97 560.57	12.0 14.0	3.6 2.9	7.0 9.0	8.0	4-0-4 7-2-1-4-5		5.0 5.0	4-4 5-11	5.0	--	--	--	--	--	--

Note: The limits are not shown.

2

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TABLE 2

NIAGARA RIVER OFF-SHORE BORINGS DATA FOR TEMPORARY COFFERDAM ANALYSIS (Drilled by Vibracore)
(Information from Bid Documents, Volume 3, Section 6)

Boring No.	River Bottom Elevation (ft)	Total Soil Depth Drilled to Refusal Below River Bottom (ft)	Loose Silty Sand Alluvium Depth Below River Bottom (ft)	Laboratory Testing Results						
									Grain Size	
				Sample Depth (ft)	WC (%)	LL	PL	PI	% Sand	% Fines (Silt and Clay)
BH7-94	561.62	15	15	6 to 7.5 (sandy silt with shells)	23.6	--	--	--	43	57
BH8-94	561.78	17	17	6 to 8 (sandy silt with black banding)	20.8	19	18	1	64	36
BH8A-94	561.78	17	14.8	--	--	--	--	--	--	--
BH9-94	561.50	22.2	18	6 to 7.5 (sandy silt with wood)	23.3	--	--	--	59	41
BH10-94	561.33	22	18	20 to 22 (clay)	48.3	45	21	24	1	99
BH11-94	561.50	20	--	--	--	--	--	--	--	--
BH11A-94	561.60	20	18	18 to 20 (clay)	47.7	49	25	24	1	99
BH12-94	562.00	21.2	21.2 (very soft sandy silt between 16 and 19 ft)	11-13 (sandy silt with organics) 17 to 19 (sandy silt with clay laminations)	28.7 25.1	-- 19	-- 18	-- 1	57 35	43 65
BH13-94	562.03	23	17 (very soft sandy silt 0 to 3.6 ft and 14.5 to 17 ft)	15 to 17 (sandy silt) 17 to 17.5 (clay)	21.8 40.2	19 53	19 23	1 30	46 6	54 94
BH14-94	561.60	19	16.7 (very soft sandy silt 11.5 to 12.5 ft)	16.5 to 17 (clay)	19.5	25	15	10	17	83
BH15-94	561.80	Terminated at 11 ft	Terminated at 11 ft	--	--	--	--	--	--	--
BH15A-94	561.83	18	15	--	--	--	--	--	--	--
BH15B-94	561.83	15	12.3	7 to 9 (silty sand with organic fibers)	26.8	23	22	1	8	92
BH16-94	561.90	14.5	13.9	10.5 to 12.5 (silty sand with organics)	32.1	27	22	5	2	98
BH17-94	561.90	10.5	6	4 to 6 (silty sand with shells)	20.2	--	--	--	66	34
BH18-94	562.30	10.2	6.5 (loose silt 0.5 to 6.5 ft)	4 to 6 (silt with organic fiber)	26.6	23	22	1	23	77
BH19-94	562.40	10.6	10.6	--	--	--	--	--	--	--
BH20-94	561.70	18.5	11.3	--	--	--	--	--	--	--
TOTAL 18 BORINGS										

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TABLE 3

NIAGARA RIVER WATER ELEVATION
(Information from Bid Documents, Volume 3, Section 8)

(1) LaSalle Station Mean Water Level

= 561.89 International Great Lakes Datum (IGL)
= 561.89 + 1.22 = 563.11 ft USGS

(2) 102nd Street Site Niagara River Mean Water Level in the Past 21 Years, 1965 to 1985

= 563.11 + 0.73 = 563.84 ft USGS

(3) The High Water Levels at LaSalle Gage Station from 1965 Through 1985 Data Are:

August 1969	562.83 IGL = 562.83 + 1.22 = 564.05 USGS
December 1972	562.87 IGL = 562.87 + 1.22 = 564.09 USGS
January 1973	563.05 IGL = 563.05 + 1.22 = 564.27 USGS
November 1975	562.84 IGL = 562.84 + 1.22 = 564.06 USGS
February 1985	562.97 IGL = 562.97 + 1.22 = 564.19 USGS

The maximum high water elevation at LaSalle Gage Station is 564.27 USGS

(4) The maximum high water elevation at 102nd Street site is 564.27 + 0.73 = 565.0.

(5) When designing the temporary cofferdam, the Niagara River water level at Elevation 565.0 shall be used.

TABLE 4

DETERMINE NIAGARA RIVER BOTTOM ELEVATIONS
ALONG TEMPORARY COFFERDAM

Reference Drawings:

Fluor Daniel 594000-10Q-01, Rev. 0
Conestoga-Rovers Project 1431, Drawing No. 16, Plan 1

Combine the above two drawings, it becomes Smith Environmental Drawing 96-905-B13 (see Page 11 of this report).

Temporary Cofferdam Phase Area	River Bottom Elevation Interpolated from Conestoga-Rovers Drawing (ft)	Lowest River Bottom Elevation (ft)	Average River Bottom Elevation from Soil Borings (ft)	Design River Bottom Elevation (ft)
A	561.4 to 563.8	561.4	561.1	561.1
B	561.5 to 561.7	561.5	561.1	561.1
C	561.7 to 562.7	561.7	561.3	561.3
D	562.6 to 563.1	562.6	561.2	561.2
E	560.0 to 563.8	560	560.3	560.3

The bathymetric survey indicates that the river bottom surface gradually slopes away from the shoreline at an approximate slope of 0.01 feet per foot. The alignment of the five-foot depth of water is approximately 500 feet from shore, with the exception of along the Niagara River at the west end of Phase E area where a navigable channel is present and the river bottom surface slopes away from the shoreline at a much steeper angle. Since the 0.01 foot river bottom slope is very small, the cofferdam base is treated as a level base for seepage and stability analyses.

5. Develop Temporary Cofferdam General Soil Profile at Each Phase A, B, C, D, and E Areas.

Phase A Area Temporary Cofferdam Soil Profile Plotted from Tables 1, 2, 3, and 4

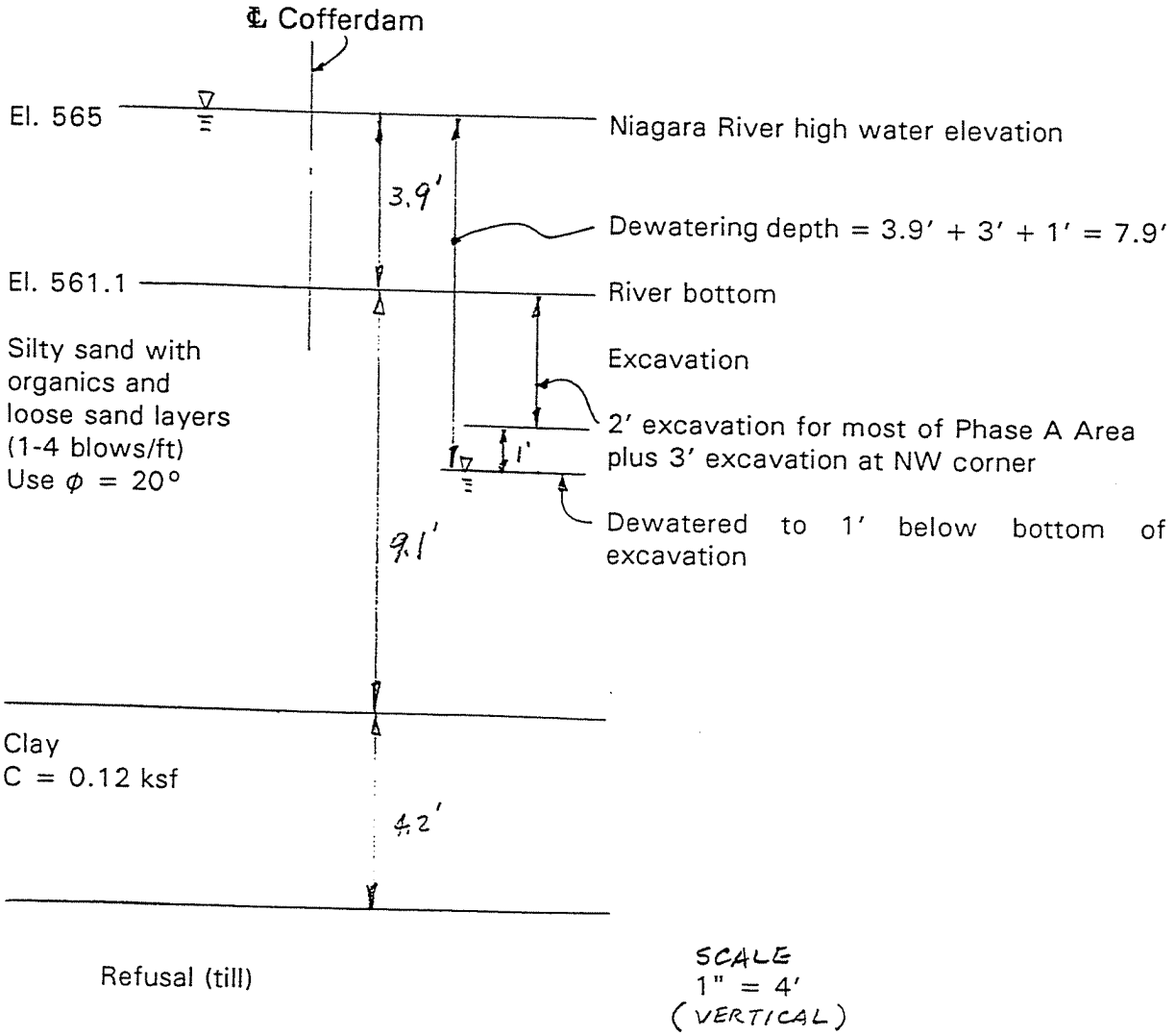

FIGURE 1

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Phase B Area Temporary Cofferdam Soil Profile Plotted from Tables 1, 2, 3, and 4

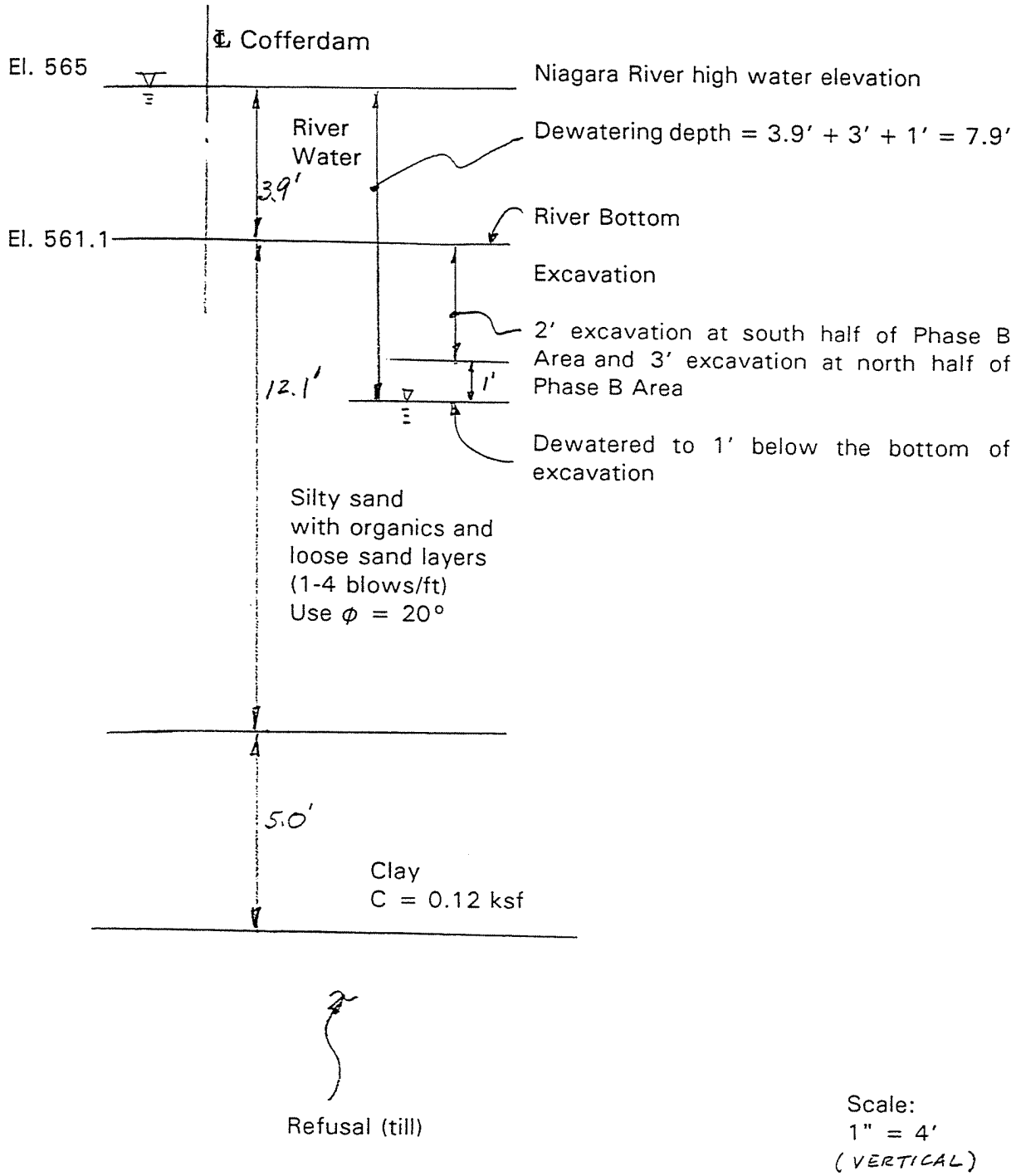

FIGURE 2

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Phase C Area Temporary Cofferdam Soil Profile Plotted from Tables 1, 2, 3, and 4

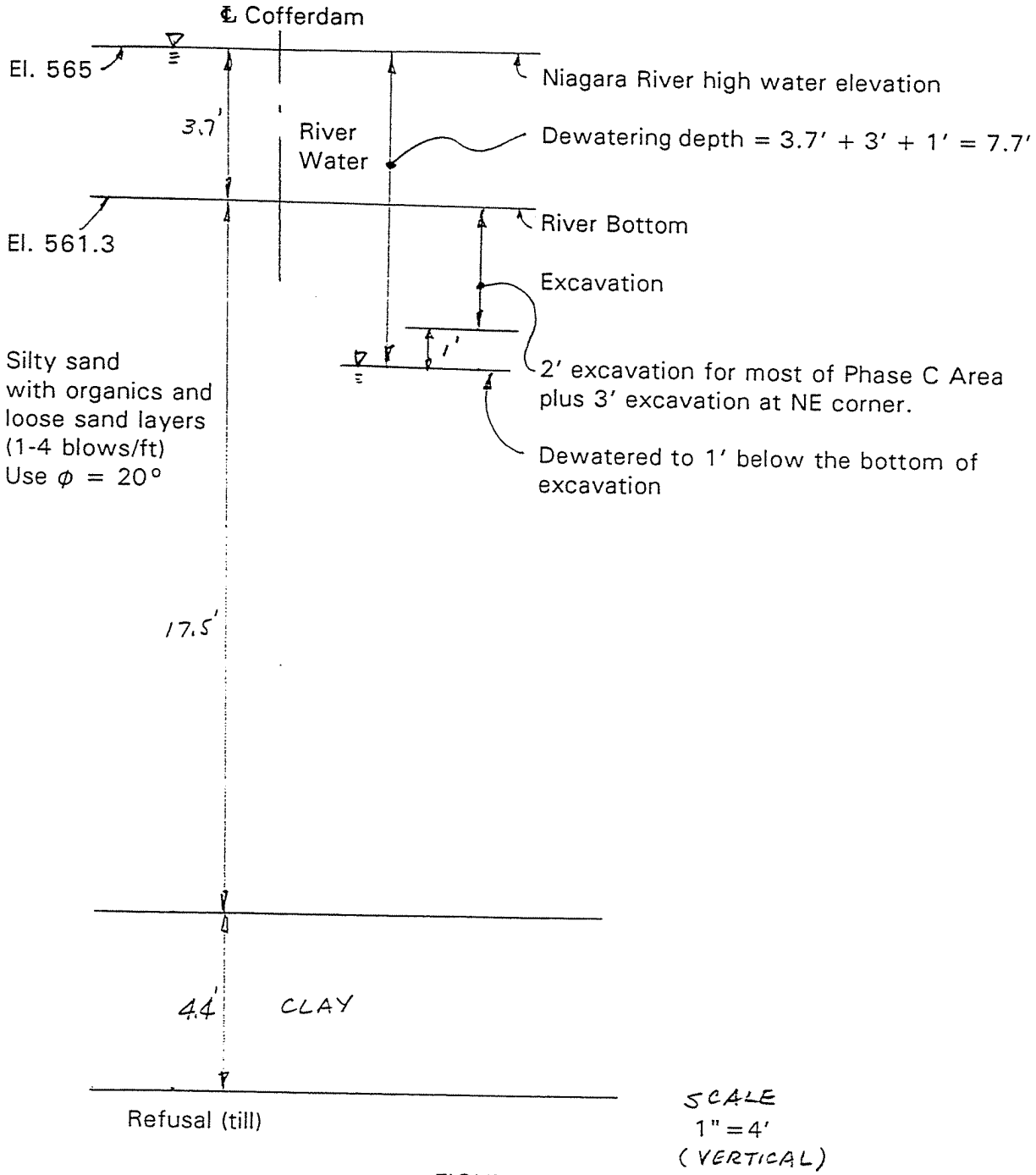

FIGURE 3

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Phase D Area Temporary Cofferdam Soil Profile Plotted from Tables 1, 2, 3, and 4

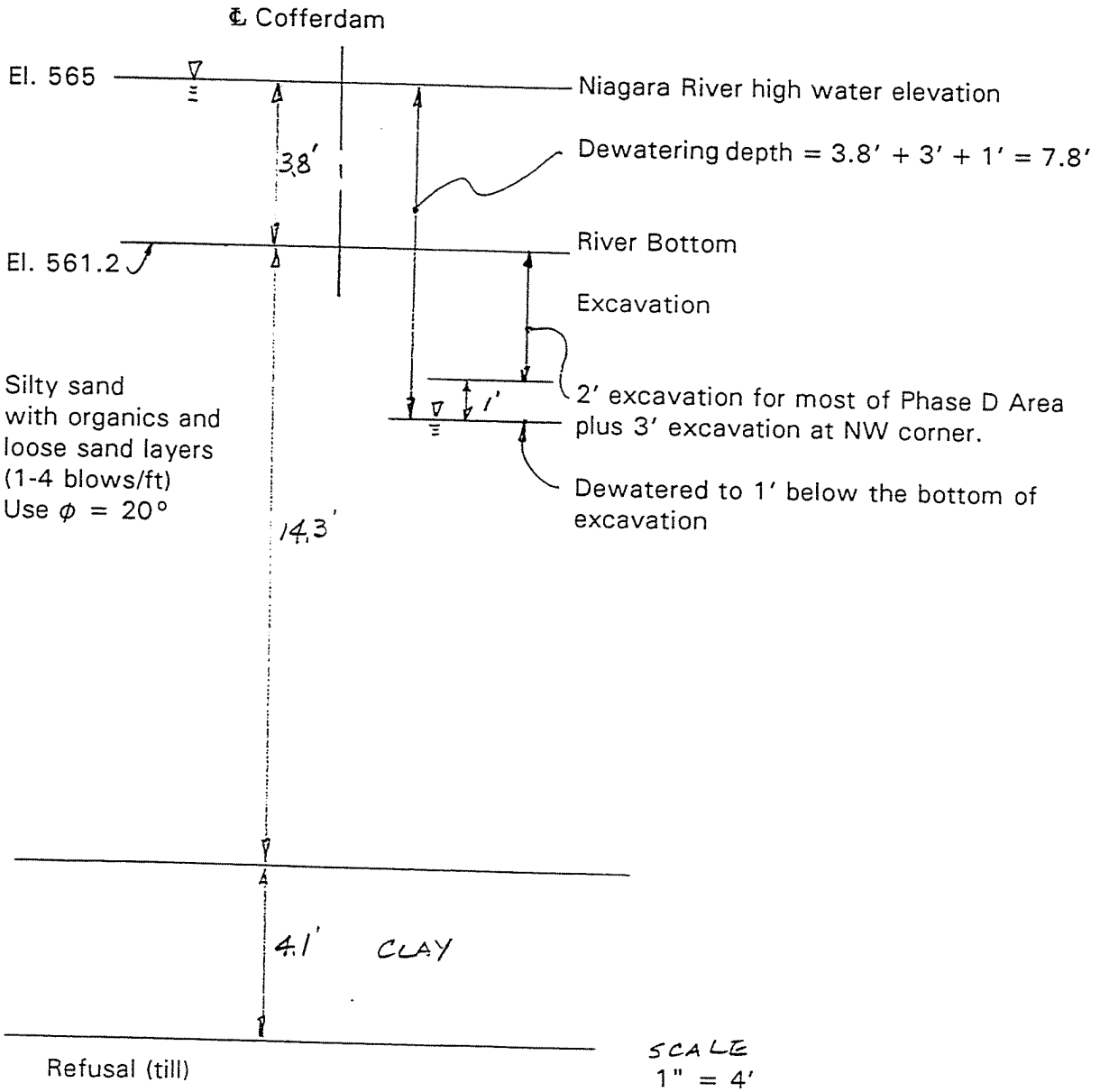


FIGURE 4

Phase E Area, Soil Profile

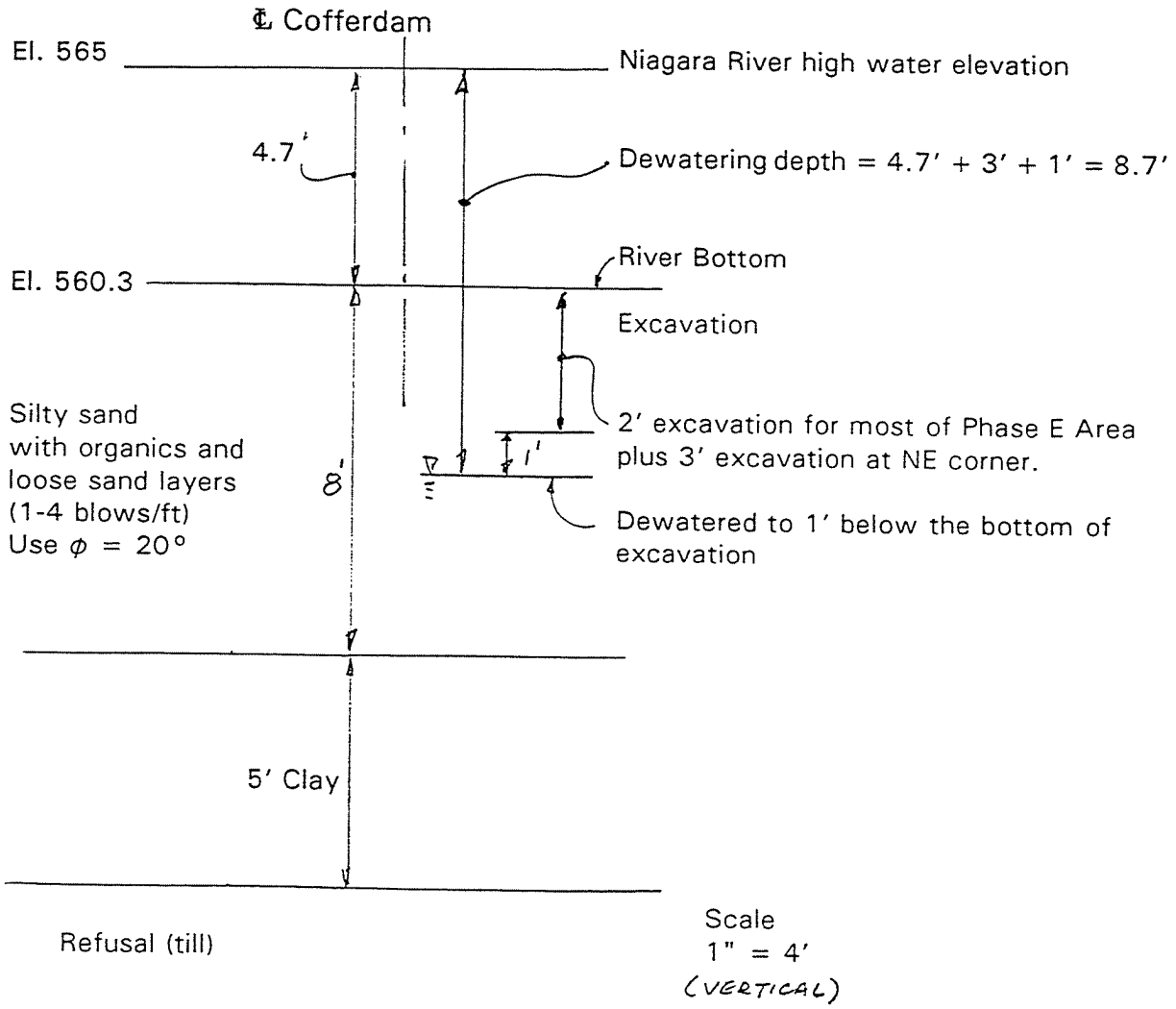
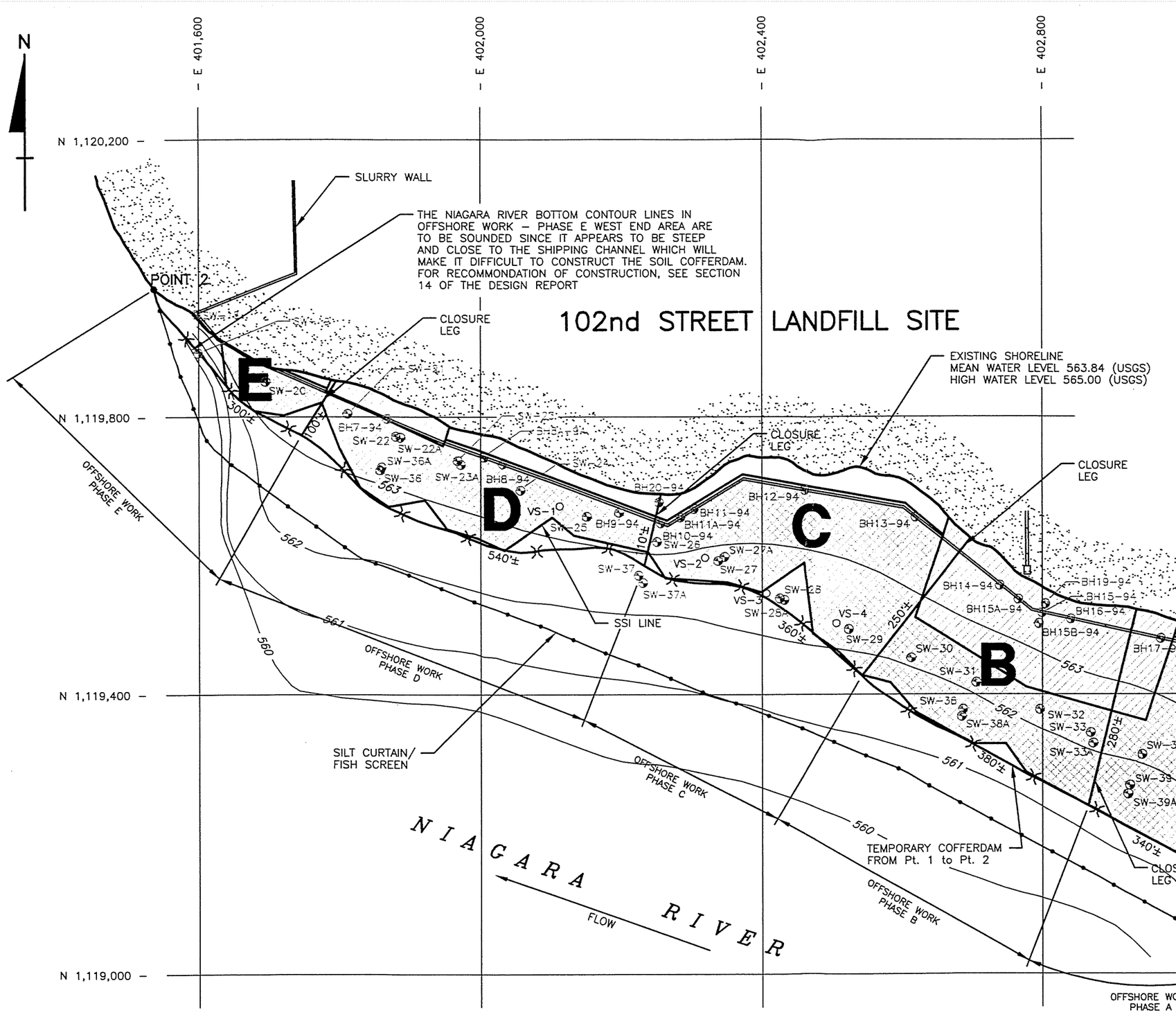


FIGURE 5

Note: One-half of the Phase E area cofferdam will have a different construction method. See Section 14 of this report.

-905-B13



LEGEND:

- EMBAYMENT SEDIMENTS LYING WITHIN THE AREAS OF ELEVATED CHEMICAL CONCENTRATION ARE TO BE EXCAVATED TO A DEPTH OF 3 FEET AND BACKFILLED ACCORDING TO SPECIFICATION No. 02200
- EMBAYMENT SEDIMENTS LYING WITHIN THE CONTOUR LINE OF SSI'sARE TO BE EXCAVATED TO A DEPTH OF 2 FEET AND BACKFILLED ACCORDING TO SPECIFICATION No. 02200
- SOIL BORING (APPROXIMATE LOCATION)
- IN–SITU VANE SHEAR TEST (APPROXIMATE LOCATION)

NOTES:

1. THE EXCAVATION, COFFERDAM, CLOSURE LEGS, AND SHORELINE LAYOUTS ARE REFERENCED FROM FLUOR DANIEL DRAWING No. 594000–10Q–01, REV. 0.
2. THE NIAGARA RIVER BOTTOM CONTOURS ARE REFERENCED FROM CRA CONSULTING ENGINEERS DRAWING 1431 No. 16 PLAN 1.
3. THE SOIL BORINGS ARE REFERENCED FROM FLUOR DANIEL DRAWING No. 23594000, FIGURE 1–1 AND FIGURE 1.2.1.
4. FOR SOIL BORING LOGS, SEE BIDDING DOCUMENTS VOLUME 3, SECTIONS 5 AND 6.

APPROXIMATE SCALE

150 0 150 FEET

PLAN OF OFFSHORE BORINGS, RIVER BOTTOM CONTOURS, EXCAVATIONS, TEMPORARY COFFERDAM AND CLOSURE LEGS
102nd STREET LANDFILL
NIAGARA FALLS, NEW YORK

PREPARED FOR

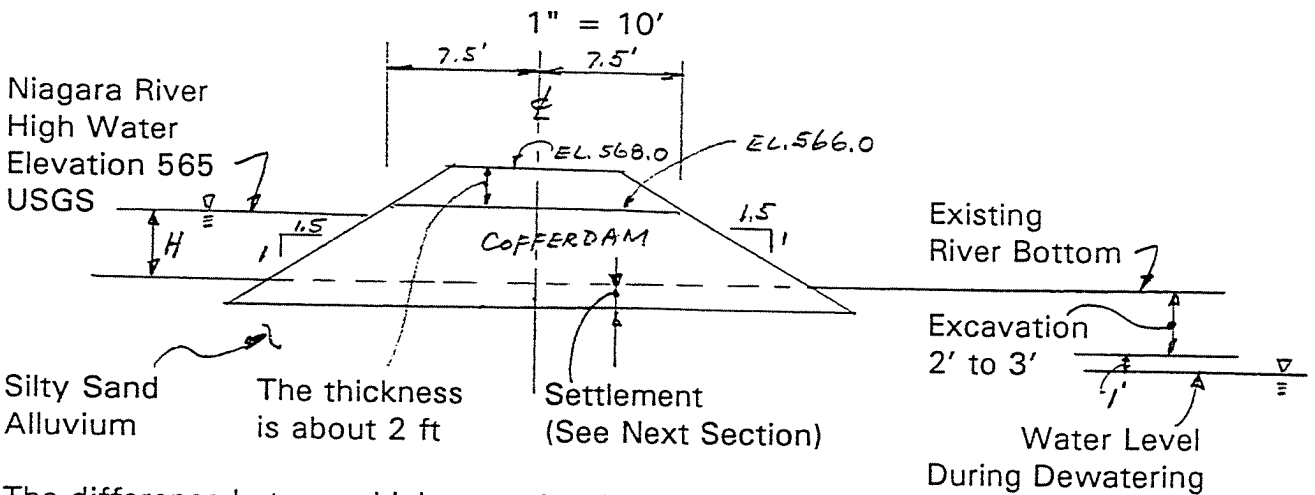
OCCIDENTAL CHEMICAL CORP./OLIN CORP.

FIGURE 6

6. Soil Cofferdam Configuration

The base bid temporary cofferdam will be a compacted silt-sand-clay berm. The berm will be placed on the river bottom along the temporary cofferdam line and the four closure legs between the phase areas. The top crest width is 15 feet minimum for dozer and vehicle mobilization. The freeboard for temporary structure is 1 foot above high river water level elevation 565.0 or 2.16 feet above mean water level elevation 563.84 to make the crest elevation = 566.0 USGS. According to project Specification 02200, Section 3.5C2, it requires crest elevation at 568.0 feet which provides 3 feet freeboard for high water level elevation 565.0 and 4.16 feet for mean water level elevation 563.84 feet. Because the imported soil to be trucked to the site and dumped into the water following Section 15 of this report, it is more effective to compact at 1 foot to 2 feet above the water level. Therefore, elevation 566 is chosen for the compaction. The width of the cofferdam is 15 feet at elevation 566 for truck dumping and repetitive dozer compaction. This is the base bid quantity of 12,000 cu yd as shown on page 18 of this report.

The configuration of the cofferdam is:



The difference between high water level and mean water level = 565-563.84 = 1.16 ft.

High Water	Mean Water
H = 3.9' (Phase A Area)	H = 3.9' - 1.16 = 2.74' (Phase A Area)
= 3.9' (Phase B Area)	= 3.9' - 1.16 = 2.74' (Phase B Area)
= 3.7' (Phase C Area)	= 3.7' - 1.16 = 2.54' (Phase C Area)
= 3.8' (Phase D Area)	= 3.8' - 1.16 = 2.64' (Phase D Area)
= 4.7' (Phase E Area)	= 4.7' - 1.16 = 3.54' (Phase E Area)

To perform effective soil compaction below elevation 566 is very important:

- Reduce the seepage through the cofferdam to a minimum.
- Create a solid base for truck and equipment operation.
- Resist upward seepage during embayment area dewatering.

- Provide shearing resistance at cofferdam - river bottom interface against sliding during dewatering.

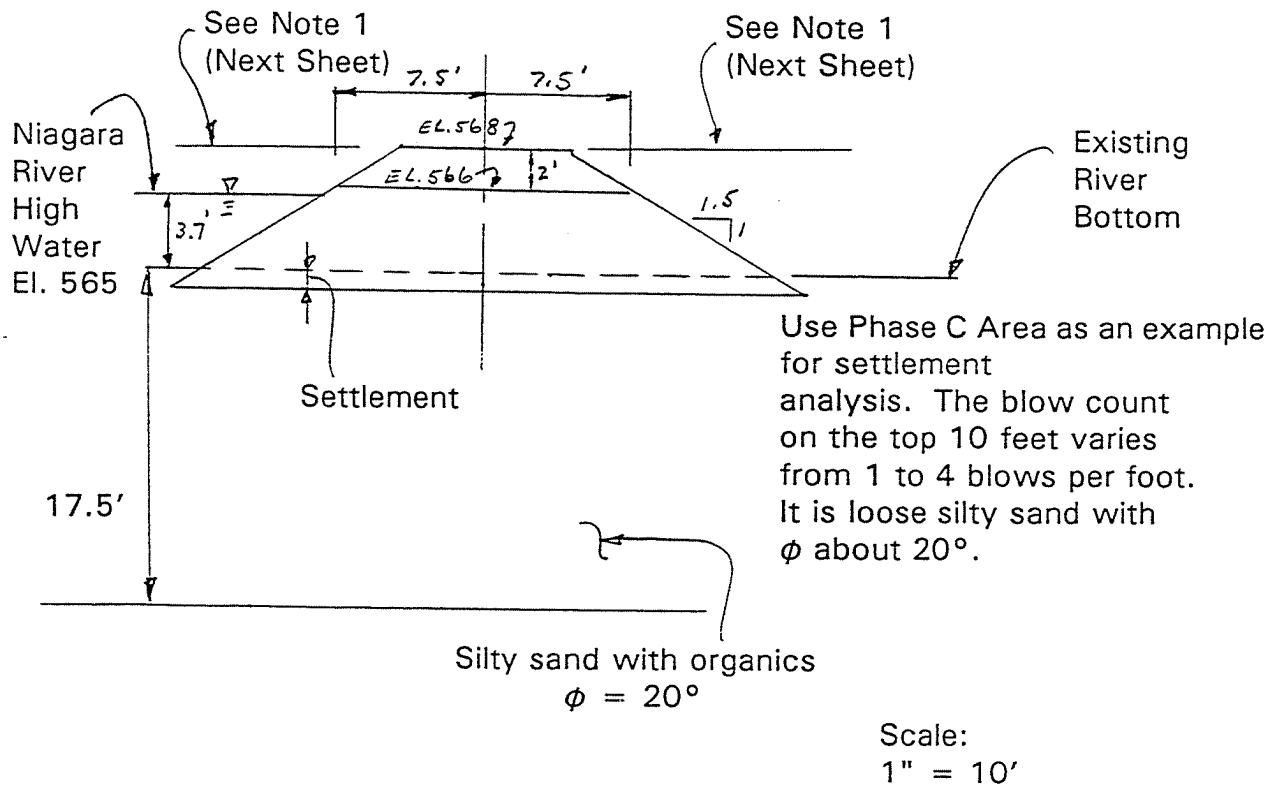
In order to satisfy the criteria of Specification 02200, Section 3.5C2, a 2-foot-thick cap is to be added to this compacted base configuration and make the crest elevation 568.0. The width at elevation 568.0 is about 9 feet with 1.5 to 1 side slopes. The soil selected has 40 to 46 percent fines (see page 26 of this report) and only moderate compaction is needed for this 2-foot-thick cap. Since the 1,900-foot temporary cofferdam is constructed as a whole unit to elevation 568 and encircles the embayment area, the four closure legs crest will stay at elevation 566.

The volume of this 1,900-foot-long, 2-foot-thick cap is (9′ + 15′)/2 x 2′ x 1,900′ x 1/27 = 1,700 cubic yards. This is listed at the top of page 19 of this report.

A 40-mil PVC liner will be placed on the river side of the cofferdam slope.

7. Soil Cofferdam Settlements

The cofferdam construction equipment weight, vibrations, and soil weight will cause the following settlements of the soil berm:



Settlement of river bottom due to cofferdam:

Ref. B.K. Hough "Basic Soil Engineering", Ronald Press Co., First and Second Editions. Figures 5-7 and 5-8, First Edition (attached, see pages 16 and 17 of this report).

Initial overburden at middle of silty sand layer

$= \frac{17.5'}{2} \times 60$ pcf submerged weight $= 525$ psf $= 0.26$ tsf

Install 6.7' high berm with truck and dozer operation. The surcharge load influence at the middle of the layer is approximately

$= 6.7' \times 120$ pcf total unit weight (actually partially submerged)

$= 804$ psf $= 0.40$ tsf

Note 1:

There are numerous influence calculations due to the trapezoidal berm loads, the individual truck wheel loads, and the dozer track loads, but it will be lumped together with full area covered with 6.7 feet of soil. This is an approximate calculation.

Figure 5-7 (see p. 16 and p. 17 of this calculation):

Treat loose silty sand or silt and sand mixtures as loose sand.

The void ratio will drop from loose sand at e = 0.76 to firm sand at e = 0.58 at initial overburden of 0.26 tsf during construction. Because the alluvium is not fully compacted to the full depth, use firm sand as the compacted case.

Change in void ratio = 0.76 - 0.58 = 0.18 due to initial construction

There is e = 0.01 change when static cofferdam dead load 0.40 tsf is acting during the excavation period.

Total void ratio change = 0.18 + 0.01 = 0.19

$$e = \frac{V_v}{V_s}, \quad Porosity = \quad n = \frac{e}{1+e}, \quad n = \frac{V_v}{V_t}$$

$$Change\ in\ Porosity\ During\ Construction = \frac{0.76}{1+0.76} - \frac{0.58}{1+0.58} = 0.43 - 0.37 = 0.06$$

$$or\ \frac{\Delta V_v}{V_t}\ change = 0.06$$

$V_t = 17.5'$ $\Delta V_v = 0.06 \times 17.5' = 1.05$ feet due to machine load vibration and cofferdam weight.

Total settlement is about 1.0 foot, including settlement during the excavation period.

This 1.0-foot settlement shall be added to the cofferdam construction.

Note:

The dozer and truck vibrations usually affect the soil to a depth equal to 1.5 times the width of the machine. The D6H dozer has an 8' x 13' projected area on the ground. It apparently has the ability to densify ½ to ⅔ depth of the alluvium soil.

B. K. HOUGH: "BASIC SOILS ENGINEERING"
RONALD PRESS CO. 1ST EDITION

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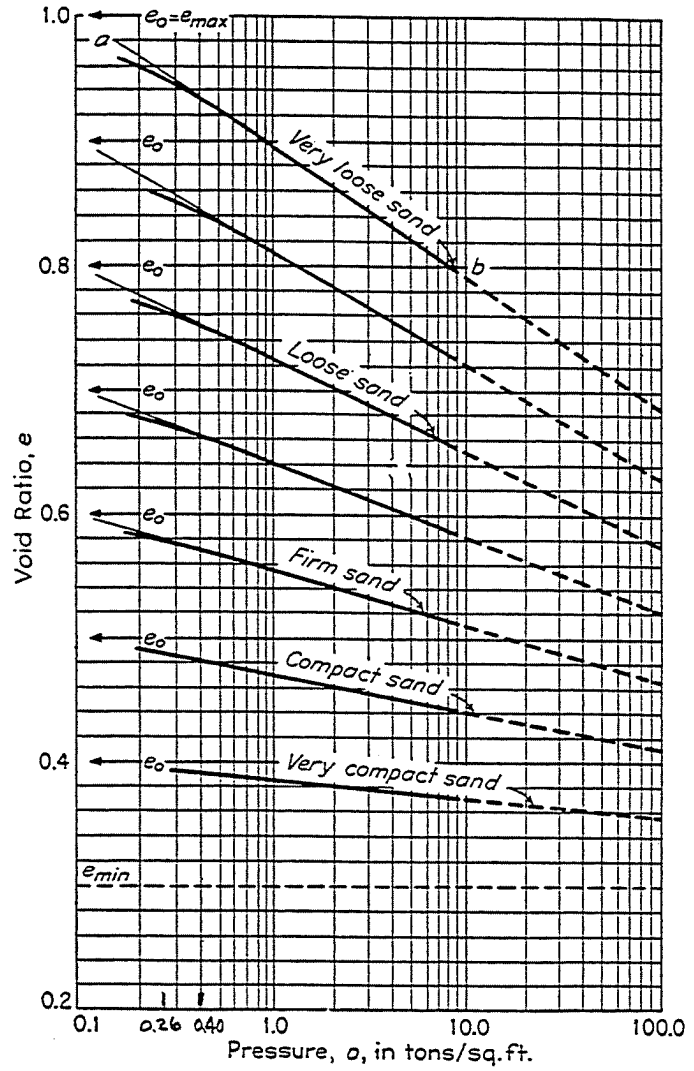

FIG. 5–7. Effect of initial density on slope and position of compression diagrams for granular soil.

diagram whether they occur initially or during compression. Sand, for example, is particularly subject to disturbance produced by shock or vibration—effects which may well occur while the material is under load. The result produced by such disturbance of a test specimen of sand is illustrated in Fig. 5–8(*a*). Here it is shown that an initially loose sand specimen is compressed under static loading from void ratio e_o to the void ratio at point *b* in the diagram. While under load at point *b*, vibrations are applied. Significant decrease in volume then occurs without change in

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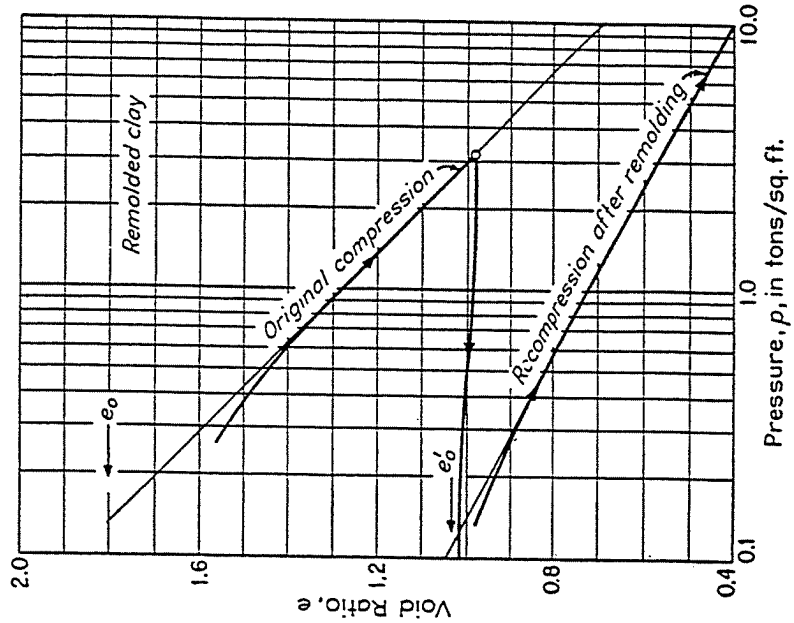
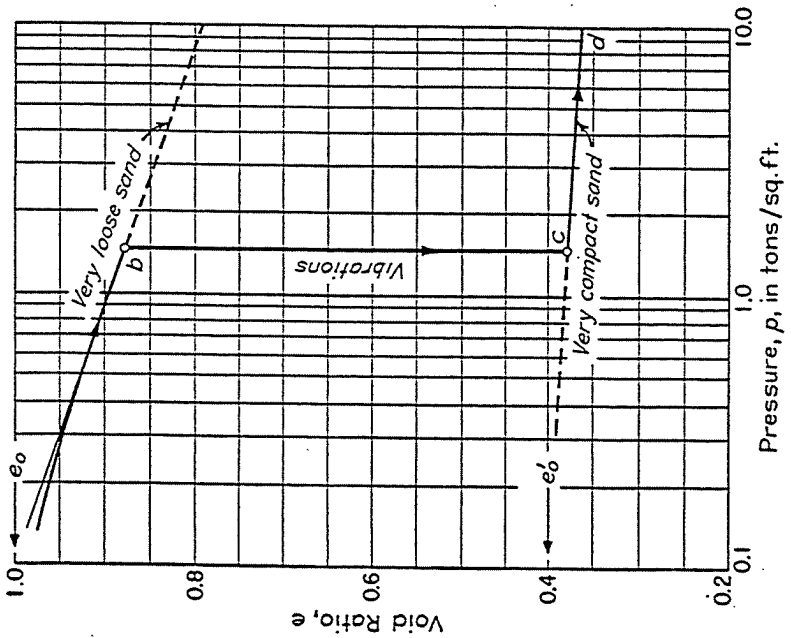




After Casagrande

FIG. 5-8. Effects other than loading.

8. Soil Cofferdam Soil Quantities

Temporary Cofferdam-Compacted Soil Berm With Crest at Elevation 566.0

							V = A x L	
Phase Area	Length, L (ft)	Top of Berm, Width (ft)	Approx. Side Slopes	Height, H (ft)	Base Width, B (ft)	Cross Section Area, A (ft^2)	Approx. Volume of Berm, V (ft^3)	Approx. Volume of Berm, V (yd^3)
A	340	15	$1.5^H:1^V$	3.9+1.0+1 = 5.9	5.9x3+15 = 33	(15+33) x ½ x 5.9 = 142	48,280	1,790
B	380	15	$1.5^H:1^V$	3.9+1+1 = 5.9	5.9x3+15 = 33	(15+33) ½ x 5.9 = 142	53,960	2,000
C	360	15	$1.5^H:1^V$	3.7+1+1 = 5.7	5.7x3+15 = 32	(15+32) x ½ x 5.7 = 134	48,240	1,790
D	540	15	$1.5^H:1^V$	3.8+1+1 = 5.8	5.8x3+15 = 33	(15+33) x ½ x 5.8 = 140	75,600	2,800
E	150**	15	$1.5^H:1^V$	6.7	35	(15+35) x ½ x 6.7 = 168	25,200	940
TOTAL	1,770**							9,320 yd^3

**Does not include Phase E area west end 150-foot cofferdam. For detailed analysis, see Section 14 of this report.

Closure Legs Between Two Phase Areas With Crest at Elevation 566.0**

				Approx. Volume of Closure Legs, V	V = A x L
Phase Areas	Length, L (ft)	End Area at Shoreline, El. 565 (ft^2)	Average Cross Section Area, A (ft^2)	ft^3	yd^3
A-B	290	*1.3' x 15' = 20	(20 + 142) x ½ = 81	23,490	870
B-C	250	20	(20 + 142) x ½ = 81	20,250	750
C-D	110	20	(20 + 134) x ½ = 77	8,470	310
D-E	90	20	(20 + 140) x ½ = 80	7,200	270
TOTAL	740				2,200

*Depth approximately equals settlement due to construction equipment compaction.
**The width of the closure legs can be narrowed to 9 feet for dozer operation.

Total Soil Approximate Yardage = 9,320 + 2,200 ≃ 12,000 cu yds with crest at elevation 566.0.

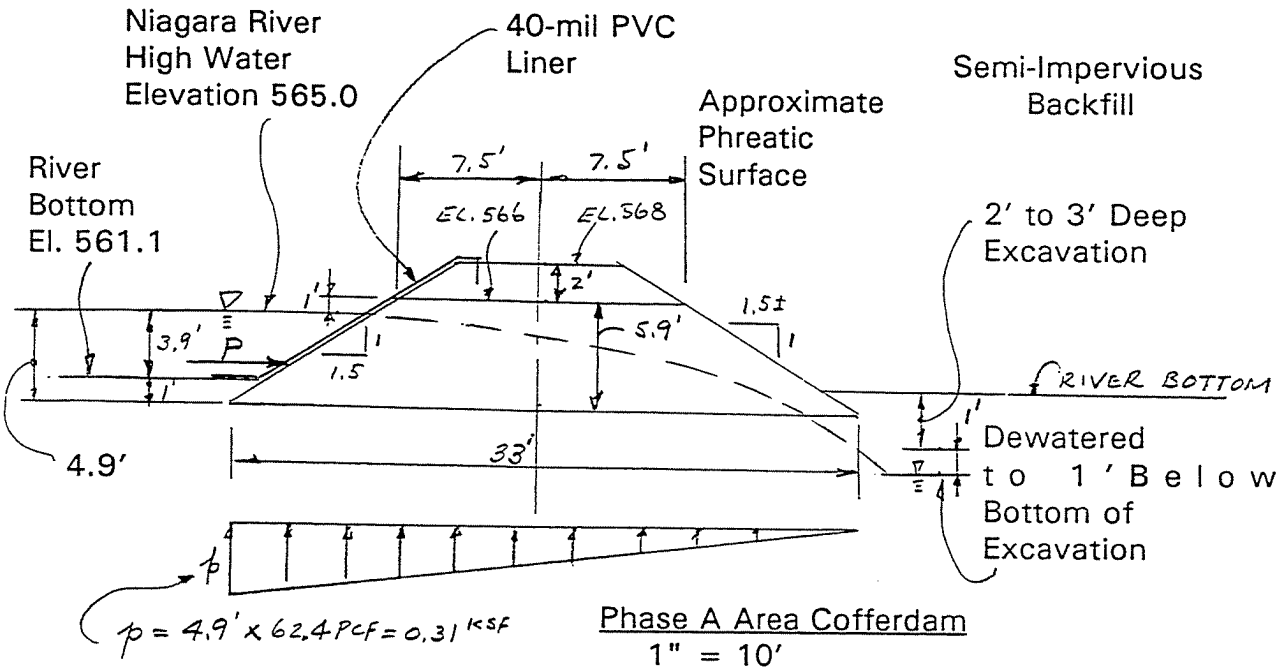
From the import soil compaction curve, the maximum dry density is 140.5 lbs/ft^3 at a water content of 6.7 percent (see page 26 of this report. The weight of compacted soil per cubic yard = 140.5 x 1.067 x 27 = 4,048 lbs = 2.024 tons/cu yd. Total tonnage of soil = 12,000 cu yd. x 2.024 tons/cu yd. = 24,288 tons, say 25,000 tons with crest elevation 566.0.

Moderately compacted 2-foot-thick cap with crest elevation 568.0:

Cap Volume for 1,900-foot cofferdam excluding closure legs = 1,700 cubic yards (see page 13 of this report) = 1,700 x 2.024 tons/cu yd = 3,440 tons = 14 percent of 25,000 tons.

Total tonnage of soil = 25,000 + 3,440 = 28,440 tons with crest of Elevation 568.0.

9. Soil Cofferdam Stability



Phase A area cofferdam has largest water depth value. Therefore, use Phase A cofferdam for stability analysis. Height of the cofferdam is 3.9' + 1' + 1' = 5.9'

Total water pushing force at river side = P
$P = \frac{1}{2} \times 62.4 \times (4.9)^2 = 750$ lbs/ft = $0.8^{k/ft}$

The phreatic surface is shown as dash line and about ½ of the cofferdam area is submerged.

Total cross section area of cofferdam for Phase Area A is 142 ft^2, without 2' cap. Say 71 ft^2 dry, 71 ft^2 submerged.

Weight of cofferdam = 71 ft^2 x 120 lbs/ft^3 + 71 ft^2 x 60 lbs/ft^3 = 12,780 lbs/ft = $12.8^{k/ft}$

The friction angle between cofferdam base and river bottom = 25° (assumed minimum ϕ value for silty sand after truck and dozer operation with some organic silt retained at the interface)

Shear Resistance = 12.8^k tan 25° = $6^k > 0.8^k$
Uplift Force = ½ x 0.31 ksf x 33′ = $5.1^k < 12.8^k$ downward weight
Factor of Safety Against Sliding = $6^k/0.8^k = 7 > 2$ O.K.
Factor of Safety Against Uplifting = $12.8^k/5.1^k = 2.5 > 2$ O.K.

When the 2-foot cap is added:

Increased Volume = [(9′ + 15′)/2] x 2′ = 24 ft^2
Increased Weight = 24 ft^2 x 0.12 k/ft^3 = 2.9 k/ft

Weight of Cofferdam During Dewatering = 12.8 k/ft + 2.9 k/ft = 15.7 k/ft

Shear Resistance = 15.7^k tan 25° = 7.3^k

Factor of Safety Against Sliding = $7.3^k/0.8^k = 9 > 2.0$ O.K.

Uplift Force = ½ x 0.31^{ksf} x 33′ = 5.1^k

Factor of Safety Against Uplifting = $15.7^k/5.1 = 3.1 > 2.0$ O.K.

Bearing Capacity:

Ref. Terzaghi & Peck "Soil Mechanics in Engineering Practice", John Wiley & Sons, 2nd Edition.

p. 222, Strip Footing, ϕ = 25° after soil is densified by truck and dozer operation

$N_c = 20$, $N_q = 10$, $N_\gamma = 7$

$q_d = c\,N_c + \gamma D_f\,N_q + \frac{1}{2}\gamma B N\gamma$ for general failure condition

$c = 0$, $D_f = 0$, B (Average Width) = (15′ + 33′)/2 = 24′

γ = submerged soil weight = 0.06 kcf

$\therefore q_d = 0 + 0 + \frac{1}{2}\,\gamma B N\gamma = 0 + 0 + \frac{1}{2} \times 0.06 \times 24 \times 7 = 5.0$ ksf

Weight of truck and soil = 20 tons

Contact area = 8′ x 20′ (Use this area instead of spreading many wheel loads to the alluvium surface. This is an approximation).

Truck weight = (20 tons x 2 k/ton)/(8′ x 20′) = 0.25 ksf
Soil weight = 5.9′ x 0.09 kcf = 0.53 ksf
Total = 0.25 + 0.53 = 0.78 ksf

Factor of Safety Against Soil Bearing = 5 ksf/0.78 ksf = 6 > 2 O.K.

When the 2-foot cap is added:

Soil Weight = 7.9 ft x 0.09 kcf = 0.71 ksf
Truck Weight = 0.25 ksf Total Weight = 0.71 + 0.25 = 0.96 ksf
B = Average Width = (9′ + 33′)/2 = 21 ft
$q_d = \frac{1}{2}\gamma BN_\gamma = \frac{1}{2} \times 0.06 \times 21 \times 7 = 4.4$ ksf

Factor of Safety Against Soil Bearing = 4.4 ksf/0.96 ksf = 4.6 > 2.0 O.K.

10. Embayment Area Seepage and Dewatering

A. The Permeability of Existing Silty Sand, K

From the laboratory tests on Borings SW-32 (Sample Depth 0′-6′) and SW-38 (Sample Depth 0′-2′) silty sand samples, the permeability values are 1.4 to 2.4 x 10^{-4} cm/sec and 1.6 to 1.7 x 10^{-5} cm/sec, respectively. It is not known that these shallow sample permeability values can represent 15- to 20-foot thick alluvium layer or not.

From Terzaghi & Peck "Soil Mechanics in Engineering Practice", John Wiley, 2nd Edition reference.

p. 55 Coefficient of permeability = 10^{-3} cm/sec or lower for loose silty sand

$\therefore$ use alluvium soil K = 10^{-3} cm/sec for analysis, conservative

B. The water level shall be lowered from high river water elevation 565 to 1 foot below the bottom of 2- or 3-foot excavation.
Refer to pages 6 to 10 of this report:

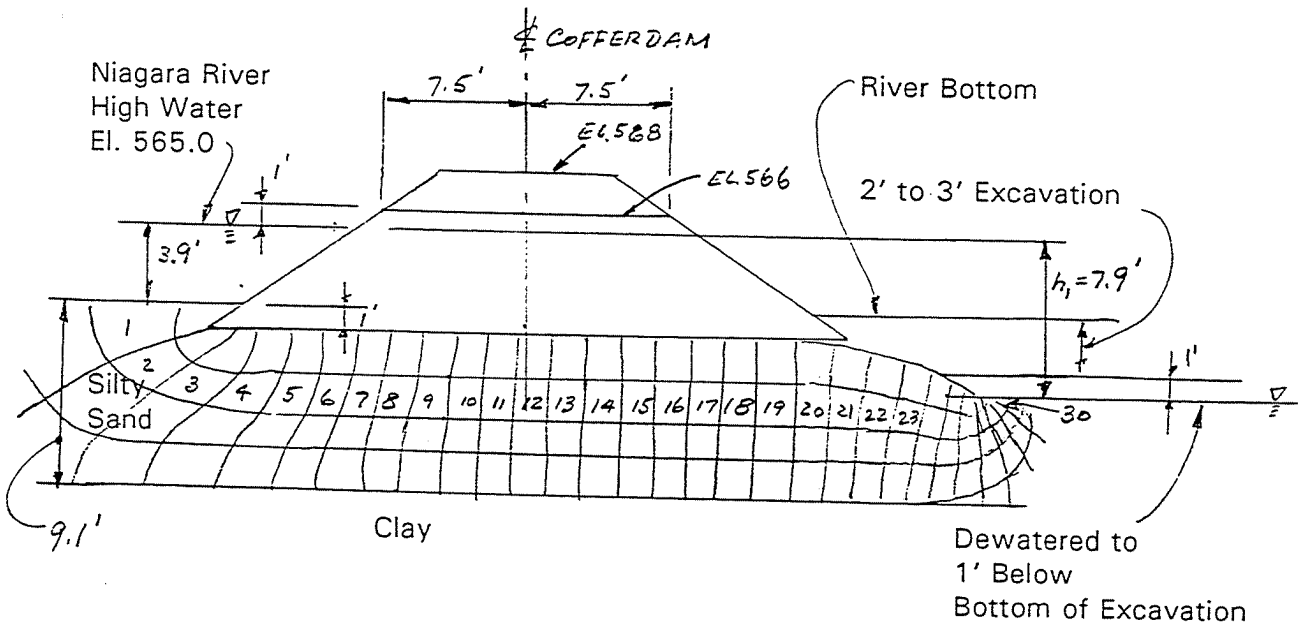
Phase Area	Figure	Dewater Depth Below Elevation 565 (ft)
A	1	7.9 with 3' excavation
B	2	7.9 with 3' excavation
C	3	7.7 with 3' excavation
D	4	7.8 with 3' excavation
E	5	8.7 with 3' excavation

C. Horizontal Seepage in the Existing Alluvium Stratum Under the Cofferdam

Maximum differential head = 7.9 ft for Phase A Area

Ref. Terzaghi & Peck "Soil Mechanics in Engineering Practice", 2nd Edition, p. 160, Eq. (23.5):

Silty sand layer thickness = 9.1 ft



Approximate Flow Net
Scale: 1" = 10'

$$Q = kh_1 \frac{N_f}{N_d}$$

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N_f = Number of flow channels = 4

N_d = Number of drops = 30

h_1 = 7.9 ft for Phase Area A

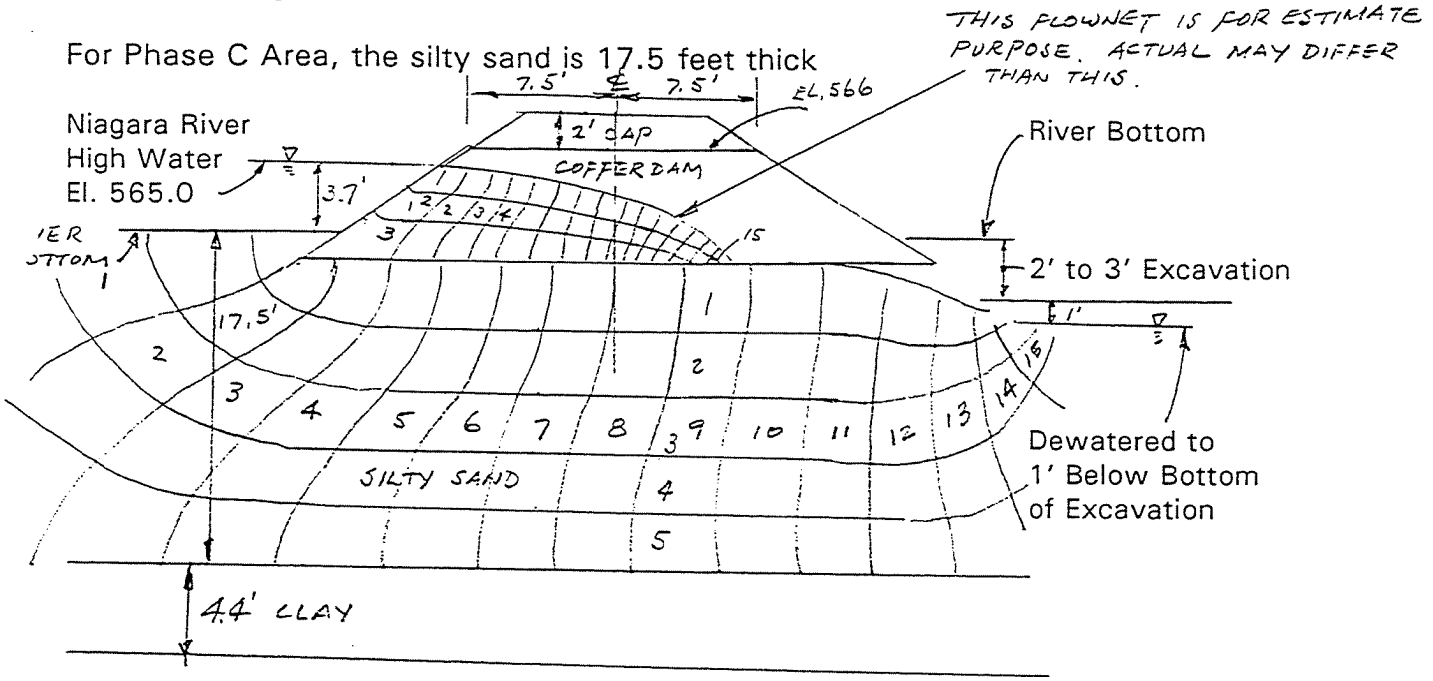
k = 10^{-3} cm/sec for silty sand with organics

= $10^{-3} \times \frac{60}{30} = 2 \times 10^{-3}$ ft/min

Q = 2×10^{-3} ft/min x 7.9 ft x $\frac{4}{30}$ = 0.0021 ft^3/min/ft cofferdam

= 0.02 gpm/ft of cofferdam

For Phase C Area, the silty sand is 17.5 feet thick



Approximate Flownet
Scale: 1" = 10'

N_f = 5, N_d = 15, k = 2×10^{-3} ft/min, h_1 = 7.7 ft

Q = 2×10^{-3} ft/min x 7.7 ft x $\frac{5}{15}$ = 0.0052 ft^3/min/ft cofferdam

= 0.04 gpm/ft of cofferdam

∴ Use 0.04 gpm/ft of cofferdam as the seepage rate through the alluvium.

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Seepage flow through the soil berm itself:

Use Phase C Area flownet $N_f = 3$, $N_d = 15$, $K = 10^{-4}$ cm/sec to 10^{-5} cm/sec for soil containing 40 to 46 percent fines (Terzaghi and Peck, p. 55), Use 0.5×10^{-4} cm/sec = 10^{-4} ft/min.

Seepage $Q = 10^{-4}$ ft/min x 7.7 ft x $\frac{3}{15}$ = 0.00015 ft^3/min/ft cofferdam

= 0.0012 gpm/ft of cofferdam = 1.7 gallons/day/ft of cofferdam

For 1,900 ft long cofferdam, the total seepage through the soil cofferdam (not the alluvium) is 3,200 gallons/day. This is smaller than project Specification 02200, Section 3.5C2 specified 5,000 gallons per day. We believe the specified 5,000 gallons per day is for soil berm only, not the existing alluvium stratum.

D. Dewatering

The seepage through the soil berm of 0.0012 gpm/ft is much smaller than the seepage through the alluvium 0.04 gpm/ft. Therefore, use seepage through the alluvium for dewatering analysis.

Phase Area	Approximate Periphery Length (ft)	Seepage in the Existing Alluvium Under the Soil Berm (gpm)	
A	1,030	42	Use 0.04 gpm/ft of boundary
B	1,200	48	
C	1,080	43	
D	1,290	52	
E	750	30	

The 50 gpm seepage of each phase area plus original water in the soil voids can be sumped out by using sump pumps.

E. In order to avoid boiling at the exit end, the river bottom soil should be kept about 20 feet in-place beyond the toe of the cofferdam. The boiling pressure for Area C = $\frac{4 \text{ drops}}{15 \text{ drops}}$ x 7.7′ = 2.1′ water head.

It requires 2.1′ of total weight of soil to balance this pressure with a factor of safety of 2.

The dewatered soil will act as a weight to counterbalance the boiling. For details, see Terzaghi & Peck, p. 161 to p. 165 for using the grade filter at the toe of the dam to resist boiling.

11. Cofferdam Soil Selection, Construction, and Removal

Method of Construction

A. Install silt curtain/fish screen.

B. The soil will be trucked to the cofferdam site from outside. The truck dumps the soil along the cofferdam route continuously (see Section 15).

C. Dozer will do the grading and compaction.

D. The width of the cofferdam at elevation 566.0 is 15 feet. It can provide for the maneuverability of the trucks and the dozers. The side slope will be 1.5 horizontal to 1.0 vertical on both sides of the cofferdam. The soil compaction is more effective when the dozer works at elevation 566.0. The base width is about 33 feet and the distance from the centerline of the cofferdam to the inside slope toe is about 16 feet. There is a requirement for the stability by not excavating the 20-foot-wide strip of soil north of the inside slope toe. Therefore, the centerline of the cofferdam should be kept 16+20 = 36 feet away from the SSI line or the periphery of the contaminated soil excavation area. There are two-thirds of the cofferdam centerline alignment and SSI line located within 36 feet and adjustment for this situation should be addressed.

E. The weight and dozer vibrations will densify the soils.

F. The truck dumping the soil shall be fast enough such that the fines will not disperse and spread in the river water.

G. The 190-foot-long cofferdam and the phase area four closure legs will be constructed as a whole unit using Fluor Daniel Drawing 594000-10Q-01 Rev. 0 layout (Smith Environmental Figure 6 or page 11 of this report) with some modifications explained in above Item D.

- Smith Environmental proposes to build a cofferdam and closure legs as a whole unit. Smith Environmental believes once the material is placed in the river, it will be too saturated to be removed and reused as in the Scope of Work, Part I, Page 31 of 35, Rev. No. 0, Section 4.1, Item 7 and Part II, Page 14 of 23, Section 3.9.1, Item 9A.

- Another reason would be to keep haul units off the bulkhead platform and to keep contaminated material off clean areas. The cofferdam would stay in place until all work of the bulkhead was completed.

- Save construction time and cost than building each individual phase area cofferdam and closure leg at a time.

H. Construct the 2-foot-thick cofferdam cap from elevation 566.0 to elevation 568.0. The cap will maintain a 9-foot width at the crest and 1.5 horizontal to 1.0 vertical slopes on both sides of the cofferdam.

I. Dewatering by sumping - 5 to 6 sump pumps per phase area with pump capacity of 30 to 50 gpm each. Additional dewatering trenches may be needed if the soil has large amounts of fines. If turbidity >17 NTU, the water will be treated.

J. Install water barrier (see detail below).

K. For State Codes on the embankment construction across the water submerged ground, see Section 15 of this report.

Selection of Soil

The soil needs about 40 percent fines to make the soil particles bind together, but not pure clay or pure sand. The soils suitable for the cofferdam construction are American Association of State Highway and Transportation Officials (AASHTO) Designation M145-87 classified soils A-2-6, A-2-7, A-4, A-5, A-6, or A-7. This specification is attached to this report (see pages 60 to 66).

Smith Environmental obtained the soils in the area close to the site:

Supplier: Haseley Trucking Co., 10315 Lockport Road, Niagara Falls, NY 14304-0212, Telephone (716) 297-1550
Location: Borrow Pit at Wheeler Road

Grain Size Analysis:

Test Date	Analyzed By	Sample No.	% Gravel	% Sand	% <200 Sieve	Probable AASHTO Group	Maximum Dry Density, lbs/ft	Optimum Moisture Content, %
April 1988	GZA Geoenvironmental 364 Nagel Drive Buffalo, NY 14225	04058-1	31	29	40	A-2-6, A-2-7, or A-4	140.5	6.7
March 24, 1992	GZA Geoenvironmental 364 Nagel Drive Buffalo, NY 14225	03092-2	15	39	46 (with 7% <0.002 mm)	A-2-6, A-2-7 or A-4	--	--

Comments:

These soils conform to AASHTO M145-87 sieve analysis requirements, but characteristics of the fraction passing No. 40 sieve were not shown. There are 15 to 31 percent gravel in the soil and it will give the soil particles more stability during the filling operation. It has some clay fraction (7% <0.002 mm) for binding and the clay can also reduce the coefficient of permeability to about 10^{-5} cm/sec. Smith Environmental keeps these original test grain size curves and other laboratory data in the office.

Water Barrier Installation Along the Outside Face of the Cofferdam

A. The water barrier is a 40-mil PVC liner. It will be glued together to form a long piece.

B. The width of the liner = 6.9′ berm height above river bottom (Phase A area) x 1.5 for slope + 3′ wrap at top of the berm at elevation 568.0 + 3′ flat at river bottom = 16.4′. Use 18′ in case slope is flatter or river bottom is deeper.

C. Dig a 4" x 12" trench 2′ in from the edge of the cofferdam crest at elevation 568. Fold the edge of the PVC liner and fix into the trench. Alternatively, the liner can be folded at elevation 567 and anchored.

D. Prepare 130 pieces of 12" x 24" sand bags. Place sand bags at 15-foot centers at river bottom to hold the liner in place. Each sand bag will have ¼ Manila rope tied to the top of the soil berm.

E. Drive wooden stakes behind the 4" x 12" trench at 15-foot centers such that the Manila rope can be tied on.

F. If the river flow is fast, additional sand bags shall be placed at 7.5-foot centers.

Method of Cofferdam Removal

A. After the required 2-foot and 3-foot designated contaminated soils in the embayment area are excavated and backfilled with clean soils, the removal of the cofferdam and the closure legs shall begin.

B. Build roads from Point 1 to Point 2 to the designated disposal areas (for Point 1 and Point 2, see Figure 6 or Page 11 of this report).

C. Remove 40-mil PVC liner. Remove the sand bags by pulling the Manila ropes.

D. Start the soil removal at the center of the Phase C cofferdam toward the ends of Point 1 and Point 2 using a dozer to strip the top 2 feet of soil. The remainder of the soil will be excavated using a backhoe. This removal will be part underwater. Trucks will be used to transport the removed soils.

E. This removal shall be done in the dry season at the lowest water stage.

F. The removal of the last 150-foot cofferdam at the west end of the Phase E area has to be approved by the original design engineer.

12. Existing Alluvium (Silty Sand) Liquefaction During Dozer Operation Along the Cofferdam

The low blow count soil near the river bottom occurs in each phase area. Therefore, the liquefaction possibility should be checked.

Ref. B. Das "Fundamentals of Soil Dynamics", Elsevier Science Publishing Co., 1983, Chapter 11 "Liquefaction of Saturated Sand"

The saturated loose sand liquefaction potential depends on:

A. Relative density, R_D

B. Confining pressure, σ_3

C. Peak pulsating stress, σ_d

D. Number of cycles of pulsating stress applications, n.

The relative density, R_D, for loose sand will be about 40 percent and void ratio e $\simeq$ 0.80

The confined pressure σ_3 at depths of 5 to 10 feet without the berm is about 7.5 ft x 60 pcf = 450 psf = 3.2 psi. After placing the soil berm, the load increased 0.40 tsf (see page 14, Soil Cofferdam Settlement Calculation) or 5.6 psi. The new confined pressure σ_3 is 3.2 + 5.6 $\simeq$ 9 psi.

The confined pressure induced by the dozer weight is:

D6H dozer operating weight = 39^k (Caterpillar Performance Handbook, 23rd Edition, 1992)

Shoe Width = 22 ft

Contact Area = 4,564 in^2

Contact Pressure = 8.5 psi

Total Confined Pressure = 9 + 8.5 = 17.5 psi

The dozer vibrating pulsating stress acting on the alluvium soils may be only 10 to 20 percent of 8.5 psi value when the pulsating wave transmitted through the soil berm with damping.

$$\sigma_d = 0.2 \times 8.5 \cong 2 \text{ psi}$$

Figure 11.10 of this reference indicates no liquefaction. Therefore, the cofferdam is safe against the dozer operation.

13. Alternative Bid of Cofferdam - Drive Sheet Piling

A. Soil Depth to Refusal.

Based on Table 1 (see page 2 of this report), the maximum soil depth to refusal (till) is 24 feet at Boring SW-28. This 24 feet contains 18 feet loose silty sand alluvium and 6 feet clay.

B. Maximum Piling Length.

The total depth of piling = (565 - 561.37) water + 24 feet soil + 3 foot freeboard to elevation 568 + 1 foot tip driven into till = 3.6 + 24 + 3 + 1 = 31.6 feet, use 30 feet.

C. Piling Length of Each Phase Area (use Table 1 data, see page 2 of this report)

Phase Area	Table 1 Sand Thickness (ft)	Table 1 Clay Thickness (ft)	Water Depth (ft)	3-Ft Freeboard and 1-Ft Into Till	Total Length of Sheeting (ft)
A	9.1	4.2	3.9	4	21.2
B	12.1	5.0	3.9	4	25
C	17.5	4.4	3.7	4	29.6
D	14.3	4.1	3.8	4	26.2
E	8.0	5.0	4.7	4	21.7

Use 20-foot to 30-foot long steel sheeting as the temporary cofferdam and the closure legs between the phase areas.

D. Size of Steel Sheeting

The most common size of steel sheeting for shoring use available on the market is PZ-27. The weight of PZ-27 is 27 lbs/ft^2 of wall. One ton will cover 2,000 lbs/27 lbs/ft^2 = 74 square feet of wall. For an average length of sheeting of 25 feet, one ton of PZ-27 sheeting will cover 3 feet of cofferdam or closure legs.

PZ-27 Sheeting:
Nominal Depth = 12 inches
Nominal Width = 18 inches
Section Modulus = 30.2 in^3/ft of wall
Web Thickness = 3/8 inches
Flange Thickness = 3/8 inches
Weight = 27 lbs/ft^2 of wall

E. Total Length of PZ-27 Steel Sheeting Wall

Cofferdam Wall:

Phase Area	Cofferdam Length (ft)	PZ-27 Sheeting Length (ft)	Total PZ-27 Tonnage
A	340	20	
B	380	25	
C	360	30	
D	540	25	
E	300	25	
TOTAL	1,920	--	(1,920)/3 ft/ton = 640 tons at an average sheeting length of 25 feet

Closure Legs:

Phase Areas	Closure Leg Length (ft)	PZ-27 Sheeting Length (ft)	Total PZ-27 Tonnage
A-B	280	25 to 15 with average of 20	
B-C	250	30 to 15 with average of 22	
C-D	110	30 to 15 with average of 22	
D-E	100	25 to 15 with average of 20	
TOTAL	740	--	[(740)/(3 ft/ton)] x 20/25 = 200 tons at an average sheeting length of 20 feet

Total PZ-27 sheeting tonnage = 640 + 200 = 840 tons

This tonnage can be reduced to a quarter if each cell is constructed and removed successively. The driving cost will be higher because it needs several mobilizations.

There is no sheeting driven along the shoreline.

F. Total PZ-27 Sheeting Driving Area

Cofferdam:

1,920 ft wall x average 25 ft long sheeting = 48,000 ft^2

Closure Legs:

740 ft wall x average 20 ft long sheeting = 14,800 ft^2

TOTAL $\cong$ 62,800 ft^2, Use 65,000 ft^2

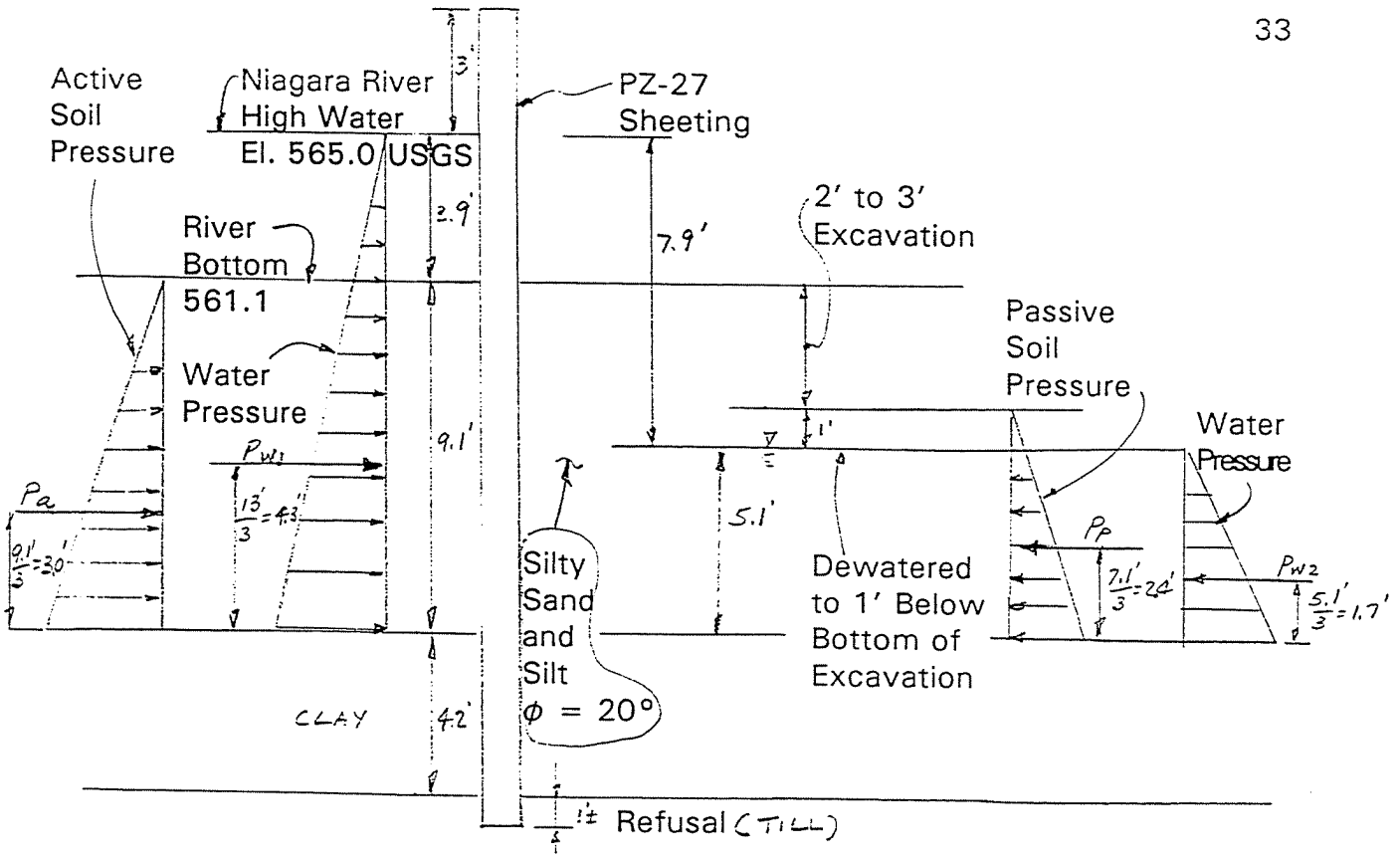
G. The Water Level Difference Between the River Side and the Excavation Side:

Phase Area	Differential Head	PZ-27 Average Sheeting Length (ft)
A	7.9	20
B	7.9	25
C	7.7	30
D	7.8	25
E	8.7	25

H. Stability of PZ-27 Sheeting During Dewatering and Excavation

The critical case is Phase A Area sheeting.

Use $\phi = 20°$ to analyze first.



Pressure Diagram
1" = 5'

$\gamma_{subm.}$ = 60 pcf = 0.06 kcf, ϕ = 20°

$$K_a = \frac{1-\sin\phi}{1+\sin\phi} = \frac{1-0.34}{1+0.34} = 0.49$$

$$K_p = \frac{1+\sin\phi}{1-\sin\phi} = \frac{1+0.34}{1-0.34} = 2.03$$

$P_a = \frac{1}{2} K_a \gamma_{subm.} (H)^2 = \frac{1}{2} \times (0.49)(0.06)(9.1)^2 = 1.2$ k/ft of wall, where H = 9.1'

$P_{W1} = \frac{1}{2} \gamma_w (H)^2 = \frac{1}{2} \times 0.0624\ (13)^2 = 5.3$ k/ft of wall, where H = 3.9' + 9.1' = 13'

$P_p = \frac{1}{2} K_p \gamma_{subm.} (H)^2 = \frac{1}{2} \times 2.03 \times 0.06 \times (7.1)^2 = 3.1$ k/ft of wall, where H = 7.1'

$P_{W2} = \frac{1}{2} \gamma_W (H)^2 = \frac{1}{2} \times 0.0624 \times (5.1)^2 = 0.8$ k/ft of wall, where H = 5.1'

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For clay $\phi = 0$, $K_A = K_p = 1$, neglect 4.2 ft clay pressures.

As a preliminary calculation, take moment about the top of clay:

M_o = Overturning Moment $= P_a \times 3.0' + P_{W1} \times 4.3' = 1.2 \times 3.0 + 5.3 \times 4.3$
$= 26.4$ k-ft/ft of wall

M_R = Resisting Moment $= P_p \times 2.4' + P_{W2} \times 1.7'$
$= 3.1 \times 2.4 + 0.8 \times 1.7 = 8.8$ k-ft/ft of wall
$8.8 < 26.4$ N.G.

In order to increase the soil resistance at the excavation side, leave the soil 20 ft wide behind the sheeting intact and dewater. It will be excavated later in segments to maintain the sheeting stability.

$H = 9.1'$

ϕ will change from 20° to 30° after dewatering due to the increase in overburden pressure:

$$K_p = \frac{1+\sin 30°}{1-\sin 30°} = \frac{1+0.5}{1-0.5} = 3.0$$

$P_p = \frac{1}{2} K_p \gamma_{sub.} H^2 = \frac{1}{2} (3.0)(0.06)(9.1)^2 = 7.5$ k/ft

Moment Arm $= 9.1/3 = 3.0$ ft

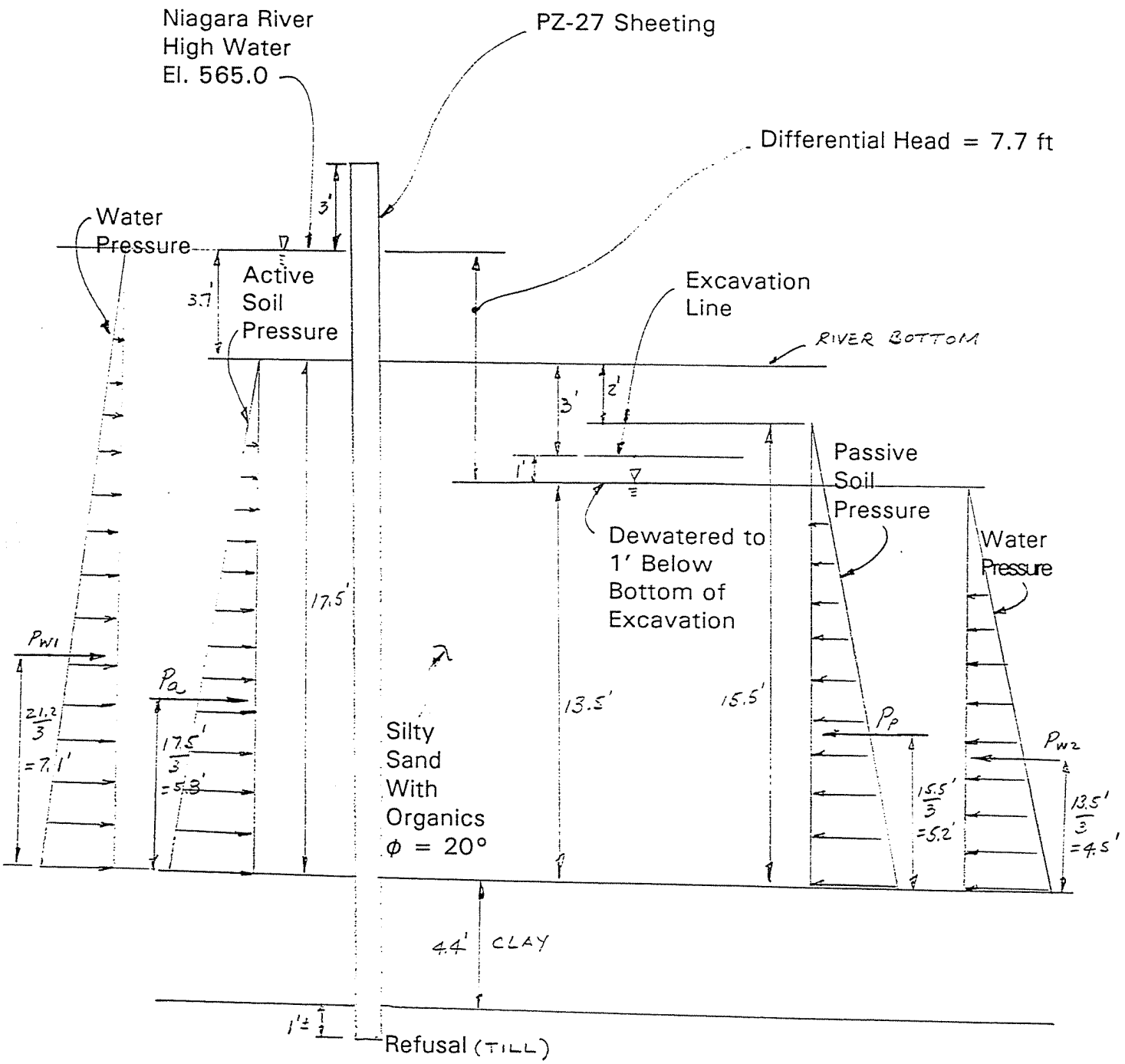
Resisting Moment $= P_p \times 3.0' + P_{W2} \times 1.7'$

$= 7.5 \times 3.0 + 0.8 \times 1.7 = 23.9$ k-ft/ft

Close to 26.4 k-ft/ft of wall

After dewatering 4 feet below river bottom in the excavation area, the dewatered soil total weight will increase the stability of the sheeting. Detail analysis is needed in the future to determine what extent of soil behind the wall should be left in-place to preserve a larger factor of safety of the sheeting against overturning if the sheeting scheme is adopted.

Check of Area C Sheeting:



Pressure Diagram
1" = 5'

PR\W:\330\02\NIAGARA [Jan. 26, 1996]

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$P_a = \frac{1}{2} \times (0.49)(0.06)(17.5)^2 = 4.5$ k H = 17.5′

$P_{W1} = \frac{1}{2}\ (0.0624)(21.2)^2 = 14.0$ k H = 21.2′

$P_p = \frac{1}{2} \times (2.03)(0.06)(15.5)^2 = 14.6$ k H = 15.5′

$P_{W2} = \frac{1}{2}\ (0.0624)(13.5)^2 = 5.7$ k H = 13.5′

For preliminary calculation, take moment about top of clay:

$M_o = P_a \times 5.8' + P_{W1} \times 7.1' = 4.5 \times 5.8 + 14 \times 7.1 = 125.5$ k-ft/ft wall

$M_R = P_p \times 5.2' + P_{W2} \times 4.5' = 14.6 \times 5.2 + 5.7 \times 4.5 = 101.1$ k-ft/ft wall

< 125.5 N.G.

∴ Perform the similar procedure to keep 20-foot wide soil behind the sheeting intact and dewater, then excavate in pieces.

I. Leakage Control through the PZ-27 Sheeting Interlocks.

Ref. "Pike Buck Steel Sheet Piling Design Manual", Pile Buck Co., Jupiter, Florida, 1987, p. 36.

The joint leakage = 0.025 gallons/minute/ft^2 wall/ft net head for moderately and highly permeable soils.

For 7.9-foot head difference, leakage = 0.025 gpm/ft^2 x 7.9 = 0.20 gpm/ft^2

25-foot long sheeting = 0.20 gpm/ft^2 x 25 ft ≅ 5 gpm/ft of wall

For piling in the silty sand, it may be only 10 to 20 percent of this leakage.

∴ Brush some bentonite slurry on the joints, if needed, during driving to plug the interlock openings.

14. Recommended Construction of the 150-Foot Cofferdam at the West End of the Phase E Area

Reference Drawing - Fluor Daniel 594000-10Q-01 Rev. 0, 594000-30K-03 Rev. 0, and pages 41 through 45 of this report.

Reasons for cofferdam construction recommendation:

A. There are no contours in the 100-foot area from the west end of the cofferdam alignment.

B. The river bottom contours just outside the 100-foot area are congested, which indicate a steeper slope for the river bottom.

C. The shipping channel is at this area. Any fill placed in the shipping channel is a problem. It may have to obtain approval from the regulatory agencies.

D. The toe of the bulkhead coincides with the centerline of the cofferdam or located outside the cofferdam and creates construction problems. The bottom elevation of the bulkhead toe is at elevation 563.5 ± (see page 45 of this report) and the river bottom is at 560.7 or lower (see page 43 of this report). There is a gap in the water of 3 feet or bigger and requires the cofferdam soil to support the bulkhead.

The following items are recommended to construct the soil berm cofferdam:

1. Clarify the drawing to show the exact layout of the cofferdam centerline and bulkhead toe in this 150-foot zone.

2. Perform sounding from shoreline to a line 30 feet outside the cofferdam centerline.

3. Develop river bottom profiles at 0 feet, 25 feet, 50 feet, 75 feet, 100 feet, 125 feet, and 150 feet from the west end of Phase E area with the outline of bulkhead, riprap slope, soil cofferdam, etc. shown.

4. The probable scheme to construct a stable cofferdam on this steeper river bottom is estimated as follows:

   - A profile is attached to this recommendation using Survey Points I-1, I-2, I-3, and I-4 (see Page 43).

- Select a line 2 feet outside the centerline of the cofferdam.

- Drive HP8x36 (or HP10x42) piles at 6-foot centers along this line to a depth of 20 to 25 feet below the river bottom. The pile is about 30 feet long and protrudes 8 feet above the river bottom to El. 568. The function of the piles is to retain the soil for embayment area dewatering.

- Weld a 3" x 3" x ½" angle horizontal girt above the water level.

- Hang soil retention screen drapes on this girt.

- Place 1-foot size riprap on the river bottom outside the screen and place soil inside the screen at the same time such that the soils will be contained by the screen drapes.

- The soil shall be semi-impervious and compacted by the dozers to control the river water seepage. The soil shown on page 26 can be used.

- The river bottom soils at the shallow water area are loose to very loose silty sand according to the SW borings blow counts. This 150-foot area water is deeper and soil may be looser. Therefore, the dozer and truck working in this area have to be careful.

- The average soil berm height is estimated about 7 feet and the riprap height is about 9 feet, including settlements.

- Estimated quantities of material from section shown on Page 43:

  The zone of steeper river bottom is about 150 feet long starting from the west end of the Phase E Area.

  Top of Compacted Berm at Elevation 566.0:

  Soil Berm: Top width 10 feet, bottom width 16 feet, 7 feet high, 150 feet long

$$Volume = \left[\frac{10' + 16'}{2} \times 7'\right] \times 150' \times \frac{1}{27} = 510 \ cu \ yds$$

  Riprap: Top width 6 feet, bottom width 22 feet, 9 feet high, 150 feet long

$$Volume = \left[\frac{6' + 22'}{2} \times 9'\right] \times 150' \times \frac{1}{27} = 700 \ cu \ yds$$

Piles (HP8x36 or HP10x42 on 6-foot centers):

25 pcs @ 30' long @ 42 lbs/ft = 16 tons

Driving length = 25 x 30' = 750 ft

Girt:

3" x 3" x ½" angle 150' long @ 10.2 lbs/ft = 0.8 tons

Soil Retention Screen Drapes:

Say 7 feet deep, but using 24 feet including wrapping under the soil and the riprap area = 24' x 150' = 3,600 ft^2. Use Mirafi 700x woven geotextile fabric or equivalent.

Factor of Safety Against Sliding

Soil Berm Area = $\frac{10' + 16'}{2}$ x 7' = 91 ft^2, approximately ½ submerged, ½ above water level. Average soil weight for soil = (60 pcf + 120 pcf)/2 during dewatering = 90 pcf.

Weight of soil berm = 91 ft^2 x 90 pcf = 8,200 lbs/ft = 8.2 k/ft

Riprap area = $\frac{6' + 22'}{2}$ x 9' = 126 ft^2

Most riprap are submerged, use 60 pcf.
Weight of riprap = 126 ft^2 x 60 pcf = 7,600 lbs = 7.6 k/ft
Total weight = 8.2 k/ft + 7.6 k/ft = 15.8 k/ft

River bottom soil interface friction angle = 25°

Friction resistance = (15.8 k/ft) tan 25° = 7.4 k/ft

Water pushing force during embayment area dewatering:
Outside water level elevation = 565
Inside water level elevation = 560 - 3' = 557
Difference in Head = 565 - 557 = 8'
Water Pushing Force = ½ x 0.0624 kcf x $(8)^2$ = 2 k/ft
Factor of Safety Against Sliding = $7.4^k/2^k$ = 3.7 > 2.0 O.K.

If pile resistance is added, the factor of safety will be slightly higher. Pile resistance can be analyzed by the horizontal subgrade reaction theory of the silty sand. Since the silty sand is loose, the horizontal subgrade reaction is small and can be neglected.

When construct cofferdam to Elevation 568:

Area of riprap increase = (6' + 3')/2 x 2' = 9 ft^2

Weight increase = 9 ft^2 x 120 pcf = 1,080 lbs = 1.1 k/ft

Area of soil berm increase = (9' + 7')/2 x 2' thick = 16 ft^2

Weight increase = 16 ft^2 x 120 pcf = 1,920 lbs/ft = 1.9 k/ft

Total weight increase = 1.1 + 1.9 = 3.0 k/ft

Total Friction Resistance = (15.8 k/ft + 3.0 k/ft) tan 25° = 8.8 k/ft

Factor of safety against sliding = $8.8^k/2^k$ = 4.4 > 2.0 O.K.

Material Increase Due to Change Crest from Elevation 566 to 568:

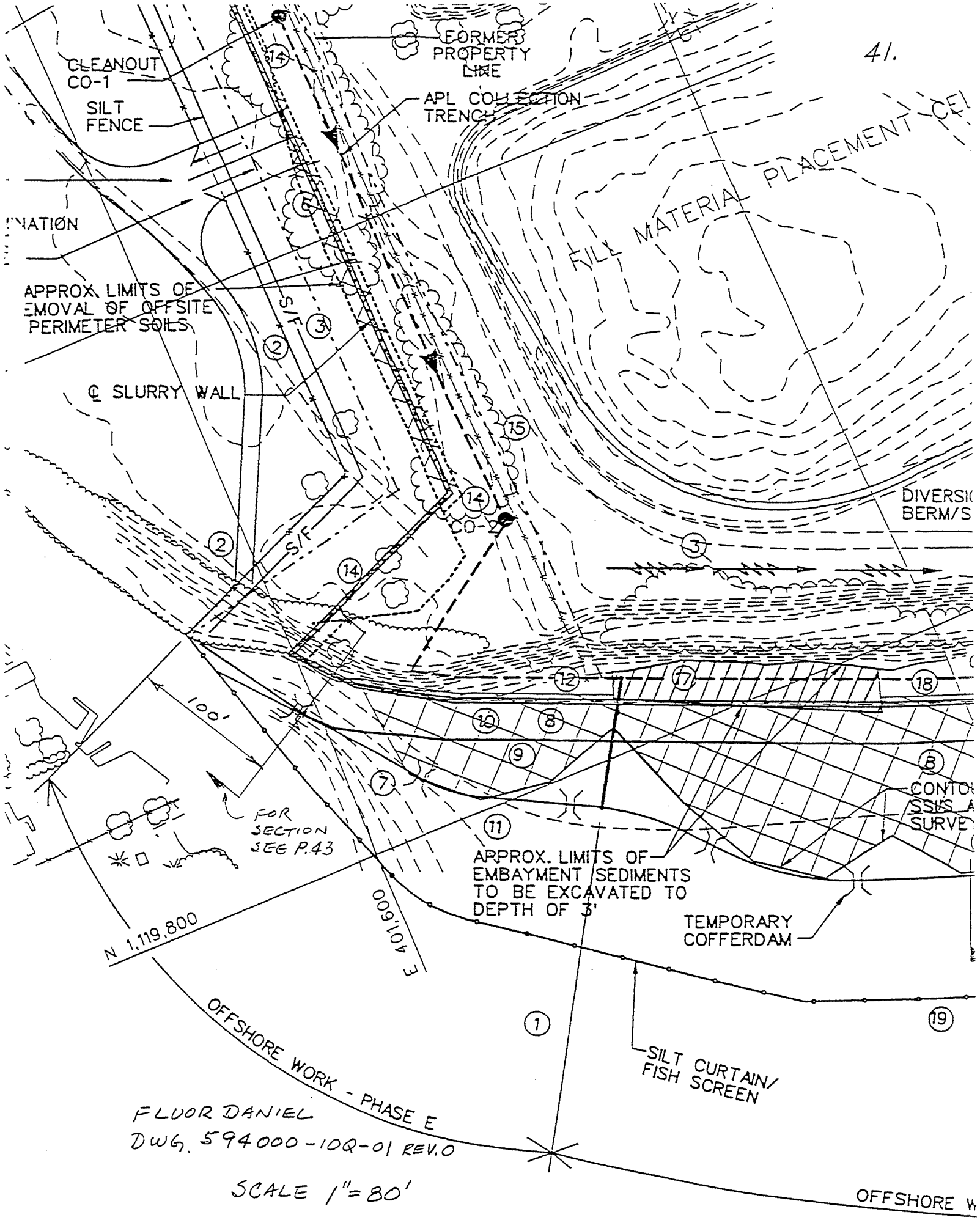
Soil: 16 ft^2 x 150 ft long x 1/27 = 90 cu yds

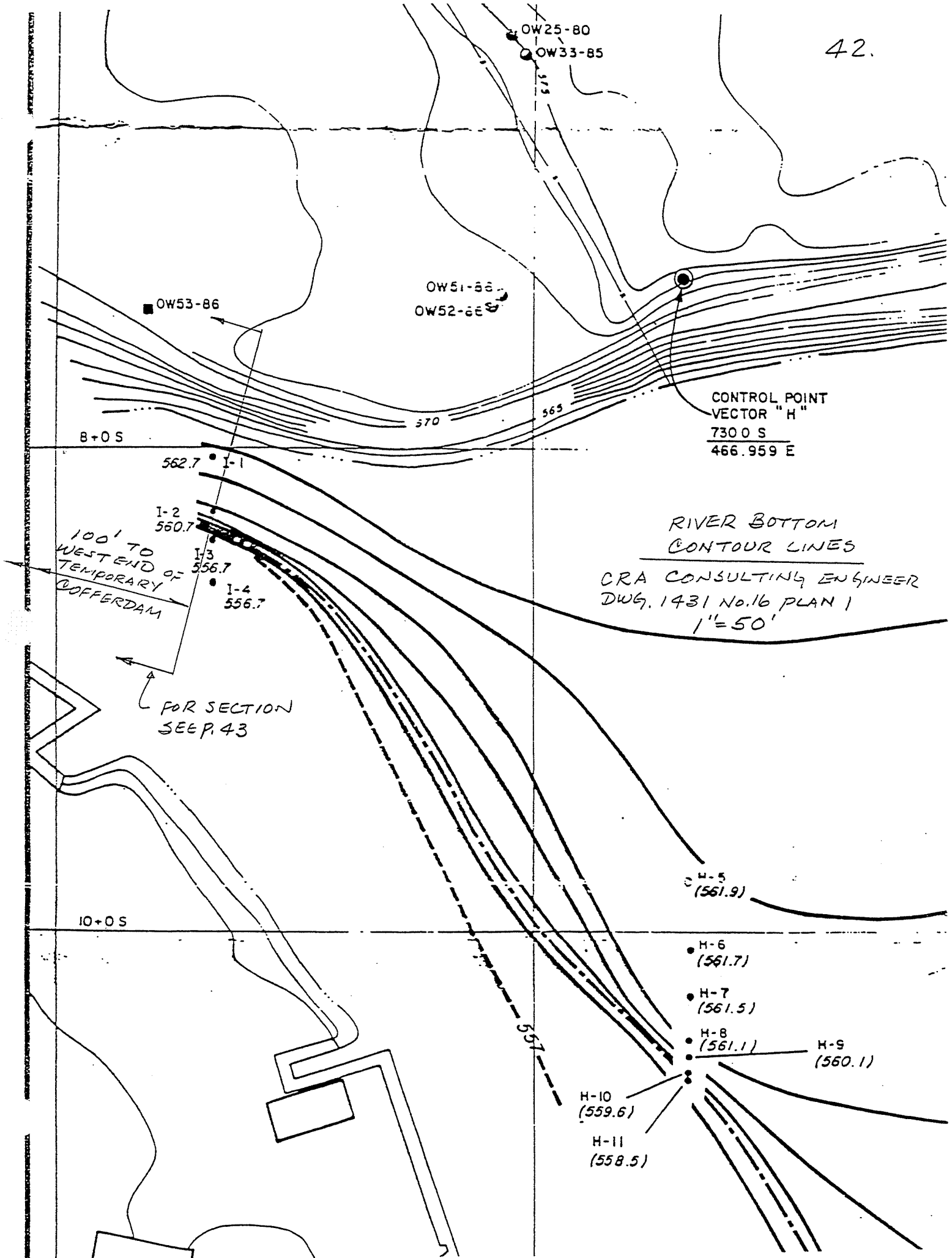
Riprap: 9 ft^2 x 150 ft long x 1/27 = 50 cu yds

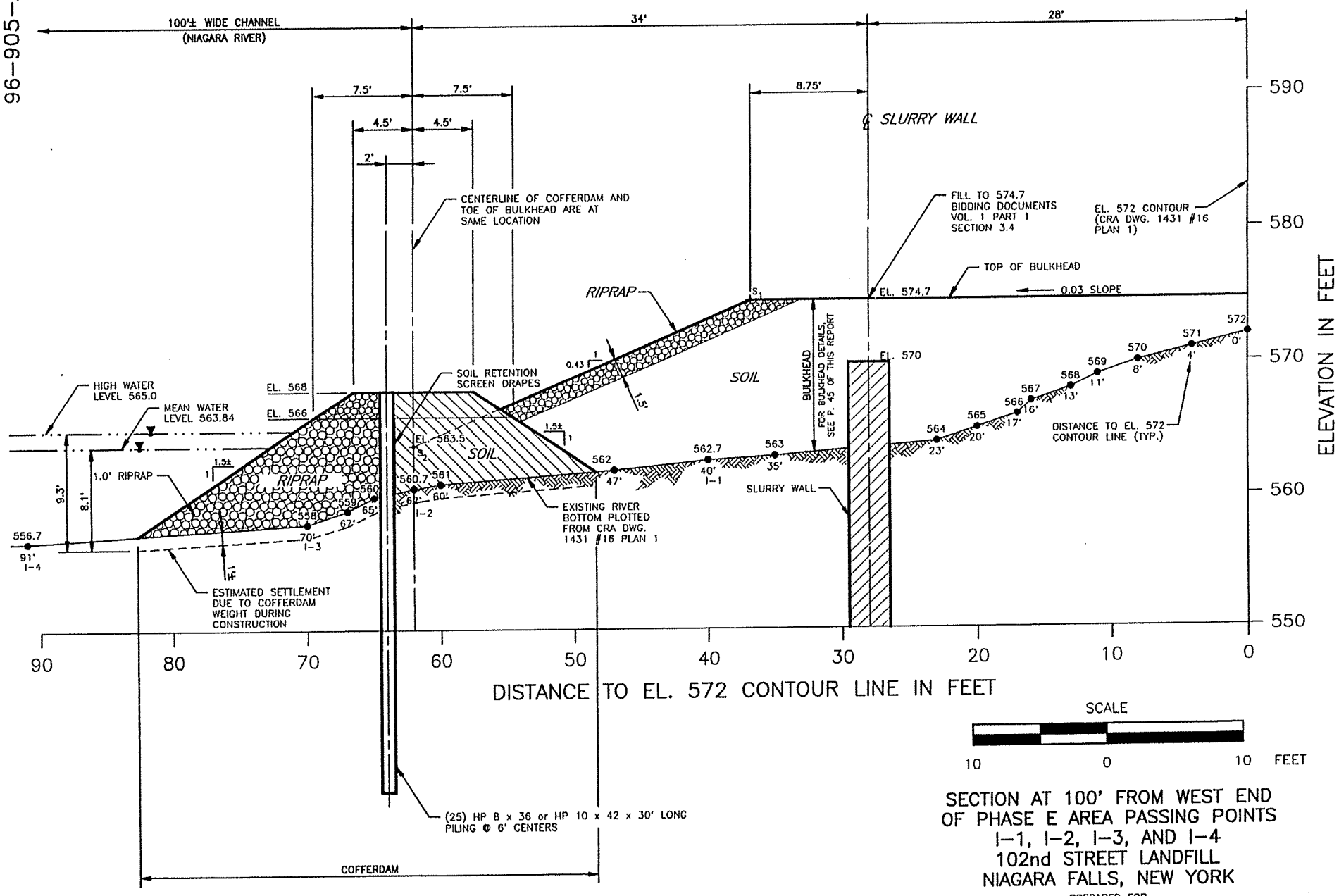
Piles, Girt, and Screen Drapes Quantities are the Same

5. Remove Cofferdam

- The removal quantities are the same as installation.
- The cofferdam may be needed to be left in-place for the bulkhead and riprap stabilization. How much should be left in-place shall be studied by the original design engineer. The configuration and compaction of the cofferdam are part of the bulkhead structure stability design analysis.
- If part of the fill and riprap stays, it may need permits from the regulatory agencies.


FORMER PROPERTY LINE
CLEANOUT CO-1
SILT FENCE
APL COLLECTION TRENCH
FILL MATERIAL PLACEMENT
APPROX. LIMITS OF REMOVAL OF OFFSITE PERIMETER SOILS
℄ SLURRY WALL
S/F
CO-2
DIVERSION BERM/S
100'
FOR SECTION SEE P.43
APPROX. LIMITS OF EMBAYMENT SEDIMENTS TO BE EXCAVATED TO DEPTH OF 3'
TEMPORARY COFFERDAM
N 1,119,800
E 401,600
OFFSHORE WORK - PHASE E
SILT CURTAIN/ FISH SCREEN
OFFSHORE W
FLUOR DANIEL
DWG. 594000-10Q-01 REV.0
SCALE 1"=80'


OW25-80
OW33-85
OW53-86
OW51-86
OW52-86
570
565
CONTROL POINT
VECTOR "H"
730 0 S
466.959 E
8+0 S
562.7
I-1
I-2
560.7
I-3
556.7
I-4
556.7
100' TO WEST END OF TEMPORARY COFFERDAM
FOR SECTION SEE P. 43
RIVER BOTTOM CONTOUR LINES
CRA CONSULTING ENGINEER
DWG. 1431 No. 16 PLAN 1
1"=50'
H-5
(561.9)
10+0 S
H-6
(561.7)
H-7
(561.5)
H-8
(561.1)
H-9
(560.1)
H-10
(559.6)
H-11
(558.5)
557



SCALE

10 0 10 FEET

SECTION AT 100' FROM WEST END OF PHASE E AREA PASSING POINTS I-1, I-2, I-3, AND I-4
102nd STREET LANDFILL
NIAGARA FALLS, NEW YORK
PREPARED FOR
OCCIDENTAL CHEMICAL CORP./OLIN CORP.

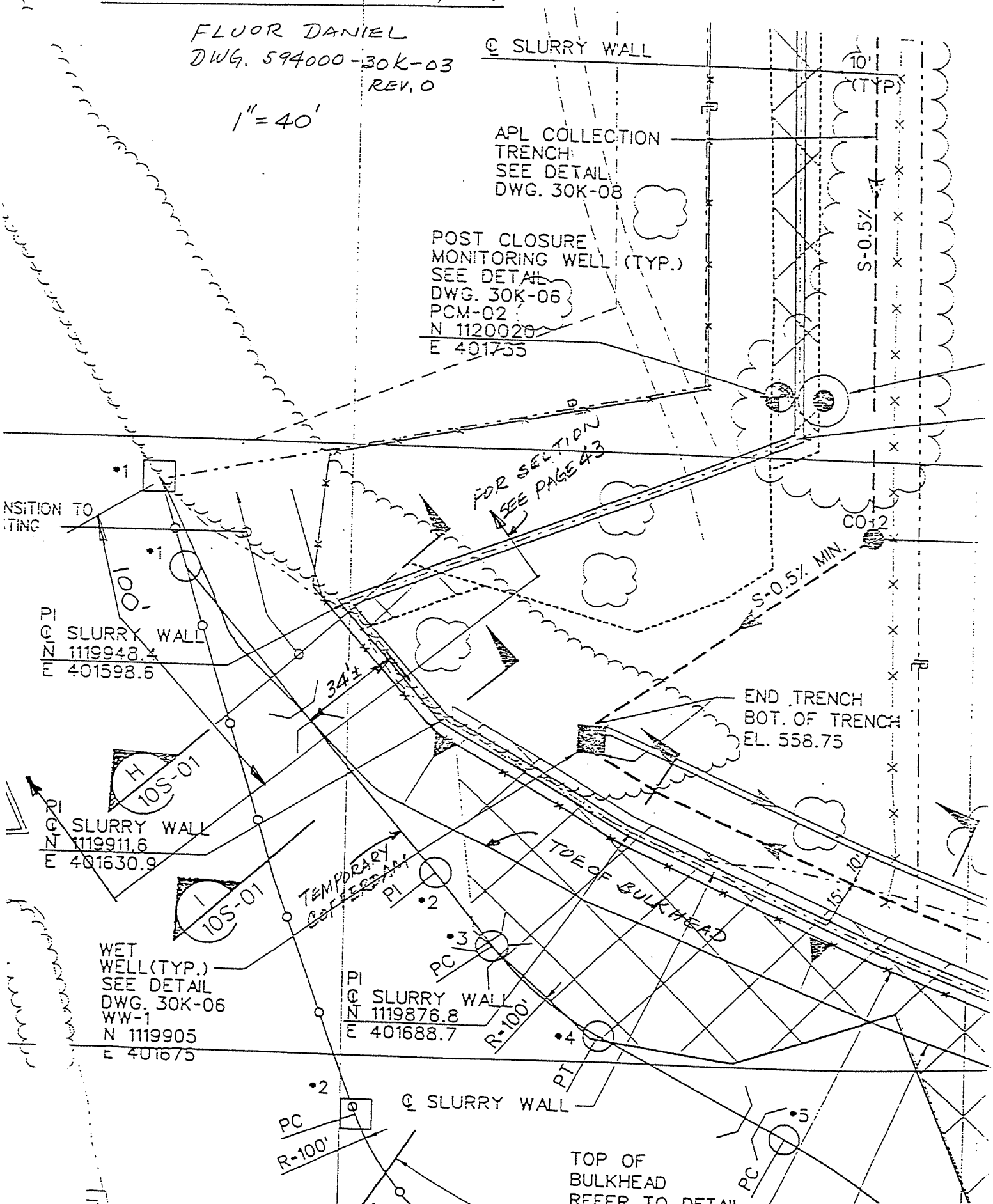
POINT S_1: 8.75' FROM CENTERLINE OF SLURRY WALL,
ELEVATION = 574.7 − (8.75' x 0.03) = 574.43

POINT S_2: 34' FROM CENTERLINE OF SLURRY WALL, EL. 563.5
DIFFERENCE IN ELEVATION = 574.43 − 563.5 = 10.93'
HORIZONTAL DISTANCE = 34' − 8.75' = 25.25'
RIPRAP SLOPE = $\frac{10.93'}{25.25'}$ = 0.43

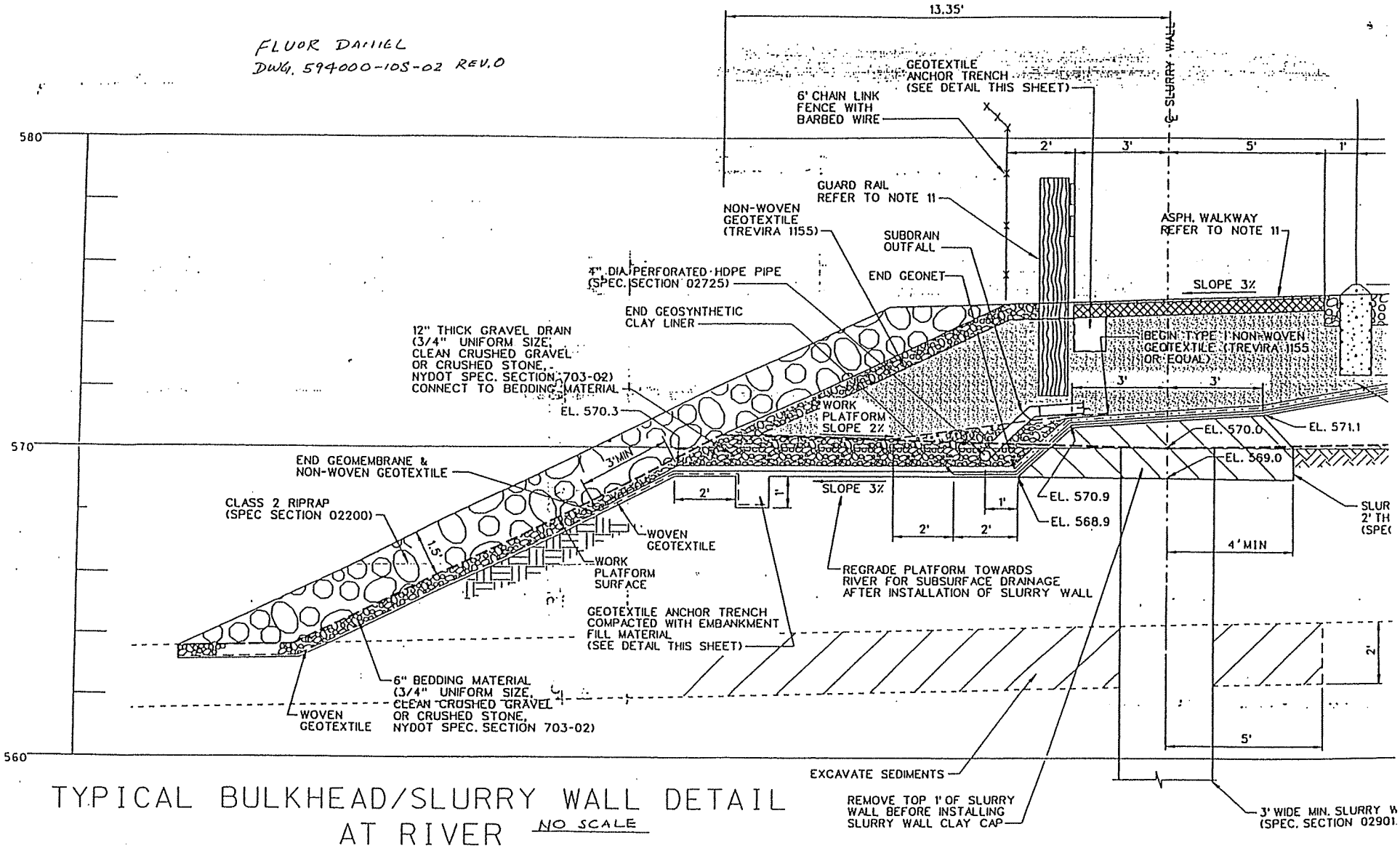
TEMPORARY COFFERDAM PLAN

FLUOR DANIEL
DWG. 594000-30K-03
REV. 0

1"=40'



FLUOR DANIEL
DWG. 594000-105-02 REV.0



TYPICAL BULKHEAD/SLURRY WALL DETAIL AT RIVER

NO SCALE

15. State Codes for Embankment Construction Procedure Across the Water Submerged Ground and the Soils to be Used

New York State Department of Transportation (DOT) Standard Specifications, 1995, p. 2-23 to p. 2-24 (attached)

> Section 203-3.10 did not mention embankment construction methods across the water submerged ground

California State DOT Standard Specification 1988, p. 19-18 to p. 19-21 (attached for reference), Section 19-6.02(2) states:

> Where embankments are to be constructed across low, swampy ground which will not support the weight of hauling equipment, the lower part of the embankment may be constructed by dumping successive loads in a uniformly distributed layer of a thickness not greater than that necessary to support the equipment while placing subsequent layers, after which the remainder of the embankment shall be constructed in layers and compacted as specified.

Florida State DOT Standard Specification 1996, p. 112 to p. 115 (attached for reference), Section 120-8.2.2 states:

> Placing in Unstable Areas: Where the material is deposited in water, or in low swampy ground that will not support the weight of hauling equipment, the fill shall be constructed by dumping successive loads in a uniformly distributed layer of a thickness not greater than necessary to support the hauling equipment while placing subsequent layers. Once sufficient material has been placed so that the hauling equipment can be supported, the remaining portion of the embankment shall be constructed in layers in accordance with the applicable provisions of 120-8.2.1 and 120-8.2.3.

Florida State DOT Standard Specification 1986, p. 147 to p. 149 (attached for reference), Section 120-8.2.2 states:

> Placing in Unstable Areas: Where the material is deposited in water, or on low swampy ground that will not support the weight of hauling equipment, the fill shall be constructed by dumping successive loads in a uniformly distributed layer of a thickness not greater than necessary to support the hauling equipment while placing subsequent layers. The upper portions of such embankments shall be constructed in layers in accordance with the applicable provisions of 120-8.2.1 and 120-8.2.3.

Materials for Embankment:

AASHTO Specification M57-80 (1990), 1 page (attached)

AASHTO Specification M145-87, 5 pages (attached)

AASHTO M57-80 (1990) Section 3.2.1 states:

> In embankments - Materials classified in the A-1, A-2-4, A-2-5 or A-3 groups as in AASHTO M145 shall be used when available and shall be compacted to the depth specified to not less than 95 percent of the maximum density per AASHTO T99. If material of this character is not available and materials from the A-2-6, A-2-7, A-4, A-5, A-6, or A-7 groups must be used, special attention should be given to the design and construction of the embankment. Materials from these groups shall be compacted to not less than 95 percent of the maximum density and within two percentage points of the optimum moisture content per AASHTO T 99.

In the cofferdam analysis, any soil A-2-6, A-2-7, A-4, A-5 can be used.

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
STANDARD SPECIFICATION, 1995

When the Contractor has surplus materials that he wishes to dispose of within the right-of-way, the Engineer will, whenever possible, allow the material to be used to flatten embankment side slopes, or if this is not possible, allow deposition in other locations within the right-of-way as designated and approved by the Engineer. Where complete disposal of surplus materials cannot be accommodated within the right-of-way, the excess shall become the Contractor's property for disposal off the project, subject to the provisions of §107-10. All disposal within the right-of-way shall be subject to the Engineer's approval of final condition and appearance, but is not subject to the provisions governing lift placement and compaction of embankment contained in §203-3.10 and §203-3.12.

203-3.09 Embankment Foundation. After completion of the work required under §201, Clearing and Grubbing, and §202, Removal of Structures and Obstructions, the embankment foundation shall be prepared. Sod and topsoil shall be removed where the final pavement grade is 2 m or less above the existing ground surface and in other areas designated in the plans or by the Engineer. Prior to embankment construction and subbase course placement, the surface on which the embankment and/or subbase is to be placed shall be thoroughly compacted to the satisfaction of the Engineer. Unsuitable materials other than sod and topsoil shall be removed to the depths shown in the plans or as directed by the Engineer. Underwater areas shall be filled with "Select Borrow or Select Fill," §203-2.02B, to 0.6 m above the water surface at the time of placement.

Where embankments are to be constructed over ground that will not adequately support embankment construction equipment, an initial layer of fill may be allowed to form a working platform. The need, manner of construction, and thickness of such a layer shall be subject to approval of the Engineer, and the layer will be permitted only where the lack of support is, as determined by the Engineer, not due to deficient ditching, grading or drainage practices or where the embankment could be constructed in the approved manner by the use of different equipment or procedures. Thicknesses of up to 1 m may be permitted for such a layer.

In locations where embankments are to be constructed on hillsides or against existing embankments with slopes steeper than 1 (vertical) on 3 (horizontal), the slopes shall be benched. The benches shall be constructed as shown on the Standard Sheet, "Earthwork Transition and Benching Details."

Where old pavement is encountered within 0.6 m of the top of the subbase course, it shall be thoroughly broken up or scarified.

203-3.10 Embankments. The embankment shall be constructed of suitable material as defined by §203-1.08, Suitable Material. Embankment material shall not be placed on frozen earth, nor shall frozen soils be placed in any embankments. Embankment material shall be placed and spread in lifts (layers) of uniform thickness, then uniformly compacted as specified under applicable portions of §203-3.12, Compaction. During embankment construction operations, earth moving equipment shall be routed as evenly as possible over the entire width of embankments. At the close of each day's work, the working surface shall be crowned, shaped and rolled with smooth steel wheel or pneumatic tired rollers, for proper drainage.

Particles with a dimension in excess of two-thirds of the loose lift thickness are designated as oversized particles. Oversized particles shall be removed prior to compaction of the lift and may be placed in the Embankment Side Slope Area, Subsection 203-1.06. Embankments constructed from rock products, shall be spread by bladed equipment on each lift to minimize the formation of large voids as the work progresses. The top lift of a rock fill shall be thoroughly chinked.

When permitted by a note in the plans or proposal, stumps, logs, and other materials may be placed in the Embankment Side Slope Area, §203-1.06, provided that: 1) such matter is deposited and compacted concurrent with the adjacent embankment, and; 2) any stumps or woody material are covered by not less than 0.6 m of soil beneath the exposed side slope surface.

Damage to any compacted lift at any time during the course of construction, such as rutting under the loads imposed by earth moving equipment, shall be fully repaired by the Contractor at his own expense prior to placement of any overlying materials.

50

Waste Glass shall not be placed in contact with synthetic liners, geogrids or geotextiles. Waste Glass ·corporated into embankments shall be thoroughly mixed with other suitable material so that Waste Glass ɔnstitutes no more than 30 percent by volume anywhere in the embankment as visually determined by the Engineer-In-Charge.

203-3.11 Subgrade Area. Where a subgrade area is defined in an embankment by §203-1.05, Subgrade Area, the material placed shall conform to §203-2.02A, Subgrade Area Material, placed and compacted in conformance with §203-3.10 and §203-3.12. Where longitudinal and transverse changes from cut to fill are encountered in the work, a subgrade transition section shall be provided in conformance with Standard Sheet "Earthwork Transition and Benching Details." Where a subgrade area becomes defined by §203-1.05 in a cut section, the materials placed and other details shall be as specified under §203-3.14C, unless otherwise required by the contract documents. Prior to subbase course placement, the surface on which the subbase is to be placed shall be thoroughly compacted to the satisfaction of the Engineer.

203-3.12 Compaction

A. General Requirements. It shall be the Contractor's responsibility to properly place and compact all materials in the road section and other locations specified in the contract documents, and to correct any deficiencies resulting from insufficient or improper compaction of such materials throughout the contract period. The Contractor shall determine the type, size and weight of compactor best suited to the work at hand, select and control the lift (layer) thickness, exert proper control over the moisture content of the material, and other details necessary to obtain satisfactory results. During the progression of the work, the Department will inspect the Contractor's operations and will permit the work to continue where:

1. Lift thickness is controlled and does not exceed the maximum allowed according to the equipment classifications in subparagraph B of this subsection, and the equipment meets all specified class criteria. Thinner lifts and lighter equipment than the maximum allowed may be necessary for satisfactory results on some materials.

2. The compactive effort (number of passes and travel speed) is uniformly applied and not less than that specified for the given equipment class and lift thickness. Higher efforts than the minimum allowed may be necessary for satisfactory results on some materials.

3. The Engineer concludes from a visual observation that proper compaction has been attained, with the exception of backfill at structures, culverts, pipes, conduits, and direct burial cables. However, the State reserves the right to perform density tests at any time. When tests are performed, the results shall indicate that not less than 90 percent of Standard Proctor Maximum Density is attained in any portion of an embankment, or 95 percent in a subgrade area, or as specified for other items with a percent maximum density requirement.

4. Significant rutting under the action of the compactor is not observed on the final passes on a lift.

Whenever the Contractor's operations do not conform to the above criteria, or requirements contained in other subparagraphs of this subsection, the Engineer will prohibit placement of an overlying lift until the Contractor takes effective corrective action.

When the Engineer determines that density tests are necessary, the Contractor shall provide any assistance requested to facilitate such tests. Such assistance shall include but will not be limited to excavation and backfill of test pits and holes. This work shall be considered to be incidental construction.

CALIFORNIA DEPARTMENT OF TRANSPORTATION
STANDARD SPECIFICATION, 1988

a bottom width of less than 12 feet, as shown on the plans, except as hereinafter provided, will be paid for at the contract price per cubic yard for ditch excavation.

The above price and payment shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in excavating ditches completely, as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

The excavation of gutters within the median area of a divided highway, and gutters between the roadbed shoulder and an adjacent excavation slope, and gutters in excavation benches, and side gutters contiguous to embankment slopes, all as shown on the plans, will be paid for as roadway excavation and payment will not be made as ditch excavation for such work.

19-5 COMPACTION

19-5.01 Description.—Earthwork compaction consists of obtaining the required compaction in all earthwork described in these specifications or the special provisions, except structure backfill.

19-5.02 General.—Embankments shall be constructed in layers. The loose thickness of each layer of embankment material before compaction shall not exceed 0.67-foot, except as provided in the following paragraph for rocky material.

When embankment material contains rock, the loose thickness of each layer of embankment material before compaction below a plane 3 feet below finished grade shall conform to the following:

(1) When embankment material contains, by volume, over 50 percent of rock larger than 0.5-foot in greatest dimension, the loose layers of embankment shall not exceed the maximum size of rock in the material.

(2) When embankment material contains, by volume, between 25 percent and 50 percent of rock larger than 0.5-foot in greatest dimension, the loose layers of embankment shall not exceed 3 feet in thickness, however, said layers are not to exceed the maximum size of rock in the material.

(3) When embankment material contains, by volume, up to 25 percent of rock larger than 0.5-foot in greatest dimension the loose layers of embankment shall not exceed 0.67-foot thickness in the area between the rocks larger than 0.67-foot.

The interstices around the rock in each layer shall be filled to the greatest extent practicable with earth or other fine material, after which the layer shall be compacted until there is no visible evidence of further consolidation of the material being compacted.

19-5.03 Relative Compaction (95 Percent).—Relative compaction of not less than 95 percent shall be obtained for a minimum depth of 0.5-foot below the grading plane for the width between the outer edges of shoulders, whether in excavation or embankment.

In addition, relative compaction of not less than 95 percent shall be obtained for a minimum depth of 2.5 feet below finished grade for the width of the traveled way plus 3 feet on each side thereof, whether in excavation or in embankment.

Except for the outer 5 feet measured horizontally from the embankment side slopes, the full width of embankment within 150 feet of bridge abutments shall be compacted to a relative compaction of not less than 95 percent. The 150-foot limit of 95 percent compaction will be measured horizontally from the bridge abutment and either parallel or concentric with the roadway centerline. In addition, a relative compaction of not less than 95 percent shall be obtained for embankment under retaining wall footings without pile foundations within the limits established by inclined planes sloping 1.5:1 out and down from lines one foot outside the bottom edges of the footing.

19-5.04 Relative Compaction (90 Percent).—Relative compaction of not less than 90 percent shall be obtained in all material in embankment, except as specified herein to be 95 percent.

19-5.05 Foundation Preparation.—Preparation of the foundation to receive material shall be the responsibility of the Contractor. If the Contractor elects to excavate and replace basement material to facilitate compaction, before replacement has begun and when ordered by the Engineer, a layer of material below the excavated material shall be compacted to the depth, width and degree of compaction ordered by the Engineer, and such ordered work will be paid for as extra work as provided in Section 4-1.03D.

19-5.06 Payment.—Payment for earthwork compaction will be considered as included in the various contract items of work requiring compaction of earthwork and no separate payment will be made therefor. If the Contractor elects to excavate and replace basement material to facilitate compaction, full compensation for such work will be considered as included in the contract items of work requiring the compaction of earthwork and no separate payment will be made therefor. If such basement material is placed in embankment or used in other planned or authorized work, and is replaced with planned excavated material or imported borrow, payment will be made for the quantity of replacement material used at the contract unit price for the type of excavation involved or imported borrow, as the case may be.

19-6 EMBANKMENT CONSTRUCTION

19-6.01 Placing.—Embankment construction shall consist of constructing roadway embankments, including the preparation of the areas upon which they are to be placed; the construction of temporary surcharge embankment above the grading plane; the construction of dikes within or outside the right of way; the placing and compacting of approved material within roadway areas where unsuitable material has been removed; and the placing and compacting of embankment material in holes, pits and other depressions within the roadway area.

Attention is directed to Sections 19-5, "Compaction," and 19-2.05, "Slopes."

Rocks, broken concrete, or other solid materials, which are larger than 0.33-foot in greatest dimension, shall not be placed in embankment areas where piles are to be placed or driven.

When embankment is to be made and compacted on hillsides or where new embankment is to be compacted against existing embankments or where embankment is built one-half width at a time, the slopes of original hillsides and old or new embankments shall be cut into a minimum of 6

feet horizontally as the work is brought up in layers. Material thus cut out shall be recompacted along with the new embankment material at the Contractor's expense, unless the width of excavation required by the Engineer exceeds 6 feet, in which case the excavation of material in excess of 6 feet horizontally will be measured and paid for as roadway excavation.

Where embankment is to be made and compacted on original hillsides, old or new embankments, and end dumping is permitted, the slopes of the original ground or embankment shall be plowed or cut into before starting end dumping.

When embankment is to be placed on an existing roadway, the existing roadbed shall be scarified, watered, graded and rolled in advance of placing new material thereon.

Whenever selection is possible, borrow or excavation material having a Sand Equivalent value less than 10 shall not be placed within 2.5 feet of finished grade, and shall be placed in the lower portions of embankments.

Clods or hard lumps of earth over 0.5-foot in greatest dimension shall be broken up before compacting the material in embankment, except as provided in the following paragraph.

When the embankment material consists of large rocky material, or hard lumps, such as hardpan or cemented gravel which cannot be broken readily, such material shall be well distributed throughout the embankment. Sufficient earth or other fine material shall be placed around the larger material as it is deposited so as to fill the interstices and produce a dense, compact embankment.

Embankment construction shall not be performed when material is frozen or a blanket of snow prevents proper compaction.

When bridge footings are to be constructed in embankment, the embankment shall be constructed to the elevations of the grading plane and the finished slope extended to the grading plane before excavating for the footing, or when foundation piling is shown on the plans, before driving the piles or excavating for the footing.

19-6.02 Compacting.—Embankments shall be constructed in layers of uniform thickness and each layer shall be compacted in accordance with the requirements specified in this Section 19-6.02 with the following 2 exceptions:

(1) Sidehill embankments, where the width including bench cuts for bonding existing and new embankments is too narrow to accommodate compacting equipment, may be constructed by end dumping if permitted by the Engineer, until the embankment, including benching, is wide enough to permit the use of compacting equipment, after which the remainder of the embankment shall be placed in layers and compacted as specified.

(2) Where embankments are to be constructed across low, swampy ground which will not support the weight of hauling equipment, the lower part of the embankment may be constructed by dumping successive loads in a uniformly distributed layer of a thickness not greater than that necessary to support the equipment while placing subsequent layers, after which the remainder of the embankment shall be constructed in layers and compacted as specified.

Unless specified herein, or in the special provisions, or directed by the Engineer, the construction of dikes, the placing and compacting of approved material within the right of way where unsuitable material has

been removed, and the filling of holes, pits and other depressions within the right of way, shall conform to all of the requirements herein and in Section 19-5, "Compaction." Trenches, holes, depressions and pits outside of areas where embankments are to be constructed shall be graded to provide a presentable and well-drained area.

Embankments shall be constructed so that each layer shall have a cross fall not to exceed one foot in 20 feet.

At locations where it would be impractical to use mobile power compacting equipment, embankment layers shall be compacted to the specified requirements by any method that will obtain the specified compaction.

At the time of compaction, the moisture content of embankment material shall be such that the specified relative compaction will be obtained and the embankment will be in a firm and stable condition. Embankment material which contains excessive moisture shall not be compacted until the material is dry enough to obtain the required compaction. Full compensation for any additional work involved in drying embankment material to the required moisture content shall be considered as included in the contract price paid for excavating or furnishing the material and no additional compensation will be allowed therefor.

Embankments shall be maintained to the grade and cross section shown on the plans until the acceptance of the contract.

Surcharge material when required shall be placed in uniform layers and shall be compacted by routing the grading equipment over the full width of the embankment. Following removal of surcharge material above the grading plane, and before placing subsequent layers of subbase or base, the embankment below the grading plane shall conform to the relative compaction requirements in Section 19-5, "Compaction."

19-6.025 Settlement Period.—Where an embankment settlement period is provided for in the special provisions, the embankment shall remain in place for the required settlement period before excavating for the abutment, wingwall, or, retaining wall footings or driving the foundation piles at each location.

Where an embankment settlement period is specified, the embankment shall be constructed at least to the grading plane and to the other limits shown on the plans or specified in the special provisions, for a distance of at least 150 feet, measured parallel to the center line of roadway from the bridge abutments, and for the entire length of the retaining walls and a width of not less than 30 feet from the face of wall.

Where a settlement period for a surcharge embankment is shown on the plans or provided for in the special provisions, the surcharge shall be constructed to the height and to the limits shown or specified. The surcharge shall remain in place until the end of the settlement period.

The duration of the required settlement period at each location will be provided for in the special provisions.

Where settlement periods are required, embankments and surcharge embankments shall not encroach upon traveled ways nor upon existing improvements that are subject to damage, and if necessary, the Contractor shall furnish and install bulkheads or whatever means may be necessary to retain the embankment material as provided in Section 19-1.02, "Preservation of Property."

Settlement platforms shall be constructed if directed by the Engineer, and the cost of initial construction will be paid for as extra work as pro-

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Engineer ditches for draining the borrow pits shall be constructed. Unless otherwise shown in plans, the excavation of such pit drains shall be classified as borrow and all suitable materials excavated from pit drains shall be used as borrow.

120-6.8 Haul Routes for Borrow Pits: The Contractor shall provide and maintain at his own expense all necessary roads for hauling the borrow material. The Department will obtain any necessary property easements for haul roads from pits which it furnishes. Where borrow area haul roads or trails are used by others the Contractor shall not permit such roads or trails to deteriorate in condition due to his operations.

The Contractor shall make his own arrangements for the use of all non-public haul routes crossing the property of any railroad. Any expense for the use of such haul routes shall be the responsibility of the Contractor. The Contractor shall establish haul routes which will direct his vehicles away from developed areas when feasible and insure noise from hauling operations is kept to a minimum. The Contractor shall advise the Engineer in writing of all proposed haul routes.

120-7 Materials for Embankment.

120-7.1 Use of Materials Excavated From the Roadway and Appurtenances: All suitable materials resulting from the excavation shall be used as far as practicable in the construction of the roadway and at such other places as shown in the plans or required for completion of the work, as directed by the Engineer, including backfill of pipe trenches and spaces from which unsuitable materials are required to be excavated, whether anticipated or unanticipated. Where so shown in the plans suitable material excavated from lateral ditches shall be used in the construction of the roadway and appurtenances. Overburden stripped from material pits shall be used in the construction of embankments unless otherwise indicated in the plans or ordered by the Engineer.

120-7.2 General Requirements for Embankment Materials: Embankments shall be constructed of material containing no muck, stumps, roots, brush, vegetable matter, rubbish or other material that will not compact into a suitable and enduring roadbed, and material designated as undesirable shall be removed and wasted. Utilization of material in embankment construction shall be in accordance with plan details or as directed by the Engineer.

The maximum sizes of rock which will be permitted in the completed embankment are as follows:

In top 300 mm: 90 mm.

300 to 600 mm: 150 mm.

In the depth below 600 mm: not to exceed the compacted thickness of the layer being placed.

When and where approved by the Engineer, the Contractor may place larger rocks outside the 2 to 1 slopes. Compaction around these rocks shall be in accordance with 120-9.2.

Where embankments are constructed adjacent to bridge end bents or abutments, rock larger than 90 mm in diameter shall not be placed within 0.9 m of the location of any end-bent piling.

120-7.3 Selected Material for Plant Growth: For any areas enclosed by median curb or by concrete islands, or any other areas designated by the Engineer for subsequent landscape planting, when material suitable for plant growth, as designated by the Engineer, is available from the excavation within the limits of the project, at least the top 200 mm of earth material in such enclosed areas (or other areas designated for such landscaping) shall be composed of such selected material from the project excavation. Material which is unsuitable for plant growth shall not be placed in such areas.

120-7.4 Materials Used at Pipes, Culverts, etc.: Embankments over and around pipes, culverts, and bridge foundations shall be made with selected materials.

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120-8 Embankment Construction.

120-8.1 General: Embankments shall be constructed true to lines, grades and cross sections shown in the plans or ordered by the Engineer, within the tolerances specified herein. They shall be constructed in sections of not less than 90 m in lengths or for the full length of the embankment.

120-8.2 Dry Fill Method:

120-8.2.1 General: Except as provided below for material placed on unstable ground and for materials used for flattening slopes, embankments shall be placed in successive layers of not more than 200 mm in thickness, measured loose, for the full width of the embankment. However, if the Contractor can demonstrate with field tests that he has compacting equipment sufficient to achieve density for the full depth of a thicker lift, and if it is approved by the Engineer, he may be allowed to construct the embankment in successive layers of not more than 300 mm compacted thickness. All layers shall be approximately parallel to the center line profile of the road.

The Engineer's approval will be based on the results of a test section constructed by the Contractor, using his specified compactive effort. The test section will be a minimum of 90 m in length, full width, and shall not exceed 300 m in length.

Once approved, a change in soil classification of the embankment materials will require the construction of a new test section. The compactive effort will not be allowed to change once a test section is approved.

The Department reserves the right to terminate the Contractor's use of thick lift construction and have him revert to the 200 mm loose lifts whenever it is determined that satisfactory results are not being achieved.

As far as practicable, traffic over the work during the construction of embankments shall be distributed so as to cover the maximum area of the surface of each layer.

120-8.2.2 Placing in Unstable Areas: Where the material is deposited in water, or in low swampy ground that will not support the weight of hauling equipment, the fill shall be constructed by dumping successive loads in a uniformly distributed layer of a thickness not greater than necessary to support the hauling equipment while placing subsequent layers. Once sufficient material has been placed so that the hauling equipment can be supported, the remaining portion of the embankment shall be constructed in layers in accordance with the applicable provisions of 120-8.2.1 and 120-8.2.3.

120-8.2.3 Placing on Steep Slopes: When embankments are constructed on a hillside sloping more than 20 degrees from the horizontal, the surface of the original ground on which the embankments is to be placed shall be plowed deeply or cut into steps, as directed, before filling is started.

120-8.2.4 Placing Outside Standard Minimum Slope: Where material which, is unsuitable for normal embankment construction is to be used in the embankment outside the standard minimum slope (approximately two to one), such material shall be placed in layers of not more than 450 mm in thickness, measured loose. Material which is suitable for normal embankment but which is being placed outside such standard minimum slope, may also be placed in 450 mm layers.

120-8.3 Hydraulic Method:

120-8.3.1 Method of Placing: When the hydraulic method is used, as far as practicable, all dredged material shall be placed in its final position in the embankment by such method. Any dredged material that is rehandled, or moved and placed in its final position by any other method, shall be placed and compacted as specified in 120-8.2. The

Contr[illegible] may use baffles or any form of construction he may select so long as th[illegible] slope[illegible]e embankments are not steeper than indicated in the plans. All timber used for temporary bulkheads or baffles shall be removed from the embankment, and the holes thus formed shall be filled and thoroughly compacted. When fill is being placed on submerged land, dikes shall be constructed prior to beginning of dredging and the dikes shall be maintained throughout the dredging operation.

120-8.3.2 Excess Material: Excess material placed outside the prescribed slopes, below the normal high-water level, shall not be used to raise the fill. Only the portion of this material required for dressing the slopes shall be removed.

120-8.3.3 Protection of Openings in Embankment: Openings shall be left in the embankments at the bridge sites. Any material which is allowed to invade these openings or existing channels shall be removed by the Contractor, without additional compensation, to provide the same depth of channel as existed before the construction of the embankment. No material shall be excavated or dredged within 60 m of the toe of the proposed embankment, unless otherwise shown in the plans.

120-9 Compaction Requirements.

120-9.1 Moisture Content: The materials shall be compacted at a moisture content such that the specified density can be attained. If necessary to attain the specified density, water shall be added to the material, or the moisture content shall be lowered by manipulating the material or allowing it to dry, as is appropriate.

120-9.2 Compaction of Embankments:

120-9.2.1 Density Requirements: Except for embankment constructed by the hydraulic method (as specified in 120-8.3) and for the material placed outside the standard minimum slope, (as specified in 120-8.2.4), and for other areas specifically excluded herein, each layer of the material used in the formation of embankments shall be compacted to a density of at least 100% of the maximum density as determined by AASHTO T 99, Method C. Each layer shall be uniformly compacted, using equipment which will achieve the required density, and as compaction operations progress, each layer shall be shaped and manipulated as necessary to assure uniform density throughout the embankment.

120-9.2.2 Compaction over Unstable Foundations: Where the embankment material is deposited in water or on low swampy ground, and in a layer thicker than 300 mm (as provided in 120-8.2.2) the top 150 mm (compacted thickness) of such layer shall be compacted to the density specified in 120-9.2.1.

120-9.2.3 Compaction Where Plastic Material Has Been Removed: Where unsuitable material is removed and the remaining surface is of the A-4, A-5, A-6, or A-7 Soil Groups, as determined by the Engineer, the surface of the excavated area shall be compacted by rolling with a sheepsfoot roller exerting a compression of at least 1.7 MPa on the tamper feet, for the full width of the roadbed (subgrade and shoulders). Such rolling shall be done before any backfill is begun and shall be continued until the roller feet do not penetrate the surface more than 25 mm. Such rolling will not be required where the remaining surface is below the normal water table and covered with water. The procedure and equipment required for this operation may be varied at the discretion of the Engineer.

120-9.2.4 Compaction of Material To Be Used In Base, Pavement, or Stabilized Areas: No compaction will be required under this Section, of embankment material which will be incorporated into a pavement, base course, or stabilized subgrade, to be constructed as a part of the same contract.

120-9.2.5 Compaction of Grassed Shoulder Areas: For the upper 150 mm layer of all shoulders which are to be grassed, no specific density will be required under this

Section and compaction shall be only to the extent directed.

120-9.2.6 Compaction of Grassed Embankment Areas: For the outer layer of all embankments where plant growth will be established, no specific density will be required. This layer shall be left in a loose condition to a minimum depth of 150 mm for the subsequent seeding or planting operations.

120-9.3 Compaction for Pipes, Culverts, etc.: The backfill of trenches shall be compacted to the densities specified for embankment or subgrade, as applicable, and in accordance with the requirements of 125-8.

Embankments over and around pipes, culverts, and bridges shall be thoroughly compacted, in a manner which will not place undue stress on the structures, and in accordance with the requirements of 125-8.

120-9.4 Compaction of Subgrade: If the plans do not provide for stabilizing, the subgrade area (as defined in 1-42) in both cuts and fills shall be compacted to the density specified in 120-9.2.1. Density requirements shall not apply where narrow widening strips are being constructed on undisturbed soil.

Where trenches for widening strips are not of sufficient width to permit the use of standard compaction equipment, any compaction effort required shall be accomplished by vibratory rollers, trench rollers, or other type compaction equipment approved by the Engineer.

It shall be the Contractor's responsibility to maintain the required density until the base or pavement is placed on the Subgrade.

120-10 Maintenance and Protection of Work.

While construction is in progress adequate drainage for the roadbed shall be maintained at all times. A shoulder at least 1 m wide shall be maintained adjacent to all pavement or base construction in order to provide support for the edges.

The Contractor shall maintain all earthwork construction throughout the life of the contract, unless otherwise provided, and shall take all reasonable precautions to prevent loss of material from the roadway due to the action of wind or water. He shall repair at his expense, except as otherwise provided herein, any slides, washouts, settlement, subsidence, or other mishap which may occur prior to final acceptance of the work. Maintenance and protection of earthwork construction shall be in accordance with Section 104.

