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SOLID WASTE MANAGEMENT
FAYETTEVILLE REGIONAL OFFICE

APPROVED
DIVISION OF SOLID WASTE MANAGEMENT
DATE 8/9/95 BY DDB

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WASH. CNTY C&D
94-04 BINDER 1 OF 2

CONSTRUCTION PLAN REPORT

FOR

WASHINGTON COUNTY

CONSTRUCTION AND DEMOLITION
WASTE LANDFILL AND TIRE MONOFILL

FINAL DESIGN
NOT RELEASED FOR CONSTRUCTION

PRINTED
JUN 15 1995
ON

Prepared by:

Diehl & Phillips, P.A.
Consulting Engineers
219 E. Chatham Street
Cary, NC 27511
919-467-9972

NORTH CAROLINA PROFESSIONAL SEAL 13371 ENGINEER ALAN R. KEITH

Alan R. Keith
6/14/95

CONSTRUCTION PLAN REPORT

FOR

WASHINGTON COUNTY

CONSTRUCTION AND DEMOLITION
WASTE LANDFILL AND TIRE MONOFILL

*NOTE: REFER TO CONSTRUCTION PLAN REPORT DATED AUG. 4, 1995 FOR THIS SECTION. BINDER 2 OF 2

Prepared by:

Diehl & Phillips, P.A.
Consulting Engineers
219 E. Chatham Street
Cary, NC 27511
919-467-9972

Alan R. Keith
6/12/95

TABLE OF CONTENTS

1.0 GENERAL INFORMATION

The County of Washington contracted with Diehl & Phillips, P.A. to complete construction plans for a construction and demolition waste (C&D) landfill and a tire monofill. The landfill will be constructed on County-owned land at the end of NCSR 1363 off NC 308 between Plymouth and Roper, NC. The site is adjacent to the closed Washington County Sanitary Landfill. The site has been approved for use as a C&D landfill and tire monofill by the North Carolina Division of Solid Waste Management. A copy of the site application approval letter is enclosed in the Appendix.

The proposed C&D landfill will be constructed above ground using dikes. The dikes for the initial construction will consist of processed silica (PS) or alum mud which is stockpiled on the closed sanitary landfill site and in the unused south berm of the existing landfill. Information regarding the PS is included in the Appendix. The closed sanitary landfill utilized the PS for dikes which enclosed a vertical expansion of the sanitary landfill.

Cover material will be excavated from the land surrounding the C&D landfill and the tire monofill. A 200-foot buffer will be maintained between the landfill/monofill and the property line. A 50-foot buffer will be maintained between the landfill/monofill, borrow areas and wetlands. Wetlands on the site have been delineated according to U.S. Army Corps of Engineers criteria.

The proposed landfill/monofill will use the existing truck scales, office and maintenance building at the entrance to the facility. Access to the landfill/monofill is controlled by an existing lockable gate at the end of NCSR 1363. The exiting gate is the only vehicle access to the site.

A tire cutter will be used to slice tires prior to disposal in the tire monofill. A temporary shed will be erected over the tire cutter next to a proposed temporary tire stockpile area. No commingling of tires and C&D waste is proposed.

2.0 SITE DATA

The proposed Washington County C&D landfill and tire monofill will serve the residents of Washington County, North Carolina (1995 population estimated at 14,450). The following is data regarding the landfill:

Owner:
County of Washington, North Carolina
Washington County Courthouse
PO Box 1007, Plymouth, NC 27962
919-793-5823
Fax: 919-793-9788

Operator:
Norman Furlough, Landfill Superintendent
Washington County Landfill
NCSR 1363, Roper, NC
PO Box 1007, Plymouth, NC 27962
919-793-5615

Equipment Available:	One (1) caterpillar 953 tracked loader, one (1) Caterpillar D8 bulldozer, one (1) dragline, one (1) tandem dump truck, one (1) tractor with implements, one (1) pick-up truck, one (1) tire slicer
Landfill Operator:	One (1) full time and Landfill Superintendent
Size of Tract:	71 acres total

Total Available Volume of Phase 1 C&D Area:

335,000 Cu Ft or 12,400 Cu Yds

Total Available Volume of Phase 1 Tire Monofill:

140,00 Cu Ft or 5,185 Cu Yds

Estimated Annual C&D Waste Receipt:	750 Tons
Estimated Annual Tires Receipt:	220 Tons
Projected Life of Phase 1 Facility:	5 Years

3.0 PROPOSED CONSTRUCTION

The landfill/monofill is proposed to be constructed above ground to provide adequate buffer between waste and groundwater. Minor grading will be required to provide positive drainage from active landfilling areas. The accompanying plans indicate proposed grading and site development.

Processed silica (PS) stockpiled on the existing closed sanitary landfill site and in the unused berm will be moved into the landfill/monofill area using the County's dump truck, placed and compacted to form the Phase 1 berms. A long berm along the north edge of the landfill and three short berms perpendicular to the north berm are proposed to form the Phase 1 operational areas. A 15-foot high berm with 2:1 outer slopes, 1.5:1 inner slopes and a 10-foot wide top are proposed. The PS will be placed in lifts 6 to 9 inches in thickness and compacted using the County's tracked equipment. The above methods were used to successfully construct several thousand linear feet of berms for the sanitary landfill vertical expansion. The existing berms are stable with no known slope failures to date. Slope stability data related to the PS is included in the Appendix. Earthwork calculations are included in Section 4.0.

Expansion of the landfill for future phases would be accomplished by extension of the short berms and construction of the southern berm. This would be accomplished by using PS in the existing unused southern berm constructed for the sanitary landfill vertical expansion.

Landfilling will begin against the center berm and proceed east and west in lifts approximately 5-feet high. Interim cover will be placed on the waste cells as required by Solid Waste Management Rules. Six inches of interim cover is proposed to be placed weekly or when the

active area reaches 1/2 acre (150' X 150') in size. A total of three lifts of waste would carry the waste to the top of the berm. Landfilling according to permit requirements will continue until the first phase is filled. Depending upon permitting, the landfill would be closed or additional phases constructed following Phase 1.

Closure of the landfill would be accomplished by installing a final 2-foot thick cap on the waste per Solid Waste Management Rules. Grading of the working face at the end of the landfilling for positive drainage would be performed prior to capping.

At this time there are no proposed uses for the landfill site after closure except storage of County-owned equipment, recycle goods stockpiling and/or temporary storage, and vehicle maintenance at the existing maintenance building. The area immediately surrounding the landfill will not be used. The site will be left as open land.

4.0 EARTHWORK CALCULATIONS

Berm Construction:

Berm Area: 545 Sq.Ft./Linear foot for 15' High Berm

North Berm: 510 LF X 545 SF/LF = 277,950 CF

$\frac{2 \text{ X } 545 \text{ SF/LF}}{2}$ X 30 LF = 16,350 CF

Total Volume of North Berm: 294,300 CF = 10,900 CY

East and West Berm:
2 X 70 LF X 545 SF/LF = 76,300 CF = 2,825 CY

Middle Berm: 70 LF X 488 SF/LF = 34,160 CF = 1,265 CY

Total Volume Phase 1 Berms: 14,990 CY

Interim Cover:

C&D Waste:

750 Tn/Yr X 2000 Lbs/Tn = $\frac{1,500,000 \text{ Lbs/Yr}}{600 \text{ Lbs/CY}}$ = 2,500 CY/Yr

Assume waste placed in three lifts totaling 13' in height, 20' wide

2500 CY = $\frac{67,500 \text{ CF}}{13'}$ = $\frac{5,192 \text{ SF}}{20'}$ = 260' Long Working Area

Annual area to be covered =
260' X 20' X 2' Thick = 10,400 CF = 385 CY

Total Annual Interim Cover for C&D = 385 CY

Tires Waste:

220 Tn/Yr X 2000 Lbs/Tn = $\frac{440{,}000 \text{ Lbs/Yr}}{300 \text{ Lbs/CY}}$ = 1,467 CY/Yr

Assume tires placed in three lifts totaling 13' in height, 20' wide

1467 CY = $\frac{39{,}600 \text{ CF}}{13'}$ = $\frac{3{,}046 \text{ SF}}{20'}$ = 152' Long Working Area

Annual area to be covered =
152' X 20' X 2' Thick = 6,080 CF = 225 CY

Total Annual Interim Cover for Tires = 225 CY
Total Annual Interim Cover for C&D = 385 CY

Total Annual Interim Cover for Waste = 610 CY

Total Phase 1 Interim Cover Requirements = 3,050 CY

Final Cap:

Phase 1 Cap:

510' X 100' X 2' = $\frac{102{,}000 \text{ CF}}{27}$ = 3,778 CY

Total Cover Requirement for Phase 1 = 6,830 CY

Available Cover (See Appendix)

Cover available from area west of disposal area:	1,864 CY
Cover available from area south of disposal area:	7,030 CY
Cover available for future phases:	15,483 CY

5.0 SOLID WASTE MANAGEMENT COMPLIANCE DATA

The proposed landfill/monofill will be constructed and operated according to North Carolina Division of Solid Waste Management Rules (Rules). The following describes compliance with Section .0503(2) of the Rules:

a. Explosive gas shall be monitored and/or vented according to the requirements of the Rules.
b. Access to the site is limited to a single vehicular access point which is at the landfill office and can be closed using a lockable gate.
c. Surface water discharge shall be covered under general National Pollutant Discharge Elimination System (NPDES) permitting for landfills. The Division of Environmental Management has stated that C&D landfills and tire monofills are exempt from NPDES permits.

d. A groundwater monitoring plans has been developed for this facility by S&ME, Inc. A copy of the plans in included in the Appendix. Monitoring wells for the proposed facility are shown on the construction plans.

e. Open burning is not proposed at the site. Accidental fires would be controlled by landfill personnel using grading equipment or if necessary, by local volunteer fire departments.

f. A 200-foot buffer is provided between the site property line and disposal and borrow areas.
A 50-foot buffer is provided between wetland areas and disposal and borrow areas.
No private dwellings or wells are within 500 feet of the disposal area.
No streams or rivers are located on the site.

g. A sedimentation and erosion control plan will be submitted to the North Carolina Division of Land Resources with the construction plans. No work will take place without approval by the Division of Land Resources.

APPENDIX

NORTH CAROLINA DIVISION OF SOLID WASTE MANAGEMENT
SITE APPLICATION APPROVAL LETTER

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Solid Waste Management

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
William L. Meyer, Director

DEHNR

February 17, 1995

Mr. Lee Smith, County Manager
Washington County
Post Office Box 1007
Washington County Courthouse
Plymouth, North Carolina 27962

RE: General Conditions and Site Specific Design Requirements for the Proposed Washington County Construction Demolition (C&D)

Dear Mr. Smith:

The Solid Waste Section (the Section) of the Division of Solid Waste Management, has completed its review of the site study for the proposed Washington County C & D Landfill. The proposed site is located adjacent to the existing landfill in Washington County, North Carolina. The Division is notifying Washington County that the site is considered suitable, in accordance with Section .0503 and Washington County is authorized to prepare an application for a permit to construct. This letter addresses the construction plans for the disposal areas and support facilities, and design and construction standards for the referenced facility.

Section .0201 of the Solid Waste Management Rules (15A NCAC 13B) requires the Division to issue a solid waste permit in two parts. The first part is a Permit to Construct and the second part is a Permit to Operate. The Division may only issued a Permit to Operate after it determines that the facility has been constructed in accordance with the construction permit and that all pre-operative conditions have been met. <u>This letter is not a permit.</u> This letter only informs the applicant that they may proceed with their permit application. The final action the Division may take on a permit application is the issuance or denial of a permit.

<u>Buffers</u>

Horizontal buffers shall be as described in the conceptual design and as designated in Rule .0503(2)(f) and shall also include the following buffer criteria:

a) A 200 foot minimum buffer shall be maintained between facility (property) boundaries and disposal areas unless otherwise approved by the Division.

b) A minimum 50-foot buffer shall be maintained between borrow areas and delineated wetlands.

c) A minimum 50-foot buffer shall be maintained between disposal areas and delineated wetlands.

Washington County may utilize all remaining areas of the site, except buffers areas, for other solid waste management activities (such as yard waste composting or recycling) or for landfill support activities(i.e. stockpiling of cover materials) upon approval by the Solid Waste Section.

The Permit to Construct and the Permit to Operate will be issued to the Washington County Board of Commissioners. The Division encourages Washington County to take an aggressive approach to comprehensive solid waste management in order to contribute toward the States' waste reduction goals and lessen dependency upon conventional disposal in a municipal solid waste landfill facility. Washington County should considered utilizing portions of the site for other solid waste management options (recycling, composting.) The Section will make itself available to discuss these options upon request.

We appreciate your continuing cooperation. If you have any questions, or would like to schedule a meeting to discuss this letter, please contact our office (910) 486-1191.

Sincerely,

Jim Barber
Solid Waste Section
Eastern Area Engineer

cc: Alan Keith
Jim Coffey
Terry Dover
Chuck Boyette

Processed Silica Berm
Slope Stability Analysis

LAW ENGINEERING

GEOTECHNICAL, ENVIRONMENTAL
& CONSTRUCTION MATERIALS
CONSULTANTS

February 27, 1991

Diehl & Phillips
219 East Chatham Street
Cary, North Carolina 27511

Attention: Mr. Alen Keith

SUBJECT: REPORT OF GEOTECHNICAL SERVICES
AND LABORATORY TESTING - WASHINGTON COUNTY LANDFILL
WASHINGTON COUNTY LANDFILL DIKE AND COVER MATERIAL
PLYMOUTH, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47291-6356

Dear Mr. Keith:

Law Engineering has completed the geotechnical services and laboratory testing for the proposed dike and cover material for the Washington County Landfill located in Plymouth, North Carolina. These services were requested and authorized by Mr. William C. Diehl, P.E. in general accordance with our Proposal P47291-3704. The results of our study, including summaries of the field exploration, laboratory testing analyses and our recommendations for slope design and earthwork construction procedures for this project are submitted herewith.

PROJECT INFORMATION

Project information has been provided by Mr. Alan Keith of Diehl & Phillips. We have drawings entitled Washington County Sanitary Landfill Vertical Expansion which were prepared by Diehl & Phillips and dated December 14, 1989. Additional project information has been provided by Mr. Gary Alberg of the North Carolina Department of Environmental Health and Natural Resources.

3301 ATLANTIC AVE.
P.O. BOX 18288
RALEIGH, NC 27619
919-876-0416

We understand waste materials (alum sludge) from American Cyanamid located on the Weyerhaeuser Facility in Plymouth, North Carolina are to be used as borrow material at the Washington County Landfill located just east of Plymouth off of N.C. 308. The proposed uses of the borrow would include placement as a landfill cover and vertically raising an existing dike at the landfill. A portion of the existing dike has been constructed at the landfill with the alum sludge. The finished dike is to be 15 feet in height and will retain landfill debris. The alum sludge to be used for cover and raising the dike will be blended with agricultural grade lime.

FIELD EXPLORATION

To evaluate the existing dike material in-place density testing was conducted within the top one foot. Hand auger borings with dynamic cone penetrometer testing were performed at one foot intervals to a depth of six feet. The results of the field testing are attached in the Appendix of this report.

Sealed bulk samples of the alum sludge and lime mix were obtained at various locations along the dike and at stockpiled areas (see Drawing No. 1 attached). These samples were transported to our laboratory for visual observations by the engineer and laboratory testing.

In addition to field testing of the dike materials, hand auger borings with dynamic cone penetrometer testing were performed in the near surface soils in front of the dike. The results of the field testing are attached in the Appendix of this report.

LABORATORY TESTING

The proposed dike and cover material consisting of an alum sludge and lime mixture was transported to our office for laboratory testing. The laboratory testing included the following:

- Standard Proctor compaction testing.
- Consolidated undrained tri-axial testing of recompacted samples, saturated and unsaturated.
- Atterberg Limits for shrink swell characterization.
- Permeability testing of recompacted samples, saturated and unsaturated.

The results of our laboratory testing can be found in the Appendix of this report.

DISCUSSION

Compaction Characteristics: Based on the laboratory test results, the alum sludge/lime mixture appears to have an affinity for water/moisture similar to a non-plastic silt. As such, the compaction characteristics of this material require special attention to moisture control. The material requires moisture contents on the order of 58% to achieve maximum dry densities during compaction based on the standard Proctor test results. However, satisfactory compaction levels presently exist at much lower moisture contents.

Field density tests on the alum sludge previously placed in the existing dike indicated compacted dry densities over 100% of the standard Proctor maximum dry density at well below the optimum moisture content (field test locations 1 and 4), see Drawing No. 1. The results of the dynamic cone penetration further indicate a relatively uniform consistency with depth. As a result, the in-place dike material appears to be reasonably compacted.

Future placement of the alum sludge should be conducted similar to soil fill. We recommend the material be placed in 8 to 10 inch thick lifts and compacted to at least 95% of the standard Proctor maximum dry density. Additional moisture control may be required to facilitate compaction.

The materials optimum moisture content is very close to its liquid limit. As such, compaction of the material will require close monitoring of moisture content during placement. The use of vibratory compaction equipment (i.e., pneumatic vibratory drum rollers) should be discouraged as vibratory action could induce pore pressures to occur that may cause moisture contents at optimum conditions to increase to or above the materials liquid limit and may induce liquefaction of the material.

Cover Material: Although the material has an affinity for water and is moderately impervious ($K=2x10^{-5}$ cm/sec.) at optimum moisture contents (on the order of 58%). Although the shrinkage limit is high and the plasticity index is low (which typically equates to low probability of shrink well potential).

The optimum moisture content for this material is above the shrinkage limit. Based on our testing of this material, volumetric shrinkage in the range of the liquid limit and the shrinkage limit is high (over 30%). By these considerations, the material should be suitable for landfill cover provided field testing is conducted as outlined below.

As the material is not a soil, we recommend that a test area be designated at the site for placement of a trial cover layer to verify the adequacy of the material for use as a cover.

The trial cover layer should be placed at the thickness planned for the landfill cover, placed over similar materials as the cover would be (i.e., garbage) and should be approximately 75 feet by 75 feet in plan dimension to reflect actual construction placement of the material. The material should be placed in 8 to 10 inch thick lifts and compacted to 95% of the Standard Proctor maximum dry density at or slightly above the optimum moisture content. Once placed, the trial cover layer could be tested for field permeability and monitored for signs of shrinkage over a period of time. Should shrinkage cracks develop another test section should be placed as outlined above except moisture contents should be well less than optimum and near the shrinkage limit (approximately 47%). In order to determine the adequacy of the material for use as a cover material, it should be noted that a reduction in moisture content could yield a high permeability for the in-place material.

Dike Slope Stability: The vertical expansion is proposed to have a maximum dike height of 15 feet and will retain approximately 23 feet of garbage. The back slope side of the dike (side retaining garbage) will have a geometry of 1±(H):1(V) while the front slope will have a geometry ranging from 2(H):1(V) maximum to a flatter 3(H):1(V) slope. The front and back slopes will be separated by a 15 feet wide crest.

A computerized slope stability analysis and hand calculation was performed for both the 2(H):1(V) and 3(H):1(V) front slope, vertically expanded cross sections. Strength parameters determined in the laboratory for the alum sludge material under saturated conditions and assumed strength parameters for the landfill debris (garbage) and the underlying sands were used in the analysis.

A summary of the analysis are tabulated below:

Front Slope Cross Section	Type of Analysis	FS Circular	FS Sliding Wedge
2(H):1(V)	Total	2.32	3.17
2(H):1(V)	Effective	-	3.45
3(H):1(V)	Total	2.59	3.66
3(H):1(V)	Effective	-	3.98

Based on the results above, a suitable factor of safety (greater than 1.30) against circular and sliding wedge instability was determined for the proposed vertically expanded 2(H):1(V) and 3(H):1(V) front slopes.

Due to the materials' lack of cohesion and light unit weight, the material may be prone to erode easily, as such the flatter slopes are recommended where possible. To minimize the erosion potential, the material placed may be periodically tracked down along the front slope face by wide tracked construction equipment. This would serve to add additional compaction effort along the front slope face and in addition will help to seal off the material.

Once the dike material is in place to its full height and prior to placing a final cover to promote a vegetative growth, it may be necessary to scarify or bench the front face of the slope to properly place the final cover.

CLOSING

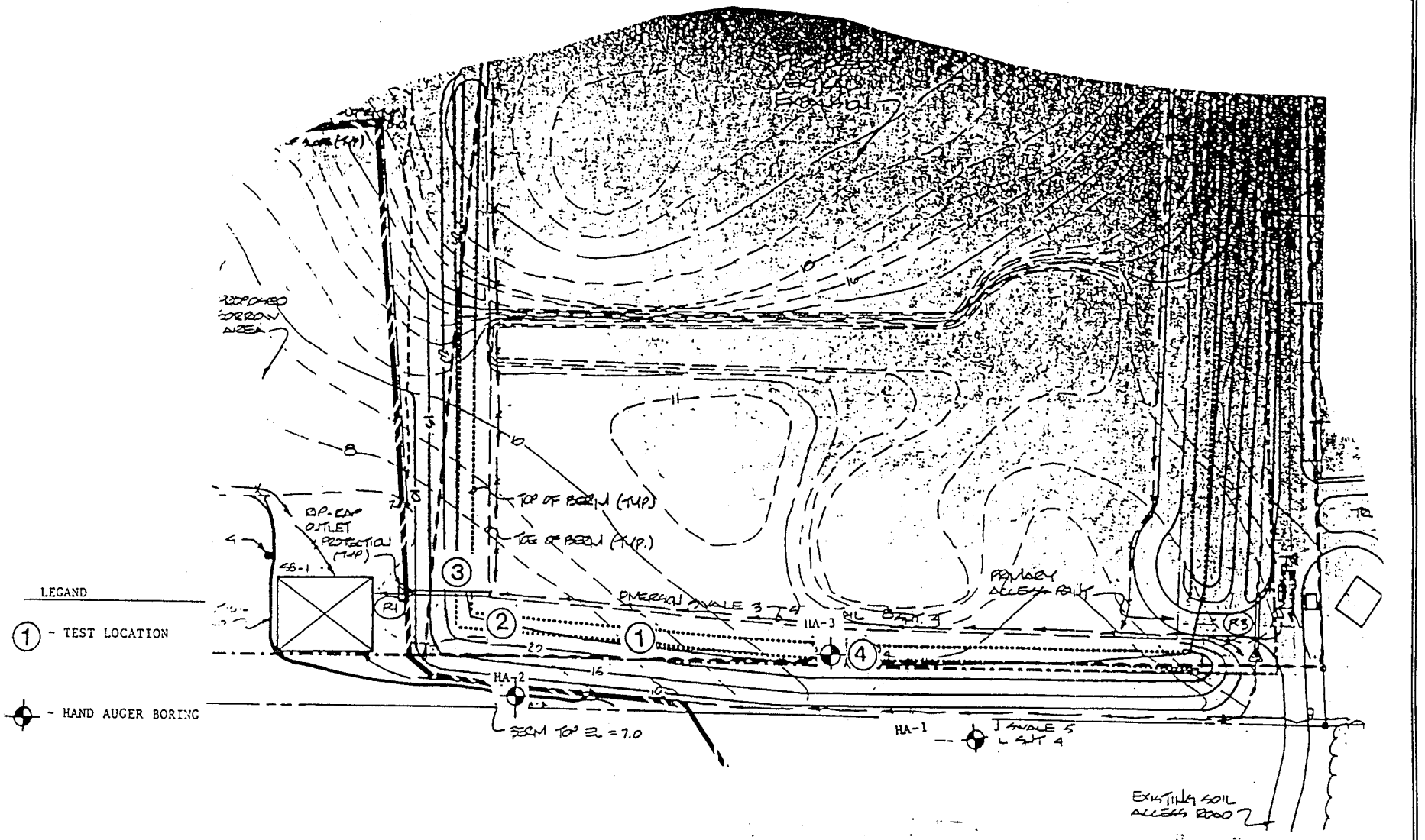
We have appreciated being of service to you on this phase of the project and are prepared to assist you with any future needs. If you have any questions concerning this report or any of our testing and consulting services, please not hesitate to contact this office.

