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DIVISION OF WASTE MANAGEMENT
FAYETTEVILLE REGIONAL OFFICE

CITY OF DURHAM
SANITARY LANDFILL
CONSTRUCTION QUALITY ASSURANCE REPORT

DURHAM
1869
CITY OF MEDICINE

SCANNED
3/6/15 Carmen Johnson

CITY OF DURHAM, NORTH CAROLINA

June 1999

Volume II of II

0759-043

ENVIRONMENTAL ENGINEERS, MALCOLM PIRNIE SCIENTISTS & PLANNERS

9

RECEIVED
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DIVISION OF WASTE MANAGEMENT
FAYETTEVILLE REGIONAL OFFICE

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VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/07/98
Report No.: 027

Acre 1 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	99.9	22.3	99.4	Tube/Sample (DL-132)
2	See Test Location Plan	100.3	22.6	99.8	
3	See Test Location Plan	97.1	23.6	96.~~7~~6 OW	
4	See Test Location Plan	98.4	21.1	97.9	
5	See Test Location Plan	101.1	21.2	100+	
6	See Test Location Plan	101.8	22.7	100+	
7	See Test Location Plan	103.7	21.9	100+	
8	See Test Location Plan	95.5	22.1	95.0	
9	See Test Location Plan	96.5	26.8	96.0	
10	See Test Location Plan	96.8	26.4	96.3	
11	See Test Location Plan	95.7	23.8	95.~~7~~2 OW	
12	See Test Location Plan	98.6	25.4	98.1	
13	See Test Location Plan	99.1	22.7	98.6	
14	See Test Location Plan	96.4	24.2	95.9	
15	See Test Location Plan	101.3	22.8	100+	
16	See Test Location Plan	97.3	24.1	96.8	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	2.8x10(-8)
Dry Density (pcf)	99.3
Moisture Content (%)	22.0

Atterberg Limits (ASTM D4318)

PL	22
LL	63
PI	41
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	24.6
%Silt	28.5
%Clay	46.9

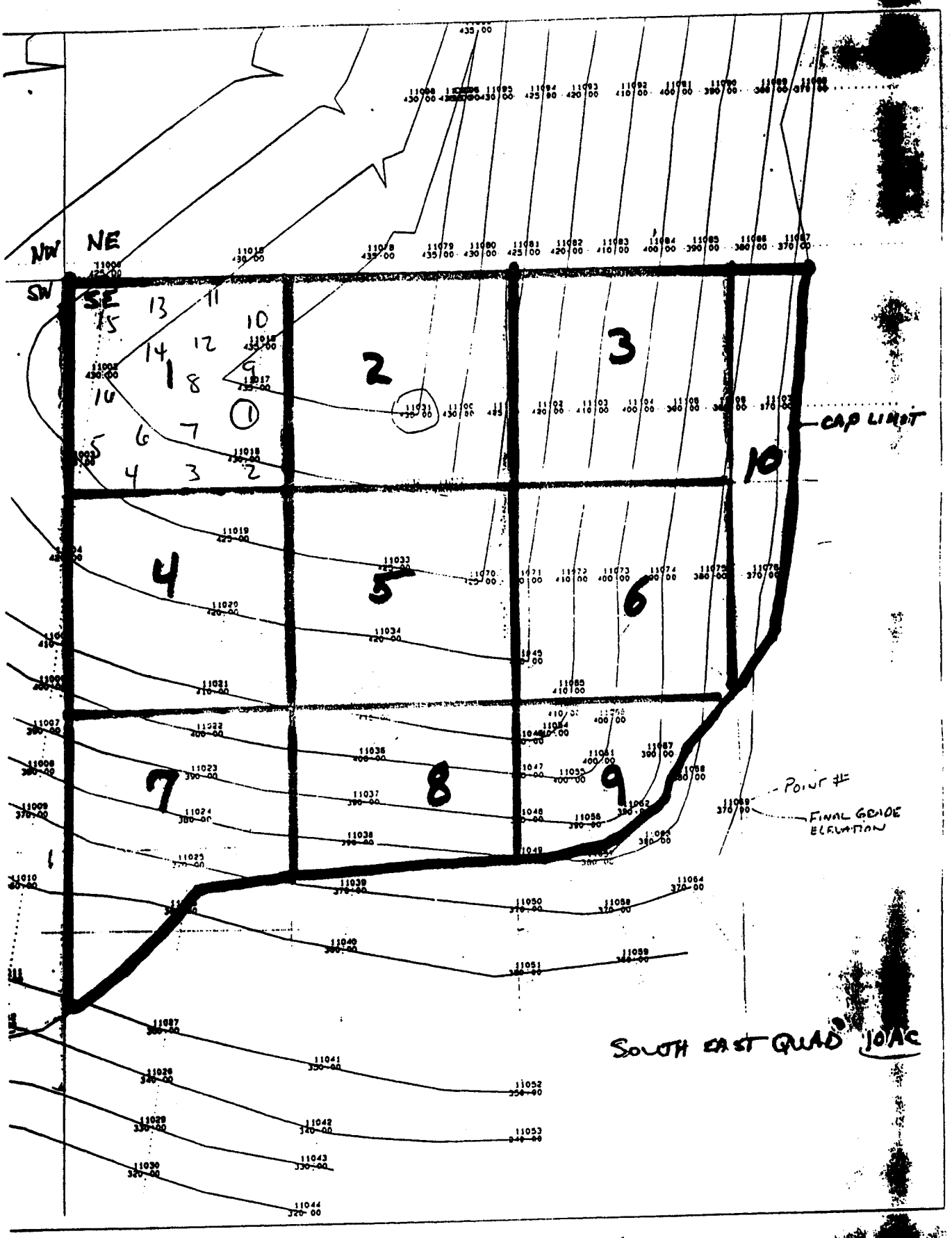
Sincerely,
VAN DER HORST Geotechnical Engineering, P.A.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



① Indicates Tube/Sample Location
Acre 1, Lift 3
Report: 027

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/01/98
Report No.: P-079

Project No.: VNC-98-029
Sample No. DL-132

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.8E-08	cm/sec
% Moisture	22.8	%
Dry Density	99.3	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/30/98
Location: Acre 1, Lift 3
Retest of DL-094

Length (in):	3.620
Diameter (in.):	2.838
Area (sq. in.):	6.337
Volume (cu. in.):	22.94
Wet Weight (grams):	734.7
Dry Weight (grams):	598.1
Dry Density (pcf):	99.3

Moisture Content Test Data

Wet Weight	71.58
Dry Weight	62.38
Tare weight	22.11
% Moisture	22.8

Test Data

Confining Pressure 3.0 psi

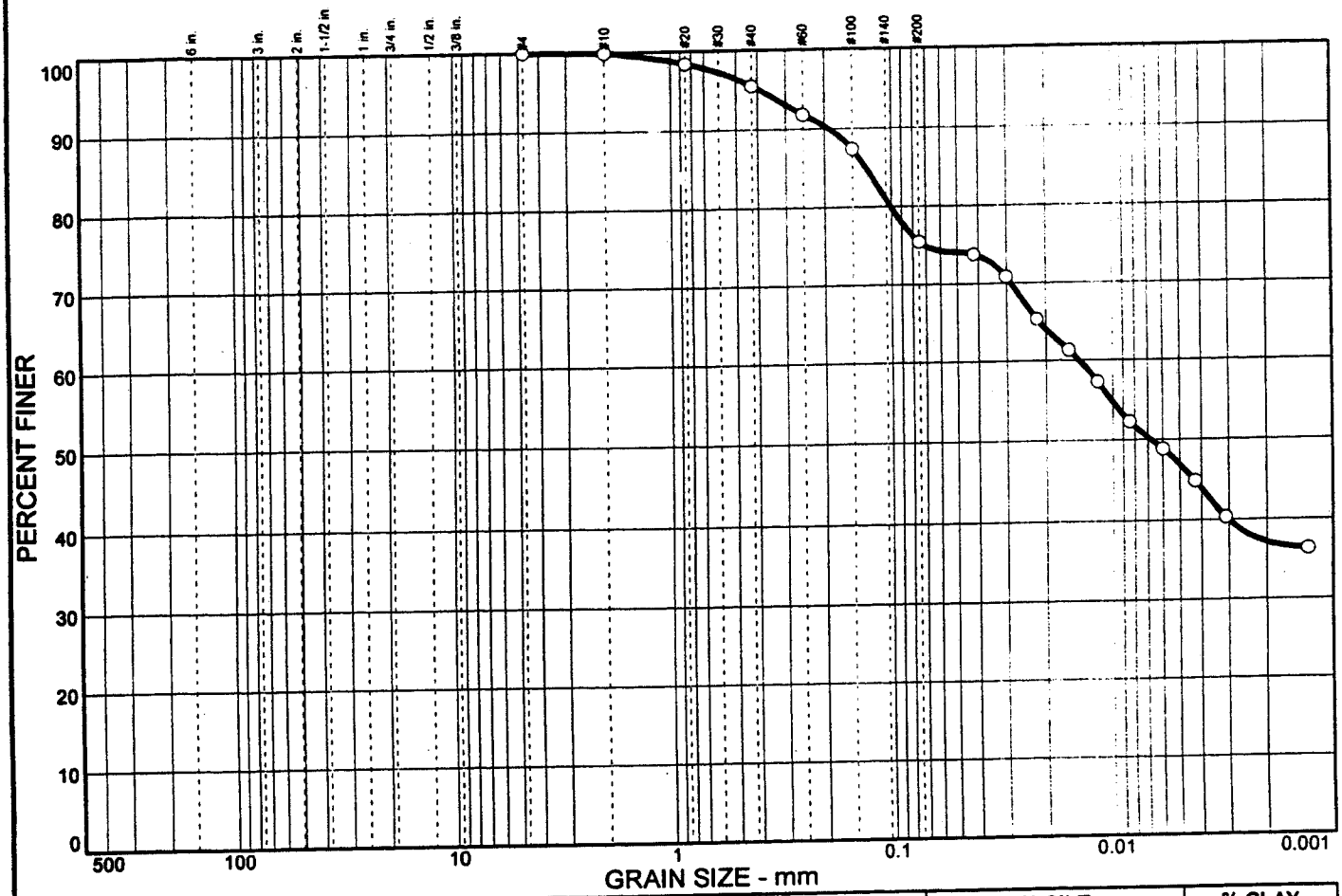
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
285	91.40	0.60	0.50	0.83	0.55	3.14E-08
404	91.40	0.75	0.65	0.87	0.70	2.82E-08
434	94.20	0.75	0.65	0.87	0.70	2.54E-08
362	94.20	0.65	0.55	0.85	0.60	2.61E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.8E-08** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	24.6	28.5	46.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	98.4		
#40	95.5		
#60	91.8		
#100	87.4		
#200	75.4		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 22 LL= 63 PI= 41

Coefficients

D_{85}= 0.130 D_{60}= 0.0142 D_{50}= 0.0068
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-132, Sampled from In-situ Permeablity Test Location

Sample No.: DL-132 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 1, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/07/98
Report No.: 028

Acre 2 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	96.3	23.9	95.8	
2	See Test Location Plan	103.7	22.0	100+	
3	See Test Location Plan	103.7	21.9	100+	
4	See Test Location Plan	99.6	24.2	99.1	
5	See Test Location Plan	97.5	24.2	97.0	
6	See Test Location Plan	96.9	27.0	96.5 4oh	
7	See Test Location Plan	95.9	25.4	95.5 4oh	
8	See Test Location Plan	102.1	21.8	100+	
9	See Test Location Plan	96.4	22.6	96.6 95.9	Tube/Sample (DL-113)
10	See Test Location Plan	98.6	25.4	98.1	
11	See Test Location Plan	99.1	24.2	98.6	
12	See Test Location Plan	102.1	23.0	100+	
13	See Test Location Plan	96.4	23.8	95.9	
14	See Test Location Plan	97.4	24.1	96.9	
15	See Test Location Plan	100.6	23.0	100+	
16	See Test Location Plan	102.4	22.4	100+	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	3.6x10(-8)
Dry Density (pcf)	102.8
Moisture Content (%)	22.0

Atterberg Limits (ASTM D4318)

PL	24
LL	70
PI	46
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	26.2
%Silt	28.6
%Clay	45.2

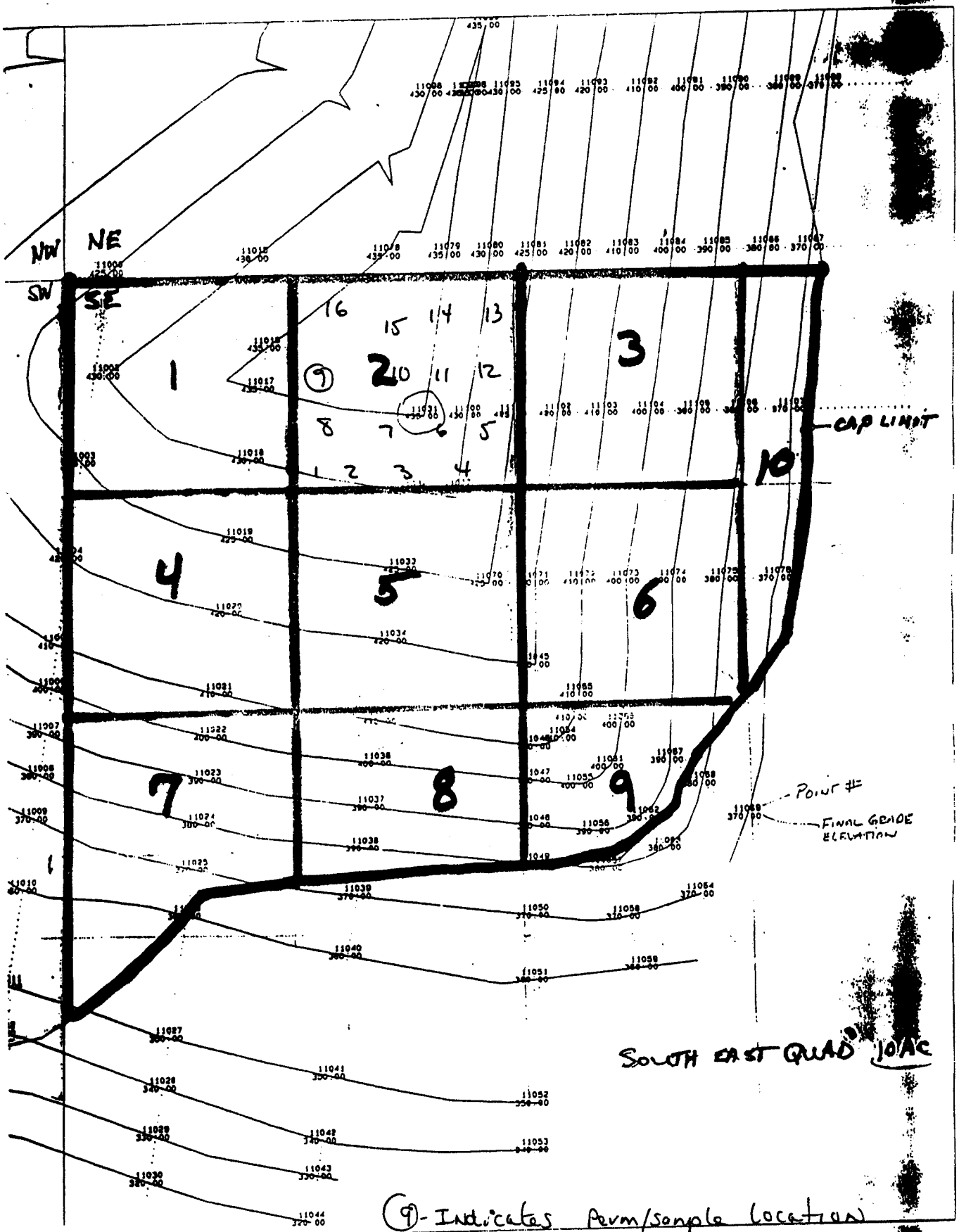
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(9)- Indicates Perm/sample location

Acre 2, Lift 3

Report: 028

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/03/98
Report No.: P-080

Project No.: VNC-98-029
Sample No. DL-113

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.6E-08	cm/sec
% Moisture	22.0	%
Dry Density	102.8	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/29/98
Location: Acre 2, Lift 3
Retest of DL-095

Length (in):	3.528
Diameter (in.):	2.851
Area (sq. in.):	6.395
Volume (cu. in.):	22.56
Wet Weight (grams):	742.9
Dry Weight (grams):	609.0
Dry Density (pcf):	102.8

Moisture Content Test Data

Wet Weight	135.49
Dry Weight	115.03
Tare weight	21.99
% Moisture	22.0

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
211	83.07	0.45	0.50	1.11	0.48	3.89E-08
335	83.07	0.70	0.70	1.00	0.70	3.61E-08
376	83.07	0.80	0.80	1.00	0.80	3.67E-08
693	83.07	1.35	1.30	0.96	1.33	3.30E-08

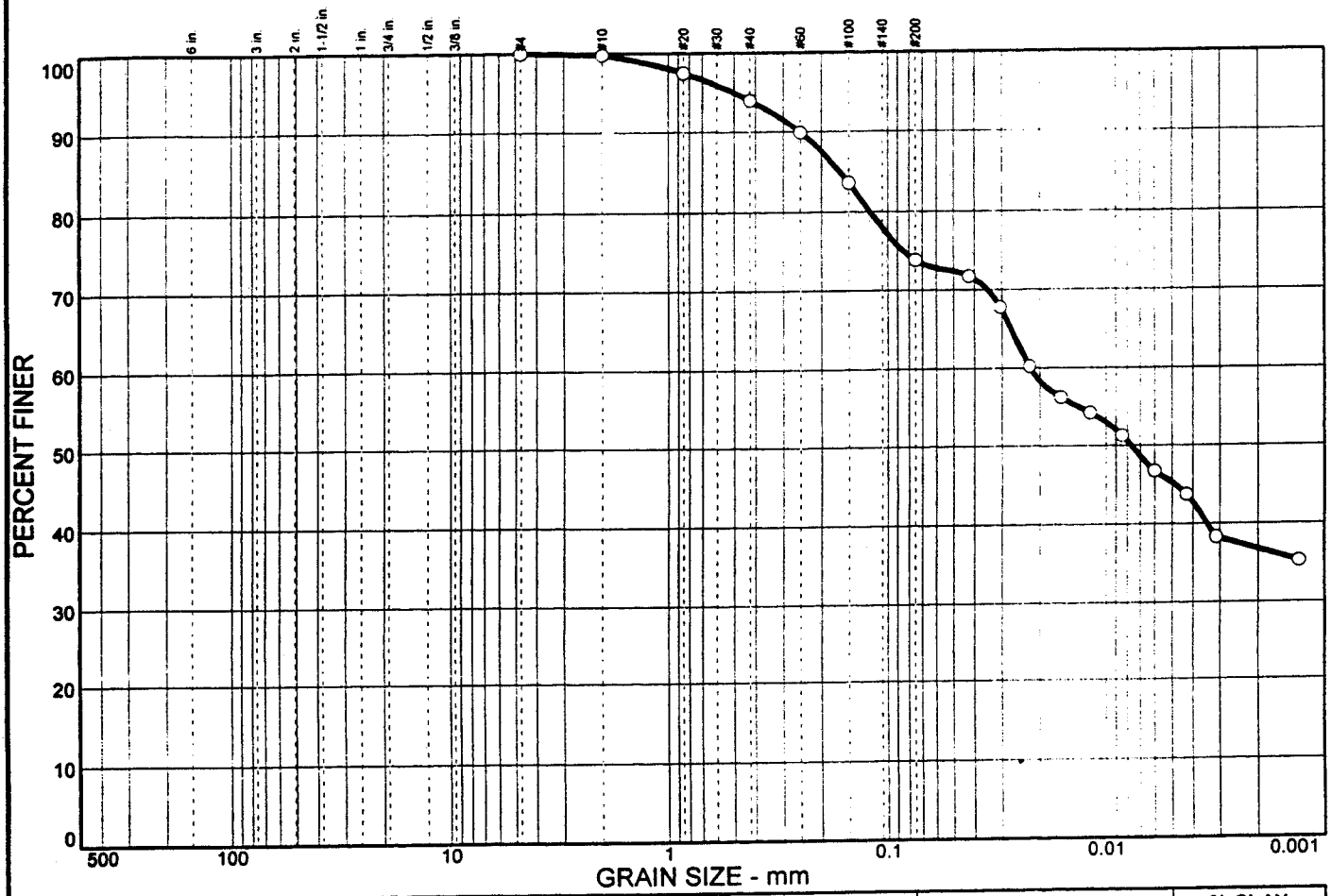
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **3.6E-08** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405
VANDERHORST Geotechnical Engineering, P.C.
Fax: (919) 876-0460

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	26.2	28.6	45.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	97.5		
#40	94.0		
#60	89.9		
#100	83.6		
#200	73.8		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 24 LL= 70 PI= 46

Coefficients

D_{85}= 0.165 D_{60}= 0.0222 D_{50}= 0.0077
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-113, Sampled from In-situ Permeablity Test Location

Sample No.: DL-113 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 2, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/07/98
Report No.: 025

Acre 3 Lift 3
Clay Source: Roberts Borrow Pit
ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture
Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	96.9	27.0	96.4	
2	See Test Location Plan	100.2	21.5	99.7	
3	See Test Location Plan	102.2	21.9	100+	
4	See Test Location Plan	100.8	22.0	100+	
5	See Test Location Plan	95.7	23.2	95.2	
6	See Test Location Plan	103.1	22.1	100+	
7	See Test Location Plan	98.2	23.6	97.7	
8	See Test Location Plan	101.2	22.4	100+	
9	See Test Location Plan	100.6	21.7	100+	
10	See Test Location Plan	99.3	24.0	98.8	
11	See Test Location Plan	95.8	26.1	95.2 3 on	Tube/Sample (DL-092)
12	See Test Location Plan	95.9	25.1	95.3 4 on	
13	See Test Location Plan	100.2	22.4	99.7	
14	See Test Location Plan	99.6	22.0	99.1	
15	See Test Location Plan	97.2	21.6	96.7	
16	See Test Location Plan	100.9	21.2	100+	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	5.3x10(-8)
Dry Density (pcf)	100.0
Moisture Content (%)	23.6

Atterberg Limits (ASTM D4318)

PL	24
LL	68
PI	44
USCS Classification	CH

Grain-size Analysis (ASTM D422)

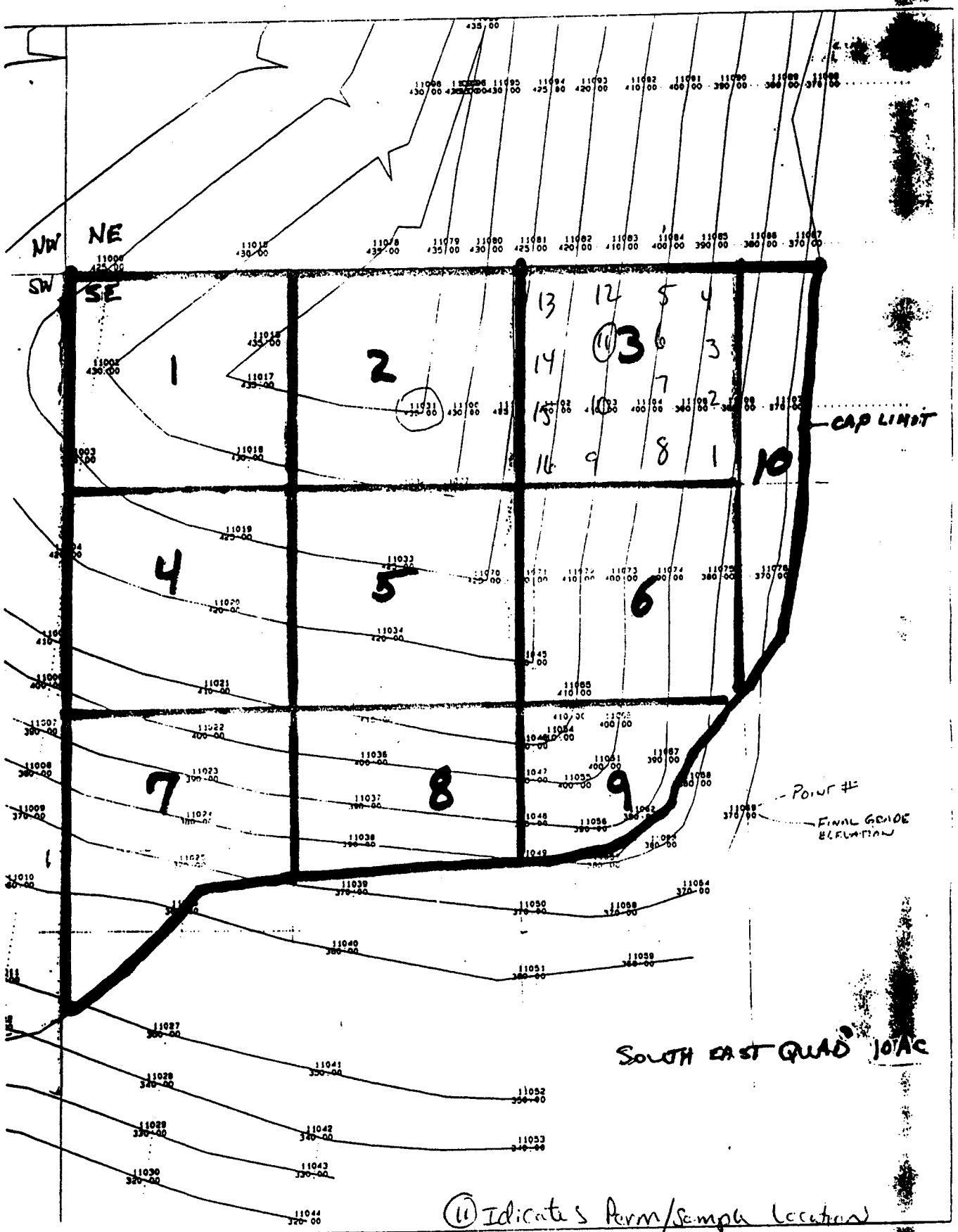
%Gravel	0.0
%Sand	20.4
%Silt	29.0
%Clay	50.6

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(11) Indicates Perm/Sample Location

Acre 3, Lift 3

Report: 025

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/01/98
Report No.: P-077

Project No.: VNC-98-029
Sample No. DL-092

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.3E-08	cm/sec
% Moisture	23.6	%
Dry Density	100.0	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/23/98
Location: Acre 3, Lift 3

Length (in):	3.281
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	20.97
Wet Weight (grams):	680.2
Dry Weight (grams):	550.4
Dry Density (pcf):	100.0

Moisture Content Test Data

Wet Weight	113.54
Dry Weight	96.10
Tare weight	22.12
% Moisture	23.6

Test Data

Confining Pressure 3.0 psi

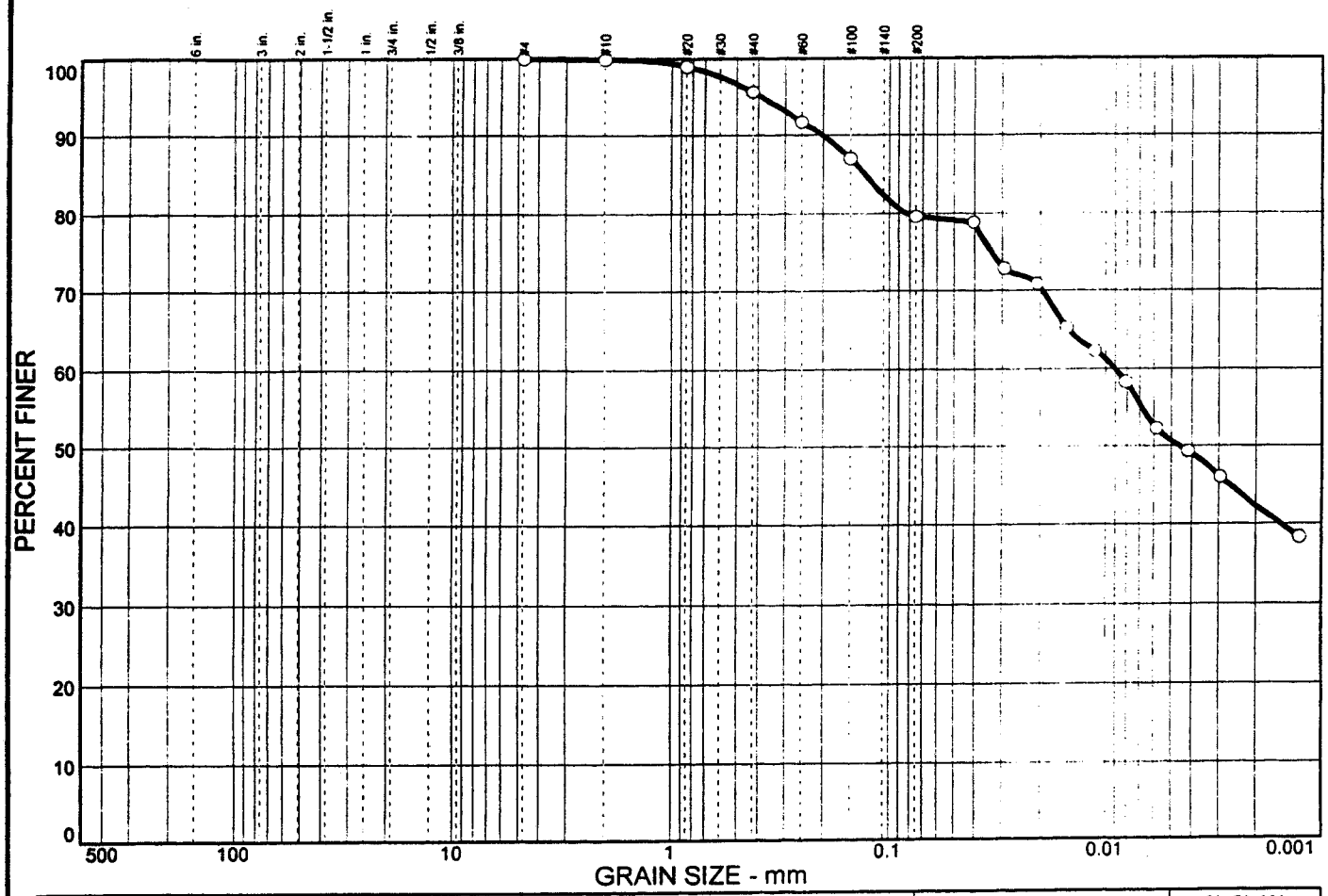
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
440	88.62	1.40	1.60	1.14	1.50	5.14E-08
1050	88.62	3.60	3.50	0.97	3.55	5.09E-08
311	88.62	1.10	1.10	1.00	1.10	5.33E-08
612	88.62	2.30	2.30	1.00	2.30	5.66E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **5.3E-08** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	20.4	29.0	50.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.0		
#40	95.7		
#60	91.7		
#100	87.0		
#200	79.6		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 24 LL= 68 PI= 44

Coefficients

D_{85}= 0.129 D_{60}= 0.0090 D_{50}= 0.0046
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-92, Sampled from In-situ Permeablity Test Location

Sample No.: DL-92 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 3, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 11/09/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
Roberts Clay Acre 4, Lift 3

RECEIVED
NOV 10 1998

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	11-07-98	Clay.029	Clay Cover Test Report Acre 4, Lift 3

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/07/98
Report No.: 029

Acre 4 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	101.2	24.1	100+	
2	See Test Location Plan	98.6	22.4	98.1	
3	See Test Location Plan	97.3	22.1	96.8	
4	See Test Location Plan	97.8	23.4	97.3	
5	See Test Location Plan	101.6	22.1	100+	
6	See Test Location Plan	97.4	25.7	97.0	
7	See Test Location Plan	103.2	21.3	100+	Perm/Sample (DL-096)
8	See Test Location Plan	98.9	22.9	98.5	
9	See Test Location Plan	103.2	22.0	100+	
10	See Test Location Plan	101.9	22.2	100+	
11	See Test Location Plan	100.1	22.6	99.6	
12	See Test Location Plan	98.0	23.5	97.5	
13	See Test Location Plan	103.9	21.2	100+	
14	See Test Location Plan	99.4	24.0	98.9	
15	See Test Location Plan	100.0	21.9	99.5	
16	See Test Location Plan	99.7	23.4	99.2	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	2.9x10(-8)
Dry Density (pcf)	103.8
Moisture Content (%)	21.5

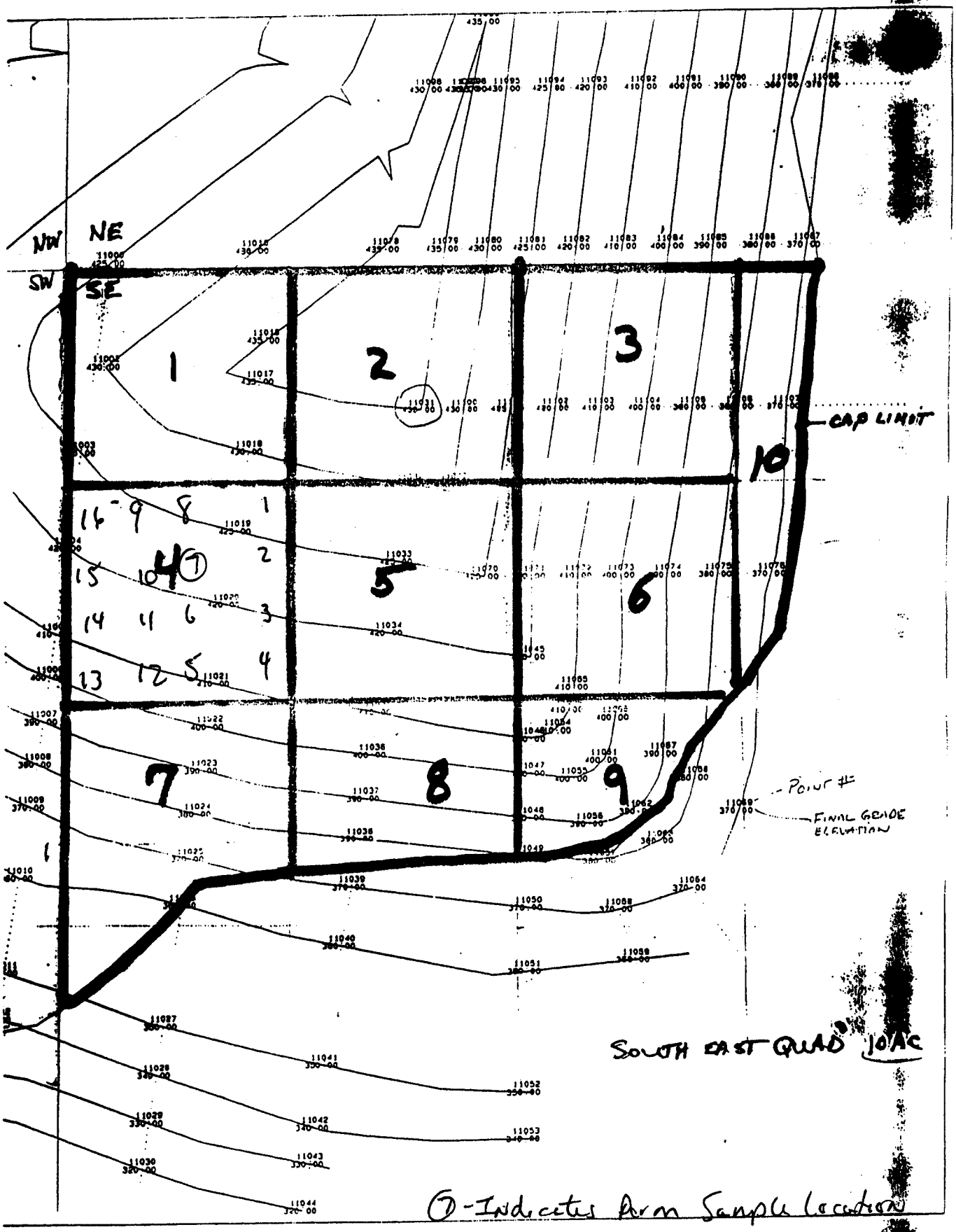
Atterberg Limits (ASTM D4318)		Grain-size Analysis (ASTM D422)	
PL	25	%Gravel	0.0
LL	67	%Sand	28.2
PI	42	%Silt	22.9
		%Clay	48.9
USCS Classification	CH		

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



⑦-Indicates Perm Sample Location

Acre 4, Lift 3

Report: 029

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/07/98
Report No.: P-081

Project No.: VNC-98-029
Sample No. DL-096

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.9E-08	cm/sec
% Moisture	21.5	%
Dry Density	103.8	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 10/29/98
Location: Acre 4, Lift 3

Length (in):	3.452
Diameter (in.):	2.860
Area (sq. in.):	6.435
Volume (cu. in.):	22.21
Wet Weight (grams):	735.5
Dry Weight (grams):	605.4
Dry Density (pcf):	103.8

Moisture Content Test Data

Wet Weight	138.39
Dry Weight	117.78
Tare weight	21.89
% Moisture	21.5

Test Data

Confining Pressure 3.0 psi

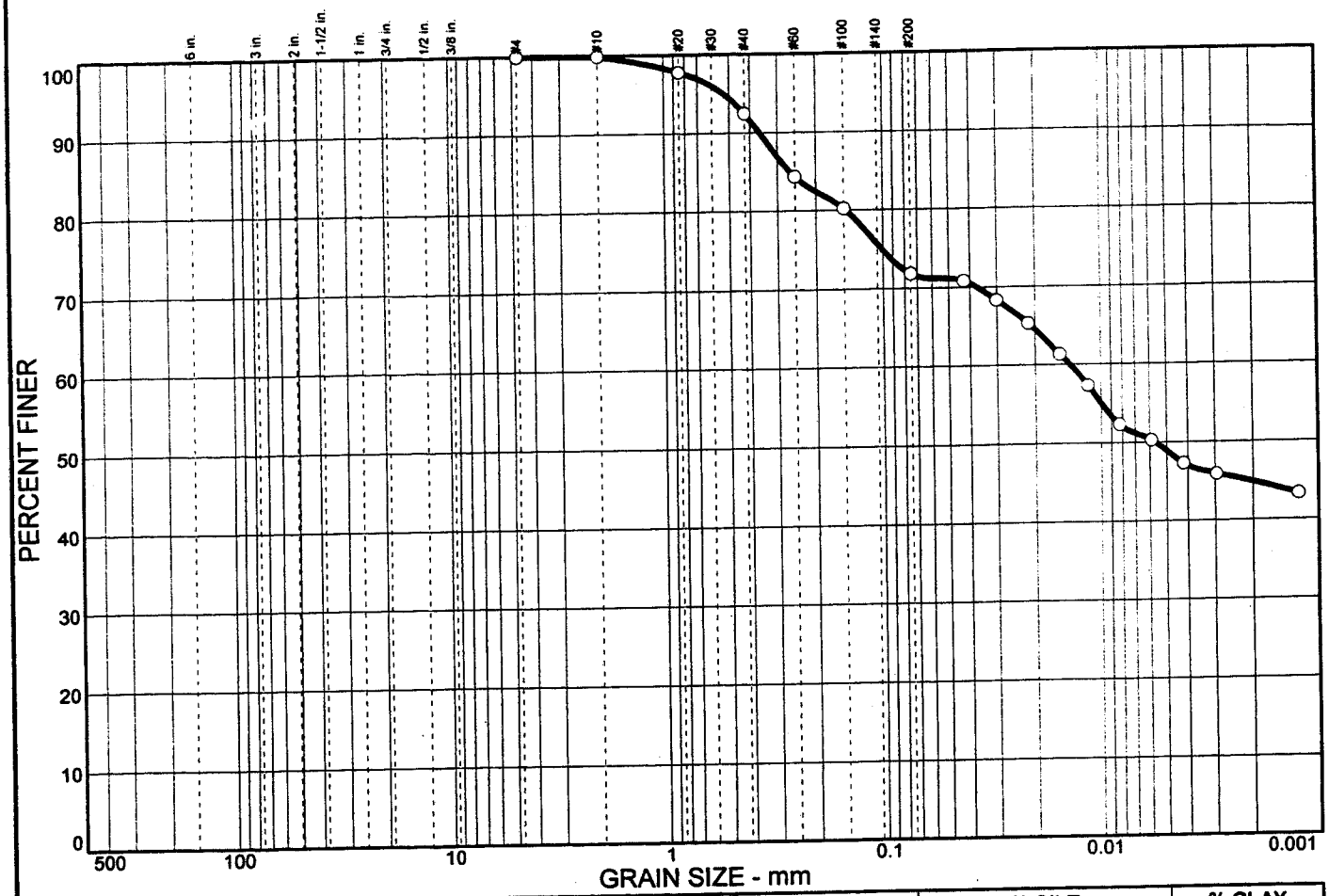
△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
207	105.23	0.50	0.55	1.10	0.53	3.36E-08
259	105.23	0.55	0.65	1.18	0.60	3.07E-08
372	105.23	0.80	0.70	0.88	0.75	2.67E-08
380	105.23	0.70	0.80	1.14	0.75	2.62E-08

△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.9E-08** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	28.2	22.9	48.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	97.8		
#40	92.5		
#60	84.3		
#100	80.2		
#200	71.8		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 25 LL= 67 PI= 42

Coefficients

D_{85}= 0.264 D_{60}= 0.0139 D_{50}= 0.0056
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-096, Sampled from In-situ Permeablity Test Location

Sample No.: DL-96 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 4, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 11/13/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
Roberts Clay Acre 5, Lift 3

RECEIVED
NOV 17 1998

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	11/08/98	Clay .030	Clay Cover Testing Acre 5, Lift 3
		Gilbert Southern	
	Contractor's Name		
		11/17/98	

REMARKS: Const. Testing
Technical

COPIES 2250
~~2250-9~~
32A

SIGNED: Dionne Boyd

CT-013
James Baier

Submitted By:
Approved By:

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/08/98
Report No.: 030

Acre 5 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	100.3	22.3	99.8	
2	See Test Location Plan	101.4	22.4	100+	
3	See Test Location Plan	100.0	22.3	99.5	
4	See Test Location Plan	95.8	21.8	95.3	
5	See Test Location Plan	104.7	21.1	100+	
6	See Test Location Plan	97.4	22.5	96.9	
7	See Test Location Plan	97.6	22.7	97.1	
8	See Test Location Plan	103.0	21.3	100+	Tube/Sample (DL-115)
9	See Test Location Plan	100.4	21.8	99.9	
10	See Test Location Plan	97.3	22.1	96.8	
11	See Test Location Plan	97.8	23.4	97.3	
12	See Test Location Plan	101.4	22.0	100+	
13	See Test Location Plan	99.6	23.0	99.1	
14	See Test Location Plan	98.2	22.8	97.7	
15	See Test Location Plan	101.4	22.1	100+	
16	See Test Location Plan	100.6	22.8	100+	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	4.5x10(-8)
Dry Density (pcf)	102.4
Moisture Content (%)	21.2

Atterberg Limits (ASTM D4318)

PL	26
LL	55
PI	29
USCS Classification	CH

Grain-size Analysis (ASTM D422)

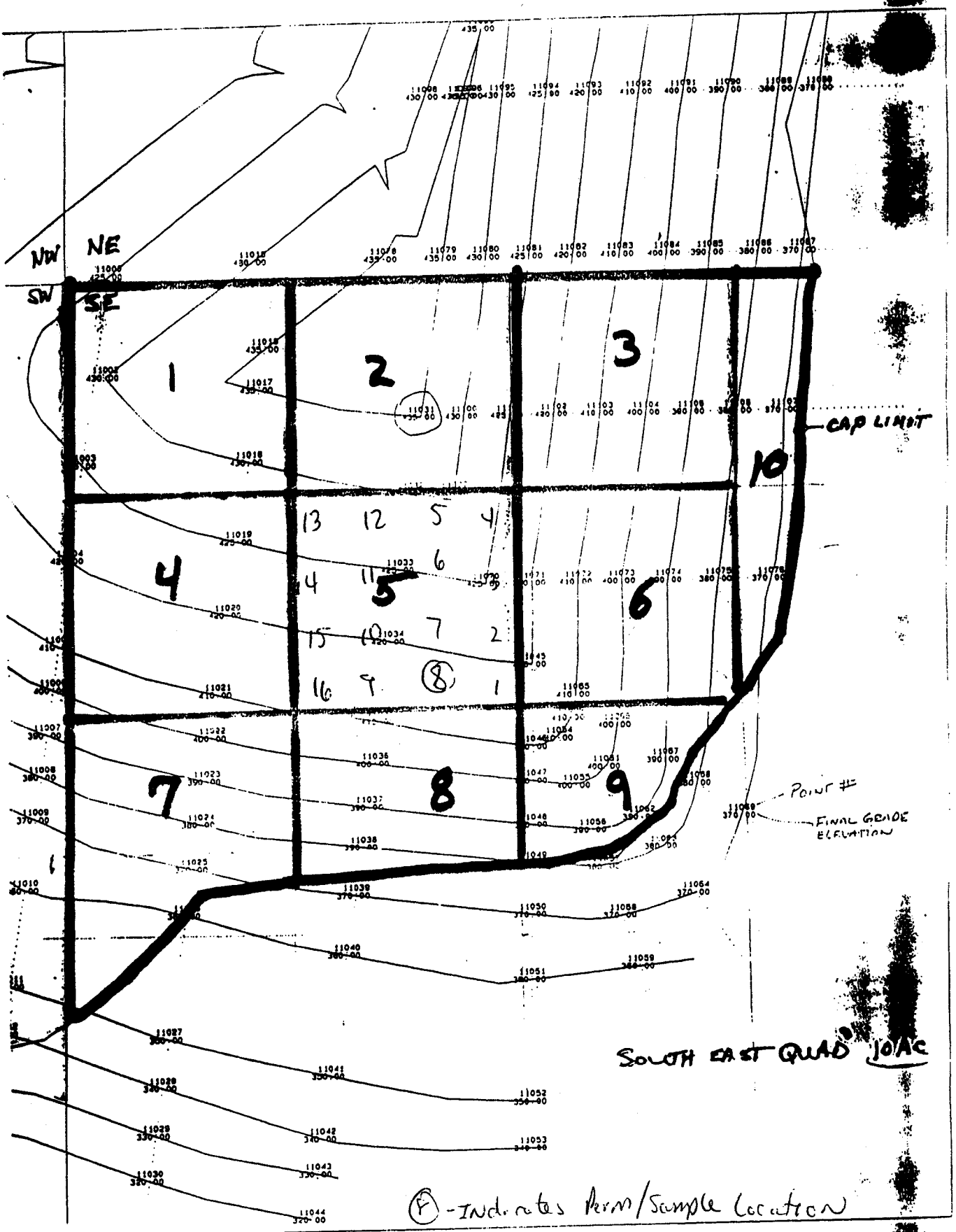
%Gravel	0.2
%Sand	30.0
%Silt	19.1
%Clay	50.7

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

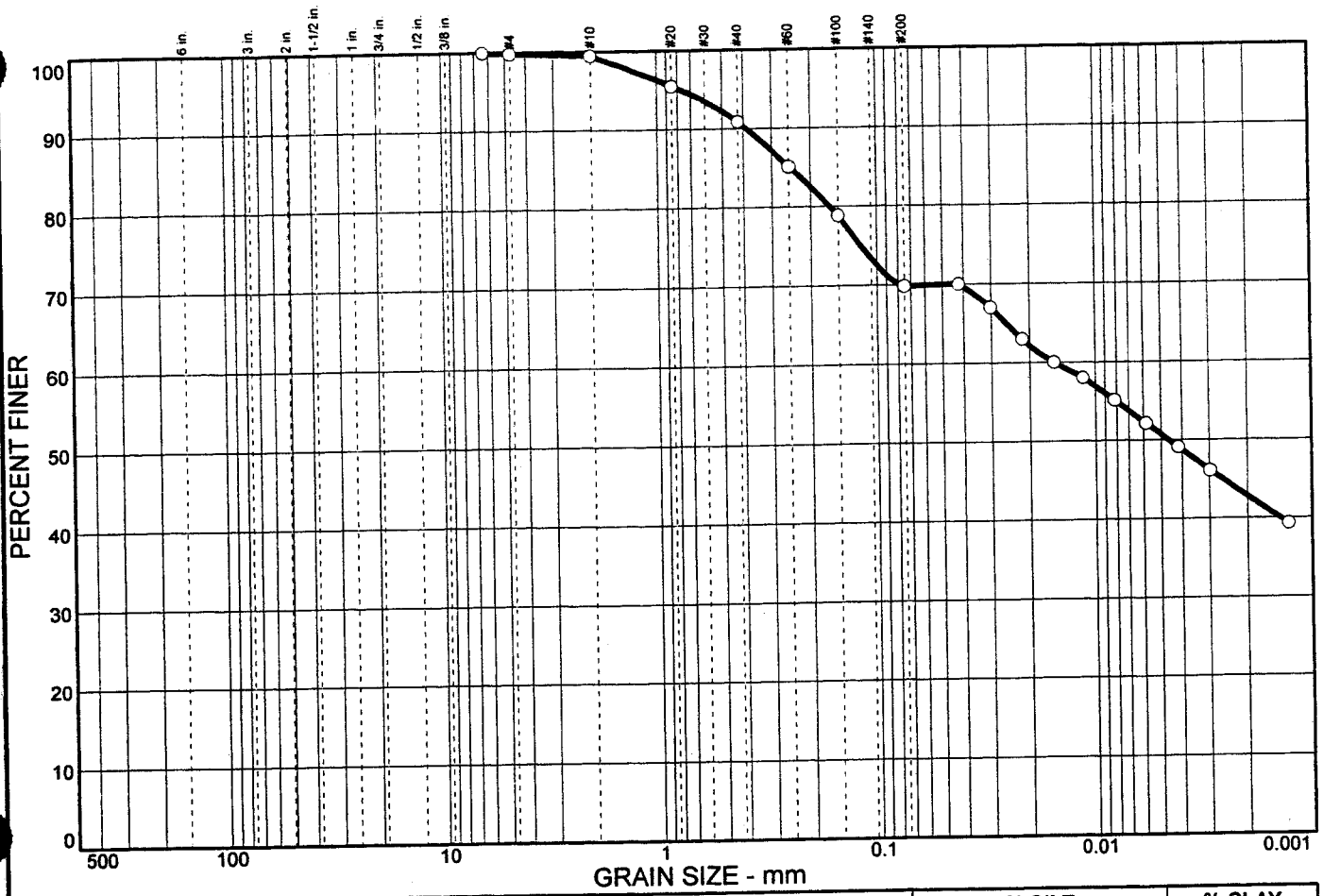
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(F) - Indicates Perm/Sample Location

Acre 5, Lift 3
Report: 030

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	30.0	19.1	50.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.5		
#20	95.5		
#40	90.9		
#60	85.1		
#100	78.8		
#200	69.8		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 26 LL= 55 PI= 29

Coefficients

D_{85}= 0.248 D_{60}= 0.0155 D_{50}= 0.0046
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-115, Acre 5, Lift 3

Sample No.: DL-115 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 5, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/09/98
Report No.: P-090

Project No.: VNC-98-029
Sample No. DL-115

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.5E-08	cm/sec
% Moisture	21.2	%
Dry Density	102.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 10/27/98
Location: Acre 5, Lift 3
Retest - DL-097

Length (in):	3.890
Diameter (in.):	2.840
Area (sq. in.):	6.346
Volume (cu. in.):	24.68
Wet Weight (grams):	804.0
Dry Weight (grams):	663.1
Dry Density (pcf):	102.4

Moisture Content Test Data

Wet Weight	151.50
Dry Weight	128.79
Tare weight	21.87
% Moisture	21.2

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1017	83.07	2.90	2.60	0.90	2.75	5.19E-08
649	83.07	1.50	1.35	0.90	1.43	4.21E-08
211	83.07	0.50	0.50	1.00	0.50	4.55E-08
714	83.07	1.65	1.35	0.82	1.50	4.03E-08

△ T — Change in time (minutes)
H — Driving head (inches)
Inflow (B) — Flow in (cubic centimeters)
Inflow (C) — Flow out (cubic centimeters)
Q — Flow (cubic centimeters)

Permeability (k) **4.5E-08** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 11/09/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
Roberts Clay Acre 6, Lift 3

RECEIVED NOV 10 1998

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	11-07-98	Clay.024	Clay Cover Test Report Acre 6, Lift 3

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/07/98
Report No.: 024

Acre 6 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	99.5	21.1	99.0	
2	See Test Location Plan	102.8	21.1	100+	
3	See Test Location Plan	101.2	22.2	100+	Tube/Sample (DL-091)
4	See Test Location Plan	103.1	21.9	100+	
5	See Test Location Plan	96.4	22.8	95.9	
6	See Test Location Plan	98.6	22.4	98.1	
7	See Test Location Plan	101.0	21.3	100+	
8	See Test Location Plan	98.1	22.8	97.6	
9	See Test Location Plan	99.7	24.3	99.2	
10	See Test Location Plan	96.1	23.0	95.6	
11	See Test Location Plan	99.7	21.0	99.2	
12	See Test Location Plan	98.1	22.7	97.6	
13	See Test Location Plan	100.8	23.0	100+	
14	See Test Location Plan	98.3	22.4	97.8	
15	See Test Location Plan	102.3	21.4	100+	
16	See Test Location Plan	100.2	22.0	99.7	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	3.5x10(-8)
Dry Density (pcf)	96.8
Moisture Content (%)	24.4

Atterberg Limits (ASTM D4318)

PL	22
LL	70
PI	48
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	23.3
%Silt	30.5
%Clay	46.2

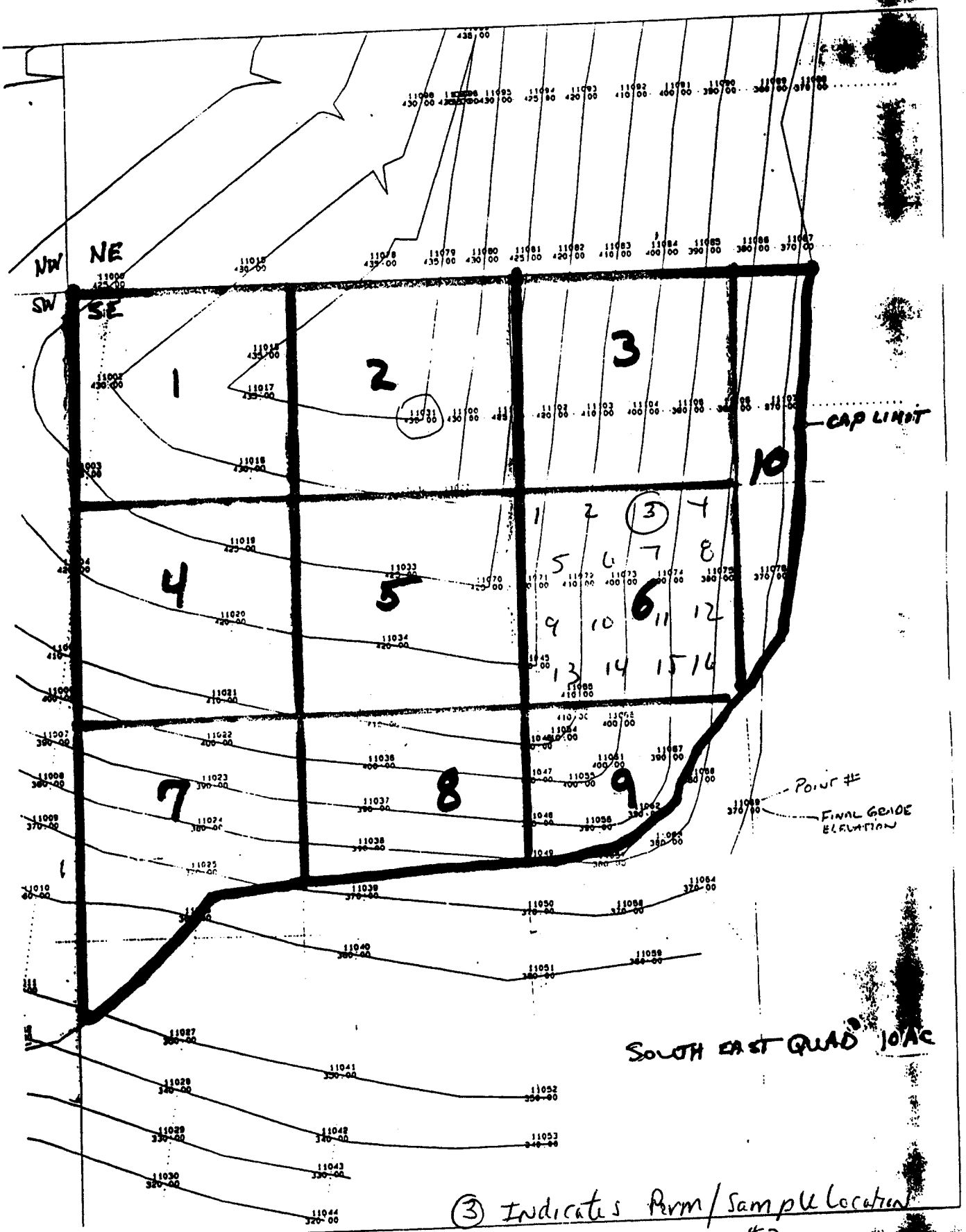
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(3) Indicates Perm/Sample Location

Acre 6, Lift #3

Report: 024

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/01/98
Report No.: P-076

Project No.: VNC-98-029
Sample No. DL-091

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.5E-08	cm/sec
% Moisture	24.4	%
Dry Density	96.8	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 10/23/98
Location: Acre 6, Lift 3

Length (in):	3.348
Diameter (in.):	2.849
Area (sq. in.):	6.386
Volume (cu. in.):	21.38
Wet Weight (grams):	675.9
Dry Weight (grams):	543.4
Dry Density (pcf):	96.8

Moisture Content Test Data

Wet Weight	105.21
Dry Weight	88.92
Tare weight	22.12
% Moisture	24.4

Test Data

Confining Pressure 3.0 psi

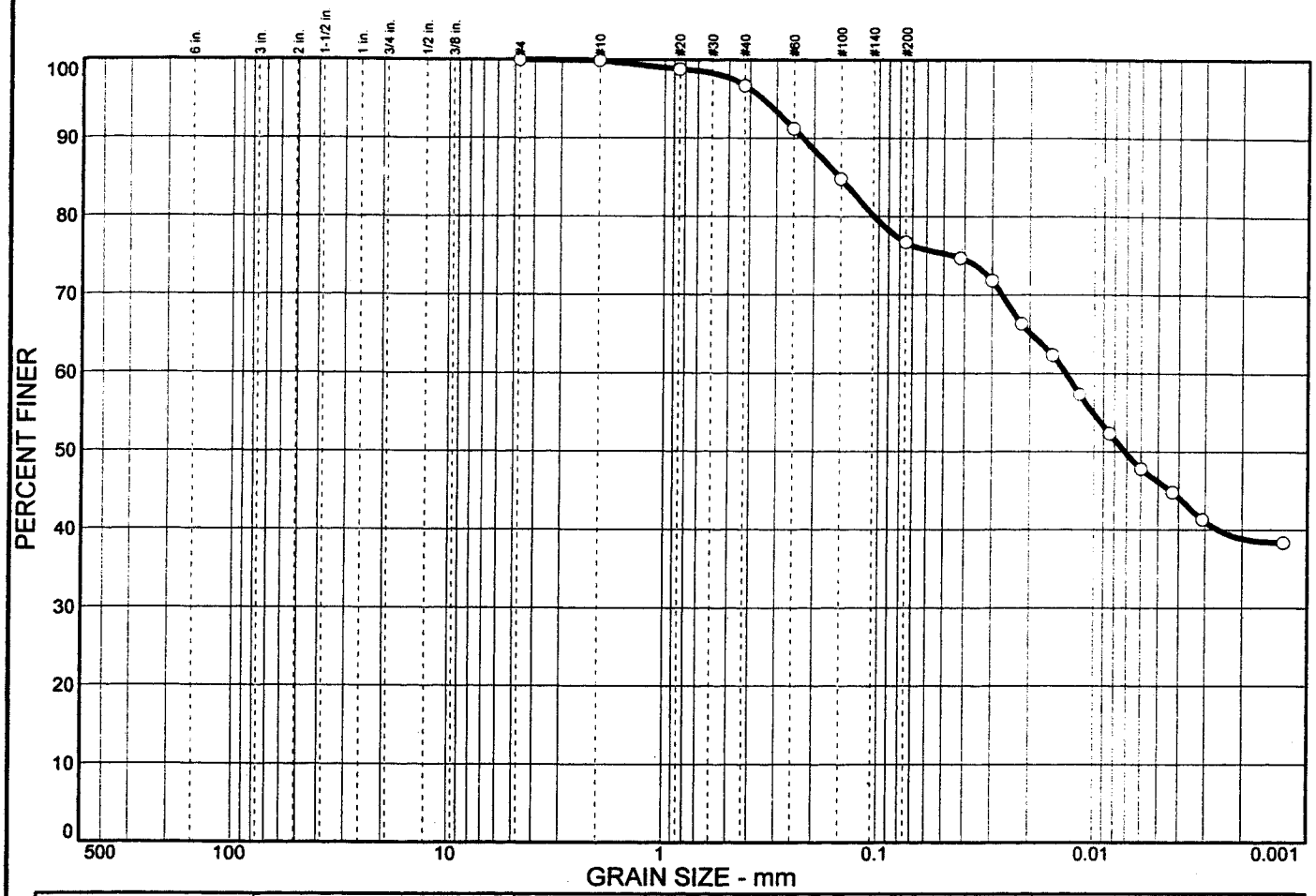
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
442	83.08	0.90	1.10	1.22	1.00	3.71E-08
1046	83.08	2.50	2.30	0.92	2.40	3.76E-08
311	83.08	0.60	0.65	1.08	0.63	3.30E-08
587	83.08	1.20	1.10	0.92	1.15	3.21E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **3.5E-08** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	23.3	30.5	46.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	98.8		
#40	96.7		
#60	91.2		
#100	84.8		
#200	76.7		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 22 LL= 70 PI= 48

Coefficients

D_{85}= 0.152 D_{60}= 0.0136 D_{50}= 0.0072
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-091, Sampled from In-situ Permeablity Test Location

Sample No.: DL-91 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 6, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 11/13/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
Roberts Clay Acre 7, Lift 3

RECEIVED
NOV 17 1998

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	11/08/98	Clay .031	Clay Cover Testing Acre 7, Lift 3
	Contractor's Name:		Gilbert Southern
	Date:		11/17/98

REMARKS: Const. Testing
Technical
2250

COPIES 2250-9
32A

SIGNED: Dionne Boyd

CT-013
James Bier

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/08/98
Report No.: 031

Acre 7 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	99.6	21.1	99.1	
2	See Test Location Plan	102.3	21.1	100+	
3	See Test Location Plan	102.2	21.0	100+	
4	See Test Location Plan	100.9	21.1	100+	
5	See Test Location Plan	98.7	22.2	98.2	
6	See Test Location Plan	96.1	23.4	95.6	Tube/Sample (DL-098)
7	See Test Location Plan	95.7	23.6	95.2	
8	See Test Location Plan	97.6	22.7	97.1	
9	See Test Location Plan	99.3	24.1	98.8	
10	See Test Location Plan	101.2	21.0	100+	
11	See Test Location Plan	104.6	21.6	100+	
12	See Test Location Plan	99.8	22.3	99.3	
13	See Test Location Plan	97.2	22.9	96.7	
14	See Test Location Plan	95.8	23.8	95.3	
15	See Test Location Plan	99.4	22.9	98.9	
16	See Test Location Plan	98.1	22.9	97.6	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	4.0x10(-8)
Dry Density (pcf)	99.7
Moisture Content (%)	22.8

Atterberg Limits (ASTM D4318)

PL	20
LL	46
PI	26

USCS Classification CL

Grain-size Analysis (ASTM D422)

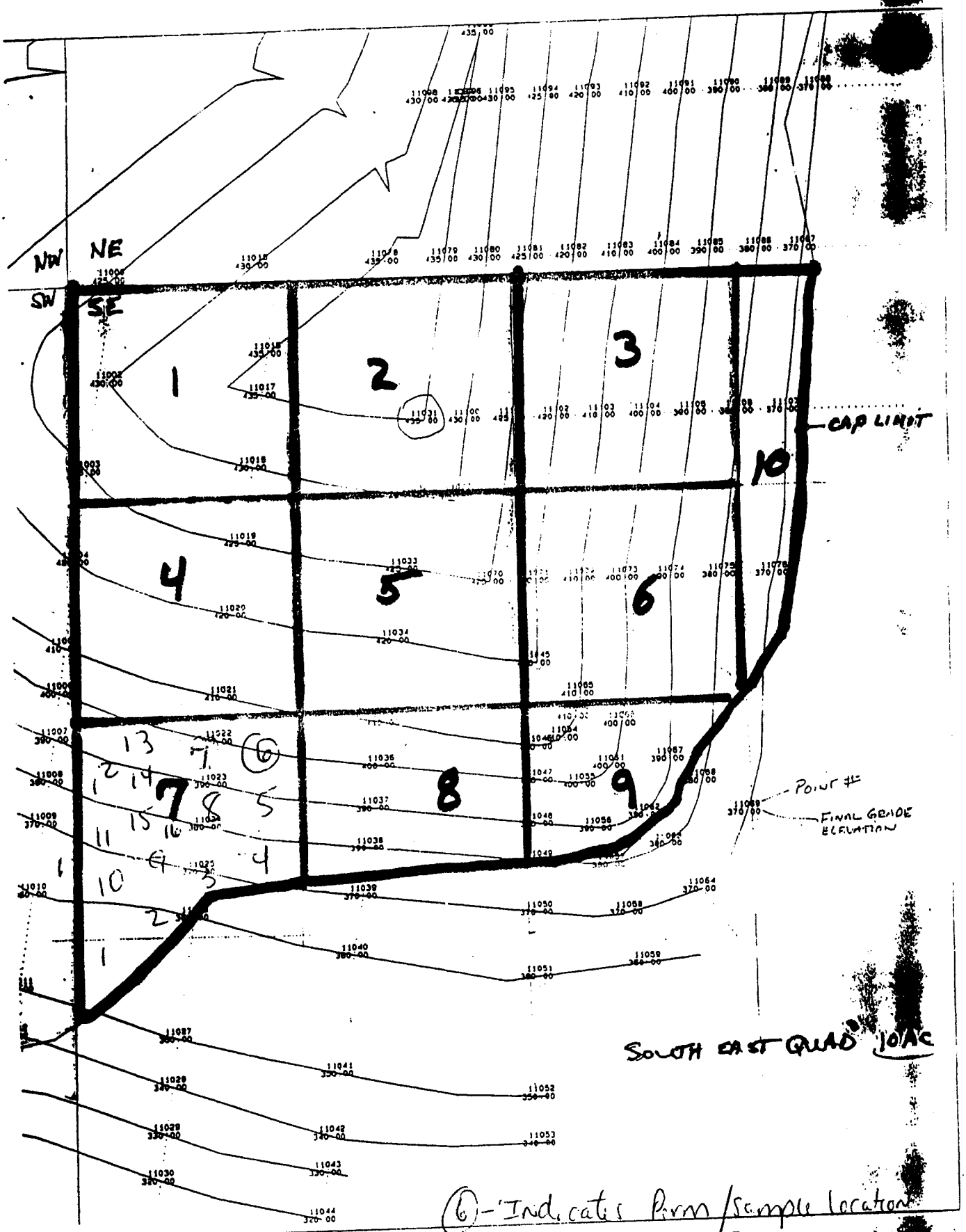
%Gravel	0.5
%Sand	31.2
%Silt	18.2
%Clay	50.1

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(6) - Indicates Perm/Sample location

Acre 7, Lift 3

Report : 031

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date:	11/09/98
Report No.:	P-083

Project No.:	VNC-98-029	Project:	Durham Landfill Closure
Sample No.	DL-098	Client:	Gilbert Southern Corp.

Test Summary

Permeability	4.0E-08	cm/sec
% Moisture	22.8	%
Dry Density	99.7	pcf

Sample Information

Specimen Type:		Date Sampled:	10/25/98
Remolded		Location:	Acre 7, Lift 3
Tube	X		

Length (in):	3.305
Diameter (in.):	2.845
Area (sq. in.):	6.368
Volume (cu. in.):	21.05
Wet Weight (grams):	676.2
Dry Weight (grams):	550.8
Dry Density (pcf):	99.7

Moisture Content Test Data

Wet Weight	114.38
Dry Weight	97.24
Tare weight	21.98
% Moisture	22.8

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
312	83.08	0.70	0.80	1.14	0.75	3.90E-08
338	83.08	0.80	0.85	1.06	0.83	3.96E-08
511	83.08	1.20	1.35	1.13	1.28	4.05E-08
601	83.08	1.60	1.50	0.94	1.55	4.19E-08

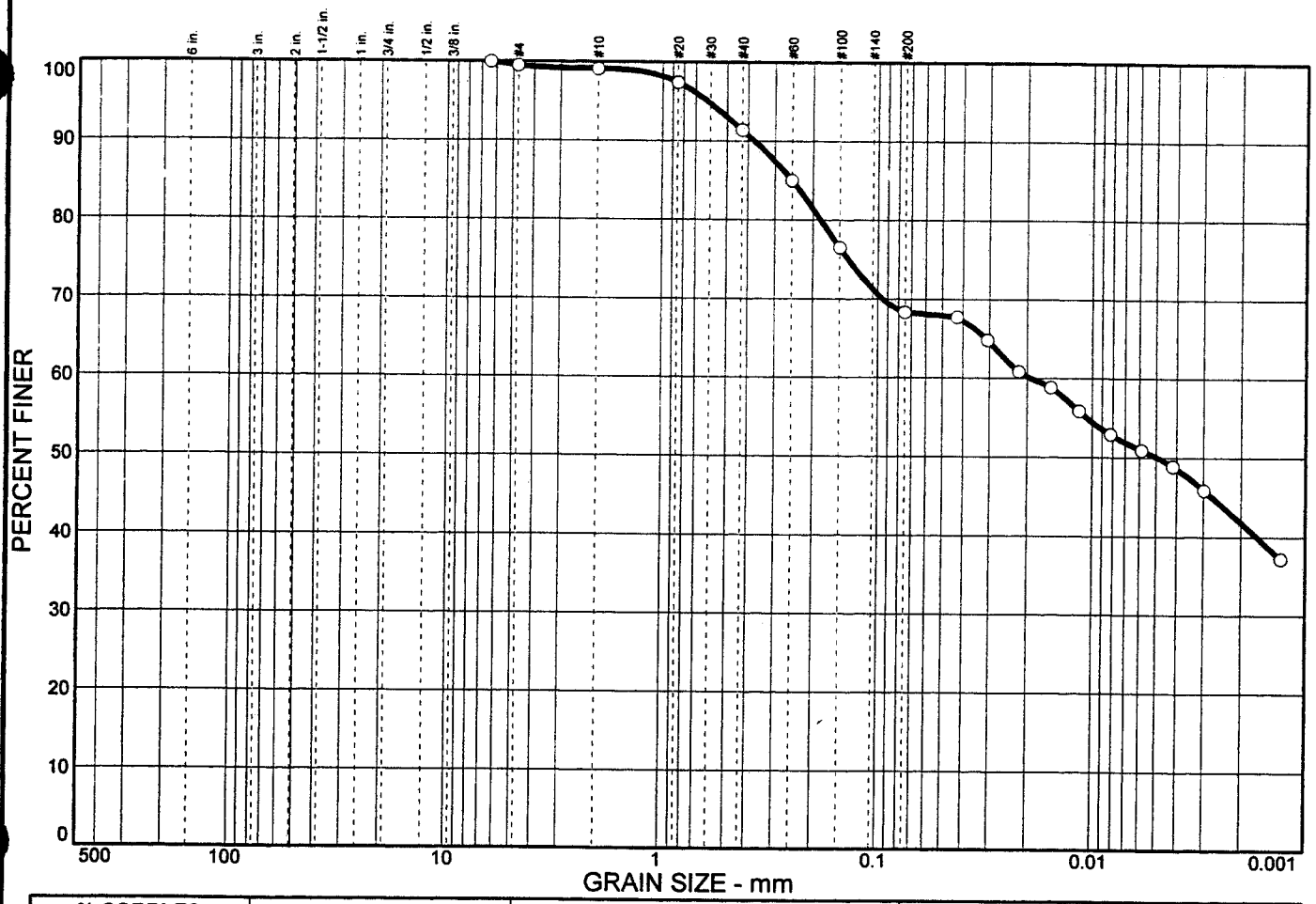
△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **4.0E-08** cm/sec

Respecfully submitted R. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.5	31.2	18.2	50.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.5		
#10	99.1		
#20	97.4		
#40	91.4		
#60	85.0		
#100	76.5		
#200	68.3		

* (no specification provided)

Soil Description

Roberts Pit - Sandy lean clay

Atterberg Limits

PL= 20 LL= 46 PI= 26

Coefficients

D_{85}= 0.250 D_{60}= 0.0195 D_{50}= 0.0049
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-098, Acre 7, Lift 3

Sample No.: DL-098 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 7, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 11/09/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
Roberts Clay Acre 8, Lift 3

RECEIVED
NOV 10 1998

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	11-07-98	Clay.022	Clay Cover Test Report Acre 8, Lift 3

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/07/98
Report No.: 022

Acre 8 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	99.4	22.8	98.9	Tube/Sample (DL-089)
2	See Test Location Plan	99.0	24.5	98.5	
3	See Test Location Plan	105.5	21.4	100+	
4	See Test Location Plan	103.8	21.2	100+	
5	See Test Location Plan	96.3	26.2	95.8	
6	See Test Location Plan	95.7	26.5	95.2	
7	See Test Location Plan	96.8	22.6	96.4	
8	See Test Location Plan	100.8	22.8	100+	
9	See Test Location Plan	100.2	21.8	99.7	
10	See Test Location Plan	101.1	22.0	100+	
11	See Test Location Plan	99.8	21.9	99.3	
12	See Test Location Plan	96.9	26.2	96.4	
13	See Test Location Plan	100.4	23.3	99.9	
14	See Test Location Plan	101.5	21.7	100+	
15	See Test Location Plan	96.8	23.1	96.3	
16	See Test Location Plan	102.1	21.9	100+	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	4.4x10(-8)
Dry Density (pcf)	98.2
Moisture Content (%)	26.8

Atterberg Limits (ASTM D4318)

PL	28
LL	63
PI	35
USCS Classification	CH

Grain-size Analysis (ASTM D422)

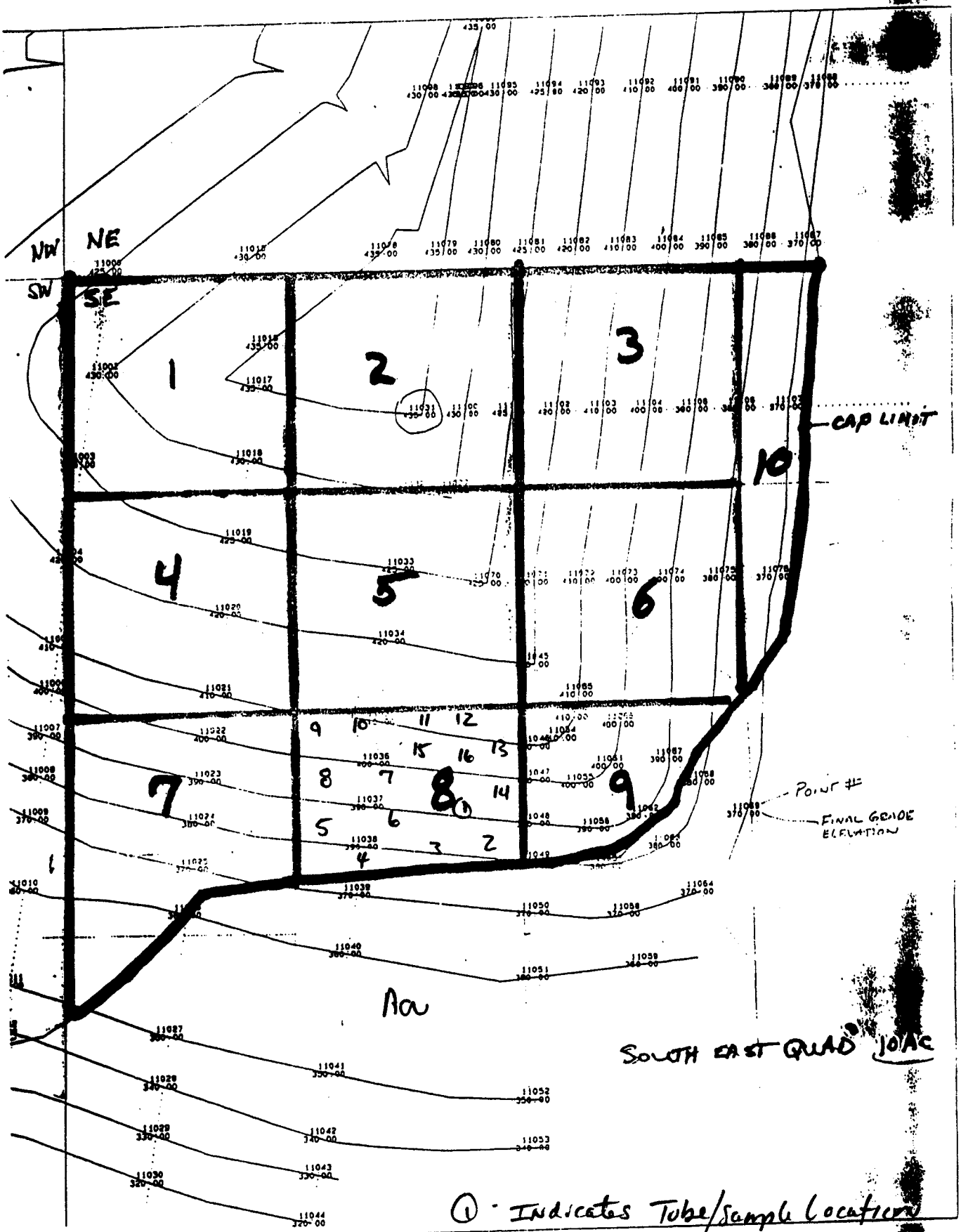
%Gravel	0.0
%Sand	27.7
%Silt	31.9
%Clay	40.4

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



① · Indicates Tube/Sample Location

Area 8, Lift 3

Report : 022

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date:	10/31/98
Report No.:	P-068

Project No.:	VNC-98-029	Project:	Durham Landfill Closure
Sample No.	DL-089	Client:	Gilbert Southern Corp.

Test Summary

Permeability	4.4E-08	cm/sec
% Moisture	26.8	%
Dry Density	98.2	pcf

Sample Information

Specimen Type:		Date Sampled:	10/23/98
Remolded		Location:	Acre 8, Lift 3
Tube	X		

Length (in):	3.447
Diameter (in.):	2.863
Area (sq. in.):	6.449
Volume (cu. in.):	22.23
Wet Weight (grams):	726.3
Dry Weight (grams):	572.8
Dry Density (pcf):	98.2

Moisture Content Test Data

Wet Weight	80.49
Dry Weight	68.14
Tare weight	22.03
% Moisture	26.8

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
328	83.08	0.80	1.00	1.25	0.90	4.59E-08
1120	83.08	2.70	2.65	0.98	2.68	4.00E-08
350	83.08	0.90	0.90	1.00	0.90	4.30E-08
303	83.08	0.80	0.90	1.13	0.85	4.69E-08

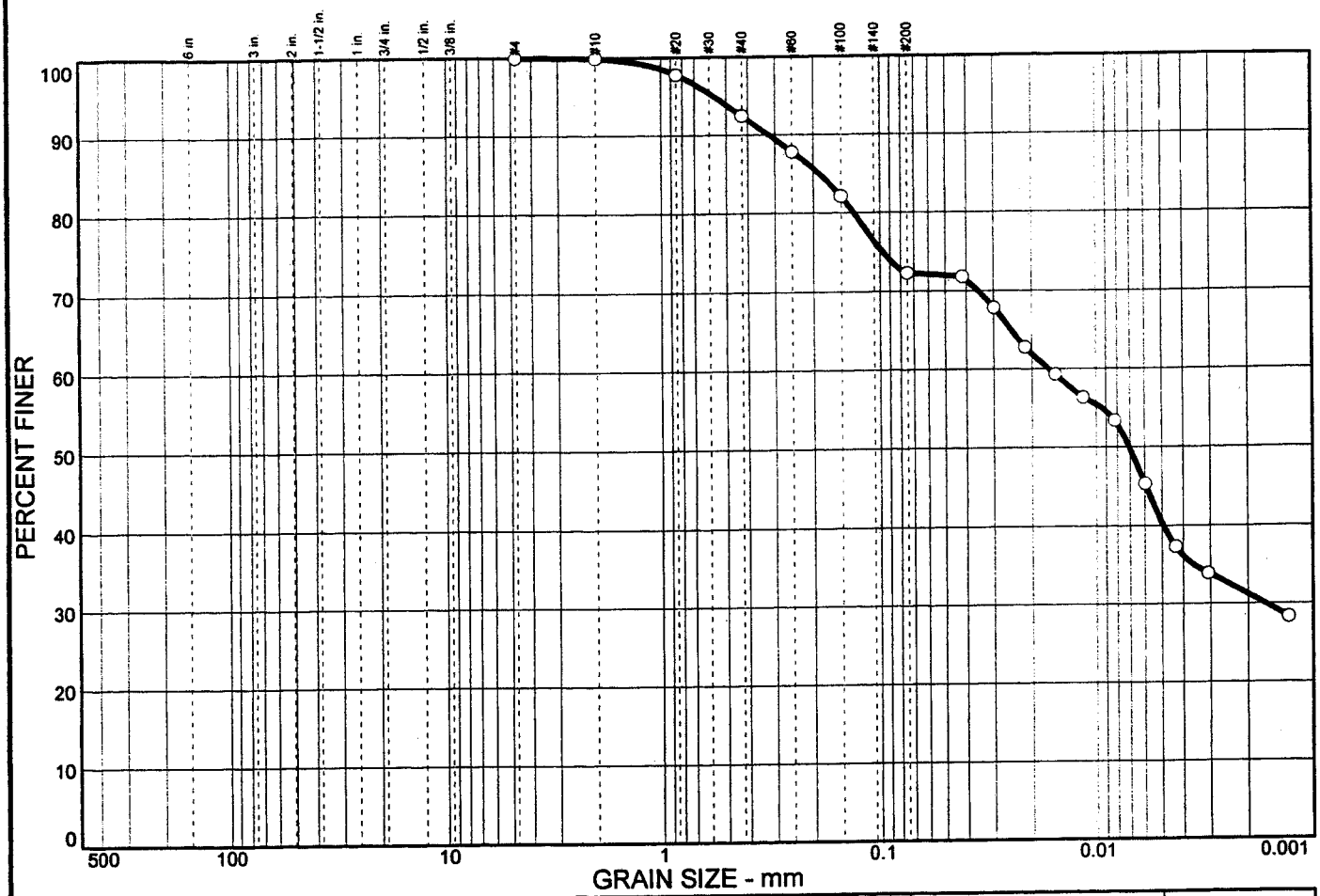
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **4.4E-08** cm/sec

Respecfully submitted R. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	27.7	31.9	40.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	97.8		
#40	92.5		
#60	87.8		
#100	82.1		
#200	72.3		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 28 LL= 63 PI= 35

Coefficients

D_{85}= 0.188 D_{60}= 0.0167 D_{50}= 0.0071
D_{30}= 0.0017 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-89, Sampled from In-situ Permeablity Test Location

Sample No.: DL-89 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 8, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 11/09/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
Roberts Clay Acre 9, Lift 3

RECEIVED
NOV 10 1998

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	11-05-98	Clay.023	Clay Cover Test Report Acre 9, Lift 3

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/05/98
Report No.: 023

Acre 9 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	103.8	21.6	100+	
2	See Test Location Plan	96.3	26.2	95.8	Tube/Sample (DL-090)
3	See Test Location Plan	100.2	21.3	99.7	
4	See Test Location Plan	102.9	23.2	100+	
5	See Test Location Plan	102.1	22.4	100+	
6	See Test Location Plan	99.2	22.1	98.7	
7	See Test Location Plan	96.8	23.1	96.3	
8	See Test Location Plan	100.4	23.3	99.9	
9	See Test Location Plan	102.3	21.1	100+	
10	See Test Location Plan	96.6	22.9	96.0 - 1 on	
11	See Test Location Plan	101.5	21.7	100+	
12	See Test Location Plan	98.4	22.6	97.9	
13	See Test Location Plan	99.2	24.1	98.7	
14	See Test Location Plan	96.6	23.1	96.0 - 1 on	
15	See Test Location Plan	102.7	21.6	100+	
16	See Test Location Plan	97.7	24.0	97.2	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	2.9x10(-8)
Dry Density (pcf)	98.0
Moisture Content (%)	25.2

Atterberg Limits (ASTM D4318)

PL	23
LL	71
PI	48
USCS Classification	CH

Grain-size Analysis (ASTM D422)

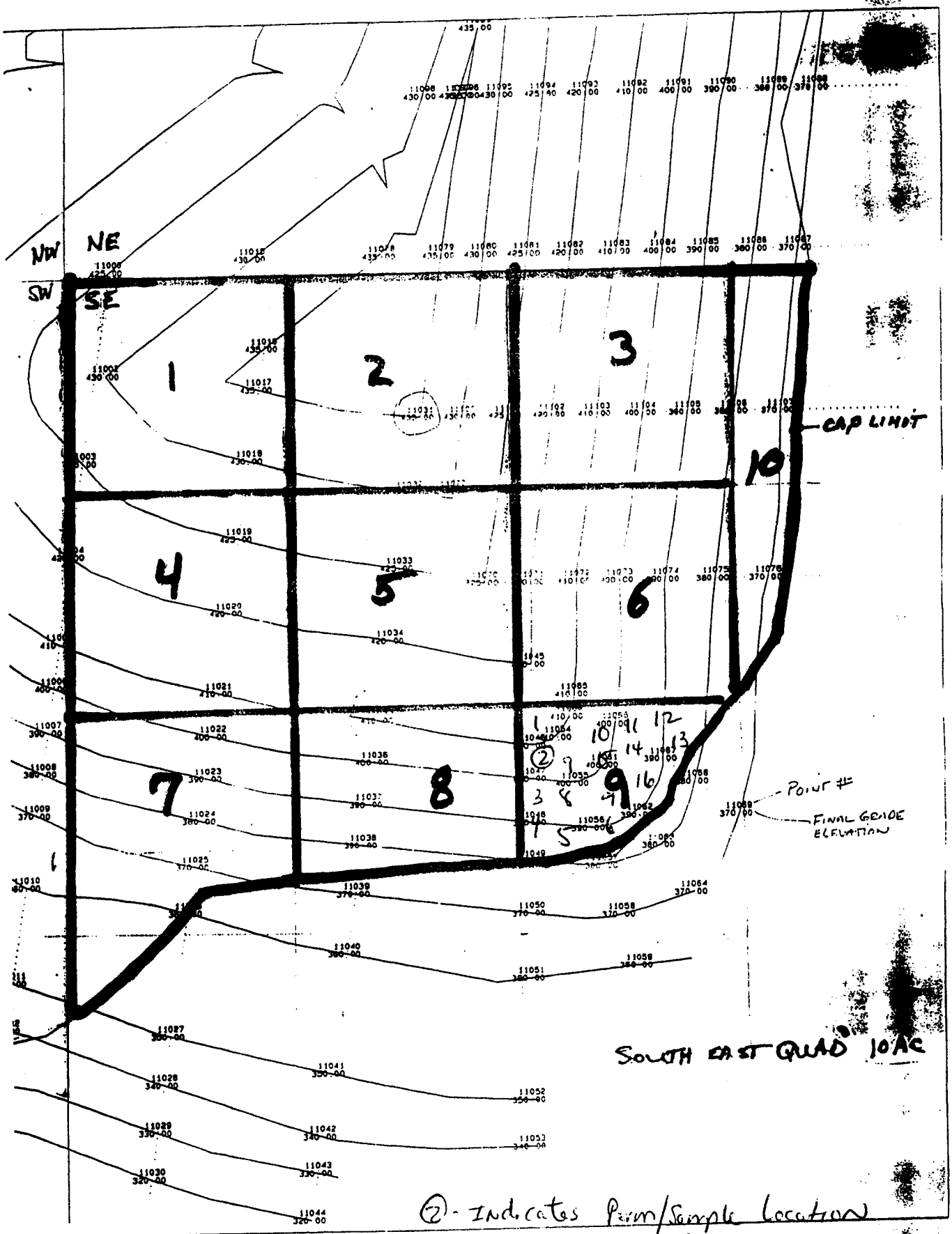
%Gravel	0.0
%Sand	19.5
%Silt	28.3
%Clay	52.2

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



② - Indicates Perm/Sample Location

Acre 9, Lift 3

Report : 023

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date:	10/31/98
Report No.:	P-069

Project No.:	VNC-98-029	Project:	Durham Landfill Closure
Sample No.	DL-090	Client:	Gilbert Southern Corp.

Test Summary

Permeability	2.9E-08	cm/sec
% Moisture	25.2	%
Dry Density	98.0	pcf

Sample Information

Specimen Type:		Date Sampled:	10/23/98
Remolded		Location:	Acre 9, Lift 3
Tube	X		

Length (in):	3.032
Diameter (in.):	2.859
Area (sq. in.):	6.431
Volume (cu. in.):	19.50
Wet Weight (grams):	627.7
Dry Weight (grams):	501.4
Dry Density (pcf):	98.0

Moisture Content Test Data

Wet Weight	95.44
Dry Weight	80.69
Tare weight	22.12
% Moisture	25.2

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
307	83.08	0.70	0.65	0.93	0.68	3.24E-08
1109	83.08	2.40	2.30	0.96	2.35	3.13E-08
289	83.08	0.50	0.50	1.00	0.50	2.55E-08
462	83.08	0.80	0.80	1.00	0.80	2.55E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

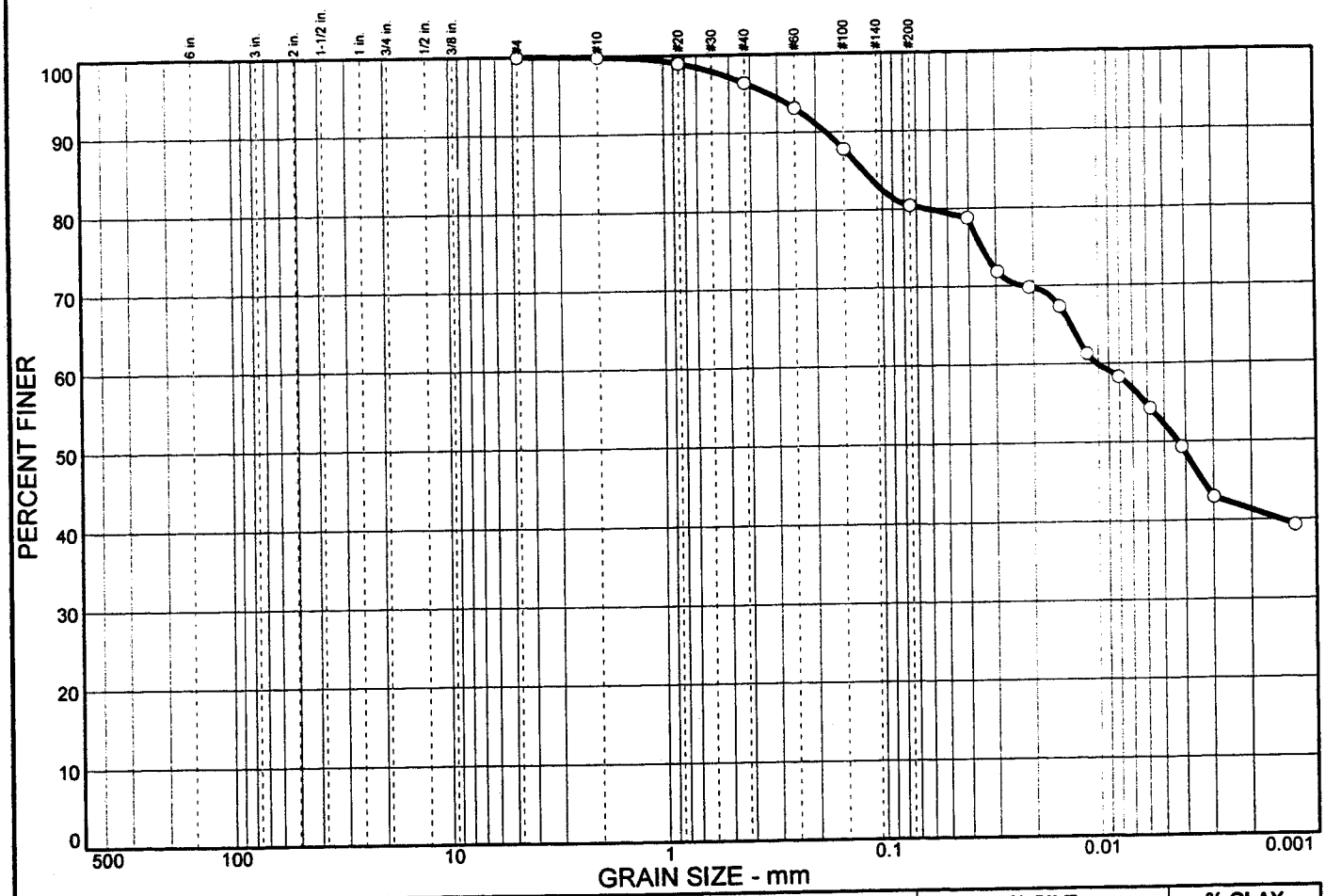
Permeability (k) **2.9E-08** cm/sec

Respecfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-0460

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	19.5	28.3	52.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.0		
#40	96.4		
#60	93.1		
#100	87.8		
#200	80.5		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 23 LL= 71 PI= 48

Coefficients

D_{85}= 0.122 D_{60}= 0.0102 D_{50}= 0.0043
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-90, Sampled from In-situ Permeablity Test Location

Sample No.: DL-90 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 9, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

VAN DER HORST

CLAY COVER TESTING

RECEIVED NOV 12 1998

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/07/98
Report No.: 026

Acre 10 Lift 3
Clay Source: Roberts Borrow Pit
ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture
Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	103.5	21.3	100+	
2	See Test Location Plan	96.1	22.3	95.6	
3	See Test Location Plan	97.1	22.4	96.6	
4	See Test Location Plan	102.0	23.0	100+	
5	See Test Location Plan	99.2	24.1	98.7	
6	See Test Location Plan	96.6	23.1	96.0	
7	See Test Location Plan	102.7	21.2	100+	
8	See Test Location Plan	100.2	21.6	99.7	
9	See Test Location Plan	97.7	24.0	97.2	Tube/Sample (DL-093)
10	See Test Location Plan	98.1	23.1	97.6	
11	See Test Location Plan	95.8	23.6	95.3	
12	See Test Location Plan	99.4	22.4	98.9	
13	See Test Location Plan	97.5	23.5	97.0	
14	See Test Location Plan	101.2	22.2	100+	
15	See Test Location Plan	100.6	22.4	100+	
16	See Test Location Plan	102.1	21.3	100+	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	3.8x10(-8)
Dry Density (pcf)	98.0
Moisture Content (%)	23.5

Atterberg Limits (ASTM D4318)

PL	24
LL	62
PI	38
USCS Classification	CH

Grain-size Analysis (ASTM D422)

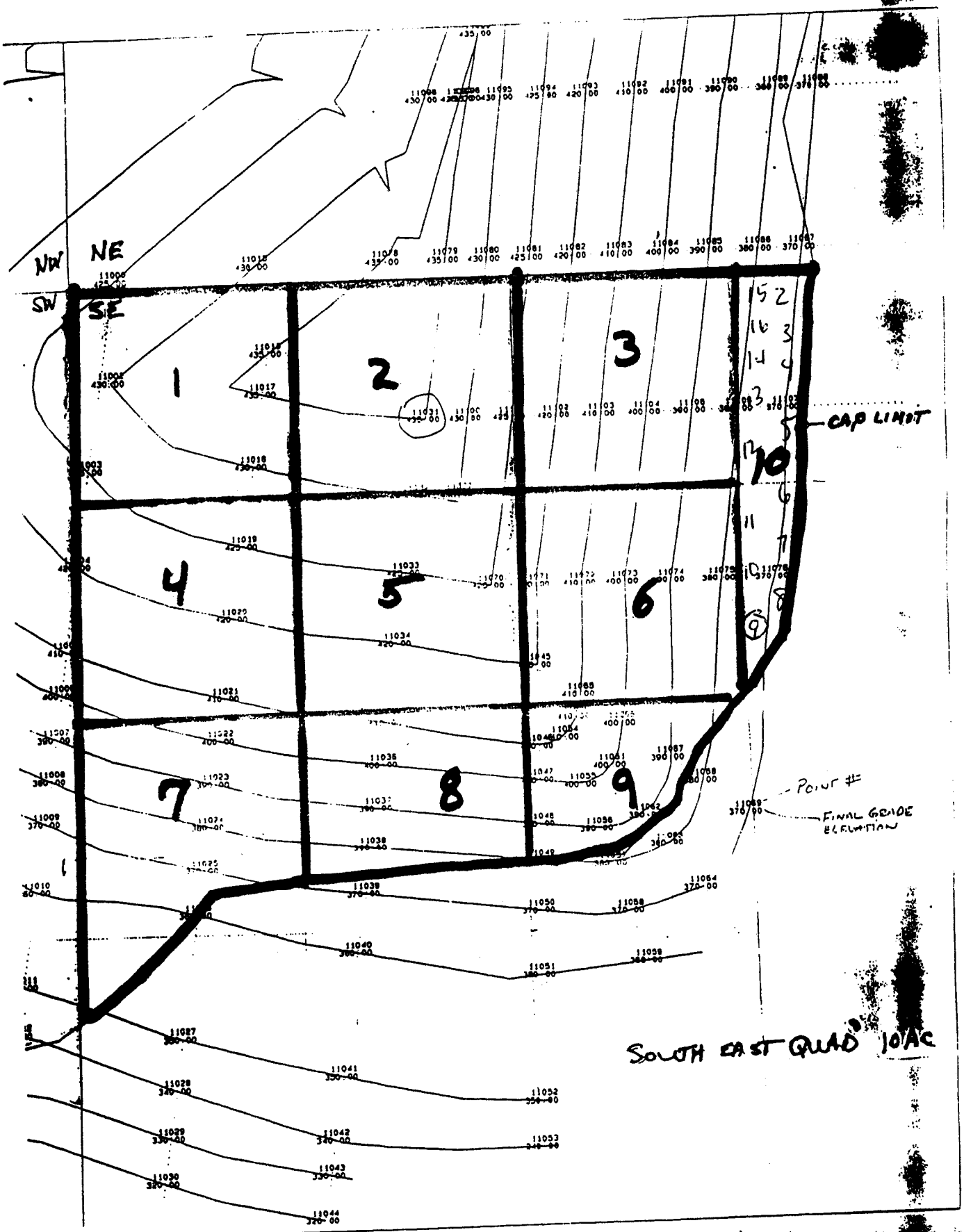
%Gravel	0.0
%Sand	21.9
%Silt	28.7
%Clay	4943

Sincerely,
VAN DER HORST Geotechnical Engineering, P.A.

Robert L. Mashewske, P.E.