All channels excavated as a part of the contract work shall be maintained against natural shoaling or other encroachments to the lines, grades, and cross sections shown in the plans, until final acceptance of the project.

120-11 Final Dressing.

120-11.1 General: As a final grading operation the surface of the earthwork shall be shaped to conform to the lines, grades and cross sections shown in the plans or as directed, within the tolerances specified in 120-11.2. For cuts or fills where plant growth will be established, no final machining will be permitted. Slopes shall be left in a roughened condition conforming to lines, grades and cross sections shown in the plans or as directed, within the tolerances specified in 120-11.2. Hand dressing will not be required except as necessary in confined areas where equipment operation is restricted.

Unless otherwise indicated, lateral ditches shall be dressed to the grade and cross section shown in the plans, for a distance of 90 m from the center line of the road, measured at right angles to the center line. In sections of lateral ditches beyond this 90 m distance no dressing of the lateral ditches will be required provided all the material is removed within the lines and grades shown in the plans. The Contractor shall maintain and keep open and free from leaves, sticks and other debris, all ditches dug by him, until

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perimeter. Where the plans show the depth and width of excavation, such depth and width shall be considered as being approximate only and shall be subject to variation as directed. In borrow pits furnished by the Department no material shall be excavated within five feet of the adjacent property lines.

129-6.7 Drainage of Borrow Pits: Where shown in the plans or ordered by the Engineer, ditches for draining the borrow pits shall be constructed. Unless otherwise shown in the plans, the excavation of such pit drains shall be classified as borrow and all suitable materials excavated from pit drains shall be used as borrow.

120-6.8 Haul Routes for Borrow Pits:

The Contractor shall provide and maintain at his own expense all necessary roads for hauling the borrow material. The Department will obtain any necessary property easements for haul roads from pits which it furnishes. Where borrow area haul roads or trails are used by others the Contractor shall not permit such roads or trails to deteriorate in condition due to his operations.

The Contractor shall make his own arrangements for the use of all non-public haul routes crossing the property of any railroad. Any expense for the use of such haul routes shall be the responsibility of the Contractor.

The Contractor shall establish haul-routes which will direct his vehicles away from developed areas when feasible and insure noise from hauling operations is kept to a minimum. The contractor shall advice the Engineer in writing of all proposed haul routes.

120-7 Materials for Embankment.

120-7.1 Use of Materials Excavated From the Roadway and Appurtenances: All suitable materials resulting from the excavation shall be used as far as practicable in the construction of the roadway and at such other places as shown in the plans or required for completion of the work, as directed by the Engineer, including backfill of pipe trenches and spaces from which unsuitable materials are required to be excavated, whether anticipated or unanticipated. Where so shown in the plans suitable material excavated from lateral ditches shall be used in the construction of the roadway and appurtenances. Overburden stripped from material pits shall be used in the construction of embankments unless otherwise indicated in the plans or ordered by the Engineer.

120-7.2 General Requirements for Embankment Materials:

Embankments shall be constructed of material containing no muck, stumps, roots, brush, vegetable matter, rubbish or other material that will not compact into a suitable and

enduring roadbed, and material designated as undesirable shall be removed and wasted. Utilization of material in embankment construction shall be in accordance with plan details or as directed by the Engineer.

The maximum sizes of rock which will be permitted in the completed embankment are as follows:

In top 12 inches	3½ inches
12 inches to 2 feet	6 inches
2 feet to 4 feet	12 inches
4 feet to 8 feet	24 inches

Below eight feet, a maximum dimension of 36 inches will be allowed except that, in wet areas, rock or boulders exceeding 36 inches in size will be permitted if placed as directed by the Engineer and placed so as to be appropriately isolated. Material placed around such large isolated rocks shall be compacted in accordance with 120-9.2.

Where embankments are constructed adjacent to bridge end bents or abutments, rock larger than 3½ inches in diameter shall not be placed within three feet of the location of any end-bent piling.

120-7.3 Selected Material for Plant Growth: For any areas enclosed by median curb or by concrete islands, or any other areas designated by the Engineer for subsequent landscape planting, when material suitable for plant growth, as designated by the Engineer, is available from the excavation within the limits of the project, at least the top eight inches of earth material in such enclosed areas (or other areas designated for such landscaping) shall be composed of such selected material from the project excavation. Material which is unsuitable for plant growth shall not be placed in such areas.

120-7.4 Materials Used at Pipes, Culverts, etc.: Embankments over and around pipes, culverts, and bridge foundations shall be made with selected materials.

120-8 Embankment Contruction.

120-8.1 General: Embankments shall be constructed true to lines, grades and cross sections shown in the plans or ordered by the Engineer, within the tolerances specified herein. They shall be constructed in sections of not less than 300 feet in lengths or for the full length of the embankment.

120-8.2 Dry Fill Method:

120-8.2.1 General:

Except as provided below for materials placed on unstable ground and for materials used for flattening slopes, embankments shall be placed insuccessive layers of not more than eight inches in thickness, measured loose, for the full

width of the embankment. Such layers shall be approximately parallel to the center line profile of the road.

As far as practicable, traffic over the work during the construction of embankments shall be distributed so as to cover the maximum area of the surface of each layer.

120-8.2.2 Placing in Unstable Areas: Where the material is deposited in water, or on low swampy ground that will not support the weight of hauling equipment, the fill shall be constructed by dumping successive loads in a uniformly distributed layer of a thickness not greater than necessary to support the hauling equipment while placing subsequent layers. The upper portions of such embankments shall be constructed in layers in accordance with the applicable provisions of 120-8.2.1 and 120-8.2.3.

120-8.2.3 Placing on Steep Slopes: When embankments are constructed on a hillside sloping more than 20 degrees from the horizontal, the surface of the original ground on which the embankments is to be placed shall be plowed deeply or cut into steps, as directed, before filling is started.

120-8.2.4 Placing Outside Standard Minimum Slope: Where material which is unsuitable for normal embankment construction is to be used in the embankment outside the standard minimum slope (approximately two to 1), such material shall be placed in layers of not more than 18 inches in thickness, measured loose. Material which is suitable for normal embankment but which is being placed outside such standard minimum slope, may also be placed in 18-inch layers.

120-8.3 Hydraulic Method:

120-8.3.1 Method of Placing: When the hydraulic method is used, as far as practicable all dredged material shall be placed in its final position in the embankment by such method. Any dredged material that is rehandled, or moved and placed in its final position by any other method, shall be placed and compacted as specified in 120-8.2. The Contractor may use baffles or any form of construction he may select so long as the slopes of the embankments are not steeper than indicated in the plans. All timber used for temporary bulkheads or baffles shall be removed from the embankment, and the holes thus formed shall be filled and thoroughly compacted. When fill is being placed on submerged land, dikes shall be constructed prior to beginning of dredging and the dikes shall be maintained throughout the dredging operation.

120-8.3.2 Excess Materal: Excess material placed outside the prescribed slopes, below the normal high-water level, shall not be used to raise the fill. Only the portion of this material required for dressing the slopes shall be removed.

120-8.3.3 Protection of Openings in Embankment: Openings shall be left in the embankments at the bridge sites. Any material which is allowed to invade these openings or existing channels shall be removed by the Contractor, without additional compensation, to provide the same depth of channel as existed before the construction of the embankment. No material shall be excavated or dredged within 200 feet of the toe of the proposed embankment, unless otherwise shown in the plans.

120-9 Compaction Requirements.

120-9.1 Moisture Content: The materials shall be compacted at a moisture content such that the specified density can be attained. If necessary to attain the specified density, water shall be added to the material, or the moisture content shall be lowered by manipulating the material or allowing it to dry, as is appropriate.

120-9.2 Compaction of Embankments:

120-9.2.1 Density Requirements: Except for embankment constructed by the hydraulic method (as specified in 120-8.3) and for the material placed outside the standard minimum slope, (as specified in 120-8.2.4), and for other areas specifically excluded herein, each layer of the material used in the formation of embankments shall be compacted to a density of at least 100 percent of the maximum density as determined by AASHTO T 99, Method C. Each layer shall be uniformly compacted, using equipment which will achieve the required density, and as compaction operations progress, each layer shall be shaped and manipulated as necessary to assure uniform density throughout the embankment.

120-9.2.2 Compaction over Unstable Foundations: Where the embankment material is deposited in water or on low swampy ground, and in a layer thicker than 12 inches (as provided in 120-8.2.2) the top six inches (compacted thickness) of such layer shall be compacted to the density specified in 120-9.2.1.

120-9.2.3 Compaction Where Plastic Material Has Been Removed: Where unsuitable material is removed and the remaining surface is of the A-4, A-5, A-6, or A-7 Soil Groups, as determined by the Engineer, the surface of the excavated area shall be compacted by rolling with a sheepsfoot roller exerting a compression of at least 250 pounds per square inch on the tamper feet, for the full width of the roadbed (subgrade and shoulders). Such rolling shall be done before any backfill is begun and shall be continued until the roller feet do not penetrate the surface more than one inch. Such rolling will not be required where the remaining surface is below the normal water table and covered with water. The procedure

AASHTO DESIGNATION: M57-80 (1990)
AASHTO DESIGNATION: M145-87

PROVISIONAL

Standard Specification
for

Materials for Embankments and Subgrades

AASHTO DESIGNATION: M 57-80 (1990)

1. SCOPE

1.1 This specification covers materials for use in the construction of embankments and subgrades.

2. DEFINITIONS

2.1 Definitions of these materials are given in Standard Definitions of Terms Relating to Subgrade, Soil-Aggregate, and Fill Materials (AASHTO M 146).

3. GENERAL REQUIREMENTS

3.1 Materials shall be free from detrimental quantities of organic material, such as leaves, grass, roots, and sewage.

3.2 Materials obtained from cuts or borrow areas shall conform to one of the following requirements:

NOTE 1—See Standard Recommended Practice for the Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes (AASHTO M 145).

3.2.1 *In embankments*—Materials classified in the A-1, A-2-4, A-2-5 or A-3 groups as in AASHTO M 145 shall be used when available and shall be compacted to the depth specified to not less than 95 percent of the maximum density per AASHTO T 99. If material of this character is not available and materials from the A-2-6, A-2-7, A-4, A-5, A-6, or A-7 groups must be used, special attention should be given to the design and construction of the embankment. Materials from these groups shall be compacted to not less than 95 percent of the maximum density and within two percentage points of the optimum moisture content per AASHTO T 99.

3.2.2 *In subgrades*—Materials classified in the A-1, A-2-4, A-2-5 or A-3 groups as shown in AASHTO M 145 shall be used when available and shall be compacted to the depth specified to not less than 95 percent of the maximum density per AASHTO T 99. Materials in the A-2-6, A-2-7, A-4, A-5, A-6, or A-7 groups may be used if compacted to the depth specified to not less than 95 percent of the maximum density and within two percentage points of the optimum moisture content per AASHTO T 99.

3.3 Local shale may be used in embankment or subgrade construction if the condition of existing pavements and embankments indicate satisfactory results. Appropriate special specifications shall be prepared for such material.

4. DENSITY REQUIREMENTS

4.1 Density percentage requirements may be specified in terms of AASHTO T 180, provided the resultant density and optimum moisture content are comparable with AASHTO T 99 under the above conditions.

5. METHODS OF TESTING

5.1 Methods of testing materials for embankments and subgrades shall be in accordance with the standard methods of the American Association of State Highway and Transportation Officials (see table entitled "AASHTO Standard Methods").

NOTE 2—Either Method T 88 or T 11 and T 27 will be used to determine the particle size distribution as a basis for classification.

AASHTO Standard Methods

Soil preparation (Dry method)	T 87
Soil preparation (Wet method)	T 146
Material passing 0.075 mm sieve	T 11
Sieve analysis	T 27
Mechanical analysis of soils	T 88
Liquid limit	T 89
Plastic limit	T 90
Moisture—Density relationship (10 lb. hammer)	T 180
Moisture—Density relationship (5.5 lb. hammer)	T 99
Density of soil in place	T 191, T 204, T 205, T 233, and T 238
Moisture in place by nuclear methods	T 239
Coarse particle correction	T 224

FOR REFERENCE ONLY

Recommended Practice
for

The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes

AASHTO DESIGNATION: M 145-87

1. SCOPE

1.1 This recommended practice describes a procedure for classifying soils into seven groups based on laboratory determination of particle-size distribution, liquid limit and plasticity index. Evaluation of soils within each group is made by means of a "group index," which is a value calculated from an empirical formula. The group classification, including group index should be useful in determining the relative quality of the soil material for use in earthwork structures, particularly embankments, subgrades, subbases, and bases. However, for the detailed design of important structures additional data concerning strength or performance characteristics of the soil under field conditions will usually be required.

2. REFERENCED DOCUMENTS

2.1 *AASHTO Standards:*

T 11	Amount of Material Finer Than 75 μm Sieve in Aggregate
T 27	Sieve Analysis of Fine and Coarse Aggregates
T 87	Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
T 88	Particle Size Analysis of Soils
T 90	Determining the Plastic Limit and Plasticity Index of Soils
T 89	Determining the Liquid Limit of Soils
T 146	Wet Preparation of Disturbed Soil Samples for Test

2.2 *ASTM Standard:*

D 1140	Amount of Material in Soils Finer Than the No. 200 (75-μm) Sieve

NOTE 1—Either AASHTO T 88, or T 11 and T 27, or ASTM D 1140 will be used to determine the particle size distribution of soils or soil-aggregate mixtures as a basis for classification.

3. CLASSIFICATION

3.1 The classification is made by using the test limits and group index values shown in Table 1. If a more detailed classification is desired, a further subdivision of the groups shown in Table 1 may be made. An example of the classification with such subgroups is shown in Table 1 may be made. An example of the classification with such subgroups is shown in Table 2. The liquid limit and plasticity index ranges for the A-4, A-5, A-6, and A-7 soil groups are shown graphically in Figure 2.

3.2 *Classification Procedure*—With required test data available, proceed from left to right in Table 1 or Table 2 and the correct group will be found by process of elimination. The first group from the left into which the test data will fit is the correct classification. All limiting test values are shown as whole number. If fractional numbers appear on test reports, convert to nearest whole number for purposes of classification. Group index values should always be shown in parentheses after group symbol as: A-2-6(3), A-4(5), A-6(12), A-7-5(17), etc.

4. DEFINITIONS OF GRAVEL, SAND, AND SILT-CLAY

4.1 The terms "gravel," "coarse sand," and "silt-clay," as determinable from the minimum test data required in this classification arrangement and as used in subsequent word descriptions, are defined as follows:

4.1.1 *Gravel*—Material passing sieve with 75 mm (3-in.) square openings and retained on the 2.00 mm (No. 10) sieve.

4.1.2 *Coarse Sand*—Material passing the 2.00 mm (No. 10) sieve and retained on the 0.425 mm (No. 40) sieve.

4.1.3 *Fine Sand*—Material passing the 0.425 mm (No. 40) sieve and retained on the 0.075 mm (No. 200) sieve.

4.1.4 *Silt Clay (Combined silt and clay)*—Material passing the 0.075 mm (No. 200) sieve.

4.1.5 Boulders (retained on 75 mm (3 in.) sieve) should be excluded from the portion of the sample to which the classification is applied, but the percentage of such material, if any, in the sample should be recorded.

4.1.6 The term "silty" is applied to fine material having plasticity index of 10 or less and the term "clayey" is applied to fine material having plasticity index of 11 or greater.

5. DESCRIPTION OF CLASSIFICATION GROUPS

5.1 *Granular Materials*—Containing 35 percent or less passing 0.075 mm (No. 200) sieve, Note 2.

5.1.1 *Group A-1*—The typical material of this group is a well-graded mixture of stone fragments or gravel, coarse sand, fine sand and a nonplastic or feebly plastic soil binder. However, this group includes also stone fragments, gravel, coarse sand, volcanic cinders, etc. without soil binder.

5.1.1.1 Subgroup A-1-a includes those materials consisting predominantly of stone fragments or gravel, either with

TABLE 1 Classification of Soils and Soil-Aggregate Mixtures

General Classification	Granular Materials (35% or Less Passing 0.075 mm)			Silt-Clay Materials (More than 35% Passing 0.075 mm)			
Group Classification	A-1	A-3[a]	A-2	A-4	A-5	A-6	A-7
Sieve analysis, percent passing:							
2.00 mm (No. 10)	—	—	—	—	—	—	—
0.425 mm (No. 40)	50 max.	51 min.	—	—	—	—	—
0.075 mm (No. 200)	25 max.	10 max.	35 max.	36 min.	36 min.	36 min.	36 min.
Characteristics of fraction passing 0.425 mm (No. 40)							
Liquid limit	—	—		40 max.	41 min.	40 max.	41 min.
Plasticity index	6 max.	N.P.	[b]	10 max.	10 max.	11 min.	11 min.
General rating as subgrade	Excellent to good			Fair to poor			

[a] The placing of A-3 before A-2 is necessary in the "left to right elimination process" and does not indicate superiority of A-3 over A-2.
[b] See Table 2 for values.

TABLE 2 Classification of Soils and Soil-Aggregate Mixtures

General Classification	Granular Materials (35% or Less Passing 0.075 mm)							Silt-Clay Materials (More than 35% Passing 0.075 mm)			
	A-1			A-2							A-7
Group Classification	A-1-a	A-1-b	A-3	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7-5, A-7-6
Sieve analysis, percent passing:											
2.00 mm (No. 10)	50 max.	—	—	—	—	—	—	—	—	—	—
0.425 mm (No. 40)	30 max.	50 max.	51 min.	—	—	—	—	—	—	—	—
0.075 mm (No. 200)	15 max.	25 max.	10 max.	35 max.	35 max.	35 max.	35 max.	36 min.	36 min.	36 min.	36 min.
Characteristics of fraction passing 0.425 mm (No. 40)											
Liquid limit	—		—	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.
Plasticity index	6 max.		N.P.	10 max.	10 max.	11 min.	11 min.	10 max.	10 max.	11 min.	11 min.[a]
Usual types of significant constituent materials	Stone fragments, gravel and sand		Fine sand	Silty or clayey gravel and sand				Silty soils		Clayey soils	
General Ratings as Subgrade	Excellent to Good							Fair to poor			

[a] Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30 (see Figure 2).

or without a well-graded binder of fine material.

5.1.1.2 Subgroup A-1-b includes those materials consisting predominantly of coarse sand either with or without a well-graded soil binder.

5.1.2 *Group A-3*—The typical material of this group is fine beach sand or fine desert blow sand without silty or clay fines or with a very small amount of nonplastic silt. The group includes also stream-deposited mixtures of poorly-graded fine sand and limited amounts of coarse sand and gravel.

5.1.3 *Group A-2*—This group includes a wide variety of "granular" materials which are border-line between the materials falling in Groups A-1 and A-3 and silt-clay materials of Groups A-4, A-5, A-6, and A-7. It includes all materials containing 35 percent or less passing the 0.075 mm (No. 200) sieve which cannot be classified as A-1 or A-3, due to fines content or plasticity or both, in excess of the limitations for those groups.

5.1.3.1 Subgroups A-2-4 and A-2-5 include various granular materials containing 35 percent or less passing the 0.075 mm (No. 200) sieve and with a minus 0.425 mm (No. 40) portion having the characteristics of the A-4 and A-5 groups. These groups include such materials as gravel and coarse sand with silt contents or plasticity indexes in excess of the limitations of Group A-1, and fine sand with nonplastic silt content in excess of the limitations of Group A-3.

5.1.3.2 Subgroups A-2-6 and A-2-7 include materials similar to those described under Subgroups A-2-4 and A-2-5 except that the fine portion contains plastic clay having the characteristics of the A-6 or A-7 group.

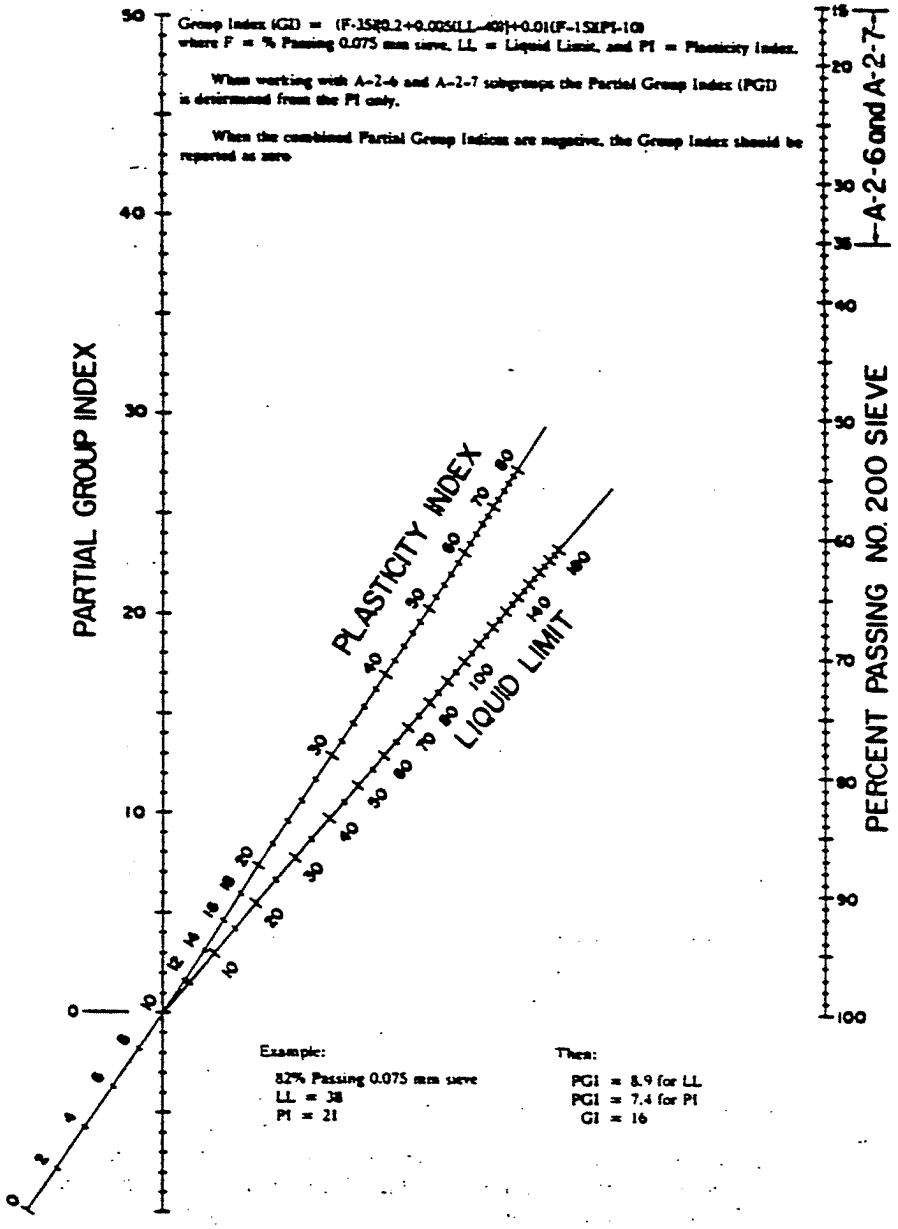


FIGURE 1 Group Index Chart

NOTE 2—Classification of materials in the various groups applies only to the fraction passing the 75 mm (3-in.) sieve. Therefore, any specifications regarding the use of A-1, A-2, or A-3 materials in construction should state whether boulders retained on the 75 mm (3-in.) sieve are permitted.

5.2 *Silt-Clay Materials*—Containing more than 35 percent passing the 0.075 mm (No. 200) sieve.

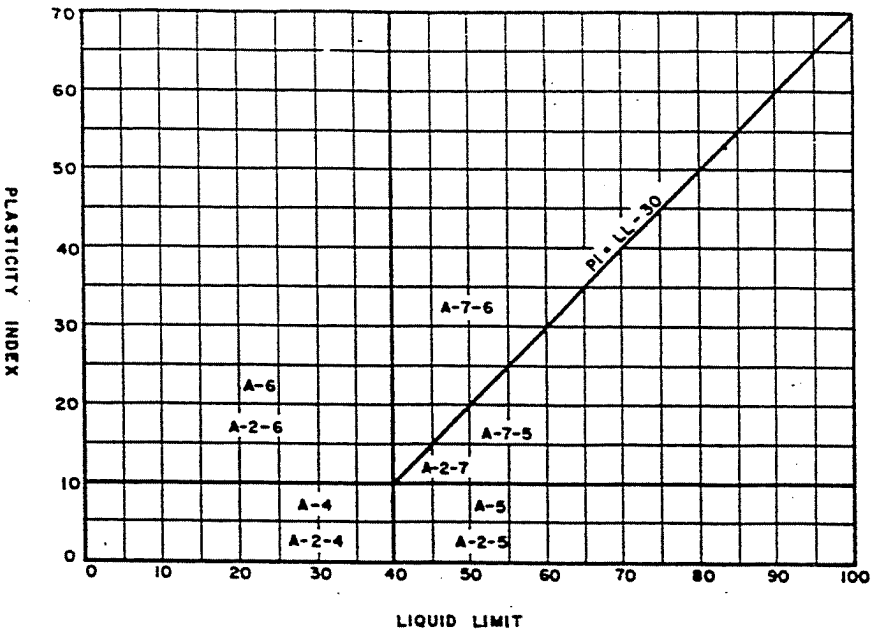
5.2.1 *Group A-4*—The typical material of this group is a nonplastic or moderately plastic silty soil usually having the 75 percent or more passing the 0.075 mm (No. 200) sieve. The group includes also mixtures of fine silty soil and up to 64 percent of sand and gravel retained on 0.075 mm (No. 200) sieve.

5.2.2 *Group A-5*—The typical material of this group is similar to that described under Group A-4, except that it is usually of diatomaceous or micaceous character and may be highly elastic as indicated by the high liquid limit.

5.2.3 *Group A-6*—The typical material of this group is a plastic clay soil usually having 75 percent or more passing the 0.075 mm (No. 200) sieve. The group includes also mixtures of fine clayey soil and up to 64 percent of sand and gravel retained on the 0.075 mm (No. 200) sieve. Materials of this group usually have high volume change between wet and dry states.

5.2.4 *Group A-7*—The typical material of this group is similar to that described under Group A-6, except that it has the high liquid limits characteristic of the A-5 group and may be elastic as well as subject to high volume change.

5.2.4.1 Subgroup A-7-5 includes those materials with moderate plasticity indexes in relation to liquid limit and



NOTE—A-2 soils contain less than 35 % finer than 200 sieve.

FIGURE 2 Liquid Limit and Plasticity Index Ranges for Silt-Clay Materials

which may be highly elastic as well as subject to considerable volume change.

5.2.4.2 Subgroup A-7-6 includes those materials with high plasticity indexes in relation to liquid limit and which are subject to extremely high volume change.

NOTE 3—Highly organic soils (peat or muck) may be classified in an A-8 group. Classification of these materials is based on visual inspection, and is not dependent on percentage passing the 0.075 mm (No. 200) sieve, liquid limit or plasticity index. The material is composed primarily of partially decayed organic matter, generally has a fibrous texture, dark brown or black color and odor of decay.

These organic materials are unsuitable for use in embankments and subgrades. They are highly compressible and have low strength.

6. GROUP INDEX

6.1 The group index is calculated from the following formula:

Group index = (F-35) [0.2 + 0.005 (LL-40)] + 0.01 (F-15) (PI-10),

in which,

F = percentage passing 0.075 mm (No. 200) sieve, expressed as a whole number. This percentage is based only on the material passing the 75 mm (3-in.) sieve.
LL = liquid limit
PI = plasticity index

6.1.1 When the calculated group index is negative, the group index shall be reported as zero (0).

6.1.2 The group index should be reported to the nearest whole number.

6.2 Figure 1 may be used in estimating the group index, by determining the partial group index due to liquid limit and that due to plasticity index, then obtaining the total of the two partial group indexes.

6.3 When calculating the group index of A-2-6 and A-2-7 subgroups, only the PI portion of the formula (or of Figure 1) shall be used.

6.4 The following are examples of calculations of the group index:

6.4.1 Assume that an A-6 material has 55 percent passing the 0.075 mm (No. 200) sieve, liquid limit of 40, and plasticity index of 25. Then,

Group index = (55-35) [0.2 + 0.005 (40-40)] + 0.01 (55-15) (25-10)
= 4.0 + 6.0 = 10

6.4.2 Assume that an A-7 material has 80 percent passing the 0.075 mm (No. 200) sieve, liquid limit of 90, and plasticity index of 50. Then,

Group index = (80-35) [0.2 + 0.005 (90-40)] + 0.01 (80-15) (50-10)
= 20.3 + 26.0, or 46.3

6.4.3 Assume that an A-4 material has 60 percent passing the 0.075 mm (No. 200) sieve, liquid limit of 25, and plasticity index of 1. Then,

Group index = (60-35) [0.2 + 0.005 (25-40)] + 0.01 (60-15) (1-10)
= 25 × (0.2 − 0.075) + 0.01 (45) (−9)
= 3.1 − 4.1 = − 1.0
Report as 0.

6.4.4 Assume that an A-2-7 material has 30 percent passing the 0.075 mm (No. 200) sieve, liquid limit of 50, and plasticity index of 30. Then,

Group index = 0.01 (30-15) (30-10)
= 3.0 or 3 (Note that only the PI portion of formula was used.)

7. BASIS FOR GROUP INDEX FORMULA

7.1 The empirical group index formula devised for approximately within-group evaluation of the "clayey granular materials" and the "silt-clay materials" is based on the following assumptions:

7.1.1 Materials falling within Groups A-1-a, A-1-b, A-2-4, A-2-5, and A-3 are satisfactory as subgrade when properly drained and compacted under moderate thickness pavement (base and/or surface course) of a type suitable for the traffic to be carried, or can be made satisfactory by additions of small amounts of natural or artificial binders.

7.1.2 Materials falling within the "clayey granular" Groups A-2-6 and A-2-7 and the "silt-clay" Groups A-4, A-5, A-6, and A-7 will range in quality as subgrade from the approximate equivalent of the good A-2-4 and A-2-5 subgrades to fair and poor subgrades requiring a layer of subbase material or an increased thickness of base course over that required under 7.1.1 in order to furnish adequate support for traffic loads.

7.1.3 The assumed critical minimum percentage passing the 0.075 mm (No. 200) sieve is 35 neglecting plasticity, and 15 as affected by plasticity indexes greater than 10.

7.1.4 Liquid limits of 40 and above are assumed to be critical.

7.1.5 Plasticity indexes of 10 and above are assumed to be critical.

7.1.6 For soils that are non-plastic and when the liquid limit cannot be determined, the group index shall be considered zero (0).

7.2 There is no upper limit of group index value obtained by use of the formula. The adopted critical values of percentage passing the 0.075 mm (No. 200) sieve, liquid limit and plasticity index, are based on an evaluation of subgrade, subbase and base course materials by several highway organizations that use the tests involved in this classification system.

7.3 Under average conditions of good drainage and thorough compaction, the supporting value of a material as subgrade may be assumed as an inverse ratio to its group index, that is, a group index of O indicates a "good" subgrade material and a group index of 20 or greater indicates a "very poor" subgrade material.

APPENDIX F

WEST END TEMPORARY STEEL SHEET PILING

COFFERDAM REPORTS

- Design Report
- Evaluation Report

WEST END TEMPORARY STEEL SHEET PILING

COFFERDAM DESIGN REPORT

Project 96-015-03
June 1996

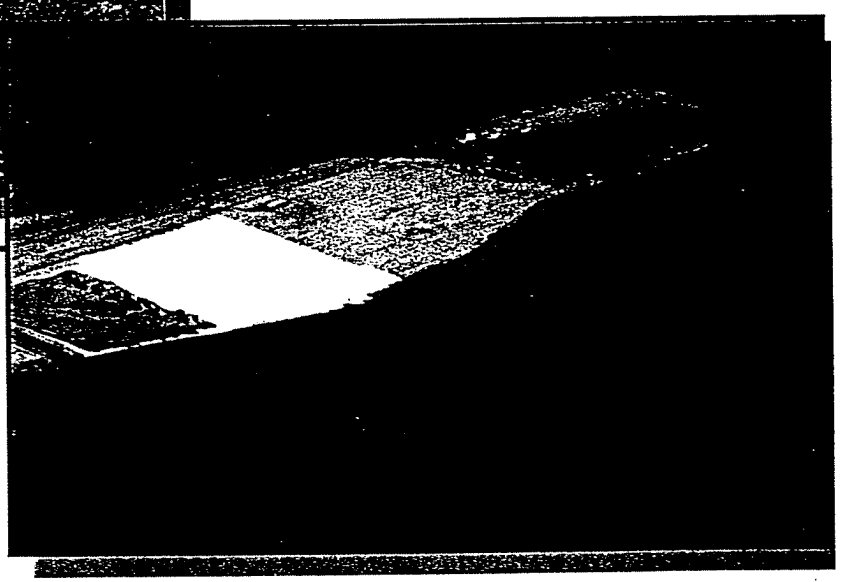
SMITH
ENVIRONMENTAL TECHNOLOGIES CORPORATION

West End Temporary Steel Sheet Piling Cofferdam Design Report

102nd Street Landfill Niagara Falls, New York

Remedial Action

SITE



Submitted By:

Smith Environmental
800 Canonie Drive
Porter, Indiana 46304

Phone: 219-926-8651
Fax: 219-926-7169

Submitted To:

OXY
OxyChem

Olin
CORPORATION

FLUOR DANIEL

West End Temporary Steel Sheet Piling Cofferdam Design Report

102nd Street Landfill Site Niagara Falls, New York

Remedial Action

Smith Environmental Technologies Corporation
800 Canonie Drive
Porter, IN 46304

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SMITH
ENVIRONMENTAL TECHNOLOGIES CORPORATION

PROJECT NO. 96-015-03
JUNE 7, 1996

WEST END TEMPORARY STEEL SHEET PILING COFFERDAM
DESIGN REPORT
102nd STREET LANDFILL
NIAGARA FALLS, NEW YORK

REMEDIAL ACTION
FOR
OCCIDENTAL CHEMICAL CORPORATION
AND
OLIN CORPORATION

SUBMITTED BY:

SMITH ENVIRONMENTAL
TECHNOLOGIES CORPORATION
800 CANONIE DRIVE
PORTER, INDIANA 46304

PHONE: 219-926-8651
FAX: 219-926-7169

DESIGNED BY:

CHIA CHANG
NEW YORK PROFESSIONAL ENGINEER
LICENSE NO. 060564-1
EXPIRES: 8-31-99

CHECKED BY:

MICHAEL A. DEFINIS
PROJECT ENGINEER
SMITH ENVIRONMENTAL
TECHNOLOGIES CORPORATION
800 CANONIE DRIVE
PORTER, INDIANA 46304

SMITH
ENVIRONMENTAL TECHNOLOGIES CORPORATION

PROFESSIONAL ENGINEER'S CERTIFICATION

Chia Chang

New York PE 060564-1

Professional Engineer's Number
Expires: 8-31-99

Smith Environmental Technologies Corporation

Firm

PR\W:\96-015\PECERT (May. 30, 1996)

SMITH
ENVIRONMENTAL TECHNOLOGIES CORPORATION

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WEST END TEMPORARY STEEL SHEET PILING COFFERDAM DESIGN

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Soil Properties	11
Lateral Pressures	12-14
Sheet Piling Stability	15-17
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Construction Procedure	20
Appendices	

A. K. Terzaghi & R. Peck, "Soil Mechanics in Engineering Practice", John Wiley & Sons, 2nd Edition, 1967, p. 193 to 199, p. 347.

B. H.G. Poulous & E.H. Davis, "Elastic Solutions for Soil and Rock Mechanics", John Wiley & Sons, 1974, p. 41-42.

C. Department of the Navy, Navy Facilities Engineering Command, Design Manual 7.2 "Foundations and Structures", May 1982, p. 7.2-236, p. 7.2-237, p. 7.2-238, and p. 7.2-240.

D. Steel Sheet Piling Size

- Bethlehem Steel

E. B.K. Hough, "Basic Soils Engineering", Ronald Press Co., 2nd Edition, 1969, p. 269-273.

F. K. Terzaghi & R. Peck, "Soil Mechanics in Engineering Practice," John Wiley & Sons, 1st Edition, 12th Printing, 1962, p. 82 to p. 86.

ANALYSIS

Information for the Sheeting Location

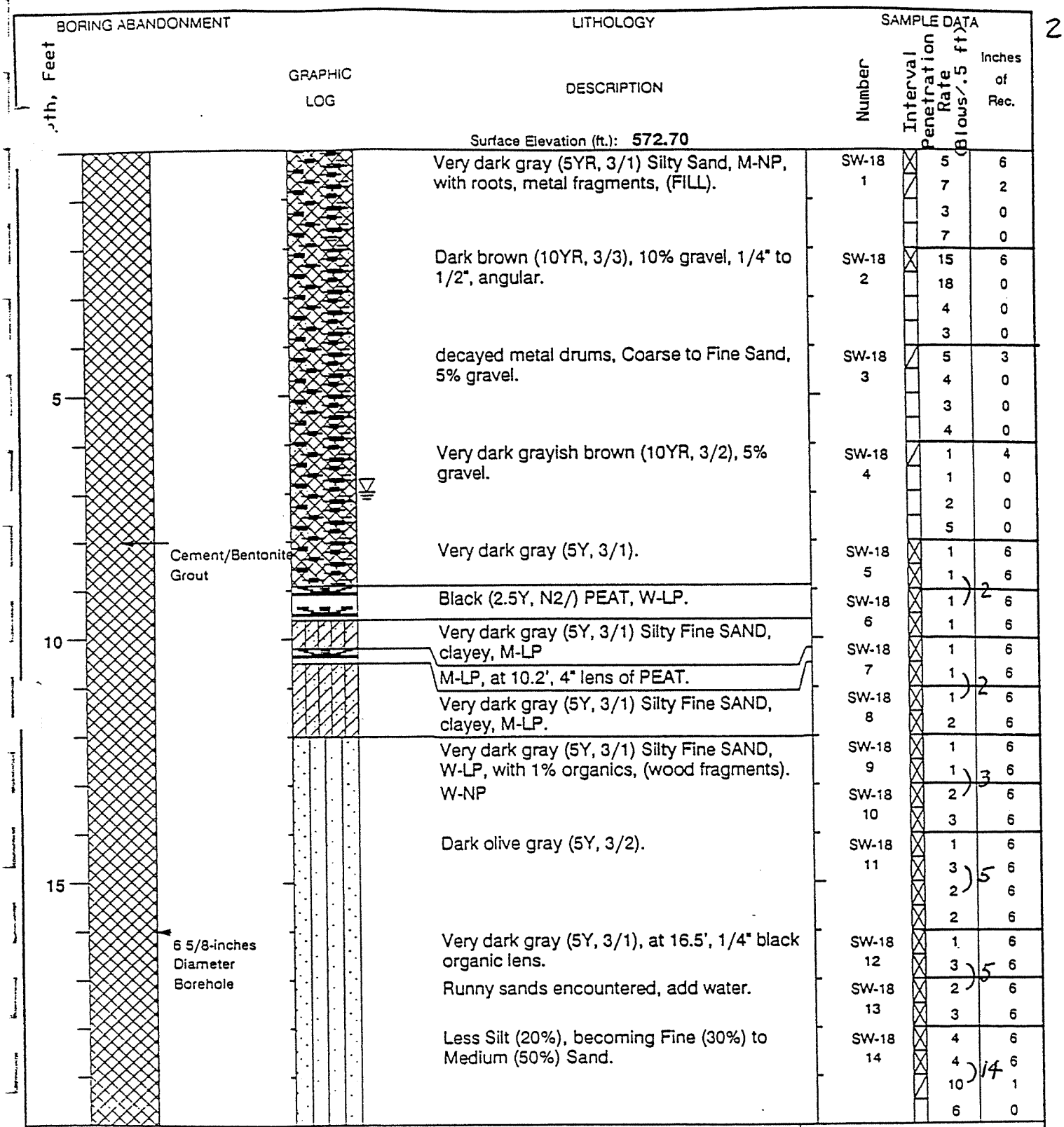
Boring Logs SW-18, SW-19, and SW-20 (four sheets, page 2-5)

Plan of Temporary Sheet Pile Wall (one sheet, page 6) (Smith Environmental Drawing No. 96-015-B4)

Temporary Sheet Pile Wall Section (one sheet, page 7) (Smith Environmental Drawing No. 96-015-A5)

CRA Bathymetric Survey Drawing CRA 1431-1 Rev. 0 (one sheet, page 8) (only river bottom contours near the sheeting site are shown)

Typical Bulkhead/Slurry Wall Detail at River from Fluor Daniel Drawing 594000-10S-02 Rev. 0 (one sheet, page 9)



EXPLANATION

- 24" Split-Spoon Sampler
- No Recovery
- 6" Partial Recovery
- 6" Full Recovery
- 30" Shelby Tube Sampler
- First water during drilling

Checked By: T. Maley

Soil Boring:	SW-18
Drilling Method:	Hollow Stem Auger
Start date:	September 25, 1992
Completion date:	September 25, 1992
Logged by:	S. Fundingsland
Subcontractor:	Advanced Drilling Inv.
Equipment:	Mobile B-57
Client:	OXYCHEM/OLIN
Project:	102nd Street, Niagara Falls, NY

FLUOR DANIEL
Environmental Services
Marlton, NJ

BORING ABANDONMENT		LITHOLOGY	SAMPLE DATA		
Depth, Feet	GRAPHIC LOG	DESCRIPTION	Number	Interval Penetration Rate (Blows/.5 ft)	Inches of Rec.
		Reddish brown (5YR, 5/3) Silty Fine SAND, 10% Clay, M-LP, with 5% Medium Sand, (TILL).	SW-18 15	2 3 4 6 (7)	5 0 0 0
		Reddish brown (5YR, 5/4), increase in clay (approx. 20%) with 5% gravel (1/4" to 1 1/4"), subrounded.	SW-18 16	3 4 3 5 (7)	6 6 2 0
		Till on nose of SS.	SW-18 17	3 8 8 14 (16)	0 0 0 0
25		End Boring SW-18 at 26.0 ft.			

Cement/Bentonite Grout

6 5/8-inches Diameter Borehole End Augers

End Split-Spoon

EXPLANATION

24" Split-Spoon Sampler

- No Recovery
- 6" Partial Recovery
- 6" Full Recovery

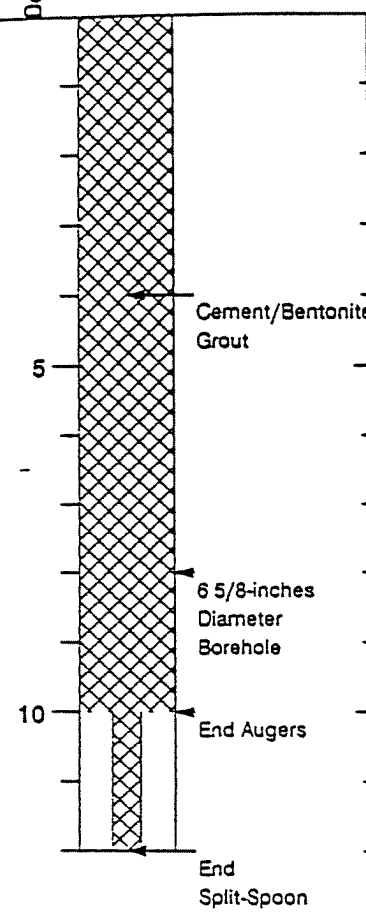
30" Shelby Tube Sampler

First water during drilling

Checked By: T. Maley

Soil Boring:	SW-18
Drilling Method:	Hollow Stem Auger
Start date:	September 25, 1992
Completion date:	September 25, 1992
Logged by:	S. Fundingsland
Subcontractor:	Advanced Drilling Inv.
Equipment:	Mobile B-57
Client:	OXYCHEM/OLIN
Project:	102nd Street, Niagara Falls, NY

FLUOR DANIEL
Environmental Services
Marlton, NJ



Depth, Feet	Description	Number	Interval	Penetration Rate (Blows/.5 ft)	Inches of Rec.
	Surface Elevation (ft.): 559.97				
	Very dark gray (10YR, 2/1) and gray Silty Fine SAND, W-LP, 0-5% clay, roots, and shells, occasional black layers. Grading into Very dark gray (10YR, 3/1) Silty Fine SAND, (ALLUVIUM).	SW-19 1		2 1 3 2 (4)	6 6 6 6
		SW-19 2		1 0 0 1 (0)	6 6 2 0
	Collected Shelby Tube sample at 4-6 ft. Gray Fine SAND at top of sample (4.0 ft), gray Fine to Medium SAND with 12-35% Fine to Coarse Gravel at bottom of sample (6.0 ft.). 5-12% gravel at 6.0-8.0 ft., (BASAL ALLUVIUM).	SW-19 * 3			19
		SW-19 4		1 2 2 3 (4)	6 6 2 0
	Reddish brown (5YR, 5/3) Fine Sandy/Silty CLAY, M-P, soft, 0-5% Fine to Coarse Gravel, (TILL). Reddish gray (5YR, 5/2).	SW-19 5		0 2 2 3 (4)	6 2 0 0
	Reddish brown (5YR, 5/3). Slightly more dense at 11.0 ft.	SW-19 6		2 1 3 3 (4)	6 6 2 0
	End Boring SW-19 at 12.0 ft. NOTE: Surface elevation reflects the elevation of the river bottom, which was 3.6 ft. below the surface of the water at the time of drilling				

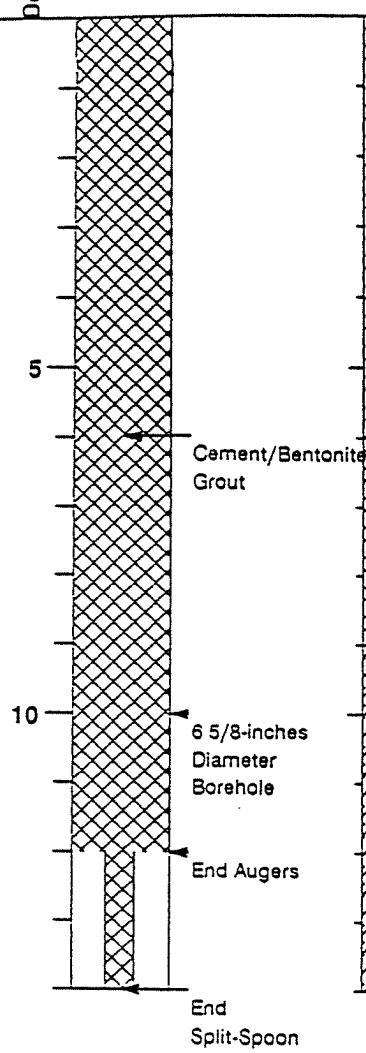
EXPLANATION
- 24" Split-Spoon Sampler
- No Recovery
- 6" Partial Recovery
- 6" Full Recovery
- 30" Shelby Tube Sampler
- First water during drilling

Checked By: T. Maley

Soil Boring:	SW-19
Drilling Method:	Hollow Stem Auger
Start date:	October 22, 1992
Completion date:	October 22, 1992
Logged by:	T. Maley
Subcontractor:	Advanced Drilling Inv.
Equipment:	Mobile B-57
Client:	OXYCHEM/OLIN
Project:	102nd Street, Niagara Falls, NY

FLUOR DANIEL
Environmental Services
Marlton, NJ

NOTE: '*' indicates 3-inch diameter split-spoon sample



Depth, Feet	Graphic Log	Description	Sample Number	Interval	Penetration Rate (Blows/.5 ft)	Inches of Rec.
		Surface Elevation (ft.): 560.57				
		Very dark gray (10YR, 3/1) Silty Fine SAND, W-LP, 0-5% shells and roots, (ALLUVIUM).	SW-20 1	2 3 4 3	7	6 6 6 6
			SW-20 2	1 1 1 2	2	6 6 2 0
		Dark gray (10YR, 4/1) with occasional black organic horizontal layers.	SW-20 3	1 0 1 1	1	6 3 0 0
		Grades to Dark gray (10YR, 4/1) Fine SAND, W-NP, 0-12% silt, (ALLUVIUM). At 7.3'-7.4' seam of fine to medium sand and fine gravel, W-NP.	SW-20 4	2 2 2 4	4	6 6 4 0
			SW-20 5	4 3 2 2	5	6 6 2 0
		Reddish gray (5YR, 5/2) Fine Sandy/Silty CLAY, M-P, soft, 0-5% fine to coarse gravel, (TILL).	SW-20 6	3 2 3 5	5	6 6 0 0
		Becoming more dense at 13.0 ft.	SW-20 7	3 4 7 9	11	6 6 4 0
		End Boring SW-20 at 14.0 ft. NOTE: Surface elevation reflects the elevation of the river bottom, which was 2.9 ft. below the surface of the water at the time of drilling (2:00p.m. on 10/21/92).				

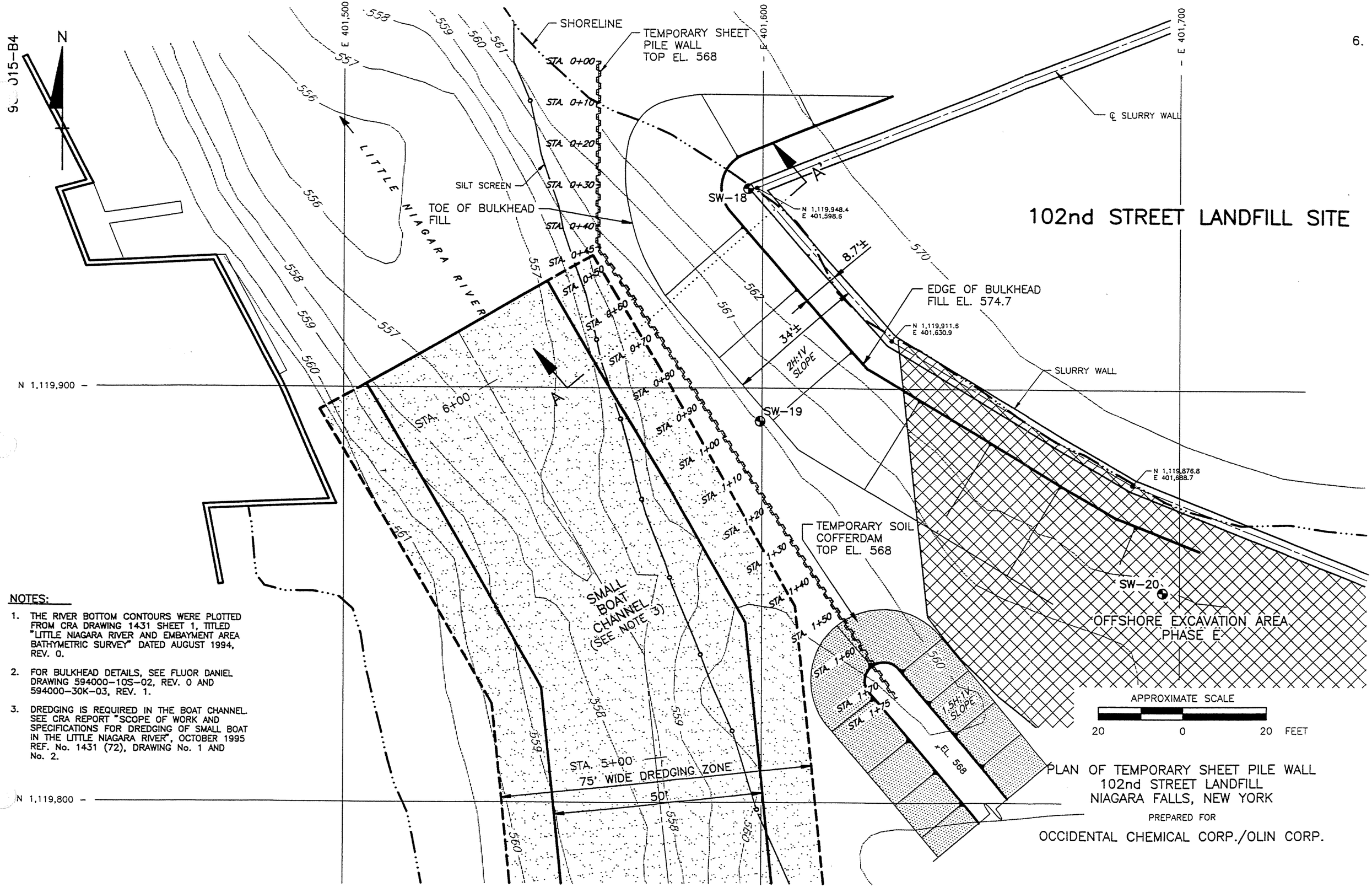
EXPLANATION

- 24" Split-Spoon Sampler
- ☐ No Recovery
- ☒ 6" Partial Recovery
- ☒ 6" Full Recovery
- 30" Shelby Tube Sampler
- First water during drilling

Checked By: T. Maley

Soil Boring:	**SW-20**
Drilling Method:	Hollow Stem Auger
Start date:	October 21, 1992
Completion date:	October 21, 1992
Logged by:	T. Maley
Subcontractor:	Advanced Drilling Inv.
Equipment:	Mobile B-57
Client:	OXYCHEM/OLIN
Project:	102nd Street, Niagara Falls, NY

FLUOR DANIEL
Environmental Services
Marlton, NJ



102nd STREET LANDFILL SITE

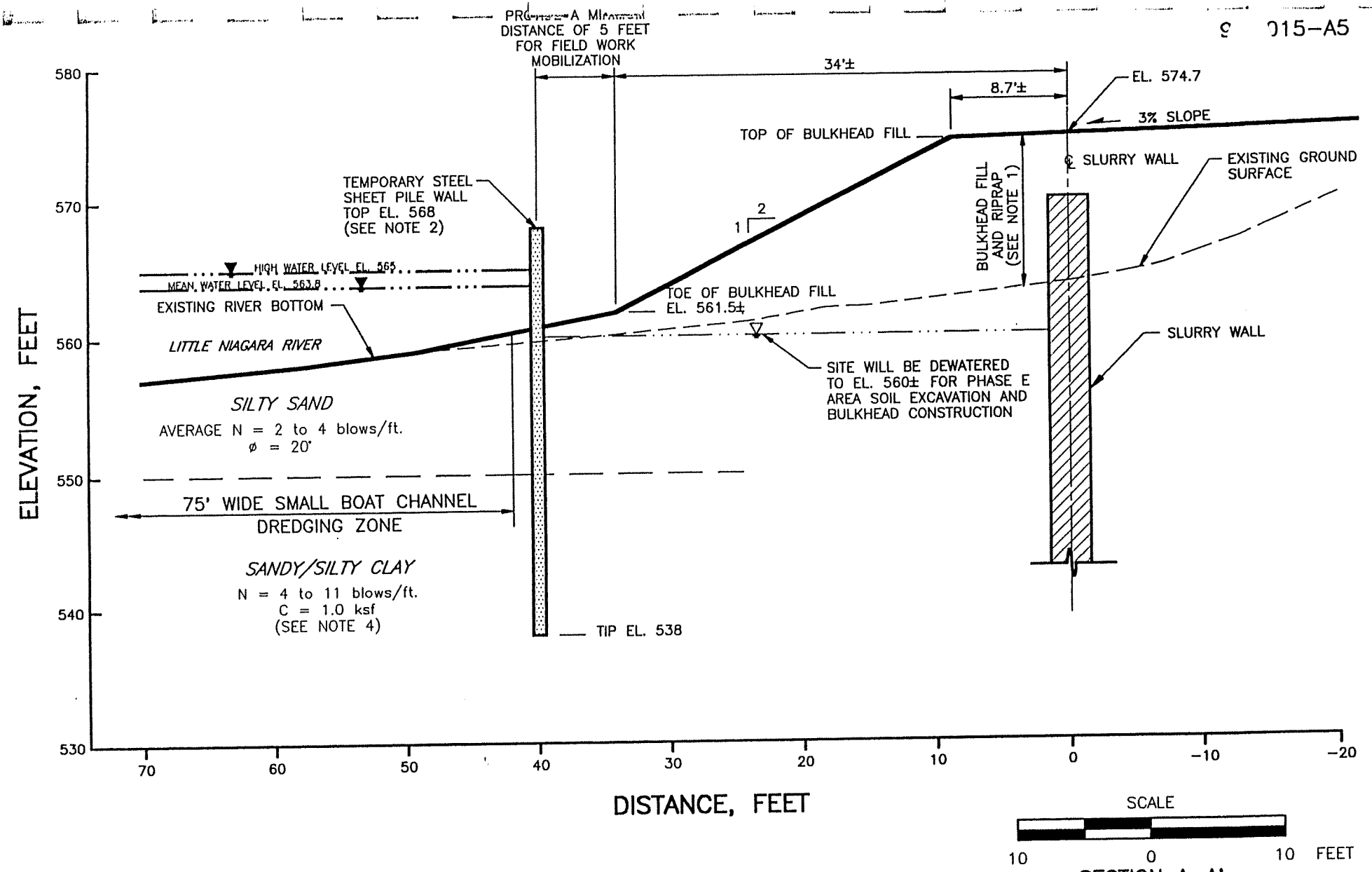
NOTES:

1. THE RIVER BOTTOM CONTOURS WERE PLOTTED FROM CRA DRAWING 1431 SHEET 1, TITLED "LITTLE NIAGARA RIVER AND EMBAYMENT AREA BATHYMETRIC SURVEY" DATED AUGUST 1994, REV. 0.
2. FOR BULKHEAD DETAILS, SEE FLUOR DANIEL DRAWING 594000-10S-02, REV. 0 AND 594000-30K-03, REV. 1.
3. DREDGING IS REQUIRED IN THE BOAT CHANNEL. SEE CRA REPORT "SCOPE OF WORK AND SPECIFICATIONS FOR DREDGING OF SMALL BOAT IN THE LITTLE NIAGARA RIVER", OCTOBER 1995 REF. No. 1431 (72), DRAWING No. 1 AND No. 2.

PLAN OF TEMPORARY SHEET PILE WALL
102nd STREET LANDFILL
NIAGARA FALLS, NEW YORK

PREPARED FOR

OCCIDENTAL CHEMICAL CORP./OLIN CORP.



SCALE

10 0 10 FEET

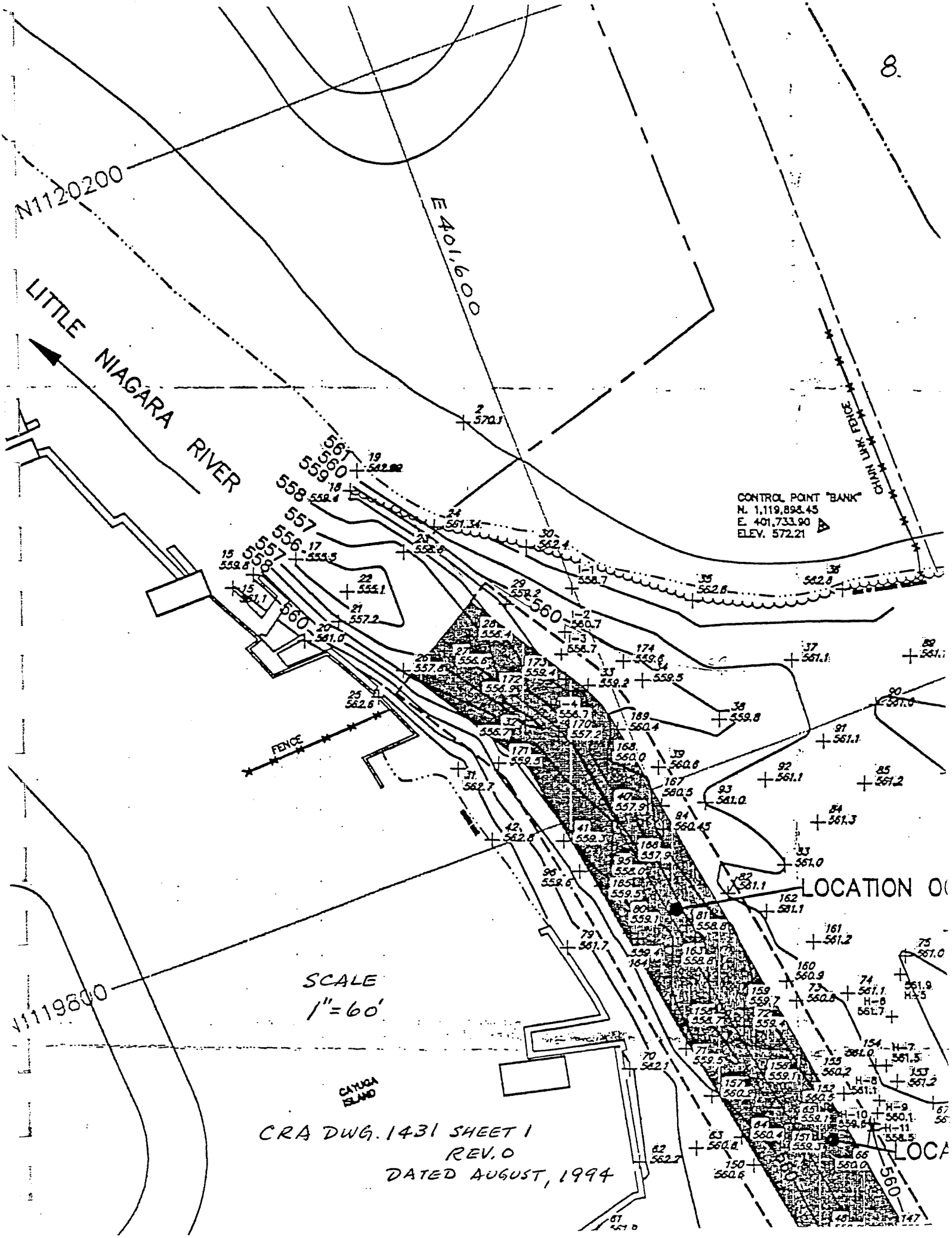
SECTION A-A'
AT TEMPORARY STEEL SHEET PILE WALL
102nd STREET LANDFILL
NIAGARA FALLS, NEW YORK

PREPARED FOR

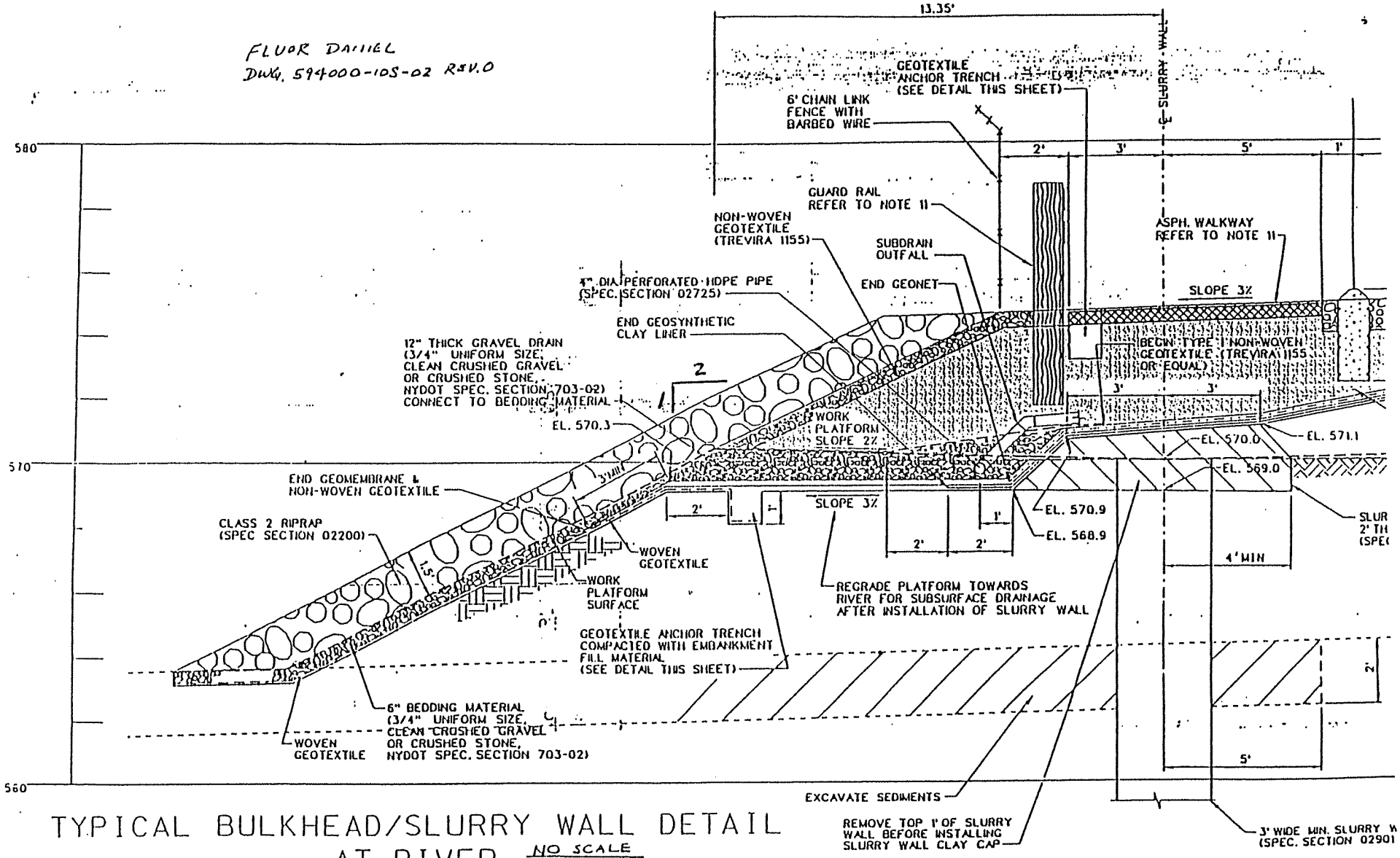
OCCIDENTAL CHEMICAL CORP./OLIN CORP.

NOTES:

1. FOR BULKHEAD DETAILS, SEE FLUOR DANIEL DRAWING 594000-10S-02, REV. 0 AND 594000-30K-03, REV. 1.
2. THE STEEL SHEET PILE WALL WILL BE REMOVED AFTER THE DEWATERING AND SLURRY WALL BULKHEAD CONSTRUCTION IS COMPLETED ABOVE RIVER WATER LEVEL.
3. FOR PLAN OF TEMPORARY SHEET PILE WALL, SEE DRAWING 96-015-B4.
4. SOIL DATA FROM BORING LOGS SW-19 AND SW-20.
   - N = STANDARD PENETRATION RESISTANCE, blows/ft.
   - ø = ANGLE OF INTERNAL FRICTION, degrees
   - C = COHESION, ksf


N1120200
E 401,600
LITTLE NIAGARA RIVER
CHAIN LINK FENCE
CONTROL POINT "BANK"
N. 1,119,898.45
E. 401,733.90
ELEV. 572.21
FENCE
SCALE
1"=60'
CAYUGA ISLAND
CRA DWG. 1431 SHEET 1
REV. 0
DATED AUGUST, 1994

FLUOR DANIEL
DWG. 594000-105-02 REV.0



TYPICAL BULKHEAD/SLURRY WALL DETAIL AT RIVER

NO SCALE

6

Soil Data

From Soil Boring Logs SW-18, SW-19, and SW-20:

Boring No.	Elevation	Soil	Depth (ft)	Standard Penetration Blows Per Foot From 24" Long Spoon (N)
SW-18	565.7 to 546.7	Silty Sand	7'-26'	N = 2-2-3-5-5-14-7-7-16
SW-19	560.0-553.0	Silty Sand	0'-7'	N = 4-0-4
SW-19	553.0-548.0	Sandy/Silty Clay	7'-12'	N = 4-4
SW-20	560.6-551.6	Silty Sand	0'-9'	N = 7-2-1-4-5
SW-20	551.6-546.6	Sandy/Silty Clay	9'-14'	N = 5-11

Boring SW-18 is at the shoreline and its soil data will not be used for this analysis, only SW-19 and SW-20 are used.

Note: The blows per foot are the summation of blows of the second and third 6-inch penetration.

Temporary Steel Sheeting Layout Requirements

The layout of the temporary steel sheeting requires satisfying the following criteria:

- The sheeting should be placed with a minimum 5-foot distance outside the toe of bulkhead.
- The sheeting should be placed outside the 75-foot-wide small boat channel dredging zone.
- The soil cofferdam which connects the sheeting shall be placed outside the boat channel dredging zone and the Phase E excavation area. The centerline of the soil cofferdam shall be kept 36 feet away from the embayment soil excavation limits as indicated on page 25 of "Temporary Cofferdam Design Report, 102nd Street Landfill, Niagara Falls, New York".

Based on these criteria, the layout of the steel sheeting is shown on page 6 of this report. The length of sheet piling cofferdam is 175 feet beginning at Station 0+00 and ending at Station 1+75. Since the area is very congested, the soil cofferdam will be constructed closer than 36 feet in the Phase E excavation area for a short distance and a seepage problem may occur at the toe of the soil cofferdam. Smith Environmental will take precautionary steps to avoid this problem during construction.

Sheeting Size Selection

The common size of steel sheet piling on the market for shoring use is PZ-27.

Use PZ-27, 30 feet long
Top Elevation = 568
Tip Elevation = 538

The properties of PZ-27 sheeting is shown in Appendix D.

Soil Properties

The 30-foot-long PZ-27 sheeting will penetrate the silty sand layer and silty clay layer. The silty sand exists from river bottom elevation 560± to Elevation 550±. The standard penetration resistance is less than 4 blows per foot and $\phi = 20°$ is used. The silty clay exists from Elevation 550 to piling tip elevation 538 with an average standard penetration resistance of approximately 8 blows per foot.

Refer to Terzaghi and Peck "Soil Mechanics in Engineering Practice", 1st Edition, Twelfth Printing, 1962, p. 82 to p. 86 (attached, see Appendix F). The ϕ angle for loose saturated silty sand is about 20°.

Refer to Terzaghi and Peck "Soil Mechanics in Engineering Practice", 2nd Edition 1967, p. 347 (attached, see Appendix A). The unconfined compressive strength of silty clay, q_u, value is 1 ton per square foot or 1 tsf. Cohesion = $q_u/2$ = 1 ksf

Same reference p. 193 to p. 199:

Active Soil Pressure Coefficient, K_a, for Cohesionless Soil (Sand) = $\frac{1 - \sin\phi}{1 + \sin\phi}$

for $\phi = 20°$, $K_a = 0.49$

Passive Soil Pressure Coefficient, K_p, for Cohesionless Soil (Sand) = $\frac{1 + \sin\phi}{1 - \sin\phi} = 2.03$

Active Soil Pressure for Cohesive Soil, p_a, is:

$$p_a = \gamma h K_a - 2c\sqrt{K_a}$$

for $\phi = 0$, $K_a = 1$ for cohesive soil, c = 1 ksf

Passive Soil Pressure for Cohesive Soil (clay) is:

$$p_p = \gamma h K_p + 2c\sqrt{K_p}$$

Where: $K_p = \frac{1}{K_a} = 1$ for $\phi = 0°$ c = 1 ksf

SMITH
ENVIRONMENTAL TECHNOLOGIES CORPORATION

Lateral Pressures

Lateral Pressure from Bulkhead Soil and Riprap:

Use complete configuration of bulkhead for lateral load analysis (see sketch on p. 14).
Average weight bulkhead soil and riprap above water level = 120 lbs/ft
p = 0.12 kcf x 14.7′ = 1.76 ksf

Refer to Poulous & Davis "Elastic Solutions for Soil & Rock Mechanics", John Wiley & Sons, 1974, p. 41 and 42 (attached, see Appendix B).

$$\sigma_x = \frac{p}{\pi a}\left[a\beta + \alpha x + 2z \log_e \frac{R_2}{R_1}\right]$$

Table 3.5

at $\frac{X}{a} = 0$ a = 30′ ±

$\frac{Z}{a}$	0	.25	.5	.75	1.0
Z, ft	0	7.5	15.0	22.5	30
$\frac{\sigma_x}{p}$	0	0.30	0.40	0.45	0.47

Use $\sigma_x = 0.4$, p = 0.4 x 1.76 = 0.7 ksf

$F_1 = \sigma_x (22') = 0.7$ ksf x 22′ = 15.4 k

The river bottom elevation varies from Elevation 562.5 to 559.2 in the sheet piling area and Elevation 560 is used for the analysis. The Phase E area dewatering is 70 to 100 feet away. Therefore, the water level in the sheeting area may stay at Elevation 560. An additional 2 feet of soil may be placed from Elevation 560 up for the bulkhead. The unit weight of this fill is approximately 120 pounds per cubic foot or 0.12 kcf.

Active soil pressure due to 2-foot soil from Elevation 562 to 560.

2′ x 0.12 kcf = 0.24 ksf

$p_2 = K_a (0.24) = (0.49)(0.24) = 0.12$ ksf

$F_2 = 0.12$ ksf x 10′ = 1.2 k

$p_3 = K_a (0.24) = (1.0)(0.24) = 0.24$ ksf

$F_3 = 0.24$ ksf x 12′ = 2.9 k

Active Soil Pressure:

$p_4 = 0.06$ ksf x 10′ x 0.49 = 0.30 ksf

$F_4 = ½ \times 0.30$ ksf x 10′ = 1.5 k

$p_5 = 10' \times 0.06\ k_a - 2c\sqrt{K_a} = 10 \times 0.06 \times 1 - 2 \times 1 = 0$

$p_6 = 22' \times 0.06\ k_a - 2c\sqrt{K_a} = 1.32 - 2 = 0$

Water Pressure:

$p_7 = 0.0624 \times 22' = 1.4$ ksf

$F_7 = 1.4$ ksf x 22′ x ½ = 15.4 k

Passive Pressure of River Side Soils:

$p_8 = 0.06$ kcf x 10′ x 2.03 = 1.2 ksf

$F_8 = 1.2$ ksf x 10′ x ½ = 6 k

$p_9 = \gamma h K_p + 2c = 0.06 \times 10' \times 1 + 2 \times 1$ ksf = 2.6 ksf

$p_{10} = 0.06$ kcf x 22′ x 1 + 2 x 1 ksf = 3.3 ksf

$F_9 = (P_9 + P_{10})/2 \times 12' = (2.6 + 3.3)/2 \times 12' = 35.4$ k

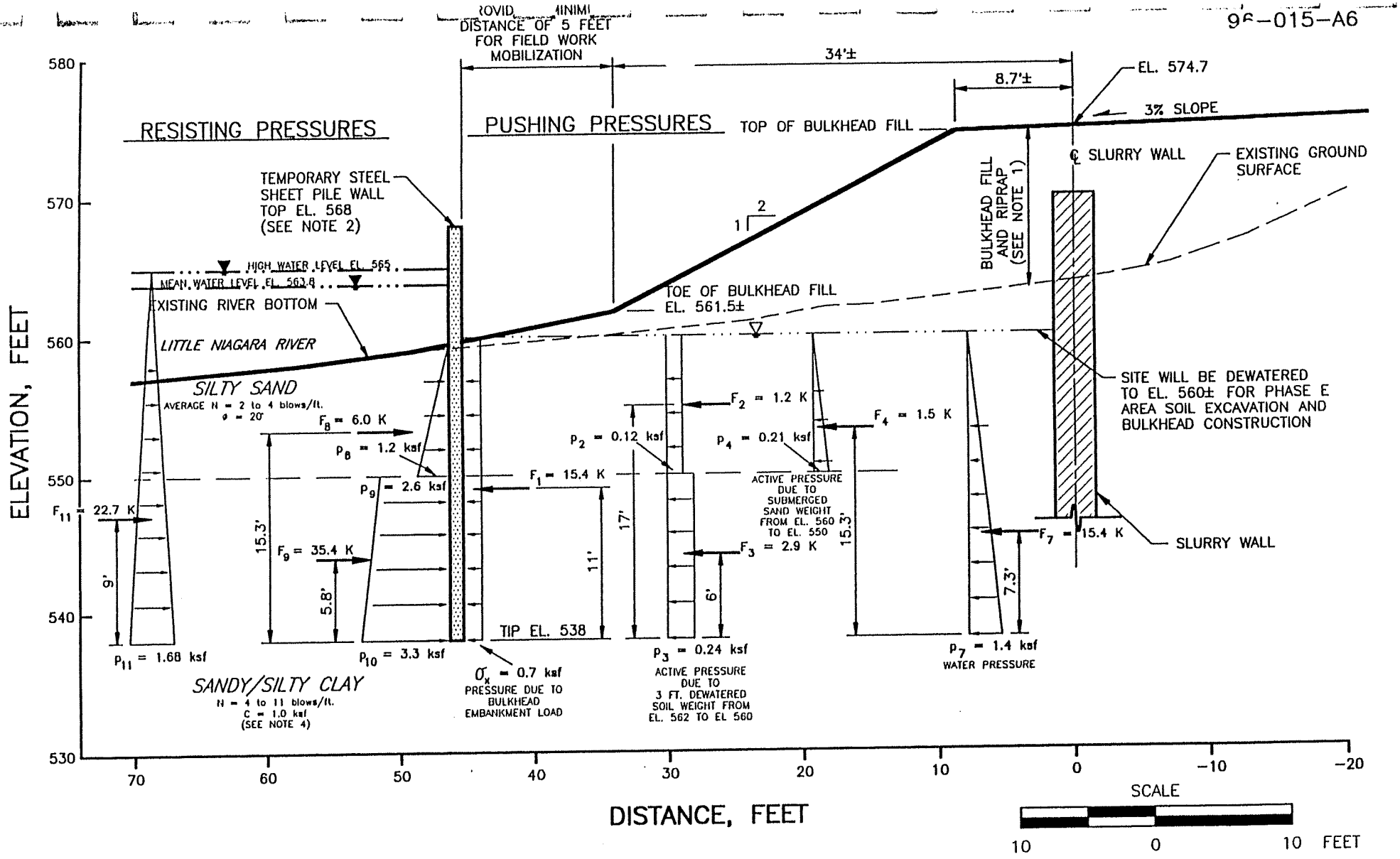
Water Pressure:

$p_{11} = 0.0624 \times 27' = 1.68$ ksf

$F_{11} = ½ \times 27' \times 1.68$ ksf = 22.7 k

All forces are plotted on Page 14.

The lateral pressures from the dozer and backhoe equipment loads are small because these are transient loads and are operated at certain distances from the sheeting.



NOTES:

1. FOR BULKHEAD DETAILS, SEE FLUOR DANIEL DRAWING 594000-10S-02, REV. 0 AND 594000-30K-03, REV. 1.
2. THE STEEL SHEET PILE WALL WILL BE REMOVED AFTER THE DEWATERING AND SLURRY WALL BULKHEAD CONSTRUCTION IS COMPLETED ABOVE RIVER WATER LEVEL.
3. FOR PLAN OF TEMPORARY SHEET PILE WALL, SEE DRAWING 96-015-B4.
4. SOIL DATA FROM BORING LOGS SW-19 AND SW-20.
   - N = STANDARD PENETRATION RESISTANCE, blows/ft.
   - ø = ANGLE OF INTERNAL FRICTION, degrees
   - C = COHESION, ksf

LATERAL FORCES ON THE STEEL SHEETING WHEN DEWATERING THE PHASE E AREA TO EL. 560
TEMPORARY STEEL SHEET PILE WALL
102nd STREET LANDFILL
NIAGARA FALLS, NEW YORK

PREPARED FOR

OCCIDENTAL CHEMICAL CORP./OLIN CORP.

Sheet Piling Stability

Check moment of all forces shown on page 14 about the bottom of sheeting with the bulkhead in-place for rotation and the balance of the horizontal forces for sliding:

Landside Pushing Force (K)	Moment Arm About Bottom of Sheeting (ft)	Moment (k-ft)
F_1 = 15.4	11	169.4
F_2 = 1.2	17	20.4
F_3 = 2.9	6	17.4
F_4 = 1.5	15.3	23.0
F_7 = 15.4	7.3	112.4
Total 36.4		342.6

Riverside Resisting Force (K)	Moment Arm About Bottom of Sheeting (ft)	Moment (k-ft)
F_8 = 6	15.3	91.8
F_9 = 35.4	5.8	205.3
F_{11} = 22.7	9	204.3
Total 64.1		**501.4**

Factor of Safety Against Sliding = $\frac{64.1}{36.4} = 1.8$

Factor of Safety Against Rotation About Tip of Piling = $\frac{501.4}{342.6} = 1.5$

Check the sheeting stability when the bulkhead is not in-place. The pushing force is on the riverside and the resistance is on the landside.

Riverside lateral pressures are F_4 and F_{11}
Landside lateral pressures are F_7, F_8, and F_9

	Pushing Force, k	Moment, k-ft
F_4	1.5	23.0
F_{11}	22.7	204.3
Total	24.2	227.3

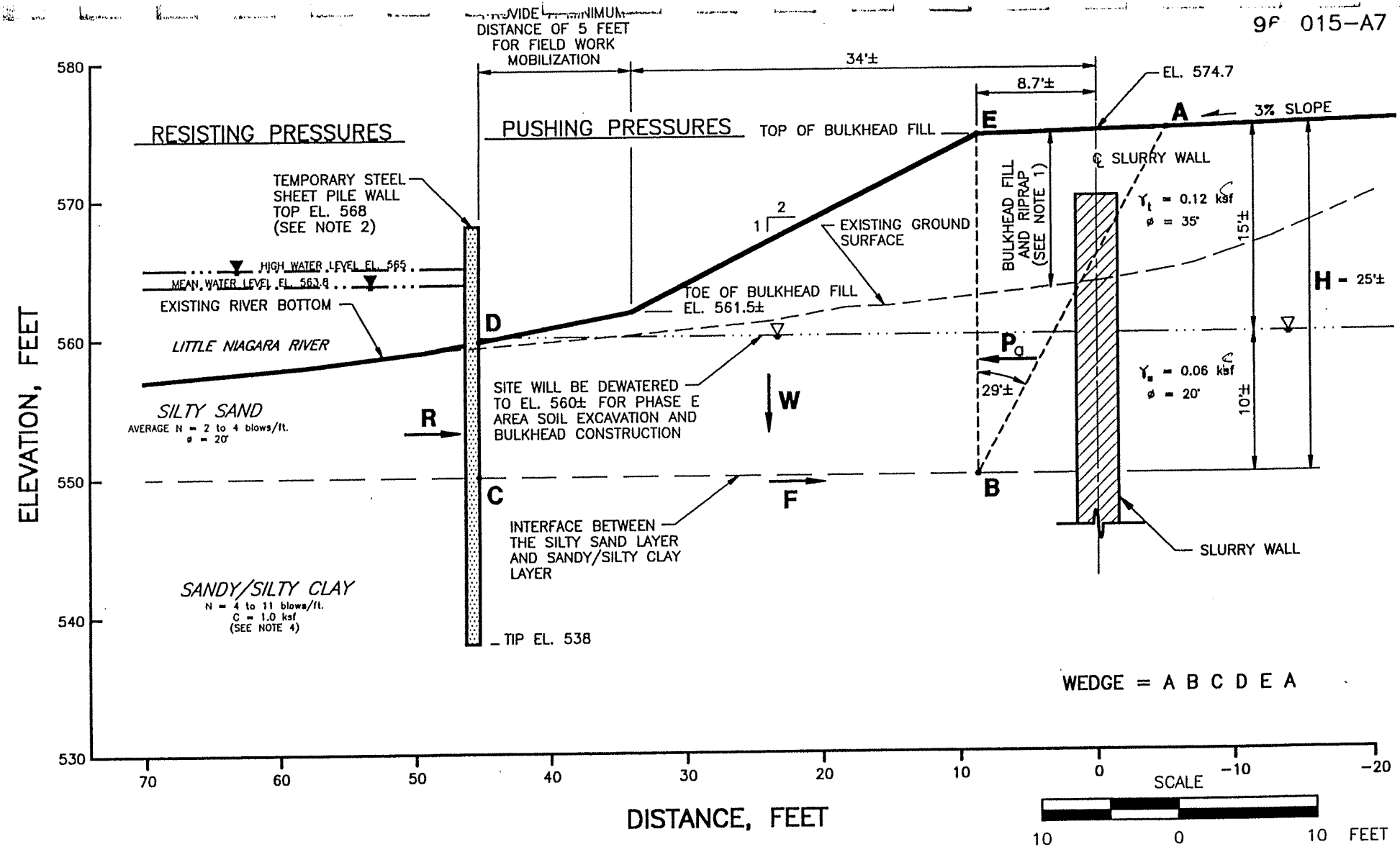
Factor of Safety Against Sliding = $\frac{56.8\,k}{24.2} = 2.3$

	Resisting Force, k	Moment, k-ft
F_7	15.4	112.4
F_8	6.0	91.8
F_9	35.4	205.3
Total	56.8	409.5

Factor of Safety Against Rotation About Tip of Piling = $\frac{409.5}{227.3} = 1.8$

These factors of safety are adequate.

SMITH



WEDGE SLIDING
LATERAL FORCES ON THE STEEL SHEETING
WHEN DEWATERING THE PHASE E AREA TO EL. 560
TEMPORARY STEEL SHEET PILE WALL
102nd STREET LANDFILL
NIAGARA FALLS, NEW YORK

PREPARED FOR

OCCIDENTAL CHEMICAL CORP./OLIN CORP.

NOTES:

1. FOR BULKHEAD DETAILS, SEE FLUOR DANIEL DRAWING 594000-10S-02, REV. 0 AND 594000-30K-03, REV. 1.
2. THE STEEL SHEET PILE WALL WILL BE REMOVED AFTER THE DEWATERING AND SLURRY WALL BULKHEAD CONSTRUCTION IS COMPLETED ABOVE RIVER WATER LEVEL.
3. FOR PLAN OF TEMPORARY SHEET PILE WALL, SEE DRAWING 96-015-B4.
4. SOIL DATA FROM BORING LOGS SW-19 AND SW-20.
   N = STANDARD PENETRATION RESISTANCE, blows/ft.
   ø = ANGLE OF INTERNAL FRICTION, degrees
   C = COHESION, ksf

Check Wedge Sliding Force on the Sheeting:

Reference B.K. Hough "Basic Soils Engineering", Ronald Press Co., 2nd Edition, 1969, p. 269-273 (attached, see Appendix E).

Refer to page 16 Wedge ABCDEA.

The sliding surface is the sand-clay interface BC.

The height of wedge from 550 to 574.7 is about 25 ft.

γ = average unit weight = (15′ x 0.12 kcf + 10′ x 0.06 kcf)/25′ = 0.096 kcf

ϕ angle for compacted bulkhead material $\cong$ 35°

Reference Terzaghi & Peck "Soil Mechanics in Engineering Practice," First Edition, 12th Printing 1962, p. 82 to p. 86 (attached, see Appendix F)

ϕ angle for in-situ loose silty sand = 20° (it may increase to 30° after the bulkhead embankment is in-place)

$$\phi \text{ average for wedge ABE} = \frac{15' \times 35^\circ + 10' \times 20^\circ}{25'} = 29^\circ$$

$$K_a = \text{active pressure coefficient} = \frac{1-\sin\phi}{1+\sin\phi} = \frac{1-\sin 29^\circ}{1+\sin 29^\circ} = 0.35$$

P_a = total active pressure = $\frac{1}{2} \gamma H^2 K_a$

= $\frac{1}{2}$ (0.096 kcf)(25′)^2 (0.35) = 10.5^k

F = shearing resistance along BC = W tanϕ

W = weight of soil above BC = 15′ x 30′ x $\frac{1}{2}$ x 0.12 kcf

+ 10′ x 37′ x 0.06 kcf = 27 + 22.2 = 49.2 k

F = W tan 20° = 49.2 k tan 20° = 17.9 k > p_A = 10.5 k

If use c = 1 ksf then F = 1 ksf x 37′ = 37 k > 10.5 k

Since F > P_a, there is no extra force R due to wedge sliding acting on the CD portion of the steel sheet piling, therefore the sheeting is stable.

$$\text{Factor of Safety} = \frac{17.9^k}{10.5^k} = 1.7$$

Piling Stresses

Reference Department of Navy "Design Manual 7.2 Foundations & Earth Structures", p. 7.2-237, 237, 238, and 240 (attached, see Reference C).

For sand of ϕ = 20° and silty clay c = 1 ksf

f = horizontal subgrade modulus = 5 tons/ft^3 = 10 k/ft^3 for both sand and silty clay

$$T = \text{relative stiffness factor} = \left(\frac{EI}{f}\right)^{1/5}$$

E = Modulus of Elasticity = 30,000 ksi for steel = 4,320,000 ksf

I = Moment of Inertia = 276.3 in^4/ft for PZ-27 = 0.0133 ft^4/ft

$$T = \left(\frac{4{,}320{,}000 \text{ ksf} \times 0.0133 \text{ ft}^4}{10 \text{ k/ft}^3}\right)^{1/5} = 5.65 \text{ ft}$$

L = 560 - 538 = 22 ft embedment

$\frac{L}{T} = \frac{22}{5.65} = 3.9$ Use $\frac{L}{T} = 4$

For pile with $\frac{L}{T} \geq 4$ is more desirable. Selecting 30-foot-long sheeting satisfies this requirement.

Bending moment and forces with outside water at Elevation 565 and inside at Elevation 560:

P = ½ (0.0624 kcf) x (5)^2 = 0.8 k/ft

M = 0.8 k x 5/3′ = 1.3 k-ft

At Z = 1.0 T, $M_M = F_M (M) = 0.85\ M = 0.85\ (1.3) = 1.1^{k-1}$

$M_p = F_p (PT) = 0.77\ (0.8^k \times 5.65') = 3.5^{k-ft}$

TOTAL M = 1.1 + 3.5 = 4.6^{k-ft}

Bethlehem Steel Co. piling size (see Appendix D attached):

S_x = Moment of inertia of PZ-27 sheeting = 30.2 in^4/ft

$$f = \text{Bending Stress} = \frac{M}{S_x} = \frac{4.6 \times 12}{30.2} = 2.0 \text{ ksi} < 24 \text{ ksi allowable}$$

Deflection of sheeting at Elevation 560:

$$\delta_M = F_\delta \left[\frac{MT^2}{EI}\right] = 1.6 \left[\frac{4.6^{k\text{-ft}} \times (5.65')^2}{4{,}320{,}000 \text{ k/ft}^2 \times 0.0133 \text{ ft}^4}\right] = 0.0041 \text{ ft} = 0.05''$$

$$\delta_P = F_\delta \left[\frac{PT^3}{EI}\right] = 2.3 \left[\frac{0.8^k \times (5.65')^3}{4{,}320{,}000 \text{ k/ft}^2 \times 0.0133 \text{ ft}^4}\right] = 0.006 \text{ ft} = 0.07''$$

Total deflection at Elevation 560 = 0.05" + 0.07" = 0.12"

Slope of sheeting at Elevation 560:

$$S_M = F_\theta \left[\frac{MT}{EI}\right] = -1.8 \left[\frac{(4.6)(5.65)}{4{,}320{,}000 \text{ k/ft}^2 \times 0.0133 \text{ ft}^4}\right] = -0.00081 \text{ radian}$$

$$S_P = F_\theta \left[\frac{PT^2}{EI}\right] = -1.8 \left[\frac{(0.8)^k (5.65')^2}{4{,}320{,}000 \text{ k/ft}^2 \times 0.0133 \text{ ft}^4}\right] = -0.00080 \text{ radian}$$

Total slope = 0.00081 + 0.00080 = 0.00161 radian from vertical
= 0.092° from vertical

Movement at top of sheeting = 8 ft x 0.00161 radian = 0.0129 ft = 0.15 inches

The deflection due to flexural bending of 8 ft cantilever with approximate lateral load of 0.8^k is small

Total Deflection at Top of Sheeting is:

0.12" at Elevation 560
0.15" due to pile rotation

Total 0.27" - small

Conclusion:Selected sheeting PZ-27 30 feet long is adequate.

SMITH

CONSTRUCTION PROCEDURE

1. Drive 30-foot-long PZ-27 steel sheeting in the river a minimum 5 feet away from the toe of the bulkhead fill as shown on Smith Environmental Drawing 96-015-B4 (page 6 of this report). Flyash or bentonite powder will be used to seal the sheeting interlocks.

2. The top of sheeting is set at Elevation 568.

3. The steel sheeting will overlap 10 feet with the temporary soil cofferdam from Station 1+65 to 1+75, see page 6 of this report.

4. Dewater the Phase E area.

5. Remove contaminated soil and backfill with 2-foot-thick clean soil in the Phase E designated areas.

6. Build bulkhead with riprap to Elevation 568 for slurry wall construction. The 1.5-foot-thick riprap will have a slope of 2H:1V with toe rested on the top of the fill as indicated in Item 5.

7. Remove the sheeting when the bulkhead is constructed to Elevation 568.

   The purpose of sheet piling installation is to isolate the Phase E area for dewatering, contaminated soil excavation, backfilling, and bulkhead construction. After these requirements are met, the sheet piling is no longer needed. Therefore, remove the sheet piling after the bulkhead reaches Elevation 568. The riverbed slope in the sheeting area is steeper than the other phase areas, the sands are in a loose state, and the clay is in a soft to medium stiff state according to the soil boring data and the standard penetration resistance. It is recommended that a review by the Project Design Engineer using the wedge failure method and circular failure method be performed to assure the bulkhead built to Elevation 574.7 along the river is safe in sliding and settlement.

8. Continue constructing the bulkhead to Elevation 574.7 from Elevation 568.

APPENDIX A

K. TERZAGHI & R. PECK, "SOIL MECHANICS IN ENGINEERING PRACTICE", JOHN WILEY & SONS, 2ND EDITION, 1967, P. 193 TO 199, P. 347

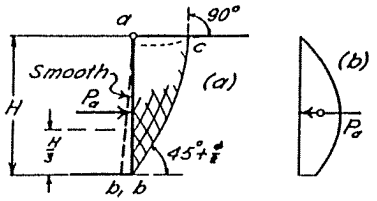


Fig. 27.3. Failure of sand behind smooth vertical wall when deformation condition for active Rankine state is not satisfied. (*a*) Section through back of wall. (*b*) Stress against back of wall.

state because the upper part of the wall cannot move, and, as a consequence, the deformation condition for the active Rankine state within the sliding wedge is not satisfied.

Theoretical and experimental investigations regarding the type of failure caused by a tilt of the lateral support about its upper edge have led to the conclusion that the surface of sliding starts at *b* (Fig. 27.3*a*) at an angle of $45° + \phi/2$ with the horizontal and that it becomes steeper until it intersects the ground surface at a right angle. The upper part of the sliding wedge remains in a state of elastic equilibrium until the lower part of the wedge has passed completely into a state of plastic equilibrium. The distribution of pressure against the lateral support is roughly parabolic (Fig. 27.3*b*) instead of triangular (Fig. 27.1*b*).

Similar investigations regarding the effect of pushing the bottom of the support toward the soil (Fig. 27.4*a*) have shown that the surface of sliding rises from *b* at an angle $45° - \phi/2$ with the horizontal and that it also intersects the ground surface at a right angle. The corresponding distribution of pressure is shown in Fig. 27.4*b*.

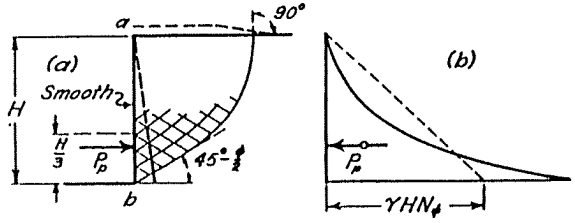


Fig. 27.4. Failure of sand behind smooth vertical wall when deformation condition for passive Rankine state is not satisfied. (*a*) Section through back of wall. (*b*) Stress on back of wall.

Selected Reading

A general discussion of the application of the theory of plasticity to states of limiting equilibrium, including problems of earth pressure, stability of slopes, and bearing capacity, is contained in Sokolovski, V. V. (1960): *Statics of soil media.* Translated from the Russian by D. H. Jones and A. N. Schofield, London, Butterworths, 237 pp.

Mathematical methods for solving problems with mixed boundary conditions are developed in Hansen, B. (1965): *A theory of plasticity for ideal frictionless materials,* Copenhagen, Teknisk Forlag, 471 pp.

ART. 28 RANKINE'S EARTH-PRESSURE THEORY

Earth Pressure against Retaining Walls

Retaining walls serve the same function as the vertical sides of the box shown in Fig. 27.2. The soil adjoining the wall is known as the *backfill.* It is always deposited after the wall is built. While the backfill is being placed, the wall yields somewhat under the pressure. The ultimate value of the pressure depends not only on the nature of the soil and the height of the wall but also on the amount of yield. If the position of the wall is fixed, the earth pressure is likely to retain forever a value close to the earth pressure at rest (Article 27). However, as soon as a wall yields far enough, it automatically satisfies the deformation condition for the transition of the adjoining mass of soil from the state of rest into an active state of plastic equilibrium. Hence, the factor of safety of a retaining wall capable of yielding must be adequate with respect to the active earth pressure, but does not need to be investigated for greater values of earth pressure.

Although the back of every real retaining wall is rough, approximate values of the earth pressure can be obtained on the assumption that it is smooth. In the following paragraphs, this assumption is made. Methods for obtaining more accurate values will be described in subsequent articles.

Active Earth Pressure of Cohesionless Soil Against Smooth Vertical Walls

If the surface of a sand backfill is horizontal, and if the back of the retaining wall is vertical and perfectly smooth, the magnitude and the distribution of pressure against the back of the wall are identical with those of the active pressure against the fictitious plane *ab* in Fig. 27.1*a*. Therefore, the earth pressure can be computed on the basis of the equa-

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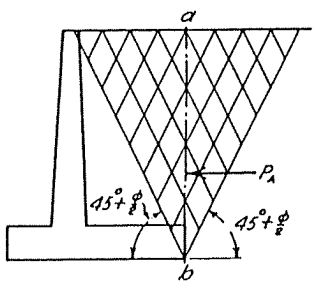

Fig. 28.1. Failure of sand behind cantilever retaining wall; deformation condition for active Rankine state is almost satisfied.

tions already derived. In reality, there are no perfectly smooth surfaces. However, the equations based on this assumption are so simple that they are quite commonly used for evaluating the earth pressure against real retaining walls and other structures acted on by earth pressure. It is shown subsequently that the roughness of the back of a wall commonly reduces the active and increases the passive earth pressure. Hence, as a rule, the error associated with the assumption is on the safe side.

Furthermore, in one case of considerable practical importance, the assumption of a smooth vertical wall is almost strictly correct. This case is illustrated by Fig. 28.1 which represents a cantilever wall. If such a wall yields under the influence of the earth pressure, the sand fails by shear along two planes rising from the heel of the wall at angles of $45° + \phi/2$ with the horizontal. Within the wedge-shaped zone located between these two planes, the sand is in the active Rankine state, and no shearing stresses act along the vertical plane *ab* through the heel. Hence, the earth pressure against this plane is identical with that against a smooth vertical wall.

If the sand backfill is perfectly dry, the active pressure against a smooth vertical wall at any depth z is

$$p_h = \gamma z \frac{1}{N_\phi} \tag{27.5}$$

It increases in simple proportion to the depth, as indicated by the pressure triangle *abc* (Fig. 27.2*a*). The total pressure against the wall is

$$P_A = \int_0^H p_h \, dz = \frac{1}{2} \gamma H^2 \frac{1}{N_\phi} \tag{28.1}$$

The point of application of P_A is located at a height $H/3$ above b.

If the wall is pushed into the position $a_2'b$ in Fig. 27.2*b* the pressure p_h against the wall assumes a value corresponding to the passive Rankine state,

$$p_h = \gamma z N_\phi \tag{27.6}$$

and the total pressure against the wall becomes equal to

$$P_P = \int_0^H p_h \, dz = \frac{1}{2} \gamma H^2 N_\phi \tag{28.2}$$

Active Earth Pressure of Partly Submerged Sand Supporting a Uniform Surcharge

In Fig. 28.2*a* the line *ab* represents the smooth vertical back of a wall with height H. The effective unit weight of the sand when dry is γ_d and when submerged is γ' (see Article 12); the unit weight of water is γ_w. The surface of the horizontal backfill carries a uniformly distributed surcharge q per unit of area. Within the backfill the water table is located at depth H_1 below the crest of the wall. The angle of internal friction of both the dry and submerged sand is assumed to be ϕ.

As the wall yields from position *ab* into position $a_1'b$, the pressure against its back decreases from the value of the earth pressure at rest to that of the active Rankine pressure. In Article 26, it was shown that the entire effect of the porewater pressure on the effective stresses in the sand can be taken into account by assigning to the submerged part of the sand the submerged unit weight γ' (Eq. 12.6). Within the depth H_1 the pressure on the wall due to the weight of the adjoining sand is represented by the triangle *ace* in Fig. 28.2*b*. At any depth z' below the water table the effective vertical pressure on a horizontal section through the sand is

$$p_v = H_1\gamma + z'\gamma'$$

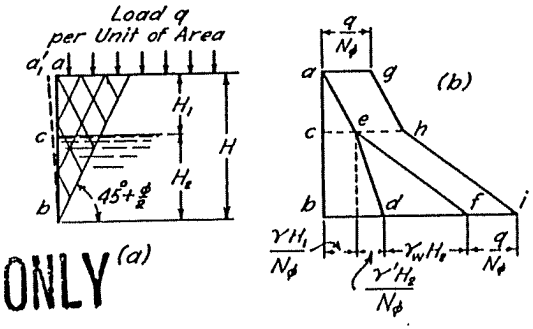

Fig. 28.2. Active earth pressure of partly submerged sand supporting a uniform surcharge. (*a*) Section through back of supporting structure. (*b*) Pressure against back of structure.

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For the corresponding horizontal active Rankine pressure we obtain by means of Eq. 27.5

$$p_h = \frac{p_v}{N_\phi} = (H_1\gamma + z'\gamma')\frac{1}{N_\phi} \tag{28.3}$$

The total effective horizontal pressure below the water level is represented by the area *bced* in Fig. 28.2*b*. To this pressure must be added the total water pressure,

$$P_w = \tfrac{1}{2}\gamma_w H_2^2 \tag{28.4}$$

which acts against the lower part *cb* of the wall. In Fig. 28.2*b*, the water pressure is represented by the triangle *def*.

If the fill carries a uniformly distributed surcharge q per unit of area, the effective vertical stress p_v increases at any depth by q, and the corresponding horizontal active Rankine pressure increases by

$$\Delta p_h = \frac{q}{N_\phi} \tag{28.5}$$

In Fig. 28.2*b* the pressure produced by the surcharge q is represented by the area *aefihg*.

Active Earth Pressure of Cohesive Soils against Smooth Vertical Surfaces

In Fig. 28.3*a* the line *ab* represents the smooth vertical back of a wall in contact with a cohesive soil having a unit weight γ. The shearing resistance of the soil is defined by the equation,

$$s = c + p\tan\phi$$

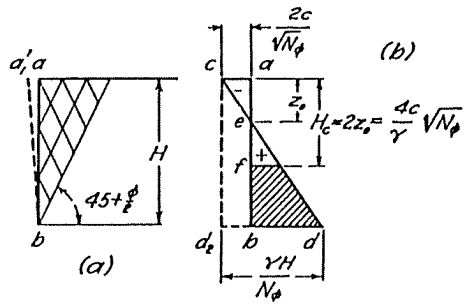

Fig. 28.3. Failure of clay behind smooth vertical wall when deformation condition for active earth pressure is satisfied. (*a*) Section through back of wall. (*b*) Pressure against back of wall.

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which, according to Article 26, applies at least crudely to dry or moist cohesive soil located above the water table. The relation between the extreme values of the principal stresses in such soils is determined by the expression,

$$p_1 = p_3 N_\phi + 2c\sqrt{N_\phi} \tag{26.2}$$

wherein p_1 and p_3 are, respectively, the major and minor principal stresses, and

$$N_\phi = \tan^2\left(45° + \frac{\phi}{2}\right) \tag{26.1}$$

is the flow value. In Article 16 it is also shown that the surfaces of sliding intersect the direction of the minor principal stress at an angle $45° + \phi/2$, regardless of the value of c (Eq. 26.2).

Since the back of the wall is smooth, the vertical principal stress at depth z below the horizontal surface of the backfill is $p_v = \gamma z$. Before the support *ab* moves, it is acted on by the earth pressure at rest. In this state the horizontal stress p_h is the minor principal stress. An outward movement of the support into or beyond the position $a_1'b$ reduces p_h to the value corresponding to the active Rankine pressure. Substituting $p_v = p_1 = \gamma z$ and $p_h = p_3$ into Eq. 26.2, we obtain

$$p_h = \gamma z\frac{1}{N_\phi} - 2c\frac{1}{\sqrt{N_\phi}} \tag{28.6}$$

This stress at any depth z is represented by the horizontal distance between the lines *ab* and *cd* in Fig. 28.3*b*. At depth,

$$z_0 = \frac{2c}{\gamma}\sqrt{N_\phi} \tag{28.7}$$

the stress p_h is equal to zero. At a depth less than z_0, the pressure against the wall is negative, provided that a crack does not open up between the wall and the uppermost part of the soil. The total earth pressure against the wall is

$$P_A = \int_0^H p_h\,dz = \frac{1}{2}\gamma H^2\frac{1}{N_\phi} - 2c\frac{H}{\sqrt{N_\phi}} \tag{28.8}$$

If the wall has a height,

$$H = H_c = \frac{4c}{\gamma}\sqrt{N_\phi} = 2z_0 \tag{28.9}$$

the total earth pressure P_A is equal to zero. Hence, if the height of a vertical bank is smaller than H_c, the bank should be able to stand without lateral support. However, the pressure against the wall increases from $-2c/\sqrt{N_\phi}$ at the crest to $+2c/\sqrt{N_\phi}$ at depth H_c, whereas on the

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vertical face of an unsupported bank the normal stress is zero at every point. Because of this difference the greatest depth to which a cut can be excavated without lateral support of its vertical sides is slightly smaller than H_c (see Article 35).

For the $\phi = 0$ condition (Article 18), $N_\phi = 1$. Therefore

$$P_A = \tfrac{1}{2}\gamma H^2 - 2cH \tag{28.10}$$

and

$$H_c = \frac{4c}{\gamma} \tag{28.11}$$

Since the soil does not necessarily adhere to the wall, it is commonly assumed that the active earth pressure of cohesive soils against retaining walls is equal to the pressure represented in Fig. 28.3*b* by the triangular area *bde*, equal to area cdd_2 − area $cebd_2$. Therefore,

$$P_A = \frac{1}{2}\gamma H^2 \frac{1}{N_\phi} - 2cH \frac{1}{\sqrt{N_\phi}} + \frac{2c^2}{\gamma} \tag{28.12}$$

For the $\phi = 0$ condition,

$$P_A = \frac{1}{2}\gamma H^2 - 2cH + \frac{2c^2}{\gamma} \tag{28.13}$$

Passive Earth Pressure of Cohesive Soils in Contact with Smooth Vertical Surfaces

If the face *ab* of the wall or block that supports the soil and its uniform surcharge q is pushed toward the backfill as indicated in Fig. 28.4*a*, the horizontal principal stress p_h increases and becomes greater than p_v. As soon as *ab* arrives at or beyond the position $a_2'b$, which represents the

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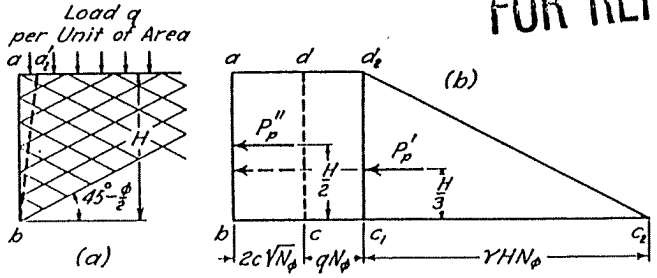

Fig. 28.4. Failure of clay behind smooth vertical wall when deformation condition for passive earth pressure is satisfied. (*a*) Section through back of wall. (*b*) Stress on back of wall.

deformation condition for the passive Rankine state, the stress conditions for failure (Eq. 26.2) are satisfied. Since p_h represents the major principal stress, we may substitute $p_h = p_1$ and $p_v = p_3 = \gamma z + q$ into Eq. 26.2 and obtain

$$p_h = \gamma z N_\phi + 2c\sqrt{N_\phi} + qN_\phi \tag{28.14}$$

The stress p_h can be resolved into two parts. One part

$$p_h' = \gamma z N_\phi$$

increases like a hydrostatic pressure in simple proportion to depth. In Fig. 28.4*b* the stresses p_h' are represented by the width of the triangle $c_1c_2d_2$ with the area

$$P_P' = \tfrac{1}{2}\gamma H^2 N_\phi \tag{28.15}$$

The point of application of P_P' is located at an elevation $H/3$ above *b*. The quantity P_P' represents the total passive earth pressure of a cohesionless material with an angle of internal friction ϕ and a unit weight γ.

The second part of p_h is

$$p_h'' = 2c\sqrt{N_\phi} + qN_\phi$$

This part is independent of the depth. It is represented by the width of the rectangle abc_1d_2 in Fig. 28.4*b*. The total pressure is equal to the area of the rectangle. Hence,

$$P_P'' = H(2c\sqrt{N_\phi} + qN_\phi) \tag{28.16}$$

The point of application of P_P'' is at mid-height of the surface *ab*. Since Eq. 28.16 does not contain the unit weight γ, the value P_P'' can be computed on the assumption that the backfill is weightless. From Eqs. 28.15 and 28.16, we find that the total passive earth pressure is

$$P_P = P_P' + P_P'' = \tfrac{1}{2}\gamma H^2 N_\phi + H(2c\sqrt{N_\phi} + qN_\phi) \tag{28.17}$$

According to the preceding discussion, P_P can be computed by means of two independent operations. First, P_P' is computed on the assumption that the cohesion and the surcharge are zero ($c = 0$, $q = 0$). The point of application of P_P' is located at the lower third-point of H. Secondly, P_P'' is computed on the assumption that the unit weight of the backfill is zero ($\gamma = 0$). The point of application of P_P'' is at the midpoint of H. In the following articles this simple procedure is used repeatedly for determining the point of application of the passive earth pressure of cohesive soils. The subdivision of P_P into the two parts P_P' and P_P'' is strictly correct only when the back of the wall is verti-

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ratio of horizontal to vertical permeability can be judged on the basis of Eqs. 11.10 and 11.11.

Elaborate investigations of this nature are rarely justified economically. The determination of the permeability of natural deposits below the water table by *in situ* permeability tests is always more reliable than that by laboratory tests.

Procedures have been developed to evaluate the permeability of sand strata located above the water table on the basis of the quantity of water that percolates into the soil from that part of a drill hole extending below the casing. The results are at best no more than crude estimates and may be unreliable, because the flow pattern into the soil remains unknown and the formation of a filter skin at the entrance surface can hardly be avoided. The procedure (Zangar 1953) is similar to that described in connection with *in-situ* permeability tests in drill holes below the water table.

Shearing Resistance of Saturated Clays

If a project involving clay soils calls for an investigation of the stability of slopes, the computation of the lateral pressure against the bracing of open cuts, or an estimate of the ultimate bearing capacity of footings or rafts, the shearing resistance of the clay must be determined. If the water content of the clay will not change significantly during the period when the slopes are unsupported or during the lifetime of the temporary bracing of the open cuts, or if the factor of safety of footings is a minimum before the water content can decrease on account of the loading, the $\phi = 0$ conditions are applicable (Article 18). The undrained shearing strength on the basis of total stresses is then equal to one-half the unconfined compressive strength q_u of undisturbed samples of the clay. The shearing strength can also be determined directly by means of the vane (Fig. 44.17) or torvane (Fig. 18.3). Inasmuch as many practical problems of outstanding importance fall into the $\phi = 0$ category, means for evaluating the undrained shearing strength of saturated clay soils deserve special consideration.

During the drilling of the exploratory holes the shearing resistance of the clay can be crudely estimated on the basis of the record of the standard penetration test. Table 45.2 shows the approximate relation between the unconfined compressive strength and the number of blows per foot of penetration of the sampling spoon. However, at a given number N of blows per foot, the scattering of the corresponding values of q_u from the average is very large. Therefore, compression tests should always be made on the spoon samples. The other

Table 45.2
Relation of Consistency of Clay, Number of Blows N on Sampling Spoon, and Unconfined Compressive Strength

	q_u in tons/ ft²					
Consistency	Very Soft	Soft	Medium	Stiff	Very Stiff	Hard
N	<2	2–4	4–8	8–15	15–30	>30
q_u	<0.25	0.25–0.50	0.50–1.00	1.00–2.00	2.00–4.00	>4.00

routine tests on the spoon samples, listed in Table 9.1, are also obligatory because their results are required for comparing the clay with others previously encountered on similar jobs. The values of q_u obtained by means of compression tests are likely to be somewhat too low because spoon samples are appreciably disturbed. The supplementary investigations required on important jobs depend on the character of the soil profile.

If the soil profile is simple and regular, it is commonly possible to evaluate the average shearing resistance of the clay strata on the basis of the results of laboratory tests. The samples are secured by means of tube sample borings (Article 44) which furnish continuous cores. To obtain fairly reliable average values, the spacing between the sample borings should not exceed 100 ft. If it is known in advance that the soil profile is fairly regular and that tube sample borings will be required, continuous samples are taken in all those sections of the exploratory holes that are located within clay strata. In the sections located between clay strata spoon samples are extracted, and standard penetration tests are made.

The samples are delivered to the laboratory in sealed tubes commonly 30 or 36-in. long. Preferably, all the clay samples from one hole should be tested in the sequence in which they followed each other in the drill hole in a downward direction. Each sample is ejected from its tube by means of a close-fitting plunger in such a manner that the sample continues to move with respect to the tube in the same direction as it entered; if excessive side friction causes too much disturbance during ejection, the tube is cut into 6-in. sections, the soil itself is cut by means of a wire saw, and each section is ejected.

For routine testing each sample is cut into sections with lengths equal to about three times the diameter; that is, 2-in. tube samples

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APPENDIX B

H.G. POULOUS & E.H. DAVIS, "ELASTIC SOLUTIONS FOR SOIL AND ROCK MECHANICS", JOHN WILEY & SONS, 1974, P. 41-42

3.2 Loading over Half the Infinite Surface

3.2.1 UNIFORM VERTICAL LOADING (Fig.3.10, Gray, 1936).

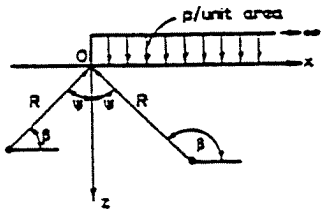

FIG.3.10

$$\sigma_z = \frac{p}{\pi}\left(\beta + \frac{xz}{R^2}\right) \qquad \ldots (3.10a)$$

$$\sigma_x = \frac{p}{\pi}\left(\beta - \frac{xz}{R^2}\right) \qquad \ldots (3.10b)$$

$$\tau_{xz} = -\frac{p}{\pi}\sin^2\beta \qquad \ldots (3.10c)$$

$$\sigma_1 = \frac{p}{\pi}(\beta + \sin\beta) \qquad \ldots (3.10d)$$

$$\sigma_3 = \frac{p}{\pi}(\beta - \sin\beta) \qquad \ldots (3.10e)$$

$$\tau_{max} = \frac{p}{\pi}\sin\beta \qquad \ldots (3.10f)$$

Loci of constant σ_1 and σ_3 are radial lines, OR.

Loci of constant τ_{max} are radial lines, OR.

Trajectories of σ_1 are a family of confocal parabolas*. Focus at 0. Horizontal axis.

Trajectories of σ_3 are a family of confocal parabolas*. Focus at 0. Horizontal axis.

The two families are orthogonal.

Trajectories of τ_{max} are two orthogonal families of parabolas. Focus at 0. Vertical axis.

Maximum $\tau_{max} = p/\pi$, occurs at points $(0,z)$, $z>0$.

Maximum $\sigma_1 = p$, " " " $(x,0)$, $x>0$.

Minimum $\sigma_3 = 0$, " " " $(x,0)$, $x<0$.

*These curves bisect the angle, β, at all points.

3.2.2 LINEARLY INCREASING VERTICAL LOADING (Fig.3.11, Gray, 1936).

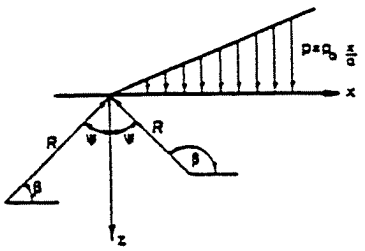

FIG.3.11

$$\sigma_z = \frac{p_o}{\pi a}\left[x\beta + z\right] \qquad \ldots (3.11a)$$

$$\sigma_x = \frac{p_o}{\pi a}\left[x\beta - z - 2z\log_e R\right] \qquad \ldots (3.11b)$$

$$\tau_{xz} = \frac{p_o}{\pi a} z\beta \qquad \ldots (3.11c)$$

$$\left.\begin{matrix}\sigma_1\\ \sigma_3\end{matrix}\right\} = \frac{p_o}{\pi a}(x\beta - z\log_e R) \pm \frac{p_o z}{\pi a}\left[(1+\log_e R)^2 + \beta^2\right]^{\frac{1}{2}} \qquad \ldots (3.11d)$$

$$\tau_{max} = \frac{p_o z}{\pi a}\left[(1+\log_e R)^2 + \beta^2\right]^{\frac{1}{2}} \qquad \ldots (3.11e)$$

3.2.3 VERTICAL "EMBANKMENT" LOADING (Fig.3.12, Gray, 1936).

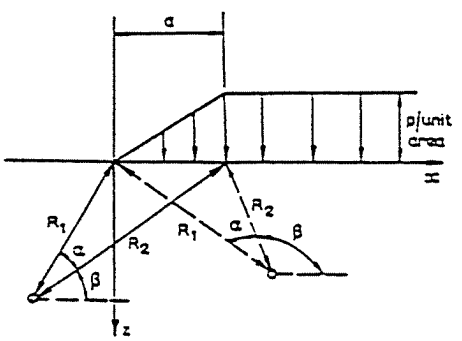

FIG.3.12

$$\sigma_z = \frac{p}{\pi a}\left[a\beta + x\right] \qquad \ldots (3.12a)$$

$$\sigma_x = \frac{p}{\pi a}\left[a\beta + x + 2z\log_e\frac{R_2}{R_1}\right] \qquad \ldots (3.12b)$$

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$$\tau_{zz} = -\frac{p}{\pi a} z\,\alpha \qquad \ldots (3.12c)$$

$$\left.\begin{matrix}\sigma_1\\ \sigma_3\end{matrix}\right\} = \frac{p}{\pi a}\left[(\alpha\beta + zz\alpha + z\log_e\frac{R_2}{R_1}) \pm z\left(\log_e^2\frac{R_2}{R_1} + \alpha^2\right)^{\frac{1}{2}}\right] \qquad \ldots (3.12d)$$

$$\tau_{max} = \frac{pz}{\pi a}\left(\log_e^2\frac{R_2}{R_1} + \alpha^2\right)^{\frac{1}{2}} \qquad \ldots (3.12e)$$

Values of stresses, presented originally by Jurgenson (1934), are tabulated in TABLE 3.5.

TABLE 3.5

STRESSES DUE TO SEMI-INFINITE EMBANKMENT LOADING
(Jurgenson, 1934)

x/a	z/a	σ_z/p	σ_x/p	τ_{zx}/p	90°-β	τ_{max}/p	σ_1/p	σ_3/p
0	0	0	0	0	-	0	0	0
	.25	.0780	.3034	.1055	21°33'	.1544	.3451	.0363
	.5	.1476	.4038	.1762	27°00'	.2178	.4935	.0579
	.75	.2048	.4487	.2214	30°35'	.2528	.5796	.0740
	1.0	.2500	.4706	.2500	33°06'	.2732	.6335	.0871
	1.25	.2852	.4821	.2685	34°56'	.2860	.6697	.0977
	1.5	.3129	.4883	.2807	36°20'	.2941	.6947	.1065
	2.0	.3524	.4946	.2952	38°14'	.3036	.7271	.1199
	2.5	.3789	.4968	.3028	39°30'	.3085	.7464	.1294
0.25	0	.2500	.2500	0	-	0	.2500	.2500
	.25	.2643	.3924	.1619	34°13'	.1741	.5025	.1543
	.5	.3023	.4544	.2302	35°52'	.2424	.6208	.1360
	.75	.3381	.4784	.2643	37°34'	.2734	.6817	.1349
	1.0	.3659	.4885	.2828	38°53'	.2894	.7166	.1378
	1.25	.3867	.4935	.2936	39°51'	.2984	.7385	.1417
-0.25	0	0	0	0	-	0	0	0
	.25	.0161	.2201	.0468	12°19'	.1123	.2304	.0058
	.5	.0633	.3430	.1157	19°48'	.1816	.3848	.0216
	.75	.1156	.4077	.1692	24°36'	.2235	.4852	.0382
	1.0	.1630	.4431	.2072	27°59'	.2501	.5532	.0530
	1.25	.2032	.4634	.2339	30°28'	.2677	.6010	.0656
0.5	0	.5000	.5000	0	-	0	.5000	.5000
	.25	.5000	.5000	.1762	45°00'	.1762	.6762	.3238
	.5	.5000	.5000	.2500	45°00'	.2500	.7500	.2500
	.75	.5000	.5000	.2807	45°00'	.2807	.7807	.2193
	1.0	.5000	.5000	.2952	45°00'	.2952	.7952	.2048
	1.25	.5000	.5000	.3028	45°00'	.3028	.8028	.1972
	1.5	.5000	.5000	.3072	45°00'	.3072	.8072	.1928
	2.0	.5000	.5000	.3119	45°00'	.3119	.8119	.1881
	2.5	.5000	.5000	.3144	45°00'	.3144	.8144	.1856
-0.5	0	0	0	0	-	0	0	0
	.25	.0051	.1642	.0237	8°19'	.0829	.1676	.0018
	.5	.0286	.2847	.0738	14°59'	.1478	.3045	.0089
	.75	.0650	.3614	.1239	19°57'	.1932	.4064	.0200
	1.0	.1045	.4086	.1653	23°42'	.2246	.4812	.0320
	1.25	.1422	.4381	.1972	26°41'	.2465	.5367	.0457
	1.5	.1762	.4566	.2214	28°50'	.2621	.5785	.0543
	2.0	.2317	.4771	.2537	32°06'	.2818	.6362	.0726
	2.5	.2734	.4869	.2729	34°19'	.2930	.6732	.0872

TABLE 3.5 Continued

x/a	z/a	σ_z/p	σ_x/p	τ_{zx}/p	90°-β	τ_{max}/p	σ_1/p	σ_3/p
0.75	0	.7500	.7500	0	-	0	.7500	.7500
	.25	.7357	.6076	.1619	55°47'	.1741	.8458	.4976
	.5	.6978	.5457	.2302	54°08'	.2424	.8642	.3794
	.75	.6619	.5217	.2643	52°26'	.2734	.8652	.3184
	1.0	.6341	.5114	.2828	51°07'	.2894	.8622	.2834
	1.25	.6133	.5065	.2936	50°09'	.2984	.8583	.2615
-0.75	0	0	0	0	0	0	0	0
	.25	.0023	.1302	.0143	6°18'	.0656	.1319	.0007
	.5	.0147	.2382	.0493	11°54'	.1222	.2487	.0043
1.0	0	1.0000	1.0000	0	90°00'	0	1.0000	1.0000
	.25	.9220	.6973	.1055	68°24'	.1541	.9638	.6556
	.5	.8524	.5962	.1762	63°01'	.2178	.9421	.5065
	.75	.7951	.5512	.2214	59°26'	.2528	.9260	.4204
	1.0	.7500	.5294	.2500	56°54'	.2732	.9129	.3665
	1.25	.7148	.5178	.2685	55°05'	.2860	.9023	.3303
	1.5	.6871	.5117	.2807	53°41'	.2941	.8935	.3053
	2.0	.6476	.5054	.2952	51°47'	.3036	.8801	.2729
	2.5	.6211	.5032	.3028	50°51'	.3085	.8707	.2537
-1.0	0	0	0	0	0	0	0	0
	.5	.0083	.2031	.0348	9°50'	.1034	.2091	.0023
	1.0	.0452	.3369	.1024	17°33'	.1782	.3695	.0129
	1.5	.0967	.4092	.1621	23°02'	.2252	.4782	.0278
	2.0	.1475	.4465	.2049	26°57'	.2536	.5506	.0434
	2.5	.1915	.4674	.2343	29°45'	.2719	.6014	.0576
1.25	0	1.0000	1.0000	0	90°00'	0	1.0000	1.0000
	.25	.9803	.7763	.0461	77°51'	.1120	.9903	.7663
	.5	.9567	.6570	.1157	70°13'	.1816	.9785	.6153
	.75	.8844	.5923	.1692	65°24'	.2235	.9619	.5149
	1.0	.8370	.5569	.2072	62°02'	.2501	.9471	.4469
	1.5	.7632	.5247	.2528	57°38'	.2795	.9235	.3645
	2.0	.7123	.5124	.2765	54°57'	.2938	.9062	.3186
	2.5	.6765	.5069	.2896	53°10'	.3018	.8935	.2899
1.5	0	1.0000	1.0000	0	90°00'	0	1.0000	1.0000
	.25	.9949	.8357	.0237	81°42'	.0829	.9982	.8234
	.5	.9714	.7152	.0738	75°02'	.1478	.9911	.6955
	.75	.9350	.6385	.1239	70°03'	.1932	.9800	.5936
	1.0	.8955	.5913	.1653	66°19'	.2246	.9680	.5188
	1.5	.8238	.5433	.2214	61°11'	.2621	.9457	.4215
	2.0	.7682	.5229	.2537	57°54'	.2818	.9274	.3658
	2.5	.7266	.5130	.2729	55°41'	.2930	.9128	.3268
2.0	0	1.0000	1.0000	0	90°00'	0	1.0000	1.0000
	.25	.9989	.8919	.0096	84°55'	.0543	.9997	.8911
	.5	.9916	.7968	.0348	80°10'	.1034	.9976	.7908
	1.0	.9548	.6631	.1024	72°28'	.1781	.9871	.6309
	1.5	.9032	.5908	.1621	66°59'	.2252	.9722	.5218
	2.0	.8524	.5534	.2049	63°04'	.2537	.9566	.4492
	2.5	.8085	.5325	.2343	60°15'	.2719	.9424	.3986

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APPENDIX C

DEPARTMENT OF THE NAVY, NAVY FACILITIES ENGINEERING COMMAND, DESIGN MANUAL 7.2 "FOUNDATIONS AND STRUCTURES", MAY 1982
P. 7.2-236, P. 7.2-237, P. 7.2-238, AND P. 7.2-240

SMITH
ENVIRONMENTAL TECHNOLOGIES CORPORATION

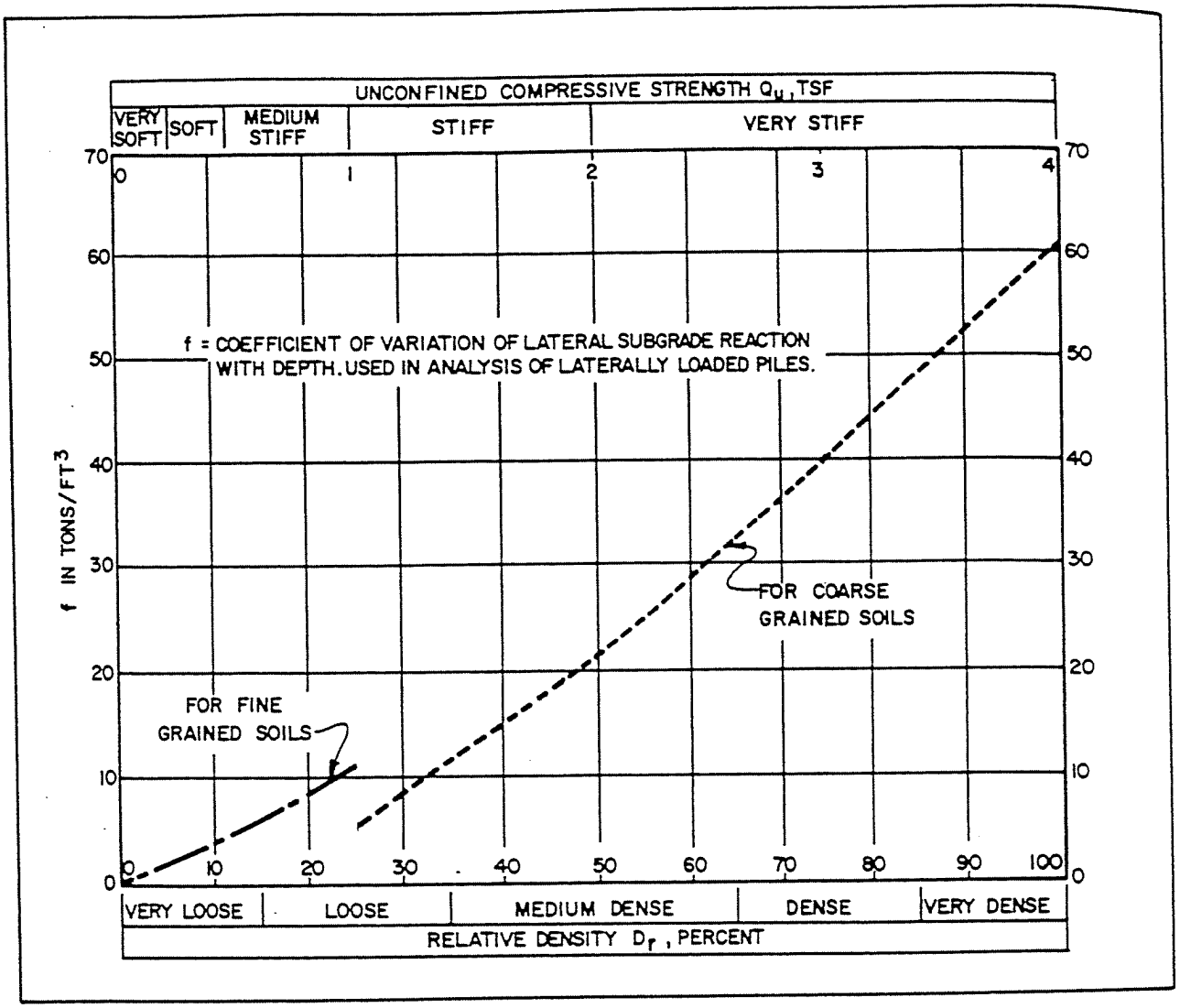

FIGURE 9
Coefficient of Variation of Subgrade Reaction

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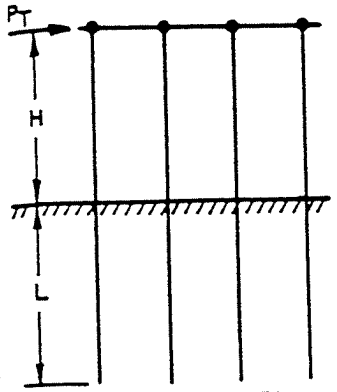
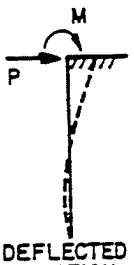
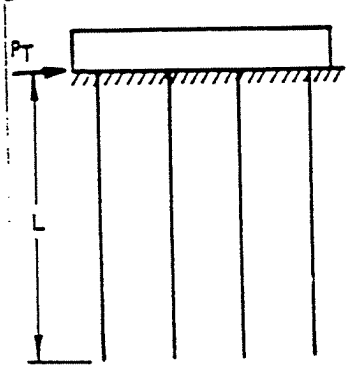
CASE I. FLEXIBLE CAP, ELEVATED POSITION

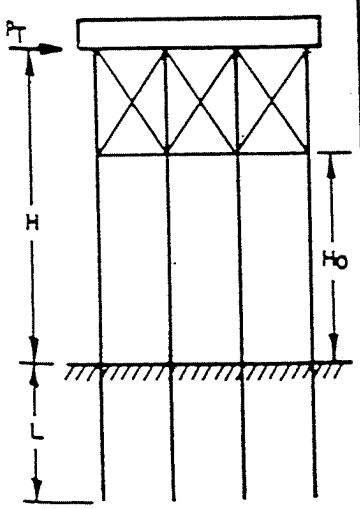
CONDITION	LOAD AT GROUND LINE	DESIGN PROCEDURE
 n = NUMBER OF PILES	FOR EACH PILE: $P = \frac{P_T}{n}$ $M = PH$  DEFLECTED POSITION	FOR DEFINITION OF PARAMETERS SEE FIGURE 12 1. COMPUTE RELATIVE STIFFNESS FACTOR. $T = (\frac{EI}{f})^{1/5}$ 2. SELECT CURVE FOR PROPER $\frac{L}{T}$ IN FIGURE 11. 3. OBTAIN COEFFICIENTS F_δ, F_M, F_V AT DEPTHS DESIRED. 4. COMPUTE DEFLECTION, MOMENT AND SHEAR AT DESIRED DEPTHS USING FORMULAS OF FIGURE 11. NOTE: "f" VALUES FROM FIGURE 9 AND CONVERT TO LB/IN^3.

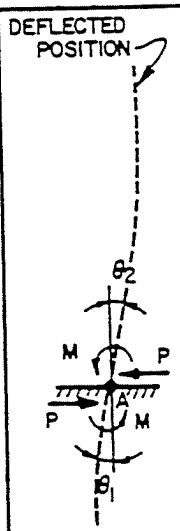
CASE II. PILES WITH RIGID CAP AT GROUND SURFACE



1. PROCEED AS IN STEP 1, CASE I.
2. COMPUTE DEFLECTION AND MOMENT AT DESIRED DEPTHS USING COEFFICIENTS F_δ, F_M AND FORMULAS OF FIGURE 12.
3. MAXIMUM SHEAR OCCURS AT TOP OF PILE AND EQUALS $P = \frac{P_T}{n}$ IN EACH PILE.

CASE III. RIGID CAP, ELEVATED POSITION





1. ASSUME A HINGE AT POINT A WITH A BALANCING MOMENT M APPLIED AT POINT A.
2. COMPUTE SLOPE θ_2 ABOVE GROUND AS A FUNCTION OF M FROM CHARACTERISTICS OF SUPERSTRUCTURE.
3. COMPUTE SLOPE θ_1 FROM SLOPE COEFFICIENTS OF FIGURE 13 AS FOLLOWS:

$$\theta_1 = F_\theta (\frac{P_T^2}{EI}) + F_\theta (\frac{MT}{EI})$$

4. EQUATE $\theta_1 = \theta_2$ AND SOLVE FOR VALUE OF M.
5. KNOWING VALUES OF P AND M, SOLVE FOR DEFLECTION, SHEAR, AND MOMENT AS IN CASE I.

NOTE: IF GROUND SURFACE AT PILE LOCATION IS INCLINED, LOAD P TAKEN BY EACH PILE IS PROPORTIONAL TO I/H_o^3.

FIGURE 10
Design Procedure for Laterally Loaded Piles

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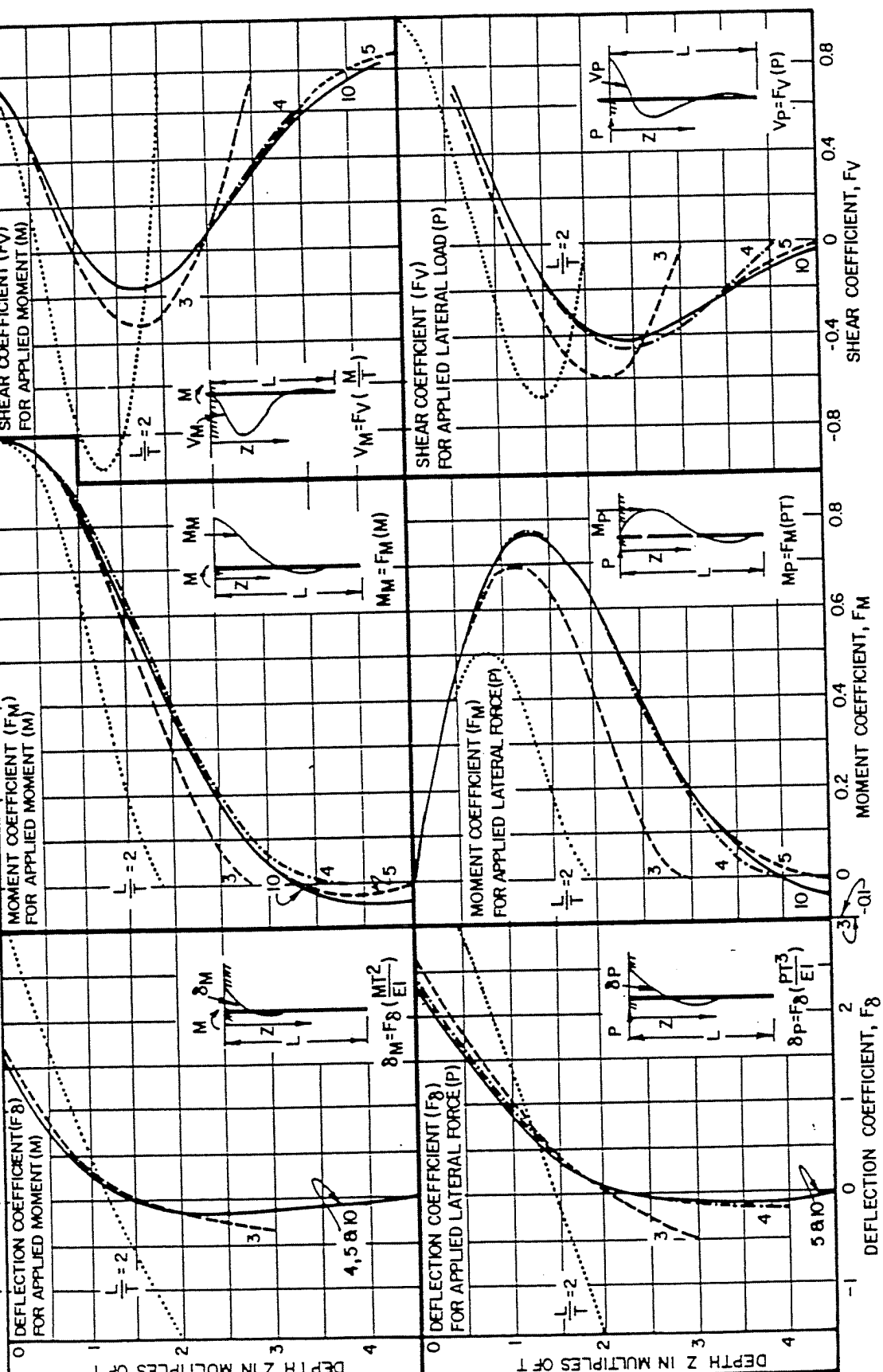

FIGURE 11
Influence Values for Pile with Applied Lateral Load and Moment
(Case 1. Flexible Cap or Hinged End Condition)

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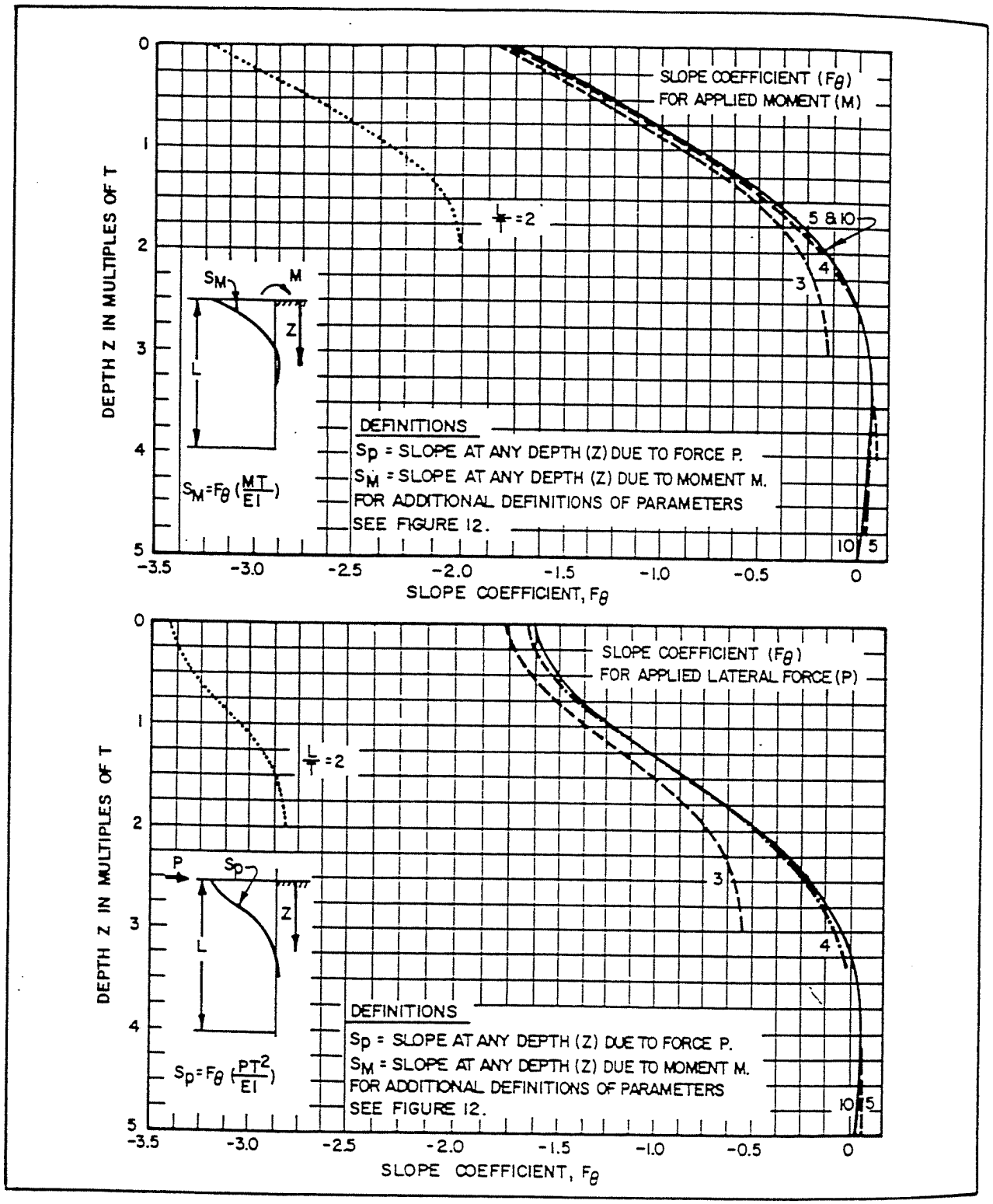

FIGURE 13
Slope Coefficient for Pile with Lateral Load or Moment

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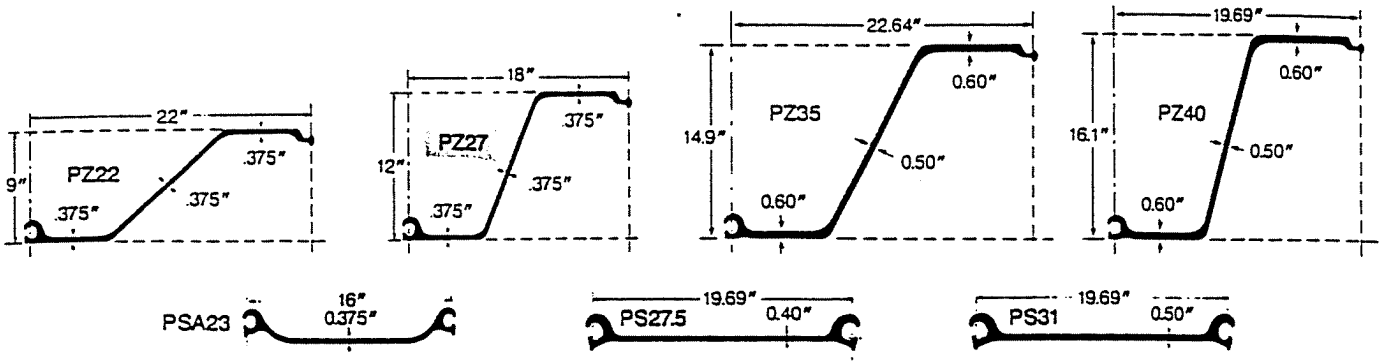
APPENDIX D

STEEL SHEET PILING SIZE

•BETHLEHEM STEEL

BETHLEHEM HEAVY-DUTY SHEET PILING

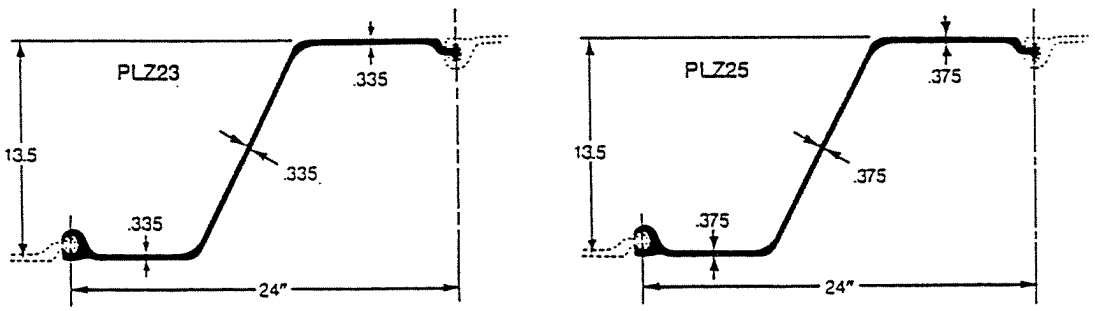


Properties and Weights

Section Designation	Area sq in.	Nominal Width, in.	Weight in Pounds		Moment of Inertia, in.⁴	Section Modulus, in.³		Surface Area, sq ft per lin ft of bar	
			Per lin ft of bar	Per sq ft of wall		Single Section	Per lin ft of wall	Total Area	Nominal Coating Area*
PZ22	11.86	22	40.3	22.0	154.7	33.1	18.1	4.94	4.48
PZ27	11.91	18	40.5	27.0	276.3	45.3	30.2	4.94	4.48
PZ35	19.41	22.64	66.0	35.0	681.5	91.4	48.5	5.83	5.37
PZ40	19.30	19.69	65.6	40.0	805.4	99.6	60.7	5.83	5.37
PSA23	8.99	16	30.7	23.0	5.5	3.2	2.4	3.76	3.08
PS27.5	13.27	19.69	45.1	27.5	5.3	3.3	2.0	4.48	3.65
PS31	14.96	19.69	50.9	31.0	5.3	3.3	2.0	4.48	3.65

Excludes socket interior and ball of interlock.

BETHLEHEM LIGHT-DUTY SHEET PILING



Properties and Weights

Section Designation	Area sq in.	Nominal Width, in.	Weight in Pounds		Moment of Inertia, in.⁴	Section Modulus, in.³		Surface Area sq ft lin ft of bar	
			Per lin ft of bar	Per sq ft of wall		Single Section	Per lin ft of wall	Total Area	Nominal Coating Area*
PLZ23	13.28	24	45.2	22.6	407.5	60.4	30.2	5.98	5.52
PLZ25	14.60	24	49.6	24.8	446.5	65.7	32.8	5.98	5.52

Excludes socket interior and ball interlock.