Sincerely
LAW ENGINEERING

David E. Miller, P.E.
Geotechnical Project Engineer

Barney C. Hale, P.E.
Senior Geotechnical Engineer

APPENDIX



WASHINGTON COUNTY LAND FILL EXPANSION	LAW ENGINEERING RALEIGH, NORTH CAROLINA	
HAND AUGER AND TEST LOCATIONS	SCALE 1"=100'	Drawn: DEM Checked: DEM Date: 2/26/91
		Job No. J-6356 Dwg. No. 1

Location	Depth Below Ground Surface (Ft.)	Penetrometer Value	Depth(Ft.)	Soil Description
HA-1	0	12-10-11	0-3.0	Slightly silty tan and gray fine sand (SP/SM)
	1	10- 7- 8	3.0-5.0	Greenish gray sandy clay (CL/SC)
	2	5- 6- 5		
	3	9- 8-10		
	4	10-10-10		
	5	15+		
HA-2	0	9- 8- 7	0.0-4.0	Tan to gray clayey sand
	1	7- 5- 6	4.0-5.0	Tan to gray clayey sand (SC)
	2	5- 6- 5		
	3	5- 5- 5		
	4	7- 6- 8		
	5	8- 5- 6		
HA-3	0	5- 4- 4		Alum Sludge
	1	3- 3- 3		
	2	7- 3- 5		
	3	4- 5- 5		
	4	5- 4- 5		
	5	6- 5- 4		
	6	5- 5- 4		

LAW ENGINEERING

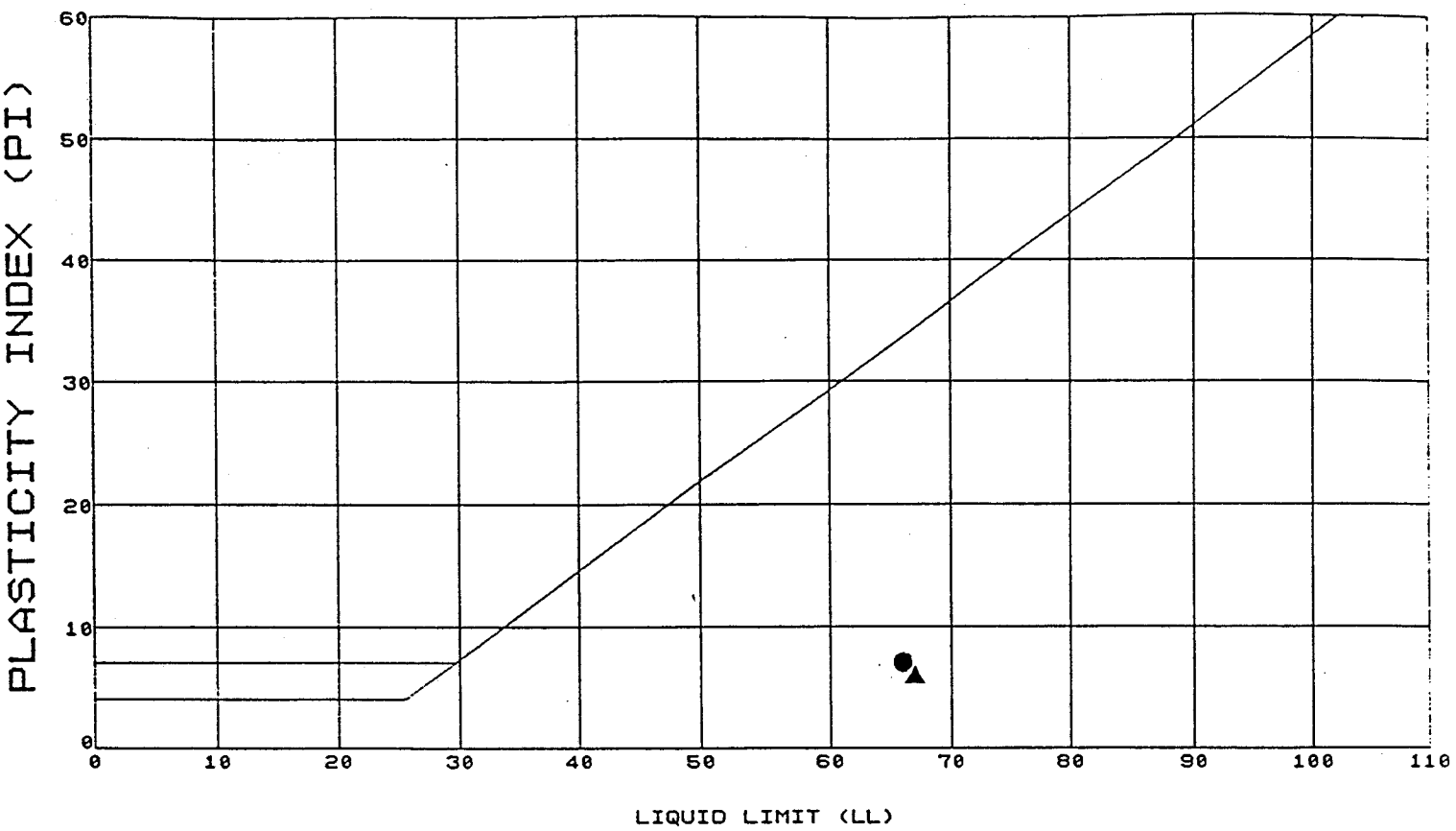
3301 ATLANTIC AVE.
RALEIGH, NORTH CAROLINA

WASHINGTON COUNTY LANDFILL

JOB NO. J-6356

LOCATION NO.	DEPTH FEET	SAMPLE NO.	COEFFICIENT OF PERMEABILITY (CM/SEC)	UNIT WEIGHT pcf		MAXIMUM STANDARD DRY DENSITY	% STANDARD DENSITY	STRENGTH ø C[PSF] (±)	SHRINKAGE LIMIT	ATTERBERG LIMITS		
				WET	DRY					LL	PL	PI
1	1.0	BAG-1		91.2	74.1	59.4	100+		46	67	61	6
2	1.0	BAG-2		62.5	44.9	58.8	76					
3	1.0	BAG-3		75.5	50.9	58.7	87		46	66	59	7
4	1.0	BAG-4		95.3	75.7	59.4	100+					
3	REMOLDED	BAG-3	2.53×10^{-6}				95±					
3	REMOLDED *	BAG-3	2.071×10^{-6}				95±					
3	REMOLDED	BAG-3					95±	TOTAL 28.5°; 100				
3	REMOLDED	BAG-3					95±	EFFECTIVE 31.3°; 100				
3	REMOLDED *	BAG-3					95±	TOTAL 34.0°; 200				
3	REMOLDED *	BAG-3					95±	EFFECTIVE 35.8°; 125				

* UNSATURATED



LEGEND:

		LL	PL	PI
●	BAG 1 1.0	66	59	7
▲	BAG 3 1.0	67	61	6

REMARKS:
SHRINKAGE LIMITS:
BAG 1: 46
BAG 3: 46

February 1991

WASHINGTON COUNTY LANDFILL - J-6356

ATTERBERG LIMITS' RESULTS

FIGURE 1

LAW ENGINEERING

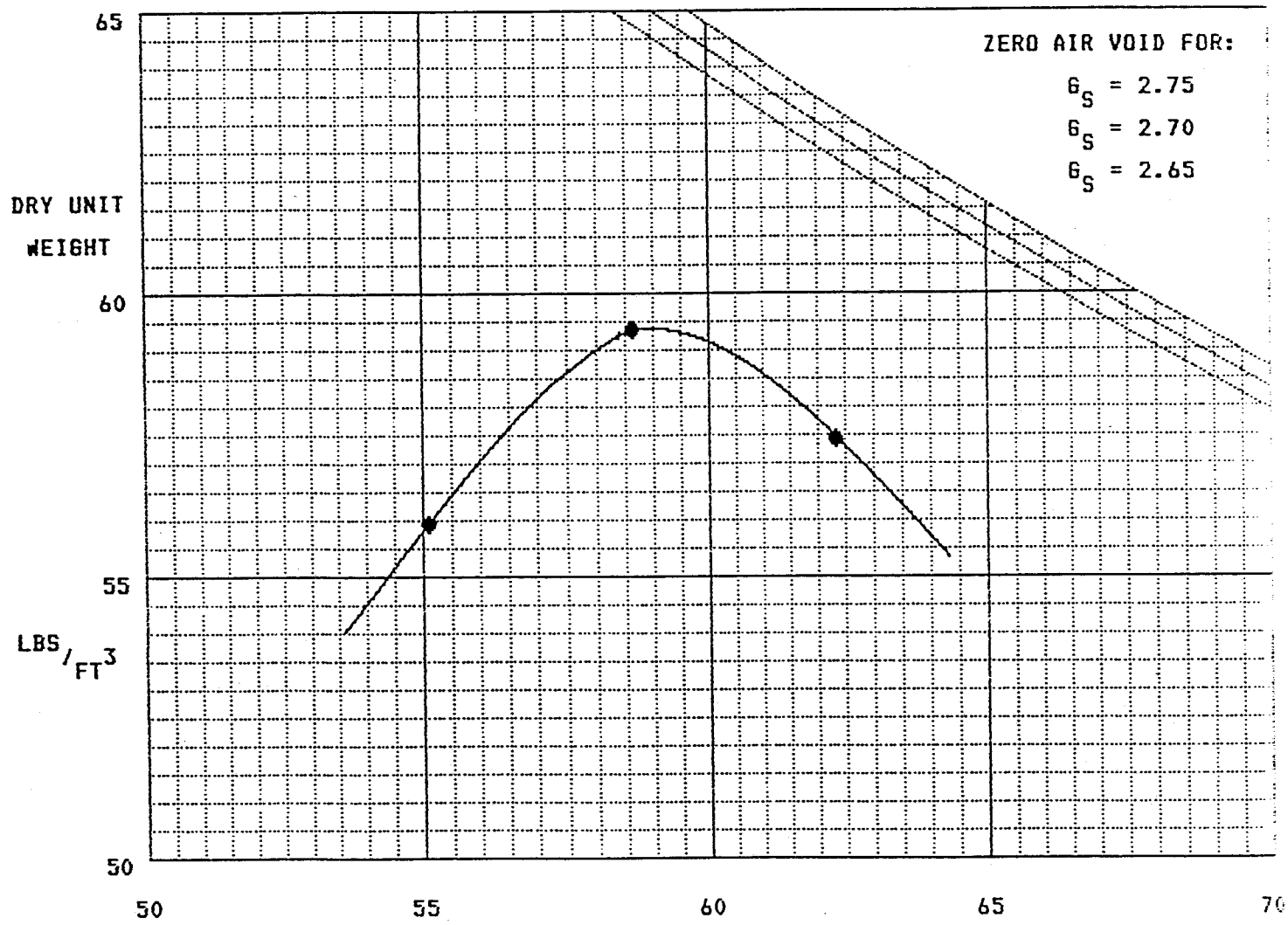
LAW ENGINEERING

STANDARD PROCTOR REPORT
ASTM D-698A

DATE: FEBRUARY 3, 1991
PROJECT NUMBER: J-6356
PROJECT NAME: WASHINGTON COUNTY LANDFILL
CLIENT: DIEHL & PHILLIPS
SAMPLE NUMBER: 1
FIELD MOISTURE:

SOIL DESCRIPTION:
ALUM MUD AND SANDY MIXTURE; ± 6 MONTHS OLD
PROPOSED USE:
LANDFILL BERM
SOURCE LOCATION:
WEYERHAEUSER CO.; PLYMOUTH, NC

MOISTURE - DENSITY RELATIONSHIP



OPTIMUM MOISTURE CONTENT 58.8 MAXIMUM DRY DENSITY 59.4

Bob Teel

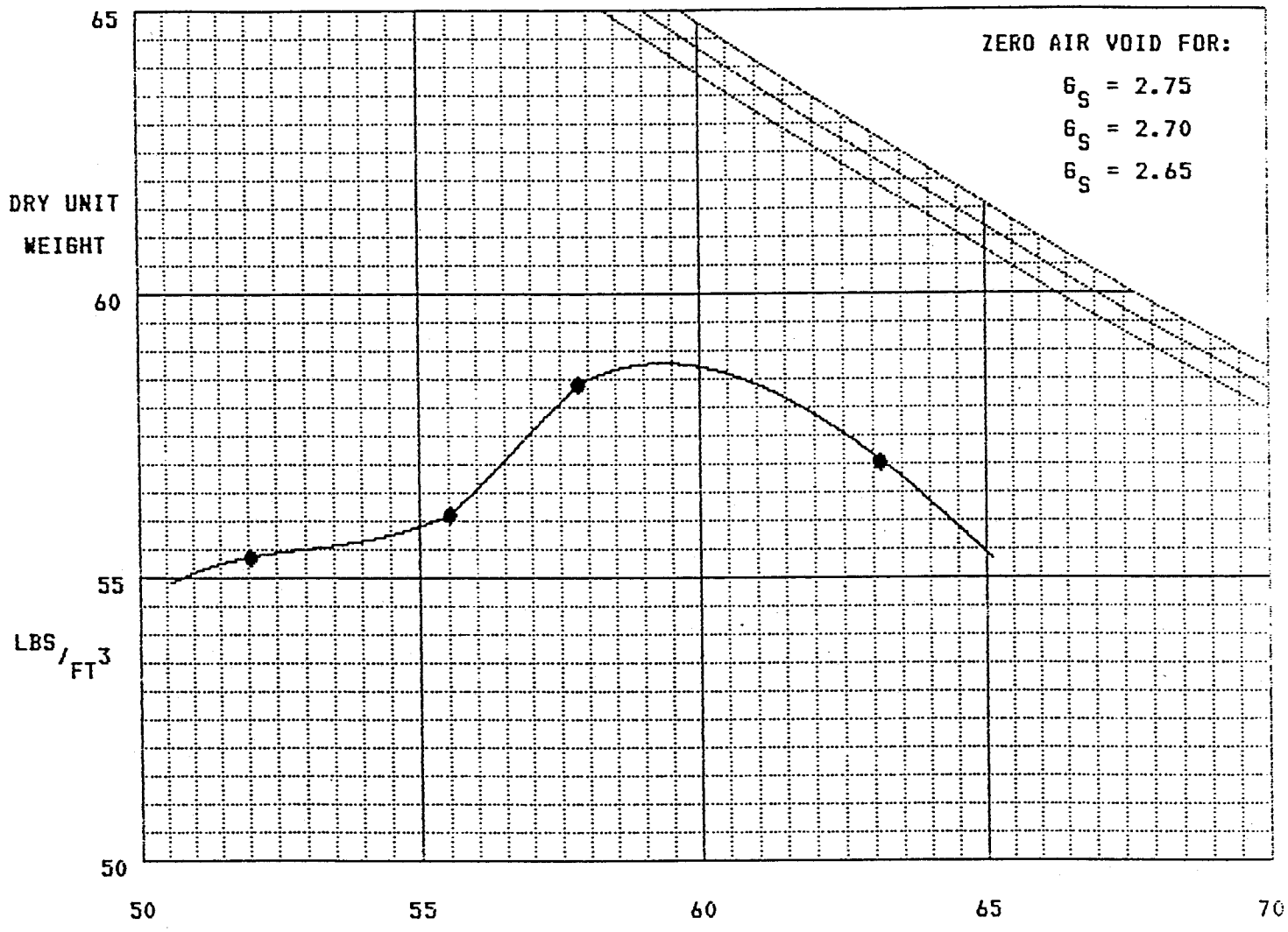
LAW ENGINEERING

STANDARD PROCTOR REPORT
ASTM D-698A

DATE: FEBRUARY 3, 1991
PROJECT NUMBER: J-6356
PROJECT NAME: WASHINGTON COUNTY LANDFILL
CLIENT: DIEHL & PHILLIPS
SAMPLE NUMBER: 2
FIELD MOISTURE:

SOIL DESCRIPTION:
ALUM MUD AND PFIZER LIME GRIT MIXTURE; 3 TO 4 MONTHS OLD
PROPOSED USE:
LANDFILL BERM
SOURCE LOCATION:
WEYERHAEUSER CO.; PLYMOUTH, NC

MOISTURE - DENSITY RELATIONSHIP



OPTIMUM MOISTURE CONTENT 59.3 MAXIMUM DRY DENSITY 58.8

Bob Teel

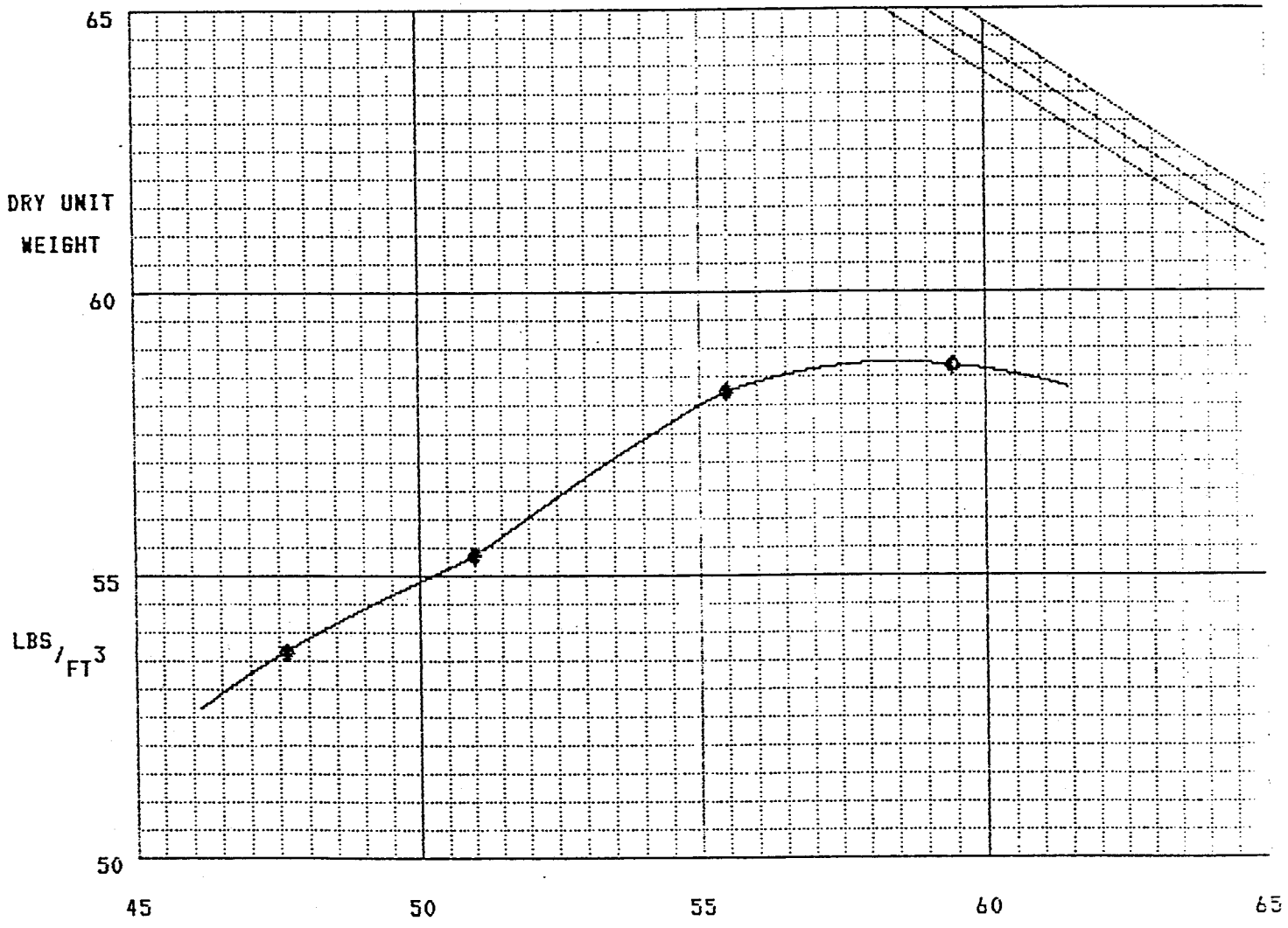
LAW ENGINEERING

STANDARD PROCTOR REPORT
ASTM D-698A

DATE: JANUARY 31, 1991
PROJECT NUMBER: WASHINGTON COUNTY LANDFILL
PROJECT NAME: J-6356
CLIENT: DIEHL & PHILLIPS
SAMPLE NUMBER: 3
FIELD MOISTURE:

SOIL DESCRIPTION:
ALUM MUD
PROPOSED USE:
LANDFILL BERM
SOURCE LOCATION:
WEYERHAEUSER CO.; PLYMOUTH, NC

MOISTURE - DENSITY RELATIONSHIP



OPTIMUM MOISTURE CONTENT 58.5 MAXIMUM DRY DENSITY 58.7

Bob Teel

LAW ENGINEERING

REPORT OF COEFFICIENT OF PERMEABILITY

CLIENT: County of Washington
c/o Diehl & Phillips

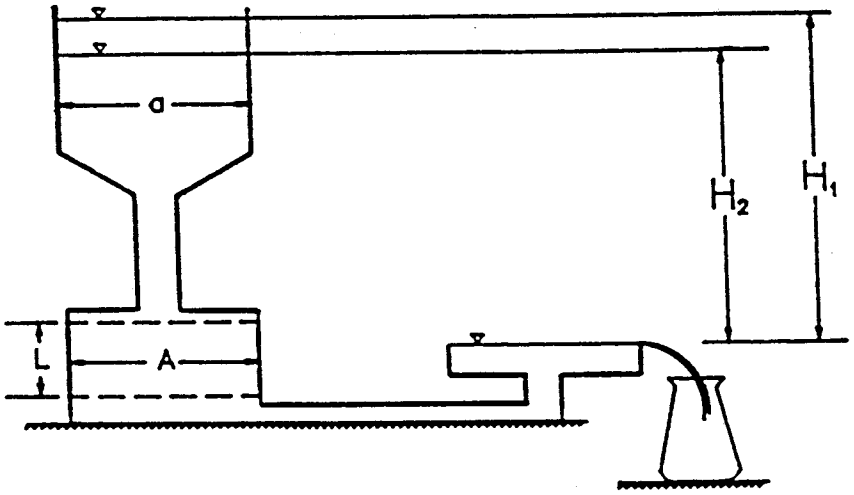
DATE: February 6, 1991

PROJECT: Washington Co. Landfill

JOB NO.: J-6356

Bag #3, Remolded
Unsaturated

$$K = \frac{2.3al}{At} \times \log_{10} H_1/H_2$$



a = 1.27 cm^2

l = 5.50 cm

A = 42.12 cm^2

t = as shown

H_1= 102.23 cm

H_2= as shown

K = as shown

t (sec)	H_2 (cm)	K (cm/sec)
60	100.01	8.422×10^{-5}
600	96.84	1.213×10^{-5}
13,920	71.12	2.071×10^{-6}

LAW ENGINEERING

REPORT OF COEFFICIENT OF PERMEABILITY

CLIENT: County of Washington
c/o Diehl & Phillips

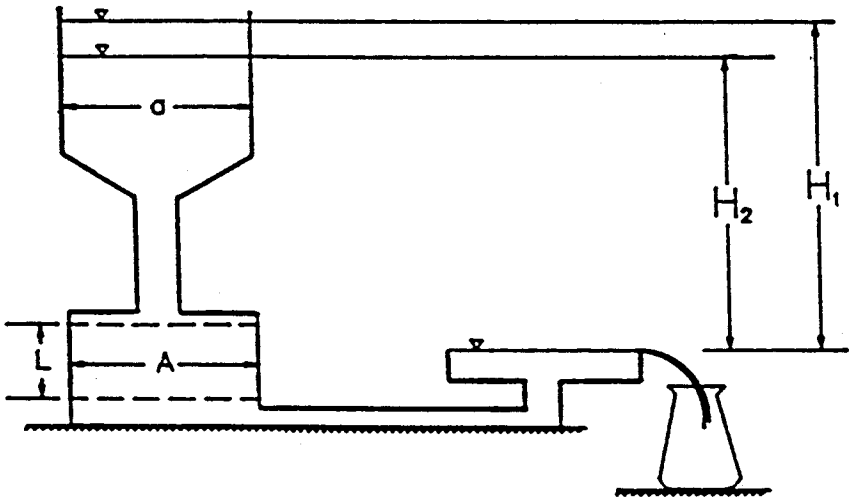
DATE: February 6, 1991

PROJECT: Washington Co. Landfill

JOB NO.: J-6356

Bag #3, Remolded
Saturated

$$K = \frac{2.3al}{At} \times \log_{10} H_1/H_2$$



a = 1.27 cm^2

l = 5.50 cm

A = 40.67 cm^2

t = 1740 sec

H_1 = 100.33 cm

H_2 = 97.79 cm

$K = 2.53 \times 10^{-6}$ cm/sec

TRIAXIAL COMPRESSION TEST 2-14-1991
CU with pore pressures 1:21 pm

Project Data

Project No.: J-6356 Date: 2/14/91 Data file: 6356
Client: WASHINGTON COUNTY
Project: WASHINGTON COUNTY LANDFILL
Sample location: BAG 1 - SATURATED
Sample description: ALUM MUD
Remarks:
Fig No. 1

Sample No. 1 Data

Type of sample:
Specific Gravity= 2.65 LL= 65 PL= 59 PI= 6

Sample Parameters	Before Test	At Testing	After Test
Diameter, in	1.48	1.36	
Height change, in		0.09	
Height, in	3.00	2.91	
Weight, grams	122.2		
Water volume change, cc		5.33	
Moisture, %	58.8	51.9	58.8
Dry density, pcf	56.8	69.7	
Saturation, %	81.5	100.0	
Void ratio	1.912	1.375	

Test Data

Deformation dial constant= 1 in per input unit
Primary load ring constant= 0.1657 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Rate of strain= 0.670 % per minute
Consolidation cell pressure = 15 psi
Consolidation back pressure = 10 psi
Consolidation effective confining stress = 5 psi
Peak deviator stress = 11.72 psi at reading no. 5
Ult. deviator stress =

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress psi	Effective Stresses Minor psi	Effective Stresses Major psi	1:3 Ratio	Pore Pres. psi	P psi	Q psi
0	0.0150	0.000	20.0	0.0	0.0	0.00	5.00	5.00	1.00	10.0	5.00	0.00
1	0.0300	0.015	26.0	1.0	0.5	0.68	5.00	5.68	1.14	10.0	5.34	0.34
2	0.0450	0.030	60.0	6.6	1.0	4.54	5.00	9.54	1.91	10.0	7.27	2.27
3	0.0600	0.045	97.0	12.8	1.5	8.69	4.80	13.49	2.81	10.2	9.14	4.34
4	0.0750	0.060	114.0	15.6	2.1	10.55	4.60	15.15	3.29	10.4	9.87	5.27
5	0.0900	0.075	125.0	17.4	2.6	11.72	4.50	16.22	3.60	10.5	10.36	5.86

TRIAXIAL COMPRESSION TEST
CU with pore pressures

2-14-1991
1:21 pm

Project Data

Project No.: J-6356 Date: 2/14/91 Data file: 6356
Client: WASHINGTON COUNTY
Project: WASHINGTON COUNTY LANDFILL
Sample location: BAG 1 - SATURATED
Sample description: ALUM MUD
Remarks:
Fig No. 1

Sample No. 2 Data

Type of sample:
Specific Gravity= 2.65 LL= 65 PL= 59 PI= 6

Sample Parameters	Before Test	At Testing	After Test
Diameter, in	1.48	1.38	
Height change, in		0.08	
Height, in	3.00	2.93	
Weight, grams	122.2		
Water volume change, cc		2.41	
Moisture, %	58.8	55.7	58.8
Dry density, pcf	56.8	66.8	
Saturation, %	81.5	100.0	
Void ratio	1.912	1.475	

Test Data

Deformation dial constant= 1 in per input unit
Primary load ring constant= 0.1657 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Rate of strain= 0.670 % per minute
Consolidation cell pressure = 20 psi
Consolidation back pressure = 10 psi
Consolidation effective confining stress = 10 psi
Peak deviator stress = 23.59 psi at reading no. 4
Ult. deviator stress =

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress psi	Effective Stresses Minor psi	Effective Stresses Major psi	1:3 Ratio	Pore Pres. psi	P psi	Q psi
0	0.0150	0.000	34.0	0.0	0.0	0.00	10.00	10.00	1.00	10.0	10.00	0.00
1	0.0300	0.015	120.0	14.3	0.5	9.45	9.50	18.95	1.99	10.5	14.23	4.73
2	0.0450	0.030	190.0	25.8	1.0	17.06	9.00	26.06	2.90	11.0	17.53	8.53
3	0.0600	0.045	229.0	32.3	1.5	21.21	8.80	30.01	3.41	11.2	19.41	10.61
4	0.0750	0.060	252.0	36.1	2.1	23.59	8.60	32.19	3.74	11.4	20.39	11.79

TRIAXIAL COMPRESSION TEST
CU with pore pressures

2-14-1991
1:21 pm

Project Data

Project No.: J-6356 Date: 2/14/91 Data file: 6356
Client: WASHINGTON COUNTY
Project: WASHINGTON COUNTY LANDFILL
Sample location: BAG 1 - SATURATED
Sample description: ALUM MUD
Remarks:
Fig No. 1

Sample No. 3 Data

Type of sample:
Specific Gravity= 2.65 LL= 65 PL= 59 PI= 6

Sample Parameters	Before Test	At Testing	After Test
Diameter, in	1.48	1.44	
Height change, in		0.34	
Height, in	3.00	2.66	
Weight, grams	122.2		
Water volume change, cc		2.91	
Moisture, %	58.8	55.0	58.8
Dry density, pcf	56.8	67.3	
Saturation, %	81.5	100.0	
Void ratio	1.912	1.458	

Test Data

Deformation dial constant= 1 in per input unit
Primary load ring constant= 0.1657 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Rate of strain= 0.670 % per minute
Consolidation cell pressure = 30 psi
Consolidation back pressure = 10 psi
Consolidation effective confining stress = 20 psi
Peak deviator stress = 37.93 psi at reading no. 6
Ult. deviator stress =

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress psi	Effective Stresses Minor psi	Effective Stresses Major psi	1:3 Ratio	Pore Pres. psi	P psi	Q psi
0	0.0150	0.000	145.0	0.0	0.0	0.00	19.50	19.50	1.00	10.5	19.50	0.00
1	0.0300	0.015	288.0	23.7	0.6	14.39	18.70	33.09	1.77	11.3	25.89	7.19
2	0.0450	0.030	400.0	42.3	1.1	25.51	18.00	43.51	2.42	12.0	30.75	12.75
3	0.0600	0.045	463.0	52.7	1.7	31.63	17.50	49.13	2.81	12.5	33.31	15.81
4	0.0750	0.060	500.0	58.8	2.3	35.11	17.10	52.21	3.05	12.9	34.65	17.55
5	0.0900	0.075	525.0	63.0	2.8	37.36	16.90	54.26	3.21	13.1	35.58	18.68

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress psi	Effective Stresses Minor psi	Effective Stresses Major psi	1:3 Ratio	Pore Pres. psi	P psi	Q psi
6	0.1050	0.090	533.0	64.3	3.4	37.93	16.70	54.63	3.27	13.3	35.66	18.96
7	0.1200	0.105	525.0	63.0	3.9	36.93	16.70	53.63	3.21	13.3	35.16	18.46
8	0.1500	0.135	500.0	58.8	5.1	34.09	16.80	50.89	3.03	13.2	33.85	17.05
9	0.1800	0.165	493.0	57.7	6.2	33.02	16.70	49.72	2.98	13.3	33.21	16.51
10	0.2100	0.195	496.0	58.2	7.3	32.91	16.60	49.51	2.98	13.4	33.05	16.45
11	0.2500	0.235	500.0	58.8	8.8	32.74	16.50	49.24	2.98	13.5	32.87	16.37
12	0.2700	0.255	499.0	58.7	9.6	32.38	16.50	48.88	2.96	13.5	32.69	16.19
13	0.3000	0.285	491.0	57.3	10.7	31.25	16.40	47.65	2.91	13.6	32.03	15.63
14	0.3400	0.325	492.0	57.5	12.2	30.82	16.40	47.22	2.88	13.6	31.81	15.41

TRIAXIAL COMPRESSION TEST
CU with pore pressures

2-14-1991
1:22 pm

Project Data

Project No.: J-6356 Date: 2/14/91 Data file: 6356
Client: WASHINGTON COUNTY
Project: WASHINGTON COUNTY LANDFILL
Sample location: BAG 1 - SATURATED
Sample description: ALUM MUD
Remarks:
Fig No. 1

Sample No. 4 Data

Type of sample:
Specific Gravity= 2.65 LL= 65 PL= 59 PI= 6

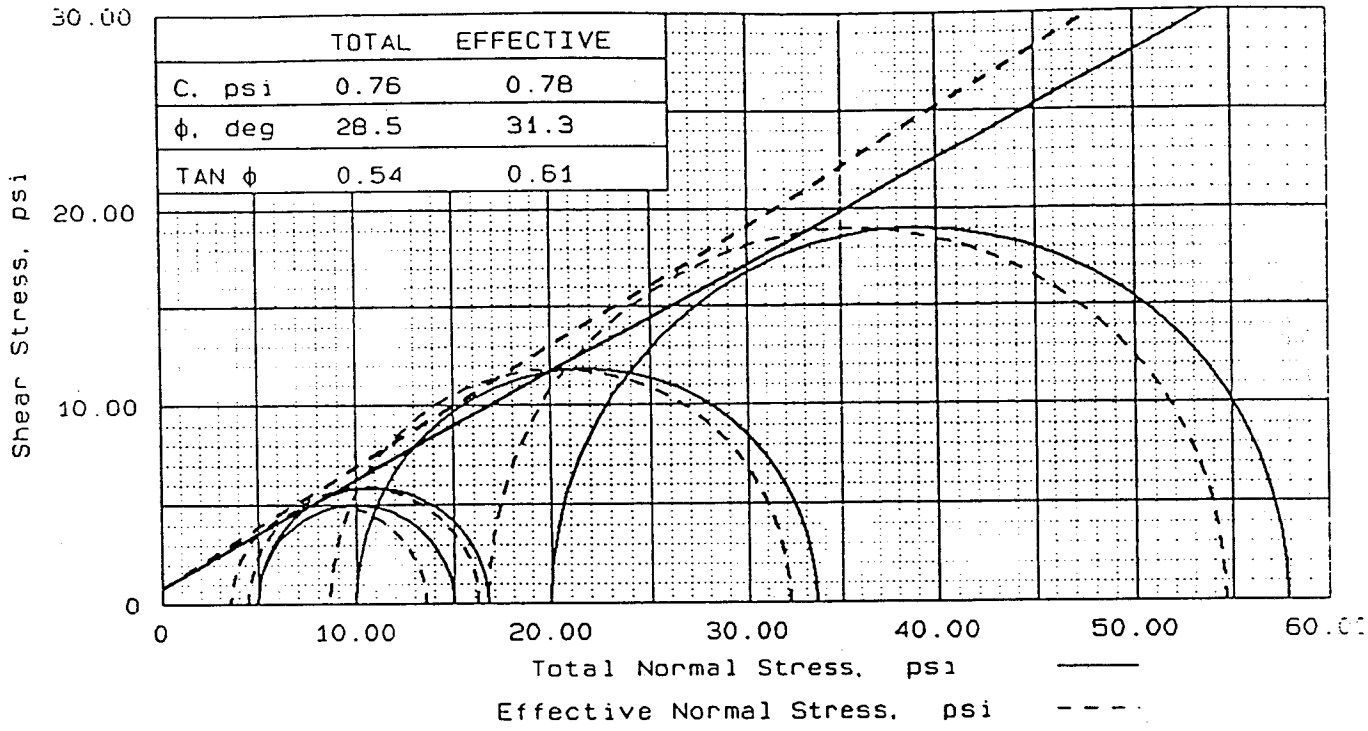
Sample Parameters	Before Test	At Testing	After Test
Diameter, in	1.48	1.27	
Height change, in		0.21	
Height, in	3.00	2.79	
Weight, grams	122.2		
Water volume change, cc		16.13	
Moisture, %	58.8	37.8	58.8
Dry density, pcf	56.8	82.6	
Saturation, %	81.5	100.0	
Void ratio	1.912	1.003	

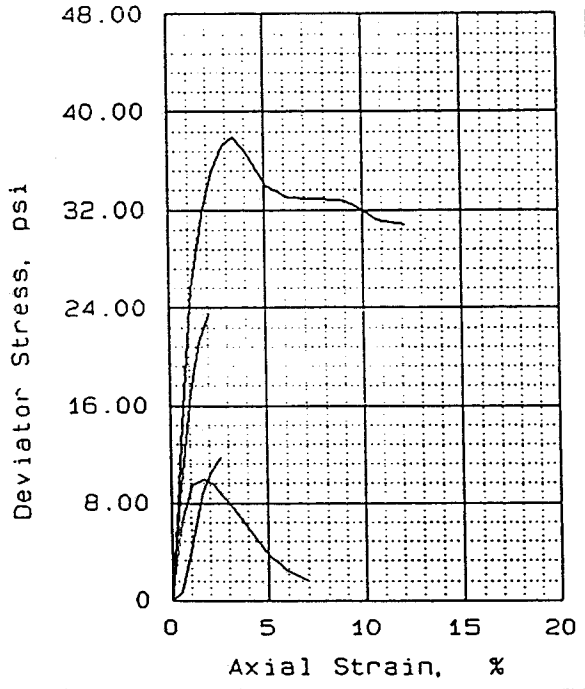
Test Data

Deformation dial constant= 1 in per input unit
Primary load ring constant= 0.1657 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Rate of strain= 0.670 % per minute
Consolidation cell pressure = 26 psi
Consolidation back pressure = 21 psi
Consolidation effective confining stress = 5 psi
Peak deviator stress = 9.99 psi at reading no. 3
Ult. deviator stress =

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress psi	Effective Stresses Minor psi	Effective Stresses Major psi	1:3 Ratio	Pore Pres. psi	P psi	Q psi
0	0.0150	0.000	25.0	0.0	0.0	0.00	4.20	4.20	1.00	21.8	4.20	0.00
1	0.0300	0.015	74.0	8.1	0.5	6.35	3.50	9.85	2.81	22.5	6.67	3.17
2	0.0450	0.030	98.0	12.1	1.1	9.40	3.50	12.90	3.69	22.5	8.20	4.70
3	0.0600	0.045	103.0	12.9	1.6	9.99	3.60	13.59	3.78	22.4	8.60	5.00
4	0.0750	0.060	100.0	12.4	2.2	9.56	3.60	13.16	3.65	22.4	8.38	4.78
5	0.0900	0.075	92.0	11.1	2.7	8.49	3.60	12.09	3.36	22.4	7.85	4.25

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress psi	Effective Stresses Minor psi	Effective Stresses Major psi	1:3 Ratio	Pore Pres. psi	P psi	Q psi
6	0.1050	0.090	85.0	9.9	3.2	7.56	3.50	11.06	3.16	22.5	7.28	3.78
7	0.1200	0.105	76.0	8.5	3.8	6.39	3.50	9.89	2.83	22.5	6.70	3.20
8	0.1500	0.135	57.0	5.3	4.8	3.97	3.10	7.07	2.28	22.9	5.08	1.98
9	0.1800	0.165	45.0	3.3	5.9	2.45	2.90	5.35	1.84	23.1	4.13	1.23
10	0.2100	0.195	38.0	2.2	7.0	1.57	2.80	4.37	1.56	23.2	3.59	0.79





SAMPLE NO.		1	2	3	4
INITIAL	WATER CONTENT, %	58.8	58.8	58.8	58.8
	DRY DENSITY, pcf	56.8	56.8	56.8	56.8
	SATURATION, %	81.5	81.5	81.5	81.5
	VOID RATIO	1.912	1.912	1.912	1.912
	DIAMETER, in	1.48	1.48	1.48	1.48
	HEIGHT, in	3.00	3.00	3.00	3.00
AT TEST	WATER CONTENT, %	51.9	55.7	55.0	37.8
	DRY DENSITY, pcf	69.7	66.8	67.3	82.5
	SATURATION, %	100.0	100.0	100.0	100.0
	VOID RATIO	1.375	1.475	1.458	1.003
	DIAMETER, in	1.36	1.38	1.44	1.27
	HEIGHT, in	2.91	2.93	2.66	2.79
BACK PRESSURE, psi		10.00	10.00	10.00	21.00
CELL PRESSURE, psi		15.00	20.00	30.00	25.00
FAILURE STRESS, psi		11.72	23.59	37.93	9.99
PORE PRESSURE, psi		10.50	11.40	13.30	22.40
STRAIN RATE, %/min.		0.670	0.670	0.670	0.670
ULTIMATE STRESS, psi					
PORE PRESSURE, psi					
$\bar{\sigma}_1$ FAILURE, psi		16.22	32.19	54.63	13.59
$\bar{\sigma}_3$ FAILURE, psi		4.5	8.6	16.7	3.6

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE:
DESCRIPTION: ALUM MUD

LL= 65 PL= 59 PI= 6.0
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: WASHINGTON COUNTY

PROJECT: WASHINGTON COUNTY LANDFILL

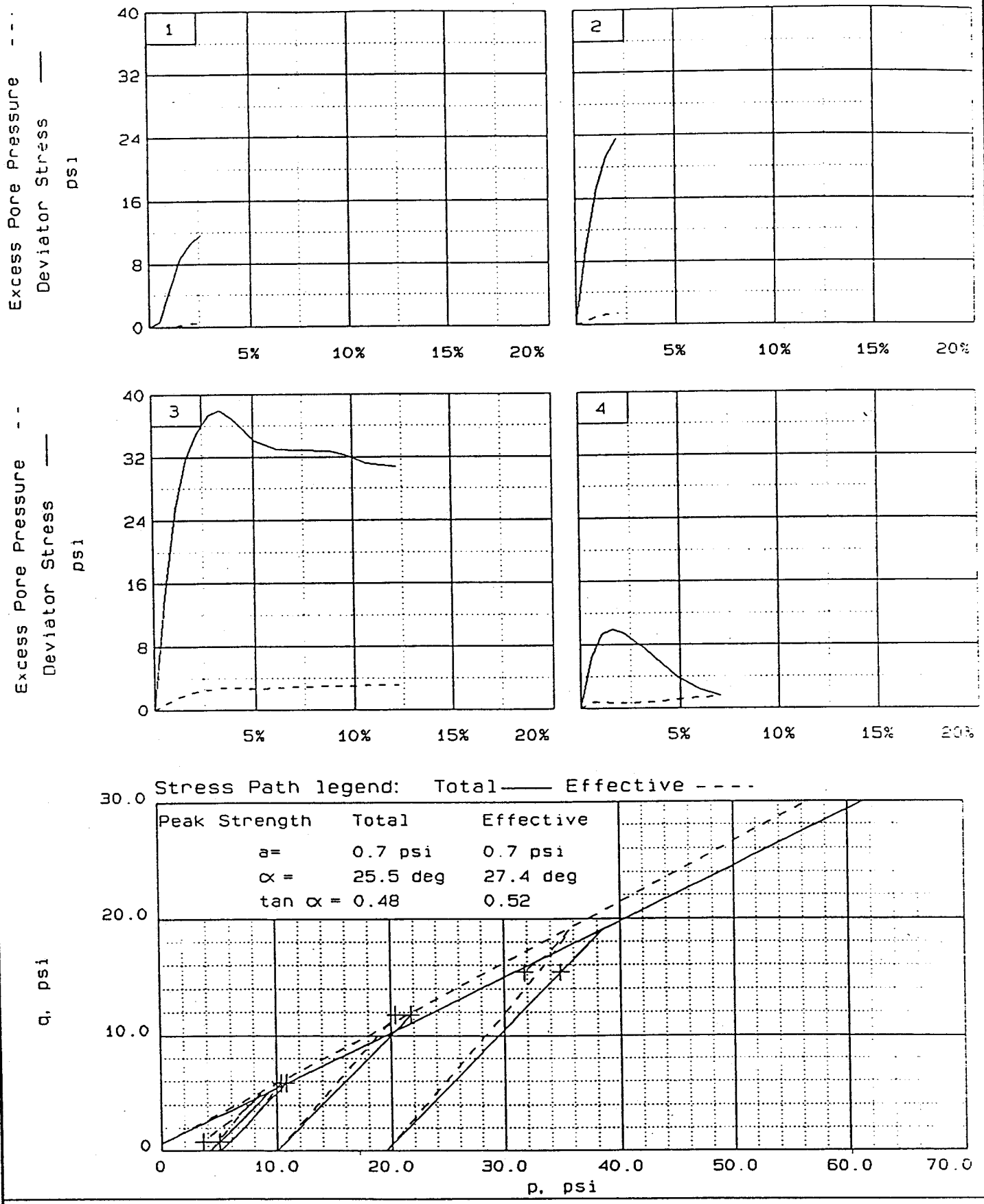
SAMPLE LOCATION: BAG 1 - SATURATED

PROJ. NO.: J-6356 DATE: 2/14/91

TRIAXIAL COMPRESSION TEST

LAW ENGINEERING

FIG. NO. 1



Client: WASHINGTON COUNTY

Project: WASHINGTON COUNTY LANDFILL

Location: BAG 1 - SATURATED

File: 6356 Project No.: J-6356 Page 2/2 Fig. No. 1

TRIAXIAL COMPRESSION TEST 2-14-1991
CU with pore pressures 1:38 pm

Project Data

Project No.: J-6356 Date: 2/14/91 Data file: 6356DRY
Client:
Project: WASHINGTON COUNTY LANDFILL
Sample location: BAG 1 - UNSATURATED
Sample description: ALUM MUD
Remarks:
Fig No. 2