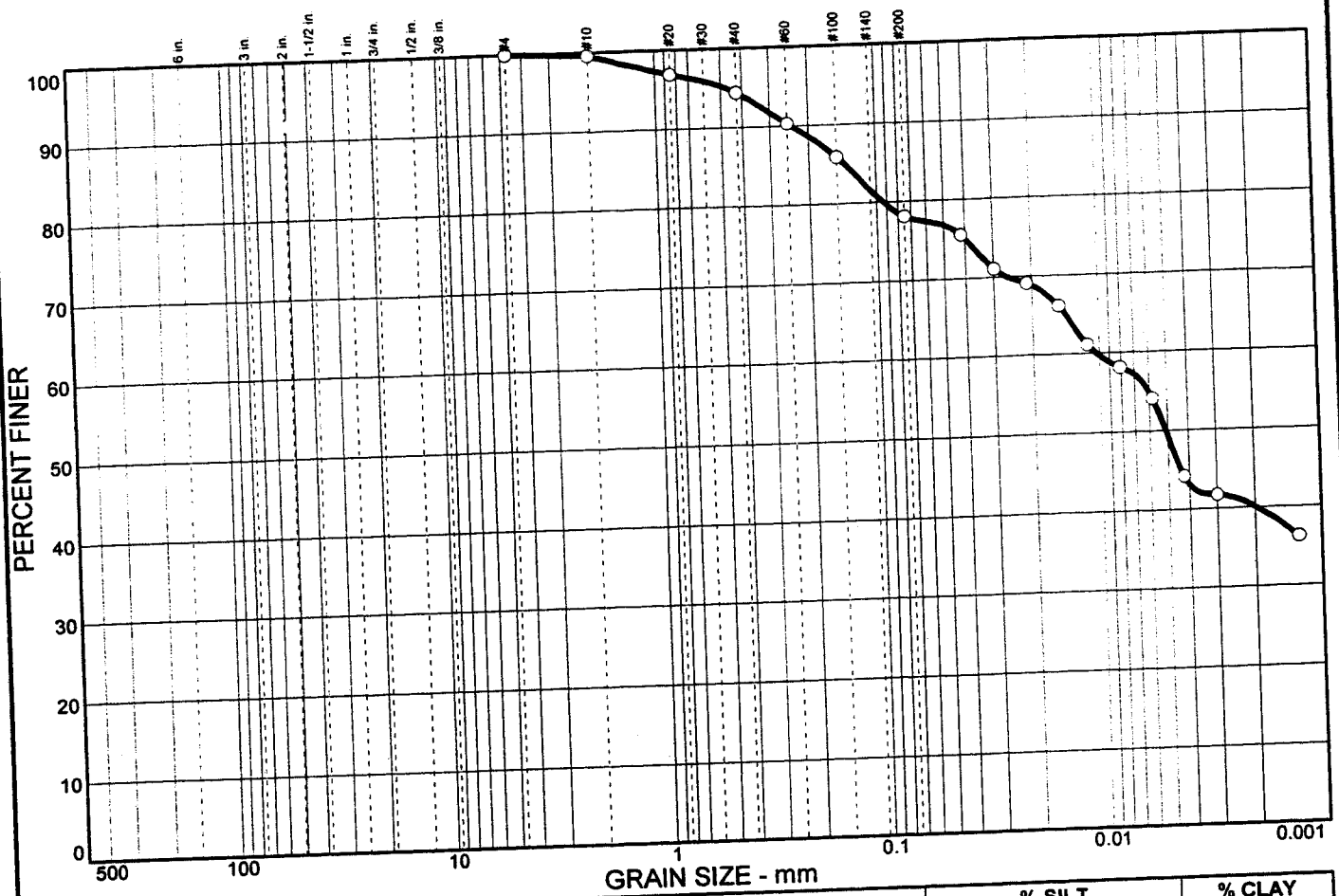
NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(9) Indicates Perm/Sample Location
Acre 10, Lift 3
Report: 026

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	21.9	28.7	49.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#20	96.9		
#40	94.4		
#60	90.3		
#100	85.9		
#200	78.1		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 24 LL= 62 PI= 38

Coefficients

D_{85}= 0.139 D_{60}= 0.0103 D_{50}= 0.0051
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-093, Sampled from In-situ Permeablity Test Location

Sample No.: DL-93 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 10, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029

Plate

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/01/98
Report No.: P-078

Project No.: VNC-98-029
Sample No. DL-093

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.8E-08	cm/sec
% Moisture	23.5	%
Dry Density	98.0	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 10/23/98
Location: Acre 10, Lift 3

Length (in):	3.501
Diameter (in.):	2.851
Area (sq. in.):	6.395
Volume (cu. in.):	22.39
Wet Weight (grams):	711.3
Dry Weight (grams):	575.9
Dry Density (pcf):	98.0

Moisture Content Test Data

Wet Weight	120.55
Dry Weight	101.79
Tare weight	21.98
% Moisture	23.5

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1036	88.62	2.30	2.70	1.17	2.50	3.88E-08
317	88.62	0.70	0.80	1.14	0.75	3.80E-08
615	88.62	1.40	1.40	1.00	1.40	3.66E-08
243	88.62	0.55	0.60	1.09	0.58	3.80E-08

△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **3.8E-08** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

RECEIVED
NOV 12 1998

DATE: 11/09/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
Roberts Clay Acre 10, Lift 3

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	11-07-98	Clay.026	Clay Cover Test Report Acre 10, Lift 3

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/19/98
Report No.: 052

Acre 11 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	99.4	22.0	98.9	
2	See Test Location Plan	95.6	26.8	95.1	
3	See Test Location Plan	98.4	25.1	97.9	
4	See Test Location Plan	97.9	25.4	97.4	Tube/Sample (DL-158)
5	See Test Location Plan	95.5	25.6	95.0	
6	See Test Location Plan	97.1	23.1	96.6	
7	See Test Location Plan	99.8	23.6	99.3	
8	See Test Location Plan	95.8	24.8	95.3	
9	See Test Location Plan	96.4	25.4	95.9	
10	See Test Location Plan	96.5	23.7	96.0	
11	See Test Location Plan	100.2	23.9	99.7	
12	See Test Location Plan	95.8	27.0	95.3	
13	See Test Location Plan	97.4	23.6	96.9	
14	See Test Location Plan	98.9	24.1	98.4	
15	See Test Location Plan	99.2	24.6	98.7	
16	See Test Location Plan	96.9	24.5	96.5	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	4.6 x 10(-8)
Dry Density (pcf)	98.6
Moisture Content (%)	23.3

Atterberg Limits (ASTM D4318)

PL	29
LL	67
PI	38
USCS Classification	CH

Grain-size Analysis (ASTM D422)

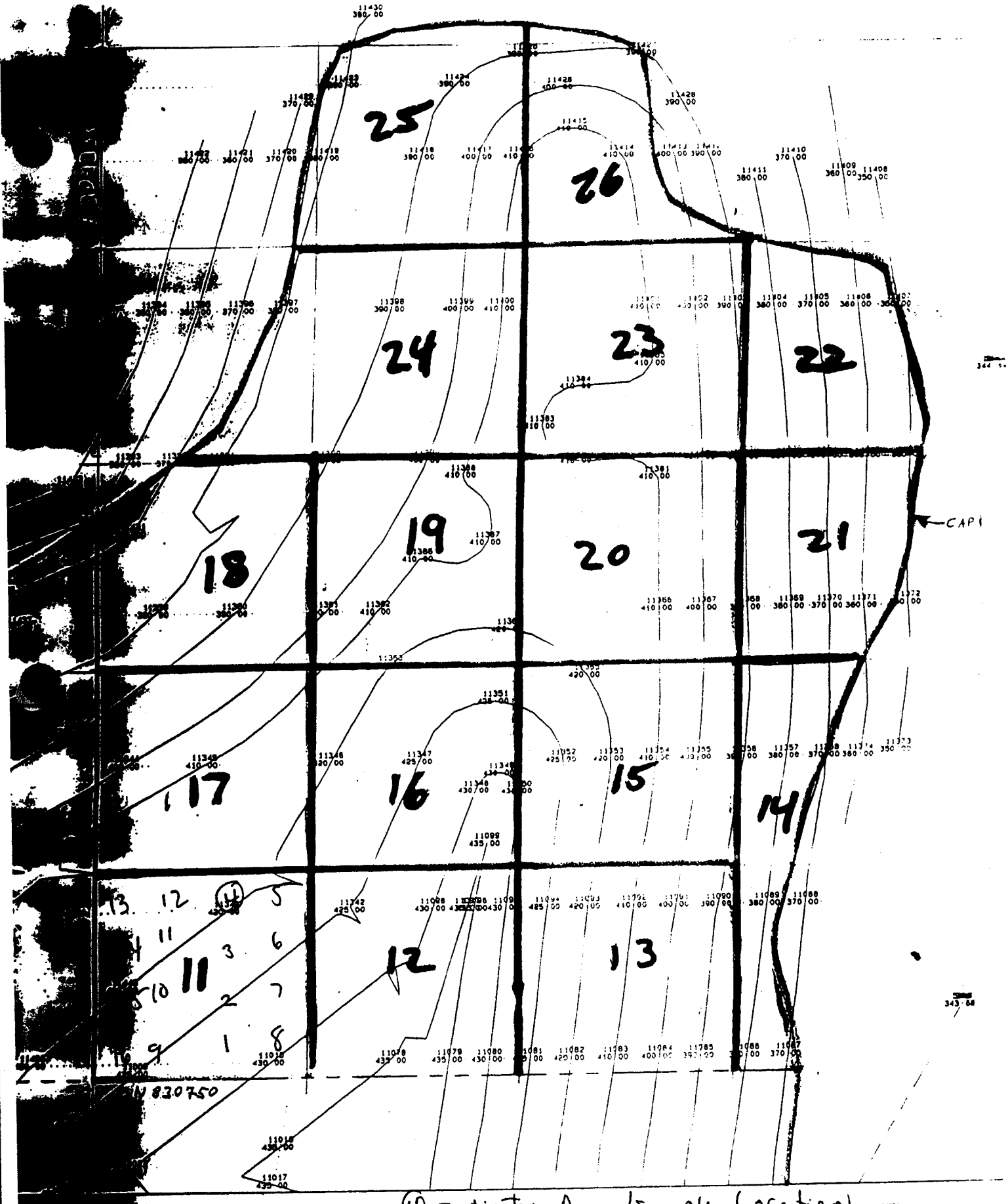
%Gravel	0.6
%Sand	31.5
%Silt	20.0
%Clay	47.9

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

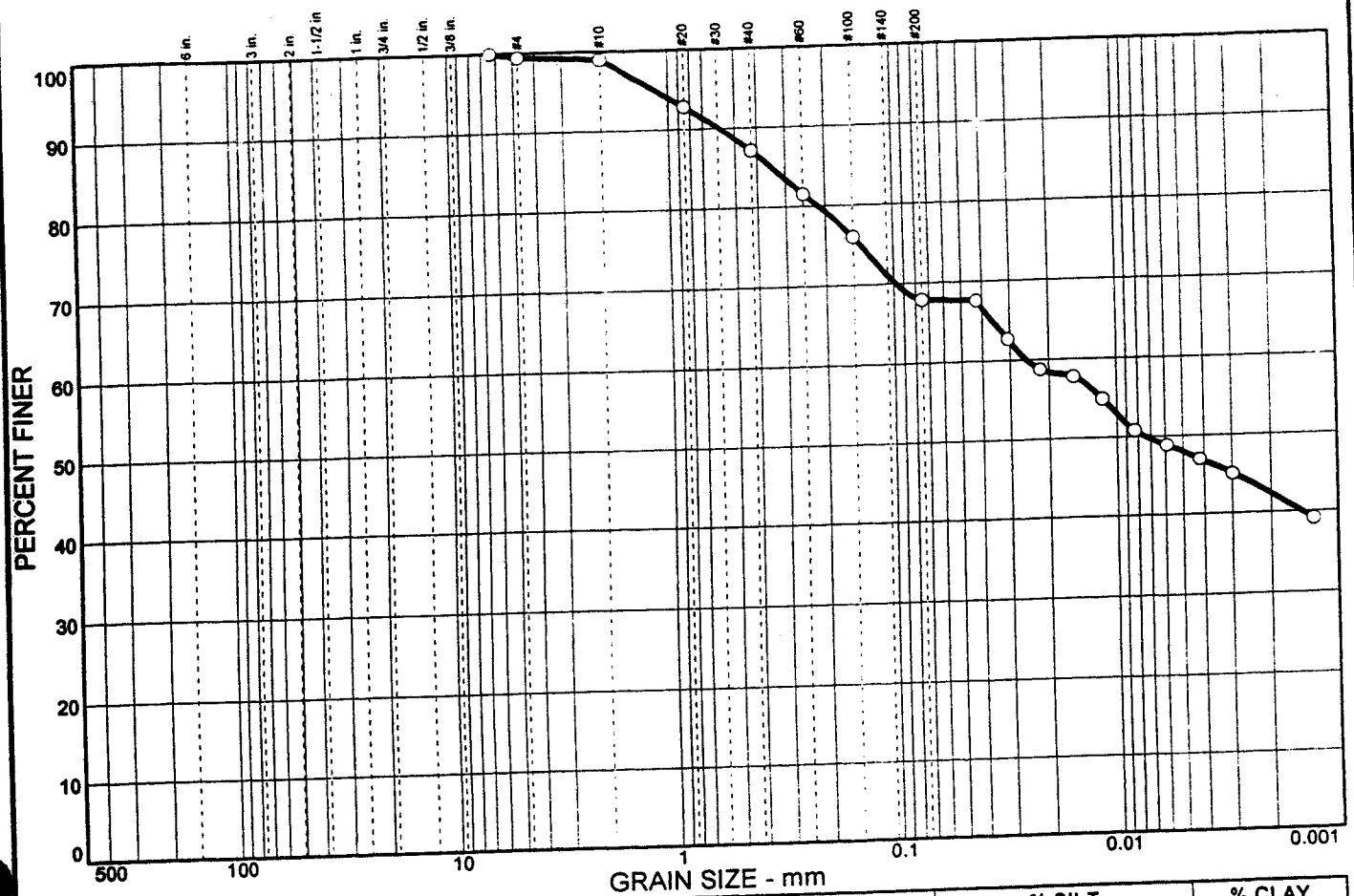
NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



④ - Indicates Perm/Sample Location
Acre 11, Lift 3
Report: 052

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.6	31.5	20.0	47.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.4		
#10	99.0		
#20	92.8		
#40	87.1		
#60	81.5		
#100	76.0		
#200	67.9		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 29 LL= 67 PI= 38

Coefficients

D_{85}= 0.347 D_{60}= 0.0253 D_{50}= 0.0074
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-158, Acre 11, Lift 3

Sample No.: DL-158 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 11, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/19/98
Report No.: P-120

Project No.: VNC-98-029
Sample No. DL-158

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.6E-08	cm/sec
% Moisture	23.3	%
Dry Density	98.6	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/07/98
Location: ACRE 11, LIFT 3

Specimen Data

Length (in):	3.438
Diameter (in.):	2.851
Area (sq. in.):	6.395
Volume (cu. in.):	21.99
Wet Weight (grams):	701.4
Dry Weight (grams):	568.8
Dry Density (pcf):	98.6

Moisture Content Test Data

Wet Weight	123.24
Dry Weight	104.11
Tare weight	22.01
% Moisture	23.3

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
316	110.77	1.10	1.20	1.09	1.15	4.59E-08
648	110.77	2.50	2.40	0.96	2.45	4.77E-08
356	110.77	1.00	1.10	1.10	1.05	3.72E-08
419	110.77	1.60	1.80	1.13	1.70	5.12E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **4.6E-08** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/23/98
Report No.: 068

Acre 12 Lift 3
Clay Source: Roberts Borrow Pit
ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture
Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	95.7	23.5	95.2	
2	See Test Location Plan	96.2	22.0	95.7	
3	See Test Location Plan	102.2	22.5	100+	
4	See Test Location Plan	100.1	22.6	99.6	
5	See Test Location Plan	95.8	23.5	95.3	
6	See Test Location Plan	97.8	26.0	97.3	
7	See Test Location Plan	98.5	22.4	98.0	Perm/Sample (DL-127)
8	See Test Location Plan	100.8	22.3	100+	
9	See Test Location Plan	100.2	21.8	99.7	
10	See Test Location Plan	99.8	22.4	99.3	
11	See Test Location Plan	97.4	24.1	96.9	
12	See Test Location Plan	97.8	23.6	97.3	
13	See Test Location Plan	98.2	22.0	97.7	
14	See Test Location Plan	96.9	22.9	96.4	
15	See Test Location Plan	97.3	23.1	96.8	
16	See Test Location Plan	96.2	24.0	95.7	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	4.3 x 10(-8)
Dry Density (pcf)	101.7
Moisture Content (%)	22.4

Atterberg Limits (ASTM D4318)

PL	26
LL	77
PI	51
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	21.1
%Silt	23.2
%Clay	55.7

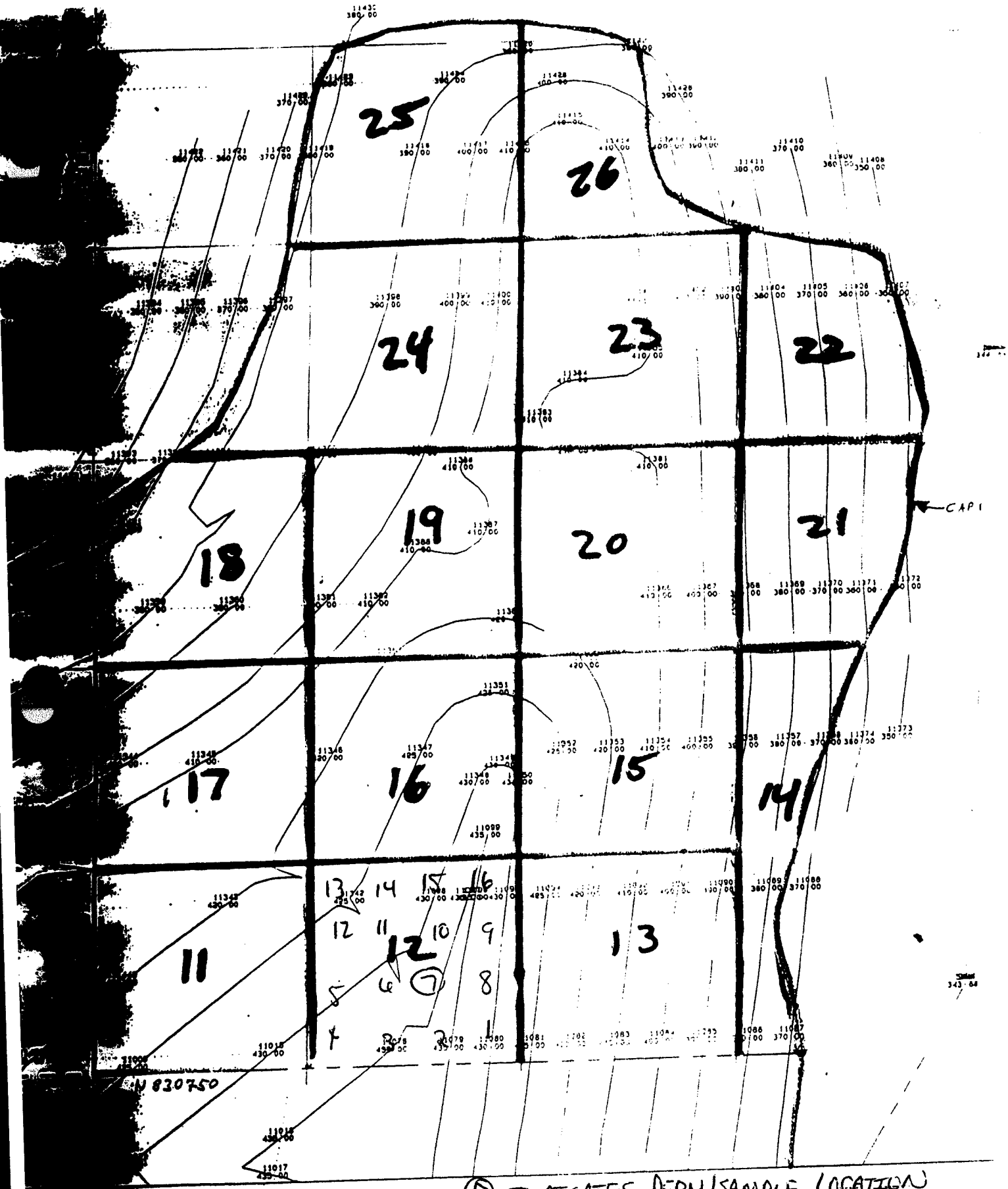
Sincerely,
VAN DER HORST Geotechnical Engineering PSC

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(7) - INDICATES PERM/SAMPLE LOCATION
ACRE 12, 4ft 3
Report: 067

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/24/98
Report No.: P-98

Project No.: VNC-98-029
Sample No.: DL-127

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.3E-008	cm/sec
% Moisture	22.4	%
Dry Density	101.7	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/30/98
Location: Acre 12, Lift 3

Length (in):	3.354
Diameter (in.):	2.840
Area (sq. in.):	6.346
Volume (cu. in.):	21.28
Wet Weight (grams):	685.0
Dry Weight (grams):	568.1
Dry Density (pcf):	101.7

Moisture Content Test Data

Wet Weight	143.98
Dry Weight	121.65
Tare weight	21.85
% Moisture	22.4

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
342	83.10	1.00	0.95	0.95	0.98	4.71E-008
348	85.80	1.00	0.85	0.85	0.93	4.26E-008
565	85.80	1.65	1.30	0.79	1.48	4.18E-008
333	85.80	0.95	0.80	0.84	0.88	4.21E-008

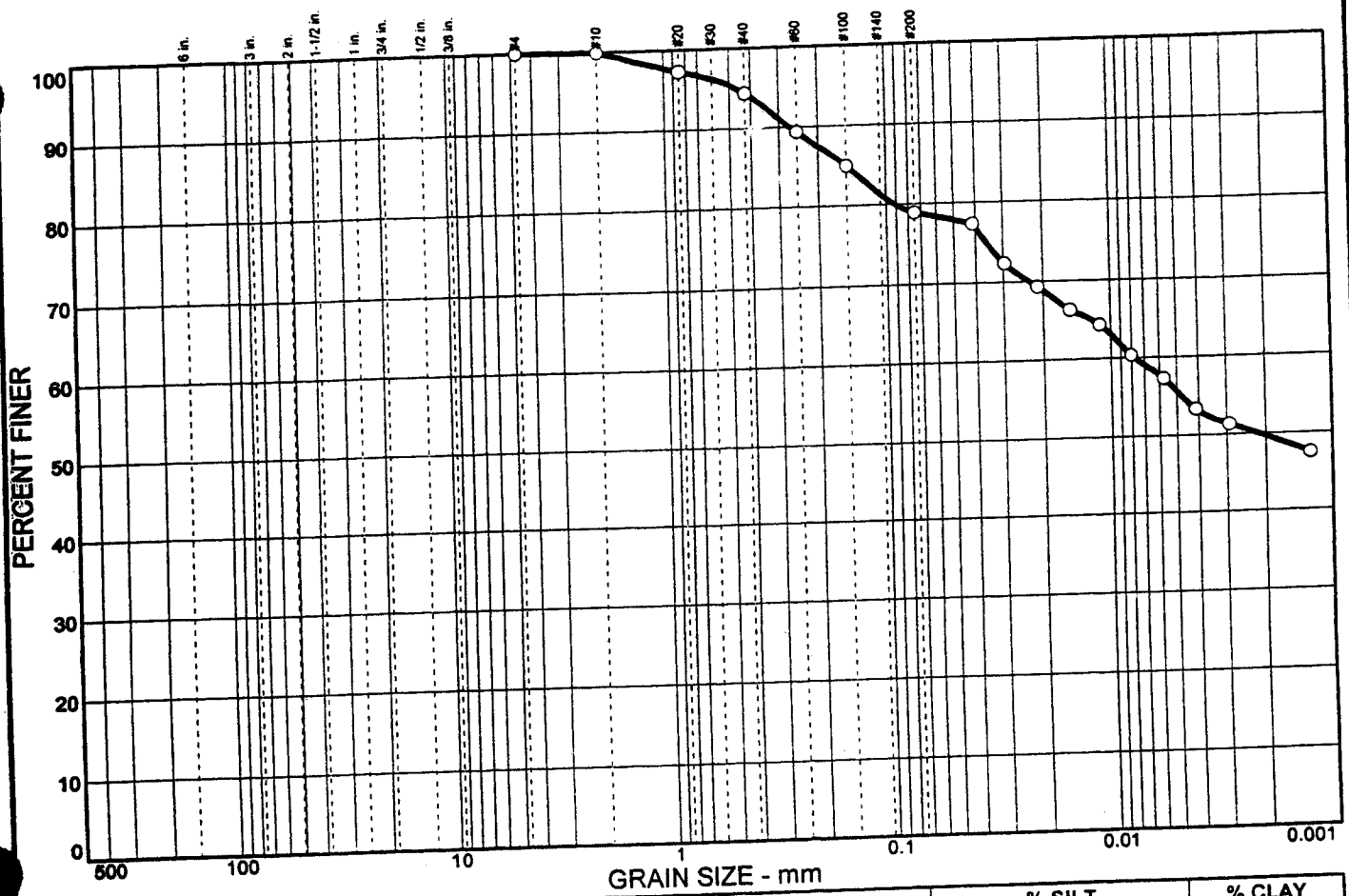
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **4.3E-008** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-0460

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	21.1	23.2	55.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	97.3		
#40	94.4		
#60	89.3		
#100	84.9		
#200	78.9		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 26 LL= 77 PI= 51

Coefficients

D_{85}= 0.152 D_{60}= 0.0078 D_{50}= 0.0022
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-127, Acre 12, Lift 3

Sample No.: DL-127 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 12, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 11/13/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
Roberts Clay Acre 13, Lift 3

RECEIVED
NOV 17 1998

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	11/13/98	Clay .040	Clay Cover Testing Acre 13, Lift 3
			Gilbert Southern
			11/17/98

REMARKS: Const. Testing
Technical

COPIES 2250
2250-9
32A

SIGNED: Dionne Boyd

CT-015
James Baier

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/13/98
Report No.: 040

Acre 13 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	98.5	26.3	98.0	
2	See Test Location Plan	95.8	26.3	95.4 3 02	
3	See Test Location Plan	96.2	26.4	95.8 7 02	
4	See Test Location Plan	97.1	25.6	96.6 6 02	
5	See Test Location Plan	96.1	26.7	95.6	
6	See Test Location Plan	99.9	26.1	99.4	
7	See Test Location Plan	100.5	26.8	100.0	
8	See Test Location Plan	99.6	25.4	99.1	
9	See Test Location Plan	96.3	24.6	95.8	Tube/Sample (DL-138)
10	See Test Location Plan	95.9	24.8	95.4	
11	See Test Location Plan	96.9	23.1	96.4	
12	See Test Location Plan	100.8	22.7	100+	
13	See Test Location Plan	96.8	22.0	96.3	
14	See Test Location Plan	99.2	22.9	98.7	
15	See Test Location Plan	95.8	24.1	95.3	
16	See Test Location Plan	96.2	25.5	95.7	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	6.1 x 10(-8)
Dry Density (pcf)	101.5
Moisture Content (%)	22.4

Atterberg Limits (ASTM D4318)

PL	27
LL	66
PI	39
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	1.6
%Sand	30.8
%Silt	22.8
%Clay	44.8

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.6	30.8	22.8	44.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	98.4		
#10	97.9		
#20	93.9		
#40	90.0		
#60	84.6		
#100	77.9		
#200	67.6		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 27 LL= 66 PI= 39

Coefficients

D_{85}= 0.259 D_{60}= 0.0259 D_{50}= 0.0075
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

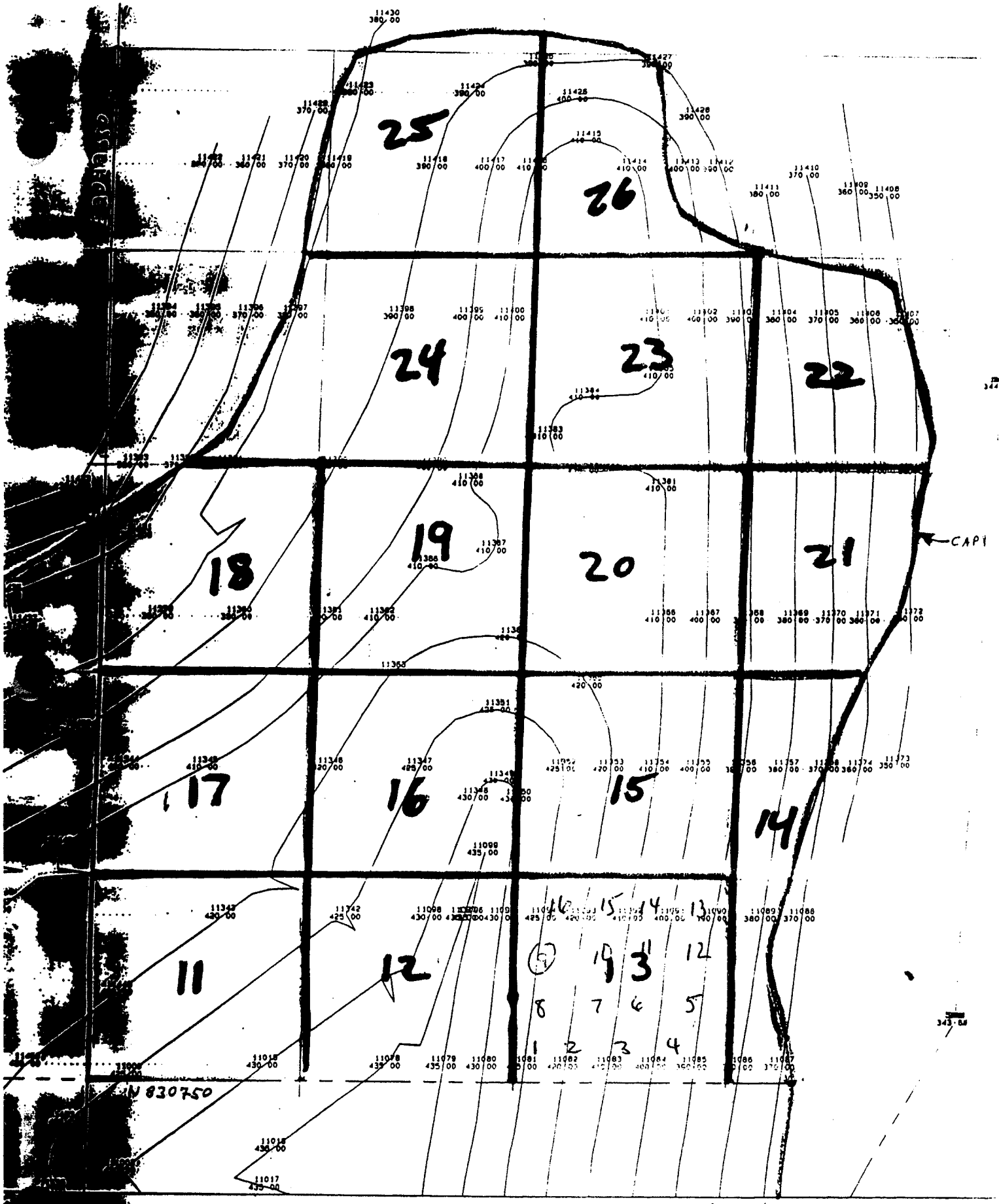
Remarks

DL-138, Acre 13, Lift 3

Sample No.: DL-138 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 13, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**



(9) Indicates Perm/Sample Location
Acre 13, Lift 3
Report: 040

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/09/98
Report No.: P-107

Project No.: VNC-98-029
Sample No. DL-138

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.1E-08	cm/sec
% Moisture	22.4	%
Dry Density	101.5	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/02/98
Location: Acre 13, Lift 3
Retest of DL-117

Length (in):	3.705
Diameter (in.):	2.840
Area (sq. in.):	6.346
Volume (cu. in.):	23.51
Wet Weight (grams):	767.2
Dry Weight (grams):	626.6
Dry Density (pcf):	101.5

Moisture Content Test Data

Wet Weight	99.37
Dry Weight	85.17
Tare weight	21.88
% Moisture	22.4

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
305	83.10	1.20	1.35	1.13	1.28	7.64E-08
238	91.38	0.90	1.00	1.11	0.95	6.63E-08
797	91.38	2.60	2.35	0.90	2.48	5.16E-08
240	83.08	0.70	0.65	0.93	0.68	5.14E-08

△ T — Change in time (minutes)
H — Driving head (inches)
Inflow (B) — Flow in (cubic centimeters)
Inflow (C) — Flow out (cubic centimeters)
Q — Flow (cubic centimeters)

Permeability (k) **6.1E-08** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 11/17/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
Roberts Clay Acre 14, Lift 3

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	11/16/98	Clay .046	Clay Cover Testing Acre 14, Lift 3

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/16/98
Report No.: 046

Acre 14 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	95.8	96.7	95.3	
2	See Test Location Plan	97.7	22.0	97.3 2	
3	See Test Location Plan	95.7	23.9	95.2	
4	See Test Location Plan	95.6	23.7	95.4 1	
5	See Test Location Plan	95.8	21.4	95.3	
6	See Test Location Plan	97.6	21.5	97.1	
7	See Test Location Plan	96.8	24.7	96.3	
8	See Test Location Plan	96.7	25.3	96.2	
9	See Test Location Plan	95.7	25.4	95.2	
10	See Test Location Plan	96.9	25.6	96.4	Sample/ Perm (DL-124)
11	See Test Location Plan	98.5	26.1	98.0	
12	See Test Location Plan	96.1	23.1	95.6	
13	See Test Location Plan	98.9	22.4	98.4	
14	See Test Location Plan	97.2	23.6	96.8 7	
15	See Test Location Plan	99.8	22.2	99.3	
16	See Test Location Plan	100.5	21.9	100.0	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	6.9 x 10 (-8)
Dry Density (pcf)	98.3
Moisture Content (%)	26.1

Atterberg Limits (ASTM D4318)

PL	27
LL	63
PI	36
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.9
%Sand	26.3
%Silt	20.9
%Clay	51.9

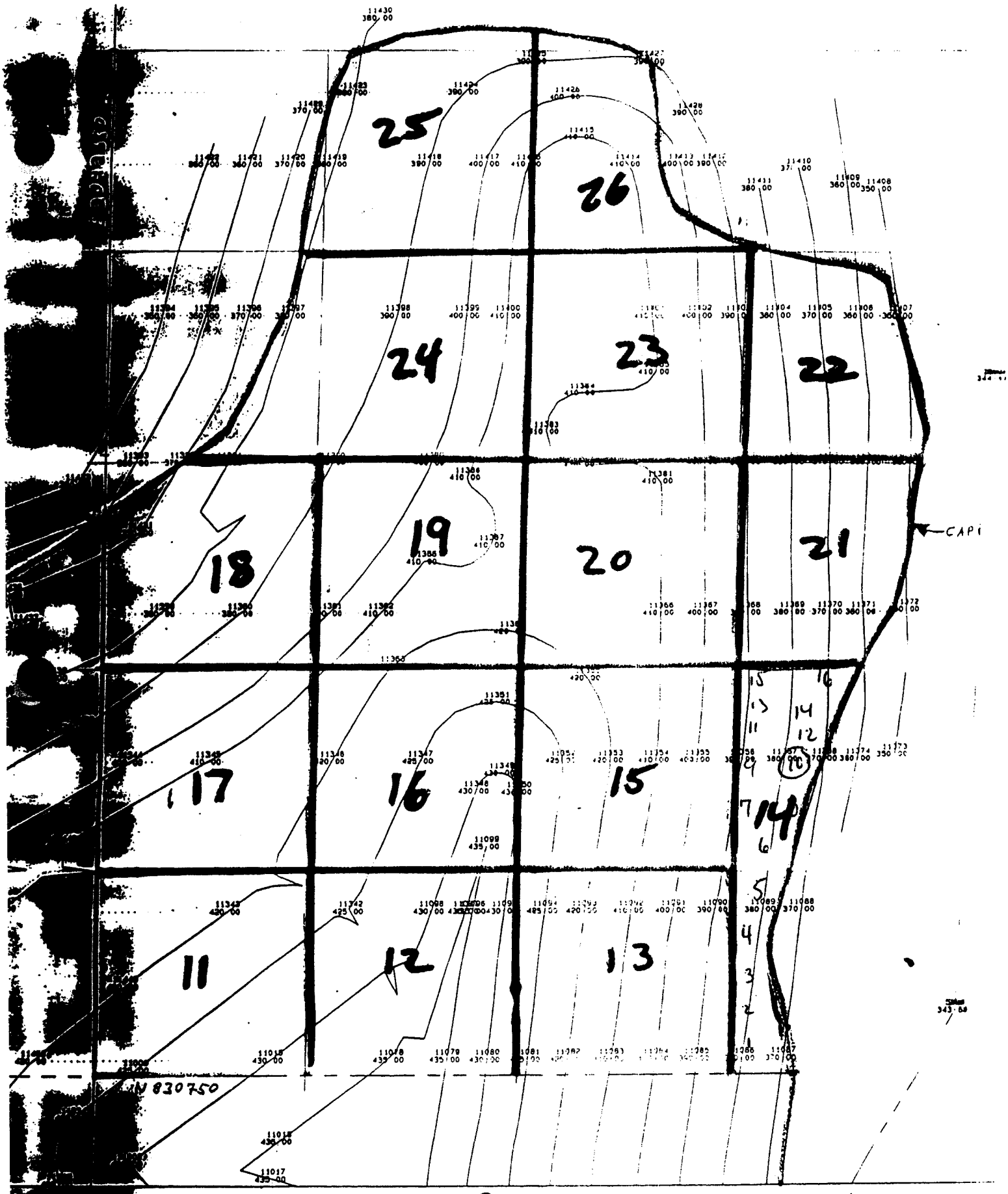
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(10) - Indicates Perm/Sample Location
Acre 14, Lift 3
Report: 046

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date:	11/09/98
Report No.:	P-096

Project No.:	VNC-98-029	Project:	Durham Landfill Closure
Sample No.	DL-124	Client:	Gilbert Southern Corp.

Test Summary

Permeability	6.9E-08	cm/sec
% Moisture	26.1	%
Dry Density	98.3	pcf

Sample Information

Specimen Type:		Date Sampled:	
Remolded		Location:	Acre 14, Lift 3
Tube	X		

Length (in):	3.076
Diameter (in.):	2.831
Area (sq. in.):	6.305
Volume (cu. in.):	19.40
Wet Weight (grams):	630.7
Dry Weight (grams):	500.2
Dry Density (pcf):	98.3

Moisture Content Test Data

Wet Weight	99.52
Dry Weight	83.49
Tare weight	22.02
% Moisture	26.1

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
236	83.10	1.10	1.15	1.05	1.13	7.28E-08
240	83.10	1.10	1.10	1.00	1.10	7.00E-08
105	83.10	0.50	0.45	0.90	0.48	6.90E-08
562	83.10	2.45	2.15	0.88	2.30	6.25E-08

△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **6.9E-08** cm/sec

Respecfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-0460

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 11/17/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
Roberts Clay Acre 15, Lift 3

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	11/16/98	Clay .047	Clay Cover Testing Acre 15, Lift 3

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/16/98
Report No.: 047

Acre 15 Lift 3
Clay Source: Roberts Borrow Pit
ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture
Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	98.2	22.8	97.7	
2	See Test Location Plan	98.0	22.8	97.5	
3	See Test Location Plan	97.4	21.0	96.9	
4	See Test Location Plan	96.2	24.5	95.7	
5	See Test Location Plan	98.2	24.0	97.7	
6	See Test Location Plan	98.6	22.2	98.1	
7	See Test Location Plan	99.1	21.7	98.6	
8	See Test Location Plan	96.5	21.6	96.0	
9	See Test Location Plan	97.5	23.2	97.0	Perm/ Sample (DL-160)
10	See Test Location Plan	96.2	25.5	95.7	
11	See Test Location Plan	97.1	22.0	96.6	
12	See Test Location Plan	99.0	21.9	98.5	
13	See Test Location Plan	101.2	23.1	100+	
14	See Test Location Plan	103.4	21.2	100+	
15	See Test Location Plan	97.8	24.7	97.3	
16	See Test Location Plan	99.4	25.3	98.9	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	4.9 x 10(-8)
Dry Density (pcf)	96.5
Moisture Content (%)	24.8

Atterberg Limits (ASTM D4318)

PL	29
LL	71
PI	42
USCS Classification	CH

Grain-size Analysis (ASTM D422)

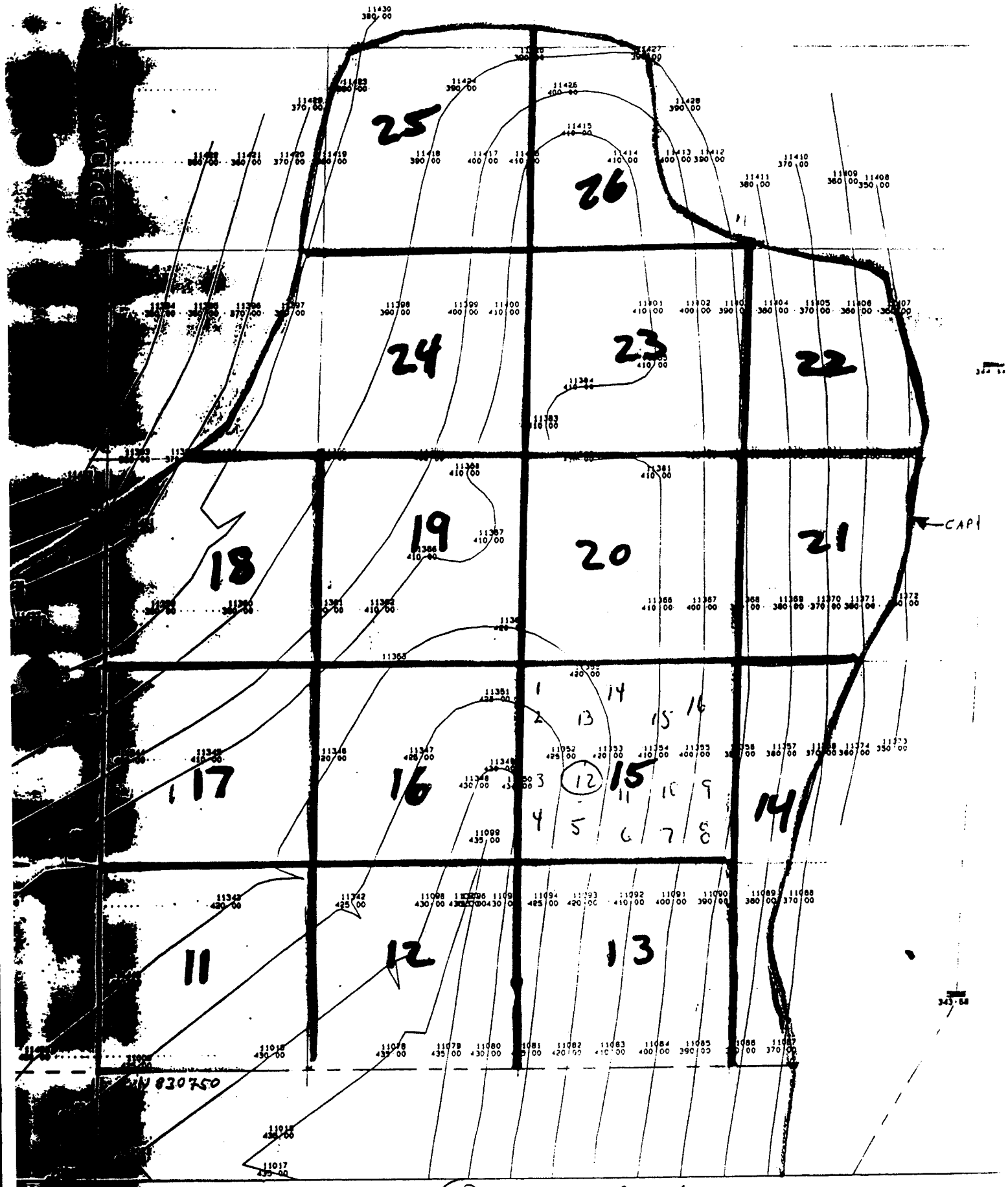
%Gravel	0.1
%Sand	27.5
%Silt	19.7
%Clay	52.7

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(12) - Indicates Perm/Sample Location

Acre 15, Cft 3

Report: 047

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/16/98
Report No.: P-112

Project No.: VNC-98-029
Sample No. DL-160

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.9E-08	cm/sec
% Moisture	24.8	%
Dry Density	96.5	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/06/98
Location: Acre 15, Lift 3
Retest of DL-125, DL-139

Length (in):	3.823
Diameter (in.):	2.860
Area (sq. in.):	6.435
Volume (cu. in.):	24.60
Wet Weight (grams):	777.8
Dry Weight (grams):	623.1
Dry Density (pcf):	96.5

Moisture Content Test Data

Wet Weight	103.06
Dry Weight	85.59
Tare weight	15.21
% Moisture	24.8

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
255	77.54	0.65	0.80	1.23	0.73	5.66E-08
887	77.54	2.35	2.20	0.94	2.28	5.11E-08
260	77.54	0.60	0.55	0.92	0.58	4.41E-08
1134	77.54	2.70	2.30	0.85	2.50	4.39E-08

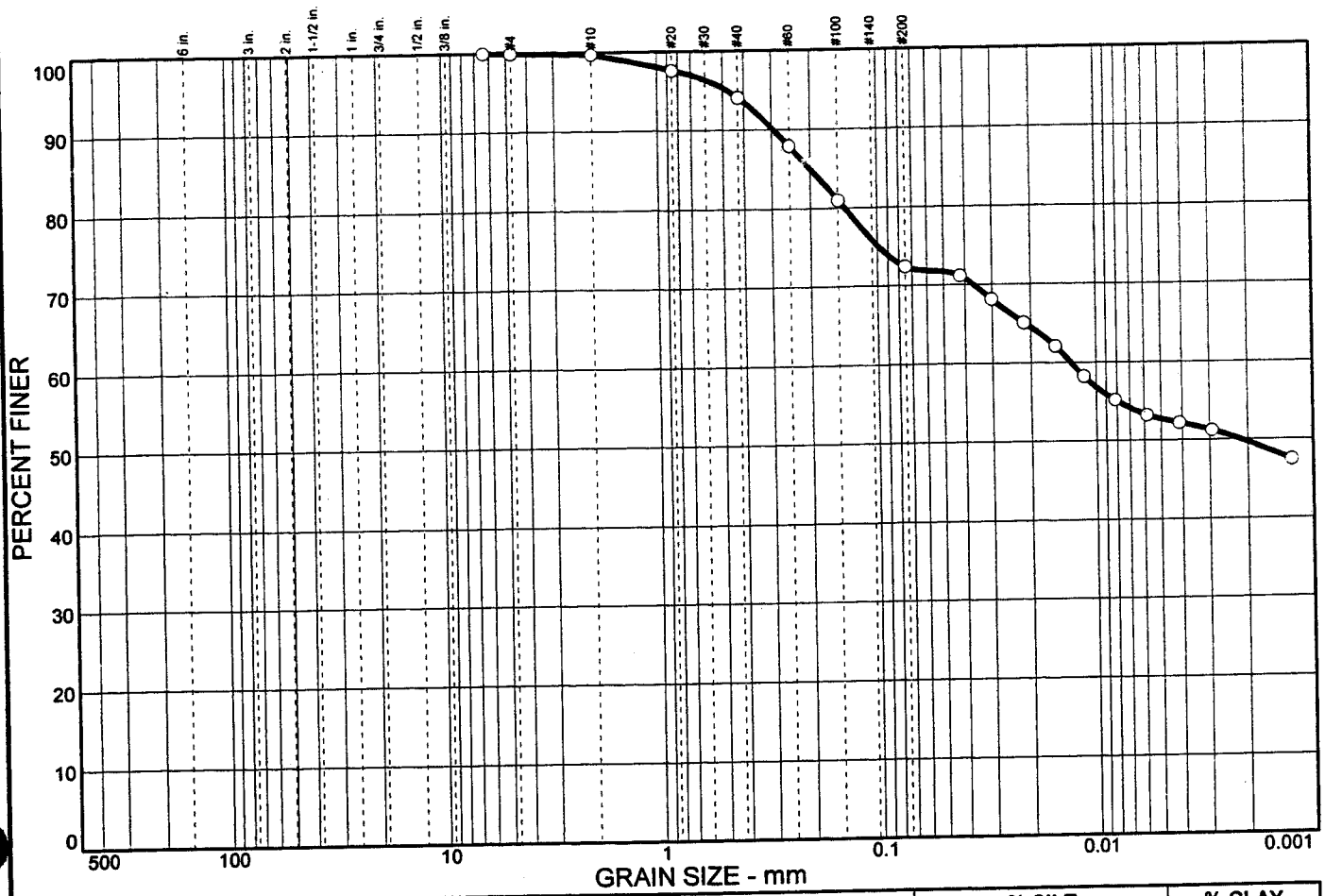
△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **4.9E-08** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	27.5	19.7	52.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.7		
#20	97.6		
#40	94.1		
#60	87.9		
#100	81.0		
#200	72.4		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 29 LL= 71 PI= 42

Coefficients

D_{85}= 0.200 D_{60}= 0.0131 D_{50}= 0.0022
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-160, Acre 15, Lift 3

Sample No.: DL-160 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 15, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/23/98
Report No.: 067

Acre 16 Lift 3
Clay Source: Roberts Borrow Pit
ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture
Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	100.3	21.5	99.8	
2	See Test Location Plan	104.1	21.0	100+	
3	See Test Location Plan	95.7	25.7	95.2	
4	See Test Location Plan	95.5	24.9	95.0	
5	See Test Location Plan	99.4	23.0	98.9	
6	See Test Location Plan	100.1	25.9	99.6	
7	See Test Location Plan	97.8	22.8	97.3	
8	See Test Location Plan	99.0	24.2	98.5	
9	See Test Location Plan	98.4	22.8	97.9	
10	See Test Location Plan	98.6	24.8	98.1	Perm/Sample (DL-135)
11	See Test Location Plan	99.7	21.9	99.2	
12	See Test Location Plan	28.6 98.6	24.0	98.1	
13	See Test Location Plan	99.9	24.2	99.4	
14	See Test Location Plan	98.6	24.1	98.1	
15	See Test Location Plan	99.3	23.6	98.8	
16	See Test Location Plan	98.4	22.6	97.9	

Density (ASTM D2922) Moisture (ASTM D3017)

Typo - Correction

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	4.5 x 10(-8)
Dry Density (pcf)	103.8
Moisture Content (%)	23.3

Atterberg Limits (ASTM D4318)

PL	21
LL	46
PI	25
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	32.1
%Silt	23.7
%Clay	44.2

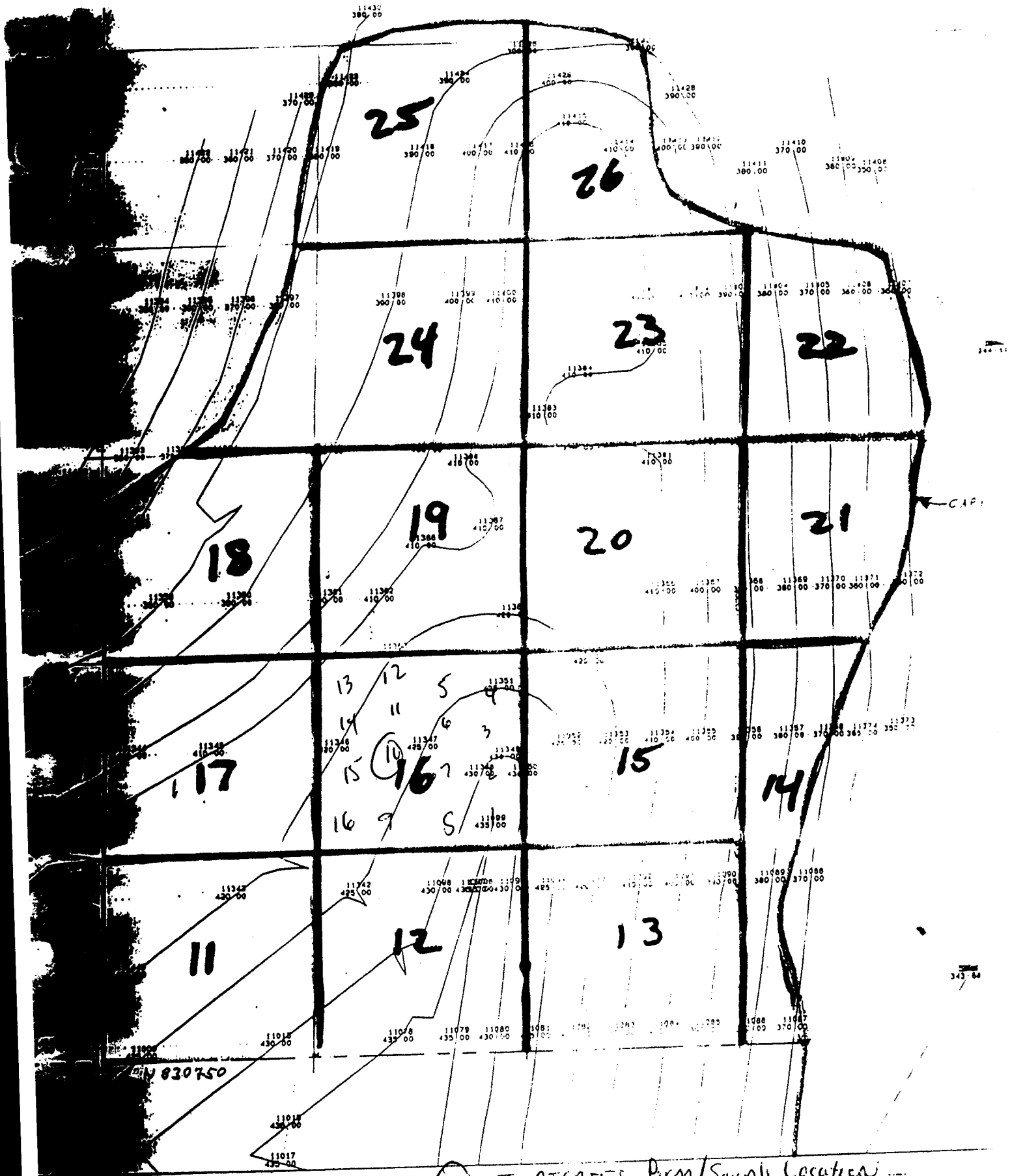
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(10) - INDICATES Perm/Sample Location

Acre 16, Lift 3

Report: 066

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/24/98
Report No.: P-104

Project No.: VNC-98-029
Sample No.: DL-135

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.5E-008	cm/sec
% Moisture	23.3	%
Dry Density	103.8	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 10/31/98
Location: Acre 16, Lift 3

Length (in):	3.720
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	23.77
Wet Weight (grams):	798.6
Dry Weight (grams):	647.9
Dry Density (pcf):	103.8

Moisture Content Test Data

Wet Weight	78.20
Dry Weight	67.63
Tare weight	22.18
% Moisture	23.3

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
283	83.10	0.85	0.70	0.82	0.78	4.99E-008
181	83.10	0.50	0.40	0.80	0.45	4.53E-008
226	83.10	0.60	0.45	0.75	0.53	4.23E-008
436	83.10	1.20	0.90	0.75	1.05	4.39E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **4.5E-008** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	32.1	23.7	44.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	100.0		
#10	99.8		
#20	95.5		
#40	90.5		
#60	84.7		
#100	77.2		
#200	67.9		

* (no specification provided)

Soil Description

Roberts Pit - Sandy lean clay

Atterberg Limits

PL= 21 LL= 46 PI= 25

Coefficients

D_{85}= 0.256 D_{60}= 0.0210 D_{50}= 0.0100
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-135, Acre 16, Lift 3

Sample No.: DL-135 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 16, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/19/98
Report No.: 053

Acre 17 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	95.9	25.3	95.4	
2	See Test Location Plan	99.0	24.2	98.5	
3	See Test Location Plan	99.7	24.4	99.2	
4	See Test Location Plan	102.7	21.8	100+	
5	See Test Location Plan	98.4	23.9	97.9	
6	See Test Location Plan	97.6	24.1	97.1	
7	See Test Location Plan	96.2	23.6	95.7	
8	See Test Location Plan	96.6	23.2	96.1	
9	See Test Location Plan	96.9	26.4	96.4	Tube/Sample (DL-152)
10	See Test Location Plan	98.3	22.6	97.8	
11	See Test Location Plan	98.5	23.7	98.0	
12	See Test Location Plan	97.3	22.8	96.8	
13	See Test Location Plan	95.6	21.9	95.1	
14	See Test Location Plan	98.9	24.2	98.4	
15	See Test Location Plan	96.2	24.8	95.7	
16	See Test Location Plan	97.9	23.2	97.4	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	1.9 x 10(-8)
Dry Density (pcf)	93.8
Moisture Content (%)	24.7

Atterberg Limits (ASTM D4318)

PL	31
LL	85
PI	54
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.2
%Sand	20.9
%Silt	23.0
%Clay	55.9

Sincerely,

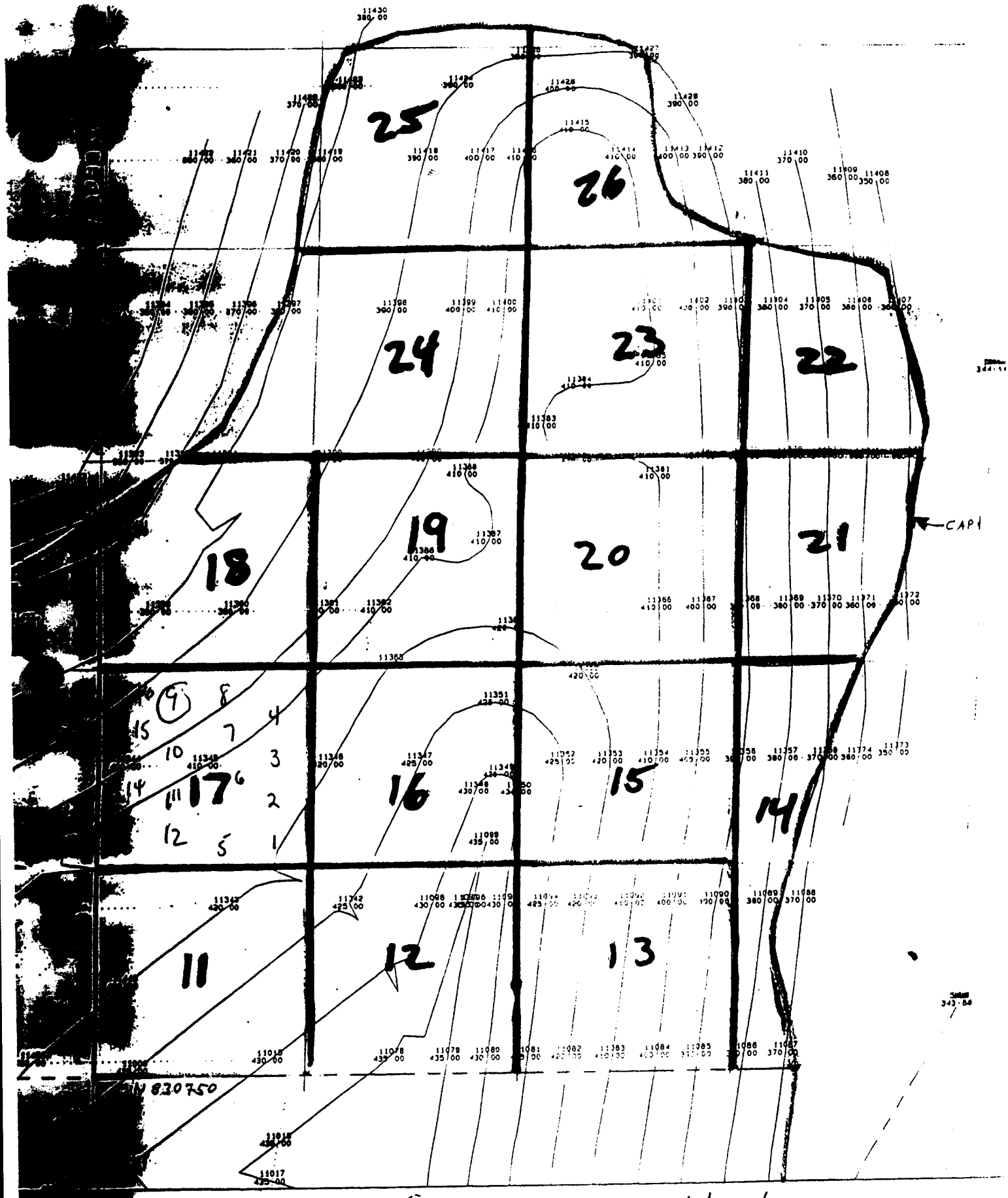
VAN DER HORST Geotechnical Engineers, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

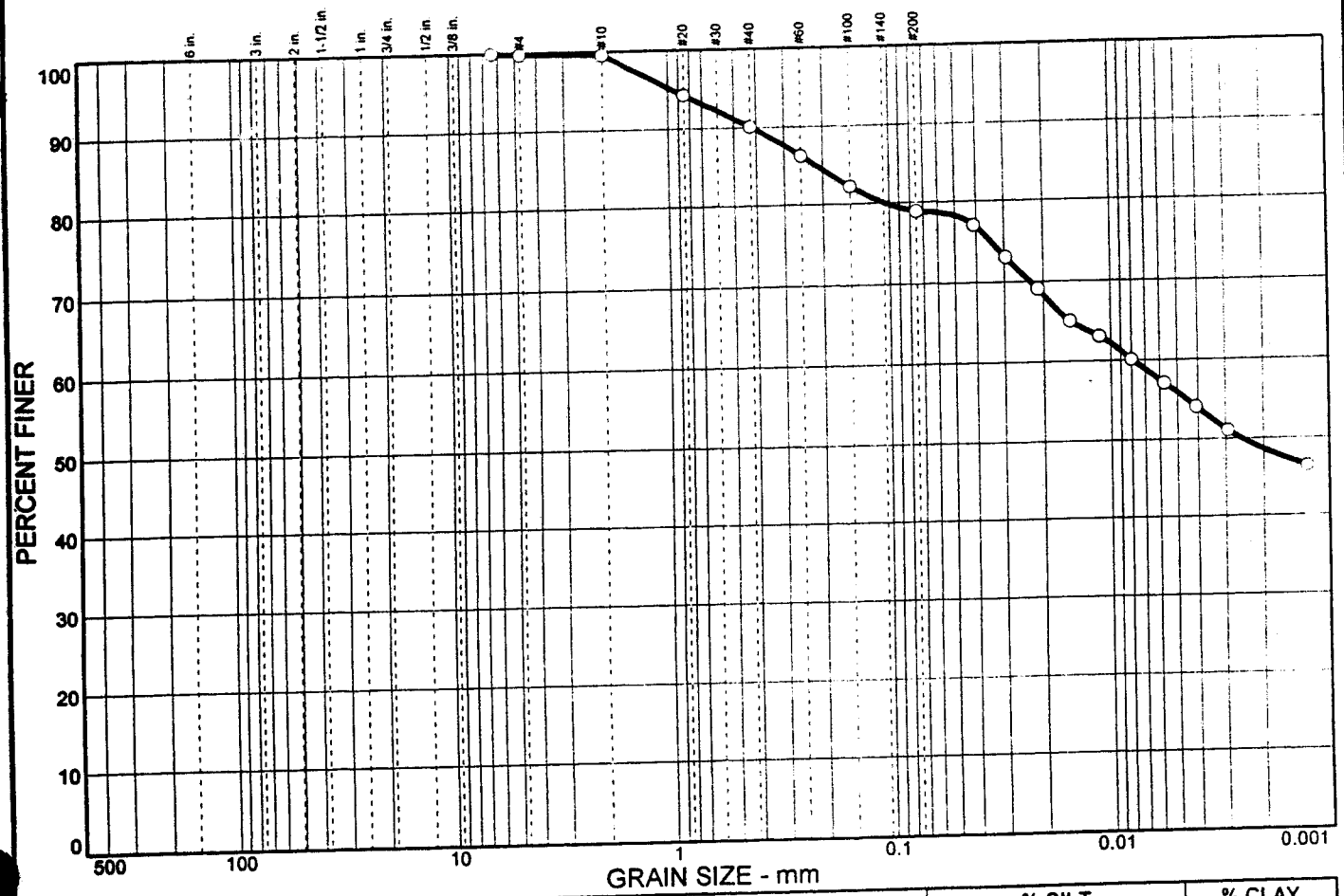
NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(9) - Indicates Prim/Sample Location
Acre 17, Lift 3
Report: 053

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	20.9	23.0	55.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.6		
#20	94.3		
#40	90.1		
#60	86.3		
#100	82.2		
#200	78.9		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 31 LL= 85 PI= 54

Coefficients

D_{85}= 0.213 D_{60}= 0.0079 D_{50}= 0.0025
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL152, Acre 12, Lift 31

Sample No.: DL-152 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 17, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/19/98
Report No.: P-121

Project No.: VNC-98-029
Sample No. DL-152

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.9E-08	cm/sec
% Moisture	24.7	%
Dry Density	93.8	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/07/98
Location: ACRE 17, LIFT 3

Specimen Data

Length (in):	3.230
Diameter (in.):	2.880
Area (sq. in.):	6.526
Volume (cu. in.):	21.08
Wet Weight (grams):	647.2
Dry Weight (grams):	519.1
Dry Density (pcf):	93.8

Moisture Content Test Data

Wet Weight	62.65
Dry Weight	54.61
Tare weight	22.03
% Moisture	24.7

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
993	110.77	1.70	1.70	1.00	1.70	1.99E-08
518	110.77	0.90	0.85	0.94	0.88	1.96E-08
416	110.77	0.70	0.65	0.93	0.68	1.89E-08
500	110.77	0.85	0.75	0.88	0.80	1.86E-08

△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **1.9E-08** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/10/98
Report No.: 108

Acre 18 Lift 3
Clay Source: On-Site Borrow Pit
ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture
Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	103.2	21.5	100+	
2	See Test Location Plan	99.7	22.8	96.8	
3	See Test Location Plan	102.1	20.0	99.1	
4	See Test Location Plan	101.6	21.7	98.6	
5	See Test Location Plan	103.7	19.3	100+	
6	See Test Location Plan	101.6	22.2	98.6	Tube/Sample (DL-233)
7	See Test Location Plan	102.0	19.8	99.0	
8	See Test Location Plan	103.8	19.9	100+	
9	See Test Location Plan	100.5	21.6	97.6	
10	See Test Location Plan	100.8	20.2	97.8	
11	See Test Location Plan	98.9	22.0	96.0	
12	See Test Location Plan	101.2	19.8	98.3	
13	See Test Location Plan	103.0	21.0	100.0	
14	See Test Location Plan	100.5	21.6	97.6	
15	See Test Location Plan	101.4	22.0	98.4	
16	See Test Location Plan	101.6	21.7	98.6	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 2.3x10(-8)

Dry Density (pcf) 107.0

Moisture Content (%) 24.3

Atterberg Limits (ASTM D4318)

PL 17
LL 42
PI 25

USCS Classification CL

Grain-size Analysis (ASTM D422)

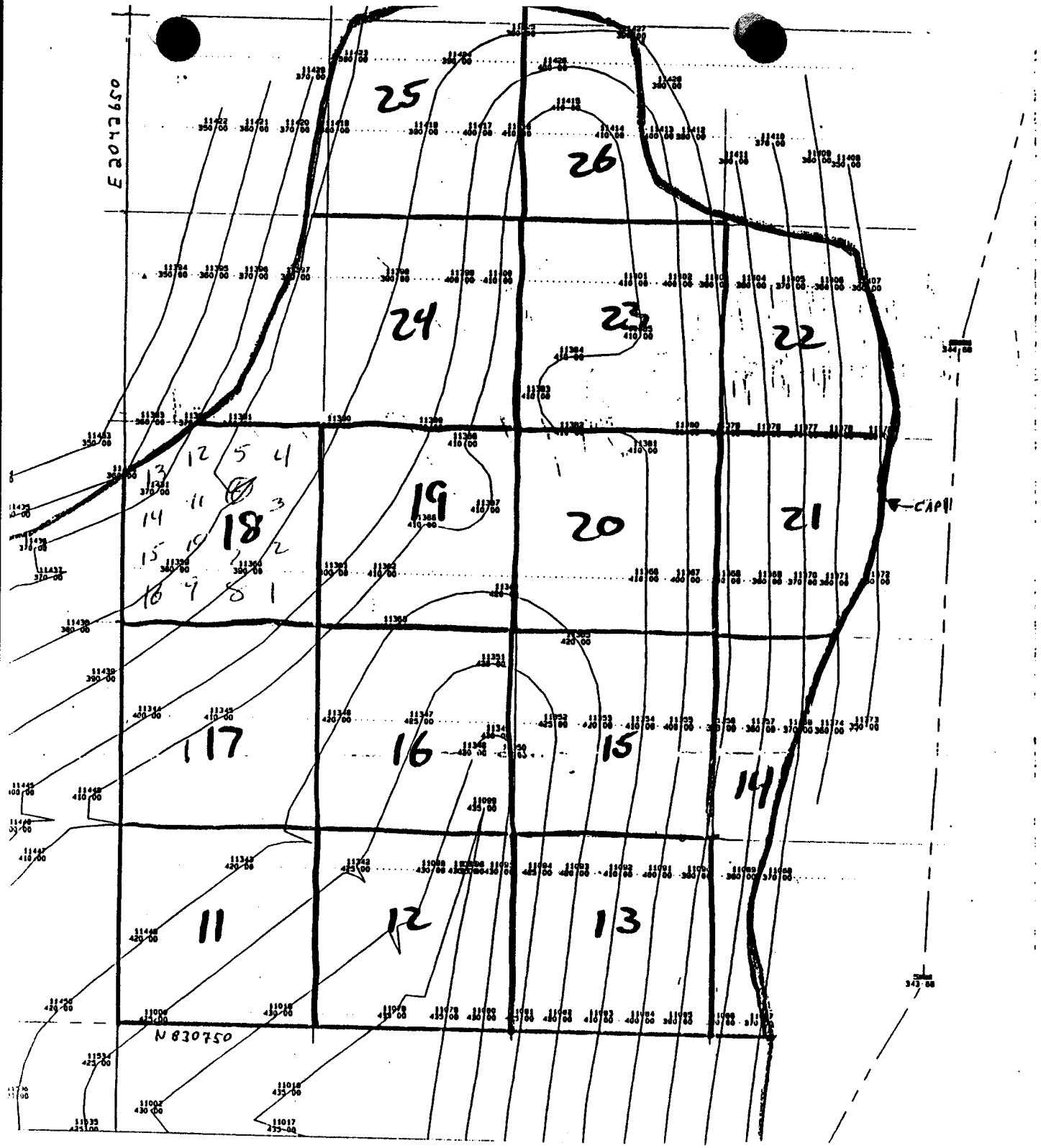
%Gravel 0.1
%Sand 42.6
%Silt 17.7
%Clay 39.6

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/2/95

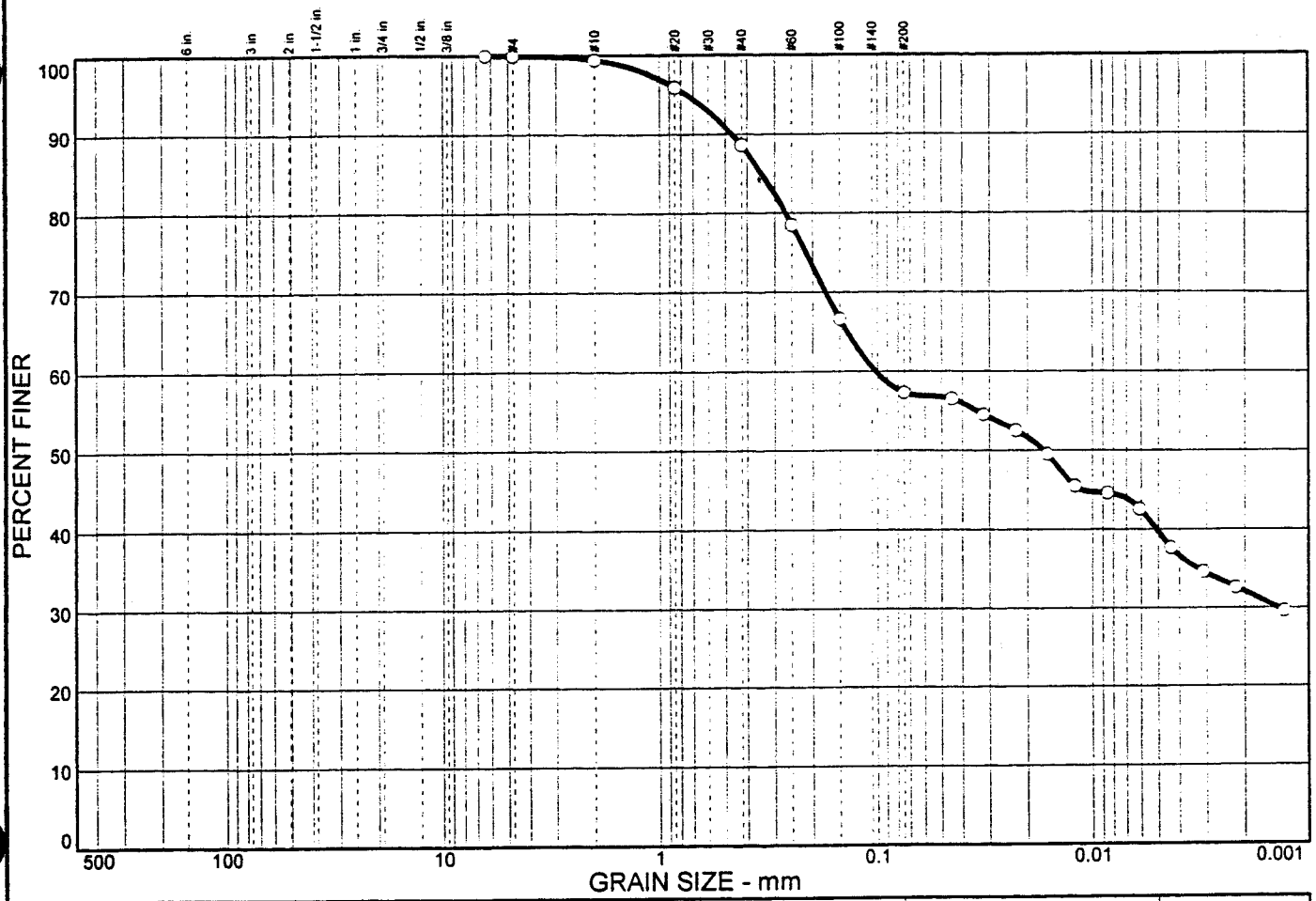
Test location Plan

Acre 18/Cr 8+3

⊙ - Perm location

Report: 108

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	42.6	17.7	39.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.4		
#20	95.9		
#40	88.6		
#60	78.5		
#100	66.6		
#200	57.3		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 17 LL= 42 PI= 25

Coefficients

D_{85}= 0.343 D_{60}= 0.102 D_{50}= 0.0169
D_{30}= 0.0014 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-233, Acre 18, Lift 3

Sample No.: DL-233 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 18, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/08/98
Report No.: P-178

Project No.: VNC-98-029
Sample No.: DL-233

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.3E-008	cm/sec
% Moisture	24.3	%
Dry Density	107.0	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/02/98
Location: Acre 18, Lift 3

Specimen Data

Length (in):	2.561
Diameter (in.):	2.800
Area (sq. in.):	6.169
Volume (cu. in.):	15.80
Wet Weight (grams):	551.8
Dry Weight (grams):	443.8
Dry Density (pcf):	107.0

Wet Weight	138.50
Dry Weight	115.71
Tare weight	22.01
% Moisture	24.3

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
684	110.77	1.25	1.05	0.84	1.15	1.64E-008
199	110.77	0.55	0.50	0.91	0.53	2.57E-008
796	113.54	2.40	2.35	0.98	2.38	2.84E-008
211	113.54	0.50	0.40	0.80	0.45	2.03E-008

Δ T — Change in time (minutes)
H — Driving head (inches)
Inflow (B) — Flow in (cubic centimeters)
Inflow (C) — Flow out (cubic centimeters)
Q — Flow (cubic centimeters)

Permeability (k) **2.3E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/10/98
Report No.: 104

Acre 19 Lift 3

Clay Source: On-Site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	101.6	21.0	98.6	
2	See Test Location Plan	102.0	21.6	99.0	
3	See Test Location Plan	102.3	22.8	99.4 3	
4	See Test Location Plan	103.7	19.7	100+	
5	See Test Location Plan	97.8	25.3	95.0	Tube/Sample (DL-234)
6	See Test Location Plan	100.6	22.6	97.7	
7	See Test Location Plan	101.5	21.8	98.5	
8	See Test Location Plan	101.8	21.7	98.8	
9	See Test Location Plan	99.4	23.2	96.5	
10	See Test Location Plan	102.9	20.1	99.9	
11	See Test Location Plan	102.9	19.8	99.9	
12	See Test Location Plan	101.1	21.7	98.2	
13	See Test Location Plan	103.4	20.0	100+	
14	See Test Location Plan	100.3	22.6	97.4	
15	See Test Location Plan	101.6	21.2	98.6	
16	See Test Location Plan	99.8	22.9	96.9	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 8.0x10(-9)

Dry Density (pcf) 105.0

Moisture Content (%) 21.5

Atterberg Limits (ASTM D4318)

PL 19
LL 40
PI 21

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel 0.1
%Sand 40.0
%Silt 17.3
%Clay 42.6

Sincerely,
VAN DER HORST Geotechnical Engineering P.A.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

12/12/95

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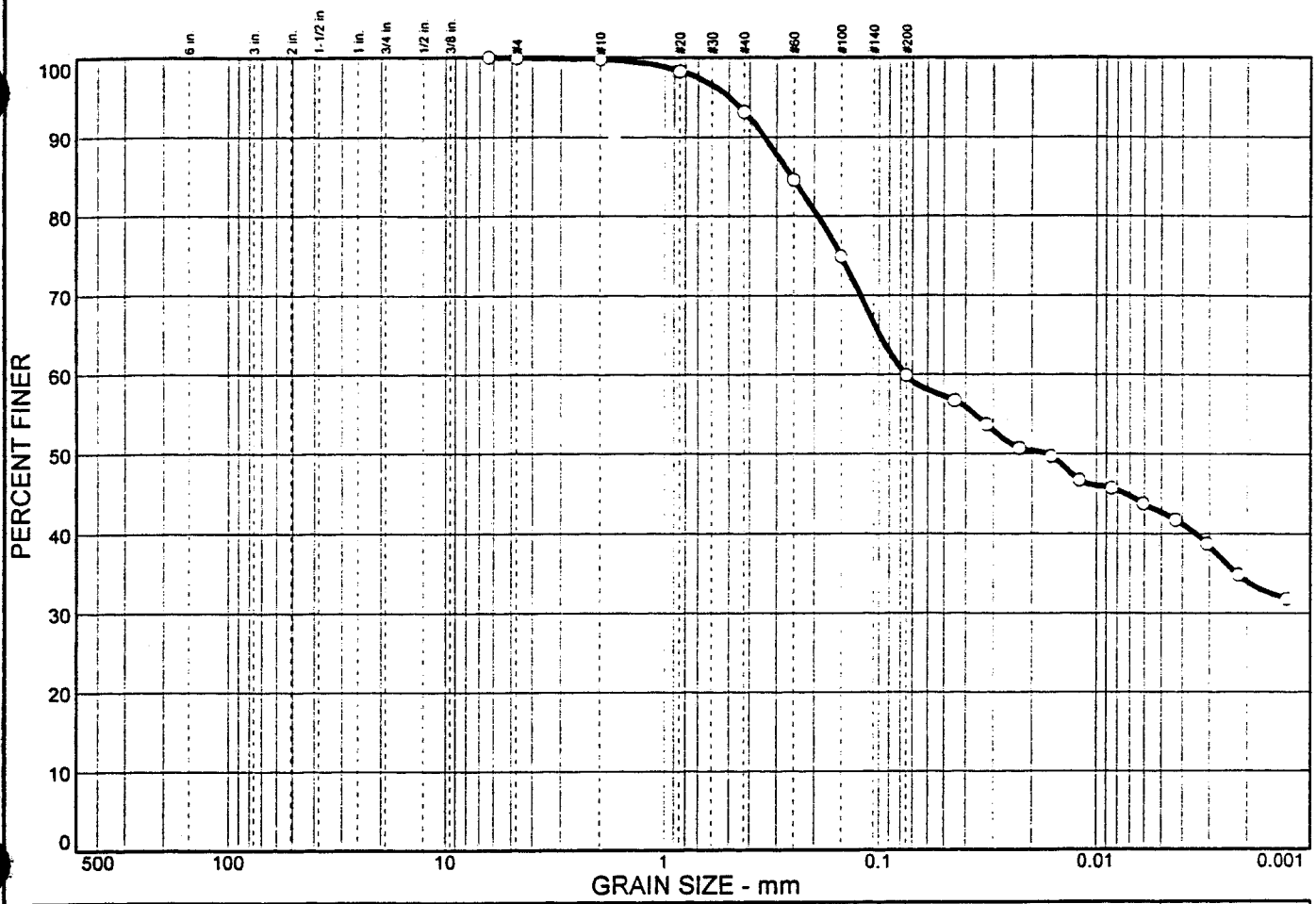
Report: 104

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	40.0	17.3	42.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.8		
#20	98.3		
#40	93.2		
#60	84.6		
#100	74.9		
#200	59.9		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 40 PI= 21

Coefficients

D_{85}= 0.256 D_{60}= 0.0756 D_{50}= 0.0172
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-234, Acre 19, Lift 3

Sample No.: DL-234 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 19, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/08/98
Report No.: P-179

Project No.: VNC-98-029
Sample No.: DL-234

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.0E-009	cm/sec
% Moisture	21.5	%
Dry Density	105.0	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/02/98
Location: Acre 19, Lift 3

Specimen Data

Length (in):	3.246
Diameter (in.):	2.848
Area (sq. in.):	6.381
Volume (cu. in.):	20.71
Wet Weight (grams):	694.1
Dry Weight (grams):	571.1
Dry Density (pcf):	105.0

Wet Weight	122.28
Dry Weight	104.52
Tare weight	22.06
% Moisture	21.5

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
453	138.46	0.50	0.50	1.00	0.50	1.05E-008
643	138.46	0.60	0.60	1.00	0.60	8.91E-009
907	138.46	0.60	0.50	0.83	0.55	5.79E-009
701	138.46	0.50	0.50	1.00	0.50	6.81E-009

Δ T Change in time (minutes)
H Driving head (inches)
Inflow (B) Flow in (cubic centimeters)
Inflow (C) Flow out (cubic centimeters)
Q Flow (cubic centimeters)

Permeability (k) **8.0E-009** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/23/98
Report No.: 069

Acre 20 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	96.1	26.7	95.6	
2	See Test Location Plan	95.7	27.0	95.0 2	
3	See Test Location Plan	98.6	25.4	98.1	
4	See Test Location Plan	96.0	26.3	95.6 5	
5	See Test Location Plan	97.8	26.2	97.3	
6	See Test Location Plan	97.1	25.9	96.6	
7	See Test Location Plan	97.3	26.8	96.8	
8	See Test Location Plan	104.4	22.4	100+	
9	See Test Location Plan	97.6	25.5	97.1	
10	See Test Location Plan	96.5	23.0	96.0	
11	See Test Location Plan	102.4	24.6	100+	
12	See Test Location Plan	98.1	25.1	97.6	
13	See Test Location Plan	96.3	26.5	95.8	Perm/Sample (DL-142)
14	See Test Location Plan	99.4	22.6	98.9	
15	See Test Location Plan	98.6	24.4	98.1	
16	See Test Location Plan	97.6	23.5	97.1	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	5.8 x 10(-8)
Dry Density (pcf)	98.2
Moisture Content (%)	26.2

Atterberg Limits (ASTM D4318)

PL	25
LL	68
PI	43
USCS Classification	CH

Grain-size Analysis (ASTM D422)

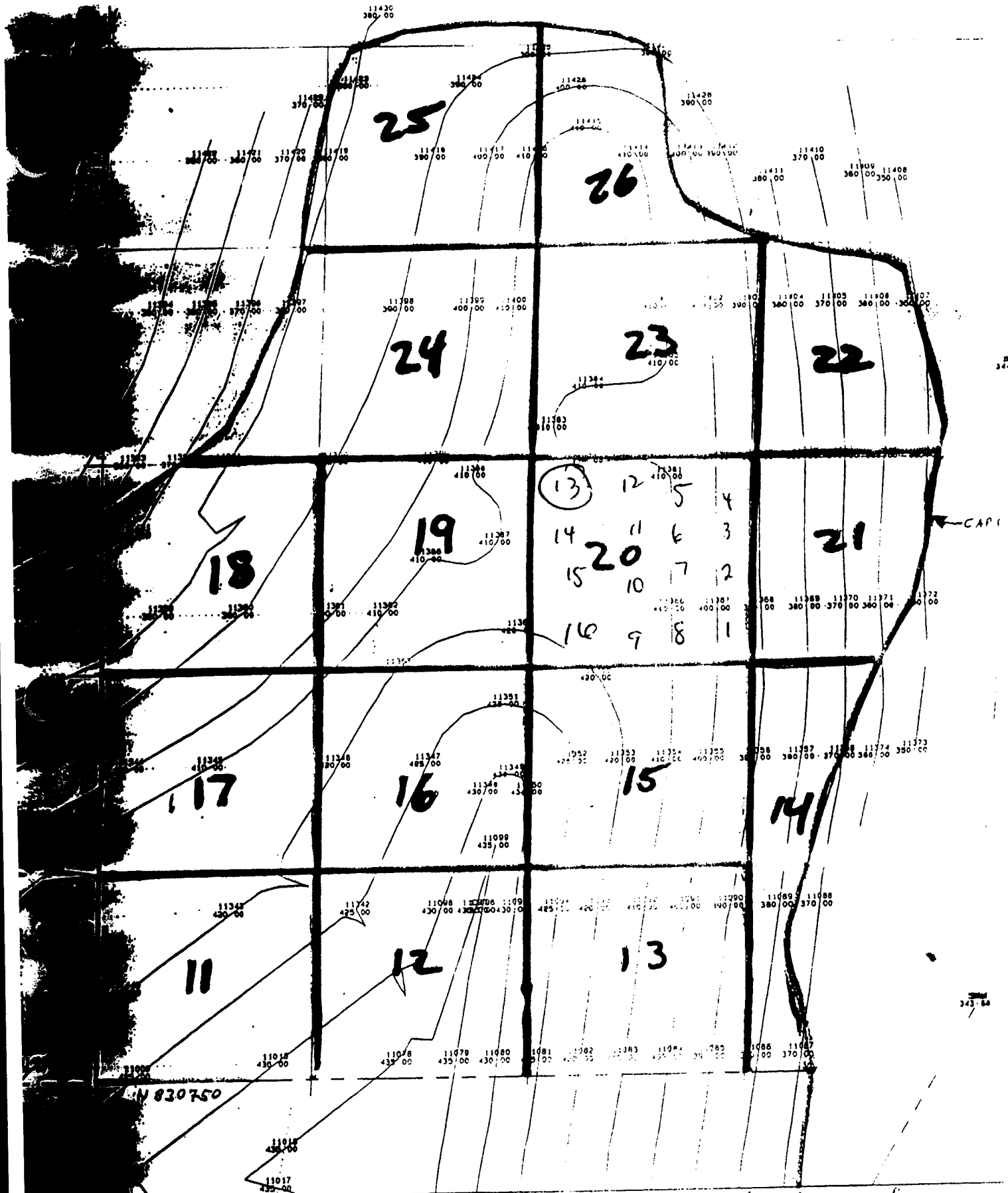
%Gravel	0.1
%Sand	33.8
%Silt	15.9
%Clay	50.2

Sincerely,
VAN DER HORST Geotechnical Engineering, P.A.

Robert L. Mashewske, P.E.

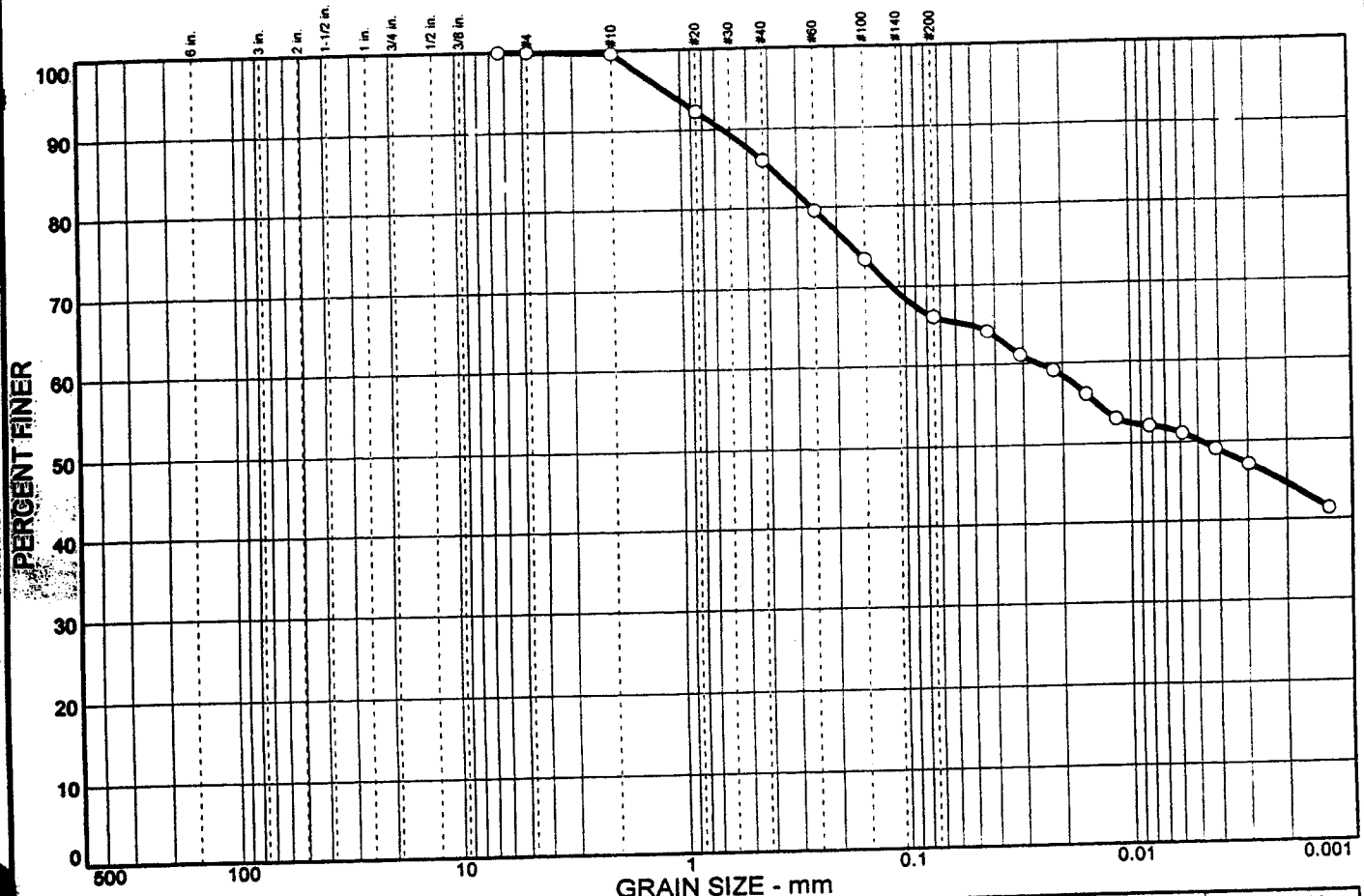
NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(13) INDICATES Perm/Sample Location
Acre 20, Lift 3
Report: 068

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	33.8	15.9	50.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.6		
#20	92.3		
#40	86.0		
#60	79.6		
#100	73.4		
#200	66.1		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 25 LL= 68 PI= 43

Coefficients

D_{85}= 0.389 D_{60}= 0.0259 D_{50}= 0.0048
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-142, Acre 20, Lift 3

Sample No.: DL-142 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 20, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/24/98
Report No.: P-110

Project No.: VNC-98-029
Sample No.: DL-142

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.8E-008	cm/sec
% Moisture	26.2	%
Dry Density	98.2	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/02/98
Location: Acre 20, Lift 3

Length (in):	3.790
Diameter (in.):	2.840
Area (sq. in.):	6.346
Volume (cu. in.):	24.05
Wet Weight (grams):	782.4
Dry Weight (grams):	619.9
Dry Density (pcf):	98.2

Moisture Content Test Data

Wet Weight	80.18
Dry Weight	68.10
Tare weight	22.02
% Moisture	26.2

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
349	94.15	1.20	1.10	0.92	1.15	5.43E-008
511	94.15	1.90	2.00	1.05	1.95	6.29E-008
219	94.15	0.80	0.75	0.94	0.78	5.84E-008
365	94.15	1.20	1.25	1.04	1.23	5.54E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 5.8E-008 cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-046

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/03/98
Report No.: 074

Acre 21 Lift 3
Clay Source: Roberts Borrow Pit
ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture
Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	97.8	24.1	97.3	
2	See Test Location Plan	96.1	27.1	95.6	
3	See Test Location Plan	96.6	25.5	96.1	
4	See Test Location Plan	96.7	24.1	96.2	
5	See Test Location Plan	102.0	22.9	100+	
6	See Test Location Plan	97.7	24.4	~~27.2~~ 97	Perm/Sample (DL-186) typo
7	See Test Location Plan	100.4	22.3	99.9	
8	See Test Location Plan	99.8	22.1	99.3	
9	See Test Location Plan	97.6	24.1	97.1	
10	See Test Location Plan	98.4	22.6	97.9	
11	See Test Location Plan	97.9	24.1	97.4	
12	See Test Location Plan	98.2	23.4	97.7	
13	See Test Location Plan	98.4	23.1	97.9	
14	See Test Location Plan	97.6	23.8	97.1	
15	See Test Location Plan	99.4	22.4	98.9	
16	See Test Location Plan	99.7	21.9	~~98.2~~ 99 OK	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	5.1 x 10(-8)
Dry Density (pcf)	97.2
Moisture Content (%)	25.5

Atterberg Limits (ASTM D4318)

PL	23
LL	65
PI	42
USCS Classification	CH

Grain-size Analysis (ASTM D422)

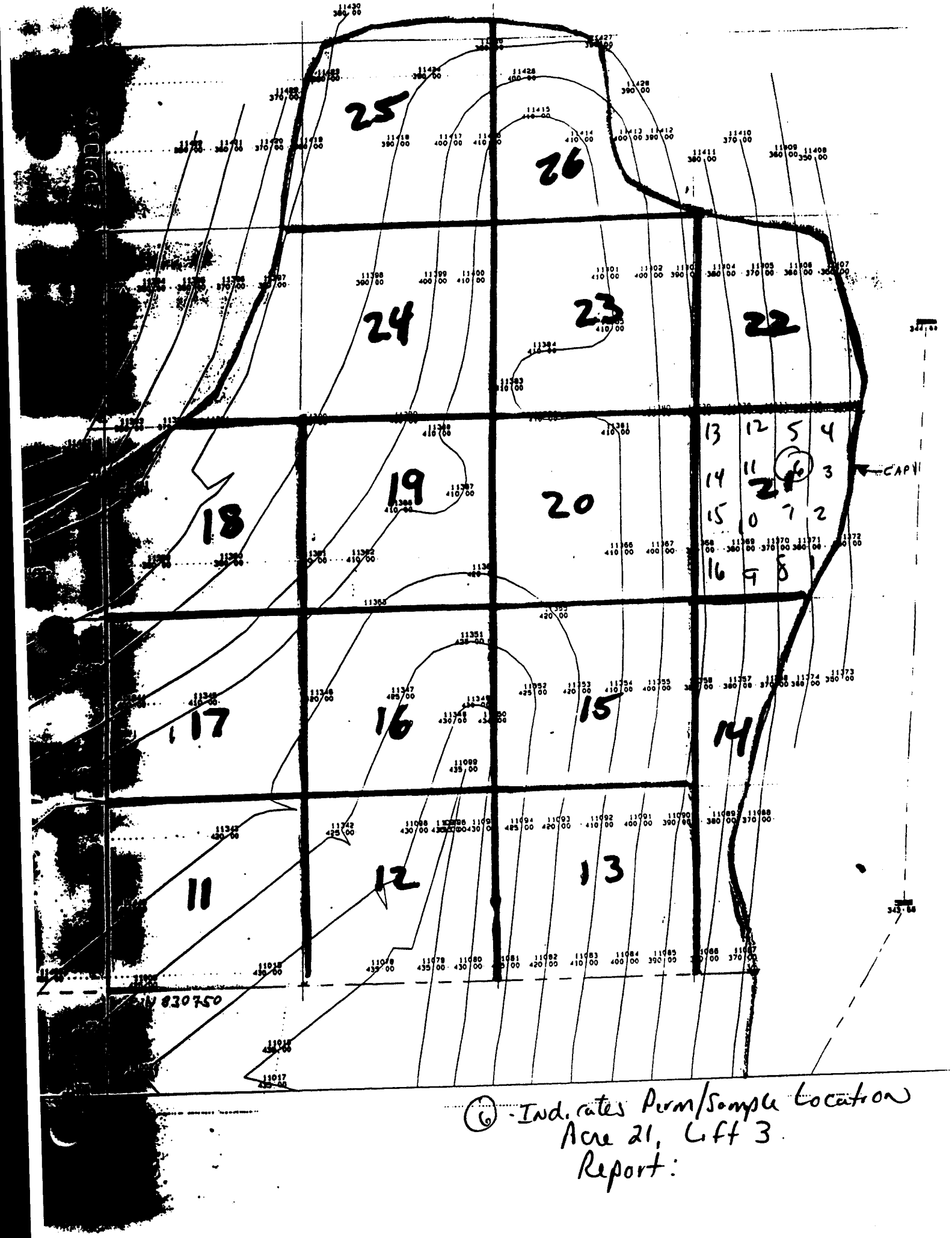
%Gravel	0.1
%Sand	35.9
%Silt	16.8
%Clay	47.2

Sincerely,
VAN DER HORST Geotechnical Engineering, P.A.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(6) - Indicates Perm/Sample Location
Acre 21, Lift 3
Report:

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/02/98
Report No.: P-166

Project No.: VNC-98-029
Sample No.: DL-186

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.1E-008	cm/sec
% Moisture	25.5	%
Dry Density	97.2	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/18/98
Location: Acre 21, Lift 3

Specimen Data

Length (in):	2.961
Diameter (in.):	2.848
Area (sq. in.):	6.381
Volume (cu. in.):	18.90
Wet Weight (grams):	604.8
Dry Weight (grams):	481.9
Dry Density (pcf):	97.2

Moisture Content Test Data

Wet Weight	119.87
Dry Weight	99.98
Tare weight	21.99
% Moisture	25.5

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
255	96.92	1.10	1.05	0.95	1.08	5.25E-008
279	96.92	1.30	1.15	0.88	1.23	5.47E-008
315	96.92	1.15	1.30	1.13	1.23	4.84E-008
412	96.92	1.60	1.60	1.00	1.60	4.83E-008

Δ T Change in time (minutes)
H Driving head (inches)
Inflow (B) Flow in (cubic centimeters)
Inflow (C) Flow out (cubic centimeters)
Q Flow (cubic centimeters)

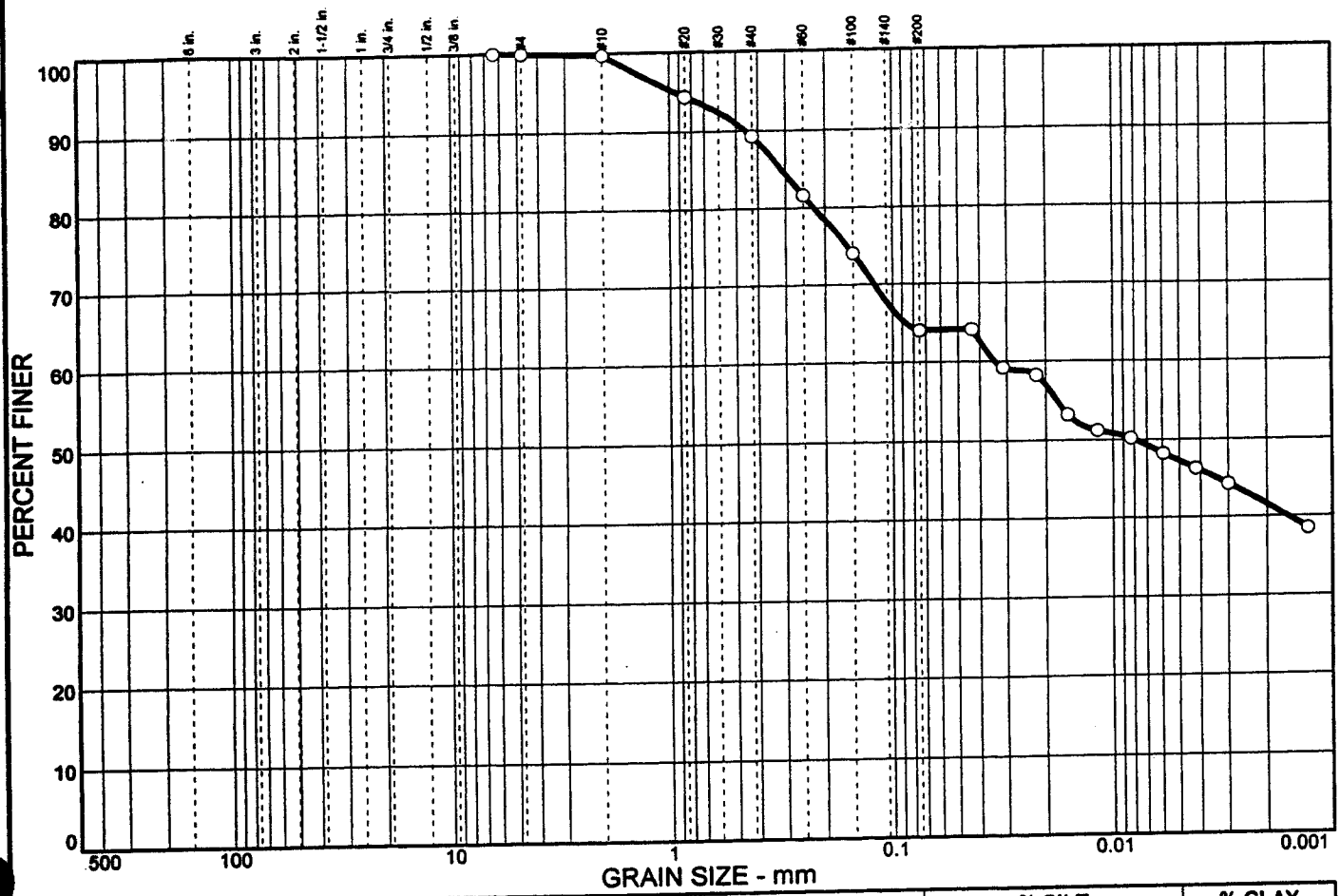
Permeability (k) **5.1E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-0460

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	35.9	16.8	47.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.7		
#20	94.4		
#40	89.3		
#60	81.6		
#100	74.0		
#200	64.0		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 23 LL= 65 PI= 42

Coefficients

D_{85}= 0.312 D_{60}= 0.0339 D_{50}= 0.0080
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-186, Acre 21, Lift 3

Sample No.: DL-186 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 21, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/03/98
Report No.: 077

Acre 22 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	96.1	22.7	95.6	
2	See Test Location Plan	97.8	25.6	97.3	
3	See Test Location Plan	97.4	26.5	96.9	
4	See Test Location Plan	99.7	25.8	99.2	
5	See Test Location Plan	98.7	23.2	98.2	
6	See Test Location Plan	96.8	24.1	96.3	
7	See Test Location Plan	97.8	26.7	92.3	Perm/Sample (DL-189)
8	See Test Location Plan	96.2	26.2	95.7	
9	See Test Location Plan	99.8	22.0	99.3	
10	See Test Location Plan	100.6	21.8	100+	
11	See Test Location Plan	100.1	22.2	99.6	
12	See Test Location Plan	98.6	22.9	98.1	
13	See Test Location Plan	97.4	23.1	96.9	
14	See Test Location Plan	96.8	24.0	96.3	
15	See Test Location Plan	97.9	22.6	97.4	
16	See Test Location Plan	97.6	22.8	97.1	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	1.8 x 10(-8)
Dry Density (pcf)	99.5
Moisture Content (%)	23.7

Atterberg Limits (ASTM D4318)

PL	21
LL	43
PI	22
USCS Classification	CL

Grain-size Analysis (ASTM D422)

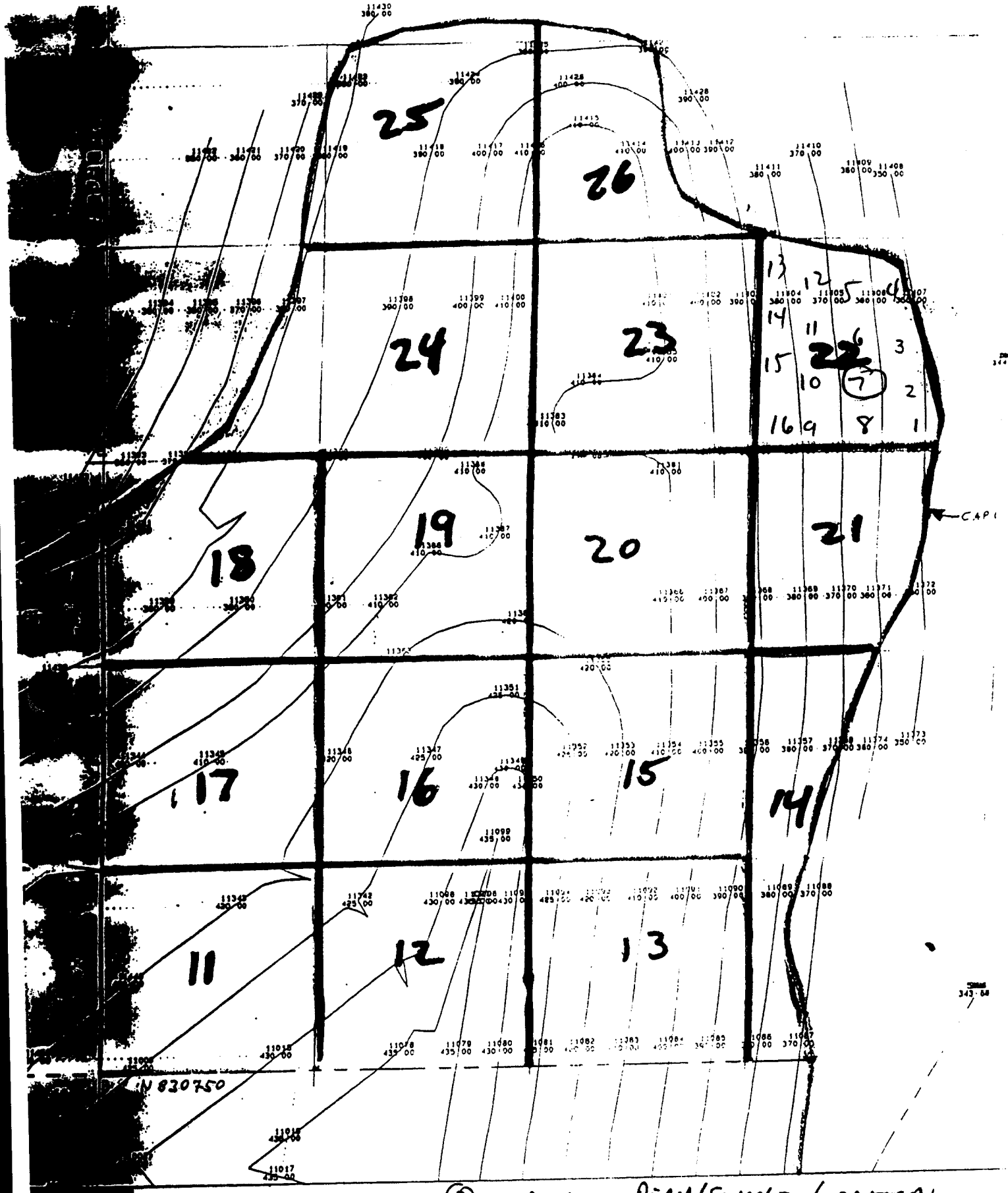
%Gravel	0.2
%Sand	29.9
%Silt	22.3
%Clay	47.6

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(7)-INDICATES PERM/SAMPLE LOCATION
Acre 22, Lift 3
Report!