BETHLEHEM STEEL H-PILES

Properties and Weights

Section Number	Weight per Foot	Area of Section	Depth of Section	Flange		Web Thickness	Axis X-X			Axis Y-Y			Surface Area
				Width	Thickness								
	lb	A in.²	d in.	b_f in.	t_f in.	t_w in.	I_x in.⁴	S_x in.³	r_x in.	I_y in.⁴	S_y in.³	r_y in.	ft²/ft
HP14x	117*	34.4	14.21	14.885	0.805	0.805	1220	172	5.96	443	59.5	3.59	7.11
	102	30.0	14.01	14.735	0.705	0.705	1050	150	5.92	380	51.4	3.56	7.06
	89	26.1	13.83	14.695	0.615	0.615	904	131	5.88	326	44.3	3.53	7.02
	73	21.4	13.61	14.585	0.505	0.505	729	107	5.84	261	35.8	3.49	6.96
HP12x	74	21.8	12.13	12.215	0.610	0.605	569	93.8	5.11	186	30.4	2.92	5.91
	63	18.4	11.94	12.125	0.515	0.515	472	79.1	5.06	153	25.3	2.88	5.86
	53	15.5	11.78	12.045	0.435	0.435	393	66.8	5.03	127	21.1	2.86	5.82
HP10x	57	16.8	9.99	10.225	0.565	0.565	294	58.8	4.18	101	19.7	2.45	4.91
	42	12.4	9.70	10.075	0.420	0.415	210	43.4	4.13	71.7	14.2	2.41	4.83
HP8x	36	10.6	8.02	8.115	0.445	0.445	119	29.8	3.36	40.3	9.88	1.95	3.92

*Not available in A572 Grade 60.

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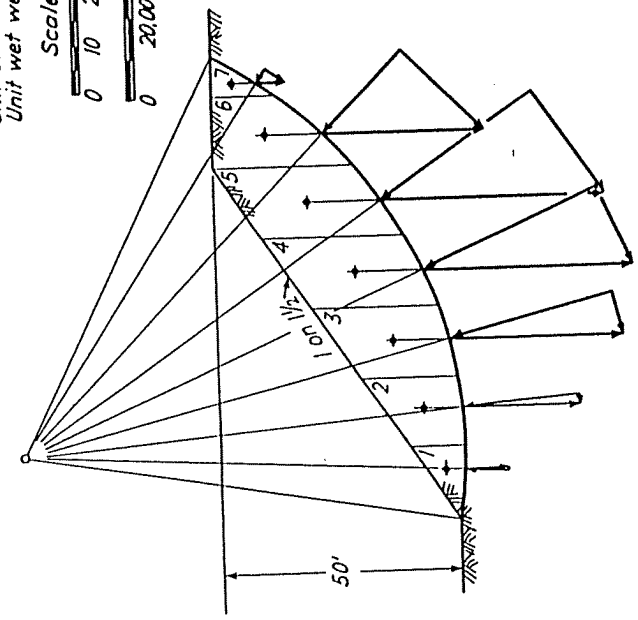
Bethlehem STEEL

APPENDIX E

B.K. HOUGH "BASIC SOILS ENGINEERING", RONALD PRESS CO., 2ND EDITION, 1969, P. 269-273

Given:
Friction angle, $\phi = 15°$ ($\tan \phi = 0.268$)
Unit cohesion, $c = 0.25$ tons/sq. ft.
Unit wet weight, $\gamma_{wet} = 126$ lb./cu. ft.

Scales:
0 10 20 30 ft.
0 20,000 40,000 lb.



Slice No.	Total Weight of Slice, W_t (lb./lin.ft.)	Normal Component of Total Weight, N (lb./lin.ft.)	Tangential Components of Total Weight: Driving Force, T_D (lb./lin.ft.)	Tangential Components of Total Weight: Resisting Force, T_R (lb./lin.ft.)	Resistance Due to Friction, $N \tan \phi$ (lb./lin.ft.)	Contact Area at Bottom of Slice, bL (sq.ft./lin.ft.)	Resistance Due to Cohesion cbL (lb./lin.ft.)
1	10,900	10,800		700	2,890	15.3	7,650
2	29,600	29,500	2,600		7,900	15.0	7,500
3	43,700	42,300	10,700		11,300	15.3	7,650
4	52,700	48,000	21,200		12,800	16.3	8,150
5	55,800	46,000	31,400		12,300	18.0	9,000
6	40,700	28,500	29,000		7,640	21.7	10,850
7	7,520	4,200	6,400		1,130	16.3	8,150
Totals			101,300	700	55,960		59,000

$$S.F. = \frac{\Sigma cbL + \Sigma N \tan \phi + \Sigma T_R}{\Sigma T_D}$$

$$S.F. = \frac{59{,}000 + 55{,}960 + 700}{101{,}300} = 1.14 \text{ Ans.}$$

Fig. 8–8. Example of analysis by slices method.

shape, very little error is introduced by assuming that the line o on passes through the center of the slice. For the triangular slices, however, it is advisable to locate and use the center of gravity in this construction. A radial line from the center of rotation through the intersection of the weight vector and the sliding surface then defines the line of action of the normal component, while a line through the bottom of the weight vector perpendicular to the radial line gives both the magnitude and direction of the tangential component. N and T forces may be evaluated by measuring the vectors obtained by this construction, and suitable entries may then be made in the tabular form and introduced in the calculations for factor of safety. The indicated construction is so simple that solutions for several trial circles may be made on the same work sheet—especially if the construction for each circle is made with a different color or weight of line.

8–8. PORE WATER EFFECTS

The above description of analytical procedures contains no direct reference to effects produced by soil moisture, although it is implied that the weight of capillary and adsorbed moisture would be included in calculations for unit weight of the sliding mass. However, the pore water often plays a major role in slope stability. If there is any possibility that a given slope may become wholly or partially saturated, a stability analysis should be made for the slope in this condition. Methods for taking into account pore water effects in mass slides in general are presented after the following discussion of translatory slides in which these effects may be equally important.

Translatory Slides

8–9. NATURE OF SLIDE

When there is a definite plane of weakness near the base of a slope, a mass slide may occur in which at least the initial movement is translatory rather than rotational. The general nature of such a slide is shown in Fig. 8–9.

It may be considered in this case that the sliding mass consists of a central block, B, and two wedges, A and P. The block, B, functions to some extent as a gravity-type retaining wall which provides lateral support for the soil to the right of the vertical face ed. Body forces acting downward on wedge A create active pressure on block B, tending to initiate the translatory movement. This movement is opposed by the passive resistance to sliding of wedge P and by shearing resistance along the base of the central block.

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8–10. FAILURE SURFACE

The entire failure surface consists of the inclined planes *ac* and *df* on which the wedges move plus the level surface *cd* on which the block moves. An analysis could be made of the driving and resisting forces acting along all three parts of the failure surface, utilizing procedures similar to those of the slices method. However, it is possible to calculate the active pressure created by wedge *A* and the passive resistance of wedge *P* by methods described in Chapter 7 without locating the failure planes on which these wedges move. Thus, in an analysis of the stability

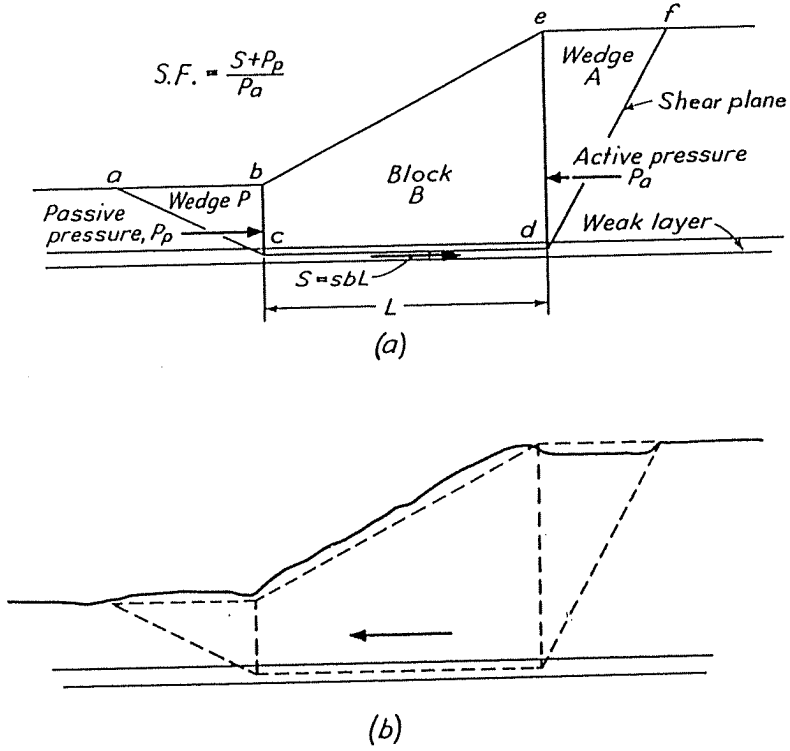

Fig. 8–9. Characteristics of a translatory slide.

of a slope against a translatory slide, the location of the more or less horizontal plane of weakness on which the block moves is the chief consideration.

As before, a process of trial may be required to locate the potential sliding surface with the lowest factor of safety. However, natural conditions control the position of this surface to a much greater extent than

in a rotational slide in fairly uniform material. A plane of weakness may be created either by a soft interval in an otherwise uniform formation or by a weak layer in a stratified formation. In formations of the latter type, the weak layer may be either a soft clay stratum or a cohesionless, relatively pervious sand or silt in which shearing resistance due to solid friction has been reduced by the development of an artesian pressure. The latter situation may be the most serious, since it is so likely to escape notice. Cohesionless soil in general is regarded as having ample strength to serve as a foundation for any ordinary slope. The conversion of such a material to one with greatly reduced strength is usually unexpected.

Location of potential failure surfaces for translatory slides depends primarily on a careful subsurface investigation program in which special attention is devoted to the detection of soil layers which are or may later become weak.

8–11. SAFETY FACTOR

As in the case of a rotational slide, the factor of safety of a slope against a translatory slide is established by the ratio of the potential resisting to the driving forces. The resistance to sliding can be considered to be the passive pressure at the toe and the shearing resistance along the base of the central block. The driving force is the active pressure due to the thrust of wedge *A*. Thus the safety factor is given by the expression of Eq. (8–6).

$$SF = \frac{cLb + W \tan \phi + P_p}{P_a} \tag{8–6}$$

in which

SF = safety factor
c = unit cohesion along base of block B
L = length of base of block B
b = distance perpendicular to section
W = weight of section of block with depth b
P_p = resultant passive pressure on block B
P_a = resultant active pressure on block B

The similarity of Eqs. (8–5) and (8–6) may be noted.

8–12. BLOCK-AND-WEDGES ANALYSIS

A stability analysis by the block-and-wedges method is illustrated below.

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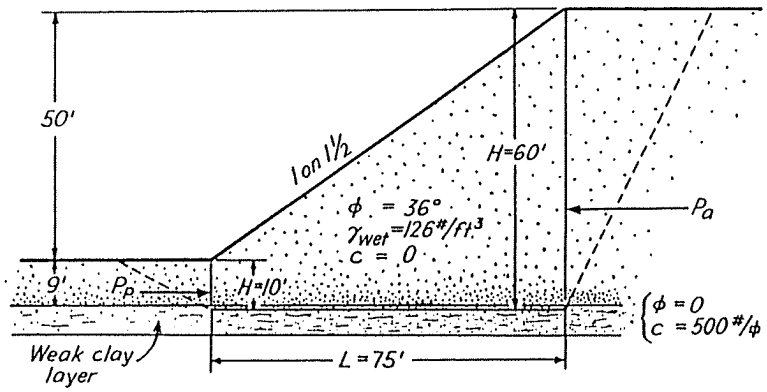
E-12

EXAMPLE 2

Given: The conditions shown in Fig. 8-10.



$$S.F. = \frac{\Sigma cbL + P_p}{P_a}$$

$$S.F. = \frac{37{,}500 + 24{,}400}{58{,}900} = 1.05 \text{ Ans.}$$

Fig. 8–10. Example of block-and-wedges stability analysis.

Required: Find the safety factor for the indicated failure surface.

$$\text{Active pressure, } P_a = \frac{126 \times 60^2}{2} \times \frac{1 - 0.588}{1 + 0.588} = 58{,}900 \text{ lb./linear ft.}$$

$$\text{Passive pressure, } P_p = \frac{126 \times 10^2}{2} \times \frac{1 + 0.588}{1 - 0.588} = 24{,}400 \text{ lb./linear ft.}$$

In this example, it is considered that the shearing resistance along the base of the block is due to cohesion only; hence it is unnecessary to calculate the weight of the block:

$$S = C = cLb = 500 \times 75 \times 1 = 37{,}500 \text{ lb./linear ft.}$$

For the given conditions, the safety factor for a translatory slide may be calculated as follows:

$$SF = \frac{\Sigma cLb + P_p}{P_a}$$

or

$$SF = \frac{37{,}500 + 24{,}400}{58{,}900} = 1.05 \; Ans.$$

There are certain conditions under which the possibility of a translatory slide exists when S is reduced to a negligible magnitude. This

is most likely when the plane of weakness lies in a cohesionless soil layer in which development of artesian pressure has lead to reduction in shearing strength. Stability in such a case depends mainly on the ratio of the passive and active pressures on the central block. When this situation exists it will be seen that the safety factor is largely independent of the inclination of the slope and depends chiefly on the amount of passive pressure which is available. For given geological conditions the passive pressure is significantly affected by the elevation of the ground water table, since submergence has an important effect on the effective unit weight of the soil in wedge P at the toe of slope.

Pore Water Effects

8–13. DISCUSSION

Water may affect the stability of an unretained slope in a number of different ways. The effective weight of the sliding mass or of sections of the mass may vary significantly with water content, for example. This in turn may influence either the resisting or the driving components of the weight or both. Entry of water into the sliding mass or loss of water may very well alter the soil characteristics, especially cohesion. The development of pore water pressures, whether greater or less than atmospheric, may have important effects on intergranular pressures and hence on strength due to solid friction. Seepage forces may act either to increase or to decrease stability, depending upon the direction of the flow. In view of these many possibilities, it is evident that efforts to make generalizations about the effect of pore water on slope stability are unprofitable. Certain effects and combinations of effects are beneficial; others are detrimental. The most common situations are discussed separately below. This discussion is presented with particular reference to a rotational type of slope failure, since means of evaluating pore water effects in analyses of rotational slides are fairly well developed. The slices method of analysis is especially convenient for this purpose. Pore water effects in situations leading to translatory and other type slides can be evaluated by methods based on the same principles.

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8–14. STEADY SEEPAGE

Example 3 is given as a means of illustrating the main features of analyses involving a condition of steady seepage of ground water toward the face of a slope. A condition of this type can develop when the ground water is raised during periods of continuous heavy rainfall. It

E-13

APPENDIX F

K. TERZAGHI & R. PECK, "SOIL MECHANICS IN ENGINEERING PRACTICE", JOHN WILEY & SONS, 1ST EDITION, 12TH PRINTING, 1962, P. 82 TO P. 86

in either a dry or moist state can be expressed approximately by the equation,

$$s = c + p \tan \phi \qquad (15.2)$$

The value c is called the *cohesion* of the sand. It depends only on the strength of the bond between the sand particles and is, therefore, a constant for the sand. Uncemented sands in a moist state also have a certain amount of cohesion, but, since this cohesion disappears upon immersion, it is referred to as *apparent cohesion*. The angle of internal friction ϕ (equation 15.2) of a cemented sand or of a moist sand is approximately equal to that of the same sand, at the same void ratio, in a cohesionless state.

TABLE 7

REPRESENTATIVE VALUES OF ϕ FOR DRY SAND

Degrees

	Round Grains, Uniform	Angular Grains, Well Graded
Loose	28.5°	34°
Dense*	35°	46°

* Average of peak values at normal stresses between 0 and 3 kg per sq cm. With increasing normal stress, the value of ϕ is likely to decrease slightly, as shown in Figure 31*a*.

SHEARING RESISTANCE OF SATURATED SAND

The change in stress caused by pulling the upper frame of the shear box produces a change in the void ratio of the sand. Experience shows that the change in void ratio due to shear depends on both the vertical load and the relative density of the sand. At very low pressures the void ratio at failure is larger and at very high pressures it is smaller than the initial void ratio, whatever the relative density of the sand may be. At intermediate values of pressure the shearing force causes a decrease in the void ratio of loose sand and an increase in the void ratio of dense sand. In saturated sand a decrease of the void ratio is associated with an expulsion of pore water, and an increase with an absorption of water. The expansion of a soil due to shear at a constant value of the pressure is called *dilatancy*.

If the equilibrium of a large body of saturated fine sand in an embankment is disturbed, for instance by the rapid drawdown of the surface of an adjoining body of water, the change in water content of the fill lags behind the change in stress, because time is required for the water to flow from the interior to the surface of the embankment. For given

dimensions of the body of sand and a given rate of change in stress, the lag in the adjustment of the water content increases with decreasing permeability of the sand.

If the lag is negligible, the conditions for the failure of the sand in the fill are identical with those associated with a slow-shear test on a saturated sample. On the other hand, if failure occurs before the water content of the fill is appreciably altered, the failure conditions correspond to

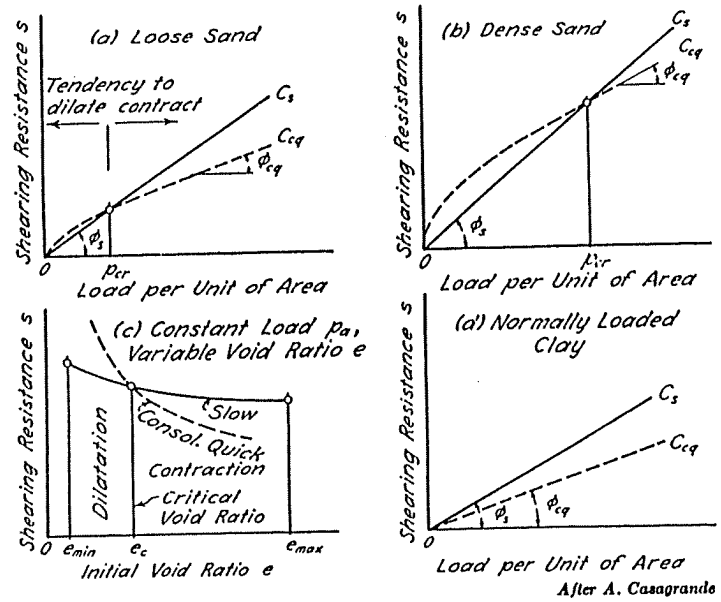

FIG. 32. (*a* and *b*) Results of slow and consolidated-quick shear tests on saturated samples of loose and dense sand, respectively; (*c*) relation between shearing resistance s and initial void ratio e for saturated samples of sand after complete consolidation under given pressure p_a; (*d*) results of slow and consolidated-quick shear tests on normally loaded clay.

those that prevail during a consolidated-quick test. Hence the stress conditions for the failure of saturated sand fills are likely to be intermediate between those which determine the resistance of saturated samples against slow shear and those which determine the resistance against consolidated-quick shear.

The results of slow-shear tests on saturated samples are identical with those on the same sand at equal relative density in a dry state, except that the angle ϕ is likely to be 1° or 2° smaller for the saturated sand. The value of ϕ obtained from slow-shear tests on saturated samples is designated by the symbol ϕ_s (see Figures 32*a* and *b*).

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When a consolidated-quick-shear test is made, the shearing force is increased at such a rate that the sample fails before the water content has started to adapt itself to the change in stress. The effect of this condition on the shearing resistance depends on whether the increase of the shearing resistance involves a tendency toward a decrease or an increase of the void ratio. A tendency of the void ratio to decrease is associated with an excess hydrostatic pressure in the pore water. Since such a pressure carries part of the vertical load on the sample, the effective vertical pressure on the surface of sliding is smaller than the total vertical pressure, and the sample fails at a smaller shearing stress than does a similar sample submitted to a slow test. A tendency of the sample to expand (dilatancy) has the opposite effect.

In Figure 32*a* the full line C_s represents the results of slow-shear tests on saturated samples of loose sand and the dash curve C_{cq} those of consolidated-quick tests on similar samples. At very low pressure the shearing stresses tend to produce dilatancy, whereas at high pressures they tend to cause a contraction. Therefore the line C_{cq} intersects the line C_s. At a pressure p_{cr} the rate of shear has no influence on the shearing resistance.

Figure 32*b* represents the results of similar tests on saturated samples of dense sand. The value of p_{cr} is very much greater for dense sand than for loose sand, but the general features of the two diagrams, Figures 32*a* and *b*, are identical. In both diagrams the slope of the dash curve C_{cq} decreases rapidly, and the curves approach straight lines with a slope angle ϕ_{cq}. The value ϕ_{cq} is referred to as the *consolidated-quick value* of the *angle of shearing resistance*. The few test data now available suggest that the average value of ϕ_{cq} is roughly equal to $2\phi_s/3$, and there is no reason to assume that it can be smaller than $\phi_s/2$. A shock can temporarily transform a mass of saturated sand with an inclined surface into a semiliquid material that flows out as if its angle of internal friction were almost equal to zero. However, failures of this type have no relation to the phenomena discussed in this article, because they are preceded by a sudden increase of the pore-water pressure under unaltered conditions of loading. No such increase has ever been observed during a shear or triaxial-compression test. The conditions which lead to failures of this type are discussed in Article 17.

In Figure 32*c* the abscissas represent the void ratio of saturated samples after complete consolidation under a given vertical pressure p_a. The ordinates represent the shearing resistance of the samples. The plain curve indicates the results of slow tests, and the dash curve those of consolidated-quick tests performed at the same pressure p_a. For dense sands having low initial void ratios the consolidated-quick-shear values

are greater than the corresponding slow-shear values. For loose sands having high initial void ratios they are smaller. At a void ratio e_c the slow- and consolidated-quick-shear values are equal. The value e_c is known as the *critical void ratio* for the pressure p_a. At the critical void ratio, the rate of application of the shearing stress has no effect on the shearing resistance. At low values of p_a this condition is satisfied even by loose sand, Figure 32*a*, whereas at high values of p_a the relative density must be great, Figure 32*b*. Hence, it is obvious that the critical void ratio decreases with increasing values of p_a.

In all the saturated specimens to which Figures 32*a* to *c* refer, the initial pore-water pressure u_w was negligible. In other words, the initial normal pressure p on the potential surface of sliding was an effective pressure. If a mass of sand is at a considerable depth below the water table, the initial pore-water pressure u_w cannot be disregarded. Under these circumstances, the value of p in equation 15.1 must be replaced by $p - u_w$, whence

$$s = (p - u_w) \tan \phi \qquad (15.3)$$

wherein p is the total normal pressure on the surface of sliding. The relations represented by Figures 32*a* and *b* remain unchanged, provided the abscissas are made equal to $p - u_w$.

The pore-water pressure u_w in equation 15.3 can also be produced by the rapid application of a surcharge. The effect of such an event on the shearing resistance can be investigated by means of a quick-shear test involving a sudden increase of the pressure on the sample from p to $p + \Delta p$, followed by rapid shear. The increase of the load by Δp at constant water content of the sample increases the pore-water pressure prior to the application of the shearing force from zero to $u_w = \Delta p$. According to the relation expressed by equation 15.3, the result of such a test is the same as if the load on the sample had remained unchanged.

As an example of the practical significance of these relations, the conditions for the stability of slopes on saturated fine sand with respect to sliding will be considered. The shearing resistance of saturated sand depends not only on the angle of internal friction and on the weight of the sand located above the potential surface of sliding, but also on the relative density of the sand and the rate at which the shearing stresses increase.

The most common cause of an increase of shearing stresses in saturated sand is the drawdown of the level of a body of water adjacent to one or both slopes of sand fills. On account of the relations represented in Figure 32, the stability of the slopes after drawdown depends on the density of the sand and the rate of drawdown. If the drawdown occurs

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slowly, the void ratio of the sand adapts itself to the changes in stress, and the shearing resistance of the sand is determined by the values of ϕ given in Table 7, page 82, reduced slightly because of the state of partial saturation after drawdown. On the other hand, if the drawdown occurs rapidly, the water content of the sand remains practically unaltered. As a consequence, the shearing resistance of the sand is determined by the consolidated-quick values represented by the dash curve in Figure 32*c*. If the void ratio of the fill is above the critical value, the consolidated-quick shearing resistance is lower than the corresponding slow-shear value. Otherwise it is higher. Hence, it is advisable to compact sand fills subject to temporary or permanent saturation as thoroughly as conditions permit.

Shearing Resistance of Silt and Silty Sand

The relations between the normal pressure and shearing resistance of silt and silty sand are similar to those shown for clean sand in Figures 32*a* to *c*. The values of ϕ_s obtained from slow-shear tests range from about 27° to 30° for the loose state, and 30° to 35° for the dense state. These values are almost as great as those for sand.

Because of the relatively low permeability of silt and silty sand, saturated soils of these categories are likely to fail in the field under conditions similar to those under which consolidated-quick tests are made. The results of consolidated-quick tests on sand are represented by the dash lines in Figures 32*a* to *c*. The curvature of the corresponding lines for silt and silty sand is likely to be less marked, because the dilatancy of silt is commonly less pronounced than that of sand with bulky grains. The relation between pressure and the peak value of the resistance against consolidated-quick shear can be expressed approximately by the equation,

$$s = p \tan \phi_{cq} \qquad (15.4)$$

wherein p is the pressure on the surface of sliding prior to the application of the shearing force, and ϕ_{cq} is the slope angle of the straight part of the dash lines (Figures 32*a* and *b*) that represent the results of consolidated-quick tests. Since the initial tangent to these lines rises at an angle greater than ϕ_{cq}, the real values of s are greater than those given by the equation. If, prior to the application of the shearing force, the pore-water pressure in the soil adjoining the surface of sliding is equal to u_w, equation 15.4 must be replaced by

$$s = (p - u_w) \tan \phi_{cq} \qquad (15.5)$$

The value of ϕ_{cq} may be as low as 17°, and values between 20° and 22° are common. More specific data are not yet available.

Shearing Resistance of Remolded Clay

If the initial water content of a remolded clay is close to the liquid limit, the resistance of the clay to both slow and consolidated-quick shear increases in direct proportion to the pressure on the surface of sliding, as shown in Figure 32*d*. Since the dash line C_{cq} representing the results of consolidated-quick-shear tests is located entirely below the slow-test line C_s, we may conclude that the dilatancy of normally loaded remolded clays is negligible even at very low pressures. Both the lines C_s and C_{cq} are straight. Therefore the relation between pressure and shearing resistance can be expressed accurately by the equations:

Slow tests: $$s = p \tan \phi_s \qquad (15.6)$$

Consolidated-quick tests: $$s = p \tan \phi_{cq} \qquad (15.7)$$

The values of ϕ_s and ϕ_{cq} range between the following limits:

ϕ_s = 28° to 30° (exceptionally as low as 20°)

ϕ_{cq} = 14° to 20° (exceptionally as low as 12°)

In Figure 33 the straight line *Ob* is a duplicate of the line C_s in Figure 32*d*. It represents the relation between pressure and shearing resistance for a normally loaded clay subjected to a slow test. It rises at the angle ϕ_s to the horizontal. The line *bd* represents the results of slow tests on samples that have been precompressed under a pressure p' and then allowed to swell under a smaller pressure p. The shearing resistance of a sample from which the load has been completely removed is represented by the ordinate c of point d. The value c is commonly referred to as the cohesion of the clay. However, in contrast to the cohesion c of a cemented sand, equation 15.2, the cohesion of a clay is not a constant for the soil. It increases with increasing precompression pressure p'.

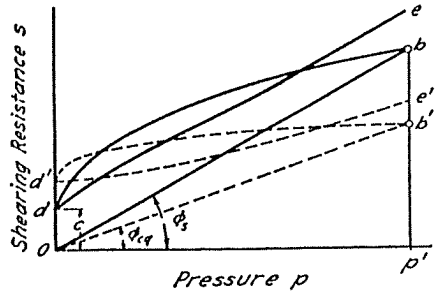

FIG. 33. Results of shear tests on precompressed, remolded clay. Full lines correspond to slow tests, dash lines to consolidated-quick tests.

The line *de* in Figure 33 represents the relation between the slow-shear values and the normal pressure on a clay which was first consolidated under the pressure p', then allowed to swell under no pressure, and finally consolidated and subjected to a slow test under a pressure p

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EVALUATION REPORT

IN-PLACE WEST END TEMPORARY STEEL

SHEET PILING COFFERDAM

CLIFF MARS

PROJECT NO. 96-015-03
AUGUST 14, 1996

EVALUATION REPORT
IN-PLACE WEST END TEMPORARY STEEL SHEET PILING COFFERDAM
102nd STREET LANDFILL
NIAGARA FALLS, NEW YORK

SUBMITTED BY:

SMITH ENVIRONMENTAL
TECHNOLOGIES CORPORATION
800 CANONIE DRIVE
PORTER, INDIANA 46304

PHONE: 219-926-8651
FAX: 219-926-7169

EVALUATED BY:

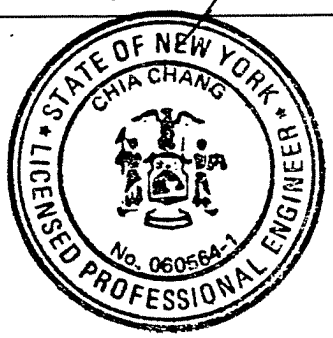
CHIA CHANG
NEW YORK PROFESSIONAL ENGINEER
LICENSE NO. 060564-1
EXPIRES: 8-31-99

CHECKED BY:

PETER PORTER
CHIEF CONSTRUCTION ENGINEER
SMITH ENVIRONMENTAL
TECHNOLOGIES CORPORATION
800 CANONIE DRIVE
PORTER, INDIANA 46304

PROFESSIONAL ENGINEER'S CERTIFICATION

Chia Chang



New York PE 060564-1

Professional Engineer's Number
Expires: 8-31-99

Smith Environmental Technologies Corporation

Firm

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EVALUATION REPORT
IN-PLACE WEST END TEMPORARY STEEL SHEET PILING COFFERDAM
102nd STREET LANDFILL
NIAGARA FALLS, NEW YORK

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EVALUATION REPORT
IN-PLACE WEST END TEMPORARY STEEL SHEET PILING COFFERDAM
102nd STREET LANDFILL
NIAGARA FALLS, NEW YORK

1. **Sheet Piling Layout**

   Reference Report: Smith Environmental "West End Temporary Steel Sheet Piling Cofferdam Design Report, 102nd Street Landfill, Niagara Falls, New York, Remedial Action" dated June 7, 1996.

   Page 6 of this report shows the layout of the steel sheet piling.

2. **Design Sheet Piling Size and Elevations Shown in the Design Report**

   From Item 1 Design Report:

   - Length of steel sheet piling cofferdam wall = 175 feet from Station 0+00 to Station 1+75
   - Depth of sheet piling = 30 feet ±
   - Top elevation = 568 feet ±
   - Tip elevation = 538 feet ±
   - Sheeting size PZ-27, ASTM A328, F_y = 38.4 ksi
     Section modulus = 30.2 in^3/ft of wall
     Section Depth = 12 inches
     Section Width = 18 inches

3. **Sheet Piling Contractor**

   Herbert F. Darling Co.
   131 California Drive
   Williamsville, NY 14221-6693
   Telephone: (716) 632-1125

4. **Date of Installation of Steel Sheet Piling Cofferdam**

   Started July 10, 1996
   Completed July 18, 1996

SMITH

5. **Hammer Used**

ICE Model 216 Vibratory Hammer
Dynamic driving force = 36.4 tons
Frequency = 400 to 1,600 vpm
Amplitude = ¼ in to ¾ in
Pile clamp force = 50 tons

This hammer is commonly used to drive the 30-foot-long sheeting in the medium dense soils. The next ICE vibratory hammer size is Model 416 with a driving force of 57.5 tons, which is too large for this wall.

6. **Actual Sheeting Used**

- ARBED AZ-18, A572 Grade 50, F_y = 50 ksi (the first four sheets on the shore were AZ-13)
- Section modulus = 33.5 in^3/ft of wall > 30.2 in^3/ft of wall of PZ-27
- Vertical length = 30 ft±, except six sheets range from 25 feet to 28 feet long
- Section Depth = 14.96 in
- Section Width = 24.81 in

The strength and section modulus are larger than PZ-27 and it is adequate to use AZ-18 as an equivalent to PZ-27.

7. **Actual Driven Tip Elevations at Refusal**

	Average Tip Elevation (ft)
• Station 0+00 to 1+40: Elevation 539.85 to Elevation 542.05	540.95 (except 25-foot-long sheets at Elevation 544.15, 544.55, and 543.25)
• Station 1+40 to 1+64: Elevation 545.25 to Elevation 546.35	545.80
• Station 1+64 to 1+75 at Elevation 539.15	539.15

See attached Table 1 and Figure 1 for tip elevations.
For definition of refusal, see Item 9.

8. **Soil Strata from Existing Borings and Factor of Safety of Sheet Piling with the In-Place Embedment**

Existing soil borings to be used for original sheet piling design are:

	Bottom of Boring Elevation (ft)	Standard Penetration (blows/ft) at Bottom of Boring
SW-18	546.7	16
SW-19	547.97	4
SW-20	546.59	11

The soil borings indicate that the soils become dense near the bottom of the borings. Because of the existing borings terminated at 8 feet above the required piling tip Elevation 538 with limited soil data, the sheeting may encounter some hard driving or refusal at higher elevations before reaching the Elevation 538.0. These average higher tip elevations shown in the above Item 7 and Figure 1 will be used to recheck the sheeting stability shown in the Report, Page 15. Tip elevation 541 will be used as the average tip elevation between Station 0+00 and 1+40. The factor of safety of sheeting with the bulkhead in place = 1.7 against sliding and 1.4 against rotation. The factor of safety of sheeting when the bulkhead is not in place = 2.2 against sliding and 1.7 against rotation. The factor of safety of 1.7 against the wedge block sliding as shown in the Report, page 17 is the same. Therefore, the sheet piling wall is adequate. The sheeting between Station 1+40 to 1+64 will be discussed in Item 10. The six 25 to 28-foot-long sheetings will be discussed in Item 11.

9. **Definition of Refusal when Driving the Sheeting with Vibratory Hammer**

A letter from H.F. Darling Co. dated July 23, 1996 (attached) confirms the hammer's dynamic force and piling tip reached refusal. The definition of the refusal is described as follows:

The sheeting was driven in pairs by the ICE Model 216 vibratory hammer. When the pair of sheeting reaches the refusal, the hammer will bounce and piling stops to penetrate further. If this bouncing lasts for half a minute, then switch the hammer to one single sheet and continue to drive. When both single sheets of this pair stop penetrating, then it means the refusal. No more driving shall be done after this occurs. Further driving by the same hammer or by a larger hammer will damage the sheeting.

10. **High Tip Elevation Sheetings Between Stations 1+40 and 1+64**

These sheetings are located at the junction between soil cofferdam and steel sheet piling cofferdam. The embedment in the soil and cofferdam varies from 15 feet to 23 feet. This part of sheeting is held by the soil cofferdam at the south, steel sheeting at the north, and the embedment below the river bottom. It acts as a diaphragm held at three sides. These sheetings are adequate to resist outside river water pressure during the Phase E area dewatering and excavation.

11. **Short Pair of Sheetings Between Stations 0+39 to 0+43, 0+47 to 0+51, and 1+23 to 1+27**

The sheets are approximately 25 to 28 feet long. These sheets are sandwiched between the 30-foot-long sheets and have embedments of approximately 15 feet below the river bottom Elevation 560.0. It is safe against outside river water pressure during the Phase E area dewatering and bulkhead construction as stated in Item 8.

12. **Conclusion**

Based on the refusal condition and the reevaluated factors of safety, the in-place sheet piling is adequate. Additional driving or modifications are not required.

TABLE 1

IN-PLACE SHEET PILING TOP AND TIP ELEVATIONS

Station			
From	To	Steel Sheet Piling Top Elevation (ft)	Steel Sheet Piling Tip Elevation or Refusal (ft)
0+00	0+12	571.35	541.35
0+12	0+22	571.05	541.05
0+22	0+39	572.05	542.05
0+39	0+43	569.15	544.15*
0+43	0+47	571.55	541.55
0+47	0+51	569.55	544.55*
0+51	0+60	571.55	541.55
0+60	0+72	569.85	539.85
0+72	0+85	570.15	540.15
0+85	1+03	570.55	540.55
1+03	1+10	571.05	541.05
1+10	1+14	569.85	539.85
1+14	1+23	570.95	540.95
1+23	1+27	568.25	543.25*
1+27	1+40	570.65	540.65
1+40	1+56	575.25	545.25
1+56	1+64	576.35	546.35
1+64	1+75	569.15	539.15

*25- to 28-foot-long sheets

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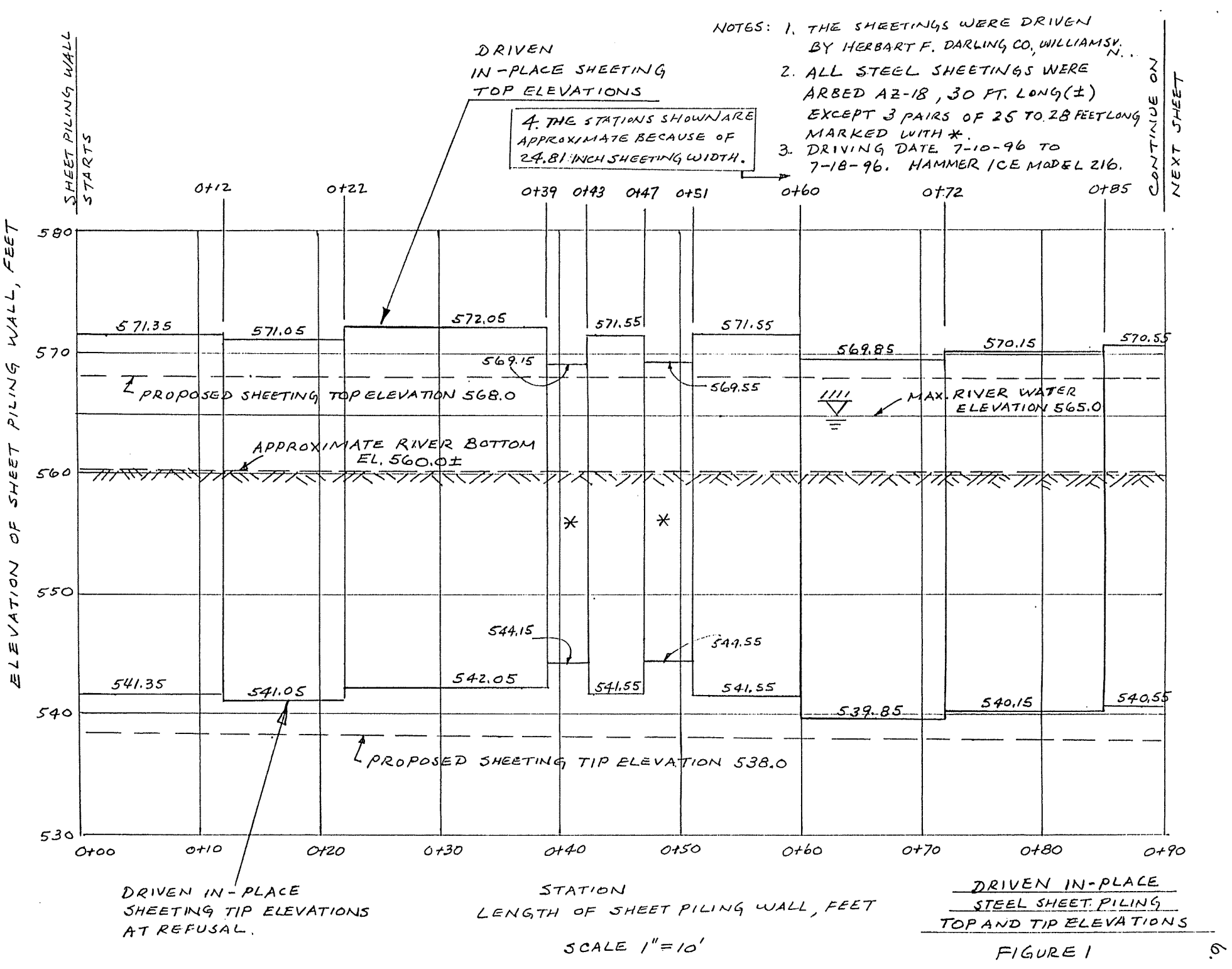
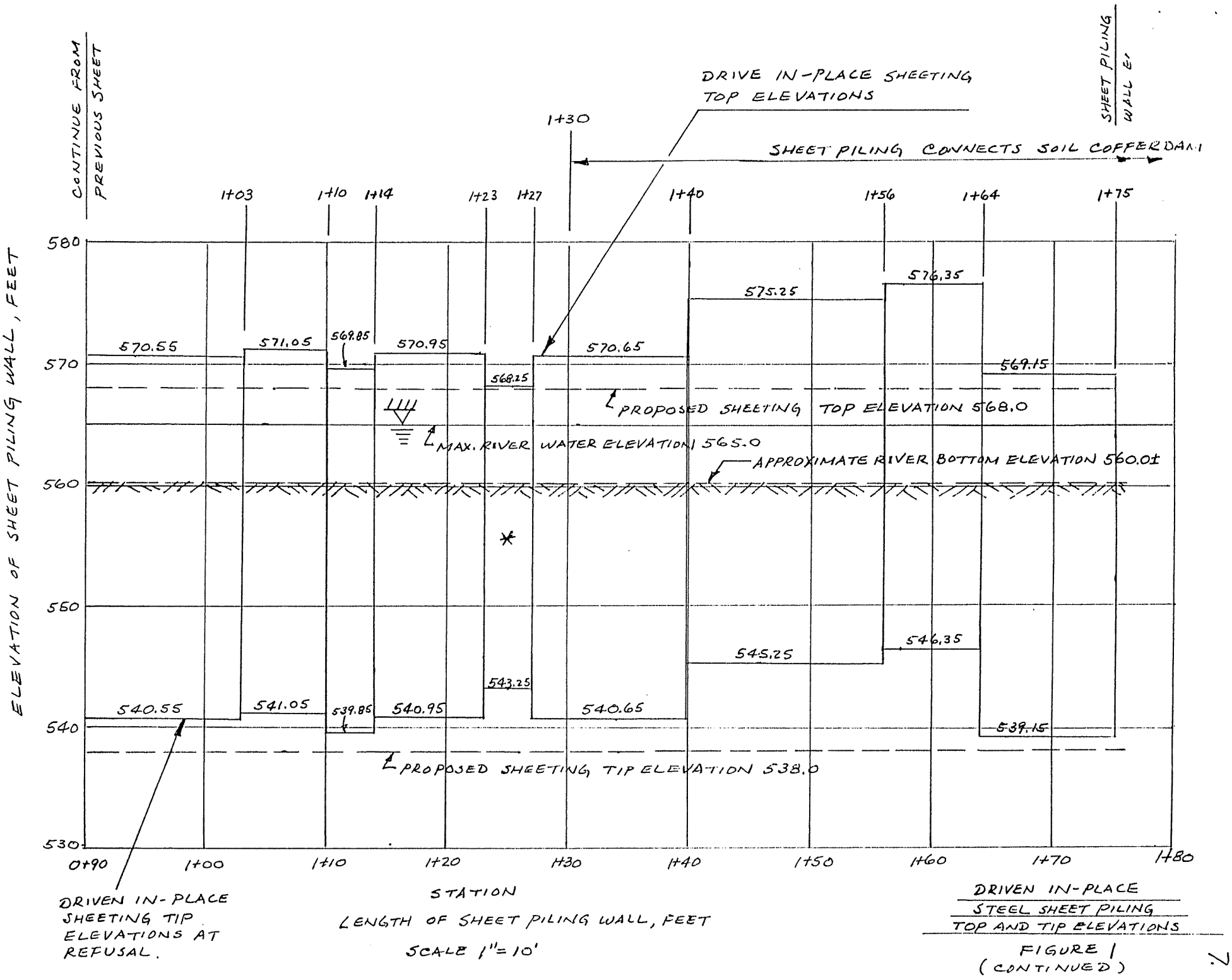


DRIVEN IN-PLACE STEEL SHEET PILING TOP AND TIP ELEVATIONS

FIGURE 1



DRIVEN IN-PLACE
STEEL SHEET PILING
TOP AND TIP ELEVATIONS

FIGURE 1
(CONTINUED)

HERBERT F. DARLING, INC.
Engineering Contractors
131 CALIFORNIA DRIVE WILLIAMSVILLE, NY 14221-6693 (716) 632-1125 FAX (716) 632-0705

Smith Environmental
9829 Buffalo Avenue PO Box 4007
Niagara Falls, New York 14304

July 23, 1996

Attn: Mr. Pete Porter

RE: Occidental Chemical
102nd Street Landfill
Niagara County

Dear Mr. Porter,

Regarding the driving of temporary cofferdam steal sheet piling in the Niagara River on the above referenced project, we hereby inform you that all sheets were driven to refusal using a 36.4 ton dynamic force vibratory hammer.

If you have any questions, please feel free to call.

Very Truly Yours,

HERBERT F. DARLING INC.

Thomas J. Mallare, P.E.
Chief Engineer

cc: HFD • DJM

g:\eng\codes\jobs\29614\letter\1

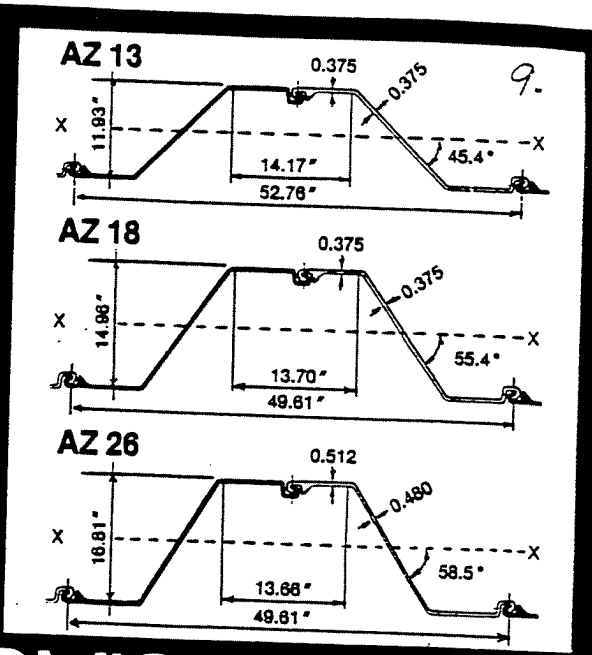
ARBED/UNIMETAL

INTRODUCES

3 NEW STEEL SHEET PILING SECTIONS

THAT ARE

- STRONGER
- LIGHTER
- MORE ECONOMICAL



	DIMENSIONS				WEIGHT		SECTION AREA	SECTION MODULUS	MOMENT OF INERTIA
AZ - Section	W Width	H Height	A Flange	E Web	Per Lin Ft. of Pile	Per Sq. Ft. of Wall	Per Lin Ft. of Wall	Per Lin Ft. of Wall	Per Lin Ft. of Wall
	In.	In.	In.	In.	Lbs.	Lbs.	In. ^{2}	In. ^{3}	In. ^{4}
AZ 13	26.38	11.93	0.375	0.375	48.38	21.92	6.47	24.2	144.3
AZ 18	24.805	14.96	0.375	0.375	49.99	24.17	7.09	33.5	250.4
AZ 26	24.805	16.81	0.512	0.480	65.72	31.75	9.35	48.4	406.5

All AZ sections will be available in RU and RD.

Once again, ARBED leads the industry with their new AZ sections; a perfect combination of the outstanding characteristics of a new rolling program, and the proven performance of the world renowned "LARSSEN" interlock.

The new AZ sections are the direct result of findings derived from a worldwide survey* of engineers to determine their needs in Z piling sections. These results were part of an intensive R & D program to redesign the interlock geometry so that when combined with the new rolling technology the sections had good swing with tighter tolerances.

Extensive testing in the laboratory as well as the field have proven ARBED's new AZ sections to be superior to other Z sections.

*Details of this private survey are available upon written request.

Skyline Now Has 23 Stocking Facilities Strategically Located Across the Country

SKYLINE STEEL CORPORATION

There's One Near You!

Corporate Office:
Skyline Steel Corporation
405 Murray Hill Parkway
East Rutherford, NJ 07073
(201) 933-7070
FAX: 201-933-0787

Skyline Steel Corporation
Suite 202
60 E. Sir Francis Drake Blvd.
Larkspur, CA 94939
(415) 461-4900
FAX: 415-461-1624

Skyline Steel Corporation
Suite 506
3169 Holcomb Bridge Rd.
Norcross, GA 30071
(404) 447-1600
FAX: 404-447-1151

Skyline Steel Corporation
Suite 345
11550 Fuqua
Houston, TX 77034
(713) 484-4000
FAX: 713-484-2782

Skyline Steel Corporation
Suite 230
5641 Burke Center Pkwy.
Burke, VA 22015
(703) 978-2500
FAX: 703-978-2908

Skyline Steel Corporation
Suite 900
3 Monroe Parkway
Lake Oswego, OR 97035
(503) 636-9633
FAX: 503-636-9273

Skyline Steel Corporation
303 West Main St.
Freehold, NJ 07728
(201) 409-2800
FAX: 201-409-2828

Skyline Steel Corporation
17W703G Butterfield Road
Oakbrook Ter., IL 60181
(708) 620-6300
FAX: 708-620-6394

Skyline Steel Corporation
Bell Realty Building
Highway 231 South
Pell City, AL 35125
(205) 338-7774
FAX: 205-338-7748

Circle 4 on Reader Service Card

Subject OCCIDENTAL CHEMICAL CORP. 102nd STREET LANDFILL Drwg.
TEMPORARY COFFERDAM Sheet No. 1 of 1
SHEETPILE SECTION ANALYSIS Job No. 296-14
By THOMAS J. MALLARE, P.E. Date 16-Jul-96 Scale

HERBERT F. DARLING, INC.
ENGINEERING CONTRACTORS
ESTABLISHED - 1940

10.

TEMPORARY COFFERDAM SHEET PILING

SHEETPILE SECTION ANALYSIS

DESIGN REQUIREMENTS:

S_{REQD} = 29.76 in^3/LF (ASTM A328 Fy = 38.4 ksi)

M_{ULT} = Fy x S = 1142.8 K-in/LF

USE ARBED AZ-13 A572 GRADE 50

S_{PURN} = 24.20 in^3/LF (ASTM A572 Fy = 50.0 ksi mi

M_{ULT} = Fy x S = 1210.0 K-in/Lmin > 1142.8 O.K.

USE ARBED AZ-18 A572 GRADE 50

S_{PURN} = 33.50 in^3/LF (ASTM A572 Fy = 50.0 ksi ml

S = 33.50 in^3/LF > 29.76 O.K.
(@ A328)

APPENDIX G

EMBAYMENT AREA PLANTING INFORMATION

SOUTHERN TIER CONSULTING, INC.

P.O. Box 30
West Clarksville, New York 14786
(716) 968-3120 FAX (716) 968-3122

November 11, 1996

Pete Porter
Smith Environmental Technologies Corporation
9829 Buffalo Avenue
Niagara Falls, NY 14304

Re: Habitat restoration of the 102nd Street Landfill

The 102nd Street Landfill was completed on November 7, 1996. Following are packing slips from Wildlife Nurseries and J & J Tranzplant Aquatic Nursery that verify that 27,500 Vallesnaria americana plants were purchased.

The site was flagged out on approximately one hundred foot grids with alternating red, white, and blue wire flags placed 4.5' apart. Plantings were completed according to specifications with two plants and one 5 gram Agriform tablet combined to make one planting unit and installed on 4.5' centers. The planters would then proceed perpendicular to the row of wire flags directly toward a flag of the same color and install the planting units 4.5' apart. The entire site was planted in this manner and all 27,500 plants were installed.

This planting density constitutes 2,151 planting units per acre or 4,302 plants per acre. More than double the required 2,000 plants per acre which we were contracted to install. All 27,500 plants were installed at approximately 4,302 plants per acre which calculates that we planted approximately 6.4 acres. We would appreciate a copy of the engineered as-built survey as soon as it is completed.

If you need any additional information or documentation please contact me at any time. Thank you for the opportunity to execute this contract with Smith Technologies and we hope to work with you again in the future.

Sincerely,

Tony R. Karr
Senior Project Manager

RECEIVED
NOV 15 1996
SMITH ENVIRONMENTAL
102ND ST. LANDFILL

Since 1896 ACKNOWLEDGMENT

INVOICE NO. 62143
FILE NO.

WILDLIFE NURSERIES, INC.

"THE ORIGINAL WILDLIFE & GAME FOOD CONSULTANTS"
P.O. Box 2724 Area Code (414) 231-3780
Oshkosh, Wisconsin, U.S.A. 54903

Sold To:

Southern Tier Consulting, Inc.
PO Box 30
West Clarksville, NY 14786

All Prices are Prepaid unless otherwise stated. If there is an error on this Invoice. Please Return At Once. Our responsibility ceases after we deliver to Transportation Company.

Deliver To:

Southern Tier Consulting, Inc.
2677 Route 305
West Clarksville, NY 14786

PO# 389

TERMS: 30 DAYS NET
1½% per month finance charge on past due accounts.

INVOICE NO. 62143
FILE NO.

DATE RECEIVED	TERMS	ORDER NO.	ROUTE VIA
10/16/96	Net	Fax/389	UPS

SHIPPED - 10/21/96

CASH RECEIVED WITH ORDER $ CHECK NO.

QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL
12,500	Vallisneria americana/Wild Celery Roots		

THANK YOU VERY MUCH FOR THIS ORDER

INVOICE

94640

J & J TRANZPLANT AQUATIC NURSERY
600 DIVISION ST. • P. O. BOX 227
WILD ROSE, WI 54984-0227
(414) 622-3552 • FAX (414) 622-3660

SHIPPED TO

SOUTHERN TIER CONSULTING, INC.
2677 ROUTE 305,
WEST CLARKSVILLE, NY 14786

ICE DATE	DATE SHIPPED	OUR ORDER NO.	YOUR ORDER NO.	TERMS	F.O.B.	SALESPERSON	SHIPPED VIA
0/22/96	10/22/96	94640	389	net-30	our-dock	JIM	UPS

QUANTITY	DESCRIPTION	PRICE	AMOUNT
1,000	Vallisneria Americana		

Thank-You
Kristine Malchow

1144950 RAPIDFORMS, INC. TO REORDER CALL 800 257 8354

THANK YOU

INVOICE

J & J TRANZPLANT AQUATIC NURSERY

600 DIVISION ST. • P. O. BOX 227
WILD ROSE, WI 54984-0227
(414) 622-3552 • FAX (414) 622-3660

94639

SHIPPED TO

SOUTHERN TIER CONSULTING, INC.
2677 ROUTE 305, P.O. BOX 30
WEST CLARKSVILLE, NY 14786

#001147

OICE DATE	DATE SHIPPED	OUR ORDER NO.	YOUR ORDER NO.	TERMS	F.O.B.	SALESPERSON	SHIPPED VIA
.0/16/96	10/16/96	94639	389	net-30	our-dock	JIM	2nd-Day

QUANTITY	DESCRIPTION	PRICE	AMOUNT
000	Vallisneria Americana		

Thank-You,

KRISTINE MALCHOW

1st shippment of celery.

M 14495P. RAPIDFORMS, INC TO REORDER CALL 800 257 8354

THANK YOU

SOUTHERN TIER CONSULTING, INC.

P.O. Box 30
West Clarksville, New York 14786
(716) 968-3120 FAX (716) 968-3122

RECEIVED
AUG 11 1997

August 7, 1997

Pete Porter
Smith Environmental Technologies Corporation
P.O. Box 4007
Niagara Falls, NY 14304

Re: Growth of Vallesneria plantings in July 1997 at the 102nd street wetland remediation planting

Dear Mr.. Porter;

Tony Karr visited the Vallesneria plantings during July to determine mid season growth for the first growing season after our late fall plantings in 1996. Alhough the water was silty when he visited the site, he was able to see that planted Vallesneria is healthy and growing. We are very encouraged by the progress of growth. There were several patches of another submerged aquatic, Potamogeton pectinatus (Sago Pondweed), occupying, by visual estimation, approximately 10 percent of the planting area. Both the Vallesneria that we planted and the Potamogeton that is voulunteeing are abundant native aquatic species in the Niagara River system. Both are also important and choice wildlife, especially waterfowl, food species.

I conclud from our qualitative observations that a native community of high value wildlife species dominated by Vallesneria is rapidly developing at the 102nd street wetland restoration site.

Sincerely,

Gary J. Pierce

Gary J. Pierce, Ph.D.
President

APPENDIX H

RETAINING WALL DESIGN REPORT

Project 96-015
September 1996

SMITH
ENVIRONMENTAL TECHNOLOGIES CORPORATION

Crib Wall Retaining Structure Along Buffalo Avenue Design Report

102nd Street Landfill
Niagara Falls, New York
Remedial Action

Submitted By:

Smith Environmental
800 Canonie Drive
Porter, Indiana 46304

Phone: 219-926-8651
Fax: 219-926-7169

Submitted To:

OXY
OxyChem

Olin
CORPORATION

FLUOR DANIEL

Crib Wall Retaining Structure Along Buffalo Avenue Design Report

102nd Street Landfill Site Niagara Falls, New York

Remedial Action

Smith Environmental Technologies Corporation
800 Canonie Drive
Porter, IN 46304

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PROPRIETARY NOTICE

This proposal / presentation contains information, ideas, and approaches for groundwater and soils treatment, and / or contamination levels, and / or groundwater hydrology which matters are proprietary to Smith Environmental Technologies Corporation. This proposal / presentation is being submitted to you with the understanding that it will not be used and upon the condition that the proposal / presentation will be used only by your immediate organization for evaluation purposes. It is not to be disclosed, duplicated, reproduced, copied, used, or transmitted in whole or in part in any manner to others without the knowledge or prior written consent of Smith Environmental Technologies Corporation. This proposal / presentation is to be returned to Smith Environmental Technologies Corporation immediately upon request or upon your decision not to award this project to Smith Environmental Technologies Corporation substantially upon the basis reflected in this proposal / presentation. If you cannot agree to maintain this proposal / presentation in confidence in the manner set forth above, the proposal / presentation should be immediately returned to Smith Environmental Technologies Corporation without further study, examination, or review.

SMITH
ENVIRONMENTAL TECHNOLOGIES CORPORATION

PROJECT NO. 96-015
SEPTEMBER 16, 1996

DESIGN REPORT
CRIB WALL RETAINING STRUCTURE ALONG BUFFALO AVENUE
102nd STREET LANDFILL
NIAGARA FALLS, NEW YORK

REMEDIAL ACTION
FOR
OCCIDENTAL CHEMICAL CORPORATION
AND
OLIN CORPORATION

SUBMITTED BY:

SMITH ENVIRONMENTAL
TECHNOLOGIES CORPORATION
800 CANONIE DRIVE
PORTER, INDIANA 46304

PHONE: 219-926-8651
FAX: 219-926-7169

PREPARED BY:

CHIA CHANG
SENIOR CONSULTANT

CHECKED BY:

PETER PORTER
CHIEF CONSTRUCTION ENGINEER

SMITH

PROFESSIONAL ENGINEER'S CERTIFICATION

The crib wall stability analysis as shown in Section 3.0 of this report is certified by crib wall supplier's Professional Engineer registered in New York State, Mr. Gilbert P. Chevalier, 41 Sycamore Road, Scarsdale, New York 10583, Telephone No. 914-723-3970.

SMITH

INDEX

DESIGN CALCULATIONS
CRIB WALL RETAINING STRUCTURE ALONG BUFFALO AVENUE

Section	Title
1.0	Supplier Specification and Installation Instructions
2.0	Crib Wall Layout
3.0	Design Calculations
4.0	Detailed Layout of Crib Wall and its Relation With Swale Invert Elevations
5.0	Wall Layout According to Original Design Drawings

SMITH

DESIGN CALCULATIONS
CRIB WALL RETAINING STRUCTURE ALONG BUFFALO AVENUE
102nd STREET LANDFILL
NIAGARA FALLS, NEW YORK

The following sections are the crib wall submittals according to Project Specification 03400, Items 1.4, 2.1, and 3.2 requirements:

Section 1.0 Supplier Specification and Installation Instructions

Supplier:
Crib Retaining Wall System, Inc.
139 South Street
New Providence, NJ 07974-1995
Telephone: (908) 464-9249
Contact: Mr. Hugh Campbell

An eight-page supplier's brochure entitled "Criblock® Retaining Walls, Solutions for Earth Retention" is attached to explain the wall specification and installation instructions.

Section 2.0 Crib Wall Layout

Figure 1 is attached to show the crib retaining wall layout

Total Length = 1,602 feet
Wall Height = 5 feet

Section 3.0 Design Calculations

Mr. Gilbert P. Chevalier, P.E., performed the stability analysis for the 5-foot-high crib wall. The landfill cover soils specified in Specification 02200, Item 2.1.C.2 are CL, CH, ML, or SC soils. For low retaining wall with 6H:1V straight slope backfill, "Design Manual 7.2-Foundations and Earth Structures" published by the Department of Navy, 1982 (attached) shows the lateral pressure coefficient K_H = 44 lbs/ft^2/ft for CL, ML, MH, SM, SC, and GC soils. At the site, a Frontier silty clay and Grand Island silty clay mixture will be used as the landfill cover material. The mixture has similar compaction results as Frontier silty clay. The Frontier silty clay had the majority field compacted dry density tested in the past months of 98 percent x (optimum water content proctor density 114.5 lbs/ft^3) = 112.2 lbs/ft^3. The field water content of this compacted soil was about 15 percent average. The total unit weight of compacted soil is equal to 112.2 x (1 + 15%) = 129.0 lbs/ft^3. The water in the landfill cover soil will be drained into the crib wall and there is no pore pressure problem.

SMITH

K_H = 44 lbs/ft^2/ft = 44 lbs/ft^3

Coefficient of Horizontal Lateral Pressure = (44 lbs/ft^3)/(129.0 lbs/ft^3) = 0.34

The computer input for active pressure coefficient will use equivalent friction angle ϕ of 30°

$K_a = (1-\sin\phi)/(1+\sin\phi) = (1-\sin 30°)/(1+\sin 30°) = 0.333 \simeq 0.34$

The stability analysis results are:

Factor of Safety Against Overturning = 5.16 > 2.0 required
Factor of Safety Against Sliding = 2.53 > 1.5 required
Toe Pressure = 924.96 lbs/ft^2
Heel Pressure = 395.91 lbs/ft^2

Mr. Chevalier has stamped the calculations with P.E. seal.

Section 4.0 Detailed Layout of Crib Wall and its Relation With Swale Invert Elevations

Smith Environmental provides Sketch 1 and Sketch 2. Sketch 1 shows the layout of the precast concrete members according to the manufacturer's brochure. Sketch 2 shows the wall section together with swale invert elevations layout along the 1,600-foot-long wall. It is important to keep the swale invert elevations above the outside finished grade Elevation 572.83. Ninety percent of the swale invert elevations will follow this condition, only about 10 percent will be lower. Therefore, the wall needs to be constructed 5 feet high minimum.

There is a crib wall water drainage problem as indicated by Note 3 of Sketch 2. Smith Environmental presents this point to the Engineer for the decision.

Section 5.0 Wall Layout According to Original Design Drawings

A print of crib layout from Fluor Daniel Drawing 594000-10S-02 is attached as the basis for the analysis.

Section 1.0 Supplier Specification and Installation Instructions

Supplier:
Crib Retaining Wall System, Inc.
139 South Street
New Providence, NJ 07974-1995
Telephone: (908) 464-9249
Contact: Mr. Hugh Campbell

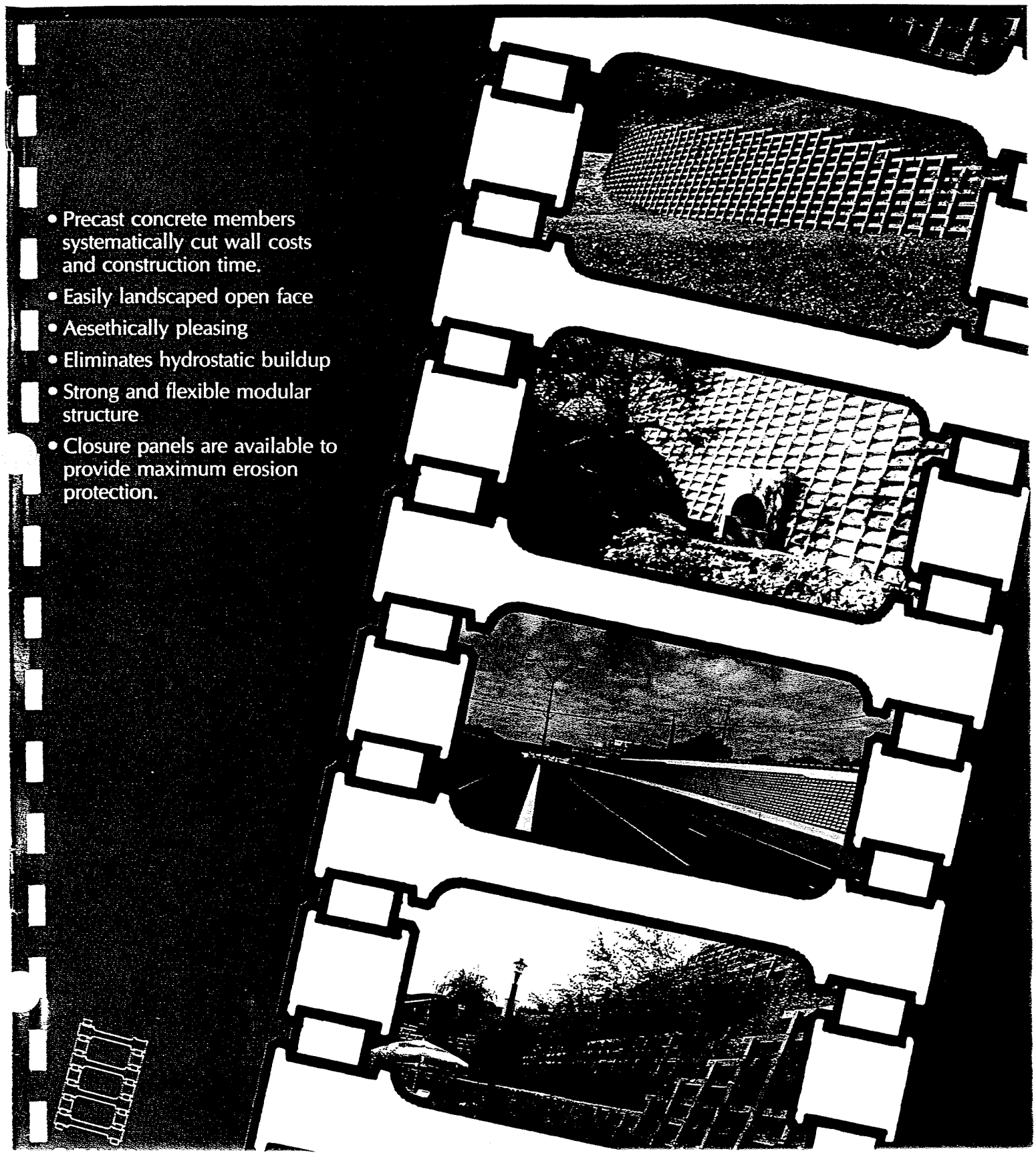
An eight-page supplier's brochure entitled "Criblock® Retaining Walls, Solutions for Earth Retention" is attached to explain the wall specification and installation instructions.

Criblock® Retaining Walls

SOLUTIONS FOR EARTH RETENTION

02276 CRI
BuyLine 4702

- Precast concrete members systematically cut wall costs and construction time.
- Easily landscaped open face
- Aesethically pleasing
- Eliminates hydrostatic buildup
- Strong and flexible modular structure
- Closure panels are available to provide maximum erosion protection.



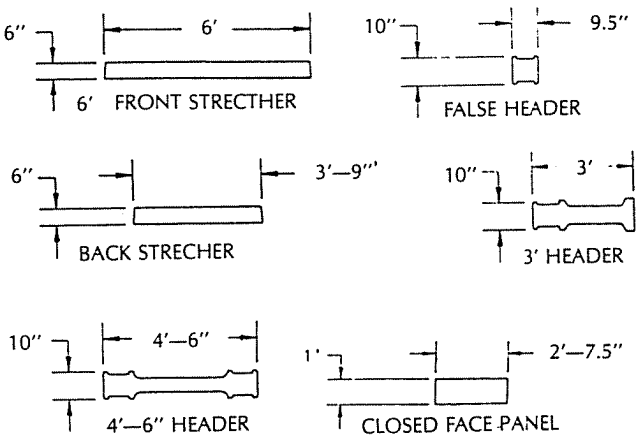
The System

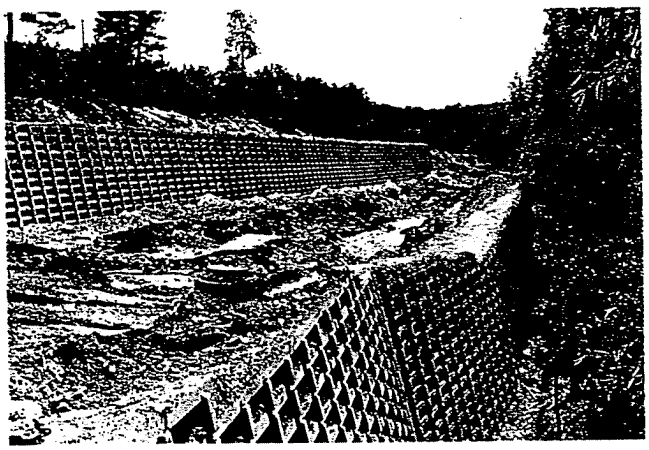
Since its introduction to the United States over a decade ago, Criblock has gained nationwide acceptance and has constructed walls from coast to coast. Over 1 million square feet was erected in 1988 alone.

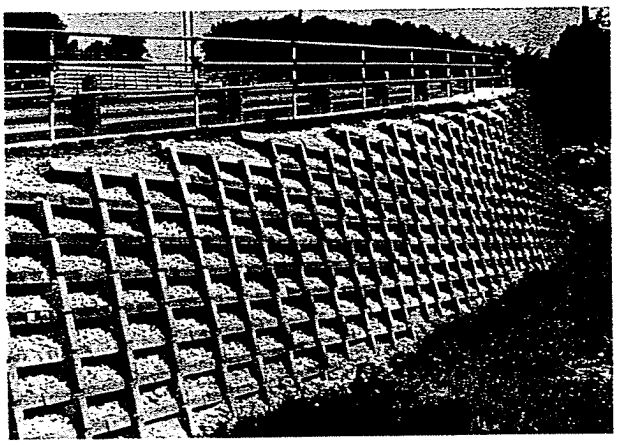
An interlocking, modular system, Criblock offers versatility in the application area as well as being a cost effective solution to your retaining wall needs.

Using component technology, the Criblock system can produce dramatic and imaginative results. Curves, angles, tiers or steps, the only limit is the designers imagination.

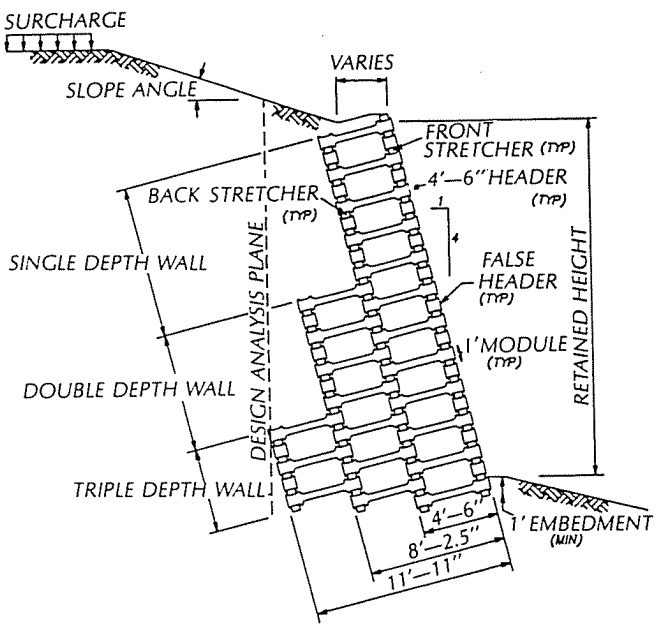
From design to manufacture to construction, Criblock is a leader in the earth retention industry.

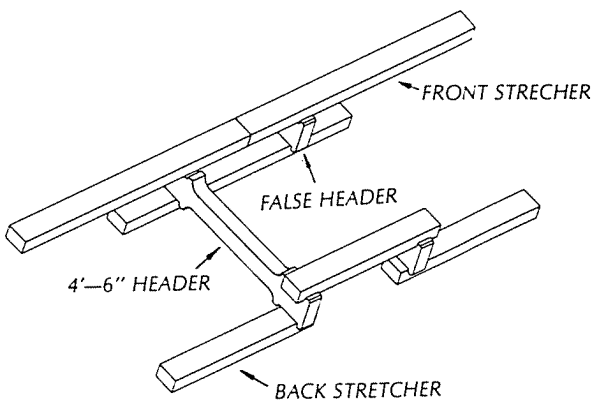






Design Services



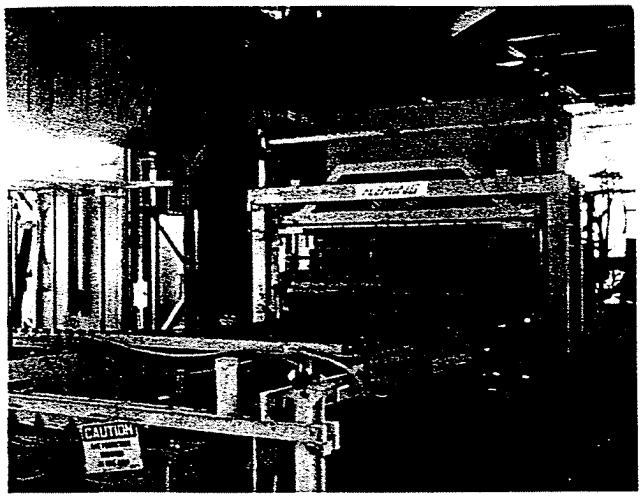


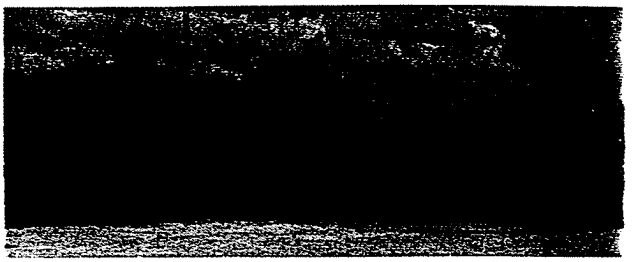
In-house engineering capabilities allow Criblock to provide assistance at all phases of a project. Preliminary feasibility studies, cost estimates, plans, specifications, and construction detail drawings all contribute to the ability to carry a retention need from concept to completed structure.

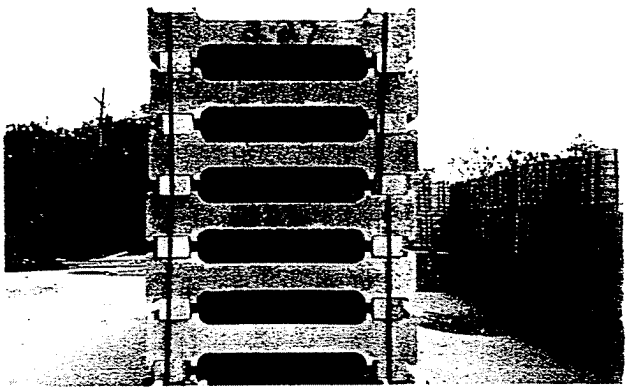
Manufacturing

02276/CRI
BuyLine 4702

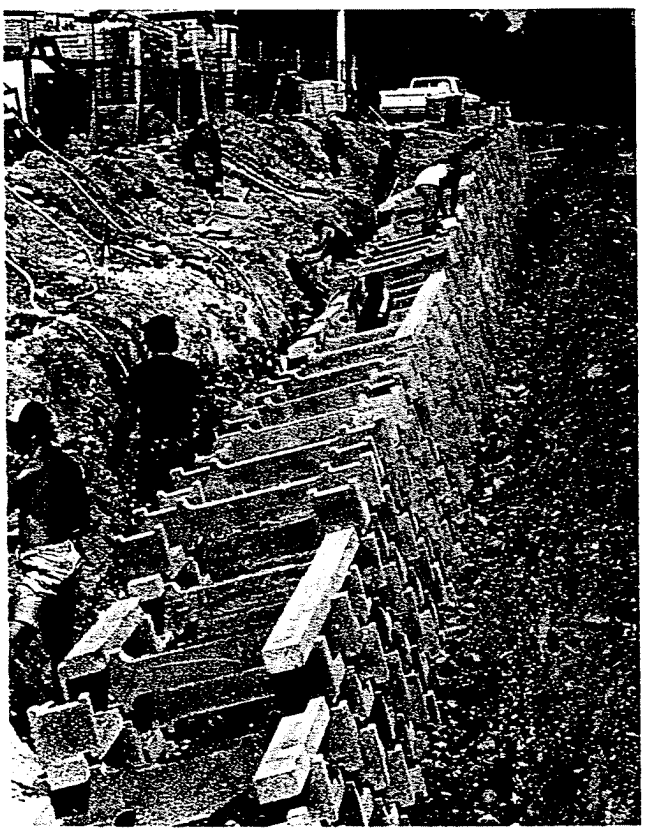
The pre-cast Criblock components are manufactured using a dry-pack method. Superior quality and consistancy are maintained through the use of fully automated machinery. A large inventory is kept on hand to provide a rapid response time for construction needs.



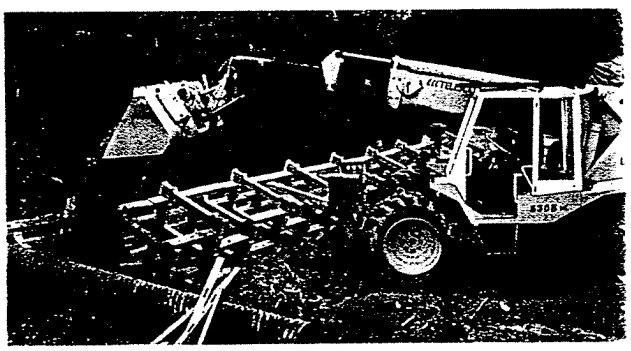


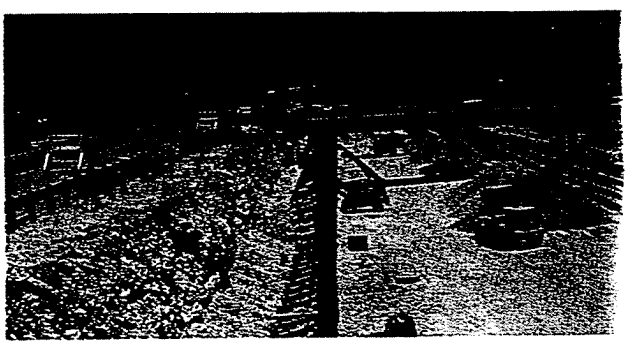


Construction



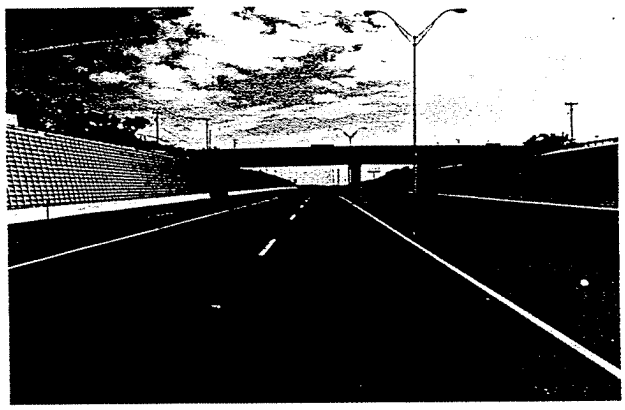
We have a full staff of construction crews who use Criblock component technology, and a philosopy of "one man, on block" to construct an extremely cost efficient retaining wa in a minimum number of days.

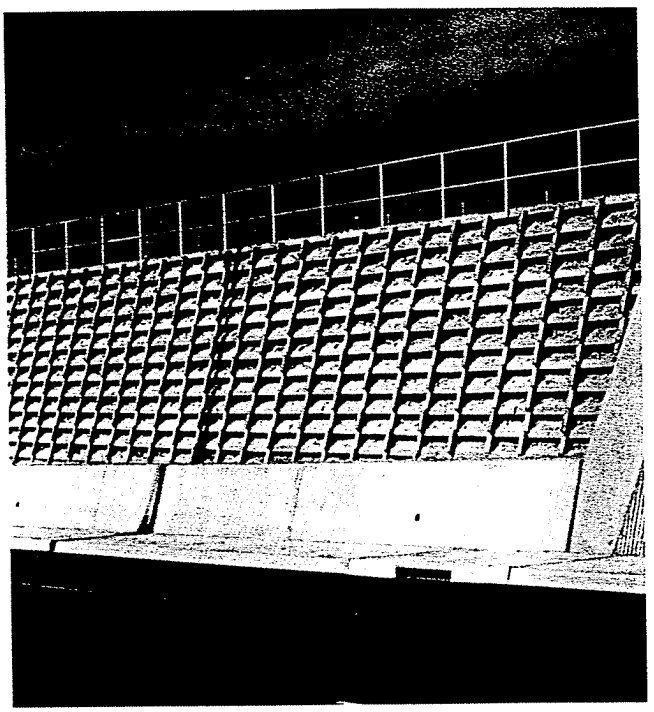




Highway Applications

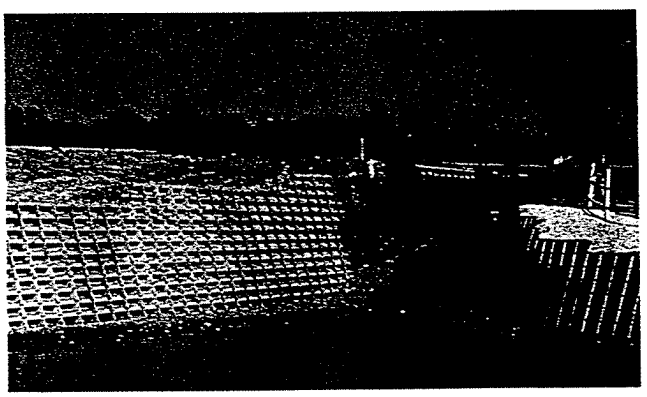
Because of their aesthetic landscaping qualities, cribwalls are being used more and more in various highway applications. The design flexibility afforded by cribwalls allows for both vertical and battered wall designs. Vertical cribwalls are most commonly used when there is limited right-of-way in which to place the wall. Typically, these walls utilize a closed face panel inserted inside the front of the wall to retain the soils within the wall. Several installations have made use of an acrylic color-coating applied to the surface of the finished wall for architectural continuity with surrounding structures.

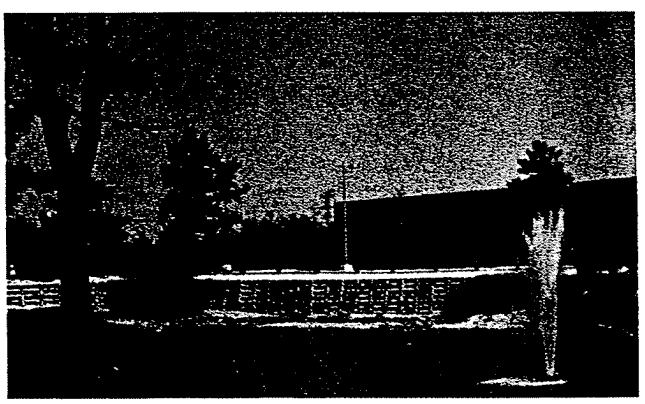


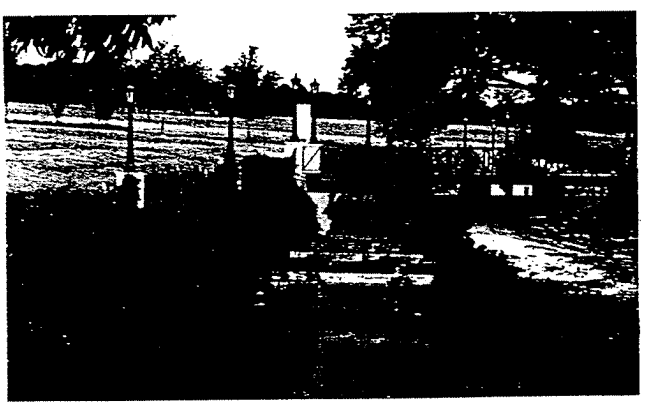


Water Applications

When designed in consultation with a geotechnical engineer, Criblock retaining walls offer one of the most versatile and cost effective earth retention methods available for water applications. The precast, modular units can be constructed in otherwise inaccessible locations. The simplicity of the system requires a minimum of heavy equipment. Numerous methods have been successfully used to prevent scouring of the face of the wall. Precast closure panels can be inserted into the front of the wall in areas where heavy water flow is encountered. Where flow rates allow, wire mesh can be placed in the front of the cells in lieu of the panels. When combined with a rock backfill and filter fabric, both of these methods have proven to be extremely versatile designs.







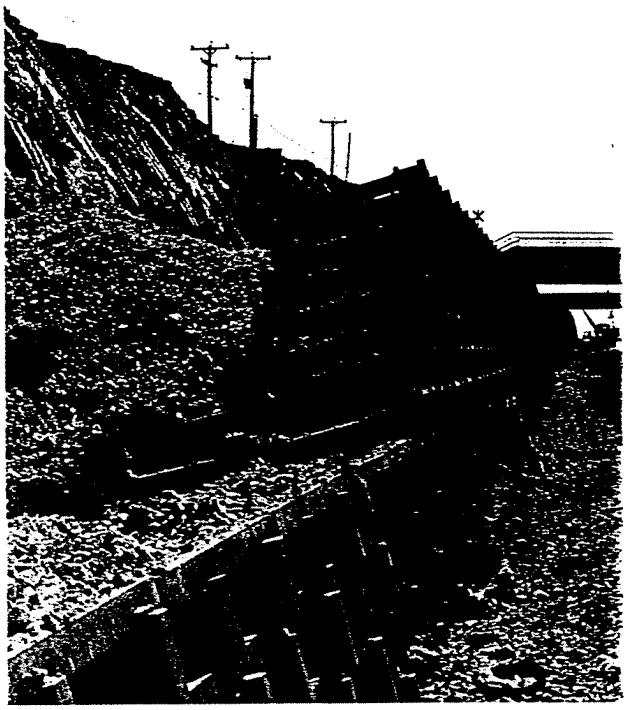
Slot-Cut Walls

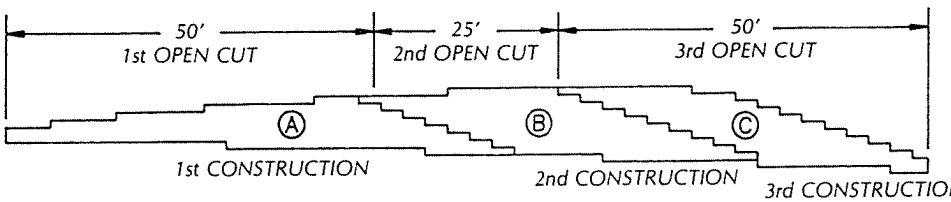
02276/CRI
BuyLine 4702

Because Criblock is an interlocking, modular system it is ideally suited for use on these higher, cut walls. Criblock retaining walls do not require temporary shoring in most cut applications. The interlocking, modular crib components offer the advantage of the "slot-cut" method of construction. Slot-cutting eliminates the need for temporary shoring and requires no special equipment or conditions.

The "slot-cutting" process involves the use of deep, but shorter cuts to provide the grades needed for wall construction. When done under the supervision and direction of a qualified soils engineer, these short but deep cuts do not undermine the stability of the slope being excavated. Slot-cutting is done in phases that include both excavation and wall construction.

The initial phase usually involves making a 50-70 foot cut at one end of the wall. This cut resembles a sort of notch with a steep backslope. Criblock wall is then stacked and backfilled within this "slot" in a pyramid fashion. (See diagram "A") Once the toe of the excavation has been stabilized with cribwall, then another 40-50 feet of excavation is opened up. Each slot is stabilized with completed cribwall before the next is cut. Successive cuts allow earlier portions of the cribwall to be topped out to finished grade elevations.





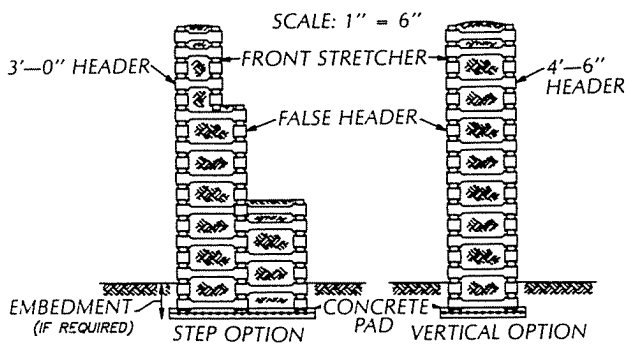
TYPICAL "SLOT CUT" CONTRUCTION PROCEDURE:

1) *IMMEDIATELY AFTER 2nd CUT, AREAS A AND B ARE OPEN.*
2) *AFTER 1st CONSTRUCTION IS COMPLETED, AREA B IS OPEN.*
3) *NEXT STEP IS TO MAKE 3rd CUT, RESULTING IN AREAS B AND C BEING OPEN. THE 2nd AND 3rd CONSTRUCTION SHOULD PROCEED.*

NOTES:

1) *25' & 50' "SLOTS" ARE SHOWN ABOVE. ACTUAL LENGTH CAN VARY, AND MUST BE AS SPECIFIED BY SOIL ENGINEER*
2) *STEPS IN WALL ALONG TERMINAL EDGE OF EACH CONSTRUCTION SEQUENCE CAN VARY IN CONFIGURATION (STEEPER OR SHALLOWER).*

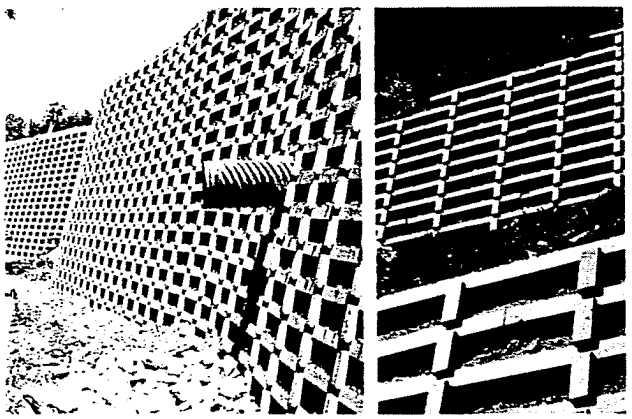
Sound Barrier

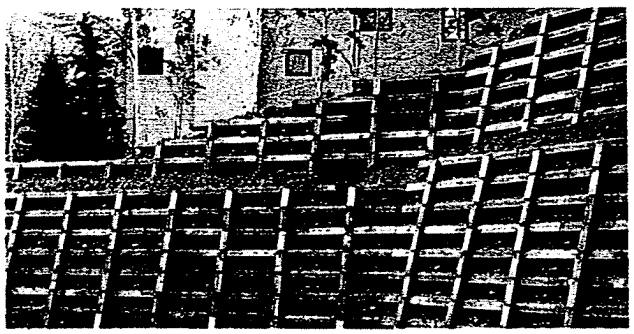


Noise pollution has become one of the foremost concerns roadway and commercial planners. The effect of noise existing residential areas has become a major issue in ma urban areas. The Sound Barrier uses the Criblock systen inherent qualities of quick construction and noise deadeni face to address the need for a cost effective, sound atte uation system.

The Sound Barrier has been tested, using a FHWA perf mance model, to average an insertion loss (the difference sound levels before and after the barrier is installed) of 17 dBA.

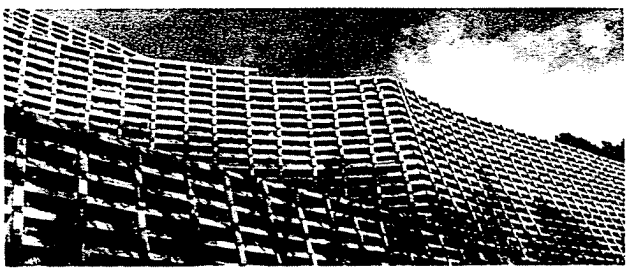
Multiple Depth





Criblock engineers each cribwall for optimum design. The need for multiple depths depends upon several factors such as: wall height, type of surcharge and specific soils conditions. The number of wall depths is then adjusted to guarantee proper factors of safety for sliding and overturning, and to distribute the weight of the wall over a base width acceptable to the specific bearing capacity of the site material.

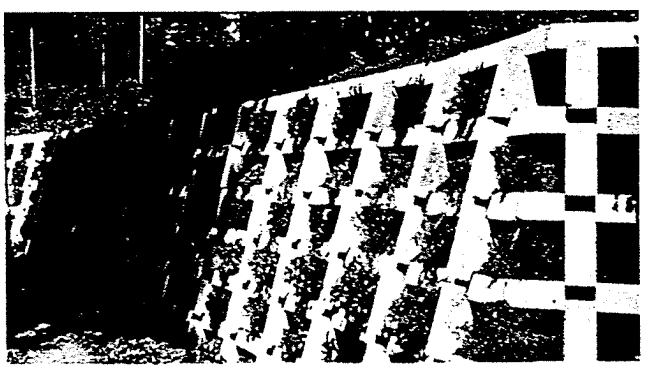
In addition to varying the number of crib depths used, the height of each depth is adjusted to offer the most efficient use of the crib material and to distribute the weight of the structure optimumly between the toe and the heel of the wall. For example, a wall 25 feet high might break out to require 15 feet of single depth, 6 feet of double, and 4 feet of triple depth.

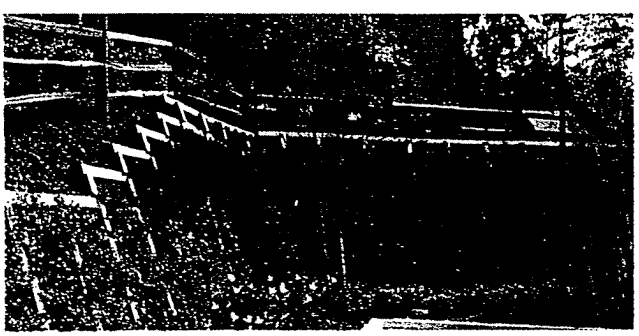


Landscaping

Perhaps one of the most unique feature advantages of the Criblock system is the aesthetic value of being able to landscape the face of the cribwall. The open cells that compose the face of the wall readily lend themselves to various landscaping concepts. Because the wall is typically built on a batter of 4:1 (vertical:horizontal) the sloped face of the wall retains the recompacted soils at a slope condusive to supporting plant life. The battered face of the wall also simplifies the irrigation design should irrigation be called for.

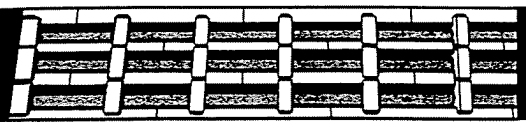
Criblock walls can be landscaped in almost any climate. Typically, native plant varieties that require little or no additional irrigation are used. Planting of the wall face is usually accomplished by "hydro-seeding" and/or handplanting





schemes that can include multiple growth stages that may allow for heartier, rapid growth plants to fill in during the initial stages while the more colorful plants have time to take root and develop. Numerous landscaping themes have been successfully used in cribwalls. These themes require that various constraints be considered, such as: walls in highly visable locations requiring colorful and dense growth; walls for highway projects that must utilize native plant varieties but cannot be irrigated; plantings that are low maintenance for use in areas with limited access; subterranean walls that receive little or no direct sunlite; and plantings designed to endure the rigors of extreme temperatures found at altitudes over 8,000 feet.

Specifications



PART I — SCOPE

This Specification sets out requirements for the design, materials, manufacture and construction of pre-cast, reinforced-concrete cribwall systems.

'CRIBLOCK™' cribwall units are the basis for this specification.

'CRIBLOCK™' Standard Plan Sheet 1 is incorporated into and made a part of this specification.

1.1 — DESIGN OF WALL SYSTEM:

The face of the wall shall consist of a grid of concrete members, with face inclined at a slope of 4 vertical to 1 horizontal, or as specifically designed for a particular job. Horizontal members are termed "Front Stretchers." Non-standard stretcher lengths required to complete the end of a wall, are termed "Closers". The face members shall be connected by transverse members termed "Headers" to a similar grid of "Back Stretchers", parallel to the face and located so that the overall thickness of the wall is not less than 3 feet. Additional spacers between the stretchers in the front and back grids may be used if the system requires it, and are termed "False Headers". Headers shall be perpendicular to the face of the wall.

The system may allow for the addition of one or more grids of members, parallel to the face and situated behind the structure described above. Such additional grids shall be connected to the grid in front of it by an interlocking header system. This constitutes a multiple-depth wall, as detailed on 'CRIBLOCK™' Standard Plans.

The space between the face and the back of the wall shall be filled with free draining rock, or well-compacted soil. The overall stability of the structure when assembled shall be such that this compaction may be carried out without displacing the members.

These specifications do not purport to provide a basis for engineering analysis of the overall wall system. 'CRIBLOCK™' Standard Plans furnish some of the basic information used in analyses. A qualified Engineer can provide information as required.

PART 2 — MATERIALS

2.1 — CEMENT:

Cement shall conform to the requirements of ASTM C 150.

Cement shall be either Type II or Type V, depending on ultimate use of product.

2.2. — AGGREGATES:

Fine and coarse aggregates shall comply with the requirements of ASTM C 33. Aggregates failing to meet this specification but which have been shown by special test to produce concrete meeting requirements of "QUALITY OF CONCRETE" may be used.

2.3 — WATER:

Water shall be potable and free from any substances deleterious to concrete or reinforcement.

2.4 — ADMIXTURES:

Air-entraining admixtures, if used shall comply with ASTM C 260. Chemical admixtures used, shall comply with ASTM C 494.

2.5 — REINFORCEMENT:

Steel reinforcements shall conform to one of the following ASTM sta dards, as appropriate: A 615, A 616 or A 617. Yield strength of steel sh. be 60,000 psi. minimum. The reinforcements shall be free from dama and contamination.

2.6 — CORROSION PROTECTION:

Where units are to be used in maritime atmosphere or in direct cont with seawater, reinforcing steel shall be protected against corrosion hot dip galvanizing at a rate of at least 2 ounces per square foot. T galvination shall be in accordance with ASTM A 123. Alternatives galvanization to be submitted for approval on a case by case basis, clude chemical coating such as SCOTCHKOTE

2.7 - CONCRETE COVER TO REINFORCEMENT:

The minimum cover to reinforcing steel shall be 1-1/4 inches (See A 318-77, Section 7.72).

2.8 — DRY MIX CONRETE:

Concrete for use in the dry-mix press process shall yield an end p duct with a minimum concrete compressive strength at 28 days of 30 psi. and with a surface dry density equal to at least 95% of the density a unit manufactured by a wet-mix process using the same type a source of aggregates.

2.9 — MANUFACTURE OF UNITS

TOLERANCES FOR INDIVIDUAL UNITS:

The length and width of all units shall be within ± 1/8 inch of specified design dimension.

2.10 — FORMED SURFACES

All surfaces of units shall have a uniform appearance free fr honeycombed areas.

2.11 — TESTING AND INSPECTION:

Acceptability of the cribbing units will be determined on the basis compression tests and visual inspection. The precast units shall be c sidered acceptable when compression test results indicate strength v conform to 28-day specifications. The contractor or his supplier shall nish facilities and perform all necessary sampling and testing in an peditious and satifactory manner. Units shall be considered accepta for placement in the wall when 7-day strengths exceed 65% of 28-c requirements.

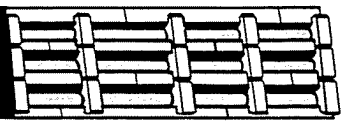
PART 3 — CONSTRUCTION

3.1 — EXCAVATION

A bench of excavation to sound material shall be made for the base the cribwall. Unless shown otherwise on the project plans, the benc shall be horizontal in the line of the wall and have a fall of 1 to 4 from front to the back of the excavation. The depth of the excavation shall b minimum of 1.0 feet below the proposed finished ground level at front face of the wall, or as shown on the project plans.

Finished base excavation to within 0.5 inches of base elevation sl include vertical steps where plans indicate base of wall is to step.

Specifications Continued



Unless shown on the plans, a concrete base slab shall not be required. After verification by the Soils Engineer for base-soil adequacy, wall is initiated by placing first course of stretchers directly onto base soil.

A maximum of 2 inches of sand or fine gravel may be used for bedding material below the bottom source of stretchers, if the contractor desires.

CRIBWALL CONSTRUCTION

The cribwall shall be placed in horizontal lifts. No more than 3 lifts shall be placed before backfilling.

The units shall be placed in a uniform pattern as shown on the drawings or as approved by the Engineer. Walls shall be provided with back stretchers for the full height of the wall, except top course. Refer to 'CRIBLOCK™' Standard Plans.

Top course of headers shall consist of full headers only.

3.5 — BACKFILLING

MATERIAL:

Backfill material shall consist of either a well-graded crushed rock of at least 1-inch diameter, or a soil reasonably free from organic and otherwise deleterious materials and conforming to the following gradation limits as determined by AASHTO T-27:

Sieve size	*Percent Passing*
3 inches	100
No. 200	10-25

In addition, if the fraction finer than the #200 mesh sieve is between 15% and 25%, the backfill must conform to the following requirements.

a. The Plasticity Index (P.I.) as determined by AASHTO T-90 shall not exceed 15 unless approved in writing by the Engineer. But in any event shall never be greater than 22.
b. The fraction finner than 15 microns (0.0015 mm) as determined by AASHTO T-88 shall not exceed 15%.
c. The material when compacted to 90% of AASTO T-99 at optimum moisture content shall exhibit an internal angle of friction of not less than 30 degrees as determined in a standard direct shear test. (AASHTO T-236).
d. The cohesion as determined by Standard Direct Shear or Triaxle Shear tests shall fall within the range of 50 to 150 psf.

Intent of this specification is that backfill material within the wall shall be structurally strong and in addition exhibit sufficient cohesion to effectively resist wind and rain erosion, but that cohesion not be so excessive as to create problems with compaction. Wall backfilled with sand need closed faced panels or UV rated filter fabric to prevent erosion.

3.3 — PLACING

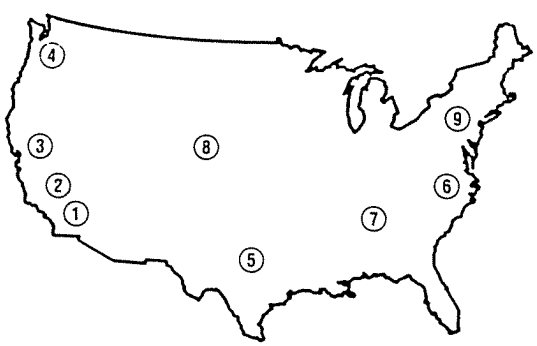
No more than 2-1/2 courses of crib framework shall be unfilled before backfill operations begin.

Drainage of the areas behind and above the cribwalling should be considered, taking care to insure that drainage is diverted from going over the face of the wall.

3.4 — COMPACTION

Unless otherwise specified by soils report, compaction within the cribbing framework shall be to a minimum of 90% relative compaction per the standard proctor. For single-depth walls and for the front cell of multiple-depth walls, compaction tests shall be taken at the center of the crib cell, approximately one-third of the distance from back stretcher to front stretcher. For all other cells of multiple-depth walls, tests shall be taken centered in the cell. Minor chipping and cracking of units shall be acceptable with the approval of the Engineer.

Criblock® Retaining Walls



① **Southern California**
1531 Grand Avenue
San Marcos, CA 92069
1-800-323-CRIB

② **Central California**
17151 Newhope Street
Suite 202
Fountain Valley, CA 92708
1-800-323-CRIB

③ **Bay Area, California**
7080 Donlon Way
Suite 212
Dublin, CA 94568
1-800-323-CRIB

④ **Northwest**
1863 Killarney Way
Bellevue, WA 98004
1-800-323-CRIB

⑤ **Southwest**
Post Office Box 1157
Del Valle, TX 78617
1-800-323-CRIB
512-389-0270
Fax 512-385-5462

⑥ **Mid-Atlantic**
Route 925 North 165-A
Waldorf, MD 20601
1-800-323-CRIB

⑦ **Southeast**
6410 Atlantic Boulevard
Suite 125
Norcross, GA 30071
1-800-272-2742
404-242-1918
Fax 404-368-8051

⑧ **Rocky Mountain**
5320 West Quarles Drive
Littleton, CO 80123
1-800-727-2600
303-933-1133
Fax 303-933-3442

⑨ **Northeast**
9 Parker Road
Morristown, NJ 07960
1-800-873-CRIB
201-285-5195
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SEP-12-1996 13:46 AMERICAN TESTING LABS 717 569 3429 P.01/01

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AMERICAN TESTING LABORATORIES, INC.

1754 FREDERICK ROAD
P.O. BOX 4014
LANCASTER, PENNSYLVANIA 17604-4014

September 11, 1996

Faddis Concrete Products
3021 Kings Highway
Downington, PA 19355

Attention: Mr. John Morris

Gentlemen;

The following report is submitted for your information.

ATL Project Number	: 09417
Date Received	: September 10, 1996
Type of Sample	: Hardened Concrete Core Samples from Crib Headers, False Headers and Stretchers
Subject Project	: Quality Control
Type of Test	: Compressive Strength
Specification	: ASTM C39
Tests Completed	: September 10, 1996

TEST RESULTS - Compressive strength of hardened concrete core samples taken at random by you from crib Headers, False Headers and Stretchers. Samples are 29 days age at time of testing.

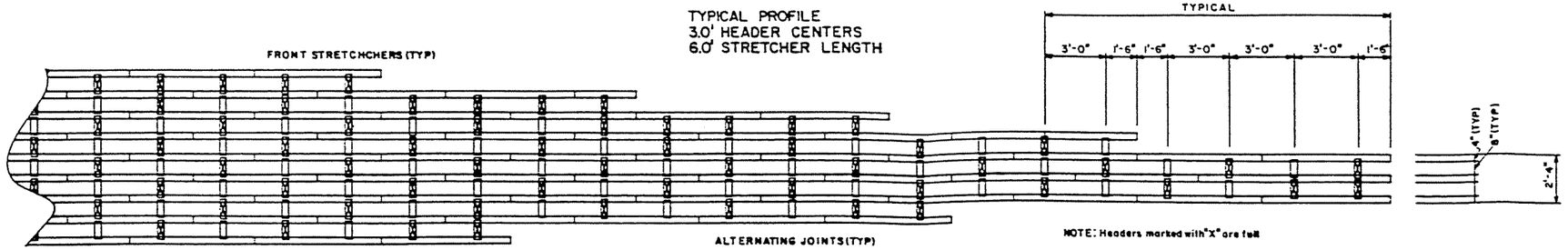
Sample Identification	Cross Sectional Area, In²	Total Load, Pounds	*Unit Load, PSI
225-6-1	5.94	36,600	5854
225-6-1	5.94	48,700	7789
225-6-1	5.94	30,700	6189
			6611 AVG.

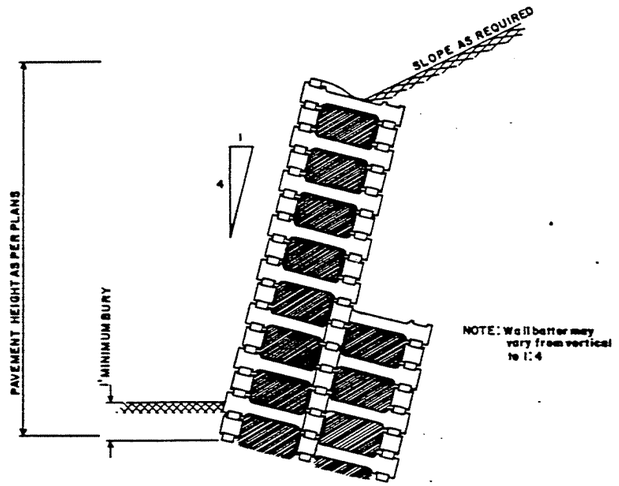
*Corrected value for l/d appreciably less than 2 as per ASTM C42. Correction factor is 0.95.

Respectfully Submitted,
AMERICAN TESTING LABORATORIES, INC.

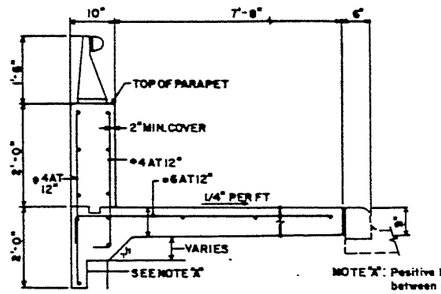
Kevin J. Kassees
Vice-President

TYPICAL PROFILE
3.0' HEADER CENTERS
6.0' STRETCHER LENGTH

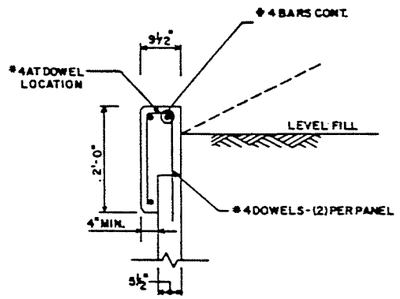


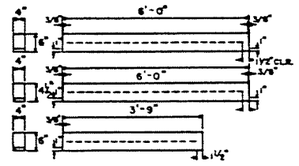


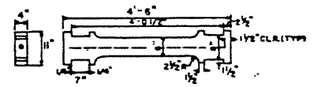
NOTE: Wall batter may vary from vertical to 1:4

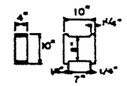


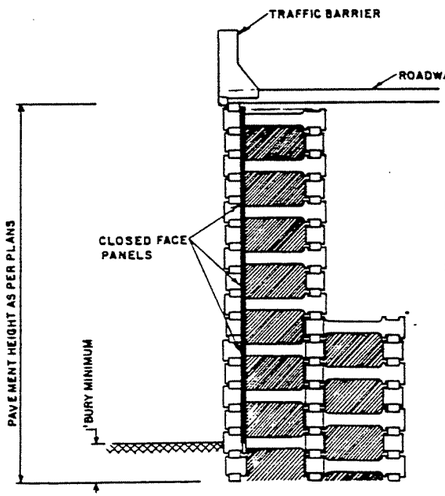
NOTE "X": Positive bond breaker between cast in place concrete panel



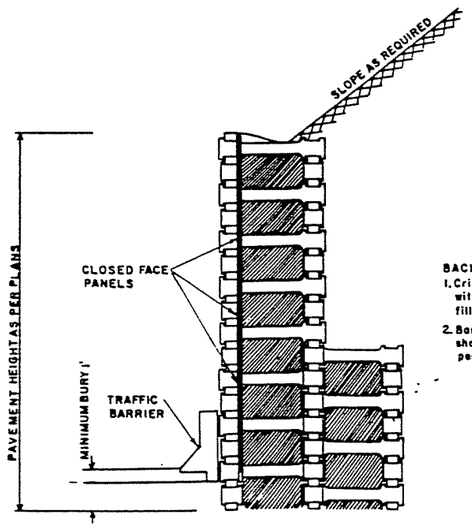








BACK FILL NOTES:
1. Cribs shall be filled with select granular fill as per specifications
2. Backfill behind cribs shall be slect fill as per specifications.

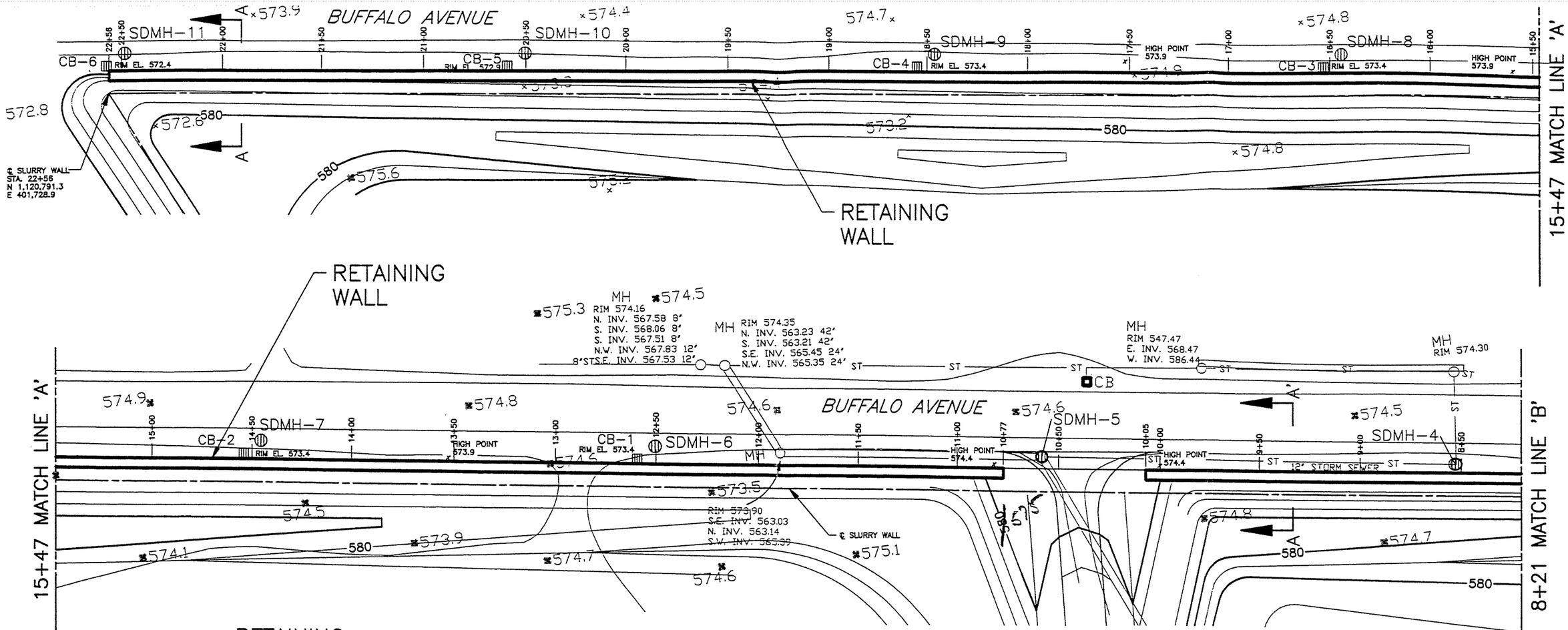


BACKFILL NOTES:
1. Cribs shall be filled with select granular fill as per specifications
2. Backfill behind cribs shall be sellect fill as per specifications

Section 2.0 Crib Wall Layout

Figure 1 is attached to show the crib retaining wall layout

Total Length = 1,602 feet
Wall Height = 5 feet



NOTES:

1. THE RETAINING WALL LAYOUT AND GROUND SURFACE CONTOURS ARE PLOTTED FROM FLUOR DANIEL DRAWINGS 594000-10U-02 AND 594000-10U-04.
2. THE SLURRY WALL STATIONS ARE PLOTTED FROM FLUOR DANIEL DRAWING 594000-30K-09.
3. REFER TO FLUOR DANIEL DRAWING 594000-10S-02 FOR THE SCHEMATIC SECTIONS OF THE RETAINING WALL.
4. TOTAL LENGTH OF RETAINING WALL IS 1602 FEET.
5. FOR CATCH BASINS CB-1 THROUTH CB-6 AND MANHOLES SDMH-3 THROUGH SDMH-11 DETAILS SEE DRAWINGS 594000-30K-02C, 04C AND 13.

N

SCALE

50 0 50 FEET

PLAN OF RETAINING WALL
ALONG BUFFALO AVENUE
102nd STREET LANDFILL SITE
FIGURE 1

Section 3.0 Design Calculations

Mr. Gilbert P. Chevalier, P.E., performed the stability analysis for the 5-foot-high crib wall. The landfill cover soils specified in Specification 02200, Item 2.1.C.2 are CL, CH, ML, or SC soils. For low retaining wall with 6H:1V straight slope backfill, "Design Manual 7.2-Foundations and Earth Structures" published by the Department of Navy, 1982 (attached) shows the lateral pressure coefficient K_H = 44 lbs/ft^2/ft for CL, ML, MH, SM, SC, and GC soils. At the site, a Frontier silty clay and Grand Island silty clay mixture will be used as the landfill cover material. The mixture has similar compaction results as Frontier silty clay. The Frontier silty clay had the majority field compacted dry density tested in the past months of 98 percent x (optimum water content proctor density 114.5 lbs/ft^3) = 112.2 lbs/ft^3. The field water content of this compacted soil was about 15 percent average. The total unit weight of compacted soil is equal to 112.2 x (1 + 15%) = 129.0 lbs/ft^3. The water in the landfill cover soil will be drained into the crib wall and there is no pore pressure problem.

K_H = 44 lbs/ft^2/ft = 44 lbs/ft^3

Coefficient of Horizontal Lateral Pressure = (44 lbs/ft^3)/(129.0 lbs/ft^3) = 0.34

The computer input for active pressure coefficient will use equivalent friction angle ϕ of 30°

$K_a = (1-\sin\phi)/(1+\sin\phi) = (1-\sin 30°)/(1+\sin 30°) = 0.333 \simeq 0.34$

The stability analysis results are:

Factor of Safety Against Overturning = 5.16 > 2.0 required
Factor of Safety Against Sliding = 2.53 > 1.5 required
Toe Pressure = 924.96 lbs/ft^2
Heel Pressure = 395.91 lbs/ft^2

Mr. Chevalier has stamped the calculations with P.E. seal.

Gilbert P. Chevalier
PROFESSIONAL PLANNER - CONSULTING ENGINEER

41 SYCAMORE ROAD. SCARSDALE. NEW YORK 10583
(914) 723-3970 - FAX (914) 472-2043

Subject: CRIB WALL RETAINING WALL SYSTEM

A Cribwall retaining wall system is a non rigid type of wall construction which does not have restraint conditions at the joints. The basic frictional resistance force acting over the joint bearing areas and contact areas is sufficient to assure the structural integrity of the assembled skeleton. This non-restrained condition occurrs because all units are installed in a dry stack condition and are not glued or mortared at the joints.

A crib wall retaining wall system consists basically of precast concrete members. These include full and false headers and front and rear stretcher units which are erected in an interlocking and alternating crib type arrangement. These units are varied by one foot heighth increments. They can beerected in single, double, triple or the required depth mode.
Non-rigid walls of this type do not have to be concerned with their base footing support strata as they are not affected by the frost heave conditions subject to a rigid type of wall. The frost line requirement as presented in most building code stipulations refers to only rigid wall conditions and the effect of frost heaves which is structural cracking of these rigid walls. Dry-stack wall systems are not subject to this cracking phenomena because of the existing vertical and lateral differential tolerances at the joints of the overall interconnected system. The accepted rule as established by numerous dry stack wall systems such as Allen Block,Keystone Walls and Crib Walls for enbedment requires a minimum of one eighth of the vertical wall heighth .

However , if there is are ground water conditions encountered at the base of the wall it may affect the allowable bearing capacities at both the toe and the heel of the wall.Also if sliding forces are a concern , the base could be further embedded and the area backfilled with clean crushed stone. This backfill should be properly drained off.

These types of wall systems(non-rigid type) require architectural specifications, site elevations, surcharge loading requirements and geotech approvals of the resulting soil bearing capacities as submitted by the Crib Wall manufacturer and installer. Basic soils bearing capacities must be supplied prior to the final designs.

CRIB WALL CONTRACTOR: Retaining Wall Systems Inc.
139 South Street
New Providence, New Jersey
(Mr. Hugh Campbell, President)

SUMMARY OF INPUT PARAMETERS

JOB NAME : OXYCHEMM/OLIN
WALL DESCRIPTION : 5 FT CRIB WALL -- ZERO SURCHARGE- 1 FT EMBED
DATE : 9/11/96

IS THIS AN INVERTED WALL ? [Y/N]	Y
WALL BATTER (RUN:RISE)	1:99
HEADER SIZE (2', 3', 4.5', OR 5')	4.50
SLOPE OF BACKFILL BEHIND WALL (RUN:RISE)	6:1
COEFFICIENT OF SLIDING FRICTION	0.58
DIST. FROM ANALYSIS PLANE TO BEGINNING OF SURCHARGE AREA	0.00
LENGTH OF SURCHARGE AREA PERPENDICULAR TO THE WALL	0.00
SURCHARGE PRESSURE [PSF]	0.00
EQUIVALENT FLUID PRESSURE OF THE BACKFILL	40.00
UNIT WEIGHT OF THE SOIL	120.00
UNIT WEIGHT OF THE WALL	118.00
ANGLE OF INTERNAL FRICTION OF THE BACKFILL	30.00
ANGLE OF INTERNAL FRICTION OF THE BASE SOIL	30.00
COHESION [PSF]	0.00
MINIMUM WALL EMBEDMENT	1.00
TIER 1 HEIGHT	5.00
TIER 2 HEIGHT	0.00
TIER 3 HEIGHT	0.00
TIER 4 HEIGHT	0.00
CALCULATED TOTAL HEIGHT	5.00

SUMMARY OF RESULTS
****

OVERTURNING MOMENT	OM=	1218.32	FT-LBS
RESISTING MOMENT	RM=	6285.20	FT-LBS
OVERTURNING FACTOR OF SAFETY	FO=	5.16	
SLIDING FACTOR OF SAFETY	FS=	2.53	
TOTAL VERTICAL FORCES	FV=	2779.20	LBS
TOE PRESSURE	TP=	924.96	PSF
HEEL PRESSURE	HP=	395.91	PSF

RETAINING WALL CALCULATIONS

****

RETAINED HEIGHT =	5.00 FT	BATTERED HEIGHT OF THE WALL =	5.00 FT
DESIGN HEIGHT =	5.74 FT	Qs(SURCHARGE) =	0.00 PSF
BATTER ANGLE =	0.58 DEG	SLOPE ANGLE OF BACKFILL =	9.46 DEG
TIERWIDTH(1) =	4.21 FT	TIERWIDTH(2) =	7.92 FT
TIERWIDTH(3) =	11.63 FT	TIERWIDTH(4) =	15.33 FT

NEGLECT PASSIVE RESISTANCE AT THE BASE IF EMBEDMENT < 2.00 FT

****

DETERMINE EARTH PRESSURE DUE TO SOIL WEIGHT

GAMMA = UNIT WEIGHT OF THE SOIL (PCF)
H = DESIGN HEIGHT (SEE ABOVE PARAMETERS) (FT)
Ka = COEFFICIENT OF ACTIVE PRESSURE (RANKINE)
B = BASE WIDTH (FT)

FOR BACKFILL SLOPE ANGLE (BETA) = 9.46 DEG, AND BACKFILL SOIL FRICTION ANGLE (PHI) = 30.00 DEG, THEN Ka = 0.333

PAsoil = 1/2(GAMMA)(H^2)(Ka) = (1/2)(120.00)(5.74)^2(.333) = 659.78 LBS

PAsoil IS LOCATED @ (H/3 - B(SIN(BATTERANGLE)) = (5.74/3) - (4.21)(SIN(0.58)) = 1.87 FT

PA(TOTAL) = PAsoil + PAsurcharge = 659.78 + 0.00 = 659.78 LBS

PA(HORIZONTAL) = HORIZONTAL COMPONENT OF Pa

PA(HORIZONTAL) = PA(TOTAL) x COS(BETA) = (659.78)(COS(9.46)) = 650.80 LBS

DETERMINE THE VERTICAL FORCES AND THEIR MOMENT ARMS

LPA = LT = [4.21 + (5.00)(TAN(0.58))][COS(0.58)] = 4.26 FT
LST(0) = 4.26 - (1/3)[4.26 - (5.00)SIN(0.58)] = 2.86 FT
LC(1) = [(5.00 - 5.00 + 5.00/2)(TAN 0.58)+(4.21)(1/2)](COS 0.58)= 2.13 FT

PA(VERTICAL) = VERTICAL COMPONENT OF Pa

PA(VERTICAL) = PA(TOTAL)xSIN(BETA) =(659.78)(SIN(9.46))	=	108.47 LBS
WST(0) = {(0.74)[4.26 - (5.00)(SIN 0.58)]}(1/2)(120.00)	=	187.81 LBS
WC(1) = (4.21)(5.00)(118.00)	=	2482.92 LBS
	FV =	2779.20 LBS

DETERMINE RESISTING MOMENT

MPA(VERT)= 108.47(4.26)	=	461.92 FT-LBS
MWST(0) = 187.81(2.86)	=	536.38 FT-LBS
MWC(1) = 2482.92(2.13)	=	5286.90 FT-LBS
RESISTING MOMENT(RM)	=	6285.20 FT-LBS

DETERMINE OVERTURNING MOMENT

LICENSED PROFESSIONAL ENGINEER GILBERT P. CHEVALIER No. 36261 UNIVERSITY OF THE STATE OF NEW YORK

MPAsurcharge = 0.00(2.83) = 0.00 FT-LBS

OVERTURNING MOMENT(OM)= 1218.32 FT-LBS

DETERMINE FACTOR OF SAFETY AGAINST OVERTURNING

S.F.(OVERTURNING) = RM/OM = (6285.20)/(1218.32) = 5.16 > 2.00 .'. O.K.

DETERMINE FACTOR OF SAFETY AGAINST SLIDING

Fi = PA(HORIZONTAL) x COS(BATTERANGLE) = 650.80(COS(0.58)) = 650.77 LBS
FR = [(PA(HORIZONTAL))(SIN(BATTERANGLE)) + FV(COS(BATTERANGLE))](FRICTCOEFF) + FV(SIN(BATTERANGLE)) + Pp + (C x B)
FR = [650.80(SIN(0.58)) +2779.20(COS(0.58))] x 0.58 + 2779.20(SIN(0.58))
+ 0.00 + 0.00 = 1643.74 LBS

F.S.(SLIDING) = FR/FI = (1643.74)/(650.77) = 2.53 > 1.50 O.K.

DETERMINE LOCATION OF THE RESULTANT AT THE BASE WHERE 1.40 < X < 2.81

X = LOCATION OF THE RESULTANT FORCE AT THE BASE (DISTANCE FROM THE RIGHT OF THE TOE OF THE WALL)[FT]-THE LOCATION OF THE RESULTANT IS PREFERED TO BE LOCATED WITHIN THE MIDDLE THIRD OF THE EFFECTIVE BASE WIDTH (WIDTH ALONG HORIZ PLANE)

(RM - OM)/FV = (6285.20 - 1218.32)/(2779.20) = 1.82 FT

DETERMINE BEARING PRESSURES AT THE BASE

PTOE = [(4)(4.21) - (6)(1.82)] x (2779.20)/(4.21)^2 = 924.96 PSF
PHEEL = [(6)(1.82) - (2)(4.21)] x (2779.20)/(4.21)^2 = 395.91 PSF

LICENSED PROFESSIONAL ENGINEER
GILBERT P. CHEVALIER
No. 36261
UNIVERSITY OF THE STATE OF NEW YORK

SEP 11 '96 09:48 GILBERT CO. / CHEVALIER P E P.1/1
FAX TRANSMITTAL MEMO
TO: Mr. Chris Cimino
DEPT:
FROM:
CO:
NO. OF PAGES 3

NAVFAC DM-7.2
MAY 1982

APPROVED FOR PUBLIC RELEASE

FOUNDATIONS AND EARTH STRUCTURES

DESIGN MANUAL 7.2

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
200 STOVALL STREET
ALEXANDRIA, VA. 22332

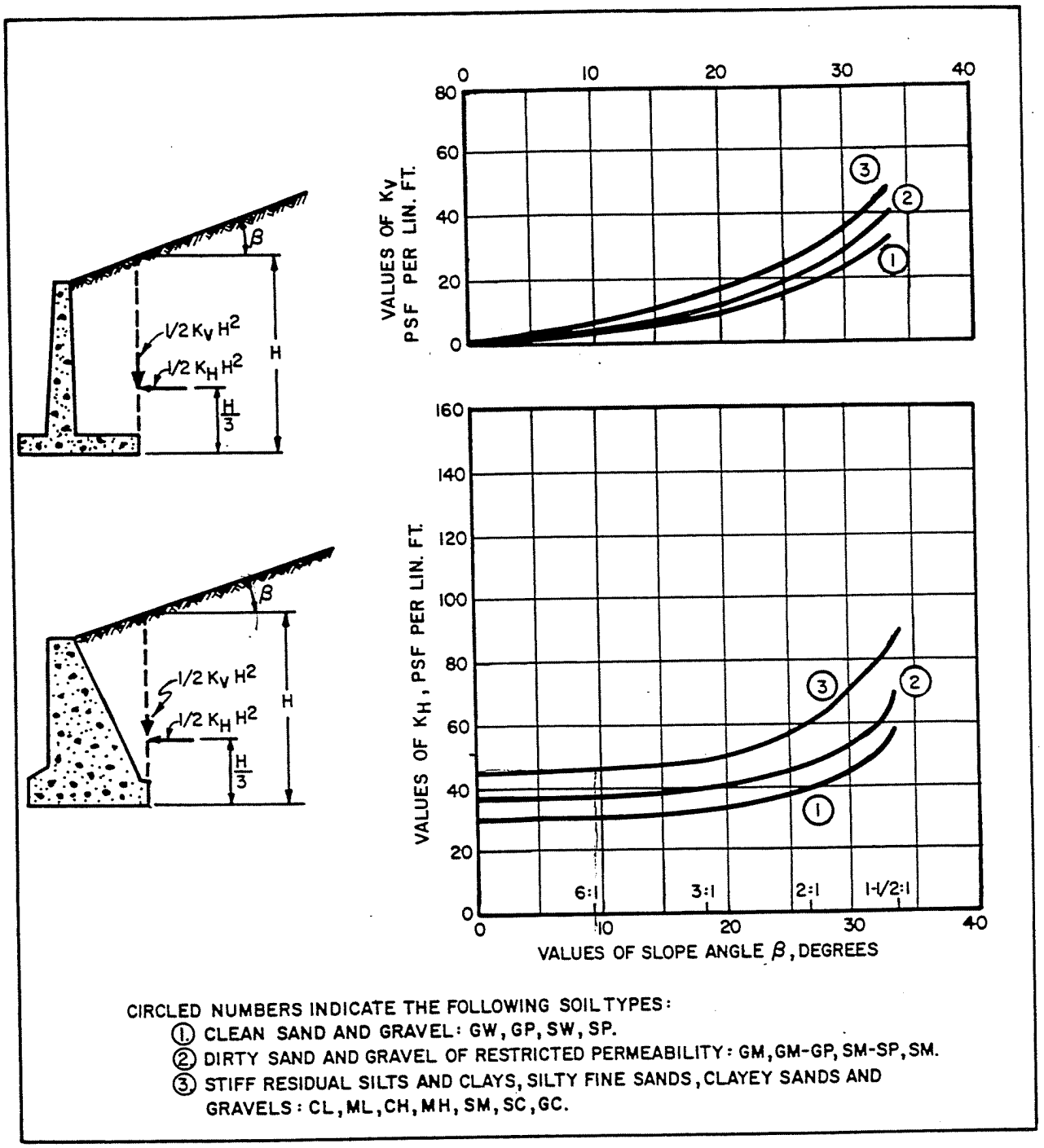


FIGURE 16
Design Loads for Low Retaining Walls (Straight Slope Backfill)

Allowable bearing capacity of the crib wall foundation soil:

The soil is a mixture of Grand Island silty clay and Frontier silty clay. The Frontier silty clay has a cohesion of 1 ton/ft^2 from previous field vane shear tests. When mixed with Grand Island silty clay, 50 percent of the above value will be assumed as the cohesion.

$c = 0.5$ tons/ft^2 $= 1{,}000$ lbs/ft^2

Ultimate bearing capacity by neglecting crib wall 1-foot embedment = $cN_c = 1{,}000 \times 5.14 = 5{,}140$ lbs/ft^2 (Reference K. Terzaghi & R. Peck "Soil Mechanics in Engineering Practice", John Wiley & Sons, 1967, p. 222 General Shear Failure).

For a factor of safety of three, the allowable bearing capacity of crib wall foundation soil $= 5{,}140/3 = 1{,}713$ lbs/ft^2 > calculated crib wall bearing at toe = 924.96 lb/ft^2 and calculated crib wall bearing at heel = 395.91 lbs/ft^2

Soil Mechanics in Engineering Practice

Karl Terzaghi

Late Professor of the Practice of Civil Engineering
Harvard University
Lecturer and Research Consultant in Civil Engineering
University of Illinois

Ralph B. Peck

Professor of Foundation Engineering
University of Illinois

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is not known. Hence, the computations must be repeated for a given value of ϕ with various inclinations ψ until the minimum value of N_γ is found. The results are conservative but agree well with those calculated for particular cases by the more advanced procedures (Meyerhof 1955). Meyerhof's values are plotted in the chart (Fig. 33.4) together with the values of N_c and N_q obtained from Eqs. 33.5 and 33.4. The use of the chart greatly facilitates the computation of the bearing capacity.

The soil does not fail as shown in Fig. 33.3*c* unless it is fairly dense or stiff, so that its settlement curve resembles C_1 in Fig. 33.1. Otherwise the footing sinks into the ground before the state of plastic equilibrium spreads beyond e and e_1 (Fig. 33.3) and the corresponding settlement curve has no well-defined break (curve C_2 in Fig. 33.1). An approximate value for the bearing capacity q_d of continuous footings on such soils can be obtained by assuming that the cohesion and friction of the soil are equal to two-thirds of the corresponding values in Coulomb's equation, or that

$$c' = \tfrac{2}{3}c \tag{33.11a}$$

and

$$\tan \phi' = \tfrac{2}{3} \tan \phi \tag{33.11b}$$

If the angle of shearing resistance is ϕ' instead of ϕ, the bearing-capacity factors assume values N_c', N_q', and N_γ'. These values are

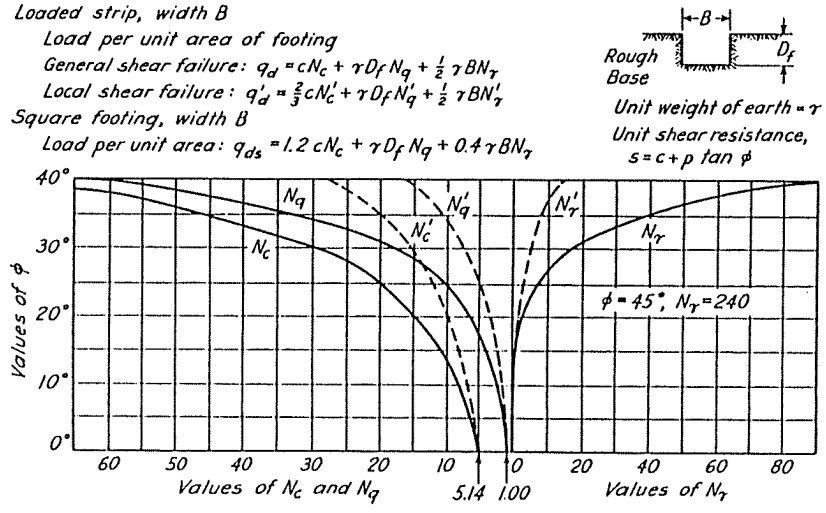


Fig. 33.4. Chart showing relation between ϕ and bearing capacity factors (values of N_γ after Meyerhof 1955).

given by the dash curves in Fig. 33.4. The bearing capacity is then obtained from the equation

$$q_d' = (\tfrac{2}{3}cN_c' + \gamma D_f N_q' + \tfrac{1}{2}\gamma B N_\gamma') \tag{33.12}$$

Experience has shown that even uniformly loaded foundations always fail by tilting. This fact, however, does not invalidate the reasoning in the preceding paragraphs. It merely demonstrates that there are no perfectly uniform subgrades. With increasing load the settlement above the weakest part of the subgrade increases more rapidly than that above the rest. Because of the tilt, the center of gravity of the structure shifts toward the weak part and increases the pressure on that part, whereas the pressure on the stronger parts decreases. These factors almost exclude the possibility of a failure without tilting.

Bearing Capacity of Footings of Finite Length

All the preceding discussions refer to continuous footings. For computing the bearing capacity of square or circular bases, only a few special cases have been solved rigorously; the solutions require the use of numerical procedures. On the basis of the results and of experiments a semiempirical equation has been developed for the bearing capacity q_{dr} per unit of area of a circular footing with radius r resting on a fairly dense or stiff soil

$$q_{dr} = 1.2cN_c + \gamma D_f N_q + 0.6\gamma r N_\gamma \tag{33.13}$$

The corresponding value for square footings, $B \times B$, on dense or stiff soil, is

$$q_{ds} = 1.2cN_c + \gamma D_f N_q + 0.4\gamma B N_\gamma \tag{33.14}$$

The values of N are given by the ordinates of the solid curves in Fig. 33.4.

If $\phi = 0$ conditions prevail and the soil possesses cohesion, the bearing capacity at the ground surface is

$$q_{dr} = q_{ds} = 6.2c = 3.1q_u \tag{33.15}$$

which is considerably greater than the value $q_d = 5.14c$ (Eq. 33.6). On the other hand, if $c = 0$ and $D_f = 0$, the bearing capacity q_{dr} per unit of area is considerably smaller than q_d for a continuous footing with a width equal to the diameter of the circular footing.

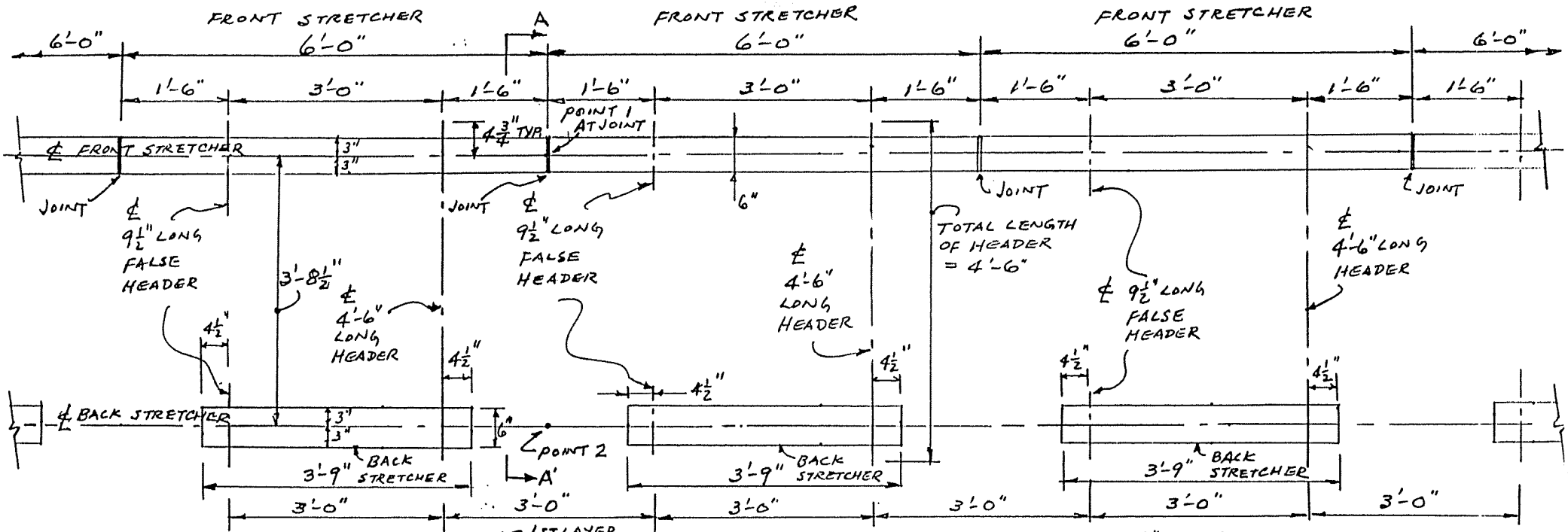
If $\phi = 0$ and $c > 0$, the increase in bearing capacity per unit of area produced by the surcharge γD_f is exactly compensated by the weight of soil removed for construction of the footing. Therefore it is convenient to deal with the *net bearing capacity*

$$q_{d\,\text{net}} = q_d - \gamma D_f \tag{33.16}$$

Section 4.0 Detailed Layout of Crib Wall and its Relation With Swale Invert Elevations

Smith Environmental provides Sketch 1 and Sketch 2. Sketch 1 shows the layout of the precast concrete members according to the manufacturer's brochure. Sketch 2 shows the wall section together with swale invert elevations layout along the 1,600-foot-long wall. It is important to keep the swale invert elevations above the outside finished grade Elevation 572.83. Ninety percent of the swale invert elevations will follow this condition, only about 10 percent will be lower. Therefore, the wall needs to be constructed 5 feet high minimum.

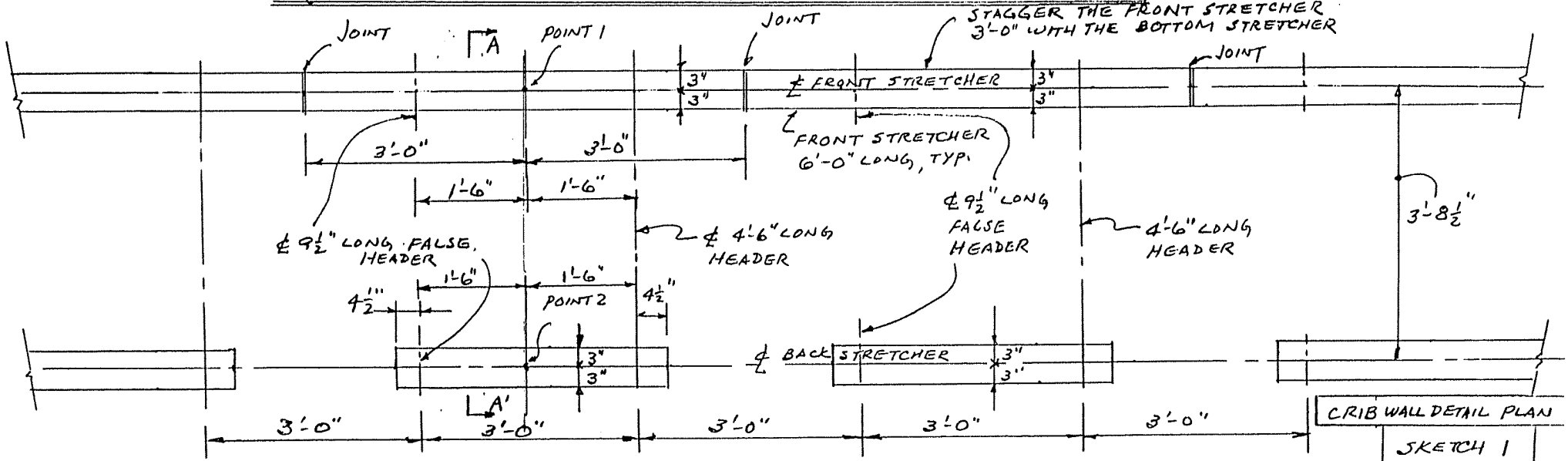
There is a crib wall water drainage problem as indicated by Note 3 of Sketch 2. Smith Environmental presents this point to the Engineer for the decision.



PLAN OF BOTTOM LAYER STRETCHERS AND HEADERS ABOVE $\frac{1}{2}$"=1'-0"

(PLAN OF 3RD LAYER IS THE SAME) (PLAN OF THE 5TH LAYER IS THE SAME)

NOTE: ALL STRETCHERS ARE 4" THICK.



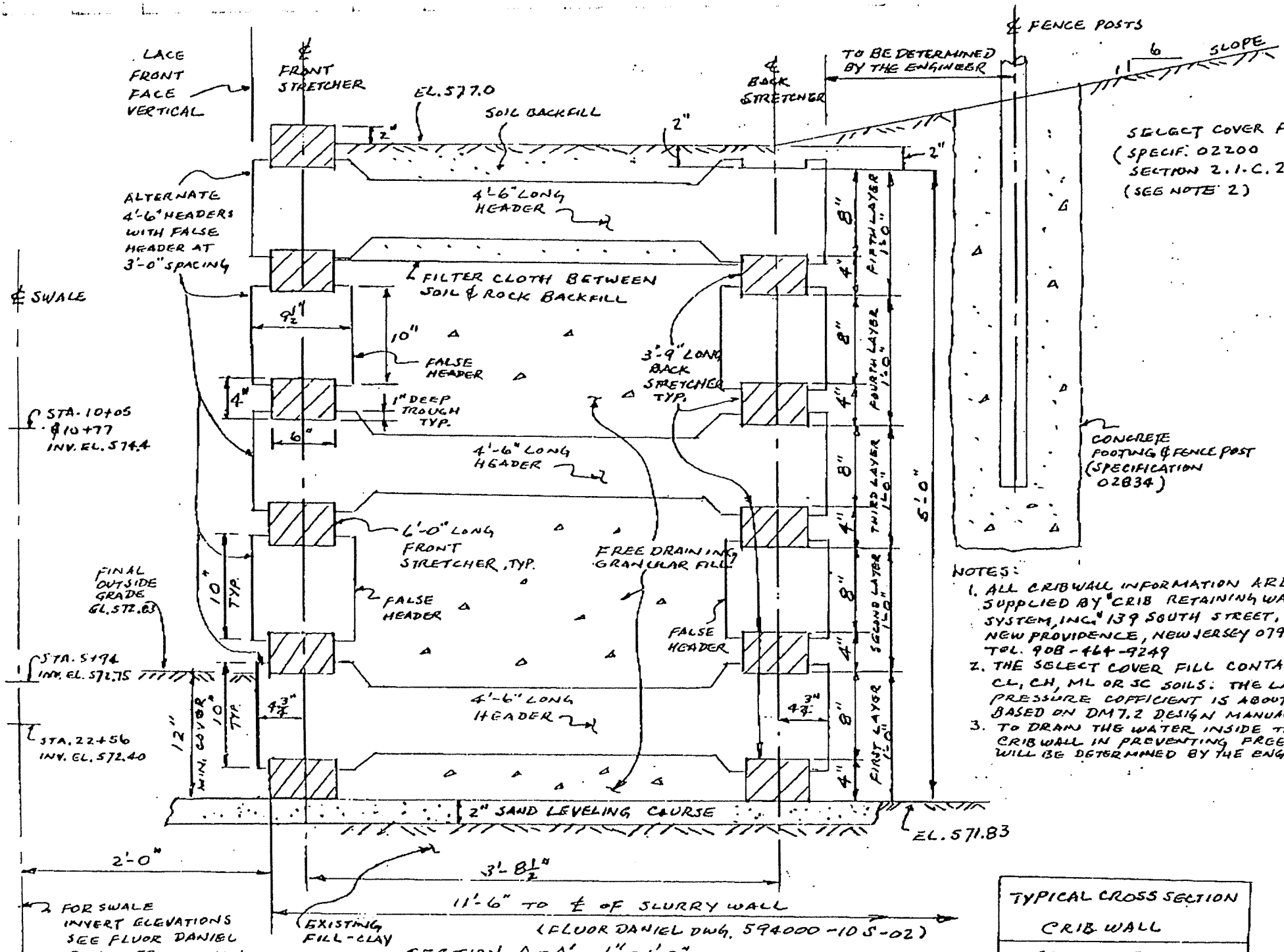
PLAN OF SECOND LAYER STRETCHERS AND HEADERS ABOVE $\frac{1}{2}$"=1'-0"

(PLAN OF THE 4TH LAYER IS THE SAME.)