Sample No. 1 Data

Type of sample:
Specific Gravity= 2.65 LL= 65 PL= 59 PI= 6

Sample Parameters	Before Test	At Testing	After Test
Diameter, in	2.83	2.73	
Height change, in		0.33	
Height, in	5.59	5.26	
Weight, grams	827.1		
Water volume change, cc		0.00	
Moisture, %	58.8	58.8	58.8
Dry density, pcf	56.4	64.7	
Saturation, %	80.7	100.0	
Void ratio	1.932	1.558	

Test Data

Deformation dial constant= 1 in per input unit
Primary load ring constant= 0.68 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Rate of strain= 1.500 % per minute
Consolidation cell pressure = 20 psi
Consolidation back pressure = 0 psi
Consolidation effective confining stress = 20 psi
Peak deviator stress = 55.79 psi at reading no. 13
Ult. deviator stress =

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress psi	Effective Stresses Minor psi	Effective Stresses Major psi	1:3 Ratio	Pore Pres. psi	P psi	Q psi
0	0.0150	0.000	40.0	0.0	0.0	0.00	20.00	20.00	1.00	0.0	20.00	0.00
1	0.0300	0.015	140.0	68.0	0.3	11.62	20.00	31.62	1.58	0.0	25.81	5.81
2	0.0450	0.030	230.0	129.2	0.6	22.02	20.00	42.02	2.10	0.0	31.01	11.01
3	0.0600	0.045	309.0	182.9	0.9	31.09	19.90	50.99	2.56	0.1	35.45	15.55
4	0.0750	0.060	371.0	225.1	1.1	38.15	19.60	57.75	2.95	0.4	38.67	19.07
5	0.0900	0.075	411.0	252.3	1.4	42.63	19.50	62.13	3.19	0.5	40.82	21.32

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress psi	Effective Stresses Minor psi	Major psi	1:3 Ratio	Pore Pres. psi	P psi	Q psi
6	0.1050	0.090	441.0	272.7	1.7	45.95	19.50	65.45	3.36	0.5	42.47	22.97
7	0.1200	0.105	462.0	287.0	2.0	48.21	19.40	67.61	3.49	0.6	43.51	24.11
8	0.1500	0.135	491.0	306.7	2.6	51.23	19.20	70.43	3.67	0.8	44.81	25.61
9	0.1900	0.175	515.0	323.0	3.3	53.53	19.00	72.53	3.82	1.0	45.77	26.77
10	0.2200	0.205	526.0	330.5	3.9	54.45	19.00	73.45	3.87	1.0	46.22	27.22
11	0.2400	0.225	531.0	333.9	4.3	54.79	19.00	73.79	3.88	1.0	46.39	27.39
12	0.2700	0.255	541.0	340.7	4.8	55.57	18.90	74.47	3.94	1.1	46.69	27.79
13	0.3000	0.285	546.0	344.1	5.4	55.79	18.90	74.69	3.95	1.1	46.80	27.90
14	0.3300	0.315	549.0	346.1	6.0	55.78	18.90	74.68	3.95	1.1	46.79	27.89

TRIAXIAL COMPRESSION TEST 2-14-1991
CU with pore pressures 1:41 pm

Project Data

Project No.: J-6356 Date: 2/14/91 Data file: 6356DRY
Client:
Project: WASHINGTON COUNTY LANDFILL
Sample location: BAG 1 - UNSATURATED
Sample description: ALUM MUD
Remarks:
Fig No. 2

Sample No. 2 Data

Type of sample:
Specific Gravity= 2.65 LL= 65 PL= 59 PI= 6

Sample Parameters	Before Test	At Testing	After Test
Diameter, in	2.83	2.79	
Height change, in		0.09	
Height, in	5.59	5.51	
Weight, grams	827.1		
Moisture, %	58.8	58.8	58.8
Dry density, pcf	56.4	59.1	
Saturation, %	80.7	86.6	
Void ratio	1.932	1.799	

Test Data

Deformation dial constant= 1 in per input unit
Primary load ring constant= 0.68 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Rate of strain= 1.500 % per minute
Consolidation cell pressure = 10 psi
Consolidation back pressure = 0 psi
Consolidation effective confining stress = 10 psi
Peak deviator stress = 22.46 psi at reading no. 5
Ult. deviator stress =

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress psi	Effective Stresses Minor psi	Effective Stresses Major psi	1:3 Ratio	Pore Pres. psi	P psi	Q psi
0	0.0150	0.000	85.0	0.0	0.0	0.00	10.00	10.00	1.00	0.0	10.00	0.00
1	0.0300	0.015	151.0	44.9	0.3	7.34	10.00	17.34	1.73	0.0	13.67	3.67
2	0.0450	0.030	211.0	85.7	0.5	13.97	9.90	23.87	2.41	0.1	16.89	6.99
3	0.0600	0.045	250.0	112.2	0.8	18.25	9.90	28.15	2.84	0.1	19.02	9.12
4	0.0750	0.060	277.0	130.6	1.1	21.17	9.80	30.97	3.16	0.2	20.39	10.59
5	0.0850	0.070	289.0	138.7	1.3	22.46	9.80	32.26	3.29	0.2	21.03	11.23

TRIAXIAL COMPRESSION TEST 2-14-1991
CU with pore pressures 1:43 pm

Project Data

Project No.: J-6356 Date: 2/14/91 Data file: 6356DRY
Client:
Project: WASHINGTON COUNTY LANDFILL
Sample location: BAG 1 - UNSATURATED
Sample description: ALUM MUD
Remarks:
Fig No. 2

Sample No. 3 Data

Type of sample:
Specific Gravity= 2.65 LL= 65 PL= 59 PI= 6

Sample Parameters	Before Test	At Testing	After Test
Diameter, in	2.83	2.78	
Height change, in		0.11	
Height, in	5.59	5.49	
Weight, grams	827.1		
Moisture, %	58.8	58.8	58.8
Dry density, pcf	56.4	59.8	
Saturation, %	80.7	88.1	
Void ratio	1.932	1.769	

Test Data

Deformation dial constant= 1 in per input unit
Primary load ring constant= 0.68 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Rate of strain= 1.500 % per minute
Consolidation cell pressure = 5 psi
Consolidation back pressure = 0 psi
Consolidation effective confining stress = 5 psi
Peak deviator stress = 15.25 psi at reading no. 6
Ult. deviator stress =

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress psi	Effective Stresses Minor psi	Effective Stresses Major psi	Effective Stresses 1:3 Ratio	Pore Pres. psi	P psi	Q psi
0	0.0150	0.000	64.0	0.0	0.0	0.00	5.00	5.00	1.00	0.0	5.00	0.00
1	0.0300	0.015	110.0	31.3	0.3	5.15	5.00	10.15	2.03	0.0	7.58	2.58
2	0.0450	0.030	145.0	55.1	0.5	9.05	5.00	14.05	2.81	0.0	9.52	4.52
3	0.0600	0.045	172.0	73.4	0.8	12.03	5.00	17.03	3.41	0.0	11.02	6.02
4	0.0750	0.060	188.0	84.3	1.1	13.78	5.00	18.78	3.76	0.0	11.89	6.89
5	0.0900	0.075	196.0	89.8	1.4	14.62	5.00	19.62	3.92	0.0	12.31	7.31
6	0.1050	0.090	202.0	93.8	1.6	15.25	5.00	20.25	4.05	0.0	12.62	7.62

TRIAXIAL COMPRESSION TEST 2-14-1991
CU with pore pressures 1:47 pm

Project Data

Project No.: J-6356 Date: 2/14/91 Data file: 6356DRY
Client:
Project: WASHINGTON COUNTY LANDFILL
Sample location: BAG 1 - UNSATURATED
Sample description: ALUM MUD
Remarks:
Fig No. 2

Sample No. 4 Data

Type of sample:
Specific Gravity= 2.65 LL= 65 PL= 59 PI= 6

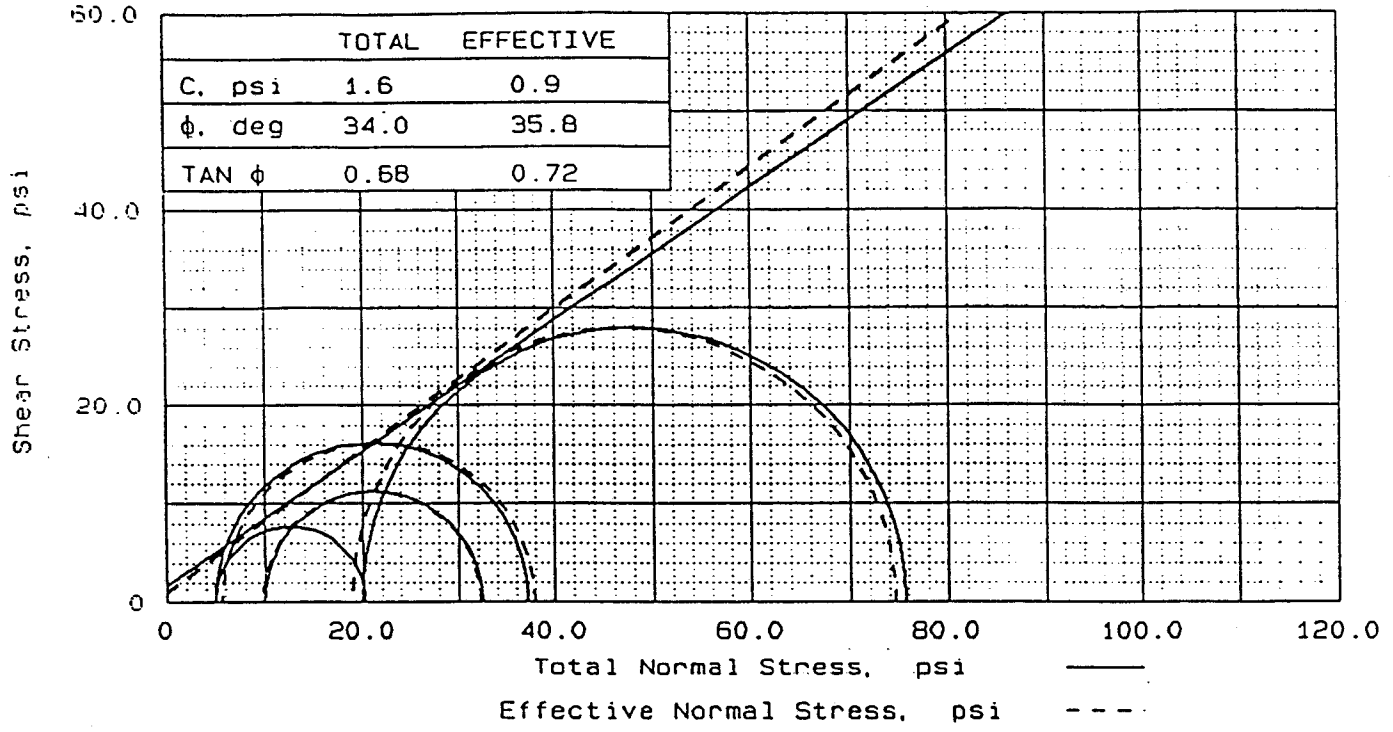
Sample Parameters	Before Test	At Testing	After Test
Diameter, in	2.83	2.63	
Height change, in		0.39	
Height, in	5.59	5.20	
Weight, grams	827.1		
Moisture, %	58.8	58.8	58.8
Dry density, pcf	56.4	70.5	
Saturation, %	80.7	115.7	
Void ratio	1.932	1.347	

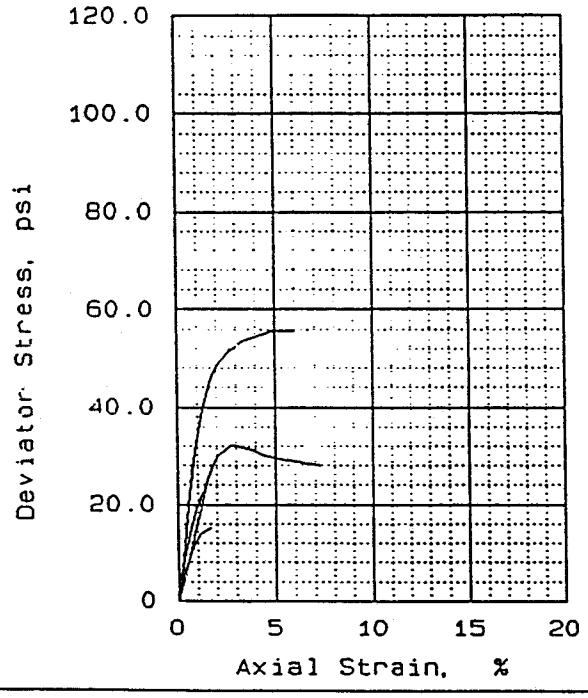
Test Data

Deformation dial constant= 1 in per input unit
Primary load ring constant= 0.68 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Rate of strain= 1.500 % per minute
Consolidation cell pressure = 5 psi
Consolidation back pressure = 0 psi
Consolidation effective confining stress = 5 psi
Peak deviator stress = 32.24 psi at reading no. 9
Ult. deviator stress =

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress psi	Effective Stresses Minor psi	Effective Stresses Major psi	1:3 Ratio	Pore Pres. psi	P psi	Q psi
0	0.0150	0.000	40.0	0.0	0.0	0.00	5.00	5.00	1.00	0.0	5.00	0.00
1	0.0300	0.015	75.0	23.8	0.3	4.38	5.00	9.38	1.88	0.0	7.19	2.19
2	0.0450	0.030	115.0	51.0	0.6	9.37	5.00	14.37	2.87	0.0	9.68	4.68
3	0.0600	0.045	156.0	78.9	0.9	14.45	5.10	19.55	3.83	-0.1	12.32	7.22
4	0.0750	0.060	195.0	105.4	1.2	19.25	5.20	24.45	4.70	-0.2	14.82	9.62
5	0.0900	0.075	236.0	133.3	1.4	24.27	5.20	29.47	5.67	-0.2	17.33	12.13
6	0.1050	0.090	261.0	150.3	1.7	27.28	5.20	32.48	6.25	-0.2	18.84	13.64

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress psi	Effective Stresses Minor psi	Effective Stresses Major psi	Effective Stresses 1:3 Ratio	Pore Pres. psi	P psi	Q psi
7	0.1200	0.105	282.0	164.6	2.0	29.79	5.20	34.99	6.73	-0.2	20.09	14.89
8	0.1500	0.135	299.0	176.1	2.6	31.69	5.50	37.19	6.76	-0.5	21.35	15.85
9	0.1600	0.145	304.0	179.5	2.8	32.24	5.70	37.94	6.66	-0.7	21.82	16.12
10	0.2100	0.195	299.0	176.1	3.8	31.32	6.00	37.32	6.22	-1.0	21.66	15.66
11	0.2400	0.225	291.0	170.7	4.3	30.17	6.20	36.37	5.87	-1.2	21.29	15.09
12	0.2700	0.255	288.0	168.6	4.9	29.63	6.20	35.83	5.78	-1.2	21.01	14.81
13	0.3000	0.285	286.0	167.3	5.5	29.21	6.20	35.41	5.71	-1.2	20.81	14.61
14	0.3300	0.315	285.0	166.6	6.1	28.92	6.30	35.22	5.59	-1.3	20.76	14.46
15	0.3600	0.345	282.0	164.6	6.6	28.39	6.30	34.69	5.51	-1.3	20.49	14.19
16	0.3900	0.375	280.0	163.2	7.2	27.98	6.30	34.28	5.44	-1.3	20.29	13.99





SAMPLE NO.		1	2	3	4
INITIAL	WATER CONTENT, %	58.8	58.8	58.8	58.8
	DRY DENSITY, pcf	56.4	56.4	56.4	56.4
	SATURATION, %	80.7	80.7	80.7	80.7
	VOID RATIO	1.932	1.932	1.932	1.932
	DIAMETER, in	2.83	2.83	2.83	2.83
	HEIGHT, in	5.59	5.59	5.59	5.59
AT TEST	WATER CONTENT, %	58.8	58.8	58.8	58.8
	DRY DENSITY, pcf	64.7	59.1	59.8	70.5
	SATURATION, %	100.0	86.6	88.1	115.7
	VOID RATIO	1.558	1.799	1.769	1.347
	DIAMETER, in	2.73	2.79	2.78	2.63
	HEIGHT, in	5.26	5.51	5.49	5.20
BACK PRESSURE, psi		0.0	0.0	0.0	0.0
CELL PRESSURE, psi		20.0	10.0	5.0	5.0
FAILURE STRESS, psi		55.8	22.5	15.2	32.2
PORE PRESSURE, psi		1.1	0.2	0.0	-0.7
STRAIN RATE, %/min.		1.500	1.500	1.500	1.500
ULTIMATE STRESS, psi					
PORE PRESSURE, psi					
$\bar{\sigma}_1$ FAILURE, psi		74.7	32.3	20.2	37.9
$\bar{\sigma}_3$ FAILURE, psi		18.9	9.8	5	5.7

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE:
DESCRIPTION: ALUM MUD

LL= 65 PL= 59 PI= 6.0
SPECIFIC GRAVITY= 2.65
REMARKS:

FIG. NO. 2

CLIENT:

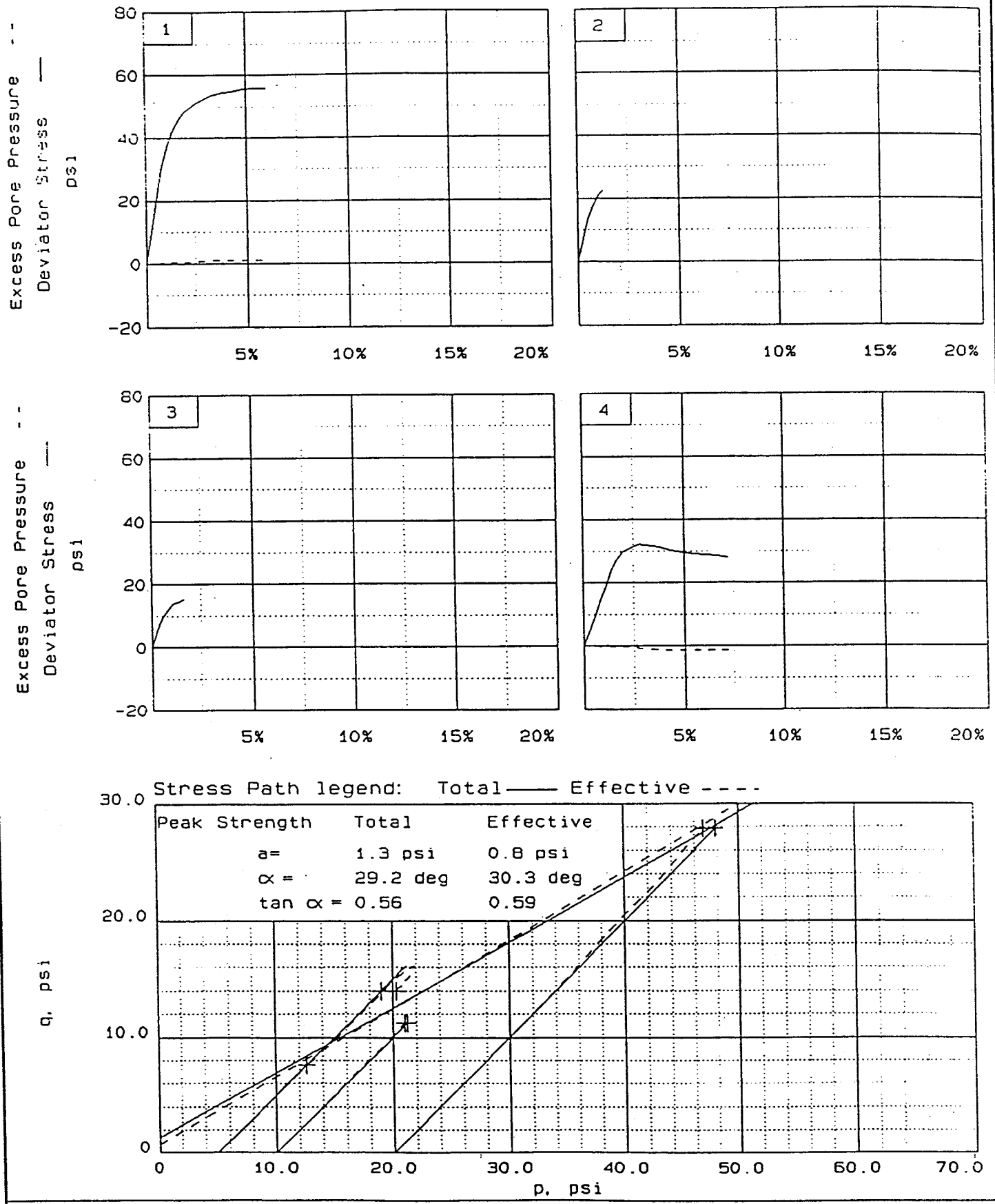
PROJECT: WASHINGTON COUNTY LANDFILL

SAMPLE LOCATION: BAG 1 - UNSATURATED

PROJ. NO.: J-6356 DATE: 2/14/91

TRIAXIAL COMPRESSION TEST

LAW ENGINEERING



Client:

Project: WASHINGTON COUNTY LANDFILL

Location: BAG 1 - UNSATURATED

File: 6356DRY Project No.: J-6356 Page 2/2 Fig. No. 2

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date:	2/21/91
Time of Run:	9:30
Run By:	FSM
Input Data Filename:	A:GARBAGE1.IN
Output Filename:	A:GARBAGE1.OUT

PROBLEM DESCRIPTION WASHINGTON CO. LANDFILL

BOUNDARY COORDINATES

5 Top Boundaries
10 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	20.00	50.00	20.00	3
2	50.00	20.00	95.00	35.00	2
3	95.00	35.00	110.00	35.00	2
4	110.00	35.00	132.00	43.00	1
5	132.00	43.00	180.00	43.00	1
6	110.00	35.00	125.00	20.00	2
7	50.00	20.00	125.00	20.00	3
8	125.00	20.00	140.00	5.00	3
9	.00	5.00	140.00	5.00	4
10	140.00	5.00	180.00	5.00	4

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	75.0	75.0	100.0	10.0	.00	.0	1
2	56.0	56.0	100.0	28.5	.00	.0	2
3	120.0	120.0	.0	32.0	.00	.0	3
4	100.0	100.0	.0	28.0	.00	.0	4

9	112.63	24.66
10	122.20	27.55
11	131.63	30.93
12	140.84	34.79
13	149.85	39.13
14	156.91	43.00

Circle Center At X = 61.9 ; Y = 210.1 and Radius, 192.3

*** 2.589 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	33.33	20.00
2	43.22	18.46
3	53.18	17.57
4	63.17	17.32
5	73.16	17.71
6	83.11	18.75
7	92.97	20.42
8	102.70	22.73
9	112.26	25.66
10	121.61	29.19
11	130.72	33.33
12	139.54	38.04
13	147.53	43.00

Circle Center At X = 62.1 ; Y = 172.4 and Radius, 155.1

*** 2.687 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	44.44	20.00
2	54.34	18.53
3	64.29	17.56
4	74.28	17.07
5	84.28	17.08
6	94.27	17.58
7	104.22	18.58
8	114.11	20.06
9	123.91	22.02
10	133.61	24.47
11	143.17	27.39
12	152.58	30.78
13	161.81	34.63
14	170.84	38.93
15	178.39	43.00

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	15.00
2	180.00	15.00

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 50.00 ft.