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-144

Project No.: VNC-98-029
Sample No.: DL-189

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.8E-008	cm/sec
% Moisture	23.7	%
Dry Density	99.5	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/18/98
Location: Acre 22, Lift 3

Specimen Data

Length (in):	3.480
Diameter (in.):	2.856
Area (sq. in.):	6.417
Volume (cu. in.):	22.33
Wet Weight (grams):	721.3
Dry Weight (grams):	583.1
Dry Density (pcf):	99.5

Moisture Content Test Data

Wet Weight	127.50
Dry Weight	107.28
Tare weight	21.93
% Moisture	23.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
635	149.54	1.30	1.15	0.88	1.23	1.82E-008
278	149.54	0.50	0.50	1.00	0.50	1.70E-008
259	149.54	0.50	0.45	0.90	0.48	1.73E-008
217	149.54	0.45	0.40	0.89	0.43	1.85E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

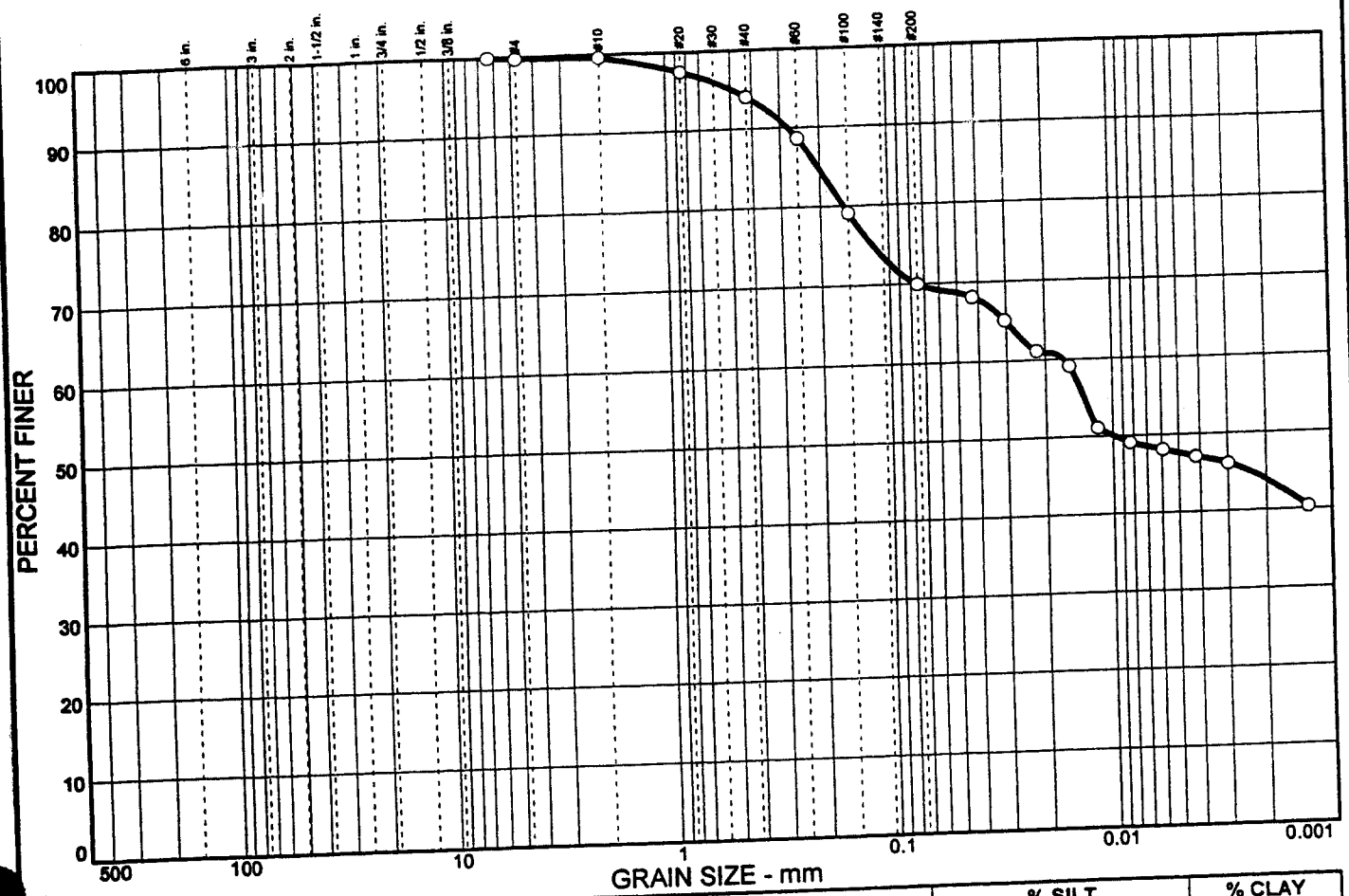
Permeability (k) **1.8E-008** cm/sec

Respecfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-0460

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	29.9	22.3	47.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.6		
#20	97.5		
#40	94.1		
#60	88.6		
#100	79.1		
#200	69.9		

* (no specification provided)

Soil Description

Roberts Pit - Sandy lean clay

Atterberg Limits

PL= 21 LL= 43 PI= 22

Coefficients

D_{85}= 0.203 D_{60}= 0.0165 D_{50}= 0.0099
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-189, Acre 22, Lift 3

Sample No.: DL-189 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 22, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/19/98
Report No.: 055

Acre 23 Lift 3
Clay Source: Roberts Borrow Pit
ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture
Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	102.1	22.8	100+	
2	See Test Location Plan	95.8	25.6	95.0 3	
3	See Test Location Plan	101.4	21.5	100+	
4	See Test Location Plan	99.4	21.5	100+ 98.9	
5	See Test Location Plan	101.7	21.8	100+	
6	See Test Location Plan	103.1	21.8	100+	
7	See Test Location Plan	104.0	21.2	100+	
8	See Test Location Plan	100.0	21.7	99.5	
9	See Test Location Plan	96.4	25.2	96.0	
10	See Test Location Plan	105.3	21.8	100+	
11	See Test Location Plan	95.7	24.9	95.2	
12	See Test Location Plan	95.6	25.6	95.1	Tube/Sample (DL-157)
13	See Test Location Plan	101.1	21.1	100+	
14	See Test Location Plan	99.2	23.6	98.7	
15	See Test Location Plan	98.4	23.0	97.9	
16	See Test Location Plan	98.7	22.6	98.3	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	6.3 x 10(-8)
Dry Density (pcf)	99.7
Moisture Content (%)	21.9

Atterberg Limits (ASTM D4318)

PL	24
LL	55
PI	31
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.2
%Sand	36.0
%Silt	18.2
%Clay	45.6

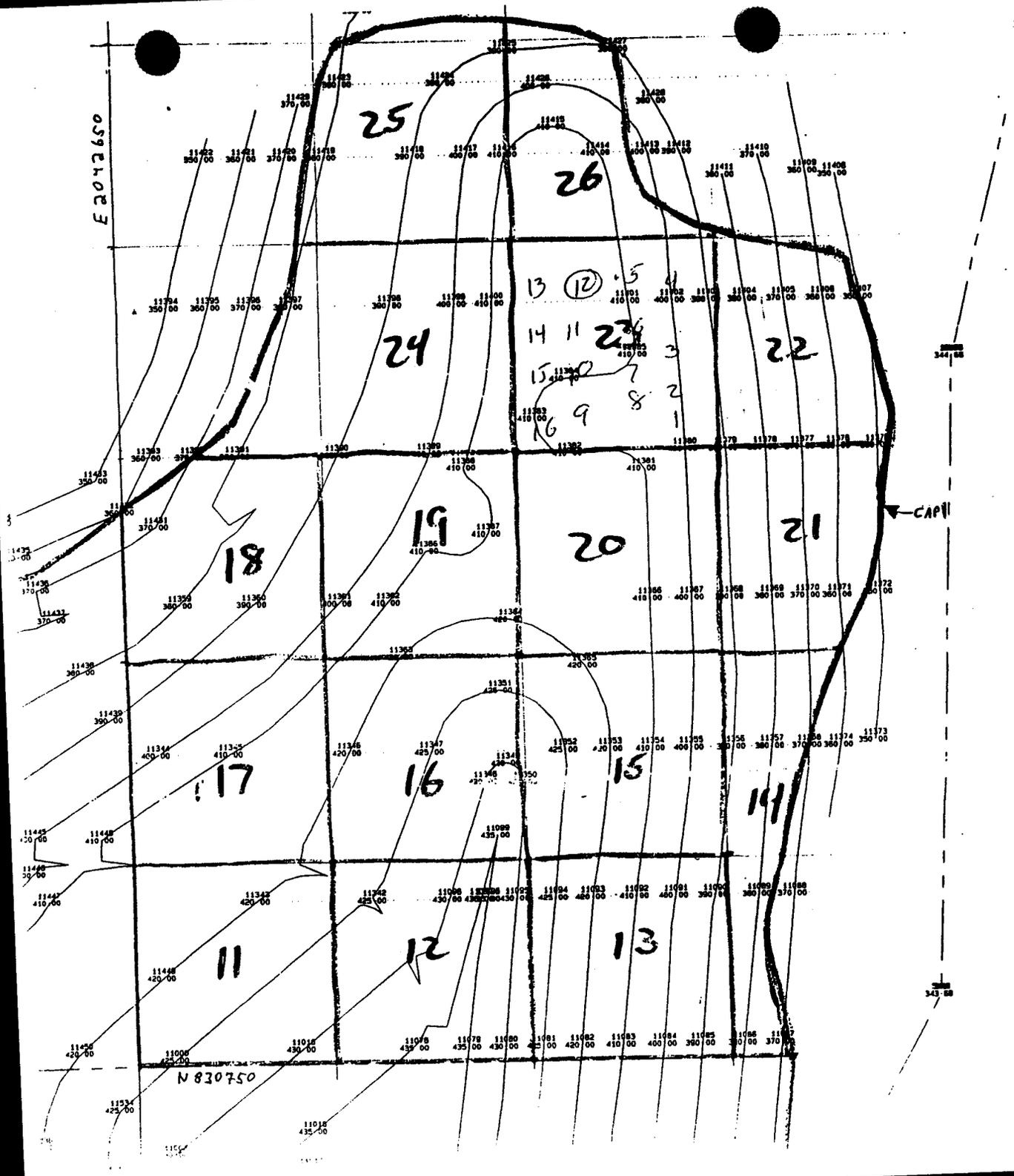
Sincerely,
VAN DER HORST Geotechnical Engineering PSC

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



11/8/98

Test location Plan

O = Perm location

(12) - Indicates Tube/Sample Location

Acre 23, Lift 3

Report : 055

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/19/98
Report No.: P-123

Project No.: VNC-98-029
Sample No. DL-157

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.3E-08	cm/sec
% Moisture	21.9	%
Dry Density	99.7	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/08/98
Location: ACRE 23, LIFT 3

Specimen Data

Length (in):	3.561
Diameter (in.):	2.848
Area (sq. in.):	6.381
Volume (cu. in.):	22.72
Wet Weight (grams):	724.6
Dry Weight (grams):	594.6
Dry Density (pcf):	99.7

Moisture Content Test Data

Wet Weight	127.34
Dry Weight	108.46
Tare weight	22.09
% Moisture	21.9

Test Data

Confining Pressure 3.0 psi

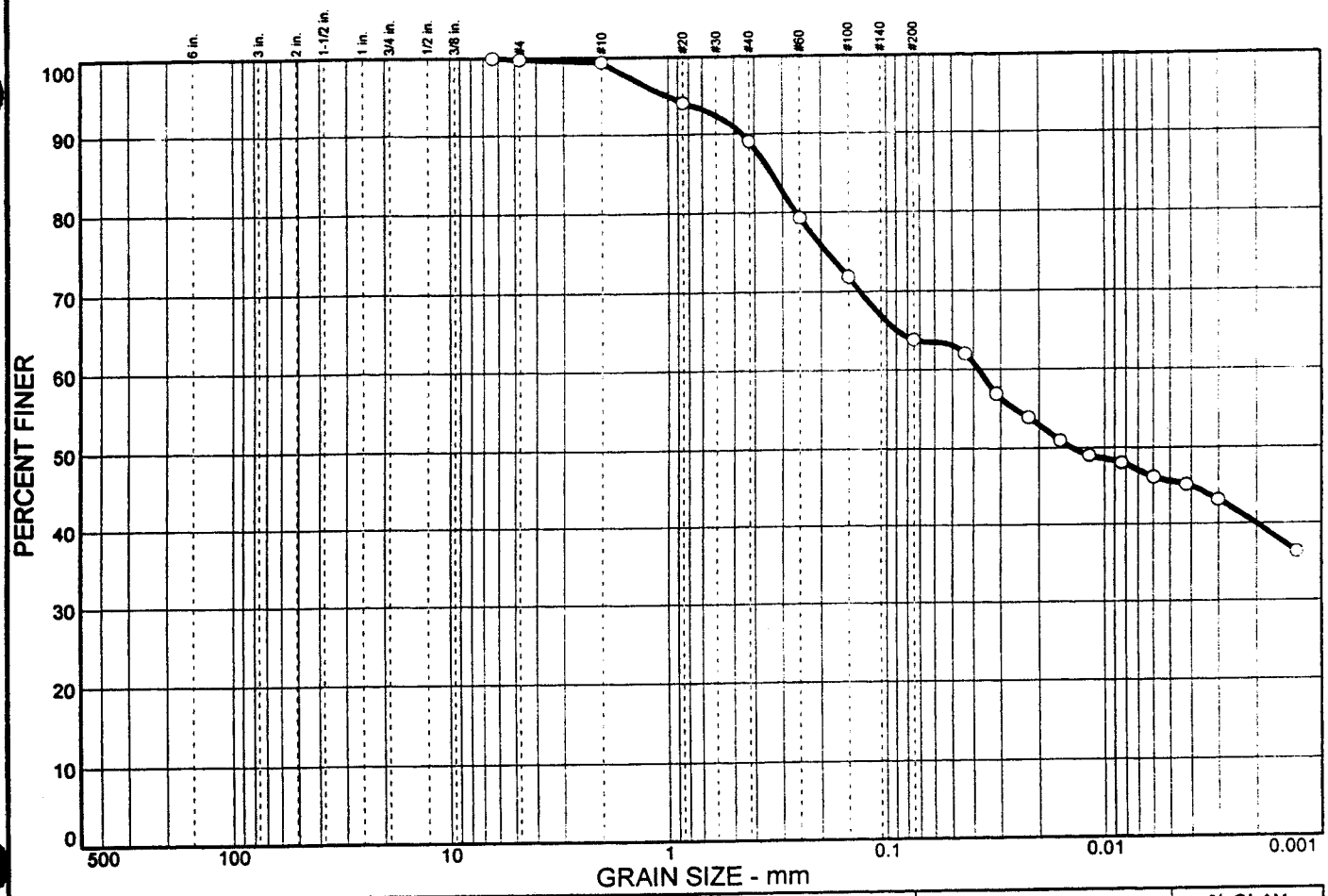
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
386	110.77	2.00	2.00	1.00	2.00	6.79E-08
175	110.77	0.80	0.90	1.13	0.85	6.36E-08
411	110.77	1.90	1.70	0.89	1.80	5.74E-08
402	110.77	2.00	1.80	0.90	1.90	6.19E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **6.3E-08** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	36.0	18.2	45.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.4		
#20	94.1		
#40	89.0		
#60	79.3		
#100	71.8		
#200	63.8		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 24 LL= 55 PI= 31

Coefficients

D_{85}= 0.337 D_{60}= 0.0379 D_{50}= 0.0141
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-157, Acre 23, Lift 3

Sample No.: DL-157 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 23, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 12/14/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
On-Site Borrow Pit Acre 24, Lift 3

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	12/10/98	Clay.103	Clay Cover Test Report Acre 24, Lift 3

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/10/98
Report No.: 103

Acre 24 Lift 3
Clay Source: On-Site Borrow Pit
ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture
Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	100.4	21.6	97.5	
2	See Test Location Plan	102.6	21.7	99.6	
3	See Test Location Plan	98.1	22.9	95.2	
4	See Test Location Plan	101.2	23.8	98.3	
5	See Test Location Plan	103.1	21.3	100+	
6	See Test Location Plan	102.8	22.9	99.8	
7	See Test Location Plan	103.1	22.8	100+	
8	See Test Location Plan	100.8	24.1	97.9	
9	See Test Location Plan	103.1	20.8	100+	
10	See Test Location Plan	101.4	21.8	98.4	
11	See Test Location Plan	100.8	23.4	97.8	Tube/Sample (DL-228)
12	See Test Location Plan	101.6	21.7	98.6	
13	See Test Location Plan	100.9	21.2	97.9	
14	See Test Location Plan	104.8	19.6	100+	
15	See Test Location Plan	102.7	19.6	99.7	
16	See Test Location Plan	100.7	22.8	97.8	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	9.0x10(-9)
Dry Density (pcf)	100.5
Moisture Content (%)	23.2

Atterberg Limits (ASTM D4318)

PL	19
LL	45
PI	26
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	41.2
%Silt	18.7
%Clay	40.1

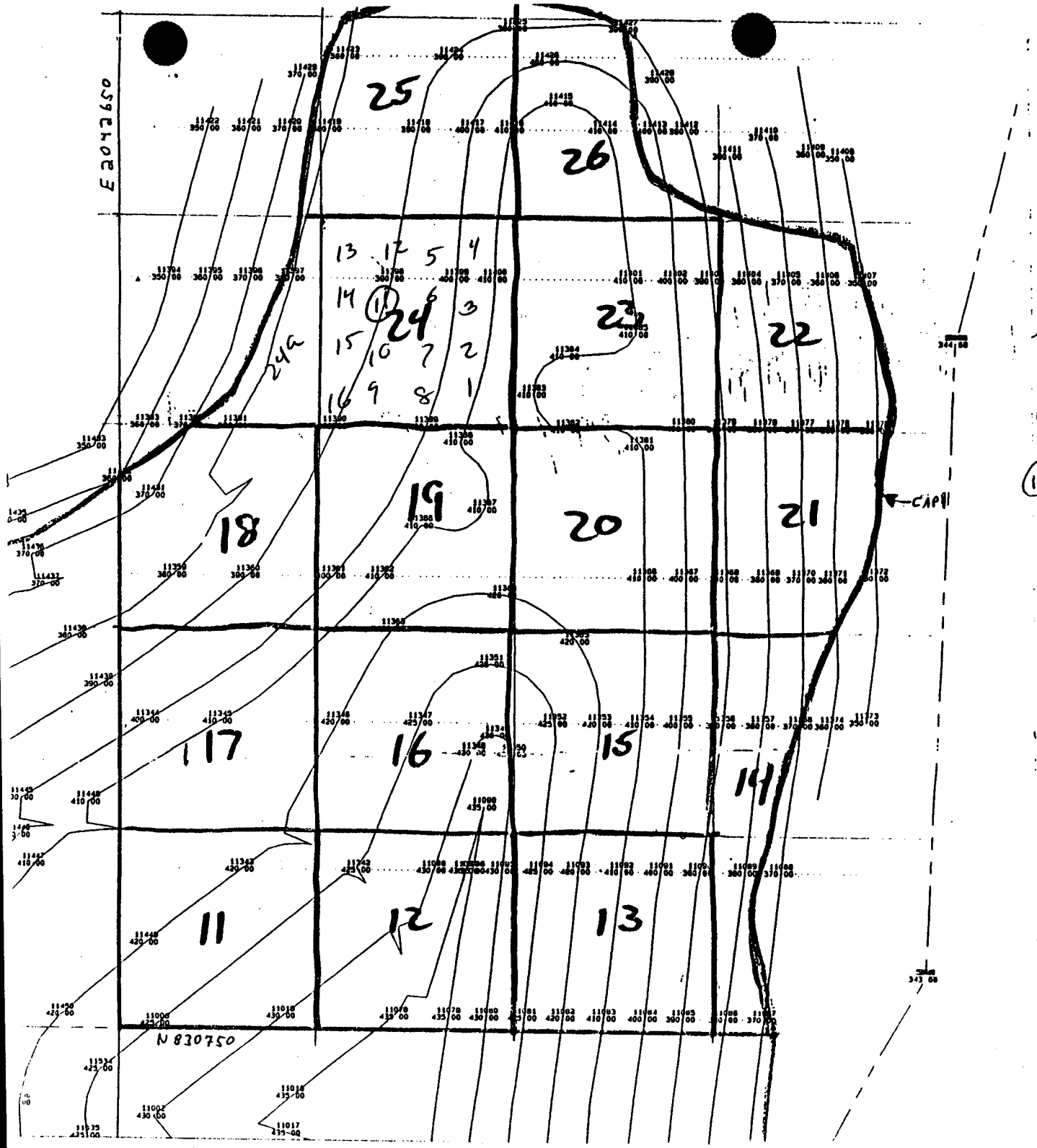
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

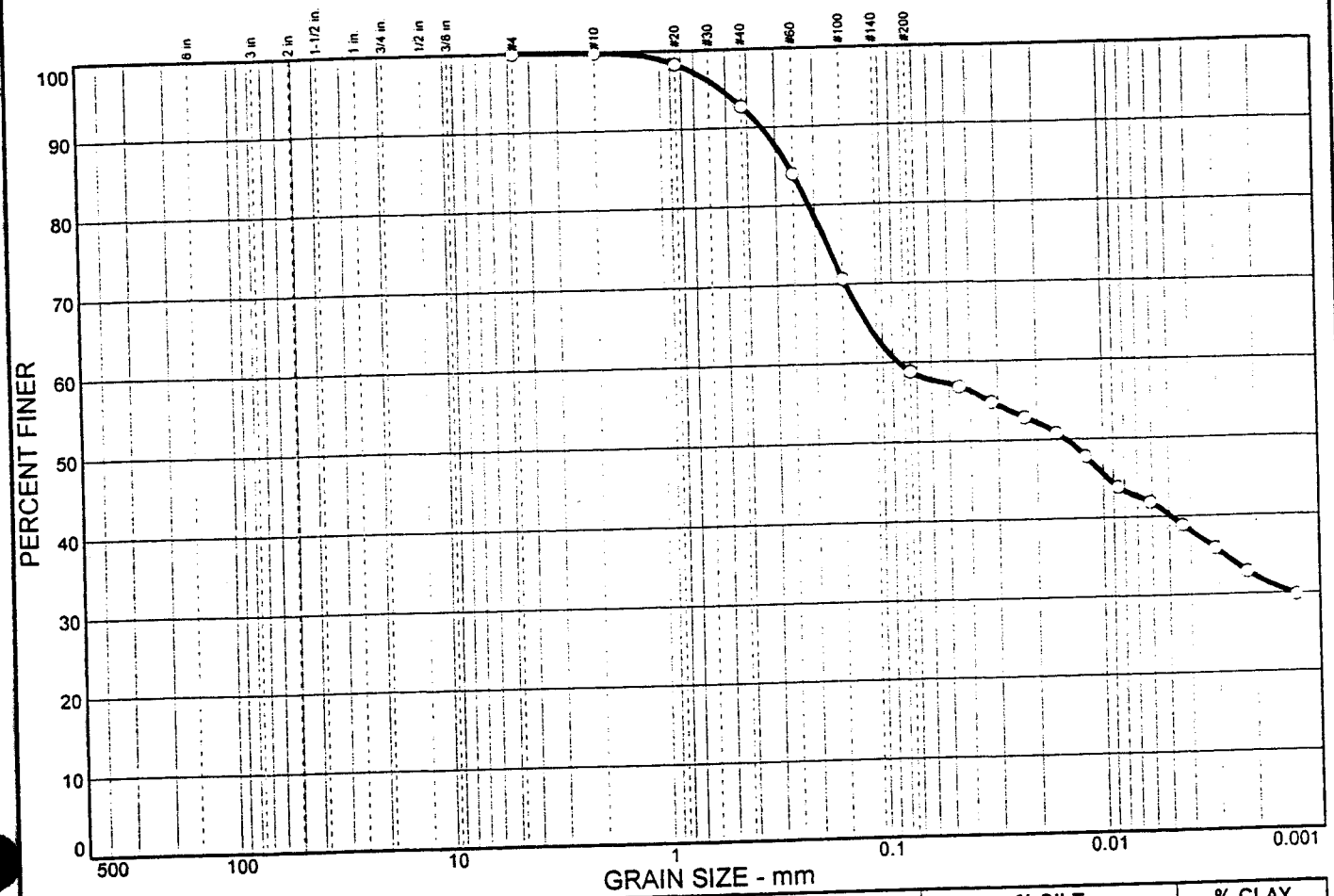
NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/1/98
Test location plan
Acre 24 Lift 3
(11) = Perm location
Report : 103

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	41.2	18.7	40.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	98.3		
#40	92.7		
#60	84.0		
#100	70.6		
#200	58.8		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 45 PI= 26

Coefficients

D_{85}= 0.262 D_{60}= 0.0851 D_{50}= 0.0147
D_{30}= 0.0014 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-228, Acre 24 Lif 3

Sample No.: DL-228 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 24, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/14/98
Report No.: P-205

Project No.: VNC-98-029
Sample No.: DL-228

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	9.0E-009	cm/sec
% Moisture	23.2	%
Dry Density	100.5	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/01/98
Location: Acre 24, Lift 3

Specimen Data

Length (in):	3.168
Diameter (in.):	2.832
Area (sq. in.):	6.310
Volume (cu. in.):	19.99
Wet Weight (grams):	650.0
Dry Weight (grams):	527.4
Dry Density (pcf):	100.5

Wet Weight	252.53
Dry Weight	212.06
Tare weight	37.90
% Moisture	23.2

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
660	94.15	0.45	0.40	0.89	0.43	8.93E-009
731	94.15	0.45	0.50	1.11	0.48	9.01E-009
563	94.15	0.45	0.35	0.78	0.40	9.85E-009
960	94.15	0.65	0.50	0.77	0.58	8.30E-009

x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **9.0E-009** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/10/98
Report No.: 101

Acre 24a Lift 3
Clay Source: On-Site Borrow Pit
ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture
Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	101.2	20.9	98.2	
2	See Test Location Plan	101.1	20.6	98.1	
3	See Test Location Plan	100.6	22.7	97.7	
4	See Test Location Plan	101.1	22.5	98.1	Tube/Sample (DL-229)
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	2.5x10(-8)
Dry Density (pcf)	103.3
Moisture Content (%)	25.5

Atterberg Limits (ASTM D4318)

PL	21
LL	49
PI	28
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.3
%Sand	39.7
%Silt	18.1
%Clay	41.9

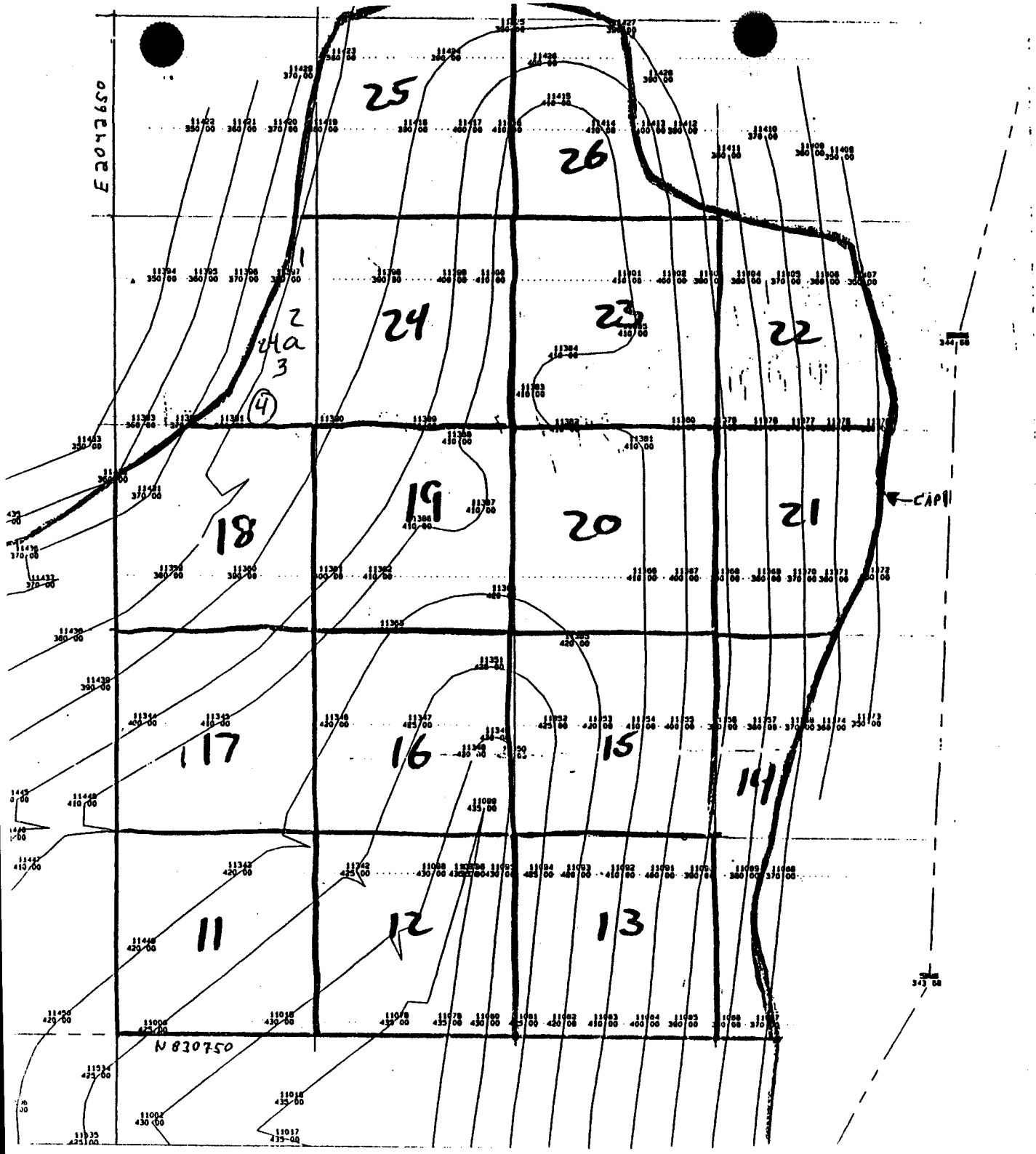
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/1/98

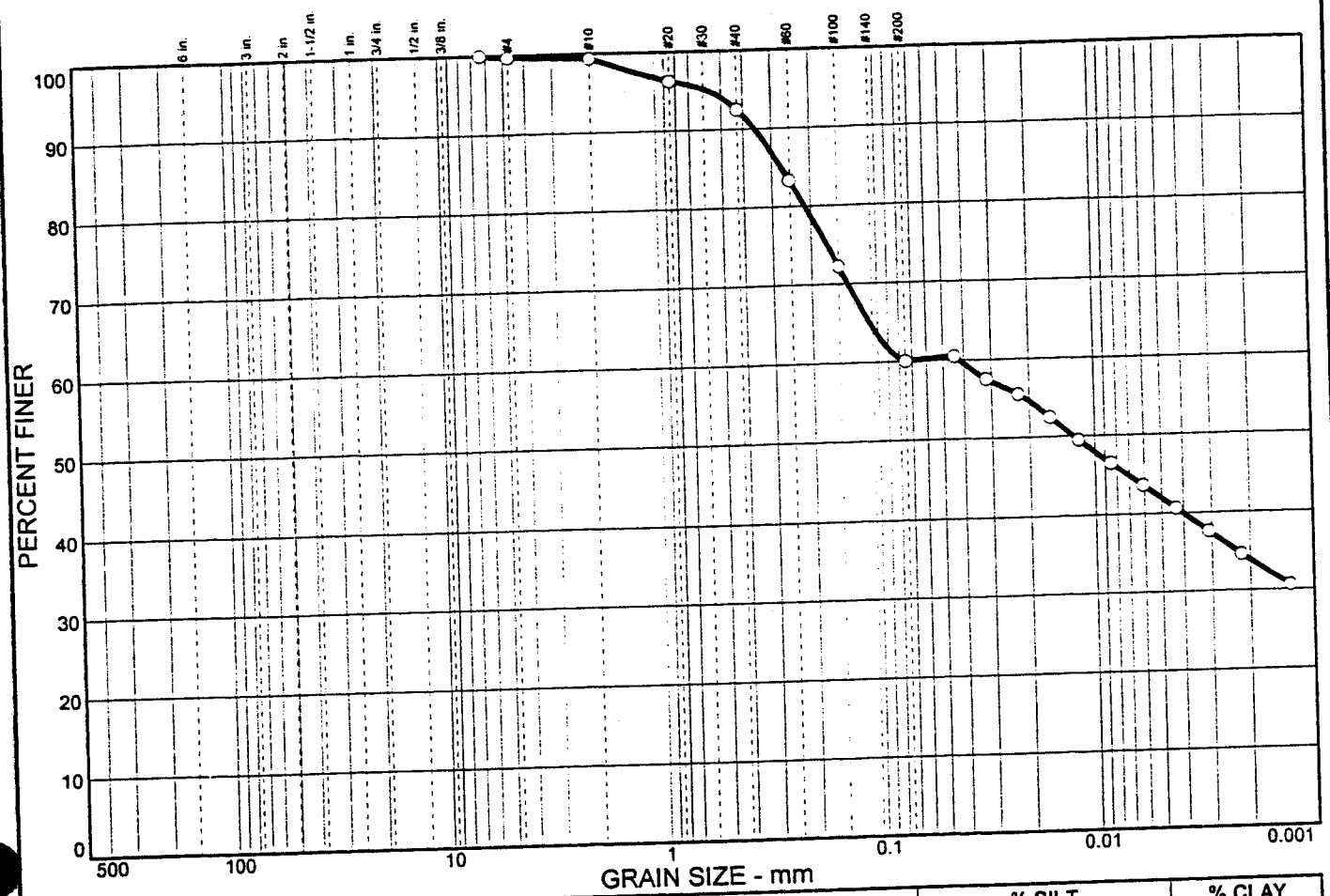
Test location Plan

Acre 24a / Lift 3

(4) = Perm location

Report: 101

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	39.7	18.1	41.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.4		
#20	96.3		
#40	92.5		
#60	83.3		
#100	72.2		
#200	60.0		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 21 LL= 49 PI= 28

Coefficients

D_{85}= 0.272 D_{60}= 0.0421 D_{50}= 0.0125
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-229, Acre 24A, Lift 3

Sample No.: DL-229 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 24A, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/14/98
Report No.: P-203

Project No.: VNC-98-029
Sample No.: DL-229

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.5E-008	cm/sec
% Moisture	25.5	%
Dry Density	100.3	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/30/98
Location: Acre 24a, Lift 3

Specimen Data

Length (in):	3.701
Diameter (in.):	2.853
Area (sq. in.):	6.404
Volume (cu. in.):	23.70
Wet Weight (grams):	783.1
Dry Weight (grams):	623.8
Dry Density (pcf):	100.3

Wet Weight	94.51
Dry Weight	79.76
Tare weight	22.01
% Moisture	25.5

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1212	80.31	1.65	1.70	1.03	1.68	2.59E-008
394	80.31	0.50	0.55	1.10	0.53	2.49E-008
315	80.31	0.45	0.50	1.11	0.48	2.82E-008
570	80.31	0.65	0.70	1.08	0.68	2.22E-008

x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.5E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-0460

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/08/98
Report No.: 092

Acre 25 Lift 3
Clay Source: On-Site Borrow Pit
ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture
Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	102.8	23.8	99.8	
2	See Test Location Plan	102.6	24.5	99.6	
3	See Test Location Plan	106.5	20.2	100+	
4	See Test Location Plan	105.4	20.5	100+	
5	See Test Location Plan	103.9	21.8	100+	
6	See Test Location Plan	100.9	23.2	98.0	Perm/Sample (DL-218)
7	See Test Location Plan	99.5	24.5	96.6	
8	See Test Location Plan	107.3	20.3	100+	
9	See Test Location Plan	106.0	22.3	100+	
10	See Test Location Plan	103.6	24.1	100+	
11	See Test Location Plan	102.6	20.4	99.6	
12	See Test Location Plan	98.7	23.6	95.8	
13	See Test Location Plan	99.4	23.0	96.5	
14	See Test Location Plan	100.7	21.6	97.8	
15	See Test Location Plan	100.2	20.9	97.3	
16	See Test Location Plan	101.9	23.0	98.9	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	1.2x10(-8)
Dry Density (pcf)	111.1
Moisture Content (%)	22.4

Atterberg Limits (ASTM D4318)

PL	20
LL	46
PI	26
USCS Classification	CL

Grain-size Analysis (ASTM D422)

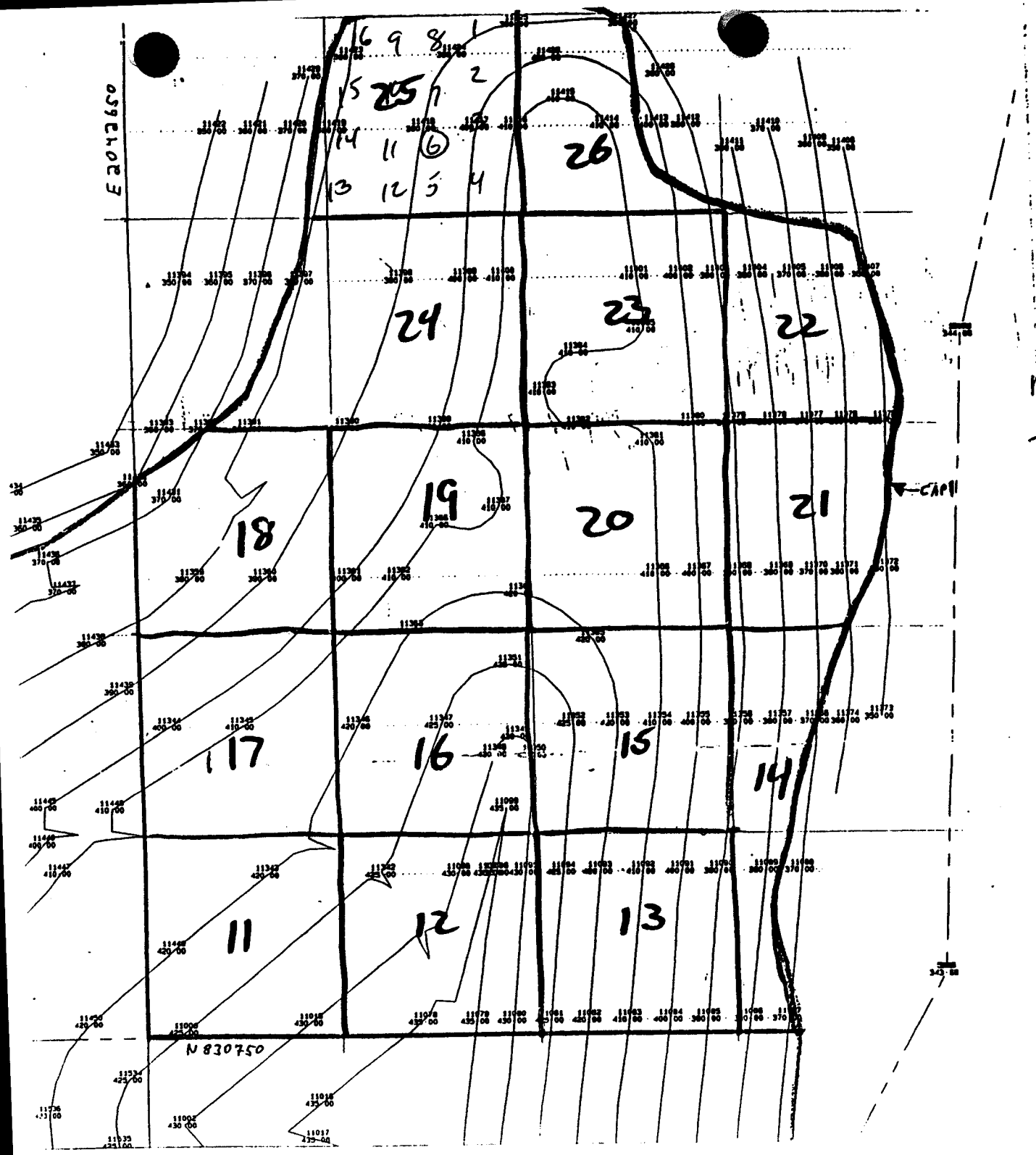
%Gravel	0.3
%Sand	47.7
%Silt	17.7
%Clay	34.3

Sincerely,
VAN DER HORST Geotechnical Engineering

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



11/27/98

Acre 25/Lift 3

Test location Plan

⑥ = Perm location

Report: 092

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/03/98
Report No.: P-168

Project No.: VNC-98-029
Sample No.: DL-218

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.2E-008	cm/sec
% Moisture	22.4	%
Dry Density	111.1	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/30/98
Location: Acre 25, Lift 3

Specimen Data

Length (in):	3.150
Diameter (in.):	2.820
Area (sq. in.):	6.257
Volume (cu. in.):	19.71
Wet Weight (grams):	703.1
Dry Weight (grams):	574.6
Dry Density (pcf):	111.1

Moisture Content Test Data

Wet Weight	107.54
Dry Weight	91.90
Tare weight	21.96
% Moisture	22.4

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
548	138.46	0.65	0.80	1.23	0.73	1.25E-008
652	138.46	0.80	1.00	1.25	0.90	1.31E-008
535	138.46	0.60	0.70	1.17	0.65	1.15E-008
951	138.46	1.05	0.95	0.90	1.00	9.94E-009

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

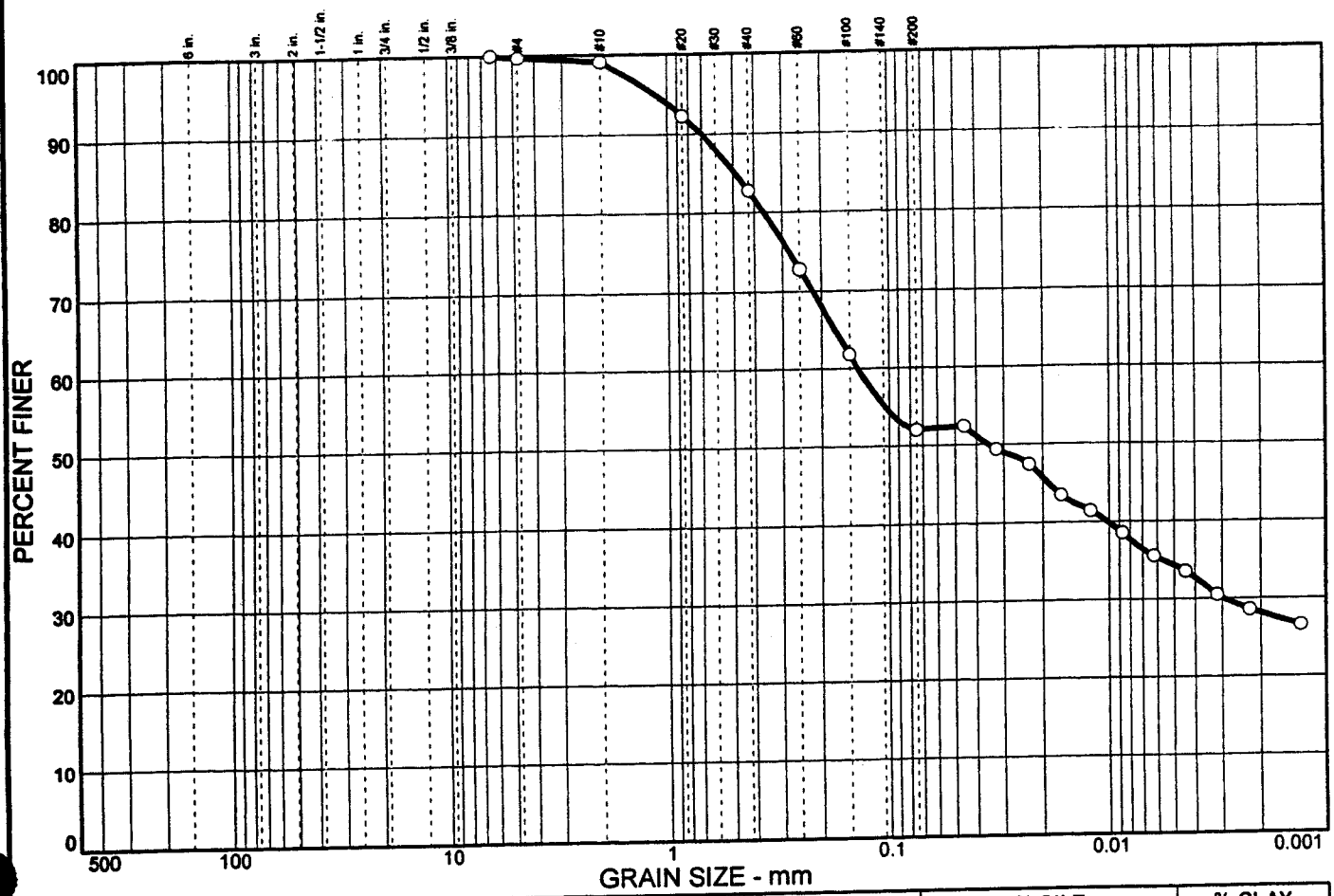
Permeability (k) **1.2E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-0460

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	47.7	17.7	34.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.1		
#20	92.3		
#40	82.8		
#60	72.8		
#100	61.8		
#200	52.0		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 20 LL= 46 PI= 26

Coefficients

D_{85}= 0.487 D_{60}= 0.138 D_{50}= 0.0354
D_{30}= 0.0030 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-218, Acre 25, Lift 3

Sample No.: DL-218 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 25, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/19/98
Report No.: 056

Acre 26 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	100.3	21.7	99.8	
2	See Test Location Plan	99.5	25.3	99.0	
3	See Test Location Plan	98.7	25.1	98.2	
4	See Test Location Plan	98.7	21.1	98.2	
5	See Test Location Plan	100.1	21.3	99.6	
6	See Test Location Plan	101.5	21.8	100+	Tube/Sample (DL-156)
7	See Test Location Plan	102.3	21.3	100+	
8	See Test Location Plan	101.6	22.1	100+	
9	See Test Location Plan	99.8	22.6	99.3	
10	See Test Location Plan	97.6	21.9	97.1	
11	See Test Location Plan	98.4	23.1	97.9	
12	See Test Location Plan	99.4	22.1	98.9	
13	See Test Location Plan	100.2	21.6	99.7	
14	See Test Location Plan	97.4	23.1	96.9	
15	See Test Location Plan	98.8	22.4	98.3	
16	See Test Location Plan	99.8	21.9	99.3	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	4.3 x 10(-8)
Dry Density (pcf)	98.8
Moisture Content (%)	24.9

Atterberg Limits (ASTM D4318)

PL	24
LL	54
PI	30

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel	0.9
%Sand	32.3
%Silt	14.2
%Clay	52.6

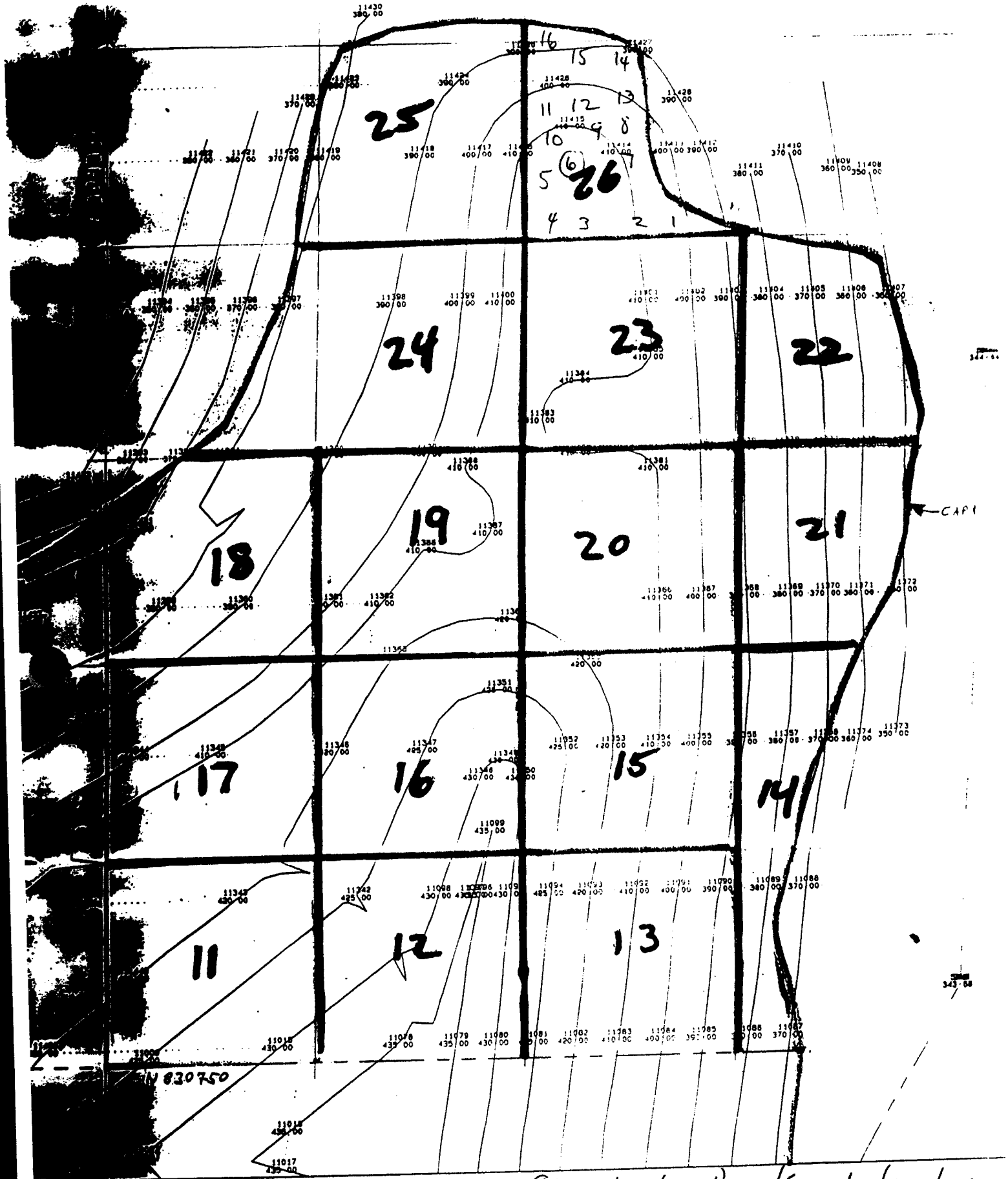
Sincerely,

VAN DER HORST Geotechnical Engineering P.C.

Robert L. Mashewske, P.E.

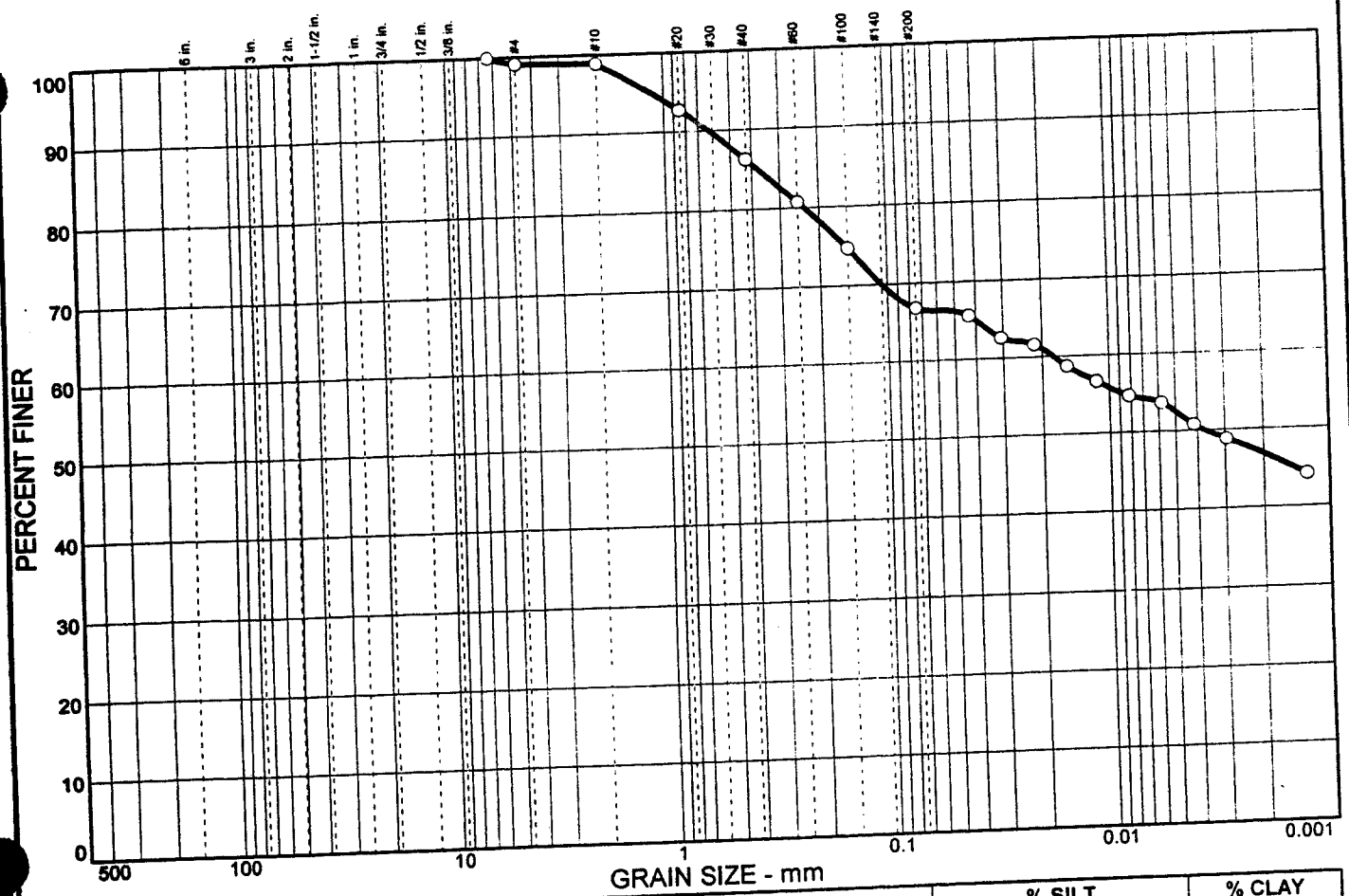
NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



(6) Indicates Pum/Sample Location
Acre 26, Gft 3
Report: 056

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.9	32.3	14.2	52.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.1		
#10	98.9		
#20	92.7		
#40	86.3		
#60	80.7		
#100	74.7		
#200	66.8		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 24 LL= 54 PI= 30

Coefficients

D_{85}= 0.374 D_{60}= 0.0179 D_{50}= 0.0037
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-156, Acre 26, Lift 3

Sample No.: DL-156 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 26, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/19/98
Report No.: P-124

Project No.: VNC-98-029
Sample No. DL-156

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.3E-08	cm/sec
% Moisture	24.9	%
Dry Density	98.8	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/08/98
Location: ACRE 26, LIFT 3

Specimen Data

Length (in):	3.542
Diameter (in.):	2.835
Area (sq. in.):	6.323
Volume (cu. in.):	22.40
Wet Weight (grams):	725.7
Dry Weight (grams):	580.8
Dry Density (pcf):	98.8

Moisture Content Test Data

Wet Weight	134.08
Dry Weight	111.69
Tare weight	21.95
% Moisture	24.9

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
436	110.77	1.20	1.40	1.17	1.30	3.92E-08
625	110.77	2.30	2.00	0.87	2.15	4.52E-08
377	110.77	1.25	1.10	0.88	1.18	4.10E-08
1088	110.77	3.70	3.70	1.00	3.70	4.47E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **4.3E-08** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 11/25/98
Report No.: 082

Acre 27 Lift 3

Clay Source: Fogleman Borrow Pit

ASTM D698 : 96.8 Max. Dry Density @ 22.5 Optimum Moisture

Required Compaction: 95% @ +22.5% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	97.2	22.7	100+	
2	See Test Location Plan	97.9	24.2	100+	
3	See Test Location Plan	96.3	28.0	99.4	
4	See Test Location Plan	98.2	22.6	100+	
5	See Test Location Plan	97.1	22.5	100+	
6	See Test Location Plan	93.6	27.7	96.7	Tube/Sample (DL-195)
7	See Test Location Plan	96.4	24.1	99.6	
8	See Test Location Plan	95.9	23.7	99.1	
9	See Test Location Plan	97.2	22.9	100+	
10	See Test Location Plan	95.2	25.3	98.3	
11	See Test Location Plan	93.8	26.0	96.9	
12	See Test Location Plan	94.7	27.1	97.8	
13	See Test Location Plan	94.8	26.2	97.9	
14	See Test Location Plan	95.9	23.7	99.1	
15	See Test Location Plan	97.9	22.7	100+	
16	See Test Location Plan	96.3	24.8	99.5	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	6.4x10(-9)
Dry Density (pcf)	100.8
Moisture Content (%)	23.0

Atterberg Limits (ASTM D4318)

PL	18
LL	53
PI	35

USCS Classification CH

Grain-size Analysis (ASTM D422)

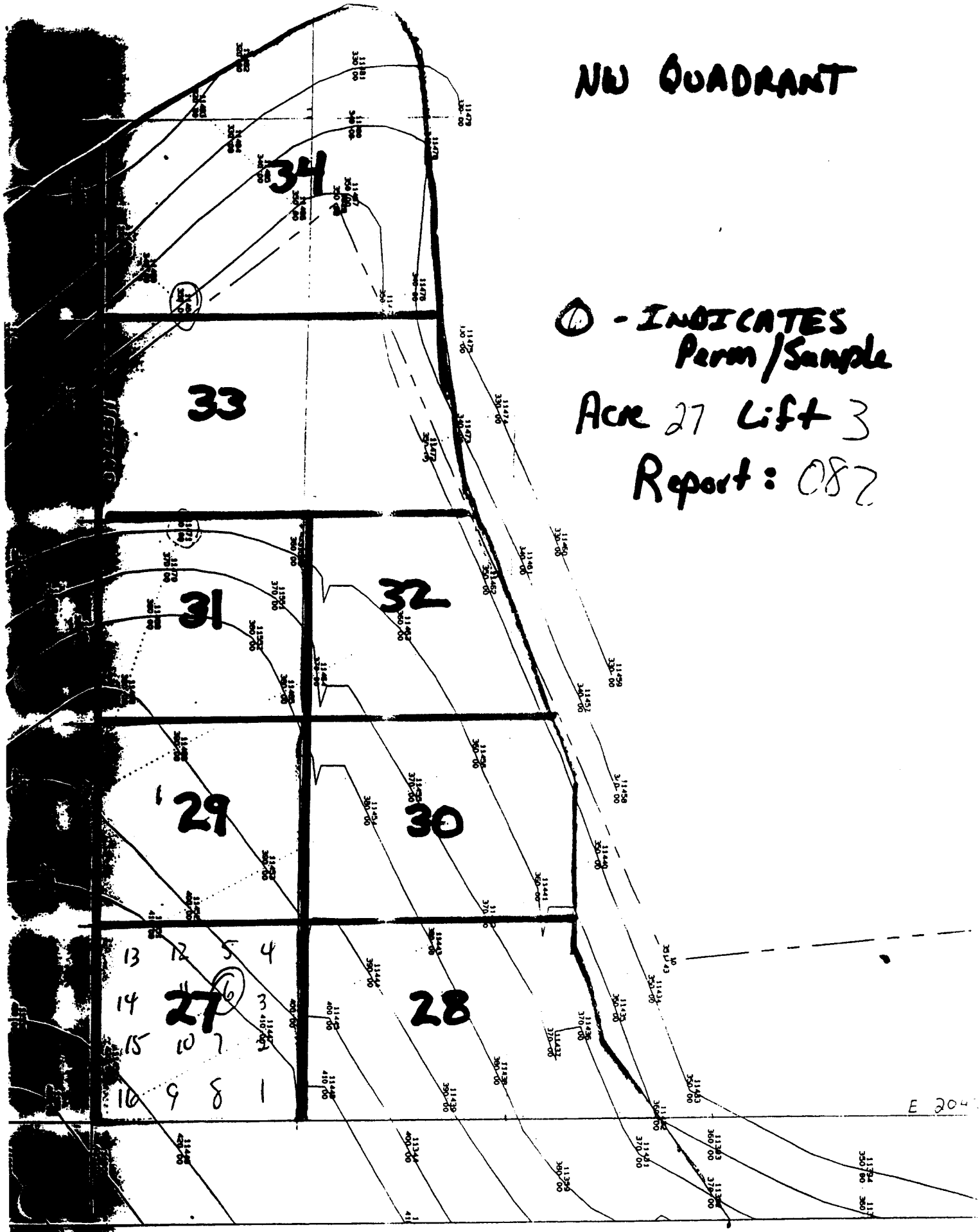
%Gravel	0.0
%Sand	26.1
%Silt	14.9
%Clay	59.0

Sincerely,
VAN DER HORST Geotechnical Engineering, PC

Robert L. Mashewske, PE

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



⑥ - INDICATES Perm/Sample

Acre 27 Lift 3

Report: 082

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-147

Project No.: VNC-98-029
Sample No.: DL-195

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.4E-009	cm/sec
% Moisture	23.0	%
Dry Density	100.8	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/20/98
Location: Acre 27, Lift 3

Specimen Data

Length (in):	3.031
Diameter (in.):	2.842
Area (sq. in.):	6.355
Volume (cu. in.):	19.26
Wet Weight (grams):	627.3
Dry Weight (grams):	509.8
Dry Density (pcf):	100.8

Moisture Content Test Data

Wet Weight	102.33
Dry Weight	87.28
Tare weight	21.97
% Moisture	23.0

Test Data

Confining Pressure 3.0 psi

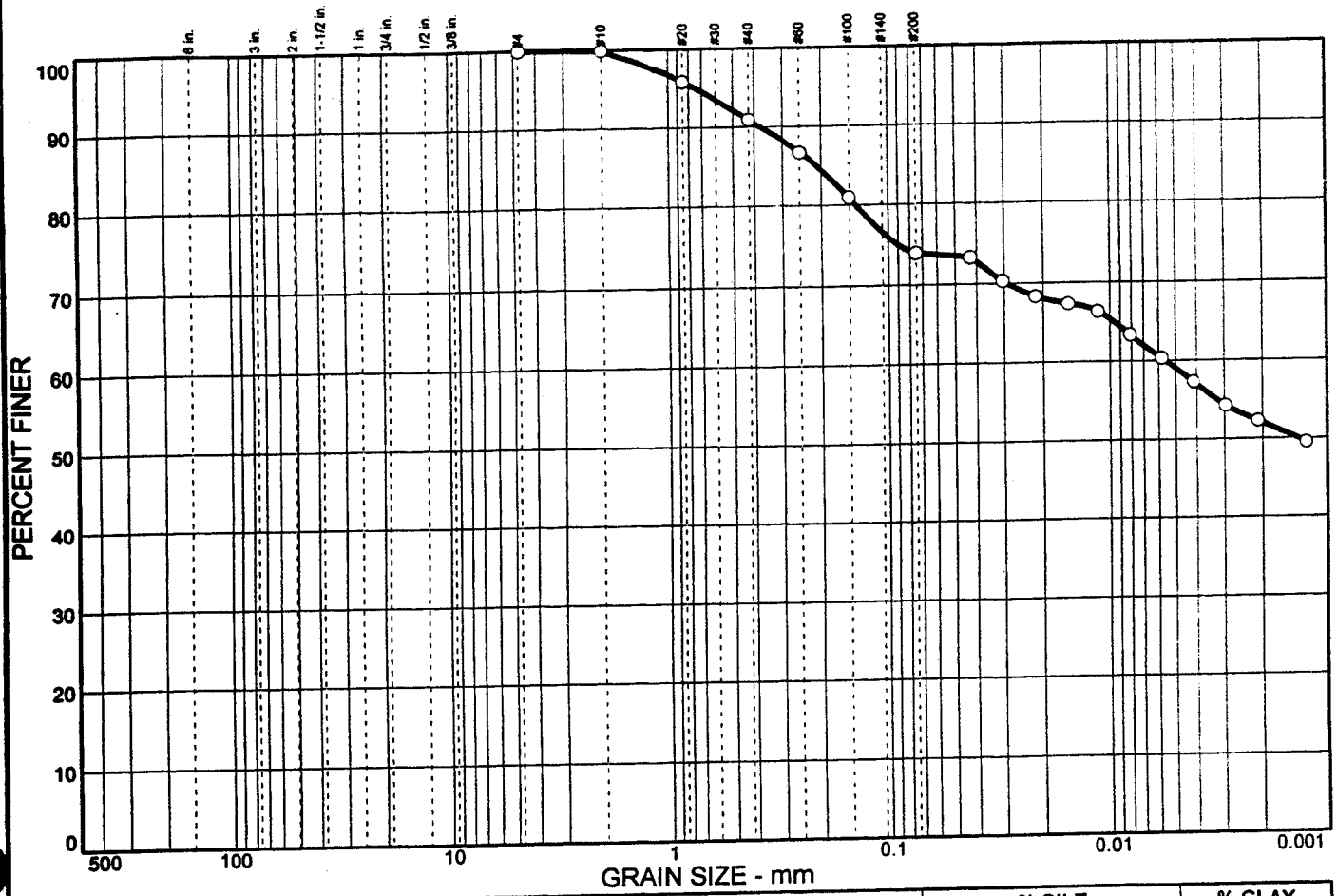
Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
668	138.46	0.65	0.40	0.62	0.53	7.04E-009
747	138.46	0.55	0.50	0.91	0.53	6.29E-009
725	138.46	0.55	0.45	0.82	0.50	6.18E-009
717	138.46	0.50	0.50	1.00	0.50	6.25E-009

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **6.4E-009** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	26.1	14.9	59.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	95.8		
#40	90.9		
#60	86.6		
#100	80.9		
#200	73.9		

* (no specification provided)

Soil Description

Fogelman - Fat clay with sand

Atterberg Limits

PL= 18 LL= 53 PI= 35

Coefficients

D_{85}= 0.213 D_{60}= 0.0056 D_{50}= 0.0014
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-195, Fogleman - Acre 27, Lift 3

Sample No.: DL-195 **Source of Sample:** Foggelman Borrow Pit **Date:**
Location: Fogelman borrow pit - Acre 27, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/17/98
Report No.: 116

Acre 28 Lift 3

Clay Source: On-Site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	101.0	22.1	98.1	
2	See Test Location Plan	102.4	20.1	99.4	
3	See Test Location Plan	103.8	21.1	100+	
4	See Test Location Plan	102.1	20.9	99.1	
5	See Test Location Plan	99.2	22.7	96.3	
6	See Test Location Plan	100.9	22.4	98.0	
7	See Test Location Plan	100.7	22.9	97.8	
8	See Test Location Plan	100.2	22.6	97.3	
9	See Test Location Plan	98.6	23.7	95.7	Perm/Sample (DL-241)
10	See Test Location Plan	101.7	21.7	98.7	
11	See Test Location Plan	102.8	22.0	99.8	
12	See Test Location Plan	101.3	21.9	98.3	
13	See Test Location Plan	103.4	21.8	100+	
14	See Test Location Plan	102.5	20.7	99.5	
15	See Test Location Plan	101.6	22.9	98.6	
16	See Test Location Plan	101.3	22.0	98.4	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 2.6x10(-8)

Dry Density (pcf) 104.6

Moisture Content (%) 20.3

Atterberg Limits (ASTM D4318)

PL 17
LL 40
PI 23

Grain-size Analysis (ASTM D422)

%Gravel 0.3
%Sand 35.7
%Silt 20.4
%Clay 43.6

USCS Classification CL

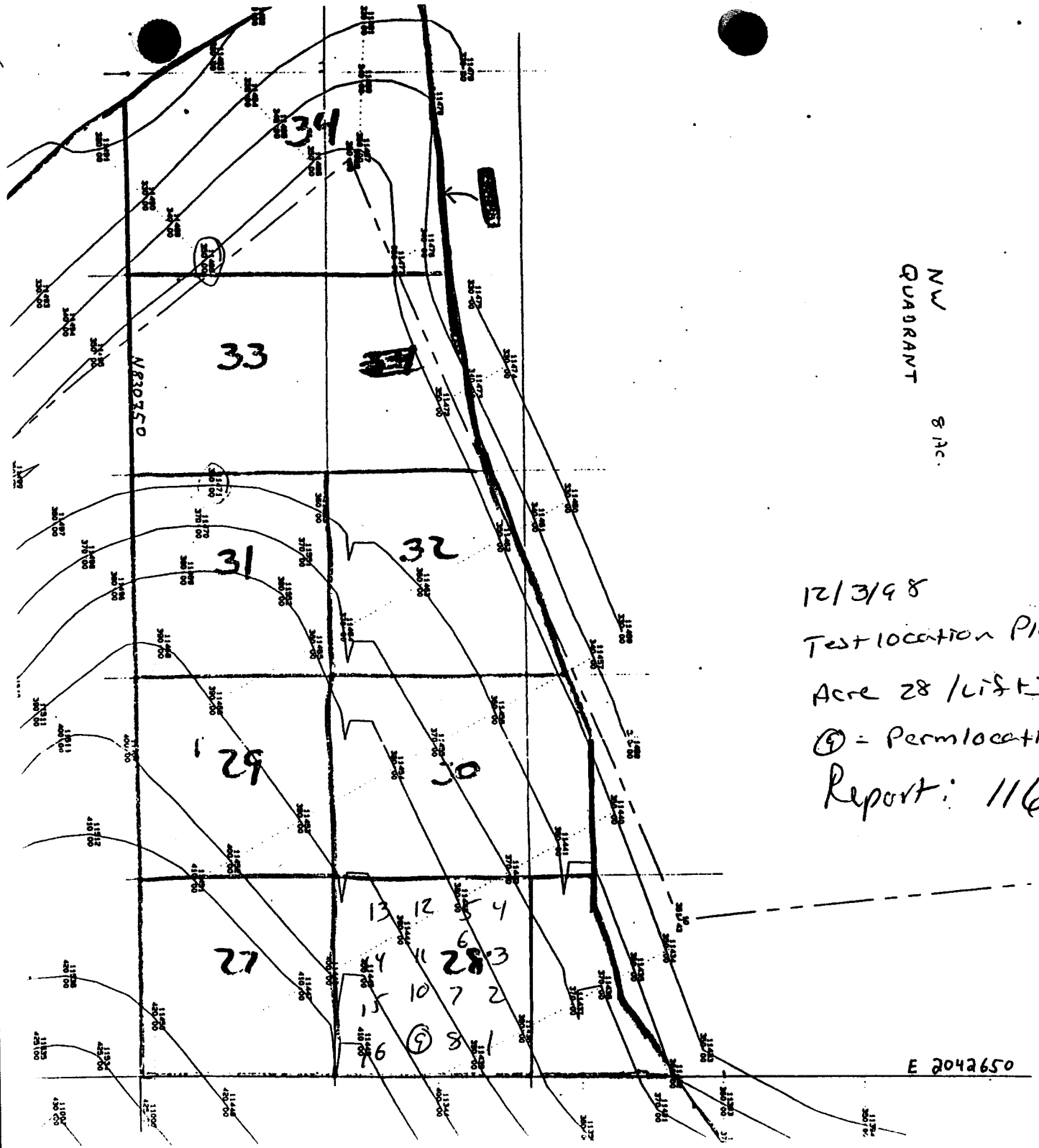
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



NW QUADRANT

8 ac.

12/3/98

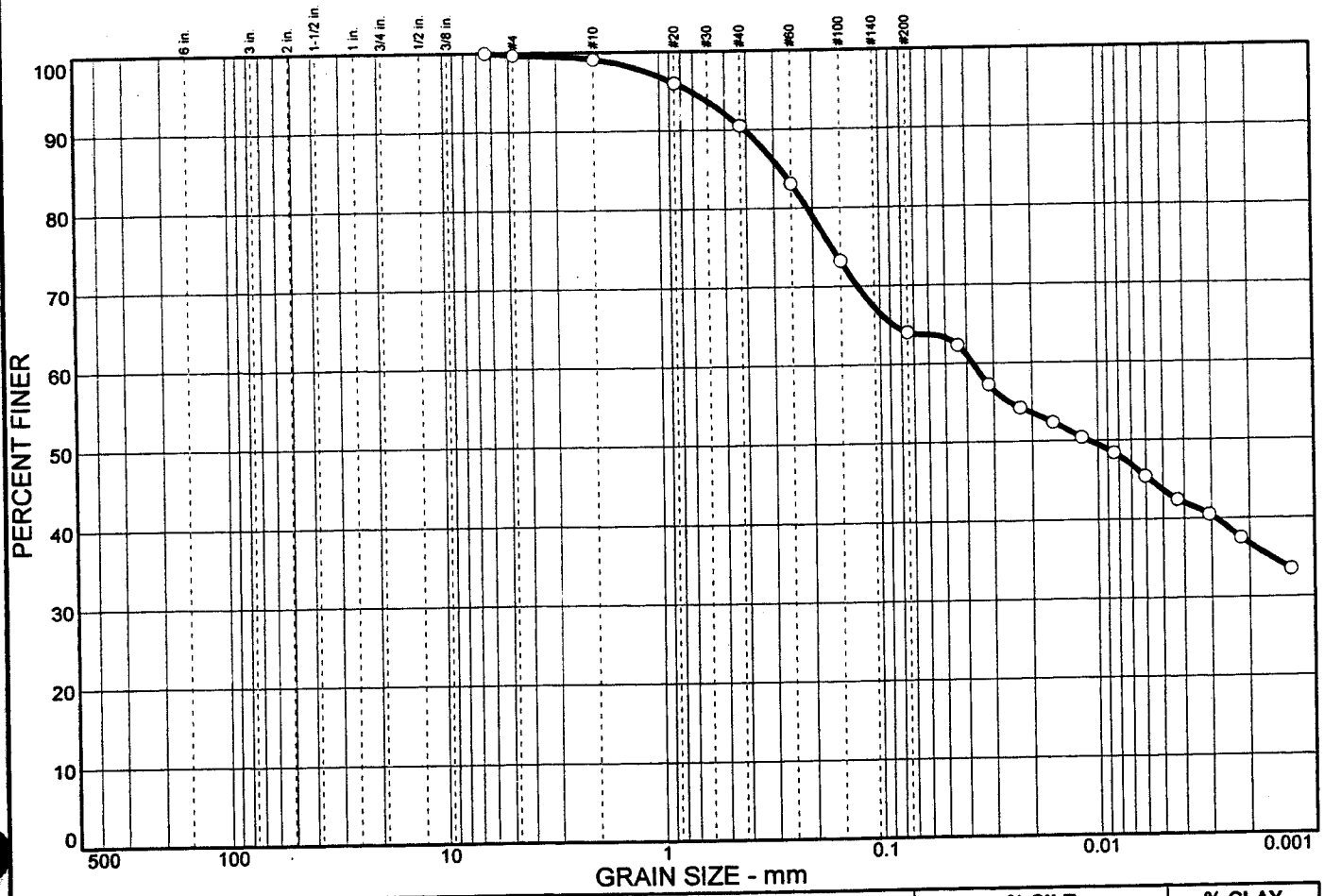
Test location Plan

Acre 28 / Lift 3

(9) = Perm location

Report: 116

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	35.7	20.4	43.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.1		
#20	96.0		
#40	90.5		
#60	83.1		
#100	73.2		
#200	64.0		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 17 LL= 40 PI= 23

Coefficients

D_{85}= 0.280 D_{60}= 0.0374 D_{50}= 0.0110
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-241, Acre 28, Lift 3

Sample No.: DL-241 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 28, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/10/98
Report No.: P-190

Project No.: VNC-98-029
Sample No.: DL-241

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.6E-008	cm/sec
% Moisture	20.3	%
Dry Density	104.6	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 12/03/98
Location: Acre 28, Lift 3

Specimen Data

Length (in):	3.478
Diameter (in.):	2.858
Area (sq. in.):	6.426
Volume (cu. in.):	22.35
Wet Weight (grams):	738.3
Dry Weight (grams):	613.5
Dry Density (pcf):	104.6

Wet Weight	123.31
Dry Weight	106.17
Tare weight	21.91
% Moisture	20.3

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
885	138.46	1.30	1.20	0.92	1.25	1.44E-008
411	138.46	0.50	4.50	9.00	2.50	6.18E-008
570	138.46	0.70	0.65	0.93	0.68	1.20E-008
525	138.46	0.90	0.80	0.89	0.85	1.65E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.6E-008** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/17/98
Report No.: 121

Acre 28a Lift 3

Clay Source: On-site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	102.9	19.7	99.9	
2	See Test Location Plan	103.3	20.4	100+	
3	See Test Location Plan	101.4	20.3	98.4	
4	See Test Location Plan	99.9	22.5	97.0	Perm/Sample (DL-242)
5	See Test Location Plan	98.6	22.6	95.7	
6	See Test Location Plan	100.7	21.4	97.8	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 7.6x10(-9)

Dry Density (pcf) 103.6

Moisture Content (%) 21.9

Atterberg Limits (ASTM D4318)

PL 19
LL 42
PI 23

USCS Classification CL

Grain-size Analysis (ASTM D422)

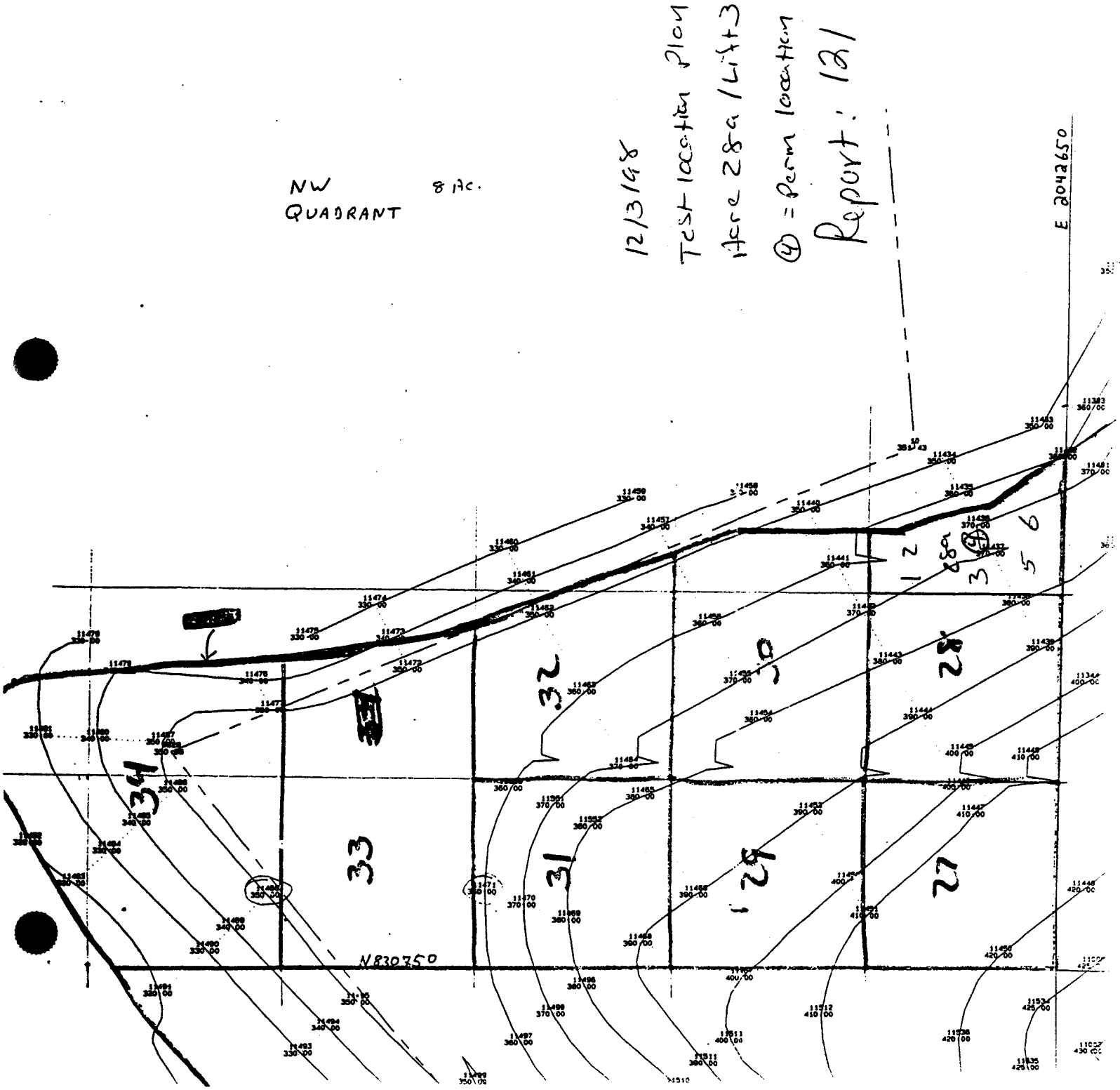
%Gravel 0.6
%Sand 44.2
%Silt 16.6
%Clay 38.6

Sincerely,
VAN DER HORST Geotechnical Engineering, PLLC

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan


NW
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12/3/98
Test location Plan
Acre 28a / Lift 3
④ = Perm location
Report: 121
E 2042650
N830750
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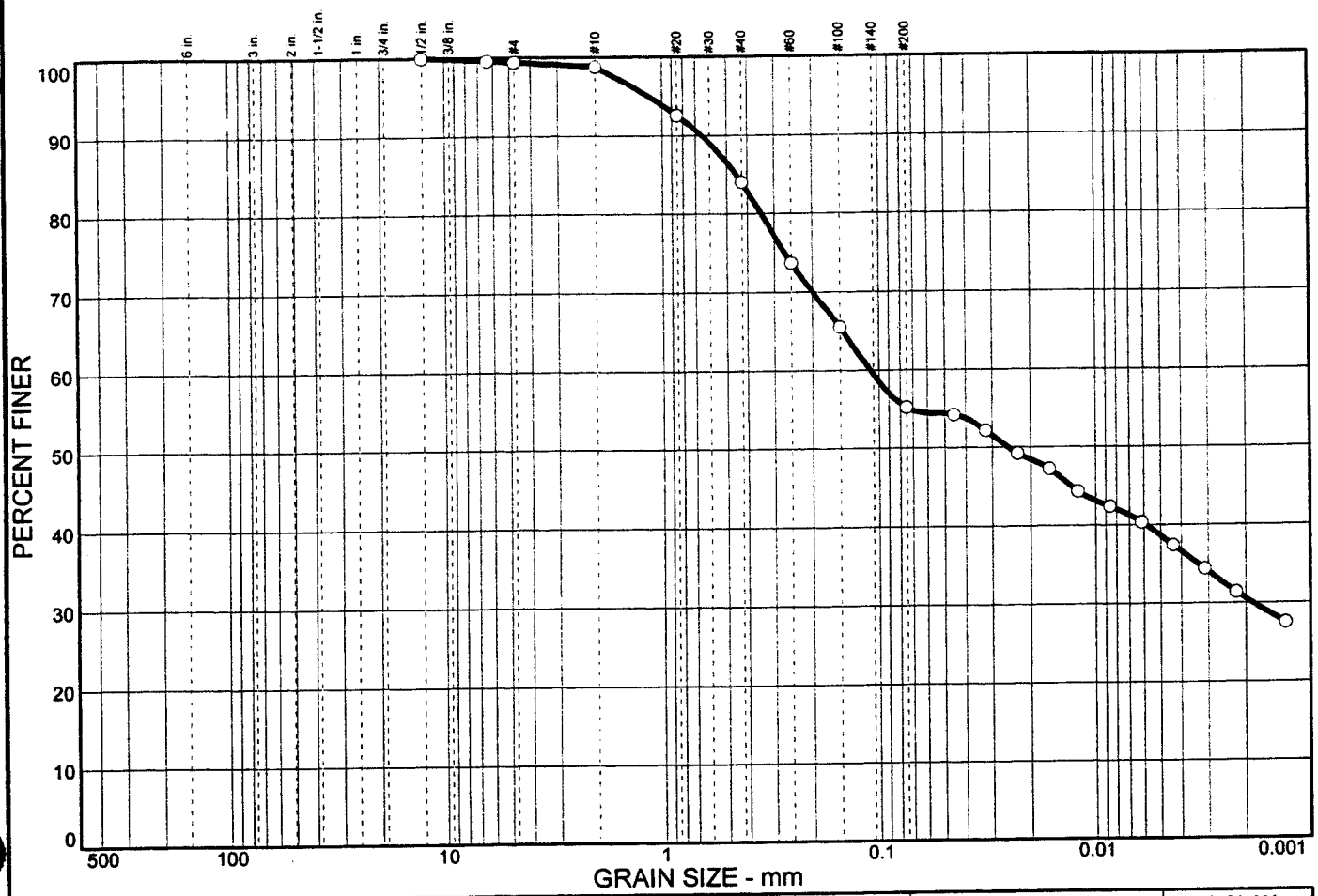
6

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.6	44.2	16.6	38.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	99.6		
#4	99.4		
#10	98.8		
#20	92.6		
#40	84.0		
#60	73.7		
#100	65.5		
#200	55.2		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 42 PI= 23

Coefficients

D_{85}= 0.451 D_{60}= 0.109 D_{50}= 0.0254
D_{30}= 0.0019 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-242, Acre 28A, Lift 3

Sample No.: DL-242 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 28A, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/10/98
Report No.: P-191

Project No.: VNC-98-029
Sample No.: DL-242

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	7.6E-009	cm/sec
% Moisture	21.9	%
Dry Density	103.6	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 12/03/98
Location: Acre 28a, Lift 3

Specimen Data

Length (in):	2.985
Diameter (in.):	2.840
Area (sq. in.):	6.346
Volume (cu. in.):	18.94
Wet Weight (grams):	628.0
Dry Weight (grams):	515.0
Dry Density (pcf):	103.6

Wet Weight	103.48
Dry Weight	88.83
Tare weight	22.04
% Moisture	21.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
690	138.46	0.65	0.70	1.08	0.68	8.64E-009
726	138.46	0.65	0.50	0.77	0.58	7.00E-009
503	138.46	0.40	0.40	1.00	0.40	7.02E-009
467	138.46	0.40	0.40	1.00	0.40	7.57E-009

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **7.6E-009** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No. VNC-98-029
Date: 11/25/98
Report No.: 083

Acre 29 Lift 3
Clay Source: Fogleman Borrow Pit
ASTM D698 : 96.8 Max. Dry Density @ 22.5 Optimum Moisture
Required Compaction: 95% @ +22.5% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	96.9	27.9	100+	
2	See Test Location Plan	96.1	24.8	99.3	
3	See Test Location Plan	97.2	24.8	100+	
4	See Test Location Plan	95.7	27.1	98.9	
5	See Test Location Plan	96.2	23.6	99.4	
6	See Test Location Plan	94.6	26.7	97.7	
7	See Test Location Plan	99.9	24.9	100+	
8	See Test Location Plan	97.6	24.7	100+	
9	See Test Location Plan	93.9	28.9	97.0	Tube/Sample (DL-196)
10	See Test Location Plan	92.4	28.0	95.5	
11	See Test Location Plan	95.7	25.9	98.9	
12	See Test Location Plan	93.8	26.8	96.9	
13	See Test Location Plan	94.2	24.1	97.3	
14	See Test Location Plan	96.9	22.9	100+	
15	See Test Location Plan	96.2	22.7	99.4	
16	See Test Location Plan	95.8	24.9	99.0	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	9.8x10(-9)
Dry Density (pcf)	103.3
Moisture Content (%)	26.4

Atterberg Limits (ASTM D4318)		Grain-size Analysis (ASTM D422)	
PL	23	%Gravel	0.0
LL	73	%Sand	23.4
PI	50	%Silt	16.3
		%Clay	60.3
USCS Classification	CH		

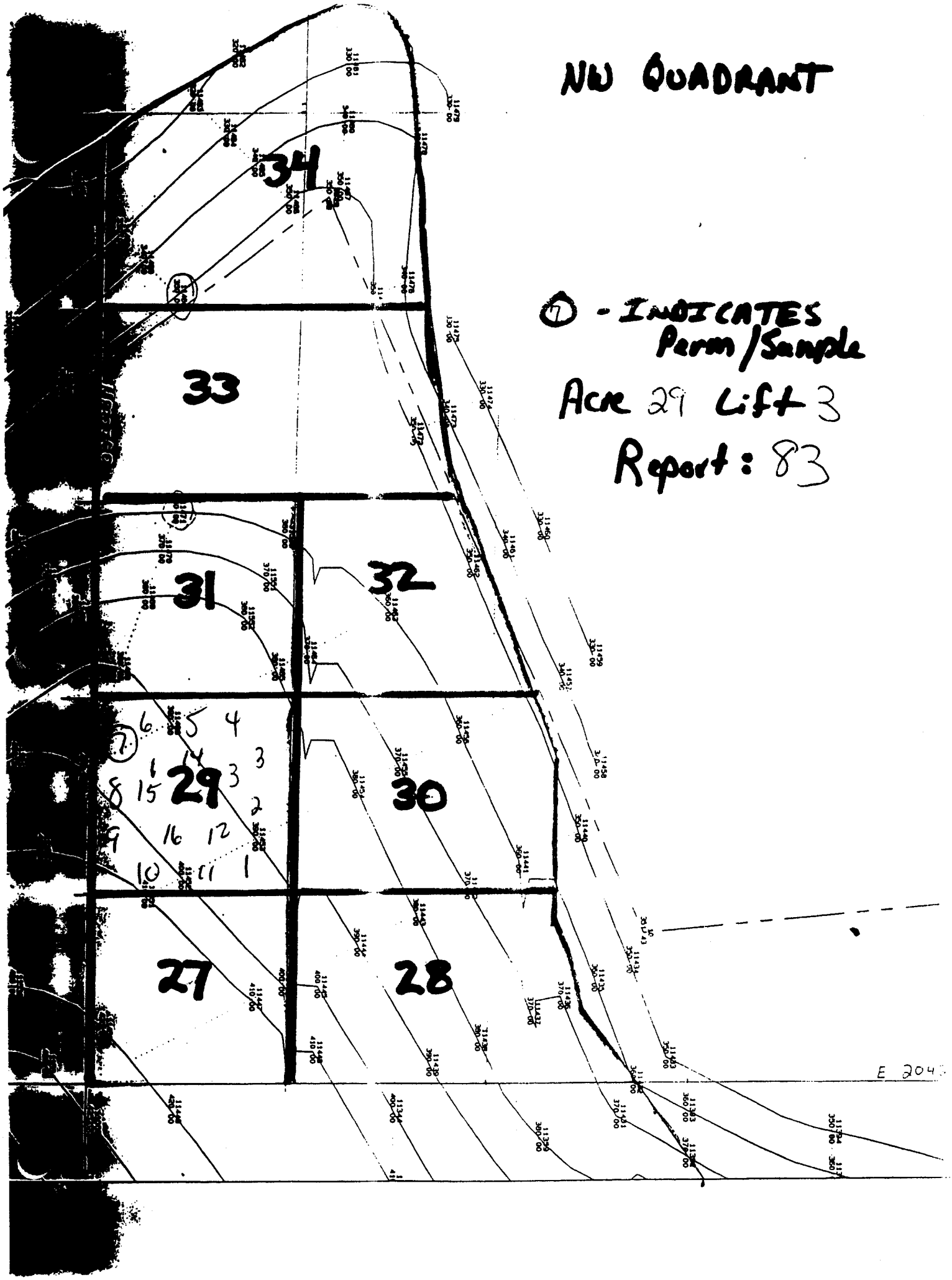
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

NW QUADRANT



⑦ - INDICATES Perm/Sample

Acre 29 Lift 3

Report: 83

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5u84 - Method A

Date: 11/30/98
Report No.: P-148

Project No.: VNC-98-029
Sample No.: DL-196

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	9.8E-009	cm/sec
% Moisture	26.4	%
Dry Density	103.3	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 11/20/98
Location: Acre 29, Lift 3

Specimen Data

Length (in):	4.011
Diameter (in.):	2.856
Area (sq. in.):	6.417
Volume (cu. in.):	25.74
Wet Weight (grams):	882.1
Dry Weight (grams):	698.1
Dry Density (pcf):	103.3

Moisture Content Test Data

Wet Weight	104.94
Dry Weight	87.62
Tare weight	21.93
% Moisture	26.4

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
714	132.92	0.65	0.60	0.92	0.63	1.07E-008
648	132.92	0.50	0.50	1.00	0.50	9.43E-009
530	132.92	0.45	0.40	0.89	0.43	9.80E-009
306	132.92	0.23	0.24	1.04	0.24	9.39E-009

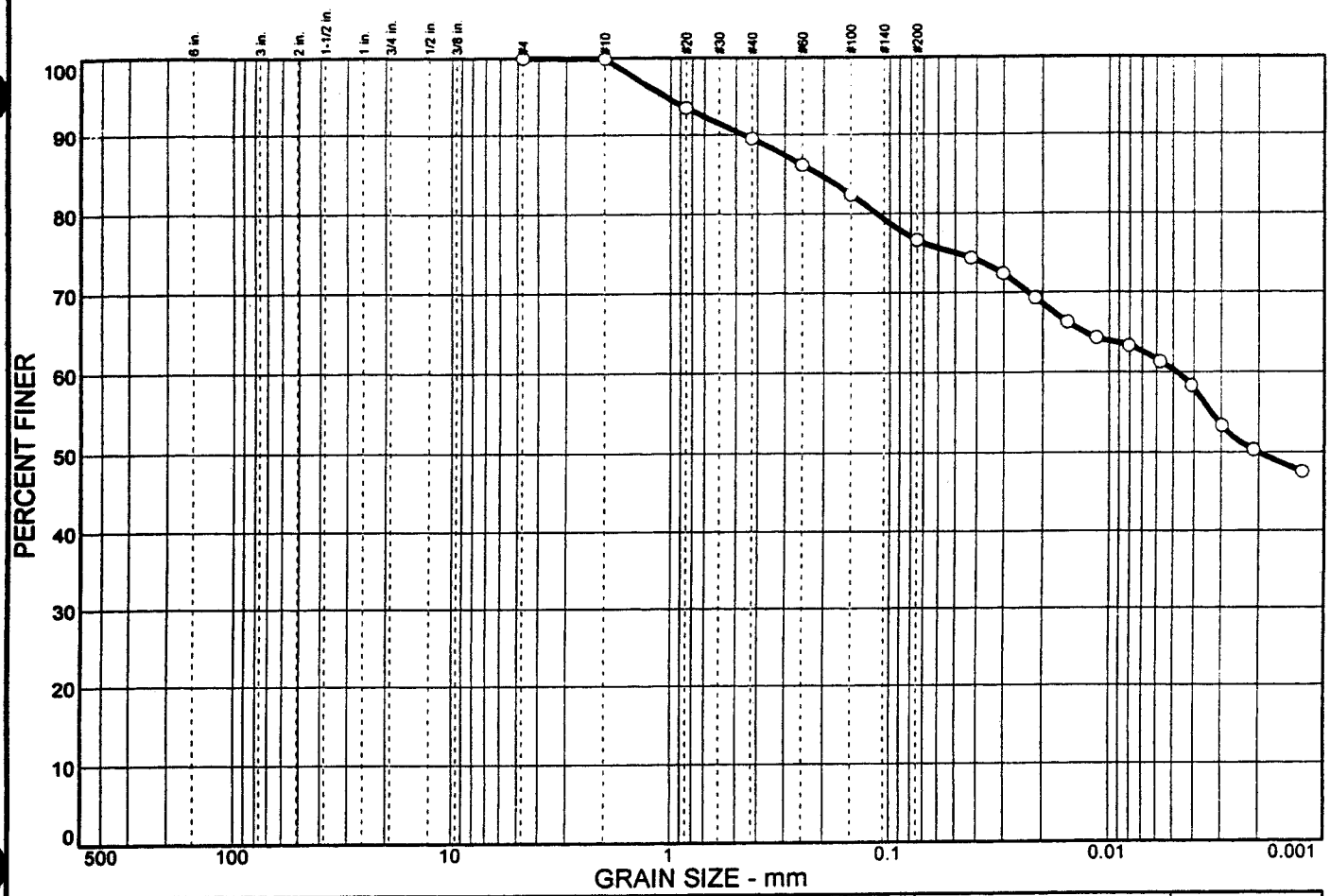
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **9.8E-009** cm/sec

Respecfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	23.4	16.3	60.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	93.5		
#40	89.5		
#60	86.1		
#100	82.4		
#200	76.6		

* (no specification provided)

Soil Description

Fogelman - Fat clay with sand

Atterberg Limits

PL= 23 LL= 73 PI= 50

Coefficients

D_{85}= 0.212 D_{60}= 0.0048 D_{50}= 0.0020
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-196, Fogleman - Acre 29, Lift 3

Sample No.: DL-196 **Source of Sample:** Foggelman Borrow Pit **Date:**
Location: Fogelman borrow pit - Acre 29, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/10/98
Report No.: 113

Acre 30 Lift 3

Clay Source: On-Site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	102.6	20.0	99.6	
2	See Test Location Plan	104.6	19.5	100+	
3	See Test Location Plan	101.8	21.9	98.8	
4	See Test Location Plan	104.2	19.8	100+	
5	See Test Location Plan	102.3	20.1	99.3	
6	See Test Location Plan	100.3	23.7	97.4	Tube/Sample (DL-243)
7	See Test Location Plan	101.4	22.4	98.4	
8	See Test Location Plan	100.4	23.4	97.5	
9	See Test Location Plan	99.6	23.0	96.7	
10	See Test Location Plan	102.4	19.8	99.4	
11	See Test Location Plan	100.3	20.6	97.4	
12	See Test Location Plan	102.0	20.3	99.0	
13	See Test Location Plan	101.7	21.7	98.7	
14	See Test Location Plan	101.1	20.5	98.2	
15	See Test Location Plan	101.5	21.2	98.5	
16	See Test Location Plan	102.9	20.0	99.9	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	1.3x10(-8)
Dry Density (pcf)	100.8
Moisture Content (%)	21.5

Atterberg Limits (ASTM D4318)		**Grain-size Analysis (ASTM D422)**	
PL	19	%Gravel	0.1
LL	48	%Sand	45.5
PI	29	%Silt	17.9
		%Clay	36.5
USCS Classification	CL		

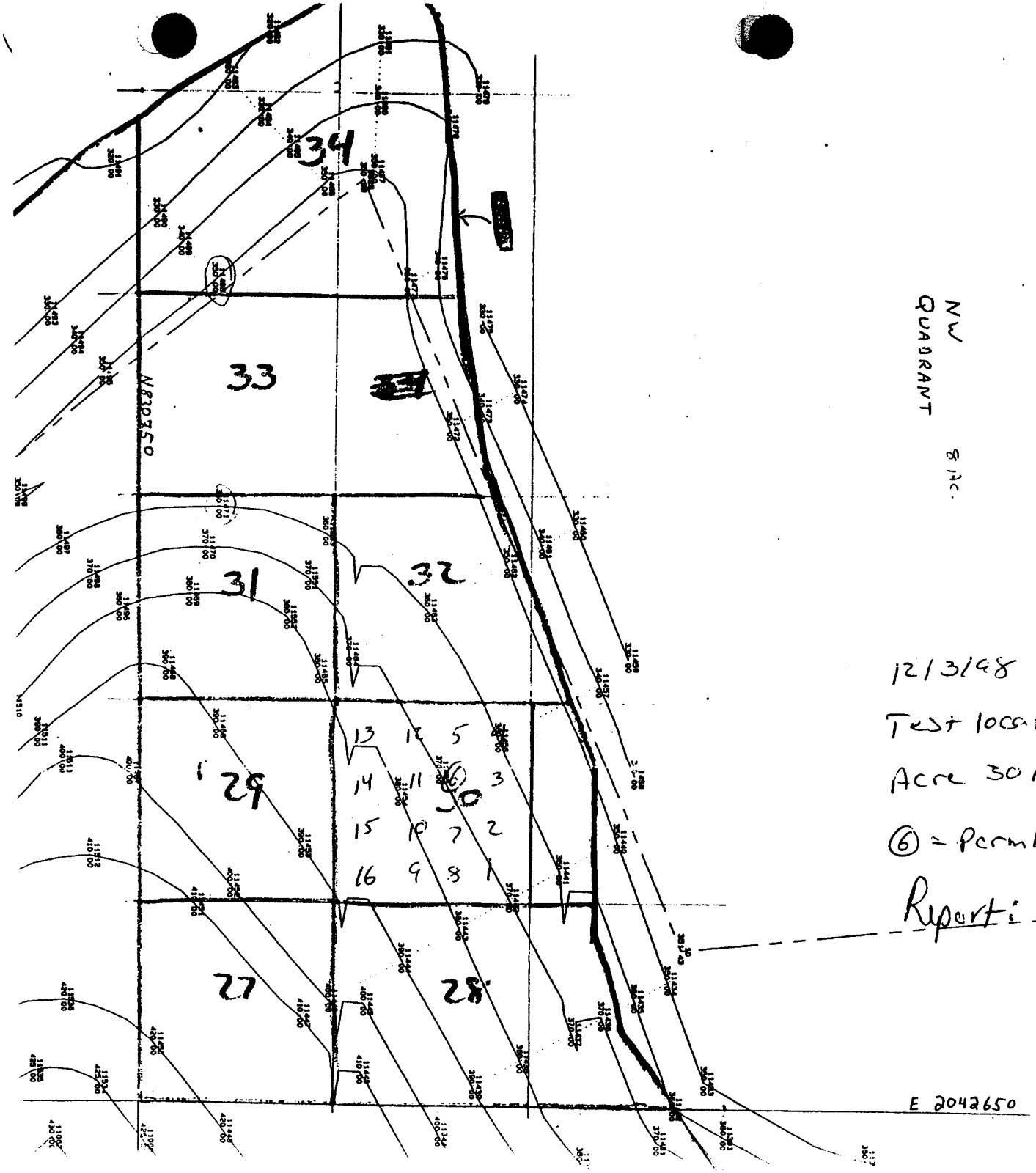
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



NW
QUADRANT

8 ac.

12/3/98

Test location Plan

Acre 30 / Lift 3

⑥ = Perm location

Report: 113

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/10/98
Report No.: P-188

Project No.: VNC-98-029
Sample No.: DL-243

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.3E-008	cm/sec
% Moisture	21.5	%
Dry Density	100.8	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/03/98
Location: Acre 30, Lift 3

Specimen Data

Length (in):	3.066
Diameter (in.):	2.870
Area (sq. in.):	6.480
Volume (cu. in.):	19.87
Wet Weight (grams):	638.7
Dry Weight (grams):	525.7
Dry Density (pcf):	100.8

Wet Weight	168.68
Dry Weight	142.72
Tare weight	22.01
% Moisture	21.5

Test Data

Confining Pressure 3.0 psi

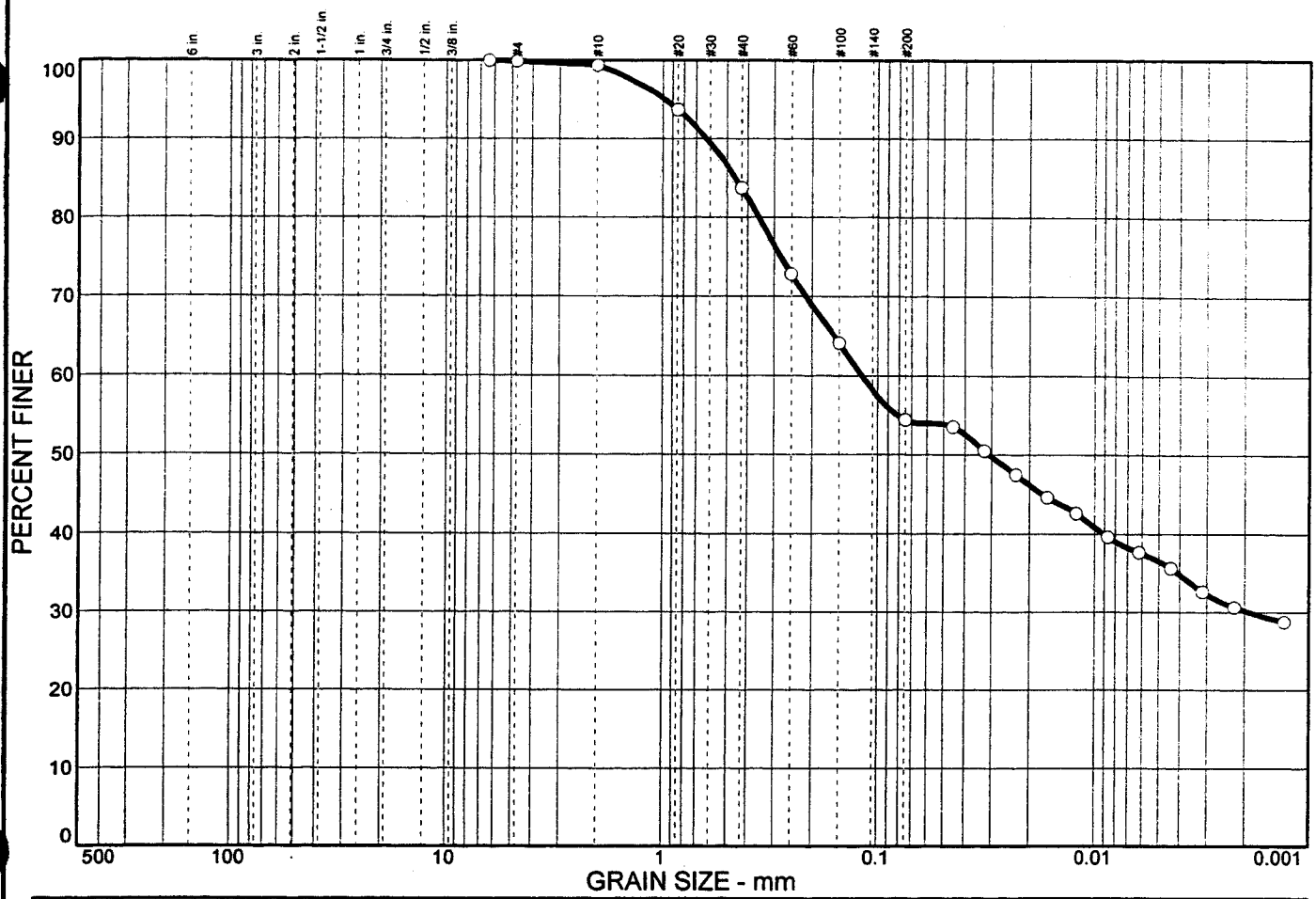
Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
267	138.46	0.45	0.40	0.89	0.43	1.41E-008
423	144.00	0.70	0.55	0.79	0.63	1.26E-008
726	146.77	1.15	0.90	0.78	1.03	1.18E-008
302	146.17	0.50	0.45	0.90	0.48	1.32E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **1.3E-008** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	45.5	17.9	36.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.4		
#20	93.7		
#40	83.7		
#60	72.8		
#100	64.1		
#200	54.4		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 48 PI= 29

Coefficients

D_{85}= 0.456 D_{60}= 0.118 D_{50}= 0.0308
D_{30}= 0.0019 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-243, Acre 30, Lift 3

Sample No.: DL-243 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 30, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/17/98
Report No.: 122

Acre 30a Lift 3
Clay Source: On-site Borrow Pit
ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture
Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	101.5	22.5	98.6	Perm/Sample (DL-244)
2	See Test Location Plan	102.8	21.1	99.8	
3	See Test Location Plan	100.5	22.9	97.6	
4	See Test Location Plan	103.2	19.4	100+	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	1.7x10(-8)
Dry Density (pcf)	96.2
Moisture Content (%)	24.9

Atterberg Limits (ASTM D4318)

PL	19
LL	40
PI	21
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.1
%Sand	45.5
%Silt	21.8
%Clay	32.6

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

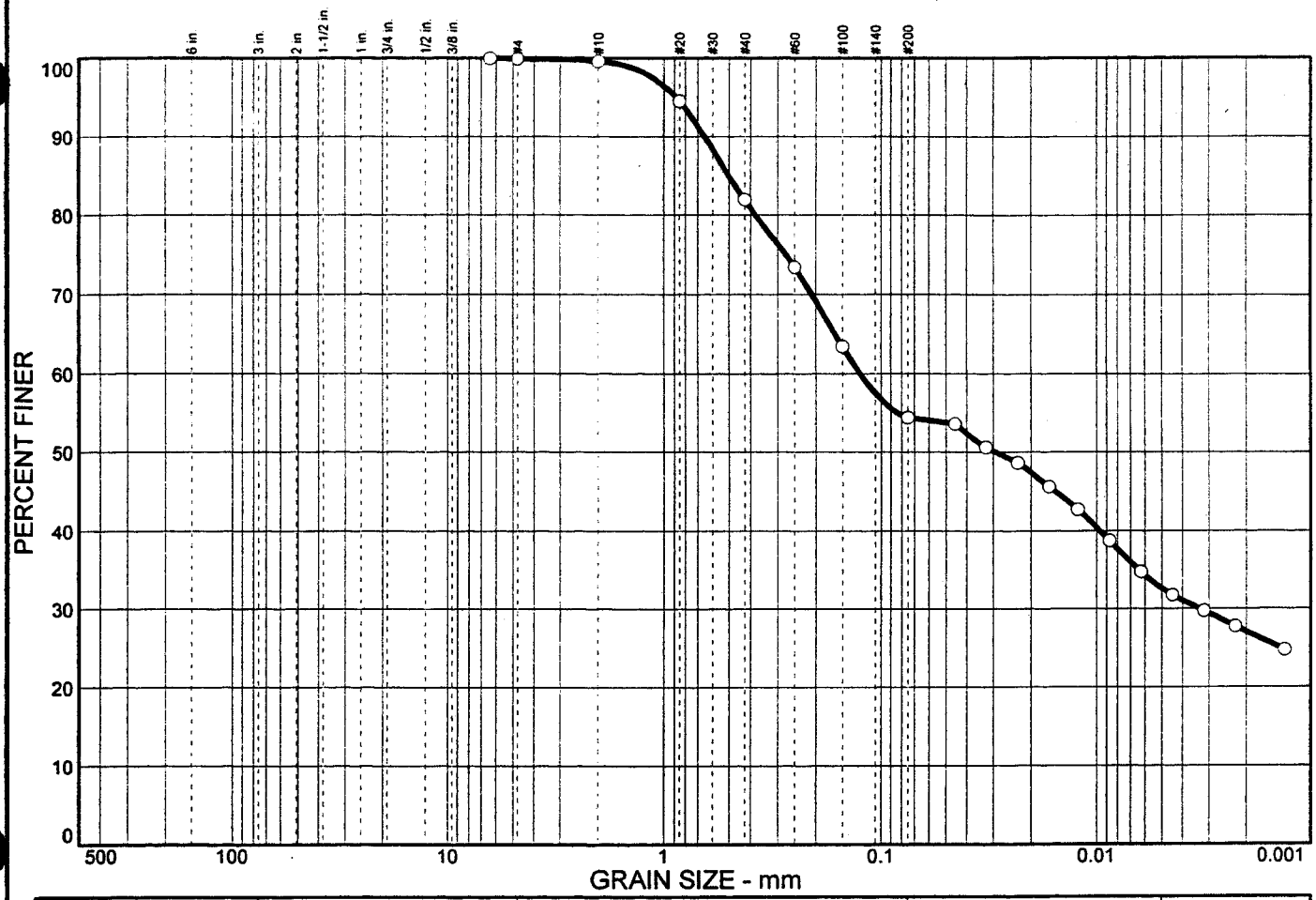
NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

NW
QUADRANT

12/3/98
Test location Plan
Acre 30a / Lifts
① = Farm location
Report : 122

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	45.5	21.8	32.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.6		
#20	94.5		
#40	81.9		
#60	73.4		
#100	63.4		
#200	54.4		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 40 PI= 21

Coefficients

D_{85}= 0.502 D_{60}= 0.124 D_{50}= 0.0294
D_{30}= 0.0033 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-244, Acre 30A, Lift 3

Sample No.: DL-244 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 30A, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/17/98
Report No.: P-214

Project No.: VNC-98-029
Sample No.: DL-244
Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.7E-008	cm/sec
% Moisture	24.9	%
Dry Density	96.2	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/03/98
Location: Acre 30a, Lift 3

Specimen Data

Length (in):	3.489
Diameter (in.):	2.853
Area (sq. in.):	6.404
Volume (cu. in.):	22.34
Wet Weight (grams):	704.7
Dry Weight (grams):	564.0
Dry Density (pcf):	96.2

Wet Weight	120.21
Dry Weight	100.61
Tare weight	22.01
% Moisture	24.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
428	138.46	0.70	0.80	1.14	0.75	1.79E-008
897	138.46	1.50	1.70	1.13	1.60	1.82E-008
1114	138.46	2.00	2.10	1.05	2.05	1.88E-008
512	138.46	0.70	0.70	1.00	0.70	1.40E-008

x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **1.7E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/10/98
Report No.: 098

Acre 31 Lift 3

Clay Source: On-Site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	93.6	27.1	96.7 90.9	
2	See Test Location Plan	97.2	24.6	100+ 94.4	
3	See Test Location Plan	96.0	22.5	99.2 93.2	
4	See Test Location Plan	96.7	26.4	99.9 93.9	
5	See Test Location Plan	94.9	24.2	98.0 92.1	
6	See Test Location Plan	97.4	23.3	100+ 94.6	
7	See Test Location Plan	95.9	22.6	99.1 93.1	
8	See Test Location Plan	94.6	24.5	97.7 91.8	
9	See Test Location Plan	98.1	24.5	100+ 95.2	Tube/Sample (DL-220)
10	See Test Location Plan	93.1	26.7	96.2 90.4	
11	See Test Location Plan	96.9	23.4	100+ 94.1	
12	See Test Location Plan	96.0	22.8	99.2 93.2	
13	See Test Location Plan	94.9	24.3	98.0 92.1	
14	See Test Location Plan	95.3	23.8	98.5 92.5	
15	See Test Location Plan	95.8	23.9	99.0 93.0	
16	See Test Location Plan	94.9	24.6	98.0 92.1	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	9.8x10(-9)
Dry Density (pcf)	101.5
Moisture Content (%)	21.7

Atterberg Limits (ASTM D4318)

PL	21
LL	42
PI	21
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.7
%Sand	46.8
%Silt	15.9
%Clay	36.6

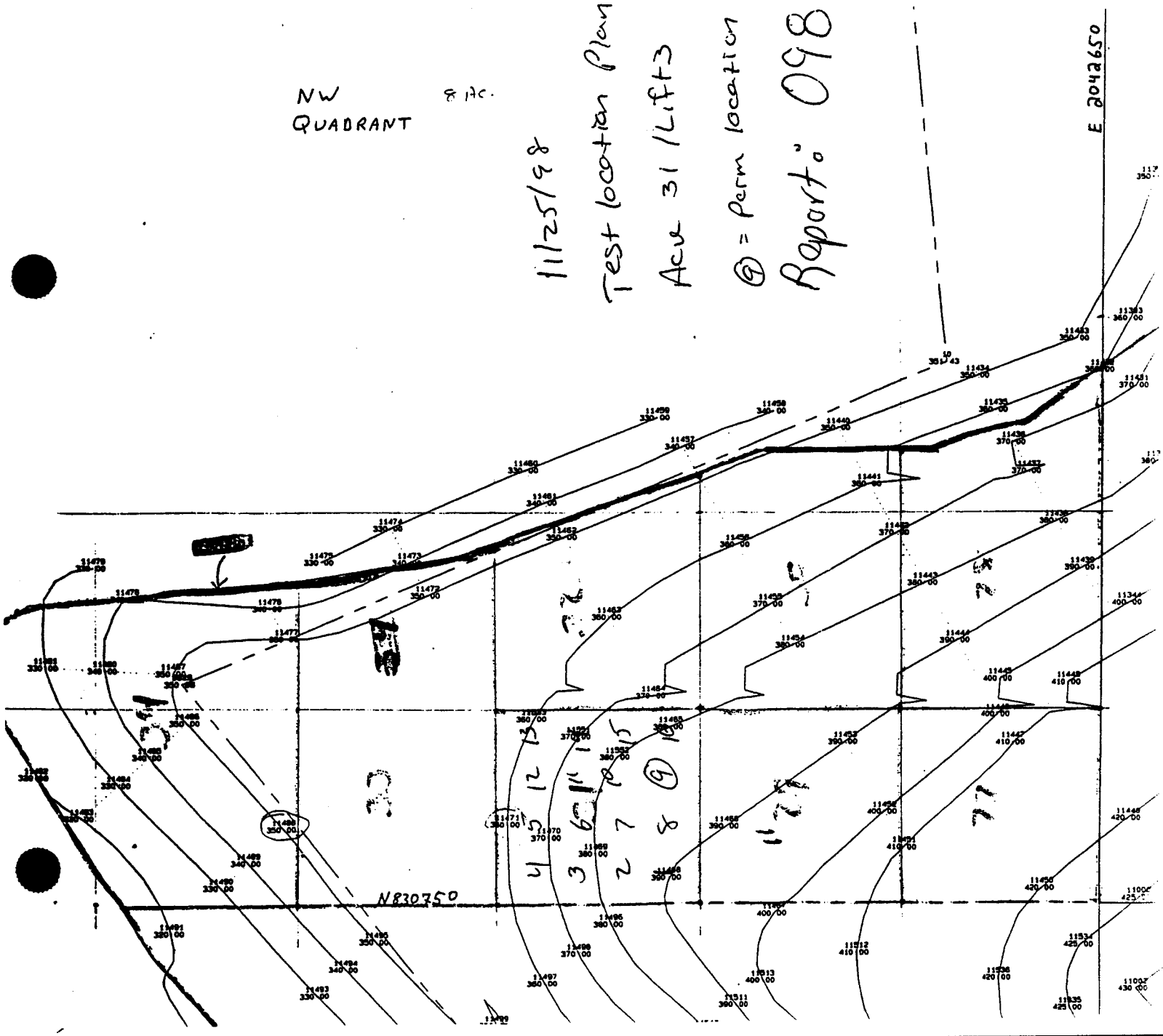
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

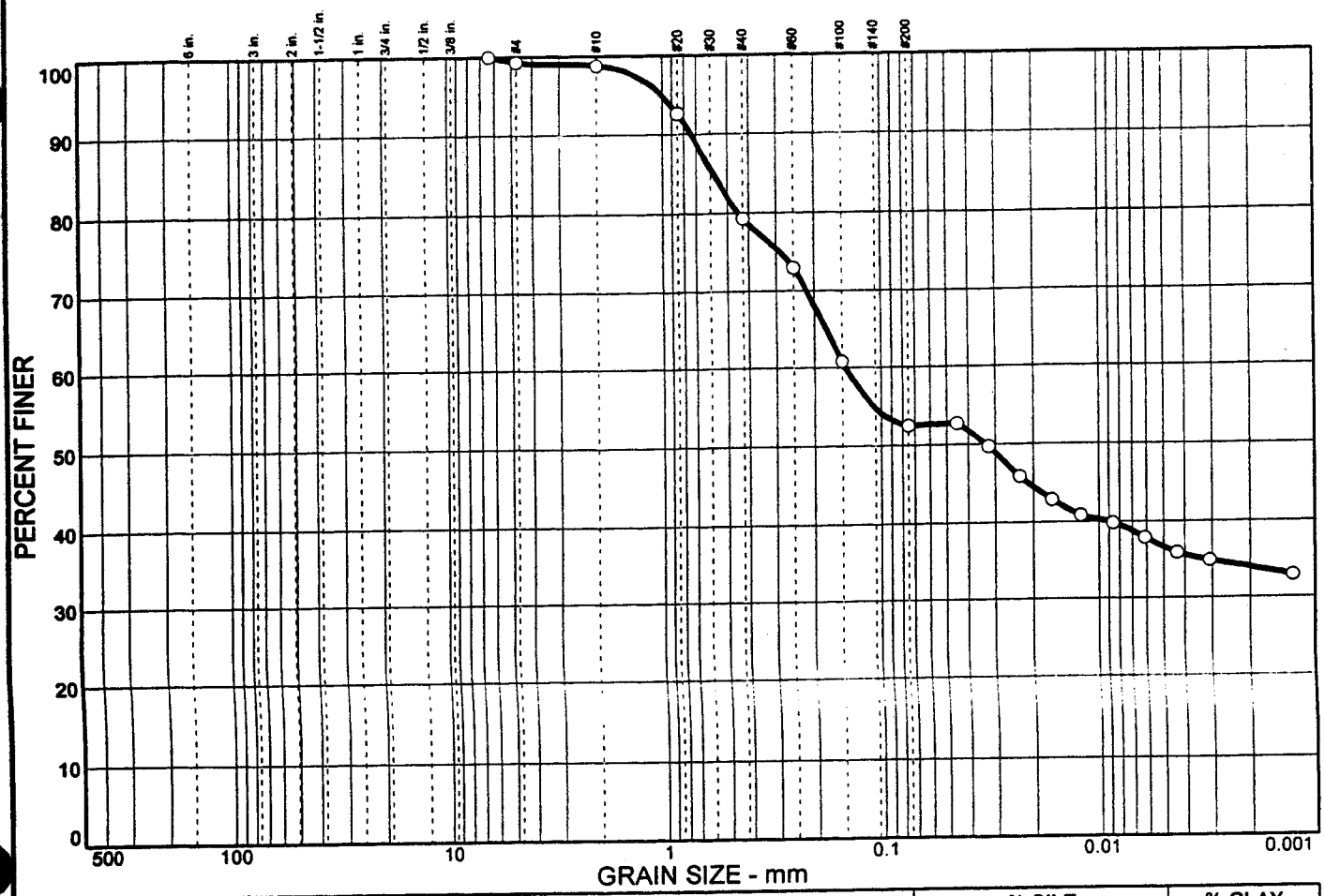
Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan


NW
QUADRANT
8 AC.
11/25/98
Test location Plan
Acu 31 /Lift3
⑨ = Perm location
Report: 098
E 2042650
N830750

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.7	46.8	15.9	36.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.3		
#10	98.8		
#20	92.6		
#40	79.3		
#60	72.9		
#100	60.8		
#200	52.5		

* (no specification provided)

Soil Description

Roberts Pit - Sandy lean clay

Atterberg Limits

PL= 21 LL= 42 PI= 21

Coefficients

D_{85}= 0.580 D_{60}= 0.145 D_{50}= 0.0331
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-220, Acre 31, Lift 3

Sample No.: DL-220 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 31, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/04/98
Report No.: P-172

Project No.: VNC-98-029
Sample No.: DL-220

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	9.8E-009	cm/sec
% Moisture	21.7	%
Dry Density	101.5	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/30/98
Location: Acre 31A, Lift 3 (Retest of DL-215)

Specimen Data

Length (in):	3.090
Diameter (in.):	2.891
Area (sq. in.):	6.576
Volume (cu. in.):	20.32
Wet Weight (grams):	659.3
Dry Weight (grams):	541.6
Dry Density (pcf):	101.5

Moisture Content Test Data

Wet Weight	135.54
Dry Weight	115.25
Tare weight	21.93
% Moisture	21.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
435	138.46	0.75	0.65	0.87	0.70	1.42E-008
456	138.46	0.50	0.50	1.00	0.50	9.68E-009
569	138.46	0.55	0.55	1.00	0.55	8.53E-009
527	138.46	0.40	0.40	1.00	0.40	6.70E-009

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **9.8E-009** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-0460

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/11/99
Report No.: 149

Acre 32 Lift 3

Clay Source: On-site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	101.1	22.0	~~98.8~~ 98.2	
2	See Test Location Plan	102.3	21.0	99.3	
3	See Test Location Plan	102.7	20.2	99.7	
4	See Test Location Plan	104.4	21.1	100+	
5	See Test Location Plan	101.6	21.1	98.6	
6	See Test Location Plan	100.8	21.6	97.9	
7	See Test Location Plan	101.8	22.6	98.8	Perm/Sample (DL-277)
8	See Test Location Plan	100.5	21.4	97.6	
9	See Test Location Plan	101.6	20.7	98.6	
10	See Test Location Plan	99.8	22.4	96.9	
11	See Test Location Plan	99.0	22.6	96.1	
12	See Test Location Plan	100.7	21.7	97.8	
13	See Test Location Plan	101.6	21.0	98.6	
14	See Test Location Plan	101.5	22.3	98.5	
15	See Test Location Plan	100.3	20.7	97.4	
16	See Test Location Plan	101.6	22.0	98.6	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 3.2x10(-8)

Dry Density (pcf) 96.5

Moisture Content (%) 26.9

Atterberg Limits (ASTM D4318)

PL 16
LL 42
PI 26

USCS Classification CL

Grain-size Analysis (ASTM D422)

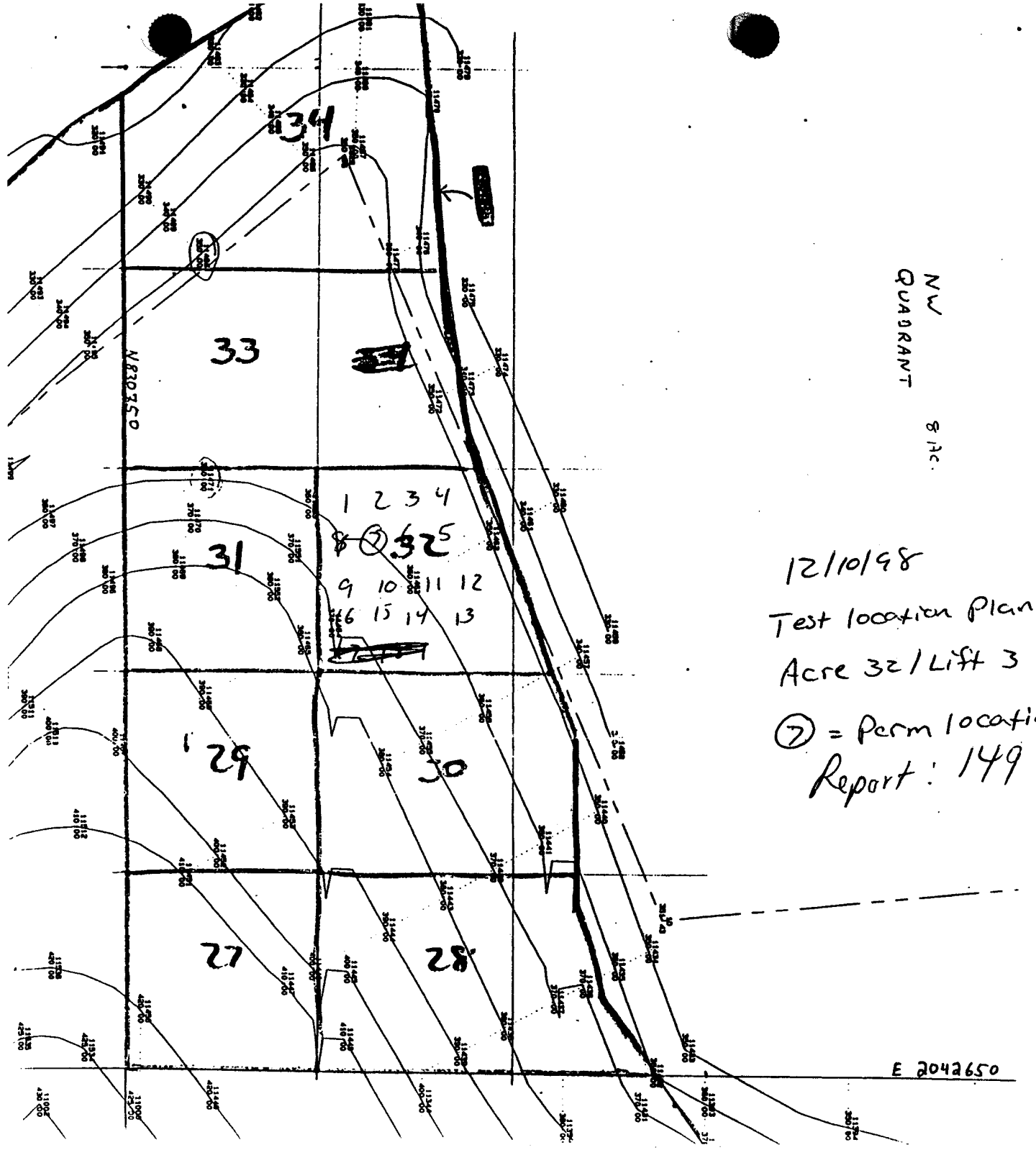
%Gravel 0.2
%Sand 42.7
%Silt 23.8
%Clay 33.3

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



NW QUADRANT

8 ac.