CRIB WALL DETAIL PLAN

SKETCH 1

SMITH ENVIRONMENTAL
PREPARED BY: CHIA CHANG 9-11-9
CHECKED BY: PETE PORTER
9-11-96



SECTION A-A' 1" = 1'-0"

NOTES:

1. ALL CRIBWALL INFORMATION ARE SUPPLIED BY "CRIB RETAINING WALL SYSTEM, INC." 139 SOUTH STREET, NEW PROVIDENCE, NEW JERSEY 07974-199 TEL. 908-464-9249
2. THE SELECT COVER FILL CONTAINS CL, CH, ML OR SC SOILS. THE LATERAL PRESSURE COFFICIENT IS ABOUT 0.34 BASED ON DM7.2 DESIGN MANUAL.
3. TO DRAIN THE WATER INSIDE THE CRIB WALL IN PREVENTING FREEZING WILL BE DETERMINED BY THE ENGINEER.

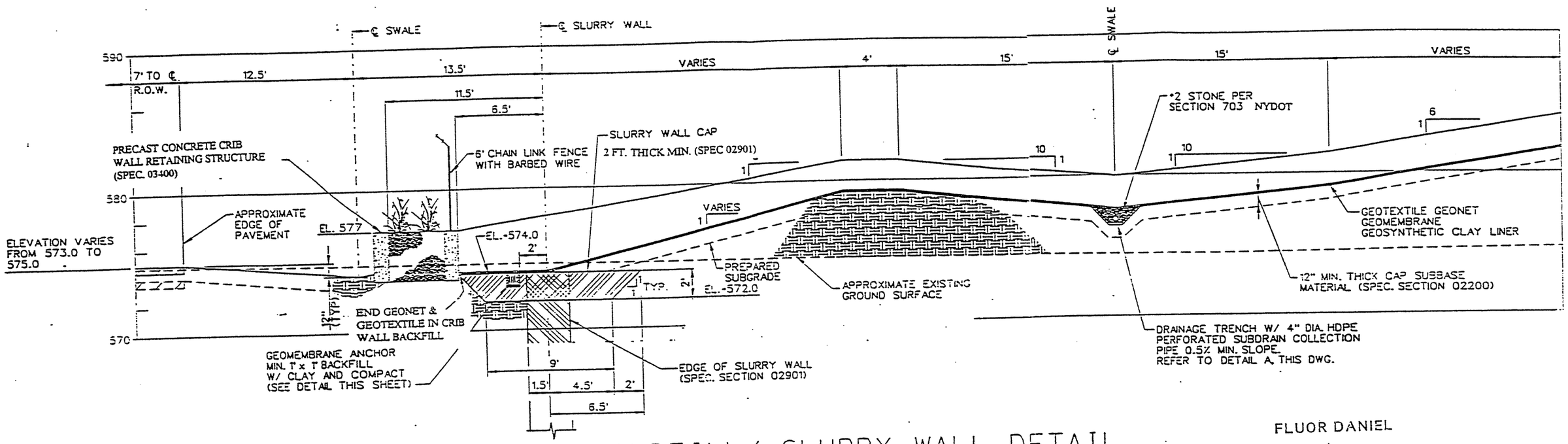
TYPICAL CROSS SECTION
CRIB WALL
SKETCH 2

9-11-96

SMITH ENVIRONMENTAL
PREPARED BY: CHIA CHANG
CHECKED BY: PETE PORTER
9-11-96

Section 5.0 Wall Layout According to Original Design Drawings

A print of crib layout from Fluor Daniel Drawing 594000-10S-02 is attached as the basis for the analysis.



TYPICAL LANDFILL/ SLURRY WALL DETAIL TOE AT BUFFALO AVENUE

FLUOR DANIEL

594000-10S-02

APPENDIX I

SLURRY WALL FIELD TESTS AT STATIONS

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Date: 8/26/96 Job #: 96-015
Temperature: 70 AM 80 PM
Wind Direction: SE AM SE PM
Conditions: Sunny AM Sunny PM (w
Prepared by: M. Jogimahanti

start exc.

Station #	Time	Depth (ft)	Key (ft)	Station #	Time	Depth (ft)	Key (ft)	Comments
2+50	1300	4						
2+60	1305	4						
2+70	1310	10						

START mix @ PLANT @ 1230pm

Batch Mix (per 50 LF) Time	>64pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Trench Slurry (per 50 LF) Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)
210	64		31		358			34	
225			32		404	64			
305				15*	450				18.5

Trench Backfill (per 150 CY) Station #	Time	>80pcf Density (pcf)	>3% Bentonite (percent)	10^{-7}cm/s Permeability (cm/sec)	3" to 6" Slump (inches)	Other Tests:
						Grain Size (1 per 100 LF)
						Atterberg (1 per 100 LF)
						Hydraulic Conductivity (1 per 500 LF)

	Water	Bentonite	Soil	Admixtures		Comments
Source	RIVER	GEOCON				
Quantity						

Air Monitoring FID FID

Time	~~OVM~~ (ppm)	By	Time	~~OVM~~ (ppm)	By	Time	OVM (ppm)	By	Comments
1300	1.0	MKJ	1531	0.9	MKJ				BACKGR = 1.0 pp
1336	1.0	MKJ							
1329	1.4	MKJ							
1346	1.4	MKJ							
1401	0.8	MKJ							
1411	0.8	MKJ							
1431	0.8	MKJ							
1444	0.6	MKJ							

Summary:
LF today: 0 SF today: 0
LF to date: 0 SF to date: 0

Comments:
- STOPPED WORK FROM 1325 to 1400 - LACK OF FENCE
- INSTALLED ORANGE FENCE @ 340PM
- NO EXCAVATION AFTER 3PM - TRYING TO GET THE RIGHT SLURRY M
- DUST DURING LOADING BENTONITE IN SILO @ BATCH PLANT - MUST BE RESOLVED.

* 60 psi

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Date: 8/27/96 Job #: 96-015
Temperature: 65 AM 70 PM
Wind Direction: NE AM N PM
Conditions: Cloudy AM Sunny PM
Prepared by: M. Jogimahanti

Station #	Time	Depth (ft)	Key (ft)	Station #	Time	Depth (ft)	Key (ft)	Comments
2+70	800	~~23.5~~	24.7	2+80	1350	~~24.7~~	25.7 MD	Start mix @ batch plant @ 715 am
2+80	1117	~~22.7~~	24.1 MD	2+80	1353	23.8"		
				2+90	1411	23.8		
				3+00	1558	23.9		
				3+10	1643	23.8		
				3+20	1644	23.8"		
				3+30	1658	23-3"	get in A.M.	
				3+40	1700	22-5"		

Batch Mix (per 50 LF) Time	>64pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Trench Slurry (per 50 LF) Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)
1156	64		45	16.5	11:37 Sta 22+00	64		43	18
1549	64		43	18	3:53	66		47	20

Trench Backfill (per 150 CY) Station #	Time	>80pcf Density (pcf)	>3% Bentonite (percent)	10^{-7}cm/s Permeability (cm/sec)	3" to 6" Slump (inches)	Other Tests:
						Grain Size (1 per 100 LF)
						Atterberg (1 per 100 LF)
						Hydraulic Conductivity (1 per 500 LF)

	Water	Bentonite	Soil	Admixtures		Comments
Source	RIVER	Geocon				40 batches for Plant
Quantity		5 bags				One 4000 bag for backfill

Air Monitoring FID

Time	~~OVM~~ (ppm)	By	Time	~~OVM~~ (ppm)	By	Time	~~OVM~~ (ppm)	By	Comments
801	0.0	MKJ	16:36	0.0	LBH				
819	0.1	MKJ	16:52	0.0	LBH				
830	0.0	MKJ							
14:27	0.1	LBH							
14:49	0.0	LBH							
15:40	0.0	LBH							
16:08	0.0	LBH							
16:23	0.0	LBH							

Summary:
LF today: 50 SF today:
LF to date: 50 SF to date:

Comments: STOPPED EXCAVATION @ 810 due to break in H_2O connection @ batch
RAIN FROM 940AM TO 11AM - DID NOT EXCAVATE
1230 to 215pm water hose busted. DID NOT EXCAVATE

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 8/28/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures		Comments
Source	RIVER	GEOCON	SUMMIT PARK			11 bags @ BATCH PLANT
Quantity						2 bags @ BACKFILL 88 Batches

Summary:
LF today: 150 (FROM STATION 3+30 TO 4+80)
LF to date: 210 (FROM STATION 2+70 TO 4+80)

Comments: SEE ATTACHED PROFILE (2 SHEETS)

SMITH ENVIRONMENTAL

Date: 8/28/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
330	748	24'.4"	280	1120	24'.7"	From 280 to 3
340	748	24'.6"	290	1121	22'9"	depth was N/
350	914	24'5"	300	1121	22' 6"	less than what
360	916	24' 0"	310	1122	24' 8"	was measured
370	916	24' 0"	320	1123	23' 3"	on 8/27/96.
380	1108	22' 11"	330	1124	24' 6"	Discussed with
390	1109	23' 4"	340	1125	23' 0"	OXY (Bob), Fluor
400	1111	23' 2"				SMITH (Murray) +
410	1149	23' 6"				GEOCON (Keith)
420	1335	22' 7"				- will check it o
430	1340	22' 2"				while placing ba
440	1343	23' 0"				or backfilling slurry w
450	1415	23' 0"				excavation for
460	1416	22' 5"				stations immedia
470	1550	22' 10"				preceding sta
480	1555	22' 10"				270. (NK)

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 8/28/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
3+40	745	64	—	45	15.5	Failed for Density
3+40	1049	64.3	—	45	18	
3+40	1054	64.3	—	—	—	
4+70	345	64.3	—	40	17.5	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
3+50	917	67.5	—	46	16	
4+00	1130	67	—	43	18.5	
4+70	330	67	—	42	16	
4+50	200	69.5	—	43	15.5	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
2+50	852	103	—	—	2 1/8"	Sample	Sample
2+50	1025	—	—	—	3.5"	Collected	Collected
3+00	1336	105	—	—	6"	by GZA	by GZA

One sample collected by GEO Con for permeability

Hydraulic Conductivity (1 per 500 LF)

Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 8/29/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	River	Geo-Con	Summit Park				5 in plant 140 batch
Quantity							3 Bags Bentonite B.F.

Summary:
LF today: 140 (from sta 4+80 → 6+20)
LF to date: 350 (from sta ~~4+80~~ 2+70 → 6+20)

Comments: Bucket on hoe was modified by adding more holes in order to drain the water. (8:30 A.M.)

SDMH #2 was Damaged today by Dozer

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 8/29/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
3+40	8:00	17'0"	3+90	10:32	17'10"	Tape
3+50	8:02	18'0"	4+00	10:33	18'5"	Tape
3+60	8:04	19'6"	4+10	~~10:34~~	~~17'10"~~	Tape G.S ke
3+70	8:07	20'0"	4+20	10:35	~~18'0"~~ G.S	Tape
3+80	8:09	20'0"	4+30	10:41	19'10"	Tape
3+90	8:10	23'4"	4+40	10:42	22'1"	Tape
4+00	8:11	24'9"	4+00	1:16	16'7"	To check from
4+90	8:13	24'3"	4+10	1:17	15'4"	4" "possible" slou
5+00	9:00	22'10"	4+20	1:22	15'10"	Tape
5+10	9:02	23'2"	4+30	1:23	16'6"	"
5+20	9:04	24'.0"	4+40	1:24	19'0"	"
5+30	10:27	22'0"	4+50	1:25	20'0"	"
5+40	10:28	21'6"	4+60	1:26	22'0"	"
5+50	11:19	21'10"	4+70	1:27	21'0"	"
5+60	11:19	21'9"	4+80	1:28	22'0"	"
5+70	1:03	21'9"	4+90	1:28	22'0"	"
5+80	1:04	21'7"	5+00	1:29	22'6"	"
5+90	1:06	21'1"	5+10	1:29	21'11"	"
6+00	1:44	19'0"	5+20	1:30	21'11"	"
5+70	2:19	21'4"	5+30	1:30	21'6"	
5+80	2:19	22'0"	5+40	1:31	21'9"	
5+90	2:19	22'0"	5+50	1:31	22'4"	
6+00	2:19	22'0"	4+30	2:15	15'0"	
5' overlap N	3:50	18'2"	4+40	2:16	15'5"	~~lost weight~~
5' overlap E	3:50	20'4"	4+50	2:17	16'0"	
6+00	~~3:50~~ 4:30	20'3"	4+60	2:18	17'0"	
6+10	4:34	18'0"	4+70	2:19	17'0"	
			4+80	2:20	17'8"	
			4+90	2:21	18'8"	
			5+00	2:22	22'0"	
			5+10	2:23	22'0"	
			5+20	2:24	21'0"	
			5+30	2:25	21'0"	
			5+40	2:27	22'0"	

Before BF toe

lug deeper

lost weight got new

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 8/29/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry

One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
~~3+50 - 5+00~~	8:15	64.5		40 set	19.5	
~~4+00 - 5+50~~	1:15	60.0		32	No Need	Plant will re-mix
~~4+00 5+50~~	3:30	63.0		37	No Need	Stopped pumping until 3 Plant will re-mix
~~4+00 5+50~~	3:45	65.0		60	13.5	
4+50 6+00	4:50	64.5		58	14.0	

Fail
Fail
Redo

In Trench Slurry

One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
5+00	9:15	66.5		43	14.5	
5+50	11:05	67		42	14.5	
6+00	1:50	64.3		40	14.5	

Backfill

One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
3+50	8:50	103			5"		
4+00	12:55	106			5.5"		
4+50	4:30	103			3.75"		

Hydraulic Conductivity (1 per 500 LF)

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 8/30/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	Niagara River	Geo-Con	Summit Park Clay				6 bags @ Batch plant
Quantity							3 bags @ Backfill

48 Batches

Summary:
LF today: 300' (Sta 6+20 through Sta 9+20)
LF to date: 650' (Sta 2+70 through Sta 9+20)

Comments: 22 Bags of Bentonite arrived today
HDPE Pipe arrived today

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 8/30/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
6+20	7:39	17' 4"	3+40	7:50	4' 5"	Morning
6+30	7:40	16' 11"	3+50		4' 5"	Depths
6+40	7:41	14' 1"	3+60		4' 10"	
6+50	7:50	15' 4"	3+70		6' 4"	
6+60	8:10	12' 9"	3+80		6' 8"	✓ Find Toe
6+70	8:30	12' 4"	3+90	7:59	7'9"	sta 5+50 11'5"
6+80	8:45	10' 2"	4+00		8'8"	sta 5+60 11'9
6+90	9:15	12' 0"	4+10		9'6"	sta 5+70 12' 1
7+00	9:16	11' 4"	4+20		10'7"	sta 5+80 12' 6
7+10	9:55	11' 6"	4+30	8:02	11'2"	sta 5+88 12'9
7+20	10:05	11' 6"	4+40	8:03	12'9"	sta 5+90 13'3
7+30	10:15	9' 11"	4+50	8:03	13'5"	Sta 6+00 14'1
7+40	10:16	11' 0"	4+60	8:04	13'4"	5' overlap E 16'
7+50	10:18	10' 10"	4+70		13'9"	5' overlap N 16'
7+60	10:30	11' 0"	4+80	8:05	14'7"	sta 6+10 17'10"
7+70	10:35	9' 7"	4+90		15'5"	sta 6+20 15'5"
7+80	11:00	9' 10"	5+00	8:06	16'10"	sta 6+30 16'8"
7+90	11:15	9' 1"	5+10	8:07	16'10"	Sta 6+40 13'4"
8+00	11:41	9' 1"	5+20	8:07	~~16'8"~~ 17'-2"	sta 6+50 14' 11
8+10	11:42	8' 4"	5+30	8:08	20'-3"	sta 6+60 11'9"
8+20			5+40		19'-7"	sta 6+70 10'9"
8+30			5+50		19'-9"	Sta 6+80 11'0"
8+40			5+60		19'-11"	Sta 6+90 11'2"
8+50			5+70		20'-0"	sta 7+00 10'0"
			5+80		20'-8"	sta 7+10 10'8"
			5+90	8:12	21'-6"	
			6+00		22'-3"	
			5' overlap E		21'-2"	
			5' Overlap N		19'-2"	
			6+10		18'-6"	
			6+20	8:30	16'-1"	

SMITH ENVIRONMENTAL

Date: 8/30/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
8+20	1:28	9'0"	5+70	1:18	9'6"	
8+30	1:29	9'0"	5+80	1:19	9'8"	
			5+90	1:20	10'0"	
			5' overlap E	1:20	15'6"	
			6+06	1:20	11'6"	
			5' overlap N	1:21	14'0"	
			6+05	1:22	~~16'0"~~	15'5"
			6+10	1:22	17'0"	
			6+20	1:23	15'0"	
			6+30	1:24	16'6"	
			6+40	1:25	13'0"	
			6+50	1:26	14'6"	
			6+60	1:31	12'0"	
			6+70	1:32	11'5"	
			6+80	1:32	11'0"	
			6+90	1:33	11'6"	hard bottom
			7+00	1:33	10'0"	" "
			7+10	1:34	10'6"	" "
			7+20	1:34	12'0"	" "
			7+30	1:34	11'0"	" "
			7+40	1:35	11'0"	" "
			7+50	1:35	10'0"	" "
			7+60	1:36	11'6"	" "
			7+70	1:36	9'8"	" "
			7+80	1:37	10'6"	" "
			7+90	1:38	9'6"	" "
			8+00	1:38	9'6"	" "
			8+10	1:39	10'0"	" "
			8+20	1:40	9'0"	

817 322 0559

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 7/30/20 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
6+50	8:50	64.5		49	15.5	
7+00	10:00	65		47	14	
7+50	10:30	66		41	16	
8+00	12:30	69		150	14.5	
8+50	2:10	65		41	17	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
6+50	8:59	65		44	16	
7+00	10:00	69		44	14.5	
7+50	10:30	68		43	16	
8+00	12:30	70		50	14	
8+50	2:10	71		45	14.5	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per ~~100~~ LF) Grain Size	(1 per 100 LF) Atterberg
~~3+40~~ 4+50	8:12	103		—	5"		
5+00	10:54	106			4.5"		
5+50	2:10	103			5"		

Hydraulic Conductivity (1 per 500 LF)

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 9/3/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				3 bags in Mix Plant: 24 bags
Quantity							5 bags @ Trench

Summary:

LF today: —

LF to date: 650 LF (STN 2+70 thru STN 9+20)

Comments:

DID NOT EXCAVATE TODAY (EXCAVATION > 100' ON 8/30/96)
7 - 8 AM SOUNDING (STN 6+50 to Stn 9+10)
8 - 11 AM EXCAVATE BOTTOM FROM STN 6+50 ONWARDS TO ACHIEVE 8/30 DEPTHS
8AM TO 5PM MIXING BACKFILL W/ BENTONITE AND SLURRY FROM BATCH PLANT
1230 TO 4PM PUMP SLURRY FROM TRENCH
- COULD NOT FROM 130 TO 230 DUE TO LACK OF BERM
- COULD NOT FROM 230 TO 315 SLURRY TOO THICK
GEOCON DID NOT HAVE TECHNICIAN TO PERFORM QA/QC TESTS - ALL DAY
SOUNDING DEPTHS DID NOT JIVE AT END OF DAY COMPARED TO DEPTH TAKEN IN AM. ~~WHICH~~ COULD BE DUE TO SLURRY ~~WALL~~ H_2O FLOODING IN BETWEEN BERMS ON EITHER SIDE OF TRENCH. (TRENCH ~~EDGES~~ COULD NOT BE SEEN). WILL HAVE TO CHECK DEPTHS 9/4/96 AFTER EXCAVATING BEYOND STN 9+20, i.e. after SLURRY MOVES INTO THE TRENCH BEYOND 9
BACKFILLED UPTO STN 7+50.

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 9/3/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
5+50	1041	105			4.5"		
6+00	250	103			5.5"		
6+50	430	107			4.25"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

Date: 9/3/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			~~7+50~~ 5+70	7:50	5'7"	
			5+80	7:51	6'7"	
			5+90		6'9"	
			6+00		9'7"	
			5' overlap E		9'8"	
			5' overlap N		7'0"	
			6+10		8'6"	
			6+20		9'4"	
			6+30		10'0"	
			6+40	8:02	12'6"	
			6+50	8:03	14'5"	
			6+60	8:04	11'5"	
			6+70	8:05	10'2"	
			6+80	8:06	10'3"	
			6+90		10'10"	
			7+00		9'6"	
			7+10		10'10"	
			7+20		~~12'4"~~	11'2"
			7+30	8:10	10'5"	
			7+40		10'11"	
			7+50		9'2"	
			7+60	8:11	10'10"	
			7+70		9'3"	
			7+80		9'8"	
			7+90	8:13	9'3"	
			8+00		9'0"	
			8+10		9'4"	
			8+20		~~9'8"~~	8'6"
			8+30	8:16	8'0"	
			8+40		8'0"	
			8+50		7'10"	
			8+60		7'10"	
			8+70		7'4"	
			8+80	8:21	8'10"	

SMITH ENVIRONMENTAL
102nd Street Landfill
Air Monitoring Log (Page ___ of ___)
Date: 9/3/96
Temperature: _____ AM _____ PM
Wind Direction: _____ AM _____ PM
Weather: _____ AM _____ PM

Activity(s) Description:
1
2 Soundings
3
4
5 9/3/96
6

Location	Time	OVM (ppm)	FID (ppm)	Comb	% O_2	CO (ppm)	H_2S (ppm)	Equip.	Logged By
				640	1015	12'8"		850	1046 9
			End of Backfill	650	1015	~~13'4"~~	14'6"	860	1048 9
				660	1015	11'11"		870	1049 9
				670	1016	12'6"		880	1051 9
				680	1016	11'6"		890	1052 10
				690	1017	10'5"		900	1054 10'
				700	1019	10'7"		910	1058 10'
				710	1020	12'0"			
				720	1021	12'0"			
				730	1022	11'0"			
				740	1023	11'6"			
				750	1024	10'5"			
				760	1025	11'5"			
				770	1026	11'7"			
				780	1030	10'0"			
				790	1031	10'5"			
				800	1032	9'10"			
				810	1039	10'2"			
				820	1041	9'7"			
				830	1043	9'3"			
				840	1045	9'5"			

Equipment:
1. FID Serial # 40425
2. OVM Serial # B-15-32
3. MiniRam Serial # SAO713
4. MiniRam Serial # SAO4400
5. MiniRam Serial # SAO718
6. OVM Serial # B-15-02
7. GilAir Personal Pump Serial # SAO398
8. Passport Serial # PASCOI #2
9. GilAir Personal Pump Serial # SAO351
10. GilAir Personal Pump Serial # SAO388

Note: Soundings were plotted on master graph as the new excavated depths for these stations. These depths were taken after cleaning the trench.

9/3/96

SOUNDING @ END OF DAY

7+50	TOP@GS
7+60	-1.0'
7+70	~~-3.6"~~ 5mm -3,5"
7+80	-3,9"
7+90	4'11"
8+00	5'5"
8+10	7'5" 4:41 PM 9-03-96
8+20	8'1"
8+30	10'9"
8+40	10'8"/10'9"
8+50	11'0"
8+60	9'10"/9'9" SCOUR IN AREA * SUSPECT * 4:45 PM 9-03-96
8+70	10'8"
8+80	10'10"
8+90	11'6"
9+00	12'0"
9+10	12'5"
9+20	// END OF EXCAVATION - "BACKHOE IDLE"

Note: Inaccurate Sounding due to flooding of trench (These depth's were not plotted on graph

Checked by Smith RPP
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 9/4/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	NIAGARA RIVER	GEOCON	SMITH				5 bags = 40 batches @ M
Quantity							6 bags in backfill

Summary:

LF today: 360 LF
LF to date: 1000 LF

Comments:

Start excavation @ 730 AM @ STN 9+20
Start Mixing Backfill @ 730 AM @ STN 9+30
Check depth w/ PVC Pipe by Bobby @ 10 30
Meeting w/ SMITH, GEOCON, OXY OLIN, FLOUR * FROM 1130 TO 1205 PM AT STATION 10+
Cleaned bottom @ 1230 pm From STN 10+10
Toe of slope @ 1200 = 11+10
Toe of slope @ 1618 = 12+00

Top of Backfill = 11+30 @ 1600 PM
End of Excavation: 12+80 @ 430 pm

Pete (GEOCON) Testing FOR TESTING GORDON — 1 hr
Jamie (GEOCON) Testing from 315 pm. GARY (GZA) 5 hrs.
MURTHY — 9 hrs.

- GEOCON UTILIZING SURVEYOR'S ROD TO CHECK DEPTH. @ 1 PM.

Persons present:
Nels Smith
Howard "
Murthy "
Pete "
Gary OXY
Bob OXY
Tom OXY
Ra' Olin
Su Flour
Joe Flour
Carlton Kajima
Pete GeoCon
Tim GeoCon

* AT N/1045 AM Bob (OXY) requested KEITH (GEOCON) TO EXCAVATE MATERIAL THAT SLOUGHED INTO THE TRENCH @ STA 10+10 ONWARDS. KEITH DID NOT WANT TO DO THAT BECAUSE ACCORDING TO KEITH, GEOCON REACHED THE REQUIRED DEPTH. A MEETING TOOK PLACE WITH THE FOLLOWING TOPIC'S DISCUSSED & conclusions

TOPIC	conclusion
— SLOUGHING	— GEOCON TO REMOVE SLOUGHED MATERIAL FROM TRENCH EDG
	— KEEP EDGES (MIN 3') CLEAN AND SURFACE SMO
— SLURRY	— CAN USE SLURRY FROM WITHIN TRENCH TO MIX W/ BA
	AT NORTH PERIMETER
— BACKFILL	— TESTS AS SPECIFIED TO BE DONE BY GEOCON
	NO FOREIGN MATERIAL TO BE PLACED IN BACKFILL MASS

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 9/4/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
9+00	10 20	64.5		40	12.5	
9+50	11 10	65		42	16	
10+00	120	66.7		40	15	
10+50	151	71		54		TESTS WILL BE PERFORMED ON 9/5/96
11+00	215	65		42		
11+50	347	67		41		
12+00	409	64		41		
12+50						

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
9+00	907	65		48	13.5	Slurry in Trench from 8/3
9+50	1046	70		59	18	
10+00	1115	72		62	16	
10+50	120	72		53	10.5	
11+00	130	72		65	17	
11+50	220	72		64		TESTS TO BE PERFORMED ON 9/5/96
12+00	359	80		60		
12+50	440	77		63		

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
750	835	105.0			6.0"		
750	850	102.0			5.5"		
800	1011	105.6			4.0"		
850	1045	105.0			4.0"		
900	1130	105.7			3.5"		
950	1340	—	COLLECTED SAMPLE IN BAG		1.5"	FAIL	
950	1555	103			4.5"	RETEST + PASS	
1000	1610	103			3.5"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

Date: 9/4/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
~~1080~~	742	10'8"	~~[illegible]~~0			
~~1~~930	748	10'7"	7+90	817	3'	
9+40	808	11'	8+00	818	3' 8"	
9+50	810	10' 9"	8+10	818	4'	
9+60	812	10' 8"	8+20	819	4' 7"	
9+70	835	11' 0"	8+30	819	6'	
9+80	836	11' 0"	8+40	820	7' 7"	
			8+50	822	9' 2"	
9+90	855	11' 5"	8+60	823	8' 8"	
10+00	856	11' 0"	8+70	824	9' 1"	
10+10	900	11' 5"	8+80	825	10'	
10+20	912	11' 1"	8+90	826	~~8' 11"~~	10+12 " ~~@ 855 11'~~
1030		10' 10"	9+00	827	~~10' 8~~"	
1040		10' 10"	9+10	828	10' 9"	
1050		10' 8"				
1060		10' 10"				
1070		10' 7"				
1080		10' 6"				
1090		10' 3"				
1100		10' 7"				
1110		10' 3"				
1120		10' 0"				
1130		10' 3"		Note:	Measurements taken	
1140		10' 2"			with weighted	
1150		10' 1"			Tape in inches.	
1160		9' 7"				
1170		10' 5"				
1180		9' 6"				
1190		10' 0"				
1200		9' 7"				
1210		~~10' 4"~~	11' 2" NW			
1220		9' 7"				
1230		~~9' 6"~~	10' 2" NW			
1240		~~9' 6"~~	10' 0" NW			

SMITH ENVIRONMENTAL

Date: 9/4/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
1250		10'2"				
1260		10'7"				
1270		10'0"				
1280		9'7"	—— TO BE REEXCAVATED 9/5/96 AM			
			END OF DAY DEPTHS			
		★	11+30	TOP OF BACKFILL		
			11+40	434	~~3'6"~~	3.6'
			11+50		~~5'0"~~	5.0'
			11+60		~~5'0"~~	5.0'
			11+70	436	~~6'4"~~	6.4'
			11+80		~~7'0"~~	7.0'
			11+90		~~8'4"~~	8.4'
			12+00	9.0'	~~9'0"~~	TOE OF SLOPE
			12+10		~~11'2"~~	11.2'
			12+20		~~9'7"~~	9.7'
			12+30	440	~~10'2"~~	10.2'
			12+40		~~10'0"~~	10.0'
			12+50		~~10'2"~~	10.2'
			12+60		~~10'7"~~	10.7'
			12+70	442	~~10'0"~~	10.0'
			12+80		—— REEXCAVATE.	
		★ Note: Measurements were taken				
			with surveyors rod in tenths			
			not in inches.			

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 9/5/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				6 Bags = 48 batches in mix plant
Quantity							6 Bags in backfill

Summary:

LF today: 270 LF
LF to date: 1270 LF

Comments:

START EXCAVATION @ 730 @ STN 12+80
START BACKFILL MIXING @ 730 @ STN 11+50
CHECK DEPTHS W/ SURVEYORS ROD @ 730.
BUTT WELDING SLURRY SUPPLY PIPE @ 1045 AM to 145 PM
INDICATED TO NELS & RICKIE — NEED MORE GUMBO
— 5 TRUCKS TO DELIVER.
EXCAVATED UP TO 1440 @ 1115 AM
NOT EXCAVATING SINCE 11 AM = NO SLURRY FROM BATCH PLANT
— WELDING PIPE
11-15 MIXING SLURRY IN TRENCH W/ BACKFILL AND LAST OF SLURRY FROM BATCH PLANT.
TOE OF SLOPE OF BACKFILL = STN 13+50 @ 1145 AM
START EXCAVATION @ STN 14+20 @ 145 PM
TOE OF SLOPE OF BACKFILL @ STN 13+70 @ 1500 hrs.
END EXCAVATION FOR THE DAY @ 4PM @ STN 15+50
TOP OF BACKFILL @ STN 14+30
TOE OF BACKFILL @ STN 15+10.

Mike Smith

QA/QC
TESTING:
GALY (GZA) 7 hrs
MURPHY (SMITH) 4 hrs
JAMIE (GEOCON) 9 hrs

SMITH ENVIRONMENTAL

Date: 9/5/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry

One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
12+50	845	66	—	42	11	11:29-11:50
13+00	936	65	—	47	14.5	1:41-2:11
13+50	1042	67	—	46	13.5	1:44-2:14
14+00	1059	67	—	45	14.0	2:16-2:46
14+50	158	65	—	45	15.5	2:44-3:04
15+00	300	~~Filtrate~~ → 66.5		40	10.5	3:18-3:48
10+50	940	17.0				
11+00	1047	12.5				
12+00	1052	16.0				
11+50	1119	14.0				

M 9/6

In Trench Slurry

One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
13+00	915	67	—	48	14	2:16-2:46
13+50	836	73	—	51	16	10:55-11:25
14+00	845	73	—	51	15.5	11:21-11:51
14+50	200	75	—	53	12.0	2:50-3:10
15+00	300	74.2	—	62	15.0	3:17-3:47
15+~~50~~	349	73.5	—	51	15.5	3:52-4:22
		Filtrate				
11+50	835	20				
12+00	920	15				
12+50	1000	14				

M 9/6

Backfill

One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
10+50	840	104			3.5		
11+00	845	103			3.5		
11+50	905	103			4.5		
12+00	1111	~~106~~ 105			4.0		
12+50	1118	106			4.5		
13+00	215	104.5			4.0		
13+50	255	106			4.5		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

Date: 9/5/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
1280	758	10.8	1140	750	3.2	
1290		9.6	1150		4.8	
1300		9.2	1160		5.5	
1310		9.6	1170		6.0	
1320		9.3	1180		7.0	
1330		9.2	1190		8.2	
1340	851	9.0	1200		9.2	
1350		9.5	1210		11.0	
1360		9.5	1220		9.2	
1370		9.2	1230		10.2	
1380		8.9	1240		9.8	
1390		9.0	1250		10.5	
1400	1020	8.8	1260		10.2	
1410		8.7	1270		10.4	
1420	140	8.9	1280	758	10.8	
1430	142	9.0				
1440	148	8.7				
1450	152	8.6				
1460	206	8.9				
1470	216	9.0				
1480	230	9.3				
1490	235	9.8				
1500	240	9.8				
1510	300	9.9				
1520	310	[illegible]				
1530	315	[illegible]				
1540	340	[illegible]				
1550	400	10.3				

SMITH ENVIRONMENTAL

Date: 9/5/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			1430	407		Top of backfill
			1440	407	1.7	
			1450		4.6	
			1460		4.0	
			70		5.5	
			80		7.4	
			90		8.2	
			1500		8.7	
			1510		9.2	Top of backfill
			1520		9.5	
			1530		9.0	
			1540		9.5	
			1550	411	10.3	End of Excavation

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 9/6/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				5 BAGS @ BATCH MIX
Quantity							=40 BATCHES
							4 BAGS @ BACKFILL

Summary:
LF today: 290 LF (STN 15+60 TO STN 18+30)
LF to date: 1560 LF (STN 2+70 TO STN 18+30) TMC

Comments:
730 AM START MIXING BACKFILL
805 AM START EXCAVATION @ STN 15+40
1238 PM TOP OF BACKFILL = STN 15+10
1238 PM START EXCAVATION = STN 16+70
1300 PM TOE OF BACKFILL = STN 16+10
1400 PM TOE OF BACKFILL = STN 16+50
1330 PM - SMITH INSTALLING STEEL PLATES, STONE, GEOTEXTILE @ STN 8+70 OVER SLURRY WALL FOR ACCESS TO SITE.
1550 PM - TOP OF BACKFILL @ STN 16+00
1630 PM - TOP OF BACKFILL @ STN 16+30
1644 PM - TOE OF BACKFILL @ STN 17+60
1644 PM - END OF EXCAVATION @ STN 18+30
EXCAVATION AREA FENCED.

Mike Gingerhart

QA/QC TESTING:
GARY (GZA) = 2 hrs
MULLIN (SMITH) = 2 hrs
JAMIE (GEOCON) = 10 hrs

9-6-96 MEJ

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: ~~9-5-96~~ JRA Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
15+50	908	64.5		40	15.5	9:00 - 9:30
16+00	910	65		41	16	9:01 - 9:32
16+50	104	67		50	12	1:06 - 1:36
17+00	130	65		42	16.5	2:36 - 3:06
17+50	245	65		40	18	3:42 - 4:12
18+00	430	64		40	18	4:48 - 5:18

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
16+00	940	68		40	17	9:35 - 10:05
16+50	1050	66		42	17	10:47 - 11:17
17+00	132	70		41	21 @ 52 min	1:41 - 2:33
17+50	247	70.5		44	17	3:09 - 3:39
18+00	355	71		47	16.5	4:16 - 4:46

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
14+00	639	103			5"		
14+50	1025	105			3.5"		
15+00	126	105			4"		
15+50	210	104.5			4"		
16+00	430	104			3.5"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

Date: 9/6/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
15+20	800	10.0	14+40	755	3.0	
15+30	802	9.5	14+50		3.4	
15+40	803	9.6	14+60		3.6	
15+50	804	10.3	14+70		5.4	
15+60	834	10.1	14+80		7.2	
15+70	834	10.5	14+90		9.7	
15+80		10.6	15+00	758	8.6	
15+90		10.7	15+10		9.5	Toe of backfill
16+00	1010	10.9	15+20		10.0	
16+10		10.7	15+30		9.5	
16+20	1026	11.0	15+40	803	9.5	
16+30		10.7				
16+40		11.0				
16+50		10.5				
16+60		10.4				
16+70	1118	10.6		END OF DAY		16+30 TOP OF BACKFILL
16+80		10.8	16+40	433	1.8	
16+90		10.6	16+50		3.8	
17+00		10.6	16+60		4.0	
17+10		10.5	16+70		4.7	
17+20		10.6	16+80		5.7	
17+30		10.8	16+90		5.5	
17+40	231	11.0	17+00		5.8	
17+50	235	11.2	17+10		6.3	
17+60		11.9	17+20		7.9	
17+70		12.1	17+30		10.3	
17+80		11.7	17+40		10.6	
17+90		11.0	17+50		11.0	
18+00	353	11.8	17+60		11.9	TOE OF SLOPE
18+10		10.9	17+70		12.0	
18+20		10.9	17+80		11.6	
18+30	423	10.4	17+90		10.9	
			18+00		11.7	
			18+10		10.7	END OF EXCAVATION
			18+20		10.2	
			18+30	1644	10.0	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 9/7/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source							
Quantity							

Summary:

LF today: 0

LF to date: 1560LF (STN. 270 TO STN 1830)

Comments: GEO CON'S CREW ON-SITE.
NO ACTIVITIES (EXCAVATION OR BACKFILLING)
@ 11 AM - 11 BAGS (4000 POUNDS EACH) WERE
UNLOADED. (BENTONITE).

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 9/9/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				1 bag @ Batch Plant = 8 Batches
Quantity							3 bags in backfill

Summary:
LF today: 80 (FROM STN 1830 TO STN 1910)
LF to date: 1640 (FROM STN 270 TO STN 1910)

Comments:
7 30 AM : SMITH GRADING FROM STATION 18+50 ONWARDS W/ DOZER TO REMOVE TOP 6" TO ENABLE TRUCKS TO PC300LC BACKHOE (GEO-CON'S) TO GET LOADED W/ SPOILS FROM SLURRY WALL EXCAVATION. THIS WAS NECESSARY DUE TO OVERNITE RAIN, COURTESY HURICANE FRAN.
730 AM: GEO CON MIXING BACKFILL GUMBO @ AROUND STATION 16+50.
8 00 AM: SOUNDINGS PERFORMED ~~SLOPE~~ TOE OF BACKFILL @ STN ~~16~~ MK) 17+60.
1030 AM: SMITH PUSHING SCRAPED SOIL W/ DOZER ON TOP OF LANDFILL SLOPE, i.e. SOUTH OF NORTH PERIMETER SLURRY WALL @ AROUND STATION 19+50
ALSO GEO CON LOADING MATERIAL IMMEDIETLY NORTH OF GUMBO PILES INTO CERRONE'S TRUCKS - TO BE DISPOSED OF ON TOP OF LANDFILL.
SLURRY NOT BEING PUMPED FROM 7AM TO 130PM
BATCH MIX CREW WELDING STONE PIPE FROM 9AM TO 12 NOON FROM BATCH MIX
NOT MIXING FROM 1030 AM ONWARDS.
900 AM SMITH'S SURVEYORS CHECKED GRADE FROM STN 1830 ONWARDS. DEPTH TO BE EXCAVATED WAS LOWER COT 6" BECAUSE NO 6" WAS SCRAPED OF FROM TOP TO MAKE A DRIVABLE SURFACE.
12 1250 PM GRADING BACKFILL FROM OTHER SOURCES SPREAD OUT ON SCRAPED AREA BY SMITH. ALSO ROLLING W/ SMOOTH DRUM.
1255 PM START EXCAVATION @ STN 18+40 MIXING BACKFILL. SLURRY FROM MIX @ 145PM.
1110 PM END EXCAVATION & BACKFILL MIXING ACTIVITIES FOR THE DAY

Uncontaminated.

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 9-9-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry

One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
18+50	243	65		42	15.5	

In Trench Slurry

One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
18+30	1015	70.5		50	16	
18+50	150	71		51	16	
19+00	247	73		51	16.5	

Backfill

One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
16+50		105			4"		
17+00		104.5			5"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 9/9/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
18+30 ~~16+20~~	1319	10.5	16+20	TOP OUT		
18+40	1326	10.9	16+30	800	0	TOP of BACKFILL
18+50	1330	10.3	16+40		1.5	
18+60	1358	10.9	16+50		1.7	
18+70		10.6	16+60		3.0	
18+80		9.6	70		4.2	
18+90		10.0	80		5.1	
19+00		10.0	90		5.6	
19+10	245	10.0	17+00		6.1	
			10		6.8	
			20		8.1	
			30		9.7	
			40		10.8	
			50		11.6	
END OF DAY			60		11.6	
~~18+80~~			70		11.4	
17+40	TOP OF	BACKFILL	80		11.0	
50	245	3.0	90		11.1	
60		3.4	18+00		10.8	
70		5.0	10		11.4	
80		5.0	20		11.5	
90		5.3				
1800		5.4				
+10		6.1				
20		6.7				
30		7.1				
40		8.8				
50		9.5				
60		11.2				
70		9.5				
80		10	TOE OF SLOPE			
90		9.4				
1900		10				
10	255	10				

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 9/10/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				6 bags @ mix plant
Quantity							= 48 batches
							5 bags @ backfill

Summary:
LF today: 300 (STN 1910 TO STN 2210)
LF to date: 1940 (STN 270 TO STN 2210)

Comments: START EXCAVATION AT 746 AM
START MIXING BACKFILL AT 720 AM
SOUNDINGS AT 730 AM
START SLURRY FROM BATCH PLANT @ 830 AM
840 AM STOPPED EXCAVATION @ STN 19+80
DUMP TRUCKS GETTING STUCK IN CLAY WHILE HAULING SPOILS
NELS ON-SITE. ORDERING FOR STONE. BUILDING RAMP.
SMITHS DOZER MOVING DUMPED SPOILS @ NW CORNER OF landfill. SMITHS PC400LC PICKING UP SPOILS AND DUMPING INTO EXCLUSION ZONE. CERRONE'S 2 TRUCKS HAULING SPOILS. 2 loads of STONE DELIVERED FROM 1100 TO 1140 AM TO CONSTRUCT RAMP
RE START EXCAVATION AT 900 AM.
SHIPMENT OF BENTONITE ARRIVED ON-SITE @ 915 AM
TOP OF BACKFILL @ 1035 @ STN 18+80
TOP OF BACKFILL @ 1140 @ STN 19+20
TOP OF BACKFILL @ ~~1480~~ 115PM @ STN 19+60
@ 145PM STN ~~20+20~~ 21+20 TO 22+10 @ DEPTH OF 2'-6' RUBBER/ + MISC. DEBRIS ENCOUNTERED.
SLURRY CARRYING LINE BUSTED AT AROUND NE Corner of exclusion Zone. @ 230 PM. FIXED IT BY 315PM.
TOP OF BACKFILL @ 335PM @ STN 20+20
END EXCAVATION @ 430PM @ STN 22+10

QA/QC Testing.
Murthy - 2 hrs
Geza - 3 hrs
Jamie (GEOCON) - 6 hrs.

Page __ of __

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 9-10-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
19+00	840	66		44	13	
19+50	845	66		45	13.5	
20+00	~~955~~ 1040	65.5		49	12.5	
20+50	1200	65		50	12	
21+00	113	66		41	16	
21+50	405	64.5		55	16	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
19+50	814	73		55	17.5	
20+00	935	72		52	17	
20+50	1210	74		65	18.5	
21+00	120	75		67	20.0	
21+50	414	73		64	17.5	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
17+50	803	104			5"		
19+00	925	103			5"		
19+50	1120	103			5.0"		
19+00	1135	104			5.25		
19+50	125	101			5.5"		
20+00	240	103.5			4.5"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 9/10/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
19+10	740	10.0	17+40		TOP OF BACKFILL	
19+20	"	9.5	17+50	731	3.0	
+30	"	9.4	17+60	"	3.4	
+40	"	10.0	+70	"	4.5	
50	↓	10.0	80	"	4.2	
60	840	9.5	90	"	5.4	
70	910	10.0	1800	"	5.6	
80	915	9.8	10	"	6.1	
90	1007	10.3	20	"	6.6	
2000	1010	10.0	30	"	~~5.0~~ 7.2 TOP OF SLOPE JMM	
2010	1024	9.9	40	"	8.6	
20	1032	10.2	50	"	10.5	
30	1052	10.6	60	"	11.0	
40	1059	10.6	70	"	9.3	
50	1115	11.0	80	"	9.6	TOE OF BACKFILL
60	1125	11.0	90	"	9.6	
70	1141	11.2	1900	↓	10.1	
80	1256	11.1	1910	740	10.0	
90	1304	11.3				
2100	1339	11.7		END OF DAY		
10	1342	11.4	2100	TOP OF BACKFILL		
20	1415	11.8	2110	427	3.0	
30	1416	11.9	20	"	4.4	
40	1420	12.0	30	"	4.4	
50	1542	12.2	40	"	5.8	
60	1544	11.9	50	"	7.4	
70	1546	11.5	60	"	8.3	
80	~~1600~~ 1600	~~11.8~~ 11.3	70	"	9.0	TOE OF SLOPE
90	1600	11.8	80	"	11.6	
2200	1621	11.3	21+90	"	11.4	
2210	1622	11.2	2200	↓	11.2	
END OF EXCAVATION			2210	431	10.7	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 9/11/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				6 BAGS @ BATCH MIX
Quantity							= 48 BATCHES

5 BAGS @ BACKFILL

Summary:
LF today: 230 LF (STN 2210 TO STN 2440)
LF to date: 2170 LF (STN 270 TO STN 2440)

Comments: START EXCAVATION @ 745 AM. START BACKFILL MIXING @ 730 AM
SOUNDINGS DONE BY BOTH GEOCON & FLUOR.
SMITH GRADING ACCESS PATHWAYS & CERRONE DUMP TRUCKS HAULING SPOILS
TOP OF BACKFILL @ 1010 AM @ STN 21+60
STN 22+30 TO 24+40 @ DEPTHS FROM 2' TO 6' MUNICIPAL
GARBAGE (BOTTLES + BROKEN GLASS) ENCOUNTERED.
DOZER DURING BACKFILLING TRENCH FELL INTO TRENCH
@ STN 21+50 TO 21+70.
TOP OF BACKFILL AT 1145 AM @ STN 22+10
TOP OF BACKFILL AT 210 PM @ STN 22+90
END OF EXCAVATION @ STN 24+40 = TOE OF SLOPE
TOP OF BACKFILL AT STN 23+10.

MK Zygmunt

QA/QC Testing:
MURTHY: 2 hrs
GAZA: 4 hrs
JAMIE: 10 hrs.

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 9-11-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
22+00	801	64.5		41	15.5	
22+50	1250	66		42	15.0	
23+00	1253	65.5		41	14.0	
23+50	210	66		1 min 05 sec	13.5	
24+00	339	64.5		42	16.5	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
22+00	806	72		1 min 18 sec	18	
22+50	1022	71		1 min 40 sec	17.5	
23+00	1100	73.5		1 min 22 sec	18.5	
23+50	215	69		58 sec	16.0	
24+00	331	70.5		56 sec	15.5	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
20+50	912	103			5.5"		
21+00	938	104			4.75"		
21+50	920	104.5			4.5"		
22+00	1000	105			4.0"		
22+50	132	102.5			3.75"		
23+00	245	104			4.0"		
23+50	358	102			4.25"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 9/4/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
2220	820	11.3	2110	745		TOP OF BACKFILL
30	830	10.6	2120	746	3.0	CHECK BY
40	850	11.0	2130		4.0	FLUOR
50	905	11.0	2140		5.3	
56	10.00	10.7	2150		6.6	
5' key 2256 East	1020	11.9	2160		7.1	
5' key 2256 North	1026	11.8	70		7.5	
60	1036	10.5	80		9.6	
70	1038	10.8	90		11.5	
80	1105	9.6	2200		10.9	
90	1105	9.7	2210	751	9.4	
2300	1130	9.6				
10	1135	9.7	2110	720	1.9	BY GEOCON
20	1249	10.0	20		3.6	
30	1253	9.8	30		4.8	
40	124	10.8	40		5.7	
40	200	~~10.2~~ 11.2 NLO	50		7.0	
50	|	13.3	60		8.0	
60	|	16.7	70		8.9	
70	↓	17.2	80		11.1	
80	230	19.3	90		11.3	
90	231	20.5	2200		11.3	
2400	233	21.2	2210	730	11.0	
2410	353	23.2	2310	TOP OF	BACKFILL	
2420	354	23.3	20	425	4.0	
2430	415	23.1	30	|	4.8	
2440	416	23.0	40	|	5.7	
~~2450~~ NLO	END OF EXCAVATION		50	|	7.4	
			60	|	10.0	
			70	|	10.0	
			80	|	12.5	
			90	|	13.3	
			2400	|	14.8	
			10	|	15.5	
			20	↓	17.1	
			30		17.6	

THESE DEPTHS DIFFER FROM DESIGN DEPTHS. OKayed by Fluor + OKY on site

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 9/12/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

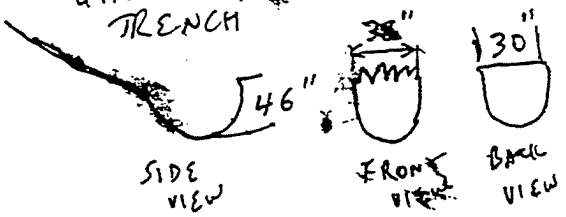
	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				5 bags @ MIX
Quantity							=40 batches
							6 bags @ backfill

Summary:

LF today: 100 LF (STN 2440 TO STN 2540)
LF to date: 2270 LF (STN 270 TO STN 2540)

Comments: START EXCAVATION @ 8:15 AM. ALSO START MIXING BACKFILL ADJACENT TO ~~EAST~~ WEST FENCE. LATE START DUE TO LIGHTNING
SOUNDINGS @ 7:30 AM INDICATED SLOUGHING. GEOCON SCRAPED 6" TO 1' TO GET DOWN TO 9/11/96 DEPTHS AND REMOVED SLOUGHED MATERIAL. RESOUNDED TO CHECK DEPTH @ 8:30 AM.
SMITH - ONE HOE AND ONE DOZER TO GRADE/RE-
SPOILS FROM TRENCH AND PLACE IT IN THE LANDFI
ENCOUNTERING MUNICIPAL FILL FROM N2' TO 6' FROM
STN 2440 ± 0 SNN DURING EXCAVATION OF TRENCH
STOPPED EXCAVATION @ 10:45 AM GEOCON WELDING PIPE FOR
SLURRY FROM BATCH PLT.
TOP OF BACKFILL AT 11:30 AM @ STN 2380
STOPPED EXCAVATION AND BACKFILLING ACTIVITIES AT
2:40 PM (LIGHTNING)

DIMENSIONS OF BUCKET UTILIZED FOR EXCAVATING TRENCH



QA/QC Testing:
JAMIE = 8 hrs.

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 9-12-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
24+50	900	64.5		46	15	
25+00	101	65.0		40	16.5	
25+50						

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
24+50	908	72.5		54	18.5	
25+00	107	72.0		55	19	
25+50	325	71.0		50		TEST ON 9/13/96

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
24+00	922	103.5			4.0"		
~~24+50~~							

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 9/12/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
2440	950	23.6	2320	730	3.2	
50	1060	23.5	30		3.0	
60	1130	23.0	40		4.9	
70	1131	23.0	50		6.5	
80	1131	23.5	60		8.4	
90	1132	24.5	70		9.3	
2500	115	23.5	80		11.2	
2510	150	24.5	90		11.[illegible]	NEED TO REM
20	150	24.5 MCS	93		11.[illegible]	SLOUGHED MATE
30	210	24.6 2500	2400		12.8	
40	210	24.6	10		12.7	
			20		15.2	
			30		15.0	
			40	745	[illegible]	
			2355	849	8.6	70 4.5
			70		13.0	80 5.5
			80		12.8	90 6.5
			85	850	13.4	2400 7.3
			90		14.3	10 9.0
9-6-96 SOUNDINGS @ 2:14 PM			2400	857	15.5	20 10.0
23+30	213	4.5	10		17.0	30 11.
23+90	214	5.2	20		14.5	40
24+00	215	10.0	30		15.6	50 12.2
24+10	215	9.8	40		14.1	
24+20	216	11.0	2350	857		TOP OF FILL
24+30	217	11.5	60		9.0	
24+40	219	12.0				SEE PAGE 2 OF 2
24+50	220	12.5				
24+60	221	13.8				
24+70	222	13.3				
24+80	224	17.0				
24+90						

23+50 SLOUGH 2:12 PM REMOVED BY CLAM @ 2:30 PM

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 9/12/96 Job #: 96-01.

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END	OF DAY		
			2350	TOP	OF BACKFILL	
			60	357	2.0	
			70		4.5	
			80		5.5	
			90		6.5	
			2400		8.0	
			10		9.0	
			20		10.0	
			30		11.0	
			40		11.5	
			50		12.2	
			60		12.8	
			70		13.8	
			80		14.5	
			90		17.3	
			2500		17.5	
			10		18.8	
			20		20.2	
			30		20.2	
			40		18	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 9/13/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				0 BAGS @ BATCH MIX
Quantity							= 0 BATCHES

4 BAGS @ BACKFILL

Summary:
LF today: 50 LF (STN 2540 TO STN 2590)
LF to date: 2320 LF (STN 270 TO STN 2590)

Comments: STARTED TO CLEAN OUT TOP 6" TO 12" OF SLOUGHED BACKFILL MATERIAL @ STN 24+80.
STARTED EXCAVATION @ 8:00 AM @ STN 25+40
STARTED BACKFILL MIXING @ 8:30 AM @ STN 2370.
COMPLETED EXCAVATION OF TRENCH @ 10:40 @ STN 2590 FOR THIS PHASE OF SLURRY WALL INSTALLATION.
GEOCON FENCED AREA (SNOW FENCE) AND QUIT WORK AT SLURRY WALL @ 11:15 AM.
SMITH - ONE OPERATOR ON BACK HOE } TO LOAD/REMOVE
ONE OPERATOR ON DOZER } EXCAVATED SPOIL
S/A/S/C: JAMIE (GEOCON) 4 hrs.

Page __ of __

SMITH ENVIRONMENTAL

Date: 9/13/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
~~24+50~~			2360	TOP OF BACKFILL		
25+50	845	24.5	70	730	4.0	
25+60		25.0	80		5.0	
70		25.0	90		6.0	
80	↓	26.0	2400		7.4	
90	1025	26.0	10		8.0	
TEMPORARILY STOPPED			20		9.4	
SLURRY WALL EXCAVATION			30		10.8	
@ STN 25+90.			40		11.3	
GEOCON WILL RESUME			50		12.2	
AFTER APL TRENCH			60		12.8	
IS COMPLETED.			70		13.3	
			80		13.7	
			90		12.6	
			2500		13.3	
END OF EXCAVATION SOUNDINGS			10		12.5	
24+60	TOP OF BACKFILL		20		11.5	
70	1053	2.0	30	↓	15.0	
80		4.2	40	745	12.0	
90		8.2				
2500		8.6				
10	↓	9.4				
20	1100	10.0				
30		11.2				
40		13.8				
50		10.3				
60		9.0				
70		12.6				
80		10.8				
90	↓	13.2				

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/15/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				7 BAGS BENTONITE IN BATCH MIX. 1 BAG FOR BACKFILL
Quantity							

Summary:
LF today: 30 (STN 2590 TO STN 2620)
LF to date: 2350 (STN 270 TO STN 2620)

Comments:
SMITH PREPARING PAD NW SIDE OF SITE FOR BACKFILL MIX OPERATIONS.
GUMBO BEING UNLOADED BY HASLEY TRUCKS ALONG SIDE SLURRY WALL TO BE EXCAVATED.
COMPLETED PAD BY 12 NOON.
GEOCON EXCAVATED BACKFILL IN TRENCH FROM 930 TO 1145 AM. ALONG THE LENGTH OF THE SLOPE SOUNDINGS @ 1245 PM AND 130 PM. BETWEEN THIS TIME FROM STN 25+40 TO 25+80 THE BACKFILL WAS REMOVED TO THE EXCAVATED DEPTH.
STARTED TO PUMP SLURRY FROM BATCH MIX @ 1245. COULD NOT REPUMP UNTIL 330 BECAUSE OF BUST IN SLURRY CARRYING PIPE.
130 PM OXY & FLOUR OKeyed REMOVAL OF EXISTING BACKFILL IN TRENCH. GEOCON CAN PROCEED EXCAVATING BEYOND STN 25+90.
STARTED EXCAVATING BEYOND STN 25+90 @ 330 PM.
GEOCON STARTED MIXING GUMBO + BENTONITE SLURRY STARTING @ STN 24+60.
GEOCON ALSO DEVELOPING APL TRENCH &
DECONTAMINATING EQUIPMENT USED FOR APL TRENCH OPERATIONS.

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10-15-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry

One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
26+00	112	65.0		42 sec	16.5	

In Trench Slurry

One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
26+00	415	~~87~~ 67		47 sec	17	

Backfill

One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
26+00							

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/15/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
25+90	355	27'0"	24+60	1245	4'-9"	4.75'
26+00	415	27'0"	70		5'-5"	5.42'
26+10	425	27'0"	80		6'-1"	6.08'
26+20	440	27'0"	90		5'-9"	5.75'
			2500		10'-3"	10.25'
GEOCON HAD TO			10		12'-4"	12.33'
EXCAVATE DEEPER			20		11'3"	11.25'
THAN DESIGN DEPTHS			30		10'7"	10.58'
TO GET THE 3' KEY.			40		11'2"	11.17'
OKeyed BY OXY &			50		11'3"	11.25'
FLUOR.			60		12'0"	12.0'
			70		12'10"	12.83'
			80	↓	15'2"	15.17'
			90	1256	12'1"	12.08'
			AFTER CLEANING FURTHER			
			24+60	1330	4'-0"	4.0'
			70		5'3"	5.25'
			80		7'0"	7.0'
			90		6'3"	6.25'
			2500		10'6"	10.5'
			10		13'6"	13.5'
			20		14'0"	14.0'
			30		16'5"	16.42'
			40		26'0"	26.0'
			50		26'0"	26.0'
			60		26'11"	26.92'
			70		27'0"	27.0'
			80	↓	26'2"	26.17'
			90	1350		

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/16/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				5 BAGS BENTONITE M
Quantity							7 BAGS BENTONITE BACK

Summary:
LF today: 110 (STN 2620 TO STN 2730)
LF to date: 2460 (STN 270 TO STN 2730)

Comments:
SOUNDINGS @ 730 AM
START EXCAVATION @ 730 AM
MIXING BACKFILL W/BENTONITE ADJACENT TO PLATFORM.
RECIRCULATING H_2O FROM APL TRENCH @ CO5
SMITH PROVIDED OFF ROAD TRUCK TO TRANSPORT SPOILS FROM SLURRY TRENCH @ 1130 AM.
GEO CONTINUE TO DIG N 5 FEET BELOW DESIGN DEPTHS TO ATTAIN 3 FEET KEY.
STOPPED EXCAVATION @ 415 PM TO HELP REMOVE PC300LC FROM THE DECON PAD.

MH Doyle Inspector

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 10-16-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
26+50	833	64.5		72 sec	21.5	
27+00						

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
26+50	845	72		68 sec	18	
27+00						

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
26+00	902	102.0			3.25"		
26+50	1045	101.5			3.5"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

Date: 10/16/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
2630	745	30	24+50	730	0	TOP OF SLOPE
40		30	60		4'8"	4.67'
50		30	70		6'0"	6.0'
60		29	80		7'0"	7.0'
70		29	90		7'7"	7.58'
80		29	2500		9'0"	9.0'
90		29	10		13'6"	13.5'
2700		29	20		13'5"	13.42'
10		29	30		15'5"	15.42'
20	↓	29	40		22'0"	22.0'
30	415	29	50		22'6"	22.5'
END OF EXCAVATION			60		24'10"	24.83'
			70		26'10"	26.83'
END OF DAY SOUNDINGS:			80		25'0"	25.0'
2510	445	TOP OF SLOPE	90		24'10"	24.83'
20		3'6" 3.5'	2600		27'4"	27.33'
30		4'6" 4.5'	10	↓	27'0"	27.0'
40		4'8" 4.67'	20	745	25'8"	25.67'
50		5'7" 5.58'				
60		7'6" 7.5'				
70		8'8"	8.67'			
80		9'11"	9.92'			
90		10'7"	10.58'			
2600		12'5"	12.42'			
10		12'6"	12.5'			
20		13'10"	13.83'			
30		14'6"	14.5'			
40		17'9"	17.75'			
50		18'0"	18'			
60		19'5"	19.42'			
70		20'10"	20.83'			
80		21'10"	21.83'			
90		22'9"	22.75'			
2700		23'1"	23.08'			
10	↓	27'10"	27.83'			
20	505PM	29'0"	29.0'			

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/17/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				6 BAGS @ BATCH
Quantity							6 BAGS @ BACKFILL

Summary:
LF today: 160 (STN 2730 TO 2890)
LF to date: 2620 (STN 270 TO 2890)

Comments: START EXCAVATION @ 945 AM.
ALSO BACKFILLING
APL TRENCH - GEOCON CIRCULATING BP SLURRY.
HOOKED UP 6" PUMP AT 3PM TO CIRCULATE
BP POLYMER IN BACK TANK BY THE MODULAR
TANK.
END OF EXCAVATION & BACKFILLING @ 5PM.

Page __ of __

SMITH ENVIRONMENTAL

Date: 10-17-96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry

One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
27+00	920	66.0		45 sec	14.0	
27+50	1100	65.0		43 sec	16.0	
28+00	102	65.0		49 sec	16.0	
28+50	210	64.5		40 sec	15.5	

In Trench Slurry

One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
27+00	901	84.0		49 sec	17.0	
27+50	1015	84.5		58 sec	17.5	
28+00	1257	83.0		92 sec	18.0	
28+50	348	83.0		102 sec	18.0	

Backfill

One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
27+00	1045	98			3.5"		
27+50	140	96			5.5"		
28+00	330	98.5			5-75"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

Date: 10/17/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
2740	745	29'0"	2510	725	0	TOP OUT
50	↓	29'0"	20	↓	4'4"	4.33
60		29'0"	30		4'8"	4.67
70		29'0"	40		5'3"	5.25
80		28'9"	50		6'0"	6.00
90		28'10"	60		6'9"	6.75
2800		28'9"	70		9'1"	9.08
10		28'11"	80		10'8"	10.67
20		30'0"	90		10'6"	10.50
30		30'1"	2600		12'6"	12.50
40		30'0"	10		12'10"	12.83
50		29'0"	20		13'11"	13.92
60		29'0"	30		14'3"	14.25
70	↓	29'0"	40		15'6"	15.00
80	745	29'0"	50		17'3"	17.25
90	746	29'0"	60		19'6"	19.50
			70		21'5"	21.42
			80		22'6"	22.50
			90		23'10"	23.83
			2700		27'2"	27.17
			10		27'9"	27.75
			20	↓	28'8"	28.67
			30	743	28'5"	28.42

SMITH ENVIRONMENTAL

Date: 10/17/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

END OF DAY SOUNDINGS

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			2660	447	0	TOP of SLOPE
			70		3' 5"	3.47
			80		2' 7"	2.58
			90		4' 3"	4.25
			2700		6' 5"	6.42
			10		8' 8"	8.67
			20		9' 10"	9.83
			30		11' 6"	11.50
			40		12' 8"	12.67
			50		14' 5"	14.42
			60		14' 8"	14.67
			70		16' 3"	16.25
			80		17' 8"	17.67
			90		19' 3"	19.25
			2800		21' 6"	21.50
			10		25' 11"	25.92
			20		28' 4"	28.33
			30		28' 7"	28.58
			40		28' 7"	28.58
			50		28' 8"	28.67
			60		28' 10"	28.83
			70	↓	28' 9"	28.75
			80	458	29' 0"	29.00

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/18/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				5 BAGS @ BATCH MIX
Quantity							7 BAGS @ BACKFILL

Summary:
LF today: 150 (STN 2890 TO STN 3040)
LF to date: 2770 (STN 270 TO STN 3040)

Comments: START EXCAVATION @ 800 AM. ALSO MIXING BACKFILL. GEOCON RECYCLING WATER IN APL TRENCH USING BOTH 2" PUMP & 6" PUMP. ALSO WORKING @ BAKER TANK. HYDRAULIC LINE CAME LOOSE @ 910 AM FOR PC400LC. RESUMED EXCAVATION @ 945 AM. PROBLEM W/ HYDRAULIC LINE AGAIN @ 300. WELDED THE LINE TO THE HOE W/ BURNING PERMIT. RESUMED EXCAVATION @ 415 PM. COMPLETED EXCAVATION ACTIVITIES & BACKFILLING @ 445 PM. FOR THE WEEKEND.

MR. Smith

PER GEOCON'S REQUEST ON 10/17/96 AM, GUMBO WAS NOT DELIVERED ~~on~~ TODAY. FOR MOST OF THE DAY GUMBO PLACED ON WEST SIDE OF TRENCH FROM STN 2800 TO 2950 WAS USED TO FILL, AFTER MIXING W/ BENTONITE, THE TRENCH FROM STN 2700 TO 2800.

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 10-18-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
29+00	915	65.0		41 sec	14.0	
29+50	1022	65.0		42 sec	14.5	
30+00	334	64.5		45 sec	14.0	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
29+00	905	80.0		50 sec	19.0	
29+50	1012	78.0		52 sec	18.0	
30+00	150	79.0		47 sec	18.5	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
28+50	848	102			5.5"		
29+00	1127	101.5			5.25"		
29+50	352	102.0			5.5"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/18/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
2900	800	28'0"	START DAY SOUNDINGS			
10	↓	28'0"	2660	TOP OF SLOPE		
20		28'0"	70	736	3'7"	3.58
30		28'6"	80	↓	3'6"	3.50
40		28'5"	90		5'2"	5.17
50		28'4"	2700		6'4"	6.33
60		28'0"	10		9'0"	9.00
70		27'0"	20		10'0"	10.00
80		27'0"	30		11'9"	11.75
90		27'0"	40		12'8"	12.67
3000		27'0"	50		13'6"	13.50
10		27'0"	60		15'0"	15.00
20		27'2"	70		16'9"	16.75
30	↓	27'1"	80		17'2"	17.17
40	430pm	27'0"	90		20'0"	20.00
5' overlap	435pm	27'0"	2800		22'4"	22.33
			10		27'3"	27.25
			20		27'10"	27.83
			30		27'10"	27.83
			40		28'6"	28.50
			50		28'10"	28.83
			60		28'11" (28.92)	Cleaned out bottom 29.0
			70	↓	29'0"	
			80	745	28'10"	28.83
			90	746	29'0"	29.0

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/18/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END OF DAY SOUNDINGS			
			2800		0	TOP OUT
			2810	442	4' 6"	4.50
			20		4' 7"	4.58
			30		6' 9"	6.75
			40		6' 10"	6.83
			50		7' 7"	7.58
			60		7' 10"	7.83
			70		9' 9"	9.75
			80		10' 0"	10.00
			90	"	11' 6"	11.50
			2900	445	13' 2"	13.17
			10		13' 3"	13.25
			20		13' 9"	13.75
			30		14' 3"	14.25
			40		16' 3"	16.25
			50		17' 8"	17.67
			60		18' 0"	18.00
			70		23' 7"	23.58
			80		24' 6"	24.50
			90		26' 6"	26.50
			30 00		27' 0"	27.00
			10		26' 10"	26.83
			20		26' 10"	26.83
			30	↓	27' 1"	27.08
			40	451	27' 0"	27.00

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/2/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				
Quantity							

Summary:

LF today: 0 LF

LF to date: 2770 LF

Comments: RAIN ALL DAY (THE SITE IS ALSO SOAKED DUE TO OVER NITE RAIN).
GEOCON WELDING HDPE SLURRY SUPPLY PIPE
SMITH INSTALLED BERM BY SW CORNER FOR SLURRY WALL EXCAVATION BY 9AM.
GEOCON ALSO MOVED EXISTING SLURRY SUPPLY PIPE CLOSER TO LANDFILL TO ACCOMODATE OFFLOAD TRUCKS IN LIEU OF REMOTE MIXING & DUMPING
DID NOT PUMP SLURRY. DID NOT EXCAVATE NOR BACKFILL TODAY.
BULKHEAD DAMAGED EXTENSIVELY DUE TO GEOCON'S ACTIVITIES ONSITE ON SATURDAY (10/19/96) AND TODAY, MAINLY DUE TO FORKLIFT RUNNING TO FACILITATE APL TRENCH RECIRCULATING AND MOVING SUPPLY PIPE.

2:00PM GEOCON WAS APPRAISED BY BOB HOUT AND MURTHY OF PROPER DECON PROCEDURES. IT WAS NOTICED BY BOTH BOB + MURTHY THAT GEOCON WAS NOT ADHERING TO SITE RULES WRT DECONING WHEN EXITING AN EXCLUSION ZONE. MEASURES MUST BE IMPLEMENTED BY GEOCON IMMEDIATELY.

Checked by Smith ____
Checked by Geo-Con ____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/22/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				0 BAGS IN BACKFILL
Quantity							1 BAGS AT BATCH M

Summary:
LF today: 30 (STN 3040 TO 3070)
LF to date: 2800 (STN 270 TO 3070)

Comments: GEOCON CLEANING EQUIPMENT AND LOADING MATERIAL USED FOR APL TRENCH. TRUCK ON SITE @ 10AM & LEFT @ 1200 NOON. ALSO GENERAL CLEANING/PICKING UP MATERIAL.
1300 SOUND TRENCH. START EXCAVATION ~~@~~ TO CLEAN TRENCH FROM STN 2960 ONWARDS.
START EXCAVATION BEYOND 30+40 TO LOWER H2O LEVEL IN TRENCH @ 220 PM. SOME WATER ACCUMULATED DUE TO OVERNITE RAIN. STOPPED EXCAVATION @ STN 31+00 (DID NOT EXCAVATE TO REQUIRED DEPTH). ALSO BACKFILLED PORTION OF TRENCH SMITH RE BUILDING BERM AT SW CORNER @ 430PM.
GUMBO TO ARRIVE ONSITE IN AM ON 10/23/96.
DID NOT GET GUMBO TODAY.

230PM BUST IN SLURRY CARRYING PIPE.
GEO CON MAKING REPAIRS. REPAIRED BY 5PM.
PUMPED SLURRY TO INCREASE VISCOSITY IN TRENCH. AFTER 5PM.

Mr Goginahalli

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 10-2-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
30+50	247	71.5		39sec		* retest in morning

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

Date: 10/22/96 Job #: 96-015

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
3050	1315	26'11" 26.92	BEFORE EXCAVATION.			
3060	1326	27'4" 27.33	2780	1300	TOP OUT	
3070	1349	27'0" 27.0	90	|	3'0"	3.0
			2800	|	3'4"	3.33
			10	|	4'5"	4.42
			20	|	6'2"	6.17
			30	|	6'10"	6.83
FROM 3040 TO			40	|	7'6"	7.5
~~3090~~ (NE)			50	|	7'10"	7.83
3100			60	|	8'4"	8.33
THE WIDTH OF			70	|	9'8"	9.67
THE TRENCH			80	|	11'1"	11.08
VARIES FROM 5.75'			90	|	12'2"	12.17
TO 6.0'. THE			2900	|	12'8"	12.67
DEPTH IS FROM TOP			10	|	13'0"	13.0
OF EXISTING ELEVATION			20	|	14'4"	14.33
TO BOTTOM OF GARBAGE.			30	|	16'11"	14.92
THIS MUST BE DERIVED			40	|	16'0"	16.0
FROM PLAN DRAWINGS.			50	|	17'8" 17.67	AFTER CLEANING
			60	|	18'3" 18.25	22'0" 22.23 @ 205
			70	|	20'0" 20.0	23'0" 23
			80	|	21'0" 21.0	24'3" 24.25
			90	|	24'4" 24.33	25'5" 25.42
			3000	|	25'0" 25.0	26'10" 26.83
			10	|	25'6" 25.5	27'2" 27.17
			20	↓	26'0" 26	27'1" 27.08
			30	1310	24'0" 24	27'4" 27.33
			40			27'1" 27.08
			3050 ~~3105~~			27'2" 27.17
			3040E			27'2" 27.17
			50			26'11" 26.92
			60			27'4" 27.33 ↓
			70			27'0" @213

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/22/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END	OF DAY.		
			2830	415	0	TOP OUT
			40		2'0"	
			50		4'0"	
			60		4'3"	
			70		5'6"	
			80		6'6"	
			90		7'6"	
			2900		8'4"	
			10		9'0"	
			20		10'6"	
			30		10'11"	
			40		12'4"	
			50		13'6"	
			60		15'3"	
			70		15'3"	
			80		16'5"	
			90		17'6"	
			3000		19'0"	
			10		20'1"	
			20		22'0"	
			30		22'5"	
			40		26'10"	
			50	↓	27'1"	
			60	430	27'0"	

Checked by Smith ____
Checked by Geo-Con ____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/23/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				3 BAGS @ BATCH
Quantity							1 BAGS IN BACKFILL

Summary:
LF today: 60 (STN 3070 TO STN 3130)
LF to date: 2860 (STN 270 TO STN 3130)

Comments:
SITE CONDITIONS SLOPPY & SOUPY
GUMBO - START HAULING @ 830 AM.
930AM - ONE LOAD OF GUMBO WAS UNLOADED @ STN 2800 WITH OIL. GEOCON, USING A HOE TOSSED OUT PORTIONS OF GUMBO, W/TR OIL, ON TO LANDFILL ACROSS TRENCH @ 1100 AM
START EXCAVATION @ STN 1040 (INCLUDING CLEANING OUT TOP of BACKFILL @ TOE of SLOPE) @ 900 AM.
SMITH PROVIDED HOE, MOXY TRUCK AND DOZER TO HELP LOADING OUT OF SPOILS. - ALL DAY
BUST IN SLURRY SUPPLY @ 4PM @ CO2 of APL TRENCH.
EXCAVATION HALTED @ 430 PM FOR THE DAY.
INDICATED TO GEOCON BY SMITH THAT THEY MUST ADHERE TO DESIGN WRT ALIGNMENT of SLURRY WALL, INCLUDING @ WW2. MUST USE MATS IF NECESSA

AT 100 PM, BOB HOUT INDICATED ~~THAT~~ THAT SLURRY EXCAVATION & BACKFILLING OPERATION IS A NON-CONTAMIN OPERATION... NO EXCLUSION ZONE REQUIRED, BUT NEED FENCE SINCE IT IS AN OPEN EXCAVATION. UPON FURTHER DISCUSSION W/ GEOCON, IT WILL B SMITH TO INSTALL ORANGE FENCE ON TOP OF RIPRA SLOPE AND GEOCON TO INSTALL ORANGE FENCE AT TOE OF LANDFILL, i.e. NORTH of APL TRENCH. AIR MONITORING NOT REQUIRED SINCE IT IS NOT AN EXCLUSION ZONE AND NOT EXCAVATING IN CONTAMINATED A

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 10-22-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
30+50	1135	66.0		75 sec	14.5 sec	
31+00	105	65.0		72 sec	13.0 sec	
31+50	~~1557~~ 330	66.0		68 sec	13.0 sec	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
30+50	1022	74.0		41 sec	19.0 sec	
31+00	120	73.5		40 sec	14.0 sec	
31+50	358	80.0		49 sec	18.0 sec	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
29+50	115	102.0			5.0"		
29+70	338	102.5			3.25"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/23/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
3080	1015	27'0"	START OF DAY			
90	↓	26'6"	2830	TOP OUT		
3100	1145	26'6"	40	800	2'2"	
10	148	26'0"	50		3'10"	
20	↓	26'0"	60		4'6"	
30	440	26'0"	70		6'2"	
			80		6'9"	
			90		9'0"	
END OF DAY SOUNDING			2900		9'0"	
2860	TOP OUT		10		9'9"	
2870	510	3'3"	20		10'10"	
80	|	3'5"	30		11'3"	
90	|	3'10"	40		12'2"	
2900	|	4'5"	50		13'11"	
10	|	5'2"	60		14'8"	
20	|	7'5"	70		15'8"	
30	|	8'8"	80		16'0"	
40	|	9'0"	90		16'8"	
50	|	10'8"	3000		18'4"	
60	|	12'10"	10		20'2"	
70	|	13'8"	20		26'11"	
80	|	14'3"	30		22'6"	
90	|	16'0"	40	↓	26'10"	
3000	|	17'7"	50	820	27'1"	
10	|	18'9"				
20	|	20'9"				
30	|	21'0"	CONTINUED FROM END OF DAY SOUNDINGS			
40	|	26'6"	3130	518	25'11"	
50	|	27'0"	40	|	24'0"	
60	|	27'1"	50	↓	24'3"	
70	|	26'10"	60	520	23'0"	
80	|	26'11"				
90	|	26'6"				
3100	↓	26'2"				
10		26'1"				
20	518	26'0"				

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/24/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				3 BAGS @ BATCH
Quantity							6 BAGS IN BACKFILL

Summary:
LF today: 90 LF (STN 3130 TO STN 3220)
LF to date: 2950 LF (STN 270 TO STN 3220)

Comments: SOUNDINGS @ 800 AM. START EXCAVATION @ 815 AM. ALSO BACKFILL MIXING ALONGSIDE TRENCH.
945 AM: GEOCON PLACED MATS ACROSS TRENCH @ STN 3150 TO EXCAVATE SW CORNER PRIOR OF SLURRY WALL.
SMITH'S HOE, MOXY TRUCK & DOZER TAKING SPOILS FROM TRENCH ON TO LANDFILL. CONDITIONS VERY SLIPPERY & WET - WORKED SMITH'S EQUIPMENT FROM 7 AM TO 2 PM.
TO TURN CORNER @ SW CORNER, GEOCON UTILIZED SMITH'S STEEL PLATES BECAUSE THE ENDS OF WOODEN MATS, ACROSS THE TRENCH WAS SINKING.
COMPLETE EXCAVATION ACTIVITIES FOR THE DAY @ 5 PM.

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 10-24-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
32+00	401	65.5		95 sec	12.0	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
32+00	342	80.0		47 sec	17.5	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
29+40	207	103.0			4.75"		
29+90	423	102.5			4.50"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/24/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
3140	1000	25'0"	2850	800	TO POUT	
50	|	25'0"	60	|	3'3"	
60	|	25'0"	70	|	3'4"	
70	|	25'0"	80	|	3'10"	
80	|	25'0"	90	|	4'5"	
90	|	25'0"	2900	|	4'7"	
95	|	25'0"	10	|	6'6"	
95 West	|	24'0"	20	|	7'6"	
95 North	|	25'0"	30	|	8'5"	
3200	|	24'0"	40	|	9'6"	
10	↓	24'0"	50	|	11'3"	
20	430	24'0"	60	|	12'9"	
			70	|	13'2"	
			80	|	14'10"	
			90	|	16'0"	
			3000	|	17'5"	
WIDTH OF TRENCH			10	|	18'5"	
CONTINUED TO BE			20	|	20'3"	
VARYING FROM			30	|	20'9"	
5' TO 6' WIDE			40	|	26'5"	
AT TOP TO BOTTOM OF			50	|	26'11"	
EXISTING DEBRIS IN			60	|	26'11"	
LANDFILL FROM			70	|	27'0"	
STATION 30+40 TO			80	|	26'10"	
STATION 31+95.			90	|	26'6"	
			3100	|	26'2"	
			10	|	25'11"	
			20	↓	26'0"	
			30	820	25'10"	

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/24/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END OF DAY		SOUNDINGS	
			2920	TOP OF BACKFILL		
			2930	445	1'8"	
			40		2'0"	
			50		2'6"	
			60		4'7"	
			70		4'11"	
			80		6'6"	
			90		7'3"	
			3000		9'10"	
			10		9'10"	
			20		12'0"	
			30		14'8"	
			40		17'6"	
			50		18'6"	
			60		18'0"	
			70		18'0"	
			80		19'0"	
			90		19'6"	
			3100		20'6"	
			10		21'0"	
			20		21'6"	
			30		23'0"	
			40		23'7"	
			50		24'7"	
			60	↓	25'0"	
			70	501	25'2"	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/25/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				7 BAGS IN BACKFILL
Quantity							6 BAGS AT BATCH

Summary:
LF today: 110 (STN 3220 TO STN 3330)
LF to date: 3060 (STN 270 TO STN 3330)

Comments:
START EXCAVATION @ 8:00 AM
BACKFILLING ALONGSIDE TRENCH
SMITH (PC150 + DOZER) HELPING REMOVE SPOILS - ALL DAY.
SMITH INSTALLING ORANGE FENCE ON SOUTH SIDE OF TRENCH ALONG RIVER. ALSO POLY ON FENCE
MIXING BACKFILL IN MIXING POND.
PROBLEM WITH RAIN WATER IN WEST END OF POND. GEOCON PUMPED WATER OUT @ 1000 AM.
PORTION OF MIXED GUMBO i.e. WITH RAIN WATER WILL NOT BE USED AS BACKFILL UNTIL MONDAY 10/28 PER FLUOR IT WILL BE KEPT IN WEST END OF POND TO DEHYDRATE.
GEOCON INSTALLING FENCE (ORANGE) ALONG THE TOE OF LANDFILL

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 10-25-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
32+50	1017	65.0		44 sec	13.0	
33+00	104	65.5		89 sec	12.5	
~~33+50~~						

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
32+50	1009	81.5		49 sec	17.5	
33+00	1242	81.0		48 sec	18.1	
~~33+50~~						

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
30+00	1035	102.0			5.0"		
30+40	122	101.5			5.25"		
~~30+80~~							

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/25/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
3230	800	23'6" 23.5	2920	~~800~~ 740	0.0	TOP of BACK
40		23'3" 23.25	30		1'8"	
50		23'1" 23.08	40		2'0"	
60		23'0" 23.00	50		2'6"	
70		23'0" 23.00	60		4'7"	
80		23'0" 23.00	70		4'11"	
90		23'0" 23.00	80		6'6"	
3300		23'0" 23.00	90		7'6"	
10		23'0"	3000		9'9"	
20	↓	23'0"	10		10'9"	
30	445	23'0"	20		11'10"	
			30		12'0"	
			40		13'2"	
			50		15'2"	
THE WIDTH OF			60		17'0"	
TRENCH CONTINUED			70		17'6"	
TO BE 5'TO 6' WIDE			80		18'6"	
UPTO STATION 3250.			90		19'4"	
			3100		20'0"	
			10		22'0"	
			20		22'6"	
			30		23'6"	
			40		23'6"	
			50		24'10"	
			60		25'0"	
			70		24'11"	
			80		25'1"	
			90		25'2"	
			3200		24'2"	
			~~10~~	↓	24'0"	
			~~20~~	820	22'0"	CLEANED DOWN
			30	802	19'10"	BEFORE EXCAVATING FURTHER

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/25/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END OF DAY SOUNDING			
			3040	525	0.0	TOP OUT
			50		2'7"	
			60		3'8"	
			70		5'0"	
			80		5'5"	
			90		7'0"	
			3100		8'8"	
			10		9'9"	
			20		10'8"	
			30		11'8"	
			40		12'3"	
			50		14'0"	
			60		15'5"	
			70		15'11"	
			80		16'11"	
			90		21'0"	
			3200		20'2"	
			10		21'8"	
			20		21'0"	
			30		22'0"	
			40		22'3"	
			50		22'4"	
			60		22'1"	
			70		23'4"	
			80		23'2"	
			90	↓	23'0"	
			3300	550	23'0"	
			10	↓	23'0"	
			20	↓	23'0"	
			30	555	23'0"	

Checked by Smith ____
Checked by Geo-Con ____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/26/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				10 BAGS IN BACKF
Quantity							3 BAGS @ BATCH

Summary:
LF today: 150 (STN 3330 TO STN 3480)
LF to date: 3210 (STN 270 TO STN 3480)

Comments: START EXCAVATION ACTIVITIES @ 800 AM.
MIXING GUMBO + BENTONITE + SLURRY IN POND
GEOCON CASTING SPOILS ON SOUTH SLOPE
DIRECTLY WITH PC400 HOE.
SMITH HOE AND DOZER CLEANING UP THE Nar
AREA AROUND CO2 AND WWI OF THE APL TRENCH
SMITH PROVIDED MOXY TRUCK @ 1PM FOR
HAULING MIXED BACKFILL TO TRENCH, STARTING
@ STATION 31+00.

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 10-26-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
33+50	918	66.0		45 sec	14.0	
34+00	1045	65.0		42 sec	12.0	
34+50	1235	66.0		44 sec	12.5	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
33+50	826	78.0		42 sec	19.0	
34+00	1031	78.5		45 sec	17.5	
34+50	1240	77.0		47 sec	17.5	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
30+80	810	103.0			5.5"		
31+20	1010	105.0			4.75"		
31+60	130	103.5			3.75"		
32+05	400	104.0			4.0"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/26/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
3340	800	23'6" 23.5	START OF DAY SOUNDINGS			
50		24'0" 24.0	3040	800	0-0	TOP OUT
60		24'6" 24.5	50		2'6"	
70		24'6" 24.5	60		3'9"	
80		24'10" 24.83	70		5'0"	
90		25'8" 25.67	80		5'10"	
3400		26'7" 26.58	90		7'9"	
10		26'7" 26.58	3100		8'5"	
20		26'7" 26.58	10		9'0"	
30		26'7" 26.58	20		9'5"	
40		27'2" 27.17	30		10'8"	
50		27'3" 27.25	40		12'2"	
60		27'6" 27.5	50		13'4"	
70	↓	26'4" 26.33	60		15'0"	
80	430	26'5" 26.42	70		15'6"	
			80		15'10"	
			90		16'11"	
			3200		17'6"	
			10		18'9"	
			20		19'0"	
			30		20'2"	
			40		22'10"	
			50		23'10"	
			60		23'0"	
			70		23'4"	
			80		23'2"	
			90		23'3"	
			3300		23'3"	
			10		23'0"	
			20	↓	23'0"	
			30	815AM	23'0"	
			40			

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/26/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END	OF DAY	SOUNDINGS	
			3150	500	0-0	TOP OUT
			60		3'0"	
			70		3'4"	
			80		3'7"	
			90		3'9"	
			3200		5'10"	
			10		7'3"	
			20		8'8"	
			30		10'11"	
			40		11'10"	
			50		12'6"	
			60		13'3"	
			70		13'3"	
			80		15'8"	
			90		16'5"	
			3300		17'2"	
			10		18'2"	
			20		19'5"	
			30		20'5"	
			40		21'0"	
			50		22'2"	
			60		23'0"	
			70		24'0"	
			80		24'10"	
			90		25'2"	
			3400		26'0"	
			10		26'1"	
			20		26'2"	
			30	↓	26'6"	
			40	525	27'2"	
			50		27'4"	
			60		27'5"	
			70	↓	26'6"	
			80	530	26'5"	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/28/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				3 BAGS IN POND
Quantity							9 BAGS IN BATCH

Summary:
LF today: 80 (STN 3480 TO STN 3560)
LF to date: 3290 (STN 270 TO STN 3560)

Comments: START EXCAVATION @ 800 AM WITH 400 PC MIXING GUMBO + SLURRY + BENTONITE IN POND @ 730 AM. STARTED TO HAUL BACKFILL FROM POND TO TRENCH USING MOXY TRUCK, PROVIDED BY SMITH @ 1000 AM.
PUTTING UP FENCE (ORANGE) ON BOTH SIDES OF TRENCH IS GEOCON'S RESPONSIBILITY.
DUE TO TRANSMISSION PROBLEMS MOXY WAS UNABLE TO HAUL BACKFILL @ 100 PM. HAULED 13 LOADS TODAY. APPROX. 9 CY PER LOAD.
NO GUMBO WAS DELIVERED TODAY.
1230 PM - 2PM - SMITH'S DOZER CLEANING UP ACCESS ROAD FROM MIXING POND TO SW CORNER TO ENABLE DELIVERY OF MIXED BACKFILL.
WORK finished

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 10-28-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
35+00	940	64.5		77sec	11.5	
35+50	151	65.0		45 sec	14.5	
36+00						

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
35+00	905	76.0		48 sec	18.0	
35+50	1351	80.0		49 sec	19.0	
36+00						

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
32+40	630	100.0			4.0"		
32+80	835	99.5			5.5"		
33+20	113	100.0			5.0"		
33+60							
		* Slumps are being taken at mixing pond. (every 12th truck)					

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/28/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
3490	910	26'10"	START OF DAY SOUNDINGS			
3500	922	26'6"	31+50	800	0.0	TOP OUT
10	↓	26'6"	60	↓	3'5"	
20		26'6"	70		3'6"	
30		26'6"	80		3'11"	
40		26'6"	90		5'2"	
50		26'0"	3200		6'2"	
60	~~3~~00	26'0"	10		6'8"	
			20		8'6"	
			30		10'0"	
			40		11'7"	
			50		12'0"	
			60		12'5"	
			70		12'5"	
			80		14'2"	
			90		14'10"	
			3300		16'0"	
			10		17'3"	
			20		18'0"	
			30		19'0"	
			40		19'5"	
			50		20'5"	
			60		22'9"	
			70		22'10"	
			80		23'7"	
			90		24'4"	
			3400		25'0"	
			10		26'4"	
			20		26'5"	
			30		27'0"	
			40		27'1"	
			50	↓	27'3"	
			60	820	27'4"	

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/28/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END OF DAY SOUNDINGS			
			3190	315	0.0	TOPOUT
			3200		1'4"	
			10		2'7"	
			20		3'5"	
			30		4'6"	
			40		5'10"	
			50		6'8"	
			60		7'4"	
			70		9'0"	
			80		11'4"	
			90		11'9"	
			3300		13'3"	
			10		15'2"	
			20		15'9"	
			30		16'9"	
			40		17'6"	
			3350		17'8"	
			60		19'3"	
			70		20'6"	
			80		22'3"	
			90		22'0"	
			3400		23'6"	
			10		25'0"	
			20		25'2"	
			30		25'0"	
SOUNDINGS CONTINUED			40		26'0"	
3550	do	26'0"	50		25'4"	
60	330	26'4"	60		25'6"	
			70		25'7"	
			80		26'3"	
			90		26'5"	
			3500		26'3"	
			10		26'0"	
			20		27'0"	
			30		26'4"	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/29/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				4 BAGS IN POND
Quantity							1 BAGS IN ~~BACKFILL~~ BATCH PL

Summary:
LF today: 100 (STN 3560 TO STN 3660)
LF to date: 3390 (STN 270 TO STN 3660)

Comments: GEOCON MIXNG IN POND - START 730 AM
GEOCON PUTTING UP ORANGE FENCE ON BOTH SIDES OF TRENCH - START 730 AM. ~~CAT TRUCK~~ MK)
910 AM - SMITH PROVIDED ~~MOXY~~ TO HAUL MIXED BACKFILL. TOTAL LOADS BY CAT = 37 LOADS
AT 3 PM MOXY LOADED OUT 3 LOADS FROM POND TO TRENCH BEFORE IT BROKE DOWN AGAIN.
STOPPED WORK FOR THE DAY @ 5PM.
~~MK~~ mkb
ONE OPERATOR W/ FORKLIFT AND ONE LABORER FOR GEOCON ARE PICKING UP HDPE PIPES LAYING AROUND SITE.

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 10-29-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
36+00	1012	65.0		49secs	13.0	
36+50	~~412~~ 401	64.5		62sec	12.5	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
36+00	1058	75.0		47sec	18.5	
36+50	327	76.0		49sec	14.0	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
32+00	920	99.0			5.0*		
	925	99.5			5.5"		
↓	930	99.0			5.5"		
~~32+00~~	1048	100.0			6.0"		
↓	145	99.0			6.0"		
33+00	410	99.5			5.5"		

Slumps from 3 different points in the pit

* All slumps being taken from mixing pond

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/29/96 Job #: 96-01
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
3570	900	26'4"	START OF DAY		SOUNDINGS	
80	|	26'2"	31+90	735	TOP OUT	
90	|	26'2"	3200	|	1'5"	
3600	|	26'0"	10	|	3'0"	
10	|	26'5"	20	|	3'5"	
20	|	26'5"	30	|	5'10"	
30	|	26'5"	40	|	5'10"	
40	|	26'7"	50	|	7'0"	
50	↓	26'8"	60	|	7'8"	
60	415	26'9"	70	|	9'0"	
			80	|	10'6"	
			90	|	11'6"	
			3300	|	13'4"	
			10	|	15'3"	
			20	|	15'8"	
			30	|	16'10"	
			40	|	17'10"	
			50	|	18'4"	
			60	|	18'4"	
	AM		70	|	19'8"	
SOUNDINGS CONTINUED			80	|	21'6"	
3510	|	26'6"	90	|	22'10"	
20	|	26'7"	3400	|	23'8"	
30	|	26'3"	10	|	24'9"	
40	|	26'6"	20	|	24'9"	
50	↓	26'5"	30	|	26'2"	
60	750	26'5"	40	|	26'2"	
			50	|	26'3"	
			60	|	26'1"	
			70	|	26'0"	
			80	|	26'6"	
			90	|	26'4"	
			3500	↓	26'4"	

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/29/96 Job #: 96-01:

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END OF DAY		SOUNDING	
			3290	445	0.0	Top out
			3300		3'0"	
			10		5'5"	
			20		5'9"	
			30		7'4"	
			40		9'0"	
			50		9'4"	
			60		10'3"	
			70		10'6"	
			80		11'9"	
			90		12'6"	
			3400		13'11"	
			10		15'2"	
			20		16'0"	
			30		16'4"	
			40		17'6"	
			50		18'4"	
			60		18'9"	
			70		19'0"	
			80		19'6"	
			90		21'1"	
			3500		21'0"	
			10		20'11"	
			20		26'0"	
			30		25'0"	
			40		25'6"	
			50		26'0"	
			60		26'0"	
			70		26'3"	
			80		26'6"	
			90		26'2"	
			3600		25'9"	
			10		26'5"	
			20	↓	26'5"	
			30	501	26'6"	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/30/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				3 BAGS IN POND
Quantity							4 BAGS @ BATCH PLT

Summary:
LF today: 100 (STN 3660 TO STN 3760)
LF to date: 3490 (STN 270 TO STN 3760)

Comments:
START EXCAVATION @ 730 AM.
SMITH PROVIDED 1 TRUCK TO HAUL BACKFILL FROM POND TO TRENCH.
27 LOADS HAULED TODAY.
SMITH ADDED LIME TO DEHYDRATE HAUL ROAD ON BULKHEAD AND GRADED THE ROAD
A PUMP WAS DELIVERED WHICH WILL BE USED TO PUMP BACKFILL FROM ~~TRENCH~~ POND TO TRENCH @ 4 PM.
JOE of FLUOR WANTED TO CHECK DEPTHS BEFORE SOUNDINGS WING SURVEYORS ROD BUT CHANGED HIS MIND. WE ARE MEASURING DEPTHS WITH A TAPE MEASURE W/ WEIGHT ~~ATTACHED~~ AT THE BOTTOM.
END OF EXCAVATION @ 430 PM.

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 10-30-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
37+00	902	65.0		42 sec	13.0	
37+50	401	64.5		47sec	12.0	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
37+00	851	90.5		47 sec	19.0	
37+50	342	90.0		48 sec	19.5	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
33+00	825	102.0			5.25"		
33+40	1029	101.5			5.5"		
33+80	222	102.5			5.5"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/30/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
3670	750	27'0"	START OF DAY SOUNDINGS			
80		27'4"	3290	725	0.0	TOP OUT
90		27'4"	3300		3'0"	
3700		27'5"	10		5'3"	
10		27'5"	20		6'0"	
20		27'8"	30		7'6"	
30		28'0"	40		9'8"	
40		28'2"	50		9'6"	
50		28'4"	60		9'8"	
60		28'4"	70		11'5"	
			80		12'4"	
			90		13'0"	
			3400		14'6"	
			10		15'4"	
			20		16'0"	
			30		16'4"	
			40		17'0"	
			50		19'0"	
			60		19'0"	
			70		19'7"	
AM SOUNDINGS CONTINUED			80		20'3"	
3610		26'6"	90		20'10"	
20		26'7"	3500		23'0"	
30		26'4"	10		23'6"	
40		26'6"	20		23'9"	
50	↓	26'6"	30		24'4"	
60	750	25'6"	40		26'3"	
			50		26'0"	
			60		26'4"	
			70		26'3"	
			80		26'2"	
			90		26'3"	
			3600	↓	26'1"	

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/30/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END OF DAY SOUNDINGS			
			3370	430	0.0	TOP OUT
			80		2'5"	
			90		3'8"	
			3400		5'0"	
			10		5'8"	
			20		7'5"	
			30		8'3"	
			40		9'4"	
			50		10'6"	
			60		11'4"	
			70		12'4"	
			80		13'5"	
			90		14'0"	
			3500		15'0"	
			10		15'11"	
			20		15'10"	
			30		17'5"	
			40		18'3"	
			50		19'0"	
			60		19'1"	
CONTINUE SOUNDINGS			70		20'4"	
3710		27'5"	80		20'5"	
20		27'2"	90		22'3"	
30		27'5"	3600		20'0"	
40		28'3"	10		22'0"	
50	450	28'6"	20		22'5"	
			30		23'0"	
			40		24'0"	
			50		24'3"	
			60		25'4"	
			70		26'0"	
			80		27'2"	
			90		27'3"	
			3700	↓	27'4"	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 10/31/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				5 BAGS IN BACKFI
Quantity							3 BAGS IN MIX PL

Summary:
LF today: 70 (STN 3760 TO 3830)
LF to date: 3560 (STN 270 TO 3830)

Comments:
START EXCAVATION @ 800 AM.
MIXING BACKFILL IN POND
SMITH'S CAT TRUCK HAULING BACKFILL
— 40 LOADS TODAY
SMITH PERSONNEL SETTING UP PUMP TO PUMP BACKFILL INTO SLURRY. ALSO SETTING UP CARRY PIPES
GUMBO BEING DELIVERED TO SITE. EXCESS GUMBO IS BEING STOCKPILED BY THE BATCH MIX PLANT
CARRY PIPES ARE BEING LAID ON NORTH SIDE OF TRENCH BY SMITH.
WATER LINE SUPPLYING H_2O TO THE BATCH MIX ON THE BULKHEAD WAS DAMAGED (LEAK). SMITH WILL MAKE REPAIRS TOMORROW.
GEOCON TO WIPE/CLEAN HOE & OTHER EQUIPMENT IN ORDER TO MAKE IT MORE VISIBLE DUE TO SPLASHING OF BACKFILL.

MD Ziemiański

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 10-31-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>61.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
38+00	1050	65.5		53 sec	12.5	
38+50						* no pumping to trench after 11:00 am

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
38+00	840	76.0		56 sec	19.5	
39+50	235	77.0		59 sec	14.5	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
33+80	817	101.0			4.75"		
↓	1015	103.5			5.0"		
	134	102.0			5.5"		
34+80	342	102.0			5.5"		
	* All slumps being taken from mixing pond						

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/31/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
3760		28.4	START OF DAY SOUNDINGS			
70		29.0	3350	745	0.0	TOP OUT
80		29.0	60		1'0"	
90		29.1	70		1'0"	
3800		29.8	80		2'10"	
10		30.0	90		4'0"	
20		30.0	3400		4'10"	
30		30.0	10		6'4"	
			20		7'3"	
			30		8'0"	
			40		9'8"	
			50		10'6"	
			60		11'5"	
			70		12'2"	
			80		13'7"	
			90		14'0"	
			3500		14'5"	
			10		15'6"	
AM SOUNDINGS CONTINUED			20		15'9"	
			30		17'3"	
3680		26'2"	40		18'2"	
90		26'0"	50		18'4"	
3700		26'3"	60		18'4"	
10		27'3"	70		19'5"	
20		26'8"	80		19'6"	
30		27'5"	90		19'7"	
40		28'3"	3600		19'9"	
50	759	28'2"	10		21'8"	
			20		21'9"	
			30		23'1"	
			40		23'6"	
			50		23'7"	
			60		23'7"	
			70		25'0"	

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 10/31/96 Job #: 96-0

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END OF DAY		SOUNDINGS	
			3470	445	0-0	TOP OUT
			80		1'0"	
			90		3'11"	
			3500		4'3"	
			10		6'1"	
			20		7'2"	
			30		8'3"	
			40		9'0"	
			50		9'8"	
			60		11'0"	
			70		12'4"	
			80		12'7"	
			90		14'6"	
			3600		15'9"	
			10		17'6"	
			20		17'9"	
			30		18'7"	
			40		18'6"	
PM SOUNDINGS CONTINUED			50		18'0"	
			60		19'6"	
3800		28'2"	70		20'3"	
10		29'0"	80		20'3"	
20		29'0"	90		20'8"	
30		29'3"	3700		24'1"	
40	↓	29'6"	10		25'4"	
50	510	27'0"	20		27'3"	
			30		27'0"	
			40		26'10"	
			50		27'0"	
			60		27'4"	
			70		27'11"	
			80		27'3"	
			90	↓	28'2"	

EXC. NOT COMPLETE

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/01/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				3 BAGS IN BATCH M
Quantity							5 BAGS IN BACKFIL

Summary:
LF today: -0- DID NOT EXCAVATE TODAY
LF to date: 3560 (STN 270 TO 3830)

Comments:
730AM
SMITH PERSONEL WELDING PIPE ON BULK HEAD TO REPAIR LEAK IN H_2O LINE FOR BATCH MIX.
2 TRUCK LOADS OF BENTONITE ARRIVED ONSITE @ 7AM FOR GEOCON. GEOCON UNLOADING.
GEOCON MIXING IN POND. GUMBO BEING DELIVERED TODAY
SMITH FINALIZING THE CONCRETE PUMP, TO PUMP BACKFILL. SLURRY FROM TRENCH (WING 400C) IS BEING UTILIZED TO PRIME THE CONCRETE PUMP.
@ 1030. DID NOT WORK. TRUCK (CAT) HAULING BACKFILL
GEOCON SETTING UP PUMP TO PUMP OUT SLURRY FROM TRENCH. THIS SLURRY WILL BE PUMPED INTO THE RIFT BETWEEN THE LANDFILL AND THE PILE CREATED WITH SPOILS OF SLURRY WALL EXCAVATION @ THE SOUTH SIDE OF OXY LANDFILL
1245 - GEOCON PUMPED SOME SLURRY.
1330 - MOXY TRUCK STARTED TO HAUL BACKFILL.
CAT TRUCK HAULED 17 LOADS (SEVENTEEN)
MOXY TRUCK HAULED 4 LOADS.
PER GEOCON'S REQUEST STOPPED HAULING BACKFILL @ 4PM. GEOCON'S PUMP (TO PUMP OUT SLURRY FROM TRENCH) MALFUNCTION. GEOCON TO GET ARE
MA Jinahet
SMITH WORKING ON CLEANING CONCRETE PUMP BACKFILL CARRYING PIPE. ALSO WORKING ON REALIGNING/REPOSIT PIPE. (ELIMINATE BEND)
GEOCON HAULED OUT UNUSED GUAR BAGS.

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 11-1-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
35+50						

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
38+00	1000	75		70		

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
34+80	1256	102.5			5.75"		
↓	340	102.0			5.25"		
35+50							

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/01/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
DID NOT EXCAVATE			START OF DAY SOUNDINGS			
TODAY			3470	740	0-0	TOP OUT
			80		3'2"	
			90		3'10"	
			3500		5'2"	
			10		6'3"	
			20		7'3"	
			30		8'3"	
			40		8'11"	
			50		9'6"	
			60		10'10"	
			70		11'9"	
			80		12'6"	
			90		14'6"	
			3600		15'4"	
			10		17'10"	
			20		17'10"	
			30		18'2"	
			40		18'2"	
AM SOUNDINGS		CONTINUED	50		17'10"	
3800	|	28'3"	60		18'3"	
10	|	28'4"	70		19'6"	
20	|	28'1"	80		19'4"	
30	|	29'0"	90		20'0"	
40	↓	29'3"	3700		21'4"	
50	805	27'0"	10		21'3"	
			20		24'6"	
			30		26'10"	
			40		27'0"	
			50		27'2"	
			60		27'3"	
			70	|	27'6"	
			80	|	27'4"	
			90	↓	28'0"	

EXC. NOT COMPLETE

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/01/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END OF DAY		SOUNDINGS	
			3540	415	0-0	TOP OUT
			50		4'9"	
			60		6'8"	
			70		7'10"	
			80		9'7"	
			90		11'3"	
			3600		12'3"	
			10		13'5"	
			20		13'9"	
			30		13'0"	
			40		13'0"	
			50		12'9"	
			60		11'9"	
			70		15'0"	
			80		15'6"	
			90		18'0"	
			3700		18'0"	
			10		22'6"	
			20		23'10"	
			30		23'8"	
			40		26'6"	
			50		27'0"	
			60		27'0"	
			70		27'5"	
			80		27'0"	
			90		28'7"	
			3800		28'10"	
			10		28'10"	
			20		29'0"	
			30		29'2"	
			40	↓	29'5"	EXC. NOT COMPLETE
			50	436	27'0"	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/02/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				1 BAGS IN MIXER
Quantity							0 BAGS IN BACKFILL

Summary:

LF today: 0 DIDNOT EXCAVATE TODAY
LF to date: 3560 (STN 270 TO STN 3830)

Comments: GEO CON PUMPING SLURRY FROM TRENCH TO SOUTH SIDE OF LANDFILL. (INTERMITANTLY)
MIXING BACKFILL IN POND.
SMITH TRUCK (CAT) HAULING BACKFILL TO TRENCH.
@ 1000 AM. (TOTAL 24 LOADS)
SMITH REALIGNED CLEANED OUT PIPELINE FOR CONCRETE PUMP, ELIMINATED BEND. WILL BE TRIED OUT ON 11/4/96

DNR Engineer

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 11/02/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
3800	1100	82		75		

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
3540	815	109			5"		
↓	1130	108			4.5"		
3580	200	106			6.0"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/02/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
DIDNOT EXCAVATE			START OF DAY		SOUNDINGS	
			35+40	745	3'2"	
			50		4'8"	
			60		6'9"	
			70		7'7"	
			80		9'4"	
			90		10'8"	
			3600		12'0"	
			10		13'6"	
			20		14'5"	
			30		14'7"	
			40		14'7"	
			50		14'7"	
			60		15'0"	
			70		15'3"	
			80		16'3"	
			90		16'4"	
			3700		16'8"	
			10		18'0"	
			20		20'0"	
			30		21'2"	
			40		21'3"	
			50		22'3"	
			60		25'0"	
			70		27'6"	
			80		27'6"	
			90		28'2"	
			3800		28'3"	
			10		28'8"	
			20		28'7"	
			30		29'0"	
			40	↓	29'0"	
			50	801	29'6"	

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/02/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END	OF DAY	SOUNDINGS	
			3580	230	0-0	TO POUT
			90		4'4"	
			3600		5'4"	
			10		7'6"	
			20		8'6"	
			30		9'3"	
			40		10'2"	
			50		11'6"	
			60		13'7"	
			70		13'7"	
			80		13'0"	
			90		13'2"	
			3700		13'8"	
			10		13'9"	
			20		14'9"	
			30		16'10"	
			40		18'6"	
			50		19'10"	
			60		19'10"	
			70		23'5"	
			80		25'9"	
			90		26'2"	
			3800		28'3"	
			10		28'3"	
			20		28'6"	
			30		29'2"	
			40	↓	29'0"	
			50	245	27'1"	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/4/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				3 BAGS IN MIX
Quantity							5 BAGS IN POND (FIVE)

Summary:
LF today: 102 (STN 3830 TO 3932)
LF to date: 3662 (STN 270 TO 3932)

Comments:
STARTED EXCAVATION @ 715 AM
SMITH TRUCKS HAULING BACKFILL (EXCAVATED
N10AM GEOCON PLACING MATS ACROSS TRENCH
TO EXCAVATE TRENCH N STN 39+32, TO MAKE THE
BEND.
1230 PM STARTED TO EXCAVATE N STN 39+32.
CAT TRUCK UTILIZED TO HAUL SPOILS +
MOXY TRUCK UTILIZED TO HAUL BACKFILL.
SMITH BAGGED THE IDEA OF USING CONCRETE PUMP
TO PUMP BACKFILL. SMITH DISMANTLING TO SHIP
PUMP & PIPES OFF-SITE.
PC400 (GEOCON'S) BROKE DOWN (HYDRAULIC) FROM
200 PM TO 300 PM.
COMPLETED EXCAVATION TO STN 39+32 (CORNER BY WW2)
END OF ACTIVITIES FOR THE DAY.
MK Boginabouski

LOADS OF SPOILS FROM TRENCH = ~~104~~ INCL
LOADS OF BACKFILL TO TRENCH = 31

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 11-4-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
38+50	820	65.0		52 sec	13.0	
39+00	1121	64.5		48 sec	14.0	
39+50						

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
39+00	1041	82.5		103 sec	17.5	
39+50						

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
35+90	842				7.5"		
	914	105.0			5.0"		
	1109	106.5			5.75"		
	1112	107.0			6.0"		
37+00	142	106.5			5.5"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/4/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
3840		29'2"	START OF DAY SOUNDINGS			
50		28'10"	3590	700	0.0	TOP OUT
60		28'10"	3600		3'7"	
70		29'0"	10		5'6"	
80		28'10"	20		8'8"	
90		29'0"	30		9'4"	
3900		29'0"	40		10'6"	
10		28'10"	50		12'2"	
20		29'0"	60		12'4"	
30		29'0"	70		12'4"	
EAST 30		29'0"	80		12'5"	
			90		12'4"	
EXCAVATED 10' BEYOND STN 39+32.			3700		13'9"	
			10		13'10"	
			20		14'8"	
			30		16'6"	
			40		18'6"	
			50		18'10"	
			60		20'0"	
			70		25'5"	
			80		25'6"	
			90		26'10"	
			3800		27'6"	
			10		28'4"	
			20		28'6"	
			30	↓	29'2"	
			40	720	29'0"	

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/4/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END OF DAY		SOUNDINGS	
			3690	405	0.0	TOP OUT
			3700		2'4"	
			10		3'10"	
			20		4'10"	
			30		7'2"	
			40		8'6"	
			50		9'0"	
			60		8'8"	
			70		9'6"	
			80		9'7"	
			90		10'0"	
			3800		11'10"	
			10		12'7"	
			20		12'10"	
			30		15'0"	
			40		18'8"	
			50		20'4"	
			60		20'6"	
			70		24'6"	
			80		24'6"	
			90			MATS OVER TRENCH.
			3900			
			10		28'8"	
			20		29'3"	
			30	↓	29'6"	
			30EAST	420	29'6"	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/5/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				4 BAGS IN MIX
Quantity							6 BAGS IN POND

Summary:
LF today: 118 (STN 3932 TO STN 4050)
LF to date: 3780 (STN 270 TO STN 4050)

Comments: START EXCAVATION @ 700 AM. MIXING BACKFILL IN POND.
SMITH - 2 TRUCKS HAULING BACKFILL TO TRENCH.
CAT HAULED 24 LOADS & MOXY HAULED 23 LOADS
TOTAL # OF LOADS = 47. ALL DAY.
GEOCON'S OPERATOR DAMAGED 2 LENGTHS OF CONCRETE PUMP CARRY PIPES. 2 MORE LENGTHS OF PIPE WERE PREVIOUSLY DAMAGED PER TRAVIS EVANS (SMITH OPERATOR)
FROM 430 TO 515, ONE GEOCON OPERATOR AND TWO SMITH LABORERS REMOVED THE LAST OF THE DAMAGED PIPE + ONE 90° BEND TO ENABLE BACKFILL HAULING TRUCKS TO TRAVEL ON THE BULKHEAD. THE DAMAGED PIPES WERE PLACED BY SMITH PARALLEL TO THE TRENCH ON THE NORTH SIDE @ APPROX. STN 3750 TO 3850. THE LAST PIPE THAT WAS REMOVED AT 5PM WAS LAYING ACROSS THE BULKHEAD.
GEOCON'S OPERATOR (PEEWEE) WAS TOLD NOT TO TAP THE TRUCKS WITH HIS BUCKET.

GEOCON WAS ADVISED TO CLEAN MISC. MATERIAL (PIPES etc) LAYING ALL AROUND THE SITE.

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 11-5-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
39+50	809	65.0		47 sec	12.5	
40+00	136	65.5		59 sec	13.0	
40+50	220	65.0		36 sec	14.0	* need to thin out fr i.e. pumping a lit le ok by Fluor Daniel

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
39+50	750	84.0		103 sec	19.5	
40+00	100	84.5		110 sec	18.0	
40+50	221	*86.0		86 sec	18.0	* thick

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
37+00	725	106.5			4.5"		
↓	1012	105.0			6.0"		
	1110	105.5			6.0"		
	240	106.0			4.5"		
38+80	348	104.5			5.0"		

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/5/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
South 3932	700	29'0"	START OF DAY SOUND NG			
3932		29'0"	3690	645	0.0	TOPOUT
3940		29'0"	3700		2'4"	
3950		28'8"	10		4'7"	
3960		29'0"	20		6'5"	
70		29'0"	30		7'3"	
80		29'0"	40		8'8"	
90		29'2"	50		10'2"	
4000		29'4"	60		10'4"	
10		29'6"	70		10'5"	
20		29'9"	80		11'3"	
30		30'1"	90		11'6"	
40	↓	30'3"	3800		11'6"	
50	715	30'4"	10		12'0"	
			20		12'10"	
			30		13'6"	
			40		17'0"	
			50		17'0"	
			60		19'4"	
			70		20'3"	
			80		22'6"	
			90			MATS OVER TRENCH
			3900			
			10		29'0"	
			20		29'2"	
			30	↓	29'3"	
			40	701	29'0"	

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/5/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END	OF DAY	SOUNDINGS	
			3870	430	0.0	TOP OUT
			80		3'3"	
			90		4'1"	
			3900		5'0"	
			10		7'6"	
			20		7'6"	
			30		12'3"	
			40		17'6"	
			50		20'4"	
			60		22'0"	
			70		22'2"	
			80		22'8"	
			90		25'9"	
			4000		29'6"	
			10		29'6"	
			20		30'3"	
			30		30'4"	
			40	↓	30'5"	
			50	445	29'11"	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/6/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				4 BAGS IN POND
Quantity							3 BAGS IN MIXER

Summary:
LF today: 80 (STN 4050 TO STN 4130)
LF to date: 3860 (STN 270 TO STN 4130)

Comments: START EXCAVATION @ 700 AM. MIXING IN POND.
GEOCON IS RESPONSIBLE FOR DAMAGING STEEL PIPES YESTERDAY.
BEFORE COFFEE BREAK IN AM 2 TRUCKS HAULING BACKFILL. AFTER BREAK, CAT TO HAUL SPOILS AND MOXY HAULING BACKFILL.
TOTAL LOADS OF SPOILS = 23
TOTAL LOADS OF BACKFILL = 35
GUMBO NOT DELIVERED TODAY.
END OF WORK DAY @ 430 PM

Page __ of __

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 11-6-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
41+00	1256	65.5		45 sec	18.0	
41+50	313	65.0		43 sec	12.0	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
41+00	1043	82.5		71 sec	19.0	
41+50	517	84.0		83 sec	18.0	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
38+80	742	105.0			4.75"		
↓	1122	106.0			4.25"		
39+60	221	107.0			5.0"		

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/6/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill START OF DAY SOUNDI			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
H060	720	30'6"	3880	700	0.0	TO POUT
70		30'7"	90		5'0"	
80		31'4"	3900		6'0"	
90		31'6"	10		10'0"	
4100		31'7"	20		10'8"	
10		32'0"	30		16'7"	
20		32'0"	40		17'6"	
30	400	32'0"	50		21'10"	
			60		22'5"	
			70		23'7"	
			80		24'0"	
			90		27'0"	
			H000		29'0"	
			10		29'6"	
			20		29'6"	
END OF DAY		SOUNDINGS	30		30'2"	
3950	415	TO POUT	40	↓	30'4"	
60		4'8"	50	710	30'0"	
70		5'7"				
80		8'7"				
90		9'10"				
4000		10'3"				
10		13'7"				
20		16'6"				
30		16'6"				
40		17'0"				
50		18'10"				
60		23'0"				
70		27'6"				
80		30'0"				
90		30'0"				
4100		31'6"				
10		32'2"				
20	↓	32'4"				
30	430	32'3"				

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/7/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				3 BAGS IN MIXER
Quantity							5 BAGS IN BACKF

Summary:
LF today: 100 FT (STN 4+30 TO STN 4230)
LF to date: 3960 FT (STN 270 TO STN 4230)

Comments: START EXCAVATION @ 700 AM.
ALSO, MIXING BACKFILL IN POND.
SMITH TRUCKS (2) HAULING BOTH SPOILS & BACKFILL.
OF LOADS OF SPOILS HAULED TODAY =
of LOADS OF BACKFILL HAULED TODAY = 25
GUMBO BEING UNLOADED DIRECTLY INTO PIT TODAY.
SND ACTIVITIES @ 430 PM.

DMDesjmaitt

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 10-7-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
42+00	810	65.0		41 sec	14.5	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
42+00	1126	63.5		63 sec	17.5	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	$<10^{-7}$ Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
39+60	800	106.5			5.0"		
↓	1248	106.0			4.75"		
↓	232	106.0			5.0"		
40+50							

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/7/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
4140	7:00 am	33' 0"	Start of Day Soundings			
4150		33' 0"	3960	7:15 am	0.0	Topout
4160		33' 0"	3970		4' 8"	
4170		31' 9"	3980		8' 0"	
4180		32' 2"	3990		9' 6"	
4190		32' 4"	4000		10' 7"	
4200		32' 0"	4010		13' 0"	
4210		33' 2"	4020		15' 0"	
4220		33' 0"	4030		16' 4"	
4230	4:15 pm	32' 4"	4040		16' 6"	
			4050		20' 0"	
			4060		22' 5"	
End of	Day Soundings		4070		26' 0"	
4050	4:15 pm	0.0 Topout	4080		30' 0"	
4060		7' 9"	4090		30' 0"	
40+70		14' 0"	4100		31' 6"	
40+80		15' 4"	4110		32' 2"	
40+90		16' 0"	4120		32' 3"	
41+00		19' 0"	4130	7:30 am	32' 4"	
41+10		19' 8"				
41+20		22' 0"				
41+30		23' 5"				
41+40		25' 0"				
41+50		26' 7"				
41+60		26' 6"				
41+70		27' 7"				
41+80		28' 4"				
41+90		29' 4"				
42+00		32' 0"				
42+10		33' 2"				
42+20		33' 2"				
42+30	4:30 pm	32' 4"				

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/8/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	River	GeoCon	SMITH				3 Bags in mix
Quantity							4 Bags in pond (Backfill

Summary:
LF today: 120 (sta 42+30 to sta 43+50)
LF to date: 4080 (sta 2+70 to sta 43+50)

Comments:
Heavy Rains last night & all day today.
Started excavation @ 7:30 am
Continue mixing backfill in pond. Gumbo clay is being hauled from the stockpile South of Olin mixing cell
# of loads of clay from Stockpile 27 loads (including
# of loads of spoils hauled today 33 loads
Had a problem with clumps in backfill mix. After instructed by Fluor Daniel backfill was mixed thoroughly until clumps were reduced.
Had to remove excess water from mixing pond due to excess rain.
Spoils were transported to Oxy landfill at first then they were placed directly on Olin's landfill until the water in the dump pit was removed. Resumed transporting spoils to Oxy landfill by 11:00 am.
Both trucks were used to transport spoils & stockpiled Gumbo throughout the day. Smith's excavator was used to load the stockpiled Gumbo into the off-road truck
Gumbo was taken from Batch plant & South of Olin mixing cell. By 2:30 pm spoils were placed directly on the south slope of Olin landfill.
Finished @ 4:15 pm
Trench was backfilled directly from mixing pond.

Gordon Thomas

Page __ of __

SAIC III ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11-4-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64 pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
42+50	1113	64.5		41 sec	13.0	
43+00	221	65.0		47 sec	12.0	

In Trench Slurry
One Test per 50 LF

Station #	Time	<83 pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
42+50	846	87.0		64 sec	16.0	* trench is that currently pumping fresh slurry into trench to thin out
43+00	309	83.5		46 sec	17.5	

Backfill
One Test per 150 CY

Station #	Time	>85 pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
40+60	825	105.0			4.5"		
↓	102	107.0			6.0"		
41+20							

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/8/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
42+40	8:00 am	30' 4"	40+50	7:30am	0'0"	Top out
42+50		30' 3"	40+60		9'5"	
42+60		29' 9"	40+70		12' 10"	
42+70		30' 8"	40+80		15' 9"	
42+80		30' 2"	40+90		16' 3"	
42+90		30' 0"	41+00		18' 3"	
43+00		28' 5"	41+10		18' 1"	
43+10		28' 5"	41+20		19' 3"	
43+20		28' 0"	41+30		21' 7"	
43+30		28' 8"	41+40		23' 3"	
43+40		28' 8"	41+50		23' 5"	
43+50	4:00 pm	27' 9"	41+60		23' 3"	
			41+70		24' 9"	
			41+80		27' 2"	
			41+90		28' 9"	
			42+00		31' 4"	
			42+10		31' 11"	
			42+20		30' 5"	
			42+30	8:00am	30' 6"	

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/8/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
41+20	4:00 pm	0'0" Topout				
41+30		5'5"				
41+40		7'7"				
41+50		9'9"				
41+60		10'9"				
41+70		12'6"				
41+80		13'4"				
41+90		13'7"				
42+00		14'9"				
42+10		17'6"				
42+20		17'7"				
42+30		17'4"				
42+40		18'9"				
42+50		21'7"				
42+60		22'9"				
42+70		21'7"				
42+80		23'5"				
42+90		22'7"				
43+00		27'9"				
43+10		28'0"				
43+20		27'8"				
43+30						
43+40						
43+50	4:30					

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/9/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	River	GeoCon	SMITH				3 Bags in mix
Quantity							4 Bags in backfill

Summary:
LF today: 110 (Sta 43+50 to Sta 44+60)
LF to date: 4190 (Sta 2+70 to Sta 44+60)

Comments: Rain throughout the morning and into afternoon
Started excavation by 7:30 am
Smith's excavator and 2 offroads trucks were being used to load and transport Gumbo clay from stockpile near batch plant to the mixing pond.
Spoils were being placed directly on the South slope of Olin landfill.
Finished @ 2:15 pm
Backfill was placed directly into trench from mixing pond
Fluor Daniel instructed for overexcavation from Sta 43+80 through 44+30 in order to get the 3' key.

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 11-9-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
43+50	947	65.5		52 sec	12.0	
44+00	958	64.5		40sec	13.5	
44+50	1244	64.5		45 sec	13.0	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
43+50	816	84.0		57 sec	18.0	
44+00	1042	77.0		42 sec	19.0	
44+50	1250			49 sec	17.5	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
41+20	754	104.5			5.5"		
↓	1035	105.0			5.75"		
↓	143	105.0			6.0"		
42+00							

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/9/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
43+60	7:45pm	29'0"				
43+70		28'11"				
43+80		29'0"				
43+90		28'6"	Overexcavation instructed by Fluor Daniel in order to get a 3' key			
44+00		29'8"				
44+10		29'8"				
44+20		29'8"				
44+30		29'8"				
44+40		28'6"				
44+50	↓	29'0"				
44+60	2:00pm	28'7"				
			41+20	7:30 am	0.0	Topout
			41+30		5'7"	
			41+40		8'0"	
			41+50		9'6"	
			41+60		10'9"	
			41+70		13'0"	
			41+80		14'0"	
			41+90		14'3"	
			42+00		14'0"	
			42+10		17'0"	
			42+20		17'7"	
			42+30		17'4"	
			42+40		20'4"	
			42+50		20'6"	
			42+60		22'0"	
			42+70		22'4"	
			42+80	↓	23'0"	
			42+90	8:00 am	23'4"	
			43+00		26'0"	
			43+10		26'0"	
			43+20		29'4"	
			43+30		29'0"	
			43+40		29'4"	
			43+50	↓	29'6"	

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/9/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			42+00	2:00 pm	0'0"	Top out
			42+10		1'6"	
			42+20		4'1"	
			42+30		5'6"	
			42+40		7'3"	
			42+50		9'6"	
			42+60		11'1"	
			42+70		13'0"	
			42+80		14'0"	
			42+90		13'10"	
			43+00		15'6"	
			43+10		17'0"	
			43+20		21'8"	
			43+30		21'8"	
			43+40		23'0"	
			43+50		23'0"	
			43+60		25'8"	
			43+70		25'9"	
			43+80		26'3"	
			43+90		27'6"	
			44+00		28'4"	
			44+10		27'3"	
			44+20		28'0"	
			44+30	2:20 pm	28'0"	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/11/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				3 BAGS IN BACKFILL
Quantity							3 BAGS IN MIX PLANT

Summary:
LF today: 170 (STN 4460 TO 4630)
LF to date: 4360 (STN 270 TO 4630)

Comments:
START EXCAVATION @ 715 AM.
GEOCON MIXING IN POND.
SMITH TRUCKS HAULING STOCKPILED GUMBO INTO POND
830 AM GUMBO BEING HAULED FROM OFF-SITE PIT.
815 AM GEOCON OPERATOR PLACED STEEL PLATES & WOOD MATS ACROSS TRENCH @ STN 4500 TO EXCAVATE CORNER BY WW3.
CERRONE (2 People) SETUP PUMP @ 1130 AM TO PUMP STANDING WATER BETWEEN OUTER BERM OF SLURRY TRENCH AND LANDFILL TOE (FROM STN 3600 TO MIXING POND). THE H_2O IS BEING PUMPED INTO SEDIMENTATION POND NORTH of MIXING POND.
FINISHED CORNER @ STN 4525 @ 1PM. REMOVING MATS/PLATES. RESUME EXCAVATION FROM 4525 going East.
SMITH PUMPING H_2O FROM TRENCH (RAIN H_2O)
GEOCON WELDING PIPE (SLURRY SUPPLY) FROM AROUND MIXING POND TO SE CORNER OF SITE.
EXCAVATION COMPLETED @ 415 PM.

MK Jogiwalch

ONE TRUCK (CAT) WAS USED TO HAUL BACKFILL
TOTAL LOADS = 15 LOADS

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 11-11-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
45+00	1021	65.5		56 sec	11.5	
45+50	320	65.0		49 sec	13.0	
46+00						

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
45+00	825	81.0		41 sec	19.5	
45+50	138	79.0		37 sec	19.0	* starting to pump to trench to bring trench back up to spec.
46+00	342	85.0		40 sec	"	* filtrate will be done 1st thing in the morning

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
42+20	741	105.0			4.5"		
↓	1254	105.0			5.25"		
43+30	308	106.0			5.75"		

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/11/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
4470	720	28'3"	START OF DAY SOUNDINGS			
80		28'3"	4200	701	0.0	TOP OUT
90		28'3"	10		3'3"	
4500		27'0"	20		5'4"	
10		26'9"	30		6'7"	
20		26'6"	40		8'4"	
30		25'6"	50		9'0"	
40		26'0"	60		9'0"	
50		24'8"	70		12'8"	
60		24'6"	80		13'5"	
70		24'6"	90		14'6"	
80		25'0"	4300		15'7"	
90		24'3"	10		17'3"	
4600		22'5"	20		20'0"	
10		22'6"	30		20'4"	
20	↓	22'4"	40		21'6"	
30	415	22'2"	50		24'0"	
			60		24'6"	
			70		27'0"	
			80		27'0"	
			90		27'5"	
			4400		29'0"	
			10		28'10"	
			20		29'6"	
			30		29'4"	
			40	↓	29'4"	
			50	716	29'2"	

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/11/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END	OF DAY	SOUNDINGS	
			4330	4 15	0.0	TOP OUT
			40		4'3"	
			50		4'4"	
			60		6'4"	
			70		7'8"	
			80		8'6"	
			90		11'0"	
			4400		13'6"	
			10		13'6"	
			20		15'6"	
			30		16'0"	
			40		16'0"	
			50		19'6"	
			60		19'6"	
			70		22'0"	
			80		22'0"	
			90		23'7"	
			4500		24'0"	
			10		27'0"	
			20		27'0"	
			30		26'6"	
			40		27'0"	
			50		24'0"	
			60		25'4"	
			70	--	24'0"	
			80	↓	23'3"	
			90	430	23'3"	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/12/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				3 BAGS IN BACKFILL
Quantity							2 BAGS IN MIXER

Summary:
LF today: 120 (STN 4630 TO STN 4750)
LF to date: 4480 (STN 270 TO STN 4750)

Comments: 715 AM START EXCAVATION. ALSO MIXING IN POND.
800 AM GUMBO BEING DELIVERED TO SITE FROM OFF-SITE.
TWO ~~ONE~~ SMITH TRUCK HAULING MIXED BACKFILL TO TRENCH. TOTAL LOADS TODAY = 48
SMITH BUILDING A POND AT SE CORNER OF OUR EXCLUSION ZONE TO PUMP SURPLUS SLURRY.
IN AREA AROUND STATION 4750
1130 AM – SMITH H+S PERSON IDENTIFIED READINGS GREATER THAN 5 PPM. ALL PERSONS IN VICINITY WERE EVACUATED & AREA WAS RIBBONED OFF FROM 1240 TO 200. OX4 & SMITH INVESTIGATED AREA AND SINCE GEOCON'S H+S PLAN CALLS FOR LEVEL B FOR READINGS ON HNu > 1 PPM, SMITH'S OPERATOR WAS MADE TO EXCAVATE TRENCH. AREA WAS CONTINUOUSLY MONITORED. PERSONNEL IN ZONE IN "D" MODIFIED.

Marginal note: Marginal

LEAK IN SLURRY SUPPLY PIPE (ABOUT 200 FEET FROM MIX PLANT GOING SOUTH). GEO CON TO FIX IT IN AM 11/13/

SMITH ENVIRONMENTAL

'92nd Street Landfill
Niagara Falls, New York

Date: 11-12-96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
46+00	442	65.0		62sec	12.0	
46+50	902	65.5		58sec	12.5	
47+00	1102	65.5		61sec	12.0	
47+50						

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
46+00		~~84.5~~		~~4~~	13.5	
46+50	822	84.5		42 sec	18.0	
47+00	958	82.0		44 sec	17.0	
47+50	~~1013~~					

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
43+40	8:27	101.0			5.25"		
↓	10:13	105.5			5.0"		
	10:53	101.0			3.25"		
▽	240	102.5			4.75"		
45+00							

Hydraulic Conductivity (1 per 500 LF)

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/12/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

START OF DAY SOUNDINGS

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
4640	700	20'4"	4330	700	0-0	TOP OUT
50		20'0"	40		4'3"	
60		20'0"	50		4'3"	
70		18'10"	60		6'0"	
80		18'6"	70		7'0"	
90		19'0"	80		5'3"	
4700		19'0"	90		8'9"	
10		19'2"	4400		12'0"	
20		20'0"	10		12'3"	
30		19'6"	20		12'9"	
40	↓	19'0"	30		14'6"	
50	1140	19'0"	40		15'6"	
60	210	20'0"	50		15'6"	
70	↓	20'0"	60		16'0"	
80	340	20'0"	70		16'0"	
			80		17'0"	
			90		19'6"	
			4500		19'0"	
			10		22'0"	
			20		22'0"	
			30		22'1"	
			40		22'6"	
			50		22'6"	
			60		23'6"	
			70		24'0"	
			80	---	23'6"	
			90		23'6"	
			4600		23'3"	
			10		23'0"	
			20	↓	23'3"	
			30	722	22'4"	

2' deeper than design OK by Fluor.

TO BE SMOOTHED ON 11/13.

FROM BEYOND THIS POINT DEPTH WAS GREATER THAN DESIGN. OK BY FLUOR

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/12/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

END OF DAY SOUNDINGS

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			4500	350	0.0	TOP OUT.
			10		5'0"	
			20		8'0"	
			30		8'2"	THESE DEPTHS
			40		11'0"	ARE INACCURATE
			50		11'6"	DUE TO SAFETY
			60		12'7"	REASONS, THE
			70		16'0"	PERSON PERFORM
			80		15'10"	THE SOUNDINGS
			90		17'8"	DID NOT GET
			4600		21'6"	CLOSE ENOUGH
			10		22'4"	TO THE TRENCH
			20		22'0"	THE TRENCH WAS
			30		23'4"	FLOODED DUE TO
			40		22'0"	DRAWING OF SOIL
			50		22'3"	AND SLURRY LEVEL
			60		23'0"	INCREASING WITH
			70		21'7"	DECREASE IN DEP
			80		21'7"	OF EXCAVATION.
			90		21'0"	PER FLUOR, THES
			4700		20'6"	STATIONS MUST BE
			10		20'6"	SOUNDED ON AM
			20		21'0"	OF 11/13/96 BEFOR
			30		21'0"	FURTHER EXCAVATIO
			40		20'10"	OR BACKFILLING.
			50	--	19'6"	THE LEVEL OF
			60	↓	20'0"	SLURRY WAS APPROX
			70	410	19'6"	2' HIGHER THAN
						THE ELEVATION OF
						TRENCH AT THE
						EDGE OF THE
						TRENCH.

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/13/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				3 BAGS IN MIXER
Quantity							6 BAGS IN BACKFILL

Summary:
LF today: 176 (STN 4750 TO STN 4926) (ALSO STN 0+00)
LF to date: 4656 (STN 270 TO STN 4926)

Comments:
START EXCAVATION @ 745 AM BUT STOPPED IMMEDIATELY DUE TO LACK OF PROPER SOUNDING EQUIPMENT. RE STARTED EXCAVATION @ 845 AM.
ICE ON TOP OF EXCAVATED TRENCH AND CONSISTENCY OF MEASURING BECAUSE OF ICE ON TOP AND ADJACENT TO TRENCH BACKFILLING WAS NOT STARTED UNTIL 1030 AM.
OXY + FLUOR PERSONNEL RODDED THE AREAS OF CONCERN TO ENSURE NO SLOUGHING.
2 SMITH TRUCKS HAULING BACKFILL.
SMITH CONTINUOUSLY MONITORING EXCAVATION AREA.
1 SMITH OPERATOR (WITH PC200) REMOVING SPOILS FROM TRENCH CASTED ON SLOPE OF LANDFILL ONTO TOP OF LANDFILL. GUMBO BEING DELIVERED FROM OFF-SITE
EXCAVATION + BACKFILLING STOPPED @ 430 FOR THE DAY
TOTAL # OF LOADS HAULED TODAY FROM MIXING POND TO TRENCH = 48

MCDonough Inc.

GEOCON FIXED THE LEAK IN SLURRY CARRYING PIPE.

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 11-13-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
47+50	1052	65.0		46 sec	13.5	
48+00	1102	65.0		44 sec	13.5	
48+50	301	64.5		49 sec	13.0	
49+00						

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
47+50	1035	82.0		52 sec	14.5	
48+00	1033	83.0		54 sec	14.0	
48+50	128	82.0		56 sec	14.0	
49+00	245	83.5		55 sec	14.0	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
45+20	902	103.0			4.50"		
↓	1252	102.5			5.50"		
	203	105.0			4.75"		
↓	315	103.0			5.25"		
46+60							

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/13/96 Job #: 96-015

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

START OF DAY SOUNDINGS

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
4760	845	20'0"	4500	830	0-0	TO ROUT
4770		20'.0"	10		4'3"	
4780		20'.0"	20		6'6"	
90		20-6"	30		6'6"	
4800		21.4"	40		8'6"	
10		21-0	50		13'0"	
20		21.0	60		13'7"	
30		21.0	70		14'0"	
40		21.0	80		14'7"	THESE READINGS
50		21.0	90		17'0"	ARE MORE
60		21.0	4600		18'6"	ACCURATE THAN
70		21.0	10		19'6"	THE PM
80		21.0	20		18'8"	READINGS of
4890		21.0	30		19'6"	11/12/96.
~~4900~~		—	40		19'6"	THESE WERE
4895		21.0	50		19'6"	APPROVED BY
4900		21.0	60		20'0"	OXY & FLUOR.
10		21.0	70		20'1"	THE SLURRY
20		21.0	80		19'4"	LEVEL WAS
4926	430	21.0	90		19'2"	MODIFIED AND
			4700		19'0"	FLUOR/OXY
			10		19'0"	RODDED THE
			20		19'6"	BOTTOM OF
			30		20'0"	TRENCH TO VERIFY.
			40		20'0"	THE BACKFILLING
			50	—	19'5"	OPERATIONS WERE
			60		19'6"	NOT ALLOWED
			70	845	20'0"	UNTIL 1030AM.

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/13/96 Job #: 96-01:

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END OF DAY SOUNDINGS			
			46+50	430	0-0	TO POUT
			60		3'6"	
			70		4'6"	
			80		5'4"	
			90		5'4"	
			4700		5'4"	
			10		6'3"	
			20		6'10"	
			30		8'9"	
			40		10'4"	
			50		12'0"	
			60		13'6"	
			70		14'0"	
			80		16'6"	
			90		16'0"	
			4800		15'1"	
			10		17'0"	
			20		18'0"	
			30		18'0"	
			40		20'0"	
			50		19'10"	
			60		20'6"	
			70		21'0"	
			80		21'0"	
			90		20'6"	
			4900		21'0"	

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/14/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				3 BAGS IN MIXER
Quantity							5 BAGS IN BACKFILL

Summary:
LF today: 110 (STN 0+00 TO 1+10)
LF to date: 4766 (STN 270 TO 4926 and 0+00 TO 1+10)

Comments: START EXCAVATION ACTIVITIES AND BACKFILLING ACTIVITIES @ 730 AM.
2 SMITH TRUCKS HAULING BACKFILL
#OF LOADS HAULED TODAY = 48
GUMBO DELIVERED TO SITE ALL DAY.
1 SMITH HOE REMOVING SPOILS CAST ON SLOPE
DELIVERY OF GUMBO TO BE HALTED TODAY FOR THE DURATION OF THIS JOB.
SMITH MONITORED IN AM. SINCE READINGS DID NOT EXCEED 1 ppm (TODAY + THE 2 PREVIOUS DAYS) THE AREA WAS DECLARED CLEAN AS OF 1230 PM.

MMCDonough

Page __ of __

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 11-14-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
49+00	820	66.0		51sec	14.0	
0+00	1031	65.5		54 sec	12.5	
0+50	158	64.5		47 sec	13.0	
1+00						

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
~~46+50~~						
0+00	902	83.5		64 sec	18.5	
0+50	1110	84.0		61 sec	14.0	
1+00	215	85.0		67 sec	19.0	
1+50						

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
46+60	807	104.0			4.50"		
	1017	105.5			4.75"		
	1120	104.5			5.25"		
↓	1257	104.0			5.50"		
	257	105.0			4.75"		
48+60							

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/14/96 Job #: 96-01:

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
0+10	800	21'0"	START OF DAY SOUNDINGS			
20		21'0"	4650	730	0.0	TOP OUT
30		21'0"	60		3'6"	
33		21'0"	70		4'0"	
5' East 33		21'0"	80		6'0"	
40		23'0"	90		6'0"	
50		23'0"	4700		6'0"	
60		23'0"	10		6'3"	
70		23'0"	20		7'8"	
80		22'7"	30		9'4"	
90		22'5"	40		10'0"	
1+00		22'0"	50		13'0"	
1+10		22'0"	60		13'3"	
			70		13'3"	
			80		15'6"	
			90		15'6"	
			4800		15'7"	
			10		16'0"	
			20		17'0"	
			30		17'0"	
			40		20'0"	
			50		20'2"	
			60		21'0"	
			70		21'0"	
			80	↓	21'1"	
			90	745	19'6"	WILL BE CLEANED OUT BEFORE FURTHER EXCAVATION

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/14/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
			END OF DAY SOUNDINGS -			
			4850	415	0-0	TOP OUT
			60		2'0"	
			70		5'7"	
			80		6'0"	
			90		9'0"	
			4900		11'6"	
			10		12'10"	
			20		13'0"	
			0+30		13'0"	
			0+40		14'3"	
			20		14'6"	
			30		16'0"	
			40		20'5"	
			50		22'2"	
			60		22'0"	
			70		22'0"	
			80		22'2"	
			90		22'2"	
			1+00	↓	22'0"	
			10	425	21'0"	TO BE CLEANED OUT ON 11/15/96

Checked by Smith ____
Checked by Geo-Con ____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/15/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				1 BAGS IN MIXER
Quantity			—				3 BAGS IN BACKFILL

Summary:
LF today: 130 (STATION 1+10 TO STATION 240)
LF to date: 4894 (STN 2+70 TO STN 4926 & STN 0+00 TO STN 240)

Comments: START BACKFILLING ACTIVITIES @ 730 AM.
2 SMITH TRUCKS HAULING BACKFILL (ROUTE: BULKHEAD)
1000 AM TRUCKS HAULING BACKFILL AROUND (NORTH OF MODULAR TANK) FROM MIXING POND TO SE CORNER (NMH1) AT THE TRENCH. TOTAL LOADS HAULED = 67
COMPLETED EXCAVATION & BACKFILLING ACTIVITIES AT 445 PM

Page __ of __

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 11-15-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>61.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
1+00	1007	65.0		51sec	12.0	
1+50	1057	65.5		57sec	13.0	
2+00	151	65.5		49sec	12.0	
2+50	209	66.0		59sec	12.5	

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments
1+50	1101	83.5		64sec	17.5	
2+00	131	83.0		67sec	19.0	
2+50	303	84.0		61 sec	19.5	

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
44+60	812	106.0			5.0"		
	1017	105.0			4.75"		
	1252	106.0			4.25"		
	207	104.5			5.25"		
↓	323	105.0			4.50"		
1+20							

SMITH ENVIRONMENTAL

102nd Street Landfill
Niagara Falls, New York

Date: 11/15/96 Job #: 96-01

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
1+20	845	22'0"	START OF DAY		SOUNDINGS.	
30		22'0"	4850	745	0.0	TOP OUT
40		22'0"	60		2'3"	
50		22'6"	70		5'7"	
60		22'6"	80		6'3"	
70		22'5"	90		8'2"	
80		22'3"	4900		10'0"	
90		22'3"	10		11'0"	
2+50		22'6"	20		12'0"	
10		22'6"	0+00		12'0"	
20		22'6"	10		12'6"	
30	↓	22'7"	20		13'0"	
40	430	22'8"	30		14'6"	
			40		20'0"	
			50		22'0"	
			60		22'2"	
END	OF DAY	SOUNDINGS	70		22'3"	
1+20	~~0:0~~	TOP OUT	80		22'4"	
30	445	~~5~~ 10"	90	↓	22'4"	
40		6'6"	1+00	755	22'0"	WILL BE CLEANED OUT
50		8'5"				
60		10'7"				
70		14'8"				
80		22'3"				
90		22'0"				
2+00		22'6"				
10		22'0"				
20		22'1"				
30	↓	22'5"				
40	452	22'4"				

Checked by Smith _____
Checked by Geo-Con _____

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York
Summary of Activities

Date: 11/16/96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

	Water	Bentonite	Soil	Admixtures			Comments
Source	RIVER	GEOCON	SMITH				1 BAG IN BACKFILL
Quantity							0 BAG IN MIXER

Summary:
LF today: 30 (STN 2+40 TO 2+70)
LF to date: 4926 (STN 0+00 TO STN 4926)

Comments: MIXING IN POND - BACKFILL
SMITH'S 2 TRUCKS HAULING BACKFILL TO TRENCH
1000 AM GEO CON COMPLETED EXCAVATION FROM STN 2+50 TO 2+80. THIS INCLUDES 10' OVERLAP.
AT 330 PM GEO CON MIXED THE BACKFILL THAT WAS PUT IN THE TRENCH PREVIOUSLY (N STN 270) WITH THE FRESH BACKFILL W/HOE IN TRENCH.
ALL SLURRY REMAINING IN TRENCH WAS BAILED OUT WITH THE HOE BUCKET ONTO THE LANDFILL.
BACKFILLING ACTIVITIES WERE COMPLETED ~~AT~~ AT 330 PM
EXCAVATION & BACKFILLING ACTIVITIES COMPLETED AS OF TODAY.

SMITH ENVIRONMENTAL
102nd Street Landfill
Niagara Falls, New York

Date: 11-16-96 Job #: 96-015
Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Batch Mix Slurry
One Test per 50 LF

Station #	Time	>64.3pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments

In Trench Slurry
One Test per 50 LF

Station #	Time	<85pcf Density (pcf)	>6% Bentonite (percent)	>40secs Viscosity (seconds)	<20cc Filtrate (cc)	Comments

Backfill
One Test per 150 CY

Station #	Time	>85pcf Density (pcf)	<10^{-7} Permeability (cm/sec)	>3% Bentonite (percent)	3" to 6" Slump (inches)	(1 per 100 LF) Grain Size	(1 per 100 LF) Atterberg
1+20	825	105.5			4.25"		
	1016	106.0			5.0"		
↓	1252	105.5			5.0"		
2+70							

(1 per 500 LF)

SMITH ENVIRONMENTAL

Date: 11/16/96 Job #: 96-01

102nd Street Landfill
Niagara Falls, New York

Slurry Wall Installation (3 feet wide)
Subcontractor: GEO-CON

Depth of Excavation			Before Backfill			
Station #	Time	Depth (ft)	Station #	Time	Depth (ft)	Comments
2+50	200	23'3"	~~START~~ OF DAY		SOUNDINGS	
2+60	"	23'2"	1+20	730	0.0	TOP OUT
2+70	215	23'3"	30		5'0"	
			40		7'0"	
			50		7'3"	
			60		11'0"	
			70		16'0"	
			80		20'0"	
			90		22'0"	
			2+00		22'5"	
			10		22'6"	
			20		22'6"	
			30		22'5"	
			40		22'3"	
			50	"	19'0"	
			60	740	18'0"	
			BACKFILL COMPLETED			
			∴ NO PM SOUNDINGS.			
			IN FACT, NO MORE SOUNDINGS			
			HA, HA HA HA HA!			

APPENDIX J

SLURRY WALL LABORATORY TESTS AT STATIONS

109.3911

Author: Scott Lawrence at FDPH-A1
Date: 5/28/97 7:51 AM
Priority: Normal
Receipt Requested
TO: Clifford Mars at FDPH-ACCESS
TO: Chuck Taylor at FDGV-09
Subject: Slurry Wall Sampling
---------- Message Contents ----------

Cliff,

During the Slurry Wall construction, Geo-Con was required the take samples of the backfill mixture(before being added to the trench) every 150 cubic yards.

During the winter shutdown, I compiled the data and noticed that there were 2 blocks of the permeability data that were missing(along with the shelby tube perms and some of the atterburg limit tests that were performed). In the February 13 meeting, I brought this item up and Geocon was holding the information back.