Each Surface Terminates Between X = 95.00 ft.
and X = 180.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

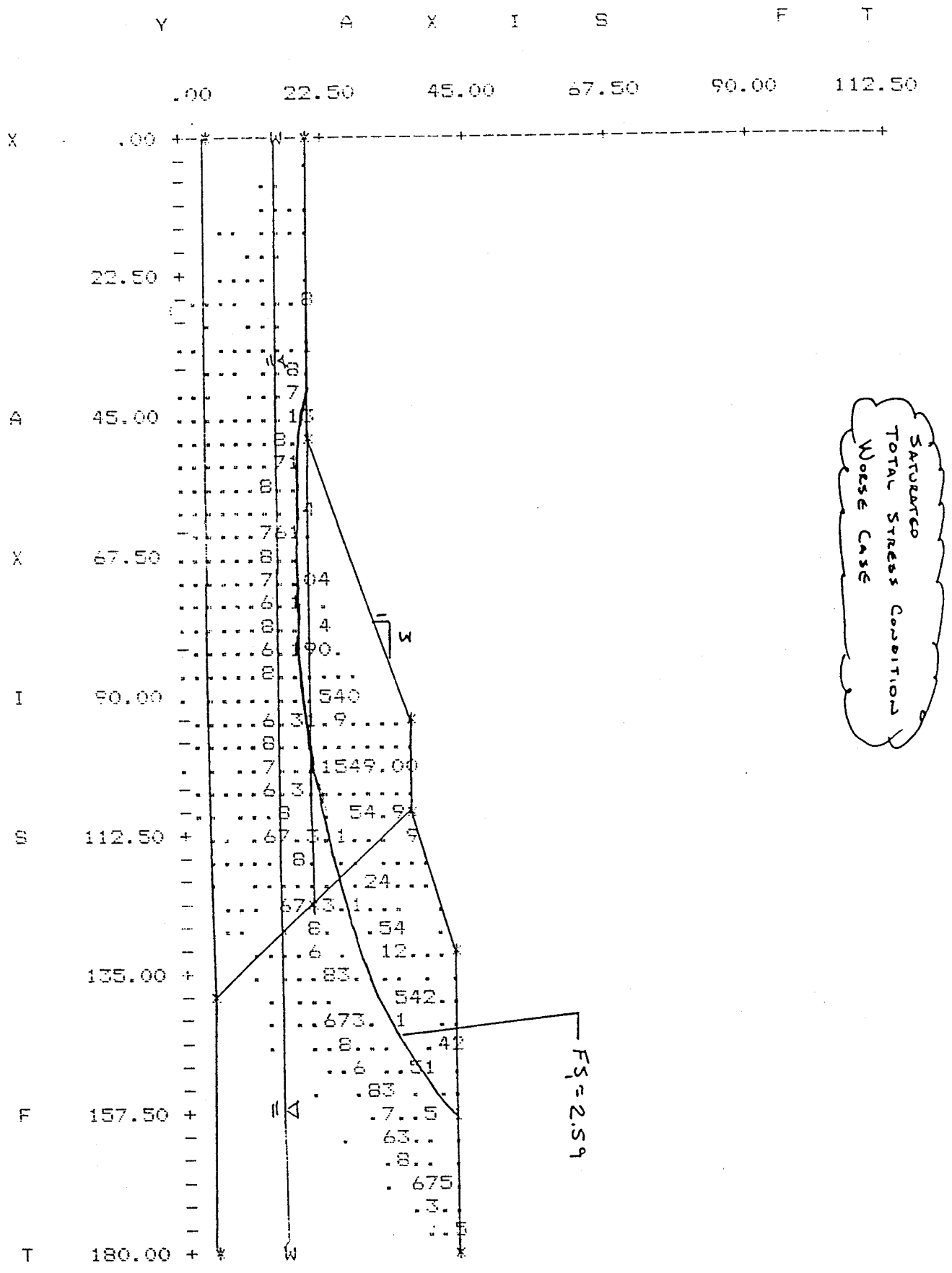
1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method *

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	33.33	20.00
2	43.26	18.77
3	53.23	18.06
4	63.23	17.86
5	73.23	18.19
6	83.19	19.04


Y A X I S F T
.00
22.50
45.00
67.50
90.00
112.50
X .00
22.50
A 45.00
X 67.50
I 90.00
S 112.50
135.00
F 157.50
T 180.00
W
1
3
FS=2.59
Saturated
Total Stress Condition
Worse Case

** PCSTABL5 **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date:	2/21/91
Time of Run:	9:45
Run By:	FSM
Input Data Filename:	A:GARBAGE2.IN
Output Filename:	A:GARBAGE2.OUT

PROBLEM DESCRIPTION WASHINGTON CO. LANDFILL

BOUNDARY COORDINATES

5 Top Boundaries
10 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	20.00	65.00	20.00	3
2	65.00	20.00	95.00	35.00	2
3	95.00	35.00	110.00	35.00	2
4	110.00	35.00	132.00	43.00	1
5	132.00	43.00	180.00	43.00	1
6	110.00	35.00	125.00	20.00	2
7	50.00	20.00	125.00	20.00	3
8	125.00	20.00	140.00	5.00	3
9	.00	5.00	140.00	5.00	4
10	140.00	5.00	180.00	5.00	4

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	75.0	75.0	100.0	10.0	.00	.0	1
2	56.0	56.0	100.0	28.5	.00	.0	2
3	120.0	120.0	.0	32.0	.00	.0	3
4	100.0	100.0	.0	28.0	.00	.0	4

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	15.00
2	180.00	15.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 65.00 ft.

Each Surface Terminates Between X = 95.00 ft.
and X = 180.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.00	20.00
2	74.85	18.25
3	84.80	17.31
4	94.80	17.18
5	104.78	17.88
6	114.66	19.40
7	124.38	21.71

9	143.11	28.71
10	151.98	33.32
11	160.44	38.65
12	166.23	43.00

Circle Center At X = 91.3 ; Y = 139.0 and Radius, 121.9

*** 2.315 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.78	20.00
2	67.67	18.53
3	77.63	17.65
4	87.63	17.35
5	97.62	17.63
6	107.58	18.50
7	117.48	19.95
8	127.27	21.97
9	136.93	24.56
10	146.42	27.71
11	155.71	31.41
12	164.77	35.65
13	173.57	40.41
14	177.75	43.00

Circle Center At X = 87.8 ; Y = 188.4 and Radius, 171.1

*** 2.391 ***

1

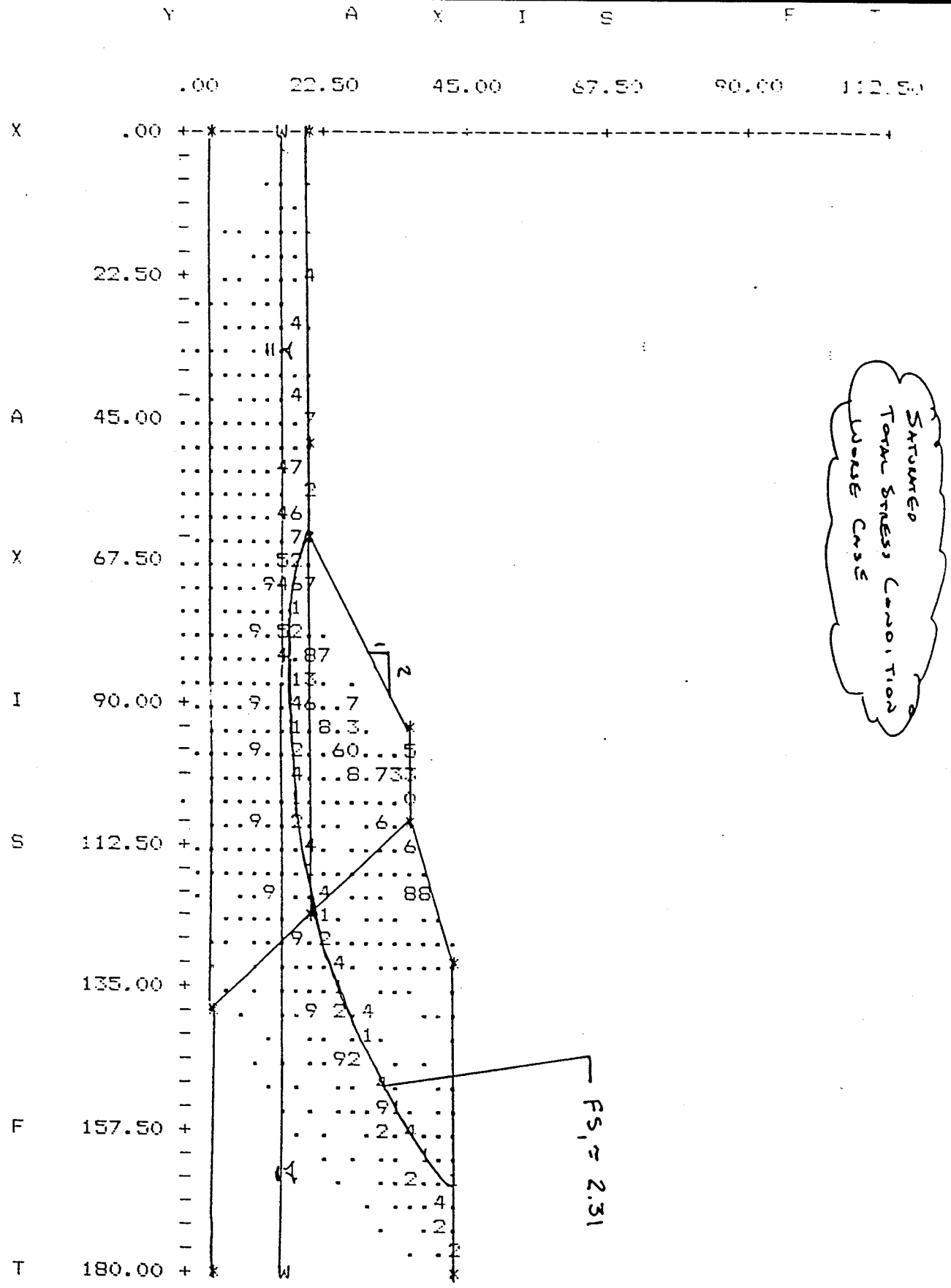
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.78	20.00
2	67.50	17.64
3	77.49	18.02
4	87.01	21.08
5	95.34	26.62
6	101.85	34.21
7	102.22	35.00

Circle Center At X = 71.2 ; Y = 54.0 and Radius, 36.5

*** 2.468 ***

Failure Surface Specified By 17 Coordinate Points



Saturated
Total Stress Condition
Wedge Case

LAW ENGINEERING
GEOTECHNICAL, ENVIRONMENTAL & CONSTRUCTION MATERIALS CONSULTANTS
3301 ATLANTIC AVE.
P.O. BOX 18288
RALEIGH, NC 27619
919-876-0416

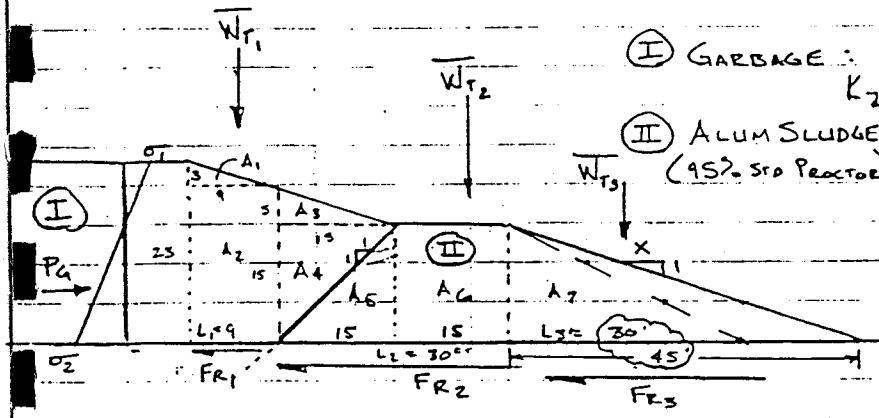
JOB NO. J6356 SHEET 1 OF 2

JOB NAME WASHINGTON Co LANDFILL

SUBJECT SLIDING WEDGE ANALYSIS

BY DEM DATE 2/25/91

CHECKED BY _____ DATE _____



(I) GARBAGE: $\phi_G = 10°$; $C_G = 100$ PSF ; 75 PCF $= \gamma_G$

$K_{a_G} = \tan^2(45 - \phi/2) = 0.704$

(II) ALUM SLUDGE: $\phi_T = 28.5°$; $C_T = 100$ PSF; 56 PCF $= \gamma_{AS}$

(95% STD PROCTOR) $\phi' = 31.3°$; $C' = 100$ PSF; 56 PCF $= \gamma_{AS}$

$A_1 = 3(9)/2 = 13.5\ FT^2$; $W_{T_1} = A_1 \gamma_G = (13.5)(75) = 1012\ ^{lb}/_{FT}\downarrow$

$A_2 = 9(15) = 135\ FT^2$; $W_{T_2} = A_2 \gamma_G = (135)(75) = 10{,}125\ ^{lb}/_{FT}\downarrow$

$A_3 = 5(15)/2 = 37.5\ FT^2$; $W_{T_3} = A_3 \gamma_G = (37.5)(75) = 2{,}812\ ^{lb}/_{FT}\downarrow$

$A_4 = 15(15)/2 = 112.5\ FT^2$; $W_{T_4} = A_4 \gamma_G = (112.5)(75) = 8{,}437\ ^{lb}/_{FT}\downarrow$

$A_5 = 15(15)/2 = 112.5\ FT^2$; $W_{T_5} = A_5 \gamma_{AS} = (112.5)(56) = 6{,}300\ ^{lb}/_{FT}\downarrow$

$A_6 = 15(15) = 225\ FT^2$; $W_{T_6} = A_6 \gamma_{AS} = (225)(56) = 12{,}600\ ^{lb}/_{FT}\downarrow$

$A_7 = (X(15))\,15/2 = 112.5X\ FT^2$; $W_{T_7} = A_7 \gamma_{AS} = (112.5X)(56) = 6300X\ ^{lb}/_{FT}\downarrow$

$F_{R_1} = W_{T_1} \tan\phi_G + C_G L_1 = (W_{T_1} + W_{T_2}) \tan 10° + (100)(9) = (1012 + 10{,}125)\tan 10° + 900 = 2864\ ^{lb}/_{FT}\leftarrow$

$F_{R_2} = W_{T_2} \tan\phi + C L_2 = (\underbrace{W_{T_3}}_{2812} + \underbrace{W_{T_4}}_{8437} + \underbrace{W_{T_5}}_{6300} + \underbrace{W_{T_6}}_{12{,}600})\tan\phi + 100(30) = [30{,}149 \tan\phi + 3000]\ ^{lb}/_{FT}\leftarrow$

$F_{R_3} = W_{T_3} \tan\phi + C L_3 = \underbrace{W_{T_7}}_{6300X} \tan\phi + 100((X)15) = (6300X)\tan\phi + 1500X \leftarrow$

$F_R = F_{R_1} + F_{R_2} + F_{R_3} = 2864 + 30{,}149\tan\phi + 3000 + (6300X)\tan\phi + 1500X \leftarrow$

$F_R = 1500X + (30{,}149 + 6300X)\tan\phi + 5864\ ^{lb}/_{FT}\leftarrow$

$\sigma_1 = K_{a_G} \gamma_G Z - 2c\sqrt{K_{a_G}} = (0.704)(75)(0) - 2(100)\sqrt{0.704} = 52.8(0) - 168 = -168\ PSF \rightarrow$

$\sigma_2 = 52.8(23) - 168 = 1047\ PSF \rightarrow$

$P_G = (\sigma_1 + \sigma_2)\,23/2 = (-168 + 1047)\,23/2 = 10{,}104\ ^{lb}/_{FT}\rightarrow$

LAW ENGINEERING

GEOTECHNICAL, ENVIRONMENTAL
& CONSTRUCTION MATERIALS
CONSULTANTS

March 5, 1991

Diehl & Phillips
219 East Chatham Street
Cary, North Carolina 27511

Attention: Mr. Alen Keith

SUBJECT: REPORT OF GEOTECHNICAL SERVICES
AND LABORATORY TESTING - WASHINGTON COUNTY LANDFILL
WASHINGTON COUNTY LANDFILL DIKE & COVER MATERIAL
PLYMOUTH, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47291-6356

Dear Mr. Keith:

Based on our telephone conversations of March 1,1991 regarding the potential volume change of the material placed for the dike and the permeability of the saturated and unsaturated permeabilities of the material at optimum moisture content in our report dated February 27, 1991. We have the following clarifications and recommendations.

To minimize potential shrinkage of the material placed in the dike, the material should be placed below the optimum moisture content (i.e., 58%±) and closer to the shrinkage limit (47%±). This may require additional compaction effort in order to achieve 95% of the standard maximum dry density.

The unsaturated permeability of the material to be used as a cover was approximately $2x10^{-5}$ cm/sec at 95% of the standard Proctor maximum dry density at an optimum moisture content of approximately 59%±. However as the material becomes saturated with time, it will become less permeable as shown by our laboratory testing. The permeability of the cover material noted on Page 3 of our report notes the moderately impervious nature of the material as $K=2x10^{-5}$ cm/sec. However, in its saturated state the material yields a permeability coefficient of $K=2x10^{-6}$ cm/sec.

3301 ATLANTIC AVE.
P.O. BOX 18288
RALEIGH, NC 27619
919-876-0416

We are available to discuss our recommendations with you and to provide additional studies or services necessary to complete the project. We have enjoyed assisting you and look forward to serving as your consultant on the remainder of this project and on future projects.

Very truly yours,

LAW ENGINEERING

David E. Miller, P.E.
Geotechnical Project Engineer

Barney C. Hale, P.E.
Senior Geotechnical Engineer

DEM/BCH/pap

GROUND WATER MONITORING PLAN

* NOTE: REFER TO CONSTRUCTION PLAN REPORT DATED AUG. 4, 1995 FOR THIS SECTION. BINDER 2 OF 2

WATER QUALITY MONITORING PLAN
WASHINGTON COUNTY C&D LANDFILL
AND TIRE MONOFILL
WASHINGTON COUNTY, NORTH CAROLINA
S&ME, INC. PROJECT NO. 1054-95-294

Prepared for:

Diehl and Phillips
219 East Chatham Street
Cary, North Carolina

Prepared By:

S&ME Inc.
3100 Spring Forest Road
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June 1995

S&ME

June 9, 1995

Diehl and Phillips
219 East Chatham Street
Cary, North Carolina 27511

Attention: Mr. Alan Keith

Reference: Water Quality Monitoring Plan
Washington County C&D Landfill and Tire Monofill
Washington County, North Carolina
S&ME Project No: 1054-95-294

Dear Mr. Keith:

S&ME, Inc. has completed the Water Monitoring Plan for the proposed Washington County C&D Landfill and Tire Monofill to be constructed adjacent to the existing Washington County sanitary landfill, located off of N.C. Highway 308, east of Plymouth, North Carolina.

The Monitoring Plan, when implemented as outlined, should be effective in providing early detection of a release of hazardous constituents so as to be protective of public health and the environment.

Abandonment of the piezometers installed during the site suitability study must be performed under the supervision of a Licensed Geologist, in accordance with North Carolina Well Abandonment Regulations (15A NCAC 2C, Rule .0113(a)(2)).

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We appreciate the opportunity to assist you with this phase of this project. Please call us at 919-872-2660 if you have any questions regarding the information contained within this report or if we can be of additional service.

Very truly yours,

S&ME INC.

Walter J. Beckwith, P.G.
NC Registration No. 584

Ernest F. Parker, Jr., P.E.
NC Registration No. 7950

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WATER QUALITY MONITORING PLAN

1.0 BACKGROUND

1.1 PLAN OVERVIEW

A Water Quality Monitoring Plan for the proposed Washington County Construction and Demolition (C&D) Landfill and Tire Monofill is a requirement of North Carolina Department of Environment, Health, and Natural Resources (NCDEHNR), Division of Solid Waste Management Rule 15A NCAC 13B, Section 0.0504(1)(g)(iv). The purpose of the Water Quality Monitoring Plan is to protect human health and the environment by monitoring the quality of surface water and groundwater in the uppermost aquifer in the immediate vicinity of the facility to determine if a release of hazardous constituents has occurred from the landfill.