12/10/98

Test location Plan

Acre 32 / Lift 3

⑦ = Perm location

Report: 149

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/14/98
Report No.: P-202

Project No.: VNC-98-029
Sample No.: DL-277

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.2E-008	cm/sec
% Moisture	26.9	%
Dry Density	96.5	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/10/98
Location: Acre 32, Lift 3

Specimen Data

Length (in):	3.713
Diameter (in.):	2.853
Area (sq. in.):	6.404
Volume (cu. in.):	23.78
Wet Weight (grams):	764.3
Dry Weight (grams):	602.2
Dry Density (pcf):	96.5

Wet Weight	119.34
Dry Weight	98.68
Tare weight	21.94
% Moisture	26.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
365	138.46	0.90	1.10	1.22	1.00	2.98E-008
428	138.46	1.20	1.30	1.08	1.25	3.18E-008
195	138.46	0.60	0.65	1.08	0.63	3.49E-008
462	138.46	1.30	1.35	1.04	1.33	3.12E-008

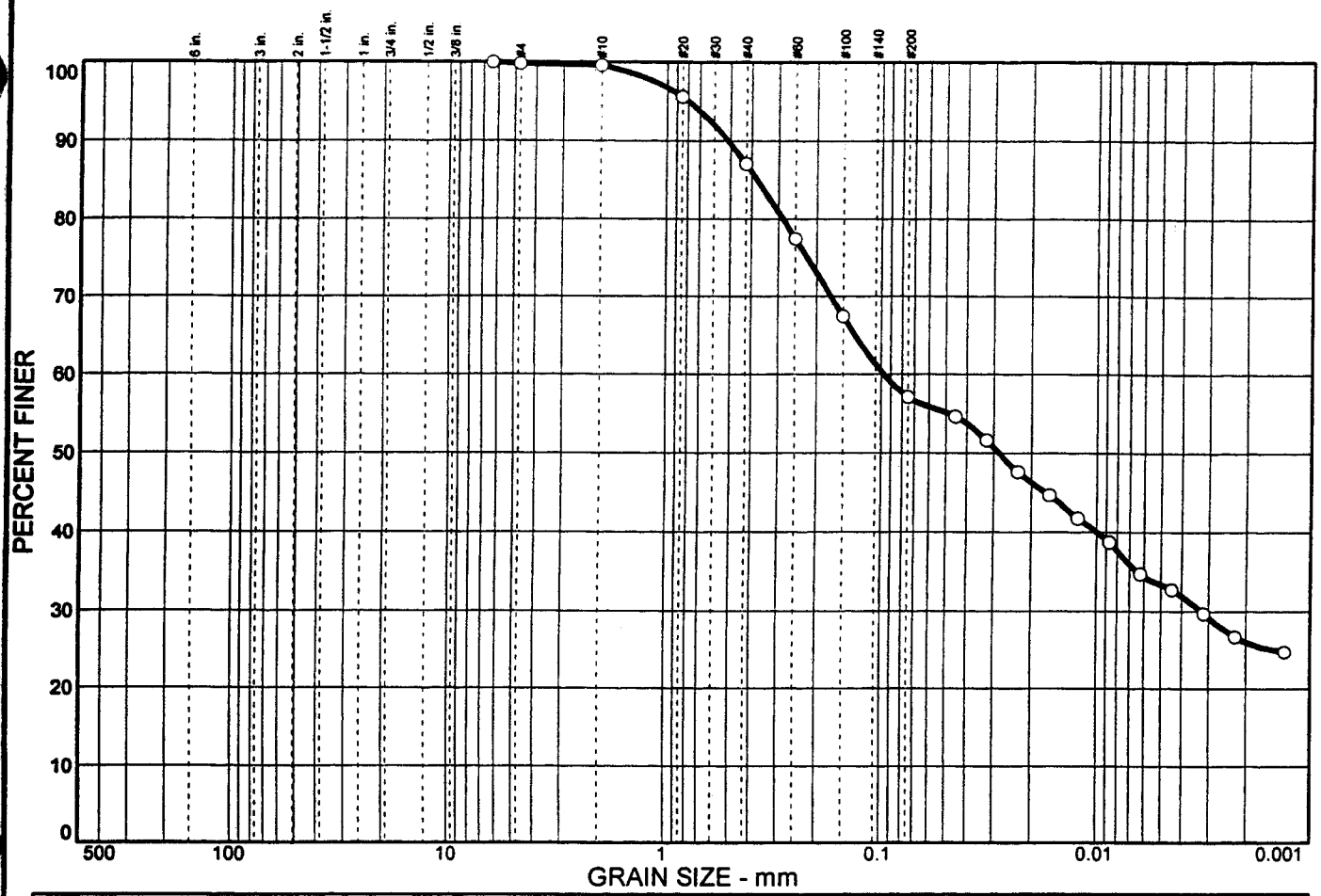
x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **3.2E-008** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	42.7	23.8	33.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.6		
#20	95.6		
#40	87.1		
#60	77.4		
#100	67.4		
#200	57.1		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 16 LL= 42 PI= 26

Coefficients

D_{85}= 0.375 D_{60}= 0.0972 D_{50}= 0.0283
D_{30}= 0.0033 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-277, Acre 32, Lift 3

Sample No.: DL-277 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 32, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/11/99
Report No.: 152

Acre 33 Lift 3

Clay Source: On-site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	99.8	22.2	96.9	
2	See Test Location Plan	102.7	20.1	99.7	
3	See Test Location Plan	103.4	19.7	100+	
4	See Test Location Plan	102.6	20.3	99.6	
5	See Test Location Plan	102.5	20.6	99.5	Perm/Sample (DL-280)
6	See Test Location Plan	101.3	20.3	98.4	
7	See Test Location Plan	100.2	21.4	97.3	
8	See Test Location Plan	101.5	21.2	98.5	
9	See Test Location Plan	100.8	20.6	97.9	
10	See Test Location Plan	99.6	22.0	96.7	
11	See Test Location Plan	100.0	21.8	97.1	
12	See Test Location Plan	102.3	20.3	99.3	
13	See Test Location Plan	101.6	20.5	98.6	
14	See Test Location Plan	102.5	20.0	99.5	
15	See Test Location Plan	102.3	20.8	99.3	
16	See Test Location Plan	101.7	21.3	98.7	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 1.3x10(-8)

Dry Density (pcf) 107.2

Moisture Content (%) 19.6

Atterberg Limits (ASTM D4318)

PL 18
LL 40
PI 22

USCS Classification CL

Grain-size Analysis (ASTM D422)

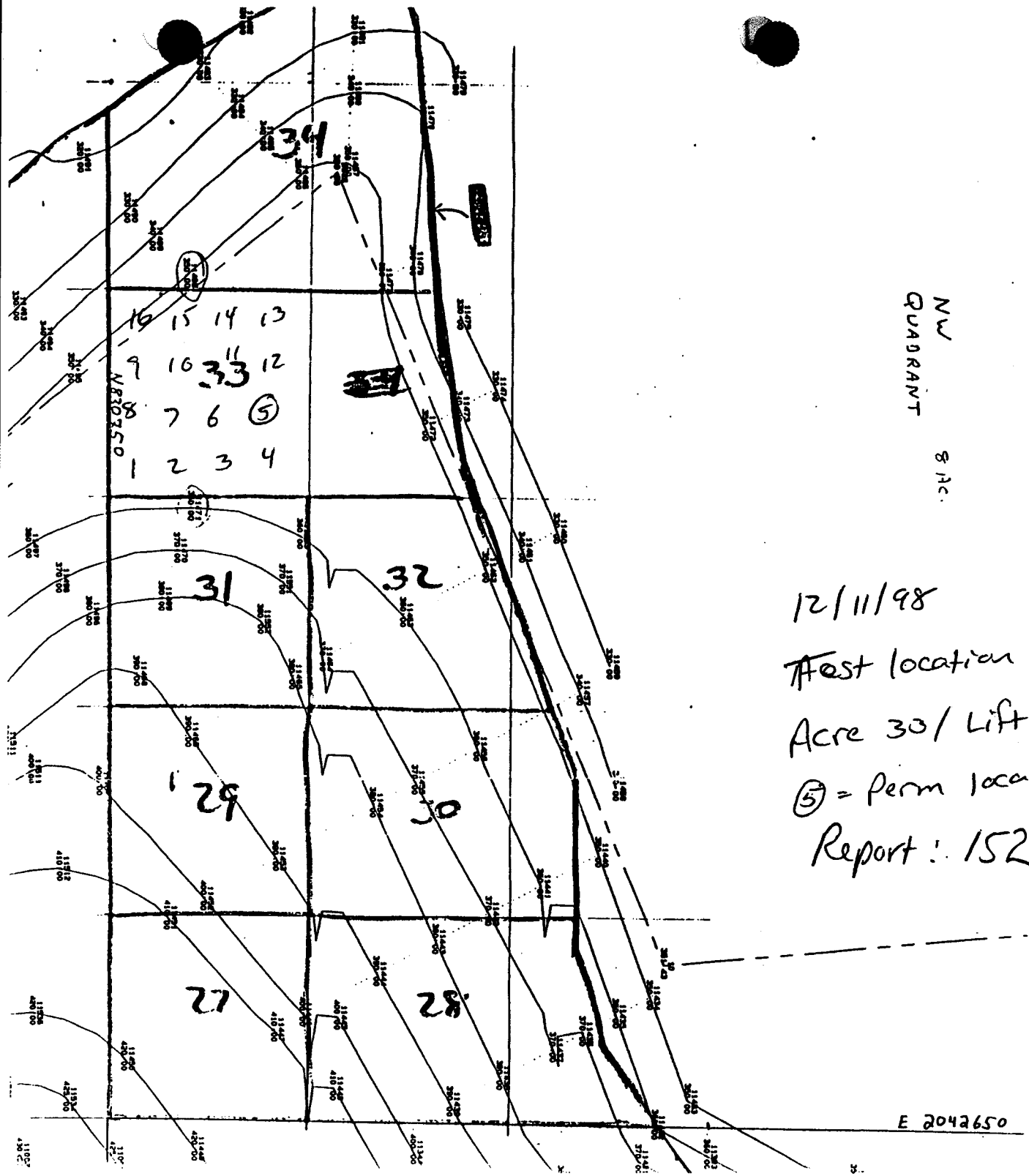
%Gravel 0.0
%Sand 44.8
%Silt 17.4
%Clay 37.8

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



NW QUADRANT

8 AC.

12/11/98

Test location Plan

Acre 30/ Lift 3

5 = Perm location

Report : 152

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/21/98
Report No.: P-224

Project No.: VNC-98-029
Sample No.: DL-280

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.3E-008	cm/sec
% Moisture	19.6	%
Dry Density	107.2	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 12/11/98
Location: Acre 33, Lift 3

Specimen Data

Length (in):	3.091
Diameter (in.):	2.865
Area (sq. in.):	6.458
Volume (cu. in.):	19.96
Wet Weight (grams):	671.6
Dry Weight (grams):	561.5
Dry Density (pcf):	107.2

Wet Weight	152.23
Dry Weight	130.89
Tare weight	22.04
% Moisture	19.6

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
360	149.53	0.60	0.45	0.75	0.53	1.21E-008
783	149.53	1.75	1.35	0.77	1.55	1.65E-008
325	149.53	0.55	0.40	0.73	0.48	1.22E-008
576	149.53	0.70	0.70	1.00	0.70	1.01E-008

X

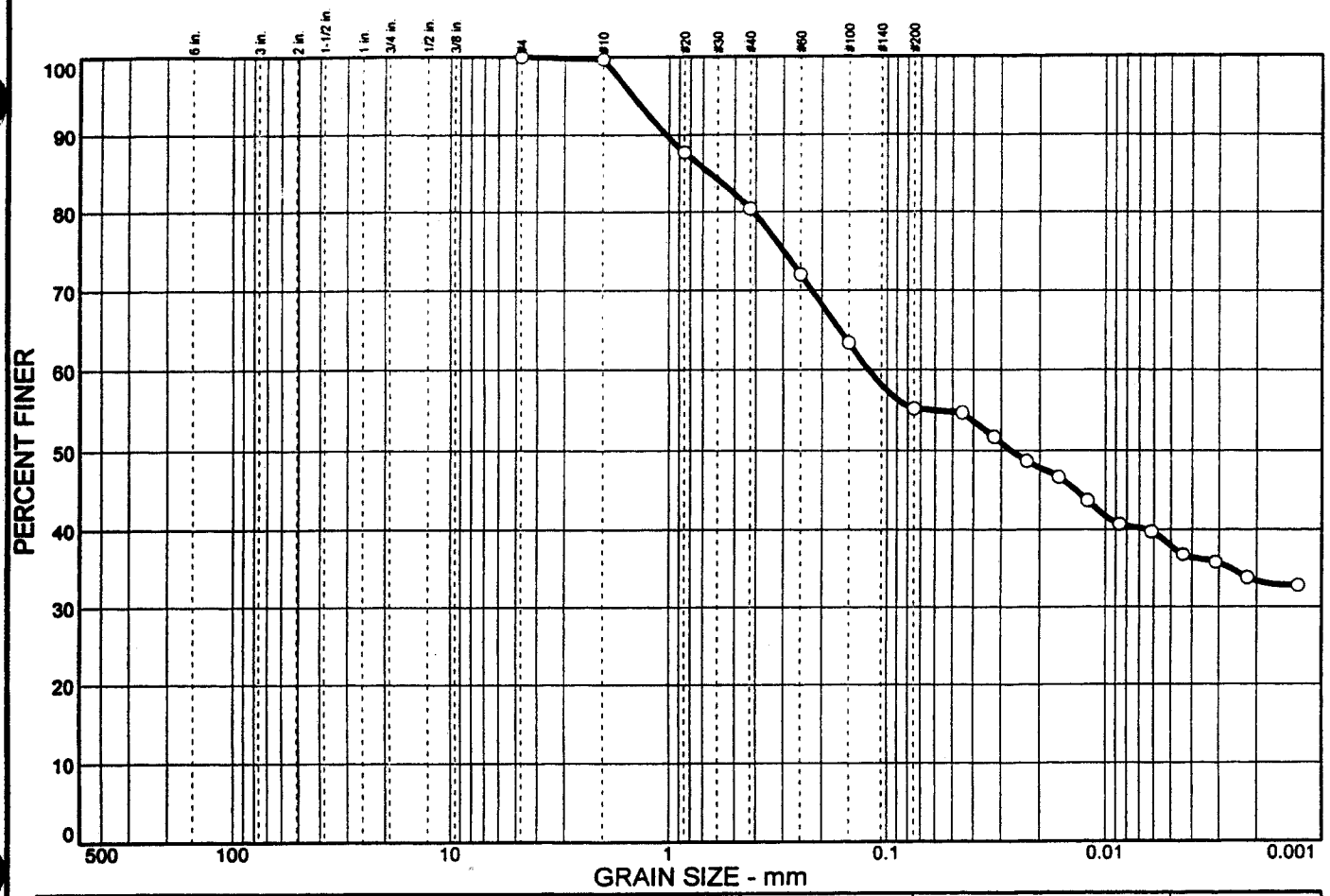
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **1.3E-008** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-0460

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	44.8	17.4	37.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	87.7		
#40	80.4		
#60	72.0		
#100	63.3		
#200	55.2		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 18 LL= 40 PI= 22

Coefficients

D_{85}= 0.652 D_{60}= 0.122 D_{50}= 0.0271
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-280, Acre 33, Lift 3

Sample No.: DL-280 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 33, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 01/20/99 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
On-Site Borrow Pit Acre 33a, Lift 3

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	01/20/99	Clay.158	Clay Cover Testing Report Acre 33a, Lift 3

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/20/99
Report No.: 158

Acre 33a Lift 3
Clay Source: Rougemont Borrow Pit
ASTM D698 : 102.8 Max. Dry Density @ 23.6 Optimum Moisture
Required Compaction: 95% @ +23.6% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	100.4	23.8	97.7	
2	See Test Location Plan	99.6	24.2	96.9	
3	See Test Location Plan	98.0	25.9	95.3	Perm/Sample (DL-288)
4	See Test Location Plan	98.7	24.1	96.0	
5	See Test Location Plan	99.3	25.3	96.6	
6	See Test Location Plan	100.8	23.9	98.1	
7	See Test Location Plan	100.3	24.2	97.6	
8	See Test Location Plan	99.4	25.3	96.7	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 2.3x10(-8)

Dry Density (pcf) 99.2

Moisture Content (%) 24.0

Atterberg Limits (ASTM D4318)

PL 16
LL 40
PI 24

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel 4.4
%Sand 29.2
%Silt 26.0
%Clay 40.4

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

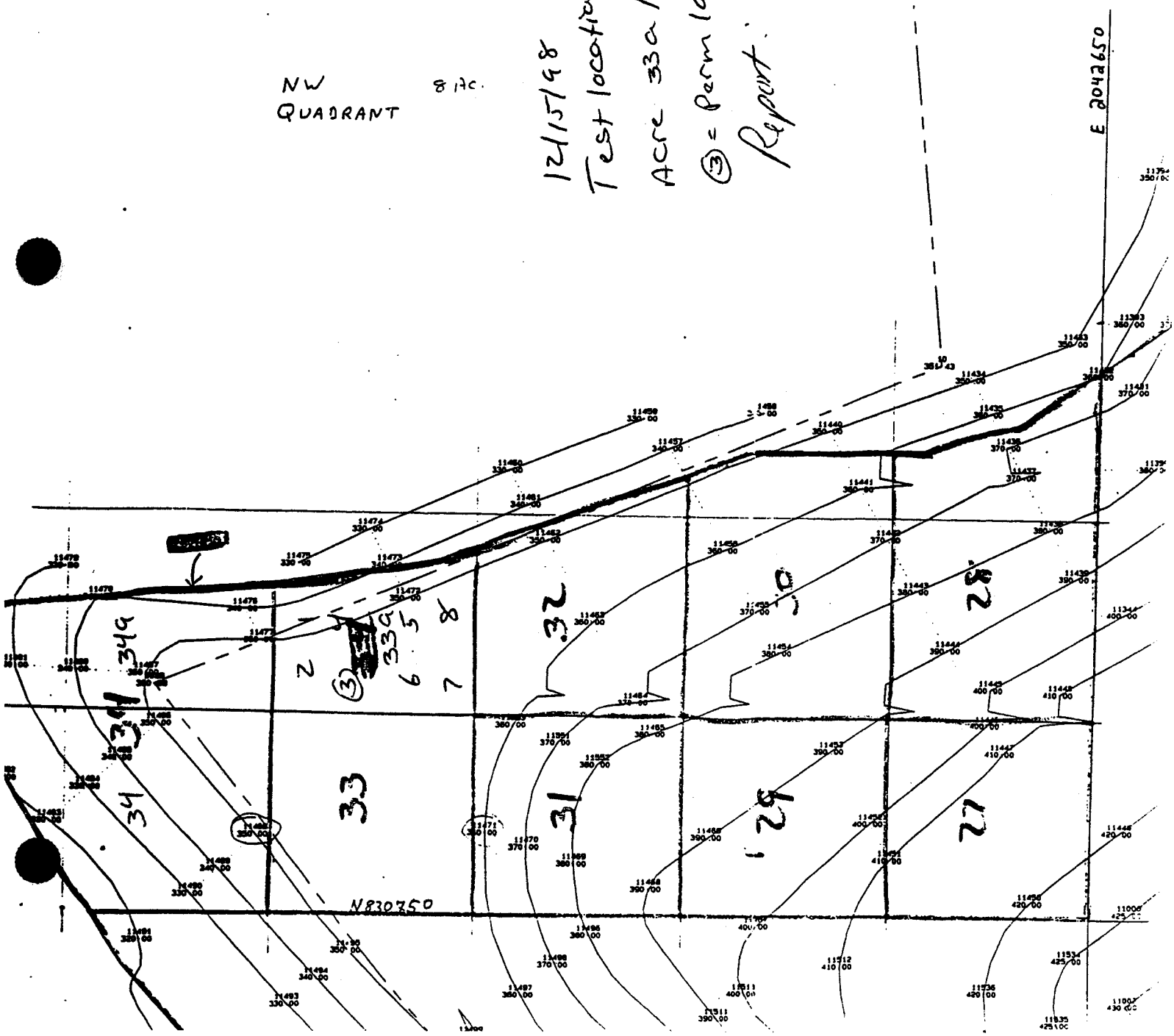
Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

NW QUADRANT 8 ac.

12/15/98
Test location Plan
Acre 33a / Lift 3
③ = Perm location
Report: 158



VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/22/98
Report No.: P-229

Project No.: VNC-98-029
Sample No.: DL-288

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.3E-008	cm/sec
% Moisture	24.0	%
Dry Density	99.2	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/15/98
Location: Acre 33a, Lift 3

Specimen Data

Length (in):	3.117		
Diameter (in.):	2.830	Wet Weight	155.99
Area (sq. in.):	6.301	Dry Weight	130.05
Volume (cu. in.):	19.64	Tare weight	22.13
Wet Weight (grams):	634.3	% Moisture	24.0
Dry Weight (grams):	511.4		
Dry Density (pcf):	99.2		

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
815	138.46	2.10	2.40	1.14	2.25	2.56E-008
1250	138.46	3.10	2.90	0.94	3.00	2.23E-008
350	141.23	0.90	0.90	1.00	0.90	2.34E-008
230	141.23	0.50	0.50	1.00	0.50	1.98E-008

x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.3E-008** cm/sec

Respecfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.4	29.2	26.0	40.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	96.9		
.25 in.	96.1		
#4	95.6		
#10	94.0		
#20	92.0		
#40	89.8		
#60	83.8		
#100	75.9		
#200	66.4		

* (no specification provided)

Soil Description

Rougemount Borrow Source - Sandy lean clay

Atterberg Limits

PL= 16 LL= 40 PI= 24

Coefficients

D_{85}= 0.273 D_{60}= 0.0305 D_{50}= 0.0143
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-288, Acre 334A, Lift 3

Sample No.: DL-288 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Acre 33A, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 01/20/99 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
On-Site Borrow Pit Acre 34, Lift 3

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	01/20/99	Clay.159	Clay Cover Testing Report Acre 34, Lift 3

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/20/99
Report No.: 159

Acre 34 Lift 3

Clay Source: Rougemont Borrow Pit

ASTM D698 : 102.8 Max. Dry Density @ 23.6 Optimum Moisture

Required Compaction: 95% @ +23.6% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	102.2	23.6	99.4	
2	See Test Location Plan	97.7	25.2	95	
3	See Test Location Plan	99.6	24.6	96.9	
4	See Test Location Plan	98.3	26.6	95.6	
5	See Test Location Plan	100.3	24.1	97.6	
6	See Test Location Plan	101.3	23.7	98.5	
7	See Test Location Plan	97.9	24.3	95.2	Perm/Sample (DL-289)
8	See Test Location Plan	98.7	24.8	96.0	
9	See Test Location Plan	98.9	25.7	96.2	
10	See Test Location Plan	99.6	25.0	96.9	
11	See Test Location Plan	99.1	24.9	96.4	
12	See Test Location Plan	100.8	24.3	98.1	
13	See Test Location Plan	101.2	24.0	98.4	
14	See Test Location Plan	100.1	25.1	97.4	
15	See Test Location Plan	99.6	25.6	96.9	
16	See Test Location Plan	99.0	24.7	96.3	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 1.9x10(-8)

Dry Density (pcf) 97.7

Moisture Content (%) 25.4

Atterberg Limits (ASTM D4318)

PL 18
LL 41
PI 23

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel 3.7
%Sand 30.9
%Silt 28.5
%Clay 36.9

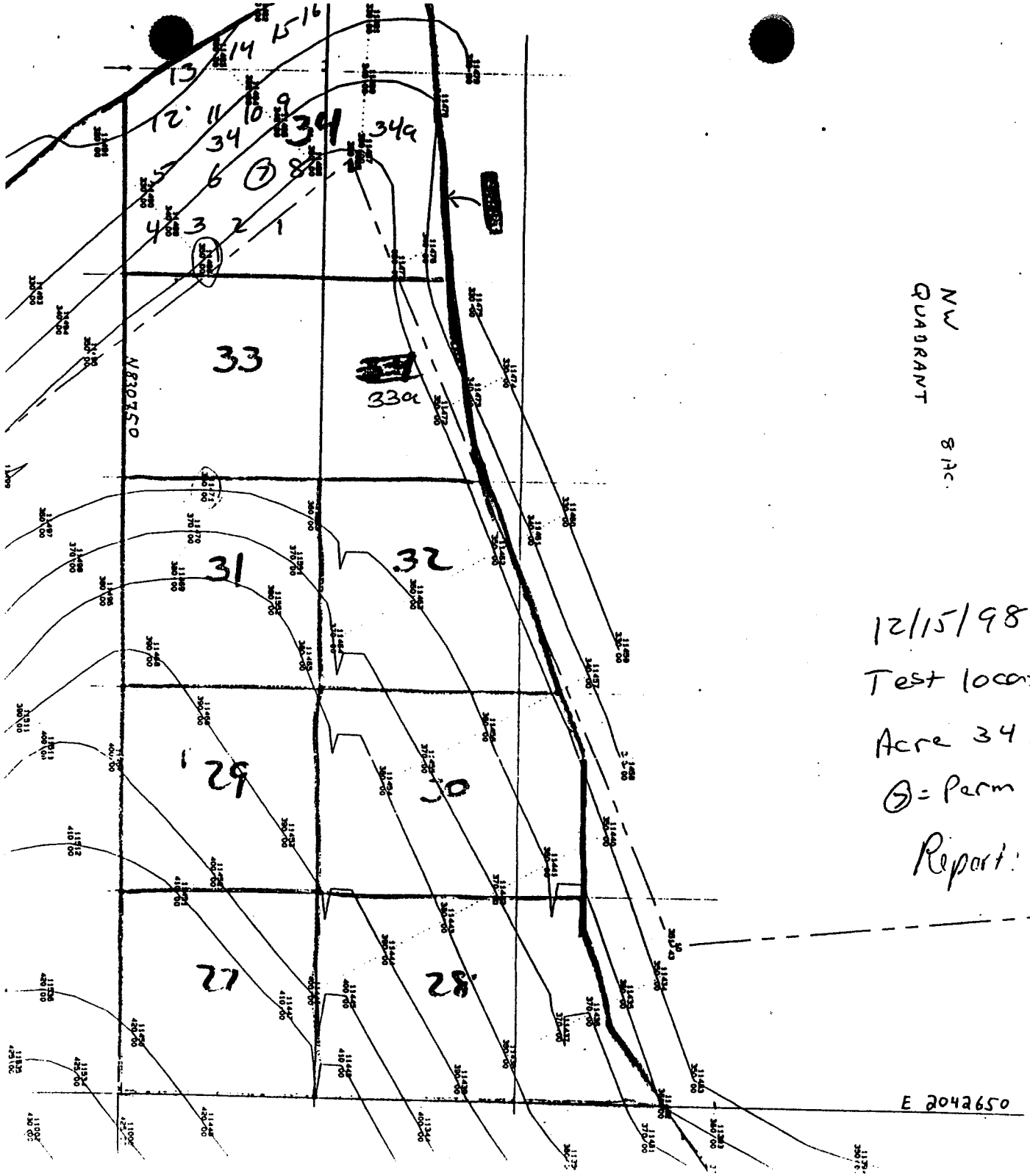
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



NW QUADRANT

8 ac.

12/15/98

Test location Plan

Acre 34 / Lift 3

⊘ = Perm location

Report: 159

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/22/98
Report No.: P-231

Project No.: VNC-98-029
Sample No.: DL-289
Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.9E-008	cm/sec
% Moisture	25.4	%
Dry Density	97.7	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 12/15/98
Location: Acre 34, Lift 3

Specimen Data

Length (in):	3.279
Diameter (in.):	2.843
Area (sq. in.):	6.359
Volume (cu. in.):	20.85
Wet Weight (grams):	670.7
Dry Weight (grams):	534.8
Dry Density (pcf):	97.7

Wet Weight	137.69
Dry Weight	114.24
Tare weight	21.95
% Moisture	25.4

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
810	138.46	1.75	1.90	1.09	1.83	2.18E-008
1255	127.38	2.55	2.30	0.90	2.43	2.03E-008
1418	127.38	2.70	2.80	1.04	2.75	2.04E-008
468	127.38	0.60	0.70	1.17	0.65	1.46E-008

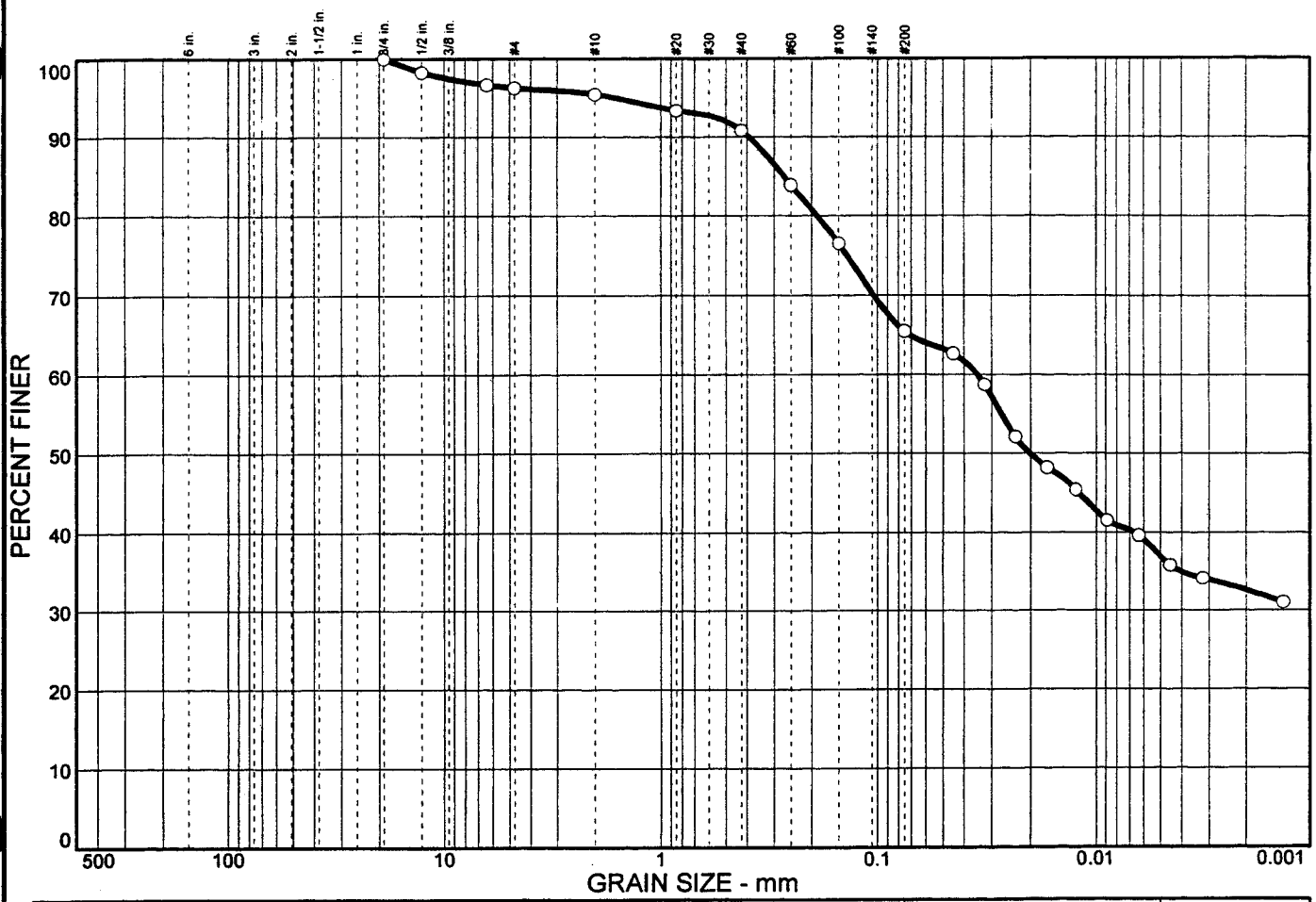
x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **1.9E-008** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.7	30.9	28.5	36.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	98.3		
.25 in.	96.7		
#4	96.3		
#10	95.5		
#20	93.4		
#40	90.8		
#60	83.9		
#100	76.5		
#200	65.4		

* (no specification provided)

Soil Description

Rougemount Borrow Source - Sandy lean clay

Atterberg Limits

PL= 18 LL= 41 PI= 23

Coefficients

D_{85}= 0.270 D_{60}= 0.0349 D_{50}= 0.0202
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-289, Acre 34, Lift 3

Sample No.: DL-289 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Acre 34, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 01/20/99 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
On-Site Borrow Pit Acre 34a, Lift 3

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	01/20/99	Clay.160	Clay Cover Testing Report Acre 34a, Lift 3

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/20/99
Report No.: 160

Acre 34a Lift 3
Clay Source: Rougemont Borrow Pit
ASTM D698 : 102.8 Max. Dry Density @ 23.6 Optimum Moisture
Required Compaction: 95% @ +23.6% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	101.3	23.7	98.5	
2	See Test Location Plan	99.6	24.9	96.9	
3	See Test Location Plan	97.9	26.1	95.2	
4	See Test Location Plan	98.3	25.6	95.6	
5	See Test Location Plan	98.1	24.6	95.4	Perm/Sample (DL-290)
6	See Test Location Plan	99.7	24.4	97.0	
7	See Test Location Plan	100.3	24.3	97.6	
8	See Test Location Plan	99.5	23.9	96.8	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 2.2x10(-8)

Dry Density (pcf) 99.4

Moisture Content (%) 23.8

Atterberg Limits (ASTM D4318)

PL 18
LL 41
PI 23

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel 1.2
%Sand 33.8
%Silt 26.9
%Clay 38.1

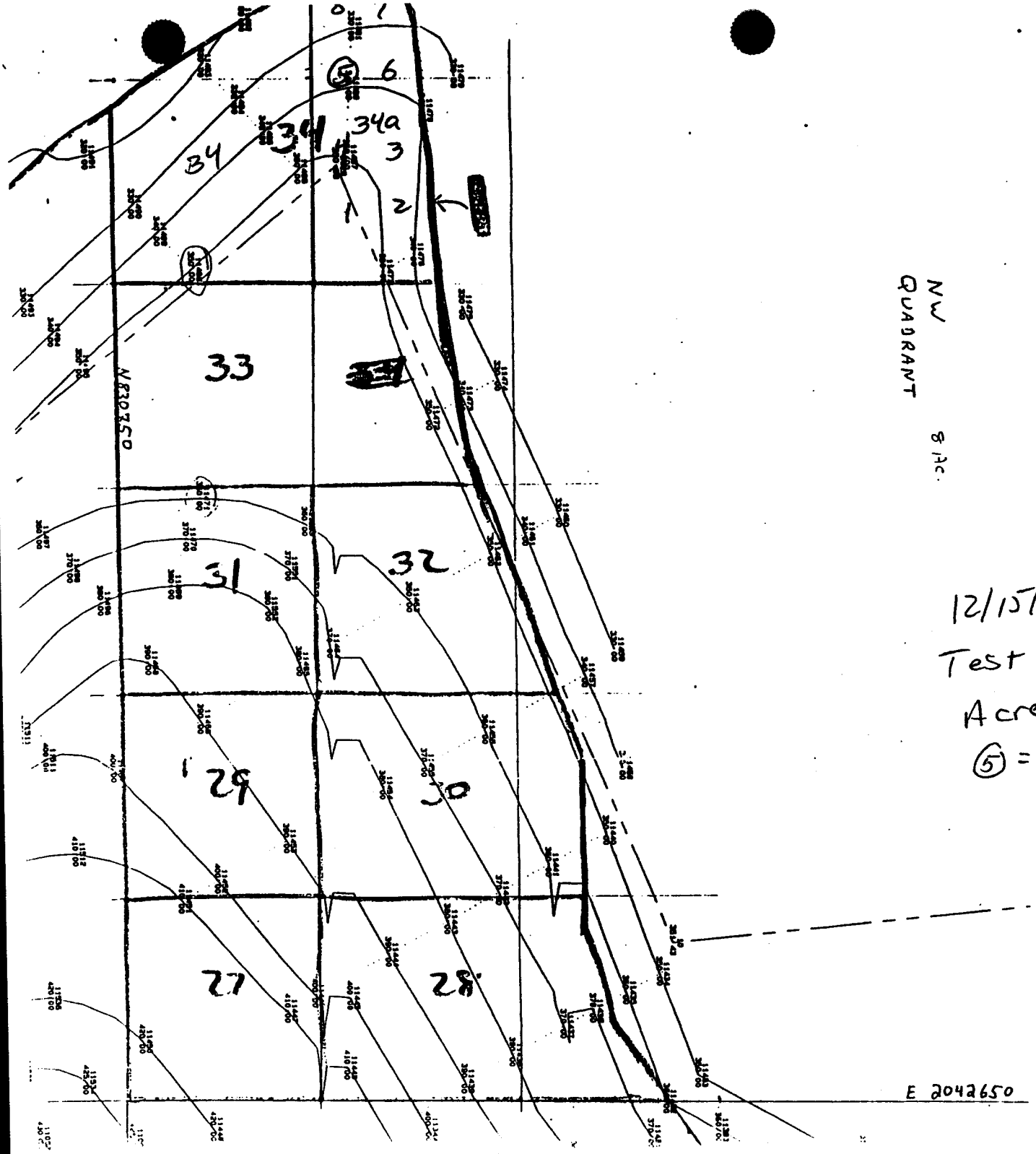
Sincerely,
VAN DER HORST Geotechnical Engineering P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



NW
QUADRANT

8 ac.

12/15/98
Test location Plan
Acre 34a 16 ft3
⑤ = Perm location
Report: 160

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 01/01/98
Report No.: P-241

Project No.: VNC-98-029
Sample No.: DL-290

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.2E-008	cm/sec
% Moisture	23.8	%
Dry Density	99.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/15/98
Location: Acre 34a, Lift 3

Specimen Data

Length (in):	3.081
Diameter (in.):	2.856
Area (sq. in.):	6.417
Volume (cu. in.):	19.77
Wet Weight (grams):	638.3
Dry Weight (grams):	515.8
Dry Density (pcf):	99.4

Wet Weight	143.83
Dry Weight	120.44
Tare weight	21.97
% Moisture	23.8

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1232	138.46	3.20	3.10	0.97	3.15	2.31E-008
1431	138.46	3.50	3.60	1.03	3.55	2.24E-008
298	138.46	0.70	0.70	1.00	0.70	2.12E-008
316	135.69	0.80	0.80	1.00	0.80	2.33E-008

x

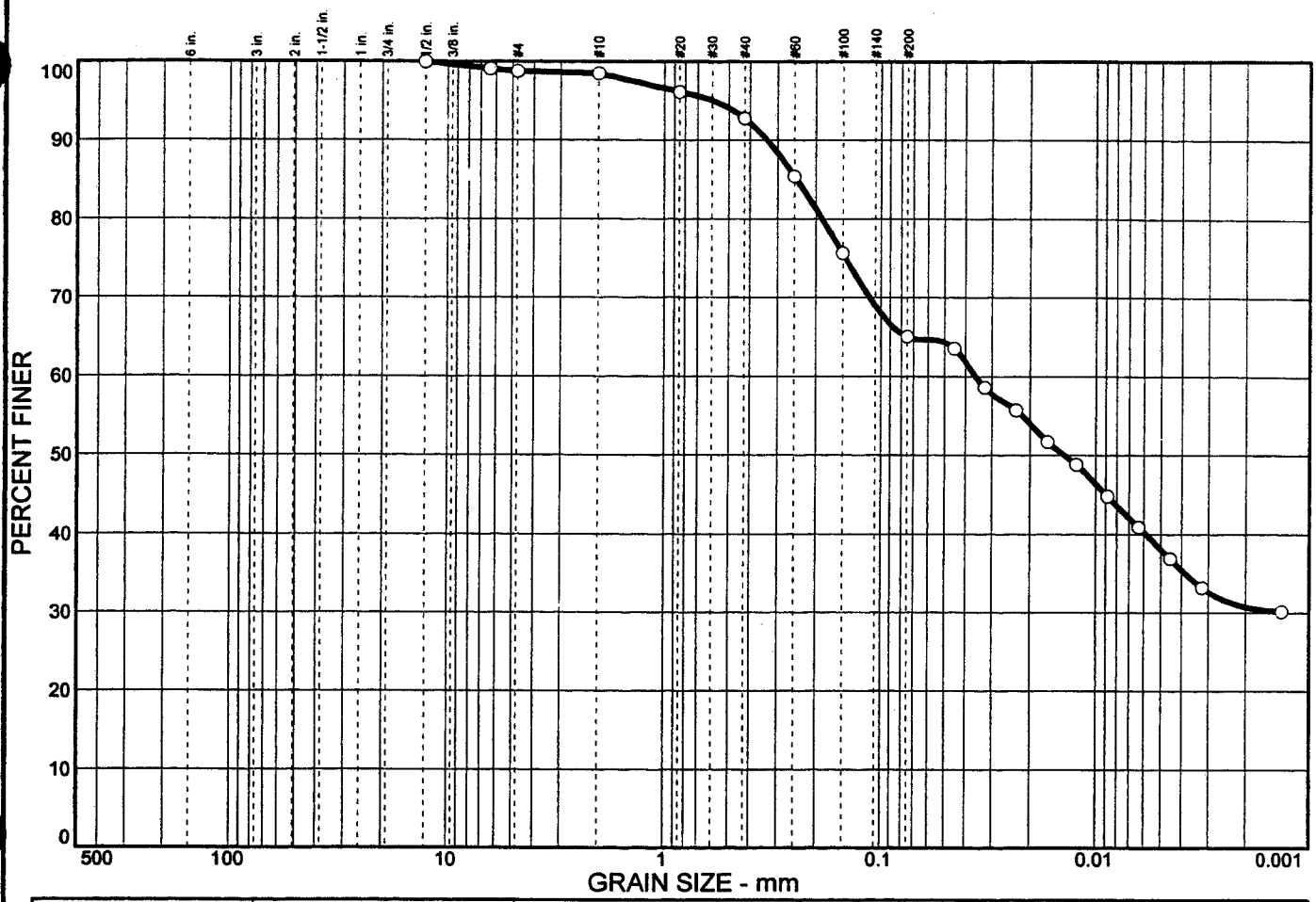
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.2E-008** cm/sec

Respecfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.2	33.8	26.9	38.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	99.1		
#4	98.8		
#10	98.5		
#20	96.2		
#40	92.8		
#60	85.4		
#100	75.6		
#200	65.0		

* (no specification provided)

Soil Description

Rougemount Borrow Source - Sandy lean clay

Atterberg Limits

PL= 18 LL= 41 PI= 23

Coefficients

D_{85}= 0.244 D_{60}= 0.0357 D_{50}= 0.0140
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-290, Acre 34A, Lift 3

Sample No.: DL-290 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Acre 34A, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No. VNC-98-029
Date: 11/25/98
Report No.: 085

Acre 35 Lift 3

Clay Source: Fogleman Borrow Pit

ASTM D698 : 96.8 Max. Dry Density @ 22.5 Optimum Moisture

Required Compaction: 95% @ +22.5% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	95.8	23.6	99.0	
2	See Test Location Plan	97.2	22.7	100+	
3	See Test Location Plan	100.9	22.5	100+	
4	See Test Location Plan	96.0	22.7	99.2	
5	See Test Location Plan	93.3	27.1	96.0 3	Tube Sample (DL-198)
6	See Test Location Plan	96.5	22.5	99.7	
7	See Test Location Plan	94.3	24.6	97.4	
8	See Test Location Plan	95.1	23.8	98.2	
9	See Test Location Plan	95.8	24.2	99.0	
10	See Test Location Plan	94.7	25.3	97.8	
11	See Test Location Plan	96.2	24.7	99.4	
12	See Test Location Plan	96.8	25.2	100.0	
13	See Test Location Plan	95.4	23.8	98.6	
14	See Test Location Plan	97.1	22.6	100+	
15	See Test Location Plan	94.9	24.8	98.0	
16	See Test Location Plan	94.7	24.2	97.8	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	7.9x10(-8)
Dry Density (pcf)	95.6
Moisture Content (%)	24.9

Atterberg Limits (ASTM D4318)

PL	22
LL	74
PI	52
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	22.3
%Silt	17.5
%Clay	60.2

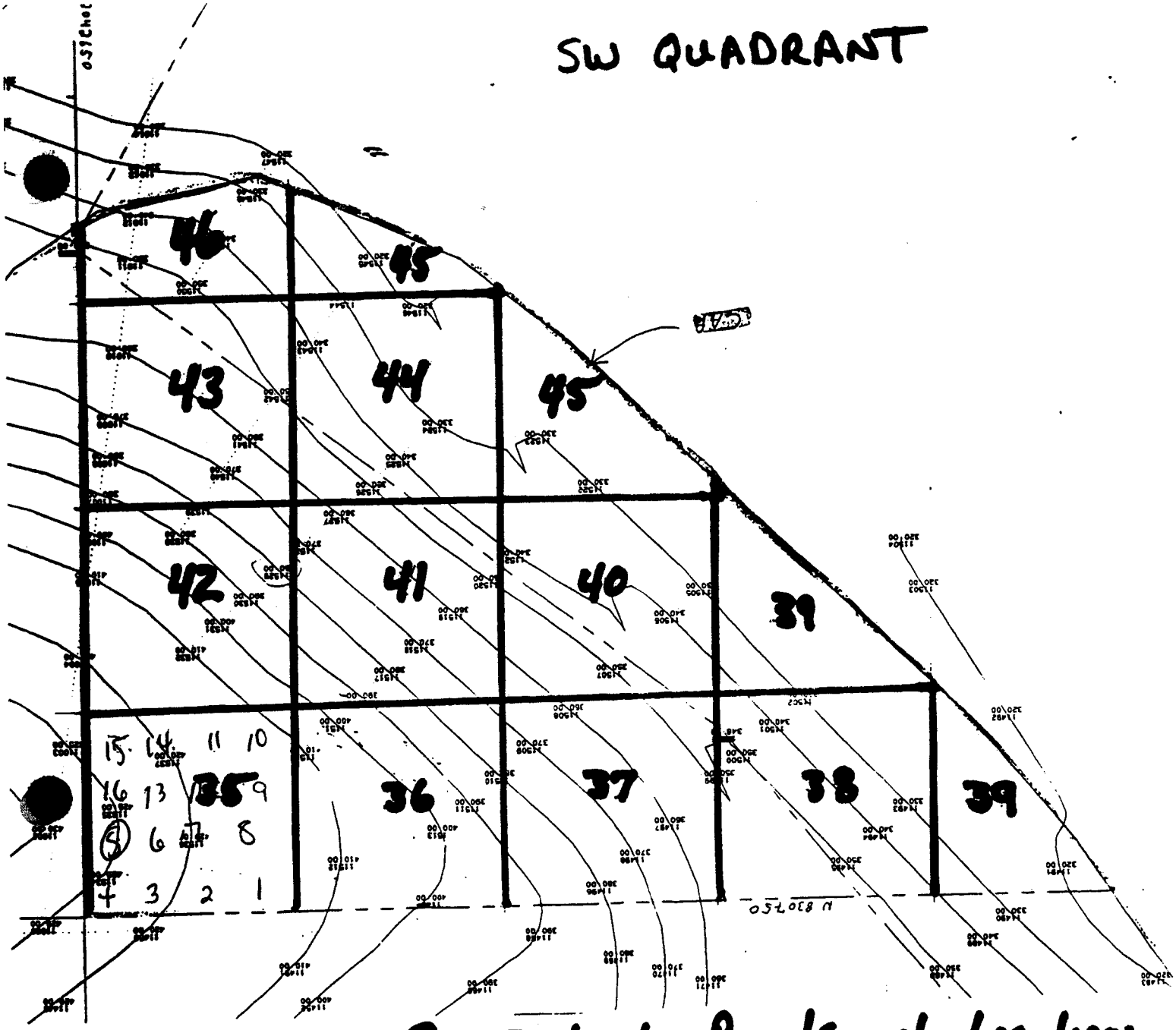
Sincerely,
VAN DER HORST Geotechnical Engineers P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

SW QUADRANT

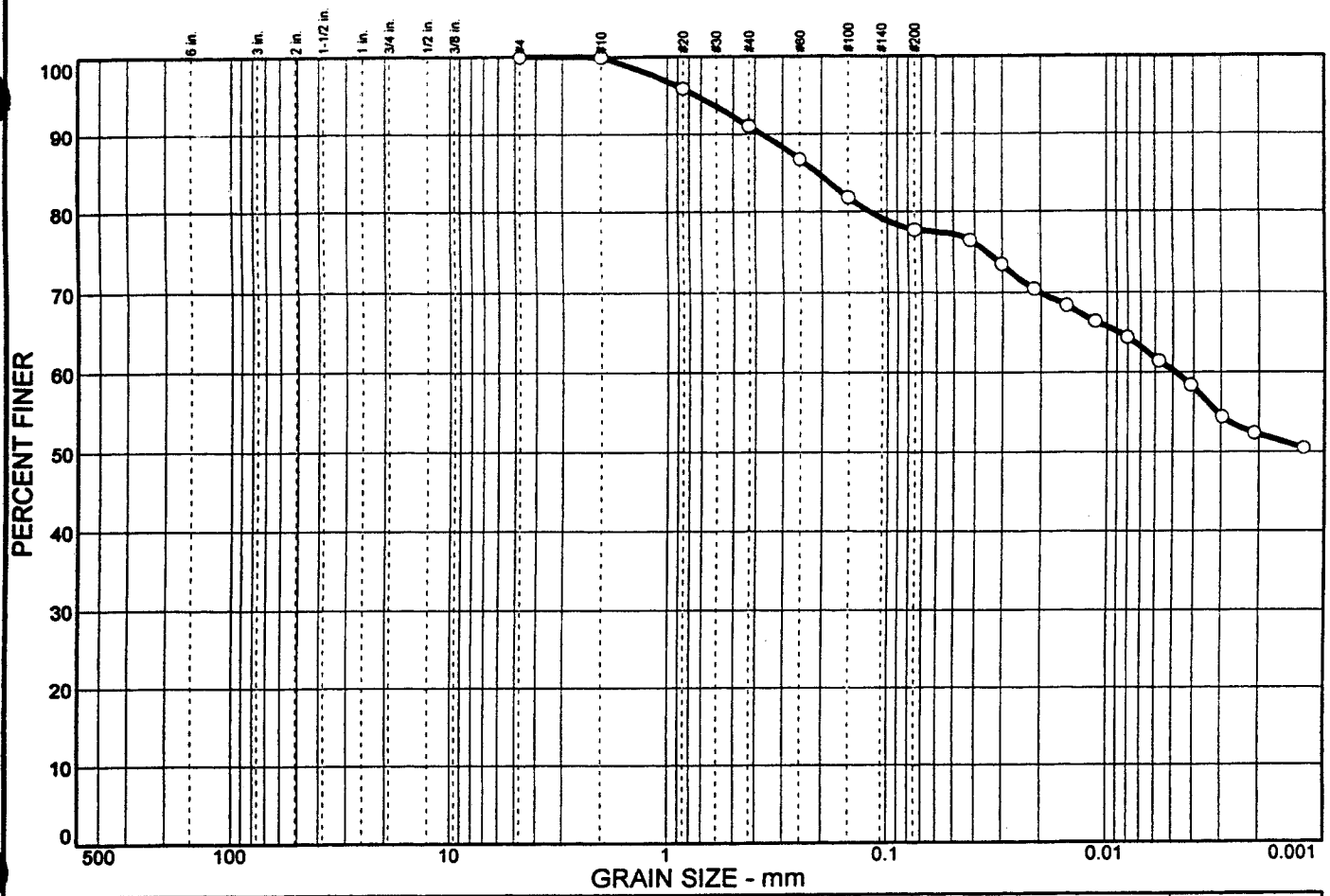


(5) - Indicates Perm/Sample Location

Acre 35 Lift 3

Report : 085

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	22.3	17.5	60.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	95.9		
#40	91.0		
#60	86.7		
#100	81.8		
#200	77.7		

* (no specification provided)

Soil Description

Fogelman - Fat clay with sand

Atterberg Limits

PL= 22 LL= 74 PI= 52

Coefficients

D_{85}= 0.209 D_{60}= 0.0049 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-198, Fogleman - Acre 35, Lift 3

Sample No.: DL-198 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman borrow pit - Acre 35, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-150

Project No.: VNC-98-029
Sample No.: DL-198

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	7.9E-008	cm/sec
% Moisture	24.9	%
Dry Density	95.6	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/20/98
Location: Acre 35, Lift 3

Specimen Data

Length (in):	3.815
Diameter (in.):	2.853
Area (sq. in.):	6.404
Volume (cu. in.):	24.43
Wet Weight (grams):	765.9
Dry Weight (grams):	613.0
Dry Density (pcf):	95.6

Moisture Content Test Data

Wet Weight	114.74
Dry Weight	96.21
Tare weight	21.92
% Moisture	24.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
242	138.46	1.55	1.85	1.19	1.70	7.86E-008
372	138.46	2.65	2.85	1.08	2.75	8.27E-008
300	138.46	2.05	2.15	1.05	2.10	7.83E-008
111	138.46	0.80	0.75	0.94	0.78	7.81E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **7.9E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/10/98
Report No.: 099

Acre 36 Lift 3

Clay Source: Fogleman Borrow Pit

ASTM D698 : 96.8 Max. Dry Density @ 22.5 Optimum Moisture

Required Compaction: 95% @ +22.5% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	100.0	23.0	100+	
2	See Test Location Plan	96.2	23.2	99.4	
3	See Test Location Plan	95.8	23.0	99.0	
4	See Test Location Plan	94.3	22.7	97.4	
5	See Test Location Plan	98.4	25.0	100+	Tube/Sample (DL-216)
6	See Test Location Plan	95.3	22.8	98.5	
7	See Test Location Plan	96.6	27.4	99.8	
8	See Test Location Plan	94.7	25.0	97.8	
9	See Test Location Plan	95.7	22.5	98.9	
10	See Test Location Plan	96.2	24.0	99.4	
11	See Test Location Plan	97.0	23.1	100+	
12	See Test Location Plan	96.4	23.6	99.6	
13	See Test Location Plan	95.9	23.7	99.1	
14	See Test Location Plan	95.2	23.7	98.3	
15	See Test Location Plan	96.1	24.6	99.3	
16	See Test Location Plan	96.7	23.2	99.9	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 9.7x10(-8)

Dry Density (pcf) 106.1

Moisture Content (%) 22.7

Atterberg Limits (ASTM D4318)

PL 19
LL 40
PI 21

USCS Classification CL

Grain-size Analysis (ASTM D422)

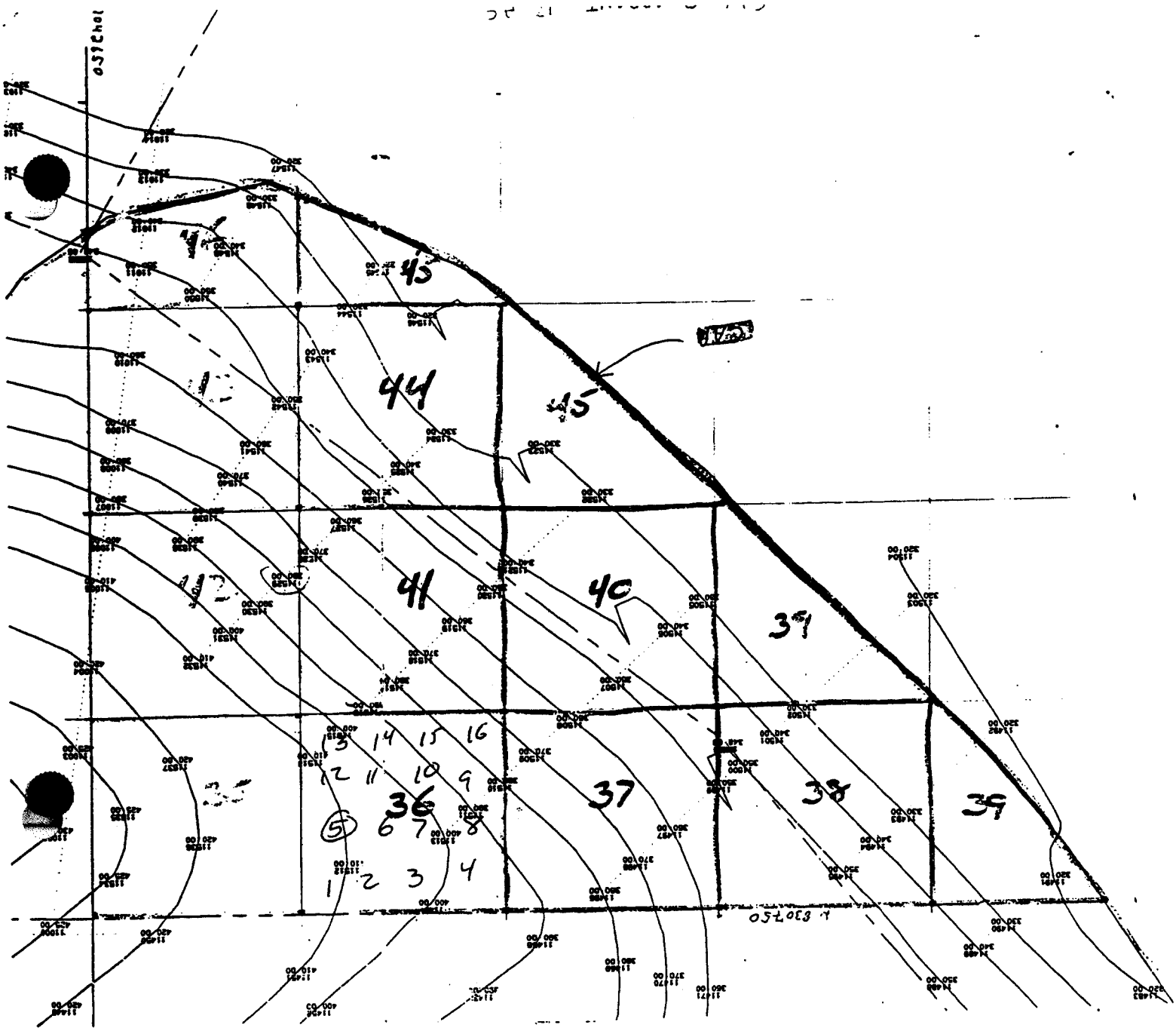
%Gravel 0.0
%Sand 43.0
%Silt 18.1
%Clay 38.9

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



11/25/98

Test location Plan

Acre 36 / Lift 3

(5) = Perm location

Report: 099

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-163

Project No.: VNC-98-029
Sample No.: DL-216

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	9.7E-008	cm/sec
% Moisture	22.7	%
Dry Density	106.1	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/25/98
Location: Acre 36, Lift 3

Specimen Data

Length (in):	3.630
Diameter (in.):	2.820
Area (sq. in.):	6.257
Volume (cu. in.):	22.71
Wet Weight (grams):	775.9
Dry Weight (grams):	632.4
Dry Density (pcf):	106.1

Moisture Content Test Data

Wet Weight	87.33
Dry Weight	75.26
Tare weight	22.08
% Moisture	22.7

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
68	138.46	0.60	0.65	1.08	0.63	1.00E-007
110	138.46	1.00	1.00	1.00	1.00	9.90E-008
145	138.46	1.25	1.30	1.04	1.28	9.58E-008
281	138.46	2.45	2.45	1.00	2.45	9.50E-008

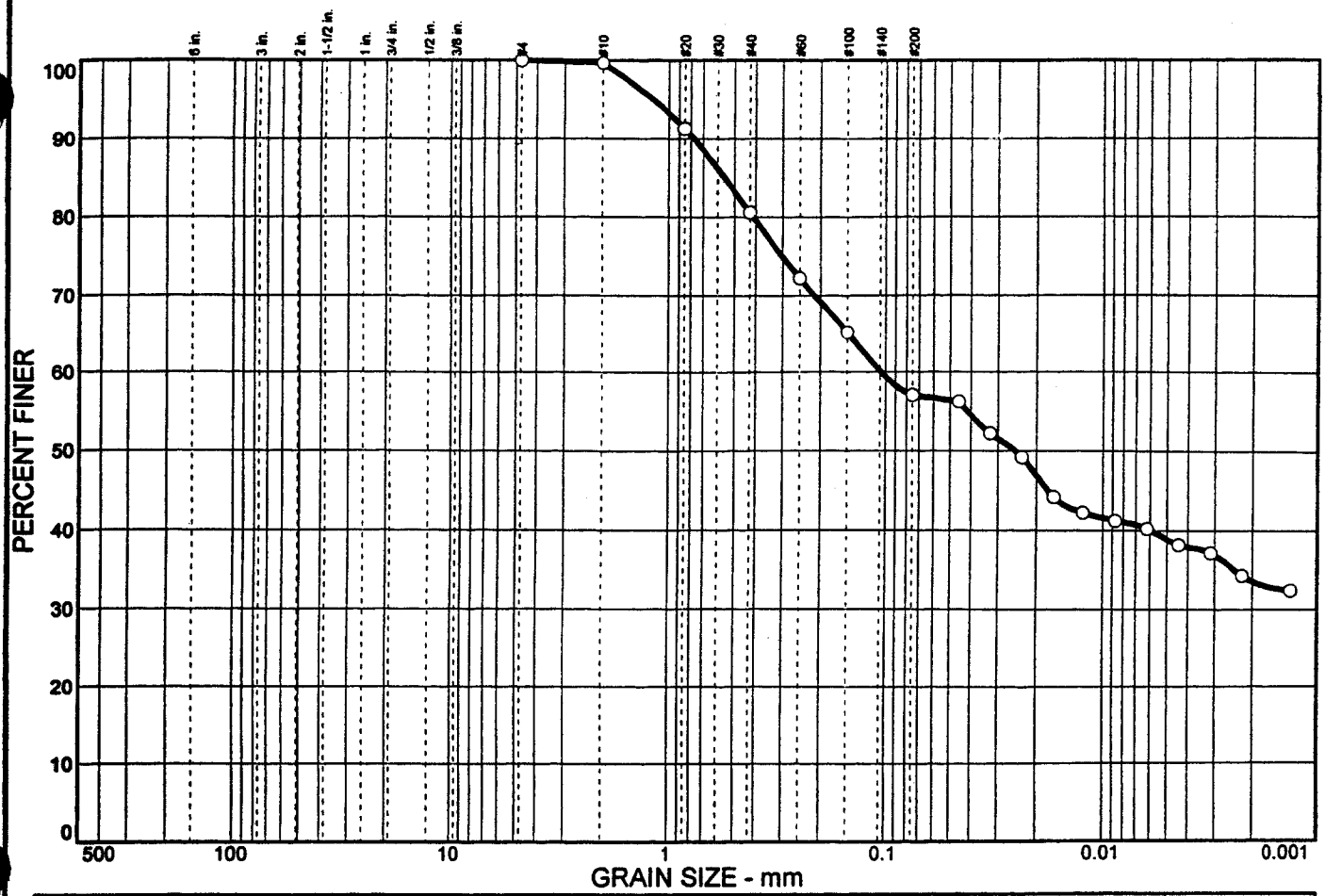
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **9.7E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	43.0	18.1	38.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	91.3		
#40	80.6		
#60	72.2		
#100	65.2		
#200	57.0		

* (no specification provided)

Soil Description

Fogelman - Sandy lean clay

Atterberg Limits

PL= 19 LL= 40 PI= 21

Coefficients

D_{85}= 0.555 D_{60}= 0.105 D_{50}= 0.0250
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-216, Fogleman - Acre 36, Lift 3

Sample No.: DL-216 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman borrow pit - Acre 36, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/05/99
Report No.: 131

Acre 37 Lift 3

Clay Source: On-site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	103.9	19.9	100+	
2	See Test Location Plan	102.7	20.2	99.7	
3	See Test Location Plan	103.9	21.1	100+	
4	See Test Location Plan	102.5	22.0	99.5	
5	See Test Location Plan	99.5	24.8	96.6	
6	See Test Location Plan	99.7	23.2	96.8	
7	See Test Location Plan	99.0	25.7	96.1	Perm/Sample (DL-259)
8	See Test Location Plan	99.2	21.5	96.3	
9	See Test Location Plan	100.2	20.9	97.3	
10	See Test Location Plan	100.4	21.1	97.5	
11	See Test Location Plan	99.8	21.8	96.9	
12	See Test Location Plan	98.9	22.6	96.0	
13	See Test Location Plan	99.4	21.1	96.5	
14	See Test Location Plan	100.6	20.7	97.7	
15	See Test Location Plan	101.7	20.1	98.7	
16	See Test Location Plan	102.0	20.8	99.0	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	1.1x10(-8)
Dry Density (pcf)	98.3
Moisture Content (%)	24.3

Atterberg Limits (ASTM D4318)

PL	17
LL	42
PI	25
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	44.5
%Silt	20.9
%Clay	34.6

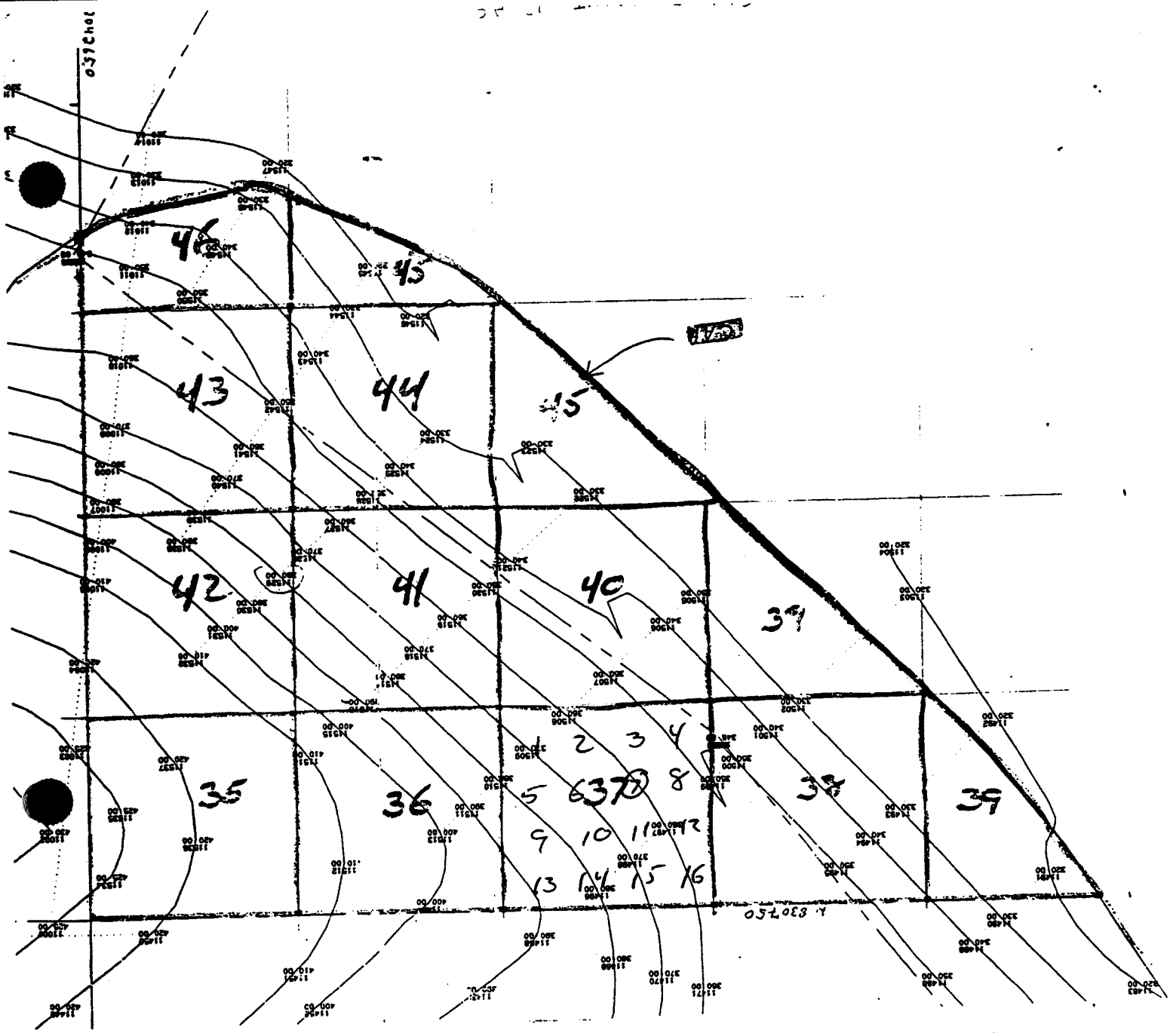
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/5/98

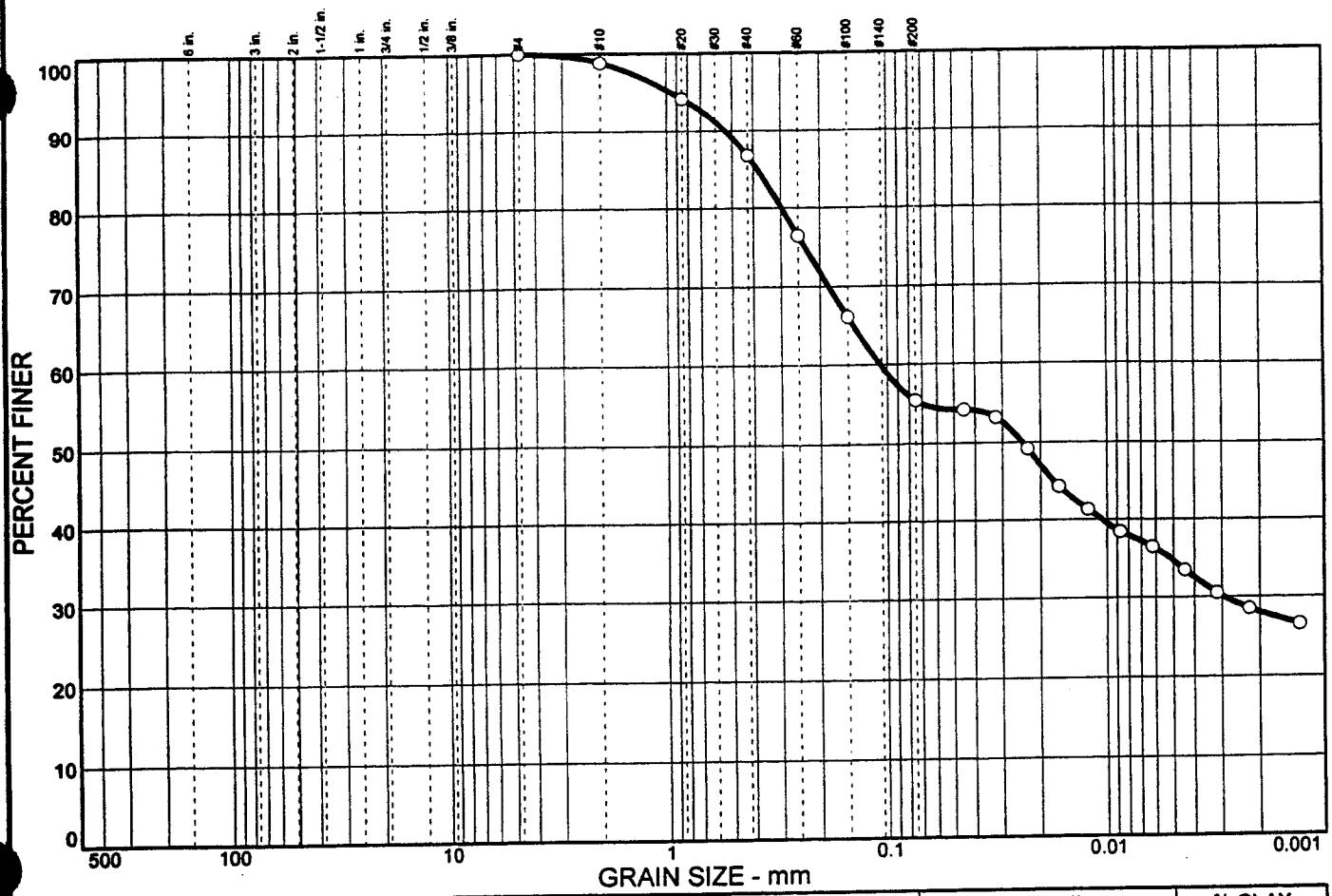
Test location Plan

Acre 37 / Lift 3

⊘ = Perm location

Report: 131

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	44.5	20.9	34.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.8		
#20	94.1		
#40	86.8		
#60	76.4		
#100	66.1		
#200	55.5		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 17 LL= 42 PI= 25

Coefficients

D_{85}= 0.382 D_{60}= 0.108 D_{50}= 0.0243
D_{30}= 0.0029 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-259, Acre 37, Lift 3

Sample No.: DL-259 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 37, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 01/05/99
Report No.: P-220

Project No.: VNC-98-029
Sample No.: DL-259
Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.1E-008	cm/sec
% Moisture	24.3	%
Dry Density	98.3	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/05/98
Location: Acre 37, Lift 3

Specimen Data

Length (in):	3.319
Diameter (in.):	2.851
Area (sq. in.):	6.395
Volume (cu. in.):	21.22
Wet Weight (grams):	680.8
Dry Weight (grams):	547.8
Dry Density (pcf):	98.3

Wet Weight	124.30
Dry Weight	104.29
Tare weight	21.90
% Moisture	24.3

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
643	138.46	0.70	0.70	1.00	0.70	1.06E-008
529	138.46	0.70	0.55	0.79	0.63	1.15E-008
499	124.61	0.60	0.55	0.92	0.58	1.25E-008
954	124.61	0.90	0.85	0.94	0.88	9.93E-009

x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **1.1E-008** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/11/99
Report No.: 142

Acre 38 Lift 3

Clay Source: On-site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	102.3	20.6	99.3	
2	See Test Location Plan	103.1	20.2	100+	
3	See Test Location Plan	100.7	21.3	97.8	
4	See Test Location Plan	101.6	23.5	98.6	
5	See Test Location Plan	100.5	22.6	97.6	
6	See Test Location Plan	97.8 9785	25.1	95.0	Perm/Sample (DL-270)
7	See Test Location Plan	988.7 98.87	23.4	95.8	
8	See Test Location Plan	97.9	25.3	95.1	
9	See Test Location Plan	99.2	24.6	96.3	
10	See Test Location Plan	98.3	24.8	95.5 4 on	
11	See Test Location Plan	100.4	23.0	97.5	
12	See Test Location Plan	99.6	24.1	96.7	
13	See Test Location Plan	101.6	22.6	98.6	
14	See Test Location Plan	102.3	21.0	99.3	
15	See Test Location Plan	102.8	20.7	99.8	
16	See Test Location Plan	101.3	22.1	98.4	
Density (ASTM D2922)					Moisture (ASTM D3017)

A little short of compliance possible typo

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 2.7x10(-9)

Dry Density (pcf) 104.0

Moisture Content (%) 19.7

Atterberg Limits (ASTM D4318)

PL 16
LL 45
PI 29

USCS Classification CL

Grain-size Analysis (ASTM D422)

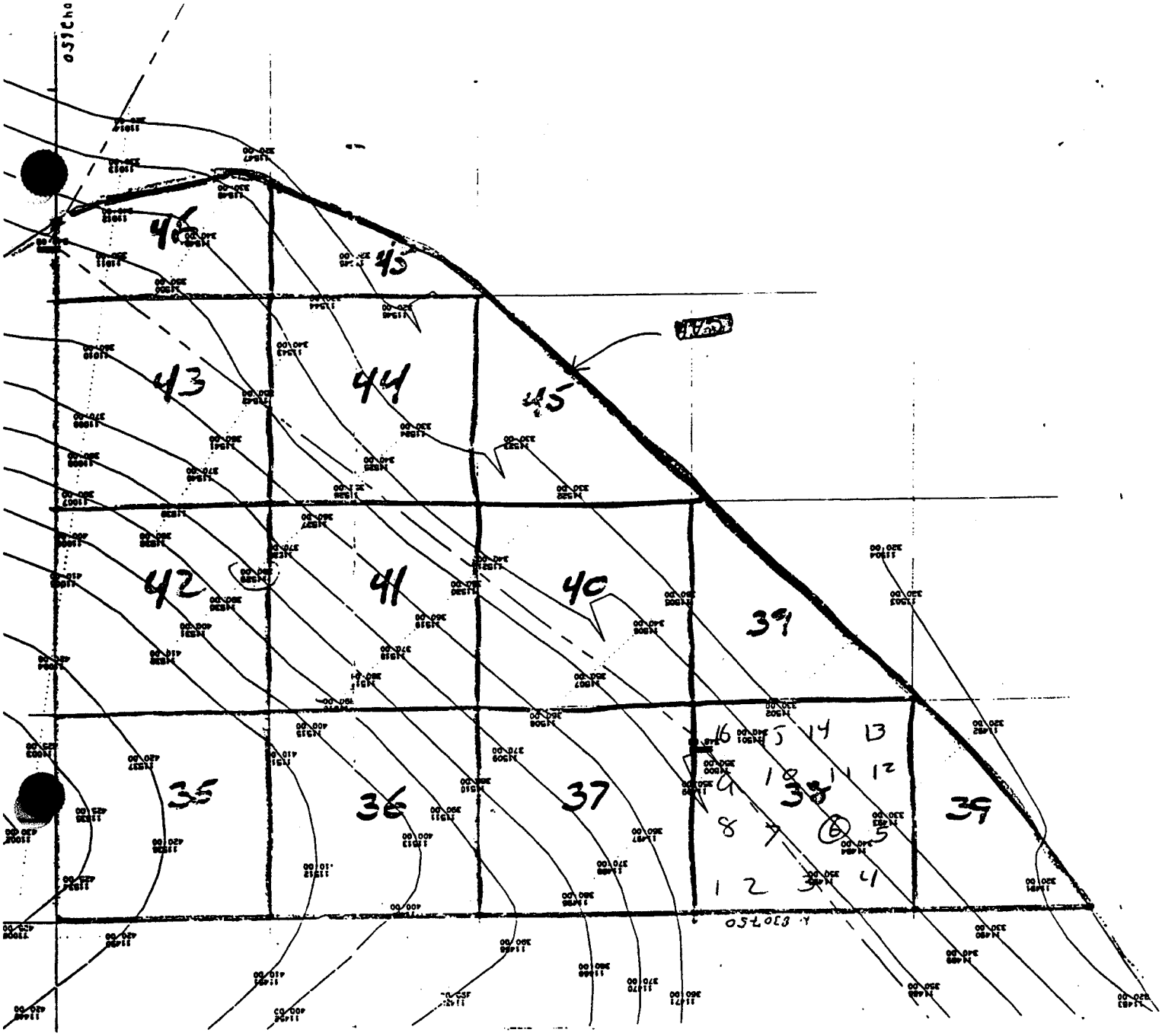
%Gravel 0.0
%Sand 38.6
%Silt 20.8
%Clay 40.6

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/8/98

Test location Plan

Acre 38/Lift 3

⑥ = Perm location

Report: 142

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 01/01/98
Report No.: P-235

Project No.: VNC-98-029
Sample No.: DL-270

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.7E-009	cm/sec
% Moisture	19.7	%
Dry Density	104.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/08/98
Location: Acre 38, Lift 3

Specimen Data

Length (in):	3.431
Diameter (in.):	2.820
Area (sq. in.):	6.257
Volume (cu. in.):	21.47
Wet Weight (grams):	702.5
Dry Weight (grams):	586.7
Dry Density (pcf):	104.1

Wet Weight	250.45
Dry Weight	215.40
Tare weight	37.90
% Moisture	19.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
3880	102.46	0.80	0.60	0.75	0.70	2.51E-009
1620	102.46	0.35	0.30	0.86	0.33	2.79E-009
1500	102.46	0.35	0.30	0.86	0.33	3.02E-009
1200	102.86	0.20	0.20	1.00	0.20	2.31E-009

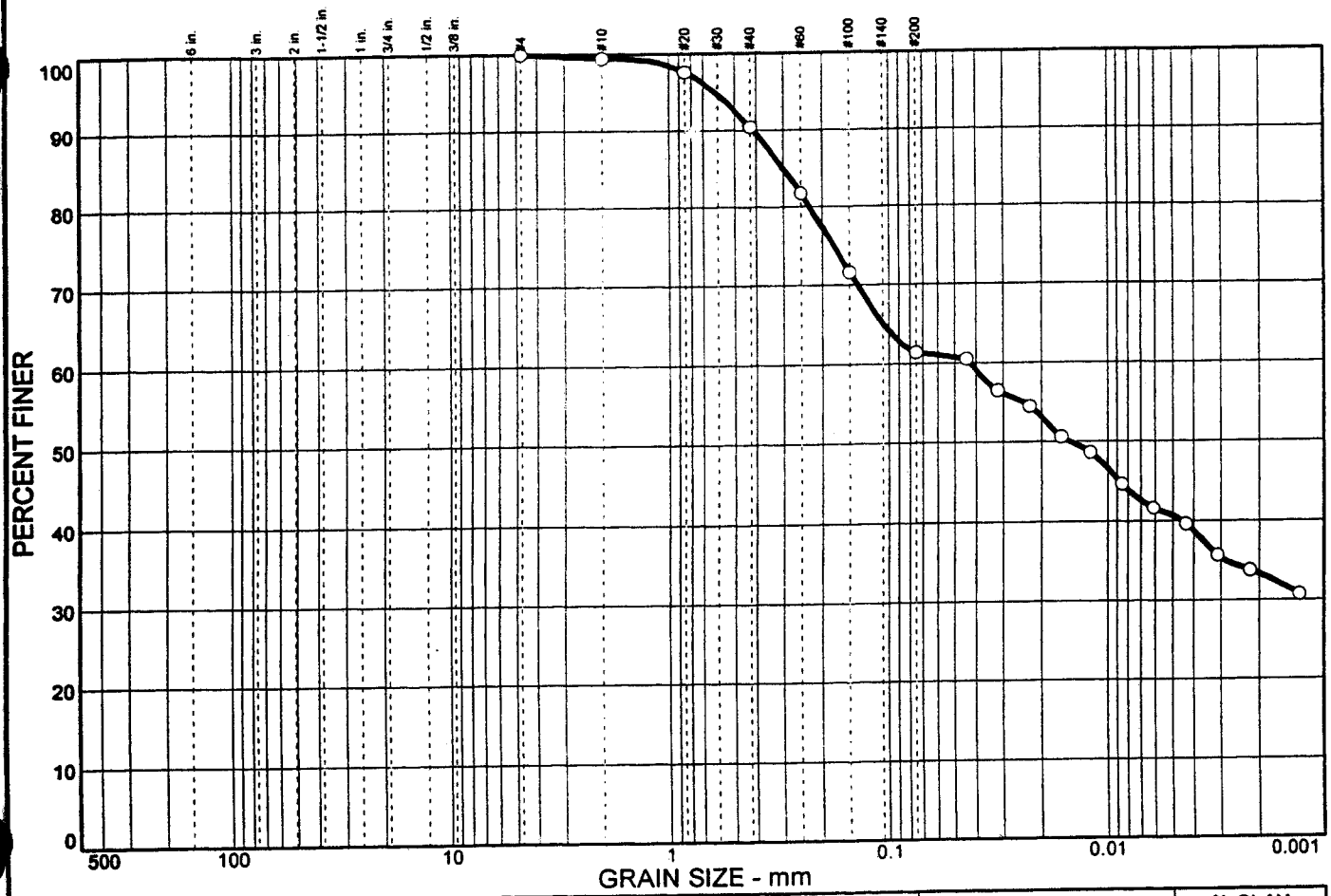
x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.7E-009** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	38.6	20.8	40.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#20	97.7		
#40	90.4		
#60	81.7		
#100	71.6		
#200	61.4		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 16 LL= 45 PI= 29

Coefficients

D_{85}= 0.301 D_{60}= 0.0427 D_{50}= 0.0150
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-270, Acre 38, Lift 3

Sample No.: DL-270 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 38, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/11/99
Report No.: 143

Acre 39 Lift 3

Clay Source: On-site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	100.4	21.7	97.5	
2	See Test Location Plan	100.7	22.4	97.8	
3	See Test Location Plan	101.6	22.6	98.6	
4	See Test Location Plan	99.8	23.4	96.9	
5	See Test Location Plan	99.2	23.8	96.3	Perm/Sample (DL-271)
6	See Test Location Plan	102.4	20.7	99.4	
7	See Test Location Plan	103.2	19.8	100+	
8	See Test Location Plan	101.9	21.6	98.9	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 3.4x10(-9)

Dry Density (pcf) 100.8

Moisture Content (%) 22.9

Atterberg Limits (ASTM D4318)

PL 16
LL 51
PI 35

USCS Classification CH

Grain-size Analysis (ASTM D422)

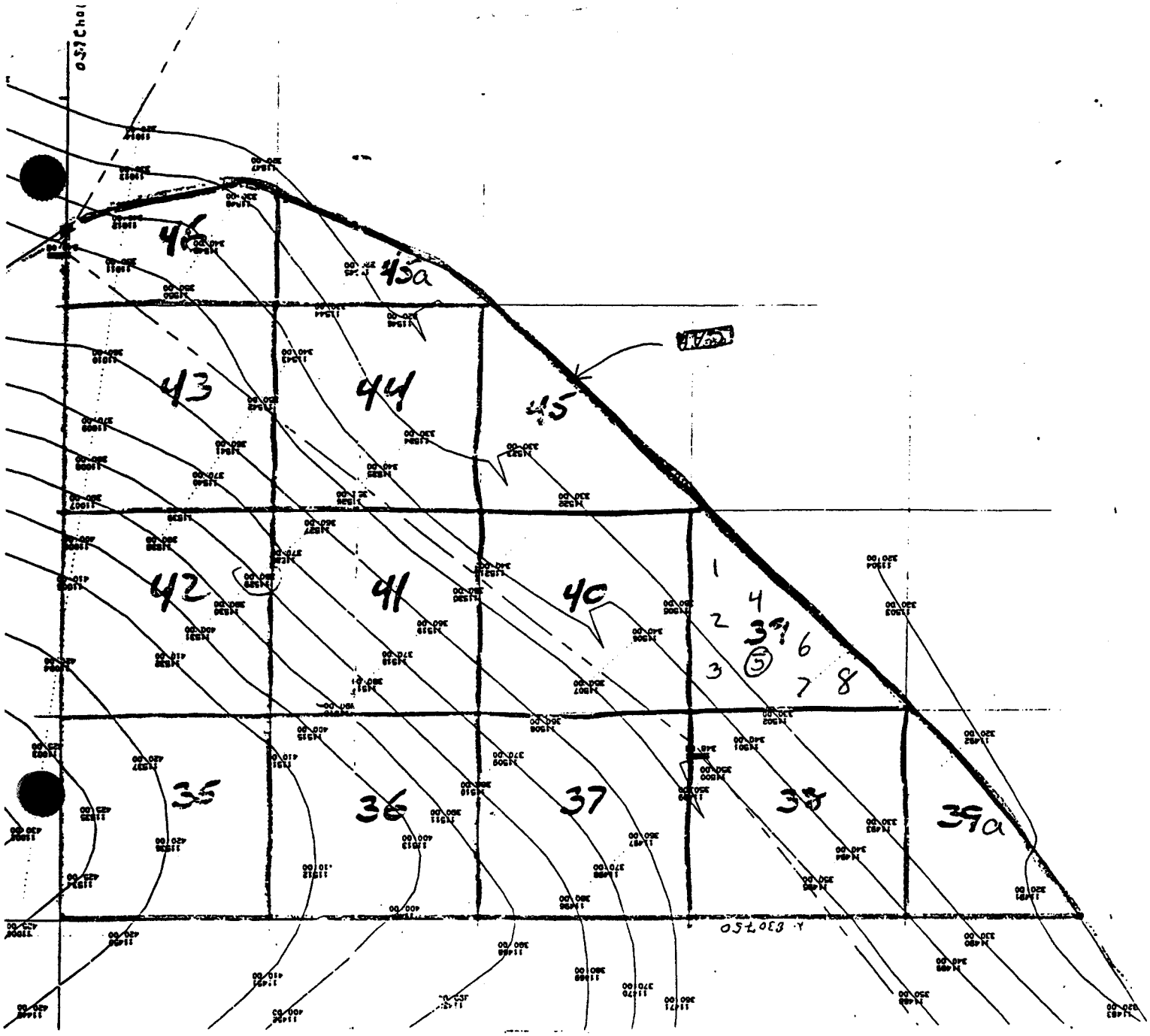
%Gravel 0.0
%Sand 38.6
%Silt 20.8
%Clay 40.6

Sincerely,
VAN DER HORST Geotechnical Engineering, P.A.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/8/98

Test Location Plan

Acre 39 / Lift 3

⑤ = Perm location

Report: 143

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 01/01/98
Report No.: P-236

Project No.: VNC-98-029
Sample No.: DL-271

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.4E-009	cm/sec
% Moisture	22.9	%
Dry Density	100.8	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/08/98
Location: Acre 39, Lift 3

Specimen Data

Length (in):	3.263
Diameter (in.):	2.806
Area (sq. in.):	6.195
Volume (cu. in.):	20.21
Wet Weight (grams):	657.2
Dry Weight (grams):	534.9
Dry Density (pcf):	100.8

Wet Weight	256.26
Dry Weight	215.57
Tare weight	37.69
% Moisture	22.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
3880	96.92	0.40	0.25	0.63	0.33	1.18E-009
1620	96.92	0.85	0.65	0.76	0.75	6.54E-009
1500	96.92	0.35	0.30	0.86	0.33	3.06E-009
1200	96.92	0.25	0.25	1.00	0.25	2.94E-009

x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

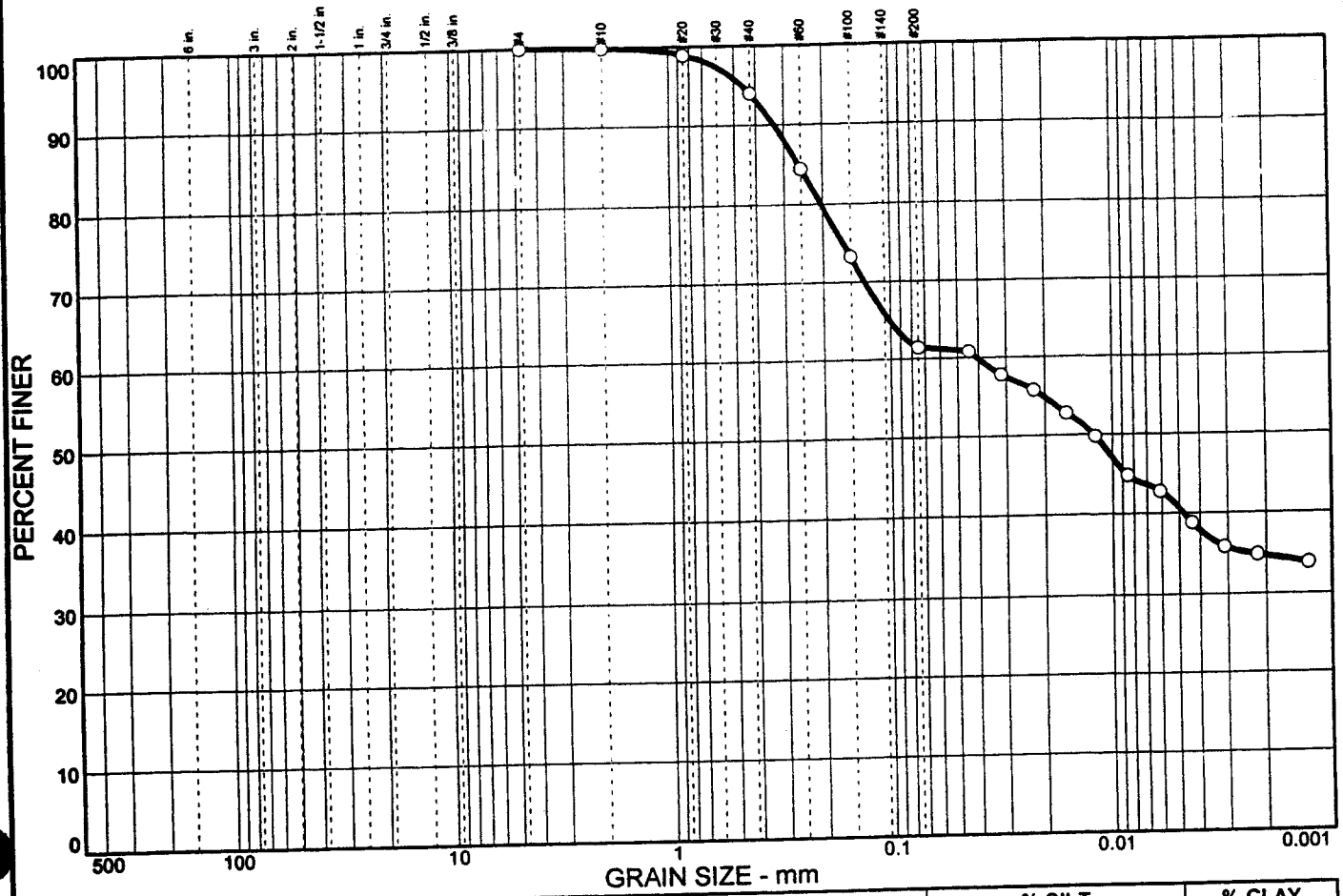
Permeability (k) **3.4E-009** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-0460

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	38.6	20.8	40.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	98.9		
#40	94.0		
#60	84.4		
#100	73.2		
#200	61.4		

* (no specification provided)

Soil Description

On-site Borrow - Sandy fat clay

Atterberg Limits

PL= 16 LL= 51 PI= 35

Coefficients

D_{85}= 0.257 D_{60}= 0.0408 D_{50}= 0.0121
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-271, Acre 39, Lift 3

Sample No.: DL-271 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 39, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/11/99
Report No.: 144

Acre 39a Lift 3
Clay Source: On-site Borrow Pit
ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture
Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	102.4	20.2	99.4	
2	See Test Location Plan	101.7	22.0	98.7	
3	See Test Location Plan	100.3	21.6	97.4	
4	See Test Location Plan	101.2	22.4	98.3	
5	See Test Location Plan	99.1	23.3	96.2	Perm/Sample (DL-272)
6	See Test Location Plan	100.6	21.2	97.7	
7	See Test Location Plan	99.8	23.0	96.9	
8	See Test Location Plan	99.6	24.0	96.7	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 5.8x10(-9)

Dry Density (pcf) 106.7

Moisture Content (%) 19.7

Atterberg Limits (ASTM D4318)

PL 17
LL 54
PI 37

USCS Classification CH

Grain-size Analysis (ASTM D422)

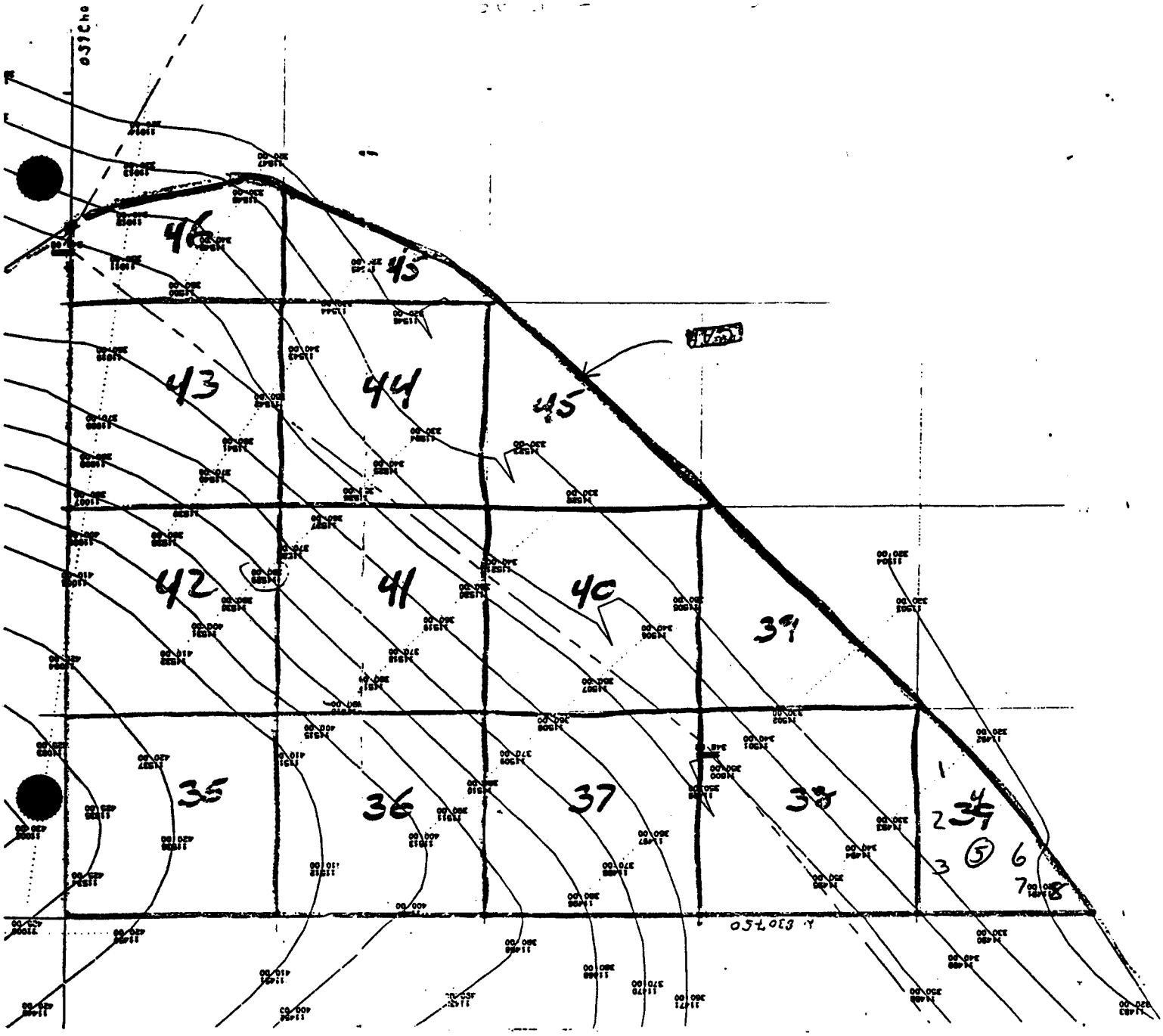
%Gravel 0.0
%Sand 31.5
%Silt 26.2
%Clay 42.3

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/8/98

Test location Plan

Acre 39a / Lift 3.