On April 29, Smith transmitted the remaining data that was missing except a block of backfill perms between stations 2200 and 2550. 4.34 samples should have been taken based on the volumes excavated in this section of trench. Geocon can't find this data, and wants to know how to fix it.

There were 102 samples taken during the construction over 11,200 yards of material(1 sample per 110 yards). So they still meet their frequency. 2 shelby tubes were taken in the trench between 2200 and 2550. One at 2240 (4.0 E-8) and 2600 (3.4E-8).

I have attached a data table that I made back in the winter showing the results. Let me know what you think and we'll go from there.

Scott

Fluor Daniel GTI

102nd Street Landfill

Summary Table of Slurry Wall Backfill Tests

Date	Station	Trench Backfill(1 per 150 cubic yards)						Soil for Backfill(1 per 100LF)				
		Time	Density >85 pcf	Slump 3-6"	Water Content	Unit Dry Weight(pcf)	Permeability <1 10E-7	Grain Size >20% Fines	Water Content	Atterburg Limits LL%	Atterburg Limits PL%	Atterburg Limits PI%
08/28/96	250	08:52	103.0	2.125	-	-	-	-	-	-	-	-
	250	10:25	-	3.5	57.2	67.5	5.9E-08	-	-	-	-	-
	300	13:36	105.0	6	-	-	-	100	40.2	46	21	25
08/29/96	350	08:50	103.0	5	52.5	69.5	2.0E-08	-	-	-	-	-
	400	12.55	106.0	5.5	57.4	67.2	3.5E-08	99	42.0	45	21	24
	450	16:30	103.0	3.75	55.6	68.3	3.0E-08	-	-	-	-	-
08/30/96	450	08:12	103.0	5	55.6	68.3	3.0E-08	-	-	-	-	-
	500	10:54	106.0	4.5	68.9	59.9	3.2E-08	100	39.8	46	21	25
	550	14:10	103.0	5	69.3	60.2	2.9E-08	-	-	-	-	-
09/03/96	550	10:41	105.0	4.5	69.3	60.2	2.9E-08	-	-	-	-	-
	600	14:50	103.0	5.5	57.5	65.1	2.8E-08	100	40.7	45	21	24
	650	16:30	107.0	4.25	51.0	71.8	2.9E-08	-	-	-	-	-
09/04/96	700	08:50	102.0	5.5	60.6	63.7	4.3E-08	99	42.9	35	20	15
	750	08:35	105.0	6	59.6	62.3	4.4E-08	-	-	-	-	-
	800	10:11	105.6	4	53.6	65.8	1.7E-08	100	42.6	46	17	29
	850	10:45	105.0	4	54.9	66.9	3.5E-08	-	-	-	-	-
	900	11:30	105.7	3.5	54.0	66.0	3.6E-08	99	38.0	46	21	25
	950	13:40	-	1.5	-	-	-	-	-	-	-	-
	950	15:55	103.0	4.5	59.2	64.5	2.9E-08	-	-	-	-	-
	1000	16:10	103.0	3.5	53.5	67.2	3E-08	100	40.9	45	20	25
09/05/96	1050	08:40	104.0	3.5	48.4	70.8	3.3E-08	-	-	-	-	-
	1100	08:45	103.0	3.5	48.5	71.4	3.3E-08	99	41.2	42	19	23
	1150	09:05	103.0	4.5	55.8	68.7	3.3E-08	-	-	-	-	-
	1200	11:11	105.0	4	58.1	65.3	3.8E-08	95	41.3	43	18	25
	1250	11:18	106.0	4.5	54.1	69.0	3.8E-08	-	-	-	-	-
	1300	14:15	104.5	4	54.9	65.4	3.3E-08	99	44.0	44	20	24
	1350	14:55	106.0	4.5	54.4	67.4	3.3E-08	-	-	-	-	-
09/06/96	1400	08:39	103.0	5	56.6	65.2	3.4E-08	99	40.6	43	19	24
	1450	10:25	105.0	3.5	52.3	68.1	3.3E-08	-	-	-	-	-
	1500	13:26	105.0	4	51.5	69.2	3.2E-08	100	35.0	47	21	26
	1550	14:10	104.5	4	48.9	70.1	3.4E-08	-	-	-	-	-
	1600	16:30	104.0	3.5	55.0	67.5	2.9E-08	100	40.0	43	20	23
09/09/96	1650	-	105.0	4	45.1	73.5	3.0E-08	-	-	-	-	-
	1700	-	104.5	5	54.6	68.8	4.0E-08	99	42.9	43	19	24
09/10/96	1750	08:03	104.0	5	54.0	68.3	4.1E-08	-	-	-	-	-
	1800	09:25	103.0	5	51.0	69.4	4.8E-08	100	40.5	44	20	24
	1850	11:20	103.0	5	55.4	67.5	5.5E-08	-	-	-	-	-
	1900	11:35	104.0	5.25	51.4	69.6	4.9E-08	99	39.6	43	19	24
	1950	13:25	101.0	5.5	58.0	65.8	3.3E-08	-	-	-	-	-
	2000	14:40	103.5	4.5	53.7	67.7	3.2E-08	100	39.4	44	20	24
9/11//96	2050	08:12	103.0	5.5	53.4	69.1	3E-08	-	-	-	-	-
	2100	08:38	104.0	4.25	54.6	67.5	3.2E-08	100	38.6	45	20	25
	2150	09:20	104.5	4.5	51.8	68.5	3.6E-08	-	-	-	-	-
	2200	10:00	105.0	4				100	43.6	42	20	22
	2250	13:32	102.5	3.75				-	-	-	-	-
	2300	14:45	104.0	4				100	37.1	44	20	24
	2350	15:58	102.0	4.25				-	-	-	-	-
09/12/96	2400	09:22	103.5	4				100	33.9	41	20	21
	2500	-	-	-	-	-	-	100	34.6	44	20	24
10/16/96	2600	09:02	102.0	3.25	57.0	65.0	3.6E-08	100	41.4	4	20	26
	2650	10:45	101.5	3.5	51.3	70.6	3.2E-08	-	-	-	-	-
10/17/96	2700	10:45	98.0	3.5	56.0	65.8	3.5E-08	99	32.6	43	19	24
	2750	13:40	96.0	5.5	62.4	62.6	3.1E-08	-	-	-	-	-
	2800	15:30	98.5	5.75	57.1	65.2	3.3E-08	99	37.1	42	19	23
10/18/96	2850	08:48	102.0	5.5	54.4	67.6	3.6E-08	-	-	-	-	-
	2900	11:27	101.5	5.25	59.2	64.7	3.6E-08	99	44.8	45	20	25
	2950	15:52	102.0	5.5	57.3	64.5	3.5E-08	-	-	-	-	-
10/23/96	2950	13:15	102.0	5	57.3	64.5	3.5E-08	-	-	-	-	-
	2970	15:38	102.5	3.25	64.3	59.5	3.4E-08	-	-	-	-	-
10/24/96	2980	14:07	103.0	4.75	55.2	63.5	3.7E-08	-	-	-	-	-
	2990	16:23	102.5	4.5	-	-	-	-	-	-	-	-

Fluor Daniel GTI

102nd Street Landfill

Summary Table of Slurry Wall Backfill Tests

Date	Station	Trench Backfill(1 per 150 cubic yards)						Soil for Backfill(1 per 100LF)				
		Time	Density >85 pcf	Slump 3-6"	Water Content	Unit Dry Weight(pcf)	Permeability <1 10E-7	Grain Size >20% Fines	Water Content	Atterburg Limits LL%	PL%	PI%
10/25/96	3000	10:35	102.0	5	54.5	66.8	3.8E-08	100	33.1	45	20	25
	3040	13:22	101.5	5.25	51.9	68.5	4.3E-08	-	-	-	-	-
10/26/96	3080	08:00	103.0	5.5	51.9	69.4	4.4E-08	-	-	-	-	-
	3100	-	-	-	-	-	-	100	32.0	45	20	25
	3120	10:10	105.0	4.75	51.3	68.2	4.7E-08	-	-	-	-	-
	3160	13:30	103.5	3.75	60.6	62.8	3.8E-08	-	-	-	-	-
	3200	16:00	104.0	4	56.7	66.2	4.3E-08	99	37.7	47	20	27
10/28/96	3240	08:30	100.0	4	57.8	65.6	3.8E-08	-	-	-	-	-
	3280	08:35	99.5	5.5	78.2	54.2	2.7E-08	-	-	-	-	-
	3320	13:13	100.0	5	-	-	-	-	-	-	-	-
	3200	09:25	98.5	5.5	-	-	-	-	-	-	-	-
	3200	09:30	99.0	5.5	-	-	-	-	-	-	-	-
	3280	10:48	100.0	6	78.2	54.2	2.7E-08	-	-	-	-	-
	3290	13:45	99.0	6	63.8	62.0	4.5E-08	-	-	-	-	-
	3300	16:10	99.0	6	59.5	63.5	3.8E-08	99	41.1	48	20	28
10/30/96	3300	08:25	102.0	5.25	59.5	63.5	3.8E-08	-	-	-	-	-
	3320				64.7	59.8	4.1E-08					
	3340	10:28	101.5	5.5	59.9	63.9	4.3E-08	-	-	-	-	-
	3360				62.4	62.0	4.1E-08					
	3380	14:22	102.5	5.5	61.1	62.4	3.5E-08	-	-	-	-	-
	3400	-	-	-	-	-	-	100	41.2	47	20	27
10/31/96	3380	08:17	101.0	4.75	61.1	62.4	3.5E-08	-	-	-	-	-
	3410	10:15	102.5	5	-	-	-	-	-	-	-	-
	3420				59.5	63.3	4.5E-08					
	3450	13:28	102.0	5.5	-	-	-	-	-	-	-	-
	3460				57.7	66.3	4E-08					
	3480	15:42	102.0	5.5	-	-	-	-	-	-	-	-
	3500	-	-	-	-	-	-	100	38.3	46	20	26
11/01/96	3480	12:56	102.5	5.75	-	-	-	-	-	-	-	-
	3520	15:40	102.0	5.25	60.0	65.0	3.4E-08	-	-	-	-	-
11/02/96	3540	08:15	109.0	5	-	-	-	-	-	-	-	-
	3560	11:30	108.0	4.5	59.8	65.9	3.6E-08	-	-	-	-	-
	3580	14:00	106.0	6	-	-	-	-	-	-	-	-
11/04/96	3590	08:42	-	7.5	-	-	-	-	-	-	-	-
	3600	09:14	105.0	5	60.6	59.6	3E-08	100	38.2	46	20	26
	3640	11:09	106.5	5.75	60.6	63.5	3.5E-08	-	-	-	-	-
	3680	11:12	107.0	6	58.7	64.3	3.4E-08	-	-	-	-	-
	3700	13:42	106.5	5.5	-	-	-	98	38.1	46	20	26
11/05/96	3700	07:25	106.5	4.5	-	-	-	-	-	-	-	-
	3720	10:12	105.0	6	60.0	63.5	3.5E-08	-	-	-	-	-
	3760	11:10	105.5	6	61.1	61.5	3.4E-08	-	-	-	-	-
	3800	14:40	106.0	4.5	56.9	64.7	3.3E-08	100	44.0	48	21	27
	3880	15:48	104.5	5	56.7	64.3	3.3E-08	-	-	-	-	-
11/06/96	3880	07:42	105.0	4.75	56.7	64.3	3.3E-08	-	-	-	-	-
	3900	-	-	-	-	-	-	100	44.8	47	21	26
	3920	11:22	106.0	4.25	60.6	62.8	3.3E-08	-	-	-	-	-
	3960	14:21	107.0	5	54.4	66.3	3.5E-08	-	-	-	-	-
11/07/96	3960	08:00	106.5	5	54.4	66.3	3.5E-08	-	-	-	-	-
	4000	12:48	106.0	4.75	65.1	61.1	4E-08	100	42.3	46	20	26
	4060	14:32	106.0	5	67.7	59.3	2.9E-08	-	-	-	-	-
11/08/96	4060	08:25	105.0	4.5	67.7	59.3	2.9E-08	-	-	-	-	-
	4100	13:02	107.0	6	46.1	71.0	2.3E-08	100	45.0	46	20	26
11/09/96	4120	07:54	104.5	5.5	-	-	-	-	-	-	-	-
	4160	10:35	105.0	5.75	51.2	66.7	3.2E-08	-	-	-	-	-
	4200	13:43	105.0	5	60.5	60.6	3.5E-08	99	33.2	42	19	23
11/11/96	4220	07:41	105.0	4.5	-	-	-	-	-	-	-	-
	4260	12:54	105.0	5.25	51.0	68.7	2.4E-08	-	-	-	-	-
	4300	15:08	106.0	5.75	43.8	74.8	2.6E-08	99	33.5	45	20	25
11/12/96	4340	08:20	106.0	5.25	-	-	-	-	-	-	-	-
	4380	10:13	105.5	5	50.2	69.9	2.5E-08	-	-	-	-	-
	4400	-	-	-	-	-	-	99	40.3	52	21	31
	4420	13:03	105.0	5.25	-	-	-	-	-	-	-	-
	4460	14:40	102.5	4.75	51.9	68.5	2.3E-08	-	-	-	-	-
	4500	-	-	-	-	-	-	99	35.1	34	18	16
11/13/96	4520	09:02	103.0	4.5	-	-	-	-	-	-	-	-

	4540	12:52	102.5	5.5	46.7	72.0	2.3E-08	-	-	-	-	-
	4590	14:03	105.0	4.75	-	-	-	-	-	-	-	-
	4600	-	-	-	-	-	-	99	37.5	50	21	29
	4620	15:15	103.0	5.25	40.7	76.5	1.5E-08	-	-	-	-	-

Fluor Daniel GTI

102nd Street Landfill

Summary Table of Slurry Wall Backfill Tests

Date	Station	Trench Backfill(1 per 150 cubic yards)						Soil for Backfill(1 per 100LF)				
		Time	Density >85 pcf	Slump 3-6"	Water Content	Unit Dry Weight(pcf)	Permeability <1 10E-7	Grain Size >20% Fines	Water Content	Atterburg Limits LL%	PL%	PI%
11/14/96	4660	08:07	104.0	4.5	41.9	74.7	1.9E-08	-	-	-	-	-
	4700	10:17	105.5	4.75	-	-	-	99	28.8	50	21	29
	4740	11:20	104.5	5.25	46.1	68.5	2E-08	-	-	-	-	-
	4780	12:57	104.0	5.5	-	-	-	-	-	-	-	-
	4800	-	-	-	-	-	-	99	39.7	57	21	36
	4820	14:57	105.0	4.75	45.5	71.0	1.8E-08	-	-	-	-	-
11/15/96	4860	08:12	106.0	5	-	-	-	-	-	-	-	-
	4900	10:17	105.0	4.75	52.7	68.2	2.9E-08	97	41.4	53	21	32
	10	12:52	106.0	4.25	-	-	-	-	-	-	-	-
	60	14:07	104.5	5.25	50.1	70.1	3.6E-08	-	-	-	-	-
	90	15:23	105.0	4.5	-	-	-	-	-	-	-	-
	100	-	-	-	-	-	-	99	39.9	39	18	21
	110				49.8	69.8	3.4E-08					
11/16/96	120	08:25	105.5	4.25	-	-	-	-	-	-	-	-
	170	10:18	106.0	5	-	-	-	-	-	-	-	-
	200	-	-	-	-	-	-	100	40.2	45	20	25
	250	12:52	105.5	5	53.0	67.1	3.2E-08	-	-	-	-	-
	300	-	-	-	-	-	-	100	38.6	44	20	24

SENT BY:WOODWARD-CLYDE ;11-26-96 ; 4:30PM ; BLUE BELL PA→ 8173820859;# 2/ 7

PROJECT: GEO-CON - NIAGARA FALLS

PROJECT No.: 6E0215

SUMMARY OF LABORATORY TEST RESULTS

BORING and SAMPLE NUMBER	DEPTH (feet)	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCONFINED COMPRESSION		UNIT DRY WEIGHT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		COMPACTION	CONSOL.	TRIAXIAL		Permeability (cm/sec)
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (ksf)	STRAIN (%)			SIEVE	HYD			U.U.	CIU	
0+60				50.1					70.1								3.6E-08
1+10				49.8					69.8								3.4E-08
2+50				57.2					67.5								5.9E-08
2+50				53.0					67.1								3.2E-08
3+50				52.5					69.5								2.0E-08
4+00				57.4					67.2								3.5E-08
4+50				55.6					68.3								3.0E-08
5+00				68.9					59.9								3.2E-08
5+50				69.3					60.2								2.9E-08
6+00				57.5					65.1								2.8E-08
6+50				51.0					71.8								2.9E-08
7+00				60.6					63.7								4.3E-08
7+50				59.6					62.3								4.4E-08
8+00				53.6					65.8								1.7E-08
8+50				54.9					66.9								3.5E-08
9+00				54.0					66.0								3.6E-08

SPECIAL TEST KEY:

* See Test Curves

Woodward-Clyde Consultants

SENT BY:WOODWARD-CLYDE ;11-26-96 ; 4:31PM ; BLUE BELL PA→ 8173820859;# 3/ 7

PROJECT: GEO-CON - NIAGARA FALLS

PROJECT No.: 6E0215

SUMMARY OF LABORATORY TEST RESULTS

BORING and SAMPLE NUMBER	DEPTH (feet)	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCONFINED COMPRESSION		UNIT DRY WEIGHT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		COMPACTION	CONSOL.	TRIAXIAL		Permeability (cm/sec)
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (ksf)	STRAIN (%)			SIEVE	HYD			U.U.	CIU	
9+50				59.2					64.5								2.9E-08
10+00				53.5					67.2								3.0E-08
10+50				48.4					70.8								3.3E-08
11+00				48.5					71.4								3.3E-08
11+50				55.8					68.7								3.3E-08
12+00				58.1					65.3								3.8E-08
12+50				54.1					69.0								3.8E-08
13+00				54.9					65.4								3.3E-08
13+50				54.4					67.4								3.3E-08
14+00				56.6					65.2								3.4E-08
14+50				52.3					68.1								3.3E-08
15+00				51.5					69.2								3.2E-08
15+50				48.9					70.1								3.4E-08
16+00				55.0					67.5								2.9E-08
16+50				45.1					73.5								3.0E-08
17+00				54.6					68.8								4.0E-08

SPECIAL TEST KEY:

* See Test Curves

Woodward-Clyde Consultants

11/26/96 ROMS L21F"

SENT BY:WOODWARD-CLYDE :11-26-96 ; 4:32PM ; BLUE BELL PA→ 8173820859:# 4/ 7

Woodward-Clyde Consultants

PROJECT: GEO-CON - NIAGARA FALLS

PROJECT No.: 6E0215

SUMMARY OF LABORATORY TEST RESULTS

BORING and SAMPLE NUMBER	DEPTH (feet)	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCONFINED COMPRESSION		UNIT DRY WEIGHT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		COMPACTION	CONSOL.	TRIAXIAL		Permeability (cm/sec)
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (ksf)	STRAIN (%)			SIEVE	HYD			U.U.	CIU	
17+50				54.0					68.3								4.1E-08
18+00				51.0					69.4								4.8E-08
18+50				55.4					67.5								5.5E-08
19+00				51.4					69.6								4.9E-08
19+50				58.0					65.8								3.3E-08
20+00				53.7					67.7								3.2E-08
20+50				53.4					69.1								3.0E-08
21+00				54.6					67.5								3.2E-08
21+50				51.8					68.5								3.6E-08
26+00				57.0					66.0								3.6E-08
26+50				51.3					70.6								3.2E-08
27+00				56.0					65.8								3.5E-08
27+50				62.4					62.6								3.1E-08
28+00				57.1					65.3								3.3E-08
28+50				54.4					67.6								3.6E-08
29+00				59.2					64.7								3.6E-08

SPECIAL TEST KEY:

* See Test Curves

SENT BY:WOODWARD-CLYDE ;11-26-96 ; 4:33PM ; BLUE BELL PA→ 8173820859:# 5/ 7

PROJECT: GEO-CON - NIAGARA FALLS

PROJECT No.: 6E021

SUMMARY OF LABORATORY TEST RESULTS

BORING and SAMPLE NUMBER	DEPTH (feet)	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCONFINED COMPRESSION		UNIT DRY WEIGHT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		COMPACTION	CONSOL.	TRIAXIAL		Permeability (cm/sec)
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (ksf)	STRAIN (%)			SIEVE	HYD			U.U.	CIU	
29+50				57.3					64.5								3.5E-08
29+70				64.3					59.5								3.4E-08
29+80				55.2					63.5								3.7E-08
30+00				54.5					66.8								3.8E-08
30+40				51.9					68.5								4.3E-08
30+80				51.9					69.4								4.4E-08
31+20				51.3					68.2								4.7E-08
31+60				60.6					62.8								3.8E-08
32+00				56.7					66.2								4.3E-08
32+40				57.8					65.6								3.8E-08
32+80				78.2					54.2								2.7E-08
32+90				63.8					62.0								4.5E-08
33+00				59.5					63.5								3.8E-08
33+20				64.7					59.8								4.1E-08
33+40				59.9					63.9								4.3E-08
33+60				62.4					62.0								4.1E-08

SPECIAL TEST KEY:

* See Test Curves

Woodward-Clyde Consultants

SENT BY:WOODWARD-CLYDE ;11-26-96 ; 4:34PM ; BLUE BELL PA→ 8173820859:# 6/ 7

PROJECT: GEO-CON - NIAGARA FALLS

PROJECT No.: 6E021

SUMMARY OF LABORATORY TEST RESULTS

BORING and SAMPLE NUMBER	DEPTH (feet)	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCONFINED COMPRESSION		UNIT DRY WEIGHT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		COMPACTION	CONSOL.	TRIAXIAL		Permeability (cm/sec)
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (ksf)	STRAIN (%)			SIEVE	HYD			U.U.	CIU	
33+80				61.1					62.4								3.5E-08
34+20				59.5					63.3								4.5E-08
34+60				57.7					66.3								4.0E-08
35+20				60.0					65.0								3.4E-08
35+60				59.8					65.9								3.6E-08
36+00				60.6					59.6								3.0E-08
36+40				60.6					63.5								3.5E-08
36+80				58.7					64.3								3.4E-08
37+20				60.0					63.5								3.5E-08
37+60				61.1					61.5								3.4E-08
38+00				56.9					64.7								3.3E-08
38+40				60.2					64.2								3.3E-08
38+80				56.7					64.3								3.3E-08
39+20				60.6					62.8								3.3E-08
39+80				54.4					66.3								3.5E-08
40+00				65.1					61.1								4.0E-08

SPECIAL TEST KEY:

* See Test Curves

Woodward-Clyde Consultants

SENT BY:WOODWARD-CLYDE ;11-26-96 ; 4:35PM ; BLUE BELL PA→ 8173820859:# 7/ 7

PRO. .T: GEO-CON - NIAGARA FALLS

PROJECT No.: 6E02

SUMMARY OF LABORATORY TEST RESULTS

BORING and SAMPLE NUMBER	DEPTH (feet)	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCONFINED COMPRESSION		UNIT DRY WEIGHT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		COMPACTION	CONSOL.	TRIAXIAL		Permeabilit (cm/sec)
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (ksf)	STRAIN (%)			SIEVE	HYD			U.U.	CIU	
40+60				67.7					59.3								2.9E-08
41+00				46.1					71.0								2.3E-08
41+60				51.2					66.7								3.2E-08
42+00				60.5					60.6								3.5E-08
42+60				51.0					68.7								2.4E-08
43+00				43.8					74.8								2.6E-08
43+80				50.2					69.9								2.5E-08
44+60				51.9					68.5								2.3E-08
45+40				46.7					72.0								2.3E-08
46+20				40.7					76.5								1.5E-08
46+60				41.9					74.7								1.9E-08
47+40				46.1					68.5								2.0E-08
48+20				45.5					71.0								1.8E-08
49+00				52.7					68.2								2.9E-08

SPECIAL TEST KEY:

* See Test Curves

Woodward-Clyde Consultants

SENT BY:WOODWARD-CLYDE ; 1-23-97 ; 2:37PM ; BLUE BELL PA→ 8173820859:# 2/ 2

PROJECT: GEO-CON - NIAGARA FALLS

PROJECT No.: 6E021E

SUMMARY OF LABORATORY TEST RESULTS

BORING and SAMPLE NUMBER	DEPTH (feet)	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCONFINED COMPRESSION		UNIT DRY WEIGHT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		COMPACTION	CONSOL.	TRIAXIAL		Permeability (cm/sec)
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (psi)	STRAIN (%)			SIEVE	HYD			U.U.	CIU	
0+00				55.3					66.7								2.9E-08
2+80				55.6					64.9								3.4E-08
5+85				58.8					63.3								3.7E-08
5+90				57.9					65.2								3.6E-08
8+50				52.9					67.4								3.5E-08
22+40				57.8					65.8								4.0E-08
26+00				55.7					64.5								3.4E-08
30+90				44.8					74.2								2.3E-08
42+00				40.9					78.0								2.5E-08
46+20				54.1					67.0								2.9E-08

SPECIAL TEST KEY:

* See Test Curves

Woodward-Clyde Consultants

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: 102ND STREET LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00 CLIENT: GEO-CON INC.
MATERIAL SOURCE: SUMMIT PARK BORROW PIT - WHEATFIELD, N.Y.
DATE REPORTED: 11/27/96 WORK ORDER NO. 2877

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
1+00	11156-1		39.9	39	18	21	99									Reddish Gray Lean Clay (CL)
2+00	11156-2		40.2	45	20	25	100									Reddish Gray Lean Clay (CL)
3+00	11156-3		38.6	44	20	24	100									Mottled Brown, Reddish Gray Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

GEOTECHNICAL LABORATOR ESTING DATA SUMMARY

PROJECT NAME: 102ND STREET LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00
CLIENT: GEO-CON, INC.
MATERIAL SOURCE: SUMMIT PARK BORROW PIT
DATE REPORTED: 9/10/96
WORK ORDER NO. 2774

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
4+00	08306-1		42.0	45	21	24	99									Brown Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

GEOTECHNICAL LABORATOR ESTING DATA SUMMARY

PROJECT NAME: 102ND STREET LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00 CLIENT: GEO-CON, INC.

MATERIAL SOURCE: SUMMIT PARK BORROW PIT
DATE REPORTED: 9/10/96

WORK ORDER NO. 2778

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
5+00	08306-1		39.8	46	21	25	100									Brown Lean Clay (CL)
6+00	08306-2		40.7	45	21	24	100									Brown Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

GEOTECHNICAL LABORATOR ESTING DATA SUMMARY

PROJECT NAME: 102ND STREET LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00 CLIENT: GEO-CON, INC.
MATERIAL SOURCE: SUMMIT PARK BORROW PIT
DATE REPORTED: 9/10/96 WORK ORDER NO. 2781

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
7+00	09036-1		42.9	35	20	15	99									Brown Lean Clay (CL)
8+00	09036-2		42.6	46	17	29	100									Brown Lean Clay (CL)
9+00	09036-3		38.0	46	21	25	99									Brown Lean Clay (CL)
10+00	09046-1		40.9	45	20	25	100									Brown Lean Clay (CL)
11+00	09046-2		41.2	42	19	23	99									Brown Lean Clay (CL)
12+00	09046-3		41.3	43	18	25	95									Brown Lean Clay (CL)
13+00	09046-4		44.0	44	20	24	99									Brown Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: 102ND STREET LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00
CLIENT: GEO-CON, INC.
MATERIAL SOURCE: SUMMIT PARK BORROW PIT
DATE REPORTED: 9/10/96
WORK ORDER NO. 2785

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
14+00	09066-1		40.6	43	19	24	99									Reddish Gray Lean Clay (CL)
15+00	09066-2		35.0	47	21	26	100									Reddish Gray Lean Clay (CL)
16+00	09066-3		40.0	43	20	23	100									Reddish Gray Lean Clay (CL)
17+00	09066-4		42.9	43	19	24	99									Reddish Gray Lean Clay (CL)
18+00	09066-5		40.5	44	20	24	100									Reddish Gray Lean Clay (CL)
19+00	09066-6		39.6	43	19	24	99									Reddish Gray Lean Clay (CL)
20+00	09066-7		39.4	44	20	24	100									Reddish Gray Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: 102ND ST. LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00 CLIENT: GEO-CON, INC.

MATERIAL SOURCE: SUMMIT PARK BORROW PIT - WHEATFIELD, N.Y.
DATE REPORTED: 9/16/96 WORK ORDER NO. 2792

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Standard)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
21+00	09116-1		38.6	45	20	25	100									Reddish Gray Lean Clay (CL)
22+00	09116-2		43.6	42	20	22	100									Reddish Gray Lean Clay (CL)
23+00	09116-3		37.1	44	20	24	100									Reddish Gray Lean Clay (CL)
24+00	09116-4		33.9	41	20	21	100									Reddish Gray Lean Clay (CL)
25+00	09116-5		34.6	44	20	24	100									Reddish Gray Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: 102ND ST. LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00
CLIENT: GEO-CON INC.
MATERIAL SOURCE: SUMMIT PARK BORROW PIT - WHEATFIELD, N.Y.
DATE REPORTED: 10/29/96
WORK ORDER NO. 2832

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
26+00	10156-1		41.4	46	20	26	100									Dark Reddish Gray Lean Clay (CL)
27+00	10156-2		32.6	43	19	24	99									Dark Reddish Gray Lean clay (CL)
28+00	10156-3		37.1	42	19	23	99									Reddish Brown Lean Clay (CL)
29+00	10156-4		44.8	45	20	25	99									Reddish Gray Lean Clay (CL)
30+00	10156-5		33.1	45	20	25	100									Reddish Gray Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

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GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: 102ND ST. LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00 CLIENT: GEO-CON INC.
MATERIAL SOURCE: SUMMIT PARK BORROW PIT - WHEATFIELD, N.Y.
DATE REPORTED: 10/29/96 WORK ORDER NO. 2835

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
31+00	10176-1		32.0	45	20	25	100									Dark Reddish Gray Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

GEOTECHNICAL LABO. ORY TESTING DATA SUMMARY

PROJECT NAME: 102ND STREET LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00 CLIENT: GEO-CON INC.
MATERIAL SOURCE: SUMMIT PARK BORROW PIT - WHEATFIELD, N.Y.
DATE REPORTED: 11/26/96 WORK ORDER NO. 2847

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
32+00	10286-1		37.7	47	20	27	99									Mottled Brown, Reddish Gray Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

GEOTECHNICAL LABO ORY TESTING DATA SUMMARY

PROJECT NAME: 102ND STREET LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00
CLIENT: GEO-CON INC.
MATERIAL SOURCE: SUMMIT PARK BORROW PIT - WHEATFIELD, N.Y.
DATE REPORTED: 11/26/96
WORK ORDER NO. 2850

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
33+00	10316-1		41.1	48	20	28	99									Dark Grayish Brown Lean Clay (CL)
34+00	10316-2		41.2	47	20	27	100									Dark Grayish Brown Lean Clay (CL)
35+00	10316-3		38.3	46	20	26	100									Dark Grayish Brown Lean Clay (CL)
36+00	10316-4		38.2	46	20	26	100									Dark Grayish Brown Lean Clay (CL)
37+00	10316-5		38.1	46	20	26	98									Dark Grayish Brown Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

GEOTECHNICAL LABORA RY TESTING DATA SUMMARY

PROJECT NAME: 102ND STREET LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00 CLIENT: GEO-CON INC.

MATERIAL SOURCE: SUMMIT PARK BORROW PIT - WHEATFIELD, N.Y.
DATE REPORTED: 11/27/96 WORK ORDER NO. 2852

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
38+00	11016-1		44.0	48	21	27	100									Dark Grayish Brown Lean Clay (CL)
39+00	11016-2		44.8	47	21	26	100									Dark Grayish Brown Lean Clay (CL)
40+00	11016-3		42.3	46	20	26	100									Dark Grayish Brown Lean Clay (CL)
41+00	11016-4		45.0	46	20	26	100									Dark Grayish Brown Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

GEOTECHNICAL LABOR ORY TESTING DATA SUMMARY

PROJECT NAME: 102ND STREET LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00
CLIENT: GEO-CON INC.
MATERIAL SOURCE: SUMMIT PARK BORROW PIT - WHEATFIELD, N.Y.
DATE REPORTED: 11/27/96
WORK ORDER NO. 2854

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
42+00	11056-1		33.2	42	19	23	99									Dark Grayish Brown Lean Clay (CL)
43+00	11056-2		33.5	45	20	25	99									Dark Grayish Brown Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: 102ND STREET LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00
CLIENT: GEO-CON INC.
MATERIAL SOURCE: SUMMIT PARK BORROW PIT
DATE REPORTED: 11/21/96
WORK ORDER NO. 2862

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
44+00	11076-1		40.3	52	21	31	99									Brown Fat Clay (CH)
45+00	11076-2		35.1	34	18	16	99									Brown Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

GEOTECHNICAL LABORATO. TESTING DATA SUMMARY

PROJECT NAME: 102ND STREET LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00 CLIENT: GEO-CON INC.

MATERIAL SOURCE: SUMMIT PARK BORROW PIT - WHEATFIELD, N.Y.
DATE REPORTED: 11/27/96 WORK ORDER NO. 2867

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
46+00	11116-1		37.5	50	21	29	99									Reddish Gray Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.

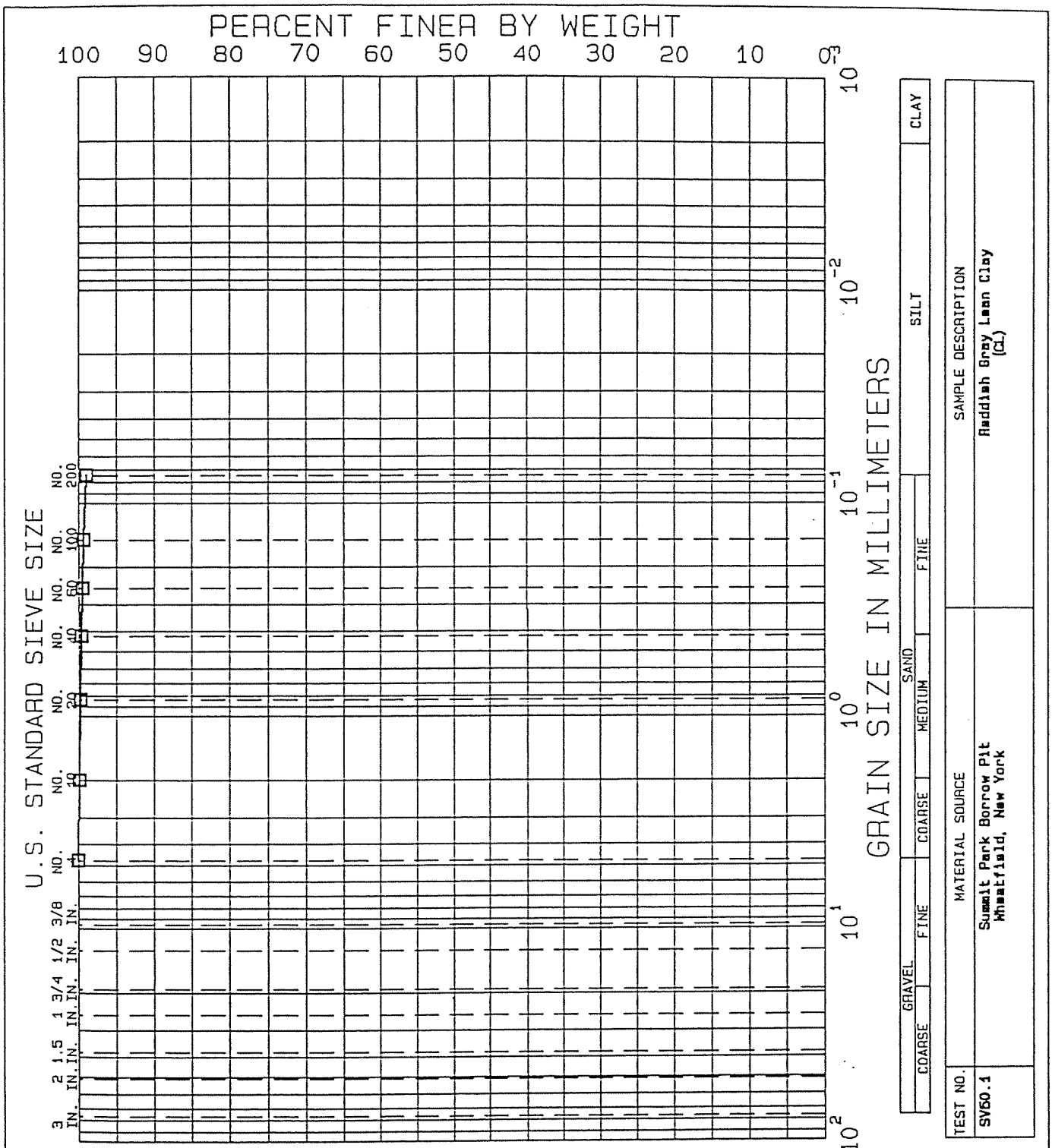
GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: 102ND STREET LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO.. 55121.00
CLIENT: GEO-CON INC.
MATERIAL SOURCE: SUMMIT PARK BORROW PIT - WHEATFIELD, N.Y.
DATE REPORTED: 11/27/96
WORK ORDER NO. . 2871

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
STATION NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
47+00	11126-1		28.8	50	21	29	99									Reddish Gray Fat Clay (CH)
48+00	11126-2		39.7	57	21	36	99									Dark Reddish Gray Lean Clay (CL)
48+96	11126-3		41.4	53	21	32	97									Reddish Gray Lean Clay (CL)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 1+00
SAMPLE NO. 11158-1
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2877
DATE 11/22/96

FILE 55121.00

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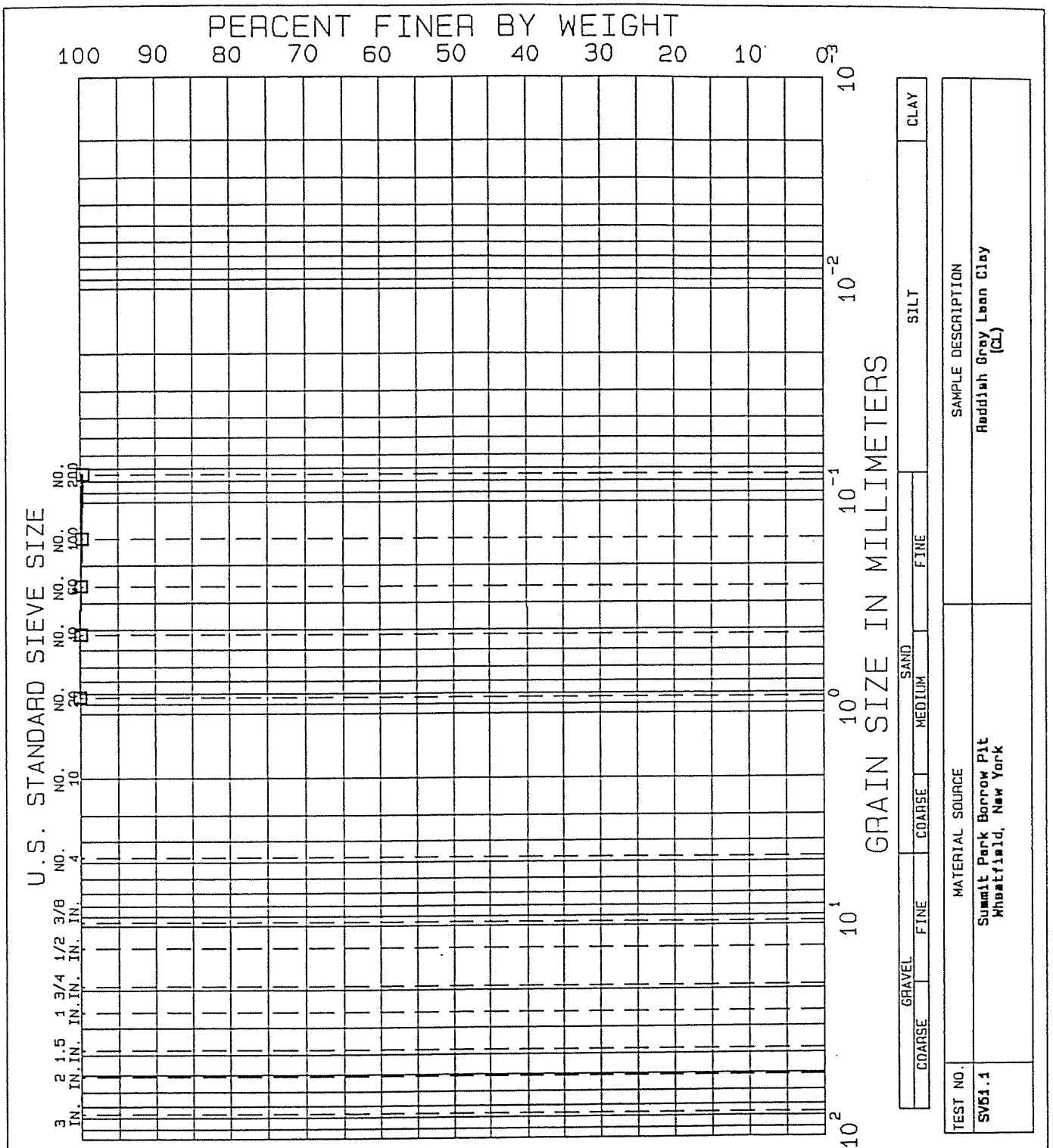
NOV 27 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 2+00
SAMPLE NO. 11156-2
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2877
DATE 11/22/96

FILE 55121.00

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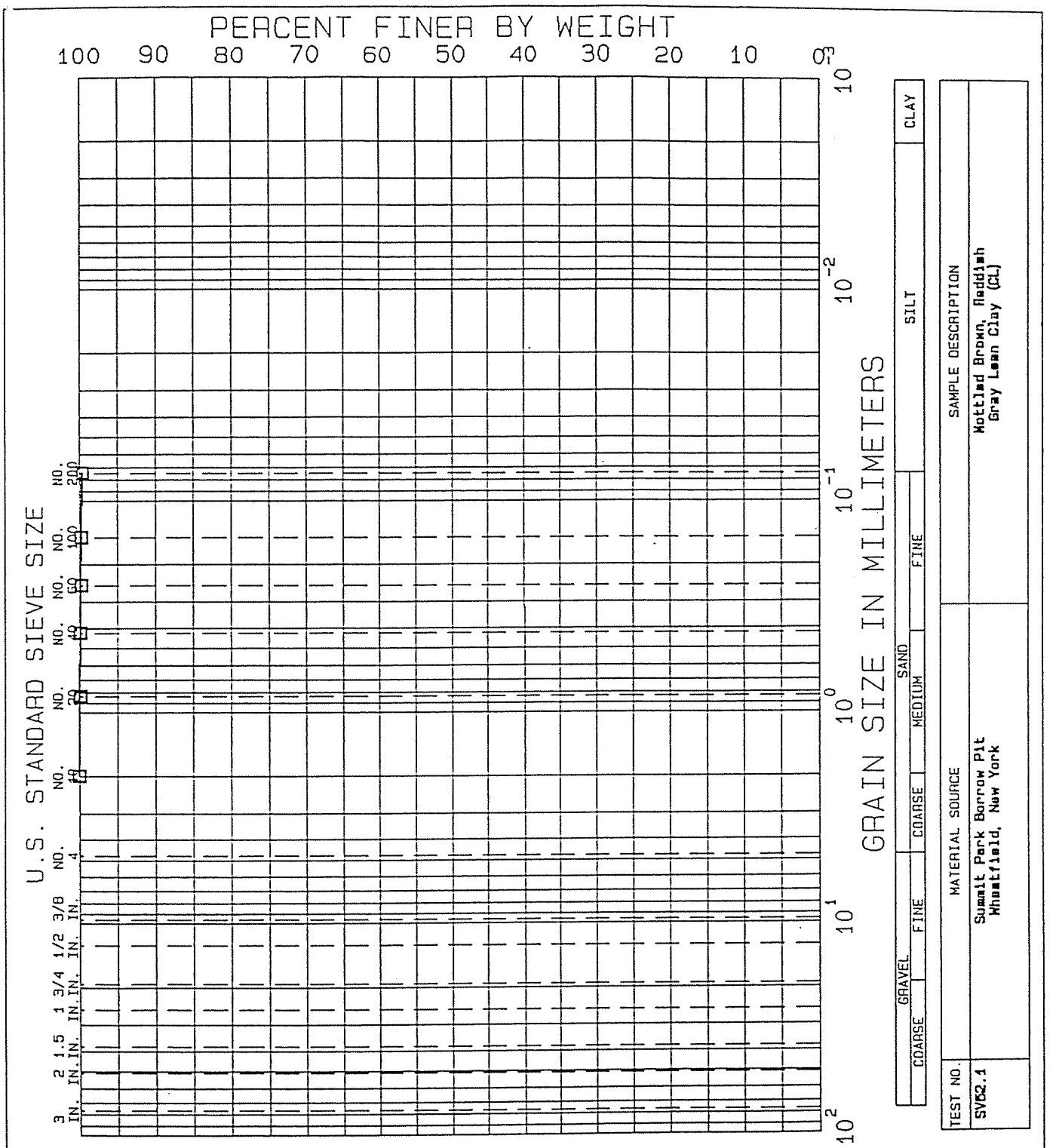

102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 3+00
SAMPLE NO. 11156-3
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2877
DATE 11/22/96

FILE 55121.00

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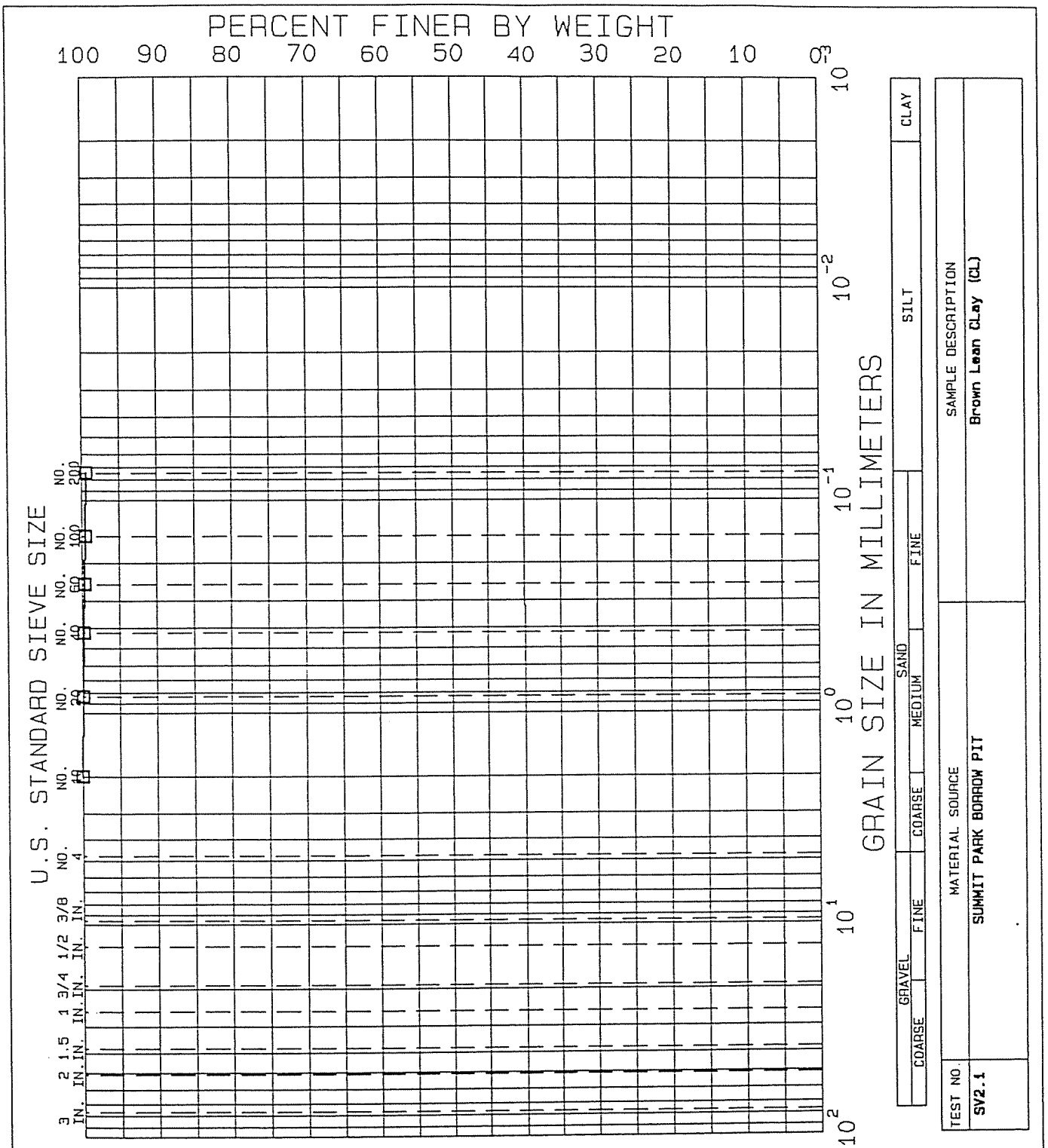

102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 4+00
SAMPLE NO. 08306-1
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2774
DATE 9/9/96

FILE 55121.00

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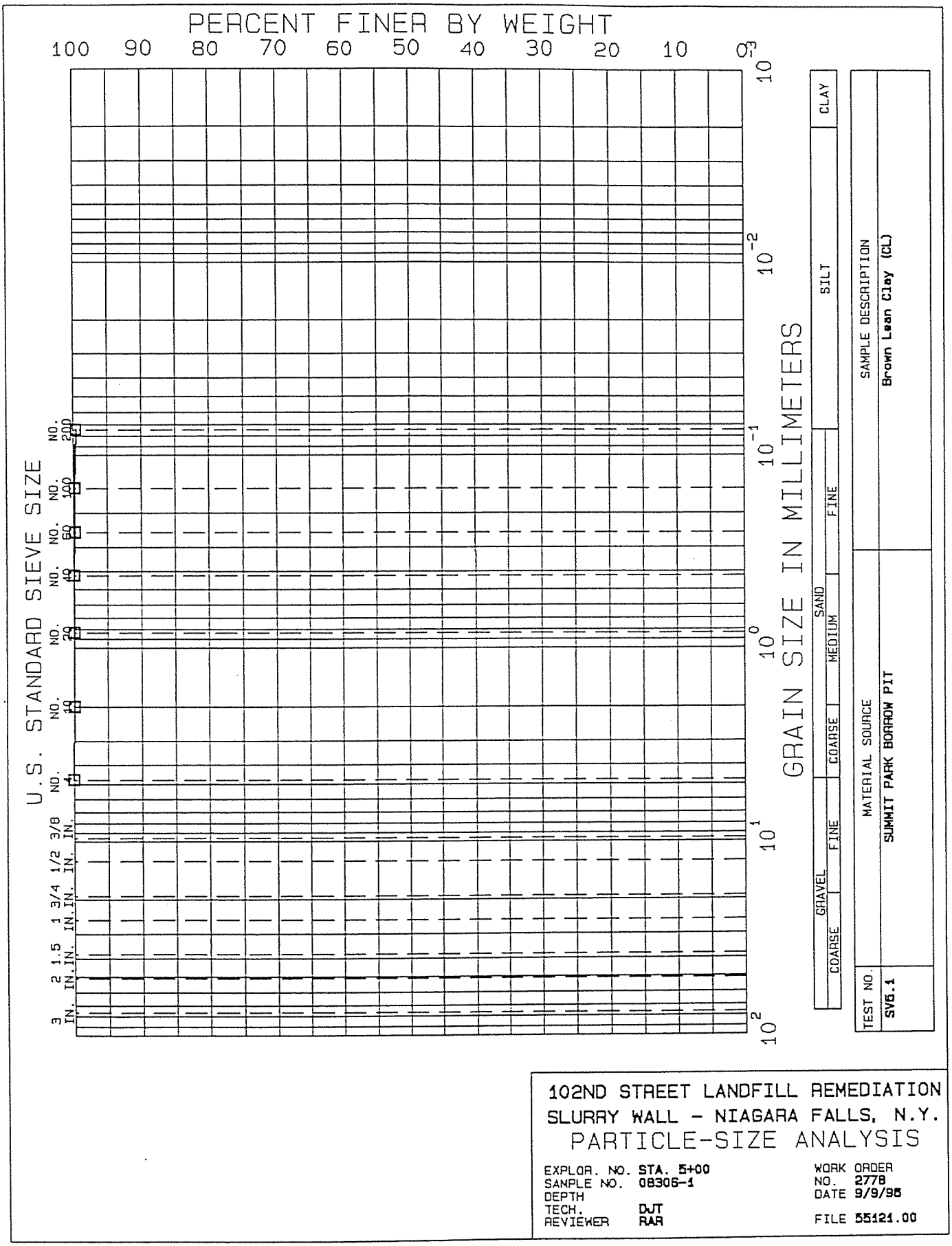

102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 5+00
SAMPLE NO. 08306-1
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2778
DATE 9/9/96

FILE 55121.00

GZA GeoEnvironmental of New York
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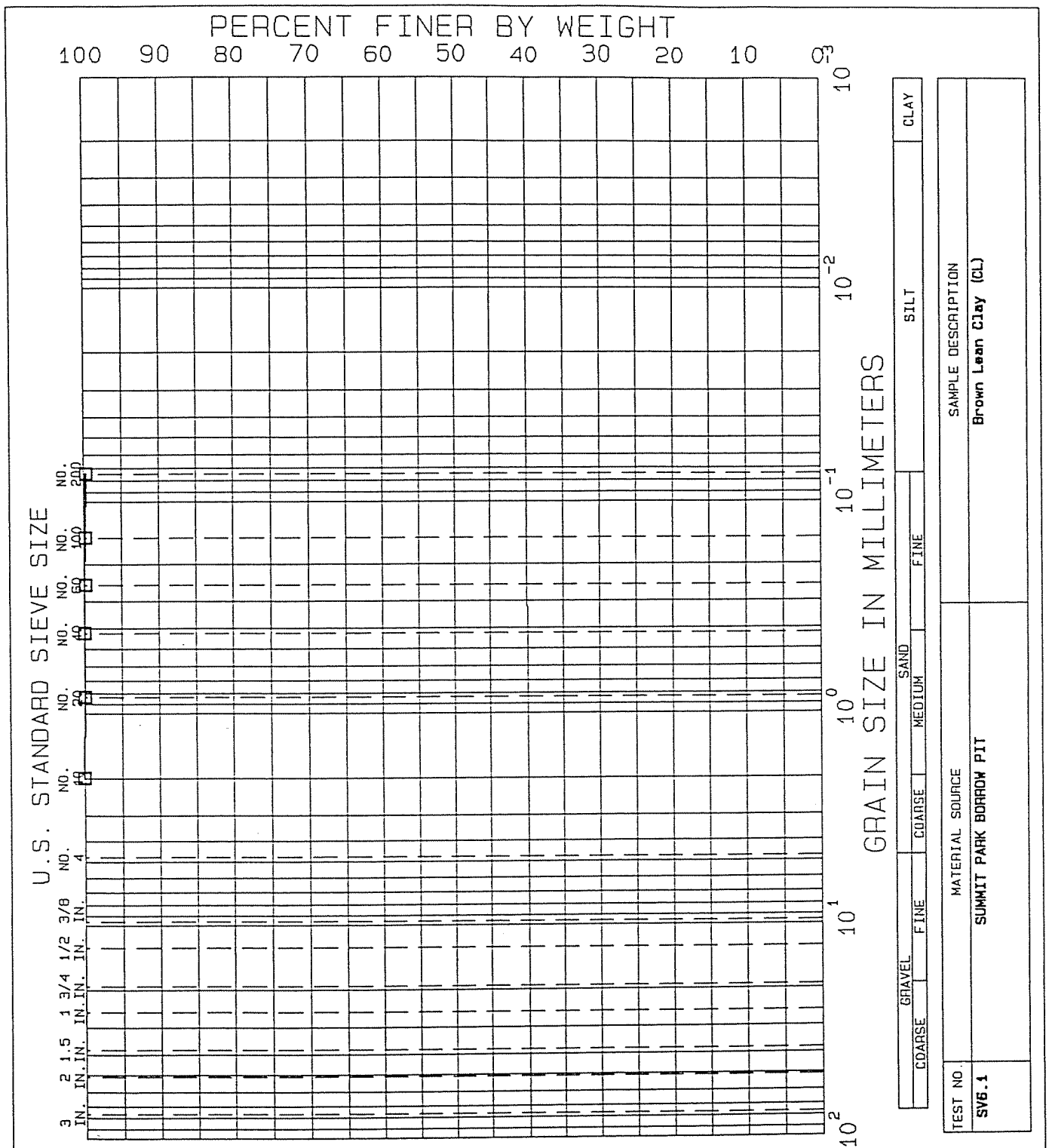

102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 6+00
SAMPLE NO. 08306-2
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2778
DATE 9/9/96

FILE 55121.00

GZA GeoEnvironmental of New York
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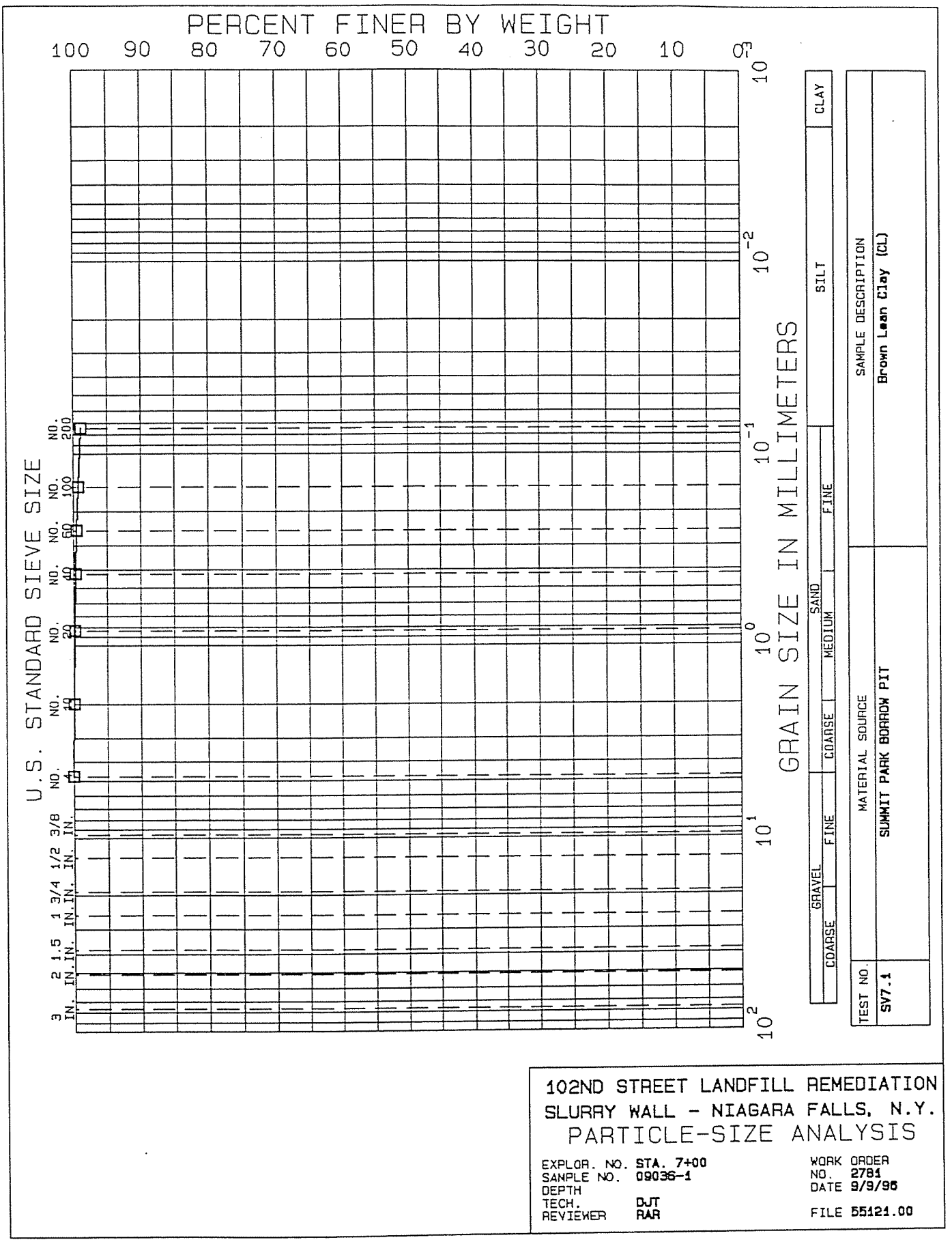


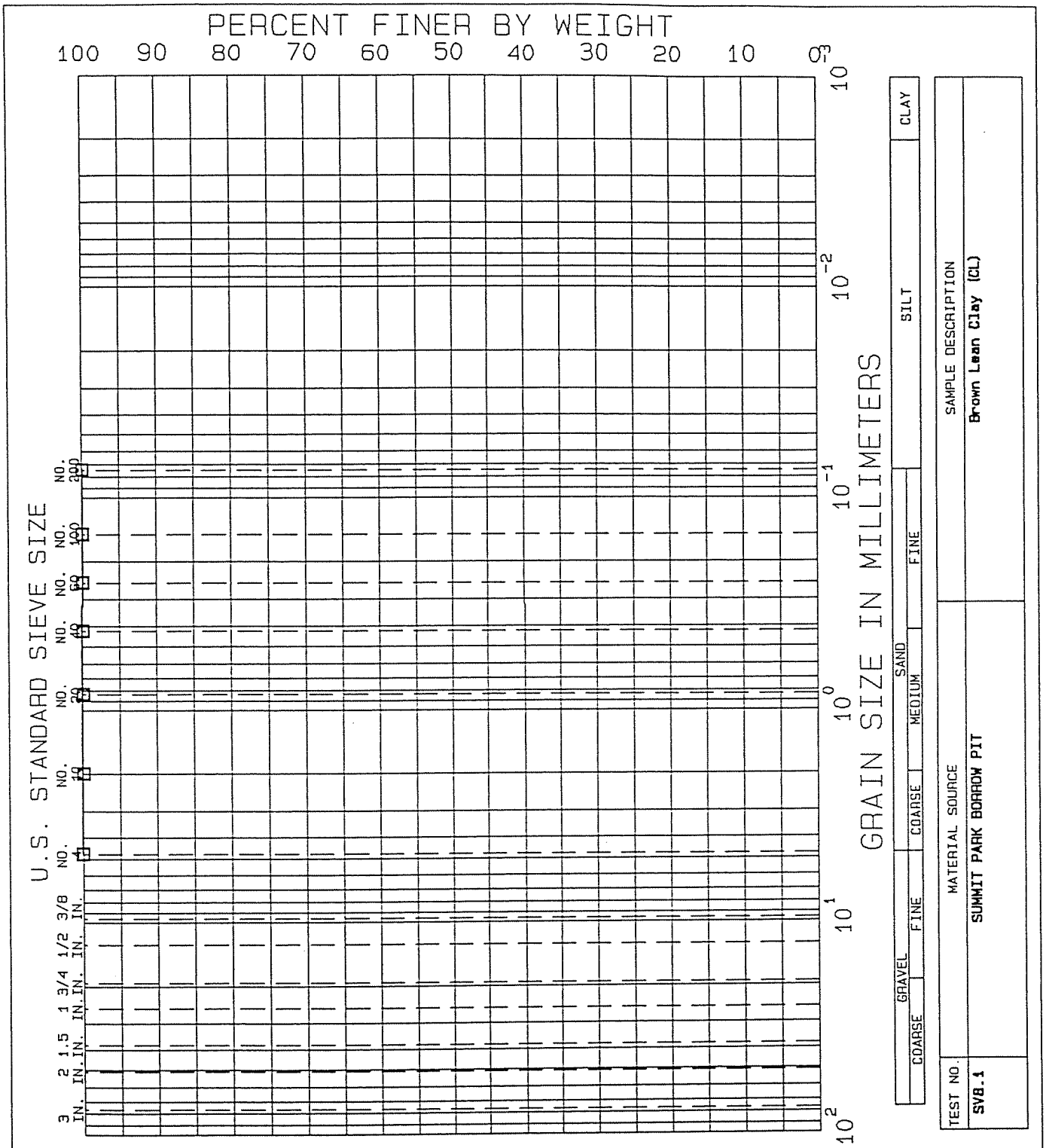
102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 7+00
SAMPLE NO. 09036-1
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2781
DATE 9/9/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 8+00
SAMPLE NO. 09036-2
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2781
DATE 9/9/96

FILE 55121.00

GZA GeoEnvironmental of New York
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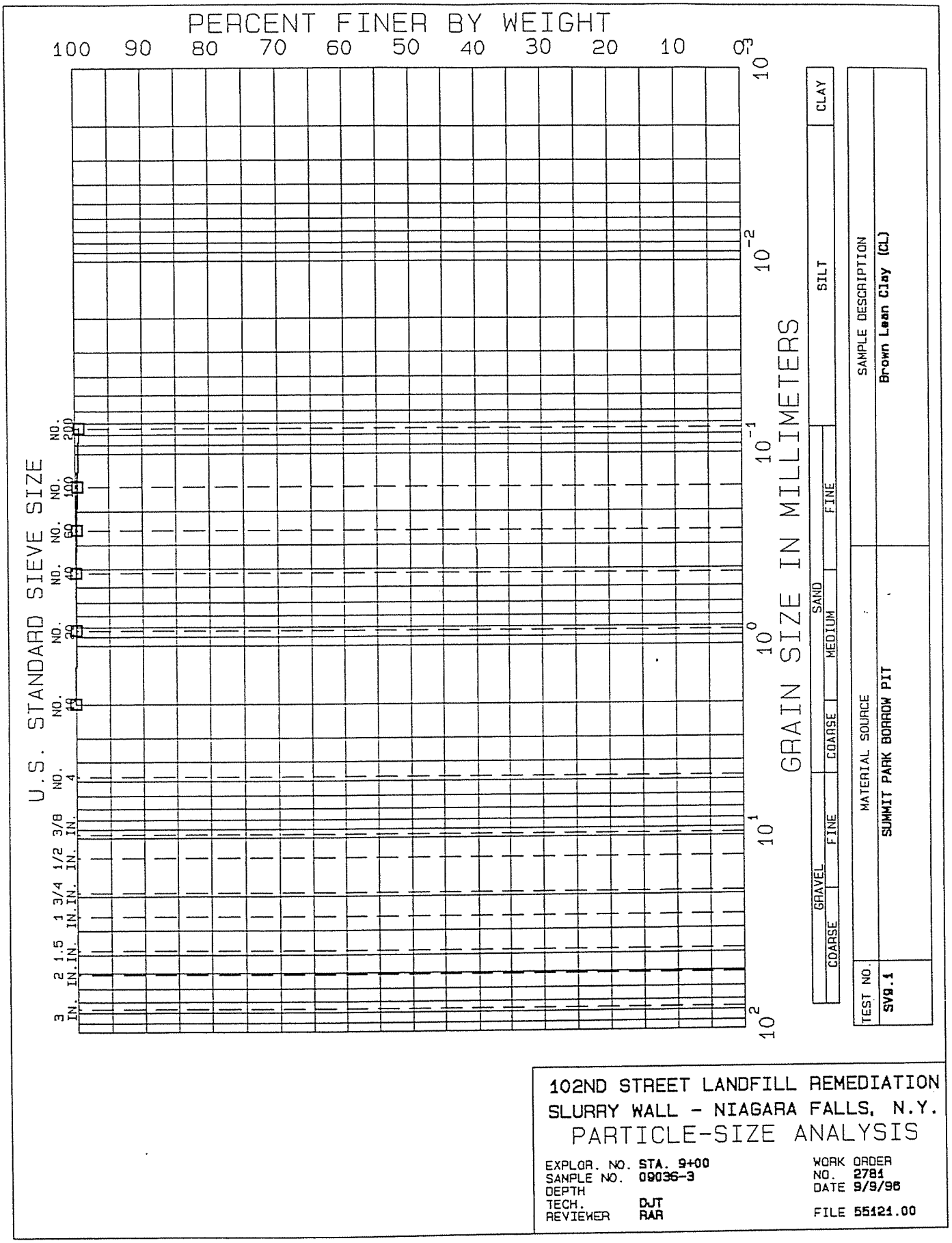

102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 9+00
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DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2781
DATE 9/9/96

FILE 55121.00

GZA GeoEnvironmental of New York
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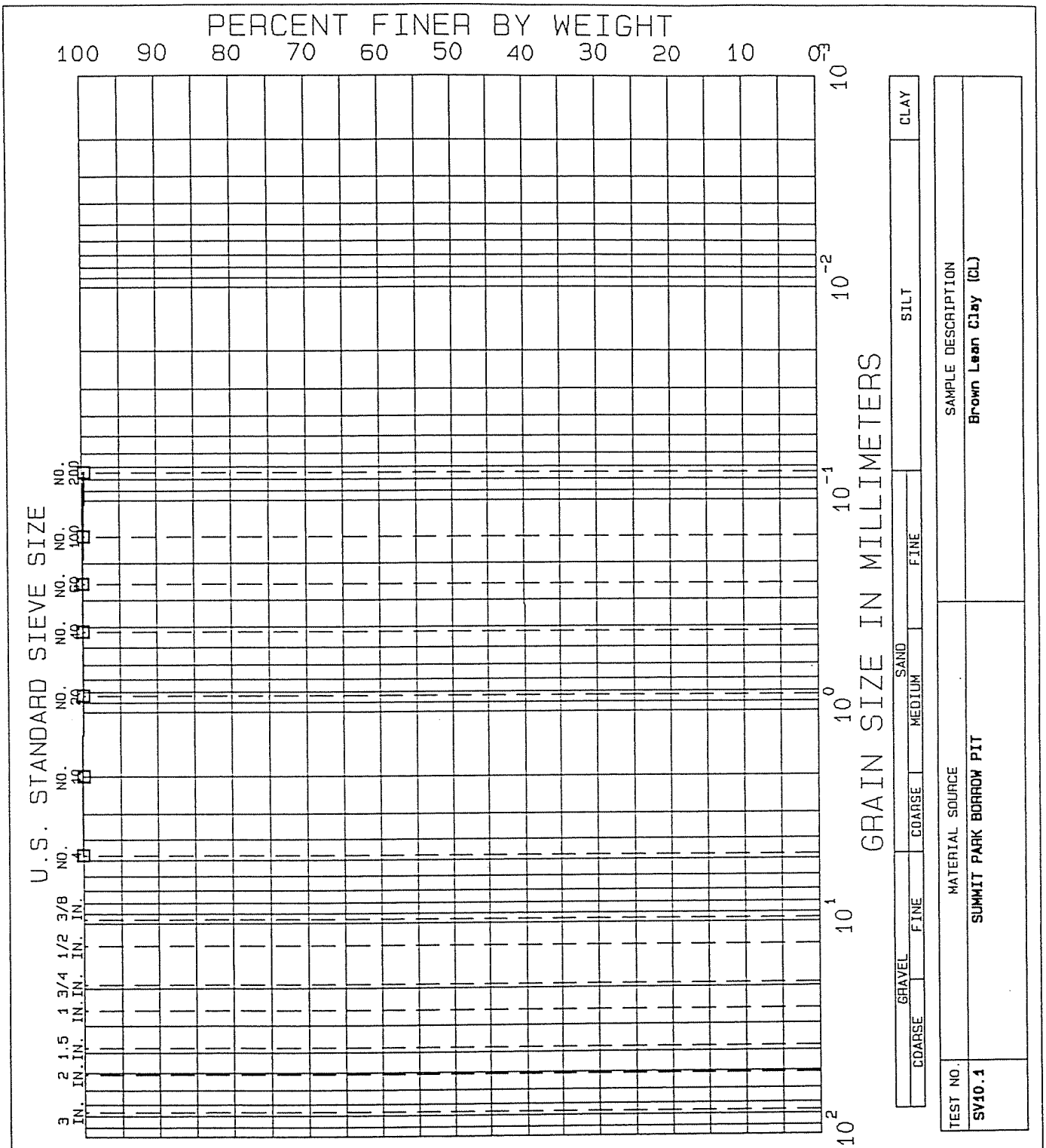

102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 10+00
SAMPLE NO. 09046-1
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2781
DATE 9/9/96

FILE 55121.00

GZA GeoEnvironmental of New York
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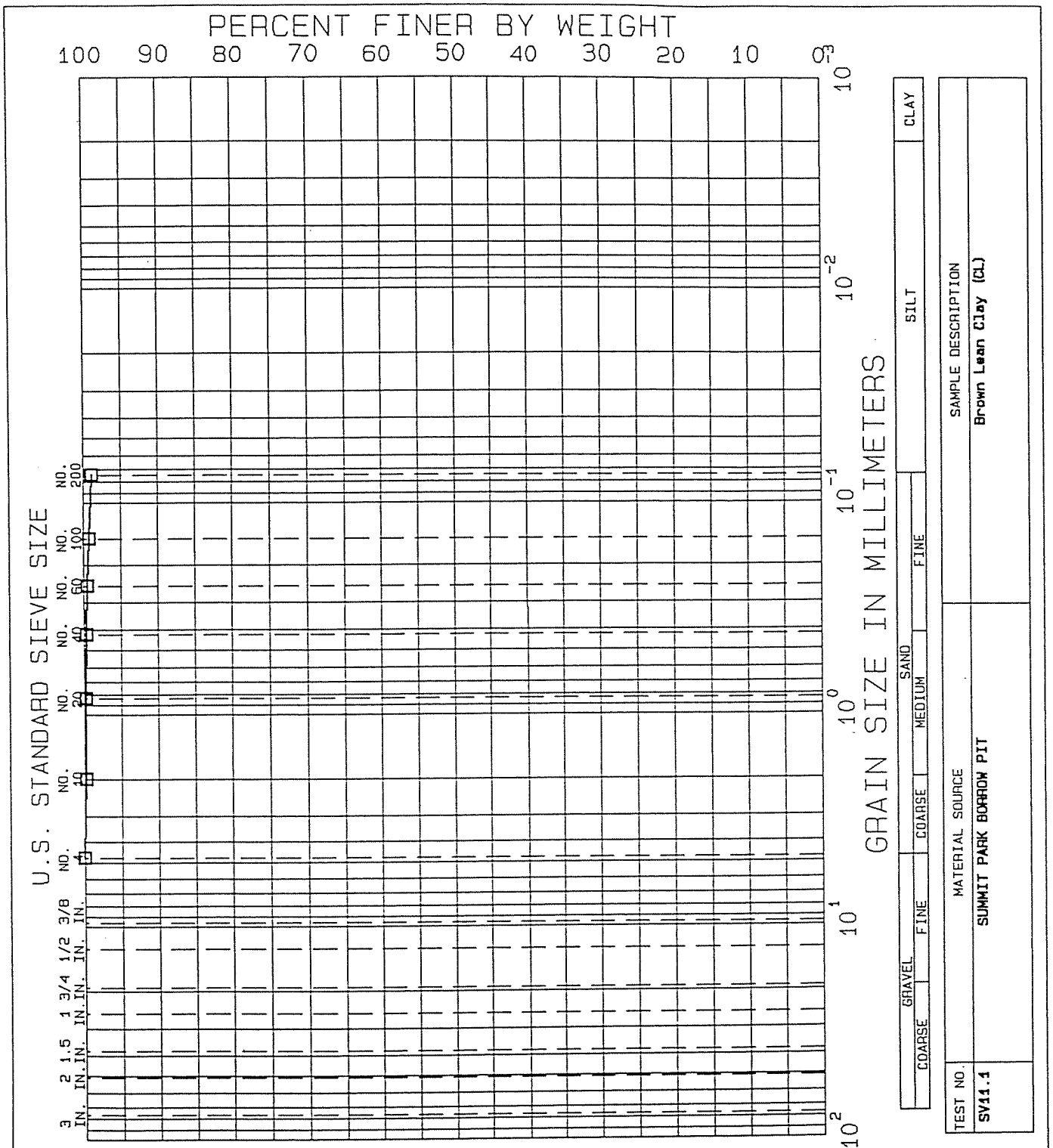


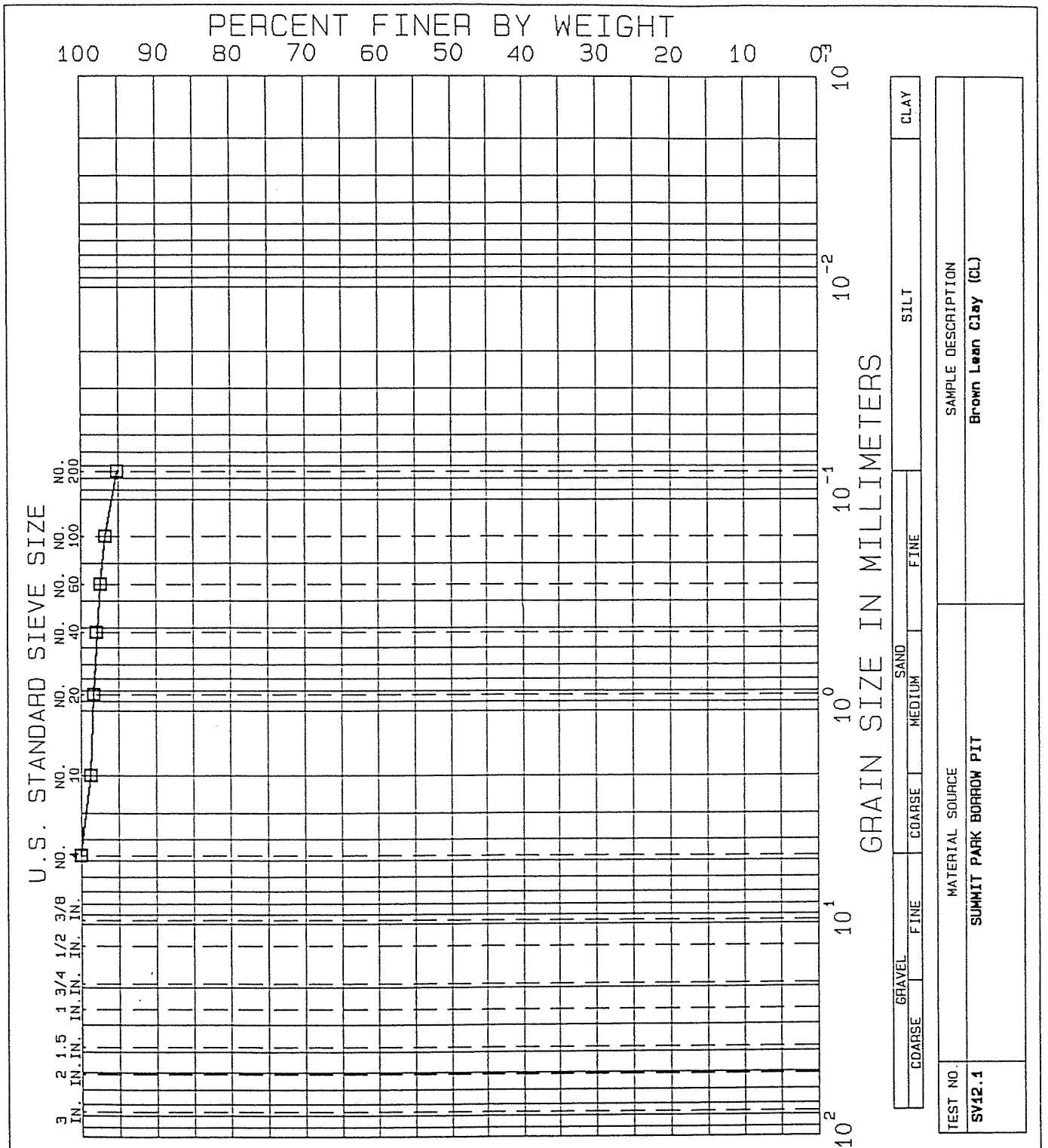
102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 11+00
SAMPLE NO. 09045-2
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2781
DATE 9/9/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists



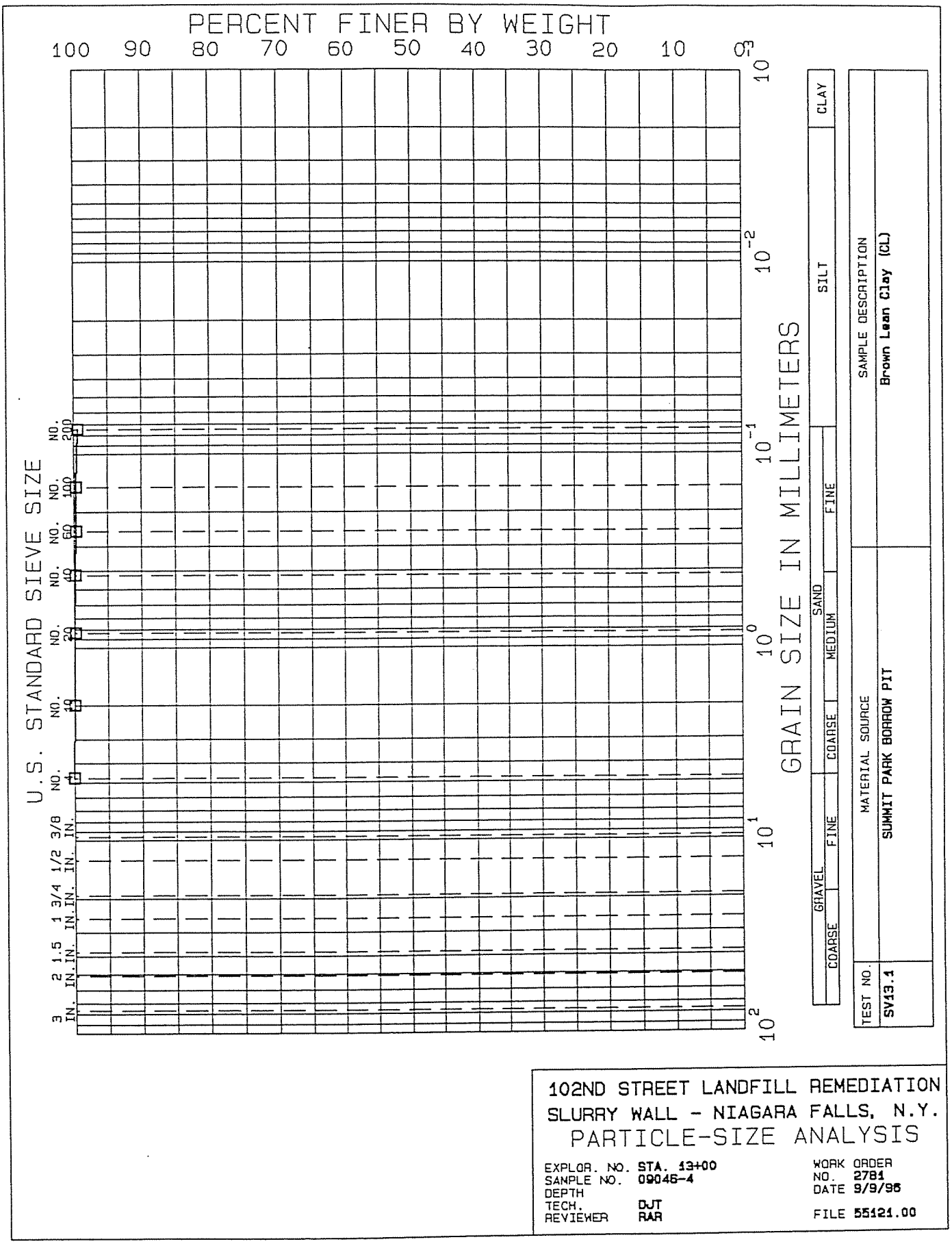
102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 12+00
SAMPLE NO. 09045-3
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2781
DATE 9/9/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 13+00
SAMPLE NO. 09045-4
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2781
DATE 9/9/95

FILE 55121.00

GZA GeoEnvironmental of New York
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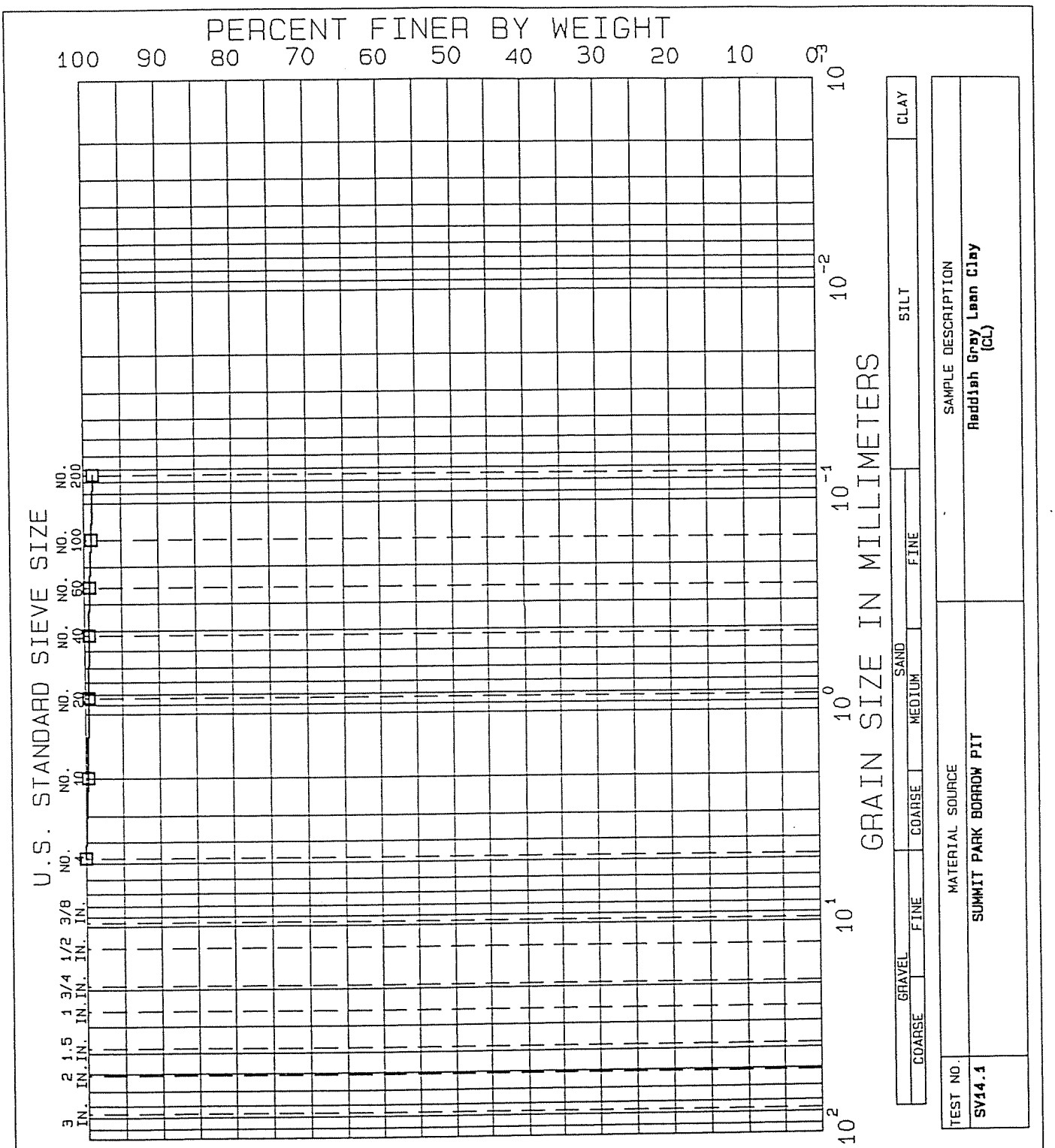

102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 14+00
SAMPLE NO. 09066-1
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2785
DATE 9/9/96

FILE 55121.00

GZA GeoEnvironmental of New York
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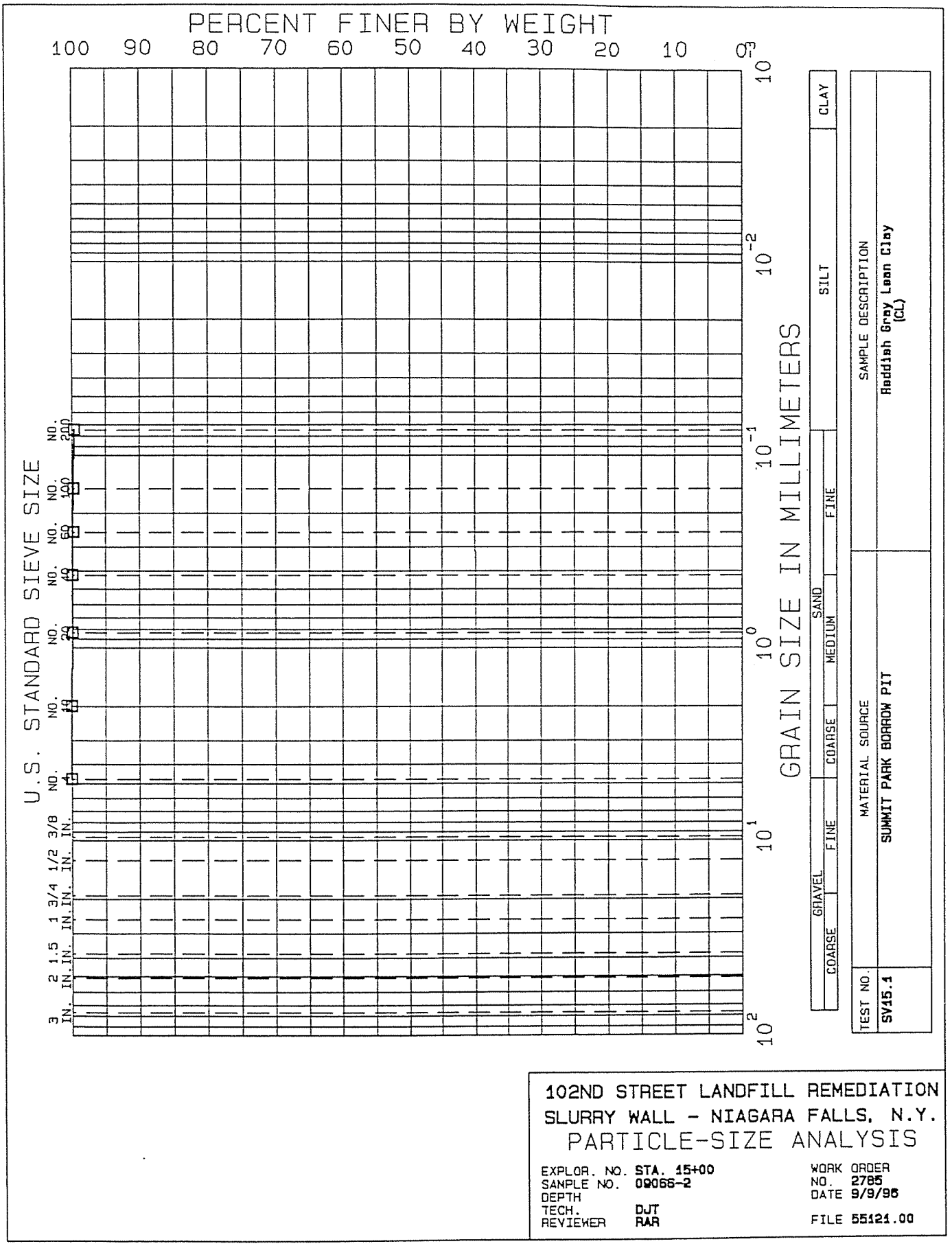
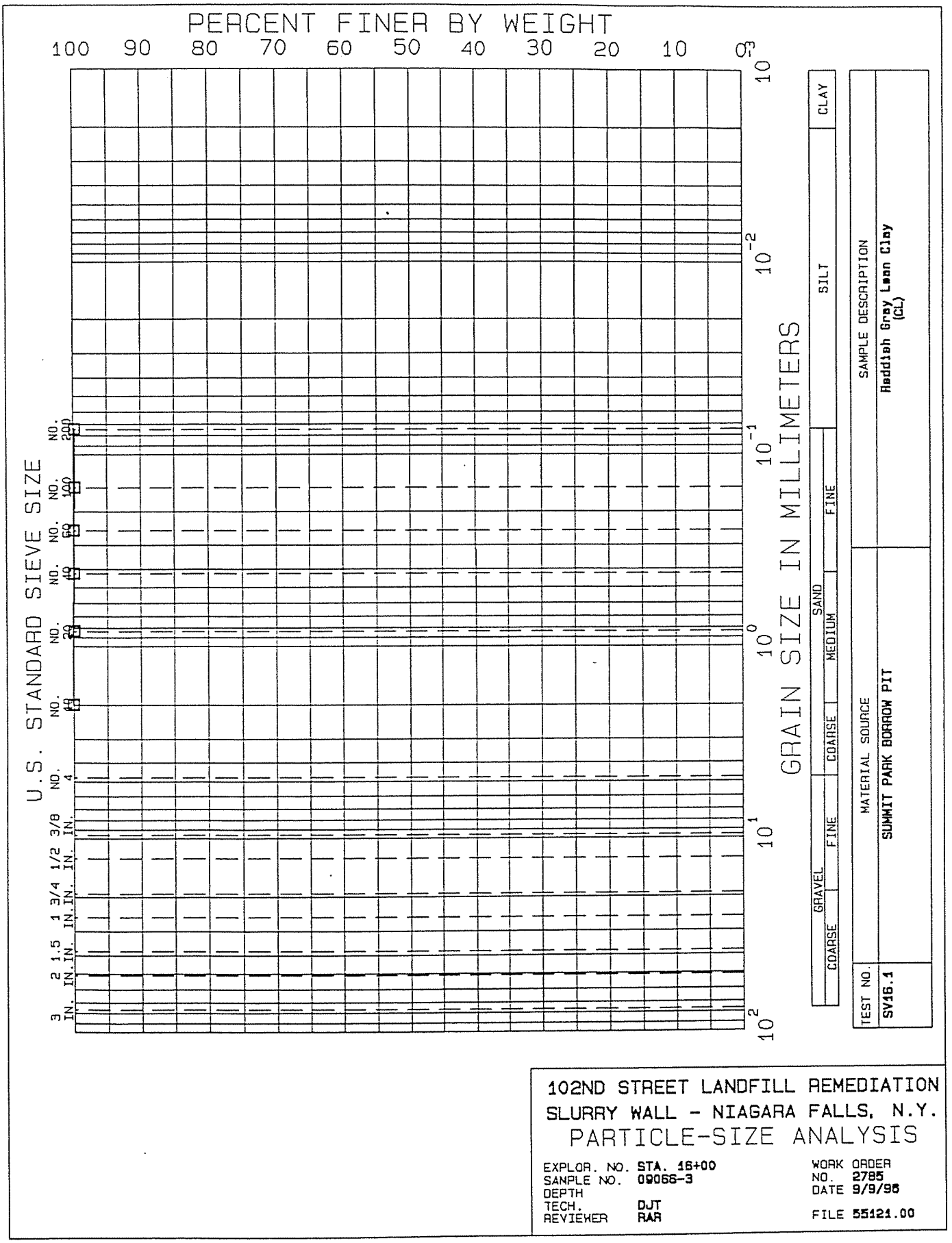


102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 15+00
SAMPLE NO. 09066-2
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2785
DATE 9/9/96
FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.

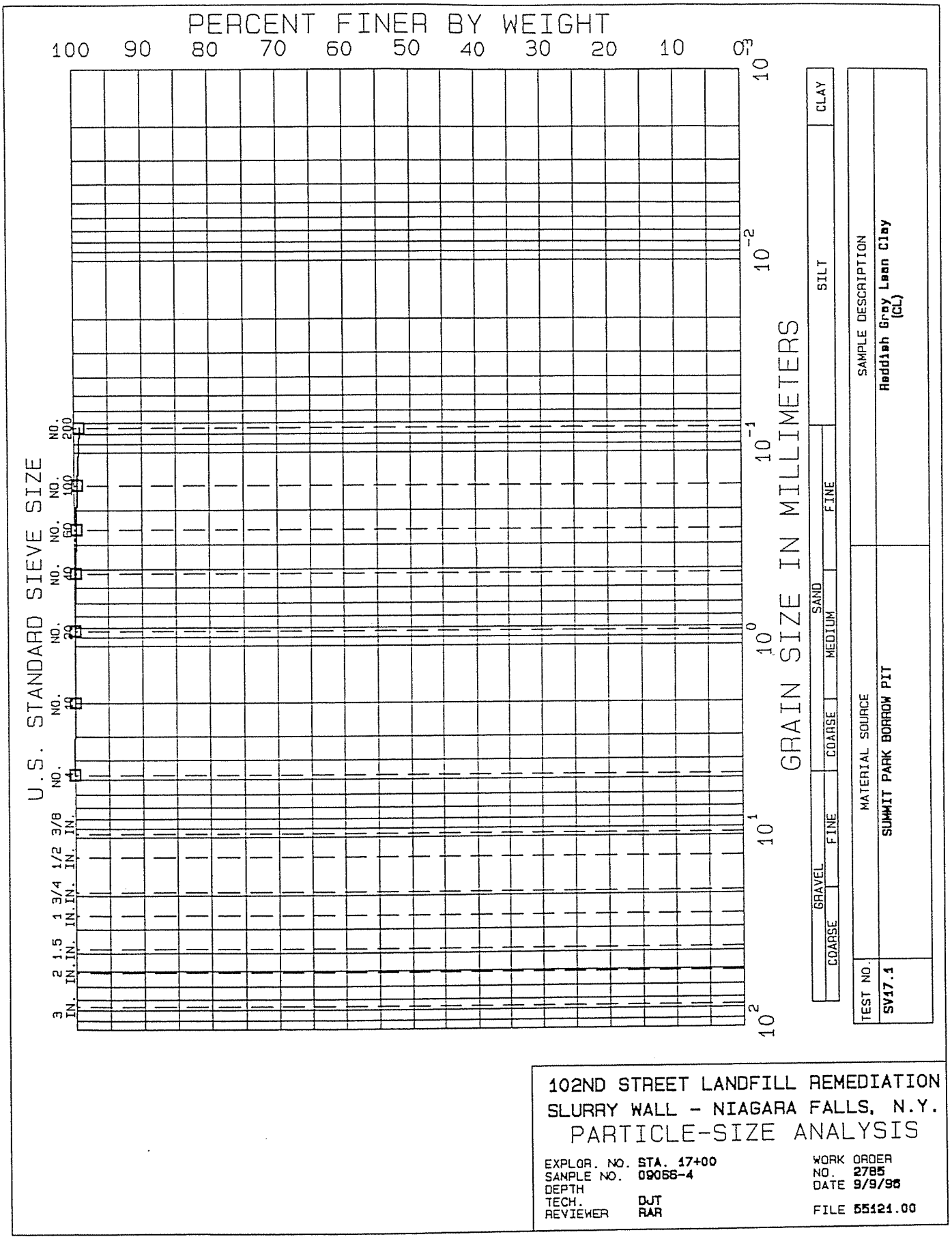
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 16+00
SAMPLE NO. 09066-3
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2785
DATE 9/9/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 17+00
SAMPLE NO. 09056-4
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2785
DATE 9/9/96

FILE 55121.00

GZA GeoEnvironmental of New York
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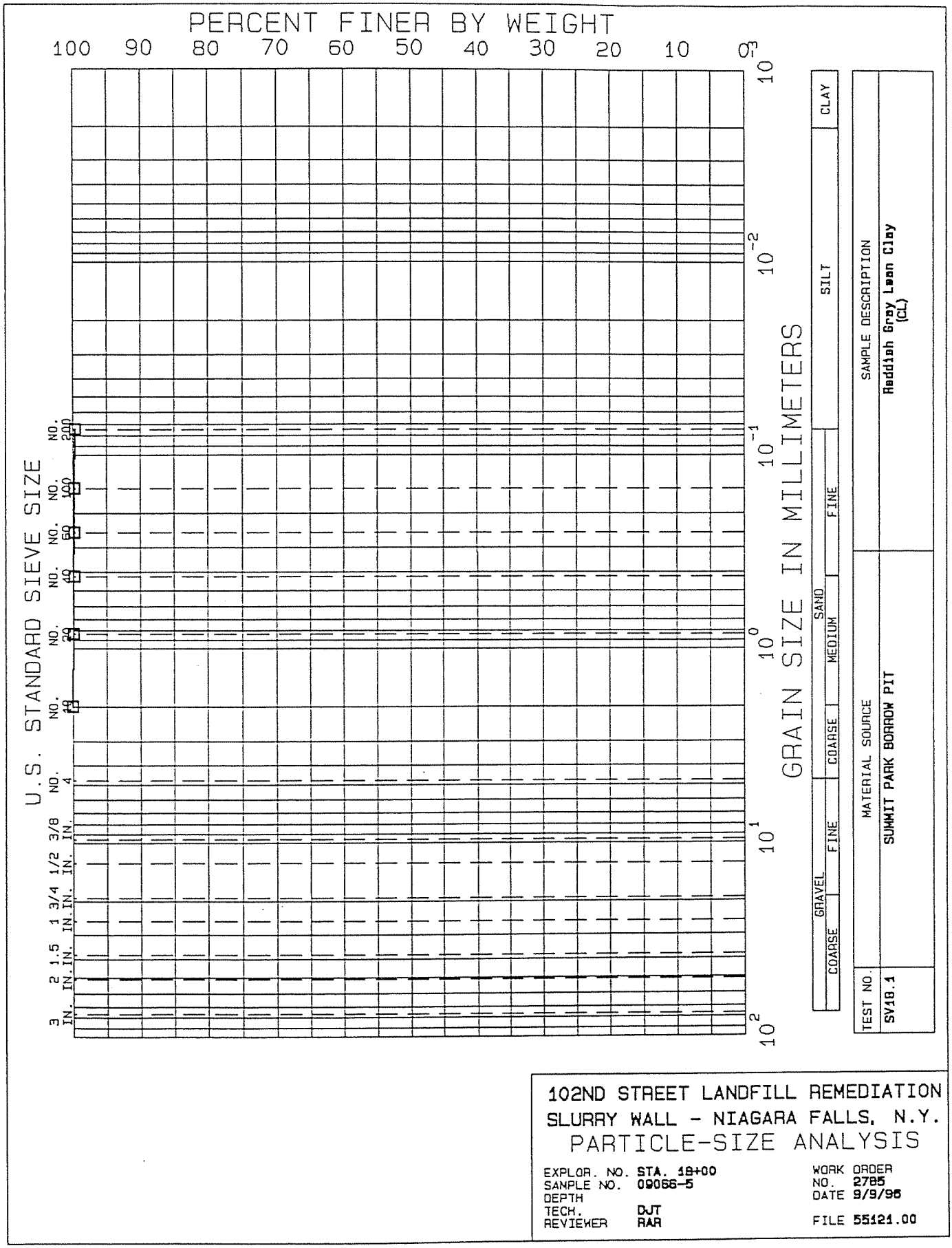


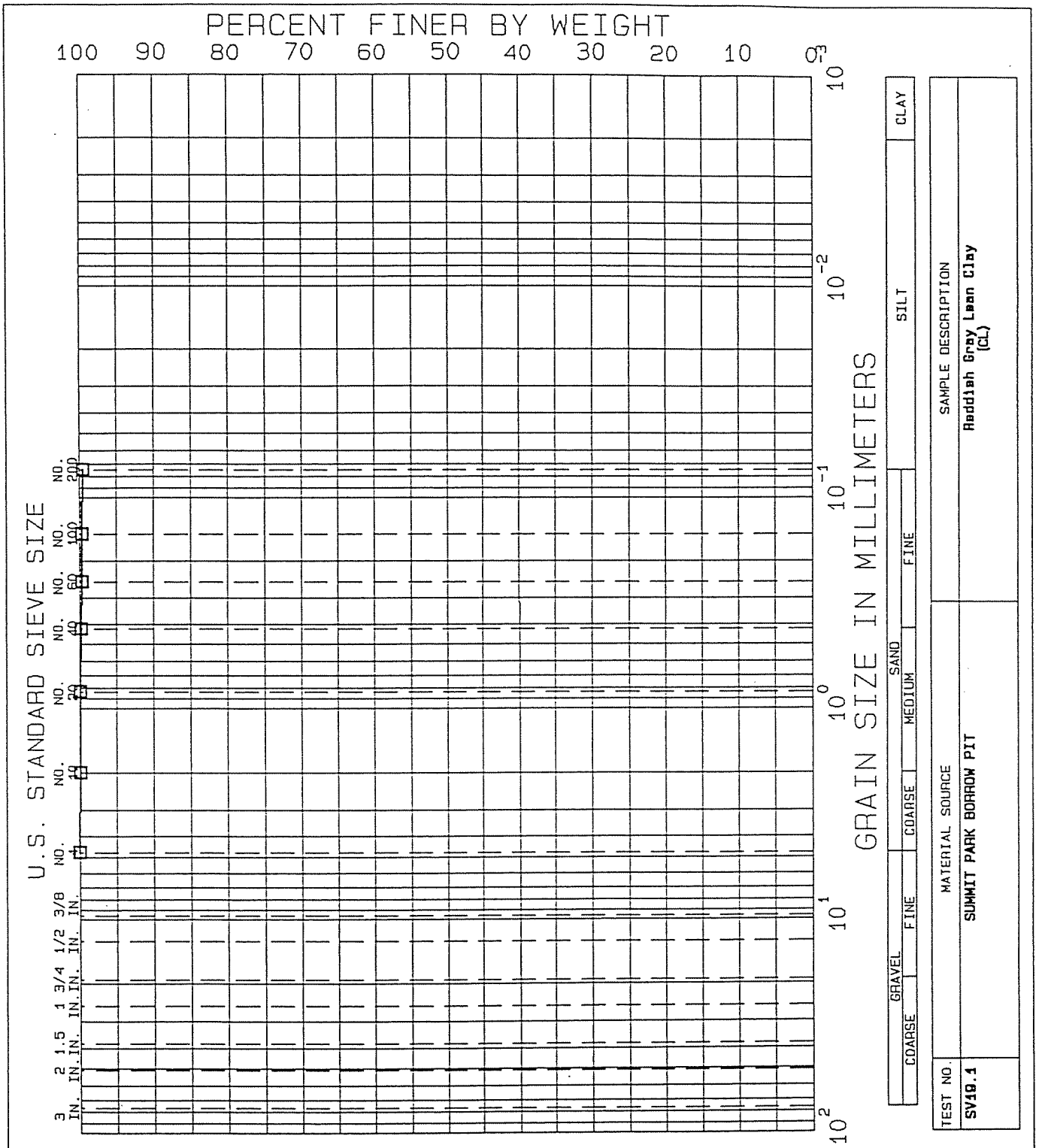
102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 18+00
SAMPLE NO. 09066-5
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2785
DATE 9/9/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists

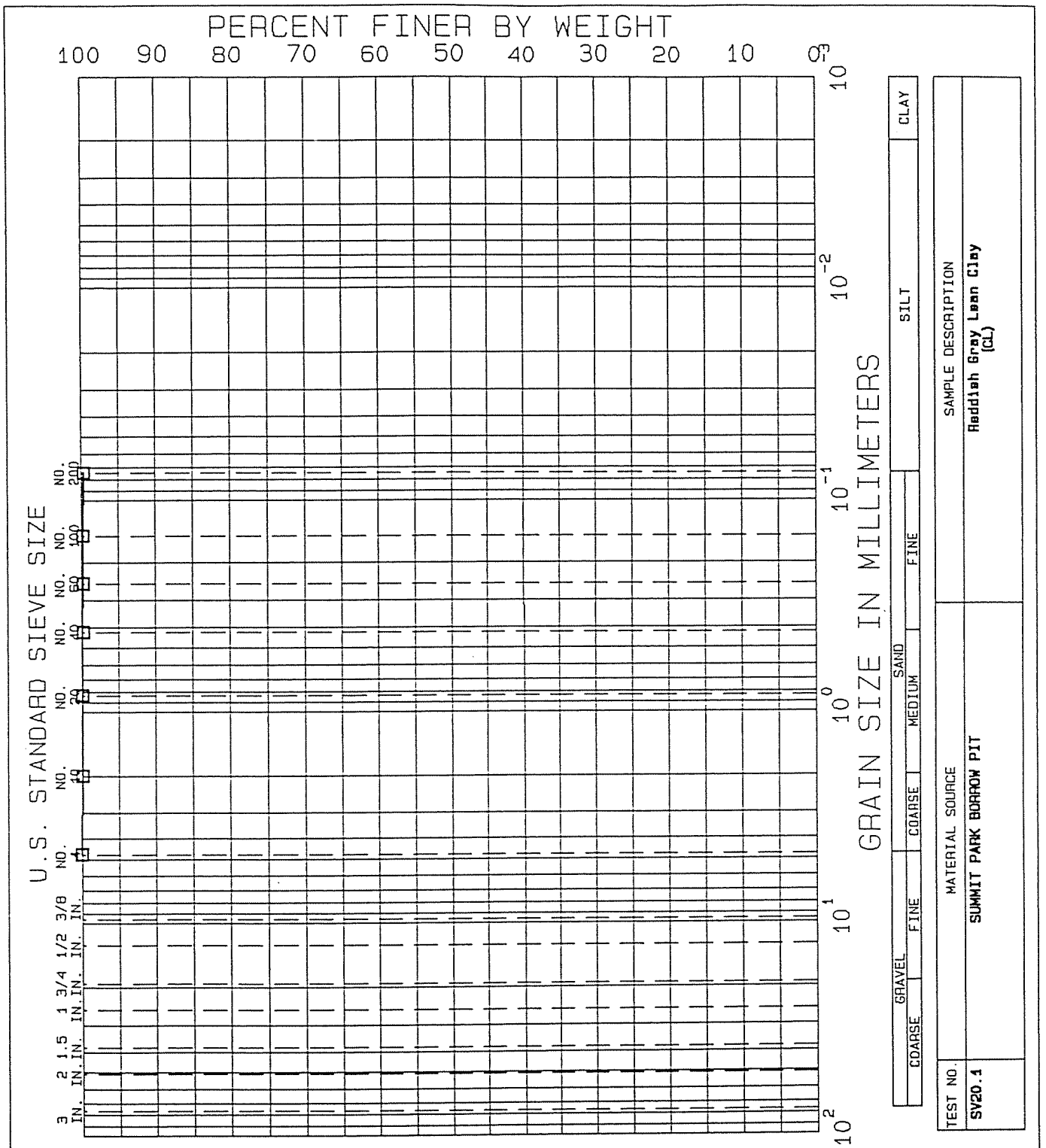


102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 19+00
SAMPLE NO. 09066-6
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2785
DATE 9/9/96
FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists



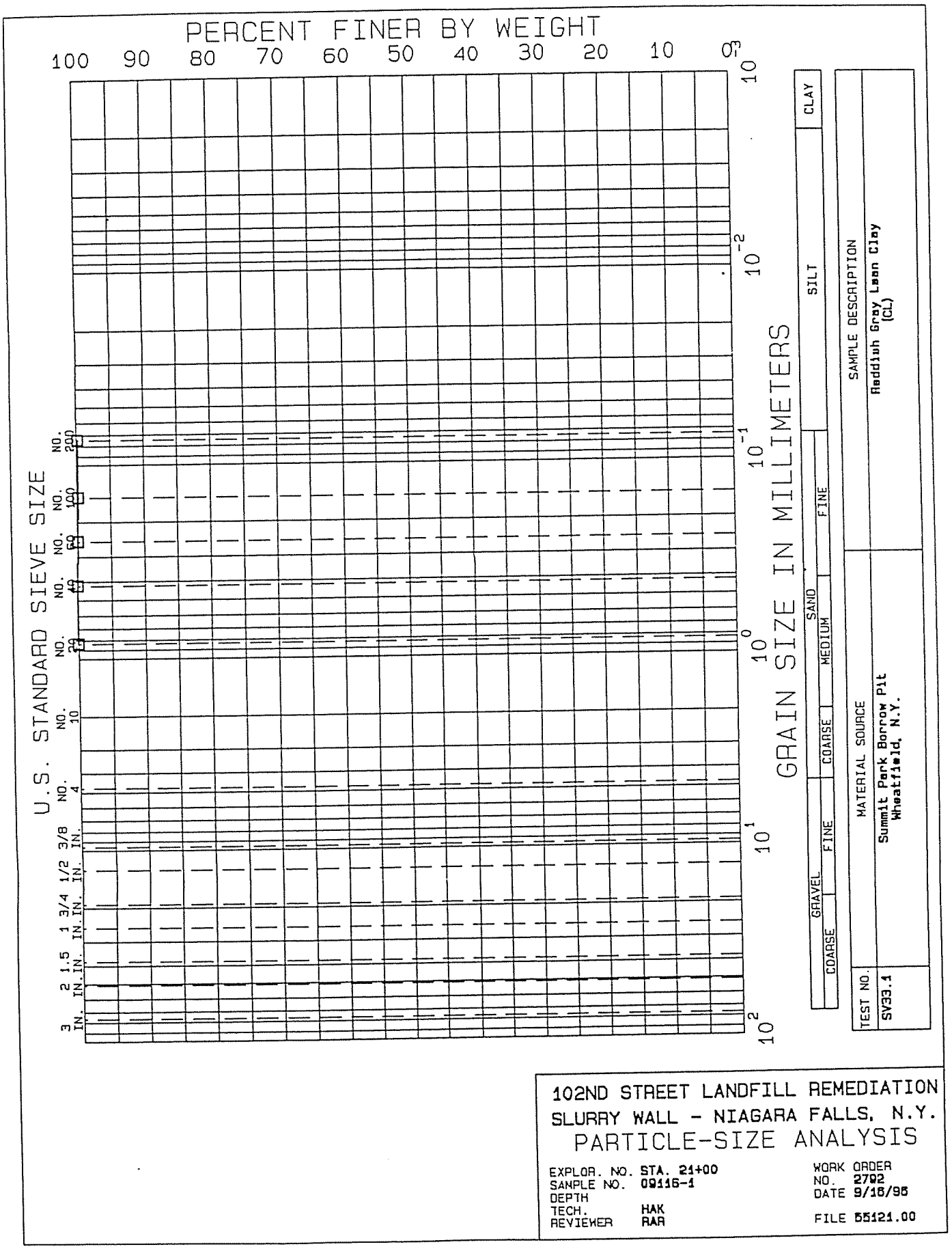
102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 20+00
SAMPLE NO. 09065-7
DEPTH
TECH. DJT
REVIEWER RAR

WORK ORDER NO. 2785
DATE 9/9/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists



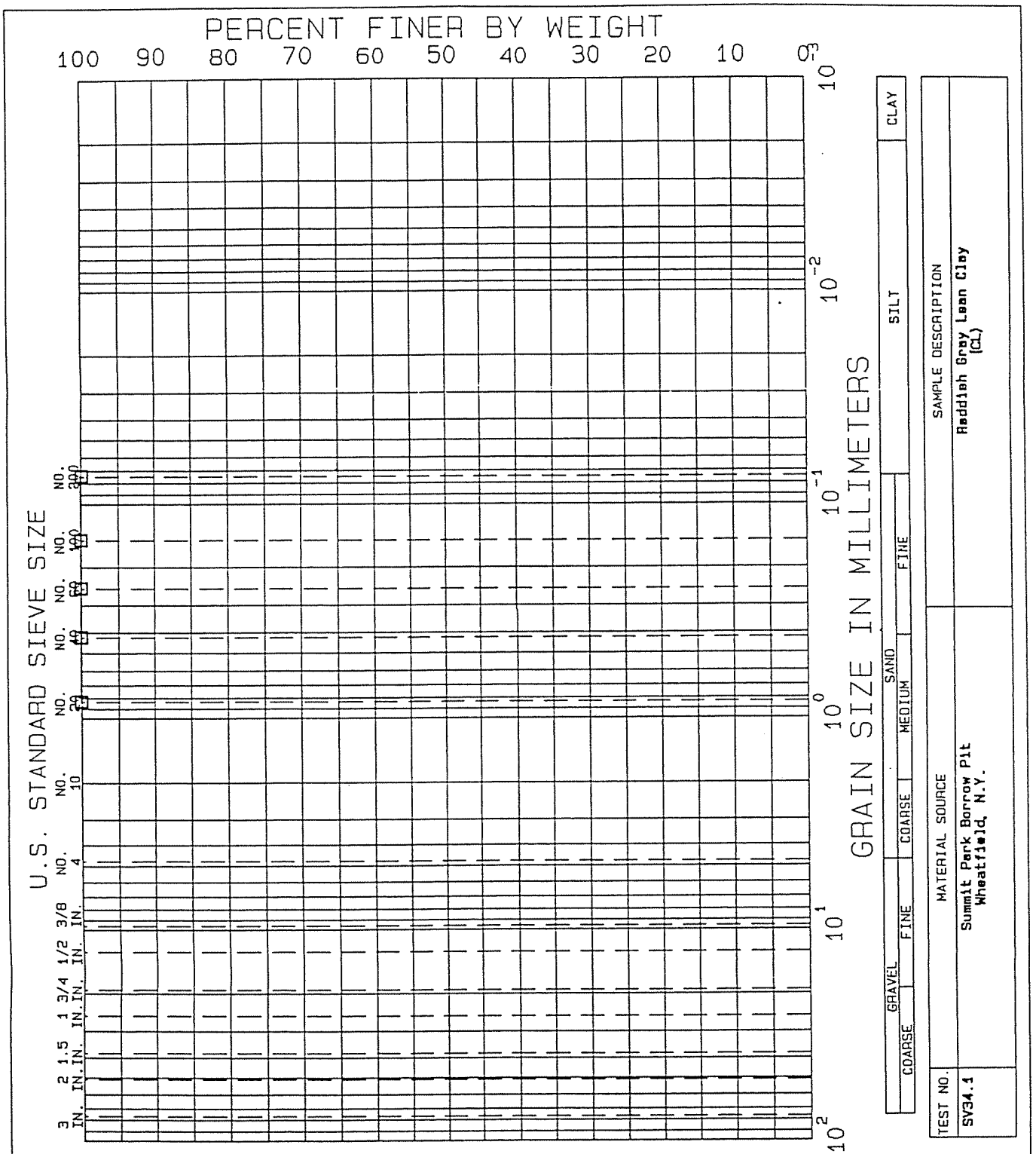
102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 21+00
SAMPLE NO. 09116-1
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2792
DATE 9/16/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists



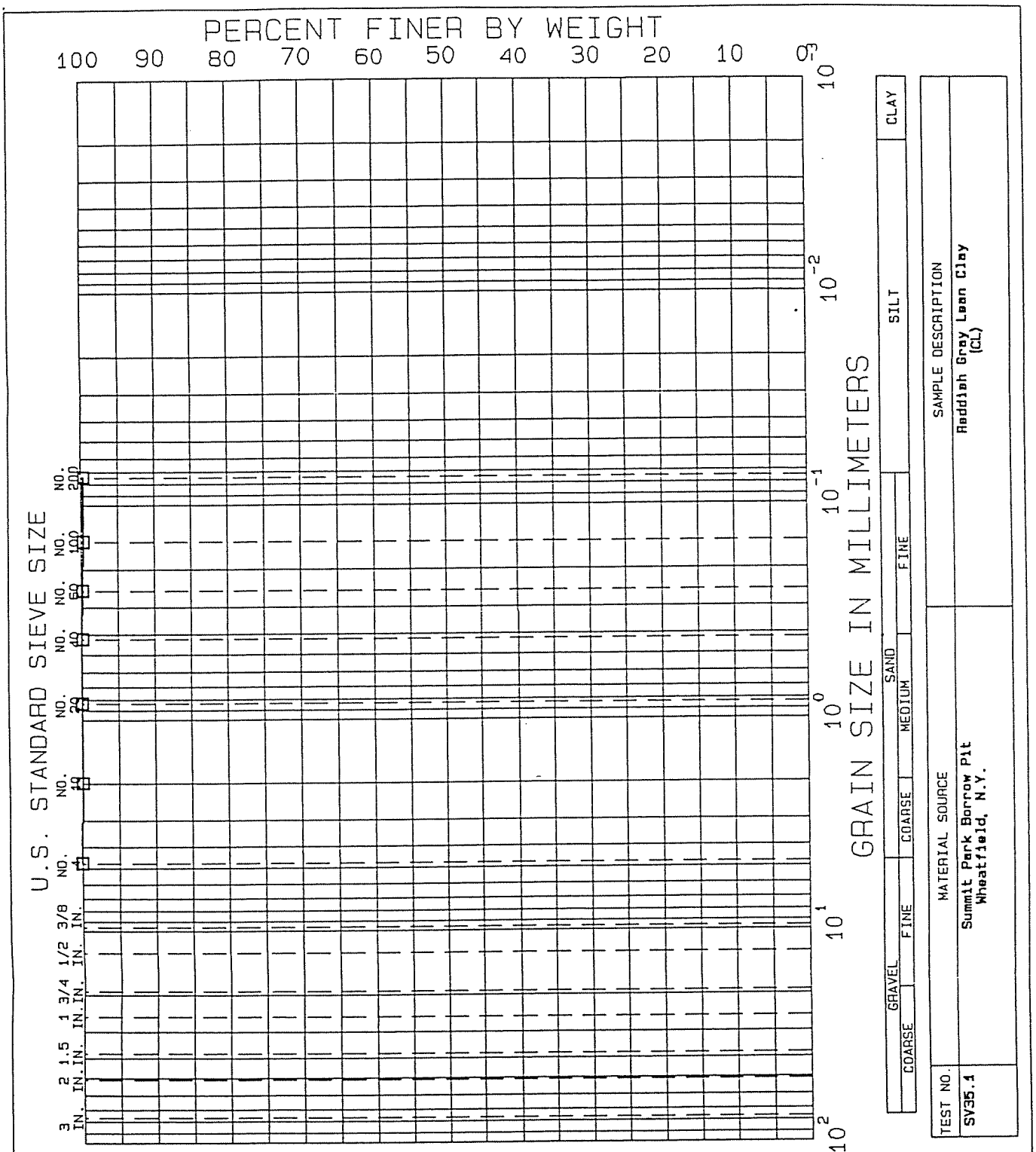
102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 22+00
SAMPLE NO. 09115-2
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2792
DATE 9/18/95

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists



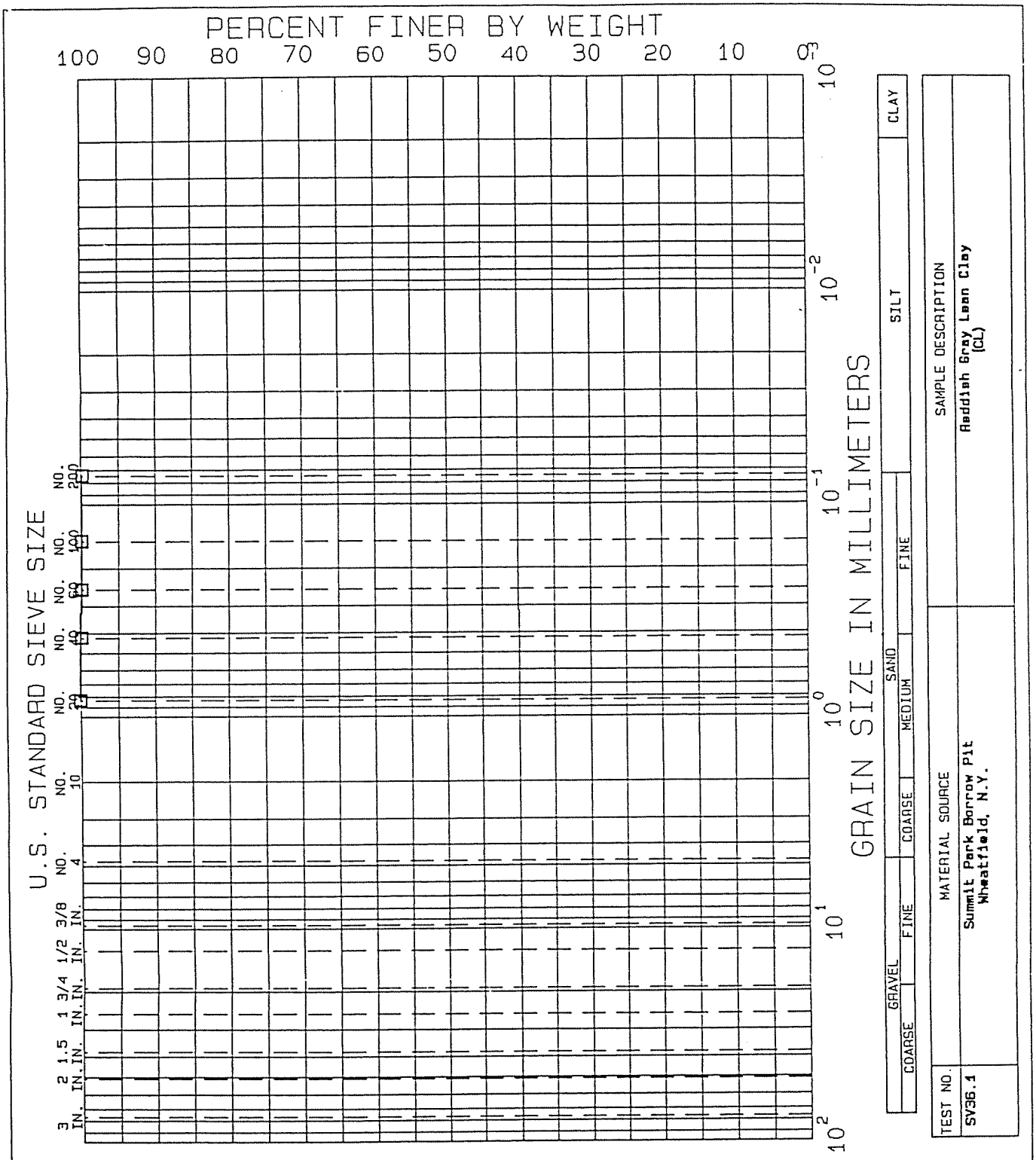
102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.

PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 23+00
SAMPLE NO. 09116-3
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2792
DATE 9/16/96

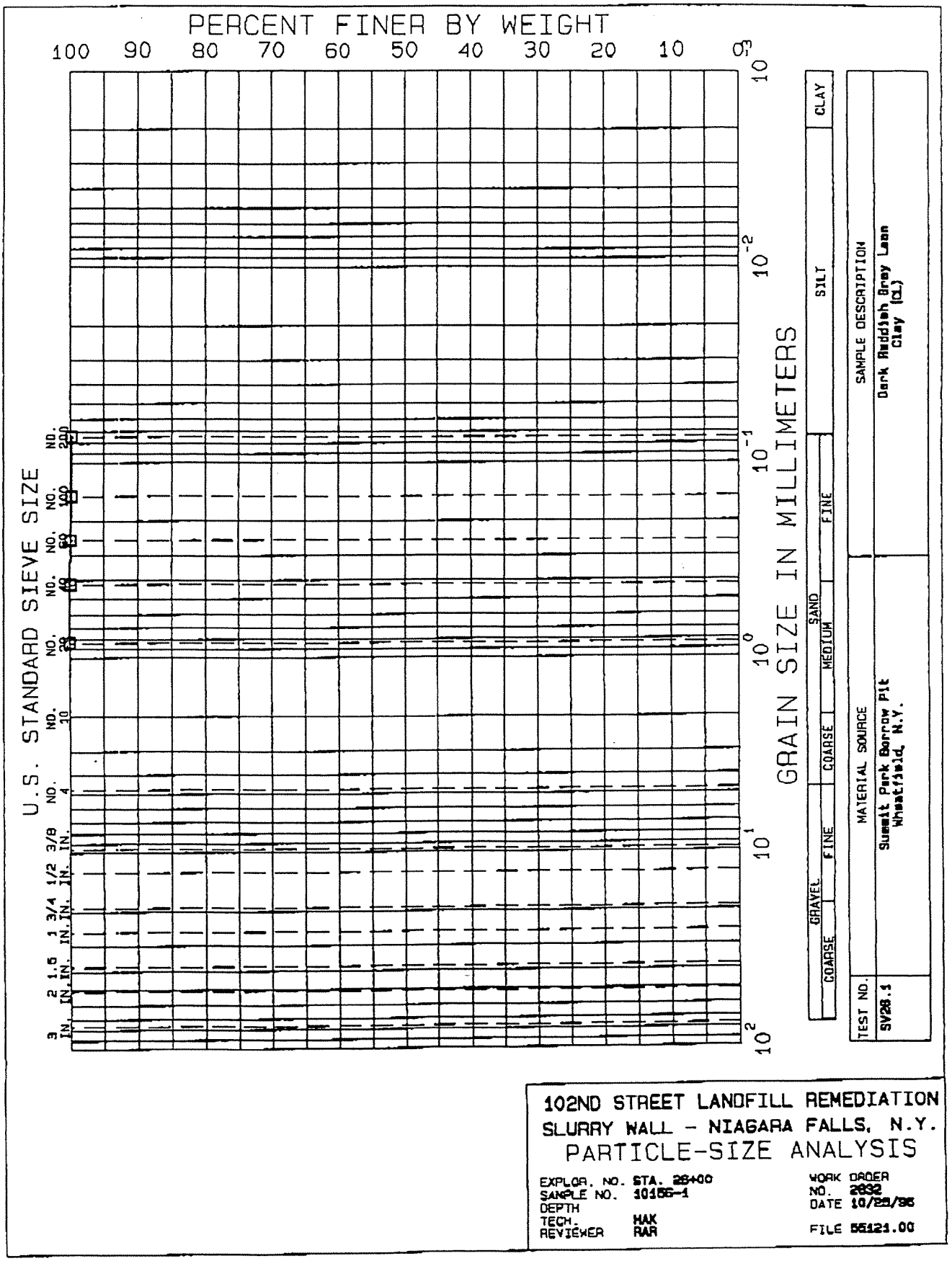
FILE 55121.00



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.	STA. 24+00	WORK ORDER NO.	2792
SAMPLE NO.	09116-4	DATE	9/16/96
DEPTH			
TECH.	HAK		
REVIEWER	RAR	FILE	55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists



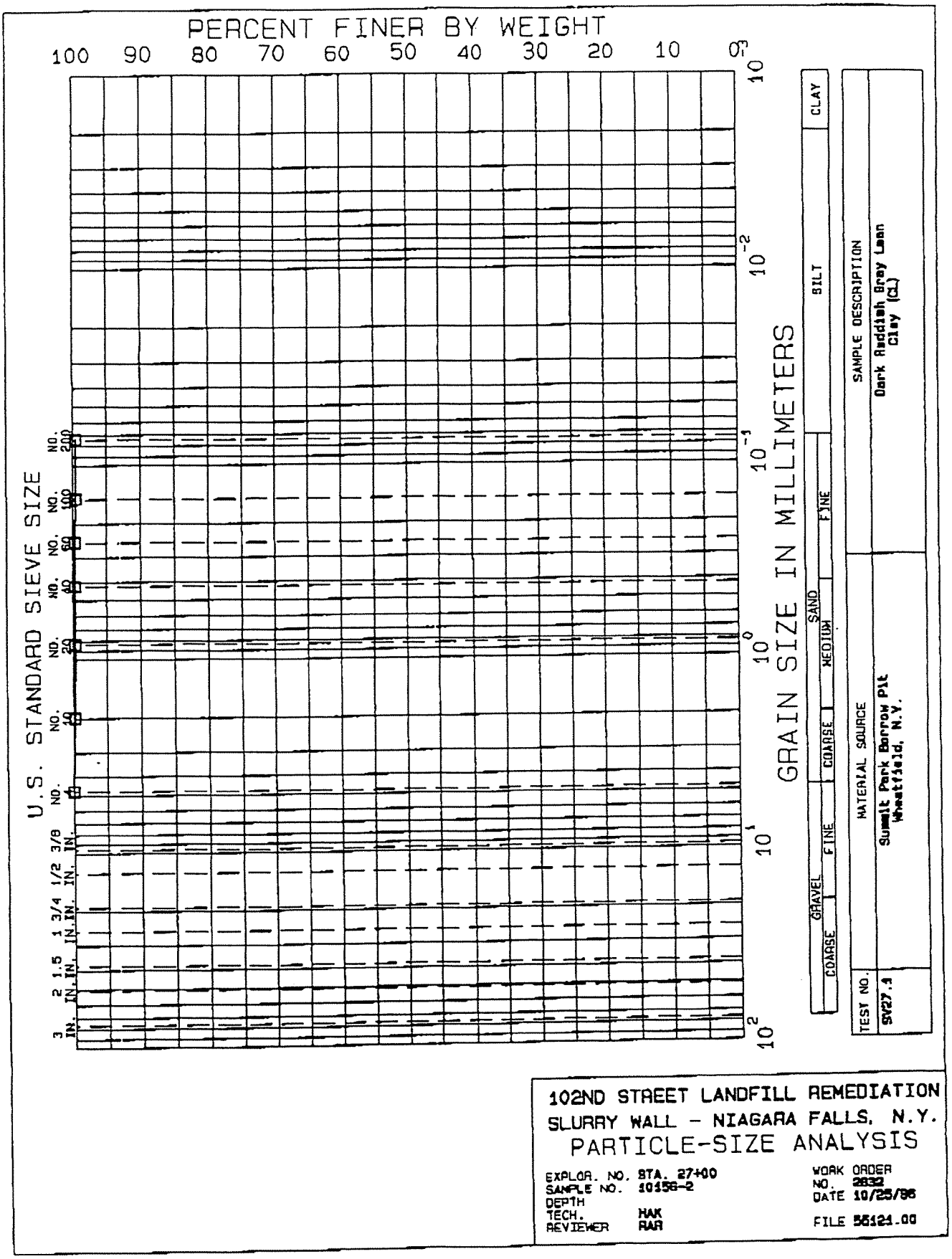
102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 28+00
SAMPLE NO. 10156-1
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2832
DATE 10/29/96
FILE 56121.00

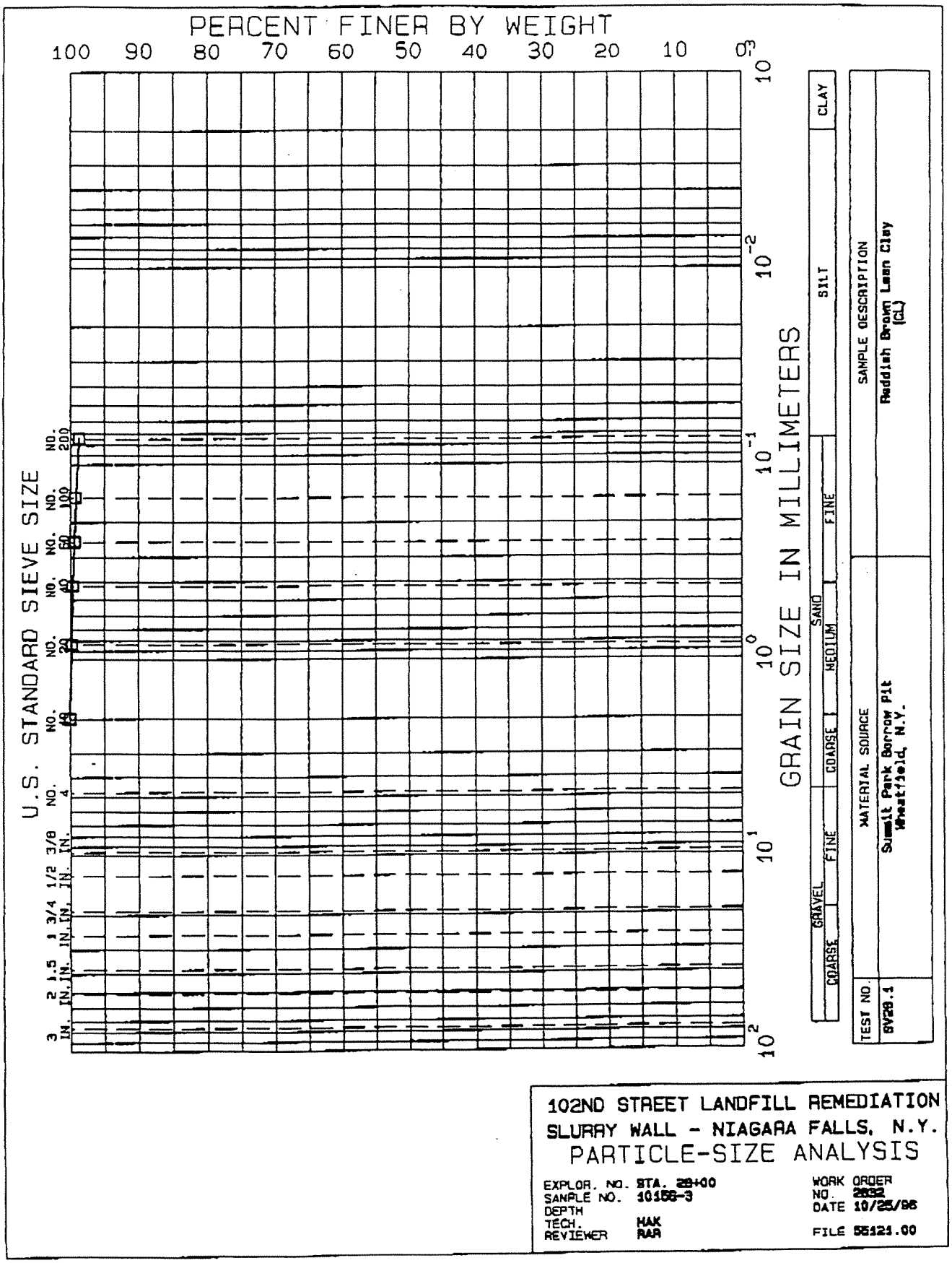
GZA GeoEnvironmental of New York
Engineers and Scientists

OCT 29 1996



GZA GeoEnvironmental of New York
Engineers and Scientists

OCT 29 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.