The information generated during the implementation of this plan will be used to assist the NCDEHNR Solid Waste Section and the operator of the Washington County C&D landfill in the evaluation of possible impacts to surface water and groundwater quality during the (active and post-closure) life of the landfill.

The following Plan includes sections describing:

- current site conditions,
- existing monitoring points or data,
- basis for new well installation,
- well design, construction and maintenance,
- sampling and analytical procedures,
- reporting and evaluation of the data.

All implemented procedures will be performed in accordance with NCDEHNR Solid Waste Section rules, guidelines, and policies.

1.2 CURRENT SITE CONDITIONS

The 71 acre site, proposed for construction of the C&D debris landfill, is located immediately east of the existing (and now closed) Washington County sanitary landfill. The existing facilities are located in northern Washington County, north of N.C. Highway 308, between the towns of Plymouth and Roper, North Carolina. The site is bounded to the north by the wooded wetland fringe of the Roanoke River. It is bounded to the east and south by privately owned, wooded, undeveloped property.

Approximately 25 percent of the site has previously been used as a source of borrow soils, both by the landfill for cover material, and previously, by the North Carolina Department of Transportation during the improvements to US Highway 64 near Plymouth, N.C. This area has been graded to the water table.

The remaining undisturbed portions of the site are elevated slightly above the surrounding land surface and covered with a thick stand of immature hardwoods and underbrush. With the exception of the site boundary adjoining the existing landfill, the land adjacent to the site boundaries is poorly drained and heavily wooded.

1.3 REVIEW OF SITE HYDROGEOLOGY

The following paragraphs summarize the hydrogeological conditions present at the site. They are included to support the basis for screen placement discussed in Section 2.2.

A more detailed discussion of site conditions can be found in the Geologic and Hydrologic Report for the Washington County C&D Landfill (S&ME, 1994).

1.3.1 Geology

Washington County is located within the Tidewater region of the Coastal Plain Physiographic Province of North Carolina. The Tidewater region is characterized by flat to subdued topography and in many areas, poorly drained soils. The Coastal Plain Region has formed through deposition of an eastward thickening wedge of sediments on crystalline bedrock. The sediments consist of interbedded sands and clays, limestone, sandstone and calcareous clays.

Surficial soils in the region consist of a series of undivided deposits of fine grained sands with interbedded clays. The undivided deposits have a thickness of between 30 and 50 feet. The Yorktown formation is present beneath the surficial deposits. The Yorktown formation typically consists of gray clayey sands and silty clays with interbedded sands and shell material. In the Plymouth, N.C. area, the Yorktown extends to a depth of approximately 95 to 100 feet.

1.3.2 Site Lithology

Soil Test borings drilled at the site for the site suitability study encountered four stratigraphic units. The units consist of 20 to 28 feet of (1) relatively clean sand containing an interbedded (2) gray silty clay, overlain in undisturbed areas with a veneer of organic topsoil. The sand is fine grained near the ground surface, coarsening with depth, to medium to coarse sand with small (pea) gravel at the base of the unit. The

interbedded clay, found in 5 of the 7 borings, contains varying amounts of silt and sand, and is discontinuous across the site. It ranges between 1 and 11 feet in thickness.

The near-surface sands rest on (3) fine grained sandy and silty soils that are characteristically darker in color and contain some finely divided decayed organic matter. Typically, this unit is comprised of finely laminated silt and very fine sand that contain lenses of silty to clean fine sand and silty clay. This unit is underlain by (4) clay and clayey silt of the Yorktown formation that was encountered in one boring at a depth of 48 feet.

1.3.3 Hydraulic Conductivity of the Surficial Aquifer

Hydraulic conductivity values were determined during the suitability study performed by S&ME, Inc., in 1994 for the four lithologic units present at the site. Based on estimates provided by aquifer tests and soil particle size distributions, the upper sands have an approximate hydraulic conductivity value of 2×10^{-2} cm/sec. The interbedded clay has an approximate hydraulic conductivity value of 5×10^{-6} cm/sec. The underlying silts and clays have an approximate hydraulic conductivity value of 2×10^{-5} cm/sec.

1.3.4 Groundwater Movement

Groundwater flow occurs generally to the north toward the swampy floodplain of the Roanoke River. Some mounding of groundwater occurs in the northwestern corner of the site due to surface water run-off (and subsequent infiltration) and seepage from the adjacent sanitary landfill. The affect of this groundwater mounding is to "push"

groundwater flow toward the north-central property area and create a discharge area where former borrow excavations have lowered the ground surface.

Based on the groundwater flow gradients, annual groundwater (Darcey) velocities range from approximately 240 feet to greater than 10,000 feet in the upper sands. Velocities in the clay are on the order of 3 feet per year or less. This value is of likely minor importance as the clays are discontinuous. Groundwater tends to move around the clay lenses because of the higher seepage rates of the surrounding sand. Velocities within the deeper soils are lower, ranging from less than 1 ft/yr in the silts and clays to approximately 240 feet per year in the sand interbeds present in the deeper soils.

The surficial sands are the most permeable strata within the surficial aquifer. The deeper fine grained soils tend to act as barriers to the downward movement of groundwater. The monitor wells described in the following sections will monitor the surficial sand strata.

1.4 REVIEW OF EXISTING SITE MONITORING

1.4.1 Number and Location of Existing Monitor Wells

There are no existing monitor wells located within the area to be permitted for the C&D Landfill. There are four existing monitor wells located around the closed sanitary landfill. Two of these wells (MW-1 and MW-2) are located in close proximity of the west boundary. These wells are currently being used for monitoring of the closed landfill. They are located too far away from the proposed C&D Landfill to effectively be used as monitoring points.

Eleven piezometers were installed at the C&D site during the early spring 1994 to determine water levels around the proposed landfill.

1.4.2 Existing Monitor Well and Piezometer Construction

The existing shallow wells in the vicinity of the closed landfill are constructed of 2-inch PVC well casing and screen, installed so that the screens intersect the water table.

The temporary piezometers were installed to determine stabilized groundwater levels across the site and to perform in-situ permeability testing of the surficial aquifer. Four deep piezometers were installed in borings, B-1, B-2, B-4 and B-5, at the completion of drilling. Seven shallow piezometers were installed in shallow off-set borings located adjacent to the soil test borings.

The piezometers were constructed of 1.25" and 2.0" Schedule 40, PVC, flush threaded casing and .010" slotted screen. Ten foot (10') screen lengths were utilized for the shallow piezometers. Five foot (5') screen lengths were used for the deep piezometers.

The piezometers were installed to obtain water level data for the site. Their construction does not allow their use as monitor wells. As such, they will require abandonment prior to construction.

1.4.3 Surface Water and Groundwater Analytical Data

S&ME has not been provided with, or is aware of any existing analytical data for surface water or groundwater from the C&D site. The existing monitor wells around the sanitary

landfill have been sampled periodically in conjunction with its former operation. These wells are located some distance from the proposed C&D site. Analytical data from these wells may not be representative of site conditions at the C&D landfill site.

2.0 GROUNDWATER MONITORING PLAN

The proposed monitoring well locations were selected to allow the detection of changes in groundwater quality at the site. The spacing and locations of the wells were selected based on existing site features and estimated groundwater flow directions.

2.1 BASIS FOR THE LOCATION AND NUMBER OF PLANNED MONITOR WELLS

Our interpretation of groundwater flow regimes suggests groundwater flow occurs in a northerly direction from the south boundary toward the Roanoke River, where it discharges onto the floodplain north of the site. Along the western edge of the site, there is an eastward flow component due to the higher groundwater head in the vicinity of the closed sanitary landfill.

The proposed monitoring network consists of three downgradient monitor wells (C&D-1, C&D-2, and C&D-3) and one upgradient monitor well (C&D-4). The new well locations were selected for characterization of groundwater quality both upgradient and downgradient of the proposed C&D landfill.

The downgradient wells, C&D-1 through C&D-3 are located within the buffer area, approximately 125 to 160 feet from the proposed waste boundary to allow detection of any groundwater impact prior to it's reaching the site's northern boundary.

Similarly, the upgradient monitor well, C&D-4 is located in the central eastern portion of the property, approximately 250 feet upgradient of the area designated on Figure 1, as "Future Phases".

The proposed monitor well locations for the landfill are also shown on Sheet 1 of the Construction Plans. Sheet 1 also shows the location of two of the existing monitor wells (also identified as MW-1 and MW-2) part of the monitoring system for the existing sanitary landfill. For this reason it is desirable to renumber the proposed wells using a different prefix, for example, C&D in lieu of MW, to eliminate confusion in reviewing analytical data generated for the two adjacent sites. MW-1 through 4 would then pertain to the closed landfill site and C&D-1 through C&D-4 would pertain to the C&D Site.

Groundwater equipotential (contour) lines and groundwater flow direction for the surficial aquifer, based on our interpretation of groundwater levels measured in the piezometers on February 21, 1994 are also shown on Figure 1 to illustrate the relationship between the well locations and groundwater flow directions.

In addition to construction of the four proposed wells, it may be desirable to leave four of the existing shallow piezometers (B-1,B-2, B-4, and B-5) in-place to be used to determine groundwater levels in the vicinity of the landfill. All of the other piezometers should be properly abandoned prior to construction.

2.2 TYPICAL MONITORING WELL DESIGN, CONSTRUCTION AND MAINTENANCE

The four planned monitoring wells, C&D-1 through C&D-4, will be installed as Type II wells, constructed in accordance with the North Carolina Well Construction Standards (15A NCAC 2C .0108) and the requirements of the North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities.

The Division typically requires monitor well screen placement such that seasonal water level variations will fall within the screened interval of the well. For sites such as this site, that exhibit a shallow depth to the water table, the Division recommends screen placement at a minimum depth of five feet.

Seasonal high groundwater levels are on the order of 2.5 to 3 feet below the existing ground surface within the areas proposed for location of the monitor wells. For the new wells, the top of screen will be positioned 5 feet below grade in order to allow sufficient room for construction of a well seal.

Typical monitoring well construction details for Type II wells are shown on Figure 2. It is estimated that each of the four wells will be screened between 5 and 20 feet. Final screened intervals may be adjusted slightly in the field depending on site conditions encountered during the drilling of the boreholes as described below.

The wells should be constructed by a qualified and experienced drilling contractor licensed in North Carolina. All equipment used for drilling and completion of the wells will be properly cleaned (decontaminated) before drilling and monitoring well installation. At a minimum, the cleaning will consist of high pressure hot-water cleaning of the downhole drilling equipment prior to performing each boring.

In order to obtain additional subsurface information at strategic locations, soil test borings will be performed at each of the well locations. Soil sampling will be performed, using split-barrel sampling procedures on no more than 5-foot intervals during the advancement of the boring.

Following the completion of each borehole, the project engineer or geologist will confirm the screened interval for the monitoring well based on-site specific conditions. It is the intent that the highly permeable surficial sands be the zone monitored.

The wells will be constructed of 2-inch diameter Schedule 40 PVC flush threaded casing (ASTM F-480 or equivalent) and .010-inch slotted screen. All well construction materials will be thoroughly cleaned prior to installation or will be installed directly from factory-sealed packaging.

The proposed monitoring wells must be installed during site construction so that an initial sampling can be performed prior to landfilling.

The wells will be constructed according to the following general criteria:

1. The screen length is to be 15 feet, located so that the top of the screen is approximately 5 feet below the ground surface.

2. The annular space between the borehole wall and the well screen will be backfilled with clean, washed sand properly sized to the formation material. The sand pack shall be placed up to a level approximately one foot above the screen. The hollow-stem augers or temporary casing, if used, will be incrementally withdrawn while the filter pack is placed. The filter pack level will be frequently sounded until the desired depth of filter pack is obtained.

3. A one foot pelletized bentonite seal will be placed above the filter pack. The bentonite will be hydrated with clean water for a minimum of 2 hours. The

bentonite pellets will be carefully tamped into a wet, cohesive clay mass before placement of the grout seal. Care will be taken so that the augers or temporary steel casing is withdrawn above the top of the pellets to prohibit the bentonite pellet seal from sticking to the augers or casing.

4. Grouting of the remaining annular space above the bentonite seal will be performed only after hydration of the bentonite. The remaining space will be filled with a cement grout from the top of the bentonite seal to approximately one foot below the ground surface. After grouting, no work is permitted on the well for a minimum of 24 hours while the grout hydrates.

5. The casing for each well and piezometer will be extended approximately two feet above grade and capped with a vented PVC cap. A 4-inch square, or larger, steel protective casing with a lockable cover will be placed over the well's riser pipe. The protective casing will be embedded into the grout so that the top of the casing is elevated slightly above the inner well casing. The protective casing will be sealed and immobilized in concrete placed around the outside of the protective casing. A 1/4-inch diameter drain hole will be drilled in the protective casing 3 to 6 inches above the concrete pad to prohibit water accumulation and possible freezing and ice damage (crushing) to the riser pipe. The protective casing will be primed, painted, and provided with a permanently affixed name plate with the following information as required in the well standards:

- Well identification number
- Drilling contractor name and registration number
- Total depth of well

- Depth of screen interval
- A warning that the well is not for water supply and that the groundwater may contain hazardous materials.

6. A concrete anti-percolation pad with dimensions of 2 feet by 2 feet will be cast around the protective casing at the ground surface. The concrete surface will be gently sloped downward from the protective casing to the edges of the pad to prevent ponding of water. Slab edges will have a minimum thickness of 4 inches. The slab will serve as anchorage for the protective casing and is intended to prevent surface water from migrating into the well and along the wall of the casing. Cuttings generated from the drilling process can be placed around the pad and graded to effect positive drainage away from the well. Alternatively, the pad can constructed within a shallow excavation opened around the well so that the top of the pad is elevated slightly above the existing ground surface.

7. The location, installation methods and construction details may be modified depending on field conditions, such as the presence of a significant thickness of clay within the surficial sand, etc. Any modifications will be discussed with NC Solid Waste Section prior to any revisions in construction of the wells or piezometers.

8. Following well installation, the wells will be developed in order to remove clay, silt, sand and other fines that may have been introduced into the formation or sand pack during the drilling and well installation process. Well development will also establish equilibrium of the well with the aquifer. Well development will be performed as soon as possible after well construction and will continue until the

suspended solids are removed from the well and turbidity is minimized. Alternate pumping and surging cycles will be used to develop the wells.

9. Prior to initial well sampling, the highest point on the top of the PVC casing for each well shall be surveyed by a North Carolina registered land surveyor. The casing elevation shall be tied into the site benchmark in order to calculate the elevation of the groundwater surface. The wells shall also be surveyed for horizontal control. Locations shall be referenced to the North Carolina Plane Coordinate System.

10. The wells and surrounding area shall be maintained in such a way to allow access to the wells for sampling and to maintain the integrity of the wells. Each monitoring well shall be accessible by at least a four-wheel drive vehicle. Brush and weeds shall be cleared from around the wells (minimum of 10-foot radius).

11. For additional well protection, barricades are recommended to be constructed around the wells. A series of concrete filled steel posts embedded into concrete can be utilized. Alternatively, any design that offers reasonable protection to the well can be used. The barricades and well protective casings shall be painted with a high visibility color paint.

12. Surface water run-off controls shall be provided, where necessary, to prohibit erosion of or undermining of the concrete pads.

13. The well head, including protective casing, locking cap, lock and concrete pads shall be monitored for their integrity. Any repairs should be performed as needed.

2.3 WELL PERFORMANCE TESTING

Hydraulic conductivity tests shall be performed on each new well prior to the initial sampling event to allow the estimation of groundwater flow rate in the vicinity of each well, using the updated estimated hydraulic gradients at the site. The tests shall be performed by the removal of a quantity of water from the well, measuring the well response and calculation of Hydraulic Conductivity using an appropriate numerical analysis method.

3.0 SAMPLING AND ANALYSIS PLAN (SAP)

The following sampling and analysis plan includes provisions for obtaining both groundwater and surface water data. This plan applies to the four proposed monitor wells to be constructed around the C&D Landfill. The sampling requirements for the existing wells associated with the closed sanitary landfill are addressed in a separate plan.

3.1 GROUNDWATER SAMPLING

Groundwater samples will be collected from the four proposed monitor wells. The primary objectives during the collection of groundwater samples for analysis are to obtain a representative groundwater sample and to prevent the sample from being altered or contaminated during withdrawal from the well or during sample preparation.

3.1.1 Determination of Groundwater Levels

Prior to the well evacuation for every sampling event, the depth to water and total well depth will be determined with the use of an electronic water level indicator. All measurements will be recorded to the nearest 0.01 foot. The water level will be measured by turning the instrument on and slowly lowering the instrument probe into the well until the water level indicator contacts the water activating an audible alarm or indicator light. The depth to the water from the highest point on the well casing will be measured and recorded. The probe will then be lowered to the bottom of the well. The total depth will be recorded. The amount of water within the well casing will be

calculated by subtracting the depth to the water surface from the total depth of the well, and multiplying the difference by the cross-sectional area inside the well casing.

3.1.2 Well Purging, Sampling and Quality Control Procedures

Special procedures are often necessary for sampling monitoring wells based on their yield. For the purpose of this plan, a high-yield well will be defined as a well that cannot be drawn down more than 20 percent of the water column by bailing or pumping by hand. A moderate-yield well can be drawn down more than 20 percent, however, it cannot be evacuated to dryness. A low-yield well can be evacuated to dryness and requires a minimum of a few hours to a day to fully recover.

The range of hydraulic conductivity values suggests that monitor wells screened in the uppermost aquifer would provide high to moderate yields. For moderate to high-yield wells, a minimum of 3 to 5 times the volume of water standing in the well will be removed prior to sampling.

For low-yield wells, a minimum of 1.5 well volumes will be removed if evacuated to dryness; for example, a 2-inch diameter (I.D.) pipe (Schedule 40) has 0.1632 gallons per foot of pipe length. Therefore, five times the volume of a 2-inch diameter well having a seven-foot water column would be equal to 5.7 gallons (0.1632 gal/ft x 7 ft. x 5 volumes). All wells will be purged using either clean teflon bailers or decontaminated or dedicated pumps.

It is desirable to have the analytical laboratory prepare and supply the sample containers in a protective cooler or transpack. Delivery of the empty containers by the laboratory

to the sampler will be noted on the Chain of Custody. The same Chain of Custody will remain with the containers until they are delivered to the laboratory for testing.

The wells will be sampled utilizing teflon bailers previously cleaned in a laboratory in accordance with procedures from the North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities. Each bailer shall be cleaned, air-dried and wrapped in aluminum foil in the laboratory prior to shipment to the field. Following sampling, the bailers shall be returned to the laboratory for cleaning and storage. A separate laboratory cleaned bailer is required for each monitoring well. Field cleaning of sampling bailers will not be allowed.

The bailer line should consist of either (1) teflon coated wire (2) single strand stainless steel wire (3) other monofilament line or (4) nylon rope. In order to avoid contamination, new bailer line should be used at each well, for each sampling event.

During sample collection, the bailer will be slowly lowered into the water column until full, then slowly retrieved. The sample containers will be filled by slowly pouring the sample from the bailer directly into the sample container without the bailer contacting the well's outer casing, sample bottle or ground. The sample will be handled in a way to minimize aeration. For the volatile organic containers, no air bubbles or "head-space" will be allowed in the containers.

A complete set of precleaned and pre-labeled sample bottles will be removed from the cooler, prior to lowering the bailer in the well, or turning on the pump to collect the sample. Once collected, a portion of the sample from the bailer or pump (for each well) will be transferred into a fresh container. Preservatives will be added as necessary (in

accordance with EPA Methods SW-846) to the sample bottles either by the laboratory or in the field immediately prior to sampling. One trip blank prepared by the laboratory will be analyzed for each sampling event. Equipment blanks are not recommended since the sampling equipment will be either laboratory cleaned or disposable.

Because water samples are analyzed for various parameters, several types of containers are required. The sample collection will proceed as follows: Volatile organics (VOCs) will be collected first in 40 ml glass vials with Teflon lined septum caps. The vials will be filled completely with no headspace. Samples to be analyzed for inorganic constituents (metals) will be collected next. The containers are most often plastic cubes or bottles that have acid placed in the container as a preservative. These containers should not be rinsed prior to filling.

After transferring the sample to the container, it will be sealed and placed in a chilled cooler or transpack pending completion of the sampling event and delivery of all of the samples to the laboratory. Finally, the well will be capped and secured. The samples will be shipped or delivered to the laboratory on the day of collection.

3.1.3 Sampling Frequency

Groundwater monitoring will be performed at the C&D facility semi-annually. The first semi-annual sampling event will be performed during construction of the landfill, prior to waste placement. Subsequent sampling events will be scheduled with one sampling event occurring between the months of October and December and the second event occurring between April and June.

3.1.4 Field Analysis Procedures

During groundwater purging and sampling, temperature, specific conductance and Ph of the groundwater shall be measured and recorded. The instruments shall be calibrated at the beginning and end of each sampling day in accordance with the manufacturer's specifications.

3.1.5 Field Reporting Requirements

The sample collector will record all pertinent information regarding the purging and sampling of monitoring wells in a field or log book. The information will include at a minimum the following:

1. Sampling date and time
2. Collector's name
3. Site name and location
4. Well identification number
5. Water level measured from top of casing to the water surface
6. Total well depth measured from top of casing to the water surface
7. Well casing inside diameter
8. Well casing volume
9. Total volume of water removed during purging
10. Times that purging was initiated and completed
11. Sample pH, temperature, and specific conductance
12. Sample volume, container type, preservatives
13. Analytical methods for each sample

14. Sample observations, i.e., color and turbidity
15. Weather conditions at the time of sampling
16. Additional comments regarding the sampling event or sample.

The field data shall be recorded and retained in the operating record files. The data shall also be submitted to the appropriate State agencies.

3.1.6 Laboratory Analysis Parameters

Laboratory analytical parameters listed in *Sampling and Analysis Requirements for Construction and Demolition Landfills*, issued by the NC Solid Waste Section (included as Appendix 1), shall be verified prior to each sampling event. The listed parameters shall be analyzed for all samples. Trip Blanks shall be analyzed for volatile organics only.

Sample analyses shall be performed by a North Carolina Division of Environmental Management "certified" laboratory. All data shall be subjected to a strict quality assurance and quality control protocols. Only analytical methods that are acceptable to the Solid Waste Management Division shall be used by the laboratory selected to perform the analyses. Acceptable analytical methods shall be those methods described in *Sampling and Analysis Requirements for Construction and Demolition Landfills* (Appendix I). The list of parameters includes 8 inorganic constituents and 47 organic constituents.

3.1.7 Data Evaluation and Reporting

Routine monitoring of the analytical data will be performed to determine if contamination may be occurring. All analytical reports shall be completed with referenced analytical methodologies, laboratory quality assurance-quality control (QA/QC) documentation, field logs, analysis request forms, Chain-of-Custody forms, and parameter concentrations. All groundwater quality monitoring data shall be compared to the North Carolina Groundwater Standards, 15A NCAC 2L .0202, where applicable.