(5) = Perm location

Report: 144

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 01/01/98
Report No.: P-237

Project No.: VNC-98-029
Sample No.: DL-272

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.8E-009	cm/sec
% Moisture	19.7	%
Dry Density	106.7	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 12/08/98
Location: Acre 39a, Lift 3

Specimen Data

Length (in):	3.122
Diameter (in.):	2.832
Area (sq. in.):	6.310
Volume (cu. in.):	19.70
Wet Weight (grams):	660.3
Dry Weight (grams):	551.8
Dry Density (pcf):	106.7

Wet Weight	200.86
Dry Weight	174.03
Tare weight	37.65
% Moisture	19.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1345	94.15	0.55	0.50	0.91	0.53	5.33E-009
1465	94.15	0.70	0.55	0.79	0.63	5.83E-009
1495	94.15	0.75	0.60	0.80	0.68	6.17E-009
1460	94.15	0.70	0.55	0.79	0.63	5.85E-009

x

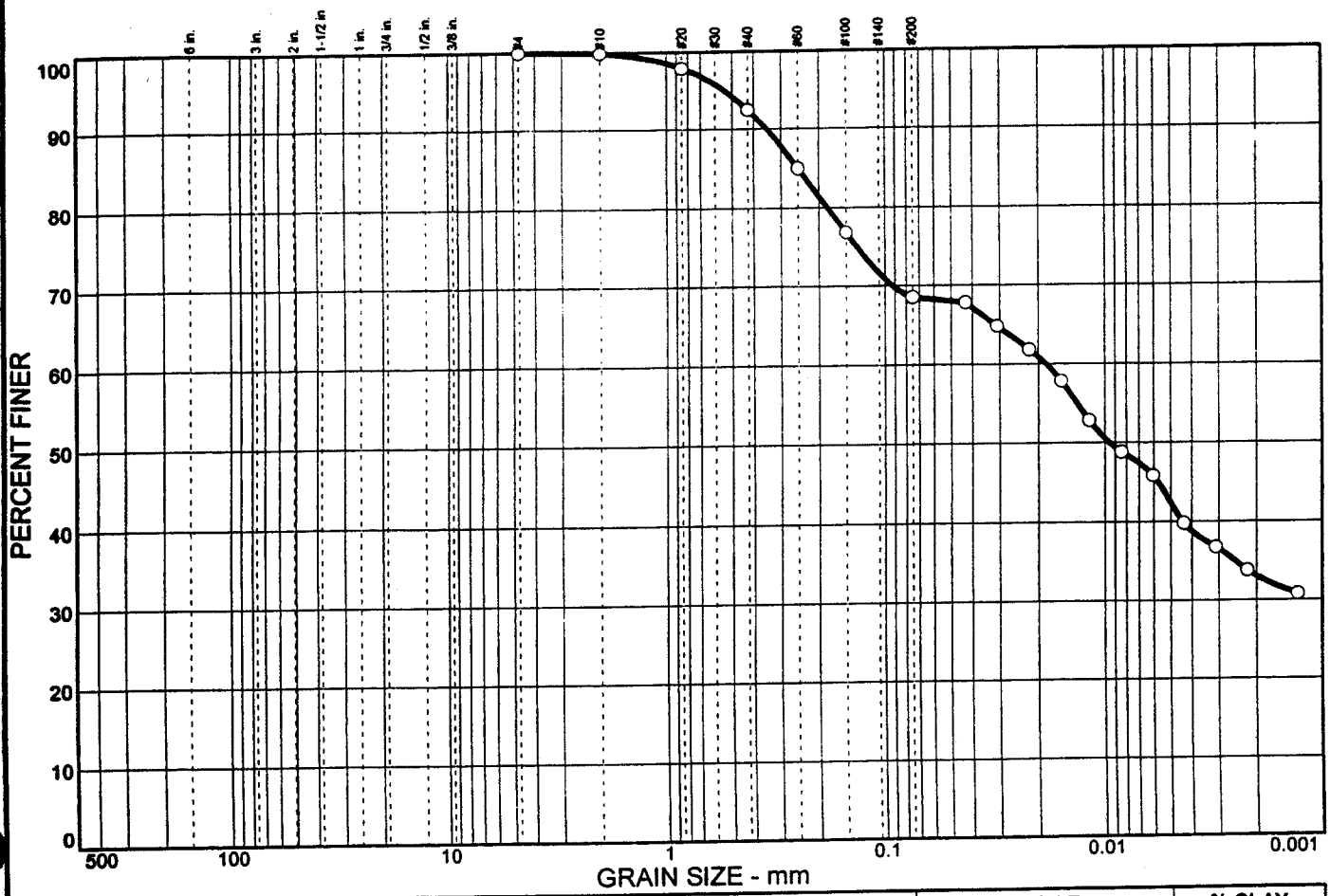
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **5.8E-009** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-0460

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	31.5	26.2	42.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	97.9		
#40	92.5		
#60	85.0		
#100	76.8		
#200	68.5		

* (no specification provided)

Soil Description

On-site Borrow - Sandy fat clay

Atterberg Limits

PL= 17 LL= 54 PI= 37

Coefficients

D_{85}= 0.250 D_{60}= 0.0186 D_{50}= 0.0096
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-272, Acre 39A, lift 3

Sample No.: DL-272 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 39A, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/11/99
Report No.: 145

Acre 40 Lift 3

Clay Source: On-site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	101.7	22.4	98.7	
2	See Test Location Plan	100.8	21.6	97.9	
3	See Test Location Plan	99.4	22.7	96.5	
4	See Test Location Plan	101.4	22.0	98.4	
5	See Test Location Plan	98.1	26.6	95.2	
6	See Test Location Plan	102.9	20.8	99.9	
7	See Test Location Plan	101.0	23.8	98.0	Perm/Sample (DL-273)
8	See Test Location Plan	102.6	20.4	99.6	
9	See Test Location Plan	102.4	19.9	99.4	
10	See Test Location Plan	103.2	19.7	100+	
11	See Test Location Plan	101.8	20.6	98.8	
12	See Test Location Plan	100.3	21.4	97.4	
13	See Test Location Plan	100.7	22.3	97.8	
14	See Test Location Plan	101.3	22.4	98.3	
15	See Test Location Plan	100.6	21.6	97.7	
16	See Test Location Plan	101.0	20.9	98.1	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 7.3x10(-9)

Dry Density (pcf) 106.3

Moisture Content (%) 19.6

Atterberg Limits (ASTM D4318)

PL 17
LL 46
PI 29

USCS Classification CL

Grain-size Analysis (ASTM D422)

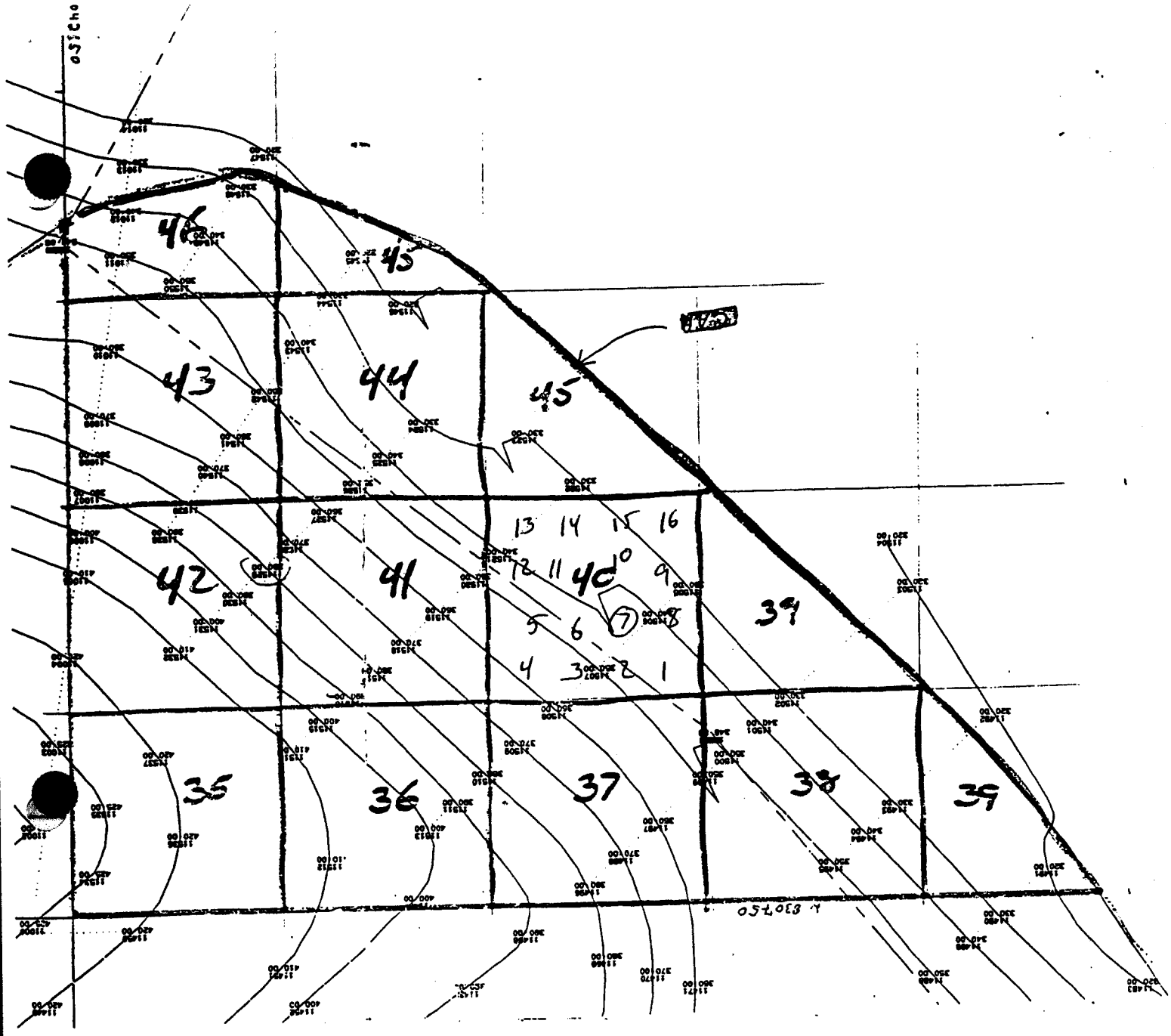
%Gravel 0.0
%Sand 28.5
%Silt 29.6
%Clay 41.9

Sincerely,
VAN DER HORST Geotechnical Engineering, P.A.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/8/98

Test location plan

Acre 40 / Lift 3

7 = Perm location

Report: 145

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 01/01/98
Report No.: P-238

Project No.: VNC-98-029
Sample No.: DL-273

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	7.3E-009	cm/sec
% Moisture	19.6	%
Dry Density	106.3	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 12/08/98
Location: Acre 40, Lift 3

Specimen Data

Length (in):	3.405
Diameter (in.):	2.805
Area (sq. in.):	6.190
Volume (cu. in.):	21.08
Wet Weight (grams):	703.6
Dry Weight (grams):	588.1
Dry Density (pcf):	106.3

Wet Weight	229.69
Dry Weight	198.16
Tare weight	37.69
% Moisture	19.6

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1760	102.46	1.00	0.90	0.90	0.95	7.53E-009
1465	102.46	0.85	0.70	0.82	0.78	7.38E-009
1495	102.46	0.90	0.70	0.78	0.80	7.47E-009
1460	102.46	0.75	0.70	0.93	0.73	6.93E-009

x

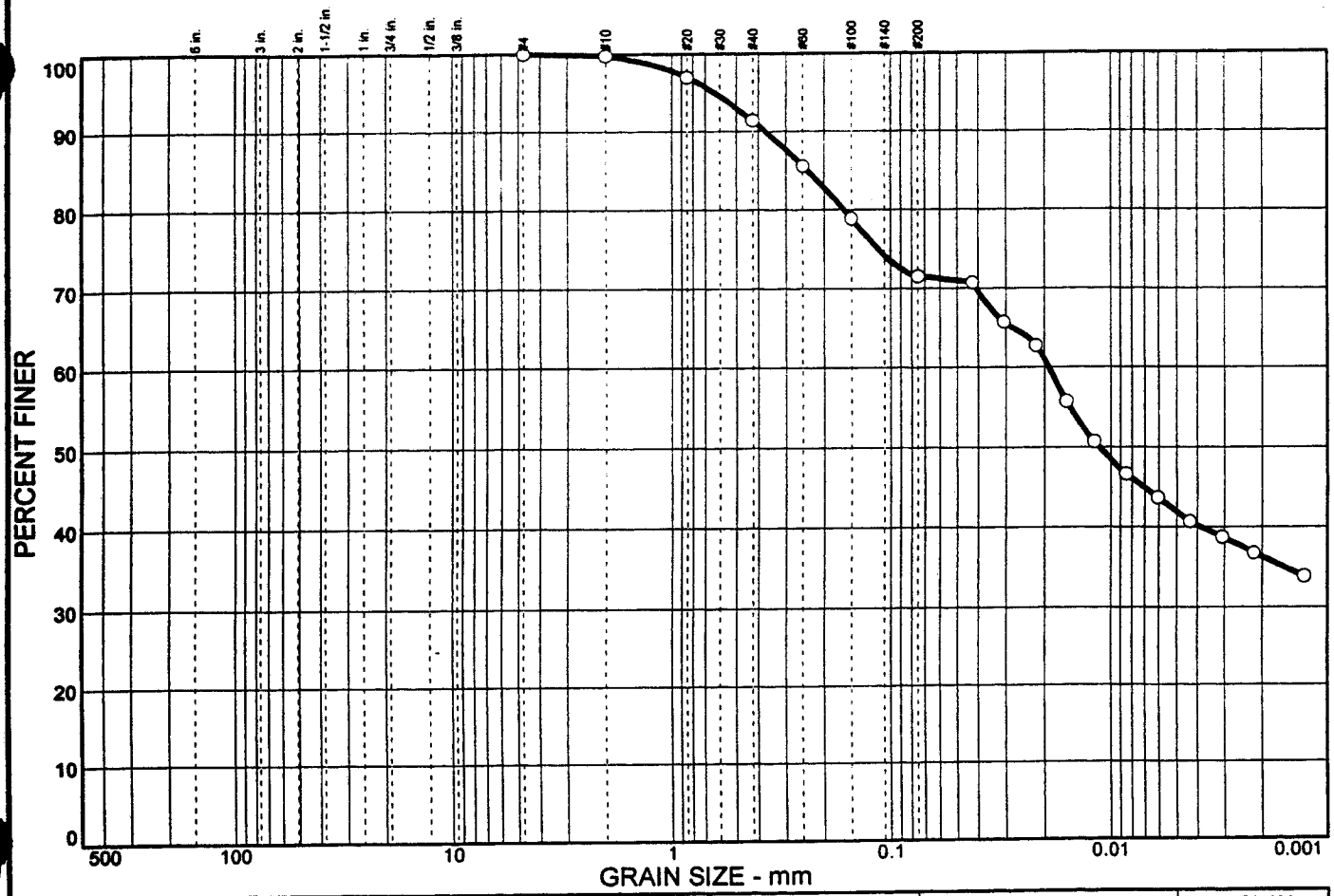
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **7.3E-009** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-0460

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	28.5	29.6	41.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	97.0		
#40	91.4		
#60	85.5		
#100	78.9		
#200	71.5		

* (no specification provided)

Soil Description

On-site Borrow - Lean clay with sand

Atterberg Limits

PL= 17 LL= 46 PI= 29

Coefficients

D_{85}= 0.240 D_{60}= 0.0192 D_{50}= 0.0112
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-273, Acre 40, Lift 3

Sample No.: DL-273 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 40, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/05/99
Report No.: 134

Acre 41 Lift 3

Clay Source: On-site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	98.6	21.7	95.7	
2	See Test Location Plan	102.0	20.8	99.0	
3	See Test Location Plan	104.0	20.7	100+	
4	See Test Location Plan	99.6	22.6	96.7	
5	See Test Location Plan	100.1	23.4	97.2	
6	See Test Location Plan	99.0	25.7	96.1	
7	See Test Location Plan	102.5	23.8	99.5	Perm/Sample (DL-262)
8	See Test Location Plan	102.1	22.0	99.1	
9	See Test Location Plan	103.7	20.6	100+	
10	See Test Location Plan	101.7	21.6	98.7	
11	See Test Location Plan	100.8	23.3	97.9	
12	See Test Location Plan	101.2	21.1	98.3	
13	See Test Location Plan	104.0	19.8	100+	
14	See Test Location Plan	102.3	20.7	99.3	
15	See Test Location Plan	99.9	21.7	97.0	
16	See Test Location Plan	100.3	22.0	97.4	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	9.8x10(-9)
Dry Density (pcf)	107.4
Moisture Content (%)	19.7

Atterberg Limits (ASTM D4318)		Grain-size Analysis (ASTM D422)	
PL	18	%Gravel	0.1
LL	39	%Sand	35.3
PI	21	%Silt	23.2
		%Clay	41.4
USCS Classification	CL		

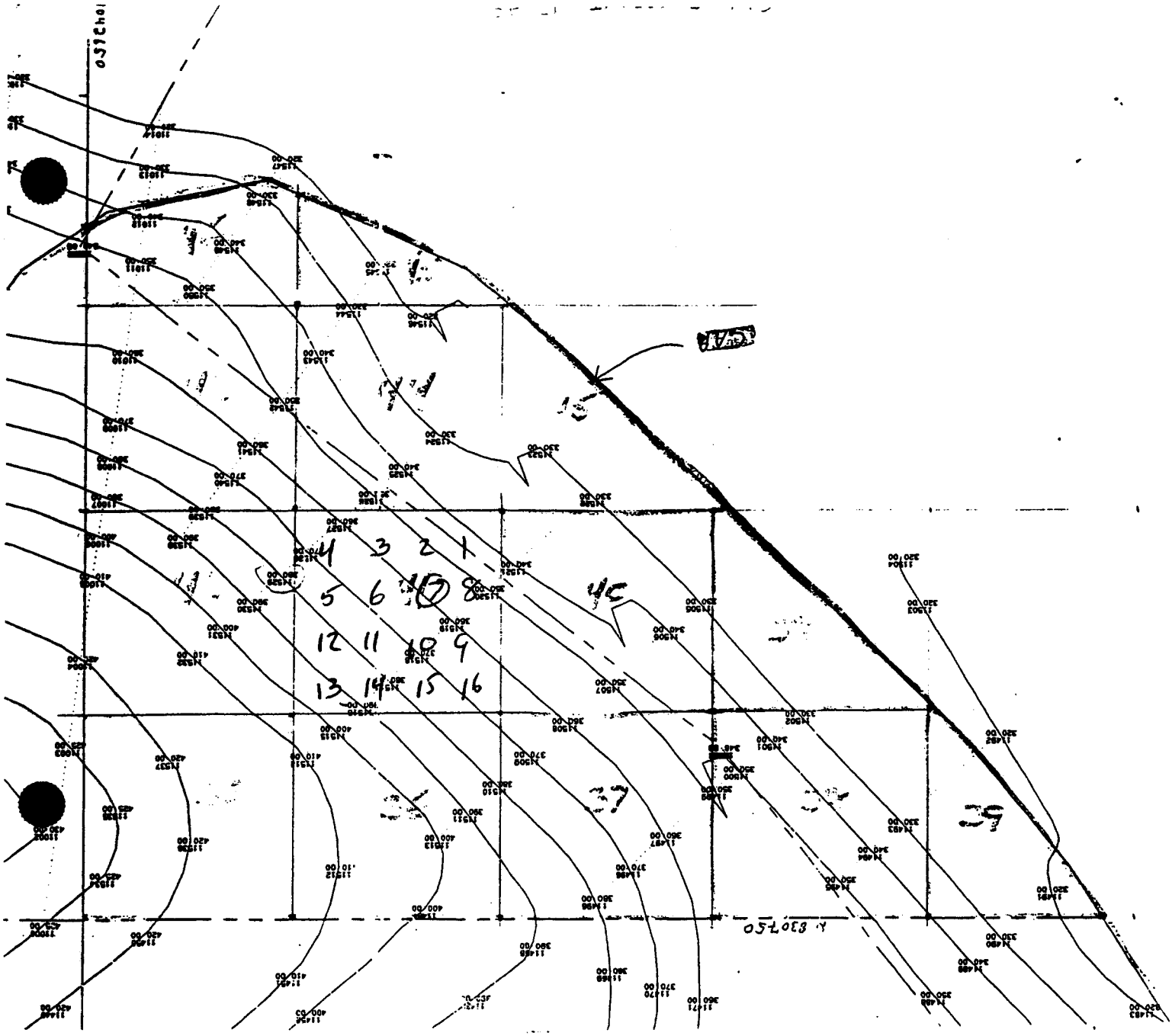
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/5/98

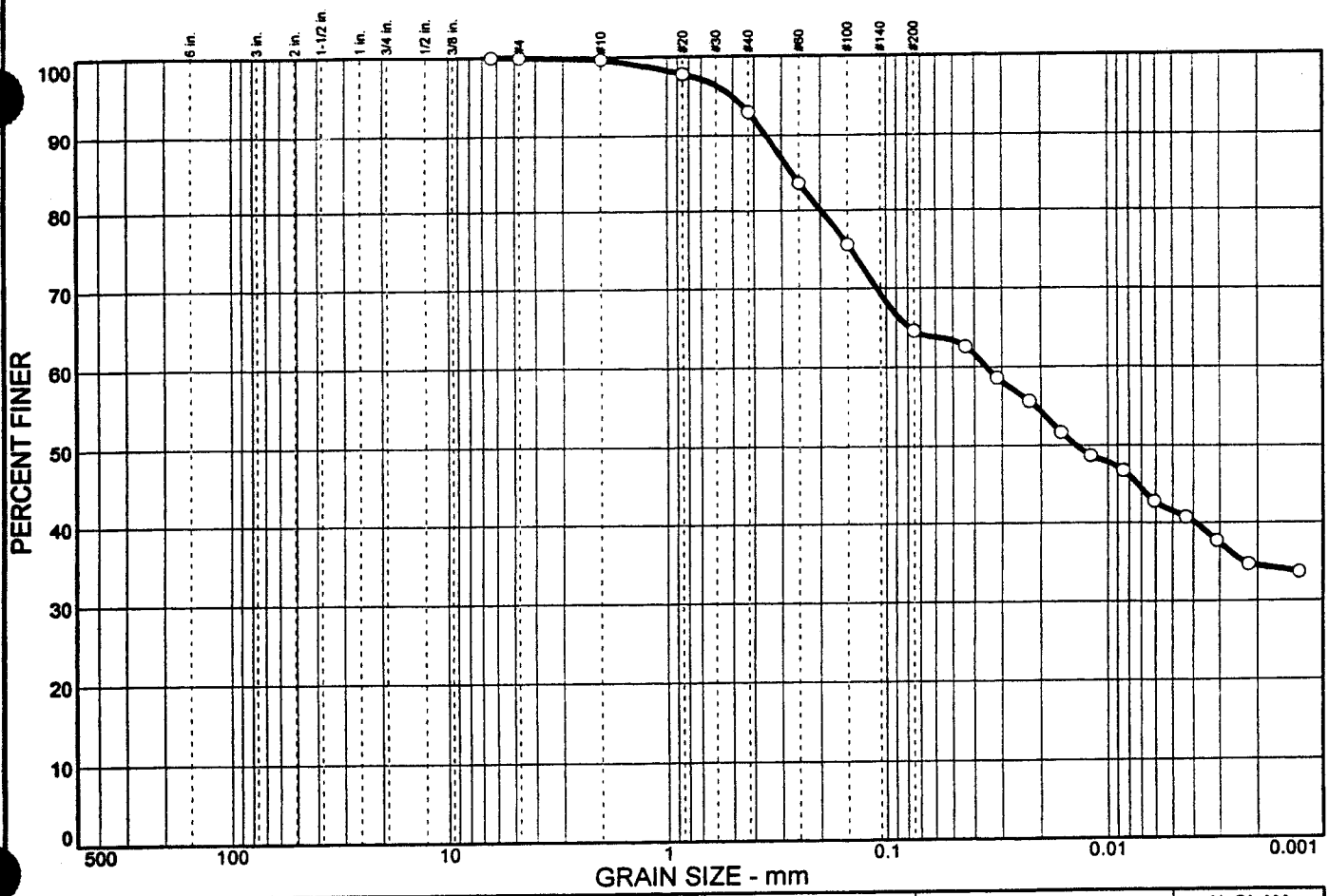
Test location Plan

Acre 41 / Lift 3

⑦ = Perm location

Report: 134

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	35.3	23.2	41.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.7		
#20	97.8		
#40	93.0		
#60	83.6		
#100	75.6		
#200	64.6		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 18 LL= 39 PI= 21

Coefficients

D_{85}= 0.270 D_{60}= 0.0353 D_{50}= 0.0139
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-262, Acre 41, Lift 3

Sample No.: DL-262 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 41, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 01/05/99
Report No.: P-197

Project No.: VNC-98-029
Sample No.: DL-262

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	9.8E-009	cm/sec
% Moisture	19.7	%
Dry Density	107.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/05/98
Location: Acre 41, Lift 3

Specimen Data

Length (in):	3.732
Diameter (in.):	2.844
Area (sq. in.):	6.363
Volume (cu. in.):	23.75
Wet Weight (grams):	801.4
Dry Weight (grams):	669.7
Dry Density (pcf):	107.4

Wet Weight	134.67
Dry Weight	116.14
Tare weight	21.91
% Moisture	19.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
956	138.50	0.65	0.80	1.23	0.73	8.35E-009
898	138.46	0.50	0.45	0.90	0.48	5.83E-009
422	138.46	0.70	0.70	1.00	0.70	1.83E-008
839	138.46	0.50	0.50	1.00	0.50	6.56E-009

x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **9.8E-009** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/10/98
Report No.: 115

Acre 42 Lift 3

Clay Source: Fogleman Borrow Pit

ASTM D698 : 96.8 Max. Dry Density @ 22.5 Optimum Moisture

Required Compaction: 95% @ +22.5% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	97.0	22.5	100+	
2	See Test Location Plan	96.4	22.6	99.6	
3	See Test Location Plan	94.8	22.9	97.9	
4	See Test Location Plan	94.2	22.8	97.3	
5	See Test Location Plan	94.6	24.6	97.8 9 typo	Tube/Sample (DL-230) ←
6	See Test Location Plan	97.6	23.0	100+	
7	See Test Location Plan	96.6	23.7	99.8	
8	See Test Location Plan	94.3	22.8	97.4	
9	See Test Location Plan	95.8	23.1	99.0	
10	See Test Location Plan	95.3	24.2	98.5	
11	See Test Location Plan	96.2	23.7	99.4	
12	See Test Location Plan	96.0	22.8	99.2	
13	See Test Location Plan	96.9	22.6	100+	
14	See Test Location Plan	94.7	21.4	97.8	
15	See Test Location Plan	94.9	23.8	98.0	
16	See Test Location Plan	95.3	23.6	98.5	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	2.7x10(-8)
Dry Density (pcf)	96.2
Moisture Content (%)	23.9

Atterberg Limits (ASTM D4318)

PL	21
LL	48
PI	27
USCS Classification	CL

Grain-size Analysis (ASTM D422)

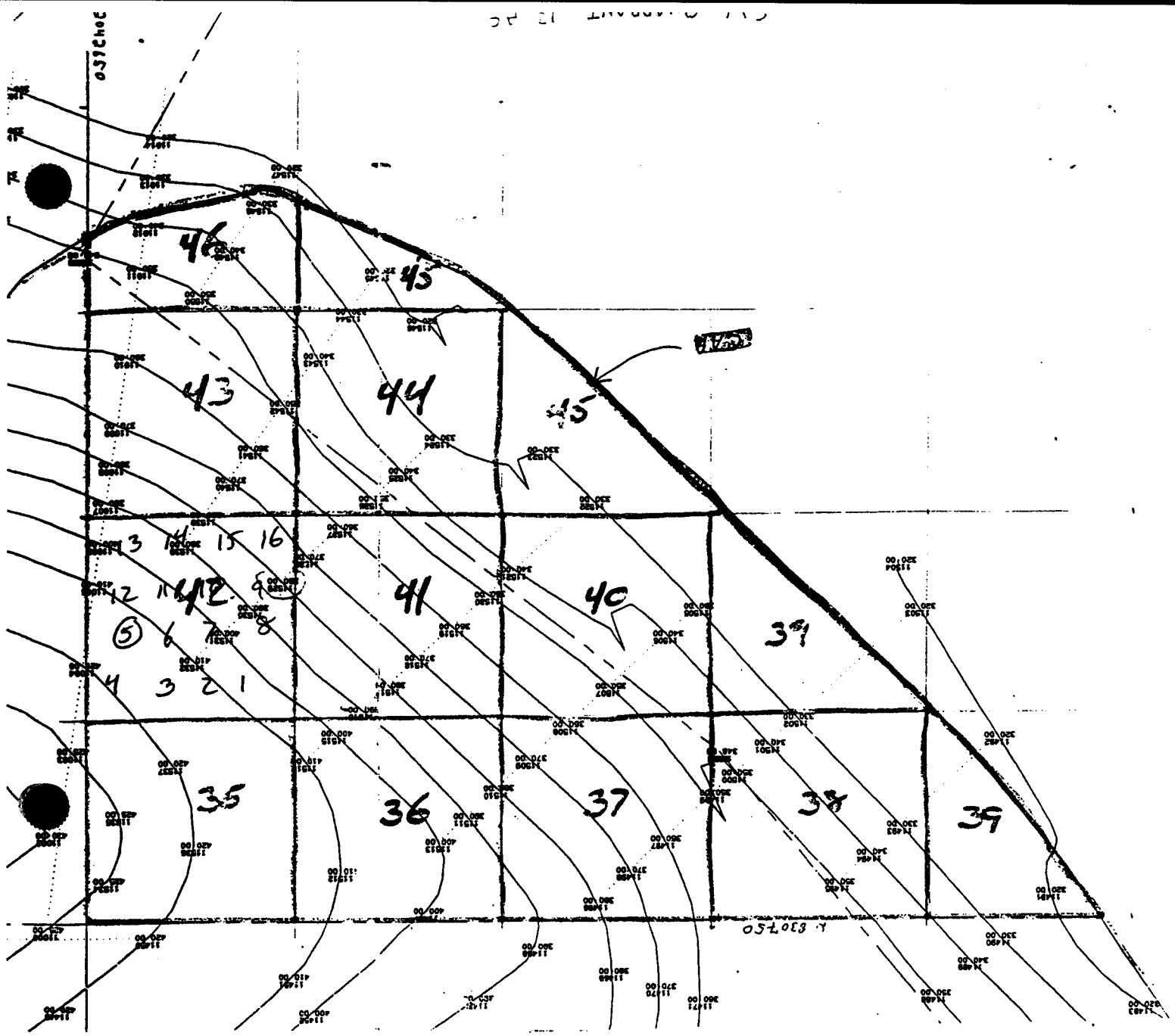
%Gravel	0.0
%Sand	48.0
%Silt	11.1
%Clay	40.9

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/1/88

Test location Plan

Acre 42/Lift 3

(5) = Perm location

Report: 115

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	48.0	11.1	40.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#20	94.0		
#40	85.4		
#60	75.1		
#100	62.5		
#200	52.0		

* (no specification provided)

Soil Description

Fogelman - Sandy lean clay

Atterberg Limits

PL= 21 LL= 48 PI= 27

Coefficients

D_{85}= 0.415 D_{60}= 0.134 D_{50}= 0.0264
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-230, Fogleman - Acre 42, Lift 3

Sample No.: DL-230 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman borrow pit - Acre 42, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/17/98
Report No.: P-213

Project No.: VNC-98-029
Sample No.: DL-230

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.7E-008	cm/sec
% Moisture	23.9	%
Dry Density	96.2	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 12/01/98
Location: Acre 42, Lift 3

Specimen Data

Length (in):	3.470
Diameter (in.):	2.829
Area (sq. in.):	6.297
Volume (cu. in.):	21.85
Wet Weight (grams):	683.5
Dry Weight (grams):	551.7
Dry Density (pcf):	96.2

Wet Weight	254.63
Dry Weight	212.79
Tare weight	37.65
% Moisture	23.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
402	102.50	0.85	0.95	1.12	0.90	3.13E-008
654	102.46	1.25	1.10	0.88	1.18	2.51E-008
660	102.46	1.25	1.10	0.88	1.18	2.49E-008
731	102.46	1.45	1.20	0.83	1.33	2.53E-008

x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.7E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

NORTH CAROLINA PROFESSIONAL SEAL 22083 ENGINEER ROBERT LEE MASHEWSKE

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/10/98
Report No.: 105

Acre 43 Lift 3

Clay Source: Fogleman Borrow Pit

ASTM D698 : 96.8 Max. Dry Density @ 22.5 Optimum Moisture

Required Compaction: 95% @ +22.5% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	97.2	22.7	100+	
2	See Test Location Plan	99.7	22.5	100+	
3	See Test Location Plan	92.5	23.6	95.6	
4	See Test Location Plan	99.2	23.4	100+	
5	See Test Location Plan	96.3	22.5	99.5	
6	See Test Location Plan	93.5	23.5	96.6	Tube/Sample (DL-231)
7	See Test Location Plan	94.5	22.6	97.6	
8	See Test Location Plan	96.2	22.9	99.4	
9	See Test Location Plan	96.0	23.0	99.2	
10	See Test Location Plan	95.8	24.1	99.0	
11	See Test Location Plan	94.3	23.6	97.4	
12	See Test Location Plan	95.0	23.2	98.1	
13	See Test Location Plan	94.7	22.6	97.8	
14	See Test Location Plan	95.6	23.0	98.8	
15	See Test Location Plan	96.8	23.0	100.0	
16	See Test Location Plan	96.2	23.6	99.4	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	1.1x10(-8)
Dry Density (pcf)	100.7
Moisture Content (%)	23.4

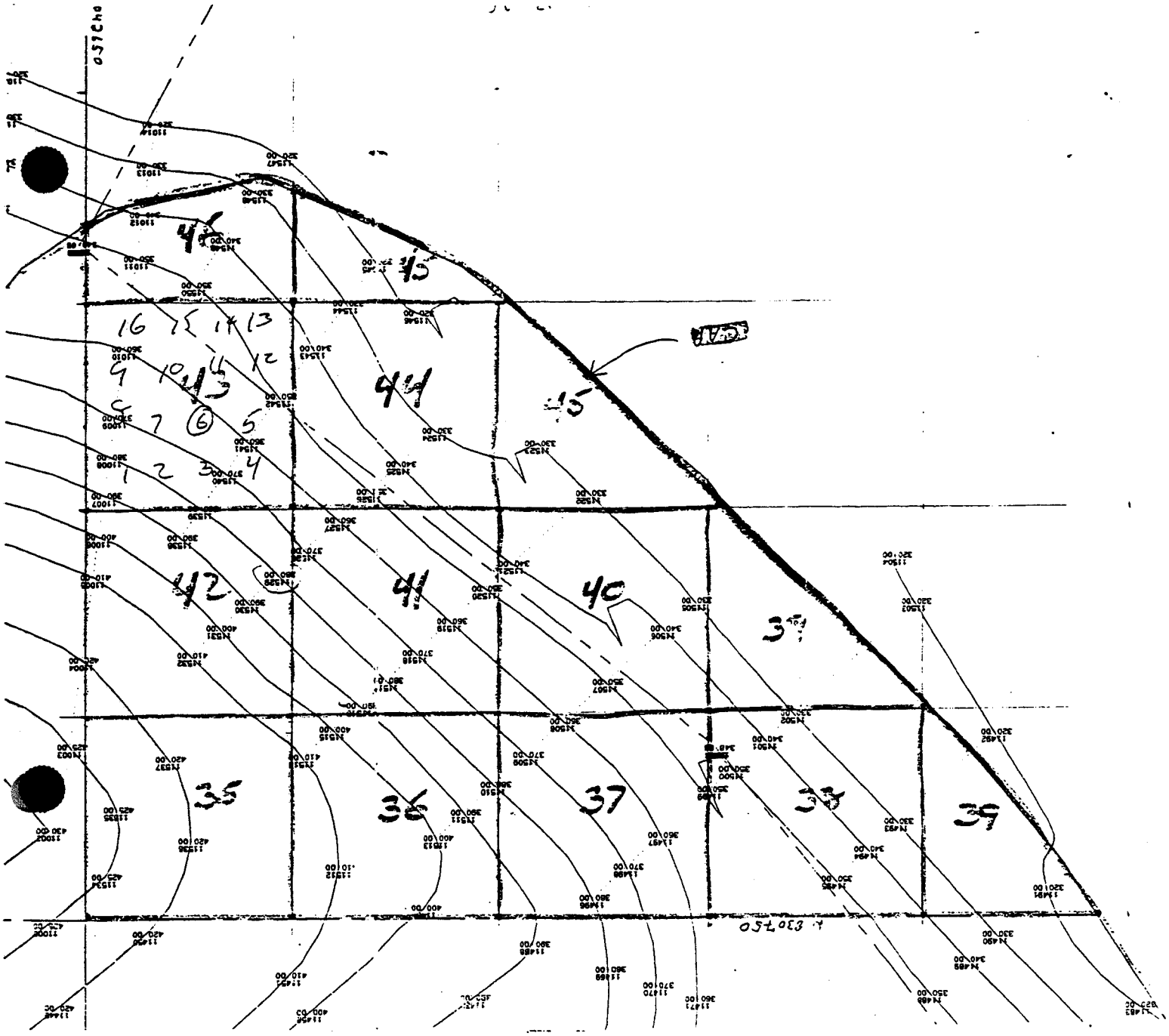
Atterberg Limits (ASTM D4318)		**Grain-size Analysis (ASTM D422)**	
PL	23	%Gravel	0.0
LL	54	%Sand	34.5
PI	31	%Silt	13.7
		%Clay	51.8
USCS Classification	CL		

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/1/98

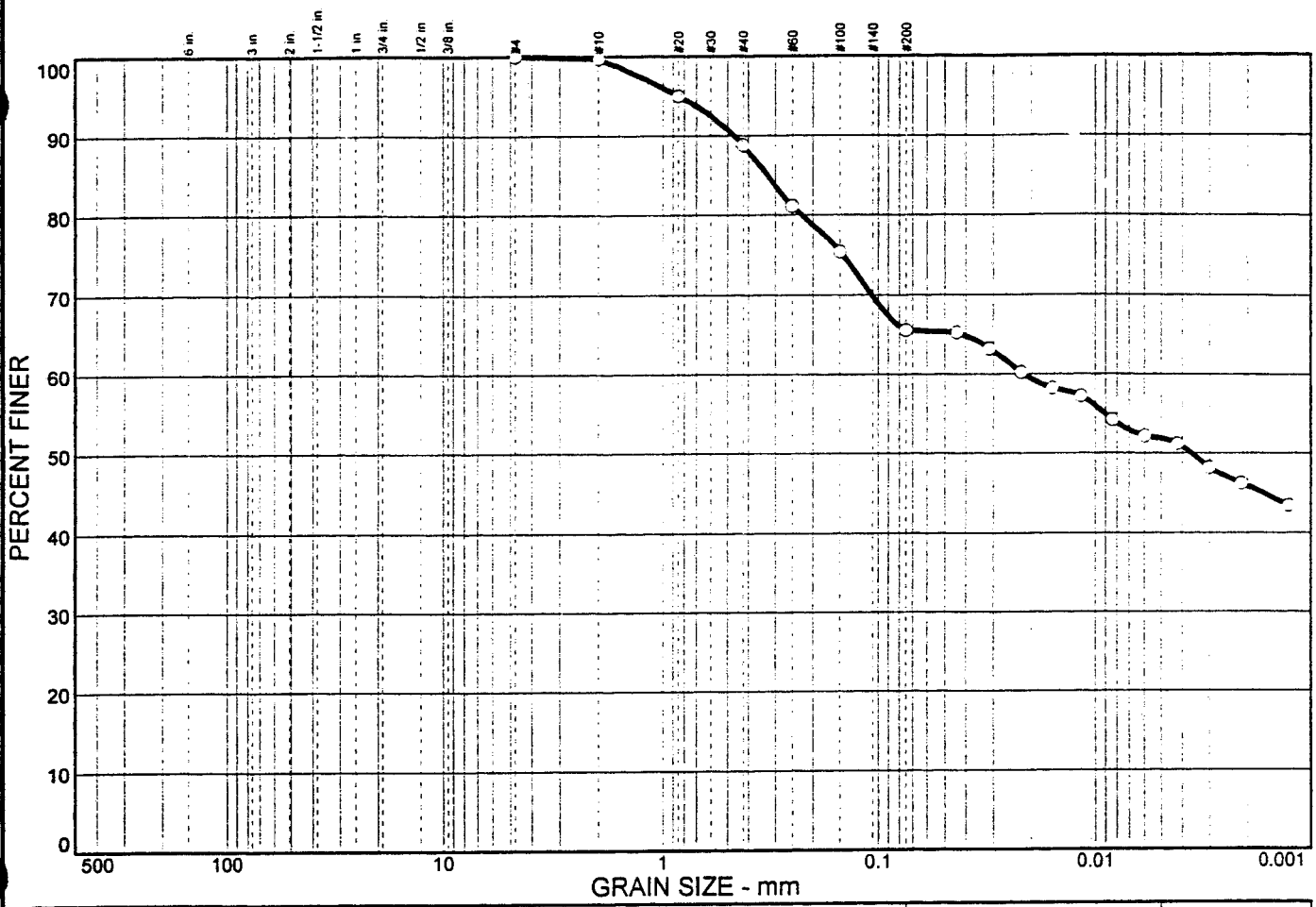
Test location Plan

Acre 43/Lift 3

⑥ = Perm location

Reports: 105

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	34.5	13.7	51.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	95.0		
#40	88.8		
#60	81.1		
#100	75.4		
#200	65.5		

* (no specification provided)

Soil Description

Fogelman - Sandy fat clay

Atterberg Limits

PL= 23 LL= 54 PI= 31

Coefficients

D_{85}= 0.328 D_{60}= 0.0219 D_{50}= 0.0036
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-231, Fogleman - Acre 43, Lift 3

Sample No.: DL-231 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman borrow pit - Acre 43, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/14/98
Report No.: P-206

Project No.: VNC-98-029
Sample No.: DL-231

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.1E-008	cm/sec
% Moisture	23.4	%
Dry Density	100.7	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/01/98
Location: Acre 43, Lift 3

Specimen Data

Length (in):	2.735
Diameter (in.):	2.833
Area (sq. in.):	6.314
Volume (cu. in.):	17.27
Wet Weight (grams):	563.4
Dry Weight (grams):	456.4
Dry Density (pcf):	100.7

Wet Weight	253.15
Dry Weight	212.23
Tare weight	37.69
% Moisture	23.4

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
662	83.08	0.65	0.50	0.77	0.58	1.18E-008
730	83.08	0.65	0.50	0.77	0.58	1.07E-008
564	83.18	0.50	0.40	0.80	0.45	1.08E-008
960	83.18	0.85	0.70	0.82	0.78	1.09E-008

x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **1.1E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 01/20/99 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
On-Site Borrow Pit Acre 44, Lift 3

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	01/20/99	Clay.154	Clay Cover Testing Report Acre 44, Lift 3

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/20/99
Report No.: 154

Acre 44 Lift 3

Clay Source: On-site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	101.1	20.7	98.2	
2	See Test Location Plan	102.7	20.3	99.7	
3	See Test Location Plan	102.0	21.0	99.0	
4	See Test Location Plan	100.6	22.6	97.7	
5	See Test Location Plan	99.8	22.7	96.9	
6	See Test Location Plan	102.4	23.4	99.4	Perm/Sample (DL-282)
7	See Test Location Plan	101.7	21.7	98.7	
8	See Test Location Plan	100.0	21.3	97.1	
9	See Test Location Plan	101.3	21.0	98.3	
10	See Test Location Plan	102.5	22.0	99.5	
11	See Test Location Plan	103.7	19.9	100+	
12	See Test Location Plan	101.6	21.6	98.6	
13	See Test Location Plan	100.7	22.3	97.8	
14	See Test Location Plan	99.4	24.8	96.5	
15	See Test Location Plan	99.7	23.6	96.8	
16	See Test Location Plan	101.3	21.9	98~~4~~ 3	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 7.5x10(-9)

Dry Density (pcf) 104.0

Moisture Content (%) 21.8

Atterberg Limits (ASTM D4318)

PL 18
LL 45
PI 27

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel 0.0
%Sand 40.7
%Silt 19.9
%Clay 39.4

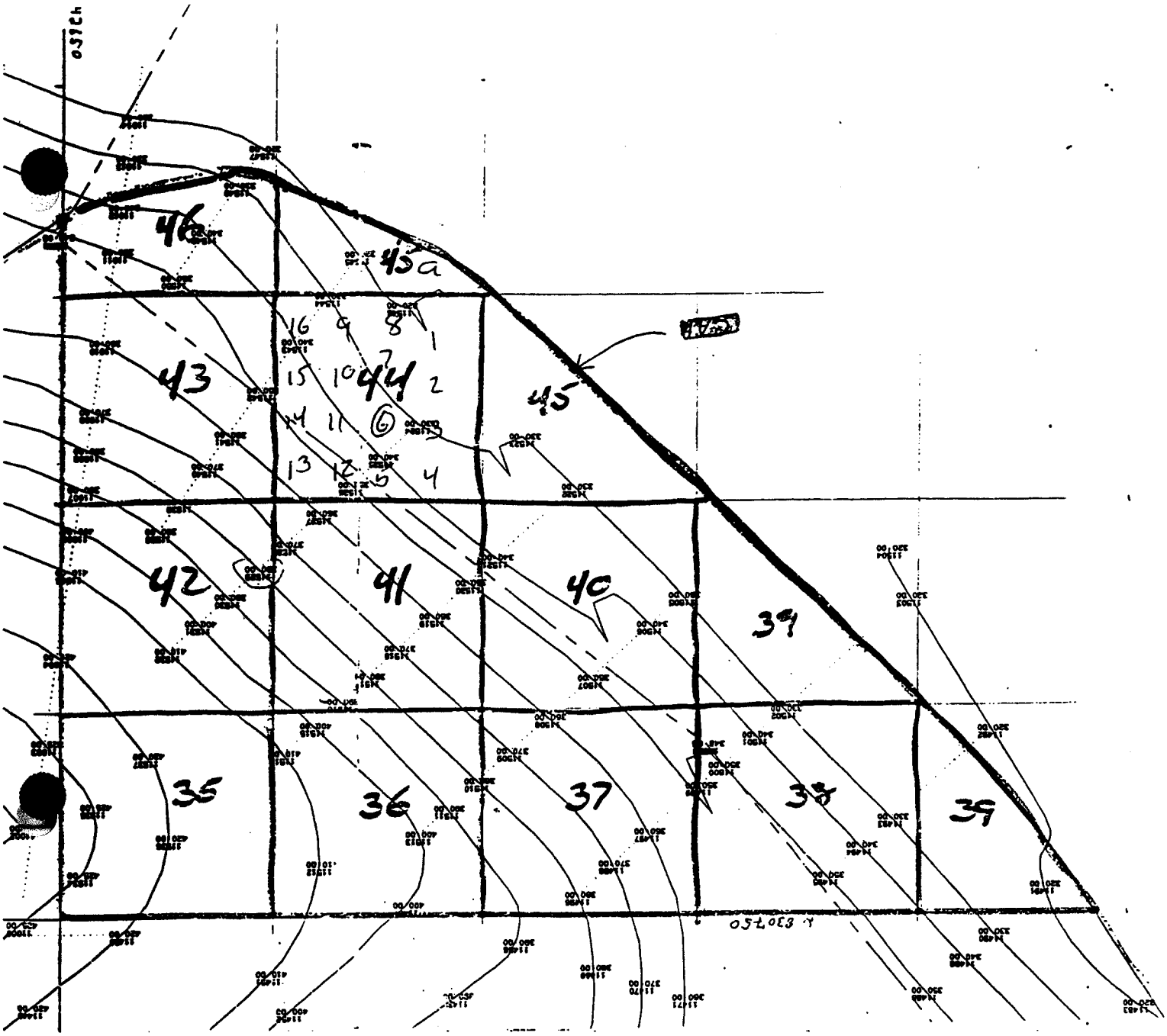
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/11/98

Test location Plan

Acre 44 / Lift 3

⑥ = Perm location

Report: 154

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/21/98
Report No.: P-225

Project No.: VNC-98-029
Sample No.: DL-282
Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	7.5E-009	cm/sec
% Moisture	21.8	%
Dry Density	104.0	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/11/98
Location: Acre 44, Lift 3

Specimen Data

Length (in):	3.128
Diameter (in.):	2.855
Area (sq. in.):	6.413
Volume (cu. in.):	20.06
Wet Weight (grams):	667.0
Dry Weight (grams):	547.8
Dry Density (pcf):	104.0

Wet Weight	125.82
Dry Weight	107.28
Tare weight	22.06
% Moisture	21.8

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1463	138.46	1.10	1.00	0.91	1.05	6.57E-009
726	138.46	0.65	0.65	1.00	0.65	8.20E-009
822	138.46	0.70	0.70	1.00	0.70	7.80E-009
1250	138.46	1.05	1.00	0.95	1.03	7.51E-009

x

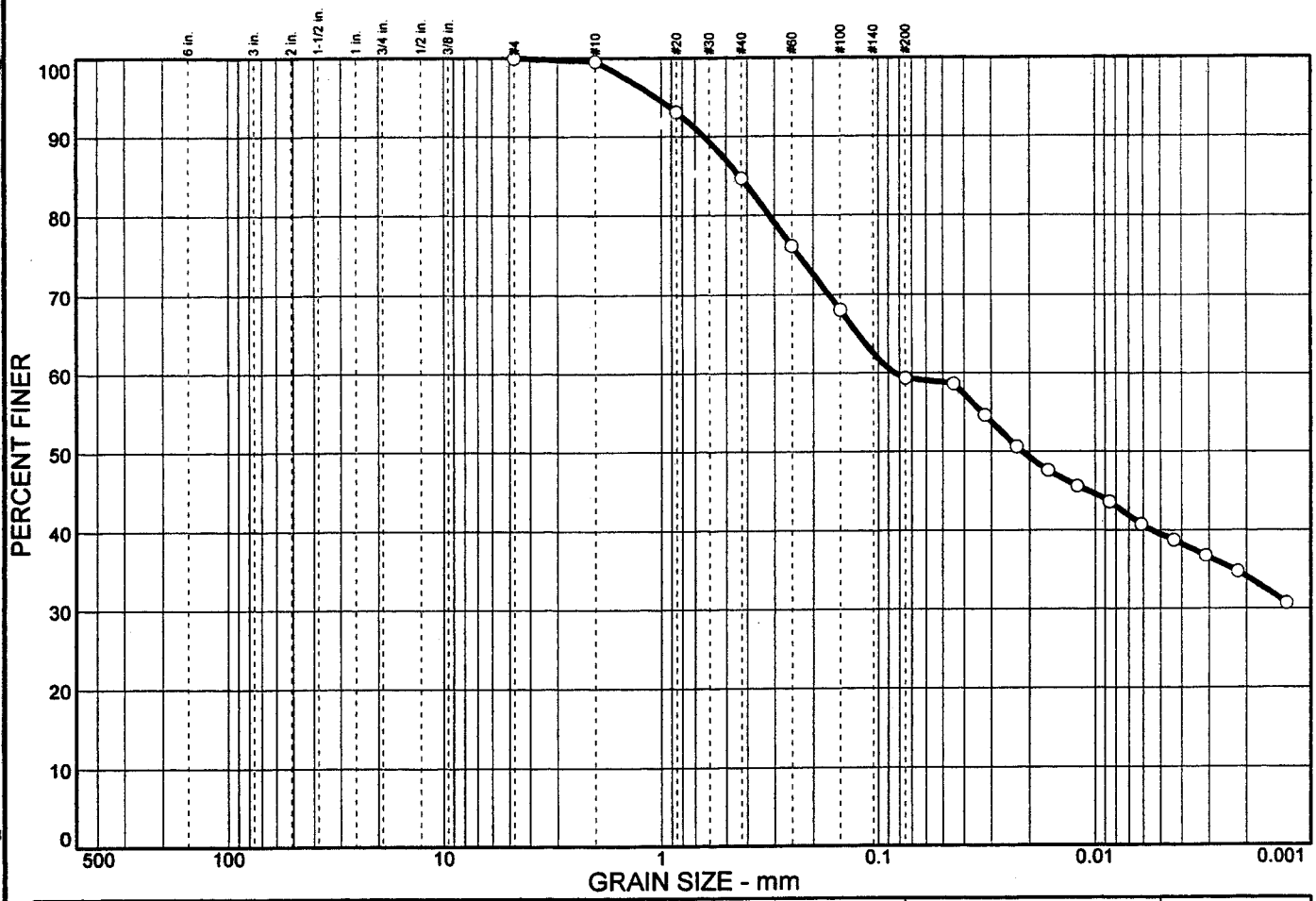
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **7.5E-009** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	40.7	19.9	39.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#20	93.1		
#40	84.7		
#60	76.1		
#100	68.0		
#200	59.3		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 18 LL= 45 PI= 27

Coefficients

D_{85}= 0.434 D_{60}= 0.0843 D_{50}= 0.0216
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-282, Acre 44, Lift 3

Sample No.: DL-282 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 44, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/11/99
Report No.: 146

Acre 45 Lift 3

Clay Source: On-site Borrow Pit

ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture

Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	104.1	21.9	100+	
2	See Test Location Plan	101.1	22.2	98.2	
3	See Test Location Plan	100.6	22.0	97.7	
4	See Test Location Plan	101.3	21.3	98.4	
5	See Test Location Plan	101.7	21.9	98.7	
6	See Test Location Plan	102.0	22.7	99.0	Perm/Sample (DL-274)
7	See Test Location Plan	100.9	20.7	98.0	
8	See Test Location Plan	103.0	20.5	100.0	
9	See Test Location Plan	99.6	22.6	96.7	
10	See Test Location Plan	101.2	21.2	98.3	

Density (ASTM D2922) Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 3.9x10(-9)

Dry Density (pcf) 104.4

Moisture Content (%) 21.2

Atterberg Limits (ASTM D4318)

PL 15
LL 48
PI 33

USCS Classification CL

Grain-size Analysis (ASTM D422)

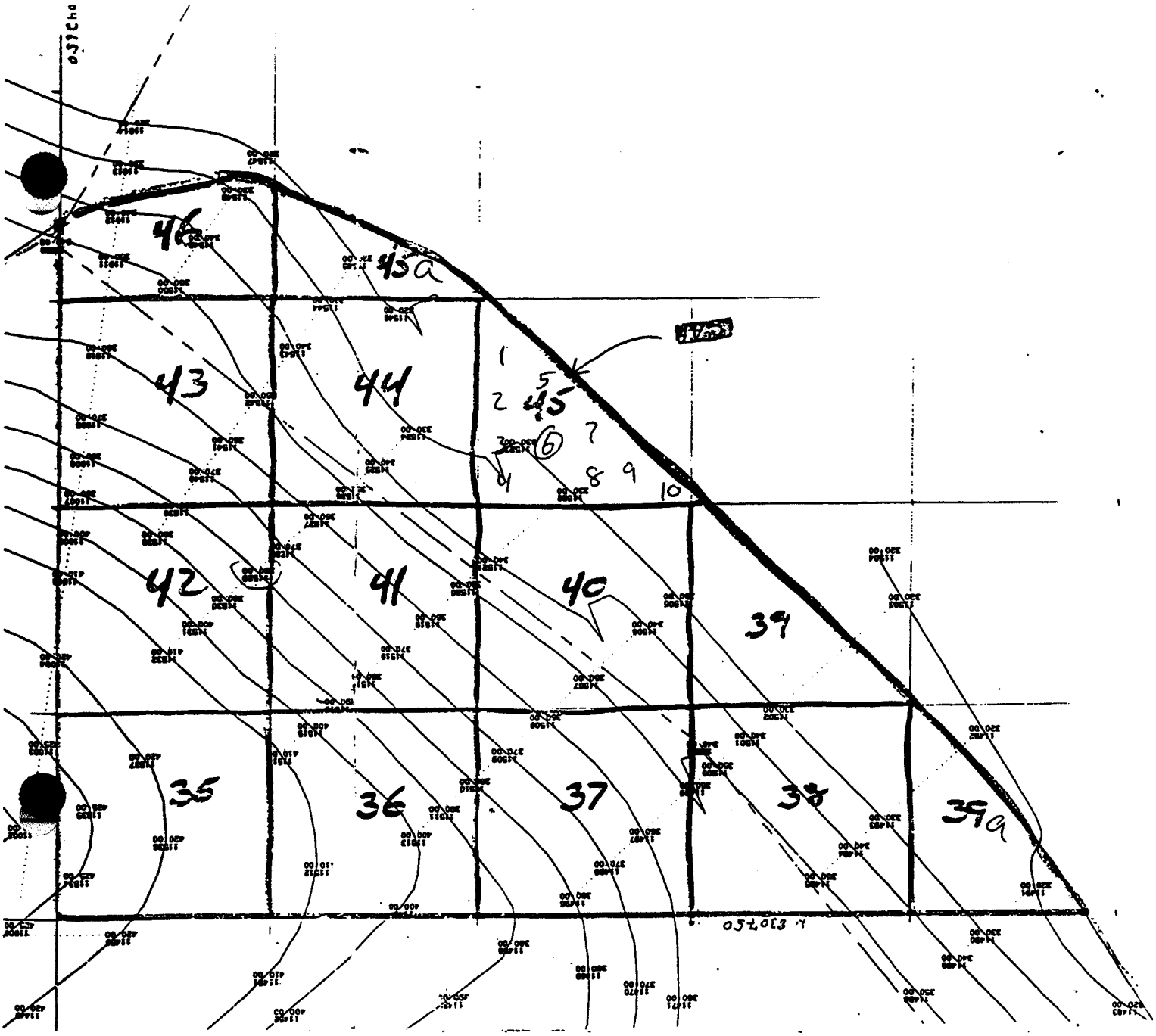
%Gravel 0.0
%Sand 36.5
%Silt 22.3
%Clay 41.2

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/8/98

Test location Plan
Acre 45 / Lift 3
⑥ = perm location

Report: 146

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 01/01/98
Report No.: P-239

Project No.: VNC-98-029
Sample No.: DL-274

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.9E-009	cm/sec
% Moisture	21.2	%
Dry Density	104.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 12/08/98
Location: Acre 45, Lift 3

Specimen Data

Length (in):	2.969
Diameter (in.):	2.807
Area (sq. in.):	6.199
Volume (cu. in.):	18.40
Wet Weight (grams):	611.5
Dry Weight (grams):	504.5
Dry Density (pcf):	104.4

Wet Weight	276.34
Dry Weight	234.54
Tare weight	37.40
% Moisture	21.2

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
3880	88.62	1.25	1.00	0.80	1.13	4.07E-009
1620	88.62	0.45	0.40	0.89	0.43	3.69E-009
1500	88.62	0.45	0.40	0.89	0.43	3.98E-009
1200	88.62	0.35	0.30	0.86	0.33	3.81E-009

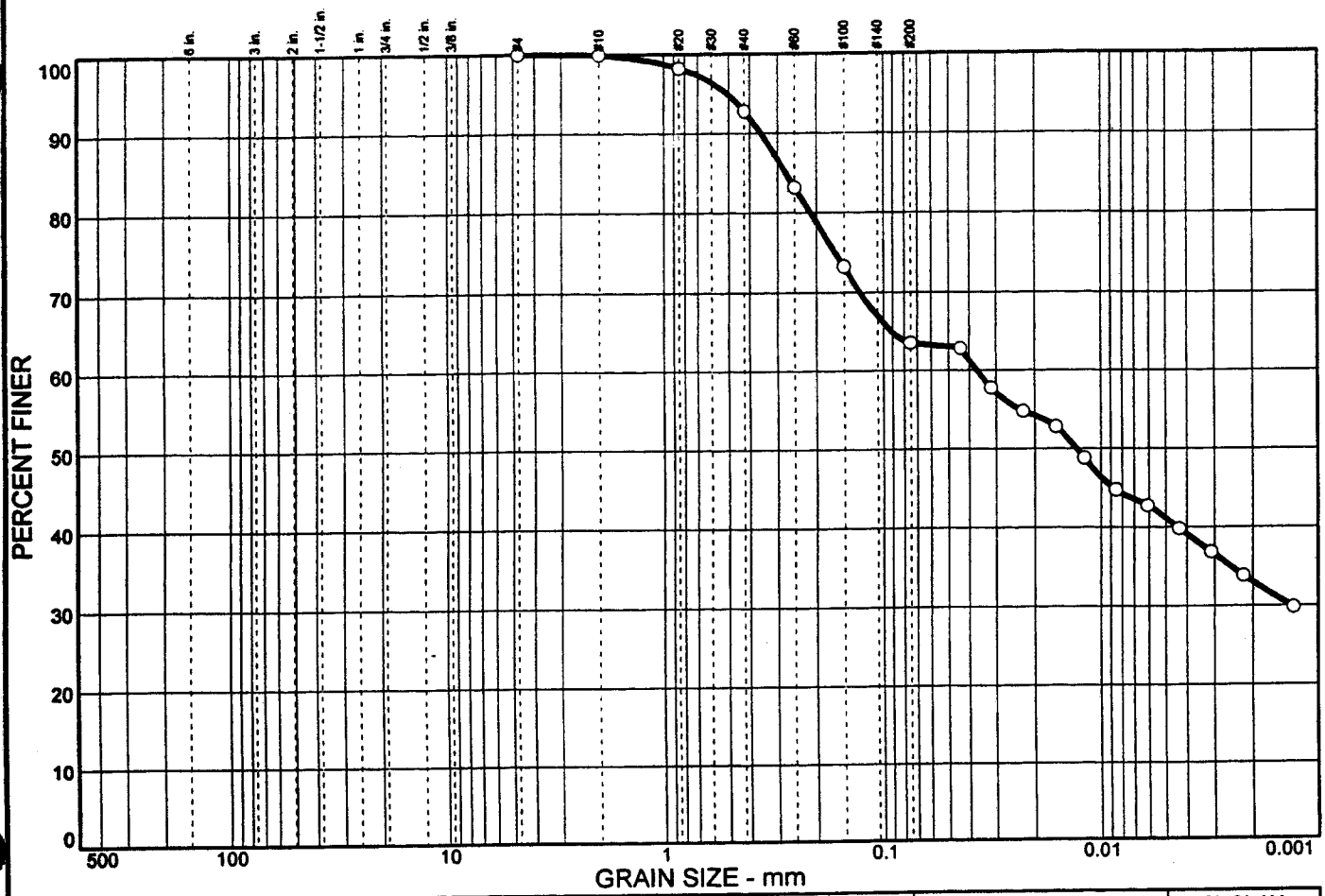
x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **3.9E-009** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	36.5	22.3	41.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	98.2		
#40	92.8		
#60	83.2		
#100	73.2		
#200	63.5		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 15 LL= 48 PI= 33

Coefficients

D_{85}= 0.274 D_{60}= 0.0369 D_{50}= 0.0129
D_{30}= 0.0013 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-274, Acre 45, Lift 3

Sample No.: DL-274 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 45, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 01/20/99 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
On-Site Borrow Pit Acre 45a, Lift 3

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	01/20/99	Clay.157	Clay Cover Testing Report Acre 45a, Lift 3

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 01/20/99
Report No.: 157

Acre 45a Lift 3
Clay Source: On-site Borrow Pit
ASTM D698 : 103.0 Max. Dry Density @ 19.3 Optimum Moisture
Required Compaction: 95% @ +19.3% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	100.0	22.4	97.1	
2	See Test Location Plan	102.7	21.7	99.7	Perm/Sample (DL-285)
3	See Test Location Plan	100.8	22.1	97.8	
4	See Test Location Plan	99.6	22.6	96.7	
5	See Test Location Plan	102.0	21.0	99.0	
6	See Test Location Plan	101.6	21.3	98.6	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec) 5.5x10(-9)

Dry Density (pcf) 100.3

Moisture Content (%) 23.9

Atterberg Limits (ASTM D4318)

PL 18
LL 43
PI 25

USCS Classification CL

Grain-size Analysis (ASTM D422)

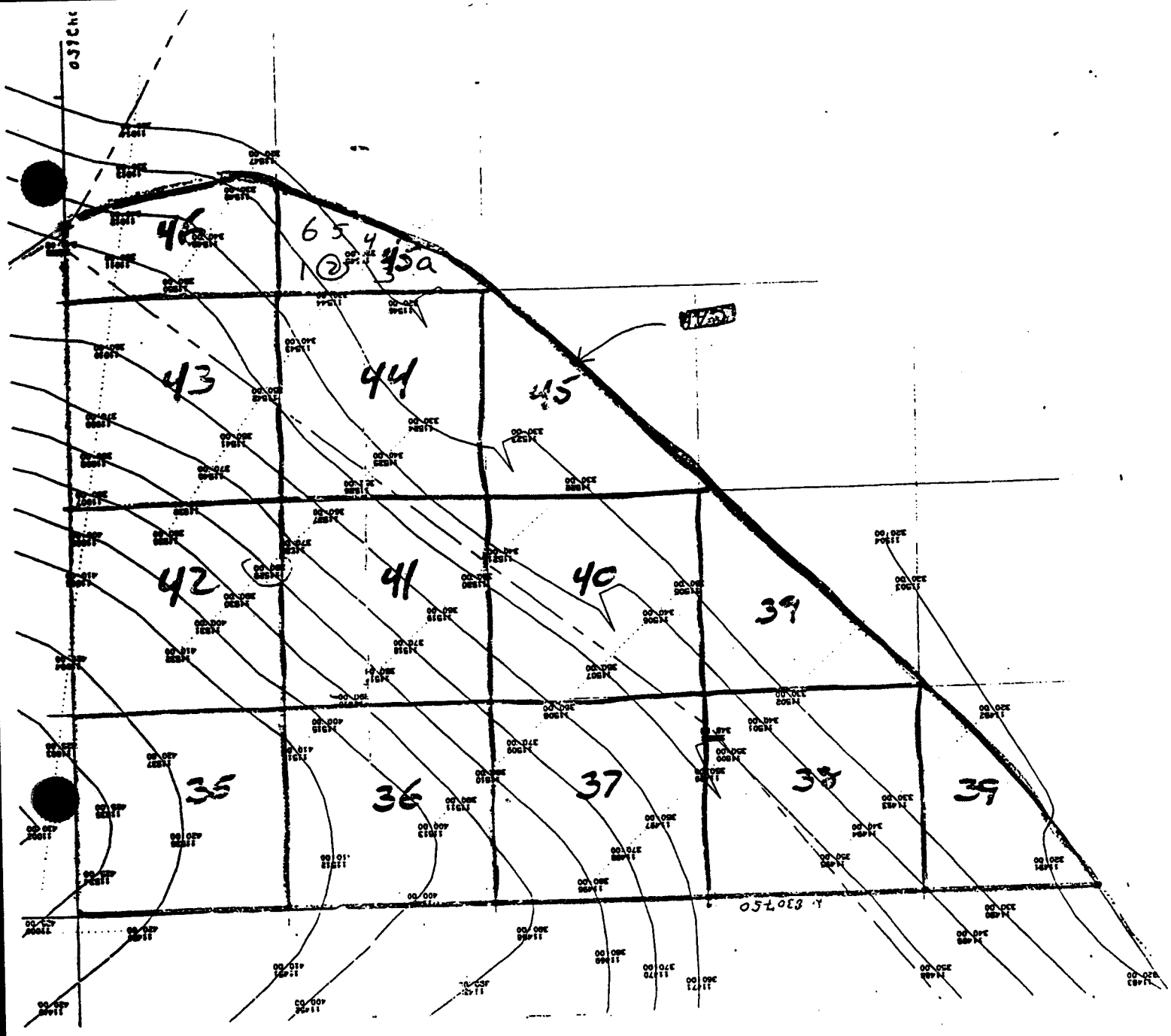
%Gravel 0.0
%Sand 28.5
%Silt 26.8
%Clay 44.7

Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/11/98

Test location Plan

Acre 45a / Lift 3

② = Perm location

Report: 157

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 01/01/98
Report No.: P-240

Project No.: VNC-98-029
Sample No.: DL-285

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.5E-009	cm/sec
% Moisture	23.9	%
Dry Density	100.3	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 12/11/98
Location: Acre 45a, Lift 3

Specimen Data

Length (in):	3.165
Diameter (in.):	2.860
Area (sq. in.):	6.435
Volume (cu. in.):	20.37
Wet Weight (grams):	664.1
Dry Weight (grams):	536.0
Dry Density (pcf):	100.3

Wet Weight	144.67
Dry Weight	121.03
Tare weight	22.11
% Moisture	23.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1448	135.69	0.85	0.95	1.12	0.90	5.86E-009
1439	135.69	0.85	0.80	0.94	0.83	5.40E-009
1981	135.69	1.15	1.10	0.96	1.13	5.35E-009
1613	135.69	0.95	0.85	0.89	0.90	5.26E-009

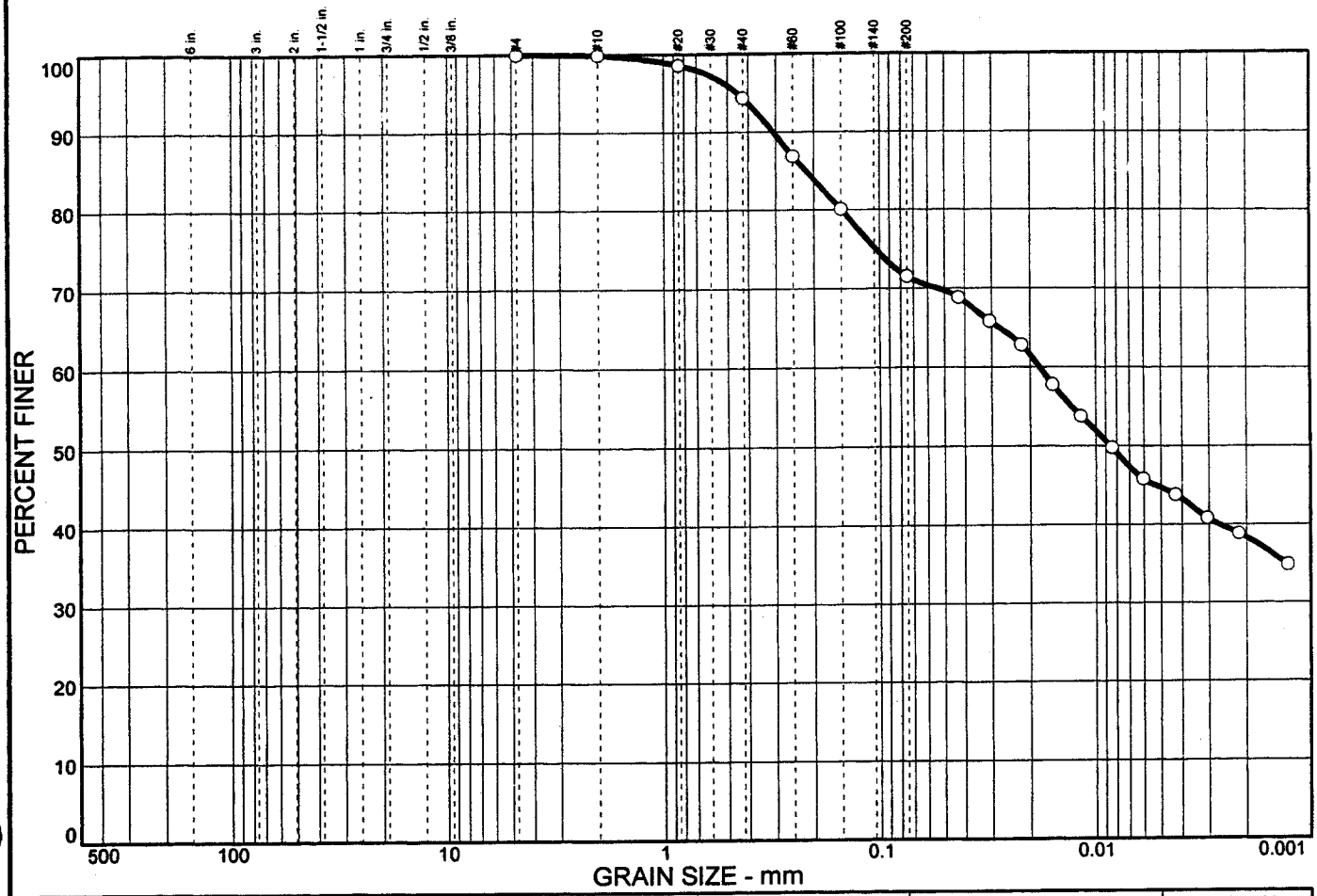
x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **5.5E-009** cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	28.5	26.8	44.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	98.6		
#40	94.4		
#60	86.9		
#100	80.1		
#200	71.5		

* (no specification provided)

Soil Description

On-site Borrow - Lean clay with sand

Atterberg Limits

PL= 18 LL= 43 PI= 25

Coefficients

D_{85}= 0.218 D_{60}= 0.0181 D_{50}= 0.0085
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-285, Acre 45A, Lift 3

Sample No.: DL-285 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 45A, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

VAN DER HORST

CLAY COVER TESTING

Project: Durham County Landfill Closure
Client: Gilbert Southern Inc.

Project No.: VNC-98-029
Date: 12/10/98
Report No.: 107

Acre 46 Lift 3

Clay Source: Roberts Borrow Pit

ASTM D698 : 100.5 Max. Dry Density @ 21.0 Optimum Moisture

Required Compaction: 95% @ +21.0% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	95.8	26.9	95.3	
2	See Test Location Plan	95.6	24.3	95.1	
3	See Test Location Plan	99.3	24.2	98.8	
4	See Test Location Plan	98.2	23.3	97.7	
5	See Test Location Plan	95.7	27.9	95.2	
6	See Test Location Plan	98.7	23.4	98.2	
7	See Test Location Plan	98.8	23.8	98.3	
8	See Test Location Plan	97.2	25.7	96.7	Tube/Sample (DL-232)
9	See Test Location Plan	100.4	21.6	99.9	
10	See Test Location Plan	99.6	21.9	99.1	
11	See Test Location Plan	98.2	22.4	97.7	
12	See Test Location Plan	98.7	22.6	98.2	
13	See Test Location Plan	96.4	23.0	95.9	
14	See Test Location Plan	95.8	24.9	95.3	
15	See Test Location Plan	96.9	23.9	96.4	
16	See Test Location Plan	97.7	23.4	97.2	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)

Permeability (cm/sec)	2.1x10(-8)
Dry Density (pcf)	99.7
Moisture Content (%)	21.0

Atterberg Limits (ASTM D4318)

PL	23
LL	51
PI	28
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.1
%Sand	47.4
%Silt	13.2
%Clay	39.3

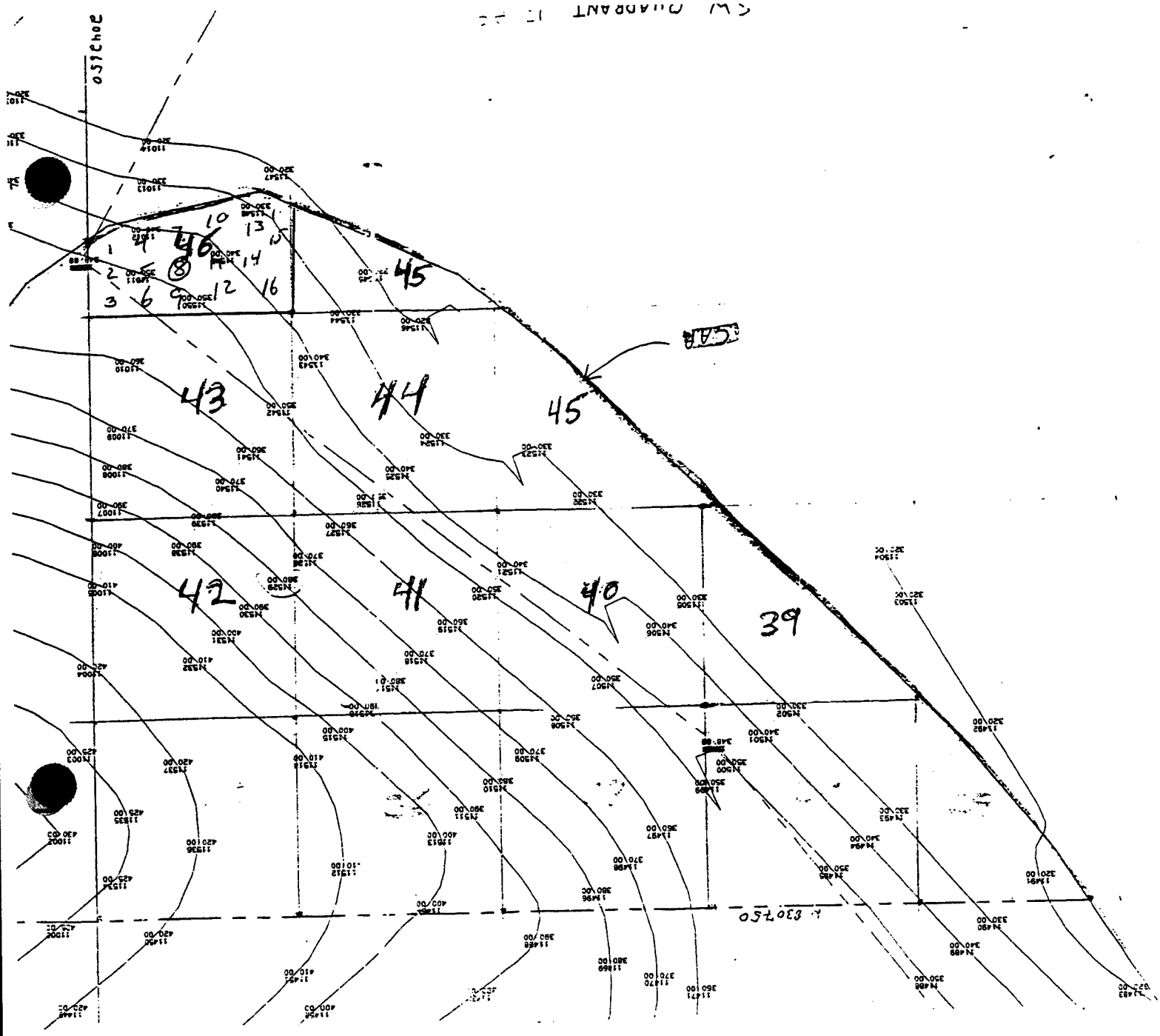
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



12/1/88

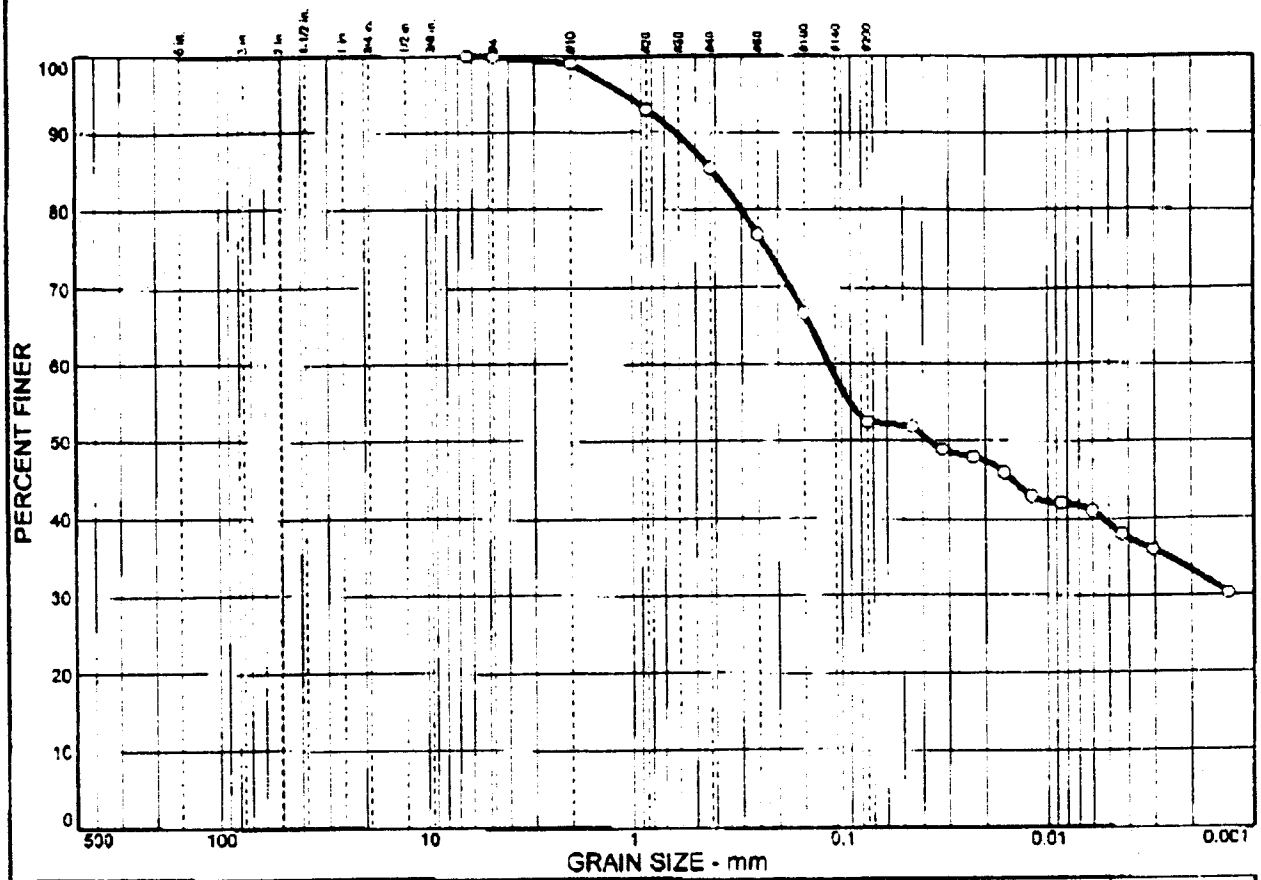
Test location Plan

Acre 46 / Lift 3

⑧ = Perm location

Report: 107

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	47.4	13.2	39.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.1		
#20	92.9		
#40	85.3		
#60	76.7		
#100	66.6		
#200	52.5		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 23 LL= 51 PI= 28

Coefficients

D_{85}= 0.416 D_{60}= 0.115 D_{50}= 0.0374
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-232, Acre 46, Lift 3

Sample No.: DL-232 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 46, Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/14/98
Report No.: P-207

Project No.: VNC-98-029
Sample No.: DL-232

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.1E-008	cm/sec
% Moisture	21.0	%
Dry Density	99.7	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/01/98
Location: Acre 46, Lift 3

Specimen Data

Length (in):	3.311
Diameter (in.):	2.820
Area (sq. in.):	6.257
Volume (cu. in.):	20.72
Wet Weight (grams):	656.4
Dry Weight (grams):	542.3
Dry Density (pcf):	99.7

Wet Weight	249.63
Dry Weight	212.79
Tare weight	37.65
% Moisture	21.0

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
960	99.69	1.60	1.35	0.84	1.48	2.12E-008
525	99.69	0.85	0.75	0.88	0.80	2.10E-008
905	99.69	1.45	1.25	0.86	1.35	2.06E-008
390	99.69	0.60	0.60	1.00	0.60	2.12E-008

x

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.1E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

10

VAN DER HORST

GEOTECHNICAL ENGINEERING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

December 21, 1998

Andy Palabnuk
Gilbert Southern Corp.
Durham County Landfill
3301 Glenn Road
Durham, NC 27704

Re: Construction Conformance Testing
Vegetative Support cover
VNC-98-029.026

Dear Andy:

Attached please find In-place Density Reports for the Vegetative Cover in the SE quadrant of the landfill (D-028) and the "veneer" area (D-029). Also Attached please find laboratory test data for 2 samples (DL-209 and DL-210). Grain-size (ASTM D422) and standard proctor (ASTM D698) were performed on each sample for compliance with project specifications. The material was delivered from the on-site borrow source and sampled in-place.

Should you have any questions or need further assistance please do not hesitate to contact our office.

Respectfully submitted
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

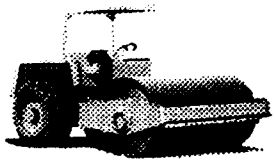
Robert L. Mashewske, P.E.
Regional Manager / Senior Engineer

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

535 Summit Point Drive
Henrietta, NY 14467
716/359-2730
Fax 716/359-9668

3101 Stonybrook Drive, Suite 156
Raleigh, NC 27604
919/876-0405
Fax 919/876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT: Durham Co. Landfill **PROJECT NO:** Vnc-98-029

CLIENT: Gilbert Southern **DATE:** 11/22/98 pg. 1 of 4

CONTRACTOR: Gilbert Southern **REPORT NO:** D-28

GENERAL LOCATION: SE Quadrant

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
1	Acre 1 See attached sketch	F.V.S	123.4	11.6	100+	DL-210
2	Acre 1 See attached sketch	F.V.S	118.8	9.5	98.1	DL-210
3	Acre 2 See attached sketch	F.V.S	109.0 OK	12.3	90.0	DL-210
4	Acre 2 See attached sketch	F.V.S	116.0	11.2	95.8	DL-210
5	Acre 2 See attached sketch	F.V.S	114.6 OK	9.7	94.6	DL-210
6	Acre 2 See attached sketch	F.V.S	115.3	8.4	95.2	DL-210
7	Acre 1 See attached sketch	F.V.S	132.1	8.1	100+	DL-210
8	Acre 1 See attached sketch	F.V.S	117.3	8.8	96.9	DL-210
9	Acre 4 See attached sketch	F.V.S	122.2	9.1	100+	DL-210
10	Acre 4 See attached sketch	F.V.S	113.3	10.5	93.4	DL-210
11	Acre 5 See attached sketch	F.V.S	110.4 OK	9.7	91.2	DL-210
12	Acre 5 See attached sketch	F.V.S	117.2	10.7	96.8	DL-210

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-210	121.1	10.9	On-site Borrow

REMARKS: F.V.S - Finished Vegetative Support Soil.

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

ARRIVED ON SITE: _____

LEFT SITE: _____

HOURS ON SITE: _____

TRAVEL TIME: _____

MILEAGE: _____

PERFORMED BY: Mark Potratz

PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST

IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	**PROJECT NO:**	Vnc-98-029
CLIENT:	Gilbert Southern	**DATE:**	11/22/98 pg. 2 of 4
CONTRACTOR:	Gilbert Southern	**REPORT NO:**	D-28

GENERAL LOCATION: SE Quadrant

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
13	Acre 5 See attached sketch	F.V.S	117.2	10.7	96.8	DL-210
14	Acre 4 See attached sketch	F.V.S	109.7	9.2	90.6	DL-210
15	Acre 4 See attached sketch	F.V.S	120.9	9.4	99.8	DL-210
16	Acre 7 See attached sketch	F.V.S	113.5	9.5	99.8 93.7	DL-210
17	Acre 7 See attached sketch	F.V.S	111.3	8.8	91.9	DL-210
18	Acre 7 See attached sketch	F.V.S	118.4	8.3	97.8	DL-210
19	Acre 7 See attached sketch	F.V.S	109.1	14.9	90.0	DL-210
20	Acre 7 See attached sketch	F.V.S	115.6	8.4	95.5	DL-210
21	Acre 8 See attached sketch	F.V.S	115.9	10.6	95.7	DL-210
22	Acre 8 See attached sketch	F.V.S	115.0	10.5	95.0	DL-210
23	Acre 8 See attached sketch	F.V.S	118.0	11.3	97.4	DL-210
24	Acre 8 See attached sketch	F.V.S	113.2	9.7	93.5	DL-210

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-210	121.1	10.9	On-site Borrow

REMARKS: F.V.S - Finished Vegetative Support Soil.

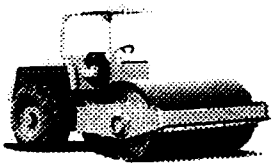
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

ARRIVED ON SITE: _____
LEFT SITE: _____
HOURS ON SITE: _____
TRAVEL TIME: _____
MILEAGE: _____

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC•3101-156 Stonybrook Drive, Raleigh, NC 27604•(919) 876-0405•Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT: Durham Co. Landfill **PROJECT NO:** Vnc-98-029

CLIENT: Gilbert Southern **DATE:** 11/22/98 pg. 3 of 4

CONTRACTOR: Gilbert Southern **REPORT NO:** D-28

GENERAL LOCATION: SE Quadrant

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
25	Acre 9 See attached sketch	F.V.S	118.0	11.3	97.4	DL-210
26	Acre 9 See attached sketch	F.V.S	113.2	9.7	93.5	DL-210
27	Acre 9 See attached sketch	F.V.S	120.6	11.2	99.6	DL-210
28	Acre 9 See attached sketch	F.V.S	109.7	15.4	90.6	DL-210
29	Acre 6 See attached sketch	F.V.S	116.1	11.7	99.6 95.8	DL-210
30	Acre 6 See attached sketch	F.V.S	111.6	12.04	92.2	DL-210
31	Acre 6 See attached sketch	F.V.S	109.5	15.9	90.4	DL-210
32	Acre 6 See attached sketch	F.V.S	111.7	12.7	92.2	DL-210
33	Acre 3 See attached sketch	F.V.S	113.9	7.2	94.1	DL-210
34	Acre 3 See attached sketch	F.V.S	113.6	11.3	93.8	DL-210
35	Acre 3 See attached sketch	F.V.S	109.1	12.6	90.0	DL-210
36	Acre 3 See attached sketch	F.V.S	114.2	13.2	94.3	DL-210

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-210	121.1	10.9	On-site Borrow

REMARKS: F.V.S - Finished Vegetative Support Soil.

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

ARRIVED ON SITE: _____

LEFT SITE: _____

HOURS ON SITE: _____

TRAVEL TIME: _____

MILEAGE: _____

PERFORMED BY: Mark Potratz

PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC@3101-156 Stonybrook Drive, Raleigh, NC 27604@(919) 876-0405@Fax (919) 876-0460

VAN DER HORST

IN-PLACE DENSITY TEST RESULTS

PROJECT: Durham Co. Landfill
PROJECT NO: Vnc-98-029
CLIENT: Gilbert Southern
DATE: 11/22/98 pg. 4 of 4
CONTRACTOR: Gilbert Southern
REPORT NO: D-28

GENERAL LOCATION: SE Quadrant

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
37	Acre 10 See attached sketch	F.V.S	109.1	12.6	90.0	DL-210
38	Acre 10 See attached sketch	F.V.S	114.2	13.2	94.3	DL-210
39	Acre 10 See attached sketch	F.V.S	109.2	11.5	90.~~1~~ 2	DL-210
40	Acre 10 See attached sketch	F.V.S	112.9	10.4	93.2	DL-210

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-210	121.1	10.9	On-site Borrow

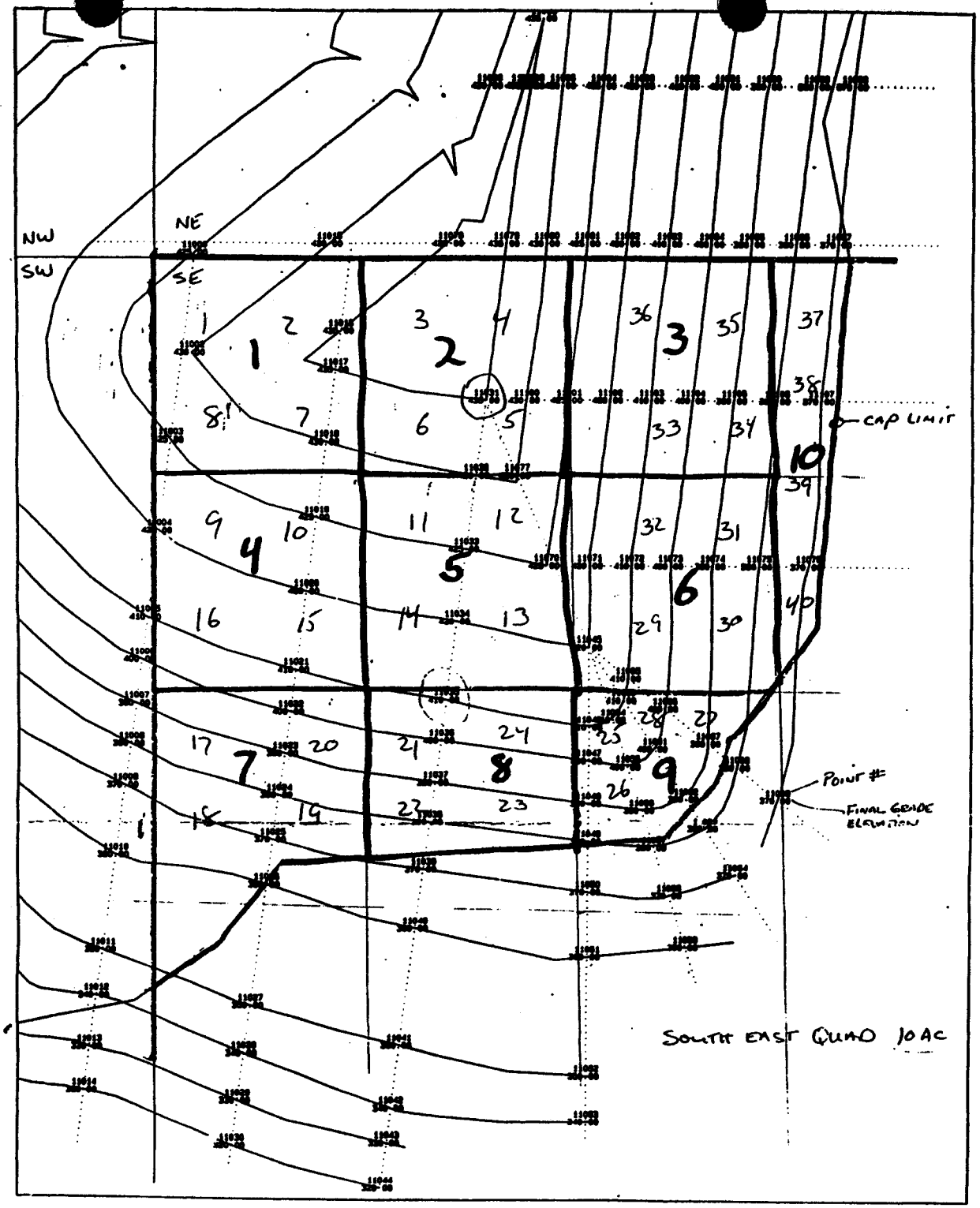
REMARKS: F.V.S - Finished Vegetative Support Soil.

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

ARRIVED ON SITE: _____
LEFT SITE: _____
HOURS ON SITE: _____
TRAVEL TIME: _____
MILEAGE: _____

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC@3101-156 Stonybrook Drive, Raleigh, NC 27604@(919) 876-0405@Fax (919) 876-0460



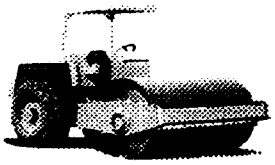
11/22/98

Test location Plan

Vegatative Support Soil

Report: D-28

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT: Durham Co. Landfill **PROJECT NO:** Vnc-98-029

CLIENT: Gilbert Southern **DATE:** 12/03/98 pg. 1 of 2

CONTRACTOR: Gilbert Southern **REPORT NO:** D-29

GENERAL LOCATION: Veneer

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
1	Test Location Plan	F.V.S	122.4	9.4	100+	DL-210
2	Test Location Plan	F.V.S	117.8	10.2	97.3	DL-210
3	Test Location Plan	F.V.S	116.9	7.9	96.5	DL-210
4	Test Location Plan	F.V.S	110.6	7.9	96.5 91.3	DL-210
5	Test Location Plan	F.V.S	118.8	7.4	91.3 98.1	DL-210
6	Test Location Plan	F.V.S	109.4	8.8	90.3	DL-210
7	Test Location Plan	F.V.S	109.6	8.9	90.5	DL-210
8	Test Location Plan	F.V.S	110.9	9.5	91.6	DL-210
9	Test Location Plan	F.V.S	110.4	13.0	91.2	DL-210
10	Test Location Plan	F.V.S	110.6	11.9	91.3	DL-210
11	Test Location Plan	F.V.S	116.0	9.1	95.8	DL-210
12	Test Location Plan	F.V.S	117.3	8.3	96.9	DL-210

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-210	121.1	10.9	On-site Borrow

REMARKS: F.V.S. - Finished vegetative support soil

ARRIVED ON SITE: _____

LEFT SITE: _____

HOURS ON SITE: _____

TRAVEL TIME: _____

MILEAGE: _____

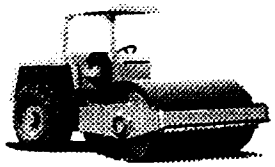
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

PERFORMED BY: Mark Potratz

PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT: Durham Co. Landfill **PROJECT NO:** Vnc-98-029

CLIENT: Gilbert Southern **DATE:** 12/03/98 pg. 2 of 2

CONTRACTOR: Gilbert Southern **REPORT NO:** D-29

GENERAL LOCATION: Veneer

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
13	Test Location Plan	F.V.S	113.2	9.0	93.5	DL-210
14	Test Location Plan	F.V.S	116.9	9.1	96.5	DL-210
15	Test Location Plan	F.V.S	120.7	8.6	99.7	DL-210
16	Test Location Plan	F.V.S.	109.1	12.3	~~90.0~~ 91.0	DL-210
17	Test Location Plan	F.V.S	109.8	10.0	90.7	DL-210
18	Test Location Plan	F.V.S	115.8	10.8	95.6	DL-210
19	Test Location Plan	F.V.S	114.1	14.5	94.5	DL-210
20	Test Location Plan	F.V.S	119.6	9.1	98.8	DL-210

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-210	121.1	10.9	On-site Borrow

REMARKS: F.V.S. - Finished vegetative support soil

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

ARRIVED ON SITE: _____

LEFT SITE: _____

HOURS ON SITE: _____

TRAVEL TIME: _____

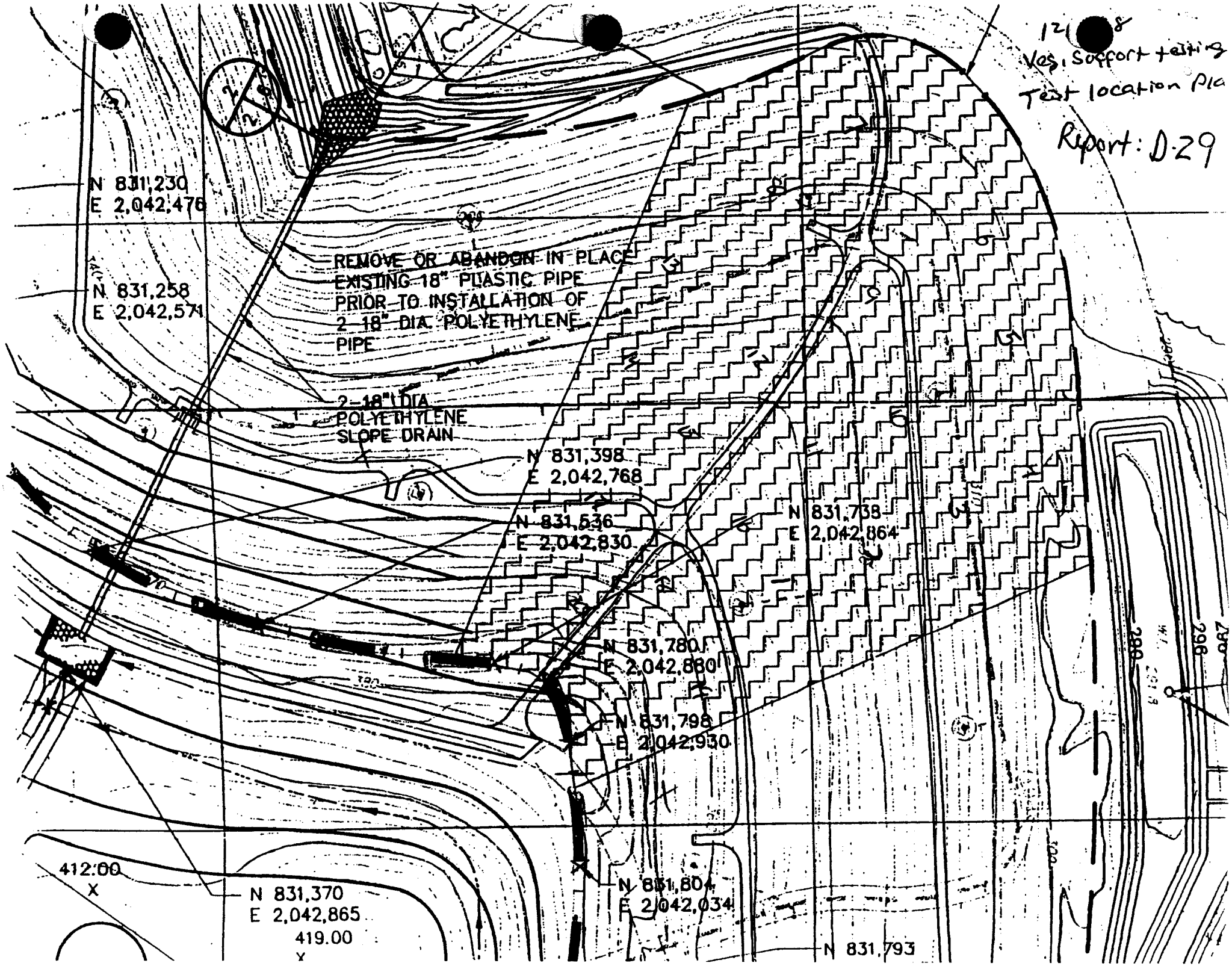
MILEAGE: _____

PERFORMED BY: Mark Potratz

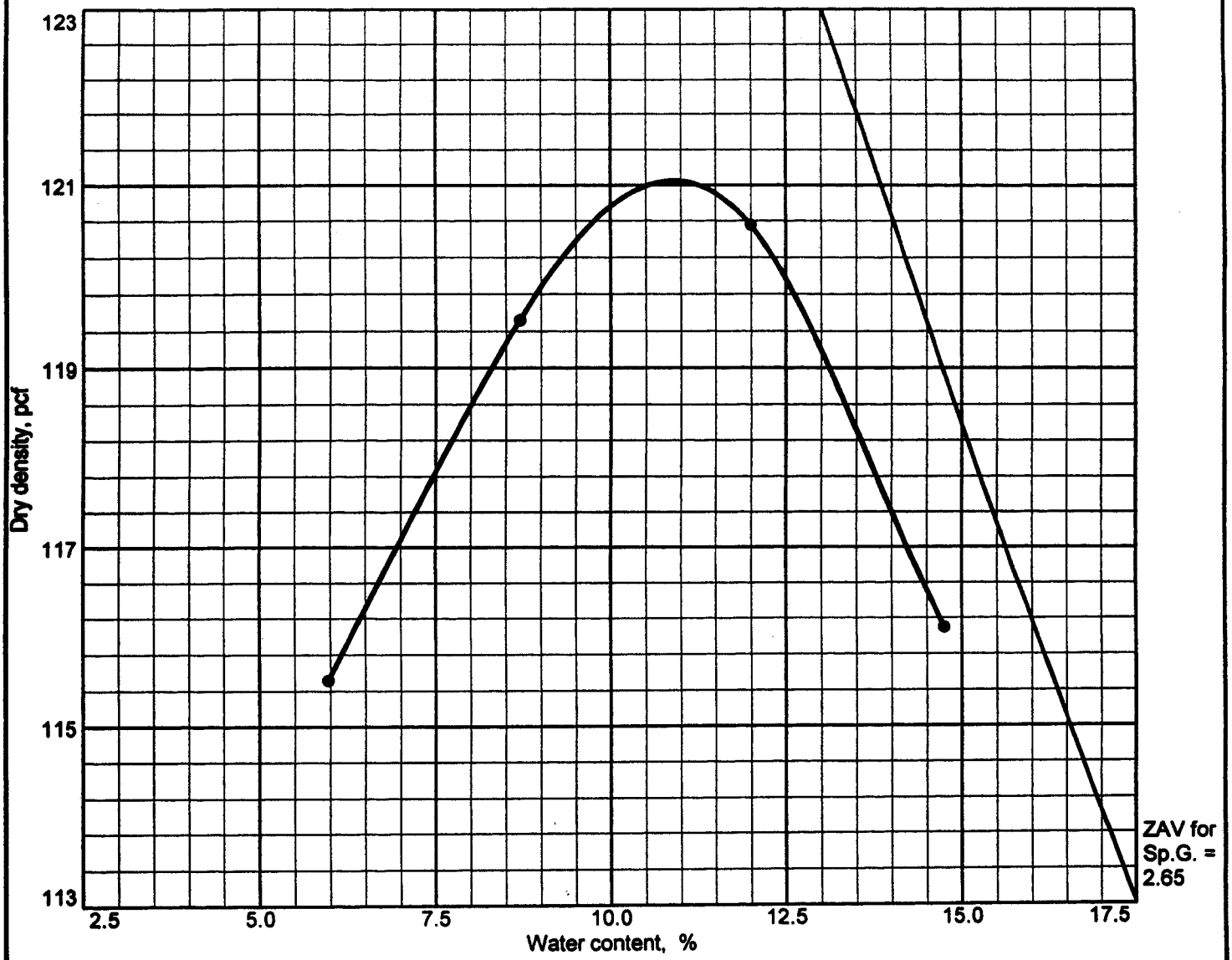
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC•3101-156 Stonybrook Drive, Raleigh, NC 27604•(919) 876-0405•Fax (919) 876-0460

121 8
Ves, Support testing
Test location Pla
Report: D-29



COMPACTION TEST REPORT



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
							4.8	48.6

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 121.1 pcf Optimum moisture = 10.9 %	On-site Borrow - silty sand, trace clay

Project No. VNC-98-029 **Client:** Gilbert Southern
Project: Durham County Landfill Closure

● **Location:** Vegatative Cover - SE quadrant

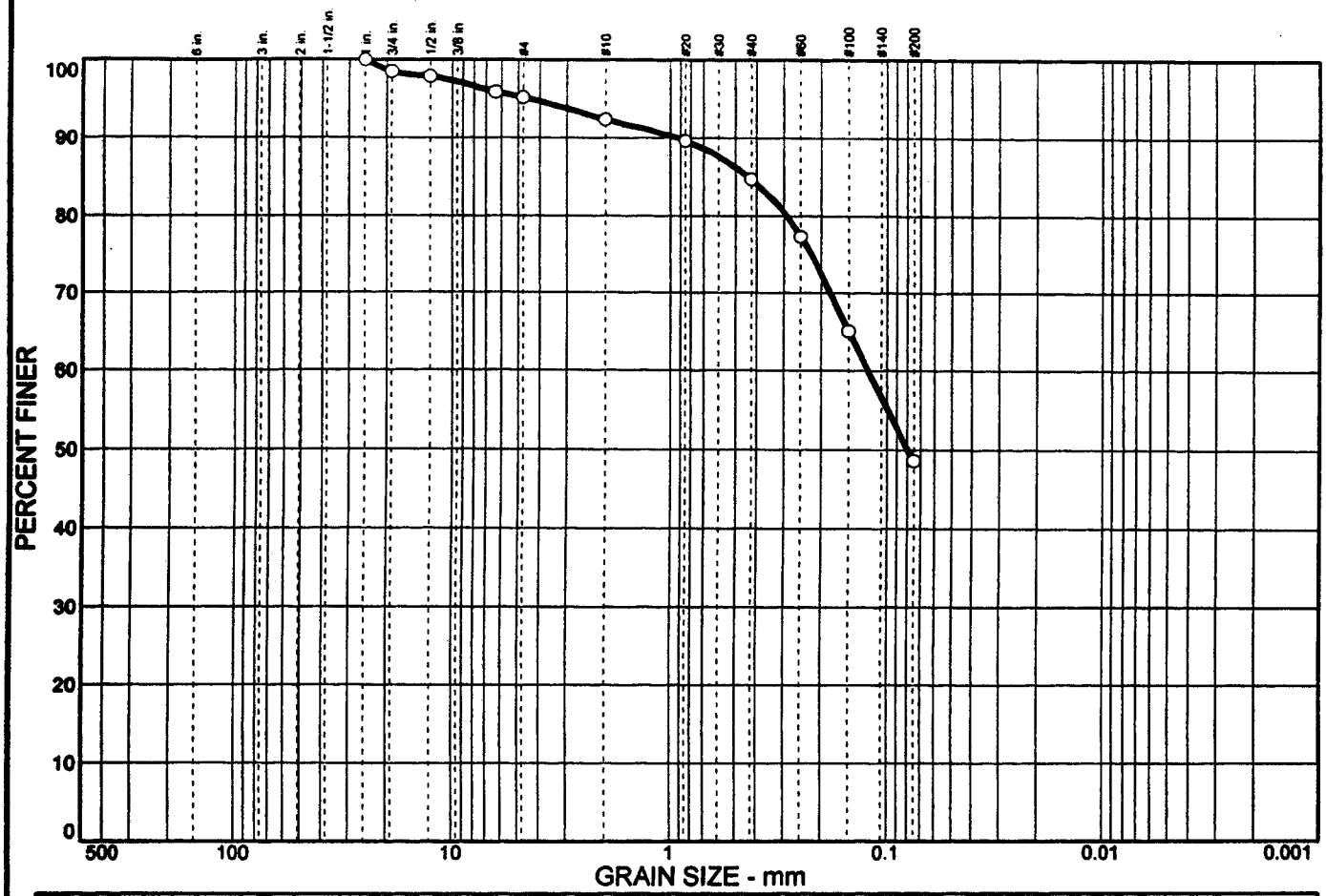
Remarks:
DL-210, Vegatative Cover - SE Quadrant

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Figure #

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.8	46.6	48.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	98.5		
.5 in.	97.9		
.25 in.	95.9		
#4	95.2		
#10	92.4		
#20	89.6		
#40	84.8		
#60	77.3		
#100	65.1		
#200	48.6		

* (no specification provided)

Soil Description

On-site Borrow - silty sand, trace clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.434 D_{60}= 0.122 D_{50}= 0.0797
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

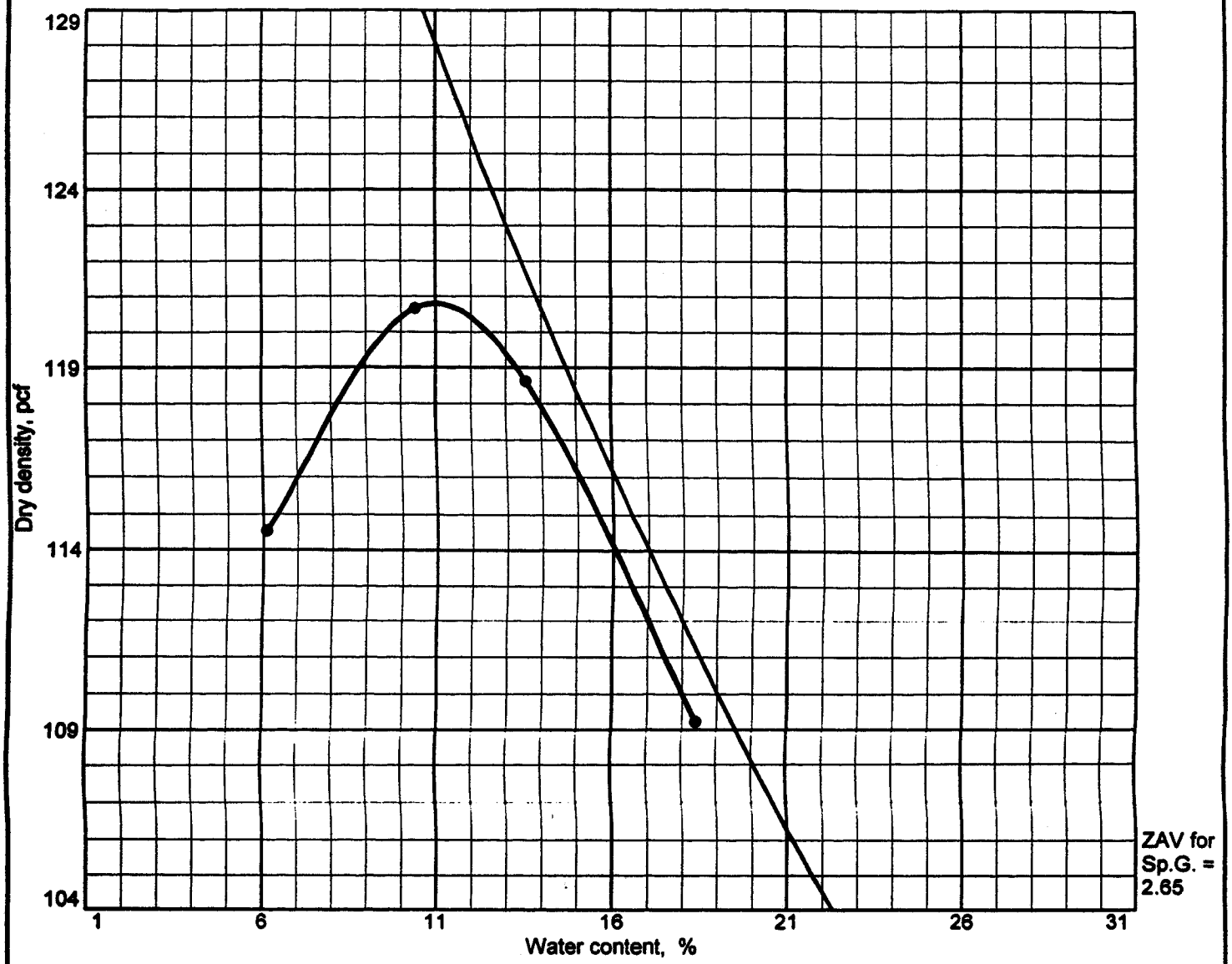
DL-210, Vegatative Cover SE Quadrant

Sample No.: DL-210 **Source of Sample:** Vegatative Cover **Date:**
Location: Vegatative Cover - SE quadrant **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

COMPACTION TEST REPORT



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
							0.6	58.3

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 120.8 pcf Optimum moisture = 11.0 %	On-site Borrow - sandy silt, little clay

Project No. VNC-98-029 **Client:** Gilbert Southern
Project: Durham County Landfill Closure

● **Location:** Vegatative Cover - SE quadrant

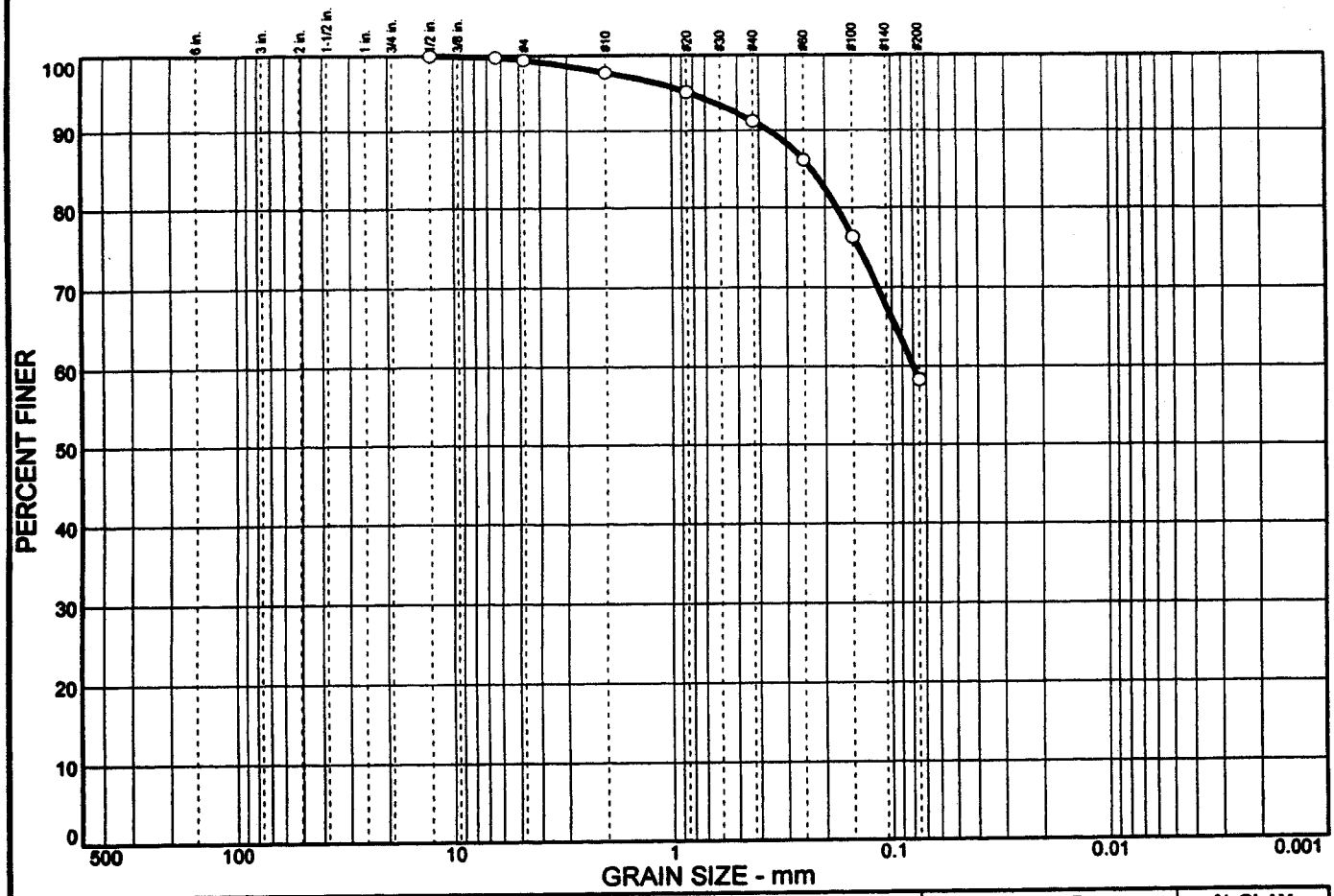
Remarks:
DL-209, Vegatative Cover - SE Quadrant

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Figure #

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.6	41.1	58.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	99.8		
#4	99.4		
#10	97.7		
#20	95.1		
#40	91.2		
#60	86.1		
#100	76.3		
#200	58.3		

* (no specification provided)

Soil Description

On-site Borrow - sandy silt, little clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.232 D_{60}= 0.0798 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

DL-209, Vegatative Cover SE Quadrant

Sample No.: DL-209 **Source of Sample:** Vegatative Cover **Date:**
Location: Vegatative Cover - SE quadrant **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 01/05/99 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	01/05/99	VNC-98-029.028	Construction Conformance Testing - Vegetative Support Cover

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST
GEOTECHNICAL ENGINEERING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

January 5, 1999

Andy Palabnuk
Gilbert Southern Corp.
Durham County Landfill
3301 Glenn Road
Durham, NC 27704

Re: Construction Conformance Testing
Vegetative Support cover
VNC-98-029.028

Dear Andy:

Attached please find In-place Density Reports for the Vegetative Cover on acres 11, 12, 13, 16, 17, 27, 29, 31, 35, 36, and 37. Also Attached please find laboratory test data for 2 samples DL-286 and DL-287. Grain-size (ASTM D422) and standard proctor (ASTM D698) were performed on each sample for compliance with project specifications. The material was delivered from the on-site borrow source and sampled in-place from acres 12 and 36 respectively.