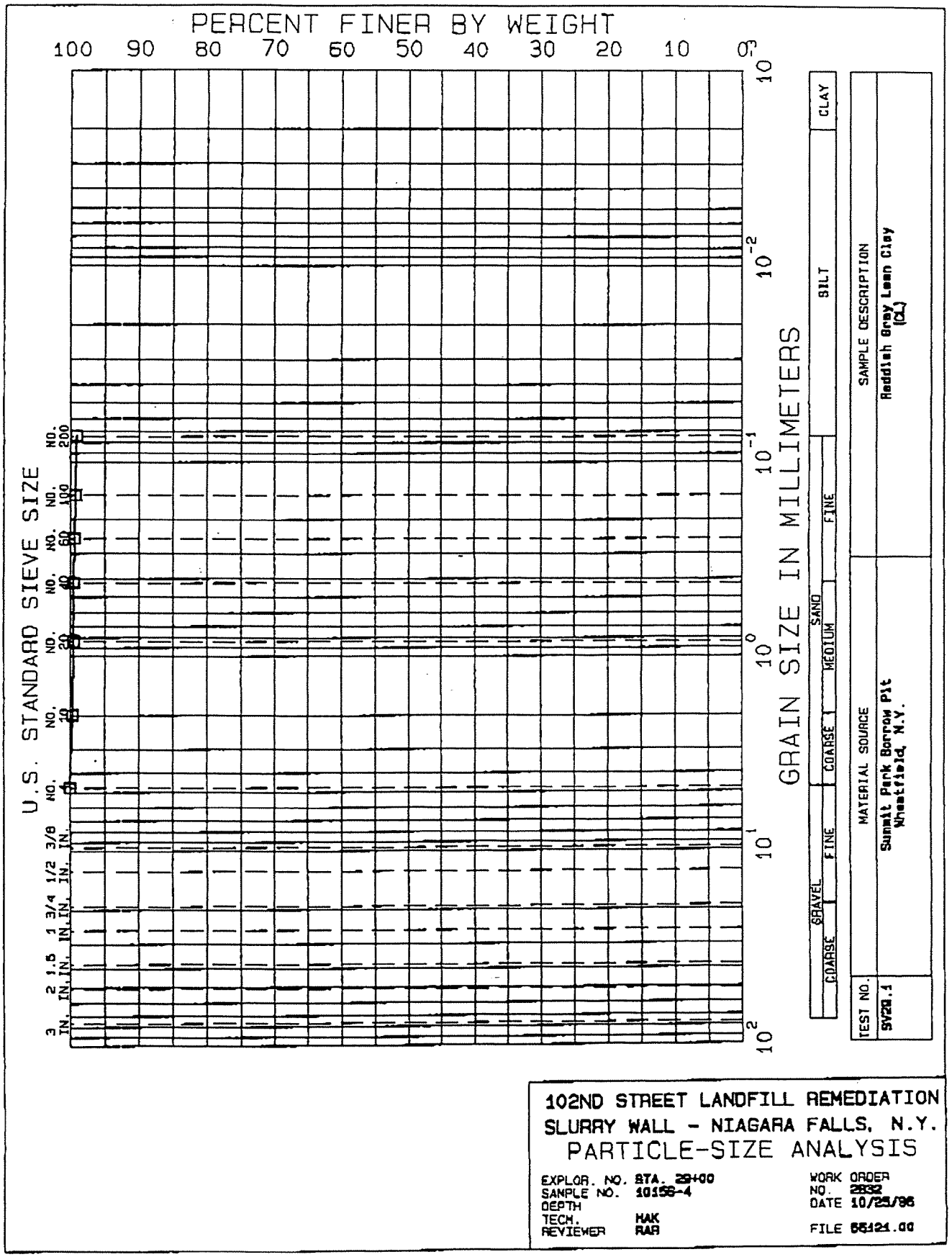
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 28+00
SAMPLE NO. 10156-3
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2632
DATE 10/25/96
FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists

OCT 2 9 1996

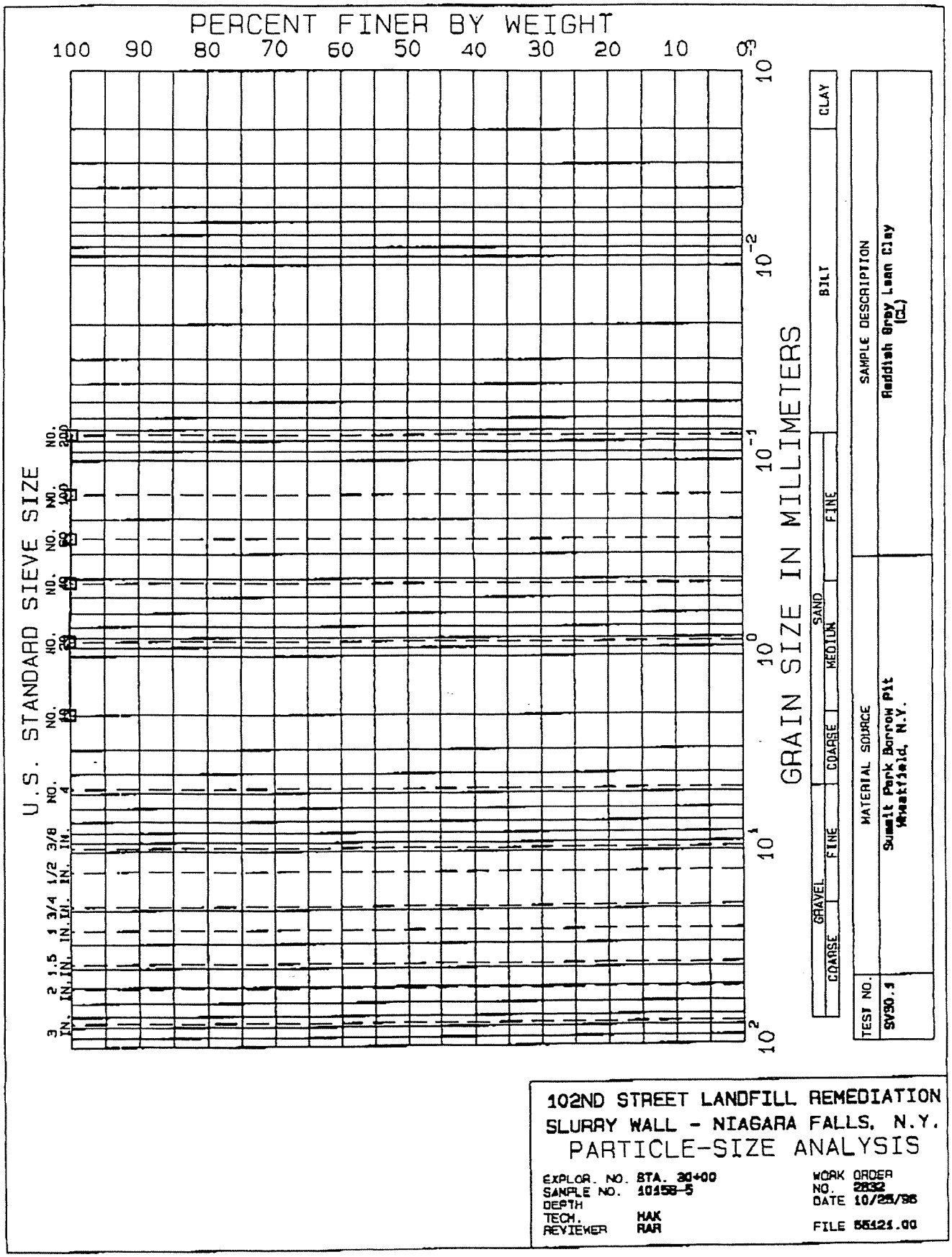


102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.	STA. 29+00	WORK ORDER NO.	2832
SAMPLE NO.	10156-4	DATE	10/25/96
DEPTH			
TECH.	HAK		
REVIEWER	RAR	FILE	55121.00

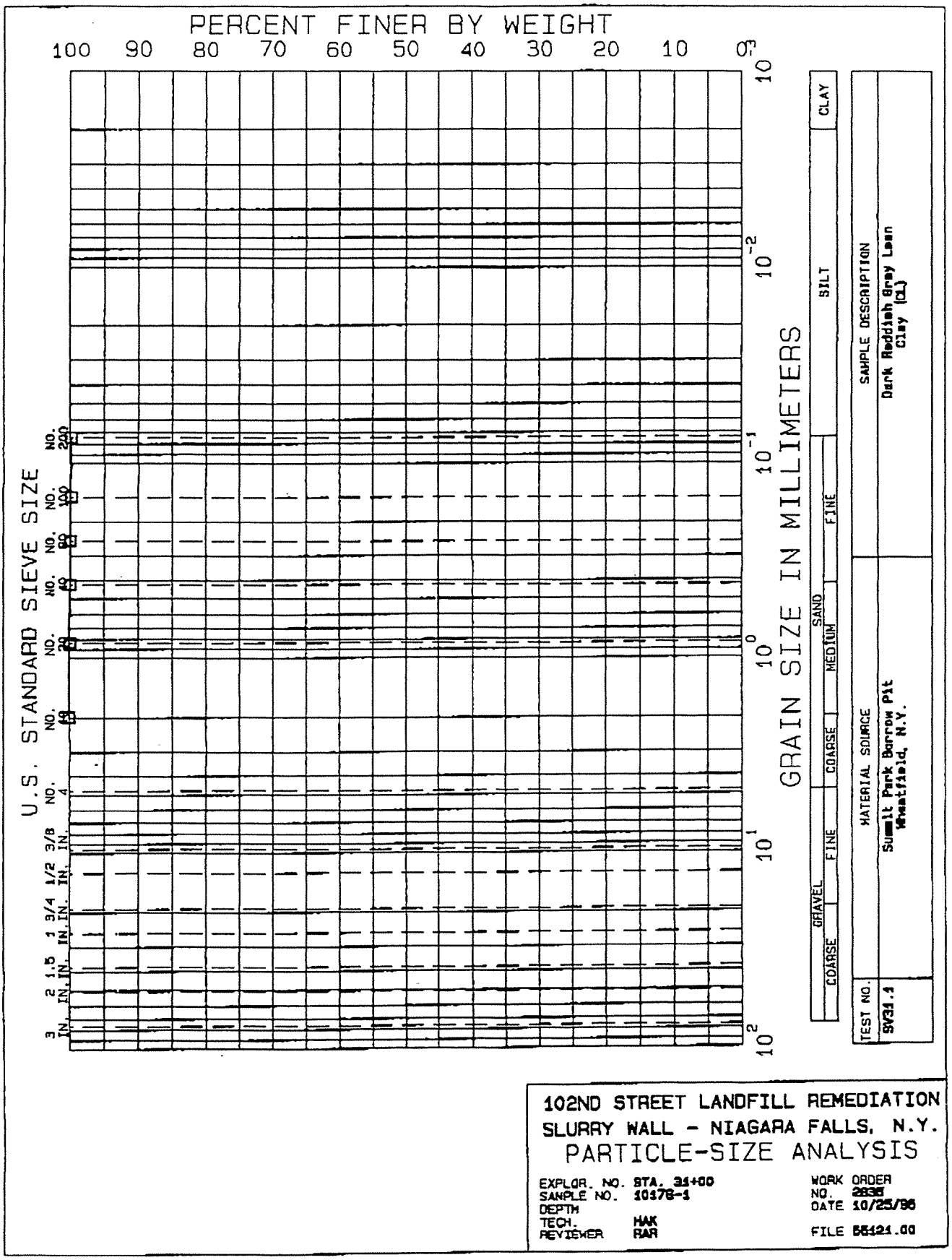
GZA GeoEnvironmental of New York
Engineers and Scientists

OCT 29 1996



GZA GeoEnvironmental of New York
Engineers and Scientists

OCT 29 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 31+00
SAMPLE NO. 10378-1
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2835
DATE 10/25/96
FILE 55121.00

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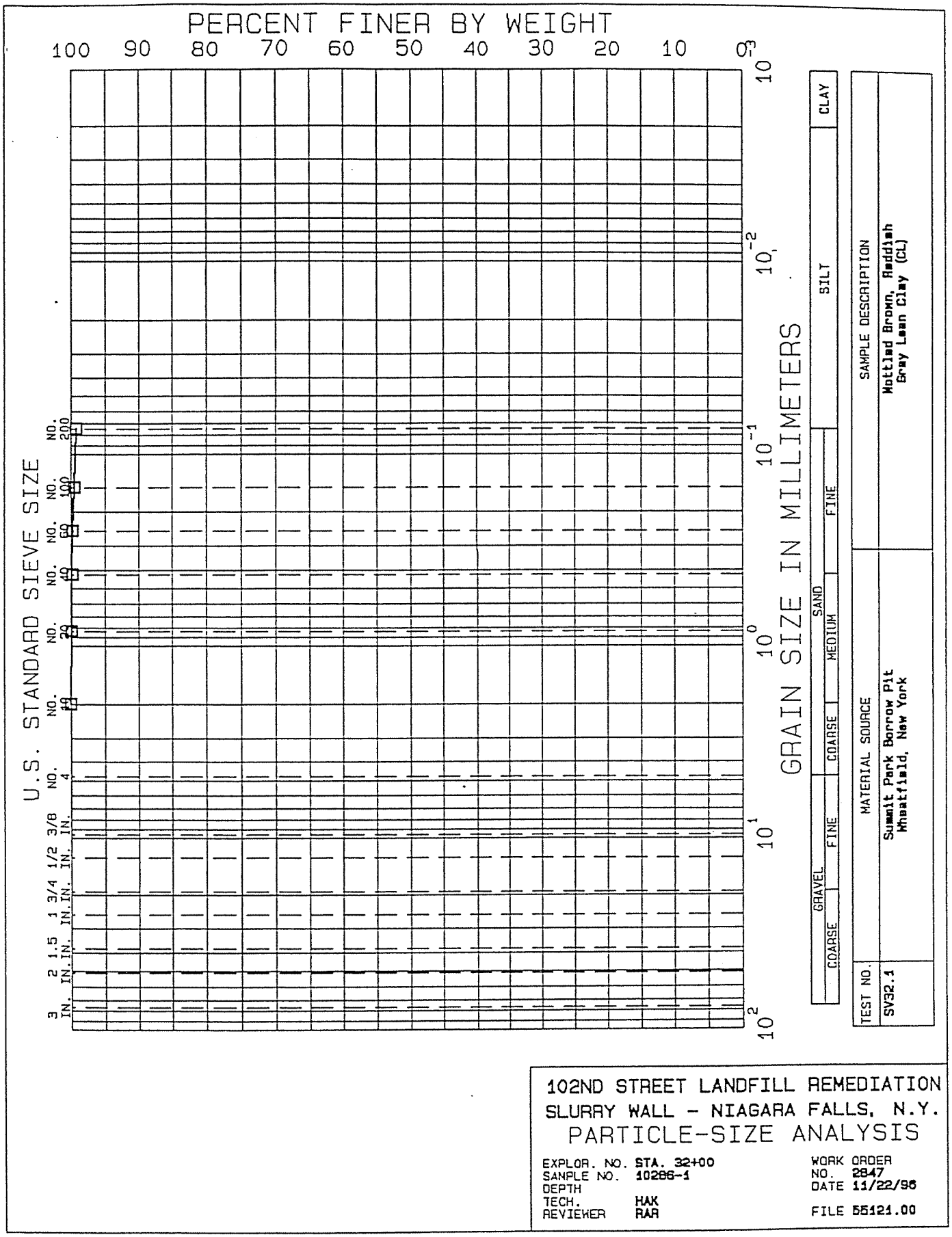
Engineers and Scientists

TOTAL P.12



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 32+00
SAMPLE NO. 10286-1
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2847
DATE 11/22/96

FILE 55121.00

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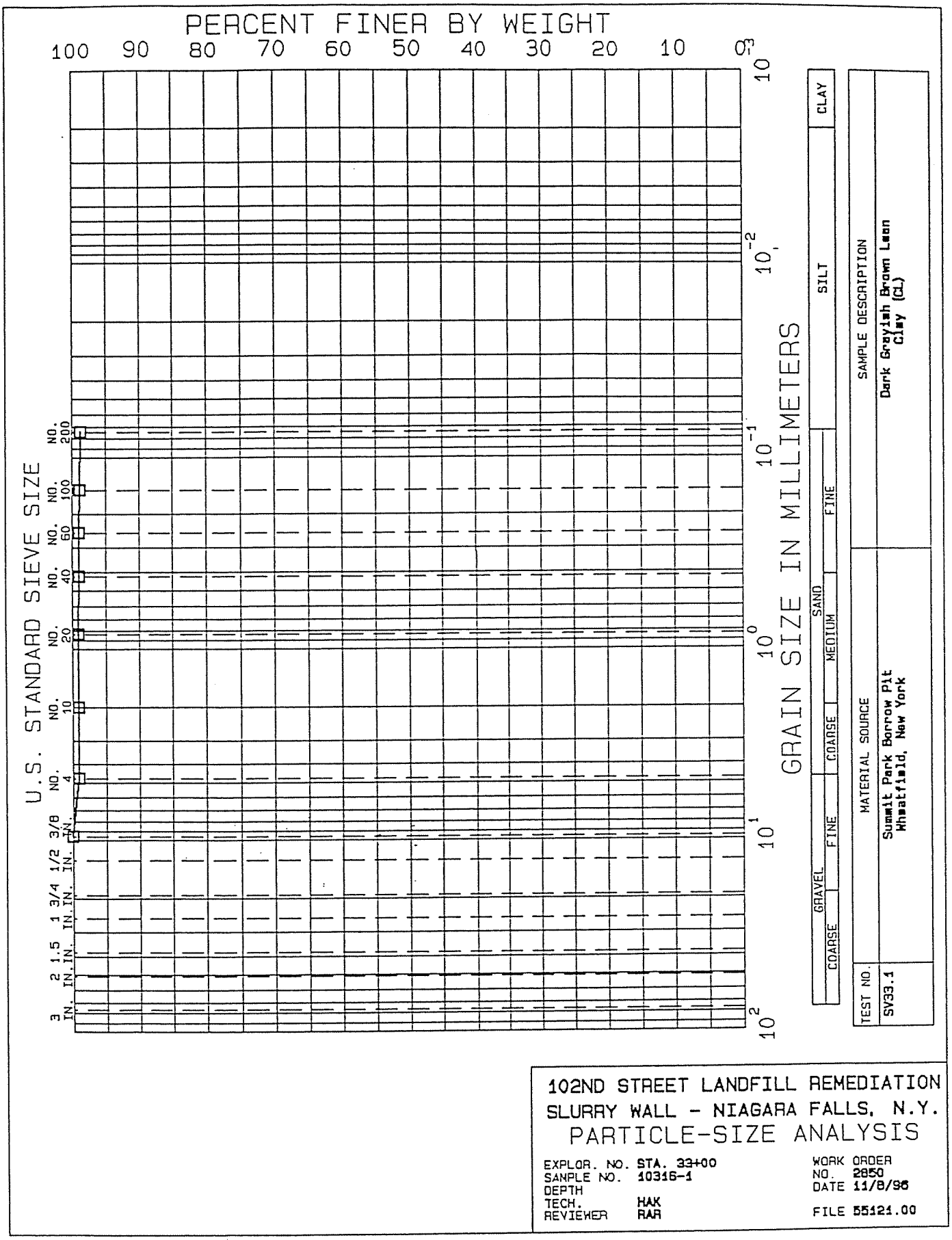

102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 33+00
SAMPLE NO. 10316-1
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2850
DATE 11/8/96

FILE 55121.00

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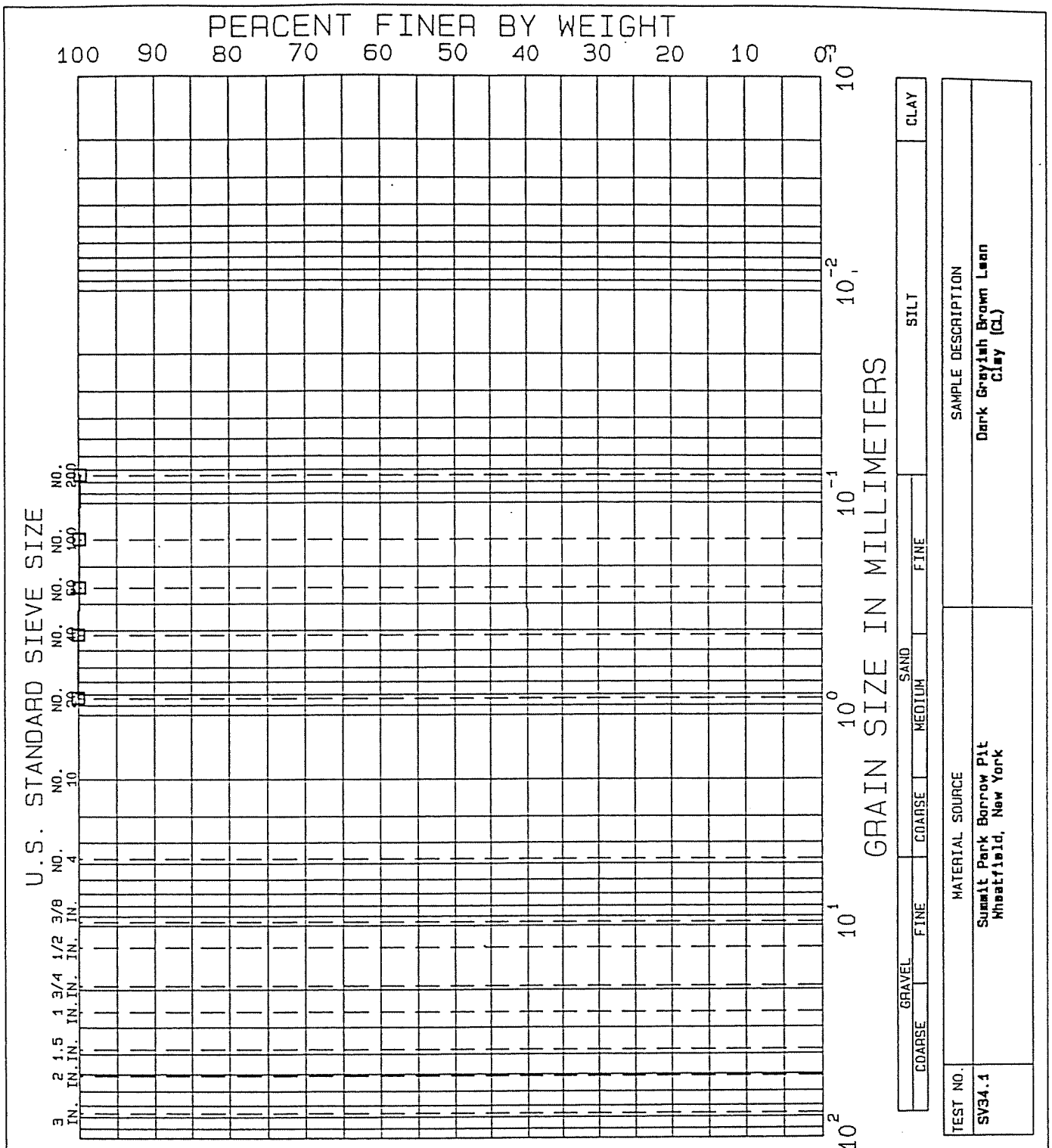
NOV 26 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 34+00
SAMPLE NO. 10316-2
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2850
DATE 11/8/96
FILE 55121.00

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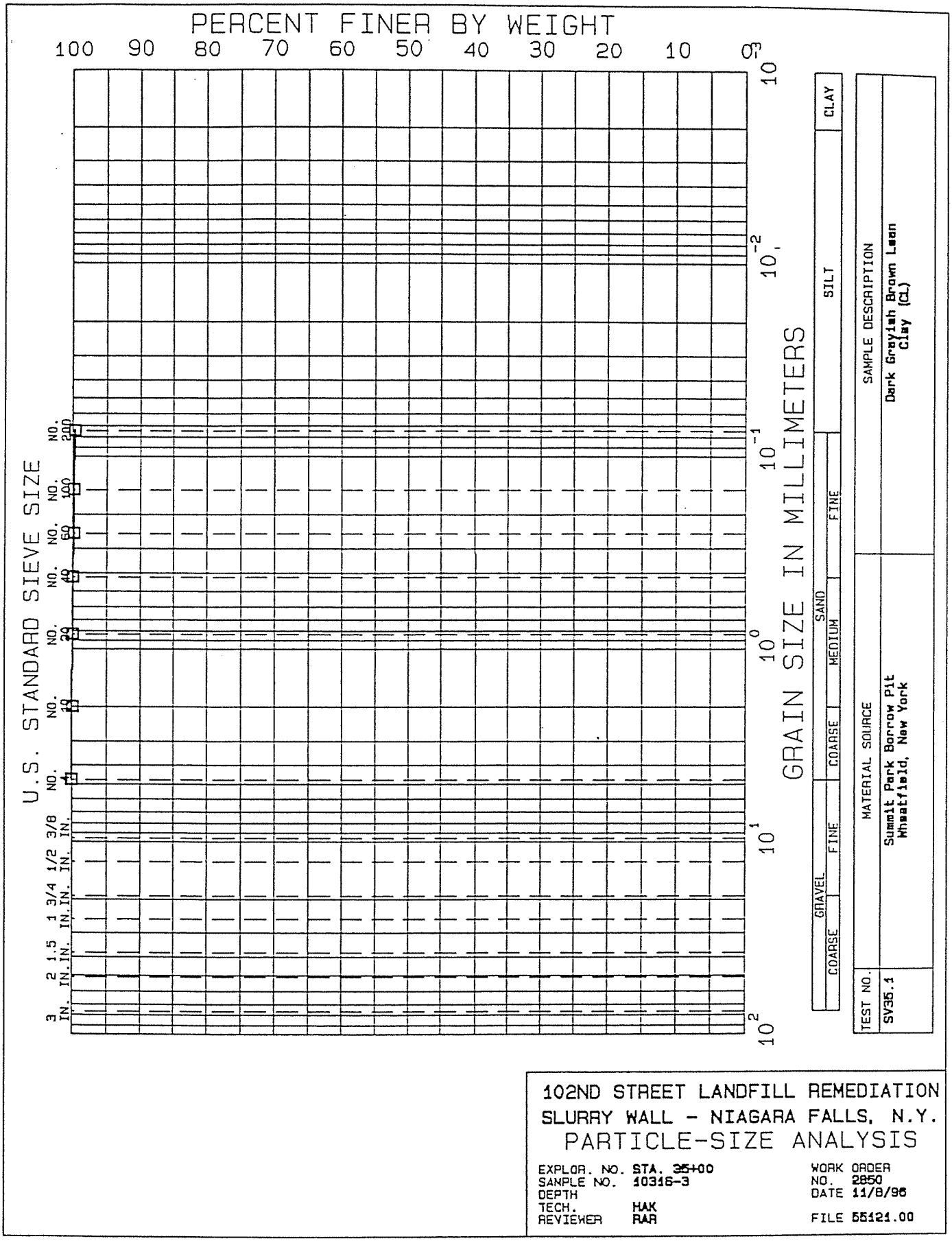
NOV 26 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 35+00
SAMPLE NO. 10316-3
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2850
DATE 11/8/96

FILE 55121.00

GZA GeoEnvironmental of New York
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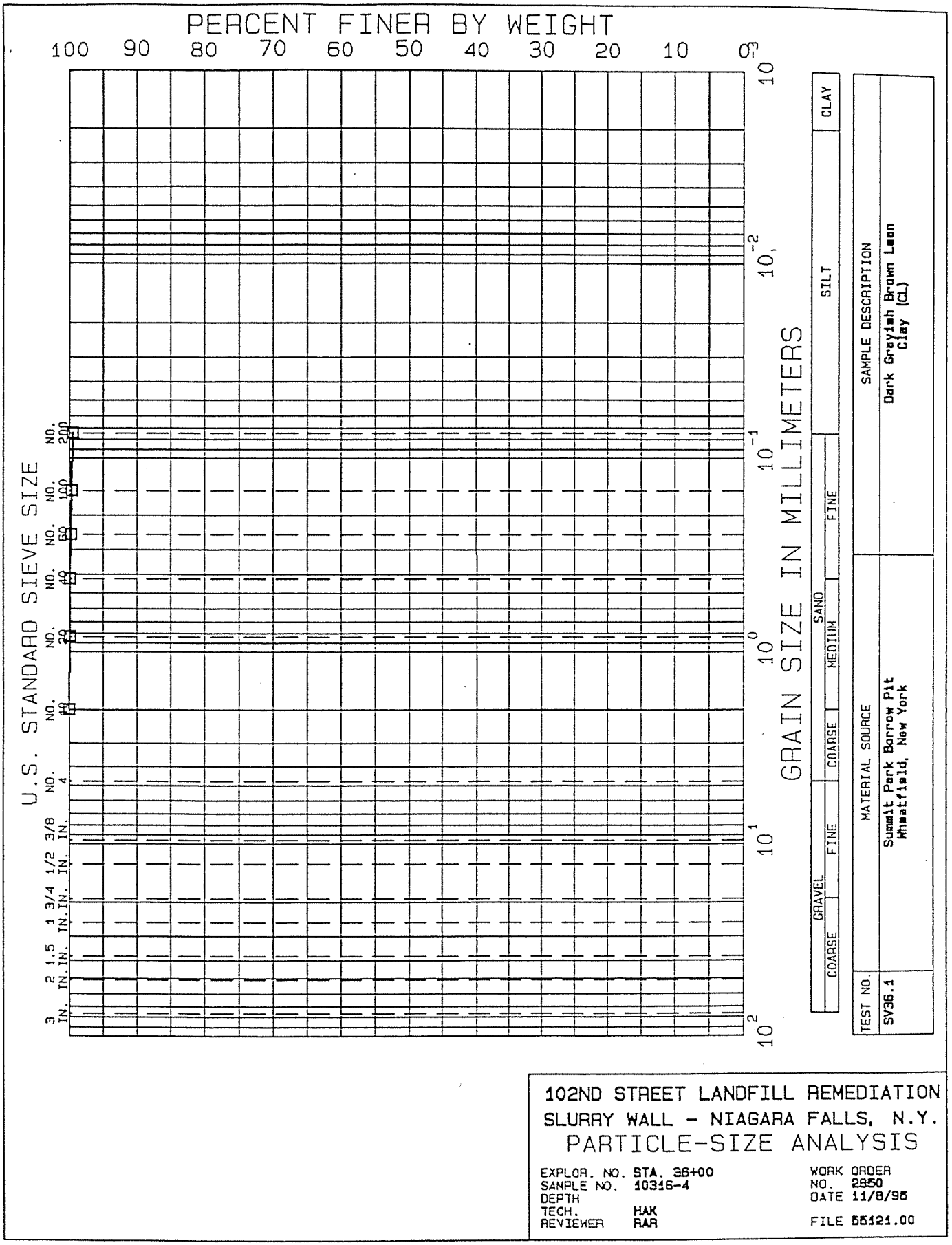
NOV 26 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

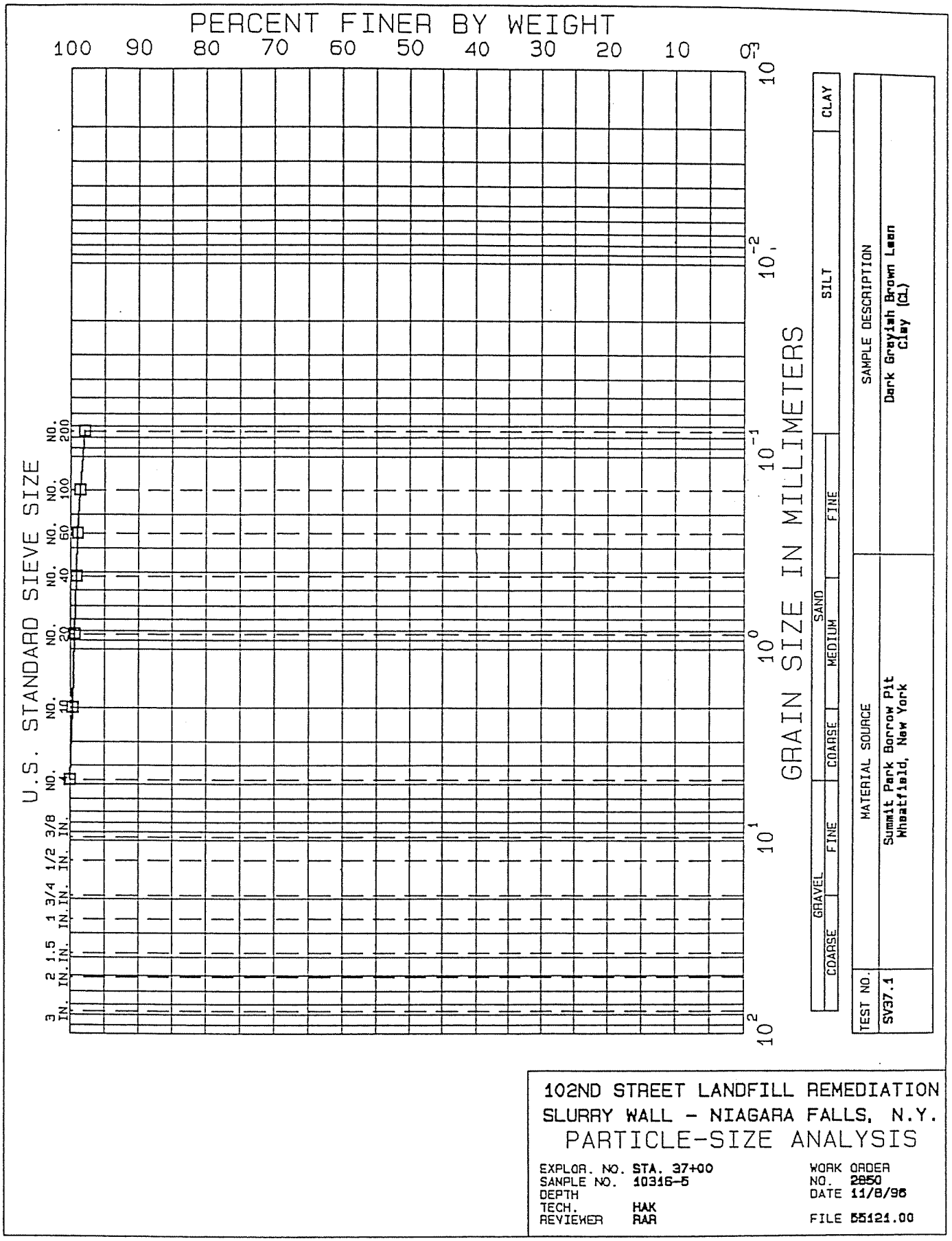
EXPLOR. NO. STA. 36+00
SAMPLE NO. 10316-4
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2850
DATE 11/8/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists

NOV 26 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 37+00
SAMPLE NO. 10316-5
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2850
DATE 11/8/96

FILE 55121.00

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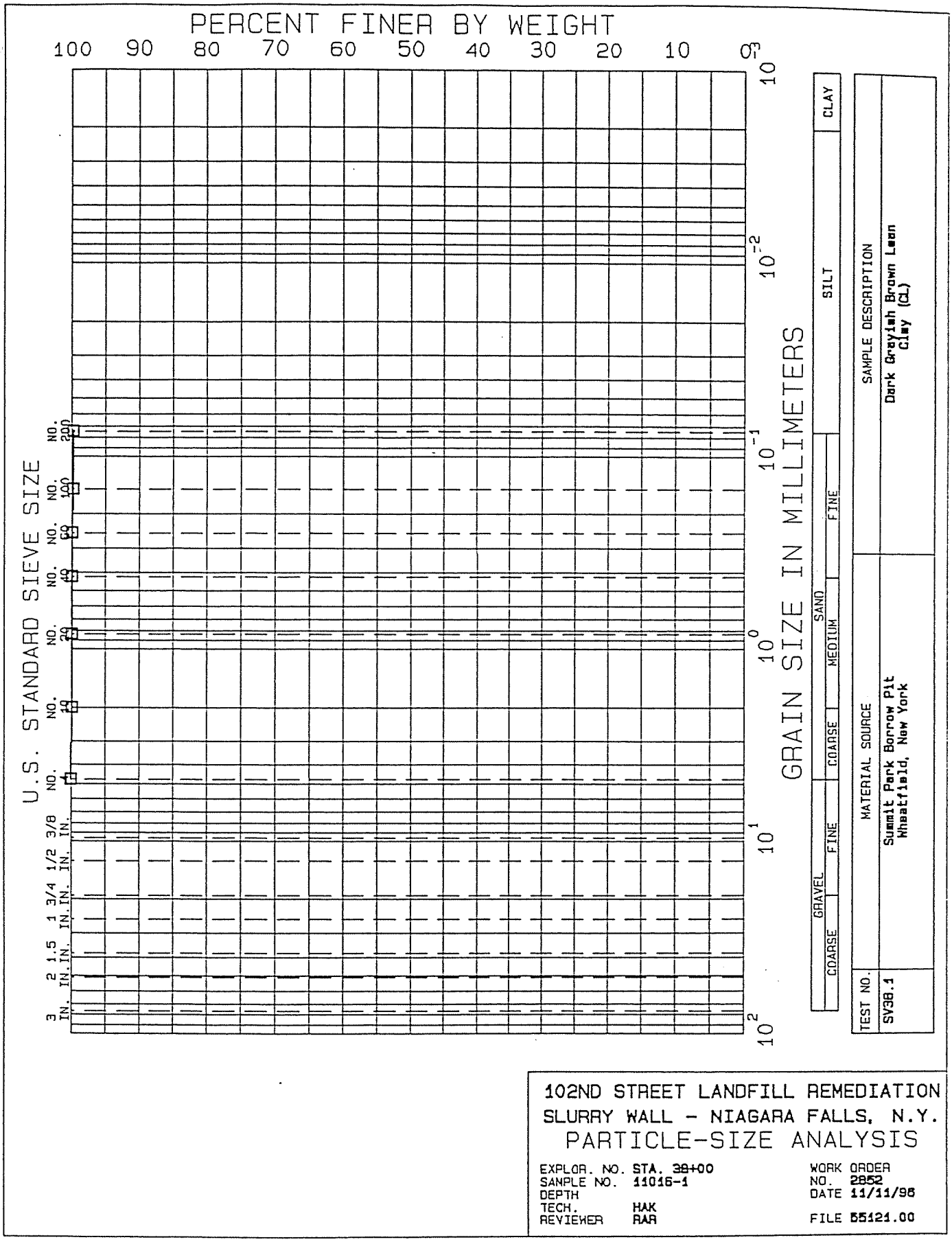

102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 38+00
SAMPLE NO. 11016-1
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2852
DATE 11/11/96

FILE 55121.00

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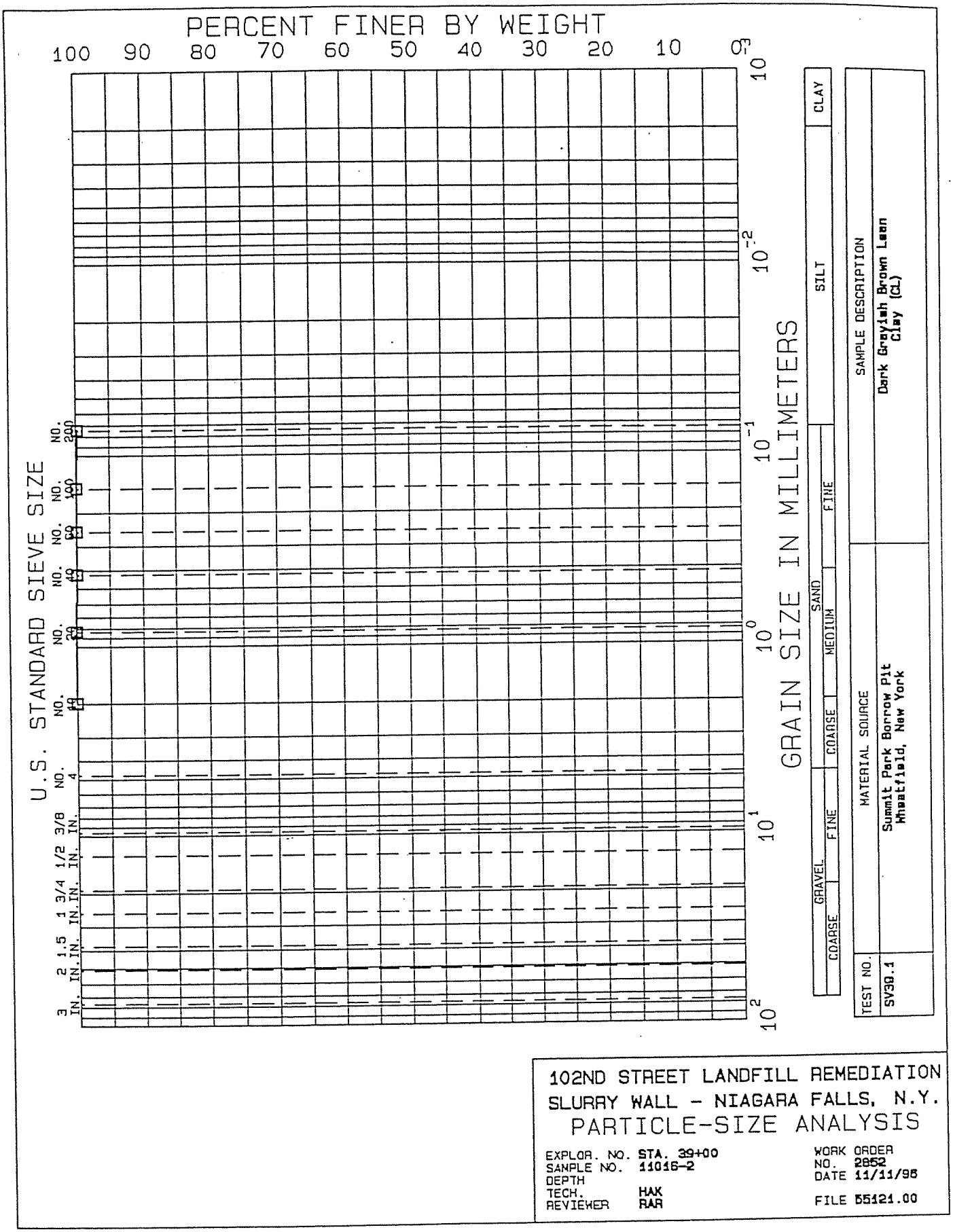
NOV 27 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 39+00
SAMPLE NO. 11016-2
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2852
DATE 11/11/96

FILE 55121.00

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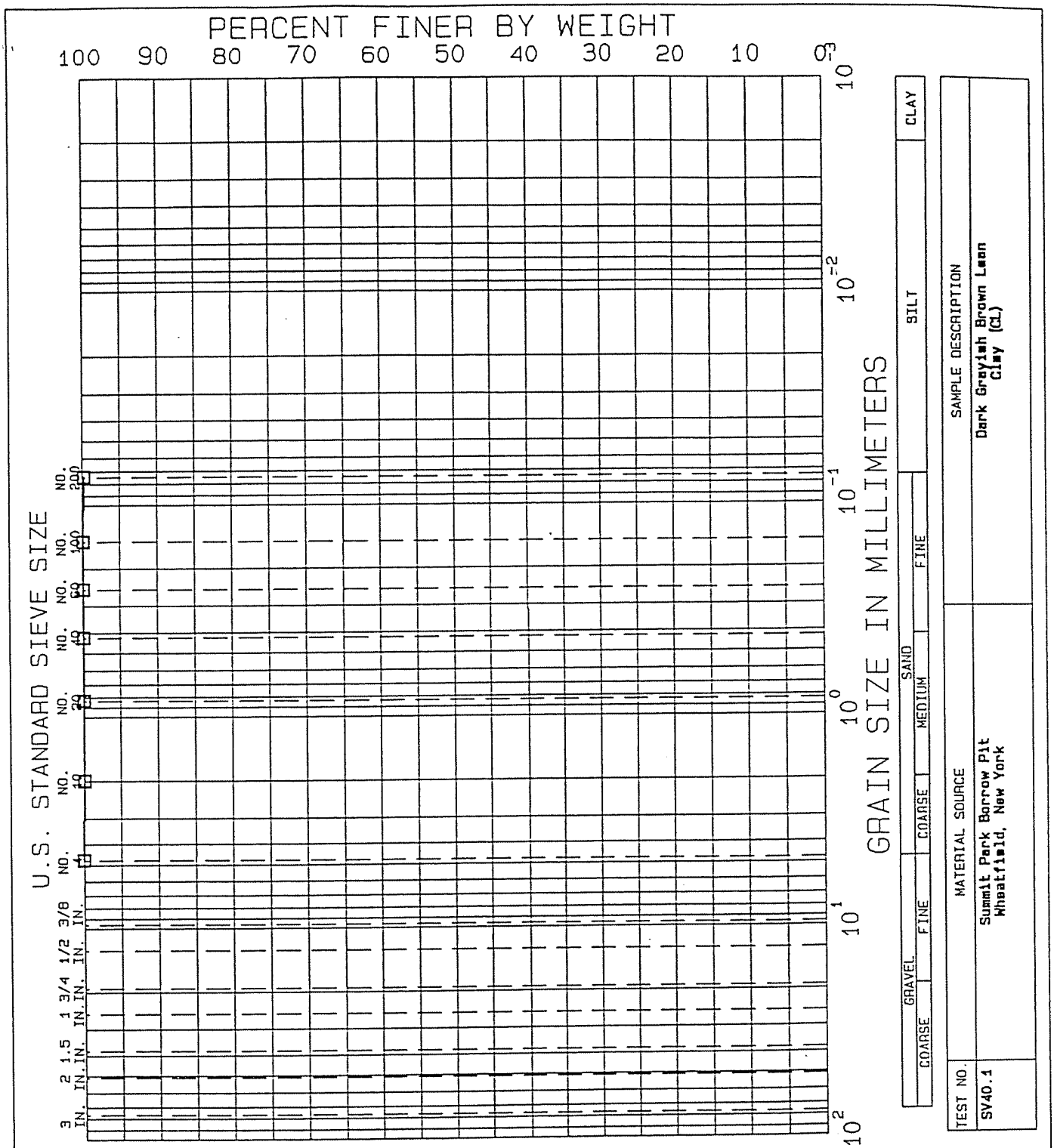
Engineers and Scientists

NOV 27 1996



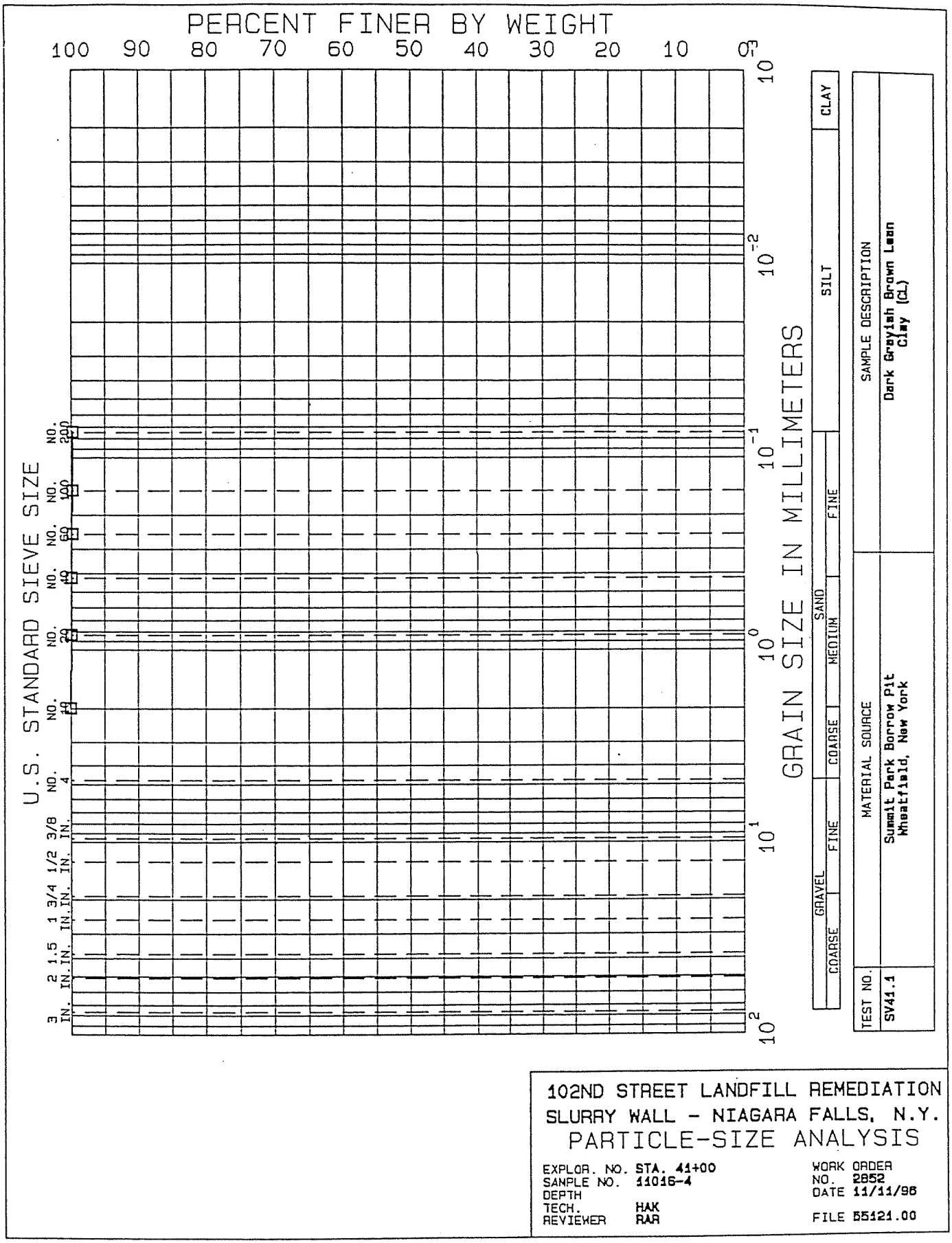
102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 40+00
SAMPLE NO. 11016-3
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2852
DATE 11/11/96
FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists

NOV 2 7 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

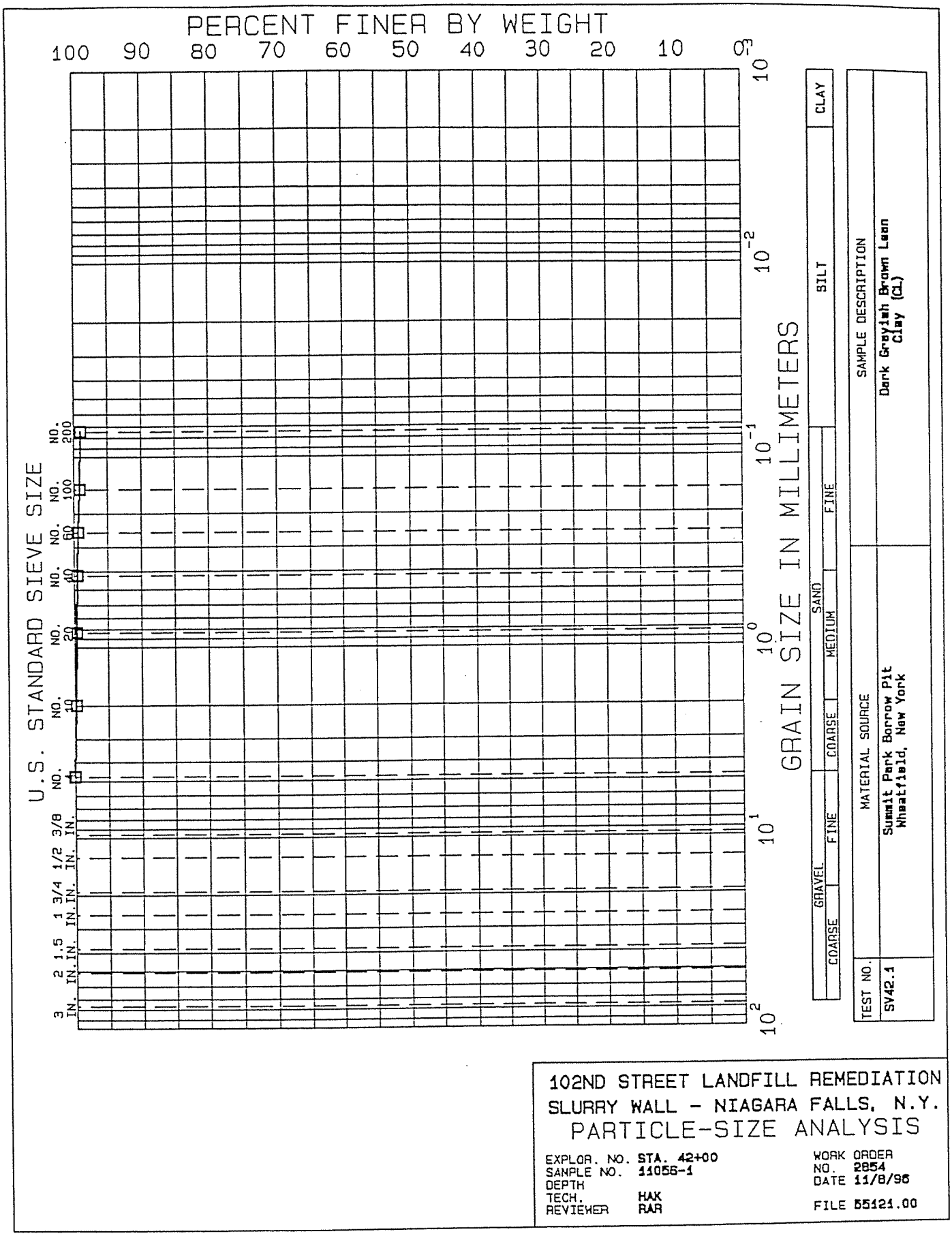
EXPLOR. NO. STA. 41+00
SAMPLE NO. 11016-4
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2852
DATE 11/11/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists

NOV 27 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

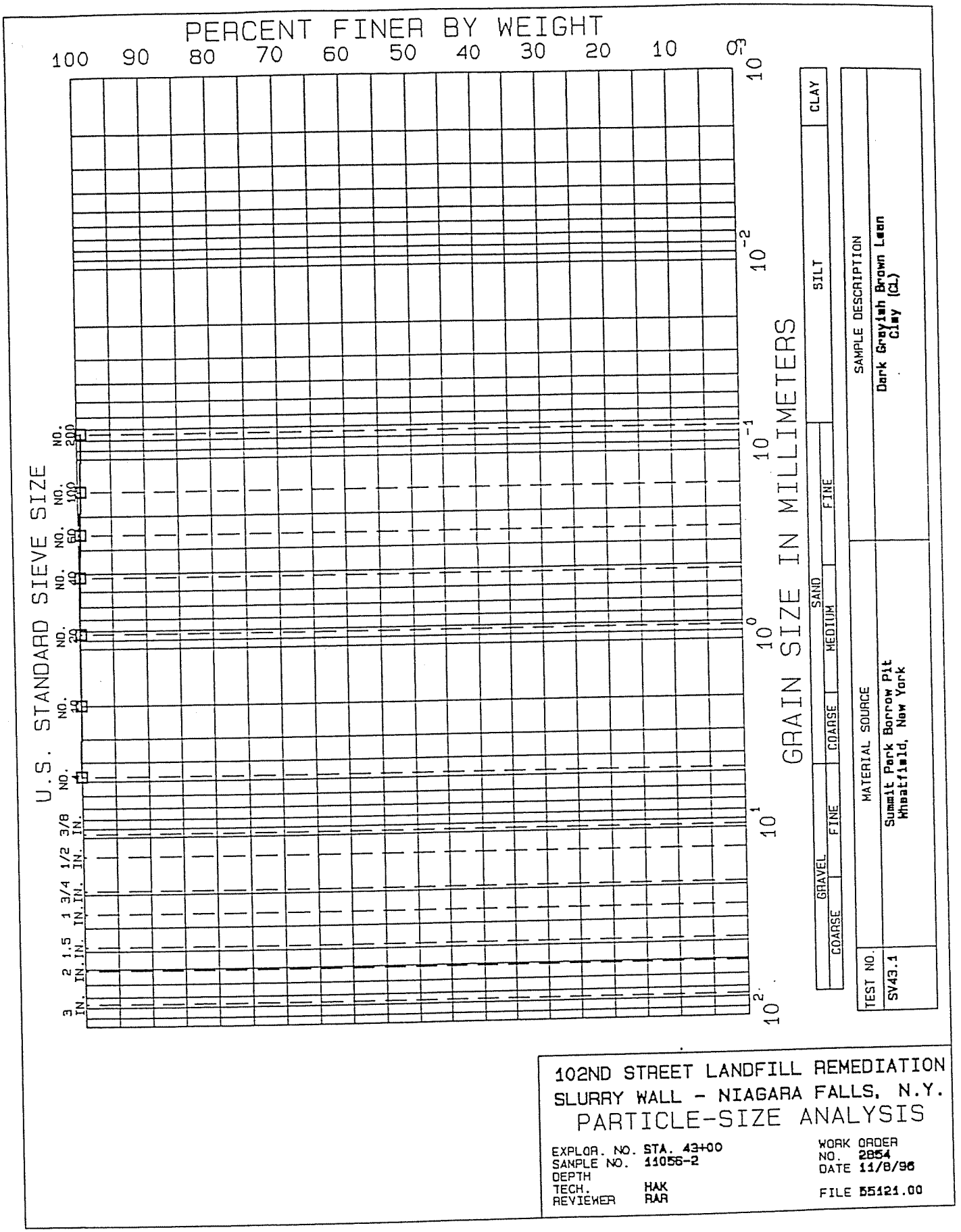
EXPLOR. NO. STA. 42+00
SAMPLE NO. 11056-1
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2854
DATE 11/8/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists

NOV 27 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 43+00
SAMPLE NO. 11056-2
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2854
DATE 11/8/96

FILE 55121.00

GZA GeoEnvironmental of New York
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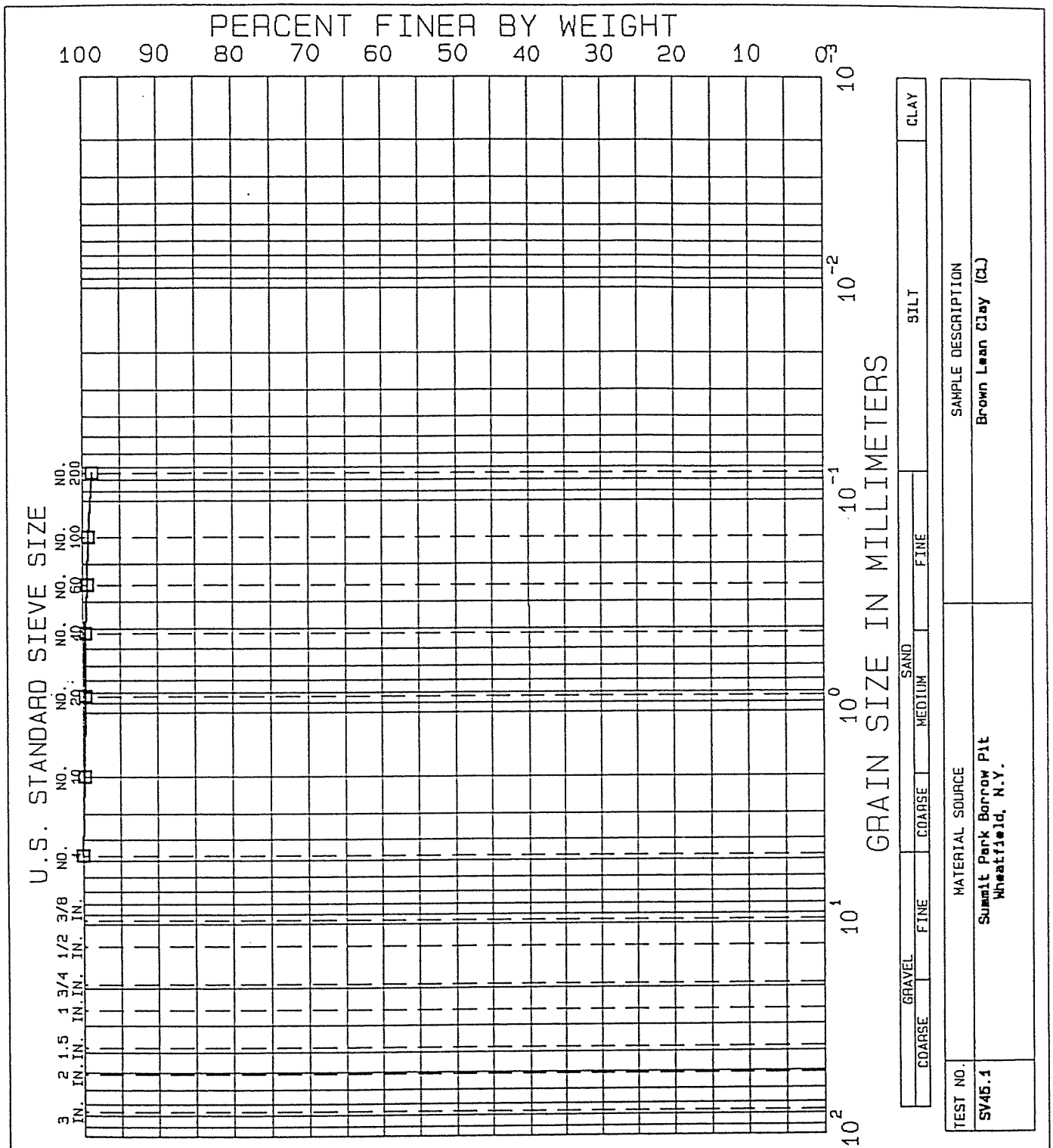
NOV 27 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

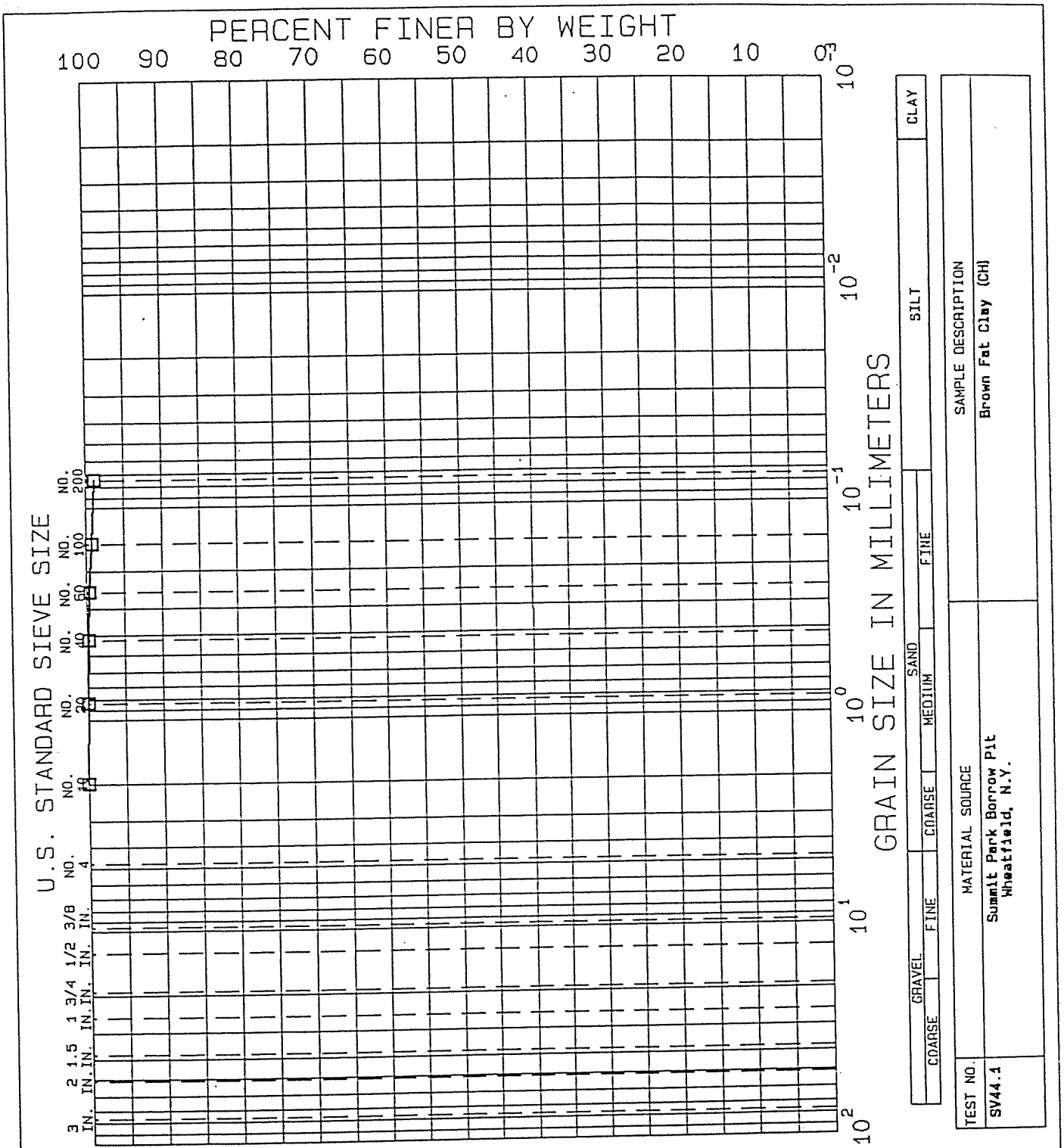
EXPLOR. NO. STA. 45+00
SAMPLE NO. 11076-2
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2862
DATE 11/12/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists

NOV 2 1 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.

PARTICLE-SIZE ANALYSIS

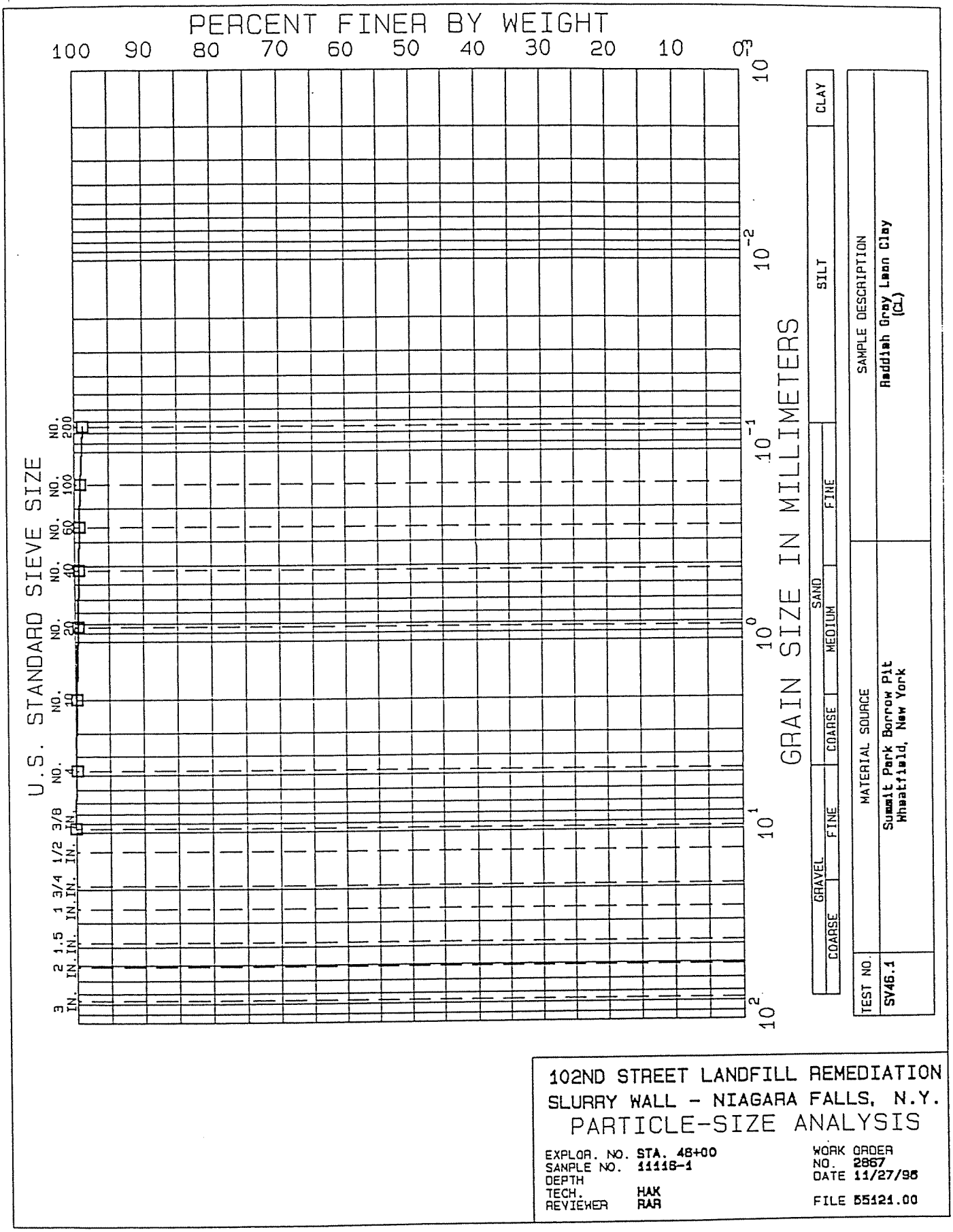
EXPLOR. NO. STA. 44+00
SAMPLE NO. 11076-1
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2862
DATE 11/12/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists

NOV 2 1 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

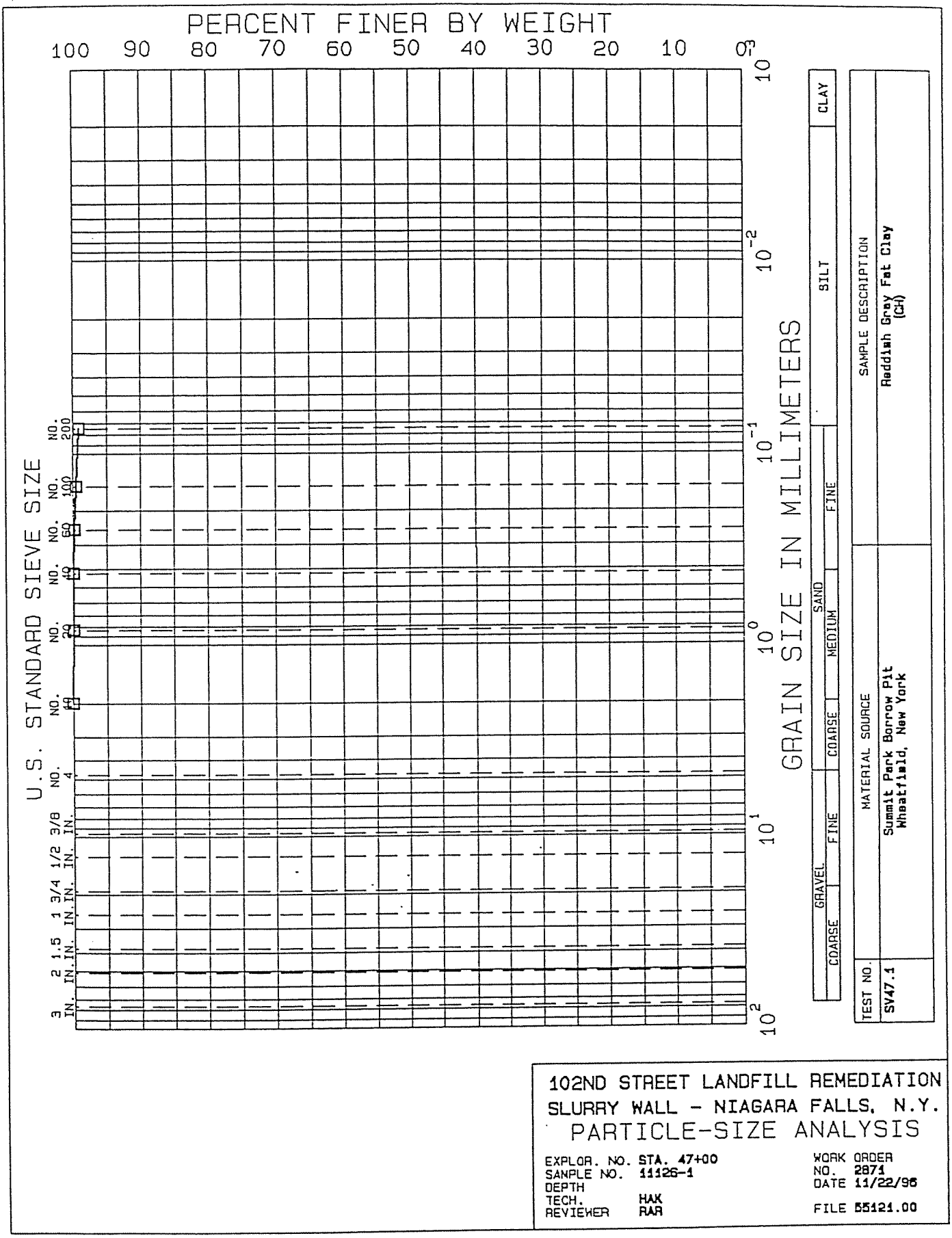
EXPLOR. NO. STA. 48+00
SAMPLE NO. 11116-1
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2867
DATE 11/27/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists

NOV 27 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

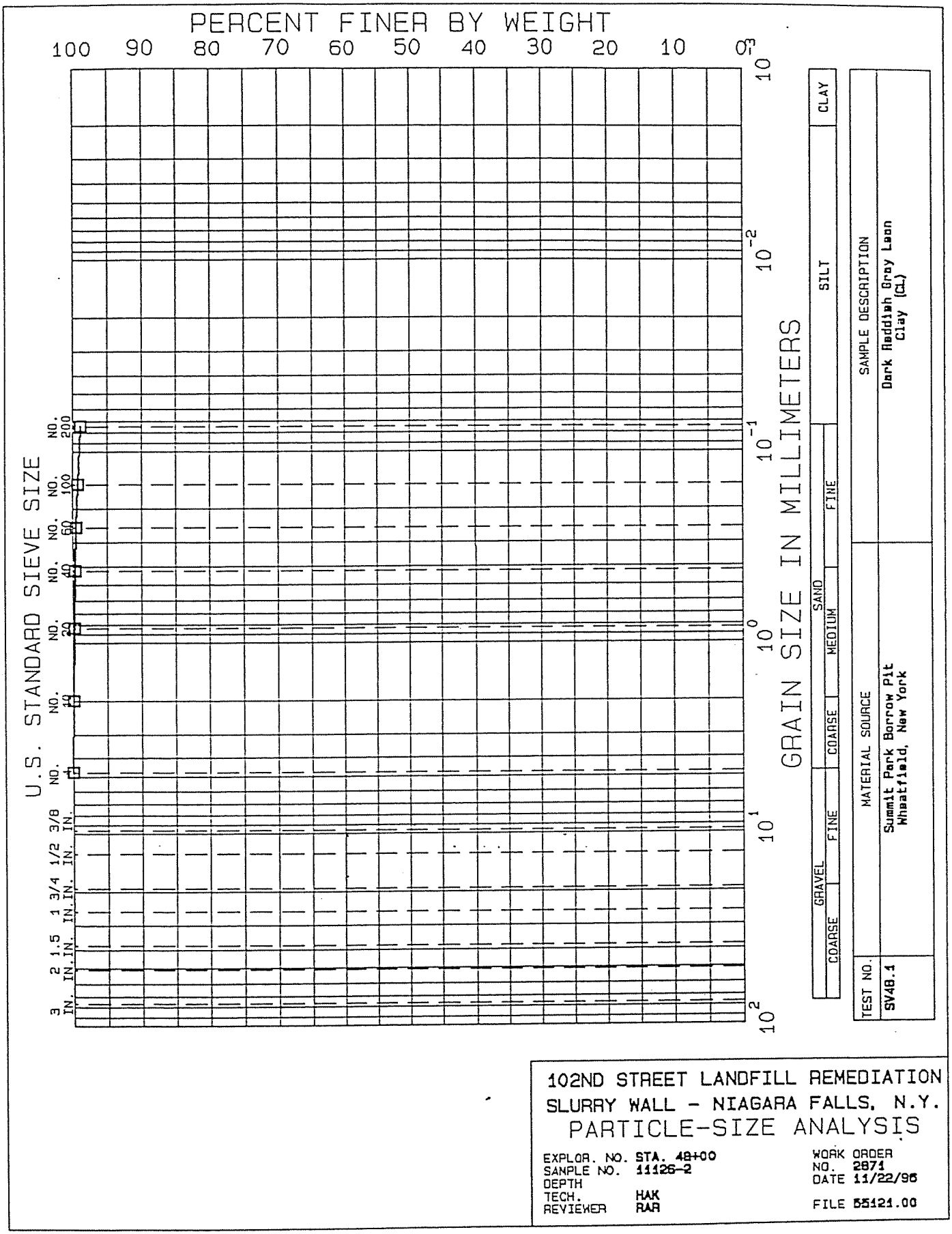
EXPLOR. NO. STA. 47+00
SAMPLE NO. 11126-1
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2871
DATE 11/22/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists

NOV 2 7 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

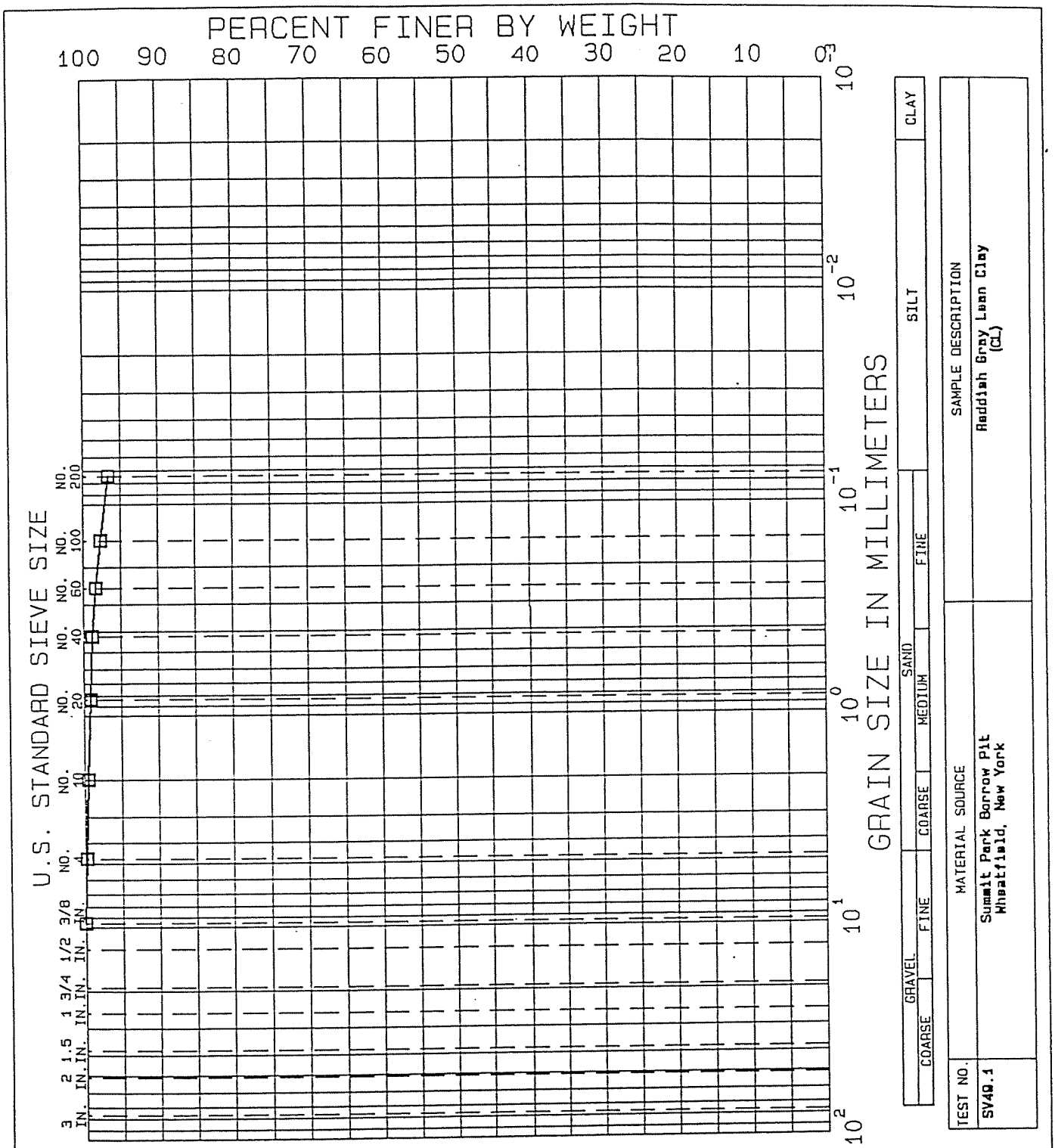
EXPLOR. NO. STA. 48+00
SAMPLE NO. 11126-2
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2871
DATE 11/22/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists

NOV 27 1996



102ND STREET LANDFILL REMEDIATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. STA. 48+96
SAMPLE NO. 11126-3
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2871
DATE 11/22/96

FILE 55121.00

GZA GeoEnvironmental of New York
Engineers and Scientists

NOV 27 1996

Sample Identification Record
Hydraulic Conductivity of in-situ Slurry Wall
102nd Street Landfill
Niagara Falls, New York

Date record prepared:	12/4/96					
Name of Company:	Geocon					
Project #:	D60025					
Sample ID #:	SW-1	SW-2B	SW-3	SW-4	SW-5	SW-6 C
Date Collected:	11-20-96	11-21-96	11-21-96	11-21-96	11/22/96	11/22/96
Time Collected:	2:50 PM	9:40am	12:00pm	3:00pm	8:30am	2:00pm
Method of Collection:	ASTM 1587	Astm 1587	Astm 1587	Astm 1587	Astm 1587	ASTM 1587
Location:	22+40	8+50	5+90	26+00	30+90	4200
Depth:	7'-9'	4'-6"	18'-20'	23'-25'	10'-12'	28-30'
Sample Type:	Shelby	Shelby	Shelby	Shelby	Shelby	Shelby
No. of Containers:	1	1	1	1	1	1
Comments: Recovery	20.5"	23.5"	15"	26.5"	23"	26"
Shipment Method:	Pickup Truck					
Shipped To:	Woodward - Clyde.					
Sampler(s) Name:	x Keith Menzie					
Sampler(s) Signature:						
Date & Time:	12-5-96 2.15					
Relinquished by (name):	x Keith Menzie					
Relinquished by (signature):						
Relinquished on (date & time):	12-5-96 2.15					
Received by (name):						
Received by (signature):						
Received on (date & time):						
Comments:						

Witness: Scott Lawrence
12/4/96

Sample Identification Record
Hydraulic Conductivity of in-situ Slurry Wall
102nd Street Landfill
Niagara Falls, New York

Date record prepared:	12-4-96					
Name of Company:	Geocon					
Project #:	D60025					
Sample ID #:	Sw-7	Sw-8C	Sw-9	Sw-10	5+85	
Date Collected:	11/22/96	11/25/96	11/25/96	11/25/96	12/3/96	
Time Collected:	4:20pm	11:45am	2:00pm	4:00pm	3:15pm	
Method of Collection:	~~Shelby~~ ASTM 1587	→	→	→	→	
Location:	2+80	3+00	0+00	46+20	5+85	
Depth:	10'-12'	20'-22'	10'-12'	16'-18'	17'-19'	
Sample Type:	Shelby	→	→	→	→	
No. of Containers:	1	1	1	1	1	
Comments: Recovery:	24½"	11"	21"	20"	24½"	

Shipment Method:	Pickup Truck		
Shipped To:	Woodward - Clyde		
Sampler(s) Name:	x Keith Menzie		
Sampler(s) Signature:			
Date & Time:	12-5-96 2:18		
Relinquished by (name):	x Keith Menzie		
Relinquished by (signature):			
Relinquished on (date & time):	12-5-96 2:18		
Received by (name):			
Received by (signature):			
Received on (date & time):			
Comments:			

[redacted] Witness: Scott Laurence
12/4/96

Sample Identification Record
Hydraulic Conductivity of in-situ Slurry Wall
102nd Street Landfill
Niagara Falls, New York

Date record prepared:	11-20-96					
Name of Company:	Geo-Con					
Project #:	96D025					
Sample ID #:	SW1					
Date Collected:	11-20-96					
Time Collected:	2:50 PM					
Method of Collection:	ASTM D1587					
Location:	22+40					
Depth:	7'-9'					
Sample Type:	Shelby tube					
No. of Containers:	1					
Comments: Recovery	20.5"					
Samples collected						
by Buffalo Drilling						
Shipment Method:	GZA Pickup					
Shipped To:	GZA					
Sampler(s) Name:	Keith McKenzie					
Sampler(s) Signature:						
Date & Time:	11-20 - 2:50 PM					
Relinquished by (name):	GZA Keith McKenzie					
Relinquished by (signature):						
Relinquished on (date & time):	11-22 - 8:00 AM					
Received by (name):	Tom Seider (GZA)					
Received by (signature):						
Received on (date & time):	11/22/96 0800					
Comments:						
TEST METHOD	ASTM D5084					
	FAX RESULTS	TO: 817-382-0859				
		ATTN: Allman				

Witness: Scott Parmenter - (GZA)
11-22-96

Sample Identification Record
Hydraulic Conductivity of in-situ Slurry Wall
102nd Street Landfill
Niagara Falls, New York

Date record prepared:	11-21-96					
Name of Company:	GeoCon					
Project #:	060025					
Sample ID #:	SW2A	SW2B	SW2C	SW3	SW4	
Date Collected:	11-21-96	11-21-96	11-21-96	11-21-96	11-21-96	
Time Collected:	9:20 AM	9:40 AM	10:05 AM	12:00 PM	3:03 PM	
Method of Collection:	ASTM D1587	ASTM D1587	ASTM D1587	ASTM D1587	ASTM D1587	
Location:	8+50	8+50	8+50	5+90	26+00	
Depth:	2'-4'	4'-6'	6'-8'	18'-20'	23'-25'	
Sample Type:	Shelby tube	Shelby tube	Shelby tube	Shelby tube	Shelby tube	
No. of Containers:	1	1	1	1	1	
Comments: Recovery	21"	23.5"	24"	15"	26.5"	
Samples collected	SW2A		SW2C			
by Buffalo Drilling	NOT SENT TO LAB		NOT SENT TO LAB			
Shipment Method:	GZA PICKUP					
Shipped To:	GZA					
Sampler(s) Name:	KEITH MCKENZIE					
Sampler(s) Signature:						
Date & Time:	11-21 930 AM TO 3PM					
Relinquished by (name):	KEITH MCKENZIE				TOM SEIDER	
Relinquished by (signature):						
Relinquished on (date & time):	11-22-96 8:00 AM				12-5-96 11:15	
Received by (name):	TOM SEIDER (GZA)					
Received by (signature):						
Received on (date & time):	11/22/96 0800					
Comments: Test Method	ASTM D5084					
	FAX results to	817-382-0859				
	ATTN:	AIMAN				

TRANSPORTED TO LAB
3644 NAGEL DR., BUFFALO, NY

12-5-96

Witness: Scott Lawton (FW02)
11-22-96

Sample Identification Record
Hydraulic Conductivity of in-situ Slurry Wall
102nd Street Landfill
Niagara Falls, New York

Date record prepared:	11/22/96					
Name of Company:	GEO-CON					
Project #:	D60025					
Sample ID #:	SW-5	SW-6A	SW-6B	SW-6C	SW-7	
Date Collected:	11/22/96	11/22/96	11/22/96	11/22/96	11/22/96	
Time Collected:	8:30	11:00AM	12:45PM	2:00PM	4:20 pm	
Method of Collection:	ASTM D1587	ASTM D1587	ASTM D1587	ASTM D1587	ASTM D1587	
Location:	STN 30+90	STN 4200	STN 4200	STN 4200	STN 2+80	
Depth:	10'-12'	14'-16'	20'-22'	28'-30'	10'	
Sample Type:	SHELBY TUBE	SHELBY TUBE	SHELBY TUBE	SHELBY TUBE	SHELBY TUBE	
No. of Containers:	1	1	1	1	1	
Comments: RECOVERY	23"	24"	26½"	26"	24½"	
SAMPLES COLLECTED		NOT SENT TO LAB	NOT SENT TO LAB			
BY BUFFALO DRILLING						
Shipment Method:	G2A PICKUP TRUCK					
Shipped To:	G2A					
Sampler(s) Name:	KEITH MENZIE					
Sampler(s) Signature:						
Date & Time:	11-22-96					
Relinquished by (name):	KEITH MENZIE	SCOTT LAWRENCE		TOM SODER		
Relinquished by (signature):						
Relinquished on (date & time):	11-25-96 9:30	11-25-96 11:25		12-5-96 11:15		
Received by (name):		R.A. Rodenbach				
Received by (signature):		R.A. Rodenbach				
Received on (date & time):	11-25-96 9:30	11-25-96 11:28 MST				12-5
Comments:						
TEST METHOD	ASTM D5084					
	FAX RESULTS	TO 817-382-0859				
		ATTN: AIMAN				

Sample Identification Record
Hydraulic Conductivity of in-situ Slurry Wall
102nd Street Landfill
Niagara Falls, New York

Date record prepared:	11/25/96 & 11/26/96					
Name of Company:	GEO CON					
Project #:	D60025					
Sample ID #:	SW-8A	SW-8B	SW-8C	SW-9	SW 10	SW-8D
Date Collected:	11/25/96	11/25/96	11/25/96	11/25	11/25	11/26
Time Collected:	9.45 AM	11:00AM	11:45 AM	2:00 PM	4:00PM	1015AM
Method of Collection:	ASTM 1587	ASTM 1587	ASTM 1587	ASTM 1587	ASTM 1587	ASTM 1587
Location:	STN 3+00	STN 3+00	STN 3+00	STN 0+00	STN 46+20	STN 2+98
Depth:	10'-12'	15'-17'	20'-22'	10'-12'	16'-18'	20'-22'
Sample Type:	SHELBY TUBE	SHELBY TUBE	SHELBY TUBE	SHELBY TUBE	SHELBY TUBE	SHELBY TUBE
No. of Containers:	1	1	1	1	1	1
Comments: RECOVERY	23½"	22½"	11"	21"	20"	13"
SAMPLES COLLECTED						
BY BUFFALO DRILLING						
Shipment Method:						
Shipped To:						
Sampler(s) Name:						
Sampler(s) Signature:						
Date & Time:						
Relinquished by (name):						
Relinquished by (signature):						
Relinquished on (date & time):						
Received by (name):						
Received by (signature):						
Received on (date & time):						
Comments:						

Sample Identification Record
Hydraulic Conductivity of in-situ Slurry Wall
102nd Street Landfill
Niagara Falls, New York

Date record prepared:	11/22/96					
Name of Company:	GEO-CON					
Project #:	D60025					
Sample ID #:	SW-5	SW-6A	SW-6B	SW-6C	SW-7	
Date Collected:	11/22/96	11/22/96	11/22/96	11/22/96	11/22/96	
Time Collected:	8:30	11:00AM	12:45PM	2:00PM	4:20 pm	
Method of Collection:	ASTM D1587	ASTM D1587	ASTM D1587	ASTM D1587	ASTM D1587	
Location:	STN 30+90	STN 4200	STN 4200	STN 4200	STN 2+80	
Depth:	10'-12'	14'-16'	20'-22'	28'-30'	10'	
Sample Type:	SHELBY TUBE	SHELBY TUBE	SHELBY TUBE	SHELBY TUBE	SHELBY TUBE	
No. of Containers:	1	1	1	1	1	
Comments: RECOVERY	23"	24"	26 1/2"	26"	24 1/2"	
SAMPLES COLLECTED		NOT SENT TO LAB	NOT SENT TO			
BY BUFFALO DRILLING			LAB			
Shipment Method:	G2A PICKUP TRUCK					
Shipped To:	G2A					
Sampler(s) Name:	KEITH MENZIE					
Sampler(s) Signature:						
Date & Time:	11-22-96					
Relinquished by (name):	KEITH MENZIE	SCOTT LAWRENCE				
Relinquished by (signature):						
Relinquished on (date & time):	11-25-96 9:30	11-25-96 11:20				
Received by (name):		R.A. Rudenbach				
Received by (signature):		R.A. Rudenbach				
Received on (date & time):	11-25-96 9:30	11-25-96 11:28 AM				
Comments:						
TEST METHOD	ASTM D5084					
	FAX RESULTS	TO 817-382-0859				
		ATTN: AIMAN				

Sample Identification Record
Hydraulic Conductivity of in-situ Slurry Wall
102nd Street Landfill
Niagara Falls, New York

Date record prepared:	11-20-96					
Name of Company:	Geo-Con					
Project #:	PH0025					
Sample ID #:	SW1					
Date Collected:	11-20-96					
Time Collected:	2:50 pm					
Method of Collection:	ASTM D1587					
Location:	22+40					
Depth:	7'-9'					
Sample Type:	Shelby tube					
No. of Containers:	1					
Comments: Recovery	20.5"					
Samples collected						
by Buffalo Drilling						
Shipment Method:	GZA pickup					
Shipped To:	GZA					
Sampler(s) Name:	Keith McKenzie					
Sampler(s) Signature:						
Date & Time:	11-20 - 2:50 PM					
Relinquished by (name):	GZA Keith McKenzie					
Relinquished by (signature):						
Relinquished on (date & time):	11-22 - 8:00 AM					
Received by (name):	Tom SEDER (GZA)					
Received by (signature):						
Received on (date & time):	11/22/96 0800					
Comments:						
TEST METHOD	ASTM D5084					
	FAX RESULTS	TO: 817-382-0859				
		ATTN: AIMAN				

WITNESS: Scott Sanders - (F-1002)
11-22-96

Sample Identification Record
Hydraulic Conductivity of in-situ Slurry Wall
102nd Street Landfill
Niagara Falls, New York

Date record prepared:	11-21-96					
Name of Company:	GeoCon					
Project #:	060025					
Sample ID #:	SW2A	SW2B	SW2C	SW3	SW4	
Date Collected:	11-21-96	11-21-96	11-21-96	11-21-96	11-21-96	
Time Collected:	9:20 AM	9:40 AM	10:05 AM	12:00 PM	3:02 PM	
Method of Collection:	ASTM D1587	ASTM D1587	ASTM D1587	ASTM D1587	ASTM D1587	
Location:	8+50	8+50	8+50	5+90	26+00	
Depth:	2'-4'	4'-6'	6'-8'	18'-20'	23'-25'	
Sample Type:	Shelby tube	Shelby tube	Shelby tube	Shelby tube	Shelby tube	
No. of Containers:	1	1	1	1	1	
Comments: Recovery	21"	23.5"	24"	15"	26.5"	
Samples collected	SW2A		SW2C			
by Buffalo Drilling	NOT SENT TO LAB		NOT SENT TO LAB			
Shipment Method:	GZA PICK UP					
Shipped To:	GZA					
Sampler(s) Name:	KEITH MCNZIC					
Sampler(s) Signature:						
Date & Time:	11-21 930 AM TO 3PM					
Relinquished by (name):	KEITH MCNZIC					
Relinquished by (signature):						
Relinquished on (date & time):	11 22 96 8:00 AM					
Received by (name):	TOM SEIDER (GZA)					
Received by (signature):						
Received on (date & time):	11/22/96 0800					
Comments: Test method	ASTM D5084					
	FAX results to	817-382-0859				
	ATTN:	AIMAN				

Witness: Scott Lawson (FHWA)
11-22-96

Sample Identification Record
Hydraulic Conductivity of in-situ Slurry Wall
102nd Street Landfill
Niagara Falls, New York

Date record prepared:	11-21-96					
Name of Company:	GeoCon					
Project #:	060025					
Sample ID #:	SW2A	SW2B	SW2C	SW3	SW4	
Date Collected:	11-21-96	11-21-96	11-21-96	11-21-96	11-21-96	
Time Collected:	9:20 AM	9:40 AM	10:05 AM	12:00 PM	3:02 PM	
Method of Collection:	ASTM D1587	ASTM D1587	ASTM D1587	ASTM D1587	ASTM D1587	
Location:	8+50	8+50	8+50	5+90	26+00	
Depth:	2'-4'	4'-6'	6'-8'	18'-20'	23'-25'	
Sample Type:	Shelby tube	Shelby tube	Shelby tube	Shelby tube	Shelby tube	
No. of Containers:	1	1	1	1	1	
Comments: Recovery	21"	23.5"	24"	15"	26.5"	
Samples collected	SW2A		SW2C			
by Buffalo Drilling	NOT SENT TO LAB		NOT SENT TO LAB			
Shipment Method:	GZA PICK UP					
Shipped To:	GZA					
Sampler(s) Name:	KEITH MCNZIE					
Sampler(s) Signature:						
Date & Time:	11-21 930 AM TO 3PM					
Relinquished by (name):	KEITH MCNZIE					
Relinquished by (signature):						
Relinquished on (date & time):	11 22 96 8:00 AM					
Received by (name):	TOM SEIDER (GZA)					
Received by (signature):						
Received on (date & time):	11/22/96 0830					
Comments: Test method	ASTM D5084					
	FAX results to	817-382-0859				
	ATTN:	AIMAN				

Witness: Scott Fowler (Floor)
11-22-96

APPENDIX K

SLURRY WALL BENTONITE ANALYSIS

DRILLING FLUIDS
). Box 832 · Greybull, Wyoming 82426
07· 195

LABORATORY ANALYSIS

Date Tested 9-6-96

SOLD TO	SHIP TO
Geo-Con Monroeville, PA	M-I Drilling Fluids c/o Transload Spec. Berwyn IL Futherence to Oxychem Niagara Falls N.Y.

SHIPPED	TRANSPORTATION COMPANY OR TRUCK NUMBER	PLANT LOCATION	TYPE OF MATERIAL
7-6-96	BN 321214	Greybull, Wyo.	

NOTE: Our data for the above shipment shows the following test results:

LABORATORY TEST RESULTS		LABORATORY TEST RESULTS
Vis. - 50	7	moist 8.0
Pl. Vis. - 15	8	
Y.P. - 20	9	
>75 micron. - 2.0	10	
[illegible] Vol 13.2	11	
[illegible] PV ratio 1:33	12	

Should you have any questions or require additional information please let us know (1-307-765-4496)

Leonard K. Smith 9-9-96

SIGNED DATE

ed By: S.B. labanal.doc (7/95)

GP-75

M-I DRILLING FLUIDS

3. 1332 · Greybull, Wyoming 82426
10. 4498

LABORATORY ANALYSIS

Date Tested 9-9-96

SOLD TO:	SHIP TO:
Geo-Con Monroeville PA	M-I Drilling Fluids c/o Transload Spec. Berwyn IL Futherance to Oxychem Niagara Falls N.Y.

SHIP DATE	RAILCAR OR TRUCK NUMBER	PLANT OF ORIGIN	TYPE OF MATERIAL
9-9-96	BN 319593	Greybull, Wyo.	M-I Gel 4000 # (FedSel90) B.B.

NOTE: Our data for the above shipment shows the following test results:

LABORATORY TEST RESULTS	LABORATORY TEST RESULTS
Vis. - 52	7 Moist 7.3
Pl. Vis. - 16	8
Y.P. - 20	9
>75 micron - 2.6	10
Filt Vol 13.0	11
Yr/PV ratio 1.25	12

Should you have any questions or require additional information please let us know (1-307-765-4498)

Leonard K. Smith 9-10-96
SIGNED DATE

Reviewed By: B.B.

labanal.doc (7/95)

M-I DRILLING FLUIDS
. Box 532 · Greybull, Wyoming 82426
77- 196

LABORATORY ANALYSIS

Date Tested 9-11-96

SHIP TO	
Geo-Con Monroeville, PA	M-I Drilling Fluids c/o Transload Spec. Berwyn IL Futherance to Oxychem Niagara Falls N.Y.

DATE SHIPPED	LABORATORY TRUCK NUMBER	SHIPPED FROM	MUD TYPE OR MATERIAL
9-11-96	BN 321412	Greybull, Wyo.	M-I Gel 4000 # B.B. Fed Ex 96'

NOTE: Our data for the above shipment shows the following test results:

LABORATORY TEST RESULTS		LABORATORY TEST RESULTS
Vis. - 49	7	moist 7.5
Pl. Vis. - 15	8	
Y.P. - 19	9	
>75 micron. - 1.9	10	
Filt. Vol 12.3	11	
PV ratio 1.27	12	

Should you have any questions or require additional information please let us know (1-307-765-4498)

Leonard L. Smith 9-12-96
SIGNED DATE

ed By: B.B.

labanal.doc (7/95)

GP-75

M-I DRILLING FLUIDS

. B) · Greybull, Wyoming 82426
)7-765-4496

LABORATORY ANALYSIS

Date Tested 9-12-96

Geo-Con Monroeville, PA	M-I Drilling Fluids c/o Transload & Spec. Berwyn IL Futherence to Oxychem Niagara Falls N.Y.

SHIP DATE	BILL OF LADING OR TRUCK NUMBER	POINT OF ORIGIN	TYPE OF MATERIAL
9-12-96	BL 32106.3	Greybull, Wyo.	M-I Gel 4000# (Fed Jet 90)

NOTE: Our data for the above shipment shows the following test results:

LABORATORY TEST RESULTS		LABORATORY TEST RESULTS
Vis. - 40	7	Moist 9.0
Pl. Vis. - 15	8	
Y.P. - 10	9	
>75 micron. - 2.2	10	
F.L. Vol 8.6	11	
YP/PV ratio .67	12	

Should you have any questions or require additional information please let us know (1-307-765-4496)

Leonard K Smith 9-13-96
SIGNED DATE

ved By: B.B.

labanal.doc (7/95)

M-I DRILLING FLUIDS
P. Box 832 · Greybull, Wyoming 82426
765-4496

LABORATORY ANALYSIS

Date Tested 9-25-96

SOLD TO:	SHIP TO:
Geo-Con Monroeville, PA	M-I Drilling Fluids c/o Transload Spec. Berwyn IL Futherence to Oxychem Niagara Fq N.Y.

SHIP DATE	RAILCAR OR TRUCK NUMBER	PLANT OF ORIGIN	TYPE OF MATERIAL
10-30-96	Arrow/DAE 62	Greybull, Wyo.	M-I Gel 4000# (Fed Jel '96').

NOTE: Our data for the above shipment shows the following test results:

LABORATORY TEST RESULTS	LABORATORY TEST RESULTS
1 Vis. - 54	7 Moist 7.29o
2 Pl. Vis. - 22	8
3 Y.P. - 10	9
4 >75 micron. - 2.0	10
Filt. Vol 12.8	11
P/PV ratio .45	12

Should you have any questions or require additional information please let us know (1-307-765-4496)

Leonard K. Smith 10-30-96
SIGNED DATE

Approved By: B.B.

labanal.doc (7/96)

M-I DRILLING FLUIDS
P. Box 832 · Greybull, Wyoming 82426
765-4496

LABORATORY ANALYSIS

Date Tested 10-10-96

SOLD TO:	SHIP TO:
Geo-Con Monroeville, PA	M-I Drilling Fluids c/o Transload Spec. Berwyn IL Futherence to Oxychem Niagara Fq N.Y.

SHIP DATE	RAILCAR OR TRUCK NUMBER	PLANT OF ORIGIN	TYPE OF MATERIAL
10-29-96	Quality 35	Greybull, Wyo.	FED JEL 90 M-I GEL 4000 #

NOTE: Our data for the above shipment shows the following test results:

LABORATORY TEST RESULTS	LABORATORY TEST RESULTS
1 Vis. - 54	7 Moist - 7.4
2 Pl. Vis. - 18	8
3 Y.P. - 18	9
4 >75 micron. - 2.5 Filt. Vol - 13.2 P/PV ratio - 1.00	10 11 12

Should you have any questions or require additional information please let us know (1-307-765-4496)

Jesse Cheatham 10-29-96
SIGNED DATE

Approved By: B.B.

labanal.doc (7/95)

DRILLING FLUIDS
Box 832 · Greybull, Wyoming 82426
765-4496

LABORATORY ANALYSIS

Date Tested 10-21-96

SOLD TO:	SHIP TO:
Geo-Con Monroeville, PA	M-I Drilling Fluids c/o Transload Spec. Berwyn IL Futherance to Oxychem Niagara Falls N.Y.

SHIP DATE	RAILCAR OR TRUCK NUMBER	PLANT OF ORIGIN	TYPE OF MATERIAL
10-28-96	Quality 17	Greybull, Wyo.	FEO, JEL 90 M-I GEL 4000 #

NOTE: Our data for the above shipment shows the following test results:

LABORATORY TEST RESULTS	LABORATORY TEST RESULTS
1 Vis. - 55	7 moist 7.2
2 Pl. Vis. - 21	8
3 Y.P. - 15	9
4 >75 micron. - 2.3	10
Filt. Vol 12.7	11
YP/PV ratio .71	12

Should you have any questions or require additional information please let us know (1-307-765-4496)

Jesse Cheatham 10-28-96
SIGNED DATE

Approved By: B.B.

labanal.doc (7/95)

M-I DRILLING FLUIDS
P. Box 832 · Greybull, Wyoming 82426
·765-4496

LABORATORY ANALYSIS

Date Tested 10-18-96

SOLD TO:	SHIP TO:
Geo-Con Monroeville, PA	M-I Drilling Fluids c/o Transload Spec. Berwyn IL Futherence to Oxychem Niagara Fa. N.Y.

SHIP DATE	RAIL CAR OR TRUCK NUMBER	PLANT OF ORIGIN	TYPE OF MATERIAL
10-29-96	Quality 31	Greybull, Wyo.	M-I Gel 4000 #/B

NOTE: Our data for the above shipment shows the following test results: Fed Jet 90'.

LABORATORY TEST RESULTS	LABORATORY TEST RESULTS
1 Vis. - 50	7 Moist 7.1 %
2 Pl. Vis. - 16	8
3 Y.P. - 8	9
4 >75 micron. - 2.9	10
Filt. Vol 13.4	11
P/PV ratio .50	12

Should you have any questions or require additional information please let us know (1-307-765-4496)

Leonard A. Smith 10-29-96
SIGNED DATE

Approved By: B.B.

labanal.doc (7/95)

APPENDIX L

SLURRY WALL REPAIR INFORMATION

Geo-Con

A Woodward-Clyde Company

November 26, 1996

D6-0025

Smith Environmental Technologies
102nd Street Landfill
9829 Buffalo Avenue
Niagara Falls, NY 14304

ATTENTION: Mr. Pete Porter / Murthy Jogimahanti
FAX: (716)283-2566

Subject: Soil-Bentonite Slurry Cutoff Wall Construction
102nd Street Landfill
Niagara Falls, NY

Gentlemen:

Following our telephone discussion this morning it is my understanding that native soils were encountered during the Shelby tube sampling of the slurry cutoff wall installed at the subject site, at approximately 20 feet deep.

It is our belief that some deviation may exist between the top and bottom of the slurry cutoff wall's alignment at this location. This normally occurs if the work platform for the slurry wall is not perfectly level during the excavation process.

As discussed, Geo-Con's drillers will be directed to deviate the drill stem to match the deviation of the cutoff wall, thus enabling us to obtain samples beyond the 20 foot depth.

Should you have any questions or need any additional information, please contact the undersigned at (817)383-1400.

Sincerely,

GEO-CON, INC.

Aiman Naguib
Office Manager

1720 Westminster • Denton, Texas 76205 • Tel (817) 383-1400

Pittsburgh (Headquarters) (412) 856-7700
California Office (415) 887-2002
Florida Office (813) 647-5888
New Jersey Office (609) 848-2220

FLUOR DANIEL

Fluor Daniel, Inc.
301 Lippincott Centre
P. O. Box 950
Marlton, NJ 08053
(609) 985-6500

December 5, 1996

Mr. James Thornton, P.E
Glenn Springs Holdings, Inc.
Occidental Chemical Corporation
1795 Baseline Road
Grand Island, NY 14072

Mr. Jack Serfass
Olin Corporation
1186 Lower River Road
Charleston, TN 37310

Re: 102nd Street Landfill - Niagara Falls, NY - Slurry Wall

Dear Mr. Thornton and Mr. Serfass:

Geo-Con's drilling subcontractor located a soil pocket within the slurry wall during the sampling program at Station 3+00. Fluor Daniel, Inc. requests a report from Geo-Con and/or Smith Environmental detailing how the extents of the soil pocket were determined. In addition to that report, Fluor Daniel, Inc. requests a plan and schedule from Geo-Con and/or Smith Environmental describing the activities involved with the excavation and replacement of that portion of the slurry wall.

If you have any questions or comments, please do not hesitate to contact me.

Very truly yours,

Clifford M. Mars, P.E.
Project Manager

cc: Gary Katlin - Oxy/Olin
Dave Cummings - Olin
Lorraine Miller - Olin
Pete Porter - Smith
Aiman Naguib - Geo-Con
Tom Robinson - EPA\DEC

FLUOR DANIEL GTI

To: Pete Porter, Smith

From: Scott Lawrence SL

Date: 12/3/96

Due to the problems encountered around Sta 3+00 of the Slurry Wall, these Additional Samples will be required:

STA	DEPTH	Type of Sample
2+50	18'	30" split spoon
5+85	17'	Shelby tube (Sent to lab)
9+80	6'	30" split spoon
23+40	6'	" "
27+90	23'	" "
38 +~~5~~00	24'	" "
39 + 45	24'	" "

cc: Gary Catlin / Bob Hout, Oxy/OLIN
Keith Menzie, Geo Con

60 Earhart Drive, #14 / Buffalo, NY 14221 USA (716) 634-1291 FAX (716) 634-6881

TO: SCOTT LAWRENCE 1 PAGE

ADDITIONAL SAMPLES AT THE FOLLOWING LOCATIONS

Depth to Dig			DEPTH	
17'	(1)	5+85	16.20 Ft	RECOVERY 20 IN. MIN. SHELBY TUBE
6'	(2)	9+80	TOP OF KEY + 2.0 Ft	" 30" SPLIT SPOON
18'	(3)	2+50	TOP OF KEY + 2.0 Ft	" 30" SPLIT SPOON
6'	(4)	23+40	"	" " "
23'	(5)	27+90	"	" " "
24'	(6)	39+45	"	" " "
24'	(7)	38+00	"	" " "

- SAMPLE AT 5+85 WILL HAVE A PERM. TEST
- SCOTT,

WHEN SPLIT SPOON SAMPLES ARE REMOVED. CUT THEM IN HALF AND PHOTOGRAPH. IT IS IMPORTANT TO CUT THEM IN HALF. SAVE THE SAMPLE. 20 IN RECOVERY IS IMPORTANT ALSO PLEASE DOCUMENT EVERYTHING

December 20, 1996 D6-0025

Smith Environmental Technologies Corp.
9829 Buffalo Avenue
Niagara Falls, NY 14304

ATTENTION: Mr. Pete Porter
FAX: (716) 283-2566

Subject: Soil-Bentonite Slurry Cutoff Wall Repair
102nd Street Landfill
Niagara Falls, NY

Dear Mr. Porter:

As you are aware, Geo-Con was required under its subcontract agreement with Smith to extract one Shelby tube sample per 500 lineal feet of completed soil-bentonite slurry cutoff wall at a depth to be selected by Smith, OxyChem/Olin, and EPA/NYDEC. Such samples are to be checked for Hydraulic conductivity as called for within the project specifications

During this conformatory drilling process, Geo-Con was directed to extract a soil-bentonite Shelby tube sample at Station 3+00. As drilling proceeded, soil-bentonite backfill was encountered up to a depth of 20 feet. However, grey, silty sand was encountered beyond the 20 foot depth. The exact thickness of this silty sand layer is not exactly known. It should be noted, however, that in the process of extracting the material within the Shelby tube at Woodward-Clyde's laboratory a 6-inch layer of this silty sand was observed.

Upon observing this problem, Geo-Con directed its drilling subcontractor to drill two additional bore holes at stations 3+15 and 2+85 in order to determine and isolate the portion of the cutoff wall where the silty sand material exists. Silty sand was not encountered in either hole, indicating the existence of sound soil-bentonite backfill material. It should also be noted that six additional split spoon samples and a Shelby tube sample were extracted in addition to the 10 Shelby tube samples previously extracted for hydraulic conductivity testing (i.e., one per 500 lineal feet of wall) to further ensure the existence of sound soil-bentonite backfill within the cutoff wall. The additional samples were collected as directed by Smith, OxyChem/Olin, and EPA/NYDEC the following locations:

1720 Westminster • Denton, Texas 76205 • Tel (817) 383-1400

Pittsburgh (Headquarters) (412) 856-7700
California Office (415) 887-2002
Florida Office (813) 647-5388
New Jersey Office (609) 845-2220

Geo-Con

Station	Depth	Type of Sample
2+50	18 ft.	30-inch split spoon
5+85	17 ft.	Shelby tube
9+80	6 ft.	30-inch split spoon
23+40	6 ft.	30-inch split spoon
27+90	23 ft.	30-inch split spoon
38+00	24 ft.	30-inch split spoon
39 +45	24 ft.	30-inch split spoon

Sound backfill material was again observed at all the locations indicated above.

In order to remedy the problem encountered at station 3+00, Geo-Con proposes the following:

1. Placement of two "end-stop" tubes such as steel casings or metal culverts vertically within the trench at stations 2+85 and 3+15. The "end-stop" tubes will have diameters slightly smaller than the trench width in order to avoid any trench side wall disturbances. Such tubes will be driven through the existing soil-bentonite backfill utilizing the Hydraulic excavator's bucket If driving the "end-stop" tubes proves to be difficult, such tubes will be pushed and lowered gradually through the existing cutoff trench's backfill as excavation between station 2+85 and 3+15 progresses. The bottom of the "end-stop" tubes will be anchored approximately 3 to 6 inches into the underlying clay/till.

2. The existing slurry cutoff wall between stations 2+85 and 3+15 will be re-excavated to design depth and will key a minimum of 3.0 feet into the underlying clay/till. Clay key verification shall be done in accordance with Geo-Con's previously submitted and approved Quality Control plan, dated July 23, 1996.

3. As excavation proceeds, bentonite slurry shall be prepared by blending water from the Niagara River with bentonite and shall be pumped into the trench to support the excavation. A two cubic yard mobile slurry mixer shall be placed adjacent to the trench for mixing and preparing bentonite slurry. Two 100 pound bentonite bags per two cubic yards of water will be blended to produce 6% bentonite slurry. Slurry quality shall be checked and maintained as per our previously referenced quality control plan.

4. A 30 cubic yard dumpster shall be placed adjacent to the trench and used for blending "clean" clay, dry bentonite and bentonite slurry to re-backfill the trench. Backfill slump shall be maintained between 3 and 6 inches prior to placement within the trench. (See attached calculations for amount of dry bentonite addition needed to clay by weight.)

Geo-Con

5. Upon excavation completion, the Hydraulic excavator will blend the soil-bentonite mixture within the dumpster and will then place such backfill in the trench. The backfill shall be lowered through the slurry to the trench bottom utilizing the hydraulic excavator's bucket.

6. Upon backfill completion, the two "end-stop" tubes will be retrieved from the trench and the hydraulic excavator will in-situ re-mix the soil-bentonite backfill at the two "end-stop" locations. * Smaller bucket

7. Previously excavated soil-bentonite backfill will be disposed of on-site at a location designated by Smith, OxyChem/Olin, and EPA/NYDEC.

8. Upon backfill completion, two in-situ soil-bentonite backfill samples will be retrieved at locations and depths to be selected by Smith, OxyChem/Olin, and EPA/NYDEC Sampling will be done utilizing the device described within the enclosed literature. Such samples will be visually examined and sent off-site for hydraulic conductivity testing. If the sampling method discussed is not acceptable to Smith, OxyChem/Olin, and EPA/NYDEC (based on field observations), an alternate method will be discussed at such time. It should be noted that this method has been utilized on many Geo-Con projects to successfully extract soil-bentonite samples for Hydraulic Conductivity testing. Shelby tubes

Geo-Con believes that the repair steps outlined above will provide Smith, OxyChem/Olin, and EPA/NYDEC with a cutoff wall fully meeting the project specifications while reducing any potential risk of side wall "cavings." This is due to the fact that only 30 feet of cutoff wall will be excavated and replaced within a very short duration.

Geo-Con is currently hoping to remobilize on-site and perform this repair starting the week of December 30, 1996 or January 6, 1997 as weather permits. This, of course, will be subject to Smith, OxyChem/Olin, and EPA/NYDEC's approval of our plan.

Should you have any questions or need any additional information, please contact the undersigned at (817)383-1400.

Sincerely,

GEO-CON, INC.

Aiman Naguib

Aiman Naguib
Office Manager

(word)g:\wp51\general\an\sm12-13.doc

WOODWARD-CLYDE CONSULTANTS

Majed Khoury

Majed Khoury, P.E.
Vice President

Geo-Con

Slurry Cutoff Wall Sampling

Geo-Con shall also obtain soil-bentonite samples at locations and depths selected by Smith and the owners utilizing the device shown in Figure 1 (or equivalent). The sampling device shall consist of an outer and an inner tube. The inner tube shall be connected to a 175 cfm air compressor or a power pack for hydraulic shutting and opening. The outer tube shall be suspended by a backhoe and inserted through the soil-bentonite mixture. Upon reaching the desired depth of sampling, the inner tube shall be hydraulically released, filling the bucket with soil-bentonite mixture. The inner tube shall then be closed-off and the entire device retrieved back to the surface.

Soil-bentonite samples will be stored in air-tight containers, labeled for stationing and sampled depth and sent to Woodward-Clyde's laboratory for hydraulic conductivity testing.

Geo-Con

Soil-Bentonite Slurry Wall Backfill Mix and Bentonite Addition Calculations:

Assumption:

- 0.5% bentonite is to be added through bentonite slurry.
- 2.5% is to be added through dry addition.
- Average unit weight of clay backfill = 110.80 pounds per cubic foot.

Calculations:

Theoretical trench volume to be repaired

$$= \frac{3' \times 23.5' \text{ (max)} \times 30'}{27} = 78.33 \text{ cy}$$

Amount of dry bentonite to be added $= 78.33 \times 110.8 \times 27 \times \frac{2.5}{100}$

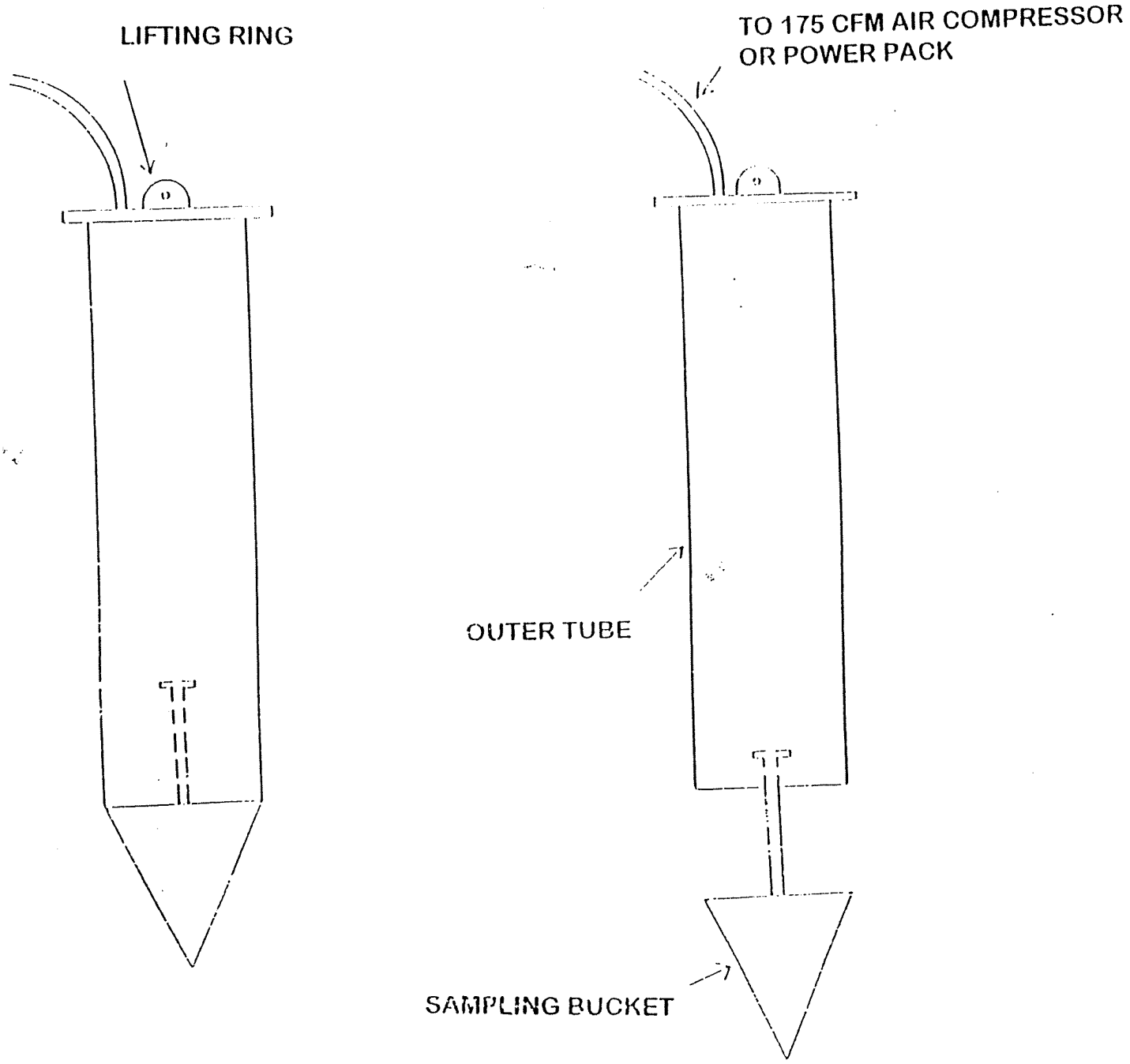
$= 5858.30$ pounds

$= 2.93$ Tons

Therefore, use two 4000 pounds bulk bentonite bags for 30 feet of trench.

Geo-Con

ATTACHMENTS



SLURRY WALL SAMPLING TOOL
FIGURE 1

Geo-Con

A Woodward-Clyde Company

May 30, 1997 D6-0025

Smith Environmental Technologies, Inc.
9829 Buffalo Avenue
Niagara Falls, NY 14304

ATTENTION: Mr. Pete Porter
FAX: (716) 283-2566

Subject: Bentonite Certification
102nd Street Landfill
Niagara Falls, NY

Dear Mr. Porter:

Enclosed please find bentonite certification for the 100 pound bags of bentonite.

Should you have any questions or need any additional information, please contact the undersigned at (817)383-1400.

Sincerely,

GEO-CON, INC.

Aiman Naguib
Office Manager

LABORATORY ANALYSIS/ CERTIFICATION

P.O. Box 832 Greybull, Wyoming 02426
307-765-4496

Date Tested: 4/2/97

SOLD TO:	SHIP TO:
GeoCon Inc. Monroeville, PA	Geo-Con Inc. Niagara Falls, NY

SHIP DATE	RAILCAR OR TRUCK NUMBER	PLANT OF ORIGIN	PRODUCT
4/03/97	A.T.S. #14032	Greybull	M-I Gel / Federal Jel 90

Note: Our data for the above shipment shows the following test results:

Test or Property		API Spec.	Result
Viscosity		30 min.	32
Plastic Viscosity	(cP)	N/A.	12
Yield Point	(#/100ft²)	N/A	10
Filtrate Volume	(cm^3)	15.0 max.	13.8
>75 micron	(wt. %)	4.0 max.	2.4

Test or Property		API Spec.	Result
Moisture	(wt %)	10.0 max.	9.1
Y.P. / P.V. Ratio		3.0 max.	.83

This certifies that the product shipped to the location as stated above meets the requirements of A.P.I. Section 13-A; Section 4 for "Drilling Grade Bentonite".

Signed 5-29-97
Date

70 sx
Sales Order # HC1V000124
Invoice # 2003075

S. Lawrence

Geo-Con

A Woodward-Clyde Company

June 10, 1997

D6-0025

Smith Environmental Technologies, Inc.
9829 Buffalo Avenue
Niagara Falls, NY 14304

ATTENTION: Mr. Pete Porter
FAX: (716) 283-2566

Subject: Final Submittals
102nd Street Landfill
Niagara Falls, NY

Dear Mr. Porter:

Enclosed please find the following for your review:

1. The slurry wall's permeability test results for the repaired section between Stations 2 + 85 and 3 + 00.

2. Atterberg Limits, moisture content, and grain size analysis of the imported clay used for trench backfilling.

3. Quality Control Daily Reports for the repaired slurry wall section.

This package should conclude all submittals needed on the subject project.

Should you have any questions or require additional information, please contact me at (940)383-1400.

Sincerely,

GEO-CON, INC.

Aiman Naguib

Aiman Naguib
Office Manager

General\AN\sm6-10.doc

PROJECT: GEO-CON - NIAGARA FALLS

PROJECT No.: 6EO2155

SUMMARY OF LABORATORY TEST RESULTS

BORING and SAMPLE NUMBER	DEPTH (feet)	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCONFINED COMPRESSION		UNIT DRY WEIGHT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		COMPACTION	CONSOL.	TRIAXIAL		Permeability (cm/sec)
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (ksf)	STRAIN (%)			SIEVE	HYD			U.U.	CIU	
2+85				49.6					71.5								3.0E-08
3+00				70.3					57.2								2.6E-08

SPECIAL TEST KEY:

* See Test Curves

SENT BY:MOUNTAIRD-CLYDE ; 6-10-97 ;11:48AM ; BLUE BELL PA→ 8173820859;# 2/ 2

DAILY FIELD SUMMARY

Project 102nd Street Landfill Remediation
Location Niagara Falls, New York
Owner Oxy/Olin Contractor GEOCON, INC.
Weather Conditions SUNNY 43°-55°F

Date 5/22/97
File No. 5512J

REPORT

07:45 - GZA ARRIVED ON SITE AND SET UP SLURRY WALL TESTING EQUIPMENT.

- CONTRACTOR EXCAVATED THE SLURRY WALL FOR REMEDIATION FROM STA 2+85 TO 3+15 TO A DEPTH OF APPROXIMATELY 23 FEET (SEE ATTACHED SITE SKETCH)

- GZA COLLECTED BAG SAMPLE 05227-1 OF SUMMIT PARK CLAY GUMBO FOR LAB TESTING.

- GZA PERFORMED MARSH FUNNEL, MUD BALANCE, FILTRATE LOSS AND SLUMP CONE TESTS AS PRESCRIBED BY GEOCON. (SEE ATTACHED DATA SHEET). TESTS WERE DONE ON BENTONITE SLURRY AT BATCH PLANT, IN TRENCH, AND SOIL BENTONITE BACKFILL.

- MATERIALS USED TO MAKE THE SLURRY WALL ARE FEDERAL GEL 90 BENTONITE, NIAGARA RIVER WATER AND SUMMIT PARK CLAY GUMBO.

20:30 - GZA LEFT SITE

21:00 - GZA ARRIVED AT OFFICE TO DELIVER SAMPLES

21:30 - GZA LEFT OFFICE

REVIEWED BY:
JOHN J. DANIEL, P.E.

NOTE: SEE DAILY ACCOUNTING SUMMARY FOR PROJECT TIME

GZA GeoEnvironmental of New York
Engineers and Scientists

DANIEL E. WULF
PREPARED BY

GEO·CON INC.

GEO-CON, INC.
Geotechnical Contracting
"Experience and Expertise"

Soil-Bentonite
Slurry Trench
Quality Control

DATE 5/22/97 JOB NAME 102nd STREET LANDFILL JOB NUMBER 5542Y

STATION	DEPTH	KEY	COMMENTS
2+80	25'	3' MIN	AFTER DNB BATCH - 20.0'
2+90	25'	3' MIN	" " " - 20.0'
3+00	25'	3' MIN	" " " - 17.0'
3+10	24.8'	3' MIN	" " " - 18.7'
3+15	24.3'	3' MIN	" " " - 21.0'
			L.F. Today = 35
			S.F. Today = 70
			S.F. To Date = —
			Amt of Bentonite Backfill Used Today =
			% of Bentonite in Soft Backfill = 6

BENTONITE SLURRY PLANT

TIME	pH	UNIT WEIGHT	FILTRATE	VISC	TEMP	COMMENTS
1120	-	65pcf	11.8 cc / 30 MIN	46sec	-	
1430	-	65pcf	-	1 MIN 22sec	-	
1620	-	65pcf	-	1 MIN 0sec	-	
1715	-	64 Pcf	-	58sec	-	Amt of Bentonite Mixed =

BENTONITE SLURRY TRENCH

TIME	STATION DEPTH	~~FIELD~~ pH	UNIT WEIGHT	VISC	TEMP	~~AIR~~ MONITERING FILTRATE	COMMENTS
1530	2+80 to 3+15 10'	—	65 PCF	1 MIN 5sec	—	11.3 cc/30 MIN	
1740	" " 25'	—	68 PCF	1 MIN 14sec	—	—	
	" "	—			—	—	
	" "	—			—	—	

BACKFILL

TIME	STATION	UNIT WEIGHT	SLUMP	PI	WC	-200	COMMENTS
1945	2+80 To 3+15	101 PCF	4"	—	—	—	1ST BATCH IN TRENCH
	"						
	"						
	"						

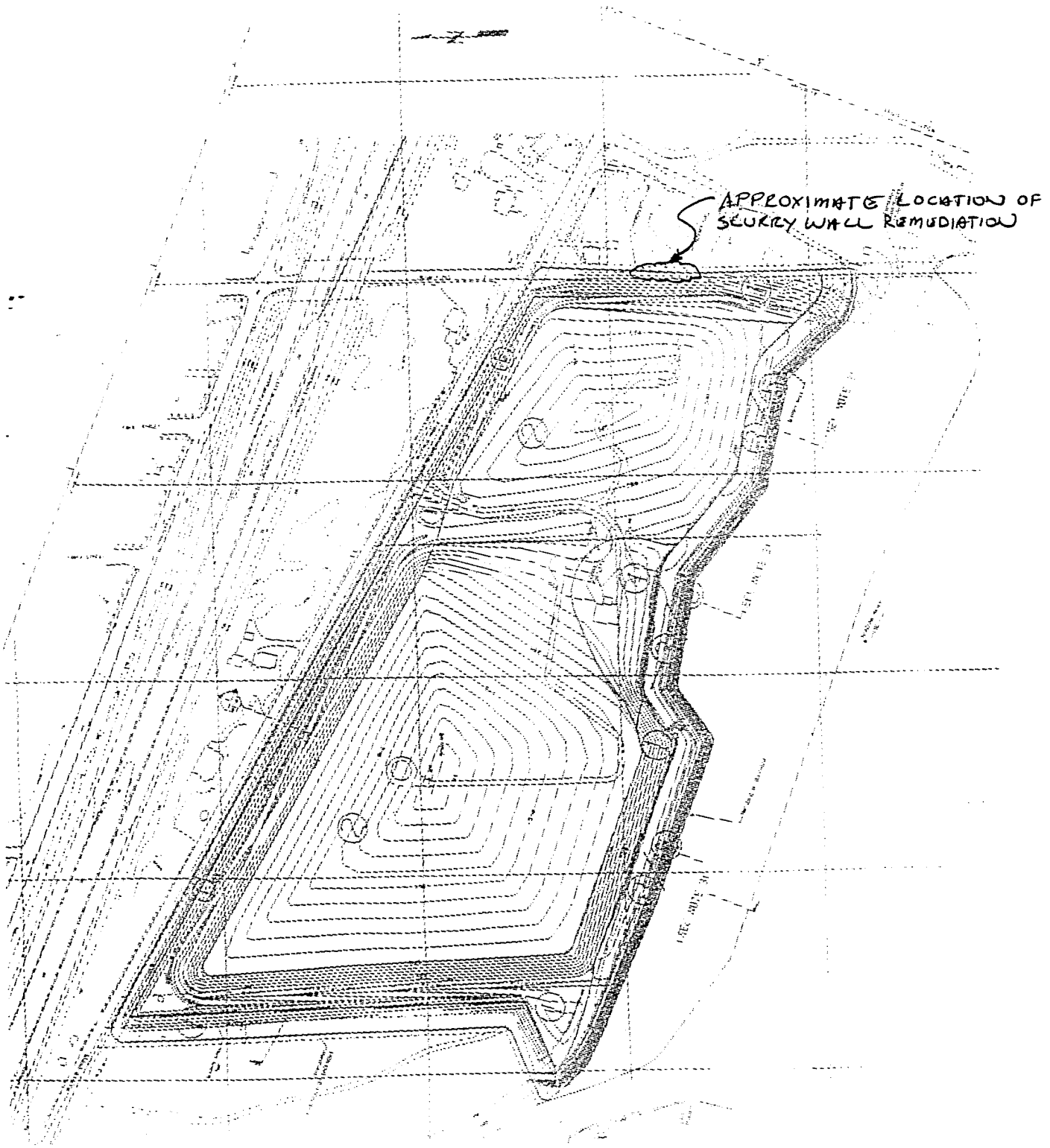
GEO-CON, INC. _____ OWNER _____

DAILY FIELD SUMMARY

Project 102nd Street Landfill Remediation
Location Niagara Falls, New York
Owner Oxy/Olin Contractor Geocon, INC.

Date 5/22/97
File No. 55121

FIELD SKETCH



APPROXIMATE SCALE: 1" = 300'

GZA GeoEnvironmental of New York
Engineers and Scientists

DANIEL E. WULF
PREPARED BY

GZA GEOENVIRONMENTAL OF NEW YORK
DAILY ACCOUNTING SUMMARY

PROJECT: OxyChem/Olin-102nd Street Landfill Remediation
CLIENT: ~~Smith Environmental Technologies Corp~~. GEOCON, INC.
GZA Project No.: 55121

DATE: 5/22/97

GZA REPRESENTATIVE: DANIEL E. WULF

SUMMARY OF PROJECT
ACTIVITIES/REMARKS: OBSERVED EXCAVATION OF SLURRY WALL TO MAKE A REPAIR AND PERFORMED TESTS ON BENTONITE SLURRY AND SOIL BENTONITE MIX.

PROJECT HOURS WORKED:

- Field: 12.0
- Travel Time: 0.5
- Office: 0.5
- Total Hours: 13.0

Daniel E. Wulf
Signature GZA Representative

Frank K
Signature [redacted] Representative
GEOCON

DAILY FIELD SUMMARY

Project 102nd Street Landfill Remediation
Location Niagara Falls, New York
Owner Oxy/Olin Contractor GEOCON, INC.
Weather Conditions SUNNY 45°-65°F

Date 5/23/97
File No. 55121

REPORT

07:45 - GZA ARRIVED ON SITE AND SET UP SLURRY WALL TESTING EQUIPMENT

- GZA OBSERVED BATCHING OF SOIL AND BENTONITE SLURRY BACKFILL AND PERFORMED SLUMP CONE & MUD BALANCE (UNIT WEIGHT) TESTS. (SEE ATTACHED SKETCH FOR LOCATION OF SLURRY WALL REMEDIATION). (SEE ATTACHED DATA SHEET FOR TEST RESULTS)

- GZA COLLECTED BAG SAMPLE 05237-1 OF SUMMIT PARK CLAY GUMBO FOR LAB TESTING.

- MATERIALS USED TO MAKE THE SLURRY WALL ARE FEDERAL GEL 90 BENTONITE, NIAGARA RIVER WATER AND SUMMIT PARK CLAY GUMBO.

- THE FINAL TOP OF SLURRY WALL WAS APPROXIMATELY 3 INCHES FROM GROUND SURFACE.

15:00 - GZA LEFT SITE

15:30 - GZA ARRIVES AT OFFICE TO DELIVER SAMPLES FOR TESTING

16:00 - GZA LEAVES OFFICE

REVIEWED BY:
JOHN J. DANZER, P.E.

NOTE: SEE DAILY ACCOUNTING SUMMARY FOR PROJECT TIME

GZA GeoEnvironmental of New York-
Engineers and Scientists

DANIEL E. WOLF
PREPARED BY

GEO·CON INC.

GEO-CON, INC.
Geotechnical Contracting
"Experience and Expertise"

Soil-Bentonite
Slurry Trench
Quality Control

DATE 5/23/97 JOB NAME 102nd STREET LANDFILL JOB NUMBER 95247

STATION	DEPTH	KEY	COMMENTS
			L.F. Today =
			S.F. Today =
			S.F. To Date =
			Amt of Bentonite Backfill Used Today =
			% of Bentonite in Soft Backfill =

BENTONITE SLURRY
PLANT

TIME	pH	UNIT WEIGHT	FILTRATE	VISC	TEMP	COMMENTS
						Amt of Bentonite Mixed =

BENTONITE SLURRY
TRENCH

TIME	STATION DEPTH	pH	UNIT WEIGHT	VISC	TEMP	AIR MONITERING	COMMENTS

BACKFILL

TIME	STATION	UNIT WEIGHT	SLUMP	PI	WC	-200	COMMENTS
0830	2+80 TO 3+15	92.5 pcf	5.75"	—	—	—	2nd BATCH IN TRENCH
1000	"	93.5 pcf	6.0"	—	—	—	3rd " " " (13' DEEP PRIOR TO B
1150	"	95.0 pcf	5.0"	—	—	—	4TH " " " (10' DEEP PRIOR TO B
1410	"	83.5 PCF	6.0"	—	—	—	5TH " " " (6' DEEP PRIOR TO B

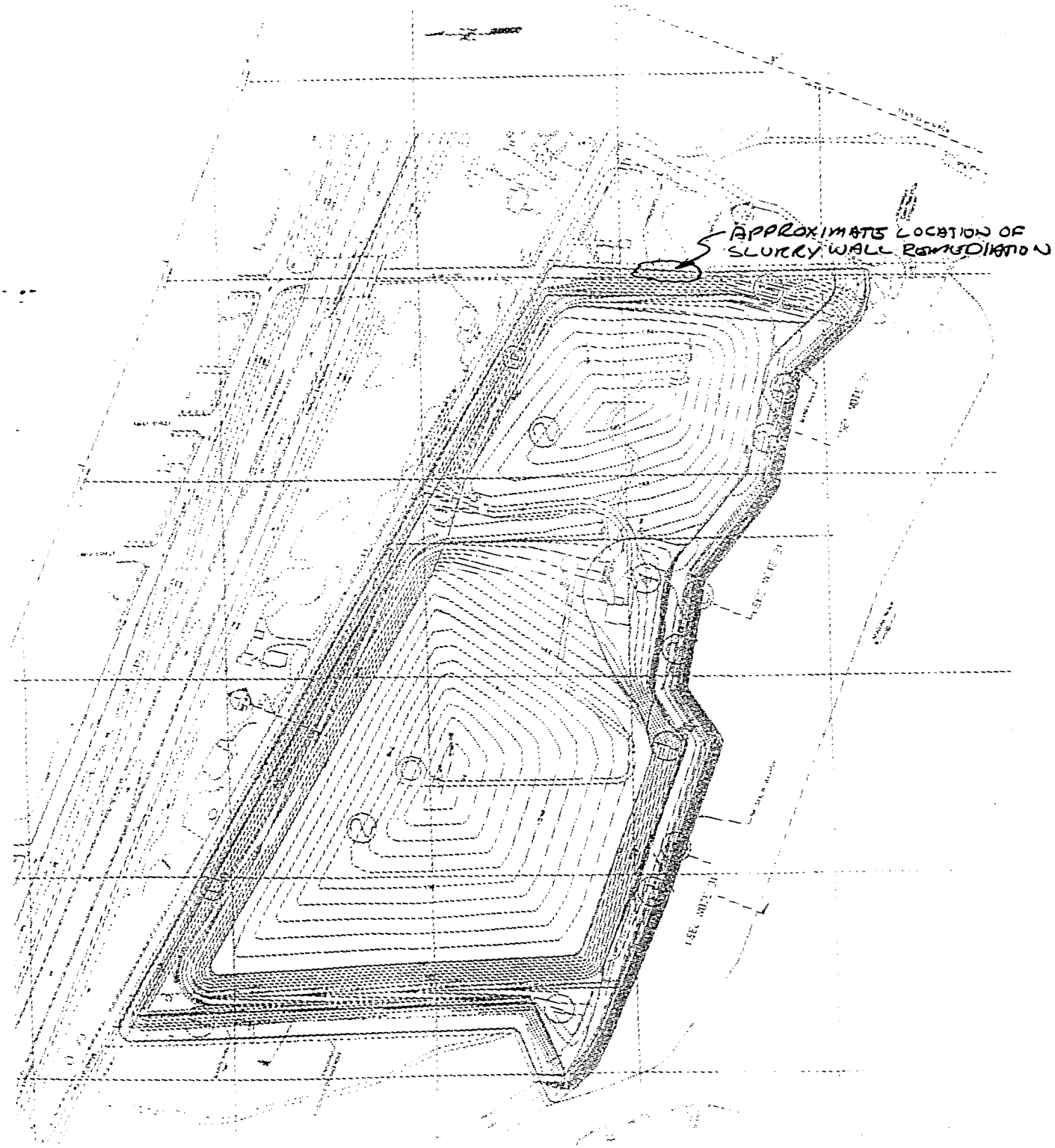
GEO-CON, INC. _____ OWNER _____

DAILY FIELD SUMMARY

Project 102nd Street Landfill Remediation
Location Niagara Falls, New York
Owner Oxy/Olin Contractor GEOCON, INC. Occidental Chemical Corp.

Date 5/23/97
File No. 55121

FIELD SKETCH



APPROXIMATE SCALE: 1" = 300'

GZA GeoEnvironmental of New York
Engineers and Scientists

DANIEL E. WULF
PREPARED BY

GZA GEOENVIRONMENTAL OF NEW YORK
DAILY ACCOUNTING SUMMARY

PROJECT: OxyChem/Olin-102nd Street Landfill Remediation
CLIENT: ~~Smith Environmental Technologies Corp.~~ GEOCON, INC.
GZA Project No.: 55121

DATE: 5/23/97

GZA REPRESENTATIVE: DANIEL E. WULF

SUMMARY OF PROJECT
ACTIVITIES/REMARKS: _____

PROJECT HOURS WORKED:

- Field: 6.5
- Travel Time: 0.5
- Office: 0.5
- Total Hours: 7.5

Signature GZA Representative

Signature ~~SMITH~~ Representative
GEOCON

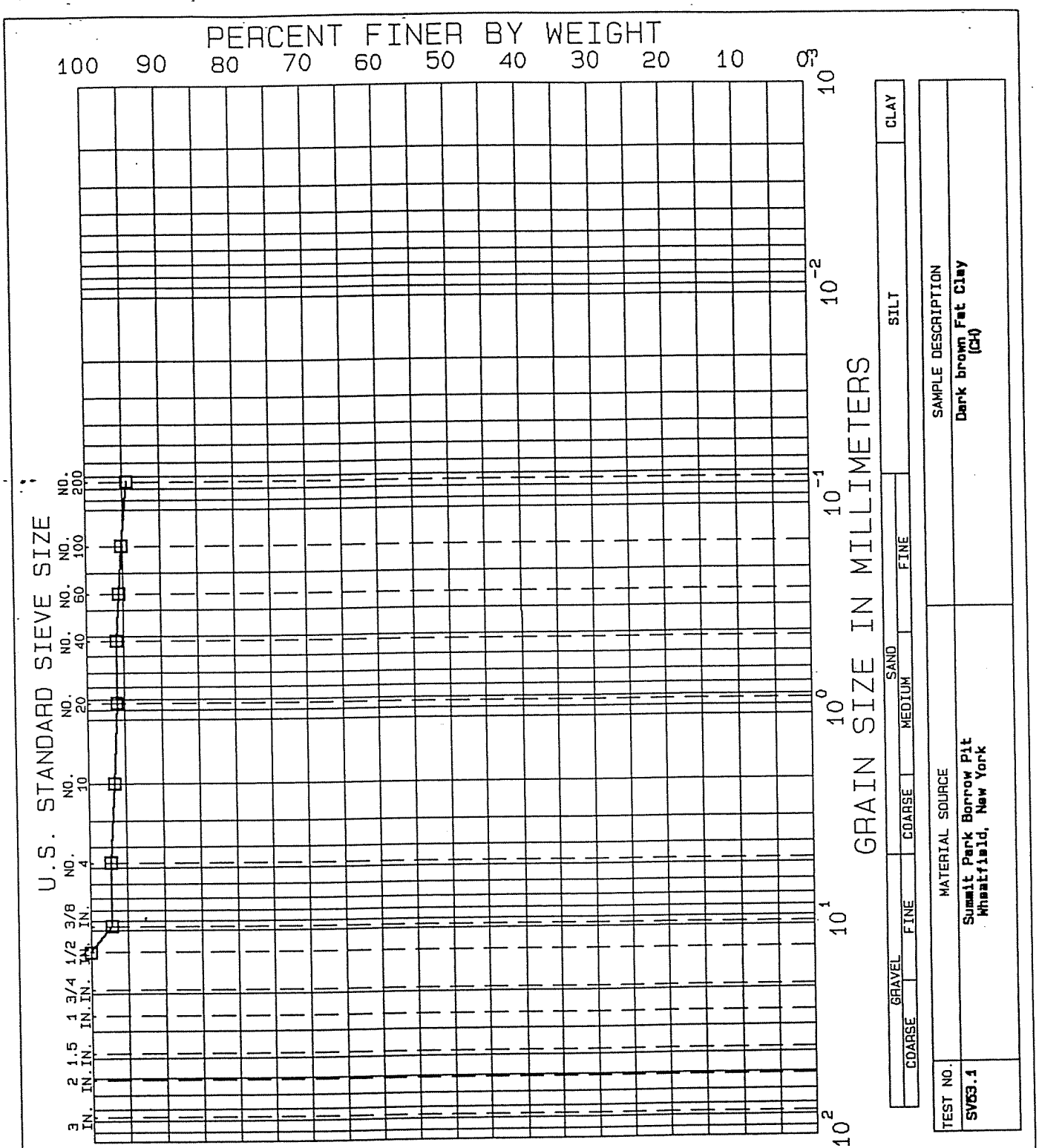
GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: 102ND STREET LANDFILL REMEDIATION SLURRY WALL - NIAGARA FALLS, N.Y.
PROJECT NO. 55121.00
CLIENT: GEO-CON INC.
MATERIAL SOURCE: SUMMIT PARK BORROW PIT - WHEATFIELD, N.Y.
DATE REPORTED: 6/4/97
WORK ORDER NO. 2968 & 2970

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
SAMPLE TYPE	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
BULK	05227-1		30.3	53	22	31	94									Dark brown Fat Clay (CH)
BULK	05237-1		27.2	51	22	29	97									Dark brown Fat Clay (CH)

Notes: 1) See Legend for Geotechnical Laboratory Testing Data Summary.

2) See Geotechnical Laboratory Test Procedures for specific test procedures completed.



102ND ST. LANDFILL REMEDATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

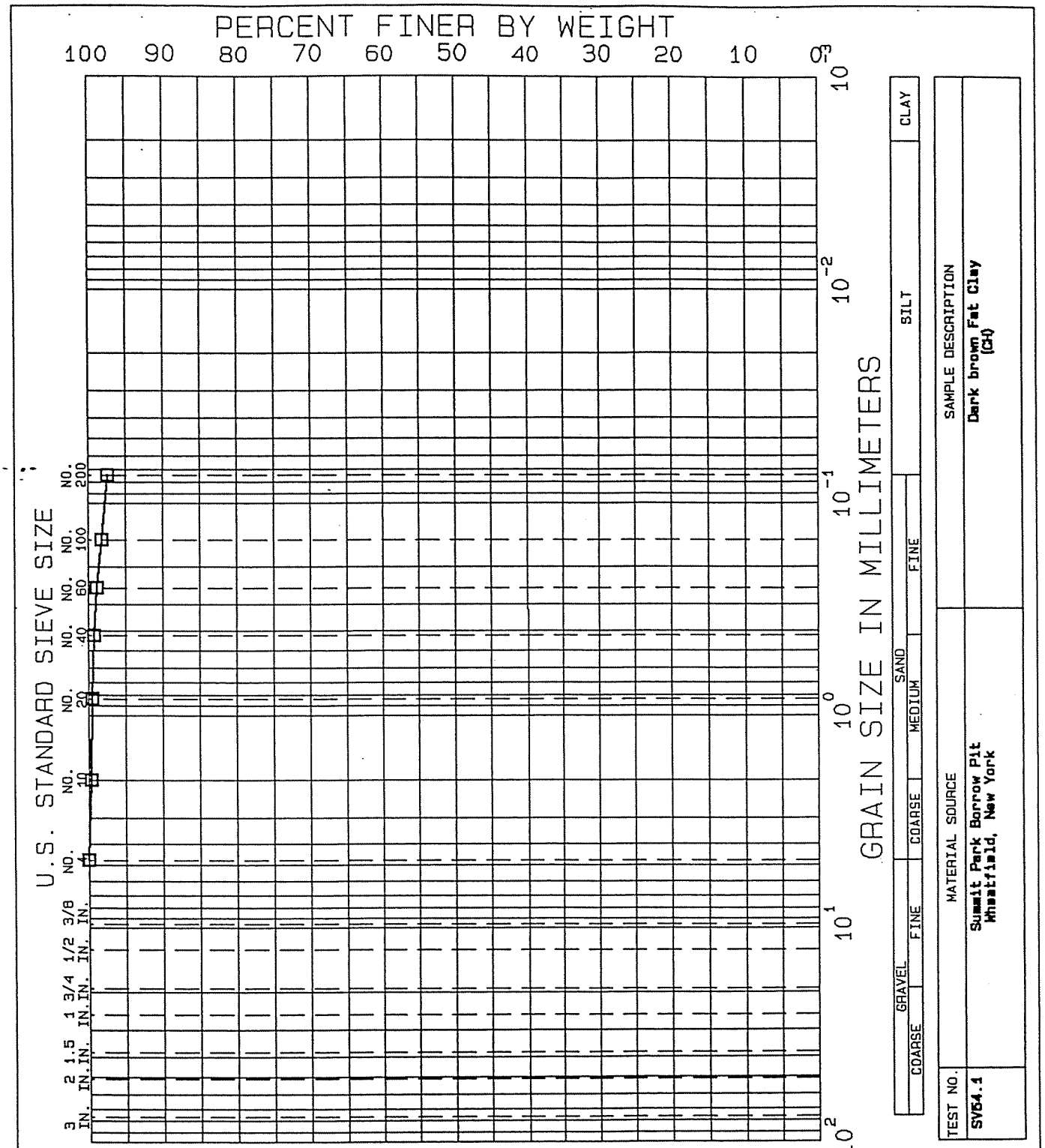
EXPLOR. NO. BULK SAMPLE
SAMPLE NO. 05227-1
DEPTH
TECH. HAK
REVIEWER RAR

WORK ORDER NO. 2968
DATE 5/30/97

FILE 55121.00

-GZA GeoEnvironmental of New York
Engineers and Scientists

JUN 04 1997



102ND ST. LANDFILL REMEDATION
SLURRY WALL - NIAGARA FALLS, N.Y.
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.	BULK SAMPLE	WORK ORDER NO.	2968
SAMPLE NO.	05237-1	DATE	5/30/97
DEPTH			
TECH.	HAK		
REVIEWER	RAR	FILE	55121.00

GZA GeoEnvironmental of New York-
Engineers and Scientists

JUN 0 4 1997

APPENDIX M

GCL QA/QC DOCUMENTATION (FACTORY)

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
[illegible] Box 428 • [illegible]
[illegible] 307) 548-6521 • Fax (307) 548-6413

6-Aug

S. Henes
Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

Dear S. Henes

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to Solmax International . These shipments left our CETCO - Lovell, Wy. plant on 5-Aug 1997 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

Printed on recycled paper.

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: **102 nd. Street Landfill**

PREPARED FOR: **Solmax International**
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
Telephone # : **514-929-1234**

PREPARED BY: **Noe Garcia**
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431
Telephone #: **800-322-1149** **Ext. 423**
Fax # **Office: (307)548-6413**

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill
Prepared For:	Solmax International
Customer #:	400297 R2
Order #:	62928
Ship Date:	8/5/97

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. NEEDLE DETECTION CERTIFICATION
3. BENTONITE CLAY CERTIFICATION
4. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
5. GCL MQA TRACKING FORM

DAILY GEOSYNTHETIC CLAY LINER PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill
SHIP DATE:	8/5/97
ORDER #:	62928
PRODUCT:	Bentomat ST

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 6th day of August 19 97

A. Christine Somer
Notary-Public

NOTARY PUBLIC
County of Big Horn State of Wyoming
My Commission Expires 8-22-98

NEEDLE DETECTION CERTIFICATION

CERTIFICATION STATEMENT

TO:	Solmax International 2801 Boul Marie Victorin Varennes, PQ. CN. JX3 1P7
ATTN:	S. Henes
PROJECT:	102 nd. Street Landfill
ORDER #:	62928
P.O #:	400297 R2
SHIP DATE:	8/5/97

This statement is to certify that all components of the Geosynthetic Clay Liner manufactured for the above project have been inspected continually for the presence of broken needles through the use of a magnetic removal system.

COLLOID ENVIRONMENTAL TECHNOLOGIES CO. (~~CETCO~~)

Subscribed and sworn to before me this 6th day of August 19 97

NOTARY PUBLIC

CHRISTINE SOMER - NOTARY PUBLIC
County of Big Horn
State of Wyoming
My Commission Expires 8-22-98

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

Facility: Colloid Environmental Technologies Co.
92 HWY. 37
Lovell, WY 82431

Contact: Jay Bischoff (800)-322-1159

Brand Name: CG-50

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/4/97**

ATTN: **S. Henes**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080497B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**28.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.8**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.3**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62928

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/5/97**

ATTN: **S. Henes**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080597A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**28.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.4**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62928

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax International
2801 Boul Marie Victorin
Varennes. PQ. CN. JX3 1P7
514-929-1234

ATTENTION: S. Henes

PROJECT: 102 nd. Street Landfill

ORDER NUMBER: 62928

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	90 Lbs.
Grab Elongation	ASTM D 4632	10 percent typical
Peel Strength	ASTM D 4632	15 lbs.
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec. (max.)
Permeability	ASTM D 5084	5 x 10(-9) cm/sec. (max.)

Colloid Environmental Technologies Co. (CETCO)

Subscribed and sworn to before me this 6th day of August 1997.

A. Christine Somer
Notary Public

A. CHRISTINE SOMER - NOTARY PUBLIC
County of Big Horn
State of Wyoming
My Commission Expires 8-22-98

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062928

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 10% Typical ASTM D 4632	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199732020	00027820	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027819	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027818	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027817	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027816	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027815	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027814	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027813	.92*	28.10	166.50	23.80*	27.60*
020-BENTOMAT ST	199732020	00027812	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027811	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027810	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027809	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027808	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027807	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027806	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027788	.96	17.30	141.20	19.80	24.70

NOTE

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

GEOSYNTHETIC CLAY LINER MQA TRACKING FORMS

QCG#TF1 QCT#TF1
8/06/97 10:37:49

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062928

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199732020									
00027798	020-BENTOMAT ST	150	2250	2933	6561464		199731010	00003762	080497B
00027806	020-BENTOMAT ST	150	2250	2901	384451		199731010	00003782	080597A
00027807	020-BENTOMAT ST	150	2250	2923	384451		199731010	00003782	080597A
00027808	020-BENTOMAT ST	150	2250	2902	384451		199731010	00003752	080597A
00027809	020-BENTOMAT ST	150	2250	2899	384451		199731010	00003752	080597A
00027810	020-BENTOMAT ST	150	2250	2887	384451		199731010	00003752	080597A
00027811	020-BENTOMAT ST	150	2250	2893	384451		199731010	00003752	080597A
00027812	020-BENTOMAT ST	150	2250	2875	384451		199731010	00003752	080597A
00027813	020-BENTOMAT ST	150	2250	2866	384451		199731010	00003752	080597A
00027814	020-BENTOMAT ST	150	2250	2855	384451		199731010	00003752	080597A
00027815	020-BENTOMAT ST	150	2250	2852	384451		199731010	00003752	080597A
00027816	020 BENTOMAT ST	150	2250	2848	384451		199731010	00003752	080597A
00027817	020-BENTOMAT ST	150	2250	2851	6717757		199730010	00003746	080597A
00027818	020-BENTOMAT ST	150	2250	2870	6717757		199730010	00003746	080597A
00027819	020 BENTOMAT ST	150	2250	2851	6717757		199730010	00003746	080597A
00027820	020 BENTOMAT ST	150	2250	2837	6717757		199730010	00003746	080597A

TOTAL SQUARE FEET..... 36,000

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

5-Aug

S. Henes,
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7
514-929-1234

Dear S. Henes,

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to 102 nd. Street Landfill, . These shipments left our CETCO - Lovell, Wy. plant on 5-Aug-97 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

Printed on recycled paper.