Results of the groundwater analyses shall be evaluated to determine if evidence of contamination exists between the "background" (upgradient) well samples and the "compliance" (downgradient) well samples.

Within 14 days of receiving the analytical data, the operator will submit a report to the Division. The report will include field observations relating to condition of monitoring wells, field data, sampling methodologies, chain-of-custody records, QA/QC data, information on groundwater flow direction, constituents that exceed groundwater standards for each well and any other pertinent information related to the sampling event.

If the operator determines that there is an exceedance of state standards for any constituent listed in Appendix I, the operator will:

- Resample the well(s) within 30 days to confirm the water quality data, and if the data is verified proceed with the following:

The sampling points should be marked with a permanent reference point so that subsequent sampling events will obtain samples from the same locations in order to maximize repeatability. One suggested upgradient sampling point is shown on Figure 1. The downgradient sampling location should be north of the area between C&D-1 and C&D-3. A proposed location is not shown, as the actual location will be based on a detailed examination of the area.

It is important that the surface water samples not contain any sediment. Thus, selection of potential sample locations will take into account potential low-flow conditions that may be present in the proposed sample areas during the fall months of the year.

3.2.2 Surface Water Sampling Procedures

The following sampling procedures are referenced from *EPA Standard Operating Procedures*, Section 4.8 and *North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities*, 1987.

To the extent possible, a single grab sample will be taken at mid-depth, at the center of the channel, in an area that exhibits the greatest degree of cross-sectional homogeneity. Direct dipping of the sample container is the most desirable method of collection but a laboratory cleaned teflon bailer or dipper may be used. The sample container should be rinsed with the water to be sampled prior to filling the container unless preservatives have been added. The sample container, bailer or dipper shall be lowered to the desired depth in the water and the sampling device or container removed. Care should be taken not to allow sediment or other debris to get in or on the sample container.

After the sample has been collected, the sample container should be lifted from the water or the sample should be poured directly into the sample container (if sample container not used to collect sample). About one-half inch of air space should be left in the container and the uncontaminated cap placed on the container. The containers for volatile organic samples shall be filled to the top without bubbles or headspace. The containers will be placed in protective cooler with ice for shipping.

3.2.3 Stormwater Sampling (NPDES Permit Requirements)

Surface water generated from precipitation falling on the landfill expansion area will be diverted to sediment basins or sediment traps prior to discharge into the stream or drainage features. Storm water sampling will not be required as C&D landfills are exempt from NPDES Stormwater sampling requirements unless they accept industrial or trade wastes.

3.2.4 Quality Control and Reporting Requirements

A primary concern during collection of surface water samples is to prevent sample alteration or contamination by sediment or other debris that may affect the analytical results. A set of sample bottles that have been precleaned in the laboratory and are pre-labeled will be removed from the cooler and the surface water sample poured into a fresh container. Preservatives will be added as necessary to the sample bottles at the laboratory or immediately prior to samples being placed in them. The sample bottles will then be securely placed into a precleaned cooler and a chain-of-custody form completed and placed with the samples.

The surface water sampling frequency, field analysis procedures, laboratory analysis parameters, field reporting requirements, data assessment, evaluation and reporting of the data and results shall be the same as that of the groundwater samples (Section 3.1). One surface water sampling event is required for the baseline sampling prior to landfilling. After the landfill opens, surface water sampling will be required on a semi-annual basis.

REFERENCES

Geologic and Hydrologic report, Proposed Washington County C&D Landfill, Washington County, North Carolina, N.C., S&ME Project No. 1054-94-119, April 1994

SAMPLING AND ANALYSIS REQUIREMENTS
CONSTRUCTION AND DEMOLITION LANDFILLS
N.C. SOLID WASTE SECTION

LAB CERTIFICATION REQUIREMENTS:
The Solid Waste Section now requires water quality sample analysis by a laboratory certified by the Division of Environmental Management for groundwater analysis (15A NCAC 2H .0800). The laboratories used for water quality analysis for Solid Waste Section facilities shall be certified under the Division of Environmental Management (DEM) Certification program for the approved methods and at the approved levels of certification.

SAMPLING ANALYTICAL METHODS AND REPORTING LIMITS:
Each parameter on the following constituent list shall be certified at the designated level and an appropriately certified method used for the sample analysis. The data shall be reported at the specified Practical Quantitation Limit (PQL).

Parameter	Certification by DEM	PQL in ppb
Arsenic	Metals, Group I - low level	10
Barium	Barium (20)	500
Cadmium	Metals, Group I - low level	1
Chromium	Metals, Group I - low level	10
Lead	Metals, Group I - low level	10
Mercury	Mercury (21)	1
Selenium	Metals, Group I - low level	20
Silver	Metals, Group II - low level	10

Volatile Organic Compounds
For the parameters and PQLs required for volatile organic compound analysis, refer to the next page of this attachment. For volatile organic analysis the laboratory shall be certified for an SW-846 GC/MS Method (8240 or 8260). The recommended method of analysis is EPA Method 8260.

SAMPLING AND ANALYSIS:
In addition to sampling for the constituents referenced above, all sampling should also include field testing of pH, temperature, and specific conductivity. EPA requires analysis for total metals. No filtering of samples is allowed. The 3030C preparation method for metals analysis is not allowed.

January 1995

VOLATILE ORGANIC COMPOUNDS

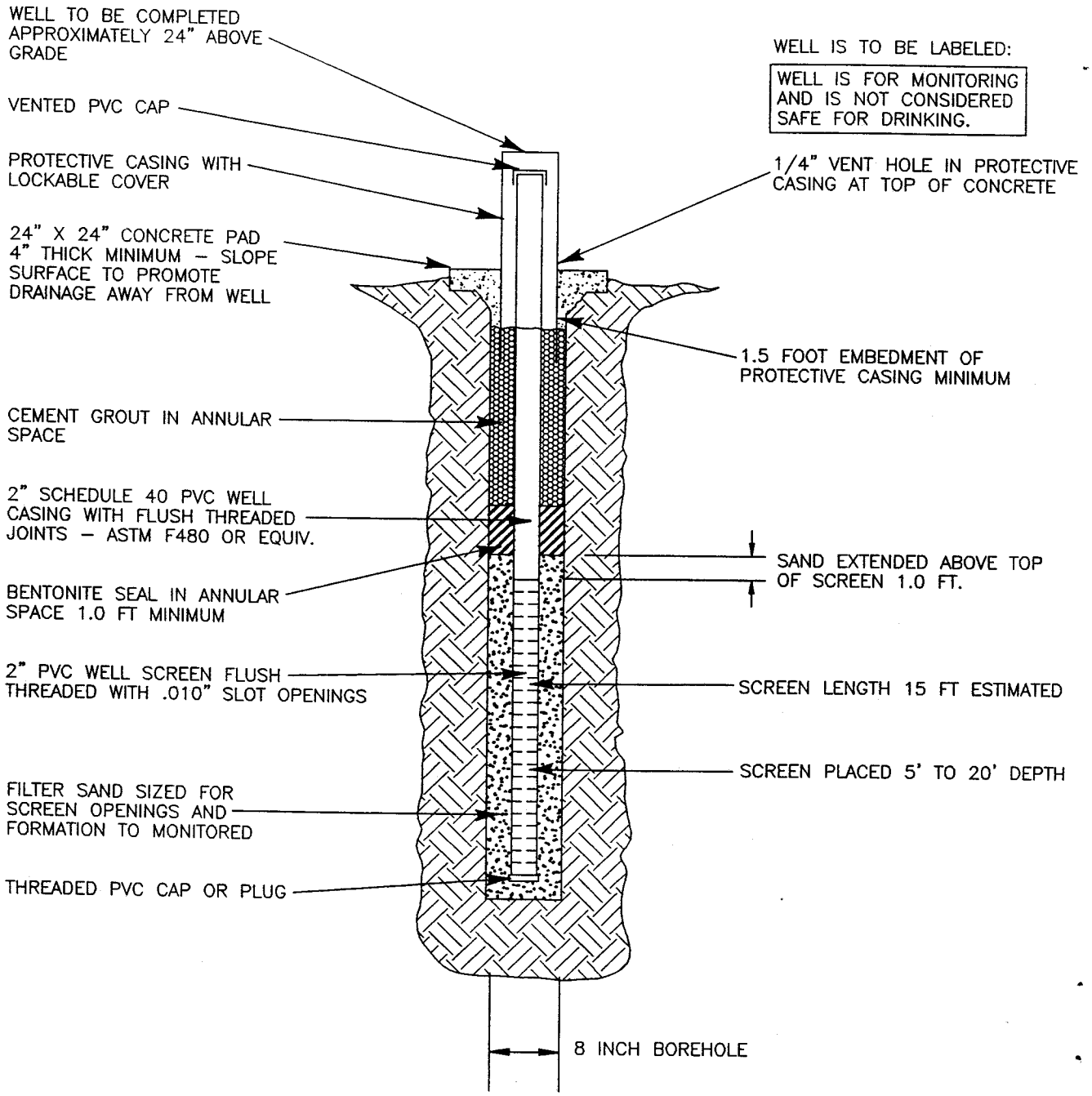
ORGANIC CONSTITUENT	PQL (UG/L)	ORGANIC CONSTITUENT	PQL (UG/L)
(16) ACETONE	100	(40) T-1,3-DICHLOROPROPENE	10
(17) ACRYLONITRILE	200	(41) ETHYLBENZENE	5
(18) BENZENE	5	(42) METHYL BUTYL KETONE	50
(19) BROMOCHLOROMETHANE	5	(43) METHYL BROMIDE	10
(20) BROMODICHLOROMETHANE	5	(44) METHYL CHLORIDE	10
(21) BROMOFORM	5	(45) METHYLENE BROMIDE	10
(22) CARBON DISULFIDE	100	(46) METHYLENE CHLORIDE	10
(23) CARBON TETRACHLORIDE	10	(47) MEK: 2-BUTANONE	100
(24) CHLOROBENZENE	5	(48) METHYL IODIDE	10
(25) CHLOROETHANE	10	(49) METHYL ISOBUTYL KETONE	100
(26) CHLOROFORM	5	(50) STYRENE	10
(27) CHLORODIBROMOMETHANE	5	(51) 1,1,1,2-TETRACHLOROETHANE	5
(28) DBCP	25	(52) 1,1,2,2-TETRACHLOROETHANE	5
(29) ETHYLENE DIBROMIDE	5	(53) TETRACHLOROETHYLENE	5
(30) O-DICHLOROBENZENE	5	(54) TOLUENE	5
(31) P-DICHLOROBENZENE	5	(55) 1,1,1,-TRICHLOROETHANE	5
(32) T-1,4-DICHLORO-2-BUTENE	100	(56) 1,1,2-TRICHLOROETHANE	5
(33) 1,1-DICHLOROETHANE	5	(57) TRICHLOROETHYLENE	5
(34) ETHYLENE DICHLORIDE	5	(58) CFC-11	5
(35) VINYLIDENE CHLORIDE	5	(59) 1,2,3-TRICHLOROPROPANE	15
(36) CIS-1,2-DICHLOROETHENE	5	(60) VINYL ACETATE	50
(37) T-1,2-DICHLOROETHENE	5	(61) VINYL CHLORIDE	10
(38) PROPYLENE DICHLORIDE	5	(62) XYLENES	5
(39) CIS-1,3-DICHLOROPROPENE	10		

ALSO KNOWN AS: (21)-TRIBROMOMETHANE, (25)-ETHYL CHLORIDE, (26)-TRICHLOROMETHANE, (27)-DIBROMOCHLOROMETHANE, (28)-1,2-DIBROMO-3-CHLOROPROPANE, (29)-1,2-DIBROMOETHANE, (30)-1,2-DICHLOROBENZENE, (31)-1,4-DICHLOROBENZENE, (33)-ETHYLIDENE CHLORIDE, (34)-1,2-DICHLOROETHANE, (35)-1,1-DICHLOROETHENE (ETHYLENE), (36)-CIS-1,2-DICHLOROETHYLENE, (37)-TRANS-1,2-DICHLOROETHYLENE, (38)-1,2-DICHLOROPROPANE, (42)-2-HEXANONE, (43)-BROMOMETHANE, (44)-CHLOROMETHANE, (45)-DIBROMOMETHANE, (46)-DICHLOROMETHANE, (47)-METHYL ETHYL KETONE, (48)-IODOMETHANE, (49)-4-METHYL-2-PENTANONE, (53)-TETRACHLOROETHENE, PERCHLOROETHYLENE, (55)-METHYLCHLOROFORM, (57)-TRICHLOROETHENE, (58)-TRICHLOROFLUOROMETHANE

END

FIGURE 1

Site Monitoring Plan



SCHEMATIC OF PROPOSED MONITOR WELL CONSTRUCTION

WASHINGTON COUNTY
C & D LANDFILL/TIRE MONOFILL
WATER QUALITY MONITORING PLAN
WASHINGTON COUNTY, N.C.

S&ME, INC.
Raleigh Branch
3100 Spring Forest Road
P.O. Box 58069
Raleigh, N.C. 27658-8069
(919) 872-2660
Fax (919) 790-9827

Job No. 1054-95-294
Scale: NOT TO SCALE
Fig No. 2

Figure 2

Schematic of Well Construction

LEGEND

- PROPOSED MONITOR WELLS
- PROPOSED SURFACE WATER SAMPLING POINT
- EXISTING PIEZOMETER
- GROUNDWATER ELEVATION FEBRUARY 22, 1994
- GROUNDWATER FLOW DIRECTION

N.C. GRID

N86°12'E 93.07'

N61°25'E 98.30'

C & D-1 PROPOSED MONITORING WELL

C & D-2 PROPOSED MONITORING WELL

C & D-3 PROPOSED MONITORING WELL

C & D-4 PROPOSED MONITORING WELL

100 YEAR FLOOD LIMITS

B-1

B-2

B-3

B-4

B-6

B-7

PHASE 1 TIRE MONOFILL

FUTURE PHASES TIRE MONOFILL

PHASE 1 PROCESSED SILICA BERM

PHASE 1 C & D LANDFILL AREA

FUTURE PHASES C & D LANDFILL AREA

FUTURE PHASE BERM

COVER SOIL BORROW AREA

ACCESS ROAD

EROSION CONTROL

MARSH

TO

WASHINGTON COUNTY
WASTE LANDFILL/TIRE MONOFILL
PROPOSED MONITORING PLAN
WASHINGTON COUNTY, NORTH CAROLINA

S&ME
ENVIRONMENTAL SERVICES • ENGINEERING • TESTING

Raleigh Branch
3100 Spring Forest Road
P.O. Box 58069
Raleigh, N.C. 27658-8069
(919) 872-2660
Fax (919) 790-9827

Job No. 1054-95-294
Scale: 1" = 100'
Fig No. 1

EROSION CONTROL CALCULATIONS

SEDIMENT BASIN DESIGN

SB-1

TOTAL DRAINAGE AREA = 5.81 AC.

DIST. AREA = 5.81 AC.

VOL. REQ'D = 5.81 AC. (1800 ft.^{3}/AC.) = 10,458 ft.^{3}

USE 3' DEPTH (DUE TO LACK OF RELIEF ON SITE)

BOTTOM AREA = 10458 ft.^{3} ÷ 3' = 3486 ft.^{3}

USE 2:1 l:w RATIO

$\therefore w = [3486\ ft.^2 \div 2]^{1/2} \sim 41.75'$ USE 42'

$l = 2w = 2(42') = 84'$

SIZE WEIR

DETERMINE Q_{10}

H = 23.0 - 4 = 19'

L = 1250'

Tc = 9.5 min - USE 9 min.

i_{10} = 6"/hr.

C = 0.20

$Q_{10} = C i_{10} A = 0.2(6.0)(5.81\ AC.) = 7.0$ cfs

CHECK SPILLWAY (L = 10')

$Q_{10} = 3.0(b)(h^{1.5})$

$h = [Q_{10}/3.0(10)]^{2/3}$

$h = [7.0/3.0(10)]^{2/3} = 0.38' < 1.0'$ OK

VELOCITY OVER WEIR $7/(0.38 \times 10) = 2.8$ FPS OK

SEDIMENT BASIN DESIGN (cont.)

SB-2

TOTAL DRAINAGE AREA = 6.32 AC.

DIST. AREA = 4.22 AC.

VOL. REQ'D = 4.22 AC. (1800 ft.^{3}/AC.) = 7596 ft.^{3}

USE 3' DEPTH (DUE TO LACK OF RELIEF ONSITE)

BOTTOM AREA = 7596 ft.^{3} ÷ 3' = 2532 ft.^{2}

USE 2:1 l:w RATIO

$\therefore w = \left[\frac{2532}{2}\right]^{1/2} = 35.6'$ USE 36'

$l = 2w = 2(36') = 72'$

SIZE WEIR

DETERMINE Q_{10}

$H = 23.0 - 4.0 = 19'$

$L = 975'$

$T_c = 7.0$ min

$i_{10} = 6.4"/hr.$

$C = 0.20$

$Q_{10} = 0.2(6.32 \text{ AC.})(6.4"/hr.) = 8.1$ cfs

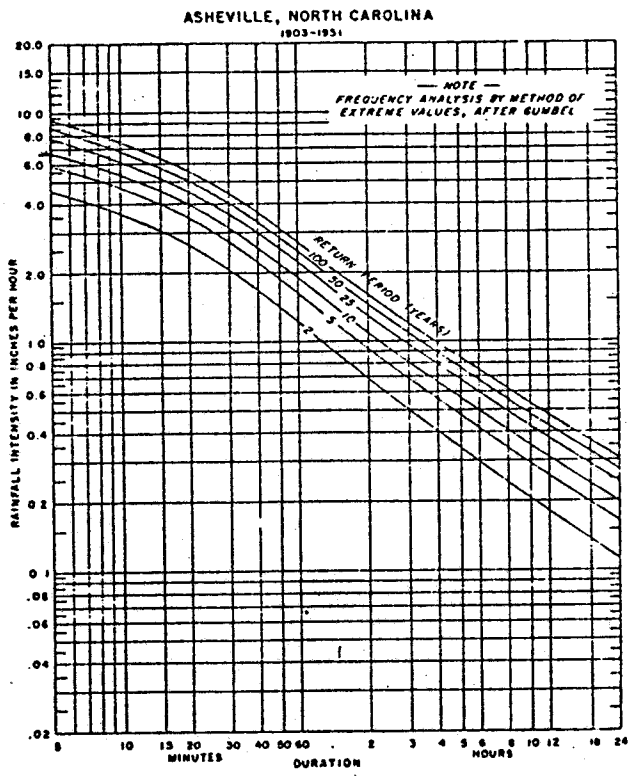
$Q_{10} = 3.0(b)(h^{1.5})$ USE b = 10'

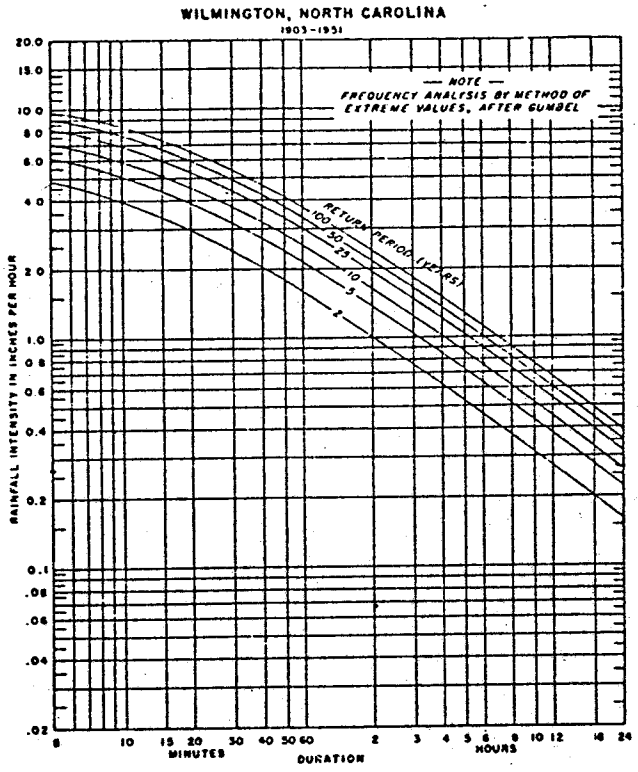
$h = \left[\frac{Q_{10}}{3.0(b)}\right]^{2/3}$

$= \left[\frac{8.1}{3.0(10')}\right]^{2/3}$

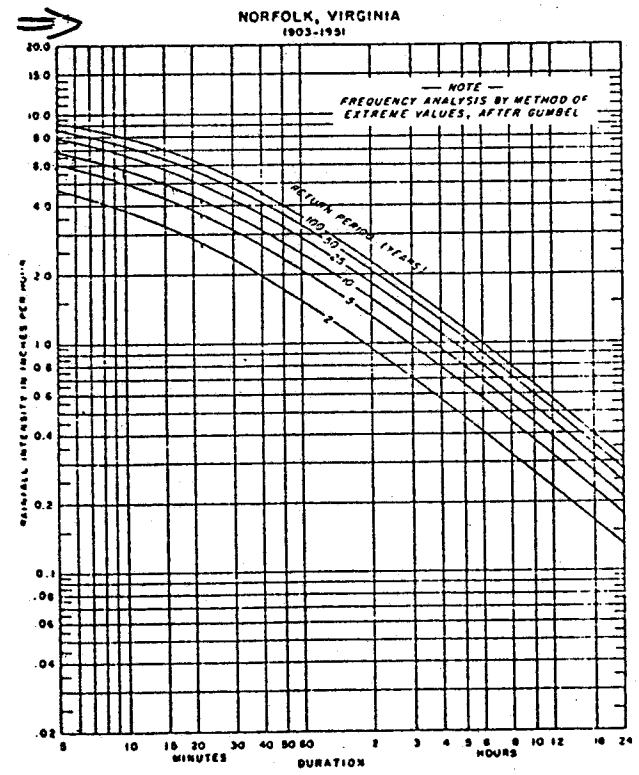
$= 0.42' < 1.0'$ OK

VELOCITY OVER WEIR = 8.1/(0.42 × 10) = 2.9 FPS OK


ASHEVILLE, NORTH CAROLINA
1903-1951
— NOTE —
FREQUENCY ANALYSIS BY METHOD OF EXTREME VALUES, AFTER GUMBEL
RETURN PERIOD (YEARS)
100
50
25
10
5
2
RAINFALL INTENSITY IN INCHES PER HOUR
MINUTES
HOURS
DURATION


WILMINGTON, NORTH CAROLINA
1903-1951
— NOTE —
FREQUENCY ANALYSIS BY METHOD OF EXTREME VALUES, AFTER GUMBEL
RETURN PERIOD (YEARS)
100
50
25
10
5
2
RAINFALL INTENSITY IN INCHES PER HOUR
MINUTES
HOURS
DURATION

USE ⇒


NORFOLK, VIRGINIA
1903-1951
— NOTE —
FREQUENCY ANALYSIS BY METHOD OF EXTREME VALUES, AFTER GUMBEL
RETURN PERIOD (YEARS)
100
50
25
10
5
2
MINUTES
HOURS
DURATION

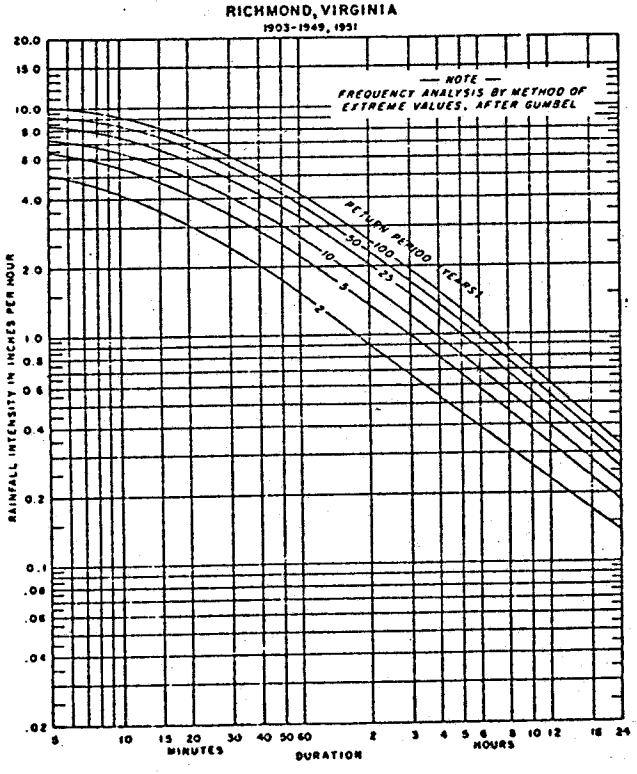

RICHMOND, VIRGINIA
1903-1949, 1951
— NOTE —
FREQUENCY ANALYSIS BY METHOD OF EXTREME VALUES, AFTER GUMBEL
RETURN PERIOD (YEARS)
100
50
25
10
5
2
RAINFALL INTENSITY IN INCHES PER HOUR
MINUTES
HOURS
DURATION

CHART 1b

DEED INFORMATION

RIDER TO OWENS DEED - PAGE TWO

thence continuing with the Eastern right of way line of N.C.S.R. 1331, North 27 degrees 18 minutes West 43.00 feet to the point of BEGINNING, and containing 40.04 acres, more or less, as computed by the Double Meridian Distance method. Said 40.04 acres excludes that part of the right of way of the aforementioned Norfolk and Southern Railway Company included in the foregoing description. Reference is made to a map prepared by B. B. White, R.L.S., from an actual field survey.