Should you have any questions or need further assistance please do not hesitate to contact our office.

Respectfully submitted
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

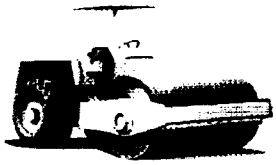
Robert L. Mashewske, P.E.
Regional Manager / Senior Engineer

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

535 Summit Point Drive
Henrietta, NY 14467
716-359-2730
Fax 716-359-9668

3101 Stonybrook Drive, Suite
Raleigh, NC 27604
919-876-0405
Fax 919-876-0[illegible]

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	**PROJECT NO:**	Vnc-98-029
CLIENT:	Gilbert Southern	**DATE:**	12/03/98 pg. 1 of 4
CONTRACTOR:	Gilbert Southern	**REPORT NO:**	D-30

GENERAL LOCATION: Acres 11, 12, 13, 16, 17, 27, 29, 31, 35, 36 & 37

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
1	Acre 11 - Test Location Plan	F.G.V	111.7	17.5	94.7	DL-286
2	Acre 11 - Test Location Plan	F.G.V	112.3	15.9	95.3	DL-286
3	Acre 11 - Test Location Plan	F.G.V	109.2	19.3	92.6	DL-286
4	Acre 11 - Test Location Plan	F.G.V	106.4	18.3	90.2	DL-286
5	Acre 12 - Test Location Plan	F.G.V	108.6	15.1	92.1	DL-286
6	Acre 12 - Test Location Plan	F.G.V	106.8	18.4	90.6	DL-286
7	Acre 12 - Test Location Plan	F.G.V	107.6	19.9	91.~~0~~3	DL-286
8	Acre 12 - Test Location Plan	F.G.V	107.5	16.0	91.~~0~~2	DL-286
9	Acre 13 - Test Location Plan	F.G.V	115.6	14.5	98.0	DL-286
10	Acre 13 - Test Location Plan	F.G.V	115.5	12.6	97.9	DL-286
11	Acre 13 - Test Location Plan	F.G.V	117.2	13.8	99.4	DL-286
12	Acre 13 - Test Location Plan	F.G.V	106.9	16.8	90.6	DL-286

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-286	117.9	12.9	On-site Vegetative Support Soil

REMARKS: F.V.G. - Finished grade vegetative cover

ARRIVED ON SITE: _____

LEFT SITE: _____

HOURS ON SITE: _____

TRAVEL TIME: _____

MILEAGE: _____

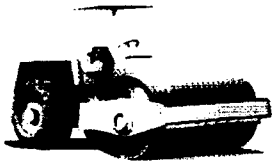
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

PERFORMED BY: Mark Potratz

PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	**PROJECT NO:**	Vnc-98-029
CLIENT:	Gilbert Southern	**DATE:**	12/03/98 pg. 2 of 4
CONTRACTOR:	Gilbert Southern	**REPORT NO:**	D-30

GENERAL LOCATION: Acres 11, 12, 13, 16, 17, 27, 29, 31, 35, 36 & 37

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
13	Acre 15 - Test Location Plan	F.G.V	106.5	15.9	90.3	DL-286
14	Acre 15 - Test Location Plan	F.G.V	108.3	17.0	91.8	DL-286
15	Acre 15 - Test Location Plan	F.G.V	109.4	18.5	92.7	DL-286
16	Acre 15 - Test Location Plan	F.G.V	109.5	15.8	92.8	DL-286
17	Acre 16 - Test Location Plan	F.G.V	108.5	15.8	92.0	DL-286
18	Acre 16 - Test Location Plan	F.G.V	112.2	15.7	95.1 92	DL-286
19	Acre 16 - Test Location Plan	F.G.V	106.6	16.3	90.4	DL-286
20	Acre 16 - Test Location Plan	F.G.V	106.8	19.2	98.6 90.6	DL-286
21	Acre 17 - Test Location Plan	F.G.V	108.6	17.3	92.1	DL-286
22	Acre 17 - Test Location Plan	F.G.V	115.1	13.7	97.6	DL-286
23	Acre 17 - Test Location Plan	F.G.V	119.9	12.3	100+	DL-286
24	Acre 17 - Test Location Plan	F.G.V	114.3	13.6	96.9	DL-286

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-286	117.9	12.9	On-site Vegetative Support Soil

REMARKS: F.V.G. - Finished grade vegetative cover

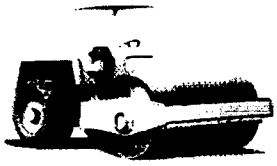
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

ARRIVED ON SITE: _____
LEFT SITE: _____
HOURS ON SITE: _____
TRAVEL TIME: _____
MILEAGE: _____

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	**PROJECT NO:**	Vnc-98-029
CLIENT:	Gilbert Southern	**DATE:**	12/03/98 pg. 3 of 4
CONTRACTOR:	Gilbert Southern	**REPORT NO:**	D-30

GENERAL LOCATION: Acres 11, 12, 13, 16, 17, 27, 29, 31, 35, 36 & 37

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST CONTENT [%]	COMP [%]	SAMPLE NO.
25	Acre 27 - Test Location Plan	F.G.V	111.7	15.2	94.7	DL-286
26	Acre 27 - Test Location Plan	F.G.V	108.8	17.4	92.~~0~~ 3	DL-286
27	Acre 27 - Test Location Plan	F.G.V	106.6	19.6	90.4	DL-286
28	Acre 27 - Test Location Plan	F.G.V	110.6	14.4	93.8	DL-286
29	Acre 29 - Test Location Plan	F.G.V	108.3	17.2	91.~~8~~ 9	DL-286
30	Acre 29 - Test Location Plan	F.G.V	113.9	14.9	96.6	DL-286
31	Acre 29 - Test Location Plan	F.G.V	107.5	18.6	91.~~0~~ 2	DL-286
32	Acre 29 - Test Location Plan	F.G.V	106.1	16.2	90.0	DL-286
33	Acre 31 - Test Location Plan	F.G.V	113.4	12.4	96.1	DL-286
34	Acre 31 - Test Location Plan	F.G.V	107.5	15.5	91.~~0~~ 2	DL-286
35	Acre 31 - Test Location Plan	F.G.V	116.9	14.2	99.~~0~~ 2	DL-286
36	Acre 31 - Test Location Plan	F.G.V	110.8	14.5	93.9	DL-286

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-286	117.9	12.9	On-site Vegetative Support Soil

REMARKS: F.V.G. - Finished grade vegetative cover

ARRIVED ON SITE: _____

LEFT SITE: _____

HOURS ON SITE: _____

TRAVEL TIME: _____

MILEAGE: _____

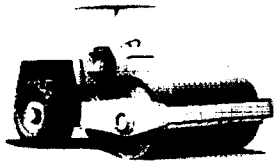
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

PERFORMED BY: Mark Potratz

PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	**PROJECT NO:**	Vnc-98-029
CLIENT:	Gilbert Southern	**DATE:**	12/03/98 pg. 4 of 4
CONTRACTOR:	Gilbert Southern	**REPORT NO:**	D-30

GENERAL LOCATION: Acres 11, 12, 13, 16, 17, 27, 29, 31, 35, 36 & 37

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
37	Acre 35 - Test Location Plan	F.G.V	116.9	14.2	99.0 2	DL-286
38	Acre 35 - Test Location Plan	F.G.V	120.8	12.4	100+	DL-286
39	Acre 35 - Test Location Plan	F.G.V	110.8	14.5	93.9	DL-286
40	Acre 35 - Test Location Plan	F.G.V	106.5	17.2	90.3	DL-286
41	Acre 36 - Test Location Plan	F.G.V	112.1	17.0	95.0 1	DL-286
42	Acre 36 - Test Location Plan	F.G.V	115.6	13.5	98.0 1	DL-286
43	Acre 36 - Test Location Plan	F.G.V	106.9	14.6	90.7	DL-286
44	Acre 36 - Test Location Plan	F.G.V	115.0	15.0	97.5	DL-286
45	Acre 37 - Test Location Plan	F.G.V	110.6	16.9	93.8	DL-286
46	Acre 37 - Test Location Plan	F.G.V	117.4	12.6	99.5	DL-286
47	Acre 37 - Test Location Plan	F.G.V	106.6	17.7	90.4	DL-286
48	Acre 37 - Test Location Plan	F.G.V	108.7	19.2	97.1 922	DL-286

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-286	117.9	12.9	On-site Vegetative Support Soil

REMARKS: F.V.G. - Finished grade vegetative cover

ARRIVED ON SITE: _____

LEFT SITE: _____

HOURS ON SITE: _____

TRAVEL TIME: _____

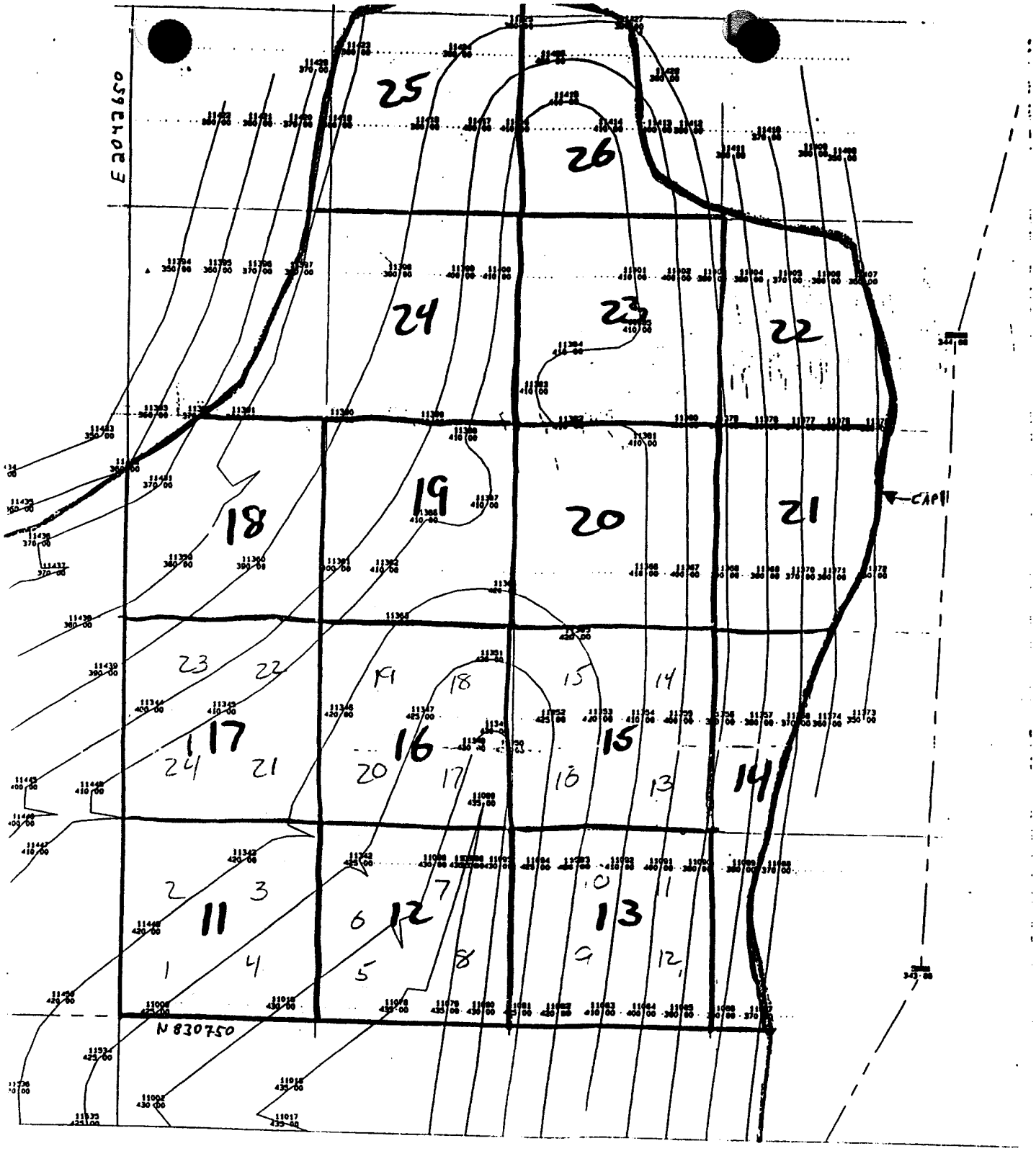
MILEAGE: _____

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

PERFORMED BY: Mark Potratz

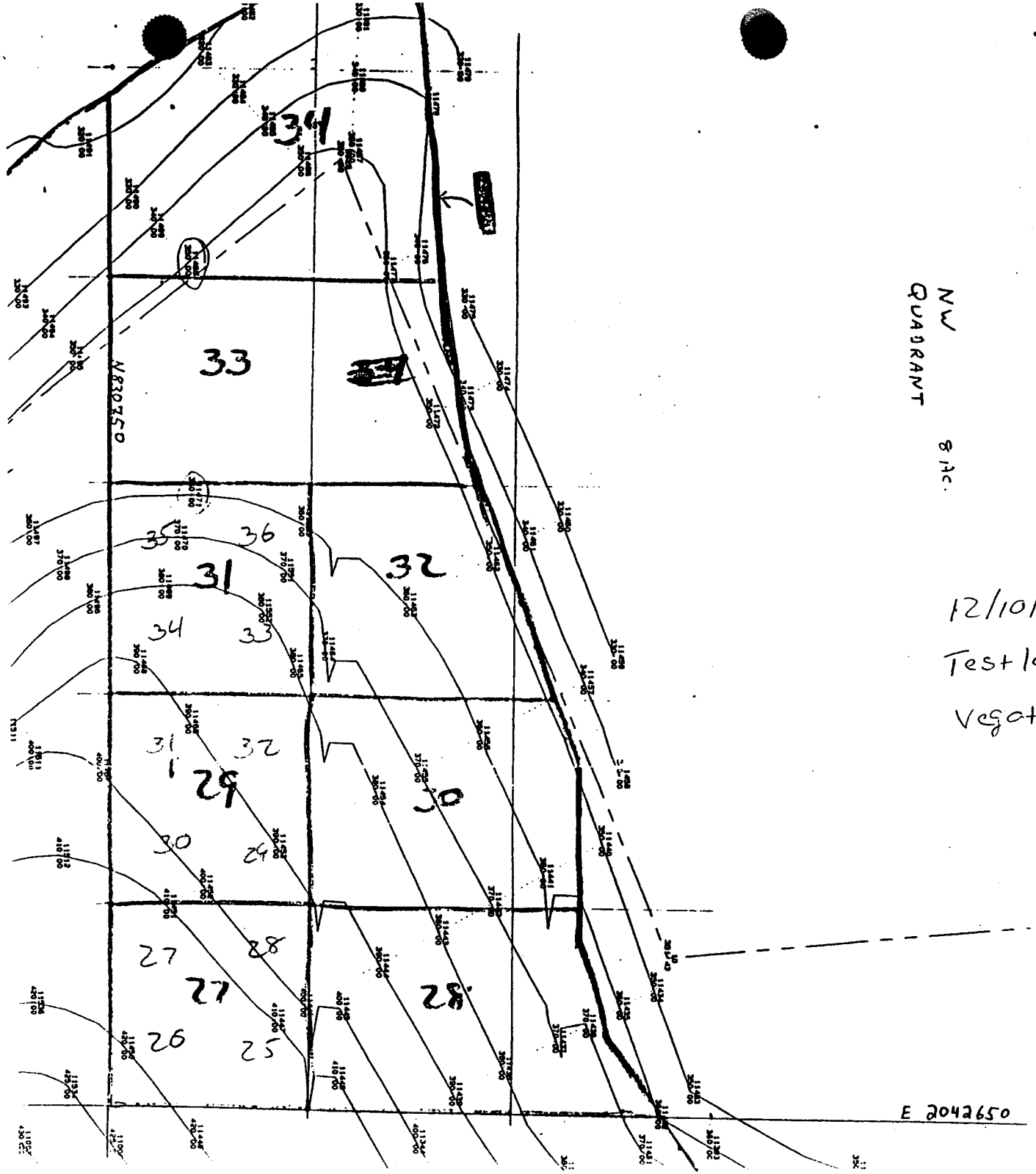
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460



12/10/98
Test location Plan
Vegetative Support Soil

Report: D-30



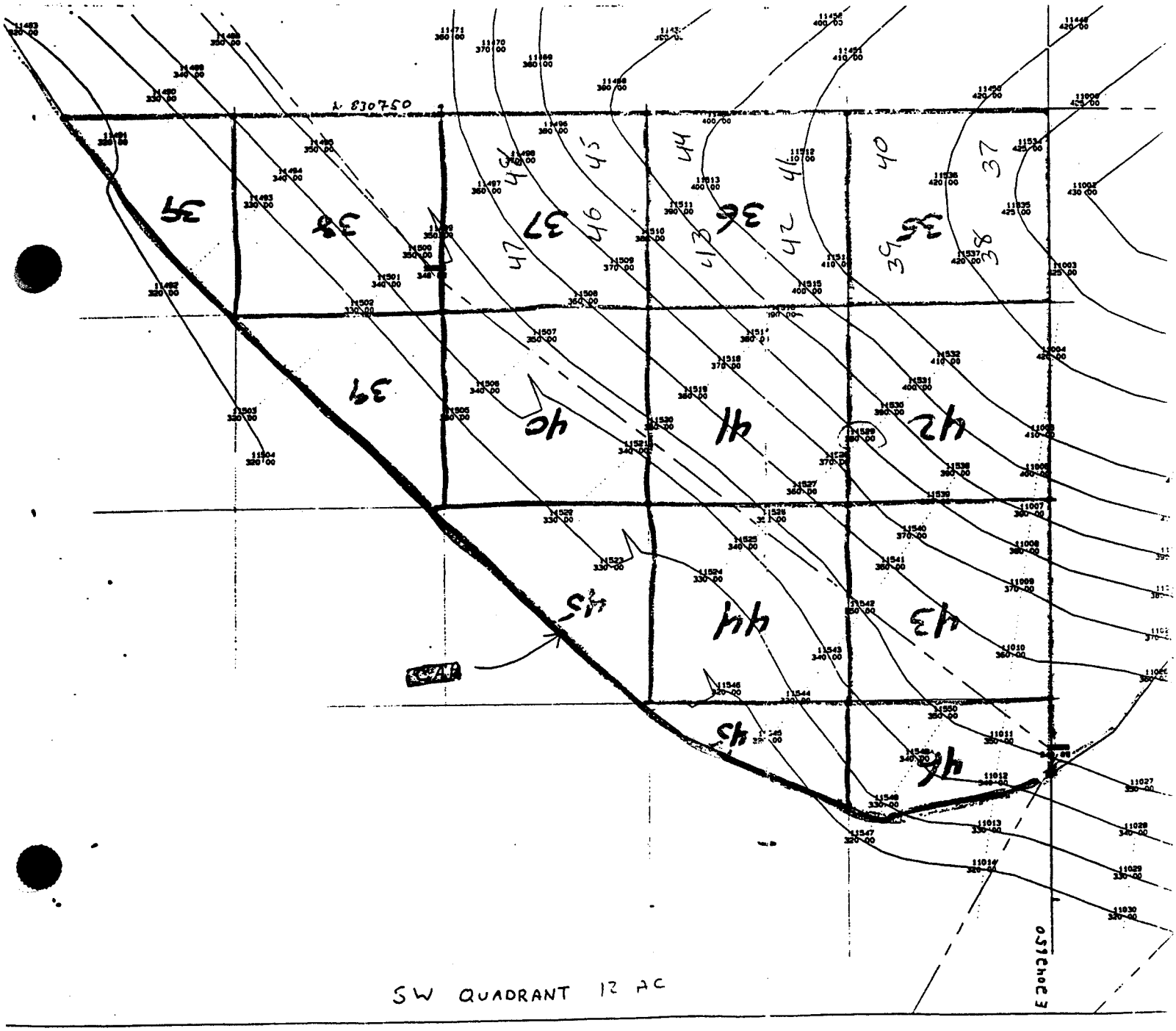
NW
QUADRANT

8 AC.

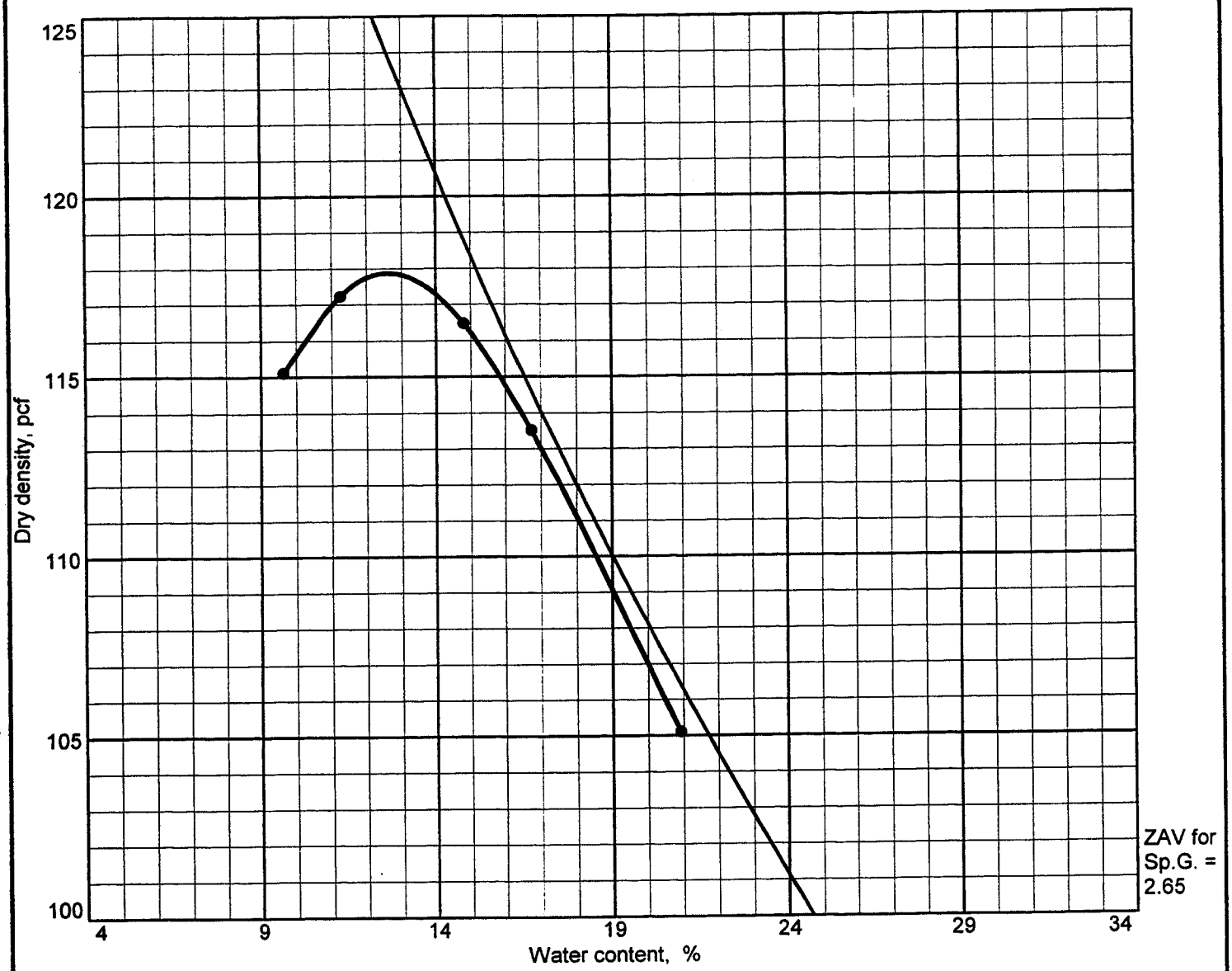
12/10/98
Test location Plan
Vegatative support soil

Report: D-30

12/10/98
Test location plan
Vegetative support soil
Report : D-30



COMPACTION TEST REPORT



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	ML						1.4	63.2

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 117.9 pcf Optimum moisture = 12.6 %	On-site Borrow - Sandy silt

Project No. VNC-98-029 **Client:** Gilbert Southern
Project: Durham County Landfill Closure

● **Location:** Vegatative Support

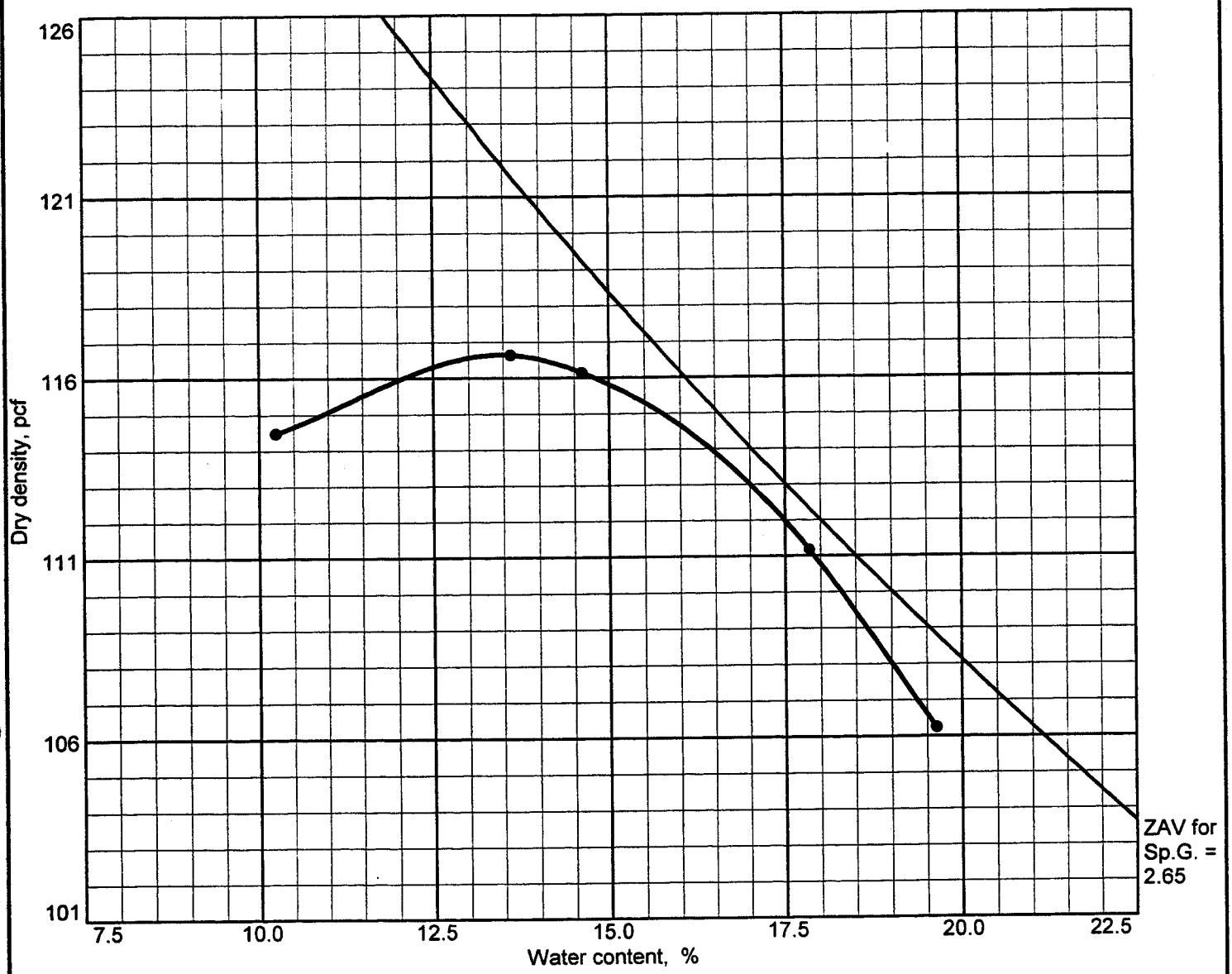
Remarks:
DL-286, Sampled in-place (ACRE 12)

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Figure #

COMPACTION TEST REPORT



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	ML			2.65			0.7	64.1

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 116.7 pcf Optimum moisture = 13.5 %	On-Site Borrow, Sandy silt

Project No. VNC-98-029 **Client:** Gilbert Southern
Project: Durham County Landfill Closure
● **Location:** Vegatative Support

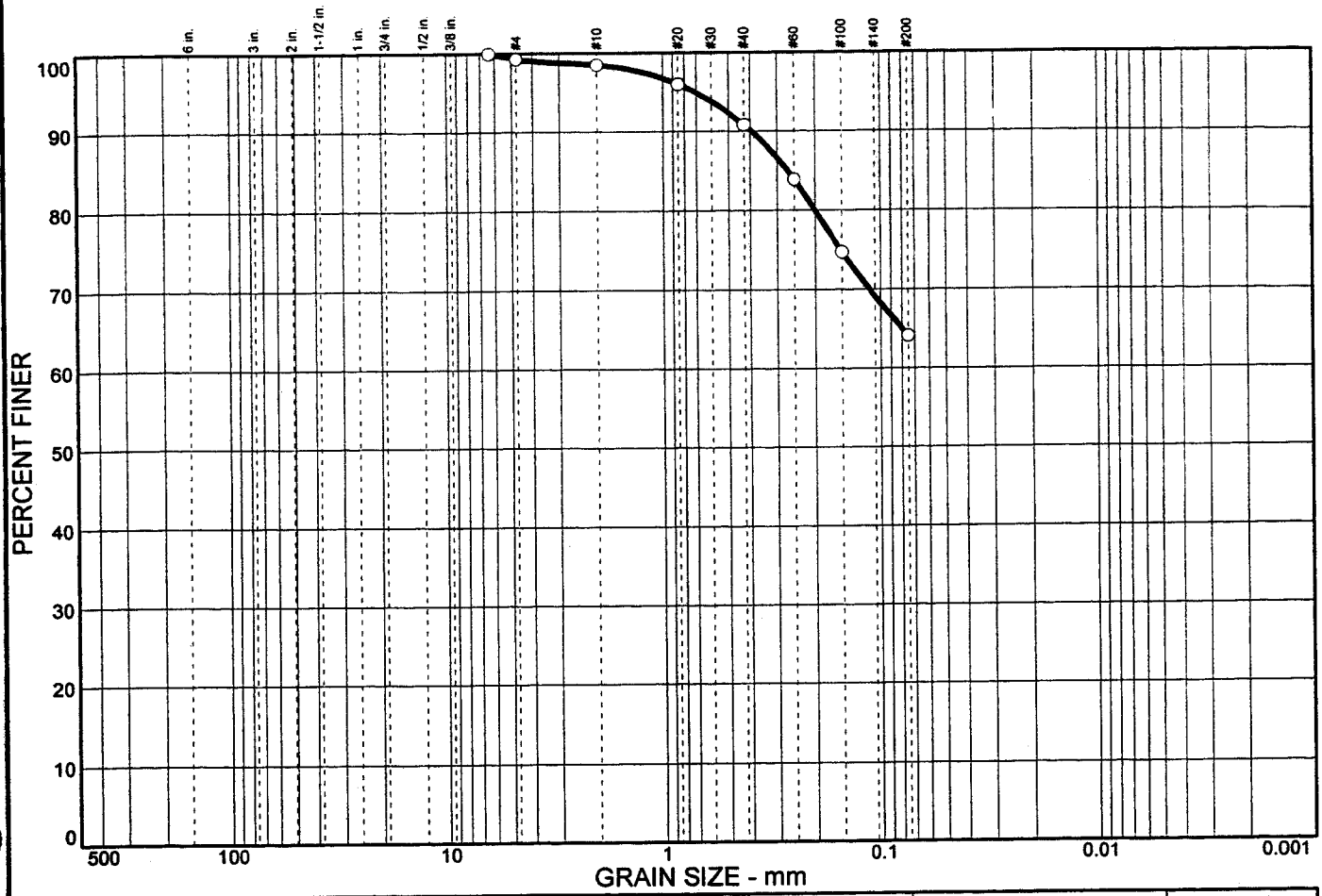
Remarks:
DL-287, Sampled inplace (ACRE 36)

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Figure #

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.7	35.2	64.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.3		
#10	98.5		
#20	96.0		
#40	90.8		
#60	83.9		
#100	74.7		
#200	64.1		

* (no specification provided)

Soil Description

On-Site Borrow, Sandy silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.268 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

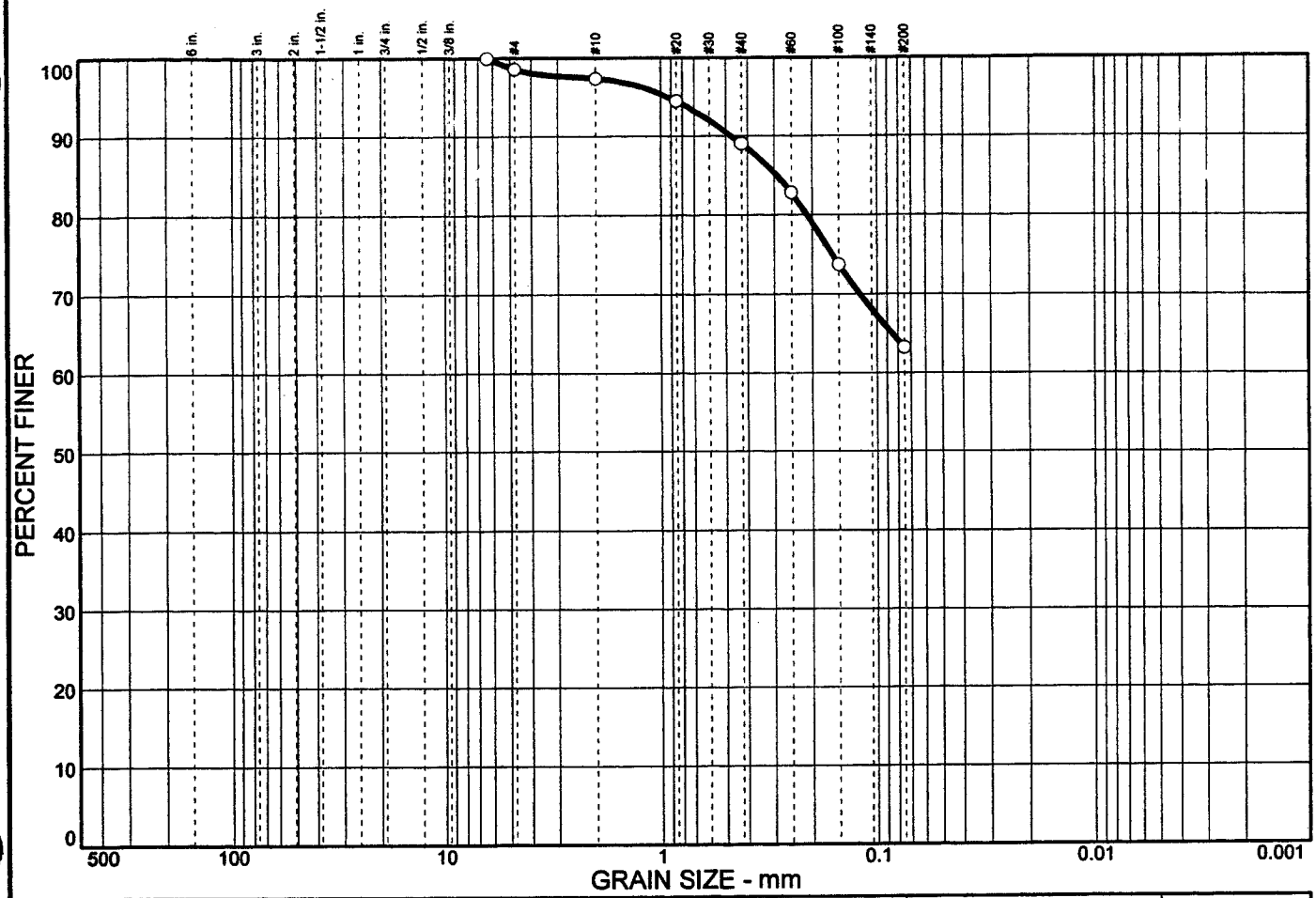
DL-287, Sampled inplace (ACRE 36)

Sample No.: DL-287 **Source of Sample:** Vegatative Cover **Date:** 12-30-98
Location: Vegatative Support **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.4	35.4	63.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	98.6		
#10	97.4		
#20	94.5		
#40	89.0		
#60	82.8		
#100	73.7		
#200	63.2		

* (no specification provided)

Soil Description

On-site Borrow - Sandy silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.293 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

DL-286, Sampled inplace (ACRE 12)

Sample No.: DL-286 **Source of Sample:** Vegatative Cover **Date:** 12/28/98
Location: Vegatative Support **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 03/25/99 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	03/18/99	D-33	In-place Density Test Results
2	03/19/99	D-34	In-place Density Test Results

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	**PROJECT NO:**	Vnc-98-029
CLIENT:	Gilbert Southern	**DATE:**	03/18/99 pg 1 of 5
CONTRACTOR:	Gilbert Southern	**REPORT NO:**	D-33

GENERAL LOCATION: NW & SW Quadrant

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
1	Acre 28 See test location Plan	Finished Grade	107.5	20.7	99.9	DL-293
2	Acre 28 See test location Plan	Finished Grade	97.4	19.7	90.5	DL-293
3	Acre 28A See test location Plan	Finished Grade	98.7	21.5	91.7	DL-293
4	Acre 28A See test location Plan	Finished Grade	101.7	22.4	94.5	DL-293
5	Acre 28 See test location Plan	Finished Grade	100.3	25.0	93.2	DL-293
6	Acre 28 See test location Plan	Finished Grade	111.6	11.3	100+	DL-293
7	Acre 30 See test location Plan	Finished Grade	96.9	16.9	90.1	DL-293
8	Acre 30 See test location Plan	Finished Grade	114.4	10.7	100+	DL-293
9	Acre 30A See test location Plan	Finished Grade	116.9	9.1	100+	DL-293
10	Acre 30A See test location Plan	Finished Grade	108.3	10.7	100+	DL-293
11	Acre 30 See test location Plan	Finished Grade	104.3	13.2	96.9	DL-293
12	Acre 30 See test location Plan	Finished Grade	100.6	14.7	93.5	DL-293
13	Acre 32 See test location Plan	Finished Grade	103.2	14.1	95.9	DL-293

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-293	107.6	17.1	Vegetative support soil

REMARKS:

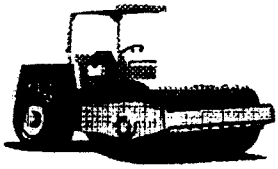
ARRIVED ON SITE: 11:30
LEFT SITE: 3:30
HOURS ON SITE: 4.0
TRAVEL TIME: 1.0
MILEAGE: 70

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	**PROJECT NO:**	Vnc-98-029
CLIENT:	Gilbert Southern	**DATE:**	03/18/99 pg 2 of 5
CONTRACTOR:	Gilbert Southern	**REPORT NO:**	D-33

GENERAL LOCATION: NW & SW Quadrant

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
14	Acre 32 See test location Plan	Finished Grade	103.4	13.7	96.1	DL-293
15	Acre 32 See test location Plan	Finished Grade	105.6	12.7	98.1	DL-293
16	Acre 32 See test location Plan	Finished Grade	104.3	14.0	96.9	DL-293
17	Acre 33A See test location Plan	Finished Grade	103.8	13.5	96.5	DL-293
18	Acre 33 See test location Plan	Finished Grade	108.8	12.8	100+	DL-293
19	Acre 33 See test location Plan	Finished Grade	106.6	12.1	99.1	DL-293
20	Acre 33 See test location Plan	Finished Grade	107.7	11.3	100+	DL-293
21	Acre 33 See test location Plan	Finished Grade	106.7	12.1	99.2	DL-293
22	Acre 30A See test location Plan	Finished Grade	112.6	10.6	100+	DL-293
23	Acre 30A See test location Plan	Finished Grade	111.7	9.2	100+	DL-293
24	Acre 34A See test location Plan	Finished Grade	108.0	10.8	100+	DL-293
25	Acre 34A See test location Plan	Finished Grade	106.7	11.5	99.2	DL-293
26	Acre 34A See test location Plan	Finished Grade	105.3	10.9	97.9	DL-293

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-293	107.6	17.1	Vegetative support soil

REMARKS:

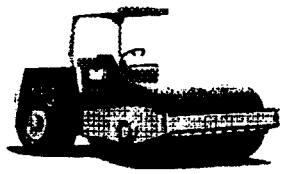
ARRIVED ON SITE: 11:30
LEFT SITE: 3:30
HOURS ON SITE: 4.0
TRAVEL TIME: 1.0
MILEAGE: 70

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT: Durham Co. Landfill **PROJECT NO:** Vnc-98-029

CLIENT: Gilbert Southern **DATE:** 03/18/99 pg 3 of 5

CONTRACTOR: Gilbert Southern **REPORT NO:** D-33

GENERAL LOCATION: NW & SW Quadrant

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
27	Acre 34 See test location Plan	Finished Grade	100.5	13.9	93.4	DL-293
28	Acre 34 See test location Plan	Finished Grade	97.5	17.0	90.6	DL-293
29	Acre 34 See test location Plan	Finished Grade	102.8	13.8	95.5	DL-293
30	Acre 34 See test location Plan	Finished Grade	105.9	13.1	98.4	DL-293
31	Acre 39A See test location Plan	Finished Grade	101.0	13.6	93.4	DL-293
32	Acre 38 See test location Plan	Finished Grade	98.9	16.1	91.9	DL-293
33	Acre 38 See test location Plan	Finished Grade	97.8	16.6	90.9	DL-293
34	Acre 38 See test location Plan	Finished Grade	105.2	11.8	97.8	DL-293
35	Acre 38 See test location Plan	Finished Grade	105.0	13.8	97.6	DL-293
36	Acre 39A See test location Plan	Finished Grade	102.4	14.1	95.2	DL-293
37	Acre 39 See test location Plan	Finished Grade	110.5	10.2	100+	DL-293
38	Acre 39 See test location Plan	Finished Grade	106.3	11.6	98.8	DL-293
39	Acre 40 See test location Plan	Finished Grade	103.2	13.8	95.9	DL-293

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-293	107.6	17.1	Vegetative support soil

REMARKS:

ARRIVED ON SITE: 11:30

LEFT SITE: 3:30

HOURS ON SITE: 4.0

TRAVEL TIME: 1.0

MILEAGE: 70

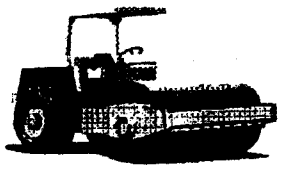
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

PERFORMED BY: Mark Potratz

PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT: Durham Co. Landfill **PROJECT NO:** Vnc-98-029

CLIENT: Gilbert Southern **DATE:** 03/18/99 pg 4 of 5

CONTRACTOR: Gilbert Southern **REPORT NO:** D-33

GENERAL LOCATION: NW & SW Quadrant

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
40	Acre 40 See test location Plan	Finished Grade	99.1	13.3	92.1	DL-293
41	Acre 40 See test location Plan	Finished Grade	97.8	12.6	90.9	DL-293
42	Acre 40 See test location Plan	Finished Grade	97.9	11.5	91.0	DL-293
43	Acre 45 See test location Plan	Finished Grade	107.2	15.7	99.6	DL-293
44	Acre 45 See test location Plan	Finished Grade	97.8	16.1	90.9	DL-293
45	Acre 45 See test location Plan	Finished Grade	107.2	12.1	99.6	DL-293
46	Acre 44 See test location Plan	Finished Grade	97.5	13.7	90.6	DL-293
47	Acre 44 See test location Plan	Finished Grade	104.2	11.7	96.8	DL-293
48	Acre 44 See test location Plan	Finished Grade	111.6	8.9	100+	DL-293
49	Acre 44 See test location Plan	Finished Grade	108.8	11.4	100+	DL-293
50	Acre 45A See test location Plan	Finished Grade	107.4	13.4	99.8	DL-293
51	Acre 46 See test location Plan	Finished Grade	104.4	14.6	97.0	DL-293
52	Acre 46 See test location Plan	Finished Grade	108.8	12.2	100+	DL-293

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-293	107.6	17.1	Vegetative support soil

REMARKS:

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

ARRIVED ON SITE: 11:30

LEFT SITE: 3:30

HOURS ON SITE: 4.0

TRAVEL TIME: 1.0

MILEAGE: 70

PERFORMED BY: Mark Potratz

PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST

IN-PLACE DENSITY TEST RESULTS

PROJECT: Durham Co. Landfill **PROJECT NO:** Vnc-98-029

CLIENT: Gilbert Southern **DATE:** 03/18/99 pg 5 of 5

CONTRACTOR: Gilbert Southern **REPORT NO:** D-33

GENERAL LOCATION: NW & SW Quadrant

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
53	Acre 43 See test location Plan	Finished Grade	106.1	12.5	98.6	DL-293
54	Acre 43 See test location Plan	Finished Grade	106.9	12.5	99.3	DL-293
55	Acre 43 See test location Plan	Finished Grade	108.3	12.8	100+	DL-293
56	Acre 43 See test location Plan	Finished Grade	110.1	10.3	100+	DL-293
57	Acre 42 See test location Plan	Finished Grade	109.5	11.0	100+	DL-293
58	Acre 42 See test location Plan	Finished Grade	104.6	14.3	97.2	DL-293
59	Acre 42 See test location Plan	Finished Grade	109.5	10.7	100+	DL-293
60	Acre 42 See test location Plan	Finished Grade	108.2	10.4	100+	DL-293
61	Acre 41 See test location Plan	Finished Grade	112.0	9.4	100+	DL-293
62	Acre 41 See test location Plan	Finished Grade	106.7	11.7	99.1	DL-293
63	Acre 41 See test location Plan	Finished Grade	106.8	11.6	99.2	DL-293
64	Acre 41 See test location Plan	Finished Grade	105.4	10.7	98.0	DL-293

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-293	107.6	17.1	Vegetative support soil

REMARKS:

ARRIVED ON SITE: 11:30

LEFT SITE: 3:30

HOURS ON SITE: 4.0

TRAVEL TIME: 1.0

MILEAGE: 70

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

PERFORMED BY: Mark Potratz

PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

11

GILBERT SOUTHERN CORP.

A KIEWIT COMPANY

3301 Glenn Road

Durham, NC 27704

(919) 667-9314

Fax (919) 667-0514

October 22, 1998

Letter: 98-009

Mr. Jay Jackson
Malcolm Pirnie, Inc.
201 McCullough Drive Suite 380
Charlotte, NC 28262

Reference: Durham Municipal Solid Waste Landfill Facility Closure

Subject: Low Permeability Soil Source Identification

Dear Mr. Jackson:

We would like to clarify the descriptive identification of the low permeability soil borrow pit named Roberts pit. On past submittals this borrow pit has been called Ellington pit and the Geer Street pit. On all future submittals this pit will be referred to as Roberts pit.

Sincerely,

Andrew G. Palahnuk
Project Superintendent

RECEIVED
OCT 2 6 1998
MALCOLM PIRNIE
CHARLOTTE
ROUTE: JCJ
JOB #
FILE:

cc: Job File

VAN DER HORST

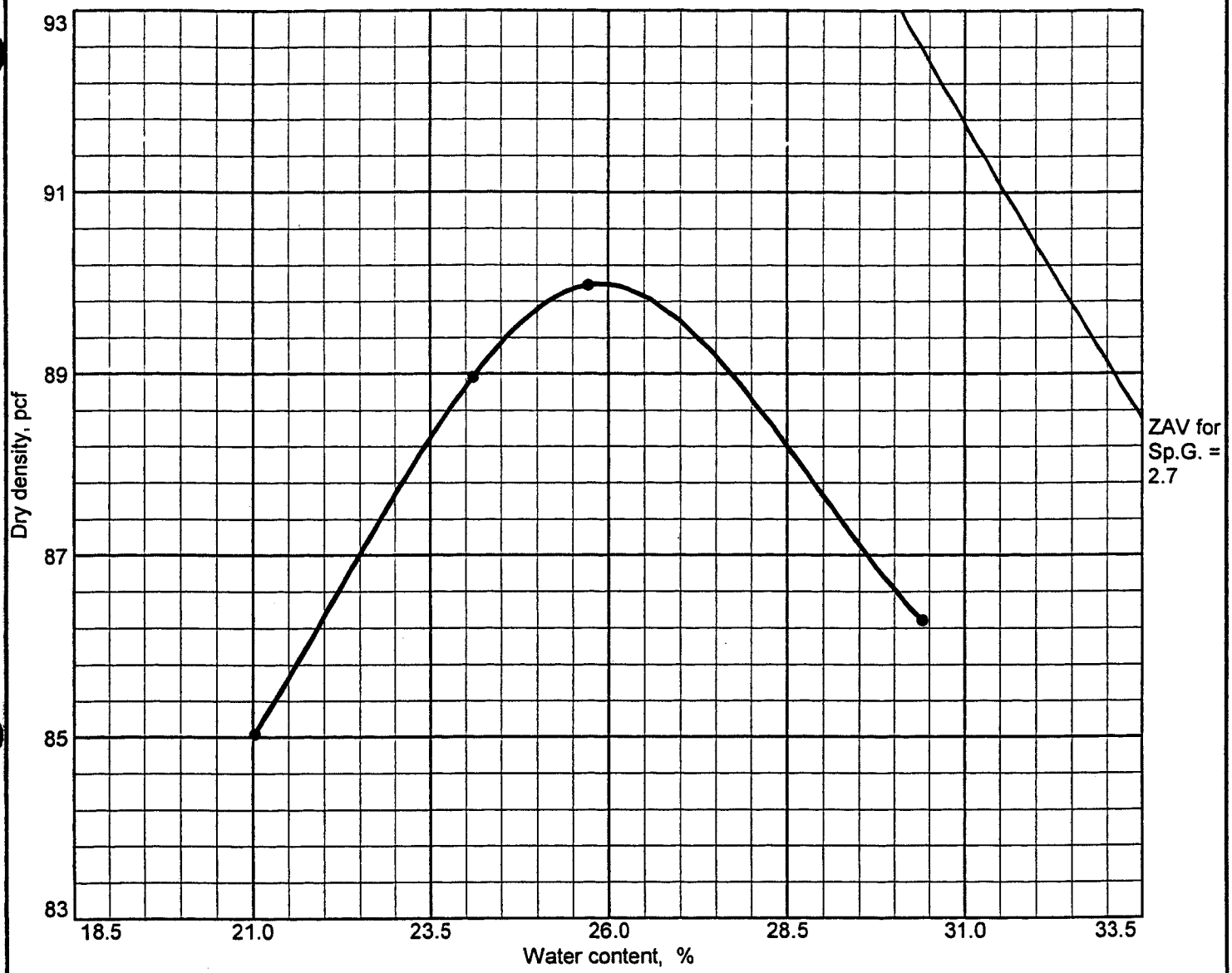
DURHAM COUNTY LANDFILL CLOSURE
VNC-98-029.017

"Initial Conformance Testing"
Hillsborough/LaSalle Low Permeability Soil

Test Method	DL-057
Location	**Stockpile**
Natural Moisture (ASTM D2216)	27.2
Grainsize Analysis (ASTM D422)	
% Gravel	0.0
% Sand	17.9
% Silt	28.1
% Clay	54.0
Atterberg Limits (ASTM D4318)	
LL	57
PL	20
PI	37
Standard Proctor (ASTM D698)	
Max. Dry Density (pcf)	90.0
Optimum Moisture (%)	25.9
Hydraulic Conductivity (ASTM D5084 - Method A)	
Permeability (cm/sec)	5.8×10^{-8}
Dry Density (pcf)	89.2
Moisture (%)	27.0

Note: Four (4) additional hydraulic conductivity tests were performed to develop the Acceptance Zone. Please see the attached individual test reports.

COMPACTION TEST REPORT



Test specification: ASTM D 698-78 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	CH				57	37	0.0	82.1

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 90.0 pcf Optimum moisture = 25.9 %	Dark Brown Fat clay with sand

Project No. VNC-98-029 **Client:** Gilbert Southern
Project: Durham County Landfill Closure
● **Location:** Stockpile - Sampled on 10/14/98

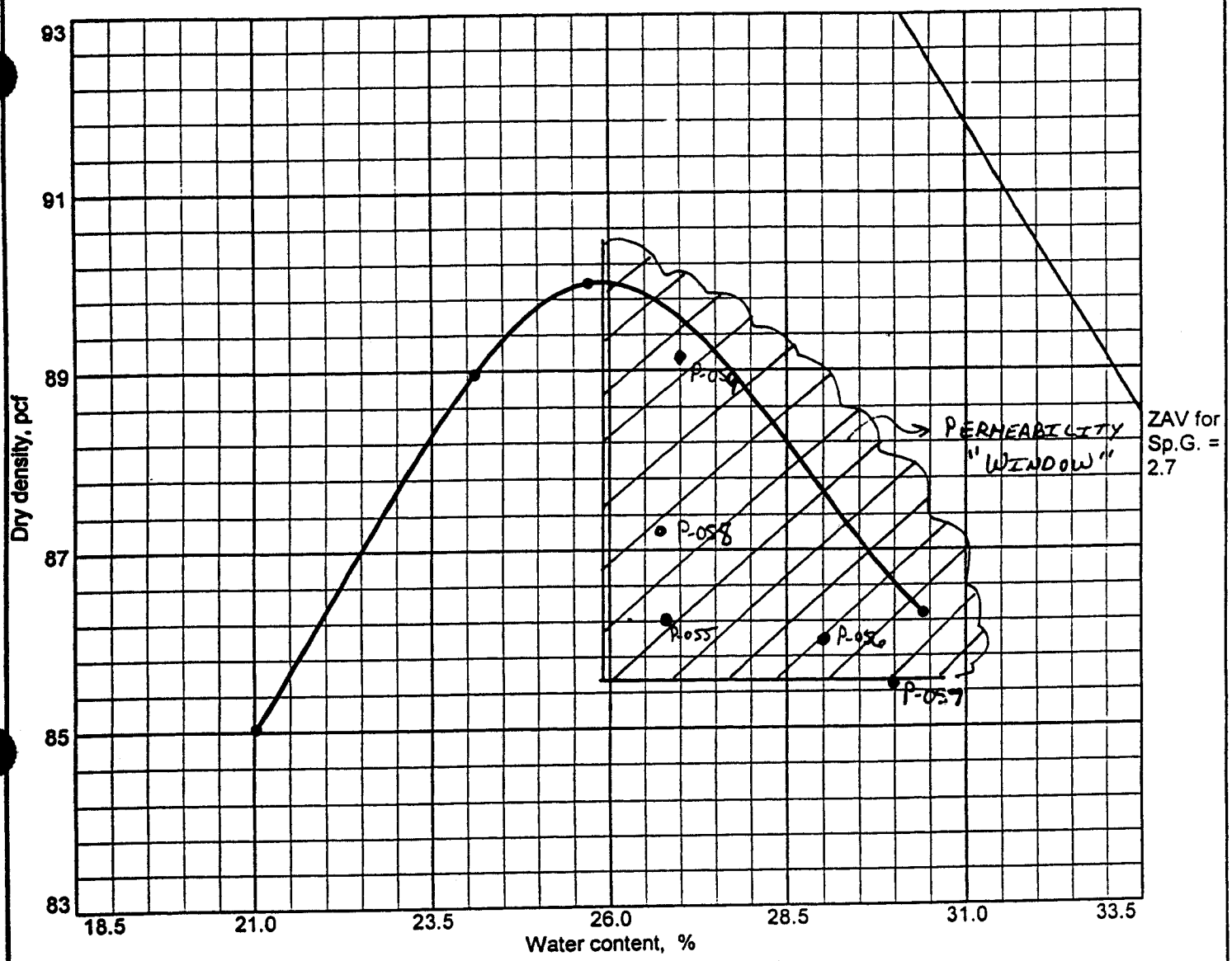
Remarks:
Sampled from source stockpile on 10/14/98

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

COMPACTION TEST REPORT



Test specification: ASTM D 698-78 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	CH				57	37	0.0	82.1

TEST RESULTS

Maximum dry density = 90.0 pcf

Optimum moisture = 25.9 %

MATERIAL DESCRIPTION

Dark Brown Fat clay with sand

Project No. VNC-98-029 **Client:** Gilbert Southern

Project: Durham County Landfill Closure

Location: Stockpile - Sampled on 10/14/98

Remarks:

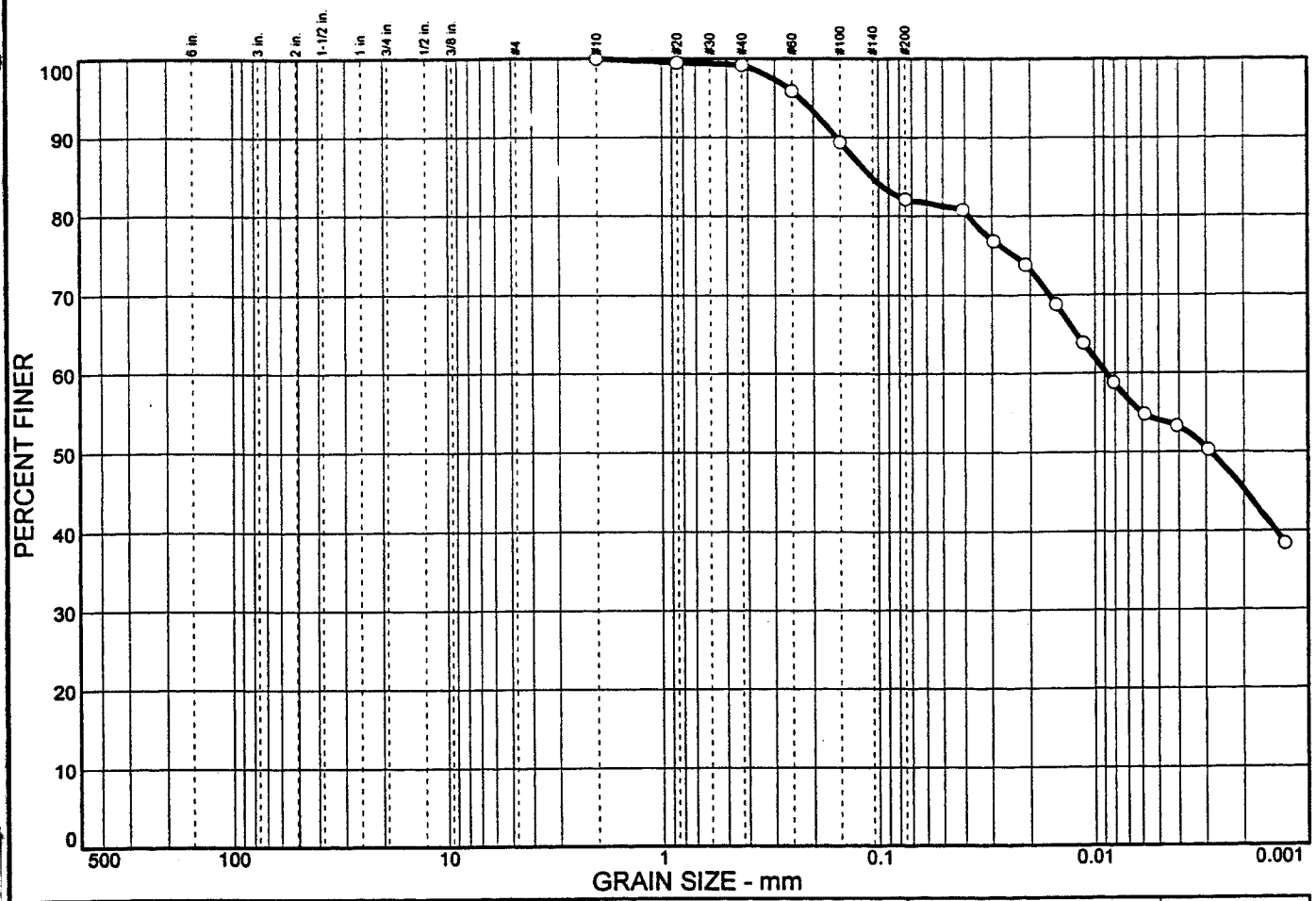
Sampled from source stockpile on 10/14/98

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	17.9	28.1	54.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.5		
#40	99.2		
#60	95.9		
#100	89.4		
#200	82.1		

* (no specification provided)

Soil Description

Dark Brown Fat clay with sand

Atterberg Limits

PL= 20 LL= 57 PI= 37

Coefficients

D_{85}= 0.108 D_{60}= 0.0088 D_{50}= 0.0029
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Sampled from source stockpile on 10/14/98

Sample No.: DL-057 **Source of Sample:** Hillsborough/LaSalle **Date:**
Location: Stockpile - Sampled on 10/14/98 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date:	10/30/98
Report No.:	P-055

Project No.:	VNC-98-029	Project:	Durham Landfill Closure
Sample No.	DL-057A	Client:	Gilbert Southern Corp.

Test Summary

Permeability	8.7E-08	cm/sec
% Moisture	26.8	%
Dry Density	86.4	pcf

Sample Information

Specimen Type:		Date Sampled:	10/14/98
Remolded	X	Location:	Hillsborough / LaSalle Stockpile - Clay
Tube			

Specimen Data

Length (in):	4.101
Diameter (in.):	2.803
Area (sq. in.):	6.181
Volume (cu. in.):	25.35
Wet Weight (grams):	729.0
Dry Weight (grams):	574.9
Dry Density (pcf):	86.4

Moisture Content Test Data

Wet Weight	184.55
Dry Weight	153.42
Tare weight	37.26
% Moisture	26.8

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
960	127.38	6.20	6.55	1.06	6.38	8.99E-08
300	127.38	1.95	2.00	1.03	1.98	8.92E-08
220	127.38	1.40	1.35	0.96	1.38	8.46E-08
200	127.38	1.25	1.20	0.96	1.23	8.29E-08

△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **8.7E-08** cm/sec

Respecfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date:	10/30/98
Report No.:	P-059

Project No.:	VNC-98-029	Project:	Durham Landfill Closure
Sample No.	DL-057E	Client:	Gilbert Southern Corp.

Test Summary

Permeability	5.8E-08	cm/sec
% Moisture	27.0	%
Dry Density	89.2	pcf

Sample Information

Specimen Type:		Date Sampled:	10/14/98
Remolded	X	Location:	Hillsborough / LaSalle Stockpile - Clay
Tube			

	2
Length (in):	4.142
Diameter (in.):	2.801
Area (sq. in.):	6.173
Volume (cu. in.):	25.57
Wet Weight (grams):	759.8
Dry Weight (grams):	598.3
Dry Density (pcf):	89.2

Moisture Content Test Data

Wet Weight	194.62
Dry Weight	161.21
Tare weight	37.48
% Moisture	27.0

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
180	124.62	0.70	0.80	1.14	0.75	5.83E-08
130	124.62	0.50	0.55	1.10	0.53	5.65E-08
120	124.62	0.50	0.50	1.00	0.50	5.83E-08
120	124.62	0.50	0.50	1.00	0.50	5.83E-08

△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **5.8E-08** cm/sec

Respecfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/30/98
Report No.: P-058

Project No.: VNC-98-029
Sample No. DL-057D
Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.7E-08	cm/sec
% Moisture	26.7	%
Dry Density	87.1	pcf

Sample Information

Specimen Type:
Remolded X
Tube

Date Sampled: 10/14/98
Location: Hillsborough / LaSalle Stockpile - Clay

Specimen Data

Length (in):	4.123
Diameter (in.):	2.795
Area (sq. in.):	6.146
Volume (cu. in.):	25.34
Wet Weight (grams):	734.1
Dry Weight (grams):	579.4
Dry Density (pcf):	87.1

Moisture Content Test Data

Wet Weight	193.38
Dry Weight	160.58
Tare weight	37.74
% Moisture	26.7

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
170	124.62	0.55	0.60	1.09	0.58	4.73E-08
200	124.62	0.70	0.65	0.93	0.68	4.72E-08
230	124.62	0.80	0.80	1.00	0.80	4.87E-08
480	124.62	1.60	1.60	1.00	1.60	4.67E-08

△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **4.7E-08** cm/sec

Respecfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date:	10/30/98
Report No.:	P-057

Project No.:	VNC-98-029	Project:	Durham Landfill Closure
Sample No.	DL-057C	Client:	Gilbert Southern Corp.

Test Summary

Permeability	5.3E-08	cm/sec
% Moisture	30.3	%
Dry Density	85.3	pcf

Sample Information

Specimen Type:		Date Sampled:	10/14/98
Remolded	X	Location:	Hillsborough / LaSalle Stockpile - Clay
Tube			

Specimen Data

Length (in):	4.102
Diameter (in.):	2.802
Area (sq. in.):	6.177
Volume (cu. in.):	25.34
Wet Weight (grams):	739.2
Dry Weight (grams):	567.3
Dry Density (pcf):	85.3

Moisture Content Test Data

Wet Weight	192.27
Dry Weight	156.29
Tare weight	37.54
% Moisture	30.3

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
480	121.85	1.70	1.85	1.09	1.78	5.24E-08
150	121.85	0.50	0.65	1.30	0.58	5.43E-08
220	121.85	0.80	0.80	1.00	0.80	5.15E-08
200	121.85	0.75	0.80	1.07	0.78	5.49E-08

△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **5.3E-08** cm/sec

Respectfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date:	10/30/98
Report No.:	P-056

Project No.:	VNC-98-029	Project:	Durham Landfill Closure
Sample No.	DL-057B	Client:	Gilbert Southern Corp.

Test Summary

Permeability	7.4E-08	cm/sec
% Moisture	29.0	%
Dry Density	85.8	pcf

Sample Information

Specimen Type:		Date Sampled:	10/14/98
Remolded	X	Location:	Hillsborough / LaSalle Stockpile - Clay
Tube			

Specimen Data

Length (in):	4.089
Diameter (in.):	2.800
Area (sq. in.):	6.168
Volume (cu. in.):	25.22
Wet Weight (grams):	732.5
Dry Weight (grams):	567.8
Dry Density (pcf):	85.8

Moisture Content Test Data

Wet Weight	203.34
Dry Weight	166.15
Tare weight	37.91
% Moisture	29.0

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
480	121.85	2.50	2.75	1.10	2.63	7.74E-08
150	121.85	0.80	0.80	1.00	0.80	7.54E-08
110	121.85	0.60	0.55	0.92	0.58	7.39E-08
100	121.85	0.50	0.50	1.00	0.50	7.07E-08

△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **7.4E-08** cm/sec

Respecfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

MALCOLM PIRNIE

LETTER OF TRANSMITTAL

: GILBERT SOUTHERN CORP
3301 GLENN ROAD
DURHAM, NC 27704

Transm'l Date : 12/16/98
Transm'l No. : CT019
Spec'n Section : 02250

Attention: ANDY PALAHNUK

Re: CITY OF DURHAM, NORTH CAROLINA
DURHAM MUNICIPAL SOLID WASTE LANDFILL FACILITY CLOSURE

Gentlemen:
We are sending you via, U.S. Mail the following items:

No.	Manufacturer's Name	Drawing Reference	Description	Act'n Taken
4	FOGLEMAN	10 PAGES	CONFORMANCE TESTING	AC

Our action relative to items submitted for approval has been noted above and on the drawings.

Remarks:

Copies to:
TOM GLENN, W/ENCL;
BARRY HERZBERG, W/ENCL; FILE

Very truly yours
MALCOLM PIRNIE, INC.

by _____
JAY JACKSON, PE

Form 69 Printed in USA
Rev 10/95

Gilbert Southern
(Company Name)

ADDRESS REPLY TO:

LETTER OF TRANSMITTAL

3301 Glenn Rd.
Durham, NC 27704

TO: Jay Jackson
Malcolm Pirnie

DATE _____ CO. NO. 44 JOB NO. 3124

TRANSMITTAL NO. _____

RE: _____

WE ARE SENDING ☒ Attached ☐ Under separate cover via _____ the following:

☐ Drawings ☐ Plans ☐ Progress Payment ☐ Subcontractor
☐ Prints ☐ Samples ☐ Specifications ☐ Change Order
☐ Payroll ☐ EEO Report ☐ Certificates of Compliance ☐ Copy of Letter

☐ _____ ☐ _____

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REMARKS _____

COPY TO: Barry Herzberg (1 copy)

SIGNED: James Bair

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 11/30/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure

RECEIVED
DEC 01 1998

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	11/28/98	VNC-98-029.022	Initial Conformance Testing - Fogelman Borrow Low Perm Soil

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

GEOTECHNICAL ENGINEERING, P.C.

CONSTRUCTION MONITORING

MATERIALS TESTING

EXPLORATORY DRILLING

November 28, 1998

Andy Palabnuk
Gilbert Southern Corp.
Durham County Landfill
3301 Glenn Road
Durham, NC 27704

Re: Initial Conformance Testing
Fogelman Borrow Low Permeability Soil
VNC-98-029.022

Dear Andy:

We are please find our laboratory analysis for the proposed low permeability soil sampled from the Fogelman borrow pit on 11/3/98. The test performed included all test in section 02250, part 2.1B. Attached please find a table summarizing our test results. Also included are all applicable laboratory test reports. Based on our laboratory tests for this sample the material meets the projects specifications for use as low permeability soil.

Also included is our "Compaction Test Report" plotting five (5) hydraulic conductivity tests at varying moisture and compacted to 95% of the standard proctor maximum dry density. We have established and indicated an "Acceptable Zone" for permeability with respect to moisture and density.

Should you have any questions or need further assistance please do not hesitate to contact our office.

Respectfully submitted
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.
Regional Manager / Senior Engineer

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

535 Summit Point Drive
Henrietta, NY 14467
716/359-2730
Fax 716/359-9668

3101 Stonybrook Drive, Suite 156
Raleigh, NC 27604
919/876-0405
Fax 919/876-0405

VAN DER HORST

DURHAM COUNTY LANDFILL CLOSURE
VNC-98-029.022

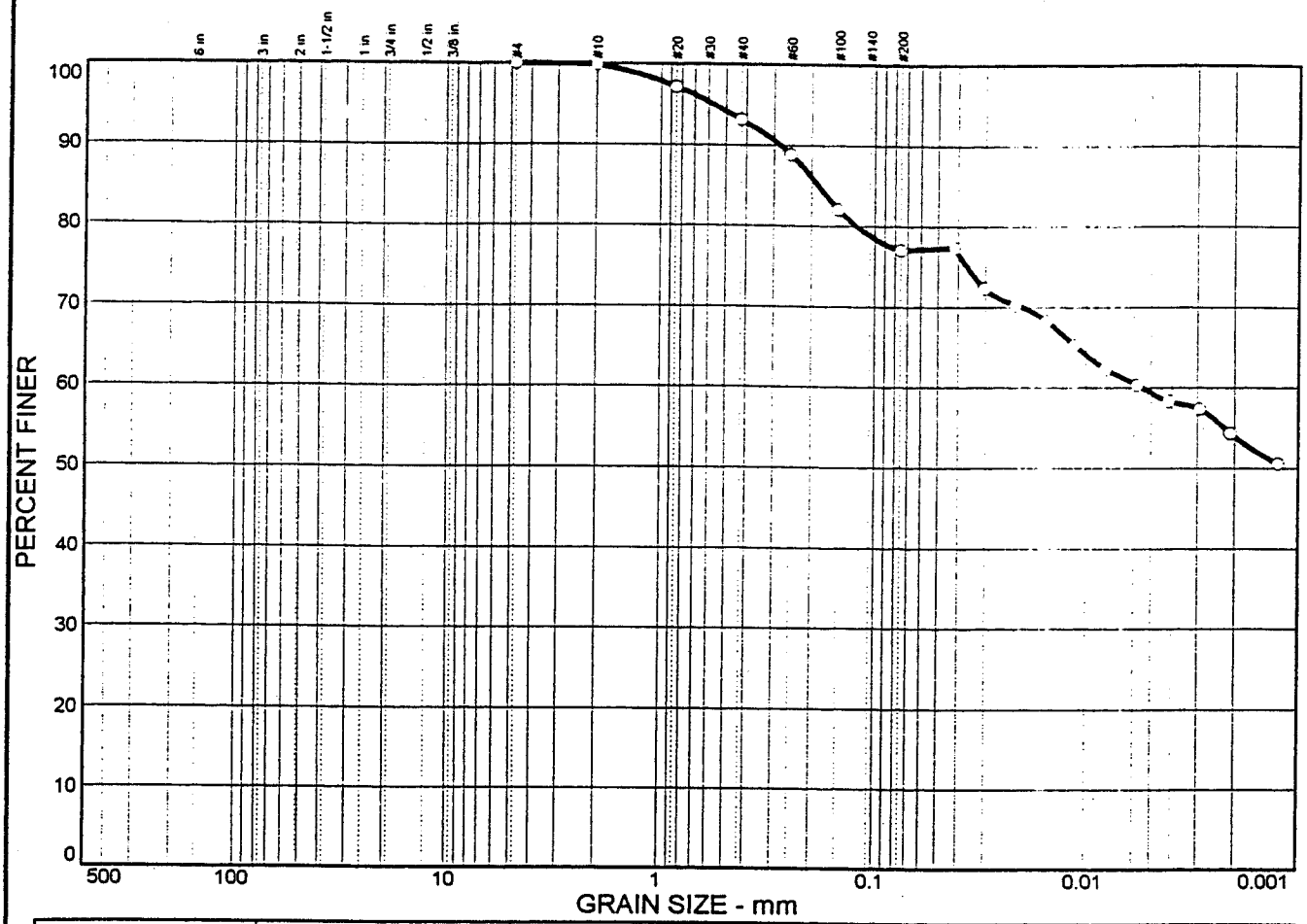
FOGLEMAN?

"Initial Conformance Testing"
Ellington Borrow Low Permeability Soil

Test Method	DL-014
Location	Ellington Borrow TP-2
Natural Moisture (ASTM D2216)	20.7%
Grainsize Analysis (ASTM D422)	
% Gravel	0.0
% Sand	23.0
% -#200	77.0
Atterberg Limits (ASTM D4318)	
LL	66
PL	26
PI	40
Standard Proctor (ASTM D698)	
Max. Dry Density (pcf)	96.8
Optimum Moisture (%)	22.5
Hydraulic Conductivity (ASTM D5084 - Method A)	
Permeability (cm/sec)	1.5×10^{-8}
Dry Density (pcf)	93.8
Moisture (%)	24.3

Note: Four (4) additional hydraulic conductivity tests were performed to develop the Acceptance Zone. Please see the attached individual test reports.

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	23.0	17.7	59.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	97.2		
#40	93.1		
#60	88.8		
#100	82.0		
#200	77.0		

* (no specification provided)

Soil Description

Fogelman - Fat clay with sand

Atterberg Limits

PL= 26 LL= 66 PI= 40

Coefficients

D_{85}= 0.186 D_{60}= 0.0055 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

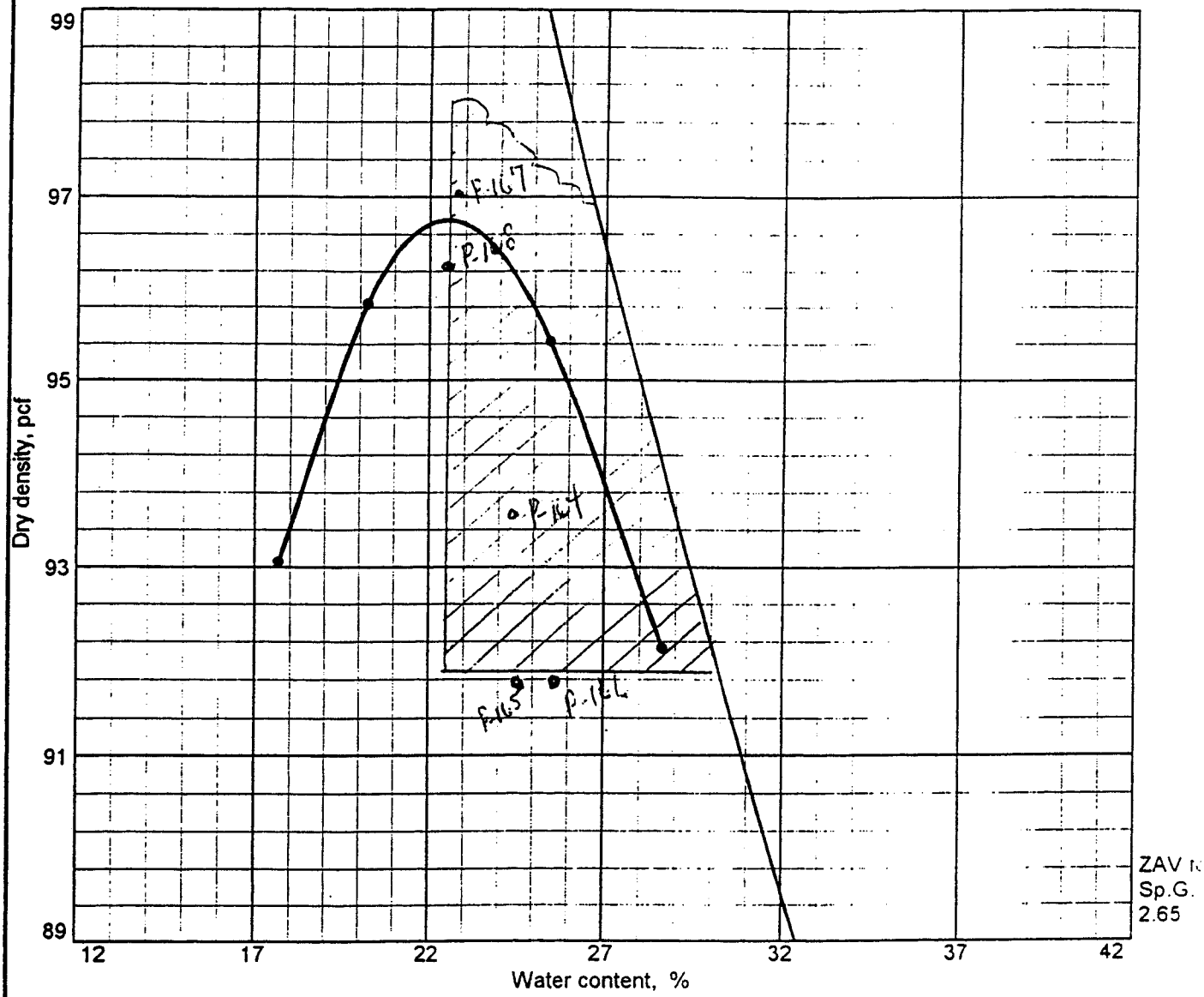
Remarks

DL-147, Sample from Fogelman Borrow Pit

Sample No.: DL-147 **Source of Sample:** Foggelman Borrow Pit **Date:**
Location: Foggelman borrow pit - Bulk Sample **Elev./Depth:**

VAN DER HORST ENGINEERING	**Client:** Gilbert Southern **Project:** Durham County Landfill Closure **Project No:** VNC-98-029 **Plate**

COMPACTION TEST REPORT



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	CH				66	40	0.0	77

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 96.8 pcf Optimum moisture = 22.5 %	Foggelman - Fat clay with sand

Project No. VNC-98- **Client:** Gilbert Southern

Project: Durham County Landfill Closure

Location: Foggelman borrow pit - Bulk Sample

Remarks:

Foggelman borrow pit - Clay

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/15/98
Report No.: P-164

Project No.: VNC-98-029
Sample No.: DL-147A

Project: Durham County Landfill Closure
Client: Gilbert Southern

Test Summary

Permeability	1.5E-008	cm/sec
% Moisture	24.3	%
Dry Density	93.8	pcf

Sample Information

Specimen Type:
Remolded X
Tube

Date Sampled: 11/03/98
Location: Fogelman Borrow Source

Specimen Data

Length (in):	4.105
Diameter (in.):	2.800
Area (sq. in.):	6.168
Volume (cu. in.):	25.32
Wet Weight (grams):	774.7
Dry Weight (grams):	623.3
Dry Density (pcf):	93.8

Moisture Content Test Data

Wet Weight	215.30
Dry Weight	180.63
Tare weight	37.91
% Moisture	24.3

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
440	121.85	0.50	0.40	0.80	0.45	1.45E-008
950	121.85	1.05	0.85	0.81	0.95	1.42E-008
515	121.85	0.60	0.50	0.83	0.55	1.52E-008
910	121.85	1.05	0.85	0.81	0.95	1.48E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 1.5E-008 cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/15/98
Report No.: P-165

Project No.: VNC-98-029
Sample No.: DL-147B

Project: Durham County Landfill Closure
Client: Gilbert Southern

Test Summary

Permeability	2.0E-008	cm/sec
% Moisture	23.6	%
Dry Density	91.8	pcf

Sample Information

Specimen Type:
Remolded X
Tube

Date Sampled: 11/03/98
Location: Fogelman Borrow Source

Specimen Data

Length (in):	4.089
Diameter (in.):	2.803
Area (sq. in.):	6.181
Volume (cu. in.):	25.28
Wet Weight (grams):	752.7
Dry Weight (grams):	609.2
Dry Density (pcf):	91.8

Moisture Content Test Data

Wet Weight	212.03
Dry Weight	188.79
Tare weight	90.16
% Moisture	23.6

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
910	121.85	1.45	1.30	0.90	1.38	2.13E-008
440	121.85	0.75	0.60	0.80	0.68	2.17E-008
950	121.85	1.45	1.15	0.79	1.30	1.93E-008
910	121.85	1.40	1.10	0.79	1.25	1.94E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.0E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/15/98
Report No.: P-166

Project No.: VNC-98-029
Sample No.: DL-147C

Project: Durham County Landfill Closure
Client: Gilbert Southern

Test Summary

Permeability	1.3E-008	cm/sec
% Moisture	25.4	%
Dry Density	91.6	pcf

Sample Information

Specimen Type:
Remolded X
Tube

Date Sampled: 11/03/98
Location: Fogelman Borrow Source

Specimen Data

Length (in):	4.095
Diameter (in.):	2.805
Area (sq. in.):	6.190
Volume (cu. in.):	25.35
Wet Weight (grams):	763.9
Dry Weight (grams):	609.2
Dry Density (pcf):	91.6

Moisture Content Test Data

Wet Weight	219.88
Dry Weight	182.93
Tare weight	37.48
% Moisture	25.4

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
910	121.85	1.00	0.80	0.80	0.90	1.40E-008
3560	121.85	4.30	3.25	0.76	3.78	1.50E-008
2960	121.85	3.00	2.40	0.80	2.70	1.29E-008
720	121.85	0.60	0.60	1.00	0.60	1.18E-008

Δ T Change in time (minutes)
H Driving head (inches)
Inflow (B) Flow in (cubic centimeters)
Inflow (C) Flow out (cubic centimeters)
Q Flow (cubic centimeters)

Permeability (k) **1.3E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/15/98
Report No.: P-167

Project No.: VNC-98-029
Sample No.: DL-147D

Project: Durham County Landfill Closure
Client: Gilbert Southern

Test Summary

Permeability	1.0E-008	cm/sec
% Moisture	22.8	%
Dry Density	97.1	pcf

Sample Information

Specimen Type:
Remolded X
Tube

Date Sampled: 11/03/98
Location: Fogelman Borrow Source

Specimen Data

Length (in):	3.995
Diameter (in.):	2.803
Area (sq. in.):	6.181
Volume (cu. in.):	24.69
Wet Weight (grams):	773.0
Dry Weight (grams):	629.5
Dry Density (pcf):	97.1

Moisture Content Test Data

Wet Weight	214.61
Dry Weight	181.73
Tare weight	37.44
% Moisture	22.8

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1419	121.85	0.90	1.10	1.22	1.00	9.72E-009
915	121.85	0.65	0.75	1.15	0.70	1.06E-008
877	121.85	0.60	0.70	1.17	0.65	1.02E-008
2173	121.85	1.40	1.55	1.11	1.48	9.36E-009

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **1.0E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/15/98
Report No.: P-168

Project No.: VNC-98-029
Sample No.: DL-147E

Project: Durham County Landfill Closure
Client: Gilbert Southern

Test Summary

Permeability	1.1E-008	cm/sec
% Moisture	22.5	%
Dry Density	96.2	pcf

Sample Information

Specimen Type:
Remolded X
Tube

Date Sampled: 11/03/98
Location: Fogelman Borrow Source

Specimen Data

Length (in):	4.031
Diameter (in.):	2.800
Area (sq. in.):	6.168
Volume (cu. in.):	24.86
Wet Weight (grams):	769.1
Dry Weight (grams):	627.6
Dry Density (pcf):	96.2

Moisture Content Test Data

Wet Weight	206.10
Dry Weight	175.05
Tare weight	37.34
% Moisture	22.5

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1261	121.85	1.10	1.30	1.18	1.20	1.33E-008
887	121.85	0.70	0.75	1.07	0.73	1.14E-008
876	121.85	0.60	0.65	1.08	0.63	9.95E-009
950	121.85	0.65	0.80	1.23	0.73	1.06E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **1.1E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

MALCOLM PIRNIE

LETTER OF TRANSMITTAL

: GILBERT SOUTHERN CORP
3301 GLENN ROAD
DURHAM, NC 27704

Transm'l Date : 12/31/98
Transm'l No. : 0034
Spec'n Section : 02250

Attention: ANDY PALAHNUK

Re: CITY OF DURHAM, NORTH CAROLINA
DURHAM MUNICIPAL SOLID WASTE LANDFILL FACILITY CLOSURE

Gentlemen:
We are sending you via, U.S. Mail the following items:

No.	Manufacturer's Name	Drawing Reference	Description	Act'n Taken
4	VAN DER HORST	19 PAGES	TEST PAD REPORT - FOGELMAN PIT CLAY BORROW & CT026	AC

Our action relative to items submitted for approval has been noted above and on the drawings.

Remarks:
NOTE THAT SUBMITTAL CT-026 WAS REVIEWED AS PART OF SUBMITTAL 0034.

Copies to:
TOM GLENN, W/ENCL;
BARRY HERZBERG, W/ENCL; FILE

Very truly yours
MALCOLM PIRNIE, INC.
by ORIGINAL SIGNED BY
JAY JACKSON, PE

Form 69 Printed in USA
Rev 10/95

Gilbert Southern
(Company Name)

ADDRESS REPLY TO:

LETTER OF TRANSMITTAL

3301 Glenn Rd,
DURHAM, NC 27704

TO: Jay Jackson
Malcolm Pirnie

DATE 12/15/98 CO. NO. 44 JOB NO. 3124

TRANSMITTAL NO. _____

RE: _____

WE ARE SENDING ☑ Attached
☐ Under separate cover via _____ the following:

☐ Drawings ☐ Plans ☐ Progress Payment ☐ Subcontractor
☐ Prints ☐ Samples ☐ Specifications ☐ Change Order
☐ Payroll ☐ EEO Report ☐ Certificates of Compliance ☐ Copy of Letter

☐ _____ ☐ _____

COPIES	DATE	NO.	DESCRIPTION
3	12/15/98	~~CT-023~~ 34	Foglemans Test pad.

RECEIVED
DEC 18 1998
MALCOLM PIRNIE
CHARLOTTE
ROUTE: SC3
SMM
JOB #
FILE:

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☐ _____ ☐ _____

☐ FOR BIDS DUE _____ 19____ ☐ PRINTS RETURNED AFTER LOAN TO US.

REMARKS _____

COPY TO: Barry Heyberg (1 copy)

SIGNED: James Bisir

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 12/14/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	12/12/98	VNC-98-029.023	Test Pad Summary Report - Fogelman Pit Clay Borrow

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST

GEOTECHNICAL ENGINEERING, PC

CONSTRUCTION MONITORING

MATERIALS TESTING

EXPLORATORY DRILLING

December 12, 1998

Mr. Andy Palabunk
Gilbert Southern Corp.
3301 Glenn Road
Durham, NC 27704

Re: Test Pad Summary Report - Fogelman Pit Clay Borrow
Durham Landfill Closure
VNC-98-029.023

Dear Andy:

VAN DER HORST Geotechnical Engineering, PC, is pleased to present our field and laboratory test results for the low permeability soil test pad. The test pad was constructed on November 15, 1998. The material placed for construction of the test pad was delivered from the Fogelman borrow source. Initial conformance testing was previously submitted for this borrow source.

The material was placed in loose lifts not exceeding 9" in loose thickness and compacted using a CAT 815 compactor. Generally compaction was obtained in two pass with the 815 and the compacted lift thickness ranged from 6 to 6 ½ inches. A tabular summary is attached to this report which provides both loose and compacted lift thickness measurements taken during the test pad construction. During construction moisture content and in-place density testing was performed. The in-place density tests and in-place moisture content tests (ASTM D3017) are presented on the attached in-place density test reports. In addition to the in-place moisture tests 10 random samples were collected at field mositure test locations for oven dried analysis. This data is also presented on the in-place density test reports. The second moisture content provided at a given location represents the oven dried test result.

Also during the test pad construction shelby tube samples and composite samples were obtained from each lift. The shelby tube samples were tested for hydraulic conductivity (permeability). Attached please find 4 permeability test reports presenting the permeability test data. The random bulk samples were tested for Atterberg Limits, Grain-size analysis and USCS soil classification. Our laboratory test reports are attached presenting our test results.

VAN DER HORST

The attached table presents a summary of laboratory test results for, Atterberg Limits (ASTM D-4318), Grain-size (ASTM D-422), USCS soil classification (ASTM D2487) and Permeability (ASTM D-5084).

We will issue the Boutwell test data along with the associated additional laboratory testing in a separate report.

Should you have any questions or need additional information, please do not hesitate to contact our office.

Respectfully submitted,

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Robert, Mashewske, P.E.
Regional Manger / Senior Engineer

VAN DER HORST

DURHAM LANDFILL CLOSURE
VNC-98-029.023

"Test Pad Evaluation Testing"
Fogelman Pit - Low Permeability Soil

Test Method	DL-143	DL-144	DL-145	DL-146
Location	Lift #1	Lift #2	Lift #3	Lift #4
Natural Moisture Content (%) (ASTM D-2216)	28.3	30.1	28.9	28.0
USCS Soil Classification	CH	CH	CH	CH
Grainsize Analysis (ASTM D422)				
% Gravel	0.0	0.0	0.0	0.0
%Sand	20.2	25.6	19.1	23.1
%Silt	19.9	20.2	22.9	20.1
% Clay	59.9	54.2	58.0	56.8
Atterberg Limits (ASTM D4318)				
LL	72	64	68	67
PL	26	24	25	25
PI	46	40	43	42
Hydraulic Conductivity (ASTM D-5084)				
Density (pcf)	98.5	94.5	93.0	92.4
Moisture (%)	23.6	24.1	28.4	31.3
Permeability (cm/sec)	6.0×10^{-8}	8.1×10^{-9}	1.7×10^{-8}	6.2×10^{-9}

VAN DER HORST

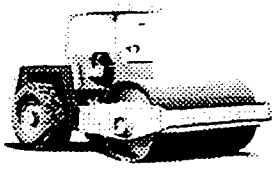
Lift Thickness Summary Table
Durham Landfill Closure - Test Pad
(Fogelman borrow clay)
VNC-98-029.023

	Lift #1		Lift #2		Lift #3		Lift #4	
Test	**Loose**	**Comp.**	**Loose**	**Comp.**	**Loose**	**Comp.**	**Loose**	**Comp.**
1	8.5	6.0	8.5	6.0	8.5	5.75	8.5	6.0
2	9.0	6.25	9.25	6.5	8.5	6.0	8.5	5.75
3	9.0	6.0	8.5	6.0	8.25	5.75	8.5	5.75
4	9.0	6.0	8.5	6.25	9.25	6.25	8.5	5.75
5	9.0	6.25	8.75	6.0	8.5	6.0	8.5	6.0
6	9.0	6.0	8.5	6.0	8.5	6.0	8.75	6.0
7	8.5	6.0	9.0	6.0	8.5	5.75	8.75	6.0
8	8.5	6.0	9.0	6.25	8.5	5.75	8.5	5.5
9	8.5	6.0	8.25	5.75	9.0	6.0	9.0	6.0
10	9.0	6.0	8.75	5.75	8.5	5.5	9.0	6.0

Note: All measurements are to the nearest 1/4"

COMPACTED LIFTS SHOULD HAVE BEEN ≤ 6-INCH PER SECTION 02250 PART 2.1.C.4 & 2. ENSURE 6-INCH MAXIMUM DURING EXECUTION PER PART 3.1.A.

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	11/5/98 pg. 1 of 4
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-27

GENERAL LOCATION: Fogelman Test Pad

TEST NO	LOCATION	DEPTH OR ELEV	DRY DENSITY [PCF]	MOIST CONTENT [%]	[illegible]	SAMPLE NO
1	See Attached Test Location Plan	lift 1	92.0	28.8/27.6	95.0	DL-147
2	See Attached Test Location Plan	lift 1	92.6	30.8	95.6	DL-147
3	See Attached Test Location Plan	lift 1	93.6	27.8	96.6	DL-147
4	See Attached Test Location Plan	lift 1	92.7	29.3/29.0	95.7	DL-147
5	See Attached Test Location Plan	lift 1	92.9	29.4	95.9	DL-147
6	See Attached Test Location Plan	lift 1	95.4	27.3	98.5	DL-147
7	See Attached Test Location Plan	lift 1	93.4	23.1/24.3	96.5	DL-147
8	See Attached Test Location Plan	lift 1	94.8	29.4	97.9	DL-147
9	See Attached Test Location Plan	lift 1	92.2	30.5	95.2	DL-147
10	See Attached Test Location Plan	lift 1	92.2	30.1/28.4	95.2	DL-147

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-147	96.8	22.5	Fogleman Borrow - Silty Clay

REMARKS: Bag sample obtained near test locations 1, 4, 7 and 10, shelby tube sample obtained near test

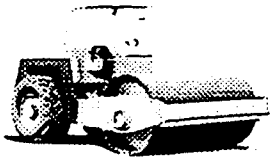
ARRIVED ON SITE: 7:00
LEFT SITE: 3:30
HOURS ON SITE: 8.5
TRAVEL TIME: 1.0
MILEAGE: 70

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	11/5/98 pg. 2 of 4
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-27

GENERAL LOCATION: Fogelman Test Pad

TEST NO.	LOCATION	DEPTH OR ELEV	DRY DENSITY [PCF]	MOIST CONTENT [%]	[illegible]	SAMPLE NO.
11	See Attached Test Location Plan	lift 2	93.2	28.5	96.2	DL-147
12	See Attached Test Location Plan	lift 2	92.8	31.6	95.9	DL-147
13	See Attached Test Location Plan	lift 2	93.3	32.3	96.4	DL-147
14	See Attached Test Location Plan	lift 2	92.3	31.6/30.8	95.3	DL-147
15	See Attached Test Location Plan	lift 2	92.7	28.4	95.7	DL-147
16	See Attached Test Location Plan	lift 2	93.6	28.8	96.7	DL-147
17	See Attached Test Location Plan	lift 2	92.5	30.1	96.7	DL-147
18	See Attached Test Location Plan	lift 2	91.6	29.4/28.3	94.6	DL-147
19	See Attached Test Location Plan	lift 2	93.0	29.6	96.1	DL-147
20	See Attached Test Location Plan	lift 2	94.6	27.9	97.7	DL-147

95.6

SAMPLE NO.	MAXIMUM D.D.(PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-147	96.8	22.5	Fogleman Borrow - Silty Clay

REMARKS: Bag sample obtained near test locations 18 and 14, shelby tube sample obtained near test location

ARRIVED ON SITE: 7:00

LEFT SITE: 3:30

HOURS ON SITE: 8.5

TRAVEL TIME: 1.0

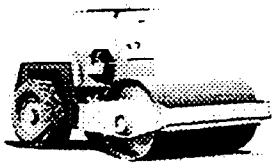
MILEAGE: 70

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

PERFORMED BY: Mark Potratz

PREVIEWED BY: Robert Mashewshc, P.E.

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	11/5/98 pg. 3 of 4
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-27

GENERAL LOCATION: Fogelman Test Pad

TEST NO	LOCATION	DEPTH OR ELEV	DRY DENSITY [PCF]	MOIST CONTENT [%]	[illegible]	SAMPLE NO
21	See Attached Test Location Plan	lift 3	92.7	31.0	95.8	DL-147
22	See Attached Test Location Plan	lift 3	95.2	29.1	98.3	DL-147
23	See Attached Test Location Plan	lift 3	93.4	28.8	96.5	DL-147
24	See Attached Test Location Plan	lift 3	93.4	29.6/29.3	96.4	DL-147
25	See Attached Test Location Plan	lift 3	92.5	29.6	95.5	DL-147
26	See Attached Test Location Plan	lift 3	94.8	28.8	97.9	DL-147
27	See Attached Test Location Plan	lift 3	95.1	27.7	98.2	DL-147
28	See Attached Test Location Plan	lift 3	91.9	31.8/30.0	94.9	DL-147
29	See Attached Test Location Plan	lift 3	92.1	30.1	95.1	DL-147
30	See Attached Test Location Plan	lift 3	93.3	28.8	96.3	DL-147

SAMPLE NO	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-147	96.8	22.5	Fogleman Borrow - Silty Clay

REMARKS: Bag sample obtained near test locations 24 and 28, shelby tube sample obtained near test location

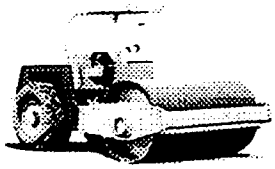
ARRIVED ON SITE: 7:00
LEFT SITE: 3:30
HOURS ON SITE: 8.5
TRAVEL TIME: 1.0
MILEAGE: 70

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	11/5/98 pg. 4 of 4
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-27

GENERAL LOCATION: Fogelman Test Pad

TEST NO	LOCATION	DEPTH OR ELEV	DRY DENSITY [PCF]	MOIST CONTENT [%]	[illegible] [PCF]	SAMPLE NO
31	See Attached Test Location Plan	lift 4	91.7	31.1	94.7	DL-147
32	See Attached Test Location Plan	lift 4	93.1	29.1	96.1	DL-147
33	See Attached Test Location Plan	lift 4	92.8	29.5	95.8	DL-147
34	See Attached Test Location Plan	lift 4	93.9	29.2/29.3	97.0	DL-147
35	See Attached Test Location Plan	lift 4	94.2	28.5	97.3	DL-147
36	See Attached Test Location Plan	lift 4	93.4	28.0	96.5	DL-147
37	See Attached Test Location Plan	lift 4	93.0	28.9	96.0	DL-147
38	See Attached Test Location Plan	lift 4	93.0	28.9/29.5	96.0	DL-147
39	See Attached Test Location Plan	lift 4	92.7	30.1	95.8	DL-147
40	See Attached Test Location Plan	lift 4	92.3	30.8	95.4	DL-147

SAMPLE NO	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-147	96.8	22.5	Fogleman Borrow - Silty Clay

REMARKS: Bag sample obtained near test locations 34 and 38, shelby tube sample obtained near test location

ARRIVED ON SITE: 7:00
LEFT SITE: 3:30
HOURS ON SITE: 8.5
TRAVEL TIME: 1.0
MILEAGE: 70

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

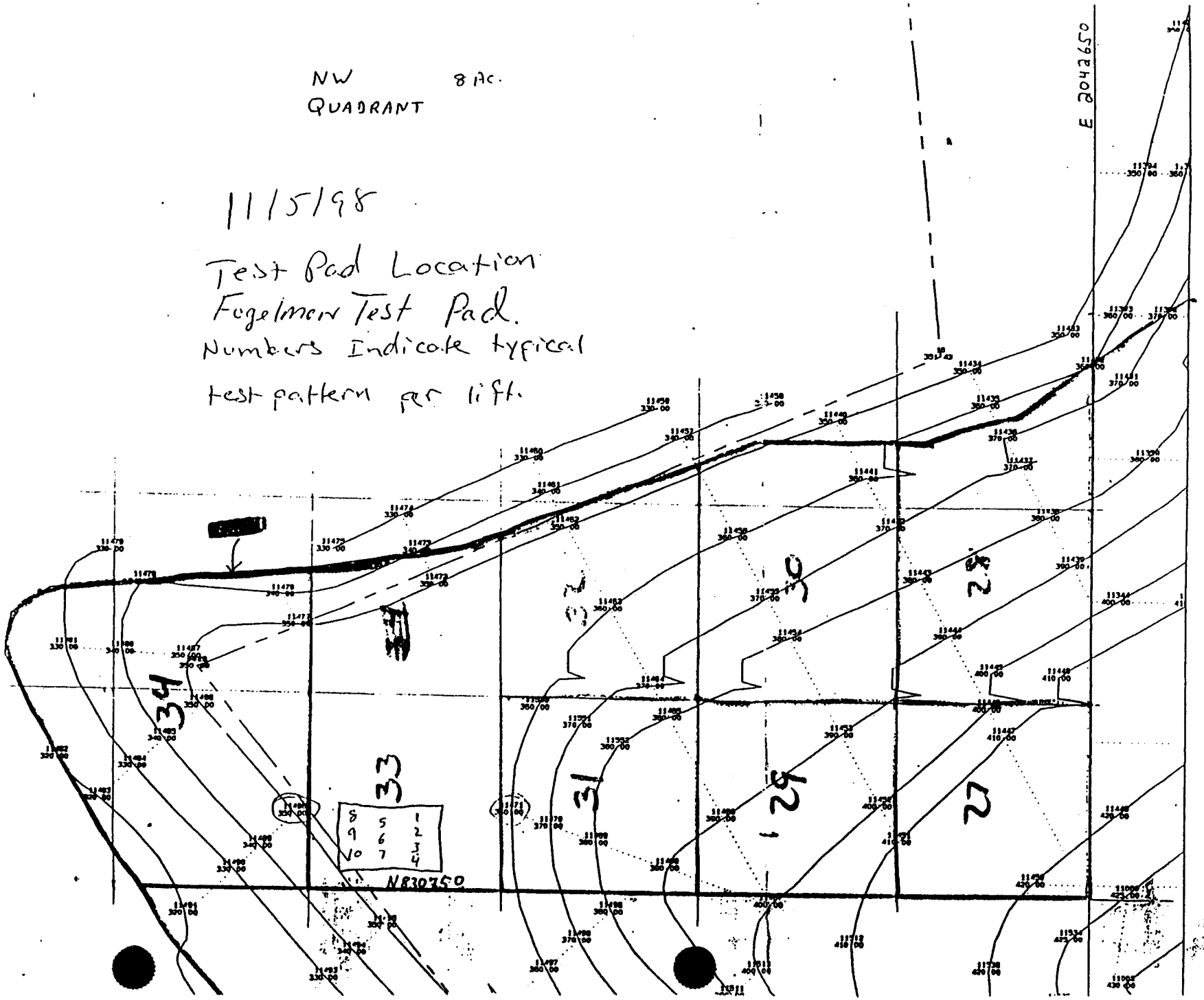
PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

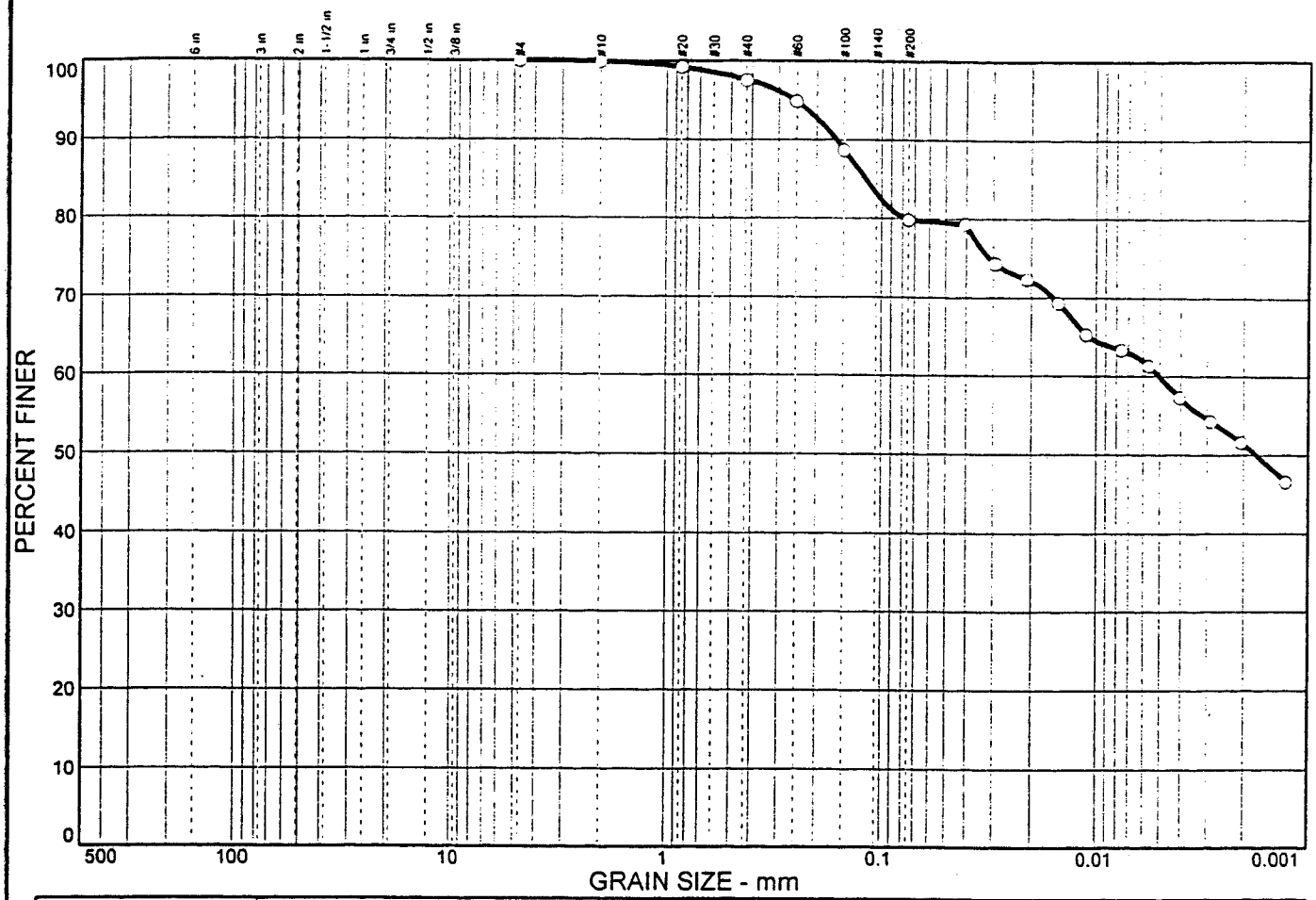
NW 8 Ac.
QUADRANT

11/5/98

Test Pad Location
Fogelman Test Pad.
Numbers Indicate typical
test pattern per lift.



Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	20.2	19.9	59.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.2		
#40	97.6		
#60	94.9		
#100	88.7		
#200	79.8		

* (no specification provided)

Soil Description

Test Pad Lift #1 - Fat clay with sand

Atterberg Limits

PL= 26 LL= 72 PI= 46

Coefficients

D_{85}= 0.119 D_{60}= 0.0050 D_{50}= 0.0017
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

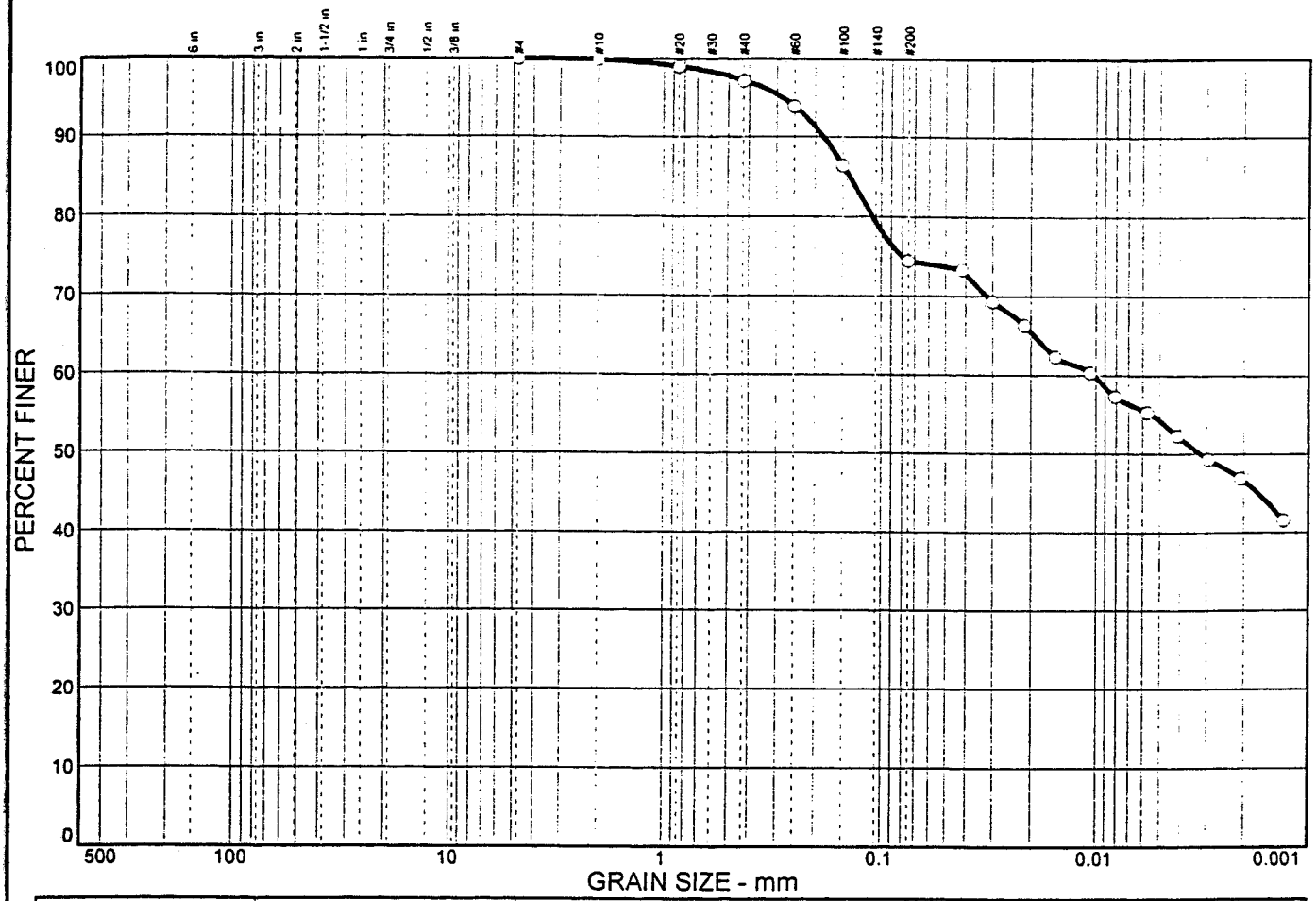
Remarks

DL-143, Test Pad Lift #1

Sample No.: DL-143 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman Test Pad - Lift #1 **Elev./Depth:**

VAN DER HORST ENGINEERING	**Client:** Gilbert Southern **Project:** Durham County Landfill Closure **Project No:** VNC-98-029 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	25.6	20.2	54.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.0		
#40	97.2		
#60	93.9		
#100	86.4		
#200	74.4		

* (no specification provided)

Soil Description

Test Pad Lift #2 - Fat clay with sand

Atterberg Limits

PL= 24 LL= 64 PI= 40

Coefficients

D_{85}= 0.140 D_{60}= 0.0103 D_{50}= 0.0032
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

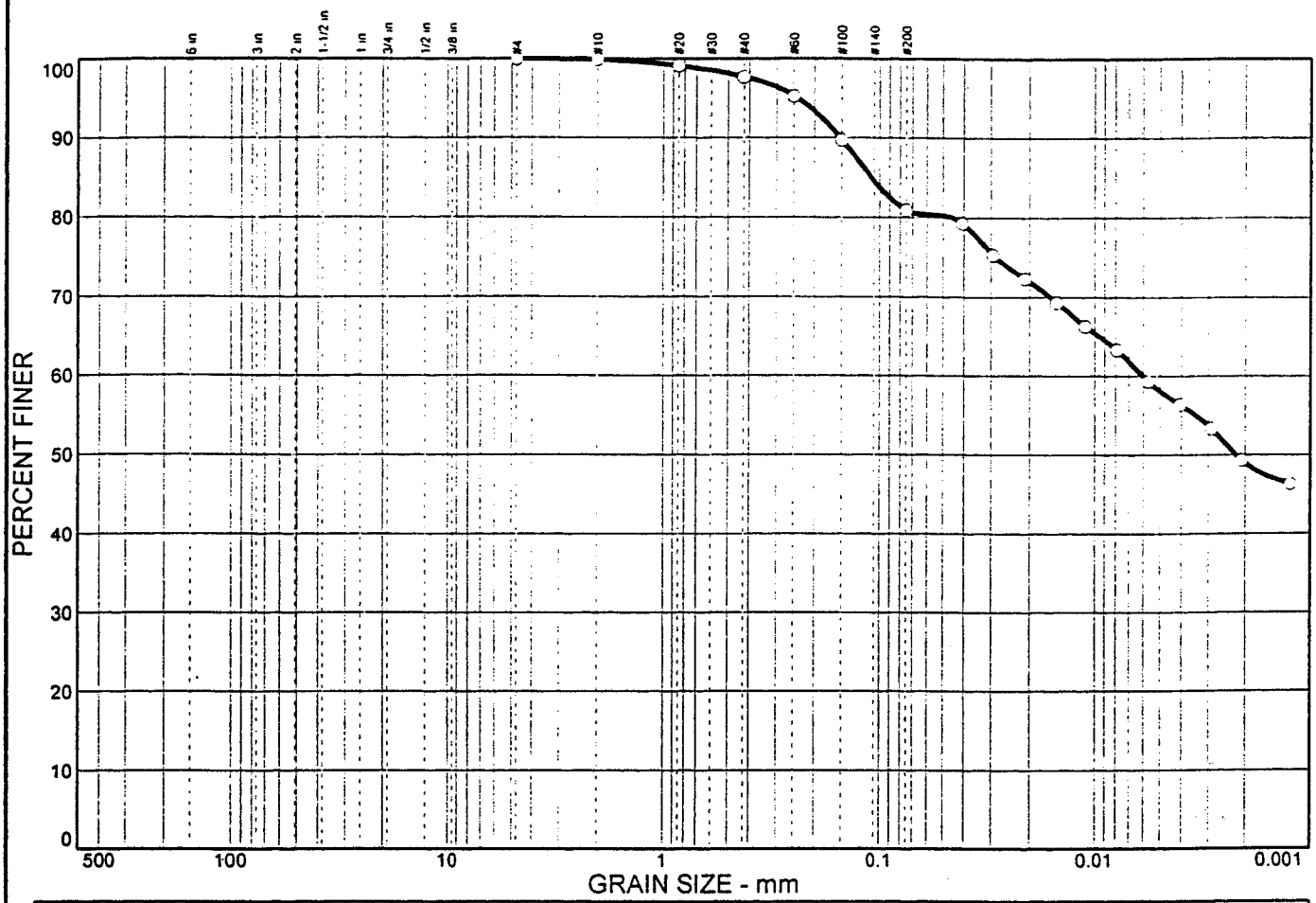
Remarks

DL-144, Test Pad Lift #2

Sample No.: DL-144 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman Test Pad - Lift #2 **Elev./Depth:**

VAN DER HORST ENGINEERING	**Client:** Gilbert Southern **Project:** Durham County Landfill Closure **Project No:** VNC-98-029 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	19.1	22.9	58.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.1		
#40	97.7		
#60	95.3		
#100	89.7		
#200	80.9		

* (no specification provided)

Soil Description

Test Pad Lift #3 - Fat clay with sand

Atterberg Limits

PL= 25 LL= 68 PI= 43

Coefficients

D_{85}= 0.110 D_{60}= 0.0060 D_{50}= 0.0022
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

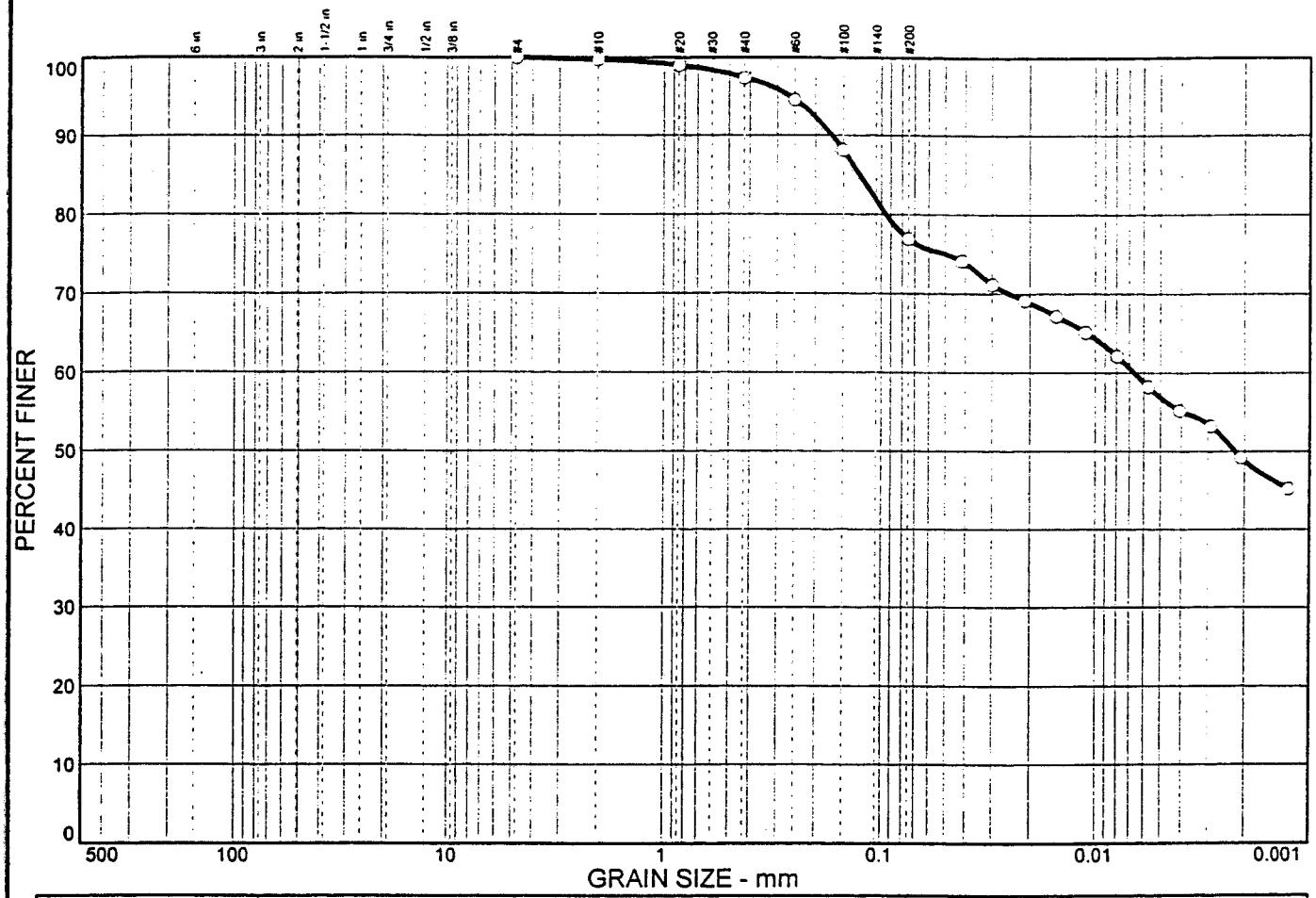
DL-145, Test Pad Lift #3

Sample No.: DL-145 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman Test Pad - Lift #3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	23.1	20.1	56.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	99.0		
#40	97.4		
#60	94.6		
#100	88.1		
#200	76.9		

* (no specification provided)

Soil Description

Test Pad Lift #4 - Fat clay with sand

Atterberg Limits

PL= 25 LL= 67 PI= 42

Coefficients

D_{85}= 0.126 D_{60}= 0.0066 D_{50}= 0.0022
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

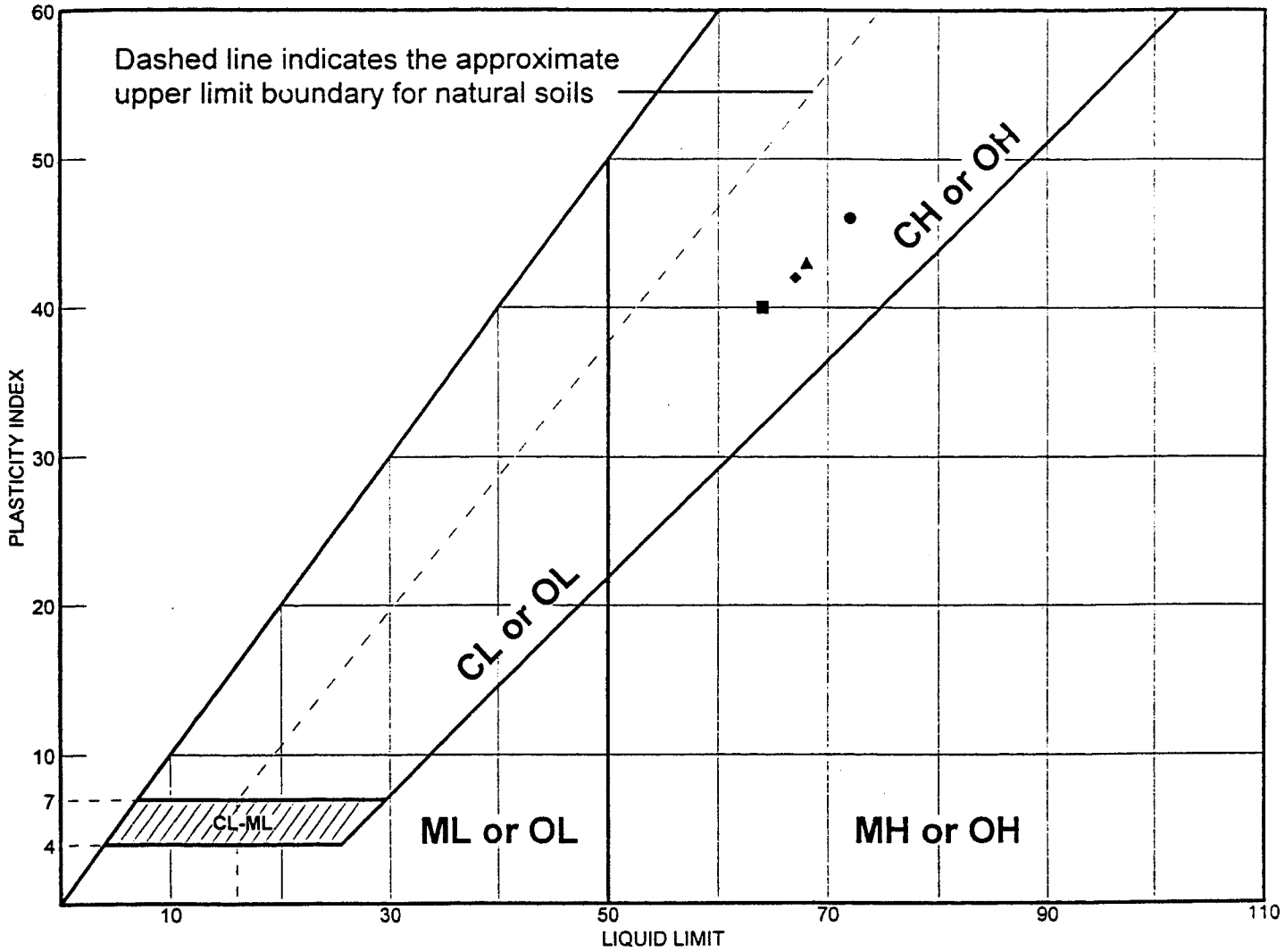
DL-146. Test Pad Lift #4

Sample No.: DL-146 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman Test Pad - Lift #4 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Test Pad Lift #1 - Fat clay with sand	72	26	46	97.6	79.8	CH
■	Test Pad Lift #2 - Fat clay with sand	64	24	40	97.2	74.4	CH
▲	Test Pad Lift #3 - Fat clay with sand	68	25	43	97.7	80.9	CH
◆	Test Pad Lift #4 - Fat clay with sand	67	25	42	97.4	76.9	CH

Project No. VNC-98-029 **Client:** Gilbert Southern

Project: Durham County Landfill Closure

● **Location:** Fogelman Test Pad - Lift #1
■ **Location:** Fogelman Test Pad - Lift #2
▲ **Location:** Fogelman Test Pad - Lift #3
◆ **Location:** Fogelman Test Pad - Lift #4

Remarks:
● DL-143, Test Pad Lift #1
■ DL-144, Test Pad Lift #2
▲ DL-145, Test Pad Lift #3
◆ DL-146, Test Pad Lift #4

LIQUID AND PLASTIC LIMITS TEST REPORT

VAN DER HORST ENGINEERING

Plate

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-133

Project No.: VNC-98-029
Sample No.: DL-143

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.0E-008	cm/sec
% Moisture	23.6	%
Dry Density	98.5	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/05/98
Location: Fogleman Test Pad, Lift 1

Specimen Data

Length (in):	3.360
Diameter (in.):	2.856
Area (sq. in.):	6.417
Volume (cu. in.):	21.56
Wet Weight (grams):	689.0
Dry Weight (grams):	557.3
Dry Density (pcf):	98.5

Moisture Content Test Data

Wet Weight	120.89
Dry Weight	101.99
Tare weight	22.02
% Moisture	23.6

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
274	83.08	0.90	1.10	1.22	1.00	5.98E-008
560	83.08	2.00	2.10	1.05	2.05	6.00E-008
280	83.08	1.00	1.00	1.00	1.00	5.85E-008
273	83.08	1.00	1.00	1.00	1.00	6.00E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **6.0E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-134

Project No.: VNC-98-029
Sample No.: DL-144

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.1E-009	cm/sec
% Moisture	24.1	%
Dry Density	94.5	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/05/98
Location: Fogleman Test Pad, Lift 2

Specimen Data

Length (in):	2.801
Diameter (in.):	2.865
Area (sq. in.):	6.458
Volume (cu. in.):	18.09
Wet Weight (grams):	557.0
Dry Weight (grams):	448.9
Dry Density (pcf):	94.5

Moisture Content Test Data

Wet Weight	93.93
Dry Weight	79.97
Tare weight	22.02
% Moisture	24.1

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1265	132.92	1.20	1.35	1.13	1.28	8.55E-009
687	132.92	0.70	0.65	0.93	0.68	8.34E-009
670	132.92	0.60	0.65	1.08	0.63	7.91E-009
708	132.92	0.60	0.70	1.17	0.65	7.79E-009

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **8.1E-009** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-135

Project No.: VNC-98-029
Sample No.: DL-145

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.7E-008	cm/sec
% Moisture	28.4	%
Dry Density	93.0	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/05/98
Location: Fogleman Test Pad , Lift 3

Specimen Data

Length (in):	3.208
Diameter (in.):	2.835
Area (sq. in.):	6.323
Volume (cu. in.):	20.29
Wet Weight (grams):	635.6
Dry Weight (grams):	495.2
Dry Density (pcf):	93.0

Moisture Content Test Data

Wet Weight	123.86
Dry Weight	101.34
Tare weight	21.91
% Moisture	28.4

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
678	102.46	1.00	0.90	0.90	0.95	1.80E-008
361	102.46	0.50	0.50	1.00	0.50	1.78E-008
555	102.46	0.70	0.70	1.00	0.70	1.62E-008
480	102.46	0.60	0.55	0.92	0.58	1.54E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **1.7E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-136

Project No.: VNC-98-029
Sample No.: DL-146

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.2E-009	cm/sec
% Moisture	31.3	%
Dry Density	92.4	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/05/98
Location: Fogleman Test Pad , Lift 4

Specimen Data

Length (in):	2.359
Diameter (in.):	2.852
Area (sq. in.):	6.399
Volume (cu. in.):	15.10
Wet Weight (grams):	480.7
Dry Weight (grams):	366.2
Dry Density (pcf):	92.4

Moisture Content Test Data

Wet Weight	111.13
Dry Weight	89.92
Tare weight	22.12
% Moisture	31.3

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1625	96.92	1.30	1.10	0.85	1.20	7.30E-009
679	127.38	0.55	0.60	1.09	0.58	6.37E-009
914	127.38	0.55	0.60	1.09	0.58	4.73E-009
477	127.38	0.40	0.40	1.00	0.40	6.31E-009

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **6.2E-009** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST
EOTECHNICAL ENGINEERING, PC
ONSTRUCTION MONITORING
TERIALS TESTING
XPLORATORY DRILLING

☐ APPROVED
☑ APPROVED AS CORRECTED
☐ REVISE AND RESUBMIT
☐ NOT APPROVED

Checking is only for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

MALCOLM PIRNIE, INC.

Date 12/22/98 By SMM

December 16, 1998

Mr. Andy Palabunk
Gilbert Southern Corp.
3301 Glenn Road
Durham, NC 27704

Re: Test Pad Report - Fogelman Borrow Source
Boutwell Permeability Testing
Durham Landfill Closure
VNC-98-029.024

Dear Andy:

VAN DER HORST Geotechnical Engineering, PC, is pleased to present our field and laboratory test results for the "Boutwell" in-place permeability testing of the low permeability soil test pad. The test pad was constructed on November 11, 1998. The material placed for construction of the test pad was from the fogelman borrow source. Initial conformance testing and test pad testing was previously submitted.

A tabular summary is attached to this report which provides the "Boutwell" permeability test results as well as corresponding shelby tube permeability test results and indices tests. Also attached please find a test location drawing . The "Boutwell" permeameters were install on 11/18/98. A detail drawing of the installation accompanies this report. The test pad was installed on an approximately level grade. The Boutwell tubes were installed perpendicular to the horizon. The bottom of the Boutwell tubes were installed to a depth of 12 inches. A soil socket below the tube was excavated to a depth of 6 inches below the bottom of the tube. The tube annulus was sealed with bentonite powder and allowed to hydrate for 48 hours.

Should you have any questions or need additional information, please do not hesitate to contact our office.

Respectfully submitted,

Robert L. Mashewske

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Robert, Mashewske, P.E.
Regional Manger / Senior Engineer

Summit Point Drive
rietta, NY 14467
/359-2730
716/359-9668

DURHAM LANDFILL CLOSURE
VNC-98-029.024

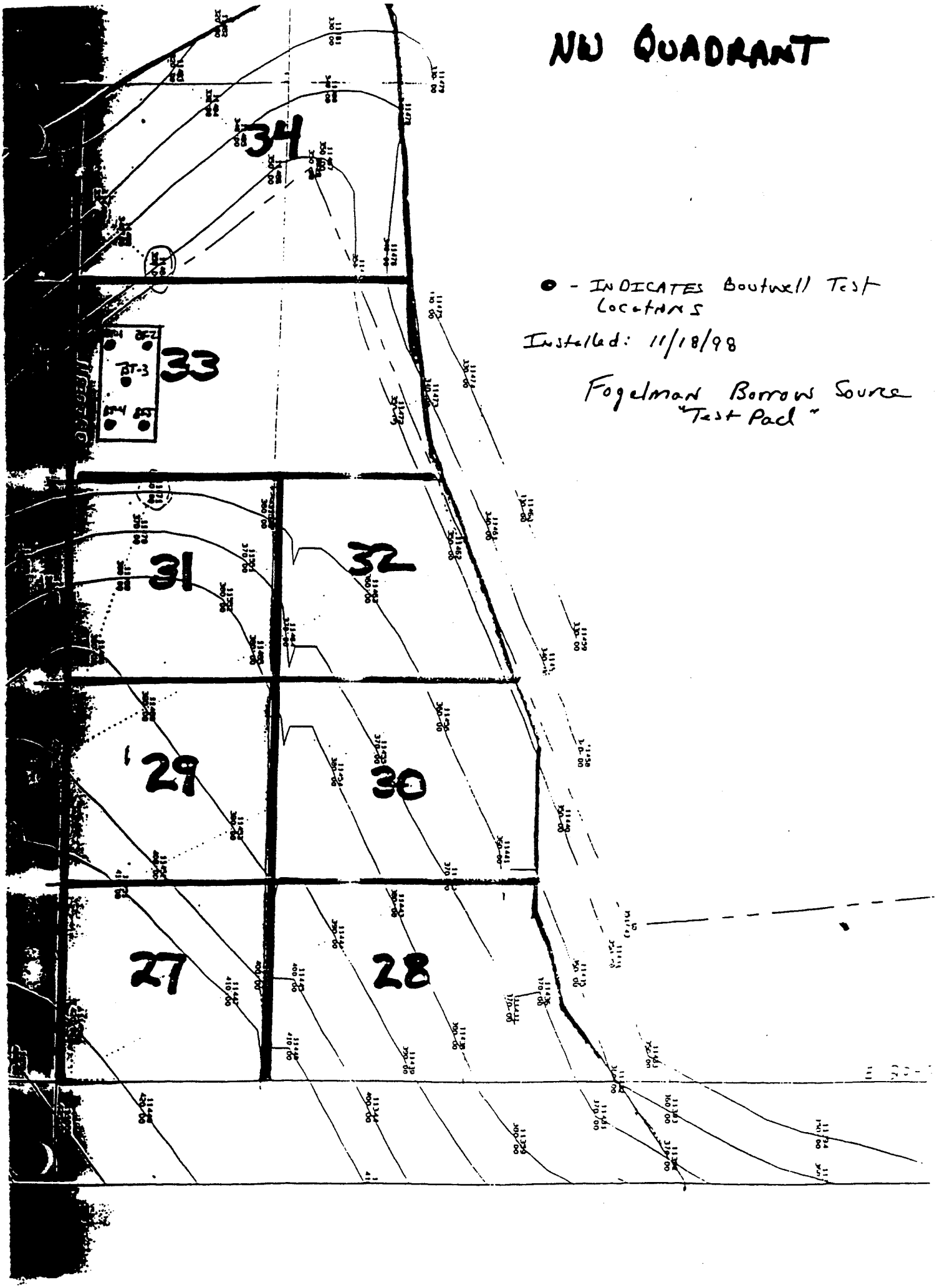
"Test Pad Evaluation Testing"
Boutwell In-place Permeability Testing
Fogelman Borrow - Low Permeability Soil

Test Method	DL-166	DL-167	DL-168	DL-169	DL-170
Location	BT-01	BT-02	BT-03	BT-04	BT-05
Natural Moisture Content (%) (ASTM D-2216)	26.5	26.7	26.5	25.8	28.9
USCS Soil Classification	CH	CH	CH	CH	CH
Grainsize Analysis (ASTM D422)					
% Gravel	0.0	0.0	0.0	0.0	0.2
%Sand	29.8	26.3	31.8	26.2	26.1
%Silt	11.6	15.7	16.7	18.9	19.5
% Clay	58.6	58.0	51.5	54.9	54.2
Atterberg Limits (ASTM D4318)					
LL	66	65	68	68	66
PL	26	25	24	25	25
PI	40	40	44	43	41
Hydraulic Conductivity (ASTM D-5084)					
Density (pcf)	92.3	94.3	94.0	97.1	94.6
Moisture (%)	26.5	26.7	26.5	25.8	28.9
Permeability (cm/sec)	6.0×10^{-9}	2.0×10^{-8}	5.8×10^{-9}	5.4×10^{-9}	4.8×10^{-9}
Boutwell Permeability (cm/sec)	2×10^{-8}	5×10^{-8}	**	$<1\times10^{-8}$	$<1\times10^{-8}$

** After 1 week running time, stabalized readings could not be obtained.

NEED 5TH TEST TO COMPLETE QA CHECK PER SPECIFICATION 02250-2.1.C-5(a) FOR HYDRAULIC CONDUCTIVITY.

NW QUADRANT



● - INDICATES Boutwell Test Locations

Installed: 11/18/98

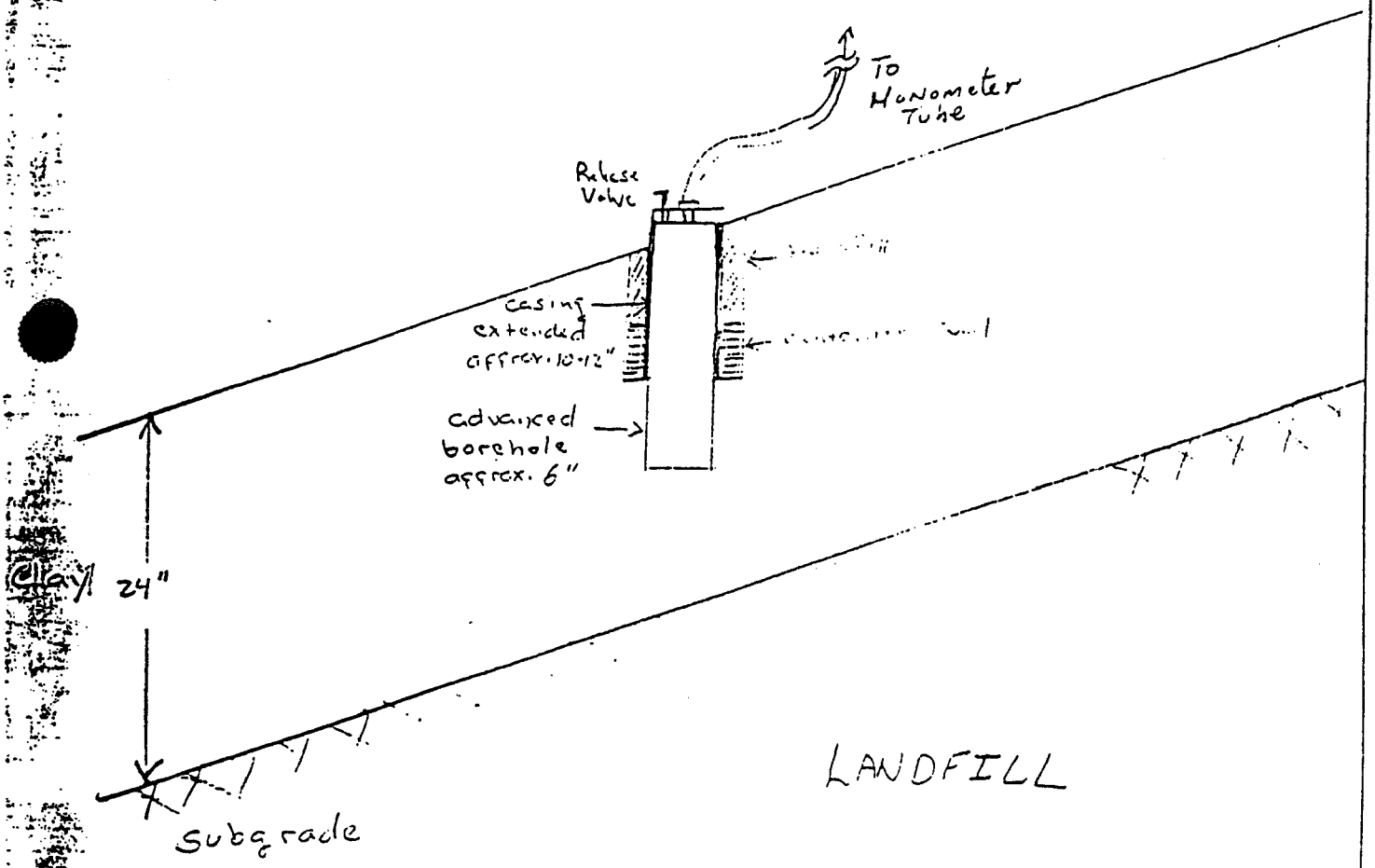
Fogelman Borrow Source "Test Pad"

VAN DER HORST
GEOTECHNICAL ENGINEERING, P.C.
3101 Stonybrook Dr., Suite 156
Raleigh, NC 27604
Fax: (919) 876-0460 Phone: (919) 876-0405

SHEET NO 1 OF 1
CALCULATED BY MP DATE 9/28/98
CHECKED BY BIN DATE 9/28/98
SCALE

VNC-98-029.016

BOUTWELL TEST INSTALLATION



VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-137

Project No.: VNC-98-029
Sample No.: DL-166

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.0E-008	cm/sec
% Moisture	26.7	%
Dry Density	94.3	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/12/98
Location: Fogleman Test Pad , Boutwell - BT- 1

Specimen Data

Length (in):	3.712
Diameter (in.):	2.860
Area (sq. in.):	6.435
Volume (cu. in.):	23.89
Wet Weight (grams):	749.5
Dry Weight (grams):	591.5
Dry Density (pcf):	94.3

Moisture Content Test Data

Wet Weight	121.81
Dry Weight	100.74
Tare weight	21.89
% Moisture	26.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
506	83.08	0.70	0.60	0.86	0.65	2.32E-008
372	83.08	0.55	0.65	1.18	0.60	2.91E-008
383	132.92	0.45	0.50	1.11	0.48	1.40E-008
787	132.92	1.10	1.05	0.95	1.08	1.54E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 2.0E-008 cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-138

Project No.: VNC-98-029
Sample No.: DL-167

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.0E-009	cm/sec
% Moisture	26.5	%
Dry Density	92.3	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/12/98
Location: Fogleman Test Pad Boutwell - BT - 2

Specimen Data

Length (in):	3.660
Diameter (in.):	2.895
Area (sq. in.):	6.594
Volume (cu. in.):	24.13
Wet Weight (grams):	739.0
Dry Weight (grams):	584.4
Dry Density (pcf):	92.3

Moisture Content Test Data

Wet Weight	120.28
Dry Weight	99.69
Tare weight	21.85
% Moisture	26.5

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
676	130.15	0.35	0.30	0.86	0.33	5.33E-009
789	130.15	0.40	0.35	0.88	0.38	5.27E-009
867	130.15	0.45	0.55	1.22	0.50	6.39E-009
635	130.15	0.40	0.40	1.00	0.40	6.98E-009

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 6.0E-009 cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-139

Project No.: VNC-98-029
Sample No.: DL-168

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.8E-009	cm/sec
% Moisture	26.5	%
Dry Density	94.0	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/12/98
Location: Fogleman Test Pad Boutwell - BT - 3

Specimen Data

Length (in):	3.632
Diameter (in.):	2.840
Area (sq. in.):	6.346
Volume (cu. in.):	23.05
Wet Weight (grams):	719.5
Dry Weight (grams):	568.8
Dry Density (pcf):	94.0

Moisture Content Test Data

Wet Weight	118.43
Dry Weight	98.22
Tare weight	21.94
% Moisture	26.5

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
876	138.46	0.50	0.50	1.00	0.50	6.13E-009
626	138.46	0.40	0.45	1.13	0.43	7.30E-009
1488	138.46	0.80	0.75	0.94	0.78	5.60E-009
1421	138.46	0.60	0.50	0.83	0.55	4.16E-009

Δ T — Change in time (minutes)
H — Driving head (inches)
Inflow (B) — Flow in (cubic centimeters)
Inflow (C) — Flow out (cubic centimeters)
Q — Flow (cubic centimeters)

Permeability (k) 5.8E-009 cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-140

Project No.: VNC-98-029
Sample No.: DL-169

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.4E-009	cm/sec
% Moisture	25.8	%
Dry Density	97.1	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/12/98
Location: Fogleman Test Pad Boutwell - BT - 4

Specimen Data

Length (in):	3.608
Diameter (in.):	2.830
Area (sq. in.):	6.301
Volume (cu. in.):	22.73
Wet Weight (grams):	728.8
Dry Weight (grams):	579.3
Dry Density (pcf):	97.1

Moisture Content Test Data

Wet Weight	146.92
Dry Weight	121.28
Tare weight	21.95
% Moisture	25.8

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
671	132.92	0.30	0.35	1.17	0.33	5.43E-009
788	132.92	0.40	0.35	0.88	0.38	5.33E-009
870	132.92	0.40	0.35	0.88	0.38	4.83E-009
633	132.92	0.35	0.35	1.00	0.35	6.19E-009

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 5.4E-009 cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-141

Project No.: VNC-98-029
Sample No.: DL-170

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.8E-009	cm/sec
% Moisture	28.9	%
Dry Density	94.6	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/12/98
Location: Fogleman Test Pad Boutwell - BT - 5

Specimen Data

Length (in):	3.355
Diameter (in.):	2.865
Area (sq. in.):	6.458
Volume (cu. in.):	21.67
Wet Weight (grams):	693.4
Dry Weight (grams):	537.7
Dry Density (pcf):	94.6

Moisture Content Test Data

Wet Weight	139.99
Dry Weight	113.51
Tare weight	22.03
% Moisture	28.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
673	138.46	0.40	0.15	0.38	0.28	3.99E-009
788	138.46	0.40	0.45	1.13	0.43	5.26E-009
876	138.46	0.45	0.35	0.78	0.40	4.45E-009
626	138.46	0.35	0.35	1.00	0.35	5.45E-009

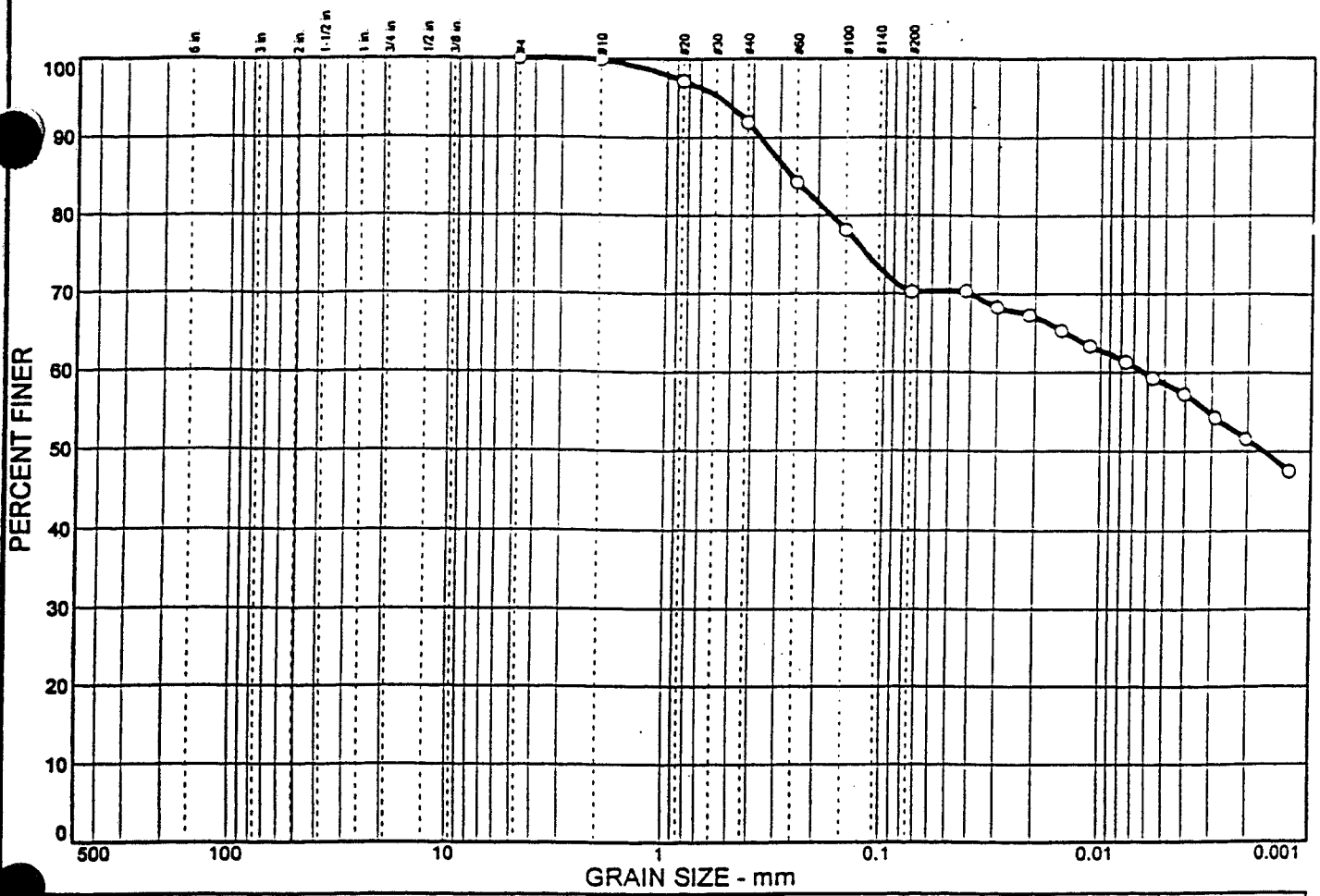
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 4.8E-009 cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	29.8	11.6	58.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	97.2		
#40	91.9		
#60	84.3		
#100	78.1		
#200	70.2		

* (no specification provided)

Soil Description

Boutwell Location #1 - Fat clay with sand

Atterberg Limits

PL= 26 LL= 66 PI= 40

Coefficients

D_{85}= 0.263 D_{60}= 0.0063 D_{50}= 0.0017
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

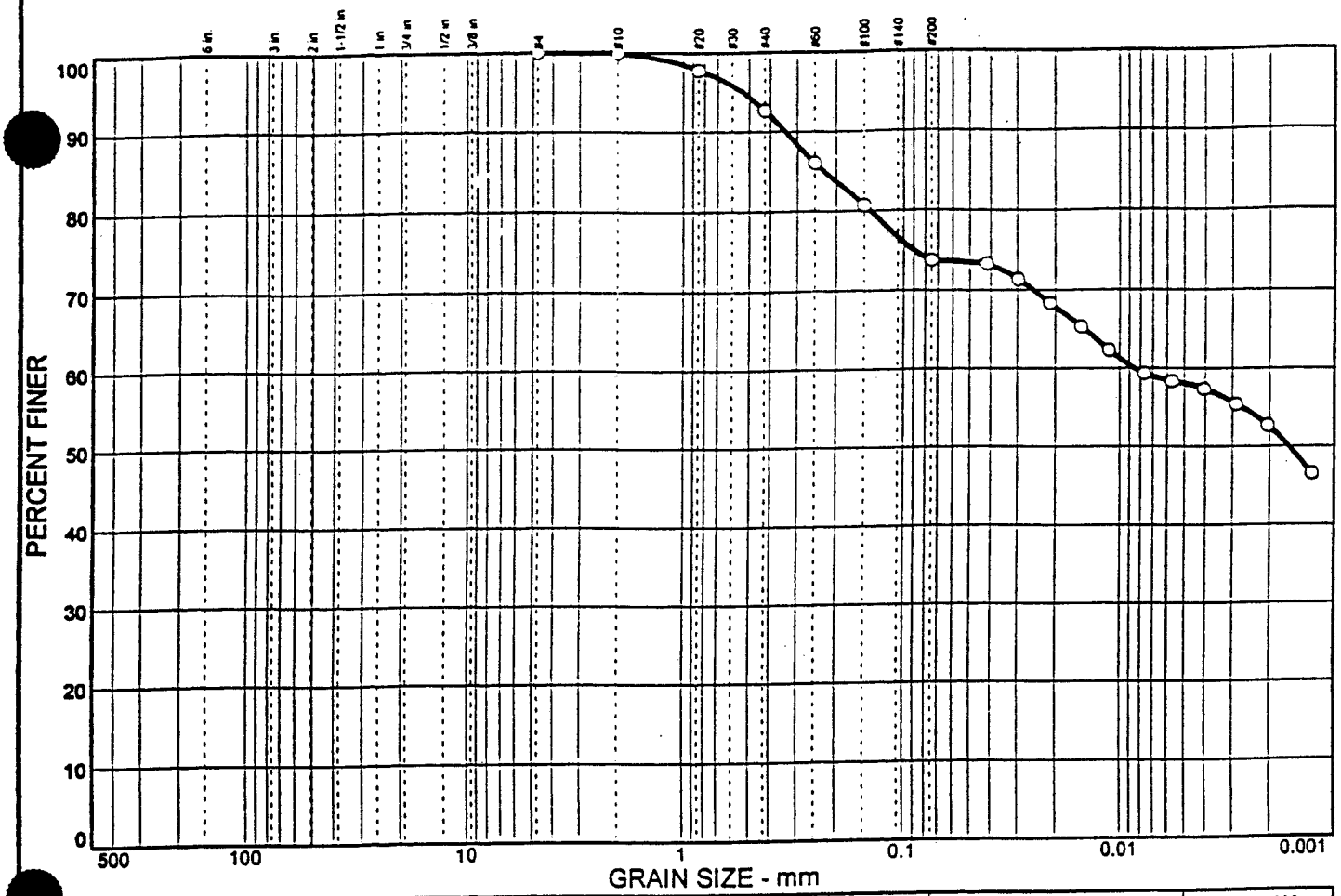
DL-166, Test Pad @ BT-1

Sample No.: DL-166 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman Test Pad - Boutwell #1 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	26.3	15.7	58.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	97.8		
#40	92.6		
#60	86.1		
#100	80.7		
#200	73.7		

* (no specification provided)

Soil Description

Boutwell Location #2 - Fat clay with sand

Atterberg Limits

PL= 25 LL= 65 PI= 40

Coefficients

D_{85}= 0.226 D_{60}= 0.0086 D_{50}= 0.0016
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

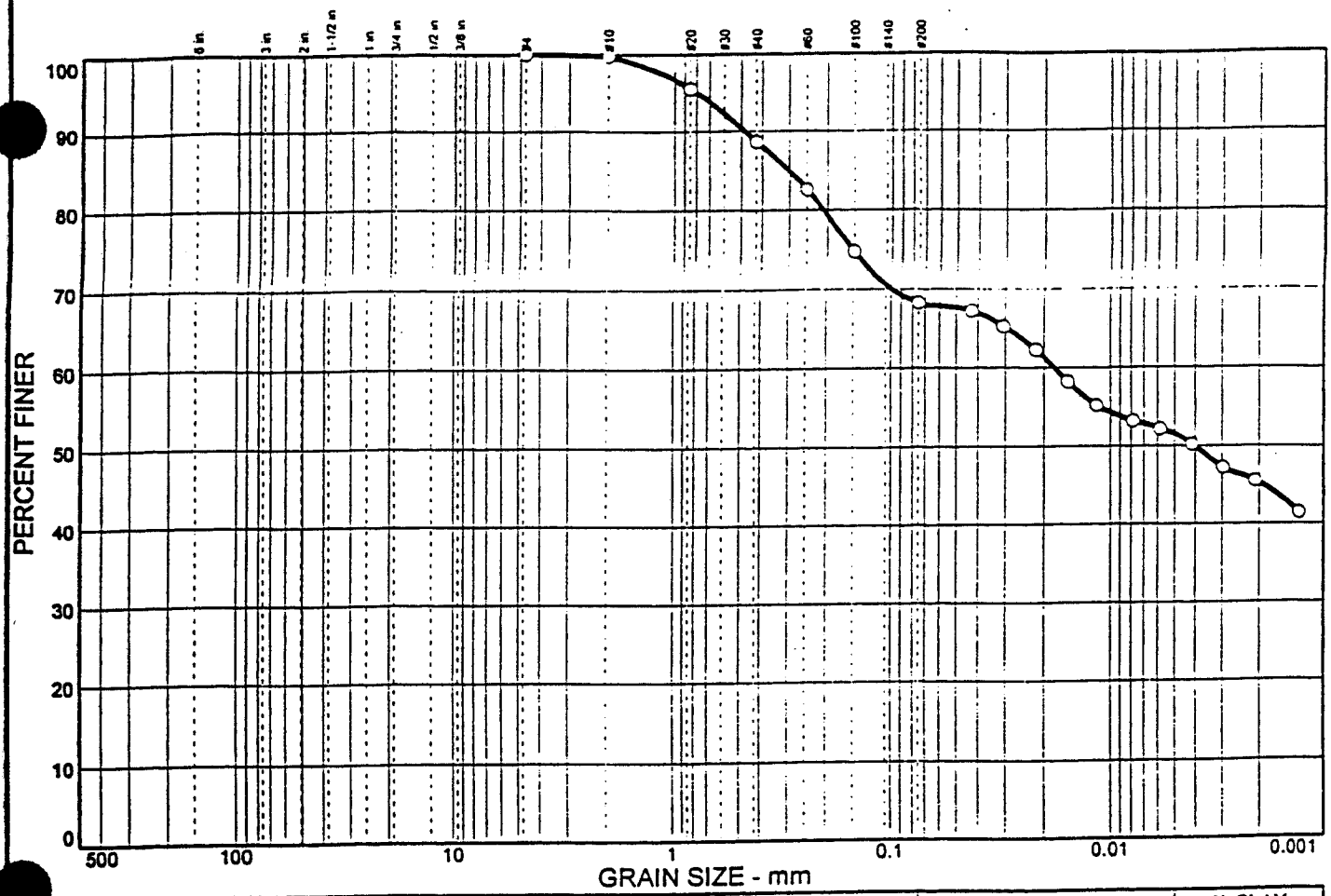
DL-167, Test Pad @ BT-2

Sample No.: DL-167 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman Test Pad - Boutwell #2 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	31.8	16.7	51.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	95.5		
#40	88.6		
#60	82.6		
#100	74.7		
#200	68.2		

* (no specification provided)

Soil Description

Boutwell Location #3 - Sandy fat clay

Atterberg Limits

PL= 24 LL= 68 PI= 44

Coefficients

D_{85}= 0.303 D_{60}= 0.0181 D_{50}= 0.0041
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

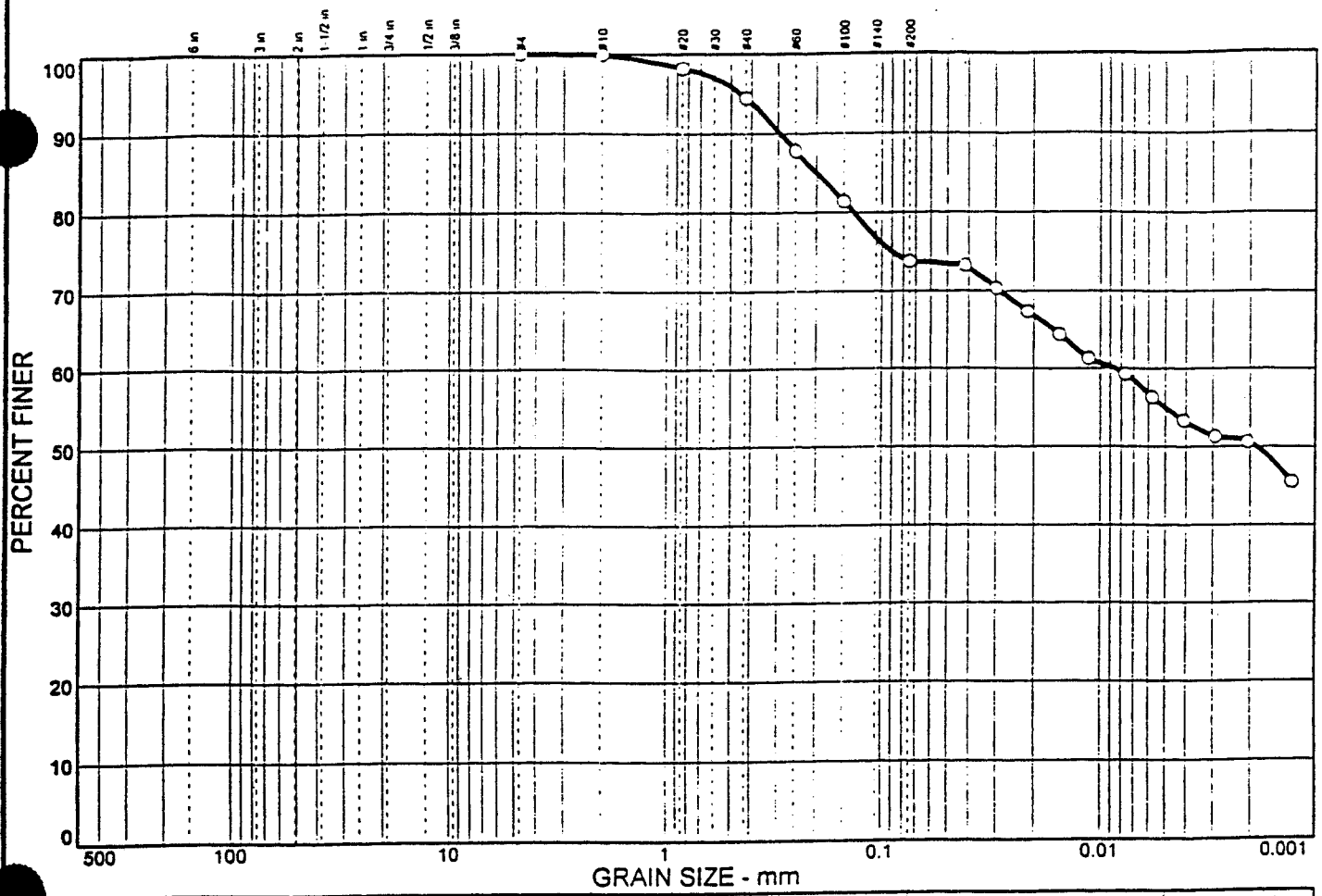
DL-168, Test Pad @ BT-3

Sample No.: DL-168 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman Test Pad - Boutwell #3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	26.2	18.9	54.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	98.2		
#40	94.5		
#60	87.8		
#100	81.4		
#200	73.8		

* (no specification provided)

Soil Description

Boutwell Location #4 - Fat clay with sand

Atterberg Limits

PL= 25 LL= 68 PI= 43

Coefficients

D_{85}= 0.200 D_{60}= 0.0086 D_{50}= 0.0019
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

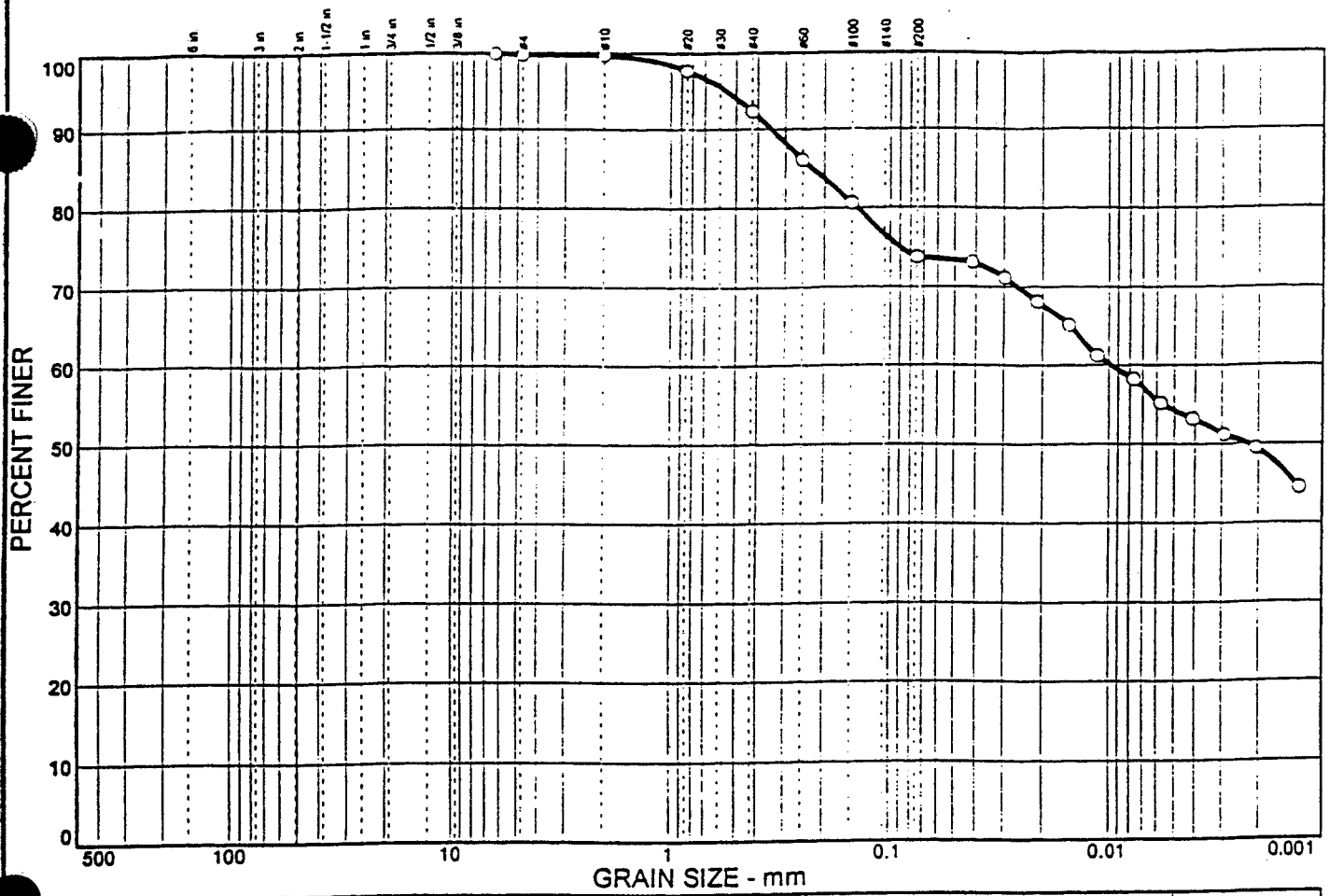
DL-169. Test Pad @ BT-4

Sample No.: DL-169 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman Test Pad - Boutwell #4 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	26.1	19.5	54.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.7		
#20	97.7		
#40	92.3		
#60	86.1		
#100	80.6		
#200	73.7		

* (no specification provided)

Soil Description

Boutwell Location #5 - Fat clay with sand

Atterberg Limits

PL= 25 LL= 66 PI= 41

Coefficients

D_{85}= 0.226 D_{60}= 0.0098 D_{50}= 0.0022
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

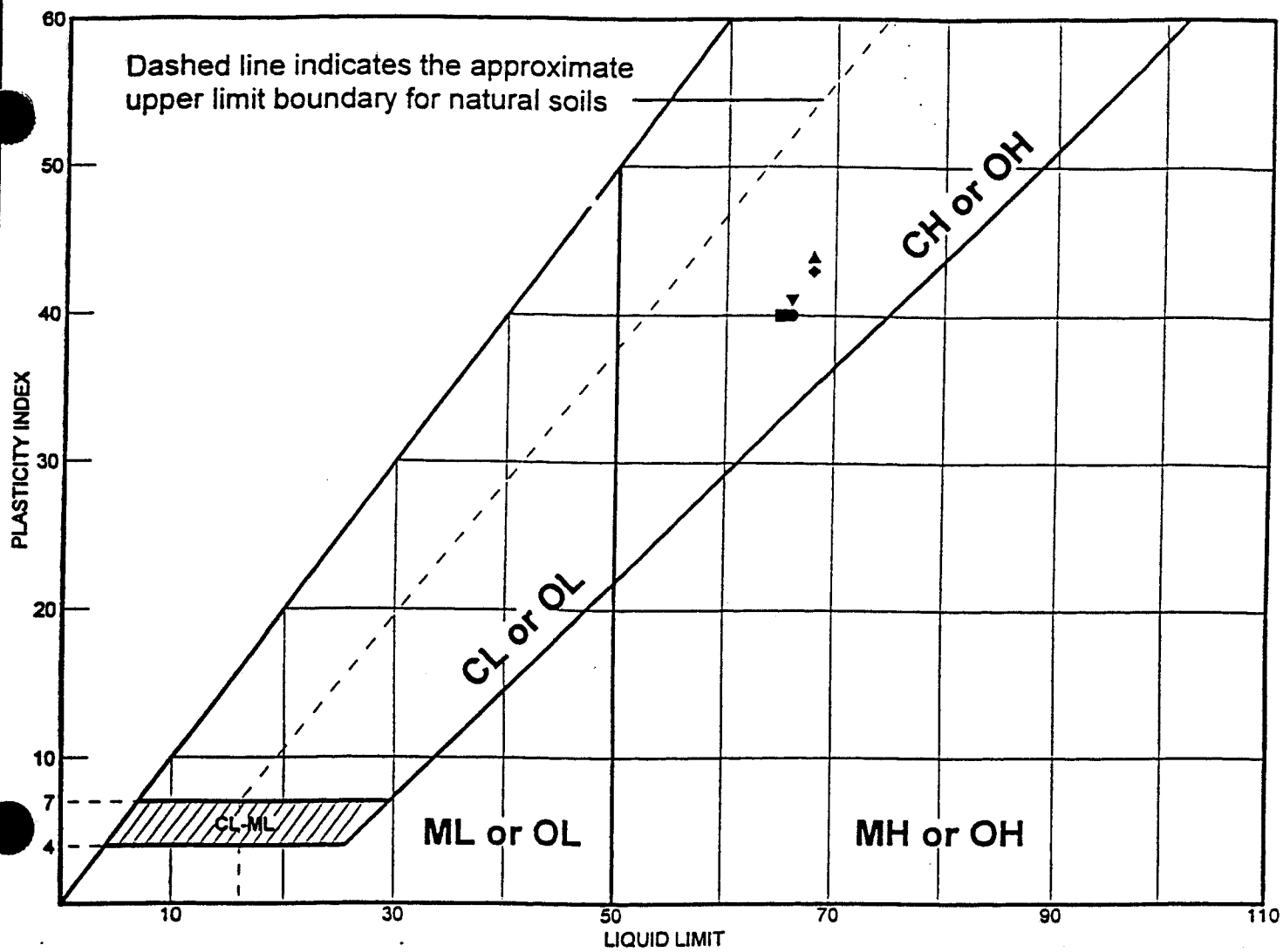
DL-170, Test Pad @ BT-5

Sample No.: DL-170 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman Test Pad - Boutwell #5 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Plate**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Boutwell Location #1 - Fat clay with sand	66	26	40	91.9	70.2	CH
■	Boutwell Location #2 - Fat clay with sand	65	25	40	92.6	73.7	CH
▲	Boutwell Location #3 - Sandy fat clay	68	24	44	88.6	68.2	CH
◆	Boutwell Location #4 - Fat clay with sand	68	25	43	94.5	73.8	CH
▼	Boutwell Location #5 - Fat clay with sand	66	25	41	92.3	73.7	CH

Project No. VNC-98-029 **Client:** Gilbert Southern

Project: Durham County Landfill Closure

● **Location:** Fogelman Test Pad - Boutwell #1
■ **Location:** Fogelman Test Pad - Boutwell #2
▲ **Location:** Fogelman Test Pad - Boutwell #3
◆ **Location:** Fogelman Test Pad - Boutwell #4
▼ **Location:** Fogelman Test Pad - Boutwell #5

Remarks:
● DL-166, Test Pad, BT-1
■ DL-167, Test Pad, BT-2
▲ DL-168, Test Pad, BT-3
◆ DL-169, Test Pad, BT-4
▼ DL-170, Test Pad, BT-5

LIQUID AND PLASTIC LIMITS TEST REPORT

VAN DER HORST ENGINEERING

Plate

MALCOLM PIRNIE

LETTER OF TRANSMITTAL

To: GILBERT SOUTHERN CORP
3301 GLENN ROAD
DURHAM, NC 27704

Transm'l Date : 01/15/99
Transm'l No. : 0036
Spec'n Section : 02225

Attention: ANDY PALAHNUK

Re: CITY OF DURHAM, NORTH CAROLINA
DURHAM MUNICIPAL SOLID WASTE LANDFILL FACILITY CLOSURE

Gentlemen:
We are sending you via, U.S. Mail the following items:

No.	Manufacturer's Name	Drawing Reference	Description	Act'n Taken
4	VAN DER HORST	10 PAGES	ROUGEMOUNT BORROW LOW PERMEABILITY SOIL	A

Our action relative to items submitted for approval has been noted above and on the drawings.

Remarks:

Copies to:
TOM GLENN, W/ENCL;
GARRY HERZBERG, W/ENCL; FILE

Very truly yours
MALCOLM PIRNIE, INC.
by ORIGINAL SIGNED BY
JAY JACKSON, PE

Form 69 Printed in USA
Rev 10/95

Gilbert Southern
(Company Name)

ADDRESS REPLY TO:

LETTER OF TRANSMITTAL

3301 Glenn Rd,
DURHAM, NC 27704

TO: Jay Jackson
Malcolm Pirnie

DATE _____ CO. NO. 044 JOB NO. 3124

TRANSMITTAL NO. _____

RE: _____

WE ARE SENDING ☒ Attached ☐ Under separate cover via _____ the following:

☐ Drawings ☐ Plans ☐ Progress Payment ☐ Subcontractor
☐ Prints ☐ Samples ☐ Specifications ☐ Change Order
☐ Payroll ☐ EEO Report ☐ Certificates of Compliance ☐ Copy of Letter

☐ _____ ☐ _____

COPIES	DATE	NO.	DESCRIPTION
3	1/11/99	036	Rougemont Borrow Low Perm
			Conformance Testing.

THESE ARE TRANSMITTED as checked below:

☒ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☐ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review and comment

☐ _____ ☐ _____

☐ FOR BIDS DUE _____ 19__ ☐ PRINTS RETURNED AFTER LOAN TO US.

RECEIVED
JAN 13 1999
MALCOLM PIRNIE
CHARLOTTE
ROUTE: JCJ
JOB #
FILE

REMARKS _____

COPY TO: Barry Herzberg (1 copy)

SIGNED: James Bisin

VAN DER HORST

GEOTECHNICAL ENGINEERING, PC
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

☑ APPROVED
☐ APPROVED AS CORRECTED
☐ REVISE AND RESUBMIT
☐ NOT APPROVED

Checking is only for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

MALCOLM PIRNIE, INC.

Date 1/15/99 By SMM

December 21, 1998

Andy Palabnuk
Gilbert Southern Corp.
Durham County Landfill
3301 Glenn Road
Durham, NC 27704

Re: Initial Conformance Testing
Rougemount Borrow Low Permeability Soil
VNC-98-029.025

Dear Andy:

We are please find our laboratory analysis for the proposed low permeability soil sampled from the Rougemount borrow pit on 11/2/98. The test performed included all test in section 02250, part 2.1B. Attached please find a table summarizing our test results. Also included are all applicable laboratory test reports. Based on our laboratory tests for this sample the material meets the projects specifications for use as low permeability soil.

Also included is our "Compaction Test Report" plotting five (5) hydraulic conductivity tests at varying moisture and compacted to 95% of the standard proctor maximum dry density. We have established and indicated an "Acceptable Zone" for permeability with respect to moisture and density.

Should you have any questions or need further assistance please do not hesitate to contact our office.

Respectfully submitted
VAN DER HORST Geotechnical Engineering, PC

Robert L. Mashewske

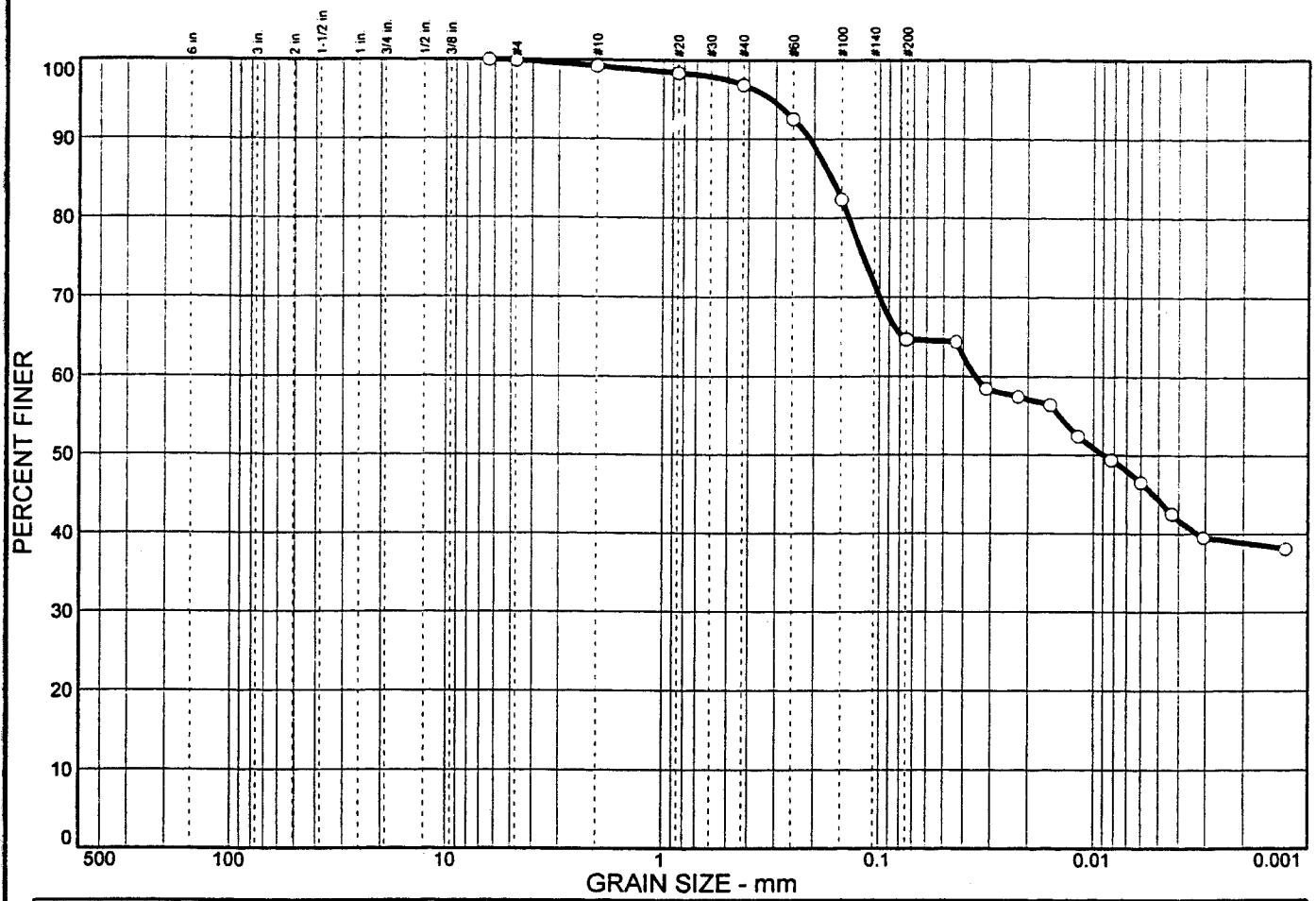
Robert L. Mashewske, P.E.
Regional Manager / Senior Engineer

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

535 Summit Point Drive
Henrietta, NY 14467
716/359-2730
Fax 716/359-9668

3101 Stonybrook Drive, Suite 156
Raleigh, NC 27604
919/876-0405
Fax 919/876-0460

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	35.3	20.3	44.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.2		
#20	98.4		
#40	96.9		
#60	92.6		
#100	82.3		
#200	64.6		

* (no specification provided)

Soil Description

Rougemount Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 40 PI= 21

Coefficients

D_{85}= 0.166 D_{60}= 0.0353 D_{50}= 0.0089
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-207, Test Pad - Lift #4

Sample No.: DL-207 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Test Pad - Lift #4 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

MALCOLM PIRNIE

LETTER OF TRANSMITTAL

To: GILBERT SOUTHERN CORP
3301 GLENN ROAD
DURHAM, NC 27704

Transm'l Date : 10/06/98
Transm'l No. : 0006A
Spec'n Section : 2250

Attention: ANDY PALAMNUK

Re: CITY OF DURHAM, NORTH CAROLINA
DURHAM MUNICIPAL SOLID WASTE LANDFILL FACILITY CLOSURE

Gentlemen:
We are sending you via, U.S. Mail the following items:

No.	Manufacturer's Name	Drawing Reference	Description	Act'n Taken
4	VAN DER HORST	15 PAGES	BOUTWELL TEST FOR ROBERTS PIT TEST PAD	A

Our action relative to items submitted for approval has been noted above and on the drawings.

Remarks:

Copies to:
TOM GLENN, W/ENCL;
BARRY HERZBERG, W/ENCL; FILE

Very truly yours
MALCOLM PIRNIE, INC.
by ORIGINAL SIGNED BY
JAY JACKSON, PE

VAN DER HORST
GEOTECHNICAL ENGINEERING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

☑ APPROVED
☐ APPROVED AS CORRECTED
☐ REVISE AND RESUBMIT
☐ NOT APPROVED

Checking is only for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

MALCOLM PIRNIE, INC.
Date 10/6/98 By JAG

September 29, 1998

Mr. Andy Palabunk
Gilbert Southern Corp.
3301 Glenn Road
Durham, NC 27704

Re: Test Pad Report - Ellington Pit Clay Borrow (ROBERTS PIT)
Boutwell Permeability Testing
Durham Landfill Closure
VNC-98-029.009

Dear Andy:

VAN DER HORST Geotechnical Engineering, PC, is pleased to present our field and laboratory test results for the "Boutwell" in-place permeability testing of the low permeability soil test pad. The test pad was constructed on September 13, 14 and 15. The material placed for construction of the test pad was delivered from the Ellington borrow source. Initial conformance testing and test pad testing was previously submitted.

A tabular summary is attached to this report which provides the "Boutwell" permeability test results as well as corresponding shelby tube permeability test results and indices tests. Also attached please find a test location drawing . The "Boutwell" permeameters were install on 9/18/98. A detail drawing of the installation accompanies this report. The test pad was installed on a 3 to 1 slope. The Boutwell tubes were installed perpendicular too the horizon. The bottom of the Boutwell tubes were installed to a depth of 12 inches. A soil socket below the tube was excavated to a depth of 6 inches below the bottom of the tube. The tube annulus was sealed with bentonite powder and allowed to hydrate for 48 hours.

Should you have any questions or need additional information, please do not hesitate to contact our office.

Respectfully submitted,

R. Mashewske 9-30-98

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

Robert, Mashewske, P.E.
Regional Manger / Senior Engineer

535 Summit Point Drive
Henrietta, NY 14467
716/359-2730

3101 Stonybrook Drive Suite 156
Raleigh, NC 27604
919/876-0405

VAN DER HORST

DURHAM LANDFILL CLOSURE
VNC-98-029.009

"Test Pad Evaluation Testing"
Boutwell In-place Permeability Testing
Ellington Pit - Low Permeability Soil

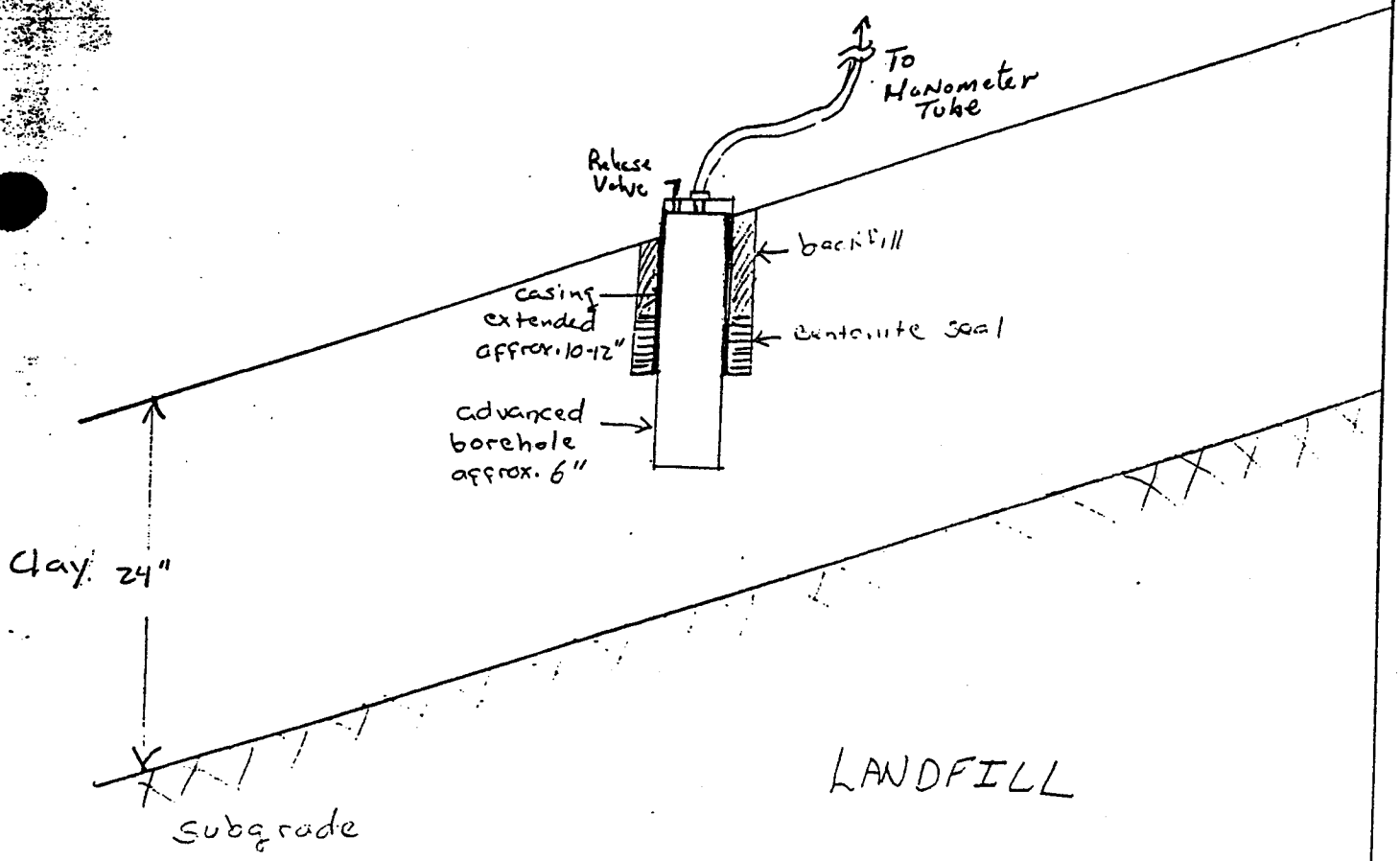
Test Method	DL-031	DL-032	DL-033	DL-034	DL-035
Location	BT-01	BT-02	BT-03	BT-04	BT-05
Natural Moisture Content (%) (ASTM D-2216)	25.2	21.6	22.8	21.0	21.5
USCS Soil Classification	CH	CH	CH	CH	CH
Grainsize Analysis (ASTM D422)					
% Gravel	0.2	0.2	0.2	0.2	0.1
%Sand	32.1	30.2	31.1	29.4	30.7
%Silt	23.5	33.7	24.6	25.1	24.2
% Clay	44.2	35.9	44.1	45.3	45.0
Atterberg Limits (ASTM D4318)					
LL	61	54	57	57	57
PL	21	22	22	22	23
PI	40	32	35	35	34
Hydraulic Conductivity (ASTM D-5084)					
Density (pcf)	97.1	98.0	93.5	97.4	103.1
Moisture (%)	25.2	21.6	22.8	24.4	22.9
Permeability (cm/sec)	5.8×10^{-8}	9.8×10^{-8}	5.7×10^{-8}	8.4×10^{-8}	7.6×10^{-8}
Boutwell Permeability (cm/sec)	7×10^{-8}	1×10^{-7}	7×10^{-8}	1×10^{-7}	1×10^{-7}

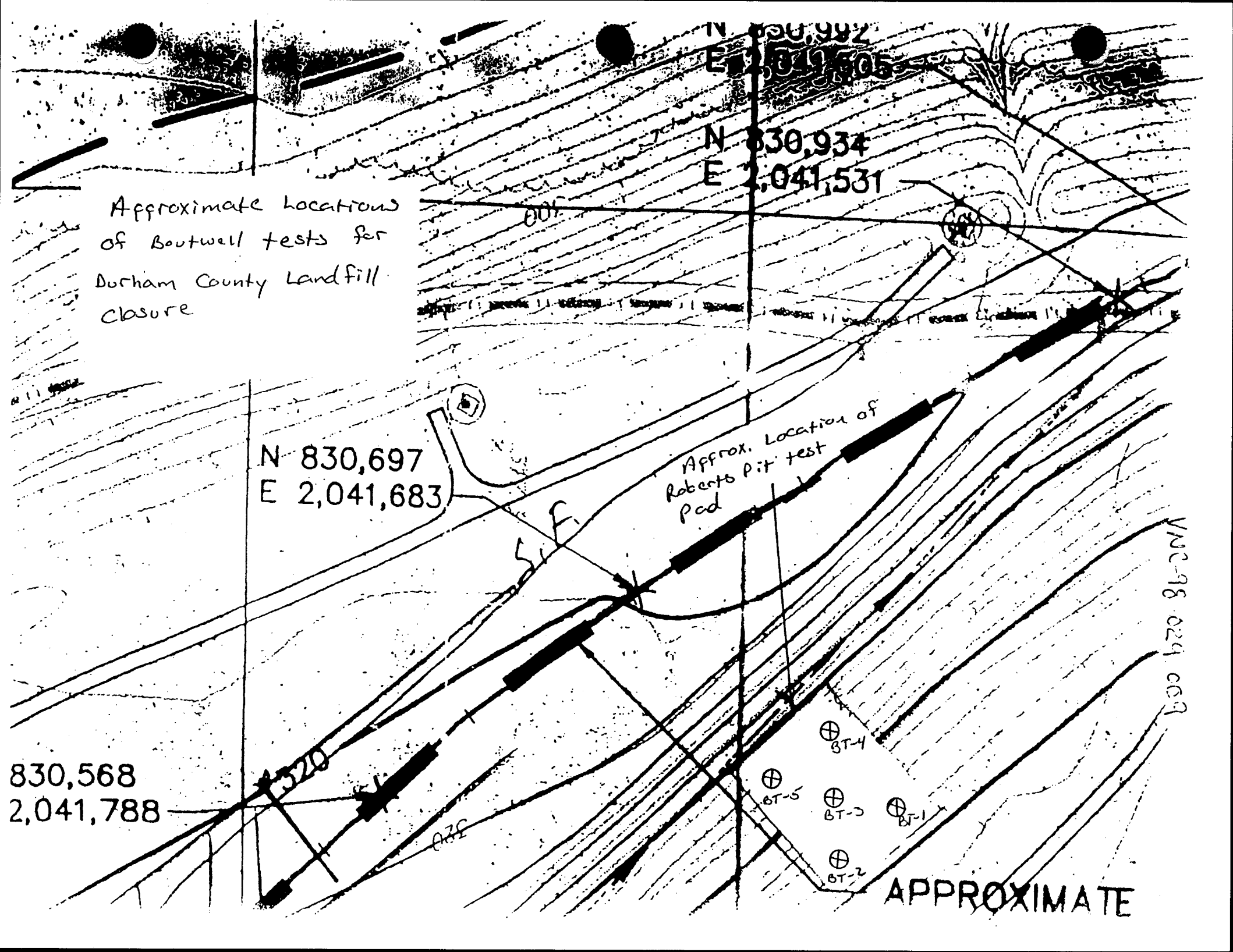
VAN DER HORST
GEOTECHNICAL ENGINEERING, P.C.
3101 Stonybrook Dr., Suite 156
Raleigh, NC 27604
Fax: (919) 876-0460 Phone: (919) 876-0405

JOB Durham Landfill Closure VNC-98-029
SHEET NO. 1 OF 1
CALCULATED BY MP DATE 9/28/98
CHECKED BY BLM DATE 9/28/98
SCALE

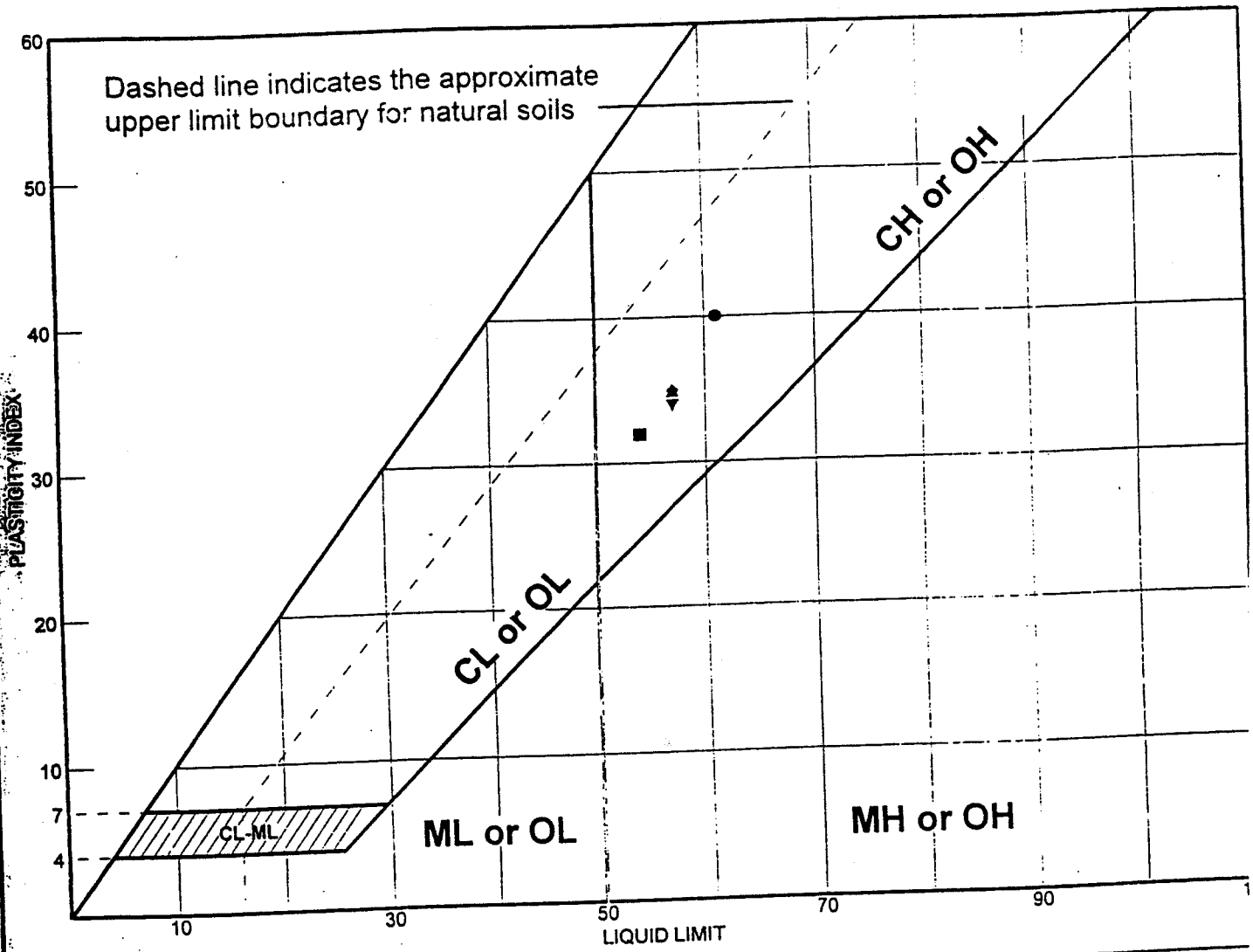
VNC-98-029.009

BOUTWELL TEST INSTALLATION




Approximate Locations of Boutwell tests for Durham County Landfill Closure
N 830,934
E 2,041,531
N 830,697
E 2,041,683
Approx. Location of Roberts Pit test pad
830,568
2,041,788
BT-4
BT-5
BT-3
BT-1
BT-2
APPROXIMATE

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy fat clay	61	21	40	87.8	67.7	CH
■	Sandy fat clay	54	22	32	90.8	69.6	CH
▲	Sandy fat clay	57	22	35	88.2	68.7	CH
◆	Fat clay with sand	57	22	35	89.3	70.4	CH
▼	Sandy fat clay	57	23	34	88.4	69.2	CH

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.

Project: Durham Landfill Closure

● **Location:** Test Pad @ Butwell #1
■ **Location:** Test Pad @ Butwell #2
▲ **Location:** Test Pad @ Butwell #3
◆ **Location:** Test Pad @ Butwell #4
▼ **Location:** Test Pad @ Butwell #5

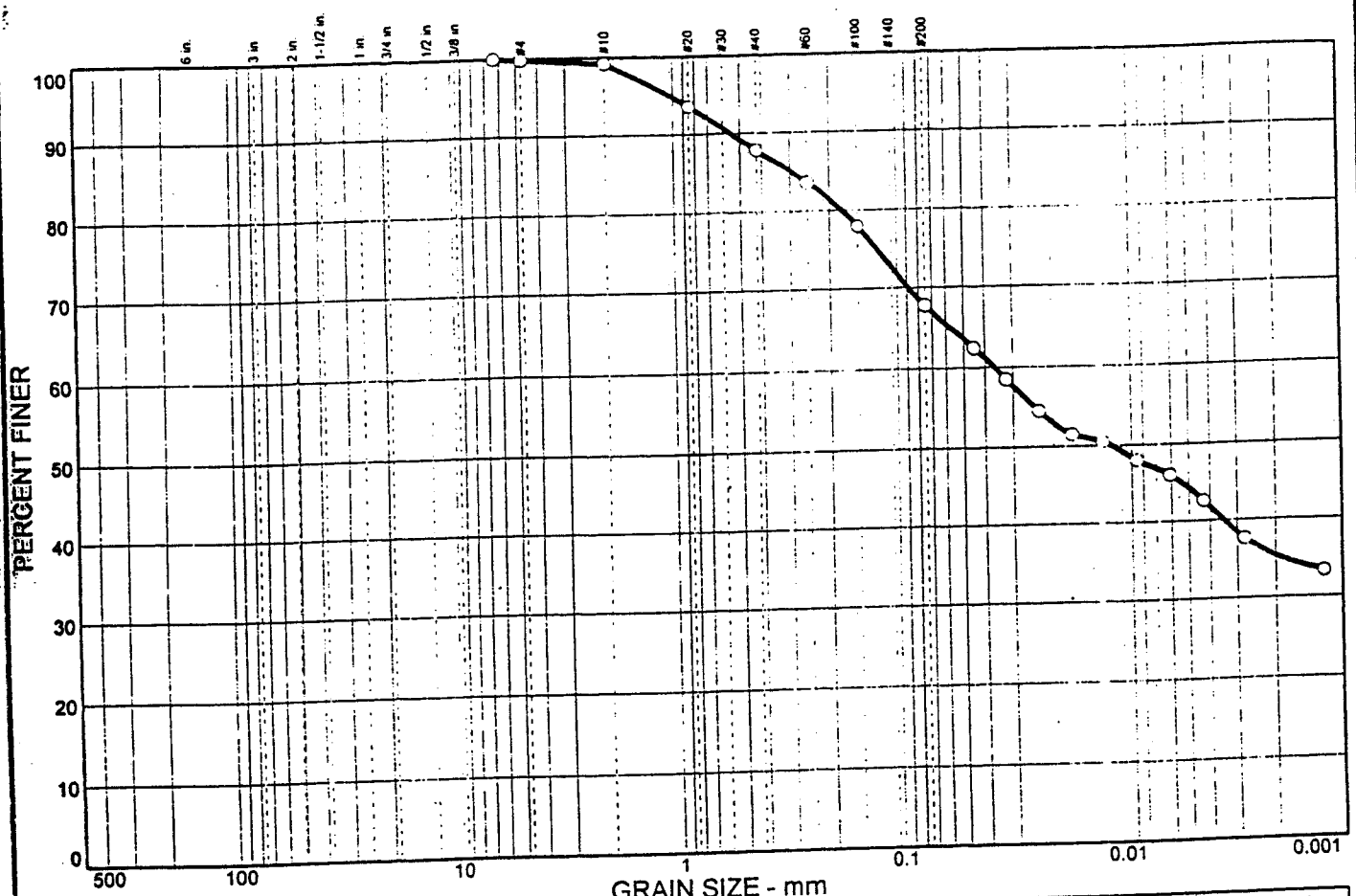
Remarks:
● Butwell #1
■ Butwell #2
▲ Butwell #3
◆ Butwell #4
▼ Butwell #5

LIQUID AND PLASTIC LIMITS TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	32.1	23.5	44.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.2		
#20	93.6		
#40	87.8		
#60	83.6		
#100	77.9		
#200	67.7		

* (no specification provided)

Soil Description

Sandy fat clay

Atterberg Limits

PL= 21 LL= 61 PI= 40

Coefficients

D_{85}= 0.296 D_{60}= 0.0364 D_{50}= 0.0111
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

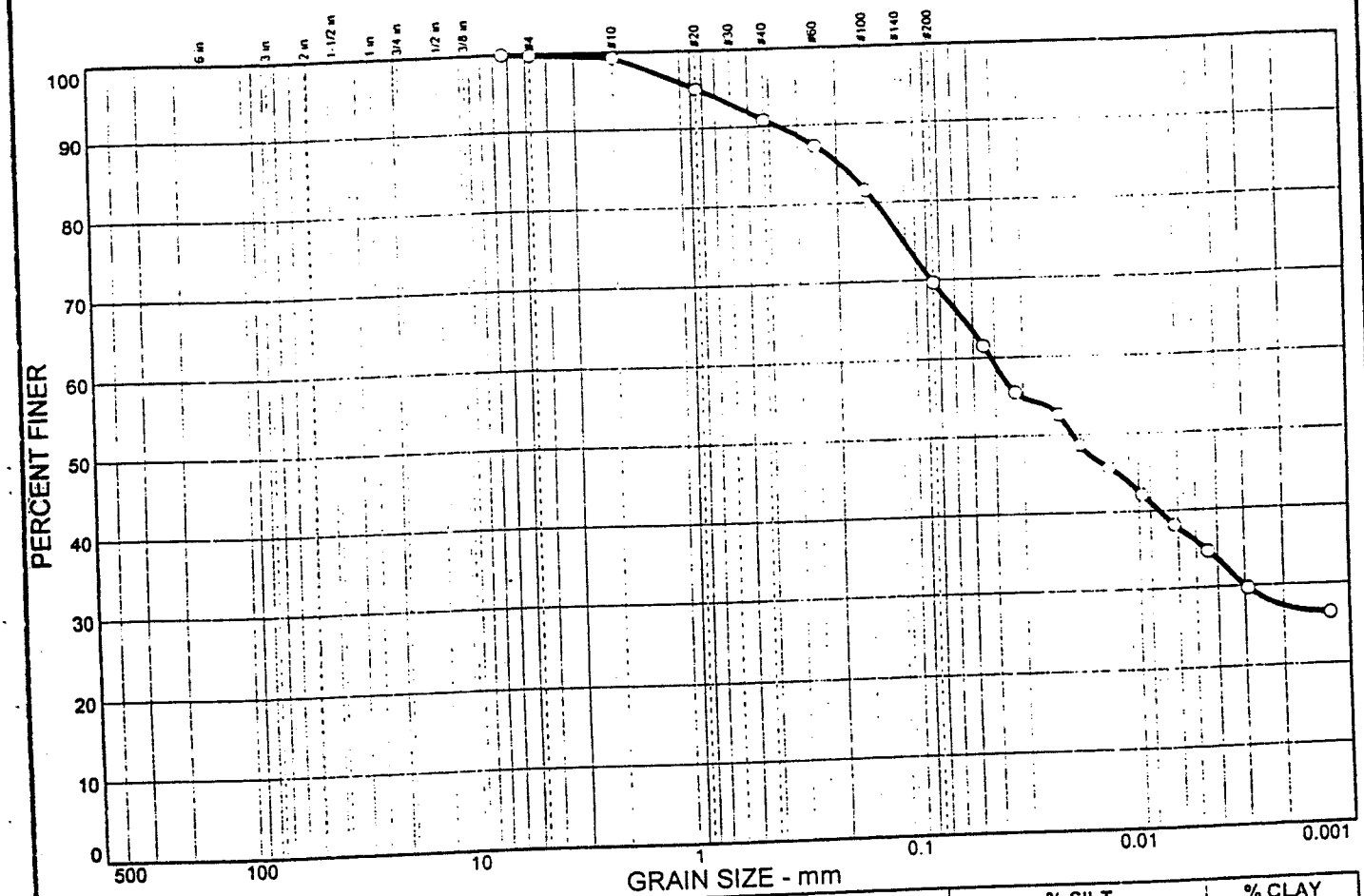
Sample No.: DL-031 **Source of Sample:** Ellington Pit **Date:**
Location: Test Pad @ Butwell #1 **Elev./Depth:** -12" to 18"

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	30.2	33.7	35.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.3		
#20	95.0		
#40	90.8		
#60	87.3		
#100	81.6		
#200	69.6		

* (no specification provided)

Soil Description

Sandy fat clay

Atterberg Limits

PL= 22 LL= 54 PI= 32

Coefficients

D_{85}= 0.196 D_{60}= 0.0418 D_{50}= 0.0180
D_{30}= 0.0030 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

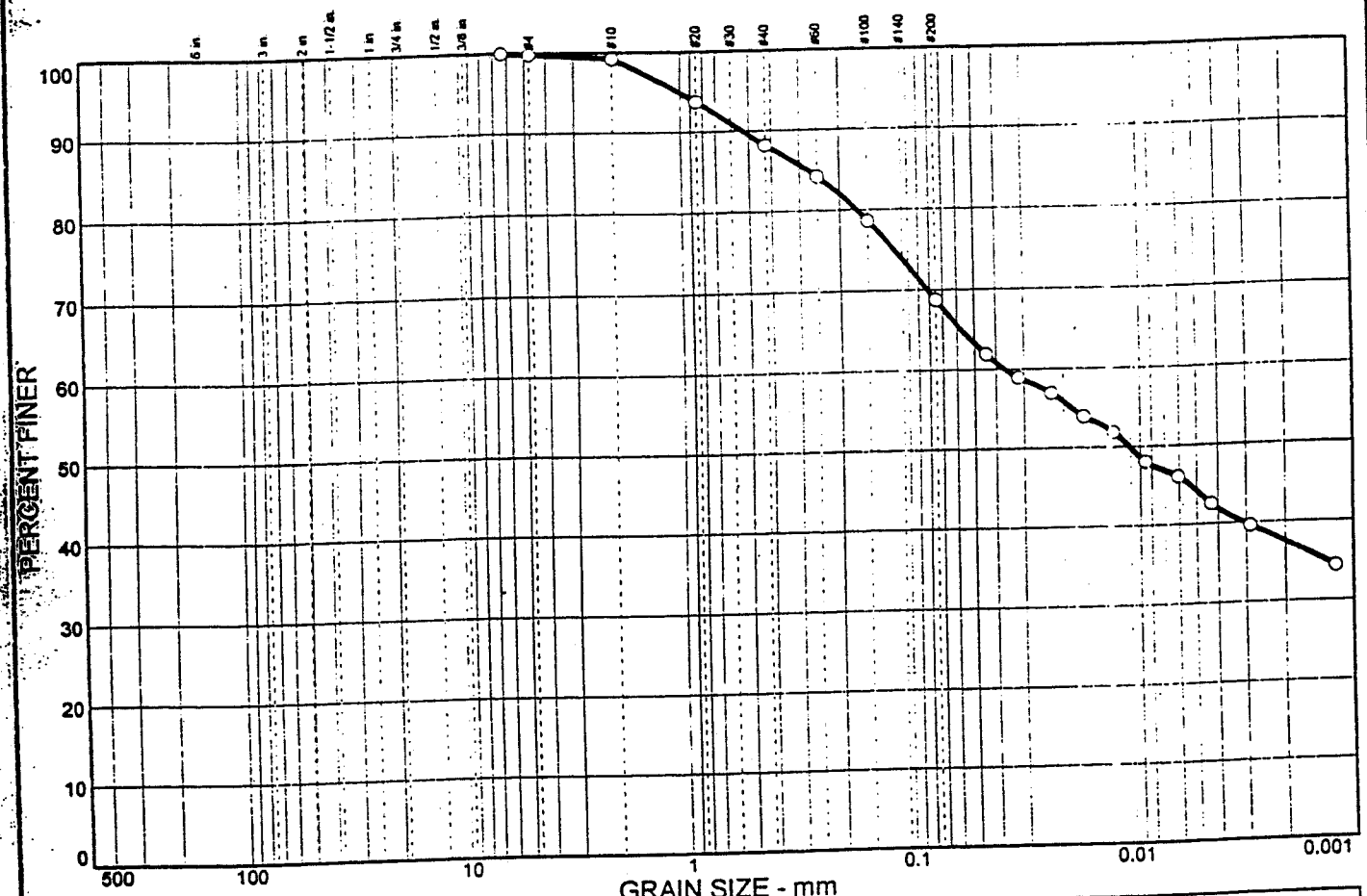
Remarks

Sample No.: DL-032 **Source of Sample:** Ellington Pit **Date:**
Location: Test Pad @ Butwell #2 **Elev./Depth:** -12" to 18"

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	31.1	24.6	44.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.2		
#20	93.7		
#40	88.2		
#60	84.2		
#100	78.6		
#200	68.7		

* (no specification provided)

Soil Description

Sandy fat clay

Atterberg Limits

PL= 22 LL= 57 PI= 35

Coefficients

D_{85}= 0.275 D_{60}= 0.0367 D_{50}= 0.0101
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTC=

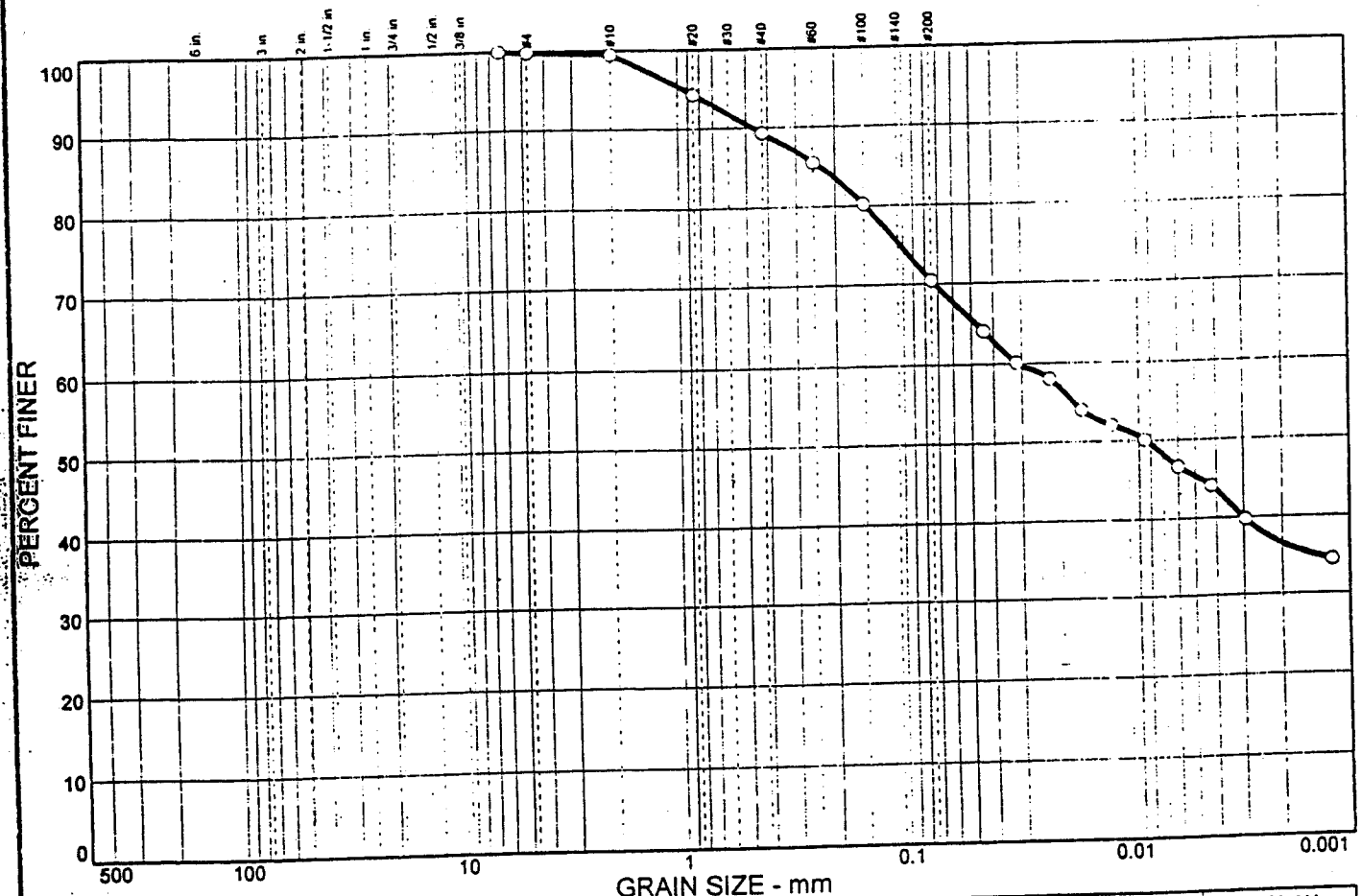
Remarks

Sample No.: DL-033 **Source of Sample:** Ellington Pit **Date:**
Location: Test Pad @ Butwell #3 **Elev./Depth:** -12" to 18"

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	29.4	25.1	45.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.5		
#20	94.3		
#40	89.3		
#60	85.5		
#100	80.2		
#200	70.4		

* (no specification provided)

Soil Description

Fat clay with sand

Atterberg Limits

PL= 22 LL= 57 PI= 35

Coefficients

D_{85}= 0.236 D_{60}= 0.0313 D_{50}= 0.0084
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

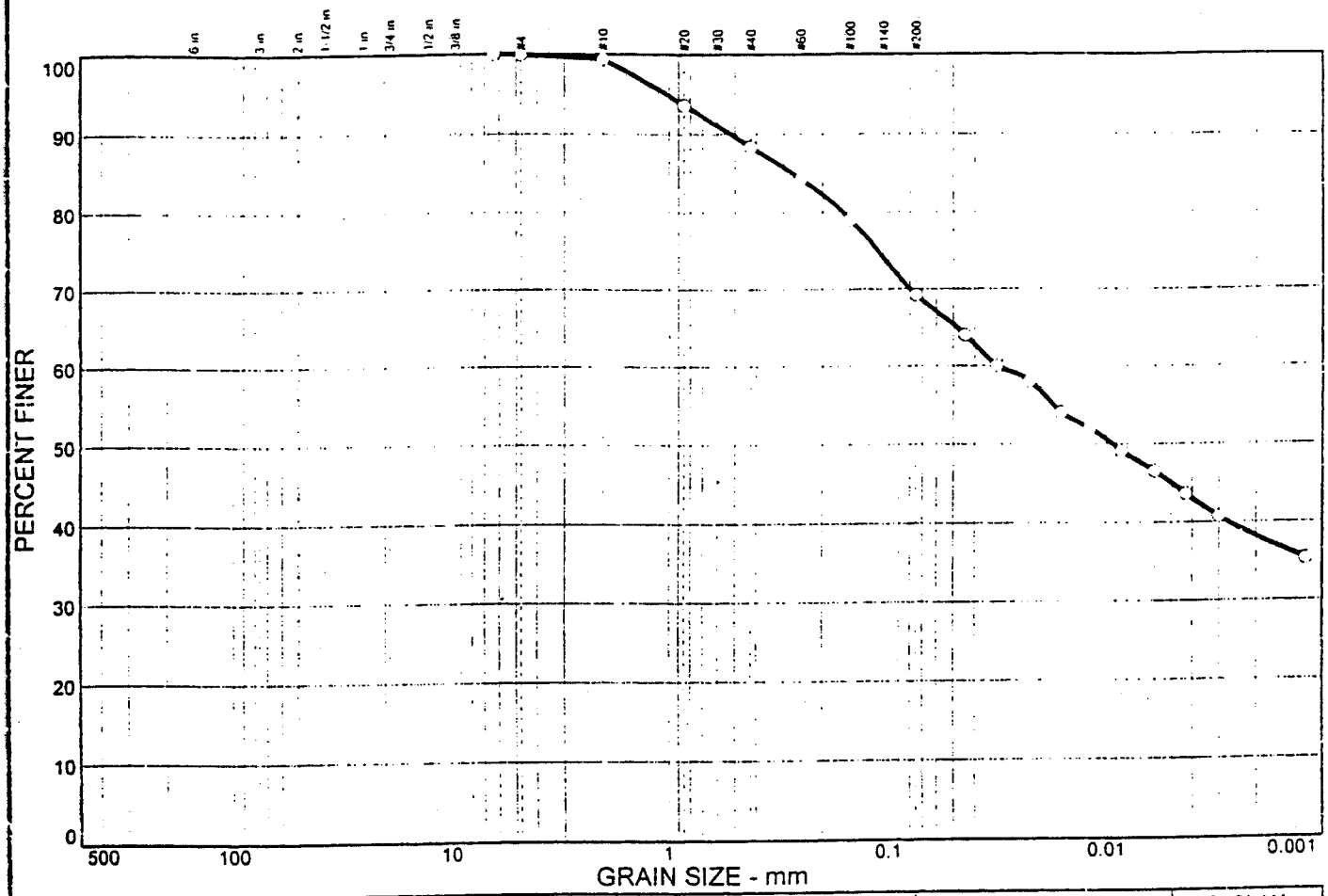
Remarks

Sample No.: DL-034 **Source of Sample:** Ellington Pit **Date:**
Location: Test Pad @ Butwell #4 **Elev./Depth:** -12 to -18"

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	30.7	24.2	45.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.4		
#20	93.7		
#40	88.4		
#60	84.3		
#100	79.0		
#200	69.2		

* (no specification provided)

Soil Description

Sandy fat clay

Atterberg Limits

PL= 23 LL= 57 PI= 34

Coefficients

D_{85}= 0.272 D_{60}= 0.0317 D_{50}= 0.0094
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTC=

Remarks

Sample No.: DL-035 **Source of Sample:** Ellington Pit **Date:**
Location: Test Pad @ Butwell #5 **Elev./Depth:** -12 to -18"

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 09/29/98
Report No.: P-015

Project No.: VNC-98-029
Sample No. DL-031

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.8E-08	cm/sec
% Moisture	25.2	%
Dry Density	97.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 09/18/98
Location: Test Pad @ Butwell #1
Ellington Borrow - Low Perm. Soil

Specimen Data

Length (in):	3.478
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	22.23
Wet Weight (grams):	709.1
Dry Weight (grams):	566.2
Dry Density (pcf):	97.1

Moisture Content Test Data

Wet Weight	150.37
Dry Weight	124.49
Tare weight	21.91
% Moisture	25.2

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
183	74.77	0.60	0.60	1.00	0.60	6.21E-08
823	80.31	2.70	2.60	0.96	2.65	5.67E-08
419	80.31	1.30	1.30	1.00	1.30	5.47E-08
248	80.31	0.80	0.80	1.00	0.80	5.68E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 5.8E-08 cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 09/29/98
Report No.: P-016

Project No.: VNC-98-029
Sample No. DL-032

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	9.8E-08	cm/sec
% Moisture	21.6	%
Dry Density	98.0	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 09/18/98
Location: Test Pad @ Butwell #2
Ellington Borrow - Low Perm. Soil

Specimen Data

Length (in):	3.696
Diameter (in.):	2.840
Area (sq. in.):	6.346
Volume (cu. in.):	23.45
Wet Weight (grams):	733.3
Dry Weight (grams):	603.1
Dry Density (pcf):	98.0

Moisture Content Test Data

Wet Weight	139.70
Dry Weight	118.77
Tare weight	21.81
% Moisture	21.6

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
182	77.54	0.90	0.90	1.00	0.90	9.66E-08
826	77.54	4.30	4.20	0.98	4.25	1.00E-07
423	77.54	2.20	1.90	0.86	2.05	9.46E-08
248	77.54	1.30	1.20	0.92	1.25	9.84E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 9.8E-08 cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 09/29/98
Report No.: P-017

Project No.: VNC-98-029
Sample No. DL-033

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.7E-08	cm/sec
% Moisture	22.8	%
Dry Density	93.5	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 09/18/98
Location: Test Pad @ Butwell #3
Ellington Borrow - Low Perm. Soil

Specimen Data

Length (in):	3.589
Diameter (in.):	2.825
Area (sq. in.):	6.279
Volume (cu. in.):	22.53
Wet Weight (grams):	679.0
Dry Weight (grams):	553.0
Dry Density (pcf):	93.5

Moisture Content Test Data

Wet Weight	155.58
Dry Weight	130.82
Tare weight	22.14
% Moisture	22.8

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
182	77.54	0.60	0.55	0.92	0.58	6.06E-08
826	77.54	2.50	2.40	0.96	2.45	5.69E-08
423	77.54	1.25	1.15	0.92	1.20	5.44E-08
248	77.54	0.70	0.75	1.07	0.73	5.60E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **5.7E-08** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 09/29/98
Report No.: P-018

Project No.: VNC-98-029
Sample No. DL-034

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.4E-08	cm/sec
% Moisture	21.0	%
Dry Density	100.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 09/18/98
Location: Test Pad @ Butwell #4
Ellington Borrow - Low Perm. Soil

Specimen Data

Length (in):	3.314
Diameter (in.):	2.840
Area (sq. in.):	6.346
Volume (cu. in.):	21.03
Wet Weight (grams):	668.4
Dry Weight (grams):	552.4
Dry Density (pcf):	100.1

Moisture Content Test Data

Wet Weight	142.27
Dry Weight	121.33
Tare weight	21.60
% Moisture	21.0

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
180	77.54	0.90	0.95	1.06	0.93	9.00E-08
827	80.31	4.40	4.00	0.91	4.20	8.59E-08
426	80.31	2.10	2.00	0.95	2.05	8.14E-08
245	80.31	1.20	1.10	0.92	1.15	7.94E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 8.4E-08 cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 09/29/98
Report No.: P-019

Project No.: VNC-98-029
Sample No. DL-035

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	7.6E-08	cm/sec
% Moisture	21.5	%
Dry Density	99.7	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 09/18/98
Location: Test Pad @ Butwell #5
Ellington Borrow - Low Perm. Soil

Specimen Data

Length (in):	3.249
Diameter (in.):	2.821
Area (sq. in.):	6.261
Volume (cu. in.):	20.34
Wet Weight (grams):	646.6
Dry Weight (grams):	532.2
Dry Density (pcf):	99.7

Moisture Content Test Data

Wet Weight	130.38
Dry Weight	111.18
Tare weight	21.90
% Moisture	21.5

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
180	74.77	0.80	0.75	0.94	0.78	7.77E-08
827	74.77	3.65	3.65	1.00	3.65	7.96E-08
426	74.77	1.85	1.70	0.92	1.78	7.52E-08
245	74.77	1.00	0.90	0.90	0.95	7.00E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 7.6E-08 cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405
VANDERHORST Geotechnical Engineering, P.C.
Fax: (919) 876-0460

MALCOLM PIRNIE

LETTER OF TRANSMITTAL

To: GILBERT SOUTHERN CORP
3301 GLENN ROAD
DURHAM, NC 27704

Transm'l Date : 10/06/98
Transm'l No. : 0006
Spec'n Section : 2250

Attention: ANDY PALAMNUK

Re: CITY OF DURHAM, NORTH CAROLINA
DURHAM MUNICIPAL SOLID WASTE LANDFILL FACILITY CLOSURE

Gentlemen:
We are sending you via, U.S. Mail the following items:

No.	Manufacturer's Name	Drawing Reference	Description	Act'n Taken
**	VAN DER HORST	SHTS 1-11	TEST PAD LOW PERM SOIL RESULTS (ELLINGTON PIT CLAY	ac

Our action relative to items submitted for approval has been noted above and on the drawings.