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: 102 nd. Street Landfill,

PREPARED FOR:
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7

Telephone # : 514-929-1234

PREPARED BY:
Noe Garcia
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431

Telephone #: 800-322-1149
Fax # Office: (307)548-6413

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill,
Prepared For:	Solmax Geosynthetics
Customer #:	400297 R2
Order #:	62941

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. BENTONITE CLAY CERTIFICATION
3. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
4. GCL QA TRACKING FORM

DAILY CLAYMAX PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill,
SHIP DATE:	8/5/97
ORDER #:	62941
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 6th day of August 1997.

A. Christine Somer
Notary-Public

A. CHRISTINE SOMER - NOTARY PUBLIC
County of Big Horn
State of Wyoming
My Commission Expires 2-22-98

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

FACILITY: **Colloid Environmental Technologies Co.**
92 HWY. 37
Lovell, WY 82431

CONTACT: Jay Bischoff (800)-322-1159

BRAND NAME: CG-50

PRODUCTION DATE: 080497B

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: Solmax Geosynthetics DATE: 8/4/97

ATTN: S. Henes,

Dear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 080497B and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	0.0
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	28.0
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	14.4
Moisture	ASTM D 2216	12.0 % (MAX)	8.8
Passing 200 Mesh	ASTM C 136	1 % (Max)	0.3

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: SF, DO, EH

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Number listed below.
62941

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO:	Solmax Geosynthetics 2801 Boul Marie Victorin Varennes, Quebec CN. J3X 1P7 514-929-1234
ATTENTION:	S. Henes,
PROJECT:	102 nd. Street Landfill,
ORDER NUMBER:	62941

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	75 lbs. (300 N)
Grab Elongation	ASTM D 4632	10 percent typical
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec.
Permeability	ASTM D 5084	5 x 10(-9) cm/sec.

Colloid Environmental Technologies Co. (CETCO)

Subscribed and sworn to before me this 16th day of August 19 97.

A. Christine Somer
Notary Public

A. CHRISTINE SOMER - NOTARY PUBLIC
County of Big Horn
State of Wyoming
My Commission Expires 2-22-98

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062941

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199732020	00001236	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001235	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001234	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001233	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001232	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001231	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001230	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001229	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001227	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001226	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001225	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001224	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001223	.94*	36.60	203.90	45.40*
020-CLAYMAX200R	199732020	00001222	.92	36.60	203.90	45.00
020-CLAYMAX200R	199732020	00001206	.92*	36.60*	203.90*	45.00*

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

QCG#TF1 QCT#TF1
8/05/97 15:40:26

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062941

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199732020									
00001206	020-CLAYMAX200R	150	2075	2985	208096203		1431474		080497B
00001222	020-CLAYMAX200R	150	2075	2860	208096203		1431474		080497B
00001223	020-CLAYMAX200R	150	2075	2941	208096203		1431474		080497B
00001224	020-CLAYMAX200R	150	2075	2862	208096203		1431474		080497B
00001225	020-CLAYMAX200R	150	2075	2870	208096203		1431474		080497B
00001226	020-CLAYMAX200R	150	2075	2872	208096203		1431474		080497B
00001227	020-CLAYMAX200R	150	2075	2871	208096203		1431474		080497B
00001229	020-CLAYMAX200R	150	2075	2862	208096027		1431474		080497B
00001230	020-CLAYMAX200R	150	2075	2854	208096027		1431474		080497B
00001231	020-CLAYMAX200R	150	2075	2801	208096027		1431474		080497B
00001232	020-CLAYMAX200R	150	2075	2923	208096027		1431474		080497B
00001233	020-CLAYMAX200R	150	2075	2830	208096027		1431474		080497B
00001234	020-CLAYMAX200R	150	2075	2842	208096027		1431474		080497B
00001235	020-CLAYMAX200R	150	2075	2843	208096027		1431474		080497B
00001236	020-CLAYMAX200R	150	2075	2861	208096027		1431474		080497B

TOTAL SQUARE FEET..... 31,125

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

9-Aug

S. Henes,
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7
514-929-1234

Dear S. Henes,

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to 102 nd. Street Landfill, . These shipments left our CETCO - Lovell, Wy. plant on 8-Aug-97 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

Printed on recycled paper.

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: 102 nd. Street Landfill,

PREPARED FOR: Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7

Telephone # : 514-929-1234

PREPARED BY: Noe Garcia
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431

Telephone #: 800-322-1149
Fax # Office: (307)548-6413

DAILY CLAYMAX PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill,
SHIP DATE:	8/8/97
ORDER #:	62935, 62936, 62939, 62940, 62942
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 9th day of Aug. 19 97.

Susie Fink
Notary-Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-31-2001

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

FACILITY: **Colloid Environmental Technologies Co.**
92 HWY. 37
Lovell, WY 82431

CONTACT: Jay Bischoff (800)-322-1159

BRAND NAME: CG-50

PRODUCTION DATE: 072897A

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: Solmax Geosynthetics DATE: 7/18/97

ATTN: S. Henes,

Dear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 071897C and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.6**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.4**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: SF, DO, EH

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Number listed below.
62935, 62936, 62939, 62940, 62942

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: Solmax Geosynthetics DATE: 7/21/97

ATTN: S. Henes,

ear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 072197B and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: SF, DO, EH

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Number listed below.
62935, 62936, 62939, 62940, 62942

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: Solmax Geosynthetics DATE: 7/30/97

ATTN: S. Henes,

Dear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 073097A and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**27.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.8**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: SF, DO, EH

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Number listed below.
62935, 62936, 62939, 62940, 62942

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **7/28/97**

ATTN: **S. Henes,**

Customer:
BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **072897A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**16.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**9.2**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.2**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Number listed below.
62935, 62936, 62939, 62940, 62942

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **8/7/97**

ATTN: **S. Henes,**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from CETCO, Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080797C** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**31.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**12.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.4**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Number listed below.
62935, 62936, 62939, 62940, 62942

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

DATE: 8/6/97

TO: Solmax International

ATTN: S. Henes

Dear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 080697C and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	0.0
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	29.0
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	12.8
Moisture	ASTM D 2216	12.0 % (MAX)	7.6
Passing 200 Mesh	ASTM D 421	1 % (Max)	0.6

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: SF, DO, EH

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62935

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/8/97**

ATTN: **S. Henes**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from CETCO, Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080897B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**30.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62935

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO:	Solmax Geosynthetics 2801 Boul Marie Victorin Varennes, Quebec CN. J3X 1P7 514-929-1234
ATTENTION:	S. Henes,
PROJECT:	102 nd. Street Landfill,
ORDER NUMBER:	62935, 62936, 62939, 62940, 62942

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	75 lbs. (300 N)
Grab Elongation	ASTM D 4632	10 percent typical
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec.
Permeability	ASTM D 5084	5 x 10(-9) cm/sec.

Colloid Environmental Technologies Co. (CETCO)

Subscribed and sworn to before me this 9th day of Aug 1997.

Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-31-2001

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062935

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 10% Typical ASTM D 4632	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199732020	00028421	.97	28.60	211.00	16.80	24.50
020-BENTOMAT ST	199732020	00028420	.97	28.60	211.00	16.80	24.50
020-BENTOMAT ST	199732020	00028419	.97	28.60	211.00	16.80	24.50
020-BENTOMAT ST	199732020	00028402	.95	28.60	211.00	20.60	25.60
020-BENTOMAT ST	199732020	00028178	.98	15.50	120.00	20.80	27.00
020-BENTOMAT ST	199732020	00028177	.98	15.50	120.00	20.80	27.00
020-BENTOMAT ST	199732020	00028176	.98	15.50	120.00	20.80	27.00

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

QCGRET2 QCTRET2
8/09/97 13:17:16

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062935

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199730020	00000777	.91	34.10	203.90	46.30
020-CLAYMAX200R	199730020	00000769	.90	34.10	203.90	45.80
020-CLAYMAX200R	199730020	00000768	.90	34.10	203.90	45.80
020-CLAYMAX200R	199729020	00000752	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000751	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000750	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000749	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000748	.91	32.90	161.70	46.50

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

QCGIFT2 QCTIFT2
8/09/97 13:17:27

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062936

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
070-CLAYMAX200R	199730020	00000767	.90	34.10	203.90	45.80
070-CLAYMAX200R	199730020	00000766	.90	34.10	203.90	45.80
070-CLAYMAX200R	199729020	00000754	.91	32.90	161.70	46.50
070-CLAYMAX200R	199729020	00000753	.91	32.90	161.70	46.50
070-CLAYMAX200R	199729020	00000747	.91	32.90	161.70	46.50
070-CLAYMAX200R	199729020	00000745	.91	32.90	161.70	46.50
070-CLAYMAX200R	199729020	00000744	.91	32.90	161.70	46.50
070-CLAYMAX200R	199729020	00000742	.91*	32.90	161.70	46.50*
070-CLAYMAX200R	199729020	00000741	.89	32.90	161.70	47.30
070-CLAYMAX200R	199729020	00000740	.89	32.90	161.70	47.30
070-CLAYMAX200R	199729020	00000739	.89	32.90	161.70	47.30
070-CLAYMAX200R	199729020	00000738	.89	32.90	161.70	47.30
070-CLAYMAX200R	199729020	00000737	.89	32.90	161.70	47.30
070-CLAYMAX200R	199729020	00000736	.89	32.90	161.70	47.30
070-CLAYMAX200R	199729020	00000726	.89*	32.90	161.70	47.30*

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

QCG#FT2 QCT#FT2
8/09/97 13:17:39

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062939

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199732020	00001306	.90	32.00	170.80	47.40
020-CLAYMAX200R	199732020	00001305	.90	32.00	170.80	47.40
020-CLAYMAX200R	199732020	00001304	.90	32.00	170.80	47.40
020-CLAYMAX200R	199732020	00001303	.90	32.00	170.80	47.40
020-CLAYMAX200R	199732020	00001301	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001300	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001286	.91*	32.00	170.80	47.90*
020-CLAYMAX200R	199732020	00001245	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001244	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001243	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001242	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001241	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001240	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001239	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001238	.94	32.00*	170.80*	43.10*
020-CLAYMAX200R	199732020	00001237	.94	36.60	203.90	45.40

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

XCGHFT2 QCTHFT2
8/09/97 13:17:51

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

O R D E R # 000062940

RIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTH D 5993	GRAB ELONGATION 12% Typical ASTH D 4632	GRAB STRENGTH 75 lb marv ASTH D 4632	MOISTURE CONTENT ASTH D 4643
-CLAYMAX200R	199731020	00001049	.93	34.00	172.30	47.80
-CLAYMAX200R	199731020	00001048	.93	34.00	172.30	47.80
-CLAYMAX200R	199731020	00001045	.93	34.00	172.30	47.80
-CLAYMAX200R	199731020	00001044	.93	34.00	172.30	47.80
-CLAYMAX200R	199731020	00001043	.93	34.00	172.30	47.80
-CLAYMAX200R	199731020	00001042	.93*	34.00*	172.30*	47.80*
-CLAYMAX200R	199731020	00001040	.91	34.10	203.90	46.30
-CLAYMAX200R	199730020	00000779	.91	34.10	203.90	46.30
-CLAYMAX200R	199730020	00000778	.91	34.10	203.90	46.30
-CLAYMAX200R	199730020	00000776	.90	34.10	203.90	45.80
-CLAYMAX200R	199730020	00000760	.90	34.10	203.90	45.80
-CLAYMAX200R	199730020	00000759	.91	32.90	161.70	46.50
-CLAYMAX200R	199729020	00000757	.91	32.90	161.70	46.50
-CLAYMAX200R	199729020	00000756	.91	32.90	161.70	46.50
-CLAYMAX200R	199729020	00000755	.91	32.90	161.70	46.50
-CLAYMAX200R	199729020	00000743				

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

QCG#FT2 QCT#FT2
8/09/97 13:18:01

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

O R D E R # 000062942

ATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTH D 5993	GRAB ELONGATION 12% Typical ASTH D 4632	GRAB STRENGTH 75 lb marv ASTH D 4632	MOISTURE CONTENT ASTH D 4643
020-CLAYMAX200R	199731020	00000956	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000955	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000954	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000953	.91	36.40	185.50	48.70
020-CLAYMAX200R	199729020	00000729	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000728	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000727	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000725	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000724	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000723	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000714	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000713	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000712	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000711	.91	32.90	161.70	49.00*
020-CLAYMAX200R	199729020	00000710	.91*	32.90	161.70	49.00

NOTE: An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.

An asterisk indicates the actual test done on the roll and the roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

ATTENTION: S. Henes

PROJECT: 102 nd. Street Landfill

ORDER NUMBER: 62935

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	90 Lbs.
Grab Elongation	ASTM D 4632	10 percent typical
Peel Strength	ASTM D 4632	15 lbs.
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec. (max.)
Permeability	ASTM D 5084	5 x 10(-9) cm/sec. (max.)

Colloid Environmental Technologies Co. (CETCO)

Subscribed and sworn to before me this 9th day of Aug. 19 97.

Susie Fink
Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

QCG#FT2 QCT#FT2
8/09/97 13:18:33

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062935

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 10% Typical ASTM D 4632	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199732020	00028421	.97	28.60	211.00	16.80	24.50
020-BENTOMAT ST	199732020	00028420	.97	28.60	211.00	16.80	24.50
020-BENTOMAT ST	199732020	00028419	.97	28.60	211.00	16.80	24.50
020-BENTOMAT ST	199732020	00028402	.95	28.60	211.00	20.60	25.60
020-BENTOMAT ST	199732020	00028178	.98	15.50	120.00	20.80	27.00
020-BENTOMAT ST	199732020	00028177	.98	15.50	120.00	20.80	27.00
020-BENTOMAT ST	199732020	00028176	.98	15.50	120.00	20.80	27.00

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

GEOSYNTHETIC CLAY LINER MQA TRACKING FORMS

QCG#TF1 QCT#TF1
8/09/97 13:17:16

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062935

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199729020									
00000748	020-CLAYMAX200R	150	2075	3114	208096024		320403		071897C
00000749	020-CLAYMAX200R	150	2075	3116	208096024		320403		071897C
00000750	020-CLAYMAX200R	150	2075	3124	208096024		320403		071897C
00000751	020-CLAYMAX200R	150	2075	3121	208096024		320403		071897C
00000752	020-CLAYMAX200R	150	2075	3127	208096024		320403		071897C
LOT# 199730020									
00000768	020-CLAYMAX200R	150	2075	3119	208054830		320403		072197B
00000769	020-CLAYMAX200R	150	2075	3119	208054830		320403		072197B
00000777	020-CLAYMAX200R	150	2075	3126	208096024		6428182		072197B

TOTAL SQUARE FEET..... 16,600

TOTAL PAGES 1

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062936

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199729020									
00000726	020-CLAYMAX200R	150	2075	3124	071897RFXB		319121		071897C
00000736	020-CLAYMAX200R	150	2075	3117	071897RFXB		319121		071897C
00000737	020-CLAYMAX200R	150	2075	3126	071897RFXB		319121		071897C
00000738	020-CLAYMAX200R	150	2075	3117	208096024		319121		071897C
00000739	020-CLAYMAX200R	150	2075	3131	208096024		320403		071897C
00000740	020-CLAYMAX200R	150	2075	3130	208096024		320403		071897C
00000741	020-CLAYMAX200R	150	2075	3131	208096024		320403		071897C
00000742	020-CLAYMAX200R	150	2075	3114	208096024		320403		071897C
00000744	020-CLAYMAX200R	150	2075	3122	208096024		320403		071897C
00000745	020-CLAYMAX200R	150	2075	3117	208096024		320403		071897C
00000747	020-CLAYMAX200R	150	2075	3128	208096024		320403		071897C
00000753	020-CLAYMAX200R	150	2075	3122	208096024		320403		071897C
00000754	020-CLAYMAX200R	150	2075	3116	208096024		320403		071897C
LOT# 199730020									
00000766	020-CLAYMAX200R	150	2075	3125	208054830		320403		072197B
00000767	020-CLAYMAX200R	150	2075	3132	208054830		320403		072197B

TOTAL SQUARE FEET..... 31,125

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062939

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199732020									
00001237	020-CLAYMAX200R	150	2075	2913	208096027		1431474		080797C
00001238	020-CLAYMAX200R	150	2075	2860	208096027		1431474		080797C
00001239	020-CLAYMAX200R	150	2075	2925	208096027		1431474		080797C
00001240	020-CLAYMAX200R	150	2075	2914	208096027		1431474		080797C
00001241	020-CLAYMAX200R	150	2075	2902	208096027		201128		080797C
00001242	020-CLAYMAX200R	150	2075	2945	208096027		201128		080797C
00001243	020-CLAYMAX200R	150	2075	2931	208096027		201128		080797C
00001244	020-CLAYMAX200R	150	2075	2936	208096027		201128		080797C
00001245	020-CLAYMAX200R	150	2075	2947	208096027		201128		080797C
00001286	020-CLAYMAX200R	150	2075	2901	208095232		1431470		080797C
00001300	020-CLAYMAX200R	150	2075	2904	208095232		1431470		080797C
00001301	020-CLAYMAX200R	150	2075	2891	208095232		1431470		080797C
00001303	020-CLAYMAX200R	150	2075	2873	208095232		2550932		080797C
00001304	020-CLAYMAX200R	150	2075	2985	208095232		2550932		080797C
00001305	020-CLAYMAX200R	150	2075	2895	208095232		2550932		080797C
00001306	020-CLAYMAX200R	150	2075	2899	208095232		2550932		080797C

TOTAL SQUARE FEET..... 33,200

QCG#TF1 QCT#TF1
8/09/97 13:17:50

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062940

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199729020									
00000743	020-CLAYMAX200R	150	2075	3121	208096024		320403		071897C
00000755	020-CLAYMAX200R	150	2075	3121	208096024		320403		071897C
00000756	020-CLAYMAX200R	150	2075	3114	208096024		320403		071897C
00000757	020-CLAYMAX200R	150	2075	3126	208096024		320403		071897C
LOT# 199730020									
00000759	020-CLAYMAX200R	150	2075	3142	208096024		320403		072197B
00000760	020-CLAYMAX200R	150	2075	3137	208096024		320403		072197B
00000776	020-CLAYMAX200R	150	2075	3124	208096024		6428182		072197B
00000778	020-CLAYMAX200R	150	2075	3127	208096024		6428182		072197B
00000779	020-CLAYMAX200R	150	2075	3129	208096024		6428182		072197B
LOT# 199731020									
00001040	020-CLAYMAX200R	150	2075	2934	208096030		2550925		073097A
00001042	020-CLAYMAX200R	150	2075	2929	208096030		2550925		073097A
00001043	020-CLAYMAX200R	150	2075	2948	208096030		2550925		073097A
00001044	020-CLAYMAX200R	150	2075	3001	208096030		2550925		073097A
00001045	020-CLAYMAX200R	150	2075	2973	208096030		2550925		073097A
00001048	020-CLAYMAX200R	150	2075	2984	208092614		2550925		073097A
00001049	020-CLAYMAX200R	150	2075	2899	208092614		2550925		073097A

TOTAL [redacted] 33,200

QCG#TF1 QCT#TF1
8/09/97 13:18:01

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062942

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199729020									
00000710	020-CLAYMAX200R	150	2075	3117	071897RFX		900262		071897C
00000711	020-CLAYMAX200R	150	2075	3110	071897RFX		900262		071897C
00000712	020-CLAYMAX200R	150	2075	3116	750601		319121		071897C
00000713	020-CLAYMAX200R	150	2075	3110	071897RFXB		319121		071897C
00000714	020-CLAYMAX200R	150	2075	3114	750601		319121		071897C
00000723	020-CLAYMAX200R	150	2075	3111	750601		319121		071897C
00000724	020-CLAYMAX200R	150	2075	3126	071897RFXB		319121		071897C
00000725	020-CLAYMAX200R	150	2075	3121	071897RFXB		319121		071897C
00000727	020-CLAYMAX200R	150	2075	3114	071897RFXB		319121		071897C
00000728	020-CLAYMAX200R	150	2075	3127	071897RFXB		319121		071897C
00000729	020-CLAYMAX200R	150	2075	3116	071897RFXB		319121		071897C
LOT# 199731020									
00000953	020-CLAYMAX200R	150	2075	2865	208095158		6389718		072897A
00000954	020-CLAYMAX200R	150	2075	2888	208095158		6389718		072897A
00000955	020-CLAYMAX200R	150	2075	2881	208095158		6389718		072897A
00000956	020-CLAYMAX200R	150	2075	2875	208095158		6389718		072897A

TOTAL SQUARE FEET..... 31,125

QCG#TF1 QCT#TF1
8/09/97 13:18:32

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062935

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199732020									
00028176	020-BENTOMAT ST	150	2250	3021	320263		199730010	00003690	080697C
00028177	020-BENTOMAT ST	150	2250	3021	320263		199730010	00003690	080697C
00028178	020-BENTOMAT ST	150	2250	3030	320263		199730010	00003690	080697C
00028402	020-BENTOMAT ST	150	2250	2951	250379		199731010	00003786	080897B
00028419	020-BENTOMAT ST	150	2250	2930	471550		199730010	00003693	080897B
00028420	020-BENTOMAT ST	150	2250	2922	471550		199730010	00003693	080897B
00028421	020-BENTOMAT ST	150	2250	2925	471550		199730010	00003693	080897B

TOTAL SQUARE FEET..... 15,750

TOTAL PAGES 1

NEEDLE DETECTION CERTIFICATION

CERTIFICATION STATEMENT

TO: Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7

ATTN: S. Henes

PROJECT: 102 nd. Street Landfill

ORDER #: 62935

P.O #: 400297 R2

SHIP DATE: 8/8/97

This statement is to certify that all components of the Geosynthetic Clay Liner manufactured for the above project have been inspected continually for the presence of broken needles through the use of a magnetic removal system.

COLLOID ENVIRONMENTAL TECHNOLOGIES CO. (CETCO)

Subscribed and sworn to before me this 9th day of Aug. 1997.

Susie Fink
NOTARY PUBLIC

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
[illegible] • Lovell, Wyoming 82431
[illegible] • Fax (307) 548-6413

6/23/97

S. Henes,
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, PQ JX3 1PF
514-929-1234

Dear S. Henes,

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to 102 nd. Street Landfill, . These shipments left our CETCO - Lovell, Wy. plant on 23-Jun-97 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Susie Fink

Susie Fink
Quality Assurance

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: 102 nd. Street Landfill,

PREPARED FOR:
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, PQ JX3 1PF

Telephone # : 514-929-1234

PREPARED BY:
Susie Fink
CETCO
P.O. Box 428
92 Hwy. 37
Loveil, Wy. 82431

Telephone #: 800-322-1149
Fax # Office: (307)548-6413 Lab: (307)548-2747

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill,
Prepared For:	Solmax Geosynthetics
Customer #:	400284
Order #:	59351, 59352, 59353

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. BENTONITE CLAY CERTIFICATION
3. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
4. GCL QA TRACKING FORM

DAILY CLAYMAX PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill,
SHIP DATE:	6/23/97
ORDER #:	59351, 59352, 59353
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (**CETCO**) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 26th day of June 19 97.

Notary-Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

FACILITY: **Colloid Environmental Technologies Co.**
92 HWY. 37
Lovell, WY 82431

CONTACT: Jay Bischoff (800)-322-1159

BRAND NAME: CG-50

PRODUCTION DATE: 062097A

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL. WY 82431

TO: **Solmax Geosynthetics** DATE: **050197A**

ATTN: **S. Henes.**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO.** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **050197A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**30.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.2**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.8**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: DM. CL

Approved By: Nicole Junk

In any correspondence regarding this shipment. please refer to our Order Number listed below.
59351. 59352. 59353

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **061997A**

ATTN: **S. Henes.**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **061997A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**24.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**11.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.4**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.7**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: DM, CL

Approved By: [signature]

In any correspondence regarding this shipment, please refer to our Order Number listed below.
59351, 59352, 59353

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **062097A**

ATTN: **S. Henes.**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO.** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **062097A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**27.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**11.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**6.8**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: DM. CL

Approved By:

In any correspondence regarding this shipment, please refer to our Order Number listed below.
59351, 59352, 59353

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, PQ JX3 1PF
514-929-1234

ATTENTION: S. Henes.

PROJECT: 102 nd. Street Landfill.

ORDER NUMBER: 59351, 59352, 59353

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	75 lbs. (300 N)
Grab Elongation	ASTM D 4632	10 percent typical
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec.
Permeability	ASTM D 5084	5 x 10(-9) cm/sec.

Colloid Environmental Technologies Co. (CETCO)

Subscribed and sworn to before me this 26th day of June 19 97.

Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-31-2001

QCG#FT2 QCT#FT2
7/07/97 15:14:36

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000059661

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 10% Typical ASTM D 4632	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199726020	00025382	.94	37.50	244.00	22.40	25.10
020-BENTOMAT ST	199726020	00025380	.94	37.50	244.00	22.40	25.10
020-BENTOMAT ST	199725020	00025328	.91	18.80	153.30	18.10	26.20
020-BENTOMAT ST	199725020	00025327	.91*	18.80	153.30	18.10*	26.20*
020-BENTOMAT ST	199725020	00025326	.96	18.80	153.30	21.00	23.30
020-BENTOMAT ST	199725020	00025325	.96	18.80	153.30	21.00	23.30
020-BENTOMAT ST	199725020	00025324	.96	18.80	153.30	21.00	23.30

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

QCG#FT2 QCT#FT2
7/07/97 15:12:20

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000059661

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199725020	00000390	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000389	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000388	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000387	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000383	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000382	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000381	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000380	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000378	1.00*	40.50*	299.50*	41.20*

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

QCG#TF1 QCT#TF1
7/07/97 15:14:35

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000059661

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199725020									
00025324	020-BENTOMAT ST	150	2250	2990	6902629		3087995A		062097B
00025325	020-BENTOMAT ST	150	2250	2997	6902629		3087995A		062097B
00025326	020-BENTOMAT ST	150	2250	3000	6902629		3087995A		062097B
00025327	020-BENTOMAT ST	150	2250	3016	6902629		199723010	00003323	062097B
00025328	020-BENTOMAT ST	150	2250	3013	6902629		199723010	00003323	062097B
LOT# 199726020									
00025380	020-BENTOMAT ST	150	2250	2832	6697389		199723010	00003305	062397A
00025382	020-BENTOMAT ST	150	2250	2899	6697389		199723010	00003305	062397A

TOTAL SQUARE FEET..... 15,750

TOTAL PAGES 1

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 00259352

MATERIAL	LOT No	ROLL No	BENTONITE MASS AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb min ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199725020	00000176	.95*	47.80	313.00	41.20*
020-CLAYMAX200R	199725020	00000175	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000174	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000173	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000172	96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000171	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000160	.96*	47.80*	313.00*	42.70*
020-CLAYMAX200R	199725020	00000107	91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000101	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000100	91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000099	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000098	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000097	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000095	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000094	.91	40.50	299.50	44.40

N O T E

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass Area and Moisture Content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000059353

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199725020	00000484	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000483	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000482	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000480	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000479	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000478	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000477	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000110	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000108	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000107	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000106	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000105	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000104	91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000396	.91	40.50	299.50	44.40
[illegible]	[illegible]	[illegible]	.91*	40.50	299.50	44.40*

NOTE

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000059351

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 1997[illegible]029									
[illegible]	029 CLAYMAX200R	150	2075	2872	050197AR		912159		050197A
LOT# 1997[illegible]5020									
[illegible]	020 CLAYMAX200R	150	2075	3120	061897NWA		912161		061997A
[illegible]	020 CLAYMAX200R	150	2075	3110	061897NWA		912161		061997A
00000321	020 CLAYMAX200R	150	2075	3116	N7082508		927166		061997A
00000322	020 CLAYMAX200R	150	2075	3110	N7082508		927166		061997A
00000403	020 CLAYMAX200R	150	2075	3106	N7084076		884404		062097A
00000404	020 CLAYMAX200R	150	2075	3107	N7084076		884404		062097A
[illegible]	020 CLAYMAX200R	150	2075	3110	N7084076		884404		062097A
[illegible]	020 CLAYMAX200R	150	2075	3111	N7084076		884404		062097A
[illegible]	020 CLAYMAX200R	150	2075	3113	N7084076		884404		062097A
[illegible]	020 CLAYMAX200R	150	2075	3116	N7084076		884404		062097A
[illegible]	020 CLAYMAX200R	150	2075	3112	N7084076		884404		062097A
[illegible]	020 CLAYMAX200R	150	2075	3123	N7084076		884404		062097A
[illegible]	020 CLAYMAX200R	150	2075	3120	062097NWA		927161		062097A
[illegible]	020 CLAYMAX200R	150	2075	3122	062097NWA		927161		062097A

TOTAL SQUARE FEET..... 31,125

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 429
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000059352

LINE #	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
[illegible]									
[illegible]	[illegible]	[illegible]	[illegible]	2089	H7082509		927166		061997A
[illegible]	[illegible]	[illegible]	[illegible]	2089	H7082509		927166		061997A
[illegible]	[illegible]	[illegible]	[illegible]	3106	H7082509		927166		061997A
[illegible]	[illegible]	[illegible]	[illegible]	3100	H7082509		927166		061997A
[illegible]	[illegible]	[illegible]	[illegible]	3101	H7082509		927166		061997A
[illegible]	[illegible]	[illegible]	[illegible]	3103	H7082509		927166		061997A
[illegible]	[illegible]	[illegible]	[illegible]	3110	H7082509		927166		061997A
[illegible]	[illegible]	[illegible]	[illegible]	3113	H7082509		927166		061997A
[illegible]	[illegible]	[illegible]	[illegible]	3101	H7082520		897105		061997A
[illegible]	[illegible]	[illegible]	[illegible]	3110	H7084076		884404		062097A
[illegible]	[illegible]	[illegible]	[illegible]	3107	H7084076		884404		062097A
[illegible]	[illegible]	[illegible]	[illegible]	3101	H7084076		884404		062097A
[illegible]	[illegible]	[illegible]	[illegible]	3100	H7084076		884404		062097A
[illegible]	[illegible]	[illegible]	[illegible]	3092	H7084076		884404		062097A
[illegible]	[illegible]	[illegible]	[illegible]	3101	H7084076		884401		062097A

[illegible] 21,125

TOTAL PAGES 1

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

7-Jul

S. Henes
Solmax
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1PF

)ear S. Henes

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to Solmax Geosynthetics . These shipments left our CETCO - Lovell, Wy. plant on June 24, 26, 1997 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

Printed on recycled paper.

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: 102 nd. Street Landfill

PREPARED FOR: Solmax
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1PF
Telephone # : 514-929-1234

PREPARED BY:
Noe Garcia
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431
Telephone #: 800-322-1149 Ext. 423
Fax # Office: (307)548-6413 Lab: (307)548-2747

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill
Prepared For:	Solmax
Customer #:	400284
Order #:	59661, 59662
Ship Date:	June 24, 26, 1997

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. NEEDLE DETECTION CERTIFICATION
3. BENTONITE CLAY CERTIFICATION
4. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
5. GCL MQA TRACKING FORM

DAILY GEOSYNTHETIC CLAY LINER PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill
SHIP DATE:	June 24, 26, 1997
ORDER #:	59661, 59662
PRODUCT:	Bentomat ST

Colloid Environmental Technologies Company (**CETCO**) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 8 day of July 19 97.

Notary-Public

STEVENS - NOTARY PUBLIC
State of Wyoming
7-11-99

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill,
SHIP DATE:	6/24/97
ORDER #:	59661
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (**CETCO**) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 8 day of July 19 97.

Notary-Public

STEVENS - NOTARY PUBLIC
State of Wyoming
7-11-99

NEEDLE DETECTION CERTIFICATION

CERTIFICATION STATEMENT

TO: Solmax
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1PF

ATTN: S. Henes

PROJECT: 102 nd. Street Landfill

ORDER #: 59661, 59662

P.O #: 400284

SHIP DATE: June 24, 26, 1997

This statement is to certify that all components of the Geosynthetic Clay Liner manufactured for the above project have been inspected continually for the presence of broken needles through the use of a magnetic removal system.

COLLOID ENVIRONMENTAL TECHNOLOGIES CO. (CETCO)

Subscribed and sworn to before me this 8 day of July 19 97.

NOTARY PUBLIC

CAROLYN STEVENS - NOTARY PUBLIC
State of Wyoming
7-11-99

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

Facility: Colloid Environmental Technologies Co.
92 HWY. 37
Lovell, WY 82431

Contact: Jay Bischoff (800)-322-1159

Brand Name: CG-50

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax**

DATE: **6/20/97**

ATTN: **S. Henes**

Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **062097B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**12.6**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.2**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.8**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
59661, 59662

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax** DATE: **6/23/97**

ATTN: **S. Henes**

Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **062397A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**29.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**11.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.4**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
59661, 59662

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax** DATE: **6/25/97**

ATTN: **S. Henes**

Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **062597B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**30.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**12.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.5**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
59661, 59662

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax** DATE: **6/19/97**

ATTN: **S. Henes,**

Dear Customer:
BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **061997A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**24.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**11.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.4**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.7**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By:_____

ıny correspondence regarding this shipment, please refer to our Order Number listed below.
ɔ9661

QCG#FT2 QCT#FT2
7/07/97 15:12:20

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000059661

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199725020	00000390	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000389	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000388	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000387	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000383	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000382	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000381	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000380	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000378	1.00*	40.50*	299.50*	41.20*

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000059661

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199725020									
00025324	020-BENTOMAT ST	150	2250	2990	6902629		3087995A		062097B
00025325	020-BENTOMAT ST	150	2250	2997	6902629		3087995A		062097B
00025326	020-BENTOMAT ST	150	2250	3000	6902629		3087995A		062097B
00025327	020-BENTOMAT ST	150	2250	3016	6902629		199723010	00003323	062097B
00025328	020-BENTOMAT ST	150	2250	3013	6902629		199723010	00003323	062097B
LOT# 199726020									
00025380	020-BENTOMAT ST	150	2250	2832	6697389		199723010	00003305	062397A
00025382	020-BENTOMAT ST	150	2250	2899	6697389		199723010	00003305	062397A

TOTAL SQUARE FEET..... 15,750

TOTAL PAGES 1

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000059661

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199725020									
00000378	020-CLAYMAX200R	150	2075	3115	061897NWA		912161		061997A
00000380	020-CLAYMAX200R	150	2075	3107	061897NWA		912161		061997A
00000381	020-CLAYMAX200R	150	2075	3098	061897NWA		927166		061997A
00000382	020-CLAYMAX200R	150	2075	3099	061897NWA		927166		061997A
00000383	020-CLAYMAX200R	150	2075	3101	061897NWA		927166		061997A
00000387	020-CLAYMAX200R	150	2075	3108	061897NWA		927166		061997A
00000388	020-CLAYMAX200R	150	2075	3086	N7082508		927166		061997A
00000389	020-CLAYMAX200R	150	2075	2102	N7082508		927166		061997A
00000390	020-CLAYMAX200R	150	2075	3117	N7082508		927166		061997A

TOTAL SQUARE FEET..... 18,675

TOTAL PAGES 1

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

31-Jul

S. Henes,
Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

Dear S. Henes,

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to 102 nd. Street Landfill. These shipments left our CETCO - Lovell, Wy. plant on 29-Jul-97.

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

Printed on recycled paper.

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill
Prepared For:	Solmax International
Customer #:	400284
Order #:	62391, 62390

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. BENTONITE CLAY CERTIFICATION
3. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
4. GCL QA TRACKING FORM

DAILY CLAYMAX PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill
SHIP DATE:	7/29/97
ORDER #:	62391, 62390
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (**CETCO**) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 31st day of July 19 97.

A. Christine Somer
Notary-Public

A. CHRISTINE SOMER - NOTARY PUBLIC
County of Big Horn
State of Wyoming
My Commission Expires 8-22-98

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

FACILITY: **Colloid Environmental Technologies Co.**
92 HWY. 37
Lovell, WY 82431

CONTACT: Jay Bischoff (800)-322-1159

BRAND NAME: CG-50

PRODUCTION DATE: 072997A

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL. WY 82431

TO: **Solmax International** DATE: **7/21/97**

ATTN: **S. Henes,**

Dear Customer:
.ie BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **072197B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

any correspondence regarding this shipment, please refer to our Order Number listed below.
62391, 62390

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **7/22/97**

ATTN: **S. Henes,**

Dear Customer:
ne BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **072297B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**30.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.4**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

n any correspondence regarding this shipment, please refer to our Order Number listed below.
62391, 62390

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL. WY 82431

TO: **Solmax International** DATE: **7/28/97**

ATTN: **S. Henes,**

Dear Customer:
ıe BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **072897A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**16.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**9.2**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.2**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

any correspondence regarding this shipment, please refer to our Order Number listed below.
ა2391. 62390

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **7/29/97**

ATTN: **S. Henes,**

Dear Customer:
ıe BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **072997A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**33.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.8**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

ı any correspondence regarding this shipment, please refer to our Order Number listed below.
62391, 62390

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

ATTENTION: S. Henes,

PROJECT: 102 nd. Street Landfill

ORDER NUMBER: 62391, 62390

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	75 lbs. (300 N)
Grab Elongation	ASTM D 4632	10 percent typical
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec.
Permeability	ASTM D 5084	5 x 10(-9) cm/sec.

Colloid Environmental Technologies Co. (CETCO)

Subscribed and sworn to before me this 31st day of July 1997.

A Christine Somer
Notary Public

CHRISTINE SOMER - NOTARY PUBLIC
County of Big Horn
State of Wyoming
My Commission Expires 8-22-98

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062391

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199731020	00000970	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000969	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000968	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000967	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000966	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000952	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000949	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000948	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000947	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000946	.91*	36.40	185.50	48.70*
020-CLAYMAX200R	199730020	00000842	.90	35.30	198.50	47.70
020-CLAYMAX200R	199730020	00000841	.90	35.30	198.50	47.70
020-CLAYMAX200R	199730020	00000835	.90*	35.30	198.50	47.70*
020-CLAYMAX200R	199730020	00000809	.90	34.10	203.90	46.80
020-CLAYMAX200R	199730020	00000808	.90	34.10	203.90	46.80
020-CLAYMAX200R	199730020	00000807	.90	34.10	203.90	46.80

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062391

ROLL#	PRODUCT	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199721020									
00000937	020-CLAYMAX200R	150	2075	3129	208052718		642133		072197B
00000938	020-CLAYMAX200R	150	2075	3132	208052718		642133		072197B
00000939	020-CLAYMAX200R	150	2075	3118	208052718		642133		072197B
00000940	020-CLAYMAX200R	150	2075	3154	208092983		6428174		072297B
00000941	020-CLAYMAX200R	150	2075	3152	208096022		6428174		072297B
00000942	020-CLAYMAX200R	150	2075	3150	208096022		6428174		072297B
LOT# 199721020									
00000946	020-CLAYMAX200R	150	2075	2829	208095302		6445864		072897A
00000947	020-CLAYMAX200R	150	2075	2841	208095158		6445864		072897A
00000948	020-CLAYMAX200R	150	2075	2835	208095158		6445864		072897A
00000949	020-CLAYMAX200R	150	2075	2816	208095158		6445864		072897A
00000952	020-CLAYMAX200R	150	2075	2852	208095158		6389718		072897A
00000966	020-CLAYMAX200R	150	2075	2920	208095158		6389718		072897A
00000967	020-CLAYMAX200R	150	2075	2847	208095158		6389718		072897A
00000968	020-CLAYMAX200R	150	2075	2842	208095158		6389718		072897A
00000969	020-CLAYMAX200R	150	2075	2858	208095158		6389718		072897A
00000970	020-CLAYMAX200R	150	2075	2914	208095158		6389718		072897A

TOTAL SQUARE FEET..... 33,200

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

5-Aug

S. Henes,
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7
514-929-1234

Dear S. Henes,

lease find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to 102 nd. Street Landfill, . These shipments left our CETCO - Lovell, Wy. plant on 5-Aug-97 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: 102 nd. Street Landfill,

PREPARED FOR:
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7

Telephone # : 514-929-1234

PREPARED BY:
Noe Garcia
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431

Telephone #: 800-322-1149
Fax # Office: (307)548-6413

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill,
Prepared For:	Solmax Geosynthetics
Customer #:	400297 R2
Order #:	62941

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. BENTONITE CLAY CERTIFICATION
3. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
4. GCL QA TRACKING FORM

DAILY CLAYMAX PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill,
SHIP DATE:	8/5/97
ORDER #:	62941
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (**CETCO**) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 6th day of August 1997.

A. Christine Somer
Notary-Public

A. CHRISTINE SOMER - NOTARY PUBLIC
County of Big Horn State of Wyoming
My Commission Expires 1-22-98

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

FACILITY: **Colloid Environmental Technologies Co.**
92 HWY. 37
Lovell, WY 82431

CONTACT: Jay Bischoff (800)-322-1159

BRAND NAME: CG-50

PRODUCTION DATE: 080497B

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **8/4/97**

ATTN: **S. Henes,**

`ear Customer:
ne BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080497B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**28.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.8**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.3**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

ı any correspondence regarding this shipment, please refer to our Order Number listed below.
62941

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7
514-929-1234

ATTENTION: S. Henes,

PROJECT: 102 nd. Street Landfill,

ORDER NUMBER: 62941

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	75 lbs. (300 N)
Grab Elongation	ASTM D 4632	10 percent typical
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec.
Permeability	ASTM D 5084	5 x 10(-9) cm/sec.

Colloid Environmental Technologies Co. (**CETCO**)

Subscribed and sworn to before me this 6th day of August 19 97

A. Christine Somer
Notary Public

A. CHRISTINE SOMER - NOTARY PUBLIC
County of Big Horn State of Wyoming
My Commission Expires 8-22-98

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O P D E P # 000062941

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199732020	00001236	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001235	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001234	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001233	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001232	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001231	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001230	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001229	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001227	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001226	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001225	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001224	.94	36.60	203.90	45.40
020-CLAYMAX200R	199732020	00001223	.94*	36.60	203.90	45.40*
020-CLAYMAX200R	199732020	00001222	.92	36.60	203.90	45.00
020-CLAYMAX200R	199732020	00001206	.92*	36.60*	203.90*	45.00*

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 778 • Lovell, Wyoming 82431
(307) 548-6821 • Fax (307) 548-6413

5-Aug

S. Henes,
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7
514-929-1234

Dear S. Henes,

lease find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to 102 nd. Street Landfill, . These shipments left our CETCO - Lovell, Wy. plant on 4-Aug-97 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

Printed on recycled paper.

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: 102 nd. Street Landfill,

PREPARED FOR:
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7

Telephone # : 514-929-1234

PREPARED BY:
Noe Garcia
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431

Telephone #: 800-322-1149
Fax # Office: (307)548-6413

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill,
Prepared For:	Solmax Geosynthetics
Customer #:	400297 R2
Order #:	62934

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. BENTONITE CLAY CERTIFICATION
3. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
4. GCL QA TRACKING FORM

DAILY CLAYMAX PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill,
SHIP DATE:	8/4/97
ORDER #:	62934
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (**CETCO**) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 5th day of August 1997.

A. Christine Somer
Notary-Public

A. CHRISTINE SOMER - NOTARY PUBLIC
County of Big Horn
State of Wyoming
My Commission Expires 8-22-98

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

FACILITY: **Colloid Environmental Technologies Co.**
92 HWY. 37
Lovell, WY 82431

CONTACT: Jay Bischoff (800)-322-1159

BRAND NAME: CG-50

PRODUCTION DATE: 073197A

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **7/31/97**

ATTN: **S. Henes,**

Dear Customer:
e BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **073197A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**28.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.6**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.3**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

any correspondence regarding this shipment, please refer to our Order Number listed below.
2934

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7
514-929-1234

ATTENTION: S. Henes,

PROJECT: 102 nd. Street Landfill,

ORDER NUMBER: 62934

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	75 lbs. (300 N)
Grab Elongation	ASTM D 4632	10 percent typical
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec.
Permeability	ASTM D 5084	5 x 10(-9) cm/sec.

Colloid Environmental Technologies Co. (**CETCO**)

Subscribed and sworn to before me this 5th day of August 19 97.

A. Christine Somer
Notary Public

A. CHRISTINE SOMER - NOTARY PUBLIC
County of Big Horn
State of Wyoming
My Commission Expires 8-22-98

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

6-Aug

S. Henes
Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

Dear S. Henes

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to Solmax International . These shipments left our CETCO - Lovell, Wy. plant on 5-Aug 1997 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

Printed on recycled paper.

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill
Prepared For:	Solmax International
Customer #:	400297 R2
Order #:	62928
Ship Date:	8/5/97

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. NEEDLE DETECTION CERTIFICATION
3. BENTONITE CLAY CERTIFICATION
4. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
5. GCL MQA TRACKING FORM

DAILY GEOSYNTHETIC CLAY LINER PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill
SHIP DATE:	8/5/97
ORDER #:	62928
PRODUCT:	Bentomat ST

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 6th day of August 19 97

A. Christine Somer
Notary-Public

CHRISTINE SOMER - NOTARY PUBLIC
County of Big Horn
State of Wyoming
My Commission Expires 8-22-98

NEEDLE DETECTION CERTIFICATION

CERTIFICATION STATEMENT

TO: Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7

ATTN: S. Henes

PROJECT: 102 nd. Street Landfill

ORDER #: 62928

P.O #: 400297 R2

SHIP DATE: 8/5/97

This statement is to certify that all components of the Geosynthetic Clay Liner manufactured for the above project have been inspected continually for the presence of broken needles through the use of a magnetic removal system.

COLLOID ENVIRONMENTAL TECHNOLOGIES CO. (~~CETCO~~)

Subscribed and sworn to before me this 6th day of August 19 97

A. Christine Somer
NOTARY PUBLIC

A. CHRISTINE SOMER - NOTARY PUBLIC
County of Big Horn
State of Wyoming
My Commission Expires 8-22-98

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

Facility: Colloid Environmental Technologies Co.
92 HWY. 37
Lovell, WY 82431

Contact: Jay Bischoff (800)-322-1159

Brand Name: CG-50

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/4/97**

ATTN: **S. Henes**

Customer:
BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080497B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**28.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.8**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.3**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

ıy correspondence regarding this shipment, please refer to our Order Numbers listed below.
62928

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/5/97**

ATTN: **S. Henes**

Customer:
...e BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080597A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**28.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.4**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

...ny correspondence regarding this shipment, please refer to our Order Numbers listed below.
62928

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

ATTENTION: S. Henes

PROJECT: 102 nd. Street Landfill

ORDER NUMBER: 62928

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	90 Lbs.
Grab Elongation	ASTM D 4632	10 percent typical
Peel Strength	ASTM D 4632	15 lbs.
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec. (max.)
Permeability	ASTM D 5084	5 x 10(-9) cm/sec. (max.)

Colloid Environmental Technologies Co. (CETCO)

Subscribed and sworn to before me this 6th day of August 1997.

A. Christine Somer
Notary Public

A. CHRISTINE SOMER - NOTARY PUBLIC
County of Big Horn
State of Wyoming
My Commission Expires 8-12-98

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER # 000062928

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 10% Typical ASTM D 4632	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199732020	00027820	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027819	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027818	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027817	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027816	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027815	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027814	.92	28.10	166.50	23.80	27.60
020-BENTOMAT ST	199732020	00027813	.92*	28.10	166.50	23.80*	27.60*
020-BENTOMAT ST	199732020	00027812	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027811	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027810	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027809	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027808	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027807	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027806	.98	28.10	166.50	20.50	22.90
020-BENTOMAT ST	199732020	00027788	.96	17.30	141.20	19.80	24.70

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

QCG#TF1 QCT#TF1
8/06/97 10:37:49

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062928

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199732020									
00027788	020-BENTOMAT ST	150	2250	2933	6561464		199731010	00003762	080497B
00027806	020-BENTOMAT ST	150	2250	2901	384451		199731010	00003782	080597A
00027807	020-BENTOMAT ST	150	2250	2923	384451		199731010	00003782	080597A
00027808	020-BENTOMAT ST	150	2250	2902	384451		199731010	00003752	080597A
00027809	020-BENTOMAT ST	150	2250	2899	384451		199731010	00003752	080597A
00027810	020-BENTOMAT ST	150	2250	2887	384451		199731010	00003752	080597A
00027811	020-BENTOMAT ST	150	2250	2893	384451		199731010	00003752	080597A
00027812	020-BENTOMAT ST	150	2250	2875	384451		199731010	00003752	080597A
00027813	020-BENTOMAT ST	150	2250	2866	384451		199731010	00003752	080597A
00027814	020-BENTOMAT ST	150	2250	2893	384451		199731010	00003752	080597A
00027815	020-BENTOMAT ST	150	2250	2852	384451		199731010	00003752	080597A
00027816	020-BENTOMAT ST	150	2250	2848	384451		199731010	00003752	080597A
00027817	020-BENTOMAT ST	150	2250	2851	6717757		199730010	00003746	080597A
00027818	020-BENTOMAT ST	150	2250	2870	6717757		199730010	00003746	080597A
00027819	020-BENTOMAT ST	150	2250	2851	6717757		199730010	00003746	080597A
00027820	020-BENTOMAT ST	150	2250	2837	6717757		199730010	00003746	080597A

TOTAL SQUARE FEET..... 36,000

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

7-Aug

S. Henes,
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7
514-929-1234

Dear S. Henes,

ase find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to 102 nd. Street Landfill, . These shipments left our CETCO - Lovell, Wy. plant on Aug 5, 6, 7 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: 102 nd. Street Landfill,

PREPARED FOR:
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7

Telephone # : 514-929-1234

PREPARED BY:
Noe Garcia
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431

Telephone #: 800-322-1149
Fax # Office: (307)548-6413

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill,
Prepared For:	Solmax Geosynthetics
Customer #:	400297 R2
Order #:	62931, 62937, 62938

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. BENTONITE CLAY CERTIFICATION
3. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
4. GCL QA TRACKING FORM

DAILY CLAYMAX PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill,
SHIP DATE:	Aug 5, 6, 7
ORDER #:	62931, 62937, 62938
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 7th day of Aug 1997.

Susie Fink
otary-Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

FACILITY: **Colloid Environmental Technologies Co.**
92 HWY. 37
Lovell, WY 82431

CONTACT: Jay Bischoff (800)-322-1159

BRAND NAME: CG-50

PRODUCTION DATE: 080497B

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **7/30/97**

ATTN: **S. Henes,**

Dear Customer:
e BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **073097A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**27.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.8**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

any correspondence regarding this shipment, please refer to our Order Number listed below.
62931, 62937, 62938

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **7/31/97**

ATTN: **S. Henes,**

Dear Customer:
e BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **073197A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**28.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.6**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.3**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

. any correspondence regarding this shipment, please refer to our Order Number listed below.
62931, 62937, 62938

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **8/4/97**

ATTN: **S. Henes,**

Dear Customer:

BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080497B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**28.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.8**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.3**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

any correspondence regarding this shipment, please refer to our Order Number listed below.
o2931, 62937, 62938

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7
514-929-1234

ATTENTION: S. Henes,

PROJECT: 102 nd. Street Landfill,

ORDER NUMBER: 62931, 62937, 62938

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	75 lbs. (300 N)
Grab Elongation	ASTM D 4632	10 percent typical
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec.
Permeability	ASTM D 5084	5 x 10(-9) cm/sec.

Colloid Environmental Technologies Co. (**CETCO**)

Subscribed and sworn to before me this 7th day of Aug. 1997

Susie Fink
Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062937

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199731020	00001085	.92	32.80	191.50	50.20
020-CLAYMAX200R	199731020	00001083	.92	32.80	191.50	50.20
020-CLAYMAX200R	199731020	00001072	.92	34.00	172.30	47.70
020-CLAYMAX200R	199731020	00001068	.92	34.00	172.30	47.70
020-CLAYMAX200R	199731020	00001067	.92	34.00	172.30	47.70
020-CLAYMAX200R	199731020	00001066	.92	34.00	172.30	47.70
020-CLAYMAX200R	199731020	00001065	.92	34.00	172.30	47.70
020-CLAYMAX200R	199731020	00001064	.92	34.00	172.30	47.70
020-CLAYMAX200R	199731020	00001063	.92	34.00	172.30	47.70
020-CLAYMAX200R	199731020	00001053	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001052	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001051	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001050	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001047	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001046	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001041	.93	34.00	172.30	47.80

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062938

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199731020	00001100	.88	32.80	191.50	48.70
020-CLAYMAX200R	199731020	00001099	.88	32.80	191.50	48.70
020-CLAYMAX200R	199731020	00001084	.92	32.80	191.50	50.20
020-CLAYMAX200R	199731020	00001082	.92	32.80	191.50	50.20
020-CLAYMAX200R	199731020	00001080	.92	32.80	191.50	50.20
020-CLAYMAX200R	199731020	00001079	.92*	32.80*	191.50*	50.20*
020-CLAYMAX200R	199731020	00001074	.91	34.00	172.30	49.20
020-CLAYMAX200R	199731020	00001062	.92	34.00	172.30	47.70
020-CLAYMAX200R	199731020	00001061	.92	34.00	172.30	47.70
020-CLAYMAX200R	199731020	00001060	.92	34.00	172.30	47.70
020-CLAYMAX200R	199731020	00001059	.92	34.00	172.30	47.70
020-CLAYMAX200R	199731020	00001058	.92	34.00	172.30	47.70
020-CLAYMAX200R	199731020	00001057	.92*	34.00	172.30	47.70*
020-CLAYMAX200R	199731020	00001056	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001055	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001054	.93	34.00	172.30	47.80

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

QCG#TF1 QCT#TF1
8/07/97 11:02:56

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062937

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199731020									
00001041	020-CLAYMAX200R	150	2075	2938	208096030		2550925		073097A
00001046	020-CLAYMAX200R	150	2075	2909	208096030		2550925		073097A
00001047	020-CLAYMAX200R	150	2075	2921	208092614		2550925		073097A
00001050	020-CLAYMAX200R	150	2075	2883	208092614		2550925		073097A
00001051	020-CLAYMAX200R	150	2075	2880	208092614		2550925		073097A
00001052	020-CLAYMAX200R	150	2075	2957	208092614		2550925		073097A
00001053	020-CLAYMAX200R	150	2075	2888	208092614		2550925		073097A
00001063	020-CLAYMAX200R	150	2075	2945	208092614		2550931		073097A
00001064	020-CLAYMAX200R	150	2075	2883	208092614		2550931		073097A
00001065	020-CLAYMAX200R	150	2075	2879	208092614		2550931		073097A
00001066	020-CLAYMAX200R	140	1936	2600	208092614		2550931		073097A
00001067	020-CLAYMAX200R	150	2075	2871	208092614		2550931		073097A
00001068	020-CLAYMAX200R	150	2075	2892	208092614		2550931		073097A
00001072	020-CLAYMAX200R	150	2075	2910	208093051		2550931		073097A
00001083	020-CLAYMAX200R	150	2075	2919	20893051		319127		073197A
00001085	020-CLAYMAX200R	150	2075	2917	20893051		319127		073197A

TOTAL SQUARE FEET..... 33,061

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062938

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199731020									
00001054	020-CLAYMAX200R	150	2075	2873	208092614		2550925		073097A
00001055	020-CLAYMAX200R	150	2075	2895	208092614		2550925		073097A
00001056	020-CLAYMAX200R	150	2075	2911	208092614		2550931		073097A
00001057	020-CLAYMAX200R	150	2075	2873	208092614		2550931		073097A
00001058	020-CLAYMAX200R	150	2075	2910	208092614		2550931		073097A
00001059	020-CLAYMAX200R	150	2075	2880	208092614		2550931		073097A
00001060	020-CLAYMAX200R	150	2075	2887	208092614		2550931		073097A
00001061	020-CLAYMAX200R	150	2075	2884	208092614		2550931		073097A
00001062	020-CLAYMAX200R	150	2075	2898	208092614		2550931		073097A
00001074	020-CLAYMAX200R	150	2075	2888	208093051		2550931		073097A
00001079	020-CLAYMAX200R	150	2075	2895	20893051		2550931		073197A
00001080	020-CLAYMAX200R	150	2075	2904	20893051		2550931		073197A
00001082	020-CLAYMAX200R	150	2075	2926	20893051		2550931		073197A
00001084	020-CLAYMAX200R	150	2075	2905	20893051		319127		073197A
00001099	020-CLAYMAX200R	150	2075	2761	208096026		319127		073197A
00001100	020-CLAYMAX200R	150	2075	2801	208096026		319127		073197A

TOTAL SQUARE FEET..... 33,200

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

9-Aug

S. Henes,
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7
514-929-1234

Dear S. Henes,

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to 102 nd. Street Landfill, . These shipments left our CETCO - Lovell, Wy. plant on 8-Aug-97 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

Printed on recycled paper.

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: 102 nd. Street Landfill,

PREPARED FOR:
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7

Telephone # : 514-929-1234

PREPARED BY:
Noe Garcia
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431

Telephone #: 800-322-1149
Fax # Office: (307)548-6413

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill
Prepared For:	Solmax International
Customer #:	400297 R2
Order #:	62935
Ship Date:	8/8/97

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. BENTONITE CLAY CERTIFICATION
3. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
4. GCL MQA TRACKING FORM
5. NEEDLE DETECTION CERTIFICATION

DAILY CLAYMAX PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill,
SHIP DATE:	8/8/97
ORDER #:	62935, 62936, 62939, 62940, 62942
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 9th day of Aug. 1997.

Susie Fink
tary-Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill
SHIP DATE:	8/8/97
ORDER #:	62935
PRODUCT:	Bentomat ST

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 9th day of Aug. 1997.

Susie Fink
Notary-Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

RODUCTION

FACILITY: **Colloid Environmental Technologies Co.**
92 HWY. 37
Lovell, WY 82431

CONTACT: Jay Bischoff (800)-322-1159

BRAND NAME: CG-50

PRODUCTION DATE: 072897A

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **7/18/97**

ATTN: **S. Henes,**

Dear Customer:

BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **071897C** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.6**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.4**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

ıny correspondence regarding this shipment, please refer to our Order Number listed below.
62935, 62936, 62939, 62940, 62942

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **7/21/97**

ATTN: **S. Henes,**

Dear Customer:

BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **072197B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

any correspondence regarding this shipment, please refer to our Order Number listed below.
62935, 62936, 62939, 62940, 62942

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **7/30/97**

ATTN: **S. Henes,**

Dear Customer:
BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **073097A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**27.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.8**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

ıny correspondence regarding this shipment, please refer to our Order Number listed below.
62935, 62936, 62939, 62940, 62942

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **7/28/97**

ATTN: **S. Henes,**

Dear Customer:

BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **072897A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**16.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**9.2**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.2**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

any correspondence regarding this shipment, please refer to our Order Number listed below.
62935, 62936, 62939, 62940, 62942

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **8/7/97**

ATTN: **S. Henes,**

Dear Customer:

BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080797C** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**31.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**12.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.4**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

ıny correspondence regarding this shipment, please refer to our Order Number listed below.
62935, 62936, 62939, 62940, 62942

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/6/97**

ATTN: **S. Henes**

r Customer:
...e BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080697C** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**29.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**12.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.6**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

. any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62935

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/8/97**

ATTN: **S. Henes**

ar Customer:
..e BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080897B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**30.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62935

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO:	Solmax Geosynthetics 2801 Boul Marie Victorin Varennes, Quebec CN. J3X 1P7 514-929-1234
ATTENTION:	S. Henes,
PROJECT:	102 nd. Street Landfill,
ORDER NUMBER:	62935, 62936, 62939, 62940, 62942

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	75 lbs. (300 N)
Grab Elongation	ASTM D 4632	10 percent typical
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec.
Permeability	ASTM D 5084	5 x 10(-9) cm/sec.

Colloid Environmental Technologies Co. (**CETCO**)

Subscribed and sworn to before me this 9th day of Aug 1997.

Susie Fink
Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-31-2001

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062935

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199730020	00000777	.91	34.10	203.90	46.30
020-CLAYMAX200R	199730020	00000769	.90	34.10	203.90	45.80
020-CLAYMAX200R	199730020	00000768	.90	34.10	203.90	45.80
020-CLAYMAX200R	199729020	00000752	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000751	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000750	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000749	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000748	.91	32.90	161.70	46.50

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062936

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199730020	00000767	.90	34.10	203.90	45.80
020-CLAYMAX200R	199730020	00000766	.90	34.10	203.90	45.80
020-CLAYMAX200R	199729020	00000754	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000753	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000747	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000745	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000744	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000742	.91*	32.90	161.70	46.50*
020-CLAYMAX200R	199729020	00000741	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000740	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000739	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000738	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000737	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000736	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000726	.89*	32.90	161.70	47.30*

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

QCG#FT2 QCT#FT2
8/09/97 13:17:39

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062939

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199732020	00001306	.90	32.00	170.80	47.40
020-CLAYMAX200R	199732020	00001305	.90	32.00	170.80	47.40
020-CLAYMAX200R	199732020	00001304	.90	32.00	170.80	47.40
020-CLAYMAX200R	199732020	00001303	.90	32.00	170.80	47.40
020-CLAYMAX200R	199732020	00001301	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001300	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001286	.91*	32.00	170.80	47.90*
020-CLAYMAX200R	199732020	00001245	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001244	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001243	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001242	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001241	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001240	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001239	.94	32.00	170.80	43.10
020-CLAYMAX200R	199732020	00001238	.94	32.00*	170.80*	43.10*
020-CLAYMAX200R	199732020	00001237	.94	36.60	203.90	45.40

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062940

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199731020	00001049	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001048	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001045	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001044	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001043	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001042	.93	34.00	172.30	47.80
020-CLAYMAX200R	199731020	00001040	.93*	34.00*	172.30*	47.80*
020-CLAYMAX200R	199730020	00000779	.91	34.10	203.90	46.30
020-CLAYMAX200R	199730020	00000778	.91	34.10	203.90	46.30
020-CLAYMAX200R	199730020	00000776	.91	34.10	203.90	46.30
020-CLAYMAX200R	199730020	00000760	.90	34.10	203.90	45.80
020-CLAYMAX200R	199730020	00000759	.90	34.10	203.90	45.80
020-CLAYMAX200R	199729020	00000757	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000756	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000755	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000743	.91	32.90	161.70	46.50

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

QCG#FT2 QCT#FT2
8/09/97 13:18:01

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062942

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199731020	00000956	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000955	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000954	.91	36.40	185.50	48.70
020-CLAYMAX200R	199731020	00000953	.91	36.40	185.50	48.70
020-CLAYMAX200R	199729020	00000729	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000728	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000727	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000725	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000724	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000723	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000714	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000713	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000712	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000711	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000710	.91*	32.90	161.70	49.00*

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

ATTENTION: S. Henes

PROJECT: 102 nd. Street Landfill

ORDER NUMBER: 62935

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	90 Lbs.
Grab Elongation	ASTM D 4632	10 percent typical
Peel Strength	ASTM D 4632	15 lbs.
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec. (max.)
Permeability	ASTM D 5084	5 x 10(-9) cm/sec. (max.)

Colloid Environmental Technologies Co. (**CETCO**)

Subscribed and sworn to before me this 9th day of Aug. 19 97.

Susie Fink
Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062935

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199729020									
00000748	020-CLAYMAX200R	150	2075	3114	208096024		320403		071897C
00000749	020-CLAYMAX200R	150	2075	3116	208096024		320403		071897C
00000750	020-CLAYMAX200R	150	2075	3124	208096024		320403		071897C
00000751	020-CLAYMAX200R	150	2075	3121	208096024		320403		071897C
00000752	020-CLAYMAX200R	150	2075	3127	208096024		320403		071897C
LOT# 199730020									
00000768	020-CLAYMAX200R	150	2075	3119	208054830		320403		072197B
00000769	020-CLAYMAX200R	150	2075	3119	208054830		320403		072197B
00000777	020-CLAYMAX200R	150	2075	3126	208096024		6428182		072197B

TOTAL SQUARE FEET..... 16,600

TOTAL PAGES 1

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062936

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199729020									
00000726	020-CLAYMAX200R	150	2075	3124	071897RFXB		319121		071897C
00000736	020-CLAYMAX200R	150	2075	3117	071897RFXB		319121		071897C
00000737	020-CLAYMAX200R	150	2075	3126	071897RFXB		319121		071897C
00000738	020-CLAYMAX200R	150	2075	3117	208096024		319121		071897C
00000739	020-CLAYMAX200R	150	2075	3131	208096024		320403		071897C
00000740	020-CLAYMAX200R	150	2075	3130	208096024		320403		071897C
00000741	020-CLAYMAX200R	150	2075	3131	208096024		320403		071897C
00000742	020-CLAYMAX200R	150	2075	3114	208096024		320403		071897C
00000744	020-CLAYMAX200R	150	2075	3122	208096024		320403		071897C
00000745	020-CLAYMAX200R	150	2075	3117	208096024		320403		071897C
00000747	020-CLAYMAX200R	150	2075	3128	208096024		320403		071897C
00000753	020-CLAYMAX200R	150	2075	3122	208096024		320403		071897C
00000754	020-CLAYMAX200R	150	2075	3116	208096024		320403		071897C
LOT# 199730020									
00000766	020-CLAYMAX200R	150	2075	3125	208054830		320403		072197B
00000767	020-CLAYMAX200R	150	2075	3132	208054830		320403		072197B

TOTAL SQUARE FEET..... 31,125

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062939

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199732020									
00001237	020-CLAYMAX200R	150	2075	2913	208096027		1431474		080797C
00001238	020-CLAYMAX200R	150	2075	2860	208096027		1431474		080797C
00001239	020-CLAYMAX200R	150	2075	2925	208096027		1431474		080797C
00001240	020-CLAYMAX200R	150	2075	2914	208096027		1431474		080797C
00001241	020-CLAYMAX200R	150	2075	2902	208096027		201128		080797C
00001242	020-CLAYMAX200R	150	2075	2945	208096027		201128		080797C
00001243	020-CLAYMAX200R	150	2075	2931	208096027		201128		080797C
00001244	020-CLAYMAX200R	150	2075	2936	208096027		201128		080797C
00001245	020-CLAYMAX200R	150	2075	2947	208096027		201128		080797C
00001286	020-CLAYMAX200R	150	2075	2901	208095232		1431470		080797C
00001300	020-CLAYMAX200R	150	2075	2904	208095232		1431470		080797C
00001301	020-CLAYMAX200R	150	2075	2891	208095232		1431470		080797C
00001303	020-CLAYMAX200R	150	2075	2873	208095232		2550932		080797C
00001304	020-CLAYMAX200R	150	2075	2985	208095232		2550932		080797C
00001305	020-CLAYMAX200R	150	2075	2895	208095232		2550932		080797C
00001306	020-CLAYMAX200R	150	2075	2899	208095232		2550932		080797C

TOTAL SQUARE FEET..... 33,200

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062940

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199729020									
00000743	020-CLAYMAX200R	150	2075	3121	208096024		320403		071897C
00000755	020-CLAYMAX200R	150	2075	3121	208096024		320403		071897C
00000756	020-CLAYMAX200R	150	2075	3114	208096024		320403		071897C
00000757	020-CLAYMAX200R	150	2075	3126	208096024		320403		071897C
LOT# 199730020									
00000759	020-CLAYMAX200R	150	2075	3142	208096024		320403		072197B
00000760	020-CLAYMAX200R	150	2075	3137	208096024		320403		072197B
00000776	020-CLAYMAX200R	150	2075	3124	208096024		6428182		072197B
00000778	020-CLAYMAX200R	150	2075	3127	208096024		6428182		072197B
00000779	020-CLAYMAX200R	150	2075	3129	208096024		6428182		072197B
LOT# 199731020									
00001040	020-CLAYMAX200R	150	2075	2934	208096030		2550925		073097A
00001042	020-CLAYMAX200R	150	2075	2929	208096030		2550925		073097A
00001043	020-CLAYMAX200R	150	2075	2948	208096030		2550925		073097A
00001044	020-CLAYMAX200R	150	2075	3001	208096030		2550925		073097A
00001045	020-CLAYMAX200R	150	2075	2973	208096030		2550925		073097A
00001048	020-CLAYMAX200R	150	2075	2984	208092614		2550925		073097A
00001049	020-CLAYMAX200R	150	2075	2899	208092614		2550925		073097A

TOTAL SQUARE FEET..... 33,200

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062942

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199729020									
00000710	020-CLAYMAX200R	150	2075	3117	071897RFX		900262		071897C
00000711	020-CLAYMAX200R	150	2075	3110	071897RFX		900262		071897C
00000712	020-CLAYMAX200R	150	2075	3116	750601		319121		071897C
00000713	020-CLAYMAX200R	150	2075	3110	071897RFXB		319121		071897C
00000714	020-CLAYMAX200R	150	2075	3114	750601		319121		071897C
00000723	020-CLAYMAX200R	150	2075	3111	750601		319121		071897C
00000724	020-CLAYMAX200R	150	2075	3126	071897RFXB		319121		071897C
00000725	020-CLAYMAX200R	150	2075	3121	071897RFXB		319121		071897C
00000727	020-CLAYMAX200R	150	2075	3114	071897RFXB		319121		071897C
00000728	020-CLAYMAX200R	150	2075	3127	071897RFXB		319121		071897C
00000729	020-CLAYMAX200R	150	2075	3116	071897RFXB		319121		071897C
LOT# 199731020									
00000953	020-CLAYMAX200R	150	2075	2865	208095158		6389718		072897A
00000954	020-CLAYMAX200R	150	2075	2888	208095158		6389718		072897A
00000955	020-CLAYMAX200R	150	2075	2881	208095158		6389718		072897A
00000956	020-CLAYMAX200R	150	2075	2875	208095158		6389718		072897A

TOTAL SQUARE FEET..... 31,125

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062935

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199732020									
00028176	020-BENTOMAT ST	150	2250	3021	320263		199730010	00003690	080697C
00028177	020-BENTOMAT ST	150	2250	3021	320263		199730010	00003690	080697C
00028178	020-BENTOMAT ST	150	2250	3030	320263		199730010	00003690	080697C
00028402	020-BENTOMAT ST	150	2250	2951	250379		199731010	00003786	080897B
00028419	020-BENTOMAT ST	150	2250	2930	471550		199730010	00003693	080897B
00028420	020-BENTOMAT ST	150	2250	2922	471550		199730010	00003693	080897B
00028421	020-BENTOMAT ST	150	2250	2925	471550		199730010	00003693	080897B

TOTAL SQUARE FEET..... 15,750

TOTAL PAGES 1

NEEDLE DETECTION CERTIFICATION

CERTIFICATION STATEMENT

TO: Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7

ATTN: S. Henes

PROJECT: 102 nd. Street Landfill

ORDER #: 62935

P.O #: 400297 R2

SHIP DATE: 8/8/97

This statement is to certify that all components of the Geosynthetic Clay Liner manufactured for the above project have been inspected continually for the presence of broken needles through the use of a magnetic removal system.

COLLOID ENVIRONMENTAL TECHNOLOGIES CO. (CETCO)

Subscribed and sworn to before me this 9th day of Aug. 19 97.

Susie Fink
TARY PUBLIC

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

15-Aug

S. Henes,
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7
514-929-1234

Dear S. Henes,

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to 102 nd. Street Landfill. These shipments left our CETCO - Lovell, Wy. plant on AUG 11, 12, 13, .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: 102 nd. Street Landfill,

PREPARED FOR:
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec CN. J3X 1P7

Telephone # : 514-929-1234

PREPARED BY:
Noe Garcia
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431

Telephone #: 800-322-1149
Fax # Office: (307)548-6413

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill,
Prepared For:	Solmax Geosynthetics
Customer #:	400297 R2
Order #:	62929, 62944, 62945, 62946

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. BENTONITE CLAY CERTIFICATION
3. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
4. GCL QA TRACKING FORM

DAILY CLAYMAX PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill,
SHIP DATE:	AUG 11, 12, 13,
ORDER #:	62929, 62944, 62945, 62946
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 15th day of Aug. 19 97

Susie Fink
tary-Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill
SHIP DATE:	8/12/97
ORDER #:	62943
PRODUCT:	Bentomat ST

Colloid Environmental Technologies Company (**CETCO**) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 15th day of Aug. 1997.

Susie Fink
Notary-Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

FACILITY: **Colloid Environmental Technologies Co.**
92 HWY. 37
Lovell, WY 82431

CONTACT: Jay Bischoff (800)-322-1159

BRAND NAME: CG-50

PRODUCTION DATE: 081397B

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **7/18/97**

ATTN: **S. Henes,**

Dear Customer:
: BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **071897C** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.6**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.4**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

any correspondence regarding this shipment, please refer to our Order Number listed below.
62929, 62944, 62945, 62946

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **7/21/97**

ATTN: **S. Henes,**

Dear Customer:

BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **072197B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

ny correspondence regarding this shipment, please refer to our Order Number listed below.
62929, 62944, 62945, 62946

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/5/97**

ATTN: **S. Henes**

ır Customer:
ıne BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080597B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**32.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**12.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.4**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

ıı any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62943

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/6/97**

ATTN: **S. Henes**

Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080697A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**27.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.6**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.4**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.7**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62943

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/6/97**

ATTN: **S. Henes**

Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080697B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**28.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**12.6**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.4**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.8**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62943

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **8/7/97**

ATTN: **S. Henes,**

Dear Customer:

BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080797C** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**31.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**12.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.4**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

ny correspondence regarding this shipment, please refer to our Order Number listed below.
62929, 62944, 62945, 62946

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/8/97**

ATTN: **S. Henes**

r Customer:
ıne BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **080897A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**24.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**15.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.6**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.5**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

ıı any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62943

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **8/13/97**

ATTN: **S. Henes,**

Dear Customer:

BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **081397B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.6**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.4**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.4**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

any correspondence regarding this shipment, please refer to our Order Number listed below.
62929, 62944, 62945, 62946

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062945

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199729020									
00000715	020-CLAYMAX200R	150	2075	3117	071897RFXB		319121		071897C
00000716	020-CLAYMAX200R	150	2075	3127	071897RFXB		319121		071897C
00000717	020-CLAYMAX200R	150	2075	3119	071897RFXB		319121		071897C
00000718	020-CLAYMAX200R	150	2075	3126	750601		319121		071897C
00000719	020-CLAYMAX200R	150	2075	3120	0797RFXB		319121		071897C
00000720	020-CLAYMAX200R	150	2075	3124	071897RFXB		319121		071897C
00000721	020-CLAYMAX200R	150	2075	3122	071897RFXB		319121		071897C
00000730	020-CLAYMAX200R	150	2075	3124	071897RFXB		319121		071897C
00000731	020-CLAYMAX200R	150	2075	3122	071897RFXB		319121		071897C
00000732	020-CLAYMAX200R	150	2075	3118	071897RFXB		319121		071897C
00000733	020-CLAYMAX200R	150	2075	3116	071897RFXB		319121		071897C
00000734	020-CLAYMAX200R	150	2075	3119	071897RFXB		319121		071897C
00000735	020-CLAYMAX200R	150	2075	3127	071897RFXB		319121		071897C
00000746	020-CLAYMAX200R	150	2075	3120	208096024		320403		071897C
LOT# 199730020									
00000764	020-CLAYMAX200R	150	2075	3132	208054830		320403		072197B
00000765	020-CLAYMAX200R	150	2075	3128	208054830		320403		072197B

TOTAL SQUARE FEET..... 33,200

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062946

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199733020									
00001307	020-CLAYMAX200R	150	2075	2975	208095241		2550932		081397B
00001313	020-CLAYMAX200R	150	2075	2954	208095241		2550932		081397B
00001314	020-CLAYMAX200R	150	2075	2958	208095241		2550932		081397B
00001315	020-CLAYMAX200R	150	2075	2943	208095241		2550932		081397B
00001316	020-CLAYMAX200R	150	2075	2963	208095241		2550932		081397B
00001317	020-CLAYMAX200R	150	2075	2976	208095241		2550932		081397B
00001318	020-CLAYMAX200R	150	2075	2997	208095241		2550932		081397B
00001319	020-CLAYMAX200R	150	2075	2959	208095241		2550932		081397B
00001320	020-CLAYMAX200R	150	2075	2930	208095241		2550932		081397B
00001321	020-CLAYMAX200R	150	2075	2918	208095241		2550932		081397B
00001322	020-CLAYMAX200R	150	2075	2928	208095241		2550932		081397B
00001323	020-CLAYMAX200R	150	2075	2923	208095241		2550932		081397B
00001324	020-CLAYMAX200R	150	2075	2959	208095241		2550932		081397B
00001326	020-CLAYMAX200R	150	2075	2907	208095241		2550932		081397B
00001327	020-CLAYMAX200R	150	2075	2895	208095241		2550932		081397B

TOTAL SQUARE FEET..... 31,125

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO:	Solmax Geosynthetics 2801 Boul Marie Victorin Varennes, Quebec CN. J3X 1P7 514-929-1234
ATTENTION:	S. Henes,
PROJECT:	102 nd. Street Landfill,
ORDER NUMBER:	62929, 62944, 62945, 62946

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	75 lbs. (300 N)
Grab Elongation	ASTM D 4632	10 percent typical
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec.
Permeability	ASTM D 5084	5 x 10(-9) cm/sec.

Colloid Environmental Technologies Co. (**CETCO**)

Subscribed and sworn to before me this 15th day of Aug. 1997.

Susie Fink
Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062944

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199732020	00001299	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001298	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001297	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001296	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001295	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001294	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001293	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001292	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001291	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001290	.91	32.00	170.80	47.90
020-CLAYMAX200R	199732020	00001289	.91	32.00	170.80	47.90
020-CLAYMAX200R	199730020	00000763	.90	34.10	203.90	45.80
020-CLAYMAX200R	199730020	00000762	.90	34.10	203.90	45.80
020-CLAYMAX200R	199730020	00000761	.90	34.10	203.90	45.80
020-CLAYMAX200R	199730020	00000758	.90*	34.10*	203.90*	45.80*
020-CLAYMAX200R	199729020	00000722	.91	32.90	161.70	49.00

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062945

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199730020	00000765	.90	34.10	203.90	45.80
020-CLAYMAX200R	199730020	00000764	.90	34.10	203.90	45.80
020-CLAYMAX200R	199729020	00000746	.91	32.90	161.70	46.50
020-CLAYMAX200R	199729020	00000735	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000734	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000733	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000732	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000731	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000730	.89	32.90	161.70	47.30
020-CLAYMAX200R	199729020	00000721	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000720	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000719	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000718	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000717	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000716	.91	32.90	161.70	49.00
020-CLAYMAX200R	199729020	00000715	.91	32.90	161.70	49.00

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062946

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199733020	00001327	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001326	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001324	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001323	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001322	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001321	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001320	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001319	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001318	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001317	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001316	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001315	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001314	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001313	.94	35.70	203.00	47.30
020-CLAYMAX200R	199733020	00001307	.90	32.00	170.80	47.40

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

ATTENTION: S. Henes

PROJECT: 102 nd. Street Landfill

ORDER NUMBER: 62943

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	90 Lbs.
Grab Elongation	ASTM D 4632	10 percent typical
Peel Strength	ASTM D 4632	15 lbs.
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec. (max.)
Permeability	ASTM D 5084	5 x 10(-9) cm/sec. (max.)

Colloid Environmental Technologies Co. (**CETCO**)

Subscribed and sworn to before me this 15th day of Aug 19 97

Susie Fink
Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

20-Aug

S. Henes
Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

Dear S. Henes

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to Solmax International . These shipments left our CETCO - Lovell, Wy. plant on 16-Aug 1997 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

Printed on recycled paper.

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: 102 nd. Street Landfill

PREPARED FOR:
Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
Telephone # : 514-929-1234

PREPARED BY:
Noe Garcia
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431
Telephone #: 800-322-1149 Ext. 423
Fax # Office: (307)548-6413

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill
Prepared For:	Solmax International
Customer #:	400297 R2
Order #:	62947
Ship Date:	8/16/97

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. NEEDLE DETECTION CERTIFICATION
3. BENTONITE CLAY CERTIFICATION
4. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
5. GCL MQA TRACKING FORM

DAILY GEOSYNTHETIC CLAY LINER PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill
SHIP DATE:	8/16/97
ORDER #:	62947
PRODUCT:	Bentomat ST

Colloid Environmental Technologies Company (**CETCO**) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 20th day of Aug 19 97.

Susie Fink
Notary-Public

SUSIE [illegible] FINK
COUNTY OF BIG HORN STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

NEEDLE DETECTION CERTIFICATION

CERTIFICATION STATEMENT

TO: Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7

ATTN: S. Henes

PROJECT: 102 nd. Street Landfill

ORDER #: 62947

P.O #: 400297 R2

SHIP DATE: 8/16/97

This statement is to certify that all components of the Geosynthetic Clay Liner manufactured for the above project have been inspected continually for the presence of broken needles through the use of a magnetic removal system.

COLLOID ENVIRONMENTAL TECHNOLOGIES CO. (CETCO)

Subscribed and sworn to before me this 20th day of Aug. 1997.

Susie Fink
NOTARY PUBLIC

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

Facility: Colloid Environmental Technologies Co.
92 HWY. 37
Lovell, WY 82431

Contact: Jay Bischoff (800)-322-1159

Brand Name: CG-50

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/14/97**

ATTN: **S. Henes**

: Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **081497C** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**34.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**9.2**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.4**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

... any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62947

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/15/97**

ATTN: **S. Henes**

ır Customer:
ıne BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **081597C** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**34.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**9.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.4**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

ın any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62947

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

ATTENTION: S. Henes

PROJECT: 102 nd. Street Landfill

ORDER NUMBER: 62947

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	**.75 lb/sq.ft.**
Grab Strength	ASTM D 4632	**90 Lbs.**
Grab Elongation	ASTM D 4632	**10 percent typical**
Peel Strength	ASTM D 4632	**15 lbs.**
Index Flux	ASTM D 5887	**1.0 x 10 (-8) cm(3)/cm(2)/sec. (max.**
Permeability	ASTM D 5084	**5 x 10(-9) cm/sec. (max.)**

Colloid Environmental Technologies Co. (**CETCO**)

Subscribed and sworn to before me this 30th day of Aug. 19 97.

Susie Fink
Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

QCG#FT2 QCT#FT2
8/20/97 11:23:41

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062947

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 10% Typical ASTM D 4632	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199733020	00029200	.92	34.90	189.30	24.80	23.20
020-BENTOMAT ST	199733020	00029199	.92	34.90	189.30	24.80	23.20
020-BENTOMAT ST	199733020	00029198	.92	34.90	189.30	24.80	23.20
020-BENTOMAT ST	199733020	00029197	.92	34.90	189.30	24.80	23.20
020-BENTOMAT ST	199733020	00029196	.92	34.90	189.30	24.80	23.20
020-BENTOMAT ST	199733020	00029195	.92	34.90	189.30	24.80	23.20
020-BENTOMAT ST	199733020	00029194	.92	34.90	189.30	24.80	23.20
020-BENTOMAT ST	199733020	00029120	.97	30.20	195.70	20.50	23.90
020-BENTOMAT ST	199733020	00029119	.97	30.20	195.70	20.50	23.90
020-BENTOMAT ST	199733020	00029117	.97	30.20	195.70	20.50	23.90
020-BENTOMAT ST	199733020	00029116	.97	30.20	195.70	20.50	23.90
020-BENTOMAT ST	199733020	00029115	.97	30.20	195.70	20.50	23.90
020-BENTOMAT ST	199733020	00029114	.97	30.20	195.70	20.50	23.90
020-BENTOMAT ST	199733020	00029113	.97	30.20	195.70	20.50	23.90
020-BENTOMAT ST	199733020	00029112	.97	30.20	195.70	20.50	23.90
020-BENTOMAT ST	199733020	00029111	.97	30.20	195.70	20.50	23.90

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

CETCO

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

Printed on recycled paper.

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062947

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199733020									
00029111	020-BENTOMAT ST	150	2250	2930	639342		199733010	00003926	081497C
00029112	020-BENTOMAT ST	150	2250	2883	639342		199733010	00003926	081497C
00029113	020-BENTOMAT ST	150	2250	2834	639342		199733010	00003926	081497C
00029114	020-BENTOMAT ST	150	2250	2871	639342		199733010	00003926	081497C
00029115	020-BENTOMAT ST	150	2250	2900	639342		199733010	00003926	081497C
00029116	020-BENTOMAT ST	150	2250	2916	639342		199733010	00003926	081497C
00029117	020-BENTOMAT ST	150	2250	2905	890373		199733010	00003926	081497C
00029119	020-BENTOMAT ST	150	2250	2908	890373		199733010	00003926	081497C
00029120	020-BENTOMAT ST	150	2250	2898	890373		199733010	00003926	081497C
00029194	020-BENTOMAT ST	150	2250	2754	716162		199733010	00003920	081597C
00029195	020-BENTOMAT ST	150	2250	2771	716162		199733010	00003920	081597C
00029196	020-BENTOMAT ST	150	2250	2784	716162		199733010	00003920	081597C
00029197	020-BENTOMAT ST	150	2250	2803	716162		199733010	00003919	081597C
00029198	020-BENTOMAT ST	150	2250	2779	716162		199733010	00003919	081597C
00029199	020-BENTOMAT ST	150	2250	2840	716162		199733010	00003919	081597C
00029200	020-BENTOMAT ST	150	2250	2860	716162		199733010	00003919	081597C

TOTAL SQUARE FEET..... 36,000

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY

234 Gordon Street • Fairmount, GA 30139 • USA
(706) 337-5316 • Fax (706) 337-7334

4-Sep-97

S. Henes
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec J3X 1P7
CANADA

Dear Sir/Madam:

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipment to Smith Tech. Corp., Niagara Falls, NY. This shipment left our CETCO - Fairmount, GA, plant on 08/29/97.

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Diane Hunsucker
Quality Assurance Coordinator

CETCO

GEOSYNTHETIC CLAY LINER

MANUFACTURING QA/QC DATA PACKAGE

PROJECT NAME: Smith Tech. Corp.

PREPARED FOR: S. Hennes
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec J3X 1P7
CANADA

PREPARED BY: Diane Hunsucker
CETCO
P. O. Box 88
234 Gordon Street
Fairmount, GA 30139
Telephone # (706) 337-5316
Fax # (706) 337-2215

Printed on recycled paper

CETCO

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING QA/QC DATA

FOR ALL GCL MANUFACTURED ON:

SMITH TECH. CORP.
NIAGARA FALLS, NY
CUSTOMER PO# 400297-122
ORDER#65577-78, 65643, 65647

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. GCL MANUFACTURING CERTIFICATON AND TEST RESULTS
3. GCL MQA TRACKING FORM

CETCO

DAILY GEOSYNTHETIC CLAY LINER PRODUCTION CERTIFICATION

Printed on recycled paper

CETCO

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	SMITH TECH. CORP.
DATE:	AUGUST 29,1997
ORDER NUMBER:	65577-78, 65578, 65643,65647
PRODUCT:	CLAYMAX 200R

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheets.

Diane Hunsucker

Diane Hunsucker
Quality Assurance Coordinator
CETCO

Subscribed and sworn to before me this 5 day of Sept, 19 97.

Janet Delli

Notary Public

OFFICIAL SEAL
JANET DELLI
Notary Public, Georgia
GORDON COUNTY
My Commission Expires
April 8, 2001

Printed on recycled paper.

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY 37
LOVELL, WYO. 82431

DATE: 23-Jul-97

TO: CETCO - CLAYMAX CORP.
234 GORDON RD.

FAIRMOUNT, GA. 30139

ATTN: QUALITY CONTROL

Dear Sirs:

A shipment of CG 50
left our Lovell, WY plant on 20-Jul-97
in BN 458747
as requested on your order no. VERBAL

A sample from this shipment was tested, and gave the following results:

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0% .	0
PASSING 200 MESH	ASTM C 136	1.0 % MAX	0.5
MOISTURE	ASTM D 5891	12.0% MAX.	8.8
FREE SWELL	ASTM D 2216	24 MIN.	24
FLUID LOSS	ASTM D 5890	18.0 MAX.	13.4

We hereby certify that the results shown above represent this shipment.
Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: R.P.

Approved By: MOSES BRISENO

CETCO

In any correspondence regarding this shipment, please refer to our
Order Number 61132

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY 37
LOVELL, WYO. 82431

DATE: 25-Jul-97

TO: CETCO - CLAYMAX CORP.
234 GORDON RD.

FAIRMOUNT, GA. 30139

ATTN: QUALITY CONTROL

Dear Sirs:

A shipment of CG 50
left our Lovell, WY plant on 22-Jul-97
in BNSF 421943
as requested on your order no. VERBAL

A sample from this shipment was tested, and gave the following results:

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0% .	0
PASSING 200 MESH	ASTM C 136	1.0 % MAX	0.6
MOISTURE	ASTM D 5891	12.0% MAX.	8
FREE SWELL	ASTM D 2216	24 MIN.	25
FLUID LOSS	ASTM D 5890	18.0 MAX.	13.6

We hereby certify that the results shown above represent this shipment.
Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: C.L.

Approved By: MOSES BRISENO

CETCO

In any correspondence regarding this shipment, please refer to our Order Number 61134

CETCO

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: S. Hennes
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, Quebec J3X 1P7
CANADA

PROJECT: Smith Tech Corp.

ORDER # 65577-78, 65643,65647

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below:

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass/Area	ASTM D 5993	0.75 lb/sq. ft.*
Grab Strength	ASTM D 4632	90 lbs.
Index Flux	ASTM D 5887	1.0 x 10(-8) cm(3)/cm(2)/sec
Permeabilty	ASTM D 5084	5 x 10(-9) cm/sec

Diane Hunsucker
Colloid Environmental Technologies Co. (CETCO)

Subscribed and sworn to before me this 5 day of Sept 19 97

Janet Delli
Notary Public

* Reported at 0% moisture content.

OFFICIAL SEAL
JANET DELLI
Notary Public, Georgia
GORDON COUNTY
My Commission Expires
April 8, 2001

Printed on recycled paper.

CETCO

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

Printed on recycled paper

QCG#FT2 QCT#FT2
8/29/97 16:13:54

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

FAIRMOUNT,GA
234 GORDON ST
FAIRMOUNT GA 30139

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000065577

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632
030-CLAYMAX200R	199735030	00008616	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008614	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008613	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008612	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008584	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008583	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008580	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008574	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008572	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008571	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008563	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008562	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008560	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008554	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008553	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008539	.89	27.20	145.40

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

FAIRMOUNT,GA
234 GORDON ST
FAIRMOUNT GA 30139

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000065578

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632
030-CLAYMAX200R	199735030	00008631	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008620	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008618	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008615	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008600	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008599	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008598	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008596	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008577	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008575	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008573	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008568	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008567	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008565	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008556	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008535	.89	27.20	145.40

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

QCG#FT2 QCT#FT2
9/03/97 6:12:15

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

FAIRMOUNT,GA
234 GORDON ST
FAIRMOUNT GA 30139

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000065643

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632
030-CLAYMAX200R	199735030	00008632	.91	30.40	120.60
030-CLAYMAX200R	199735030	00008626	.91	30.40	120.60
030-CLAYMAX200R	199735030	00008625	.91	30.40	120.60
030-CLAYMAX200R	199735030	00008624	.91	30.40	120.60
030-CLAYMAX200R	199735030	00008621	.91	30.40	120.60
030-CLAYMAX200R	199735030	00008617	.91*	30.40	120.60
030-CLAYMAX200R	199735030	00008611	.93	30.40	120.60
030-CLAYMAX200R	199735030	00008609	.93	30.40	120.60
030-CLAYMAX200R	199735030	00008605	.93	30.40	120.60
030-CLAYMAX200R	199735030	00008597	.91	30.40	120.60
030-CLAYMAX200R	199735030	00008595	.91	30.40	120.60
030-CLAYMAX200R	199735030	00008594	.91	30.40	120.60
030-CLAYMAX200R	199735030	00008526	.89	27.20	145.40
030-CLAYMAX200R	199735030	00008522	.87	27.20	145.40
030-CLAYMAX200R	199735030	00008510	.87	27.20	145.40
030-CLAYMAX200R	199735030	00008508	.87	27.20	145.40

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

QCG#FT2 QCT#FT2
8/29/97 16:54:46

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

FAIRMOUNT,GA
234 GORDON ST
FAIRMOUNT GA 30139

SHIP TO: SMITH TECHNOLOGY
9029 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000065647

ATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632
030-CLAYMAX200R	199735030	00008619	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008603	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008602	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008601	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008591	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008590	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008586	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008581	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008578	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008569	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008566	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008564	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008561	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008559	.88	27.20	145.40
030-CLAYMAX200R	199735030	00008543	.88*	27.20	145.40
030-CLAYMAX200R	199735030	00008534	.89	27.20	145.40

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

QCG#TF1 QCT#TF1
8/29/97 16:13:53

COLLOID ENVIRONMENTAL TECH CO
GCL HQA/HQC TRACKING FORM

CETCO FAIRMOUNT PLANT
234 GORDON ST
FAIRMOUNT GA 30139

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000065577

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199735030							
00008539	030-CLAYMAX200R	150	2075	2773	208113460	393363	421943
00008553	030-CLAYMAX200R	150	2075	2728	208109463	393363	421943
00008554	030-CLAYMAX200R	150	2075	2733	208109463	393363	421943
00008560	030-CLAYMAX200R	150	2075	2820	208109463	393363	458747
00008562	030-CLAYMAX200R	150	2075	2779	208109463	393363	458747
00008563	030-CLAYMAX200R	150	2075	2798	208109463	393363	458747
00008571	030-CLAYMAX200R	150	2075	2859	208109463	7056844	458747
00008572	030-CLAYMAX200R	150	2075	2892	208109463	7056844	458747
00008574	030-CLAYMAX200R	150	2075	2905	208109463	7056844	458747
00008580	030-CLAYMAX200R	150	2075	2812	208113989	7056844	458747
00008583	030-CLAYMAX200R	150	2075	2943	208113989	7056844	458747
00008584	030-CLAYMAX200R	150	2075	2881	208113989	7056844	458747
00008612	030-CLAYMAX200R	150	2075	2809	208114162	7056844	458747
00008613	030-CLAYMAX200R	150	2075	2833	208114162	7056844	458747
00008614	030-CLAYMAX200R	150	2075	2840	208114162	7056844	458747
00008616	030-CLAYMAX200R	150	2075	2846	208114162	7056844	458747

TOTAL SQUARE FEET..... 33,200

TOTAL PAGES 1

QCG#TF1 QCT#TF1
8/29/97 16:14:04

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO FAIRMOUNT PLANT
234 GORDON ST
FAIRMOUNT GA 30139

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000065578

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199735030							
00008535	030-CLAYMAX200R	150	2075	2703	208113460	7056852	421943
00008556	030-CLAYMAX200R	150	2075	2785	208109463	393363	458747
00008565	030-CLAYMAX200R	150	2075	2866	208109463	393363	458747
00008567	030-CLAYMAX200R	150	2075	2958	208109463	393363	458747
00008568	030-CLAYMAX200R	150	2075	2839	208109463	393363	458747
00008573	030-CLAYMAX200R	150	2075	3031	208109463	7056844	458747
00008575	030-CLAYMAX200R	150	2075	2859	208113989	7056844	458747
00008577	030-CLAYMAX200R	150	2075	2872	208113989	7056844	458747
00008596	030-CLAYMAX200R	150	2075	2928	208113989	7056844	458747
00008598	030-CLAYMAX200R	150	2075	2965	208113989	7056844	458747
00008599	030-CLAYMAX200R	150	2075	2899	208113989	7056844	458747
00008600	030-CLAYMAX200R	150	2075	2892	208113989	7056844	458747
00008615	030-CLAYMAX200R	150	2075	2833	208114162	7056844	458747
00008618	030-CLAYMAX200R	150	2075	2816	208114162	7056844	458747
00008620	030-CLAYMAX200R	150	2075	2855	208114162	7056844	458747
00008631	030-CLAYMAX200R	150	2075	2860	208114162	7030334	458747

TOTAL SQUARE FEET..... 33,200

CETCO FAIRMOUNT PLANT
234 GORDON ST
FAIRMOUNT GA 30139

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000065643

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199735030							
00008508	030-CLAYMAX200R	150	2075	2713	208109457	7056853	421943
00008510	030-CLAYMAX200R	150	2075	2731	208109457	7056853	421943
00008522	030-CLAYMAX200R	150	2075	2682	208113460	7056852	421943
00008526	030-CLAYMAX200R	150	2075	2707	208113460	7056852	421943
00008594	030-CLAYMAX200R	150	2075	2906	208113989	7056844	458747
00008595	030-CLAYMAX200R	150	2075	2916	208113989	7056844	458747
00008597	030-CLAYMAX200R	150	2075	2956	208113989	7056844	458747
00008605	030-CLAYMAX200R	150	2075	2833	208114162	7056844	458747
00008609	030-CLAYMAX200R	150	2075	2838	208114162	7056844	458747
00008611	030-CLAYMAX200R	150	2075	2831	208114162	7056844	458747
00008617	030-CLAYMAX200R	150	2075	2860	208114162	7056844	458747
00008621	030-CLAYMAX200R	150	2075	2804	208114162	7056844	458747
00008624	030-CLAYMAX200R	150	2075	2832	208114162	7056844	458747
00008625	030-CLAYMAX200R	150	2075	2828	208114162	7056844	458747
00008626	030-CLAYMAX200R	150	2075	2807	208114162	7056844	458747
00008632	030-CLAYMAX200R	150	2075	2854	208114162	7030334	458747

TOTAL SQUARE FEET..... 33,200

QCG#TF1 QCT#TF1
8/29/97 16:54:46

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO FAIRMOUNT PLANT
234 GORDON ST
FAIRMOUNT GA 30139

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000065647

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199735030							
00008534	030-CLAYMAX200R	150	2075	2716	208113460	7056852	421943
00008543	030-CLAYMAX200R	150	2075	2811	208113460	393363	421943
00008559	030-CLAYMAX200R	150	2075	2790	208109463	393363	458747
00008561	030-CLAYMAX200R	150	2075	2858	208109463	393363	458747
00008564	030-CLAYMAX200R	150	2075	2856	208109463	393363	458747
00008566	030-CLAYMAX200R	150	2075	2809	208109463	393363	458747
00008569	030-CLAYMAX200R	150	2075	2860	208109463	393363	458747
00008578	030-CLAYMAX200R	150	2075	2855	208113989	7056844	458747
00008581	030-CLAYMAX200R	150	2075	2855	208113989	7056844	458747
00008586	030-CLAYMAX200R	150	2075	2896	208113989	7056844	458747
00008590	030-CLAYMAX200R	150	2075	2892	208113989	7056844	458747
00008591	030-CLAYMAX200R	150	2075	2888	208113989	7056844	458747
00008601	030-CLAYMAX200R	150	2075	2864	208113989	7056844	458747
00008602	030-CLAYMAX200R	150	2075	2878	208113989	7056844	458747
00008603	030-CLAYMAX200R	150	2075	2813	208113989	7056844	458747
00008619	030-CLAYMAX200R	150	2075	2916	208114162	7056844	458747

TOTAL SQUARE FEET..... 33,200

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

17-Sep

S. Henes
Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

Dear S. Henes

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to Solmax International . These shipments left our CETCO - Lovell, Wy. plant on Aug 30, Sep. 7, 8, 1997 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: Solmax

PREPARED FOR:

Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
Telephone # : 514-929-1234

PREPARED BY:

Noe Garcia
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431
Telephone #: 800-322-1149 (Ext. 423)
Fax # (307)548-6927

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	Solmax
Prepared For:	Solmax International
Customer #:	400297 R2
Order #:	62948, 62949, 62950
Ship Date:	Aug 30, Sep. 7, 8,

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. BENTONITE CLAY CERTIFICATION
3. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
4. GCL MQA TRACKING FORM

DAILY GEOSYNTHETIC CLAY LINER PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	Solmax
SHIP DATE:	Sep. 7, 9,
ORDER #:	62949, 62950
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 17th day of Sept. 1997.

Susie Fink
Notary-Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	Solmax
SHIP DATE:	8/30/97
ORDER #:	62948
PRODUCT:	Bentomat ST

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 17th day of Sept. 1997.

Susie Fink
Notary-Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

Facility: Colloid Environmental Technologies Co.
92 HWY. 37
Lovell, WY 82431

Contact: Jay Bischoff (800)-322-1159

Brand Name: CG-50

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **9/2/97**

ATTN: **S. Henes**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **090297B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**26.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**15.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.9**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Number listed below.
62949, 62950

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **9/7/97**

ATTN: **S. Henes**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **090797B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**24.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**15.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.4**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Number listed below.
62949, 62950

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **9/8/97**

ATTN: **S. Henes**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **090897A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**15.6**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: **SF, DO, EH**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Number listed below.
62949, 62950

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **8/30/97**

ATTN: **S. Henes**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO**, Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **083097A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**15.6**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.6**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, SW.**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62948

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

ATTENTION: S. Henes

PROJECT: Solmax

ORDER NUMBER: 62949, 62950

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	75 lbs. (300 N)
Grab Elongation	ASTM D 4632	10 percent typical
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec.
Permeability	ASTM D 5084	5 x 10(-9) cm/sec.

Colloid Environmental Technologies Co. (**CETCO**)

Subscribed and sworn to before me this 17th day of Sept. 1998.

Susie Fink
Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

ATTENTION: S. Henes

PROJECT: Solmax

ORDER NUMBER: 62948

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lbs/sq.ft.
Grab Strength	ASTM D 4632	90 Lbs.
Grab Elongation	ASTM D 4632	10 percent typical
Peel Strength	ASTM D 4632	15 lbs.
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec. (max.)
Permeability	ASTM D 5084	5 x 10 (-9) cm/sec. (Max)

Colloid Environmental Technologies Co. (CETCO)

Subscribed and sworn to before me this 17th day of Sept. 19 98.

Susie Fink
Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

QCG#FT2 QCT#FT2
9/17/97 9:29:16

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062948

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
020-BENTOMAT ST	199735020	00030290	.95	152.50	35.60
020-BENTOMAT ST	199735020	00030286	.95	152.50	35.60
020-BENTOMAT ST	199735020	00030285	.95	152.50	35.60
020-BENTOMAT ST	199735020	00030284	.95*	152.50	35.60*
020-BENTOMAT ST	199735020	00030283	.98	152.50	27.30
020-BENTOMAT ST	199735020	00030282	.98	152.50	27.30
020-BENTOMAT ST	199735020	00030281	.98	152.50	27.30
020-BENTOMAT ST	199735020	00030280	.98	152.50	27.30
020-BENTOMAT ST	199735020	00030279	.98	152.50	27.30
020-BENTOMAT ST	199735020	00030278	.98	152.50	27.30
020-BENTOMAT ST	199735020	00030277	.98	152.50	27.30
020-BENTOMAT ST	199735020	00030276	.98	152.50	27.30
020-BENTOMAT ST	199735020	00030275	.98	152.50	27.30
020-BENTOMAT ST	199735020	00030274	.98	152.50	27.30
020-BENTOMAT ST	199735020	00030273	.98	152.50	27.30
020-BENTOMAT ST	199735020	00030272	.98	152.50	27.30
020-BENTOMAT ST	199735020	00030271	.98	152.50	27.30

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

QCG#FT2 QCT#FT2
9/17/97 9:22:47

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062949

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632
020-CLAYMAX200R	199737020	00001682	.89	8.30	156.30
020-CLAYMAX200R	199737020	00001681	.89	8.30	156.30
020-CLAYMAX200R	199737020	00001676	.89	8.30	156.30
020-CLAYMAX200R	199737020	00001675	.89	8.30	156.30
020-CLAYMAX200R	199737020	00001672	.89*	8.30	156.30
020-CLAYMAX200R	199737020	00001671	.90	8.30	156.30
020-CLAYMAX200R	199737020	00001670	.90	8.30	156.30
020-CLAYMAX200R	199737020	00001668	.90	8.30	156.30
020-CLAYMAX200R	199737020	00001667	.90	8.30	156.30
020-CLAYMAX200R	199737020	00001666	.90	8.30	156.30
020-CLAYMAX200R	199737020	00001665	.90	8.30	156.30
020-CLAYMAX200R	199737020	00001662	.90	8.30	156.30
020-CLAYMAX200R	199737020	00001661	.90	8.30	156.30
020-CLAYMAX200R	199737020	00001660	.90	8.30	156.30
020-CLAYMAX200R	199737020	00001659	.90	8.30	156.30
020-CLAYMAX200R	199737020	00001656	.90*	8.30*	156.30*

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

QCG#FT2 QCT#FT2
9/17/97 9:22:58

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062950

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632
020-CLAYMAX200R	199736020	00001638	.92	10.90	153.30
020-CLAYMAX200R	199736020	00001637	.92	10.90	153.30
020-CLAYMAX200R	199736020	00001636	.92	10.90	153.30
020-CLAYMAX200R	199736020	00001635	.92	10.90	153.30
020-CLAYMAX200R	199736020	00001634	.92	10.90	153.30
020-CLAYMAX200R	199736020	00001633	.92	10.90	153.30
020-CLAYMAX200R	199736020	00001632	.92	10.90	153.30
020-CLAYMAX200R	199736020	00001631	.92	10.90	153.30
020-CLAYMAX200R	199736020	00001630	.92	10.90	153.30
020-CLAYMAX200R	199736020	00001629	.92	10.90	153.30
020-CLAYMAX200R	199736020	00001628	.92	10.90	153.30
020-CLAYMAX200R	199736020	00001627	.92	10.90	153.30
020-CLAYMAX200R	199736020	00001626	.92	10.90	153.30
020-CLAYMAX200R	199736020	00001625	.92*	10.90*	153.30*
020-CLAYMAX200R	199736020	00001624	.90	28.40	145.90
020-CLAYMAX200R	199736020	00001623	.90	28.40	145.90

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

QCG#TF1 QCT#TF1
9/17/97 9:29:16

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062948

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199735020									
00030271	020-BENTOMAT ST	150	2250	2927	7030762		199735010	00004090	083097A
00030272	020-BENTOMAT ST	150	2250	2909	7030762		199735010	00004090	083097A
00030273	020-BENTOMAT ST	150	2250	2923	7030762		199735010	00004090	083097A
00030274	020-BENTOMAT ST	150	2250	2861	7030762		199735010	00004090	083097A
00030275	020-BENTOMAT ST	150	2250	2795	7030762		199735010	00004090	083097A
00030276	020-BENTOMAT ST	150	2250	2789	7030762		199735010	00004090	083097A
00030277	020-BENTOMAT ST	150	2250	2790	7030762		199735010	00004087	083097A
00030278	020-BENTOMAT ST	150	2250	2778	7030762		199735010	00004087	083097A
00030279	020-BENTOMAT ST	150	2250	2774	7030762		199735010	00004087	083097A
00030280	020-BENTOMAT ST	150	2250	2773	7030762		199735010	00004087	083097A
00030281	020-BENTOMAT ST	150	2250	2765	7030762		199735010	00004087	083097A
00030282	020-BENTOMAT ST	150	2250	2764	7030762		199735010	00004087	083097A
00030283	020-BENTOMAT ST	150	2250	2760	7030762		199735010	00004087	083097A
00030284	020-BENTOMAT ST	150	2250	2753	7030762		199735010	00004087	083097A
00030285	020-BENTOMAT ST	150	2250	2762	7030762		199735010	00004087	083097A
00030286	020-BENTOMAT ST	150	2250	2752	7030762		199735010	00004087	083097A
00030290	020-BENTOMAT ST	150	2250	2729	802939		083097A		083097A

TOTAL SQUARE FEET..... 38,250

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062949

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199737020									
00001656	020-CLAYMAX200R	150	2075	2830	208115221		2550923		090897A
00001659	020-CLAYMAX200R	150	2075	2825	208115221		2550923		090897A
00001660	020-CLAYMAX200R	150	2075	2807	208115221		2550923		090897A
00001661	020-CLAYMAX200R	150	2075	2809	208115221		2550923		090897A
00001662	020-CLAYMAX200R	150	2075	2804	208115221		2550923		090897A
00001665	020-CLAYMAX200R	150	2075	2792	208115221		2550923		090897A
00001666	020-CLAYMAX200R	150	2075	2800	208115221		2550923		090897A
00001667	020-CLAYMAX200R	150	2075	2780	208115221		2550923		090897A
00001668	020-CLAYMAX200R	150	2075	2791	208115221		2550923		090897A
00001670	020-CLAYMAX200R	150	2075	2800	208115221		2550923		090897A
00001671	020-CLAYMAX200R	150	2075	2799	208115221		2550923		090897A
00001672	020-CLAYMAX200R	150	2075	2824	208115221		2550923		090897A
00001675	020-CLAYMAX200R	150	2075	2787	208115221		2550923		090897A
00001676	020-CLAYMAX200R	150	2075	2774	208115221		2550923		090897A
00001681	020-CLAYMAX200R	150	2075	2803	208115221		2550923		090897A
00001682	020-CLAYMAX200R	150	2075	2807	208115221		2550923		090897A

TOTAL SQUARE FEET..... 33,200

QCG#TF1 QCT#TF1
9/17/97 9:22:58

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062950

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199736020									
00001623	020-CLAYMAX200R	150	2075	2844	208116329		2550923		090797B
00001624	020-CLAYMAX200R	150	2075	2848	208116329		2550923		090297B
00001625	020-CLAYMAX200R	150	2075	2917	208116329		508093		090797B
00001626	020-CLAYMAX200R	150	2075	2860	208116329		508093		090297B
00001627	020-CLAYMAX200R	150	2075	2917	208116329		508093		090797B
00001628	020-CLAYMAX200R	150	2075	2860	208115221		2550923		090297B
00001629	020-CLAYMAX200R	150	2075	2917	208116329		508093		090797B
00001630	020-CLAYMAX200R	150	2075	2870	208115221		2550923		090297B
00001631	020-CLAYMAX200R	150	2075	2864	208115221		2550923		090297B
00001632	020-CLAYMAX200R	150	2075	2874	208115221		2550923		090297B
00001633	020-CLAYMAX200R	150	2075	2858	208115221		2550923		090297B
00001634	020-CLAYMAX200R	150	2075	2860	208115221		2550923		090297B
00001635	020-CLAYMAX200R	150	2075	2853	208115221		2550923		090297B
00001636	020-CLAYMAX200R	150	2075	2843	208115221		2550923		090297B
00001637	020-CLAYMAX200R	150	2075	2835	208115221		2550923		090297B
00001638	020-CLAYMAX200R	150	2075	2831	208115221		2550923		090297B

TOTAL SQUARE FEET..... 33,200

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

26-Sep

S. Henes
Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

Dear S. Henes

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to Solmax International . These shipments left our CETCO - Lovell, Wy. plant on 17-Sep 1997 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Noe Garcia
Quality Assurance

Printed on recycled paper.

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: Solmax

PREPARED FOR:

Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
Telephone # : 514-929-1234

PREPARED BY:

Noe Garcia
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431
Telephone #: 800-322-1149 (Ext. 423)
Fax # (307)548-6927

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	Solmax
Prepared For:	Solmax International
Customer #:	400297 R2 102nd Street
Order #:	62951
Ship Date:	9/17/97

CONTENTS:

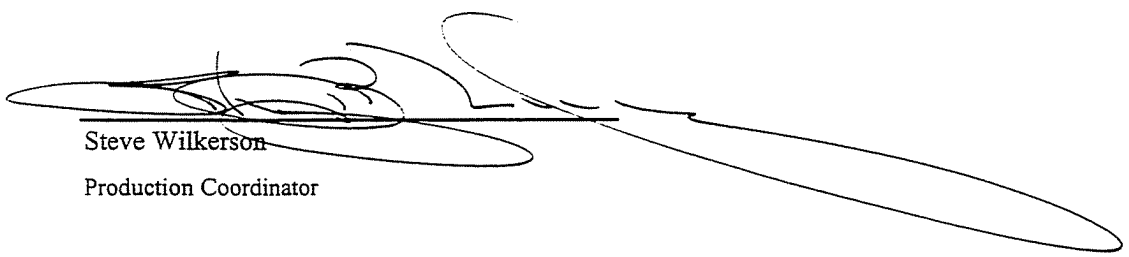
1. DAILY GCL PRODUCTION CERTIFICATION
2. BENTONITE CLAY CERTIFICATION
3. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
4. GCL MQA TRACKING FORM

DAILY GEOSYNTHETIC CLAY LINER PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	Solmax
SHIP DATE:	9/17/97
ORDER #:	62951
PRODUCT:	Bentomat ST

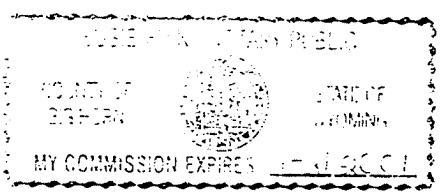
Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.



Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 17 day of [illegible] 1997.

[illegible]
Notary-Public



BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

Facility: Colloid Environmental Technologies Co.
92 HWY. 37
Lovell, WY 82431

Contact: Jay Bischoff (800)-322-1159

Brand Name: CG-50

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO

92 HWY. 37

LOVELL, WY 82431

TO: **Solmax International** DATE: **9/10/97**

ATTN: **S. Henes**

ear Customer:

ue BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **091097B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**24.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**12.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.6**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.4**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, SW.**

Approved By: **Noe Garcia**

any correspondence regarding this shipment, please refer to our Order Numbers listed below.

62951

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO

92 HWY. 37

LOVELL, WY 82431

TO: **Solmax International** DATE: **9/11/97**

ATTN: **S. Henes**

ar Customer:

The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **091197A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**27.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.6**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.5**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF. DO. SW.**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.

62951

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **9/12/97**

ATTN: **S. Henes**

ar Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **0091297A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**26.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.4**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.7**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, SW.**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.

62951

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **9/13/97**

ATTN: **S. Henes**

ear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO**, Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **091397C** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**26.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, SW.**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62951

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax International** DATE: **9/17/97**

ATTN: **S. Henes**

ear Customer:
he BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **091797B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**12.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.4**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.5**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **SF, DO, SW.**

Approved By: **Noe Garcia**

n any correspondence regarding this shipment, please refer to our Order Numbers listed below.
62951

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax International
2801 Boul Marie Victorin
Varennes, PQ. CN. JX3 1P7
514-929-1234

ATTENTION: S. Henes

PROJECT: Solmax

ORDER NUMBER: 62951

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	**.75 lbs/sq.ft.**
Grab Strength	ASTM D 4632	**90 Lbs.**
Grab Elongation	ASTM D 4632	**10 percent typical**
Peel Strength	ASTM D 4632	**15 lbs.**
Index Flux	ASTM D 5887	**1.0 x 10 (-8) cm(3)/cm(2)/sec. (max.)**
Permeability	ASTM D 5084	**5 x 10 (-9) cm/sec. (Max)**

Colloid Environmental Technologies Co. **(CETCO)**

Subscribed and sworn to before me this 11th day of July 1997.

Notary Public

NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-31-2001

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000062951

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199737020									
00031243	020-BENTOMAT ST	150	2250	3048	151443		3094702A		091097B
00031302	020-BENTOMAT ST	150	2250	3102	422685		3094691A		091197A
00031303	020-BENTOMAT ST	150	2250	3100	422685		3094691A		091197A
00031477	020-BENTOMAT ST	150	2250	3097	639271		3095090A		091297A
00031482	020-BENTOMAT ST	150	2250	3049	639271		199737010	4191	091297A
00031483	020-BENTOMAT ST	150	2250	3082	639271		199737010	4191	091297A
00031652	020-BENTOMAT ST	150	2250	2900	7060401		3095078A		091397C
LOT# 199738020									
00031942	020-BENTOMAT ST	150	2250	2998	802938		199737010	00004241	091797B
00031943	020-BENTOMAT ST	150	2250	3027	802938		199737010	00004241	091797B
00031944	020-BENTOMAT ST	150	2250	3113	802938		199737010	00004241	091797B
00031948	020-BENTOMAT ST	150	2250	3050	802938		199737010	00004241	091797B
00031950	020-BENTOMAT ST	150	2250	3100	802938		199737010	00004241	091797B
00031951	020-BENTOMAT ST	150	2250	3122	802938		199737010	00004241	091797B
00031952	020-BENTOMAT ST	150	2250	3126	802938		199737010	00004241	091797B
00031953	020-BENTOMAT ST	150	2250	3102	802938		3094690A		091797B

TOTAL SQUARE FEET..... 33,750

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

6/23/97

S. Henes,
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, PQ JX3 1PF
514-929-1234

Dear S. Henes,

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to 102 nd. Street Landfill, . These shipments left our CETCO - Lovell, Wy. plant on 23-Jun-97 .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Susie Fink

Susie Fink
Quality Assurance

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: 102 nd. Street Landfill,

PREPARED FOR:
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, PQ JX3 1PF

Telephone # : 514-929-1234

PREPARED BY:
Susie Fink
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431

Telephone #: 800-322-1149
Fax # Office: (307)548-6413 Lab: (307)548-2747

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill,
Prepared For:	Solmax Geosynthetics
Customer #:	400284
Order #:	59351, 59352, 59353

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. BENTONITE CLAY CERTIFICATION
3. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
4. GCL QA TRACKING FORM

DAILY CLAYMAX PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill,
SHIP DATE:	6/23/97
ORDER #:	59351, 59352, 59353
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 26th day of June 19 97.

Susie Fink
Notary-Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

FACILITY: **Colloid Environmental Technologies Co.**
92 HWY. 37
Lovell, WY 82431

CONTACT: Jay Bischoff (800)-322-1159

BRAND NAME: CG-50

PRODUCTION DATE: 062097A

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **050197A**

ATTN: **S. Henes,**

ear Customer:
ıe BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **050197A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**30.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.2**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.8**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **DM, CL**

Approved By: Susie Jink

any correspondence regarding this shipment, please refer to our Order Number listed below.
59351, 59352, 59353

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **061997A**

ATTN: **S. Henes,**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **061997A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**24.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**11.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.4**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.7**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **DM, CL**

Approved By: Jose Jink

any correspondence regarding this shipment, please refer to our Order Number listed below.
59351, 59352, 59353

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: **Solmax Geosynthetics** DATE: **062097A**

ATTN: **S. Henes,**

ar Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **062097A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**27.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**11.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**6.8**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: **DM, CL**

Approved By: Julie Janie

In any correspondence regarding this shipment, please refer to our Order Number listed below.
59351, 59352, 59353

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, PQ JX3 1PF
514-929-1234

ATTENTION: S. Henes,

PROJECT: 102 nd. Street Landfill,

ORDER NUMBER: 59351, 59352, 59353

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	75 lbs. (300 N)
Grab Elongation	ASTM D 4632	10 percent typical
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec.
Permeability	ASTM D 5084	5 x 10(-9) cm/sec.

Colloid Environmental Technologies Co. (**CETCO**)

Subscribed and sworn to before me this 26th day of June 19 97.

Susie Fink
Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000059351

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199725020	00000524	.90	47.80	313.00	48.20	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000522	.90	47.80	313.00	48.20	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000470	.96	47.80	313.00	42.70	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000469	.96	47.80	313.00	42.70	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000468	.96	47.80	313.00	42.70	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000467	.96	47.80	313.00	42.70	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000466	.96	47.80	313.00	42.70	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000465	.96	47.80	313.00	42.70	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000464	.96	47.80	313.00	42.70	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000463	.96	47.80	313.00	42.70	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000392	1.00	40.50	299.50	41.20	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000391	1.00	40.50	299.50	41.20	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000379	1.00	40.50	299.50	41.20	1.00	40.50	299.50	41.20
020-CLAYMAX200R	199725020	00000377	.93	37.50	268.30	42.90	.93	37.50	268.30	42.90
020-CLAYMAX200R	199722020	00000279	.93	32.60	231.90	54.90	.93	32.60	231.90	54.90

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000059352

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199725020	00000476	.95*	47.80	313.00	41.20*
020-CLAYMAX200R	199725020	00000475	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000474	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000473	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000472	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000471	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000460	.96*	47.80*	313.00*	42.70*
020-CLAYMAX200R	199725020	00000402	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000401	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000400	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000399	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000398	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000397	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000395	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000394	.91	40.50	299.50	44.40

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000059353

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199725020	00000484	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000483	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000482	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000480	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000479	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000478	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000477	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000410	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000408	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000407	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000406	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000405	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000404	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000396	.91	40.50	299.50	44.40
020-CLAYMAX200R	199725020	00000393	.91*	40.50	299.50	44.40*

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000059353

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199725020									
00000393	020-CLAYMAX200R	150	2075	3087	N7082508		927166		061997A
00000396	020-CLAYMAX200R	150	2075	3107	N7082508		927166		061997A
00000404	020-CLAYMAX200R	150	2075	3132	N7082508		927166		061997A
00000405	020-CLAYMAX200R	150	2075	3128	N7082508		927166		061997A
00000406	020-CLAYMAX200R	150	2075	3129	N7082508		927166		061997A
00000407	020-CLAYMAX200R	150	2075	3121	N7082508		927166		061997A
00000408	020-CLAYMAX200R	150	2075	3117	N7082508		927166		061997A
00000410	020-CLAYMAX200R	150	2075	3109	N7082508		927167		061997A
00000477	020-CLAYMAX200R	150	2075	3102	N7041052		884404		062097A
00000478	020-CLAYMAX200R	150	2075	3104	N7041052		884404		062097A
00000479	020-CLAYMAX200R	150	2075	3107	N7041052		884404		062097A
00000480	020-CLAYMAX200R	150	2075	3101	N7041052		884404		062097A
00000482	020-CLAYMAX200R	150	2075	3091	N7041052		884404		062097A
00000483	020-CLAYMAX200R	150	2075	3087	N7041052		884404		062097A
00000484	020-CLAYMAX200R	150	2075	3088	N7041052		884404		062097A

TOTAL SQUARE FEET..... 31,125

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000059351

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199722020									
00000279	020-CLAYMAX200R	150	2075	2872	050197AR		912159		050197A
LOT# 199725020									
00000377	020-CLAYMAX200R	150	2075	3120	061897NWA		912161		061997A
00000379	020-CLAYMAX200R	150	2075	3110	061897NWA		912161		061997A
00000391	020-CLAYMAX200R	150	2075	3116	N7082508		927166		061997A
00000392	020-CLAYMAX200R	150	2075	3110	N7082508		927166		061997A
00000463	020-CLAYMAX200R	150	2075	3106	N7084076		884404		062097A
00000464	020-CLAYMAX200R	150	2075	3107	N7084076		884404		062097A
00000465	020-CLAYMAX200R	150	2075	3110	N7084076		884404		062097A
00000466	020-CLAYMAX200R	150	2075	3111	N7084076		884404		062097A
00000467	020-CLAYMAX200R	150	2075	3113	N7084076		884404		062097A
00000468	020-CLAYMAX200R	150	2075	3116	N7084076		884404		062097A
00000469	020-CLAYMAX200R	150	2075	3112	N7084076		884404		062097A
00000470	020-CLAYMAX200R	150	2075	3123	N7084076		884404		062097A
00000522	020-CLAYMAX200R	150	2075	3120	062097NWA		927161		062097A
00000524	020-CLAYMAX200R	150	2075	3122	062097NWA		927161		062097A

TOTAL SQUARE FEET..... 31,125

QCG#TF1 QCT#TF1
6/25/97 17:13:52

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 000059352

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199725020									
00000394	020-CLAYMAX200R	150	2075	3089	N7082508		927166		061997A
00000395	020-CLAYMAX200R	150	2075	3089	N7082508		927166		061997A
00000397	020-CLAYMAX200R	150	2075	3106	N7082508		927166		061997A
00000398	020-CLAYMAX200R	150	2075	3100	N7082508		927166		061997A
00000399	020-CLAYMAX200R	150	2075	3101	N7082508		927166		061997A
00000400	020-CLAYMAX200R	150	2075	3107	N7082508		927166		061997A
00000401	020-CLAYMAX200R	150	2075	3110	N7082508		927166		061997A
00000402	020-CLAYMAX200R	150	2075	3119	N7082508		927166		061997A
00000460	020-CLAYMAX200R	150	2075	3101	N7082920		897195		061997A
00000471	020-CLAYMAX200R	150	2075	3110	N7084076		884404		062097A
00000472	020-CLAYMAX200R	150	2075	3107	N7084076		884404		062097A
00000473	020-CLAYMAX200R	150	2075	3104	N7084076		884404		062097A
00000474	020-CLAYMAX200R	150	2075	3100	N7084076		884404		062097A
00000475	020-CLAYMAX200R	150	2075	3092	N7084076		884404		062097A
00000476	020-CLAYMAX200R	150	2075	3104	N7084076		884404		062097A

TOTAL SQUARE FEET..... 31,125

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

S. Henes,
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, PQ JX3 1PF
514-929-1234

Dear S. Henes,

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to 102 nd. Street Landfill. These shipments left our CETCO - Lovell, Wy. plant on _____.

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Susie Fink

Susie Fink
Quality Assurance

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: 102 nd. Street Landfill,

PREPARED FOR:

Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, PQ JX3 1PF

Telephone # : 514-929-1234

PREPARED BY:

Susie Fink
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431

Telephone #: 800-322-1149
Fax # Office: (307)548-6413 Lab: (307)548-2747

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill.
Prepared For:	Solmax Geosynthetics
Customer #:	400284
Order #:	59347, 59348, 59349, 59350

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. BENTONITE CLAY CERTIFICATION
3. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
4. GCL QA TRACKING FORM

DAILY CLAYMAX PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill.
SHIP DATE:	
ORDER #:	59347, 59348, 59349, 59350
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (**CETCO**) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 23rd day of June 19 97.

Susie Fink
Notary-Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

FACILITY: **Colloid Environmental Technologies Co.**
92 HWY. 37
Lovell, WY 82431

CONTACT: Jay Bischoff (800)-322-1159

BRAND NAME: CG-50

PRODUCTION DATE: 062097A

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: Solmax Geosynthetics DATE: 061997A

ATTN: S. Henes,

Dear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 061997A and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**24.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**11.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.4**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.7**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: DM, CL

Approved By:

In any correspondence regarding this shipment, please refer to our Order Number listed below.
347, 59348, 59349, 59350

CERTIFICATE OF COMPLIANCE

BENTONITE
92 HWY. 37
LOVELL, WY 82431

TO: Solmax Geosynthetics DATE: 062097A

ATTN: S. Henes,

Dear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 062097A and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**27.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**11.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**6.8**
Passing 200 Mesh	ASTM C 136	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: DM, CL

Approved By: _____

For any correspondence regarding this shipment, please refer to our Order Number listed below.
47, 59348, 59349, 59350

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000059347.

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb min ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199725020	00000429	.93	40.50	299.50	47.60
020-CLAYMAX200R	199725020	00000428	.93	40.50	299.50	47.60
020-CLAYMAX200R	199725020	00000424	.97	40.50	299.50	42.40
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
020-CLAYMAX200R	199725020	00000422	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000421	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000420	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000419	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000418	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000417	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000414	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000413	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000412	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000411	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000410	.97*	40.50	299.50	42.40*

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
BIGHORN FALLS WY

O R D E R # 00005934E

MATERIAL	LOT NO.	ROLL NO.	BENTONITE MASS AREA 0.75 lb sqft ASTM D 5993	PEAK ELONGATION 12% Typical ASTM D 1682	PEAK STRENGTH 75 lb min ASTM D 4632	PEEL STRENGTH ASTM D [illegible]
020-CLAYMAX200R	199725020	00000523	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000521	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000520	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000519	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000517	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000516	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000514	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000513	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000512	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000511	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000510	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000509	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000508	.90*	47.80	313.00	48.20*
020-CLAYMAX200R	199725020	[illegible]	.90	47.80	313.00	48.20

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000059349

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb min ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199725020	00000493	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000491	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000490	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000489	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000488	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000487	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000486	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000485	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000481	.95	47.80	313.00	41.20
020-CLAYMAX200R	199725020	00000462	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000461	.96	47.80	313.00	42.70
020-CLAYMAX200R	199725020	00000459	1.00	40.50	299.50	37.60
020-CLAYMAX200R	199725020	00000416	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000415	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000403	.91	40.50	299.50	44.40

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

QCG#FT2 QCT#FT2
6/23/97 7:58:20

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000059350

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 12% Typical ASTM D 4632	GRAB STRENGTH 75 lb marv ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199725020	00000515	.90	47.80	313.00	48.20
020-CLAYMAX200R	199725020	00000506	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000505	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000504	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000503	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000502	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000501	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000500	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000499	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000498	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000497	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000496	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000495	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000494	.92	47.80	313.00	48.10
020-CLAYMAX200R	199725020	00000492	.92*	47.80	313.00	48.10*

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

COLLOID ENVIRONMENTAL TECH C.
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER: 0005914

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT#:199725020									
00000409	020-CLAYMAX200R	150	2075	3115	N7082508		927166		061997A
00000411	020-CLAYMAX200R	150	2075	3098	N7082508		927167		061997A
00000412	020-CLAYMAX200R	150	2075	3087	N7082508		927167		061997A
00000413	020-CLAYMAX200R	150	2075	3082	N7082508		927167		061997A
00000414	020-CLAYMAX200R	150	2075	3089	N7082922		927167		061997A
00000417	020-CLAYMAX200R	150	2075	3100	N7082922		927167		061997A
00000418	020-CLAYMAX200R	150	2075	3102	N7082922		927167		061997A
00000419	020-CLAYMAX200R	150	2075	3100	N7082922		927167		061997A
00000420	020-CLAYMAX200R	150	2075	3097	N7082922		927167		061997A
00000421	020-CLAYMAX200R	150	2075	3100	N7082922		927167		061997A
00000422	020-CLAYMAX200R	150	2075	3091	N7082922		927167		061997A
00000423	020-CLAYMAX200R	150	2075	3102	N7082922		927167		061997A
00000424	020-CLAYMAX200R	150	2075	3105	N7082922		927167		061997A
00000428	020-CLAYMAX200R	150	2075	3105	N7082922		927167		061997A
00000429	020-CLAYMAX200R	150	2075	3099	N7082922		927167		061997A

TOTAL SQUARE FEET..... 31,125

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 00059348

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199725020									
00000507	020-CLAYMAX200R	150	2075	3111	062097NWA		884406		062097A
00000508	020-CLAYMAX200R	150	2075	3113	062097NWA		884406		062097A
00000509	020-CLAYMAX200R	150	2075	3116	062097NWA		884406		062097A
00000510	020-CLAYMAX200R	150	2075	3112	062097NWA		884406		062097A
00000511	020-CLAYMAX200R	150	2075	3108	062097NWA		884406		062097A
00000512	020-CLAYMAX200R	150	2075	3101	062097NWA		884406		062097A
00000513	020-CLAYMAX200R	150	2075	3097	062097NWA		884406		062097A
00000514	020-CLAYMAX200R	150	2075	3086	062097NWA		884406		062097A
00000516	020-CLAYMAX200R	150	2075	3092	062097NWA		884406		062097A
00000517	020-CLAYMAX200R	150	2075	3099	062097NWA		927161		062097A
00000518	020-CLAYMAX200R	150	2075	3100	062097NWA		927161		062097A
00000519	020-CLAYMAX200R	150	2075	3109	062097NWA		927161		062097A
00000520	020-CLAYMAX200R	150	2075	3110	062097NWA		927161		062097A
00000521	020-CLAYMAX200R	150	2075	3116	062097NWA		927161		062097A
00000523	020-CLAYMAX200R	150	2075	3120	062097NWA		927161		062097A

TOTAL SQUARE FEET..... 31,125

COLLOID ENVIRONMENTAL TECH
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199725020									
00000403	020-CLAYMAX200R	150	2075	3126	N7082508		927166		061997A
00000415	020-CLAYMAX200R	150	2075	3109	N7082922		927167		061997A
00000416	020-CLAYMAX200R	150	2075	3101	N7082922		927167		061997A
00000459	020-CLAYMAX200R	150	2075	3012	N7082920		897195		061997A
00000461	020-CLAYMAX200R	150	2075	3106	N7084076		897195		061997A
00000462	020-CLAYMAX200R	150	2075	3100	N7084076		897195		061997A
00000481	020-CLAYMAX200R	150	2075	3097	N7041052		884404		062097A
00000485	020-CLAYMAX200R	150	2075	3082	N7041052		884404		062097A
00000486	020-CLAYMAX200R	150	2075	3080	N7041052		884404		062097A
00000487	020-CLAYMAX200R	150	2075	3081	N7041052		884404		062097A
00000488	020-CLAYMAX200R	150	2075	3090	N7041052		884404		062097A
00000489	020-CLAYMAX200R	150	2075	3091	N7041052		884404		062097A
00000490	020-CLAYMAX200R	150	2075	3096	N7041052		884406		062097A
00000491	020-CLAYMAX200R	150	2075	3087	N7041052		884406		062097A
00000493	020-CLAYMAX200R	150	2075	3096	N7041052		884406		062097A

TOTAL SQUARE FEET..... 31,125

COLLOID ENVIRONMENTAL TECH --
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER NUMBER 0020599350

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199725020									
00000492	020-CLAYMAX200R	150	2075	3080	N7041052		884406		062097A
00000494	020-CLAYMAX200R	150	2075	3088	N7041052		884406		062097A
00000495	020-CLAYMAX200R	150	2075	3088	N7041052		884406		062097A
00000496	020-CLAYMAX200R	150	2075	3092	N7041052		884406		062097A
00000497	020-CLAYMAX200R	150	2075	3100	N7041052		884406		062097A
00000498	020-CLAYMAX200R	150	2075	3104	N7041052		884406		062097A
00000499	020-CLAYMAX200R	150	2075	3100	N7041052		884406		062097A
00000500	020-CLAYMAX200R	150	2075	3106	N7041052		884406		062097A
00000501	020-CLAYMAX200R	150	2075	3109	N7041052		884406		062097A
00000502	020-CLAYMAX200R	150	2075	3101	N7041052		884406		062097A
00000503	020-CLAYMAX200R	150	2075	3102	N7041052		884406		062097A
00000504	020-CLAYMAX200R	150	2075	3105	N7041052		884406		062097A
00000505	020-CLAYMAX200R	150	2075	3107	N7041052		884406		062097A
00000506	020-CLAYMAX200R	150	2075	3110	N7041052		884406		062097A
00000515	020-CLAYMAX200R	150	2075	3089	062097NWA		884406		062097A

TOTAL SQUARE FEET..... 31,125

TOTAL PAGES 1

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes. PQ JX3 1PF
514-929-1234

ATTENTION: S. Henes.

PROJECT: 102 nd. Street Landfill.

ORDER NUMBER: 59347. 59348. 59349. 59350

CETCO hereby affirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass per Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	75 lbs. (300 N)
Grab Elongation	ASTM D 4632	10 percent typical
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec.
Permeability	ASTM D 5084	5 x 10(-9) cm/sec.

Colloid Environmental Technologies Co. (CETCO)

Subscribed and sworn to before me this 23rd day of June 1997.

Susie Fink
Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ORDER # 00095934

MATERIAL	LOT NO.	ROLL NO.	BENTONITE MASS/AREA 0.75 lb sqft ASTM D 5993	PEAK PEEL STRENGTH 12% Typical ASTM D 4632	PEAK GRAB STRENGTH 25 lb min ASTM D 4632	MOISTURE CONTENT ASTM D 4643
020-CLAYMAX200R	199725020	00000429	.93	41.50	299.50	42.40
020-CLAYMAX200R	199725020	00000428	.93	41.50	299.50	42.40
020-CLAYMAX200R	199725020	00000427	.97	40.50	299.50	42.40
[illegible]	[illegible]	[illegible]				
020-CLAYMAX200R	199725020	00000422	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000421	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000420	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000419	.97	40.50	299.50	42.40
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020-CLAYMAX200R	199725020	00000417	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000414	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000413	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000412	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	00000411	.97	40.50	299.50	42.40
020-CLAYMAX200R	199725020	[illegible]	.97*	[illegible]	299.5	[illegible]

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

S. Henes,
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, PQ JX3 1PF
514-929-1234

Dear S. Henes,

ase find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to 102 nd. Street Landfill. These shipments left our CETCO - Lovell, Wy. plant on _____.

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Jim Olsta @ 1-800-527-9948.

Sincerely,

Susie Fink

Susie Fink
Quality Assurance

Printed on recycled paper.

GEOSYNTHETIC CLAY LINER

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: 102 nd. Street Landfill,

PREPARED FOR:
Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes, PQ JX3 1PF

Telephone # : 514-929-1234

PREPARED BY:
Susie Fink
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431

Telephone #: 800-322-1149
Fax # Office: (307)548-6413 Lab: (307)548-2747

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	102 nd. Street Landfill.
Prepared For:	Solmax Geosynthetics
Customer #:	400284
Order #:	59342. 59343. 59344. 59345. 59346

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. BENTONITE CLAY CERTIFICATION
3. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
4. GCL QA TRACKING FORM

DAILY CLAYMAX PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	102 nd. Street Landfill.
SHIP DATE:	
ORDER #:	59342. 59343. 59344. 59345. 59346
PRODUCT:	Claymax 200R

Colloid Environmental Technologies Company (**CETCO**) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 23rd day of June 1997.

Susie Fink
Notary-Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-31-2001

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: Colloid Environmental Technologies Co.

PRODUCTION

FACILITY: Colloid Environmental Technologies Co.
92 HWY. 37
Lovell, WY 82431

CONTACT: Jay Bischoff (800)-322-1159

BRAND NAME: CG-50

PRODUCTION DATE: 3.3.97

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: Solmax Geosynthetics DATE: 4/30/97

ATTN: S. Henes,

Customer:
The BENTONITE that is used to produce our GCL is CG 50 from **CETCO**, Order Number **See Below**

A sample of the CG 50 was tested from Lot Number 043097A and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 ML.S. 2g MIN.	**27.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.2**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.5**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: SF, KL

Approved By: **Susie Fink**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
59342, 59343, 59344, 59345, 59346

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL. WY 82431

TO: Solmax Geosynthetics DATE: 5/1/97

ATTN: S. Henes.

r Customer:
The BENTONITE that is used to produce our GCL is CG 50 from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number 050197A and was provided the following test results below

TEST	METHOD	REQ. SPECIFICATION	ROLL # ACTUAL	Daily Test RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT		**0.0**
Free Swell	ASTM D 5890	24 MLS. /2g MIN.		**30.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)		**14.0**
Moisture	ASTM D 2216	12.0 % (MAX)		**7.2**
Passing 200 Mesh	ASTM D 421	1 % (Max)		**0.8**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: SF, KL

Approved By: **Susie Fink**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
59342, 59343, 59344, 59345, 59346

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: Solmax Geosynthetics DATE: 6/2/97

ATTN: S. Henes,

Customer:
The BENTONITE that is used to produce our GCL is CG 50 from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number 060297A and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # ACTUAL RESULTS Daily Test
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. 2g MIN.	**24.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.6**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.8**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: SF, KL

Approved By: **Susie Fink**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
59342, 59343, 59344, 59345, 59346

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL. WY 82431

TO: Soimax Geosynthetics DATE: **6/19/97**

ATTN: S. Henes.

: Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **061997A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Test ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0.0**
Free Swell	ASTM D 5890	24 MLS. 2g MIN.	**24.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**11.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.4**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.7**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: SF, KL

Approved By: **Susie Fink**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
59342, 59343, 59344, **59345, 59346**

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

TO: Solmax Geosynthetics
2801 Boul Marie Victorin
Varennes PQ J3X 1PF
514-929-2234

ATTENTION: S. Henes.

PROJECT: 102 nd. Street Landfill.

ORDER NUMBER: 59342, 59343, 59344, 59345, 59346

CETCO hereby confirms and certifies that all of the Geosynthetic Clay Liner manufactured in this lot achieves the physical and chemical criteria listed below.

PROPERTY	TEST METHOD	MINIMUM VALUE
Bentonite Mass per Area	ASTM D 5993	.75 lb/sq.ft.
Grab Strength	ASTM D 4632	75 lbs. (300 N)
Grab Elongation	ASTM D 4632	10 percent typical
Index Flux	ASTM D 5887	1.0 x 10 (-8) cm(3)/cm(2)/sec.
Permeability	ASTM D 5084	5 x 10(-9) cm/sec.

Colloid Environmental Technologies Co. (CETCO)

Subscribed and sworn to before me this 23rd day of June 19 97.

Susie Fink
Notary Public

SUSIE FINK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

P O D E E # 000059343

MATERIAL	LOT No.	ROLL #	BENTOMAT MASS/AREA 0.75 lb/sqft ASTM D 5993	PEEL STRENGTH 12in Typical ASTM D 4632	GRAB STRENGTH lbs in warp ASTM D 4632	ELONGATION CONTENT ASTM D 4632
020-CLAYMAX200R	199725020	00000362	.93	37.50	268.30	47.00
020-CLAYMAX200R	199725020	00000361	.93	37.50	268.30	47.00
020-CLAYMAX200R	199725020	00000360	.93	37.5	268.30	47.0
020-CLAYMAX200R	199725020	00000359	.92	37.50	268.30	47.00
020-CLAYMAX200R	199725020	00000358	.92	37.50	268.30	47.00
020-CLAYMAX200R	199725020	00000357	.92	37.50	268.30	47.00
020-CLAYMAX200R	199725020	00000356	.92	37.50	268.30	47.00
020-CLAYMAX200R	199725020	00000355	.92	37.50	268.30	47.00
020-CLAYMAX200R	199725020	00000354	.92	37.50	268.30	47.00
020-CLAYMAX200R	199725020	00000353	.92	37.50	268.30	47.00
020-CLAYMAX200R	199725020	00000352	.92	37.5	268.3	47.0
020-CLAYMAX200R	199725020	00000351	.92	37.5	268.3	47.0
020-CLAYMAX200R	199725020	00000350	.92	37.50	268.30	47.00
020-CLAYMAX200R	199725020	00000349	.92	37.50	268.30	47.00
020-CLAYMAX200R	199723020	00000346	.92	37.5	268.3	47.0
020-CLAYMAX200R	199714020	00000345	.92	37.5	268.3	47.0
020-CLAYMAX200R	199718020	00000344	.92	37.5	268.3	47.0
020-CLAYMAX200R	199718020	00000226	1.07	46.10	268.30	47.00

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

QCG#FT2 QCT#FT2
8/15/97 10:28:43

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000062943

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB ELONGATION 10% Typical ASTM D 4632	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199732020	00028344	.95	15.00	120.50	27.00	24.00
020-BENTOMAT ST	199732020	00028139	.97	22.90	162.30	24.00	24.70
020-BENTOMAT ST	199732020	00028089	.94	22.90	162.30	24.40	25.20
020-BENTOMAT ST	199732020	00028088	.94	22.90	162.30	24.40	25.20
020-BENTOMAT ST	199732020	00028087	.94	22.90	162.30	24.40	25.20
020-BENTOMAT ST	199732020	00028086	.94	22.90	162.30	24.40	25.20
020-BENTOMAT ST	199732020	00028076	.95	38.00	193.60	28.60	23.90
020-BENTOMAT ST	199732020	00028007	.99	18.40	115.80	25.40	27.10
020-BENTOMAT ST	199732020	00028006	.99	18.40	115.80	25.40	27.10
020-BENTOMAT ST	199732020	00028005	.99	18.40	115.80	25.40	27.10
020-BENTOMAT ST	199732020	00028004	.99	18.40	115.80	25.40	27.10
020-BENTOMAT ST	199732020	00028003	.99	18.40	115.80	25.40	27.10
020-BENTOMAT ST	199732020	00028002	.99	18.40	115.80	25.40	27.10
020-BENTOMAT ST	199732020	00028001	.99	18.40	115.80	25.40	27.10
020-BENTOMAT ST	199732020	00028000	.99	18.40	115.80	25.40	27.10
020-BENTOMAT ST	199732020	00027999	.99	18.40	115.80	25.40	27.10

NOTE:
An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.