SECOND TRACT: Lying and being in Lee's Mill Township, Washington County, North Carolina, described as follows:

Beginning at the point of intersection of the centerlines of N.C.S.R. 1333 and N. C. Highway No. 308; thence South 74 degrees 30 minutes West 1254 feet to the intersection of the centerlines of N. C. Highway 308 and the road leading to the Washington County Sanitary Landfill; thence with the centerline of said road North 01 degree 28 minutes East 1622.90 feet to a point; thence South 86 degrees 00 minutes East 18.00 feet to an existing iron pipe in the Eastern edge of said road; thence along the Eastern edge of said road, North 00 degrees 32 minutes West 2245.30 feet to an axle set in the corner with Robert Tetterton and Jerry Lucas Heirs, the BEGINNING corner of the herin described tract of land; thence with the Eastern line of Robert Tetterton, North 23 degrees 45 minutes West 1398.58 feet to a point in the Southern line of Rand at the edge of the high water mark of the swamp; thence with the Southern line of Rand and the edge of the high water mark the following courses and distances: North 42 degrees 30 minutes East 84.85 feet, North 61 degrees 20 minutes East 157.45 feet, North 56 degrees 00 minutes East 94.40 feet, North 63 degrees 45 minutes East 246.00 feet, South 89 degrees 35 minutes East 162.48 feet, North 66 degrees 35 minutes East 123.60 feet, North 26 degrees 01 minute East 123.93 feet, North 66 degrees 50 minutes East 147.25 feet, North 86 degrees 12 minutes East 93.07 feet, North 61 degrees 25 minutes East 98.30 feet, North 79 degrees 30 minutes East 274.95 feet, North 69 degrees 45 minutes East 250.20 feet, South 75 degrees 12 minutes East 164.35 feet, North 04 degrees 08 minutes East 121.45 feet to an existing iron pipe in the centerline of a ditch, a corner with Lewis Mizell; thence with the line of Lewis Mizell and the centerline of said ditch, South 69 degrees 21 minutes East 239.15 feet to the point in the centerline of said ditch at which an old road crosses said ditch; thence with the line of Lewis Mizell, South 56 degrees 10 minutes East 103.33 feet to a point in the Southern edge of said ditch; thence with the line of Lewis Mizell, the following courses and distances: South 51 degrees 31 minutes East 399.00 feet, South 20 degrees 09 minutes East 19.08 feet, South 06 degrees 09 minutes West 866.30 feet to a corner with Jerry Lucas Heirs; thence with the Northern line of the Jerry Lucas Heirs, South 66 degrees 43 minutes West 470.50 feet to a point in the centerline of a ditch; thence with the Northern line of the Jerry Lucas Heirs and the centerline of said ditch, the following courses and distances: South 65 degrees 28 minutes West 471.20 feet, South 69 degrees 09 minutes West 129.65 feet, South 65 degrees 26 minutes West 258.73 feet, South 66 degrees 07 minutes West 192.95 feet, South 65 degrees 00 minutes West 438.81 feet to the point of BEGINNING, and containing 71.44 acres, more or less, as computed by the Double Meridian Distance method. Reference is made to a map prepared by B. B. White, R.L.S., from an actual survey.

Washington County Commissioners Resolution to Provide
Construction & Demolition Waste Landfill ·
and
County Statement Regarding Zoning

and

Land Clearing and Inert Debris Landfill Notification

WASHINGTON COUNTY

PLYMOUTH, NORTH CAROLINA

P.O. BOX 1007
27962

July 1, 1994

To Whom It May Concern:

Washington County does not have in effect a Zoning Ordinance; therefore, the only document needed to comply with is the Land Use Plan. Upon review there are no inconsistencies with the Land Use Plan or any other plans in Washington County as to the Construction and Demolition Landfill Site.

Please contact this office with any questions as to this project.

Sincerely,

Lee Smith
County Manager

WATER SAFETY RESOLUTION: The County Manager reviewed a resolution requesting a no wake zone on Conaby Creek and reviewed the NC Wildlife Resources Commission Procedures for establishing local water safety regulations.

Commissioner Waters made a motion to approve the Resolution Establishing "No Wake" zones on Conaby Creek. Commissioner Lamb seconded, motion carried unanimously.

MANAGER'S REPORT: The Manager informed the Board that a Hurricane seminar will be held on July 20, 1994 at the Vernon James Research Center.

Water System Phase II - The Manager informed the Board that he has called Raleigh regarding the application and he is still waiting to hear from them.

Water System Phase III - The Manager informed the Board that the Preliminary has been forwarded to Marvin Howell, Farmers Home Administration.

Creswell Produce Packing Plant - The Board discussed the progress of the Creswell Produce Packing Plant.

LANDFILL CLOSURE: The Manager asked that the Board rescind the motion of June 27 which rejected the bids for landfill closure which would allow him to be able to negotiate with the lowest bidder. He stated that the estimates given to him were approximately $108,000 short and have discussed an interfund load with the Finance Officer. Ms. Critcher, Finance Officer, stated that as the cash becomes short, the County could have an interfund loan, which can be paid back over the next upcoming years. The Manager reminded the Board that the landfill would have to be closed by October 9 to avoid Sub Title D regulations.

Commissioner Waters made a motion to rescind the motion from the last meeting (rejecting the bids for landfill closure) and to allow the Manager to negotiate with the lowest bidder for the closure and capping of the landfill. Commissioner Davenport seconded, motion carried unanimously.

CONSTRUCTION AND DEMOLITION LANDFILL SITE: The Manager reminded the Board that the C&D site has to be formally approved by the Board.

Commissioner Lamb made a motion to approve the Construction and Demolition site as proposed by Diehl and Phillips. Commissioner Davenport seconded, motion carried unanimously.

RECESS

WASHINGTON COUNTY FIRE COMMISSION ORDINANCE: The County Manager briefed the Board on the need for a Fire Commission Ordinance and briefed the Board on the proposed ordinance stating that this ordinance would establish a fire commission which would be the liaison between the Board and fire departments. Discussion ensued.

Commissioner Lamb made a motion to approve the Washington County Fire Commission Ordinance as presented. Commissioner Waters seconded, motion carried unanimously.

HEALTH DEPARTMENT: Commissioner Davenport briefed the Board on a complaint from a resident in the Creswell area who had requested that a representative from the Health Department inspect their property. They were told it would be two weeks and now have been postponed another week. Commissioner Waters stated that the district now has three Sanitarians. The Board discussed alternate septic systems, management entity, etc. Commissioner Waters also informed the Board that the Albemarle Commission is planning to put some money into Tyrrell County for administrative fees, engineering, etc.

EXECUTIVE SESSION: Commissioner Davenport made a motion to go into executive session to discuss personnel, property disposition, and litigation. Commissioner Lamb seconded, motion carried unanimously.

Commissioner Waters made a motion to come out of executive session, Commissioner Lamb seconded, motion carried unanimously.

I, Lois C. Askew, Clerk of the Board of Commissioners of Washington County, North Carolina do hereby certify that the foregoing is a true copy of the minutes of the Washington County Board of Commissioners, at a meeting held on July 5, 1994.

Witness my hand and the corporate seal of the said County, this the 12 day of July 1994.

Lois C. Askew

Lois C. Askew, Clerk
Washington County Board of
Commissioners

BOOK 341 PAGE 174

State of North Carolina
Department of Environment, Health, and Natural Resources
512 North Salisbury Street • Raleigh, North Carolina 27604

James B. Hunt, Jr., Governor

Division of Solid Waste Management
Solid Waste Section
Telephone (919) 733-4996

Jonathan B. Howes, Secretary

LAND CLEARING AND INERT DEBRIS LANDFILL NOTIFICATION

Pursuant to 15A NCAC 13B .0563(2)(a), the land owner(s) and operator(s) of any Land Clearing and Inert Debris Landfill under two (2) acres in size shall submit this notification form to the Division prior to constructing or operating the landfill. This form must be filed for recordation in the Register of Deeds' Office. The Register of Deeds shall index the notification under the name of the owner(s) of the land in the county or counties in which the land is located. The Register's seal and the date, book, and page number of recording must be included on this form when submitted to the Division. This notification is not valid to authorize operation of a landfill unless complete, accurate, and recorded as required by 15A NCAC 13B .0563(2)(b).

1. Facility Name: Washington County Landfill
2. Facility location (street address): Landfill Road
   City: Roper County: Washington Zip: 27970
3. The land on which this landfill is located is described in the deed recorded in:
   deed book: 322, 324 page: 585,587,793 county: Washington
4. Name of land owner: Washington County
5. Mailing address of land owner: Post Office Box 1007
   City: Plymouth State: N.C. Zip: 27962
6. Telephone number of land owner: (919) 793-5823
   If the land is owned by more than one person, attach additional sheets with the name, address, and phone number of all additional land owners.
7. Name of operator: Washington County
8. Trade or business name of operator: Washington County
9. Mailing address of operator: PO Box 1007
   City: Plymouth State: N.C. Zip: 27962
10. Telephone number of operator: (919) 793-5823
    If the landfill is operated by more than one person, attach additional sheets with the name, address, and phone number of all additional operators.
11. Projected use of land after completion of landfill operations: LCI&D and Borrow material...

The following are the applicability, siting, and operating criteria for Land Clearing and Inert Debris Landfills operating under notification.

.0101 DEFINITIONS

(72) "Land clearing waste" means solid waste which is generated solely from land clearing activities such as stumps, trees, limbs, brush, grass, and other naturally occurring vegetative material.

(73) "Land clearing and inert debris landfill" means a facility for the land disposal of land clearing waste, concrete, brick, concrete block, uncontaminated soil, gravel and rock, untreated and unpainted wood, and yard trash.

(74) "Yard trash" means solid waste resulting from landscaping and yard maintenance such as brush, grass, tree limbs, and similar vegetative materials.

.0563 APPLICABILITY REQUIREMENTS FOR LAND CLEARING AND INERT DEBRIS (LCID) LANDFILLS

Management of land clearing and inert debris shall be in accordance with the State hierarchy for managing solid waste as provided for under N.C.G.S. § 130A-309.04(a). Disposal in a landfill is considered to be the least desirable method of managing land clearing and inert debris. Where landfilling is necessary, the requirements of this Rule apply.

(1) An individual permit from the Division of Solid Waste Management is not required for Land Clearing and Inert Debris (LCID) landfills that meet all of the following conditions:

(a) The facility is to be operated for the disposal of land clearing waste, inert debris, untreated wood, and yard trash. Operations must be consistent and in compliance with the local government solid waste management plan as approved by the Division of Solid Waste Management.

(b) The total disposal area is under two acres in size.

(c) The facility and practices comply with the siting criteria under Rule .0564, and operational requirements under Rule .0566.

(d) The fill activity is not exempt from, and must comply with all other Federal, State, or Local laws, ordinances, Rules, regulations, or orders, including but not limited to zoning restrictions, flood plain restrictions, wetland restrictions, sedimentation and erosion control requirements, and mining regulations.

(2) Where an individual permit is not required, the following applies:

(a) The owner of the land where the landfill is located must notify the Division on a prescribed form, duly signed, notarized, and recorded as per Rule .0563(2)(b). The operator of the landfill, if different from the land owner, shall also sign the notification form.

(b) The owner must file the prescribed notification form for recordation in the Register of Deeds' Office. The Register of Deeds shall index the notification in the grantor index under the name of the owner of the land in the county or counties in which the land is located. A copy of the recorded notification, affixed with the Register's seal and the date, book and page number of recording shall be sent to the Division of Solid Waste Management.

(c) When the land on which the Land Clearing and Inert Debris Landfill is sold, leased, conveyed, or transferred in any manner, the deed or other instrument of transfer shall contain in the description section in no smaller type than that used in the body of the deed or instrument a statement that the property has been used as a Land Clearing and Inert Debris Landfill and a reference by book and page to the recordation of the notification.

.0564 SITING CRITERIA FOR LAND CLEARING AND INERT DEBRIS (LCID) LANDFILLS

The following siting criteria shall apply for Land Clearing and Inert Debris (LCID) landfills:

(1) Facilities or practices, shall not be located in the 100-year floodplain.

(2) Facilities or practices shall not cause or contribute to the taking of any endangered or threatened species of plants, fish, or wildlife.

(3) Facilities or practices shall not result in the destruction or adverse modification of the critical habitat of endangered or threatened species as identified in 50 CFR Part 17 which is hereby incorporated by reference including any subsequent amendments and editions. This material is available for inspection at the Department of Environment, Health, and Natural Resources, Division of Solid Waste Management, 401 Oberlin Road, Raleigh, North Carolina 27605 where copies can be obtained at no cost.

(4) Facilities or practices shall not damage or destroy an archaeological or historical site.

(5) Facilities or practices shall not cause an adverse impact on a state park, recreation or scenic area, or any other lands included in the state nature and historic preserve.

(6) Facilities shall not be located in any wetland as defined in the Clean Water Act, Section 404(b).

(7) It must be shown that adequate suitable soils are available for cover, either from on or off site.

(8) Land Clearing and Inert Debris landfills shall meet the following surface and ground water requirements:

(a) Facilities or practices shall not cause a discharge of pollutants into waters of the state that is in violation of the requirements of the National Pollutant Discharge Elimination System (NPDES), under Section 402 of the Clean Water Act, as amended.

(b) Facilities or practices shall not cause a discharge of dredged materials or fill material into waters of the state that is in violation of the requirements under Section 404 of the Clean Water Act, as amended.

(c) Facilities or practices shall not cause non-point source pollution of waters of the state that violates assigned water quality standards.

(d) Waste in landfills with a disposal area greater than two acres shall be placed a minimum of four feet above the seasonal high water table, except where an alternative separation is approved by the Division.

(e) Waste in landfills with a disposal area less than two acres shall be placed above the seasonal high water table.

(9) The facility shall meet the following minimum buffer requirements:

(a) 50 feet from the waste boundary to all surface waters of the state as defined in G.S. 143-212.

(b) 100 feet from the disposal area to property lines, residential dwellings, commercial or public buildings, and wells.

(c) Buffer requirements may be adjusted as necessary to insure adequate protection of public health and the environment.

(10) The facility shall meet all requirements of any applicable zoning ordinance.

.0566 OPERATIONAL REQUIREMENTS FOR LAND CLEARING AND INERT DEBRIS (LCID) LANDFILLS

Land Clearing and Inert Debris (LCID) landfills shall meet the following operational requirements:

(1) Operational plans shall be approved and followed as specified for the facility.

(2) The facility shall only accept those solid wastes which it is permitted to receive.

(3) Solid waste shall be restricted to the smallest area feasible and compacted as densely as practical into cells.

(4) Adequate soil cover shall be applied monthly, or when the active area reaches one acre in size, whichever occurs first.

(5) 120 calendar days after completion of any phase of disposal operations, or upon revocation of a permit, the disposal area shall be covered with a minimum of one foot of suitable soil cover sloped to allow surface water runoff in a controlled manner. The Division may require further action in order to correct any condition which is or may become injurious to the public health, or a nuisance to the community.

(6) Adequate erosion control measures, structures, or devices shall be utilized to prevent silt from leaving the site and to prevent excessive on site erosion.

(7) Provisions for a ground cover sufficient to restrain erosion must be accomplished within 30 working days or 120 calendar days upon completion of any phase of landfill development.

(8) The facility shall be adequately secured by means of gates, chains, berms, fences, etc. to prevent unauthorized access except when an operator is on duty. An attendant shall be on duty at all times while the landfill is open for public use to assure compliance with operational requirements and to prevent acceptance of unauthorized wastes.

(9) Access roads shall be of all-weather construction and properly maintained.

(10) Surface water shall be diverted from the working face and shall not be impounded over waste.

(11) Solid waste shall not be disposed of in water.

(12) Open burning of solid waste is prohibited.

(13) The concentration of explosive gases generated by the facility shall not exceed:
(a) Twenty-five percent of the lower explosive limit for the gases in facility structures.
(b) The lower explosive limit for the gases at the property boundary.

(14) Leachate shall be properly managed on site through the use of current best management practices.

(15) Should the Division deem it necessary, ground water or surface water monitoring, or both, may be required as provided for under Rules .0601 and .0602 of this Subchapter.

(16) A sign shall be posted at the facility entrance showing the contact name and number in case of an emergency and the permit number. The permit number requirement is not applicable for facilities not requiring an individual permit.

Certification by Land Owner:

I certify that the information provided by me in this notification is true, accurate, and complete to the best of my knowledge. The facility siting and disposal operations of this Land Clearing & Inert Debris landfill will comply with the requirements of Sections .0563, .0564 and .0566 of 15A NCAC 13B, North Carolina Solid Waste Management Rules. The facility and operations of this landfill will also comply with all applicable Federal, State, and Local laws, rules, regulations, and ordinances. Where the operator is different from the land owner, I, the land owner, have knowledge of the operator's plans to dispose of solid waste on the land and I specifically grant permission for the operation of the landfill. I understand that both the land owner and operator are jointly and severally liable for improper operations and proper closure of the landfill as provided for by North Carolina General Statute 130A-309.27. I further understand that North Carolina General Statute 130A-22 provides for administrative penalties of up to five thousand dollars ($5,000.00) per day per each violation of the Solid Waste Management Rules. I further understand that the Solid Waste Management Rules may be revised or amended in the future and that the facility siting and operations of this landfill will be required to comply with all such revisions or amendments.

Lee Smith, County Manager — Print Name (Owner)

Signature (Owner)

08/05/93 — Date

North Carolina

Washington County

I, Elaine G. Davis, a Notary Public for said County and State, do hereby certify that Lee Smith, County Manager personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal, this the 5 day of August, 1993.

(Official Seal) ELAINE G. DAVIS NOTARY PUBLIC WASHINGTON COUNTY, NC

Elaine G. Davis
Notary Public

My commission expires 8-13, 1994.

STATE OF NORTH CAROLINA, COUNTY OF WASHINGTON
The foregoing or annexed certificate (s) of Elaine G. Davis

is (are) certified to be correct. This instrument was presented for registration and recorded in this office in Book 341, Page 174.
This 5 day of August, 1993 at 3:24 o'clock P.M.

Greta N. Barber
Register of Deeds

By: Asst.

EARTHWORK CALCULATIONS FOR COVER SOIL BORROW AREA

WASHINGTON COUNTY C&D LANDFILL & TIRE MONOFILL
COVER SOIL EARTHWORK

The following is a summary of earthwork available from borrow areas surroundign the proposed landfill/monofill. See cross-section locations on sheet 2 of 4 and cross-sections on sheet 4 of 4.

Area West of Proposed Landfill/Monofill

Section No.	Distance (Ft)	Area (Sq Ft)*	Volume (CY)
0+00		0	
	100		0
1+00		0	
	100		24
2+00		13	
	100		572
3+00		296	
	100		852
4+00		164	
	100		320
5+00		9	
	100		96
6+00		43	
Total			1864
* Allows 6-inches for topsoil			

Total Volume Cover Soil Available from Area West of Proposed Landfill/Monofill is 1,864 CY

Area South of Proposed Landfill/Monofill

Section No.	Distance (Ft)	Area (Sq Ft)*	Volume (CY)
6+00		0	0
	100		
7+00		576	1067
	100		
8+00		478	1953
	100		
9+00		267	1380
	100		
10+00		1420	2630
Total			7030
* Allows 6-inches for topsoil			

Total Volume Cover Soil Available from Area South of Proposed Landfill/Monofill is 7,030 CY

Future Phases of Proposed Landfill/Monofill

Section No.	Distance (Ft)	Area (Sq Ft)*	Volume (CY)
10+00		0	0
	100		
11+00		1400	2593
	100		
12+00		1449	5276
	100		
13+00		1045	4619
	100		
14+00		286	2465
	100		
15+00		0	530
Total			15483
* Allows 6-inches for topsoil			

Total Volume Cover Soil Available from Future Phases of Proposed Landfill/ Monofill is 15,483 CY