*** End of Report ***

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

P O R E # [illegible]

MATERIAL	LOT NO.	ROLL NO.	PEEL STRENGTH (MARV) 4.0 lb/in ASTM D 4632	MASS/AREA (MARV) 1.0 lb/sf Typical ASTM D 5993	GRAB (MARV) 90 lb Min ASTM D 4632	MOISTURE CONTENT (MARV) ASTM D [illegible]
020-CLAYMAX200R	199725020	[illegible]	.92	[illegible]	[illegible]	[illegible]
020-CLAYMAX200R	199725020	[illegible]	.92	[illegible]	[illegible]	[illegible]
020-CLAYMAX200R	199725020	[illegible]	.92	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
020-CLAYMAX200R	199725020	[illegible]	.92	[illegible]	[illegible]	[illegible]
020-CLAYMAX200R	199725020	00000343	.92	12.50	268.30	47.00
020-CLAYMAX200R	199725020	00000341	.92	13.80	256.50	48.80
020-CLAYMAX200R	199725020	00000340	.92	13.80	256.50	48.80
020-CLAYMAX200R	199725020	00000339	.92	13.80	256.50	48.80
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
020-CLAYMAX200R	199723020	00000207	.92	13.80	256.50	[illegible]
020-CLAYMAX200R	199718020	00000343	.96	12.60	231.90	41.20
020-CLAYMAX200R	199718020	00000342	.96*	12.60	231.90	41.20*
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 000059345

MATERIAL	LOT #	ROLL #	REINFORCE MASS/AREA 0.75 lb/sqft ASTM D 5993	PEEL STRENGTH 4 lb/in Typical ASTM D 4632	GRAB STRENGTH 75 lb min ASTM D 4632	GRAB ELONGATION ASTM D 4632
020-CLAYMAX200R	199725020	00000458	1.00	40.50	299.50	37.60
020-CLAYMAX200R	199725020	00000457	1.00	40.50	299.50	37.60
020-CLAYMAX200R	199725020	00000456	1.00	40.50	299.50	37.60
020-CLAYMAX200R	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
020-CLAYMAX200R	199725020	00000454	1.00	40.50	299.50	37.60
020-CLAYMAX200R	199725020	00000453	1.00	40.50	299.50	37.60
020-CLAYMAX200R	199725020	00000452	1.00	40.50	299.50	37.60
020-CLAYMAX200R	199725020	00000451	1.00	40.50	299.50	37.60
020-CLAYMAX200R	199725020	00000450	1.00	40.50	299.50	37.60
020-CLAYMAX200R	199725020	00000449	1.00	40.50	299.50	37.60
020-CLAYMAX200R	199725020	00000448	1.00	40.50	299.50	37.60
020-CLAYMAX200R	199725020	00000447	1.00	40.50	299.50	37.60
020-CLAYMAX200R	199725020	00000446	1.00	40.50	299.50	37.60
020-CLAYMAX200R	199725020	00000445	1.00	40.50	299.50	37.60
020-CLAYMAX200R	199725020	444	1.00	40.50	299.50	37.60

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

COLLOID ENVIRONMENTAL TECH CO
GCL QUALITY DATA

LOVELL, WY PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

O R D E R # 0210559346

MATERIAL	LOT NO.	ROLL NO	ROLL WIDTH MASS/AREA 3.75 lb sqft ASTM D 5993	GRAB ELONGATION 10% Typical ASTM D 4632	PEEL STRENGTH 20 lb/in ASTM D 4632	GRAB TENSILE ASTM D 4632
020-CLAYMAX200R	199725020	00000444	1.00	40.50	200.50	47.60
020-CLAYMAX200R	199725020	00000443	1.00	40.50	200.50	47.60
020-CLAYMAX200R	199725020	00000442	1.00	40.50	200.50	47.60
** CLAYMAX 1		11				
020-CLAYMAX200R	199725020	00000439	.92	40.50	200.50	47.60
020-CLAYMAX200R	199725020	00000438	.93	40.50	200.50	47.60
020-CLAYMAX200R	199725020	00000437	.93	40.50	200.50	47.60
020-CLAYMAX200R	199725020	00000436	.93	40.50	200.50	47.60
020-CLAYMAX200R	199725020	00000435	.93	40.50	200.50	47.60
020-CLAYMAX200R	199725020	00000434	.93	40.50	200.50	47.60
020-CLAYMAX200R	199725020	00000433	.93	40.50	200.50	47.60
020-CLAYMAX200R	199725020	00000432	.93	40.50	200.50	47.60
020-CLAYMAX200R	199725020	00000431	.93	40.50	200.50	47.60
020-CLAYMAX200R	199725020	00000430	.93	40.50	200.50	47.60
020-CLAYMAX200R	199725020	00000429	.93	40.50	200.50	47.60

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested. If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS [illegible]

ROLL#	MATERIAL	ROLL LENGTH	[illegible] FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	PLANT LOT#
LOT# 199725020									
00000342	020-CLAYMAX200R	150	2075	3116	177082925		911157		060297A
00000359	020-CLAYMAX200R	150	[illegible]	[illegible]	177082925		[illegible]2161		[illegible]
00000363	020-CLAYMAX200R	150	[illegible]	[illegible]	061897NWA		[illegible]2161		[illegible]
00000364	020-CLAYMAX200R	150	2075	3132	061897NWA		912161		060297A
00000365	020-CLAYMAX200R	150	2075	3097	061897NWA		912161		060297A
00000366	020-CLAYMAX200R	150	2075	3126	061897NWA		912161		060297A
00000367	020-CLAYMAX200R	150	2075	3088	061897NWA		912161		060297A
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]
00000369	020-CLAYMAX200R	150	2075	3087	061897NWA		912161		060297A
00000370	020-CLAYMAX200R	150	2075	3120	061897NWA		912161		060297A
00000371	020-CLAYMAX200R	150	2075	3086	061897NWA		912161		060297A
00000372	020-CLAYMAX200R	150	2075	3092	061897NWA		912161		060297A
00000373	020-CLAYMAX200R	150	2075	3117	061897NWA		912161		060297A
00000374	020-CLAYMAX200R	150	2075	3120	061897NWA		912161		060297A
00000375	020-CLAYMAX200R	150	2075	3132	061897NWA		912161		060297A
00000376	020-CLAYMAX200R	150	2075	3130	061897NWA		912161		060297A

TOTAL SQUARE FEET..... 33,200

QCG#TF1 QCT#TF1
6/23/97 6:50:41

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETC - LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP T : SMITH TECHNOLOGY
9829 BUFFALO AVE
[illegible]

[illegible]	[illegible]	LENGTH	FEET	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L T# 199718350								
00000226	020-CLAYMAX200R	150	2075	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	020-CLAYMAX200R	150	2075	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	020-CLAYMAX200R	150	2075	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L T# 199723020								
00000305	020-CLAYMAX200R	150	2075	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L T# 199725021								
00000349	020-CLAYMAX200R	150	2075	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	020-CLAYMAX200R	150	2075	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	020-CLAYMAX200R	150	2075	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
00000353	020-CLAYMAX200R	150	2075	3.89	177082925	[illegible]	[illegible]	060297A
00000354	020-CLAYMAX200R	150	2075	3076	177082925	912161		060297A
00000355	020-CLAYMAX200R	150	2075	3079	177082925	912161		060297A
00000356	020-CLAYMAX200R	150	2075	3082	177082925	912161		060297A
00000357	020-CLAYMAX200R	150	2075	3089	177082925	912161		060297A
00000358	020-CLAYMAX200R	150	2075	3077	177082925	912161		060297A
00000360	020-CLAYMAX200R	150	2075	3069	177082925	912161		060297A
00000361	020-CLAYMAX200R	150	2075	3075	177082925	912161		060297A
00000362	020-CLAYMAX200R	150	2075	3074	061897NWA	912161		060297A

TOTAL SQUARE FEET..... 35,275

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHE L ST
9829 BUFFALO AVE
NIAGARA FALLS NY

ROLL#	MATERIAL	ROLL LENGTH	ROLLED FEET	ROLL WEIGHT	MEASUREMENT TOP LOT#	MEASUREMENT TOP ROLL#	MEASUREMENT BOTTOM LOT#	MEASUREMENT BOTTOM ROLL#	CLAY LOT#
LOT# 199718020									
00000220	020-CLAYMAX200R	150	2075	2817	043097A		235792		043097A
00000223	020-CLAYMAX200R	15	2075	2854	043097A		235792		043097A
00000241	020-CLAYMAX200R	15	2075	2857	N7041032		241160		050197A
00000242	020-CLAYMAX200R	150	2075	2851	N7041032		241160		050197A
00000243	020-CLAYMAX200R	150	2075	2856	N7041032		241160		050197A
LOT# 199723020									
00000297	020-CLAYMAX200R	150	2075	2861	N7082921		268145		060297A
00000304	020-CLAYMAX200R	15	2075	2854	N7082921		268145		060297A
LOT# 199725020									
00000339	020-CLAYMAX200R	15	2075	3105	177082925		941157		060297A
00000340	020-CLAYMAX200R	150	2075	3112	177082925		941157		060297A
00000341	020-CLAYMAX200R	150	2075	3110	177082925		941157		060297A
00000343	020-CLAYMAX200R	150	2075	3118	177082925		941157		060297A
00000344	020-CLAYMAX200R	150	2075	3120	177082925		941157		060297A
00000345	020-CLAYMAX200R	150	2075	3124	177082925		941157		060297A
00000346	020-CLAYMAX200R	150	2075	3123	177082925		941157		060297A
00000347	020-CLAYMAX200R	150	2075	3127	177082925		941157		060297A
00000348	020-CLAYMAX200R	150	2075	3130	177082925		941157		060297A

TOTAL SQUARE FEET..... 33,200

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY #2421

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ROLL #	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	SUPPLIER'S LOT#	SUPPLIER'S ROLL #	CETCO TOP LOT#	CETCO BOTTOM ROLL#	CETCO LOT#
LOT# 19972502G									
00000441	020-CLAYMAX200R	150	2075	[illegible]	N7082920		897195		061997A
[illegible]	020-CLAYMAX200R	150	2075	[illegible]	[illegible]		[illegible]		[illegible]
00000446	020-CLAYMAX200R	150	2075	[illegible]	N7082920		[illegible]		[illegible]
00000447	020-CLAYMAX200R	150	2075	3110	N7082920		897195		061997A
00000448	020-CLAYMAX200R	150	2075	3109	N7082920		897195		061997A
00000449	020-CLAYMAX200R	150	2075	3113	N7082920		897195		061997A
00000450	020-CLAYMAX200R	150	2075	3115	N7082920		897195		061997A
[illegible]151	020-CLAYMAX200R	150	2075	[illegible]	[illegible] 2		[illegible]		[illegible]
00000452	020-CLAYMAX200R	150	2075	3121	N7082920		897195		061997A
00000453	020-CLAYMAX200R	150	2075	3124	N7082920		897195		061997A
00000454	020-CLAYMAX200R	150	2075	3126	N7082920		897195		061997A
00000455	020-CLAYMAX200R	150	2075	3129	N7082920		897195		061997A
00000456	020-CLAYMAX200R	150	2075	3127	N7082920		897195		061997A
00000457	020-CLAYMAX200R	150	2075	3124	N7082920		897195		061997A
00000458	020-CLAYMAX200R	150	2075	3120	N7082920		897195		061997A

TOTAL SQUARE FEET..... 31,125

QCG#TF1 QCT#TF1
6/23/97 6:51:10

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: SMITH TECHNOLOGY
9829 BUFFALO AVE
NIAGARA FALLS NY

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	GCL LOT#
LOT# 199725020									
00000425	020-CLAYMAX200R	150	2075	3116	N7082922		927167		061997A
00000430	020-CLAYMAX200R	150	2075	3082	N7082922		927167		061997A
00000431	020-CLAYMAX200R	150	2075	3078	N7082922		927167		061997A
00000432	020-CLAYMAX200R	150	2075	3076	N7082922		927167		061997A
00000433	020-CLAYMAX200R	150	2075	3073	N7082922		927167		061997A
00000434	020-CLAYMAX200R	150	2075	3074	N7082922		927167		061997A
00000435	020-CLAYMAX200R	150	2075	3070	N7082922		927167		061997A
00000436	020-CLAYMAX200R	150	2075	3081	N7082922		927167		061997A
00000437	020-CLAYMAX200R	150	2075	3079	N7082922		927167		061997A
00000438	020-CLAYMAX200R	150	2075	3074	N7082922		897195		061997A
00000439	020-CLAYMAX200R	150	2075	3079	N7082920		897195		061997A
00000440	020-CLAYMAX200R	150	2075	3081	N7082920		897195		061997A
00000442	020-CLAYMAX200R	150	2075	3084	N7082920		897195		061997A
00000443	020-CLAYMAX200R	150	2075	3091	N7082920		897195		061997A
00000444	020-CLAYMAX200R	150	2075	3096	N7082920		897195		061997A

TOTAL SQUARE FEET..... 31,125

GCL BILL OF LADINGS

- PACKING LIST -

COLLOID ENVIRONMENTAL TECH CO
0 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000059342
ORDER DATE: 6/16/97
SHIP DATE:. 6/19/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF	199725020	00000342	150.0	13.8	2074.5	3116.0
020-CLAYMAX200R		SFT	SF	199725020	00000359	150.0	13.8	2074.5	3097.0
020-CLAYMAX200R		SFT	SF	199725020	00000363	150.0	13.8	2074.5	3082.0
020-CLAYMAX200R		SFT	SF	199725020	00000364	150.0	13.8	2074.5	3102.0
0. LAYMAX200R		SFT	SF	199725020	00000365	150.0	13.8	2074.5	3097.0
020-CLAYMAX200R		SFT	SF	199725020	00000366	150.0	13.8	2074.5	3106.0
020-CLAYMAX200R		SFT	SF	199725020	00000367	150.0	13.8	2074.5	3099.0
020-CLAYMAX200R		SFT	SF	199725020	00000368	150.0	13.8	2074.5	3110.0
020-CLAYMAX200R		SFT	SF	199725020	00000369	150.0	13.8	2074.5	3097.0
020-CLAYMAX200R		SFT	SF	199725020	00000370	150.0	13.8	2074.5	3100.0
020-CLAYMAX200R		SFT	SF	199725020	00000371	150.0	13.8	2074.5	3086.0
020-CLAYMAX200R		SFT	SF	199725020	00000372	150.0	13.8	2074.5	3092.0
020-CLAYMAX200R		SFT	SF	199725020	00000373	150.0	13.8	2074.5	3117.0
020-CLAYMAX200R		SFT	SF	199725020	00000374	150.0	13.8	2074.5	3120.0
020-CLAYMAX200R		SFT	SF	199725020	00000375	150.0	13.8	2074.5	3132.0
020-CLAYMAX200R		SFT	SF	199725020	00000376	150.0	13.8	2074.5	3130.0

DER TOTALS..... 33192.0 49683.0

TOTAL ITEMS..... 16

PACKING LIST

LLOID ENVIRONMENTAL TECH CO
WEST SHURE DRIVE
NGTON HEIGHTS IL 60004

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

VARENNES PQ JX3 1PF

ORDER NO:.. 000059343
ORDER DATE: 6/16/97
SHIP DATE:. 6/19/97

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R	SFT SF	199718020	00000226	150.0	13.8	2074.5	2862.0
020-CLAYMAX200R	SFT SF	199718020	00000236	150.0	13.8	2074.5	2765.0
020-CLAYMAX200R	SFT SF	199718020	00000237	150.0	13.8	2074.5	2746.0
020-CLAYMAX200R	SFT SF	199723020	00000305	150.0	13.8	2074.5	2867.0
02 LAYMAX200R	SFT SF	199725020	00000349	150.0	13.8	2074.5	3129.0
020-CLAYMAX200R	SFT SF	199725020	00000350	150.0	13.8	2074.5	3117.0
020-CLAYMAX200R	SFT SF	199725020	00000351	150.0	13.8	2074.5	3110.0
020-CLAYMAX200R	SFT SF	199725020	00000352	150.0	13.8	2074.5	3101.0
020-CLAYMAX200R	SFT SF	199725020	00000353	150.0	13.8	2074.5	3089.0
020-CLAYMAX200R	SFT SF	199725020	00000354	150.0	13.8	2074.5	3076.0
020-CLAYMAX200R	SFT SF	199725020	00000355	150.0	13.8	2074.5	3079.0
020-CLAYMAX200R	SFT SF	199725020	00000356	150.0	13.8	2074.5	3082.0
020-CLAYMAX200R	SFT SF	199725020	00000357	150.0	13.8	2074.5	3089.0
020-CLAYMAX200R	SFT SF	199725020	00000358	150.0	13.8	2074.5	3077.0
020-CLAYMAX200R	SFT SF	199725020	00000360	150.0	13.8	2074.5	3069.0
020-CLAYMAX200R	SFT SF	199725020	00000361	150.0	13.8	2074.5	3075.0
020-CLAYMAX200R	SFT SF	199725020	00000362	150.0	13.8	2074.5	3074.0
						========	========
ORDER TOTALS.....						35266.5	51407.0
TOTAL ITEMS.....	17						

Eric Green

PACKING LIST

,LOID ENVIRONMENTAL TECH CO
;0 WEST SHURE DRIVE
,INGTON HEIGHTS IL 60004

ORDER NO:.. 000059344
ORDER DATE: 6/16/97
SHIP DATE:. 6/19/97

,LD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

400284

)DUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
CLAYMAX200R		SFT	SF 199718020	00000220	150.0	13.8	2074.5	2817.0
CLAYMAX200R		SFT	SF 199718020	00000223	150.0	13.8	2074.5	2804.0
CLAYMAX200R		SFT	SF 199718020	00000241	150.0	13.8	2074.5	2867.0
CLAYMAX200R		SFT	SF 199718020	00000242	150.0	13.8	2074.5	2851.0
CLAYMAX200R		SFT	SF 199718020	00000243	150.0	13.8	2074.5	2856.0
CL AX200R		SFT	SF 199723020	00000297	150.0	13.8	2074.5	2861.0
CLAYMAX200R		SFT	SF 199723020	00000304	150.0	13.8	2074.5	2864.0
CLAYMAX200R		SFT	SF 199725020	00000339	150.0	13.8	2074.5	3106.0
CLAYMAX200R		SFT	SF 199725020	00000340	150.0	13.8	2074.5	3112.0
CLAYMAX200R		SFT	SF 199725020	00000341	150.0	13.8	2074.5	3110.0
CLAYMAX200R		SFT	SF 199725020	00000343	150.0	13.8	2074.5	3118.0
CLAYMAX200R		SFT	SF 199725020	00000344	150.0	13.8	2074.5	3120.0
CLAYMAX200R		SFT	SF 199725020	00000345	150.0	13.8	2074.5	3124.0
CLAYMAX200R		SFT	SF 199725020	00000346	150.0	13.8	2074.5	3123.0
CLAYMAX200R		SFT	SF 199725020	00000347	150.0	13.8	2074.5	3127.0
CLAYMAX200R		SFT	SF 199725020	00000348	150.0	13.8	2074.5	3130.0

)RDER TOTALS..... 33192.0 47990.0

:OT? ITEMS..... 16

Eric Green

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
LINGTON HEIGHTS IL 60004

ORDER NO:.. 000059345
ORDER DATE: 6/16/97
SHIP DATE:. 6/20/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R	SFT	SF	199725020	00000441	150.0	13.8	2074.5	3080.0
020-CLAYMAX200R	SFT	SF	199725020	00000445	150.0	13.8	2074.5	3094.0
020-CLAYMAX200R	SFT	SF	199725020	00000446	150.0	13.8	2074.5	3107.0
020-CLAYMAX200R	SFT	SF	199725020	00000447	150.0	13.8	2074.5	3110.0
-CLAYMAX200R	SFT	SF	199725020	00000448	150.0	13.8	2074.5	3109.0
020-CLAYMAX200R	SFT	SF	199725020	00000449	150.0	13.8	2074.5	3113.0
020-CLAYMAX200R	SFT	SF	199725020	00000450	150.0	13.8	2074.5	3119.0
020-CLAYMAX200R	SFT	SF	199725020	00000451	150.0	13.8	2074.5	3122.0
020-CLAYMAX200R	SFT	SF	199725020	00000452	150.0	13.8	2074.5	3121.0
020-CLAYMAX200R	SFT	SF	199725020	00000453	150.0	13.8	2074.5	3124.0
020-CLAYMAX200R	SFT	SF	199725020	00000454	150.0	13.8	2074.5	3126.0
020-CLAYMAX200R	SFT	SF	199725020	00000455	150.0	13.8	2074.5	3129.0
020-CLAYMAX200R	SFT	SF	199725020	00000456	150.0	13.8	2074.5	3127.0
020-CLAYMAX200R	SFT	SF	199725020	00000457	150.0	13.8	2074.5	3124.0
020-CLAYMAX200R	SFT	SF	199725020	00000458	150.0	13.8	2074.5	3120.0
						ORDER TOTALS.....	31117.5	46725.0

TOTAL ITEMS..... 15

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000059346
ORDER DATE: 6/16/97
SHIP DATE:. 6/20/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R	SFT	SF	199725020 C.S.	00000425	150.0	13.8	2074.5	3116.0
020-CLAYMAX200R	SFT	SF	199725020	00000430	150.0	13.8	2074.5	3082.0
020-CLAYMAX200R	SFT	SF	199725020	00000431	150.0	13.8	2074.5	3078.0
020-CLAYMAX200R	SFT	SF	199725020	00000432	150.0	13.8	2074.5	3076.0
02 CLAYMAX200R	SFT	SF	199725020	00000433	150.0	13.8	2074.5	3073.0
020-CLAYMAX200R	SFT	SF	199725020	00000434	150.0	13.8	2074.5	3074.0
020-CLAYMAX200R	SFT	SF	199725020	00000435	150.0	13.8	2074.5	3070.0
020-CLAYMAX200R	SFT	SF	199725020	00000436	150.0	13.8	2074.5	3081.0
020-CLAYMAX200R	SFT	SF	199725020	00000437	150.0	13.8	2074.5	3078.0
020-CLAYMAX200R	SFT	SF	199725020	00000438	150.0	13.8	2074.5	3074.0
020-CLAYMAX200R	SFT	SF	199725020	00000439	150.0	13.8	2074.5	3079.0
020-CLAYMAX200R	SFT	SF	199725020	00000440	150.0	13.8	2074.5	3081.0
020-CLAYMAX200R	SFT	SF	199725020	00000442	150.0	13.8	2074.5	3084.0
020-CLAYMAX200R	SFT	SF	199725020	00000443	150.0	13.8	2074.5	3091.0
020-CLAYMAX200R	SFT	SF	199725020	00000444	150.0	13.8	2074.5	3096.0

ORDER TOTALS..... 31117.5 46233.0

TOTAL ITEMS..... 15

Eric Green

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000059347
ORDER DATE: 6/16/97
SHIP DATE:. 6/20/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R	SFT	SF	199725020	00000409	150.0	13.8	2074.5	3115.0
020-CLAYMAX200R	SFT	SF	199725020	00000411	150.0	13.8	2074.5	3098.0
020-CLAYMAX200R	SFT	SF	199725020	00000412	150.0	13.8	2074.5	3087.0
020-CLAYMAX200R	SFT	SF	199725020	00000413	150.0	13.8	2074.5	3082.0
0 CLAYMAX200R	SFT	SF	199725020	00000414	150.0	13.8	2074.5	3089.0
020-CLAYMAX200R	SFT	SF	199725020	00000417	150.0	13.8	2074.5	3100.0
020-CLAYMAX200R	SFT	SF	199725020	00000418	150.0	13.8	2074.5	3102.0
020-CLAYMAX200R	SFT	SF	199725020	00000419	150.0	13.8	2074.5	3100.0
020-CLAYMAX200R	SFT	SF	199725020	00000420	150.0	13.8	2074.5	3097.0
020-CLAYMAX200R	SFT	SF	199725020	00000421	150.0	13.8	2074.5	3100.0
020-CLAYMAX200R	SFT	SF	199725020	00000422	150.0	13.8	2074.5	3091.0
020-CLAYMAX200R	SFT	SF	199725020	00000423	150.0	13.8	2074.5	3102.0
020-CLAYMAX200R	SFT	SF	199725020	00000424	150.0	13.8	2074.5	3105.0
020-CLAYMAX200R	SFT	SF	199725020	00000428	150.0	13.8	2074.5	3105.0
020-CLAYMAX200R	SFT	SF	199725020	00000429	150.0	13.8	2074.5	3099.0

Eric Green

ORDER TOTALS..... 31117.5 46472.0

TOTAL ITEMS..... 15

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
LINGTON HEIGHTS IL 60004

ORDER NO:.. 000059348
ORDER DATE: 6/16/97
SHIP DATE:. 6/21/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
			6.5.					
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000507	150.0	13.8	2074.5	3111.0
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000508	150.0	13.8	2074.5	3113.0
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000509	150.0	13.8	2074.5	3116.0
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000510	150.0	13.8	2074.5	3112.0
CLAYMAX200R		SFT	SF 199725020 ✓	00000511	150.0	13.8	2074.5	3108.0
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000512	150.0	13.8	2074.5	3101.0
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000513	150.0	13.8	2074.5	3097.0
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000514	150.0	13.8	2074.5	3086.0
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000516	150.0	13.8	2074.5	3092.0
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000517	150.0	13.8	2074.5	3099.0
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000518	150.0	13.8	2074.5	3100.0
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000519	150.0	13.8	2074.5	3109.0
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000520	150.0	13.8	2074.5	3110.0
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000521	150.0	13.8	2074.5	3116.0
020-CLAYMAX200R		SFT	SF 199725020 ✓	00000523	150.0	13.8	2074.5	3120.0
ORDER TOTALS.....							31117.5	46590.0
TOTAL ITEMS.....			15					

Gordon Shanks

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
'.INGTON HEIGHTS IL 60004

ORDER NO:.. 000059349
ORDER DATE: 6/16/97
SHIP DATE:. 6/21/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF	199725020 ✓ 6.5.	00000403	150.0	13.8	2074.5	3126.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000415	150.0	13.8	2074.5	3109.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000416	150.0	13.8	2074.5	3101.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000459	150.0	13.8	2074.5	3012.0
0- CLAYMAX200R		SFT	SF	199725020 ✓	00000461	150.0	13.8	2074.5	3106.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000462	150.0	13.8	2074.5	3100.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000481	150.0	13.8	2074.5	3097.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000485	150.0	13.8	2074.5	3082.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000486	150.0	13.8	2074.5	3080.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000487	150.0	13.8	2074.5	3081.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000488	150.0	13.8	2074.5	3090.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000489	150.0	13.8	2074.5	3091.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000490	150.0	13.8	2074.5	3096.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000491	150.0	13.8	2074.5	3087.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000493	150.0	13.8	2074.5	3096.0

ORDER TOTALS..... 31117.5 46354.0

TOTAL ITEMS..... 15

Gordon Thomas

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000059350
ORDER DATE: 6/16/97
SHIP DATE:. 6/21/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF	199725020	00000492	150.0	13.8	2074.5	3080.0
020-CLAYMAX200R		SFT	SF	199725020	00000494	150.0	13.8	2074.5	3088.0
020-CLAYMAX200R		SFT	SF	199725020	00000495	150.0	13.8	2074.5	3088.0
020-CLAYMAX200R		SFT	SF	199725020	00000496	150.0	13.8	2074.5	3092.0
020-CLAYMAX200R		SFT	SF	199725020	00000497	150.0	13.8	2074.5	3100.0
020-CLAYMAX200R		SFT	SF	199725020	00000498	150.0	13.8	2074.5	3104.0
020-CLAYMAX200R		SFT	SF	199725020	00000499	150.0	13.8	2074.5	3100.0
020-CLAYMAX200R		SFT	SF	199725020	00000500	150.0	13.8	2074.5	3106.0
020-CLAYMAX200R		SFT	SF	199725020	00000501	150.0	13.8	2074.5	3109.0
020-CLAYMAX200R		SFT	SF	199725020	00000502	150.0	13.8	2074.5	3101.0
020-CLAYMAX200R		SFT	SF	199725020	00000503	150.0	13.8	2074.5	3102.0
020-CLAYMAX200R		SFT	SF	199725020	00000504	150.0	13.8	2074.5	3105.0
020-CLAYMAX200R		SFT	SF	199725020	00000505	150.0	13.8	2074.5	3107.0
020-CLAYMAX200R		SFT	SF	199725020	00000506	150.0	13.8	2074.5	3110.0
020-CLAYMAX200R		SFT	SF	199725020	00000515	150.0	13.8	2074.5	3089.0

ORDER TOTALS..... 31117.5 46481.0

TOTAL ITEMS..... 15

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
LINGTON HEIGHTS IL 60004

ORDER NO:.. 000059351
ORDER DATE: 6/16/97
SHIP DATE:. 6/23/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF	199722020 ✓ 00000279	150.0	13.8	2074.5	2872.0
020-CLAYMAX200R		SFT	SF	199725020 ✓ 00000377	150.0	13.8	2074.5	3120.0
020-CLAYMAX200R		SFT	SF	199725020 ✓ 00000379	150.0	13.8	2074.5	3110.0
020-CLAYMAX200R		SFT	SF	199725020 ✓ 00000391	150.0	13.8	2074.5	3116.0
CLAYMAX200R		SFT	SF	199725020 ✓ 00000392	150.0	13.8	2074.5	3110.0
020-CLAYMAX200R		SFT	SF	199725020 ✓ 00000463	150.0	13.8	2074.5	3106.0
020-CLAYMAX200R		SFT	SF	199725020 ✓ 00000464	150.0	13.8	2074.5	3107.0
020-CLAYMAX200R		SFT	SF	199725020 ✓ 00000465	150.0	13.8	2074.5	3110.0
020-CLAYMAX200R		SFT	SF	199725020 ✓ 00000466	150.0	13.8	2074.5	3111.0
020-CLAYMAX200R		SFT	SF	199725020 ✓ 00000467	150.0	13.8	2074.5	3113.0
020-CLAYMAX200R		SFT	SF	199725020 ✓ 00000468	150.0	13.8	2074.5	3116.0
020-CLAYMAX200R		SFT	SF	199725020 ✓ 00000469	150.0	13.8	2074.5	3112.0
020-CLAYMAX200R		SFT	SF	199725020 ✓ 00000470	150.0	13.8	2074.5	3123.0
020-CLAYMAX200R		SFT	SF	199725020 ✓ 00000522	150.0	13.8	2074.5	3120.0
020-CLAYMAX200R		SFT	SF	199725020 ✓ 00000524	150.0	13.8	2074.5	3122.0
ORDER TOTALS.....							31117.5	46468.0
TOTAL ITEMS.....			15					

Gordon Shands

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000059352
ORDER DATE: 6/16/97
SHIP DATE:. 6/23/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

VARENNES PQ JX3 1PF

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000394	150.0	13.8	2074.5	3089.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000395	150.0	13.8	2074.5	3089.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000397	150.0	13.8	2074.5	3106.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000398	150.0	13.8	2074.5	3100.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000399	150.0	13.8	2074.5	3101.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000400	150.0	13.8	2074.5	3107.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000401	150.0	13.8	2074.5	3110.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000402	150.0	13.8	2074.5	3119.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000460	150.0	13.8	2074.5	3101.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000471	150.0	13.8	2074.5	3110.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000472	150.0	13.8	2074.5	3107.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000473	150.0	13.8	2074.5	3104.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000474	150.0	13.8	2074.5	3100.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000475	150.0	13.8	2074.5	3092.0
020-CLAYMAX200R		SFT	SF	199725020 ✓	00000476	150.0	13.8	2074.5	3104.0

ORDER TOTALS..... 31117.5 46539.0

TOTAL ITEMS..... 15

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
LINGTON HEIGHTS IL 60004

ORDER NO:.. 000059353
ORDER DATE: 6/16/97
SHIP DATE:. 6/23/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

VARENNES PQ JX3 1PF

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R	SFT	SF	199725020 G.S. ✓	00000393	150.0	13.8	2074.5	3087.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000396	150.0	13.8	2074.5	3107.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000404	150.0	13.8	2074.5	3132.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000405	150.0	13.8	2074.5	3128.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000406	150.0	13.8	2074.5	3129.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000407	150.0	13.8	2074.5	3121.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000408	150.0	13.8	2074.5	3117.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000410	150.0	13.8	2074.5	3109.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000477	150.0	13.8	2074.5	3102.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000478	150.0	13.8	2074.5	3104.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000479	150.0	13.8	2074.5	3107.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000480	150.0	13.8	2074.5	3101.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000482	150.0	13.8	2074.5	3091.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000483	150.0	13.8	2074.5	3087.0
020-CLAYMAX200R	SFT	SF	199725020 ✓	00000484	150.0	13.8	2074.5	3088.0
ORDER TOTALS.....							31117.5	46610.0
TOTAL ITEMS.....			15					

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000059661
ORDER DATE: 6/19/97
SHIP DATE:. 6/24/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF	199725020	00025324	150.0	15.0	2250.0	2990.0
020-BENTOMAT ST		SFT	SF	199725020	00025325	150.0	15.0	2250.0	2997.0
020-BENTOMAT ST		SFT	SF	199725020	00025326	150.0	15.0	2250.0	3000.0
020-BENTOMAT ST		SFT	SF	199725020	00025327	150.0	15.0	2250.0	3016.0
0 BENTOMAT ST		SFT	SF	199725020	00025328	150.0	15.0	2250.0	3013.0
020-BENTOMAT ST		SFT	SF	199726020	00025380	150.0	15.0	2250.0	2832.0
020-BENTOMAT ST		SFT	SF	199726020	00025382	150.0	15.0	2250.0	2899.0
020-CLAYMAX200R		SFT	SF	199725020	00000378	150.0	13.8	2074.5	3115.0
020-CLAYMAX200R		SFT	SF	199725020	00000380	150.0	13.8	2074.5	3107.0
020-CLAYMAX200R		SFT	SF	199725020	00000381	150.0	13.8	2074.5	3098.0
020-CLAYMAX200R		SFT	SF	199725020	00000382	150.0	13.8	2074.5	3099.0
020-CLAYMAX200R		SFT	SF	199725020	00000383	150.0	13.8	2074.5	3101.0
020-CLAYMAX200R		SFT	SF	199725020	00000387	150.0	13.8	2074.5	3108.0
020-CLAYMAX200R		SFT	SF	199725020	00000388	150.0	13.8	2074.5	3086.0
020-CLAYMAX200R		SFT	SF	199725020	00000389	150.0	13.8	2074.5	2102.0
020-CLAYMAX200R		SFT	SF	199725020	00000390	150.0	13.8	2074.5	3117.0
ORDER TOTALS.....								34420.5	47680.0

TOTAL ITEMS..... 16

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
P NGTON HEIGHTS IL 60004

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

VARENNES PQ JX3 1PF

ORDER NO:.. 000059662
ORDER DATE: 6/19/97
SHIP DATE:. 6/26/97

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF	199726020	00025744	150.0	15.0	2250.0	3007.0
020-BENTOMAT ST		SFT	SF	199726020	00025749	150.0	15.0	2250.0	2975.0
020-BENTOMAT ST		SFT	SF	199726020	00025750	150.0	15.0	2250.0	2968.0
020-BENTOMAT ST		SFT	SF	199726020	00025751	150.0	15.0	2250.0	2979.0
02 BENTOMAT ST		SFT	SF	199726020	00025752	150.0	15.0	2250.0	2977.0
020-BENTOMAT ST		SFT	SF	199726020	00025753	150.0	15.0	2250.0	2969.0
020-BENTOMAT ST		SFT	SF	199726020	00025781	150.0	15.0	2250.0	3000.0
020-BENTOMAT ST		SFT	SF	199726020	00025782	150.0	15.0	2250.0	2999.0
020-BENTOMAT ST		SFT	SF	199726020	00025783	150.0	15.0	2250.0	2992.0
020-BENTOMAT ST		SFT	SF	199726020	00025785	150.0	15.0	2250.0	3006.0
020-BENTOMAT ST		SFT	SF	199726020	00025786	150.0	15.0	2250.0	3007.0
020-BENTOMAT ST		SFT	SF	199726020	00025787	150.0	15.0	2250.0	2995.0
020-BENTOMAT ST		SFT	SF	199726020	00025790	150.0	15.0	2250.0	2993.0
020-BENTOMAT ST		SFT	SF	199726020	00025791	150.0	15.0	2250.0	2978.0
020-BENTOMAT ST		SFT	SF	199726020	00025792	150.0	15.0	2250.0	3004.0
							33750.0	44849.0

ORDER TOTALS.....

TOTAL ITEMS..... 15

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000062390
ORDER DATE: 7/28/97
SHIP DATE:. 7/29/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
					G.S.			
020-CLAYMAX200R		SFT	SF 199731020	00000950	150.0	13.8	2074.5	2824.0
020-CLAYMAX200R		SFT	SF 199731020	00000951	150.0	13.8	2074.5	2840.0
020-CLAYMAX200R		SFT	SF 199731020	00000965	150.0	13.8	2074.5	2894.0
020-CLAYMAX200R		SFT	SF 199731020	00000997	150.0	13.8	2074.5	2890.0
0 CLAYMAX200R		SFT	SF 199731020	00000998	150.0	13.8	2074.5	2876.0
020-CLAYMAX200R		SFT	SF 199731020	00001000	150.0	13.8	2074.5	2848.0
020-CLAYMAX200R		SFT	SF 199731020	00001001	150.0	13.8	2074.5	2836.0
020-CLAYMAX200R		SFT	SF 199731020	00001005	150.0	13.8	2074.5	2895.0
020-CLAYMAX200R		SFT	SF 199731020	00001006	150.0	13.8	2074.5	2839.0
020-CLAYMAX200R		SFT	SF 199731020	00001007	150.0	13.8	2074.5	2860.0
020-CLAYMAX200R		SFT	SF 199731020	00001008	150.0	13.8	2074.5	2865.0
020-CLAYMAX200R		SFT	SF 199731020	00001009	150.0	13.8	2074.5	2863.0
020-CLAYMAX200R		SFT	SF 199731020	00001010	150.0	13.8	2074.5	2846.0
020-CLAYMAX200R		SFT	SF 199731020	00001011	150.0	13.8	2074.5	2877.0
020-CLAYMAX200R		SFT	SF 199731020	00001012	150.0	13.8	2074.5	2851.0
020-CLAYMAX200R		SFT	SF 199731020	00001013	150.0	13.8	2074.5	2948.0

DER TOTALS.....	33192.0	45852.0
TOTAL ITEMS..... 16		

Recieved 8/4/97 Gordon Shaw

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1250 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000062391
ORDER DATE: 7/28/97
SHIP DATE:. 7/29/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400284

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF	199730020	00000807	150.0	13.8	2074.5	3129.0
020-CLAYMAX200R		SFT	SF	199730020	00000808	150.0	13.8	2074.5	3132.0
020-CLAYMAX200R		SFT	SF	199730020	00000809	150.0	13.8	2074.5	3148.0
020-CLAYMAX200R		SFT	SF	199730020	00000835	150.0	13.8	2074.5	3154.0
020-CLAYMAX200R		SFT	SF	199730020	00000841	150.0	13.8	2074.5	3152.0
020-CLAYMAX200R		SFT	SF	199730020	00000842	150.0	13.8	2074.5	3150.0
020-CLAYMAX200R		SFT	SF	199731020	00000946	150.0	13.8	2074.5	2830.0
020-CLAYMAX200R		SFT	SF	199731020	00000947	150.0	13.8	2074.5	2841.0
020-CLAYMAX200R		SFT	SF	199731020	00000948	150.0	13.8	2074.5	2835.0
020-CLAYMAX200R		SFT	SF	199731020	00000949	150.0	13.8	2074.5	2816.0
020-CLAYMAX200R		SFT	SF	199731020	00000952	150.0	13.8	2074.5	2852.0
020-CLAYMAX200R		SFT	SF	199731020	00000966	150.0	13.8	2074.5	2930.0
020-CLAYMAX200R		SFT	SF	199731020	00000967	150.0	13.8	2074.5	2847.0
020-CLAYMAX200R		SFT	SF	199731020	00000968	150.0	13.8	2074.5	2842.0
020-CLAYMAX200R		SFT	SF	199731020	00000969	150.0	13.8	2074.5	2858.0
020-CLAYMAX200R		SFT	SF	199731020	00000970	150.0	13.8	2074.5	2914.0

ORDER TOTALS.....		33192.0	47430.0
TOTAL ITEMS.....	16		

Recieved 8/4/97 Gordon Shaw

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000062928
ORDER DATE: 8/01/97
SHIP DATE:. 8/05/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF	199732020	00027788	150.0	15.0	2250.0	2933.0
020-BENTOMAT ST		SFT	SF	199732020	00027806	150.0	15.0	2250.0	2901.0
020-BENTOMAT ST		SFT	SF	199732020	00027807	150.0	15.0	2250.0	2923.0
020-BENTOMAT ST		SFT	SF	199732020	00027808	150.0	15.0	2250.0	2902.0
02 BENTOMAT ST		SFT	SF	199732020	00027809	150.0	15.0	2250.0	2899.0
020-BENTOMAT ST		SFT	SF	199732020	00027810	150.0	15.0	2250.0	2887.0
020-BENTOMAT ST		SFT	SF	199732020	00027811	150.0	15.0	2250.0	2893.0
020-BENTOMAT ST		SFT	SF	199732020	00027812	150.0	15.0	2250.0	2875.0
020-BENTOMAT ST		SFT	SF	199732020	00027813	150.0	15.0	2250.0	2866.0
020-BENTOMAT ST		SFT	SF	199732020	00027814	150.0	15.0	2250.0	2893.0
020-BENTOMAT ST		SFT	SF	199732020	00027815	150.0	15.0	2250.0	2852.0
020-BENTOMAT ST		SFT	SF	199732020	00027816	150.0	15.0	2250.0	2848.0
020-BENTOMAT ST		SFT	SF	199732020	00027817	150.0	15.0	2250.0	2851.0
020-BENTOMAT ST		SFT	SF	199732020	00027818	150.0	15.0	2250.0	2870.0
020-BENTOMAT ST		SFT	SF	199732020	00027819	150.0	15.0	2250.0	2851.0
020-BENTOMAT ST		SFT	SF	199732020	00027820	150.0	15.0	2250.0	2837.0
ORDER TOTALS.....								36000.0	46081.0
TOTAL ITEMS.....				16					

Gordon 8/8/97

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
'LINGTON HEIGHTS IL 60004

ORDER NO:.. 000062929
ORDER DATE: 8/01/97
SHIP DATE:. 8/11/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF 199732020	√00001266	150.0	13.8	2074.5	2920.0
020-CLAYMAX200R		SFT	SF 199732020	√00001269	150.0	13.8	2074.5	2893.0
020-CLAYMAX200R		SFT	SF 199732020	√00001270	150.0	13.8	2074.5	2895.0
020-CLAYMAX200R		SFT	SF 199732020	√00001271	150.0	13.8	2074.5	2970.0
0 CLAYMAX200R		SFT	SF 199732020	√00001272	150.0	13.8	2074.5	2960.0
020-CLAYMAX200R		SFT	SF 199732020	√00001273	150.0	13.8	2074.5	2902.0
020-CLAYMAX200R		SFT	SF 199732020	√00001277	150.0	13.8	2074.5	2853.0
020-CLAYMAX200R		SFT	SF 199732020	√00001279	150.0	13.8	2074.5	2895.0
020-CLAYMAX200R		SFT	SF 199732020	√00001280	150.0	13.8	2074.5	2940.0
020-CLAYMAX200R		SFT	SF 199732020	√00001281	150.0	13.8	2074.5	2937.0
020-CLAYMAX200R		SFT	SF 199732020	√00001282	150.0	13.8	2074.5	2884.0
020-CLAYMAX200R		SFT	SF 199732020	√00001283	150.0	13.8	2074.5	2881.0
020-CLAYMAX200R		SFT	SF 199732020	√00001284	150.0	13.8	2074.5	2877.0
020-CLAYMAX200R		SFT	SF 199732020	√00001285	150.0	13.8	2074.5	2897.0
020-CLAYMAX200R		SFT	SF 199732020	√00001287	150.0	13.8	2074.5	2876.0
020-CLAYMAX200R		SFT	SF 199732020	√00001288	150.0	13.8	2074.5	2964.0

'RDER TOTALS..... 33192.0 46544.0

'TOTAL ITEMS..... 16

Recieved 8/14/97

P A C K I_N G L I S T

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000062931
ORDER DATE: 8/01/97
SHIP DATE:. 8/05/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF 199731020	00001146	150.0	13.8	2074.5	2800.0
020-CLAYMAX200R		SFT	SF 199731020	00001151	150.0	13.8	2074.5	2880.0
020-CLAYMAX200R		SFT	SF 199731020	00001152	150.0	13.8	2074.5	2876.0
020-CLAYMAX200R		SFT	SF 199731020	00001170	150.0	13.8	2074.5	2887.0
CLAYMAX200R		SFT	SF 199731020	00001172	150.0	13.8	2074.5	2941.0
020-CLAYMAX200R		SFT	SF 199731020	00001173	150.0	13.8	2074.5	2921.0
020-CLAYMAX200R		SFT	SF 199731020	00001174	150.0	13.8	2074.5	2904.0
020-CLAYMAX200R		SFT	SF 199731020	00001175	150.0	13.8	2074.5	2914.0
020-CLAYMAX200R		SFT	SF 199731020	00001176	150.0	13.8	2074.5	2889.0
020-CLAYMAX200R		SFT	SF 199731020	00001177	150.0	13.8	2074.5	2975.0
020-CLAYMAX200R		SFT	SF 199732020	00001207	150.0	13.8	2074.5	2905.0
020-CLAYMAX200R		SFT	SF 199732020	00001208	150.0	13.8	2074.5	2900.0
020-CLAYMAX200R		SFT	SF 199732020	00001209	150.0	13.8	2074.5	2896.0
020-CLAYMAX200R		SFT	SF 199732020	00001210	150.0	13.8	2074.5	2854.0
020-CLAYMAX200R		SFT	SF 199732020	00001215	150.0	13.8	2074.5	2857.0
020-CLAYMAX200R		SFT	SF 199732020	00001216	150.0	13.8	2074.5	2859.0
RDER TOTALS.....							33192.0	46258.0

TOTAL ITEMS..... 16

Gordon Shaw
8/8/97

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1250 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000062934
ORDER DATE: 8/01/97
SHIP DATE:. 8/04/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF	199731020 G.S. X00001097	150.0	13.8	2074.5	2798.0
020-CLAYMAX200R		SFT	SF	199731020 X00001102	150.0	13.8	2074.5	2754.0
020-CLAYMAX200R		SFT	SF	199731020 X00001103	150.0	13.8	2074.5	2771.0
020-CLAYMAX200R		SFT	SF	199731020 X00001104	150.0	13.8	2074.5	2782.0
02 LAYMAX200R		SFT	SF	199731020 X00001105	150.0	13.8	2074.5	2751.0
020-CLAYMAX200R		SFT	SF	199731020 X00001106	150.0	13.8	2074.5	2752.0
020-CLAYMAX200R		SFT	SF	199731020 X00001107	150.0	13.8	2074.5	2764.0
020-CLAYMAX200R		SFT	SF	199731020 X00001108	150.0	13.8	2074.5	2775.0
020-CLAYMAX200R		SFT	SF	199731020 X00001109	150.0	13.8	2074.5	2783.0
020-CLAYMAX200R		SFT	SF	199731020 X00001110	150.0	13.8	2074.5	2781.0
020-CLAYMAX200R		SFT	SF	199731020 X00001111	150.0	13.8	2074.5	2774.0
020-CLAYMAX200R		SFT	SF	199731020 X00001112	150.0	13.8	2074.5	2784.0
020-CLAYMAX200R		SFT	SF	199731020 X00001114	150.0	13.8	2074.5	2851.0
020-CLAYMAX200R		SFT	SF	199731020 X00001122	150.0	13.8	2074.5	2770.0
020-CLAYMAX200R		SFT	SF	199731020 X00001123	150.0	13.8	2074.5	2765.0
020-CLAYMAX200R		SFT	SF	199731020 X00001124	150.0	13.8	2074.5	2770.0
020-CLAYMAX200R		SFT	SF	199731020 X00001125	150.0	13.8	2074.5	2775.0
ORDER TOTALS.....							35266.5	47200.0
TOTAL ITEMS.....			17					

Gordon 8/5/97

P A C K I N G L I S T

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000062935
ORDER DATE: 8/01/97
SHIP DATE:. 8/08/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
				G.S.				
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028176	150.0	15.0	2250.0	3021.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028177	150.0	15.0	2250.0	3021.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028178	150.0	15.0	2250.0	3030.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028402	150.0	15.0	2250.0	2951.0
02 BENTOMAT ST		SFT	SF	199732020 ✓ 00028419	150.0	15.0	2250.0	2930.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028420	150.0	15.0	2250.0	2922.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028421	150.0	15.0	2250.0	2925.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000748	150.0	13.8	2074.5	3114.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000749	150.0	13.8	2074.5	3116.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000750	150.0	13.8	2074.5	3124.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000751	150.0	13.8	2074.5	3121.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000752	150.0	13.8	2074.5	3127.0
020-CLAYMAX200R		SFT	SF	199730020 ✓ 00000768	150.0	13.8	2074.5	3119.0
020-CLAYMAX200R		SFT	SF	199730020 ✓ 00000769	150.0	13.8	2074.5	3119.0
020-CLAYMAX200R		SFT	SF	199730020 ✓ 00000777	150.0	13.8	2074.5	3126.0
ORDER TOTALS.....							32346.0	45766.0
TAL ITEMS.....			15					

Recieved
8/12/97

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000062936
ORDER DATE: 8/01/97
SHIP DATE:. 8/08/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF	199729020 ✓ G.S. 00000726	150.0	13.8	2074.5	3124.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000736	150.0	13.8	2074.5	3117.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000737	150.0	13.8	2074.5	3126.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000738	150.0	13.8	2074.5	3117.0
02 LAYMAX200R		SFT	SF	199729020 ✓ 00000739	150.0	13.8	2074.5	3131.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000740	150.0	13.8	2074.5	3130.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000741	150.0	13.8	2074.5	3131.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000742	150.0	13.8	2074.5	3114.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000744	150.0	13.8	2074.5	3122.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000745	150.0	13.8	2074.5	3117.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000747	150.0	13.8	2074.5	3128.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000753	150.0	13.8	2074.5	3122.0
020-CLAYMAX200R		SFT	SF	199729020 ✓ 00000754	150.0	13.8	2074.5	3116.0
020-CLAYMAX200R		SFT	SF	199730020 ✓ 00000766	150.0	13.8	2074.5	3125.0
020-CLAYMAX200R		SFT	SF	199730020 ✓ 00000767	150.0	13.8	2074.5	3132.0
ORDER TOTALS.....							31117.5	46852.0
TAL ITEMS.....			15					

Recieved 8/12/97

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
,INGTON HEIGHTS IL 60004

ORDER NO:.. 000062937
ORDER DATE: 8/01/97
SHIP DATE:. 8/07/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
			G.S.					
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001041	150.0	13.8	2074.5	2938.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001046	150.0	13.8	2074.5	2909.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001047	150.0	13.8	2074.5	2921.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001050	150.0	13.8	2074.5	2883.0
0 CLAYMAX200R		SFT	SF 199731020 ✓	00001051	150.0	13.8	2074.5	2880.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001052	150.0	13.8	2074.5	2957.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001053	150.0	13.8	2074.5	2888.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001063	150.0	13.8	2074.5	2945.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001064	150.0	13.8	2074.5	2883.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001065	150.0	13.8	2074.5	2879.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001066	140.0	13.8	1936.2	2600.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001067	150.0	13.8	2074.5	2871.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001068	150.0	13.8	2074.5	2892.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001072	150.0	13.8	2074.5	2910.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001083	150.0	13.8	2074.5	2919.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001085	150.0	13.8	2074.5	2917.0
RDER TOTALS.....							33053.7	46192.0
TOTAL ITEMS.....			16					

Recieved
8/12/97
Gordon Shands

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000062938
ORDER DATE: 8/01/97
SHIP DATE:. 8/06/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF 199731020 G.S. ✓	00001054	150.0	13.8	2074.5	2873.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001055	150.0	13.8	2074.5	2895.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001056	150.0	13.8	2074.5	2911.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001057	150.0	13.8	2074.5	2873.0
02[illegible]LAYMAX200R		SFT	SF 199731020 ✓	00001058	150.0	13.8	2074.5	2910.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001059	150.0	13.8	2074.5	2880.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001060	150.0	13.8	2074.5	2887.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001061	150.0	13.8	2074.5	2884.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001062	150.0	13.8	2074.5	2898.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001074	150.0	13.8	2074.5	2888.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001079	150.0	13.8	2074.5	2895.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001080	150.0	13.8	2074.5	2904.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001082	150.0	13.8	2074.5	2926.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001084	150.0	13.8	2074.5	2905.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001099	150.0	13.8	2074.5	2761.0
020-CLAYMAX200R		SFT	SF 199731020 ✓	00001100	150.0	13.8	2074.5	2801.0

[illegible]DER TOTALS.....	33192.0	46091.0
TOTAL ITEMS..... 16		

Recieved
8/11/97
Gordon

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
[illegible]INGTON HEIGHTS IL 60004

ORDER NO:.. 000062939
ORDER DATE: 8/01/97
SHIP DATE:. 8/08/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF	199732020	00001237	150.0	13.8	2074.5	2913.0
020-CLAYMAX200R		SFT	SF	199732020	00001238	150.0	13.8	2074.5	2860.0
020-CLAYMAX200R		SFT	SF	199732020	00001239	150.0	13.8	2074.5	2925.0
020-CLAYMAX200R		SFT	SF	199732020	00001240	150.0	13.8	2074.5	2914.0
020-CLAYMAX200R		SFT	SF	199732020	00001241	150.0	13.8	2074.5	2902.0
020-CLAYMAX200R		SFT	SF	199732020	00001242	150.0	13.8	2074.5	2945.0
020-CLAYMAX200R		SFT	SF	199732020	00001243	150.0	13.8	2074.5	2931.0
020-CLAYMAX200R		SFT	SF	199732020	00001244	150.0	13.8	2074.5	2936.0
020-CLAYMAX200R		SFT	SF	199732020	00001245	150.0	13.8	2074.5	2947.0
020-CLAYMAX200R		SFT	SF	199732020	00001286	150.0	13.8	2074.5	2901.0
020-CLAYMAX200R		SFT	SF	199732020	00001300	150.0	13.8	2074.5	2904.0
020-CLAYMAX200R		SFT	SF	199732020	00001301	150.0	13.8	2074.5	2891.0
020-CLAYMAX200R		SFT	SF	199732020	00001303	150.0	13.8	2074.5	2873.0
020-CLAYMAX200R		SFT	SF	199732020	00001304	150.0	13.8	2074.5	2985.0
020-CLAYMAX200R		SFT	SF	199732020	00001305	150.0	13.8	2074.5	2895.0
020-CLAYMAX200R		SFT	SF	199732020	00001306	150.0	13.8	2074.5	2899.0

ORDER TOTALS..... 33192.0 46621.0

TOTAL ITEMS..... 16

Recieved
8/11/97 Gordon Shanks

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000062940
ORDER DATE: 8/01/97
SHIP DATE:. 8/08/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
			G.S.					
020-CLAYMAX200R	SFT	SF	199729020	✓00000743	150.0	13.8	2074.5	3121.0
020-CLAYMAX200R	SFT	SF	199729020	✓00000755	150.0	13.8	2074.5	3121.0
020-CLAYMAX200R	SFT	SF	199729020	✓00000756	150.0	13.8	2074.5	3114.0
020-CLAYMAX200R	SFT	SF	199729020	✓00000757	150.0	13.8	2074.5	3126.0
020-CLAYMAX200R	SFT	SF	199730020	✓00000759	150.0	13.8	2074.5	3142.0
020-CLAYMAX200R	SFT	SF	199730020	✓00000760	150.0	13.8	2074.5	3137.0
020-CLAYMAX200R	SFT	SF	199730020	✓00000776	150.0	13.8	2074.5	3124.0
020-CLAYMAX200R	SFT	SF	199730020	✓00000778	150.0	13.8	2074.5	3127.0
020-CLAYMAX200R	SFT	SF	199730020	✓00000779	150.0	13.8	2074.5	3129.0
020-CLAYMAX200R	SFT	SF	199731020	✓00001040	150.0	13.8	2074.5	2934.0
020-CLAYMAX200R	SFT	SF	199731020	✓00001042	150.0	13.8	2074.5	2929.0
020-CLAYMAX200R	SFT	SF	199731020	✓00001043	150.0	13.8	2074.5	2948.0
020-CLAYMAX200R	SFT	SF	199731020	✓00001044	150.0	13.8	2074.5	3001.0
020-CLAYMAX200R	SFT	SF	199731020	✓00001045	150.0	13.8	2074.5	2973.0
020-CLAYMAX200R	SFT	SF	199731020	✓00001048	150.0	13.8	2074.5	2984.0
020-CLAYMAX200R	SFT	SF	199731020	✓00001049	150.0	13.8	2074.5	2899.0

ORDER TOTALS..... 33192.0 48809.0

TOTAL ITEMS..... 16

Recieved 8/11/97

Gordon Rhoads

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
LINGTON HEIGHTS IL 60004

ORDER NO:.. 000062941
ORDER DATE: 8/01/97
SHIP DATE:. 8/05/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF	199732020	00001206	150.0	13.8	2074.5	2985.0
020-CLAYMAX200R		SFT	SF	199732020	00001222	150.0	13.8	2074.5	2860.0
020-CLAYMAX200R		SFT	SF	199732020	00001223	150.0	13.8	2074.5	2941.0
020-CLAYMAX200R		SFT	SF	199732020	00001224	150.0	13.8	2074.5	2862.0
CLAYMAX200R		SFT	SF	199732020	00001225	150.0	13.8	2074.5	2870.0
020-CLAYMAX200R		SFT	SF	199732020	00001226	150.0	13.8	2074.5	2872.0
020-CLAYMAX200R		SFT	SF	199732020	00001227	150.0	13.8	2074.5	2871.0
020-CLAYMAX200R		SFT	SF	199732020	00001229	150.0	13.8	2074.5	2862.0
020-CLAYMAX200R		SFT	SF	199732020	00001230	150.0	13.8	2074.5	2854.0
020-CLAYMAX200R		SFT	SF	199732020	00001231	150.0	13.8	2074.5	2801.0
020-CLAYMAX200R		SFT	SF	199732020	00001232	150.0	13.8	2074.5	2923.0
020-CLAYMAX200R		SFT	SF	199732020	00001233	150.0	13.8	2074.5	2830.0
020-CLAYMAX200R		SFT	SF	199732020	00001234	150.0	13.8	2074.5	2842.0
020-CLAYMAX200R		SFT	SF	199732020	00001235	150.0	13.8	2074.5	2843.0
020-CLAYMAX200R		SFT	SF	199732020	00001236	150.0	13.8	2074.5	2861.0

ORDER TOTALS..... 31117.5 43077.0

TOTAL ITEMS..... 15

8/7/97

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1250 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000062942
ORDER DATE: 8/01/97
SHIP DATE:. 8/08/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
				G,S,				
020-CLAYMAX200R		SFT	SF	199729020 ✓	00000710	150.0	13.8	2074.5	3117.0
020-CLAYMAX200R		SFT	SF	199729020 ✓	00000711	150.0	13.8	2074.5	3110.0
020-CLAYMAX200R		SFT	SF	199729020 ✓	00000712	150.0	13.8	2074.5	3116.0
020-CLAYMAX200R		SFT	SF	199729020 ✓	00000713	150.0	13.8	2074.5	3110.0
0[illegible]LAYMAX200R		SFT	SF	199729020 ✓	00000714	150.0	13.8	2074.5	3114.0
020-CLAYMAX200R		SFT	SF	199729020 ✓	00000723	150.0	13.8	2074.5	3111.0
020-CLAYMAX200R		SFT	SF	199729020 ✓	00000724	150.0	13.8	2074.5	3126.0
020-CLAYMAX200R		SFT	SF	199729020 ✓	00000725	150.0	13.8	2074.5	3121.0
020-CLAYMAX200R		SFT	SF	199729020 ✓	00000727	150.0	13.8	2074.5	3114.0
020-CLAYMAX200R		SFT	SF	199729020 ✓	00000728	150.0	13.8	2074.5	3127.0
020-CLAYMAX200R		SFT	SF	199729020 ✓	00000729	150.0	13.8	2074.5	3116.0
020-CLAYMAX200R		SFT	SF	199731020 ✓	00000953	150.0	13.8	2074.5	2865.0
020-CLAYMAX200R		SFT	SF	199731020 ✓	00000954	150.0	13.8	2074.5	2888.0
020-CLAYMAX200R		SFT	SF	199731020 ✓	00000955	150.0	13.8	2074.5	2881.0
020-CLAYMAX200R		SFT	SF	199731020 ✓	00000956	150.0	13.8	2074.5	2875.0
ORDER TOTALS.....								31117.5	45791.0
TAL ITEMS.....			15						

Recieved
8/12/97
Gordon Thomas

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
[illegible]INGTON HEIGHTS IL 60004

ORDER NO:.. 000062943
ORDER DATE: 8/01/97
SHIP DATE:. 8/12/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF	199732020 G.S. ✓ 00027999	150.0	15.0	2250.0	2903.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028000	150.0	15.0	2250.0	2879.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028001	150.0	15.0	2250.0	2908.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028002	150.0	15.0	2250.0	2901.0
0[illegible]BENTOMAT ST		SFT	SF	199732020 ✓ 00028003	150.0	15.0	2250.0	2910.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028004	150.0	15.0	2250.0	2935.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028005	150.0	15.0	2250.0	2949.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028006	150.0	15.0	2250.0	2960.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028007	150.0	15.0	2250.0	2954.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028076	150.0	15.0	2250.0	2866.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028086	150.0	15.0	2250.0	2890.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028087	150.0	15.0	2250.0	2856.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028088	150.0	15.0	2250.0	2836.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028089	150.0	15.0	2250.0	2858.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028139	150.0	15.0	2250.0	3004.0
020-BENTOMAT ST		SFT	SF	199732020 ✓ 00028344	150.0	15.0	2250.0	2919.0

RDER TOTALS..... 36000.0 46528.0

TOTAL ITEMS..... 16

Recieved 8/15/97 Gordon HD

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
LINGTON HEIGHTS IL 60004

ORDER NO:.. 000062944
ORDER DATE: 8/01/97
SHIP DATE:. 8/11/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF	199729020 G.S. √00000722	150.0	13.8	2074.5	3116.0
020-CLAYMAX200R		SFT	SF	199730020 √00000758	150.0	13.8	2074.5	3120.0
020-CLAYMAX200R		SFT	SF	199730020 √00000761	150.0	13.8	2074.5	3132.0
020-CLAYMAX200R		SFT	SF	199730020 √00000762	150.0	13.8	2074.5	3141.0
C CLAYMAX200R		SFT	SF	199730020 √00000763	150.0	13.8	2074.5	3140.0
020-CLAYMAX200R		SFT	SF	199732020 √00001289	150.0	13.8	2074.5	2891.0
020-CLAYMAX200R		SFT	SF	199732020 √00001290	150.0	13.8	2074.5	2927.0
020-CLAYMAX200R		SFT	SF	199732020 √00001291	150.0	13.8	2074.5	2892.0
020-CLAYMAX200R		SFT	SF	199732020 √00001292	150.0	13.8	2074.5	2913.0
020-CLAYMAX200R		SFT	SF	199732020 √00001293	150.0	13.8	2074.5	2881.0
020-CLAYMAX200R		SFT	SF	199732020 √00001294	150.0	13.8	2074.5	2869.0
020-CLAYMAX200R		SFT	SF	199732020 √00001295	150.0	13.8	2074.5	2861.0
020-CLAYMAX200R		SFT	SF	199732020 √00001296	150.0	13.8	2074.5	2881.0
020-CLAYMAX200R		SFT	SF	199732020 √00001297	150.0	13.8	2074.5	2885.0
020-CLAYMAX200R		SFT	SF	199732020 √00001298	150.0	13.8	2074.5	2876.0
020-CLAYMAX200R		SFT	SF	199732020 √00001299	150.0	13.8	2074.5	2931.0

RDER TOTALS.....		33192.0	47456.0
TOTAL ITEMS.....	16		

Recieved 8/14/97

PACKING LIST

[illegible] ENVIRONMENTAL TECH CO
[illegible] WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000062945
ORDER DATE: 8/01/97
SHIP DATE:. 8/11/97

SOLD TO: 677
GOLMAX GEOSYNTHETICS
3861 BOUL. MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ J0X3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

P/O. 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020 CLAYMAX200R		SFT	SF	199729020	✓00000715	150.0	13.8	2074.5	3117.0
020 CLAYMAX200R		SFT	SF	199729020	✓00000716	150.0	13.8	2074.5	3127.0
020 CLAYMAX200R		SFT	SF	199729020	✓00000717	150.0	13.8	2074.5	3119.0
020 CLAYMAX200R		SFT	SF	199729020	✓00000718	150.0	13.8	2074.5	3126.0
020 CLAYMAX200R		SFT	SF	199729020	✓00000719	150.0	13.8	2074.5	3120.0
0 CLAYMAX200R		SFT	SF	199729020	✓00000720	150.0	13.8	2074.5	3124.0
020 CLAYMAX200R		SFT	SF	199729020	✓00000721	150.0	13.8	2074.5	3122.0
020 CLAYMAX200R		SFT	SF	199729020	✓00000730	150.0	13.8	2074.5	3124.0
020 CLAYMAX200R		SFT	SF	199729020	✓00000731	150.0	13.8	2074.5	3122.0
020 CLAYMAX200R		SFT	SF	199729020	✓00000732	150.0	13.8	2074.5	3118.0
020 CLAYMAX200R		SFT	SF	199729020	✓00000733	150.0	13.8	2074.5	3116.0
020 CLAYMAX200R		SFT	SF	199729020	✓00000734	150.0	13.8	2074.5	3119.0
020 CLAYMAX200R		SFT	SF	199729020	✓00000735	150.0	13.8	2074.5	3127.0
020 CLAYMAX200R		SFT	SF	199729020	✓00000746	150.0	13.8	2074.5	3120.0
020 CLAYMAX200R		SFT	SF	199730020	✓00000764	150.0	13.8	2074.5	3132.0
020 CLAYMAX200R		SFT	SF	199730020	✓00000765	150.0	13.8	2074.5	3128.0
ORDER TOTALS.							33192.0	49961.0
TOTAL ITEMS.			16					

Recieved 8/14/97

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1250 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000062946
ORDER DATE: 8/01/97
SHIP DATE:. 8/13/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF	199733020 ✓ 6.5 00001307	150.0	13.8	2074.5	2975.0
020-CLAYMAX200R		SFT	SF	199733020 ✓ 00001313	150.0	13.8	2074.5	2954.0
020-CLAYMAX200R		SFT	SF	199733020 ✓ 00001314	150.0	13.8	2074.5	2958.0
020-CLAYMAX200R		SFT	SF	199733020 ✓ 00001315	150.0	13.8	2074.5	2943.0
0: :LAYMAX200R		SFT	SF	199733020 ✓ 00001316	150.0	13.8	2074.5	2963.0
020-CLAYMAX200R		SFT	SF	199733020 ✓ 00001317	150.0	13.8	2074.5	2976.0
020-CLAYMAX200R		SFT	SF	199733020 ✓ 00001318	150.0	13.8	2074.5	2997.0
020-CLAYMAX200R		SFT	SF	199733020 ✓ 00001319	150.0	13.8	2074.5	2959.0
020-CLAYMAX200R		SFT	SF	199733020 ✓ 00001320	150.0	13.8	2074.5	2930.0
020-CLAYMAX200R		SFT	SF	199733020 ✓ 00001321	150.0	13.8	2074.5	2918.0
020-CLAYMAX200R		SFT	SF	199733020 ✓ 00001322	150.0	13.8	2074.5	2928.0
020-CLAYMAX200R		SFT	SF	199733020 ✓ 00001323	150.0	13.8	2074.5	2923.0
020-CLAYMAX200R		SFT	SF	199733020 ✓ 00001324	150.0	13.8	2074.5	2959.0
020-CLAYMAX200R		SFT	SF	199733020 ✓ 00001326	150.0	13.8	2074.5	2907.0
020-CLAYMAX200R		SFT	SF	199733020 ✓ 00001327	150.0	13.8	2074.5	2895.0
ORDER TOTALS.....							31117.5	44185.0
TAL ITEMS.....			15					

Recieved
8/18/97
Gordon

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
LINGTON HEIGHTS IL 60004

ORDER NO:.. 000062947
ORDER DATE: 8/01/97
SHIP DATE:. 8/16/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF 199733020	00029111	150.0	15.0	2250.0	2930.0
020-BENTOMAT ST		SFT	SF 199733020	00029112	150.0	15.0	2250.0	2883.0
020-BENTOMAT ST		SFT	SF 199733020	00029113	150.0	15.0	2250.0	2834.0
020-BENTOMAT ST		SFT	SF 199733020	00029114	150.0	15.0	2250.0	2871.0
0 BENTOMAT ST		SFT	SF 199733020	00029115	150.0	15.0	2250.0	2900.0
020-BENTOMAT ST		SFT	SF 199733020	00029116	150.0	15.0	2250.0	2916.0
020-BENTOMAT ST		SFT	SF 199733020	00029117	150.0	15.0	2250.0	2905.0
020-BENTOMAT ST		SFT	SF 199733020	00029119	150.0	15.0	2250.0	2908.0
020-BENTOMAT ST		SFT	SF 199733020	00029120	150.0	15.0	2250.0	2898.0
020-BENTOMAT ST		SFT	SF 199733020	00029194	150.0	15.0	2250.0	2754.0
020-BENTOMAT ST		SFT	SF 199733020	00029195	150.0	15.0	2250.0	2771.0
020-BENTOMAT ST		SFT	SF 199733020	00029196	150.0	15.0	2250.0	2784.0
020-BENTOMAT ST		SFT	SF 199733020	00029197	150.0	15.0	2250.0	2803.0
020-BENTOMAT ST		SFT	SF 199733020	00029198	150.0	15.0	2250.0	2779.0
020-BENTOMAT ST		SFT	SF 199733020	00029199	150.0	15.0	2250.0	2840.0
020-BENTOMAT ST		SFT	SF 199733020	00029200	150.0	15.0	2250.0	2860.0

ORDER TOTALS..... 36000.0 45636.0

TOTAL ITEMS..... 16

Recieved 8/19/97 Gordon

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1[illegible]0 WEST SHURE DRIVE
A[illegible]NGTON HEIGHTS IL 60004

ORDER NO:.. 000062948
ORDER DATE: 8/01/97
SHIP DATE:. 8/30/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF	199735020	00030271	150.0	15.0	2250.0	2927.0
020-BENTOMAT ST		SFT	SF	199735020	00030272	150.0	15.0	2250.0	2909.0
020-BENTOMAT ST		SFT	SF	199735020	00030273	150.0	15.0	2250.0	2923.0
020-BENTOMAT ST		SFT	SF	199735020	00030274	150.0	15.0	2250.0	2861.0
02[illegible]ENTOMAT ST		SFT	SF	199735020	00030275	150.0	15.0	2250.0	2795.0
020-BENTOMAT ST		SFT	SF	199735020	00030276	150.0	15.0	2250.0	2789.0
020-BENTOMAT ST		SFT	SF	199735020	00030277	150.0	15.0	2250.0	2790.0
020-BENTOMAT ST		SFT	SF	199735020	00030278	150.0	15.0	2250.0	2778.0
020-BENTOMAT ST		SFT	SF	199735020	00030279	150.0	15.0	2250.0	2774.0
020-BENTOMAT ST		SFT	SF	199735020	00030280	150.0	15.0	2250.0	2773.0
020-BENTOMAT ST		SFT	SF	199735020	00030281	150.0	15.0	2250.0	2765.0
020-BENTOMAT ST		SFT	SF	199735020	00030282	150.0	15.0	2250.0	2764.0
020-BENTOMAT ST		SFT	SF	199735020	00030283	150.0	15.0	2250.0	2760.0
020-BENTOMAT ST		SFT	SF	199735020	00030284	150.0	15.0	2250.0	2753.0
020-BENTOMAT ST		SFT	SF	199735020	00030285	150.0	15.0	2250.0	2762.0
020-BENTOMAT ST		SFT	SF	199735020	00030286	150.0	15.0	2250.0	2752.0
020-BENTOMAT ST		SFT	SF	199735020	00030290	150.0	15.0	2250.0	2729.0
ORDER TOTALS.....								38250.0	47604.0
TOTAL ITEMS.....				17					

Oh Gordon Thanks
Received 9/3/97

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
[illegible] WEST SHURE DRIVE
[illegible]NGTON HEIGHTS IL 60004

ORDER NO:.. 000062949
ORDER DATE: 8/01/97
SHIP DATE:. 9/08/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
			G.S.					
020-CLAYMAX200R		SFT	SF ✓199737020	00001656	150.0	13.8	2074.5	2830.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001659	150.0	13.8	2074.5	2825.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001660	150.0	13.8	2074.5	2807.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001661	150.0	13.8	2074.5	2809.0
02[illegible]LAYMAX200R		SFT	SF ✓199737020	00001662	150.0	13.8	2074.5	2804.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001665	150.0	13.8	2074.5	2792.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001666	150.0	13.8	2074.5	2800.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001667	150.0	13.8	2074.5	2780.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001668	150.0	13.8	2074.5	2791.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001670	150.0	13.8	2074.5	2800.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001671	150.0	13.8	2074.5	2799.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001672	150.0	13.8	2074.5	2824.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001675	150.0	13.8	2074.5	2787.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001676	150.0	13.8	2074.5	2774.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001681	150.0	13.8	2074.5	2803.0
020-CLAYMAX200R		SFT	SF ✓199737020	00001682	150.0	13.8	2074.5	2807.0

ER TOTALS..... 33192.0 44832.0

TOTAL ITEMS..... 16

Received
9/10/97

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1250 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000062950
ORDER DATE: 8/01/97
SHIP DATE:. 9/07/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

65.

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-CLAYMAX200R		SFT	SF	199736020	00001623	150.0	13.8	2074.5	2844.0
020-CLAYMAX200R		SFT	SF	199736020	00001624	150.0	13.8	2074.5	2848.0
020-CLAYMAX200R		SFT	SF	199736020	00001625	150.0	13.8	2074.5	2917.0
020-CLAYMAX200R		SFT	SF	199736020	00001626	150.0	13.8	2074.5	2860.0
02 LAYMAX200R		SFT	SF	199736020	00001627	150.0	13.8	2074.5	2917.0
020-CLAYMAX200R		SFT	SF	199736020	00001628	150.0	13.8	2074.5	2860.0
020-CLAYMAX200R		SFT	SF	199736020	00001629	150.0	13.8	2074.5	2917.0
020-CLAYMAX200R		SFT	SF	199736020	00001630	150.0	13.8	2074.5	2870.0
020-CLAYMAX200R		SFT	SF	199736020	00001631	150.0	13.8	2074.5	2864.0
020-CLAYMAX200R		SFT	SF	199736020	00001632	150.0	13.8	2074.5	2874.0
020-CLAYMAX200R		SFT	SF	199736020	00001633	150.0	13.8	2074.5	2858.0
020-CLAYMAX200R		SFT	SF	199736020	00001634	150.0	13.8	2074.5	2860.0
020-CLAYMAX200R		SFT	SF	199736020	00001635	150.0	13.8	2074.5	2853.0
020-CLAYMAX200R		SFT	SF	199736020	00001636	150.0	13.8	2074.5	2843.0
020-CLAYMAX200R		SFT	SF	199736020	00001637	150.0	13.8	2074.5	2835.0
020-CLAYMAX200R		SFT	SF	199736020	00001638	150.0	13.8	2074.5	2831.0

DER TOTALS..... 33192.0 45851.0

TOTAL ITEMS..... 16

Recieved 9/10/97
Gordon Ahs

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
[illegible]0 WEST SHURE DRIVE
[illegible]LINGTON HEIGHTS IL 60004

ORDER NO:.. 000062951
ORDER DATE: 8/01/97
SHIP DATE:. 9/17/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
2801 BOUL MARIE VICTORIN

SHIP FROM:. LOVELL, WY PLANT
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. AMERI-CO

VARENNES PQ JX3 1PF

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297 R2

PRODUCT	SIZE U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST	SFT SF	199737020	00031243	150.0	15.0	2250.0	3048.0
020-BENTOMAT ST	SFT SF	199737020	00031302	150.0	15.0	2250.0	3102.0
020-BENTOMAT ST	SFT SF	199737020	00031303	150.0	15.0	2250.0	3100.0
020-BENTOMAT ST	SFT SF	199737020	00031477	150.0	15.0	2250.0	3097.0
0[illegible]BENTOMAT ST	SFT SF	199737020	00031482	150.0	15.0	2250.0	3049.0
020-BENTOMAT ST	SFT SF	199737020	00031483	150.0	15.0	2250.0	3082.0
020-BENTOMAT ST	SFT SF	199737020	00031652	150.0	15.0	2250.0	2900.0
020-BENTOMAT ST	SFT SF	199738020	00031942	150.0	15.0	2250.0	2998.0
020-BENTOMAT ST	SFT SF	199738020	00031943	150.0	15.0	2250.0	3027.0
020-BENTOMAT ST	SFT SF	199738020	00031944	150.0	15.0	2250.0	3113.0
020-BENTOMAT ST	SFT SF	199738020	00031948	150.0	15.0	2250.0	3050.0
020-BENTOMAT ST	SFT SF	199738020	00031950	150.0	15.0	2250.0	3100.0
020-BENTOMAT ST	SFT SF	199738020	00031951	150.0	15.0	2250.0	3122.0
020-BENTOMAT ST	SFT SF	199738020	00031952	150.0	15.0	2250.0	3126.0
020-BENTOMAT ST	SFT SF	199738020	00031953	150.0	15.0	2250.0	3102.0
ORDER TOTALS.....						33750.0	46016.0
TAL ITEMS.....	15						

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1250 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000065577
ORDER DATE: 8/29/97
SHIP DATE:. 8/29/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
25 ROBINSON RD.

SHIP FROM:. FAIRMOUNT,GA
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

CLINTON NY 13323

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297-122

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGH
			6.5.					
030-CLAYMAX200R	SFT	SF	199735030	✓00008539	150.0	13.8	2075.0	2773
030-CLAYMAX200R	SFT	SF	199735030	✓00008553	150.0	13.8	2075.0	2728
030-CLAYMAX200R	SFT	SF	199735030	✓00008554	150.0	13.8	2075.0	2733
030-CLAYMAX200R	SFT	SF	199735030	✓00008560	150.0	13.8	2075.0	2820
03 LAYMAX200R	SFT	SF	199735030	✓00008562	150.0	13.8	2075.0	2779
030-CLAYMAX200R	SFT	SF	199735030	✓00008563	150.0	13.8	2075.0	2798
030-CLAYMAX200R	SFT	SF	199735030	✓00008571	150.0	13.8	2075.0	2859
030-CLAYMAX200R	SFT	SF	199735030	✓00008572	150.0	13.8	2075.0	2892
030-CLAYMAX200R	SFT	SF	199735030	✓00008574	150.0	13.8	2075.0	2905
030-CLAYMAX200R	SFT	SF	199735030	✓00008580	150.0	13.8	2075.0	2812
030-CLAYMAX200R	SFT	SF	199735030	✓00008583	150.0	13.8	2075.0	2943
030-CLAYMAX200R	SFT	SF	199735030	✓00008584	150.0	13.8	2075.0	2881
030-CLAYMAX200R	SFT	SF	199735030	✓00008612	150.0	13.8	2075.0	2809
030-CLAYMAX200R	SFT	SF	199735030	✓00008613	150.0	13.8	2075.0	2833
030-CLAYMAX200R	SFT	SF	199735030	✓00008614	150.0	13.8	2075.0	2840
030-CLAYMAX200R	SFT	SF	199735030	✓00008616	150.0	13.8	2075.0	2846

DER TOTALS.....	33200.0	45251.
TOTAL ITEMS..... 16		

Recieved
9/2/97
Gordon

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
[illegible]INGTON HEIGHTS IL 60004

ORDER NO:.. 000065578
ORDER DATE: 8/29/97
SHIP DATE:. 8/29/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
25 ROBINSON RD.

CLINTON NY 13323

SHIP FROM:. FAIRMOUNT,GA
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297-122

PRODUCT	SIZE U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGH
030-CLAYMAX200R	SFT SF	199735030	00008535	150.0	13.8	2075.0	2703
030-CLAYMAX200R	SFT SF	199735030	00008556	150.0	13.8	2075.0	2785
030-CLAYMAX200R	SFT SF	199735030	00008565	150.0	13.8	2075.0	2866
030-CLAYMAX200R	SFT SF	199735030	00008567	150.0	13.8	2075.0	2958
030-CLAYMAX200R	SFT SF	199735030	00008568	150.0	13.8	2075.0	2839
030-CLAYMAX200R	SFT SF	199735030	00008573	150.0	13.8	2075.0	3031
030-CLAYMAX200R	SFT SF	199735030	00008575	150.0	13.8	2075.0	2859
030-CLAYMAX200R	SFT SF	199735030	00008577	150.0	13.8	2075.0	2872
030-CLAYMAX200R	SFT SF	199735030	00008596	150.0	13.8	2075.0	2928
030-CLAYMAX200R	SFT SF	199735030	00008598	150.0	13.8	2075.0	2965
030-CLAYMAX200R	SFT SF	199735030	00008599	150.0	13.8	2075.0	2899
030-CLAYMAX200R	SFT SF	199735030	00008600	150.0	13.8	2075.0	2892
030-CLAYMAX200R	SFT SF	199735030	00008615	150.0	13.8	2075.0	2833
030-CLAYMAX200R	SFT SF	199735030	00008618	150.0	13.8	2075.0	2816
030-CLAYMAX200R	SFT SF	199735030	00008620	150.0	13.8	2075.0	2855
030-CLAYMAX200R	SFT SF	199735030	00008631	150.0	13.8	2075.0	2860

ORDER TOTALS.....	33200.0	45961.
[illegible]TAL ITEMS.....	16	

OK Gordon
Received 9/3/97
Here KJH

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000065643
ORDER DATE: 8/29/97
SHIP DATE:. 8/29/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
25 ROBINSON RD.

SHIP FROM:. FAIRMOUNT,GA
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

CLINTON NY 13323

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

NIAGARA FALLS NY 14304

PO: 400297-122

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGH
030-CLAYMAX200R		SFT	SF	199735030 ✓00008508	150.0	13.8	2075.0	2713
030-CLAYMAX200R		SFT	SF	199735030 ✓00008510	150.0	13.8	2075.0	2731
030-CLAYMAX200R		SFT	SF	199735030 ✓00008522	150.0	13.8	2075.0	2682
030-CLAYMAX200R		SFT	SF	199735030 ✓00008526	150.0	13.8	2075.0	2707
03 'LAYMAX200R		SFT	SF	199735030 ✓00008594	150.0	13.8	2075.0	2906
030-CLAYMAX200R		SFT	SF	199735030 ✓00008595	150.0	13.8	2075.0	2916
030-CLAYMAX200R		SFT	SF	199735030 ✓00008597	150.0	13.8	2075.0	2956
030-CLAYMAX200R		SFT	SF	199735030 ✓00008605	150.0	13.8	2075.0	2833
030-CLAYMAX200R		SFT	SF	199735030 ✓00008609	150.0	13.8	2075.0	2838
030-CLAYMAX200R		SFT	SF	199735030 ✓00008611	150.0	13.8	2075.0	2831
030-CLAYMAX200R		SFT	SF	199735030 ✓00008617	150.0	13.8	2075.0	2860
030-CLAYMAX200R		SFT	SF	199735030 ✓00008621	150.0	13.8	2075.0	2804
030-CLAYMAX200R		SFT	SF	199735030 ✓00008624	150.0	13.8	2075.0	2832
030-CLAYMAX200R		SFT	SF	199735030 ✓00008625	150.0	13.8	2075.0	2828
030-CLAYMAX200R		SFT	SF	199735030 ✓00008626	150.0	13.8	2075.0	2807
030-CLAYMAX200R		SFT	SF	199735030 ✓00008632	150.0	13.8	2075.0	2854

DER TOTALS.....		33200.0	45098.
TOTAL ITEMS.....	16		

Reviewed
9/2/97
Gordon Shank

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1350 WEST SHURE DRIVE
INGTON HEIGHTS IL 60004

ORDER NO:.. 000065647
ORDER DATE: 8/29/97
SHIP DATE:. 8/29/97

SOLD TO: 677
SOLMAX GEOSYNTHETICS
25 ROBINSON RD.

SHIP FROM:. FAIRMOUNT,GA
FRT TERMS:. PREPAID & ABSORBED
SHIP VIA:.. NATIONWIDE

CLINTON NY 13323

SHIP TO: 12
SMITH TECHNOLOGY
9829 BUFFALO AVE

PO: 400297-122

NIAGARA FALLS NY 14304

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGH
030-CLAYMAX200R		SFT SF	199735030	00008534	150.0	13.8	2075.0	2716
030-CLAYMAX200R		SFT SF	199735030	00008543	150.0	13.8	2075.0	2811
030-CLAYMAX200R		SFT SF	199735030	00008559	150.0	13.8	2075.0	2790
030-CLAYMAX200R		SFT SF	199735030	00008561	150.0	13.8	2075.0	2858
03 CLAYMAX200R		SFT SF	199735030	00008564	150.0	13.8	2075.0	2856
030-CLAYMAX200R		SFT SF	199735030	00008566	150.0	13.8	2075.0	2809
030-CLAYMAX200R		SFT SF	199735030	00008569	150.0	13.8	2075.0	2860
030-CLAYMAX200R		SFT SF	199735030	00008578	150.0	13.8	2075.0	2855
030-CLAYMAX200R		SFT SF	199735030	00008581	150.0	13.8	2075.0	2855
030-CLAYMAX200R		SFT SF	199735030	00008586	150.0	13.8	2075.0	2896
030-CLAYMAX200R		SFT SF	199735030	00008590	150.0	13.8	2075.0	2892
030-CLAYMAX200R		SFT SF	199735030	00008591	150.0	13.8	2075.0	2888
030-CLAYMAX200R		SFT SF	199735030	00008601	150.0	13.8	2075.0	2864
030-CLAYMAX200R		SFT SF	199735030	00008602	150.0	13.8	2075.0	2878
030-CLAYMAX200R		SFT SF	199735030	00008603	150.0	13.8	2075.0	2813
030-CLAYMAX200R		SFT SF	199735030	00008619		13.8	2075.0	2916

ORDER TOTALS..... 33200.0 45557.

TOTAL ITEMS..... 16

Received 9/3/97

APPENDIX N

LLDPE LINER QA/QC DOCUMENTATION (FACTORY)

06/13/97

NSC

POLYETHYLENE CERTIFICATE OF ANALYSIS

Customer: Solmax Geosynthetics, Inc.

Resin Type: Novacor

Project Name: Niagara Falls, NY

Project Number: 3G28-100

Bill of Lading: 13172

We hereby certify that the polyethylene resin for the above identified shipment, meets or exceeds National Seal Company's specifications. Testing was performed on each resin blend.

Melt flow index was determined according to ASTM D 1238 Condition 190/2.16. Density was determined according to ASTM D 1505. Where appropriate, carbon black content was determined according to ASTM D 4218. The average test results are listed in the table below.

RESIN PROPERTIES

BLEND NUMBER	MELT FLOW INDEX (g/10 min)	DENSITY (g/cm^3)	CARBON BLACK CONTENT (%)
652N	0.82	0.917	
779N	0.76	0.919	

Jane Allen

Jane Allen
Quality Control Manager

6-13-97

Date:

Note: When no carbon black content value is listed, the resin contained no carbon black.

This Certificate of Analysis shall not be reproduced except in full, without the written approval of the laboratory.
National Seal Company - 1255 Monmouth Blvd. - Galesburg, IL - 61401

LLDPE GEOMEMBRANE CERTIFICATE OF ANALYSIS

NSC

Customer: Solmax Geosynthetics, Inc.

Number of Rolls Shipped: 6

Project Name: Niagara Falls, NY

Nominal Thickness: 40 mil

Project Number: 3G28-100

Bill of Lading(s): 13172

We hereby certify that the polyethylene geomembrane for the above identified shipment meets or exceeds National Seal Company's specifications, below. Testing was performed at the frequency indicated.

The raw polymeric material is first quality polyethylene resin containing no more than two percent clean re-worked plastic by weight. Thickness was measured according to ASTM D 5199. Tensile properties were determined in accordance with ASTM D 638, using Type IV dumbell specimens, a strain rate of 20 inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 5596 and rated according to the ASTM D 5596 dispersion classification chart under 100X magnification. Carbon black content was determined according to ASTM D 4218. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. Density was determined according to ASTM D 1505.

A database listing of all test values follows.

GEOMEMBRANE SPECIFICATIONS

Thickness	40 mil Minimum Average	at least every 50,000 ft^2
Stress at Break	3800 psi Minimum Average	at least every 50,000 ft^2
Strain at Break	850% Minimum Average	at least every 50,000 ft^2
Carbon Black Dispersion	Category 1 or 2	at least every 50,000 ft^2
Carbon Black Content	2% to 3%	at least every 50,000 ft^2
Dimensional Stability	+/- 3%	at least once per shift
Density	0.935 g/cm3 Maximum Average	at least every 50,000 ft^2

NATIONAL SEAL COMPANY

Jane Allen
Quality Control Manager

6-13-97
Date

This Certificate of Analysis shall not be reporduced except in full, without the written approval of the laboratory.
National Seal Company - 1255 Monmouth Blvd. - Galesburg, IL - 61401

NSC

GEOMEMBRANE STANDARD TESTING

Date: 06/13/97

Bill(s) of Lading: 13172

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	STRESS AT BREAK (psi) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
L04L778N-6I1800020	43.7	5590	5760	1010	1050	1	2.22	0.927
L04L778N-6I1800040	43.4	5740	5860	1020	1070	1	2.38	0.927
L04L652N-6I1800060	43.4	5530	5780	998	1070	1	2.34	0.927
L04L652N-6I1800070	43.2	5380	5950	973	1090	1	2.37	0.927
L04L652N-6I1800110	43.9	5190	5870	951	1080	1	2.36	0.927
L04L652N-6I1800140	43.2	5810	5980	1010	1070	1	2.34	0.927
L04L652N-6I1900010	44.3	5460	5800	980	1070	1	2.32	0.927
L04L652N-6I1900020	43.7	5630	5490	987	1000	1	2.33	0.927
L04L652N-6I1900030	43.6	5610	5900	1010	1090	1	2.32	0.927
L04L652N-6I1900040	44.4	5770	5880	1010	1080	1	2.32	0.927
L04L652N-6I1900090	43.8	5510	5860	988	1090	1	2.36	0.928
L04L652N-6I1900100	43.7	5620	5910	931	1000	1	2.38	0.928
L04L652N-6I1900110	43.6	5480	5900	922	1010	1	2.37	0.929
L04L652N-6I1900120	43.3	5530	5650	1000	1060	1	2.41	0.929
L04L652N-6I2000010	44.2	5890	5970	1050	1100	1	2.34	0.929
L04L652N-6I2000020	45.1	5570	6180	993	1140	1	2.48	0.929
L04L652N-6I2000030	43.3	5460	6310	964	1150	1	2.40	0.932

Jane Allen
Quality Control Manager

6-13-97
Date

This Certificate of Analysis shall not be reproduced except in full, without the written approval of the laboratory.
National Seal Company - 1255 Monmouth Blvd. - Galesburg, IL - 61401

NSC

GEOMEMBRANE STANDARD TESTING

Date: 06/13/97

Bill(s) of Lading: 13172

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	STRESS AT BREAK (psi) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
L04L652N-6I2000040	43.3	5340	6270	941	1130	1	2.42	0.932
L04L652N-6I2000050	43.0	5990	6030	1060	1120	1	2.43	0.932
L04L652N-6I2000060	43.0	5730	6150	1020	1140	1	2.45	0.932
L04L652N-6I2000070	43.0	5490	5970	998	1120	1	2.38	0.932
L04L779N-6I2000080	42.8	5780	5950	1040	1110	1	2.34	0.932
L04L779N-6I2000090	43.3	5710	5980	1030	1120	1	2.30	0.929
L04L779N-6I2000100	43.2	5540	5970	1010	1140	1	2.36	0.929
L04L779N-6I2000110	42.9	5450	6030	1020	1140	1	2.43	0.929
L04L779N-6I2000120	43.4	5700	5850	1020	1080	1	2.38	0.929
L04L779N-6I2000130	43.8	5390	6140	971	1120	1	2.36	0.929
L04L779N-6I2000140	43.8	5660	6220	1020	1130	1	2.38	0.929
L04L779N-6I2000150	43.8	5690	5690	1030	1060	1	2.48	0.929
L04L779N-6I2000160	43.4	5580	5940	1010	1130	1	2.36	0.929
L04L779N-6I2000170	43.5	5660	5950	1040	1140	1	2.35	0.928
L04L779N-6I2100010	43.0	5700	5670	1010	1020	1	2.36	0.928
L04L779N-6I2100020	42.9	5810	5950	1040	1110	1	2.44	0.927
L04L779N-6I2100030	42.6	5900	5830	1060	1090	1	2.42	0.932

Jane Allen

Jane Allen
Quality Control Manager

6-13-97
Date

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NSC

GEOMEMBRANE STANDARD TESTING

ate: 06/13/97

Bill(s) of Lading: 13172

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	STRESS AT BREAK (psi) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
L04L779N-6I2100040	42.6	5550	5820	1000	1090	1	2.54	0.932
L04L779N-6I2100050	42.7	5790	5890	1030	1090	1	2.40	0.932
L04L779N-6I2100060	42.3	5580	6070	999	1120	1	2.44	0.929
L04L779N-6I2100070	42.5	5490	5430	1030	1030	1	2.46	0.929
L04L779N-6I2100080	42.6	5590	5560	1010	1040	1	2.43	0.929
L04L779N-6I2100090	42.0	5550	5640	1010	1060	1	2.35	0.929
L04L779N-6I2100100	42.1	5240	5710	961	1080	1	2.40	0.929
L04L779N-6I2100110	43.3	5320	5870	994	1130	1	2.44	0.929
L04L779N-6I2100120	42.8	5690	5440	1010	997	1	2.41	0.929
L04L779N-6I2100130	43.0	5480	6070	978	1130	1	2.46	0.929
L04L779N-6I2100140	43.4	5570	5920	1040	1130	1	2.28	0.928
L04L779N-6I2100150	43.3	5600	5300	1050	1020	1	2.40	0.929
L04L779N-6I2100160	43.7	5640	5970	1060	1170	1	2.44	0.929

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LLDPE GEOMEMBRANE CERTIFICATE OF ANALYSIS

NSC

Customer: Solmax Geosynthetics, Inc.

Number of Rolls Shipped: 6

Project Name: Niagara Falls, NY

Nominal Thickness: 40 mil

Project Number: 3G28-100

Bill of Lading(s): 13171

We hereby certify that the polyethylene geomembrane for the above identified shipment meets or exceeds National Seal Company's specifications, below. Testing was performed at the frequency indicated.

The raw polymeric material is first quality polyethylene resin containing no more than two percent clean re-worked plastic by weight. Thickness was measured according to ASTM D 5199. Tensile properties were determined in accordance with ASTM D 638, using Type IV dumbell specimens, a strain rate of 20 inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 5596 and rated according to the ASTM D 5596 dispersion classification chart under 100X magnification. Carbon black content was determined according to ASTM D 4218. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. Density was determined according to ASTM D 1505.

A database listing of all test values follows.

GEOMEMBRANE SPECIFICATIONS

Thickness	40 mil Minimum Average	at least every 50,000 ft^2
Stress at Break	3800 psi Minimum Average	at least every 50,000 ft^2
Strain at Break	850% Minimum Average	at least every 50,000 ft^2
Carbon Black Dispersion	Category 1 or 2	at least every 50,000 ft^2
Carbon Black Content	2% to 3%	at least every 50,000 ft^2
Dimensional Stability	+/- 3%	at least once per shift
Density	0.935 g/cm3 Maximum Average	at least every 50,000 ft^2

NATIONAL SEAL COMPANY

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6-13-97

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06/13/97

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POLYETHYLENE CERTIFICATE OF ANALYSIS

Customer: Solmax Geosynthetics, Inc.

Resin Type: Novacor

Project Name: Niagara Falls, NY

Project Number: 3G28-100

Bill of Lading: 13171

We hereby certify that the polyethylene resin for the above identified shipment, meets or exceeds National Seal Company's specifications. Testing was performed on each resin blend.

Melt flow index was determined according to ASTM D 1238 Condition 190/2.16. Density was determined according to ASTM D 1505. Where appropriate, carbon black content was determined according to ASTM D 4218. The average test results are listed in the table below.

RESIN PROPERTIES

BLEND NUMBER	MELT FLOW INDEX (g/10 min)	DENSITY (g/cm^3)	CARBON BLACK CONTENT (%)
781N	0.76	0.919	
779N	0.76	0.919	
780N	0.77	0.918	
922N	0.85	0.918	

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Note: When no carbon black content value is listed, the resin contained no carbon black.

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GEOMEMBRANE STANDARD TESTING

Date: 06/13/97

Bill(s) of Lading: 13171

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	STRESS AT BREAK (psi) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
L04L231N-5L2100010	41.5	6100	6180	1120	1160	1	2.41	0.928
L04L231N-5L2100020	41.9	5880	5430	982	1030	1	2.44	0.929
L04L231N-5L2100030	42.1	6450	6340	1170	1180	1	2.45	0.929
L04L922N-5L2100040	42.0	6230	6080	1150	1160	1	2.51	0.929
L04L922N-5L2100050	42.2	6300	6010	1160	1160	1	2.45	0.929
L04L922N-5L2100060	41.8	6270	5890	1160	1110	1	2.55	0.929
L04L922N-5L2100070	41.8	4840	4870	984	1040	1	2.46	0.929
L04L922N-5L2100080	41.9	6250	6060	1150	1130	1	2.46	0.928
L04L922N-5L2100090	42.3	5560	5650	1010	960	1	2.43	0.928
L04L922N-5L2100100	42.1	5630	5720	1050	1140	1	2.45	0.929
L04L922N-5L2100110	42.0	6060	5850	975	972	1	2.41	0.929
L04L922N-5L2100120	41.7	5420	6180	951	1010	1	2.42	0.929
L04L922N-5L2100130	41.6	5370	5360	1020	1030	1	2.44	0.930
L04L922N-5L2100140	41.8	6060	5910	959	974	1	2.46	0.928
L04L922N-5L2100150	42.0	6030	5420	972	904	1	2.35	0.928
L04L922N-5L2100160	41.9	5180	5960	919	1090	1	2.41	0.928
L04L652N-6I2000010	44.2	5890	5970	1050	1100	1	2.34	0.929

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GEOMEMBRANE STANDARD TESTING

Date: 06/13/97

Bill(s) of Lading: 13171

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	TD	STRAIN AT BREAK (%) MD	TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
L04L652N-6I2000020	45.1	5570	6180	993	1140	1	2.48	0.929
L04L652N-6I2000030	43.3	5460	6310	964	1150	1	2.40	0.932
L04L652N-6I2000040	43.3	5340	6270	941	1130	1	2.42	0.932
L04L652N-6I2000050	43.0	5990	6030	1060	1120	1	2.43	0.932
L04L652N-6I2000060	43.0	5730	6150	1020	1140	1	2.45	0.932
L04L652N-6I2000070	43.0	5490	5970	998	1120	1	2.38	0.932
L04L779N-6I2000080	42.8	5780	5950	1040	1110	1	2.34	0.932
L04L779N-6I2000090	43.3	5710	5980	1030	1120	1	2.30	0.929
L04L779N-6I2000100	43.2	5540	5970	1010	1140	1	2.36	0.929
L04L779N-6I2000110	42.9	5450	6030	1020	1140	1	2.43	0.929
L04L779N-6I2000120	43.4	5700	5850	1020	1080	1	2.38	0.929
L04L779N-6I2000130	43.8	5390	6140	971	1120	1	2.36	0.929
L04L779N-6I2000140	43.8	5660	6220	1020	1130	1	2.38	0.929
L04L779N-6I2000150	43.8	5690	5690	1030	1060	1	2.48	0.929
L04L779N-6I2000160	43.4	5580	5940	1010	1130	1	2.36	0.929
L04L779N-6I2000170	43.5	5660	5950	1040	1140	1	2.35	0.928
L04L779N-6I2100010	43.0	5700	5670	1010	1020	1	2.36	0.928

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GEOMEMBRANE STANDARD TESTING

ate: 06/13/97

Bill(s) of Lading: 13171

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	TD	STRAIN AT BREAK (%) MD	TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
L04L779N-6I2100020	42.9	5810	5950	1040	1110	1	2.44	0.927
L04L779N-6I2100030	42.6	5900	5830	1060	1090	1	2.42	0.932
L04L779N-6I2100040	42.6	5550	5820	1000	1090	1	2.54	0.932
L04L779N-6I2100050	42.7	5790	5890	1030	1090	1	2.40	0.932
L04L779N-6I2100060	42.3	5580	6070	999	1120	1	2.44	0.929
L04L779N-6I2100070	42.5	5490	5430	1030	1030	1	2.46	0.929
L04L779N-6I2100080	42.6	5590	5560	1010	1040	1	2.43	0.929
L04L779N-6I2100090	42.0	5550	5640	1010	1060	1	2.35	0.929
L04L779N-6I2100100	42.1	5240	5710	961	1080	1	2.40	0.929
L04L779N-6I2100110	43.3	5320	5870	994	1130	1	2.44	0.929
L04L779N-6I2100120	42.8	5690	5440	1010	997	1	2.41	0.929
L04L779N-6I2100130	43.0	5480	6070	978	1130	1	2.46	0.929
L04L779N-6I2100140	43.4	5570	5920	1040	1130	1	2.28	0.928
L04L779N-6I2100150	43.3	5600	5300	1050	1020	1	2.40	0.929
L04L779N-6I2100160	43.7	5640	5970	1060	1170	1	2.44	0.929
L04L780N-6I2200010	43.8	5760	5710	1090	1110	1	2.45	0.929
L04L780N-6I2200020	43.2	5630	5910	1020	1130	1	2.32	0.929

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GEOMEMBRANE STANDARD TESTING

Date: 06/13/97

Bill(s) of Lading: 13171

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	STRESS AT BREAK (psi) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
L04L780N-6I2200030	43.2	5810	6070	1060	1160	1	2.42	0.929
L04L780N-6I2200040	43.3	5520	6370	1010	1170	1	2.44	0.929
L04L780N-6I2200050	43.3	5610	6280	1030	1160	1	2.42	0.929
L04L780N-6I2200060	43.2	5670	6100	1040	1120	1	2.44	0.929
L04L780N-6I2200070	43.1	5700	6080	1030	1130	1	2.39	0.929
L04L780N-6I2200080	43.0	5870	6170	1040	1150	1	2.36	0.929
L04L780N-6I2200160	43.8	5290	5120	968	982	1	2.31	0.929
L04L780N-6I2300010	43.9	5740	5990	1040	1100	1	2.36	0.929
L04L780N-6I2300020	43.4	5760	5740	1030	1060	1	2.40	0.929
L04L780N-6I2300030	43.8	5850	5980	1040	1110	1	2.42	0.929
L04L780N-6I2300040	43.8	5740	5940	1060	1080	1	2.54	0.929
L04L780N-6I2300050	43.1	5820	5840	1060	1150	1	2.46	0.929
L04L780N-6I2300060	42.7	5800	6290	1050	1160	1	2.46	0.929
L04L780N-6I2300080	42.7	5770	5970	1070	1160	1	2.42	0.929
L04L780N-6I2300100	43.1	5840	6290	1040	1150	1	2.45	0.929
L04L780N-6I2300110	42.9	6060	6000	1130	1140	1	2.44	0.929
L04L780N-6I2300120	43.7	5640	5730	1040	1110	1	2.38	0.928

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GEOMEMBRANE STANDARD TESTING

Date: 06/13/97

Bill(s) of Lading: 13171

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	STRESS AT BREAK (psi) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm^3)
L04L780N-6I2300130	43.2	5770	5830	1090	1120	1	2.25	0.928
L04L780N-6I2300140	43.6	5250	5730	991	1110	1	2.39	0.928
L04L780N-6I2300150	43.8	5720	6300	1050	1200	1	2.38	0.928
L04L780N-6I2300160	42.7	5890	6220	1080	1190	1	2.38	0.929
L04L781N-6I2300170	43.3	5490	6080	1020	1170	1	2.30	0.928
L04L781N-6I2400010	43.0	6040	6250	1110	1180	1	2.39	0.928
L04L781N-6I2400020	43.0	5950	6060	1100	1200	1	2.38	0.928
L04L781N-6I2400030	43.0	5730	6410	1080	1190	1	2.34	0.929
L04L781N-6I2400040	43.0	6120	6320	1110	1210	1	2.40	0.929
L04L781N-6I2400050	42.9	6020	5720	1130	1100	1	2.41	0.929
L04L781N-6I2400060	42.9	5890	5660	1060	1050	1	2.34	0.929
L04L781N-6I2400070	43.2	5800	6760	1030	1230	1	2.50	0.929
L04L781N-6I2400080	43.0	5850	6150	1040	1120	1	2.43	0.929
L04L781N-6I2400090	42.8	5410	6040	981	1120	1	2.44	0.929
L04L781N-6I2400100	42.4	5760	5650	1060	1060	1	2.34	0.929
L04L781N-6I2400110	42.3	5880	5420	1050	990	1	2.40	0.929
L04L781N-6I2400120	42.9	5870	6280	1040	1160	1	2.33	0.929

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GEOMEMBRANE STANDARD TESTING

Date: 06/13/97

Bill(s) of Lading: 13171

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	STRESS AT BREAK (psi) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
L04L781N-6I2400130	43.4	5700	6050	1020	1110	1	2.42	0.929
L04L781N-6I2400140	43.7	5110	5080	932	958	1	2.35	0.929

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6-13-97
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08/14/97

NSC

POLYETHYLENE CERTIFICATE OF ANALYSIS

Customer: Solmax Geosynthetics, Inc.

Resin Type: Chevron

Project Name: Niagara Falls, NY

Project Number: 3G28-100

Bill of Lading: 13920 & 13922

We hereby certify that the polyethylene resin for the above identified shipment, meets or exceeds National Seal Company's specifications. Testing was performed on each resin blend.

Melt flow index was determined according to ASTM D 1238 Condition 190/2.16. Density was determined according to ASTM D 1505. Where appropriate, carbon black content was determined according to ASTM D 4218. The average test results are listed in the table below.

RESIN PROPERTIES

BLEND NUMBER	MELT FLOW INDEX (g/10 min)	DENSITY (g/cm^3)	CARBON BLACK CONTENT (%)
604E	0.87	0.919	
699E	0.80	0.922	
700E	0.90	0.919	

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Quality Control Manager

8-14-97

Date:

Note: When no carbon black content value is listed, the resin contained no carbon black.

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LLDPE GEOMEMBRANE CERTIFICATE OF ANALYSIS

NSC

Customer: Solmax Geosynthetics, Inc.

Number of Rolls Shipped: 12

Project Name: Niagara Falls, NY

Nominal Thickness: 40 mil

Project Number: 3G28-100

Bill of Lading(s): 13920 & 13922

We hereby certify that the polyethylene geomembrane for the above identified shipment meets or exceeds National Seal Company's specifications, below. Testing was performed at the frequency indicated.

The raw polymeric material is first quality polyethylene resin containing no more than two percent clean re-worked plastic by weight. Thickness was measured according to ASTM D 5199. Tensile properties were determined in accordance with ASTM D 638, using Type IV dumbell specimens, a strain rate of 20 inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 5596 and rated according to the ASTM D 5596 dispersion classification chart under 100X magnification. Carbon black content was determined according to ASTM D 4218. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. Density was determined according to ASTM D 1505.

A database listing of all test values follows.

GEOMEMBRANE SPECIFICATIONS

Thickness	40 mil Minimum Average	at least every 50,000 ft^2
Stress at Break	3800 psi Minimum Average	at least every 50,000 ft^2
Strain at Break	850% Minimum Average	at least every 50,000 ft^2
Carbon Black Dispersion	Category 1 or 2	at least every 50,000 ft^2
Carbon Black Content	2% to 3%	at least every 50,000 ft^2
Dimensional Stability	+/- 3%	at least once per shift
Density	0.935 g/cm3 Maximum Average	at least every 50,000 ft^2

NATIONAL SEAL COMPANY

Jane Allen

Jane Allen
Quality Control Manager

8-14-97

Date

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GEOMEMBRANE STANDARD TESTING

Date: 08/14/97

Bill(s) of Lading: 13920 & 13922

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	STRESS AT BREAK (psi) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
RD4L699E-7G1100020	43.3	5120	4920	1030	1030	1	2.36	0.930
RD4L699E-7G1100030	43.3	5400	5140	1090	1070	1	2.37	0.929
RD4L699E-7G1100040	43.3	5280	5050	1060	1060	1	2.38	0.930
RD4L699E-7G1100050	43.0	5140	4850	1010	1020	1	2.47	0.930
RD4L699E-7G1100060	43.0	5230	5010	1040	1030	1	2.43	0.930
RD4L699E-7G1100070	43.1	5080	4840	1030	993	1	2.41	0.930
RD4L699E-7G1100080	43.2	5180	4880	1060	1010	1	2.40	0.930
RD4L699E-7G1100090	43.2	5070	4770	1050	1000	1	2.44	0.930
RD4L699E-7G1100100	43.2	4930	4790	1020	1010	1	2.34	0.929
RD4L699E-7G1100110	43.1	4920	4510	1010	973	1	2.34	0.930
RD4L699E-7G1100120	43.5	4850	4680	993	998	1	2.42	0.930
RD4L699E-7G1100130	43.5	5030	4540	1020	942	1	2.42	0.930
RD4L699E-7G1100140	43.3	4900	4560	1010	964	1	2.41	0.930
RD4L699E-7G1100150	43.7	4650	4470	991	930	1	2.38	0.930
RD4L699E-7G1100160	43.3	4820	4690	1050	1000	1	2.44	0.930
RD4L699E-7G1200010	43.0	4980	4540	1010	1130	1	2.42	0.929
RD4L699E-7G1200020	42.9	5230	4860	1080	1020	1	2.42	0.930

Jane Allen

Jane Allen
Quality Control Manager

8-14-97
Date

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GEOMEMBRANE STANDARD TESTING

Date: 08/14/97

Bill(s) of Lading: 13920 & 13922

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	TD	STRAIN AT BREAK (%) MD	TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
R04L699E-7G1200030	42.7	5090	4830	1050	1010	1	2.42	0.930
R04L700E-7G1200040	42.7	5030	4930	1030	1040	1	2.39	0.929
R04L700E-7G1200050	42.6	4910	4860	1140	1020	1	2.42	0.930
R04L700E-7G1200060	42.5	5140	4890	1070	1020	1	2.44	0.930
R04L700E-7G1200070	42.5	4950	5060	1010	1050	1	2.44	0.930
R04L700E-7G1200080	42.5	5120	4740	1050	993	1	2.42	0.930
R04L700E-7G1200090	42.9	5200	4930	1090	1060	1	2.36	0.930
R04L700E-7G1200100	42.9	5020	4850	1070	1040	1	2.44	0.929
R04L700E-7G1200110	43.0	4920	4970	1040	1060	1	2.40	0.929
R04L700E-7G1200120	43.0	4980	4840	1040	1030	1	2.40	0.929
R04L700E-7G1200130	42.9	4950	4890	1040	1050	1	2.35	0.929
R04L700E-7G1200140	42.9	5220	5240	1120	1150	1	2.39	0.929
R04L700E-7G1200150	43.1	5200	4980	1110	1080	1	2.40	0.929
R04L700E-7G1200160	43.0	5010	4670	1030	988	1	2.38	0.929
R04L604E-7G1400010	43.4	5040	5000	1040	1080	1	2.49	0.929
R04L604E-7G1400020	43.3	5180	4950	1090	1060	1	2.37	0.929
R04L604E-7G1400030	43.0	5150	5160	1070	1140	1	2.41	0.929

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GEOMEMBRANE STANDARD TESTING

ate: 08/14/97

Bill(s) of Lading: 13920 & 13922

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	TD	STRAIN AT BREAK (%) MD	TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
R04L604E-7G1400040	43.0	4990	5010	1040	1070	1	2.40	0.929
R04L604E-7G1400050	43.1	4830	4930	1010	1070	1	2.37	0.929
R04L604E-7G1400060	43.2	4950	4900	1040	1140	2	2.40	0.929
R04L604E-7G1400070	43.2	5060	4990	1070	1080	2	2.36	0.930
R04L604E-7G1400080	43.3	5100	4920	1080	1080	1	2.38	0.928
R04L604E-7G1400090	43.2	5080	5270	982	1060	1	2.32	0.928
R04L604E-7G1400100	43.1	5210	4740	1100	1130	1	2.37	0.929
R04L604E-7G1400110	43.1	4740	5250	1050	1110	1	2.40	0.929
04L604E-7G1400120	42.8	5060	5330	1000	1060	1	2.32	0.929
R04L604E-7G1400130	43.0	5200	4970	1090	1060	1	2.38	0.929
R04L604E-7G1400140	43.2	5080	5080	1060	1090	1	2.32	0.928
R04L604E-7G1400150	42.9	5100	5120	1060	1090	1	2.38	0.929
R04L604E-7G1400160	43.2	5070	5030	1050	1080	1	2.32	0.928
R04L604E-7G1500010	43.1	5020	4860	1060	1040	1	2.40	0.929
R04L604E-7G1500020	42.9	5080	4840	1060	1030	1	2.40	0.929
R04L604E-7G1500030	42.4	5000	4850	1100	1030	1	2.33	0.929
R04L604E-7G1500040	42.6	5080	4870	1040	1020	1	2.44	0.929

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GEOMEMBRANE STANDARD TESTING

Date: 08/14/97

Bill(s) of Lading: 13920 & 13922

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	STRESS AT BREAK (psi) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm^3)
R04L604E-7G1500050	42.6	5220	5140	1070	1090	1	2.41	0.929
R04L604E-7G1500060	42.5	5150	5110	1070	1070	1	2.44	0.929

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GEOMEMBRANE STANDARD TESTING

Date: 08/14/97

Bill(s) of Lading: 13920 & 13922

ROLL NUMBER	THICK (mil)	STRESS AT YIELD (ppi) MD	STRESS AT YIELD (ppi) TD	STRESS AT BREAK (ppi) MD	STRESS AT BREAK (ppi) TD	STRAIN AT YIELD (%) MD	STRAIN AT YIELD (%) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARB DISP	DENSITY (g/cm3)	CARB CONT (%)	DIMENSIONAL STABILITY MD	DIMENSIONAL STABILITY TD
R04L699E-7G1100020	43.3			222	213			1030	1030	1	0.930	2.36	-1.0	0.0
R04L699E-7G1100030	43.3			234	223			1090	1070	1	0.929	2.37	.	.
R04L699E-7G1100040	43.3			229	219			1060	1060	1	0.930	2.38	.	.
R04L699E-7G1100050	43.0			221	209			1010	1020	1	0.930	2.47	.	.
R04L699E-7G1100060	43.0			225	215			1040	1030	1	0.930	2.43	.	.
R04L699E-7G1100070	43.1			219	209			1030	993	1	0.930	2.41	.	.
R04L699E-7G1100080	43.2			224	211			1060	1010	1	0.930	2.40	.	.
R04L699E-7G1100090	43.2			219	206			1050	1000	1	0.930	2.44	-0.6	0.0
R04L699E-7G1100100	43.2			213	207			1020	1010	1	0.929	2.34	.	.
R04L699E-7G1100110	43.1			212	194			1010	973	1	0.930	2.34	.	.
R04L699E-7G1100120	43.5			211	204			993	998	1	0.930	2.42	.	.
R04L699E-7G1100130	43.5			219	197			1020	942	1	0.930	2.42	.	.
R04L699E-7G1100140	43.3			212	197			1010	964	1	0.930	2.41	.	.
R04L699E-7G1100150	43.7			203	195			991	930	1	0.930	2.38	.	.
R04L699E-7G1100160	43.3			209	203			1050	1000	1	0.930	2.44	.	.
R04L699E-7G1200010	43.0			214	195			1010	1130	1	0.929	2.42	-0.9	0.0
R04L699E-7G1200020	42.9			224	208			1080	1020	1	0.930	2.42	.	.

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GEOMEMBRANE STANDARD TESTING

.te: 08/14/97

Bill(s) of Lading: 13920 & 13922

ROLL NUMBER	THICK (mil)	STRESS AT YIELD (ppi) MD	STRESS AT YIELD (ppi) TD	STRESS AT BREAK (ppi) MD	STRESS AT BREAK (ppi) TD	STRAIN AT YIELD (%) MD	STRAIN AT YIELD (%) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARB DISP	DENSITY (g/cm3)	CARB CONT (%)	DIMENSIONAL STABILITY MD	DIMENSIONAL STABILITY TD
R04L699E-7G1200030	42.7			217	206			1050	1010	1	0.930	2.42	.	.
R04L700E-7G1200040	42.7			215	211			1030	1040	1	0.929	2.39	.	.
R04L700E-7G1200050	42.6			209	207			1140	1020	1	0.930	2.42	.	.
R04L700E-7G1200060	42.5			218	208			1070	1020	1	0.930	2.44	.	.
R04L700E-7G1200070	42.5			210	215			1010	1050	1	0.930	2.44	.	.
R04L700E-7G1200080	42.5			218	201			1050	993	1	0.930	2.42	.	.
R04L700E-7G1200090	42.9			223	211			1090	1060	1	0.930	2.36	-0.9	-0.2
R04L700E-7G1200100	42.9			215	208			1070	1040	1	0.929	2.44	.	.
J4L700E-7G1200110	43.0			212	214			1040	1060	1	0.929	2.40	.	.
R04L700E-7G1200120	43.0			214	208			1040	1030	1	0.929	2.40	.	.
R04L700E-7G1200130	42.9			212	210			1040	1050	1	0.929	2.35	.	.
R04L700E-7G1200140	42.9			224	225			1120	1150	1	0.929	2.39	.	.
R04L700E-7G1200150	43.1			224	215			1110	1080	1	0.929	2.40	.	.
R04L700E-7G1200160	43.0			215	201			1030	988	1	0.929	2.38	.	.
R04L604E-7G1400010	43.4			219	217			1040	1080	1	0.929	2.49	+1.0	-0.2
R04L604E-7G1400020	43.3			224	214			1090	1060	1	0.929	2.37	.	.
R04L604E-7G1400030	43.0			221	222			1070	1140	1	0.929	2.41	.	.

Jane Allen

Jane Allen
Quality Control Manager

8-14-97

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GEOMEMBRANE STANDARD TESTING

ıte: 08/14/97

Bill(s) of Lading: 13920 & 13922

ROLL NUMBER	THICK (mil)	STRESS AT YIELD (ppi) MD	STRESS AT YIELD (ppi) TD	STRESS AT BREAK (ppi) MD	STRESS AT BREAK (ppi) TD	STRAIN AT YIELD (%) MD	STRAIN AT YIELD (%) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARB DISP	DENSITY (g/cm3)	CARB CONT (%)	DIMENSIONAL STABILITY MD	DIMENSIONAL STABILITY TD
R04L604E-7G1400040	43.0			215	215			1040	1070	1	0.929	2.40	-	-
R04L604E-7G1400050	43.1			208	212			1010	1070	1	0.929	2.37	-	-
R04L604E-7G1400060	43.2			214	212			1040	1140	2	0.929	2.40	-	-
R04L604E-7G1400070	43.2			219	216			1070	1080	2	0.930	2.36	-	-
R04L604E-7G1400080	43.3			221	213			1080	1080	1	0.928	2.38	-1.0	-0.3
R04L604E-7G1400090	43.2			219	228			982	1060	1	0.928	2.32	-	-
R04L604E-7G1400100	43.1			225	204			1100	1130	1	0.929	2.37	-	-
R04L604E-7G1400110	43.1			204	226			1050	1110	1	0.929	2.40	-	-
J4L604E-7G1400120	42.8			217	228			1000	1060	1	0.929	2.32	-	-
R04L604E-7G1400130	43.0			224	214			1090	1060	1	0.929	2.38	-	-
R04L604E-7G1400140	43.2			219	219			1060	1090	1	0.928	2.32	-	-
R04L604E-7G1400150	42.9			219	220			1060	1090	1	0.929	2.38	-	-
R04L604E-7G1400160	43.2			219	217			1050	1080	1	0.928	2.32	-	-
R04L604E-7G1500010	43.1			216	209			1060	1040	1	0.929	2.40	-	-
R04L604E-7G1500020	42.9			218	208			1060	1030	1	0.929	2.40	-0.8	-0.2
R04L604E-7G1500030	42.4			212	206			1100	1030	1	0.929	2.33	-	-
R04L604E-7G1500040	42.6			216	207			1040	1020	1	0.929	2.44	-	-

Jane Allen
uality Control Manager

8-14-97
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GEOMEMBRANE STANDARD TESTING

ate: 08/14/97

Bill(s) of Lading: 13920 & 13922

ROLL NUMBER	THICK (mil)	STRESS AT YIELD (ppi) MD	STRESS AT YIELD (ppi) TD	STRESS AT BREAK (ppi) MD	STRESS AT BREAK (ppi) TD	STRAIN AT YIELD (%) MD	STRAIN AT YIELD (%) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARB DISP	DENSITY (g/cm3)	CARB CONT (%)	DIMENSIONAL STABILITY MD	DIMENSIONAL STABILITY TD
R04L604E-7G1500050	42.6			222	219			1070	1090	1	0.929	2.41	.	.
R04L604E-7G1500060	42.5			219	217			1070	1070	1	0.929	2.44	.	.

ane Allen
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7/16/97

NSC

POLYETHYLENE CERTIFICATE OF ANALYSIS

Customer: Solmax Geosynthetics, Inc.

Resin Type: Chevron

Project Name: Niagara Falls, NY

Project Number: 3G28-100

Bill of Lading: 13595

We hereby certify that the polyethylene resin for the above identified shipment, meets or exceeds National Seal Company's specifications. Testing was performed on each resin blend.

Melt flow index was determined according to ASTM D 1238 Condition 190/2.16. Density was determined according to ASTM D 1505. Where appropriate, carbon black content was determined according to ASTM D 4218. The average test results are listed in the table below.

RESIN PROPERTIES

BLEND NUMBER	MELT FLOW INDEX (g/10 min)	DENSITY (g/cm^3)	CARBON BLACK CONTENT (%)
700E	0.90	0.919	

Jane Allen

Jane Allen
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7-16-97

Date:

When no carbon black content value is listed, the resin contained no carbon black.

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LLDPE GEOMEMBRANE CERTIFICATE OF ANALYSIS

NSC

Customer: Solmax Geosynthetics, Inc.

Number of Rolls Shipped: 6

Project Name: Niagara Falls, NY

Nominal Thickness: 40 mil

Project Number: 3G28-100

Bill of Lading(s): 13595

We hereby certify that the polyethylene geomembrane for the above identified shipment meets or exceeds National Seal Company's specifications, below. Testing was performed at the frequency indicated.

The raw polymeric material is first quality polyethylene resin containing no more than two percent clean re-worked plastic by weight. Thickness was measured according to ASTM D 5199. Tensile properties were determined in accordance with ASTM D 638, using Type IV dumbell specimens, a strain rate of 20 inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 5596 and rated according to the ASTM D 5596 dispersion classification chart under 100X magnification. Carbon black content was determined according to ASTM D 4218. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. Density was determined according to ASTM D 1505.

A database listing of all test values follows.

GEOMEMBRANE SPECIFICATIONS

Thickness	40 mil Minimum Average	at least every 50,000 ft^2
Stress at Break	3800 psi Minimum Average	at least every 50,000 ft^2
Strain at Break	850% Minimum Average	at least every 50,000 ft^2
Carbon Black Dispersion	Category 1 or 2	at least every 50,000 ft^2
Carbon Black Content	2% to 3%	at least every 50,000 ft^2
Dimensional Stability	+/- 3%	at least once per shift
Density	0.935 g/cm3 Maximum Average	at least every 50,000 ft^2

NATIONAL SEAL COMPANY

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ity Control Manager

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GEOMEMBRANE STANDARD TESTING

)7/16/97

ill(s) of Lading: 13595

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	TD	STRAIN AT BREAK (%) MD	TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
)4L699E-7G1200010	43.0	4980	4540	1010	1130	1	2.42	0.929
04L699E-7G1200020	42.9	5230	4860	1080	1020	1	2.42	0.930
04L699E-7G1200030	42.7	5090	4830	1050	1010	1	2.42	0.930
04L700E-7G1200040	42.7	5030	4930	1030	1040	1	2.39	0.929
04L700E-7G1200050	42.6	4910	4860	1140	1020	1	2.42	0.930
04L700E-7G1200060	42.5	5140	4890	1070	1020	1	2.44	0.930
04L700E-7G1200070	42.5	4950	5060	1010	1050	1	2.44	0.930
04L700E-7G1200080	42.5	5120	4740	1050	993	1	2.42	0.930
0E-7G1200090	42.9	5200	4930	1090	1060	1	2.36	0.930
04L700E-7G1200100	42.9	5020	4850	1070	1040	1	2.44	0.929
04L700E-7G1200110	43.0	4920	4970	1040	1060	1	2.40	0.929
04L700E-7G1200120	43.0	4980	4840	1040	1030	1	2.40	0.929
:04L700E-7G1200130	42.9	4950	4890	1040	1050	1	2.35	0.929
:04L700E-7G1200140	42.9	5220	5240	1120	1150	1	2.39	0.929
:04L700E-7G1200150	43.1	5200	4980	1110	1080	1	2.40	0.929
:04L700E-7G1200160	43.0	5010	4670	1030	988	1	2.38	0.929

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Jane Allen

: y Control Manager

7-16-97

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POLYETHYLENE CERTIFICATE OF ANALYSIS

ustomer: Solmax Geosynthetics, Inc.

Resin Type: Chevron

roject Name: Niagara Falls, NY

roject Number: 3G28-100

ill of Lading: 13595

le hereby certify that the polyethylene resin for the above identified shipment, meets or exceeds National eal Company's specifications. Testing was performed on each resin blend.

lelt flow index was determined according to ASTM D 1238 Condition 190/2.16. Density was determined according o ASTM D 1505. Where appropriate, carbon black content was determined according to ASTM D 4218. he average test results are listed in the table below.

RESIN PROPERTIES

BLEND NUMBER	MELT FLOW INDEX (g/10 min)	DENSITY (g/cm^3)	CARBON BLACK CONTENT (%)
700E	0.90	0.919	

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Quality Control Manager

7-15-97

Date:

When no carbon black content value is listed, the resin contained no carbon black.

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LLDPE GEOMEMBRANE CERTIFICATE OF ANALYSIS

NSC

Customer: Solmax Geosynthetics, Inc.

Number of Rolls Shipped: 6

Project Name: Niagara Falls, NY

Nominal Thickness: 40 mil

Project Number: 3G28-100

Bill of Lading(s): 13595

We hereby certify that the polyethylene geomembrane for the above identified shipment meets or exceeds National Seal Company's specifications, below. Testing was performed at the frequency indicated.

The raw polymeric material is first quality polyethylene resin containing no more than two percent clean re-worked plastic by weight. Thickness was measured according to ASTM D 5199. Tensile properties were determined in accordance with ASTM D 638, using Type IV dumbell specimens, a strain rate of 20 inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 5596 and rated according to the ASTM D 5596 dispersion classification chart under 100X magnification. Carbon black content was determined according to ASTM D 4218. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. Density was determined according to ASTM D 1505.

A database listing of all test values follows.

GEOMEMBRANE SPECIFICATIONS

Thickness	40 mil Minimum Average	at least every 50,000 ft^2
Stress at Break	3800 psi Minimum Average	at least every 50,000 ft^2
Strain at Break	850% Minimum Average	at least every 50,000 ft^2
Carbon Black Dispersion	Category 1 or 2	at least every 50,000 ft^2
Carbon Black Content	2% to 3%	at least every 50,000 ft^2
Dimensional Stability	+/- 3%	at least once per shift
Density	0.935 g/cm3 Maximum Average	at least every 50,000 ft^2

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Quality Control Manager

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GEOMEMBRANE STANDARD TESTING

07/15/97

Bill(s) of Lading: 13595

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	STRESS AT BREAK (psi) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
R04L699E-7G1200010	43.0	4980	4540	1010	1130	1	2.42	0.929
R04L699E-7G1200020	42.9	5230	4860	1080	1020	1	2.42	0.930
R04L699E-7G1200030	42.7	5090	4830	1050	1010	1	2.42	0.930
R04L700E-7G1200040	42.7	5030	4930	1030	1040	1	2.39	0.929
R04L700E-7G1200050	42.6	4910	4860	1140	1020	1	2.42	0.930
R04L700E-7G1200060	42.5	5140	4890	1070	1020	1	2.44	0.930
R04L700E-7G1200070	42.5	4950	5060	1010	1050	1	2.44	0.930
R04L700E-7G1200080	42.5	5120	4740	1050	993	1	2.42	0.930
[illegible]0E-7G1200090	42.9	5200	4930	1090	1060	1	2.36	0.930
R04L700E-7G1200100	42.9	5020	4850	1070	1040	1	2.44	0.929
R04L700E-7G1200110	43.0	4920	4970	1040	1060	1	2.40	0.929
R04L700E-7G1200120	43.0	4980	4840	1040	1030	1	2.40	0.929
R04L700E-7G1200130	42.9	4950	4890	1040	1050	1	2.35	0.929
R04L700E-7G1200140	42.9	5220	5240	1120	1150	1	2.39	0.929
R04L700E-7G1200150	43.1	5200	4980	1110	1080	1	2.40	0.929
R04L700E-7G1200160	43.0	5010	4670	1030	988	1	2.38	0.929
R04L700E-7G1300010	42.9	5160	4990	1070	1060	1	2.40	0.930

Jane Allen

Jane Allen
Quality Control Manager

7-15-97
Date

This Certificate of Analysis shall not be reproduced except in full, without the written approval of the laboratory.
National Seal Company - 1255 Monmouth Blvd. - Galesburg, IL - 61401

NSC

GEOMEMBRANE STANDARD TESTING

07/15/97

Bill(s) of Lading: 13595

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	TD	STRAIN AT BREAK (%) MD	TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm^3)
R04L700E-7G1300020	42.7	5260	4940	1090	1040	1	2.39	0.930
R04L700E-7G1300030	42.8	5300	4820	1080	1010	1	2.44	0.930
R04L700E-7G1300040	43.1	5040	4970	1050	1050	1	2.40	0.930
R04L700E-7G1300050	42.9	5220	4860	1070	1030	1	2.42	0.930
R04L700E-7G1300060	42.8	4720	4940	969	1040	1	2.44	0.930
R04L700E-7G1300070	43.2	4850	4960	992	1050	1	2.42	0.930
R04L700E-7G1300080	42.8	5070	4780	1030	1010	1	2.36	0.929
R04L700E-7G1300090	43.1	5030	5030	1050	1080	1	2.38	0.929
P 700E-7G1300100	43.1	5000	4850	1040	1040	1	2.23	0.929
R04L700E-7G1300110	42.9	4760	4850	995	1050	1	2.40	0.929
R04L700E-7G1300120	42.4	4880	5110	992	1070	1	2.36	0.929
R04L604E-7G1300130	42.7	4860	4780	975	1110	1	2.34	0.929
R04L604E-7G1300180	43.4	4970	5170	1010	1110	1	2.30	0.928

Jane Allen

Jane Allen
Quality Control Manager

7-15-97
Date

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National Seal Company - 1255 Monmouth Blvd. - Galesburg, IL - 61401

09/09/97

NSC

POLYETHYLENE CERTIFICATE OF ANALYSIS

Customer: Solmax Geosynthetics, Inc.

Resin Type: Chevron

Project Name: Niagara Falls, NY

Project Number: 3G28-100

Bill of Lading: 14187

We hereby certify that the polyethylene resin for the above identified shipment, meets or exceeds National Seal Company's specifications. Testing was performed on each resin blend.

Melt flow index was determined according to ASTM D 1238 Condition 190/2.16. Density was determined according to ASTM D 1505. Where appropriate, carbon black content was determined according to ASTM D 4218. The average test results are listed in the table below.

RESIN PROPERTIES

BLEND NUMBER	MELT FLOW INDEX (g/10 min)	DENSITY (g/cm^3)	CARBON BLACK CONTENT (%)
604E	0.87	0.919	
699E	0.80	0.922	

Jane Allen

Quality Control Manager

9-09-97

Date:

Note: When no carbon black content value is listed, the resin contained no carbon black.

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National Seal Company - 1255 Monmouth Blvd. - Galesburg, IL - 61401

LLDPE GEOMEMBRANE CERTIFICATE OF ANALYSIS

NSC

Customer: Solmax Geosynthetics, Inc.

Number of Rolls Shipped: 5

Project Name: Niagara Falls, NY

Nominal Thickness: 40 mil

Project Number: 3G28-100

Bill of Lading(s): 14187

We hereby certify that the polyethylene geomembrane for the above identified shipment meets or exceeds National Seal Company's specifications, below. Testing was performed at the frequency indicated.

The raw polymeric material is first quality polyethylene resin containing no more than two percent clean re-worked plastic by weight. Thickness was measured according to ASTM D 5199. Tensile properties were determined in accordance with ASTM D 638, using Type IV dumbell specimens, a strain rate of 20 inches per minute and grip movement for strain determinations. Carbon black dispersion slides were prepared according to ASTM D 5596 and rated according to the ASTM D 5596 dispersion classification chart under 100X magnification. Carbon black content was determined according to ASTM D 4218. Dimensional stability was determined according to ASTM D 1204 at 100°C for one hour. Density was determined according to ASTM D 1505.

A database listing of all test values follows.

GEOMEMBRANE SPECIFICATIONS

Thickness	40 mil Minimum Average	at least every 50,000 ft^2
Stress at Break	3800 psi Minimum Average	at least every 50,000 ft^2
Strain at Break	850% Minimum Average	at least every 50,000 ft^2
Carbon Black Dispersion	Category 1 or 2	at least every 50,000 ft^2
Carbon Black Content	2% to 3%	at least every 50,000 ft^2
Dimensional Stability	+/- 3%	at least once per shift
Density	0.935 g/cm3 Maximum Average	at least every 50,000 ft^2

NATIONAL SEAL COMPANY

Jane Allen

Jane Allen
Quality Control Manager

9-09-97

Date

This Certificate of Analysis shall not be reporduced except in full, without the written approval of the laboratory.
National Seal Company - 1255 Monmouth Blvd. - Galesburg, IL - 61401

NSC

GEOMEMBRANE STANDARD TESTING

Date: 09/09/97

Bill(s) of Lading: 14187

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	STRESS AT BREAK (psi) TD	STRAIN AT BREAK (%) MD	STRAIN AT BREAK (%) TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
R04L699E-7G1100020	43.3	5120	4920	1030	1030	1	2.36	0.930
R04L699E-7G1100030	43.3	5400	5140	1090	1070	1	2.37	0.929
R04L699E-7G1100040	43.3	5280	5050	1060	1060	1	2.38	0.930
R04L699E-7G1100050	43.0	5140	4850	1010	1020	1	2.47	0.930
R04L699E-7G1100060	43.0	5230	5010	1040	1030	1	2.43	0.930
R04L699E-7G1100070	43.1	5080	4840	1030	993	1	2.41	0.930
R04L699E-7G1100080	43.2	5180	4880	1060	1010	1	2.40	0.930
R04L699E-7G1100090	43.2	5070	4770	1050	1000	1	2.44	0.930
R04L699E-7G1100100	43.2	4930	4790	1020	1010	1	2.34	0.929
R04L699E-7G1100110	43.1	4920	4510	1010	973	1	2.34	0.930
R04L699E-7G1100120	43.5	4850	4680	993	998	1	2.42	0.930
R04L699E-7G1100130	43.5	5030	4540	1020	942	1	2.42	0.930
R04L699E-7G1100140	43.3	4900	4560	1010	964	1	2.41	0.930
R04L699E-7G1100150	43.7	4650	4470	991	930	1	2.38	0.930
R04L699E-7G1100160	43.3	4820	4690	1050	1000	1	2.44	0.930
R04L604E-7G1400010	43.4	5040	5000	1040	1080	1	2.49	0.929
R04L604E-7G1400020	43.3	5180	4950	1090	1060	1	2.37	0.929

Jane Allen

Jane Allen
Quality Control Manager

9-09-97
Date

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National Seal Company - 1255 Monmouth Blvd. - Galesburg, IL - 61401

NSC

GEOMEMBRANE STANDARD TESTING

ate: 09/09/97

Bill(s) of Lading: 14187

ROLL NUMBER	THICK (mil)	STRESS AT BREAK (psi) MD	TD	STRAIN AT BREAK (%) MD	TD	CARBON DISPERSION (Category)	CARB CONT (%)	DENSITY (g/cm3)
R04L604E-7G1400030	43.0	5150	5160	1070	1140	1	2.41	0.929
R04L604E-7G1400040	43.0	4990	5010	1040	1070	1	2.40	0.929
R04L604E-7G1400050	43.1	4830	4930	1010	1070	1	2.37	0.929
R04L604E-7G1400060	43.2	4950	4900	1040	1140	2	2.40	0.929
R04L604E-7G1400070	43.2	5060	4990	1070	1080	2	2.36	0.930
R04L604E-7G1400080	43.3	5100	4920	1080	1080	1	2.38	0.928
R04L604E-7G1400090	43.2	5080	5270	982	1060	1	2.32	0.928
R04L604E-7G1400100	43.1	5210	4740	1100	1130	1	2.37	0.929
J4L604E-7G1400110	43.1	4740	5250	1050	1110	1	2.40	0.929
R04L604E-7G1400120	42.8	5060	5330	1000	1060	1	2.32	0.929
R04L604E-7G1400130	43.0	5200	4970	1090	1060	1	2.38	0.929
R04L604E-7G1400140	43.2	5080	5080	1060	1090	1	2.32	0.928
R04L604E-7G1400150	42.9	5100	5120	1060	1090	1	2.38	0.929
R04L604E-7G1400160	43.2	5070	5030	1050	1080	1	2.32	0.928

Jane Allen

Jane Allen
Quality Control Manager

9-09-97
Date

This Certificate of Analysis shall not be reproduced except in full, without the written approval of the laboratory.
National Seal Company - 1255 Monmouth Blvd. - Galesburg, IL - 61401

LLDPE BILL OF LADINGS

ORIGINAL - NOT NEGOTIABLE

13171

PK NO. 10013144

ORDER NO. 3628-100

DATE 06/13/97

MALONE

SMITH TECHNOLOGY CORP
102ND STREET LDFL/9825 BUFFALO AVE
NIAGARA FALLS, NY 14304

SITE PHONE: 716-283-1615

FROM SHIPPER: NATIONAL SEAL COMPANY
STREET: 1255 MONMOUTH BLVD.
ORIGIN: GALESBURG, ILLINOIS 61402-1448

24-HOUR NOTICE REQUIRED PRIOR TO DELIVERY FOR ASSISTANCE IN UNLOADING

PIECES	PKG	KIND OF PACKAGE, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS	WEIGHT (Subject to Correction)	CLASS OR RATE
6		40 MIL LLDPE 30.5'	44860	211975
0				

LENGTH	WIDTH	USE	PO NO.		LENGTH	WIDTH	USE	PO NO.	
1150	30.50	35075	L04L781N-6I2400020	✓	2 1150	30.50	35075	L04L781N-6I2300170	✓
1200	30.50	35600	L04L922N-5L2100160	✓	4 1150	30.50	35075	L04L779N-6I2100030	✓
1150	30.50	35075	L04L779N-6I2100020	✓	6 1150	30.50	35075	L04L779N-6I2000100	✓

CLASS RATED AS

TO:
ESS

COD

C.O.D. FEE:
PREPAID ☐ $
COLLECT ☐
TOTAL CHARGES: $

Where the rate is dependent on value, s are required to state specifically in the agreed or declared value of the y.
he agreed or declared value of the y is hereby specifically stated by the to be not exceeding.
per

This is to certify that the above named articles are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.
Signature

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.
(Signature of Consignor)

FREIGHT CHARGES
FREIGHT PREPAID except when box at right is checked
Check box if charges are to be collected ☐

CEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading, the property described above in apparent good order, except as noted nts and condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout ntract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route. ise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said route tination and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the bill of lading terms nditions in the governing classification on the date of shipment. Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing cation and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns

NATIONAL SEAL COMPANY
D. Bosco
Safety Manager

CARRIER Molpus Freight Lines
PER Richard L. Mason
DATE 6-13-97

CUSTOMER

ORIGINAL—NOT NEGOTIABLE

13172

PK NO. 10013145

ORDER NO. 3028-10C

DATE 06/13/97

IE OF CARRIER MALONE

NEE SMITH TECHNOLOGY CORP	FROM SHIPPER NATIONAL SEAL COMPANY
T 102ND STREET LDFL /9829 BUFFALO AVE	STREET 1255 MONMOUTH BLVD.
DESTINATION NIAGARA FALLS,NY 14304	ORIGIN GALESBURG, ILLINOIS 61402-1448
ROUTE SITE PHONE: 716-283-1615	

24-HOUR NOTICE REQUIRED PRIOR TO DELIVERY FOR ASSISTANCE IN UNLOADING

6	40 MIL LLDPE 30.5"		44880	P10450
0				

LENGTH	WIDTH	SF	DIN	LENGTH	WIDTH	
1 1150	30.50	35075	L04L779N-6I2100090	2 1150	30.50	35075 L04L779N-6I2100110
5 1150	30.50	35075	L04L652N-6I2000030	6 1150	30.50	35075 L04L652N-6I1900100

B.O.B

REMIT C.O.D. TO: ADDRESS

COD

C.O.D. FEE: PREPAID ☐ $ COLLECT ☐ TOTAL CHARGES: $

NOTE - Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding.
$_____ per_____

This is to certify that the above named articles are property classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.
_____ Signature

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.
_____ (Signature of Consignor)

FREIGHT CHARGES

FREIGHT PREPAID except when box at right is checked | Check box if charges are to be collected

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading, the property described above in apparent good order, except as not contents and condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughx this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its rou otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said rox o destination and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the bill of lading ter and conditions in the governing classification on the date of shipment. Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governi classification and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

NATIONAL SEAL COMPANY

CARRIER

DATE 6-13-97

CARRIER

ILER NO. 382394 2 DRUM P/

STRAIGHT BILL OF LADING
ORIGINAL—NOT NEGOTIABLE

13595

L NO. I90. Lasalle Express Cayuga St Exit - Right to stop sign Left PK NO. Boat sign Launch Fencing 1st Entrance or Right ORDER NO. 38a5-100

ME OF CARRIER MALONE FREIGHT LINES DATE

	SMITH TECHNOLOGY CORP 1 BUD STREET 3RFL	FROM SHIPPER	NATIONAL SEAL COMPANY
EE.	9825 BUFFALO AVE	STREET	1255 MONMOUTH BLVD.
TINATION	NIAGARA FALLS,NY 14304	ORIGIN	GALESBURG, ILLINOIS 61402-1448

TE site phone: 716-283-1615

24-HOUR NOTICE REQUIRED PRIOR TO DELIVERY FOR ASSISTANCE IN UNLOADING

NO. SHIPPING UNITS	HM	KIND OF PACKAGING, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS	WEIGHT (SUBJECT TO CORRECTION)	CLASS OR RATE
6		40 MIL HDPE 30.5'	44725	210450

LENGTH	WIDTH	SF	ID NO.	NO.	LENGTH	WIDTH	SF	ID NO.
1150	30.50		35075 R04L700E-7G1200140	2	1150	30.50		35075 R04L700E-7G1200090
1150	30.50		35075 R04L700E-7G1200070	4	1150	30.50		35075 R04L700E-7G1200100
1150	30.50		35075 R04L700E-7G1200110	6	1150	30.50		35075 R04L700E-7G1200120

IT
O. TO:
RESS

COD

C.O.D. FEE:
PREPAID ☐ $
COLLECT ☐
TOTAL CHARGES: $

: - Where the rate is dependent on value, ers are required to state specifically in g the agreed or declared value of the rty.
The agreed or declared value of the rty is hereby specifically stated by the er to be not exceeding.
per

This is to certify that the above named articles are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.
Signature

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.
(Signature of Consignor)

FREIGHT CHARGES
FREIGHT PREPAID except when box at right is checked
Check box if charges are to be collected ☐

ECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading, the property described above in apparent good order, except as noted ents and condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, wise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said route stination and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the bill of lading terms conditions in the governing classification on the date of shipment. Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing ification and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

P	NATIONAL SEAL COMPANY	CARRIER	MALONE
	Tom Upton	PER	KW Federal
	Sold Prepaid	DATE	7-15-97

CUSTOMER

ORIGINAL—NOT NEGOTIABLE 13920

PK NO. 10013987 ORDER NO. 3628--100

DATE 08/13/97

ER TRANSPORT PLUS

SMITH TECHNOLOGY CORP./ 102 ND STREET LD
9829 BUFFALO AVE
ON NIAGARA FALLS, NY 14304
SITE PHONE: 716-283-1415

FROM SHIPPER: NATIONAL SEAL COMPANY
STREET: 1255 MONMOUTH BLVD.
ORIGIN: GALESBURG, ILLINOIS 61402-1448

24-HOUR NOTICE REQUIRED PRIOR TO DELIVERY FOR ASSISTANCE IN UNLOADING

UNITS	KIND OF PACKAGING, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS	WEIGHT	RATE
6	40 MIL LLDPE 30.5'	45080	210450
0			

LENGTH	WIDTH	SF	LOT NO.
1 1150	30.50	35075	R04L604E-7G1400120 ✓
2 1150	30.50	35075	R04L604E-7G1400110 ✓
3 1150	30.50	35075	R04L604E-7G1400100 ✓
4 1150	30.50	35075	R04L604E-7G1400090 ✓
5 1150	30.50	35075	R04L604E-7G1500030 ✓
6 1150	30.50	35075	R04L604E-7G1500020 ✓

MIT
.D. TO:
DRESS

COD

C.O.D. FEE:
PREPAID ☐ $
COLLECT ☐
TOTAL CHARGES: $

TE - Where the rate is dependent on value, ppers are required to state specifically in ing the agreed or declared value of the perty.
The agreed or declared value of the perty is hereby specifically stated by the pper to be not exceeding.
per

This is to certify that the above named articles are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.
Signature

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.
(Signature of Consignor)

FREIGHT CHARGES
FREIGHT PREPAID except when box at right is checked
Check box if charges are to be collected ☐

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading, the property described above in apparent good order, except as noted ntents and condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, erwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said route lestination and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the bill of lading terms conditions in the governing classification on the date of shipment. Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing sification and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

F NATIONAL SEAL COMPANY
D. Brazee

CARRIER Transport Plus
PER Keith Lundmark
DATE 8.13.97

CUSTOMER

ORIGINAL—NOT NEGOTIABLE

13922

PK NO. 10013988

ORDER NO. 3628--100

ER ACE DORAN

DATE 08/13/97

	FROM SHIPPER	NATIONAL SEAL COMPANY
SMITH TECHNOLOGY CORP/ 102 ND STREET LD	STREET	1255 MONMOUTH BLVD.
9829 BUFFALO AVE		
ON NIAGARA FALLS,NY 14304	ORIGIN	GALESBURG, ILLINOIS 61402-1448
SITE PHONE: 716-283-1615		

24-HOUR NOTICE REQUIRED PRIOR TO DELIVERY FOR ASSISTANCE IN UNLOADING

		KIND OF PACKAGING, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS		
6		40 MIL LLDPE 30.5'	45190	210450

	LENGTH	WIDTH					LENGTH	WIDTH		
1	1150	30.50	35075	R04L700E-7G1200050	✓	2	1150	30.50	35075	R04L700E-7G1200060 ✓
5	1150	30.50	35075	R04L699E-7G1200030	✓	6	1150	30.50	35075	R04L699E-7G1100150 ✓

~~R04L699E-7G~~

R04L699E -7G1200025

Received 8/13/97

REMIT
C.O.D. TO:
ADDRESS

COD

C.O.D. FEE:
PREPAID ☐ $
COLLECT ☐
TOTAL CHARGES $

NOTE - Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.

The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding.

_____ per _____

This is to certify that the above named articles are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

_____ Signature

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:

The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

_____ (Signature of Consignor)

FREIGHT CHARGES

FREIGHT PREPAID except when box at right is checked ☐ Check box if charges are to be collected ☐

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading, the property described above in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said route to destination and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the bill of lading terms and conditions in the governing classification on the date of shipment. Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing classification and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

NATIONAL SEAL COMPANY	CARRIER
ER Kevin Jewson	PER
	DATE 8-13-97

CUSTOMER

O. 6899T3

STRAIGHT BILL OF LADING
ORIGINAL—NOT NEGOTIABLE

14187

NO. ——

PK NO. ——

ORDER NO. 3628-100

10014267 09/08/97

AME OF CARRIER PACER DATE

ONSIGNEE	SMITH TECHNOLOGY CORP 102ND STREET	FROM SHIPPER	NATIONAL SEAL COMPANY
TREET	LANDFILL 9829 BUFFALO AVE	STREET	1255 MONMOUTH BLVD.
ESTINATION	NIAGARA FALLS,NY 14304	ORIGIN	GALESBURG, ILLINOIS 61402-1448
OUTE	JEANEAU 514-929-1234		

24-HOUR NOTICE REQUIRED PRIOR TO DELIVERY FOR ASSISTANCE IN UNLOADING

NO. SHIPPING UNITS	KIND OF PACKAGE, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS	WEIGHT (Subject to Correction)	CLASS OR RATE
5	40 MIL LLDPE 30.5"	37700	1.75375
0			

1 1150 30.50 35075 R04L899E-7G1100080 1 2 1150 30.50 35075 R04L899E-7G1100080

3 1150 30.50 35075 R04L899E-7G1100080

7G1400080

REMIT C.O.D. TO: ADDRESS

COD

C.O.D. FEE: PREPAID ☐ $ COLLECT ☐ TOTAL CHARGES: $

NOTE - Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding.
$ _____ per _____

This is to certify that the above named articles are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.
_____ Signature

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.
_____ (Signature of Consignor)

FREIGHT CHARGES
FREIGHT PREPAID (Check box ☐ except when box in "Charges" are to right is checked ☐ to be collected)

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading, the property described above in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of said property over all or any portion of said route to destination and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the bill of lading terms and conditions in the governing classification on the date of shipment. Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing classification and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

SHIPPER	NATIONAL SEAL COMPANY	CARRIER	
PER	Tom Hunter	PER	
		DATE	9/8/97

CUSTOMER