Remarks:
PLEASE SUBMIT THE FOLLOWING ADD'L INFORMATION: 1) Procedure for repair of holes in lift as a result of density testing and soil sample collection per Section 02250, 1.4.B.4; 2) Procedure to bond lifts and record during execution per Section 02250, 1.4.B.6; and 3) Dimensions of the test pad per Section 02250, 2.1.C.4.b.

Copies to:
TOM GLENN, W/ENCL;
BARRY HERZBERG, W/ENCL; FILE

Very truly yours
MALCOLM PIRNIE, INC.
by ORIGINAL SIGNED BY
JAY JACKSON, PE

VAN DER HORST

GEOTECHNICAL ENGINEERING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

☐ APPROVED
☒ APPROVED AS CORRECTED
☐ REVISE AND RESUBMIT
☐ NOT APPROVED

Checking is only for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

MALCOLM PIRNIE, INC.

Date 10-6-98 By JAG

Contractor's Name: GILBERT SOUTHERN
Date: 9/25/98
Item: LOW PERM TEST PAD
Specification: GEN PROV
Section: 2250
Page No.: 1 — 11
Para. No.:
Drawing No.:
Location: DURHAM LANDFILL
Submittal No.: 006
Approved By: AGP

September 25, 1998

Mr. Andy Palabunk
Gilbert Southern Corp.
3301 Glenn Road
Durham, NC 27704

Re: Test Pad Summary Report - Ellington Pit Clay Borrow
Durham Landfill Closure
VNC-98-029.008

Dear Andy:

VAN DER HORST Geotechnical Engineering, PC, is pleased to present our field and laboratory test results for the low permeability soil test pad. The test pad was constructed on September 13, 14 and 15. The material placed for construction of the test pad was delivered from the Ellington borrow source. Initial conformance testing was previously submitted for this borrow source.

The material was placed in loose lifts not exceeding 9" in loose thickness and compacted using a CAT 815 compactor. Generally compaction was obtained in two pass with the 815 and the compacted lift thickness ranged from 6 to 6 ½ inches. A tabular summary is attached to this report which provides both loose and compacted lift thickness measurements taken during the test pad construction. During construction moisture content and in-place density testing was performed. The in-place density tests and in-place moisture content tests are presented on the attached in-place density test reports. In addition to the in-place moisture tests,10 random samples were collected at field mositure test locations for oven dried analysis. This data is also presented on the in-place density test reports. The second moisture content provided at a given location represents the oven dried test result.

Also during the test pad construction shelby tube samples and composite samples were obtained from each lift. The shelby tube samples were tested for hydraulic conductivity (permeability). Attached please find 4 permeability test reports presenting the permeability test data. The random bulk samples were tested for Atterberg Limits, Grain-size analysis and USCS soil classification. Our laboratory test reports are attached presenting our test results.

535 Summit Point Drive
Henrietta, NY 14467
716/359-2730
Fax 716/359-9668

3101 Stonybrook Drive, Suite 156
Raleigh, NC 27604
919/876-0405
Fax 919/876-0460

VAN DER HORST

The attached table presents a summary of laboratory test ~~results for, Atterberg~~ (ASTM D2487) Limits (ASTM D-4318), Grain-size (ASTM D-422), USCS soil classification and Permeability (ASTM D-5084).

At this time the Boutwell testing and associated laboratory testing is not complete. We will issue the Boutwell test data along with the associated additional laboratory testing in a separate report.

Should you have any questions or need additional information, please do not hesitate to contact our office.

Respectfully submitted,

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

9-15-98

Robert, Mashewske, P.E.
Regional Manger / Senior Engineer

Field Density (ASTM D3017), Field Moisture (ASTM D3017)

VAN DER HORST

DURHAM LANDFILL CLOSURE
VNC-98-029.008

"Test Pad Evaluation Testing"
Ellington Pit - Low Permeability Soil

Test Method	DL-020/24	DL-022/25	DL-023/26	DL-028/27
Location	Lift #1	Lift #2	Lift #3	Lift #4
Natural Moisture Content (%) (ASTM D-2216)	22.9	24.5	24.4	22.9
USCS Soil Classification	CH	CH	CH	CH
Grainsize Analysis (ASTM D422)				
% Gravel	0.0	0.1	0.1	0.0
%Sand	31.2	28.6	29.6	28.2
%Silt	13.9	23.0	16.8	16.4
% Clay	54.9	28.3	53.5	55.4
Atterberg Limits (ASTM D4318)				
LL	61	57	57	41
PL	21	22	23	26
PI	40	34	34	35
Hydraulic Conductivity (ASTM D-5084)				
Density (pcf)	97.3	94.2	97.4	103.1
Moisture (%)	22.9	24.5	24.4	22.9
Permeability (cm/sec)	8.8×10^{-8}	6.4×10^{-8}	1.5×10^{-8}	2.0×10^{-8}

Hydraulic conductivity testing must be performed within acceptable moisture content range.

VAN DER HORST

Lift Thickness Summary Table
Durham Landfill Closure - Test Pad
VNC-98-029

	Lift #1		Lift #2		Lift #3		Lift #4	
Test	Loose	Comp.	Loose	Comp.	Loose	Comp.	Loose	Comp.
1	8.5	6.25	9	6.5	8.5	6	9	6.25
2	8.5	6.25	9	6.5	8.5	6	8.5	6.25
3	8.25	6	8.5	6.5	8.5	6	8.5	6.25
4	8.75	6.25	8.5	6.5	9	6.5	8.25	6
5	8.75	6.5	8.25	6	9	6.25	8.25	6
6	8.5	6	8.5	6	8.75	6	8.75	6.25
7	8.5	6.25	9	6.5	8.5	6	8.75	6.25
8	8.5	6.5	9	6.25	8.5	6.25	8.25	6
9	8.75	6.5	9	6.25	9	6.25	8.5	6
10	8.5	6.25	8.75	6.5	8.5	6	8.75	6.5

Note: All measuraments are to the nearest 1/4"

Compacted lifts should have been ≤ 6 inches per Section 02250 Part 2.1.C.4c2). Ensure 6-inch maximum during execution per Part 3.1.A.

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 09/23/98
Report No.: P-011

Project No.: VNC-98-029
Sample No. DL-020

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.8E-08	cm/sec
% Moisture	22.9	%
Dry Density	97.3	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 09/13/98
Location: Test Pad Lift #1
Ellington Borrow - Low Perm. Soil

Specimen Data

Length (in):	3.770
Diameter (in.):	2.875
Area (sq. in.):	6.503
Volume (cu. in.):	24.52
Wet Weight (grams):	769.9
Dry Weight (grams):	626.4
Dry Density (pcf):	97.3

Moisture Content Test Data

Wet Weight	114.26
Dry Weight	97.03
Tare weight	21.83
% Moisture	22.9

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
914	52.62	3.10	3.00	0.97	3.05	9.56E-08
280	52.62	0.85	0.80	0.94	0.83	8.44E-08
1237	52.62	3.90	3.80	0.97	3.85	8.92E-08
599	52.62	1.70	1.80	1.06	1.75	8.37E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 8.8E-08 cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 09/23/98
Report No.: P-012

Project No.: VNC-98-029
Sample No. DL-022

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.4E-08	cm/sec
% Moisture	24.5	%
Dry Density	94.2	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X___

Date Sampled: 09/14/98
Location: Test Pad Lift #2
Ellington Borrow - Low Perm. Soil

Specimen Data

Length (in):	3.207
Diameter (in.):	2.855
Area (sq. in.):	6.413
Volume (cu. in.):	20.57
Wet Weight (grams):	632.8
Dry Weight (grams):	508.2
Dry Density (pcf):	94.2

Moisture Content Test Data

Wet Weight	138.82
Dry Weight	115.85
Tare weight	22.12
% Moisture	24.5

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
800	72.00	2.70	2.90	1.07	2.80	6.32E-08
371	72.00	1.40	1.45	1.04	1.43	6.94E-08
1073	72.00	3.90	3.60	0.92	3.75	6.31E-08
281	72.00	1.00	0.90	0.90	0.95	6.11E-08

△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **6.4E-08** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 09/23/98
Report No.: P-013

Project No.: VNC-98-029
Sample No. DL-023

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.5E-08	cm/sec
% Moisture	24.4	%
Dry Density	97.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 09/14/98
Location: Test Pad Lift #3
Ellington Borrow - Low Perm. Soil

Specimen Data

Length (in):	3.240
Diameter (in.):	2.842
Area (sq. in.):	6.355
Volume (cu. in.):	20.59
Wet Weight (grams):	654.7
Dry Weight (grams):	526.4
Dry Density (pcf):	97.4

Moisture Content Test Data

Wet Weight	128.81
Dry Weight	107.84
Tare weight	21.83
% Moisture	24.4

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1612	69.23	1.20	1.20	1.00	1.20	1.43E-08
1503	88.62	1.40	2.40	1.71	1.90	1.89E-08
1517	88.62	1.40	1.30	0.93	1.35	1.33E-08
600	88.62	0.50	0.50	1.00	0.50	1.25E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **1.5E-08** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 09/23/98
Report No.: P-014

Project No.: VNC-98-029
Sample No. DL-028

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.0E-08	cm/sec
% Moisture	22.9	%
Dry Density	103.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 09/15/98
Location: Test Pad Lift #4
Ellington Borrow - Low Perm. Soil

Specimen Data

Length (in):	3.255
Diameter (in.):	2.825
Area (sq. in.):	6.279
Volume (cu. in.):	20.44
Wet Weight (grams):	679.5
Dry Weight (grams):	552.9
Dry Density (pcf):	103.1

Moisture Content Test Data

Wet Weight	151.12
Dry Weight	127.07
Tare weight	22.05
% Moisture	22.9

Test Data

Confining Pressure 3.0 psi

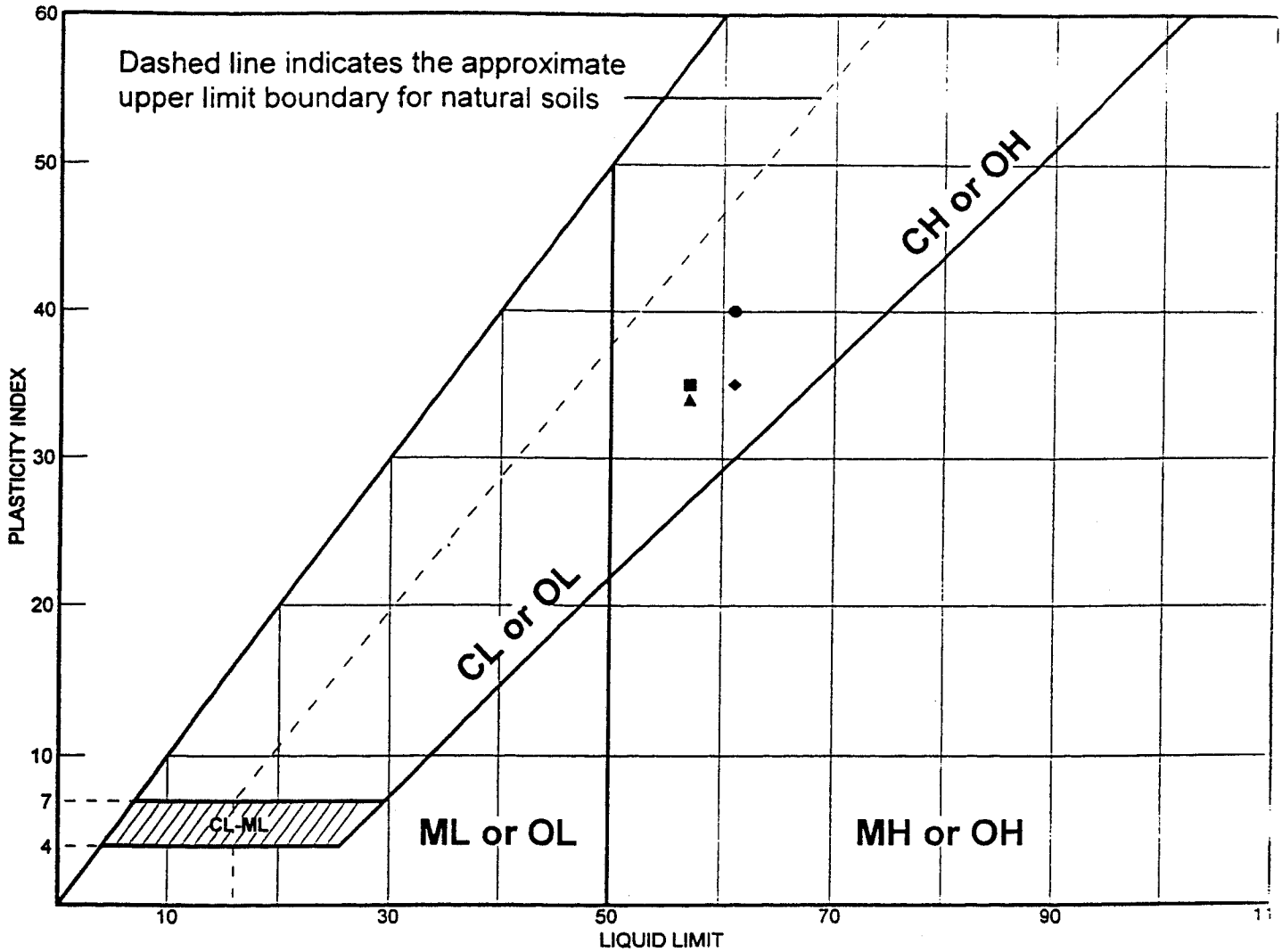
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1513	77.54	1.70	1.80	1.06	1.75	2.01E-08
1518	77.54	1.70	1.70	1.00	1.70	1.95E-08
1333	77.54	1.60	1.65	1.03	1.63	2.12E-08
597	77.54	0.70	0.70	1.00	0.70	2.04E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.0E-08** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Ellington Pit - Sandy fat CLAY, Test Pad - Lift #1	61	21	40	88.5	68.8	CH
■	Ellington - Fat clay with sand - Test Pad, Lift #2	57	22	35	89.8	71.3	CH
▲	Ellington - Fat clay with sand- Test Pad, Lift #3	57	23	34	90.5	70.3	CH
◆	Ellington - Fat clay with sand - Test Pad, Lift #4	61	26	35	90.4	71.8	CH

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.

Project: Durham Landfill Closure

● **Location:** Test Pad - Lift #1
■ **Location:** Test Pad - Lift #2
▲ **Location:** Test Pad - Lift #3
◆ **Location:** Test Pad - Lift #4

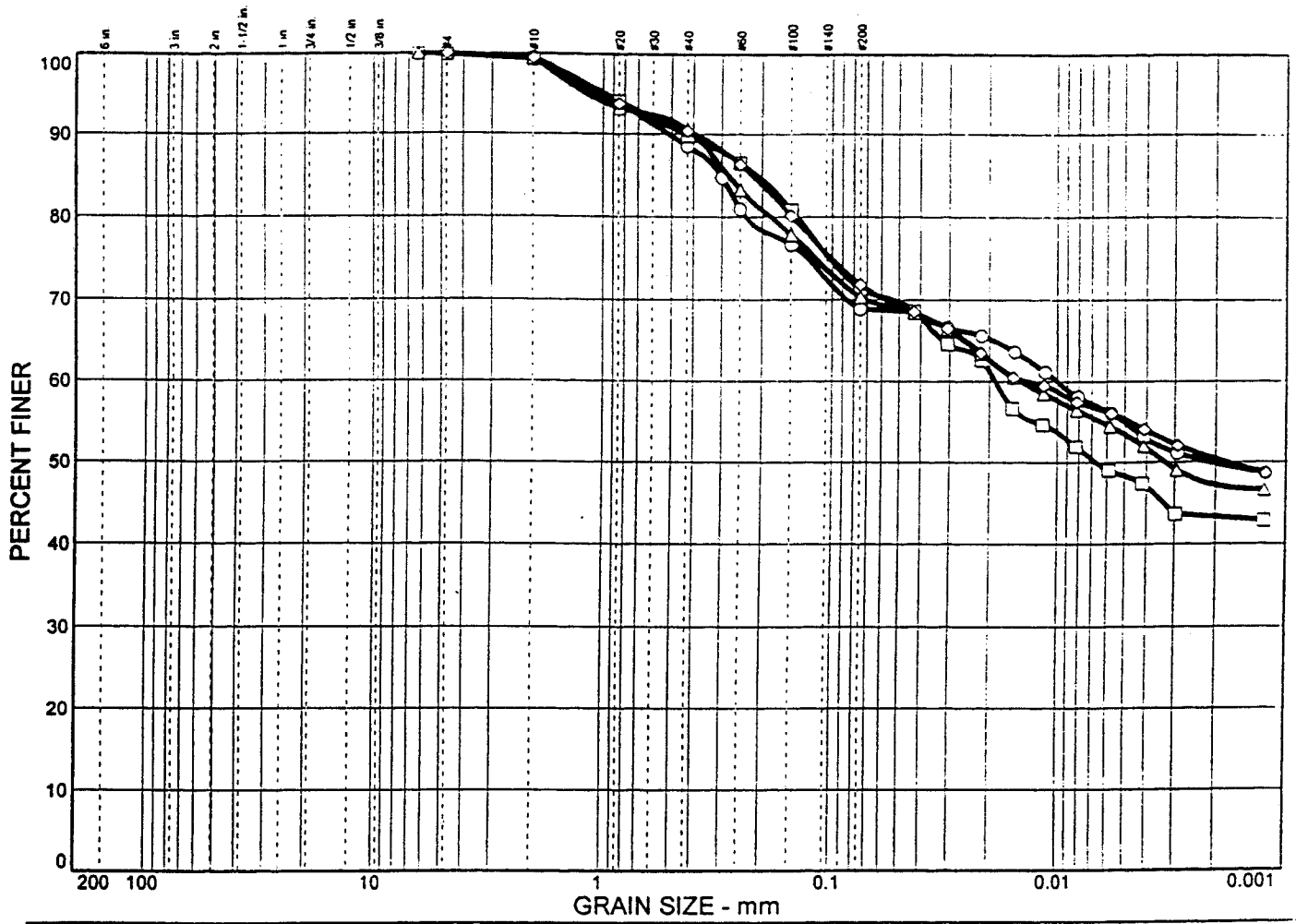
Remarks:
● Composite - TP, Lift #1
■ Composite - TP Lift #2
▲ Composite - TP, Lift #3
◆ Composite - TP, Lift #4

LIQUID AND PLASTIC LIMITS TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	31.2	13.9	54.9
□	0.0	0.1	28.6	23.0	48.3
△	0.0	0.1	29.6	16.8	53.5
◇	0.0	0.0	28.2	16.4	55.4

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	Ellington Pit	DL-024		Ellington Pit - Sandy fat CLAY, Test Pad - Lift #1	CH
□	Ellington Pit	DL-025		Ellington - Fat clay with sand - Test Pad, Lift #2	CH
△	Ellington Pit	DL-026		Ellington - Fat clay with sand- Test Pad, Lift #3	CH
◇	Ellington Pit	DL-027		Ellington - Fat clay with sand - Test Pad, Lift #4	CH

Particle Size Distribution Report

VAN DER HORST ENGINEERING

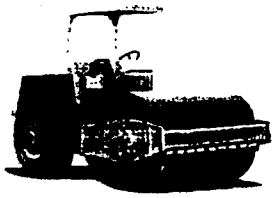
Client: Gilbert Southern Corp.

Project: Durham Landfill Closure

Project No.: VNC-98-029

Plate

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	09/13/98 pg. 1 of 1
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-1

GENERAL LOCATION: General/Common fill and Elington Pit Test Pad

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP . [%]	SAMPLE NO.
1	Center of Test Pad	FSG	120.4	14.8	94.1	DL-012
2	20'N, 5'W of SE corner of Test Pad	1"	99.7	22.0	99.2	DL-014
3	15'N, 5'W of SE corner of Test Pad	1"	98.7	22.4/23.3	98.2	DL-014
4	5'N, 5'W of SE corner of Test Pad	1"	99.8	24.4	99.3	DL-014
5	30'N, 5'W of SE corner of Test Pad	1"	102.2	23.1	100+	DL-014
6	10'N, 15'W of SE corner of Test Pad	1"	96.1	24.0	95.6	DL-014
7	20'N, 15'W of SE corner of Test Pad	1"	98.6	24.5	98.1	DL-014
8	30'N, 15'W of SE corner of Test Pad	1"	96.5	24.5	96.0	DL-014
9	35'N, 38'W of SE corner of Test Pad	1"	98.2	23.7/23.1	97.7	DL-014
10	20'N, 35'W of SE corner of Test Pad	1"	98.0	24.2	97.5	DL-014
11	5'N, 35'W of SE corner of Test Pad	1"	100.2	24.3/23.6	99.7	DL-014

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-012	128.0	10.6	Reddish Brown Sandy Silt & Gravel
DL-014	100.5	21.0	Brown Sandy Fat Clay

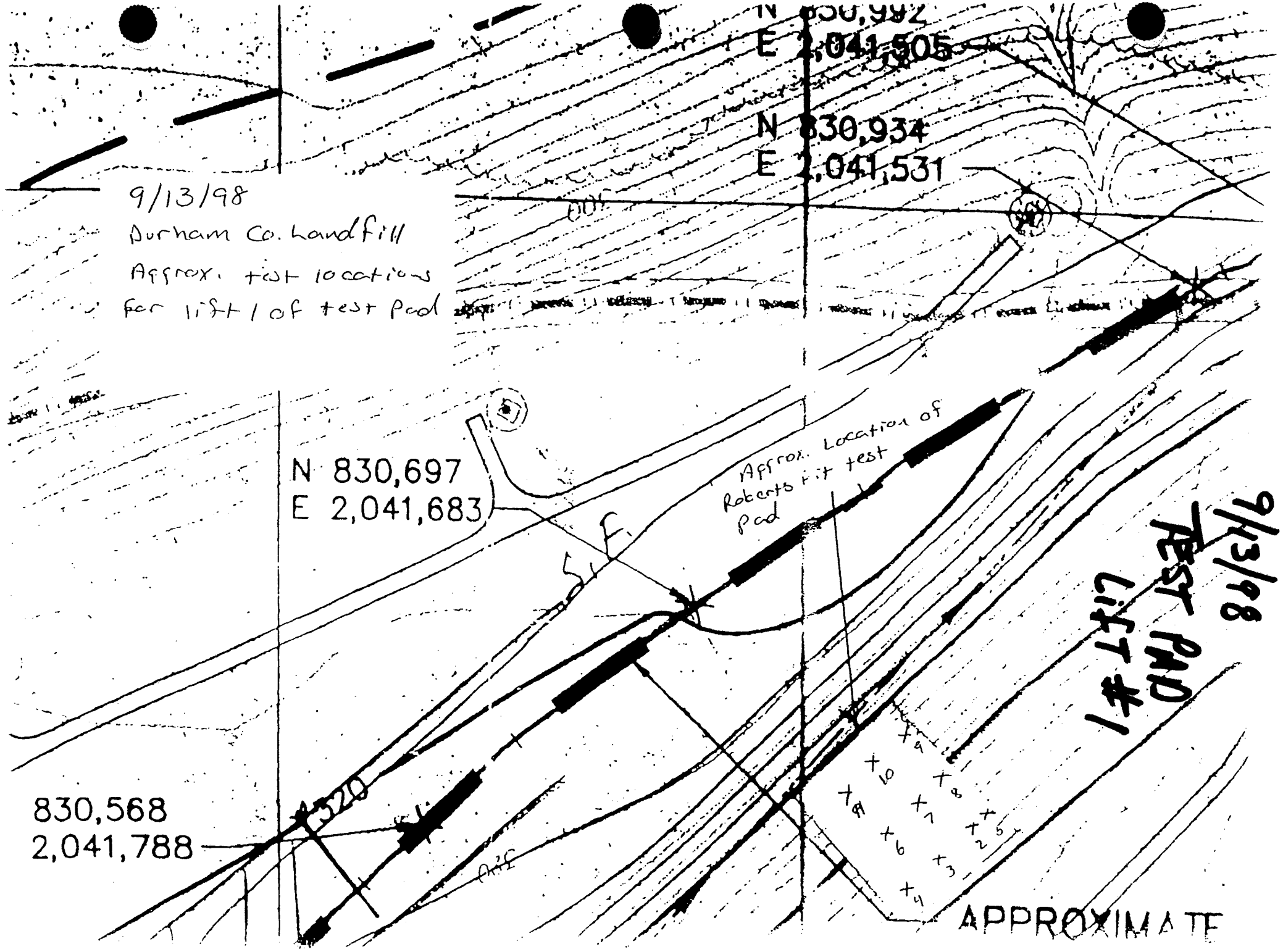
REMARKS: FSG : Finished Subgrade

ARRIVED ON SITE: 9:00
LEFT SITE: 4:30
HOURS ON SITE: 7.0
TRAVEL TIME: 1.5
MILEAGE: 60

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

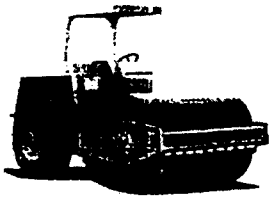
PERFORMED BY: William Lupi
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460



9/13/98
Durham Co. Landfill
Approx. test locations
for lift 1 of test pad
N 830,992
E 2,041,505
N 830,934
E 2,041,531
N 830,697
E 2,041,683
Approx. Location of
Roberts Pit test
pad
9/13/98
TEST PAD
LIFT #1
830,568
2,041,788
APPROXIMATE

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	09/14/98 pg. 1 of 2
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-2

GENERAL LOCATION: Test Pad

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP . [%]	SAMPLE NO.
1	Test Pad - See Sketch	Lift 2	98.4	23.4	97.9	DL-014
2	Test Pad - See Sketch	Lift 2	96.2	23.2	95.7	DL-014
3	Test Pad - See Sketch	Lift 2	96.0	23.1/22.4	95.5	DL-014
4	Test Pad - See Sketch	Lift 2	96.7	23.0	96.2	DL-014
5	Test Pad - See Sketch	Lift 2	97.4	24.5	96.9	DL-014
6	Test Pad - See Sketch	Lift 2	97.7	25.0/24.6	97.3	DL-014
7	Test Pad - See Sketch	Lift 2	97.8	23.1	97.3	DL-014
8	Test Pad - See Sketch	Lift 2	100.5	23.4/22.6	100+	DL-014
9	Test Pad - See Sketch	Lift 2	95.9	25.5	95.4	DL-014
10	Test Pad - See Sketch	Lift 2	96.4	23.9	95.9	DL-014
11	Test Pad - See Sketch	Lift 3	96.9	23.3	96.4	DL-014
12	Test Pad - See Sketch	Lift 3	100.3	23.0/23.8	99.8	DL-014

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-014	100.5	21.0	Ellington Pit Borrow Clay

REMARKS: 1 set of 2 shelby tube samples obtained from test number 5.

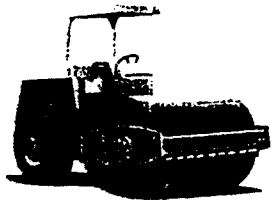
ARRIVED ON SITE: 8:00
LEFT SITE: 5:30
HOURS ON SITE: 9.0
TRAVEL TIME: 2.0
MILEAGE: 70

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT: Durham Co. Landfill
PROJECT NO: Vnc-98-029
CLIENT: Gilbert Southern
DATE: 09/14/98 pg. 2 of 2
CONTRACTOR: Gilbert Southern
REPORT NO: D-2

GENERAL LOCATION: Test Pad

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP . [%]	SAMPLE NO.
13	Test Pad - See Sketch	Lift 3	97.9	23.1	97.4	DL-014
14	Test Pad - See Sketch	Lift 3	99.6	23.5	99.1	DL-014
15	Test Pad - See Sketch	Lift 3	100.3	23.1	97.4	DL-014
16	Test Pad - See Sketch	Lift 3	98.8	23.0/24.1	98.3	DL-014
17	Test Pad - See Sketch	Lift 3	100.9	23.2	100+	DL-014
18	Test Pad - See Sketch	Lift 3	98.7	23.0	98.2	DL-014
19	Test Pad - See Sketch	Lift 3	97.0	23.1	96.5	DL-014
20	Test Pad - See Sketch	Lift 3	96.3	23.8/24.4	95.8	DL-014

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-014	100.5	21.0	Ellington Pit Clay

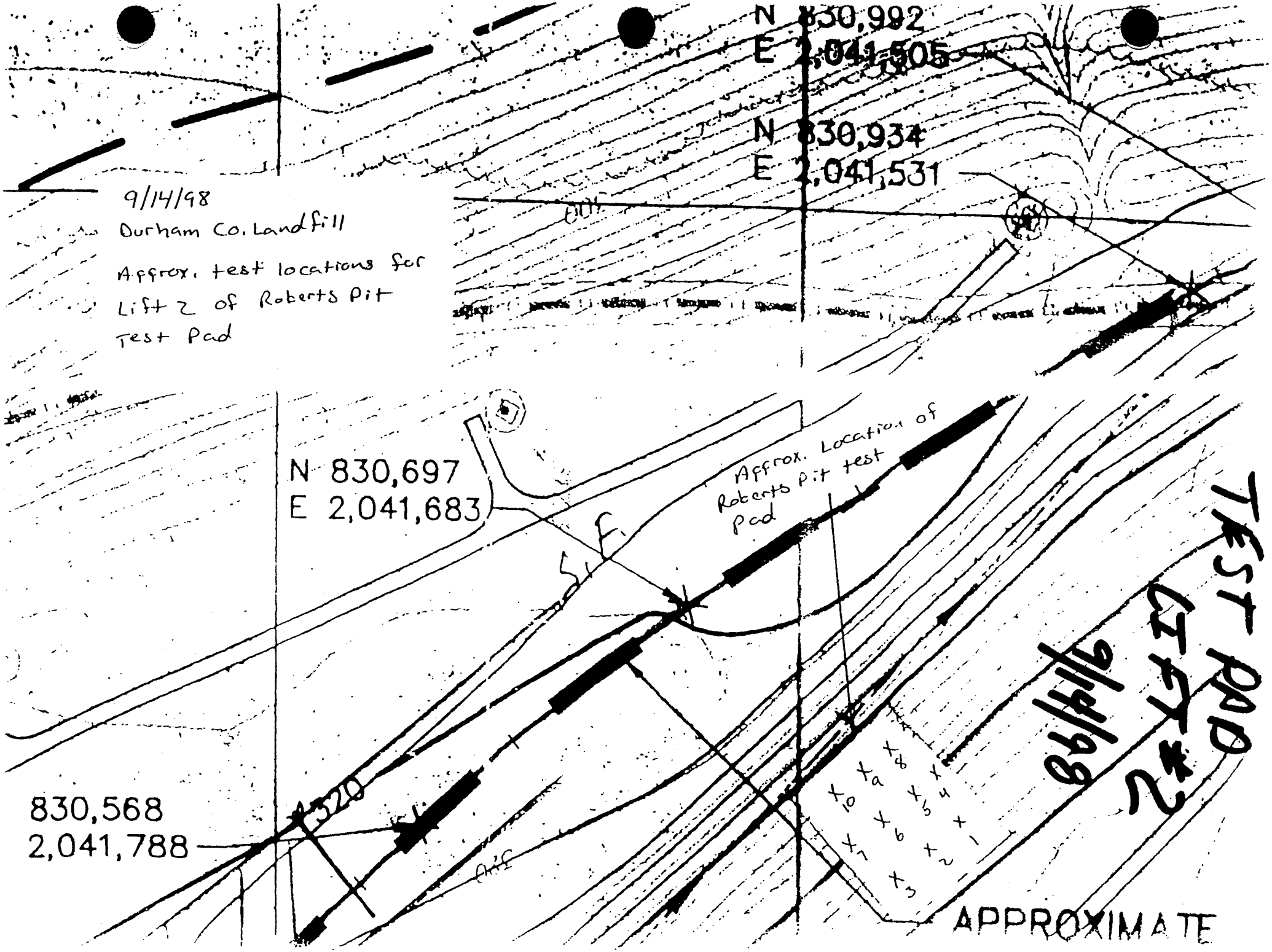
REMARKS: 1 set of 2 shelby tube samples obtained from test number 20.

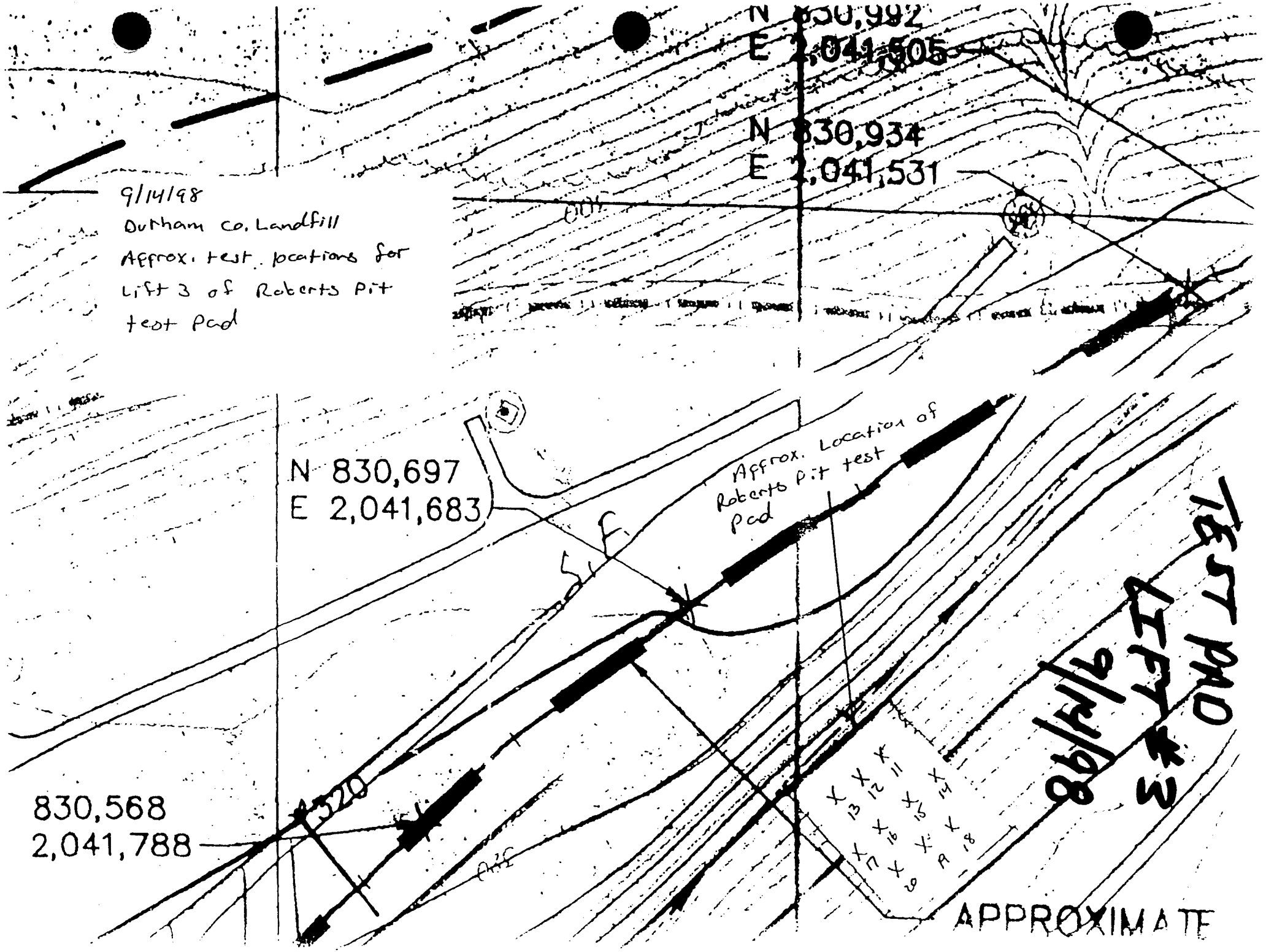
ARRIVED ON SITE: 8:00
LEFT SITE: 5:30
HOURS ON SITE: 9.0
TRAVEL TIME: 2.0
MILEAGE: 70

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

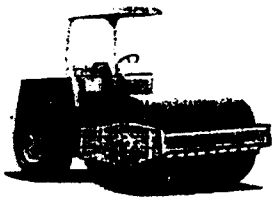
PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460


N 830,992
E 2,041,505
N 830,934
E 2,041,531
9/14/98
Durham Co. Landfill
Approx. test locations for
Lift 2 of Roberts Pit
Test Pad
N 830,697
E 2,041,683
Approx. Location of
Roberts Pit test
Pad
S.F.
830,568
2,041,788
320
TEST PAD
LIFT #2
9/14/98
APPROXIMATE


N 830,992
E 2,041,505
N 830,934
E 2,041,531
9/14/98
Durham Co. Landfill
Approx. test locations for
Lift 3 of Roberts Pit
test Pad
N 830,697
E 2,041,683
Approx. Location of
Roberts Pit test
Pad
830,568
2,041,788
TEST PAD
LIFT #3
9/14/98
APPROXIMATE

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	09/15/98 pg. 1 of 2
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-3

GENERAL LOCATION: Test Pad

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP . [%]	SAMPLE NO.
1	Test Pad - Lift 4	Lift 4	98.0	23.6	97.6	DL-014
2	Test Pad - Lift 4	Lift 4	99.1	22.9	98.6	DL-014
3	Test Pad - Lift 4	Lift 4	98.6	23.5	98.1	DL-014
4	Test Pad - Lift 4	Lift 4	98.4	23.0/23.1	97.9	DL-014
5	Test Pad - Lift 4	Lift 4	99.1	22.8	98.6	DL-014
6	Test Pad - Lift 4	Lift 4	100.9	23.6	100+	DL-014
7	Test Pad - Lift 4	Lift 4	100.2	23.0	100+	DL-014
8	Test Pad - Lift 4	Lift 4	100.6	23.0/23.6	100+	DL-014
9	Test Pad - Lift 4	Lift 4	98.5	23.2	98.0	DL-014
10	Test Pad - Lift 4	Lift 4	101.56	22.8	100+	DL-014
11	Approximately 50'E, 200'N of Well 49	-6'±	118.8	13.4	92.8	DL-001
12	Approximately 50'E, 200'N of Well 49	-6'±	115.7	14.4	90.4	DL-001

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-014	100.5	21.0	Ellington Pit Clay
DL-014	115.8	14.4	General fill Stockpile

REMARKS: Tube pushed @ test no. 5.

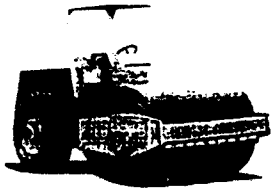
ARRIVED ON SITE: 7:30
LEFT SITE: 3:00
HOURS ON SITE: 7.0
TRAVEL TIME: 1.5
MILEAGE: 60

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	09/15/98 pg. 2 of 2
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-3

GENERAL LOCATION: Test Pad

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
13	Approximately 50'E, 200'S of Well 49	-6'±	119.3	12.1	93.1	DL-001
14	Approximately 50'W, 200'S of Well 49	-6'±	108.6	16.0	93.6	DL-018
15	Approximately 50'W 200'S of Well 49	-6'±	107.1	13.5	92.5	DL-018
16	Approximately 5'W, 200'N of Well 49	-6'±	112.1	11.6	97.1	DL-018

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-018	115.8	14.4	General Fill Stockpile

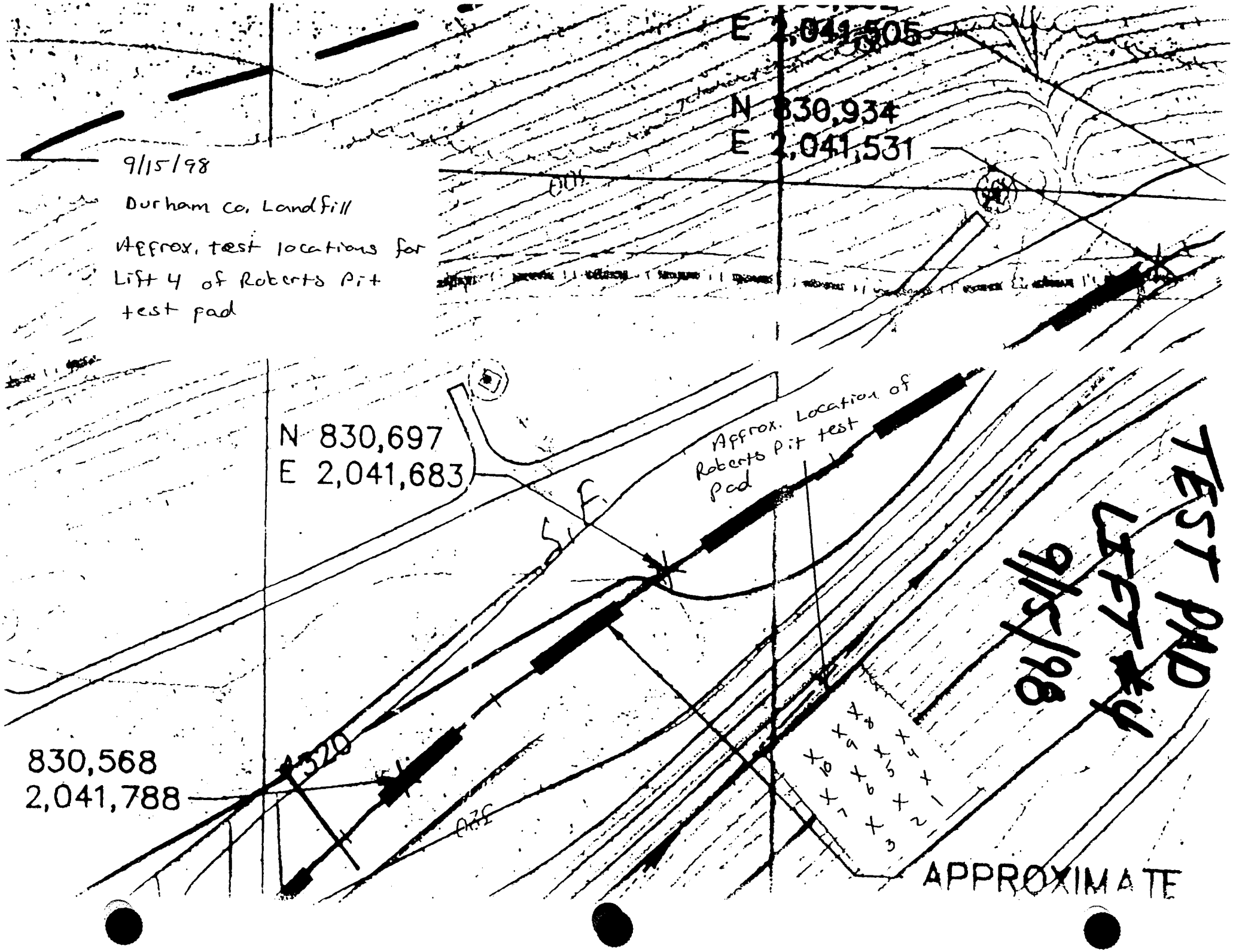
REMARKS:

ARRIVED ON SITE: 7:30
LEFT SITE: 3:00
HOURS ON SITE: 7.0
TRAVEL TIME: 1.5
MILEAGE: 60

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460


9/15/98
Durham Co. Landfill
Approx. test locations for Lift 4 of Roberts Pit test pad
E 2,041,505
N 830,934
E 2,041,531
N 830,697
E 2,041,683
Approx. Location of Roberts Pit test pad
S.F.
830,568
2,041,788
320
APPROXIMATE
TEST PAD
Lift #4
9/15/98

MALCOLM PIRNIE

LETTER OF TRANSMITTAL

To: GILBERT SOUTHERN CORP
3301 GLENN ROAD
DURHAM, NC 27704

Transm'l Date : 10/21/98
Transm'l No. : 0021
Spec'n Section : 02250

Attention: ANDY PALAHNUK

Re: CITY OF DURHAM, NORTH CAROLINA
DURHAM MUNICIPAL SOLID WASTE LANDFILL FACILITY CLOSURE

Gentlemen:
We are sending you via, U.S. Mail the following items:

No.	Manufacturer's Name	Drawing Reference	Description	Act'n Taken
4	VAN DER HORST	19 PAGES	TEST PAD - ON SITE BORROW PIT	AC

Our action relative to items submitted for approval has been noted above and on the drawings.

Remarks:
PLEASE SUBMIT THE FOLLOWING ADD'L INFORMATION: 1) Procedure for repair of holes in lift as a result of density testing and soil sample collection per section 02250, 1.4.B.4; 2) Procedure to bond lifts and record during execution per section 02250, 1.4.B.6; 3) Dimensions of test pad per section 02250, 2.1.C.4.b.

Copies to:
TOM GLENN, W/ENCL;
HARRY HERZBERG, W/ENCL; FILE

Very truly yours
MALCOLM PIRNIE, INC.

by ORIGINAL SIGNED BY
JAY JACKSON, PE

Form 69 Printed in USA
Rev 10/95

GILBERT SOUTHERN CORP.
(Company Name)

LETTER OF TRANSMITTAL

TO: MALCOLM PIRNIE
201 McCULLOUGH DRIVE
CHARLOTTE NC 28262

ADDRESS REPLY TO:
3301 GLENN RD
DURHAM NC 27704

DATE 10/19/98 CO. NO. 44 JOB NO. 3124
TRANSMITTAL NO. 021
RE: TEST PAD - ON SITE BORROW

WE ARE SENDING ☐ Attached ☐ Under separate cover via _____ the following:

☐ Drawings ☐ Plans ☐ Progress Payment ☐ Subcontractor
☐ Prints ☐ Samples ☐ Specifications ☐ Change Order
☐ Payroll ☐ EEO Report ☐ Certificates of Compliance ☐ Copy of Letter
☐ _____ ☐ _____

COPIES	DATE	NO.	DESCRIPTION
5	10/19/98		TEST PAD - ON SITE BORROW

THESE ARE TRANSMITTED as checked below:

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

RECEIVED
OCT 20 1998
MALCOLM PIRNIE
CHARLOTTE
ROUTE: JCJ
JAG
JOB #
FILE:

REMARKS _____

COPY TO: BARRY HERZBERG

SIGNED: [signature]

VAN DER HORST

GEOTECHNICAL ENGINEERING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

Contractor's Name: GILBERT SOUTHERN CORP
Date: 10/19/98
Item: TEST PAD - ONSITE BORROW PIT
Specifications: TECHNICAL
Section: 02250
Page No.: 02250-2
Para. No.: 1.4.B
Drawing No.:
Location: DURHAM
Submittal No.: 021
Approved By: SC

October 15, 1998

Mr. Andy Palabunk
Gilbert Southern Corp.
3301 Glenn Road
Durham, NC 27704

Re: Test Pad Summary Report - Onsite Borrow Pit Clay
Durham Landfill Closure
VNC-98-029.013

Dear Andy:

VAN DER HORST Geotechnical Engineering, PC, is pleased to present our field and laboratory test results for the low permeability soil test pad. The test pad was constructed on October 3 and 5, 1998. The material placed for construction of the test pad was excavated from the on-site borrow pit. Initial conformance testing and permeability "window" was previously submitted for this borrow source.

The material was placed in loose lifts not exceeding 9" in loose thickness and compacted using a CAT 815 compactor. Generally compaction was obtained in two pass with the 815 and the compacted lift thickness ranged from 6 to 6 ½ inches. A tabular summary is attached to this report which provides both loose and compacted lift thickness measurements taken during the test pad construction. During construction moisture content and in-place density testing was performed. The in-place density tests and in-place moisture content tests are presented on the attached in-place density test reports. In addition to the in-place moisture tests 10 random samples were collected at field mositure test locations for oven dried analysis. This data is also presented on the in-place density test reports. The second moisture content provided at a given location represents the oven dried test result.

Also during the test pad construction shelby tube samples and composite samples were obtained from each lift. The shelby tube samples were tested for hydraulic conductivity (permeability). Attached please find 4 permeability test reports presenting the permeability test data. The random bulk samples were tested for Atterberg Limits, Grain-size analysis and USCS soil classification. Our laboratory test reports are attached presenting our test results.

535 Summit Point Drive
Henrietta, NY 14467
716/359-2730
Fax 716/359-9668

3101 Stonybrook Drive, Suite 156
Raleigh, NC 27604
919/876-0405
Fax 919/876-0460

VAN DER HORST

VNC-98-029.013 -2-

(ASTM D2487)

The attached table presents a summary of laboratory test results for, Atterberg Limits (ASTM D-4318), Grain-size (ASTM D-422), USCS soil classification and Permeability (ASTM D-5084), FIELD DENSITY (ASTM D2922), FIELD MOISTURE (ASTM D 3017)

At this time the Boutwell testing and associated laboratory testing is not complete. We will issue the Boutwell test data along with the associated additional laboratory testing in a separate report.

Should you have any questions or need additional information, please do not hesitate to contact our office.

Respectfully submitted,

Robert L Mashewske

Robert, Mashewske, P.E.
Regional Manger / Senior Engineer

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

10-6-98

VAN DER HORST

DURHAM LANDFILL CLOSURE
VNC-98-029.013

"Test Pad Evaluation Testing"
Onsite Borrow Pit - Low Permeability Soil

Test Method	DL-042	DL-043	DL-044	DL-045
Location	Lift #1	Lift #2	Lift #3	Lift #4
Natural Moisture Content (%) (ASTM D-2216)	23.9	20.2	20.6	20.2
USCS Soil Classification	CH	CL	CL	CL
Grainsize Analysis (ASTM D422)				
% Gravel	0.1	0.0	0.0	0.0
%Sand	24.1	14.0	10.4	9.8
%Silt	31.3	39.0	43.5	48.7
% Clay	44.5	47.0	46.1	41.5
Atterberg Limits (ASTM D4318)				
LL	59	50	46	48
PL	24	23	22	22
PI	35	27	24	26
Hydraulic Conductivity (ASTM D-5084)				
Density (pcf)	99.9	99.2	103.8	108.8
Moisture (%)	23.9	20.2	20.6	20.2
Permeability (cm/sec)	1.8×10^{-8}	5.3×10^{-8}	2.1×10^{-8}	1.3×10^{-8}

VAN DER HORST

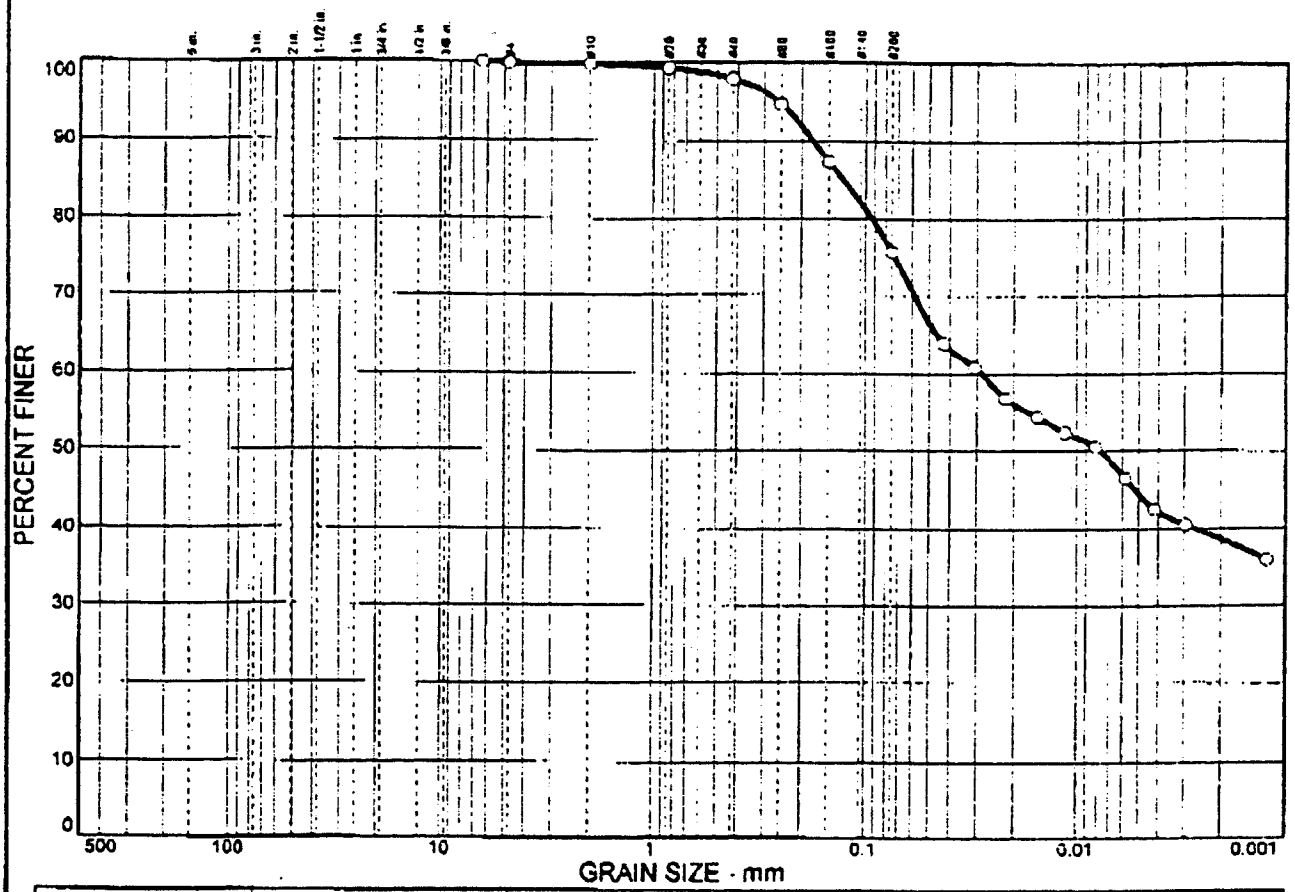
Lift Thickness Summary Table
Durham Landfill Closure - Test Pad
(on-site borrow clay)
VNC-98-029

	Lift #1		Lift #2		Lift #3		Lift #4	
Test	Loose	Comp.	Loose	Comp.	Loose	Comp.	Loose	Comp.
1	9	6.5	8.5	6.5	8.75	6.0	8.5	6.25
2	8.5	6.25	9	6.5	8.75	6.0	8.5	6.25
3	8.5	6	8.5	6.5	8.25	5.75	8.5	6.25
4	8.5	6.25	8.25	5.75	9	6.5	8.75	6
5	8.25	5.75	8.25	6	8.5	6.0	8.75	6
6	9	6.25	8.5	6	8.75	6.0	9.0	6.25
7	8.5	6..25	9.25	6.5	8.75	6.0	8.75	6.0
8	8.25	6.0	9	6.5	8.5	6.25	8.25	5.5
9	8.75	6.5	8.5	6.25	9.25	6.5	8.5	6
10	9	6.5	8.75	6.5	8.25	6.0	8.75	6.25

Note: All measuraments are to the nearest 1/4"

COMPACTED LIFTS SHOULD HAVE ≤ 6 INCHES PER SECTION 02250 PART 2.1.C.4.C.2). ENSURE 6-INCH MAXIMUM DURING EXECUTION PER PART 3.1.A.

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	24.1	31.3	44.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.8		
#20	99.3		
#40	97.9		
#60	94.7		
#100	87.3		
#200	75.8		

* (no specification provided)

Soil Description

On-site Borrow silty CLAY

Atterberg Limits

PL= 24 LL= 59 PI= 35

Coefficients

D_{85}= 0.129 D_{60}= 0.0285 D_{50}= 0.0077
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

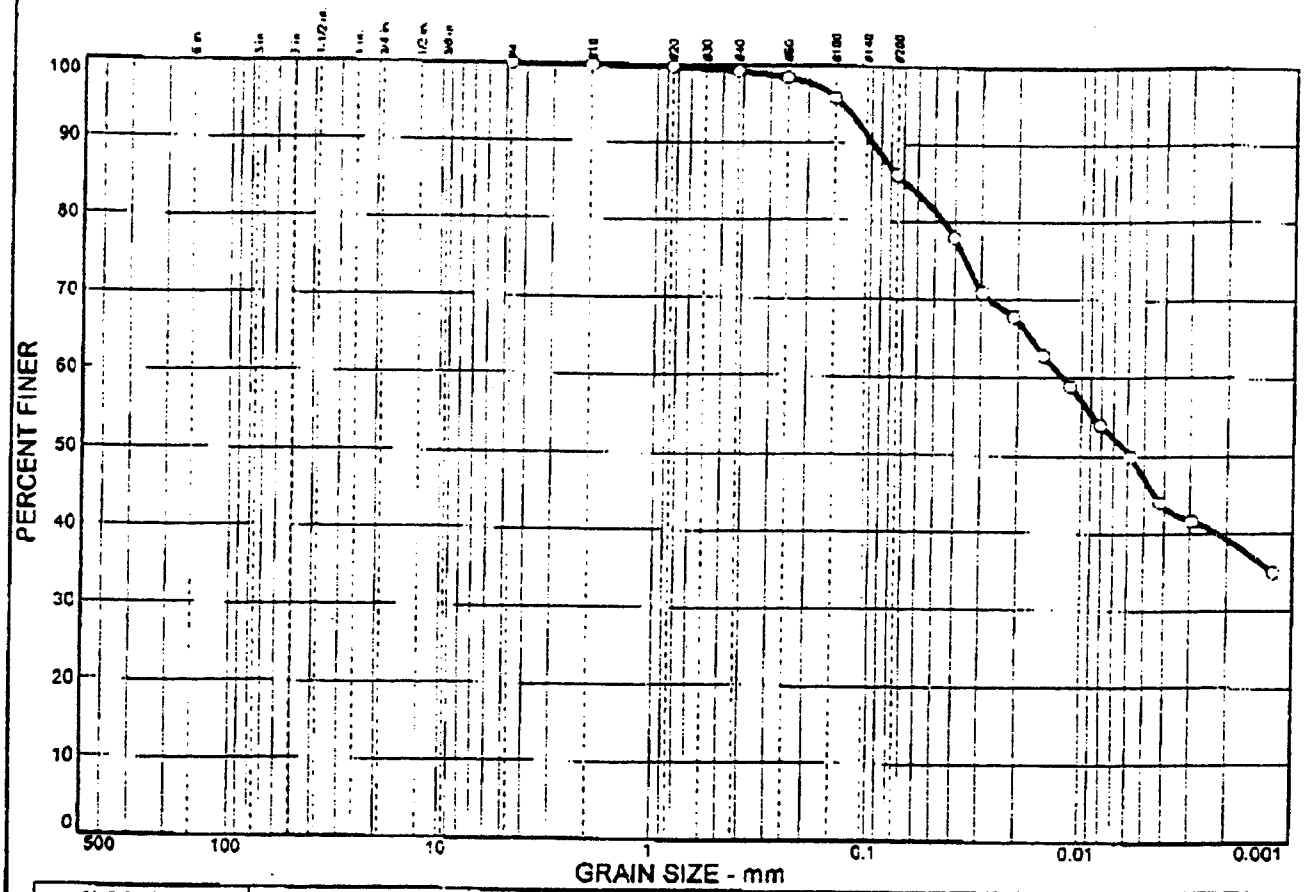
Test Pad #2 - Lift 1

Sample No.: DL-042 **Source of Sample:** On-site Borrow Clay **Date:**
Location: Test Pad #2 - Lift 1 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	14.0	39.0	47.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.7		
#40	99.2		
#60	98.4		
#100	95.8		
#200	86.0		

* (no specification provided)

Soil Description

Onsite Borrow - Silty CLAY

Atterberg Limits

PL= 23 LL= 50 PI= 27

Coefficients

D_{85}= 0.0689 D_{60}= 0.0123 D_{50}= 0.0059
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

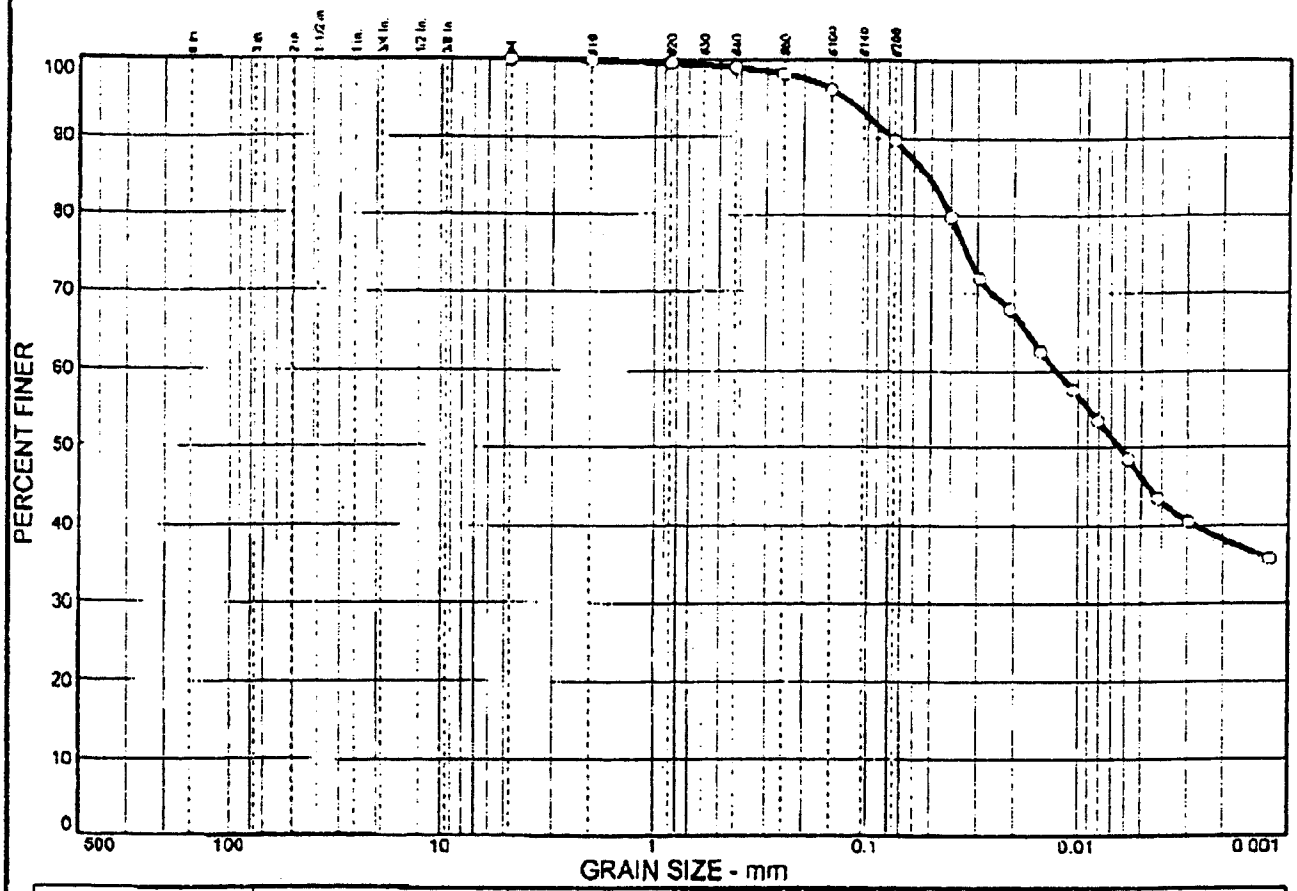
Test Pad #2 - Lift #2

Sample No.: DL-043 **Source of Sample:** On-site Borrow Clay **Date:**
Location: Test Pad #2 - Lift 2 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	10.4	43.5	46.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.6		
#40	99.0		
#60	98.2		
#100	96.2		
#200	89.6		

* (no specification provided)

Soil Description

On-site Borrow silty CLAY

Atterberg Limits

PL= 22 LL= 46 PI= 24

Coefficients

D_{85}= 0.0521 D_{60}= 0.0127 D_{50}= 0.0064
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

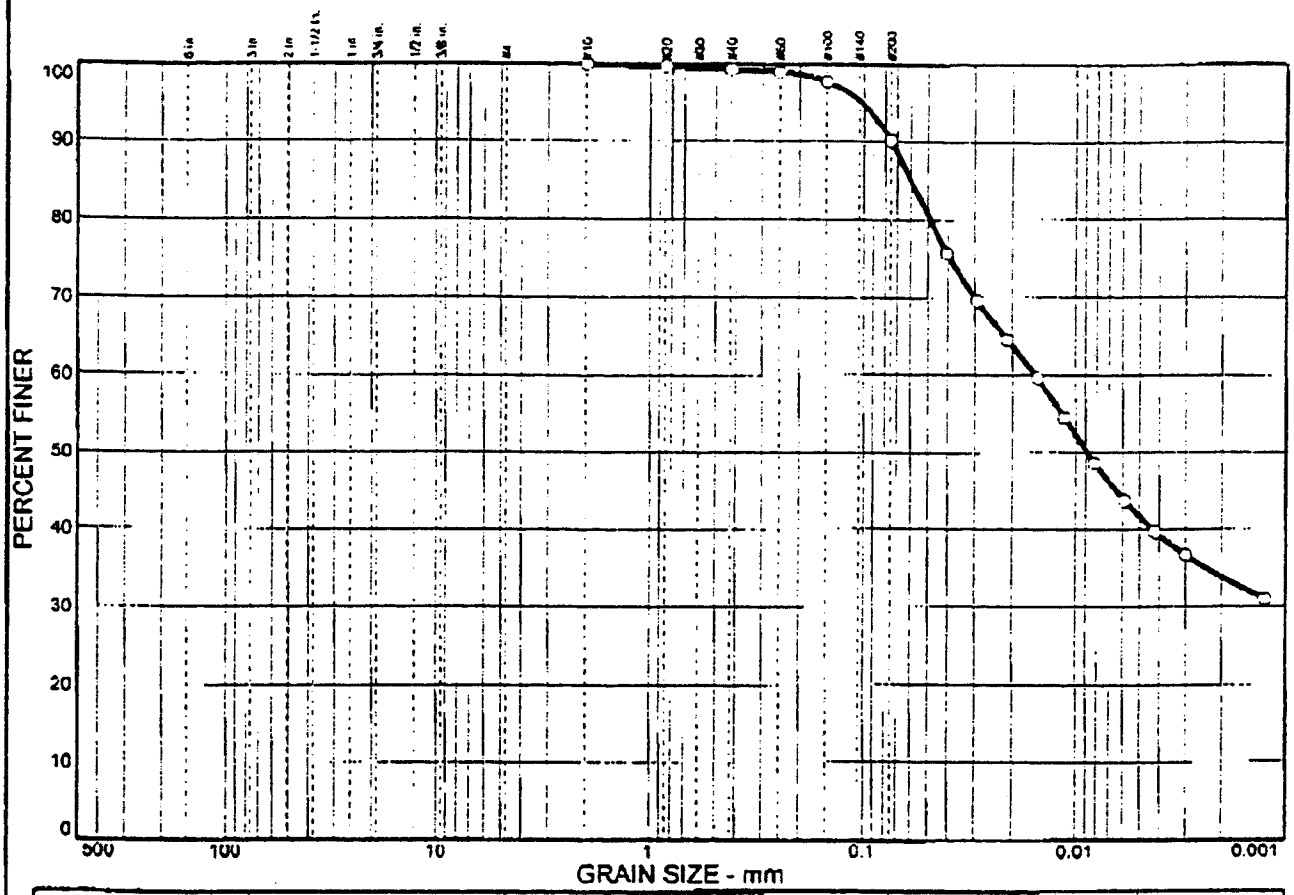
Test Pad #2 - Lift 3

Sample No.: DL-044 **Source of Sample:** On-site Borrow Clay **Date:**
Location: Test Pad #2 - Lift 3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	9.8	48.7	41.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.7		
#40	99.3		
#60	99.0		
#100	97.7		
#200	90.2		

* (no specification provided)

Soil Description

Onsite borrow silty CLAY

Atterberg Limits

PL= 22 LL= 48 PI= 26

Coefficients

D_{85}= 0.0596 D_{60}= 0.0157 D_{50}= 0.0089
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

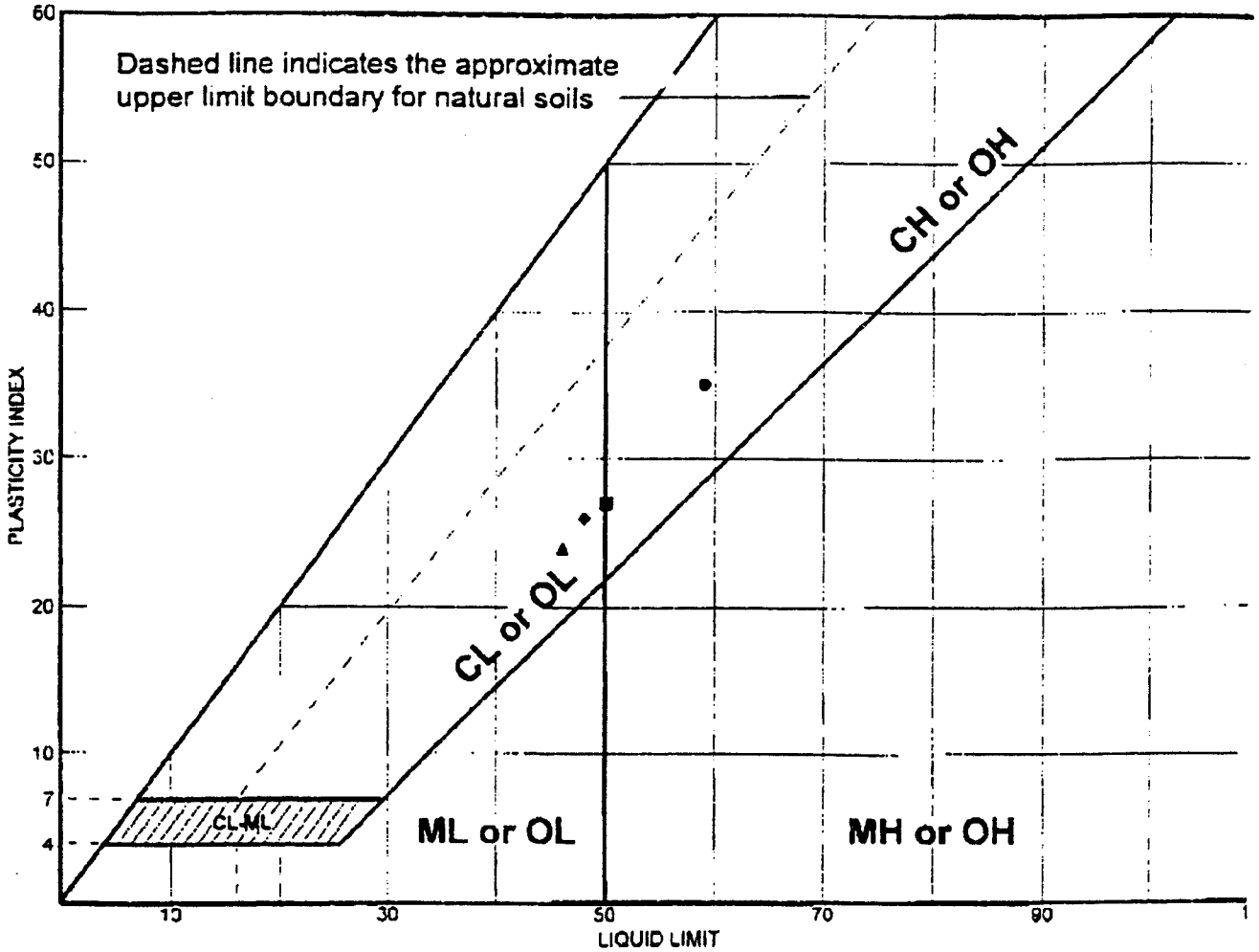
Test Pad #2 - Lift 4

Sample No.: DL-045 **Source of Sample:** On-site Borrow Clay **Date:**
Location: Test Pad #2 - Lift 4 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **Plate**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	On-site Borrow silty CLAY	59	24	35	97.9	75.8	
■	Onsite Borrow - Silty CLAY	50	23	27	99.2	86.0	
▲	On-site Borrow silty CLAY	46	22	24	99.0	89.6	
◆	Onsite borrow silty CLAY	48	22	26	99.3	90.2	

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.

Project: Durham Landfill Closure

● **Location:** Test Pad #2 - Lift 1
■ **Location:** Test Pad #2 - Lift 2
▲ **Location:** Test Pad #2 - Lift 3
◆ **Location:** Test Pad #2 - Lift 4

Remarks:
● Test Pad #2 - Lift 1
■ Test Pad #2, Lift 2
▲ Test Pad #2 - Lift 3
◆ Test Pad #2 - Lift 4

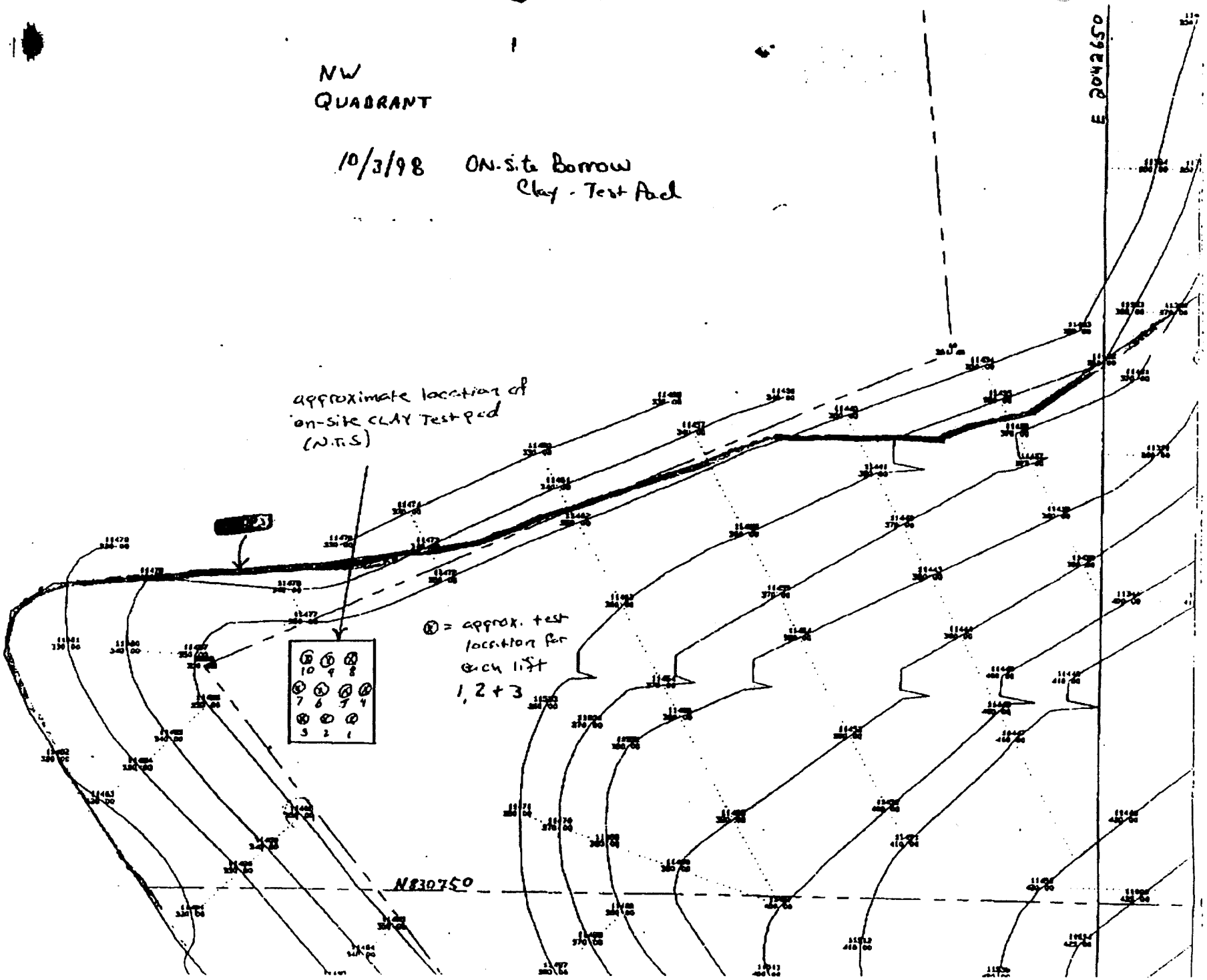
LIQUID AND PLASTIC LIMITS TEST REPORT

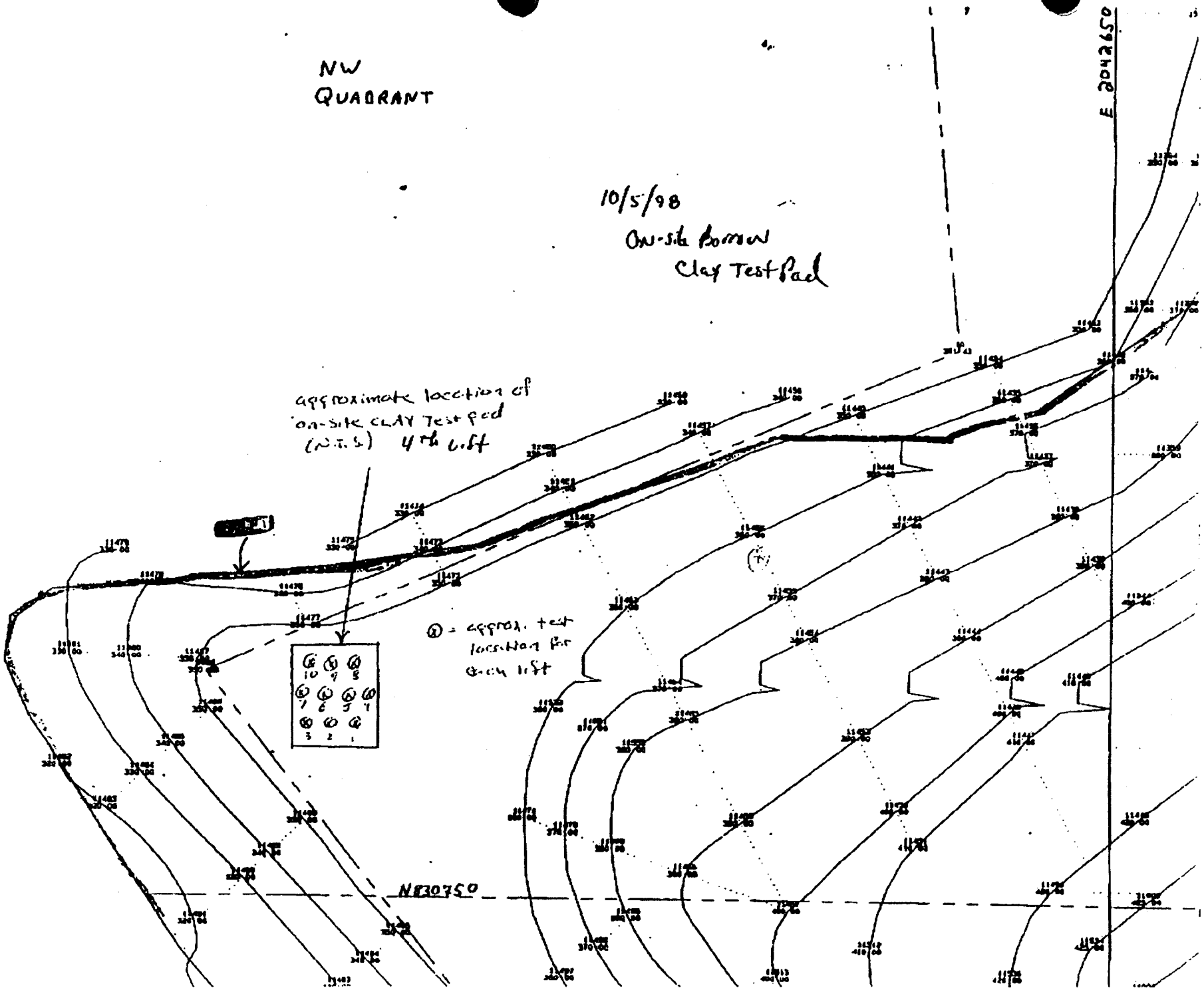
VAN DER HORST ENGINEERING

Plate

NW
QUADRANT

10/3/98 ON-Site Borrow
Clay - Test Pad




NW
QUADRANT
10/5/98
On-site Borrow
Clay Test Pad
approximate location of
on-site CLAY Test pad
(N.T.S.) 4th lift
⊗ = approx. test
location for
each lift
E 2042650
N830750

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/15/98
Report No.: P-027

Project No.: VNC-98-029
Sample No. DL-042

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.8E-08	cm/sec
% Moisture	23.9	%
Dry Density	99.9	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 10/04/98
Location: Test Pad #2 - 1st Lift
On-site Borrow Pit - Clay

Specimen Data

Length (in):	3.033
Diameter (in.):	2.871
Area (sq. in.):	6.485
Volume (cu. in.):	19.67
Wet Weight (grams):	638.7
Dry Weight (grams):	515.7
Dry Density (pcf):	99.9

Moisture Content Test Data

Wet Weight	93.75
Dry Weight	79.95
Tare weight	22.11
% Moisture	23.9

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
786	88.62	1.20	1.06	0.88	1.13	1.96E-08
841	88.62	1.15	1.20	1.04	1.18	1.92E-08
692	88.62	0.80	0.85	1.06	0.83	1.64E-08
540	88.62	0.70	0.70	1.00	0.70	1.78E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 1.8E-08 cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/15/98
Report No.: P-028

Project No.: VNC-98-029
Sample No. DL-043

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.3E-08	cm/sec
% Moisture	20.2	%
Dry Density	99.2	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 10/04/98
Location: Test Pad #2 - 2nd Lift
On-site Borrow Pit - Clay

Specimen Data

Length (in):	3.011
Diameter (in.):	2.831
Area (sq. in.):	6.305
Volume (cu. in.):	18.99
Wet Weight (grams):	593.9
Dry Weight (grams):	494.2
Dry Density (pcf):	99.2

Moisture Content Test Data

Wet Weight	107.32
Dry Weight	92.99
Tare weight	21.97
% Moisture	20.2

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
257	88.62	1.05	0.90	0.86	0.98	5.32E-08
250	88.62	0.95	1.00	1.05	0.98	5.46E-08
222	99.69	0.95	0.90	0.95	0.93	5.19E-08
723	99.69	3.00	2.85	0.95	2.93	5.04E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 5.3E-08 cm/sec

Respecfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/15/98
Report No.: P-029

Project No.: VNC-98-029
Sample No. DL-044

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.1E-08	cm/sec
% Moisture	20.6	%
Dry Density	103.8	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 10/04/98
Location: Test Pad #2 - 3rd Lift
On-site Borrow Pit - Clay

Specimen Data

Length (in):	3.043
Diameter (in.):	2.841
Area (sq. in.):	6.350
Volume (cu. in.):	19.32
Wet Weight (grams):	634.8
Dry Weight (grams):	526.2
Dry Density (pcf):	103.8

Moisture Content Test Data

Wet Weight	111.29
Dry Weight	98.05
Tare weight	22.17
% Moisture	20.6

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
784	83.08	1.10	0.95	0.86	1.03	1.96E-08
601	83.08	0.90	0.95	1.06	0.93	2.31E-06
360	83.08	0.50	0.45	0.90	0.48	1.98E-08
494	83.08	0.70	0.65	0.93	0.68	2.05E-08

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 2.1E-08 cm/sec

Respectfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/15/98
Report No.: P-030

Project No.: VNC-98-029
Sample No. DL-045

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.3E-08	cm/sec
% Moisture	20.2	%
Dry Density	108.8	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 10/04/98
Location: Test Pad #2 - 4th Lift
On-site Borrow Pit - Clay

Specimen Data

Length (in):	3.208
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	20.50
Wet Weight (grams):	704.0
Dry Weight (grams):	585.5
Dry Density (pcf):	108.8

Moisture Content Test Data

Wet Weight	143.36
Dry Weight	122.92
Tare weight	21.89
% Moisture	20.2

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
578	85.85	0.55	0.60	1.09	0.58	1.51E-08
932	99.69	0.95	0.85	0.89	0.90	1.26E-08
761	99.69	0.70	0.65	0.93	0.68	1.16E-08
934	99.69	0.90	0.90	1.00	0.90	1.26E-08

Δ T — Change in time (minutes)
H — Driving head (inches)
Inflow (B) — Flow in (cubic centimeters)
Inflow (C) — Flow out (cubic centimeters)
Q — Flow (cubic centimeters)

Permeability (k) 1.3E-08 cm/sec

Respectfully submitted Robert L. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	10/03/98 pg. 1 of 3
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-13

GENERAL LOCATION: Test Pad - On-site clay, lift 1,2 and 3

TEST NO.	LOCATION	DEPTH OR ELEV	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP. [%]	SAMPLE NO.
1	See attached map	Lift 1	99.0	25.9	96.1	DL-017
2	See attached map	Lift 1	98.0	24.9	95.2	DL-017
3	See attached map	Lift 1	97.9	26.7/24.7	95.0	DL-017
4	See attached map	Lift 1	99.1	25.4/25.1	96.1	DL-017
5	See attached map	Lift 1	100.2	24.7	97.2	DL-017
6	See attached map	Lift 1	100.4	23.6	97.5	DL-017
7	See attached map	Lift 1	98.7	23.0	95.8	DL-017
8	See attached map	Lift 1	101.4	23.7	98.5	DL-017
9	See attached map	Lift 1	100.7	24.7/25.0	97.8	DL-017
10	See attached map	Lift 1	98.1	25.8	95.2	DL-017
11	See attached map	Lift 2	98.5	25.9/24.6	95.6	DL-017
12	See attached map	Lift 2	99.0	25.2	96.1	DL-017

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-017	103.0	19.3	Orange Brown Silty Clay - on Site

REMARKS: 2 bag samples and one shelby tube sample obtained from each lift for lab testing.

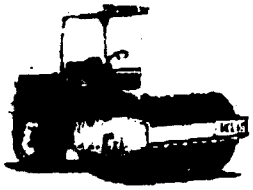
ARRIVED ON SITE: 7:30
LEFT SITE: 3:30
HOURS ON SITE: 8.0
TRAVEL TIME: 1.5
MILEAGE: 60

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC@3101-166 Stonybrook Drive, Raleigh, NC 27604@(919) 876-0405@Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	10/03/98 pg. 2 of 3
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-13

GENERAL LOCATION: Test Pad - On-site clay, lift 1,2 and 3

TEST NO.	LOCATION	DEPTH OR ELEV	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
13	See attached map	Lift 2	100.3	25.0/24.0	96.1	DL-017
14	See attached map	Lift 2	99.8	24.6	96.9	DL-017
15	See attached map	Lift 2	101.8	24.4	98.9	DL-017
16	See attached map	Lift 2	98.3	25.9	95.4	DL-017
17	See attached map	Lift 2	98.0	25.7	95.1	DL-017
18	See attached map	Lift 2	99.5	24.1	96.7	DL-017
19	See attached map	Lift 2	99.5	24.3	96.6	DL-017
20	See attached map	Lift 2	98.2	26.0	95.3	DL-017
21	See attached map	Lift 3	98.2	26.7/26.6	95.3	DL-017
22	See attached map	Lift 3	102.7	23.5	99.7	DL-017
23	See attached map	Lift 3	103.6	21.7	100+	DL-017
24	See attached map	Lift 3	101.9	24.6	98.9	DL-017

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-017	103.0	19.3	Orange Brown Silty Clay - on Site

REMARKS:

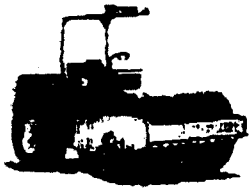
ARRIVED ON SITE: 7:30
LEFT SITE: 3:30
HOURS ON SITE: 8.0
TRAVEL TIME: 1.5
MILEAGE: 60

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC@3101-156 Stonybrook Drive, Raleigh, NC 27604@(919) 876-0405@Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	10/03/98 pg. 3 of 3
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-13

GENERAL LOCATION: Test Pad - On-site clay, lift 1, 2 and 3

TEST NO.	LOCATION	DEPTH OR ELEV	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP. [%]	SAMPLE NO.
25	See attached map	Lift 3	105.1	22.3	100+	DL-017
26	See attached map	Lift 3	103.0	23.6	100+	DL-017
27	See attached map	Lift 3	102.8	23.6	100+	DL-017
28	See attached map	Lift 3	98.0	26.9	95.0	DL-017
29	See attached map	Lift 3	100.1	24.5/22.3	97.2	DL-017
30	See attached map	Lift 3	101.1	23.8	98.2	DL-017

SAMPLE NO	MAXIMUM D D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-017	103.0	19.3	Orange Brown Silty Clay - on Site

REMARKS:

ARRIVED ON SITE: 7:30
LEFT SITE: 3:30
HOURS ON SITE: 8.0
TRAVEL TIME: 1.5
MILEAGE: 60

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

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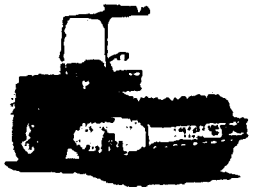
VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	10/05/98 pg. 1 of 1
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-14

GENERAL LOCATION: Test Pad - On-site clay, lift four

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP. [%]	SAMPLE NO.
1	See attached map	Lift 4	102.4	23.3/22.6	99.4	DL-017
2	See attached map	Lift 4	103.0	22.1	100+	DL-017
3	See attached map	Lift 4	103.1	22.3	100+	DL-017
4	See attached map	Lift 4	103.8	22.6	100+	DL-017
5	See attached map	Lift 4	100.2	24.3	97.3	DL-017
6	See attached map	Lift 4	97.9	22.0	95.0	DL-017
7	See attached map	Lift 4	107.1	21.4	100+	DL-017
8	See attached map	Lift 4	102.9	23.9/20.8	99.9	DL-017
9	See attached map	Lift 4	101.1	23.1	98.2	DL-017
10	See attached map	Lift 4	104.7	22.5	100+	DL-017

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-017	103.0	19.3	Orange Brown Silty Clay - on Site clay borrow

REMARKS: 2 bag samples and one shelby tube sample obtained for lab testing.

ARRIVED ON SITE: 7:30
LEFT SITE: 3:30
HOURS ON SITE: 7.5
TRAVEL TIME: 1.0
MILEAGE: 60

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC•3101-156 Stonybrook Drive, Raleigh, NC 27604•(919) 876-0405•Fax (919) 876-0460

VAN DER HORST

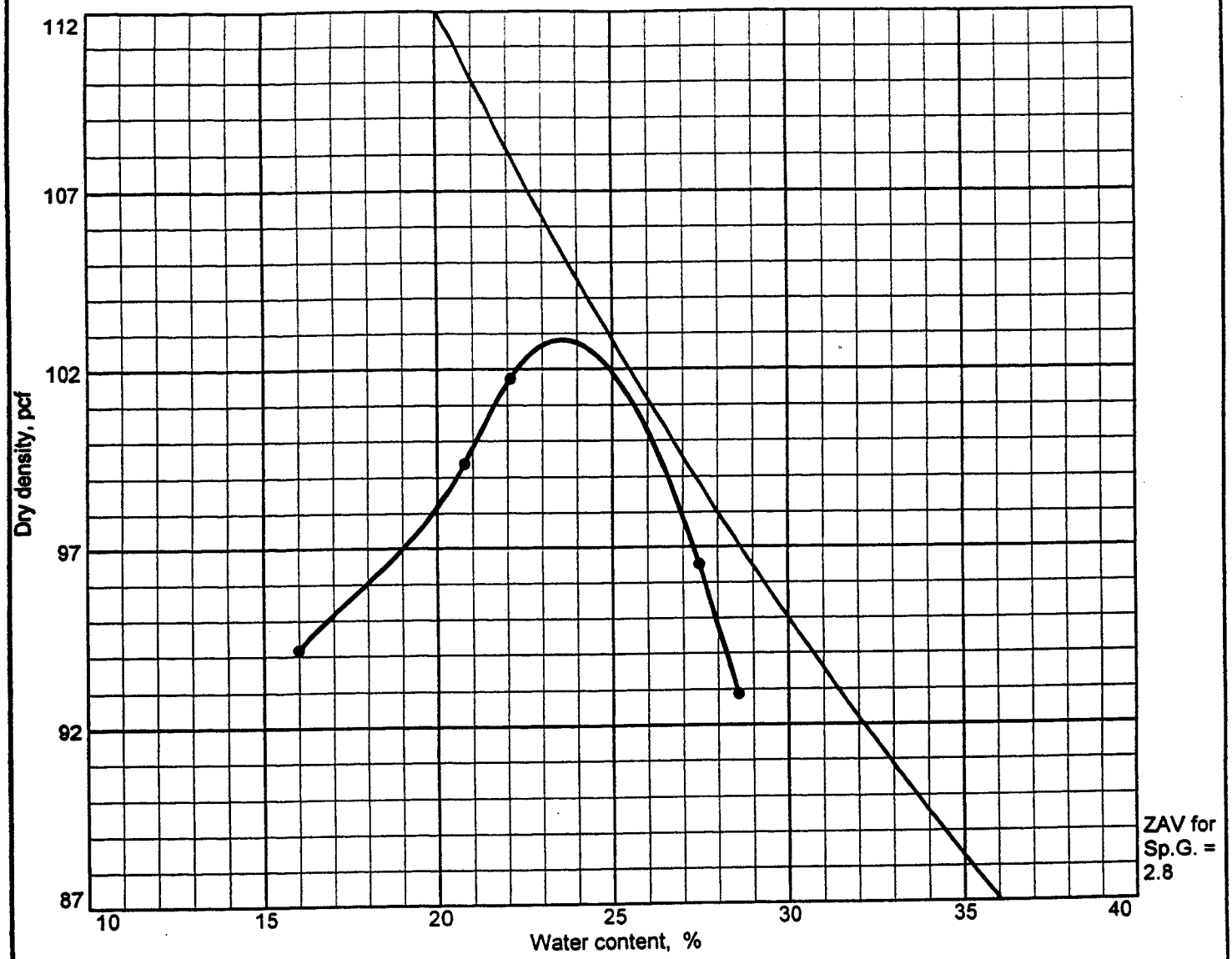
DURHAM LANDFILL CLOSURE
VNC-98-029.025

"Rougemount/Benchmark Borrow Source"

Test Method	DL-150
Location	**In-situ Cut**
Natural Moisture Content (%) (ASTM D-2216)	22.5
USCS Soil Classification	CL
Grainsize Analysis (ASTM D422) **%Gravel** **%Sand** **%Silt** **%Clay**	 0.0 35.9 22.3 41.8
Atterberg Limits (ASTM D4318) **LL** **PL** **PI**	 48 23 25
Hydraulic Conductivity (ASTM D-5084) **Density (pcf)** **Moisture (%)** **Permeability (cm/sec)**	 100.5 24.9 6.1×10^{-8}
Standard Proctor (ASTM D698) **Max. Dry Density (pcf)** **Opt. % Moisture**	 102.8 23.6

Note: Four (4) additional hydraulic conductivity tests were performed to develop the Acceptance Zone. Please see the attached individual test reports.

COMPACTION TEST REPORT



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	CL				48	25	0.0	64.1

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 102.8 pcf Optimum moisture = 23.6 %	Benchmark - Grey-brown Sandy lean clay

Project No. VNC-98-029 **Client:** Gilbert Southern
Project: Durham County Landfill Closure

● **Location:** Benchmark Borrow Source

Remarks:
DL-150, Sampled from Benchmark Borrow Pit on 11/2/98.

COMPACTION TEST REPORT

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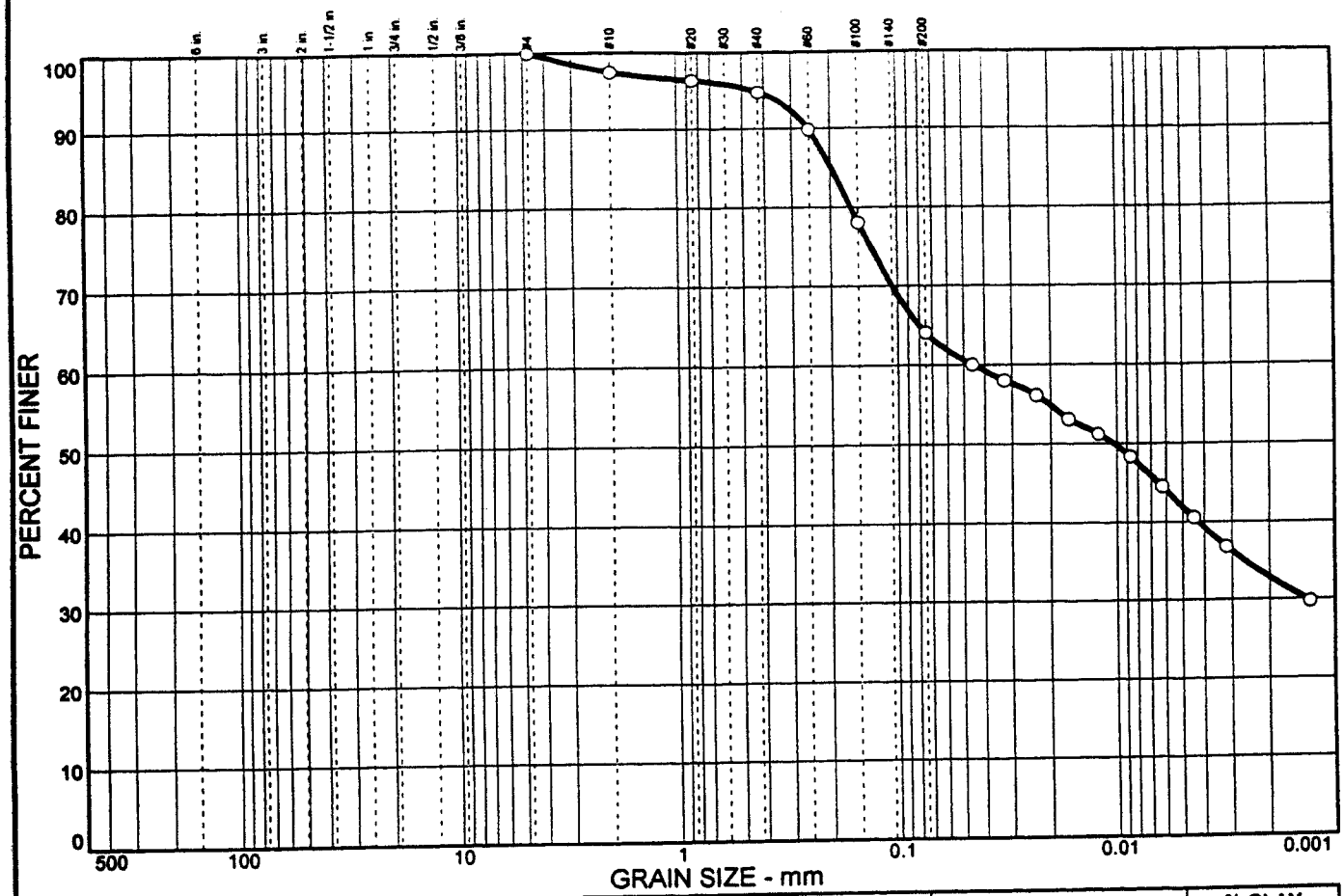
Figure #

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	35.9	22.3	41.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	97.5		
#20	96.4		
#40	94.8		
#60	89.8		
#100	78.0		
#200	64.1		

* (no specification provided)

Soil Description

Benchmark - Grey-brown Sandy lean clay

Atterberg Limits

PL= 23 LL= 48 PI= 25

Coefficients

D_{85}= 0.198 D_{60}= 0.0456 D_{50}= 0.0104
D_{30}= 0.0014 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

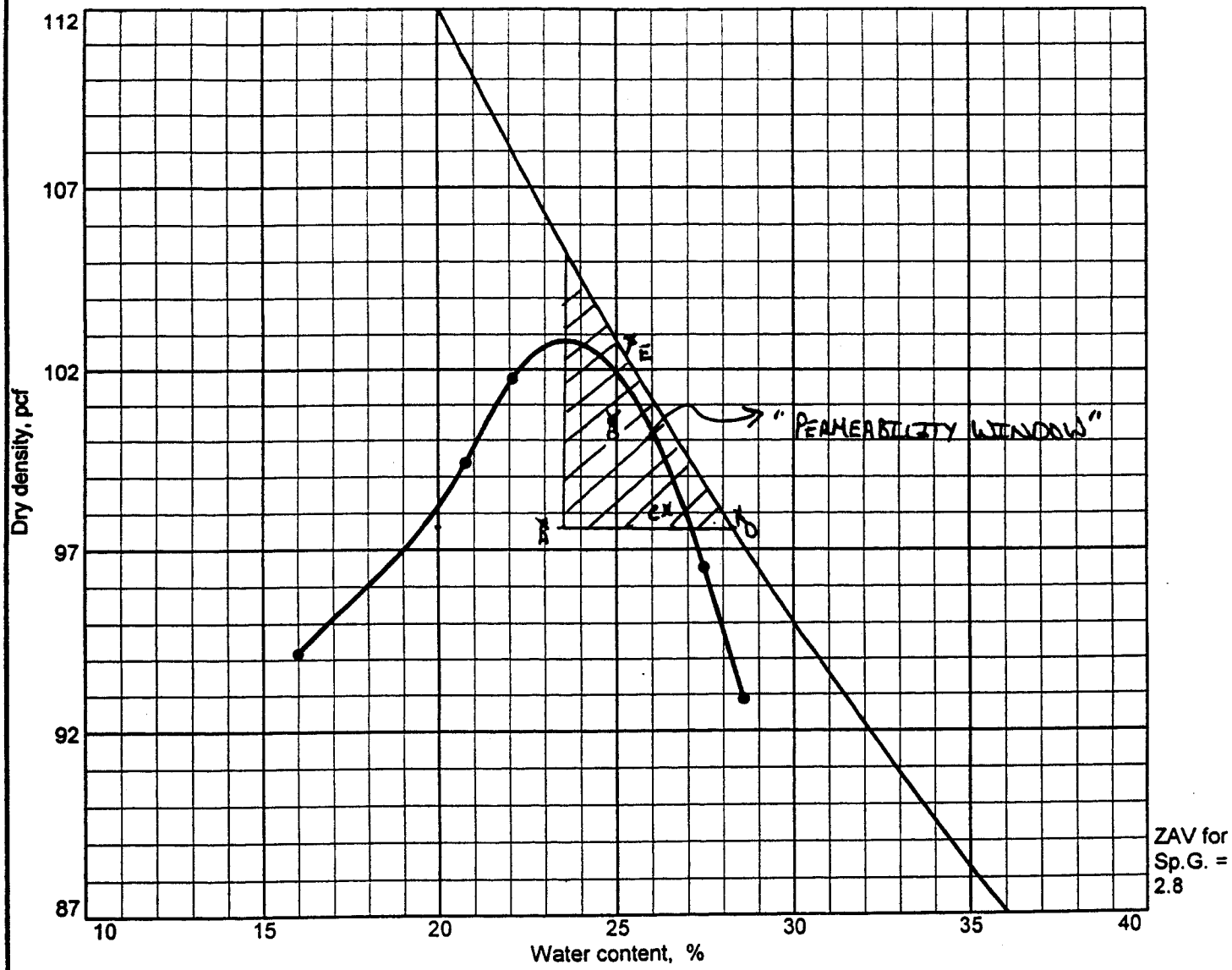
DL-150, Sampled from borrow source on 11/2/98.

Sample No.: DL-150 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Benchmark Borrow Source **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

COMPACTION TEST REPORT



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	CL				48	25	0.0	64.1

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 102.8 pcf Optimum moisture = 23.6 %	Benchmark - Grey-brown Sandy lean clay

Project No. VNC-98-029 **Client:** Gilbert Southern
Project: Durham County Landfill Closure
● **Location:** Benchmark Borrow Source

Remarks:
DL-150, Sampled from Benchmark Borrow Pit on 11/2/98.

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Figure #

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/02/98
Report No.: P-075

Project No.: VNC-98-029
Sample No.: DL-150A

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.9E-008	cm/sec
% Moisture	23.0	%
Dry Density	97.6	pcf

Sample Information

Specimen Type:
Remolded X
Tube ____

Date Sampled: 11/10/98
Location: Rougemont Quarry Borrow Pit

Length (in):	3.563
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	22.77
Wet Weight (grams):	717.2
Dry Weight (grams):	583.1
Dry Density (pcf):	97.6

Moisture Content Test Data

Wet Weight	144.80
Dry Weight	121.82
Tare weight	21.92
% Moisture	23.0

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
354	91.38	0.80	0.90	1.13	0.85	3.81E-008
485	91.38	1.20	1.30	1.08	1.25	4.09E-008
267	91.38	0.60	0.65	1.08	0.63	3.71E-008
240	91.38	0.55	0.60	1.09	0.58	3.80E-008

Δ T Change in time (minutes)
H Driving head (inches)
Inflow (B) Flow in (cubic centimeters)
Inflow (C) Flow out (cubic centimeters)
Q Flow (cubic centimeters)

Permeability (k) 3.9E-008 cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Phone (919) 876-0405 VANDERHORST Geotechnical Engineering, P.C. Fax: (919) 876-0460

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/02/98
Report No.: P-075

Project No.: VNC-98-029
Sample No.: DL-150B

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.1E-008	cm/sec
% Moisture	24.9	%
Dry Density	100.5	pcf

Sample Information

Specimen Type:
Remolded X
Tube ____

Date Sampled: 11/10/98
Location: Rougemont Quarry Borrow Pit

Length (in):	3.318
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	21.20
Wet Weight (grams):	698.2
Dry Weight (grams):	559.1
Dry Density (pcf):	100.5

Moisture Content Test Data

Wet Weight	127.64
Dry Weight	106.58
Tare weight	21.92
% Moisture	24.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
618	96.92	2.80	3.10	1.11	2.95	6.65E-008
381	96.92	1.60	1.80	1.13	1.70	6.21E-008
418	96.92	1.80	1.80	1.00	1.80	6.00E-008
429	96.92	1.75	1.70	0.97	1.73	5.60E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 6.1E-008 cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/02/98
Report No.: P-075

Project No.: VNC-98-029
Sample No.: DL-150C

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.1E-008	cm/sec
% Moisture	26.4	%
Dry Density	98.1	pcf

Sample Information

Specimen Type:
Remolded X
Tube ____

Date Sampled: 11/10/98
Location: Rougemont Quarry Borrow Pit

Length (in):	3.431
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	21.93
Wet Weight (grams):	713.5
Dry Weight (grams):	564.6
Dry Density (pcf):	98.1

Moisture Content Test Data

Wet Weight	118.32
Dry Weight	98.21
Tare weight	21.95
% Moisture	26.4

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1127	96.92	3.40	3.65	1.07	3.53	4.50E-008
652	96.92	1.80	1.80	1.00	1.80	3.98E-008
420	105.23	1.30	1.35	1.04	1.33	4.18E-008
572	105.23	1.70	1.65	0.97	1.68	3.88E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **4.1E-008** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/02/98
Report No.: P-076

Project No.: VNC-98-029
Sample No.: DL-150D

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.7E-008	cm/sec
% Moisture	28.6	%
Dry Density	97.8	pcf

Sample Information

Specimen Type:
Remolded X
Tube ____

Date Sampled: 11/10/98
Location: Rougemont Quarry Borrow Pit

Length (in):	3.665
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	23.42
Wet Weight (grams):	773.3
Dry Weight (grams):	601.1
Dry Density (pcf):	97.8

Moisture Content Test Data

Wet Weight	127.54
Dry Weight	104.05
Tare weight	22.03
% Moisture	28.6

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
318	110.76	1.40	1.40	1.00	1.40	5.93E-008
405	110.76	1.70	1.80	1.06	1.75	5.82E-008
371	110.76	1.50	1.50	1.00	1.50	5.44E-008
819	110.76	3.50	3.35	0.96	3.43	5.63E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **5.7E-008** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/02/98
Report No.: P-075

Project No.: VNC-98-029
Sample No.: DL-150E

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.6E-008	cm/sec
% Moisture	25.6	%
Dry Density	103.0	pcf

Sample Information

Specimen Type:
Remolded X
Tube ____

Date Sampled: 11/10/98
Location: Rougemont Quarry Borrow Pit

Length (in):	3.108
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	19.86
Wet Weight (grams):	674.5
Dry Weight (grams):	537.0
Dry Density (pcf):	103.0

Moisture Content Test Data

Wet Weight	118.20
Dry Weight	98.58
Tare weight	21.92
% Moisture	25.6

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
580	105.23	1.20	1.35	1.13	1.28	2.64E-008
812	105.23	1.65	1.80	1.09	1.73	2.55E-008
401	105.23	0.90	0.95	1.06	0.93	2.77E-008
820	105.23	1.70	1.75	1.03	1.73	2.53E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 2.6E-008 cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

MALCOLM PIRNIE

LETTER OF TRANSMITTAL

To: GILBERT SOUTHERN CORP
3301 GLENN ROAD
DURHAM, NC 27704

Transm'l Date : 01/20/99
Transm'l No. : 0037
Spec'n Section : 2900

Attention: ANDY PALAHNUK

Re: CITY OF DURHAM, NORTH CAROLINA
DURHAM MUNICIPAL SOLID WASTE LANDFILL FACILITY CLOSURE

Gentlemen:
We are sending you via, U.S. Mail the following items:

No.	Manufacturer's Name	Drawing Reference	Description	Act'n Taken
4	VAN DER HORST	5 PAGES	VEGETATIVE COVER CONFORMANCE TESTING	A

Our action relative to items submitted for approval has been noted above and on the drawings.

Remarks:

Copies to:
TOM GLENN, W/ENCL;
BARRY HERZBERG, W/ENCL; FILE

Very truly yours
MALCOLM PIRNIE, INC.

by ORIGINAL SIGNED BY
JAY JACKSON, PE

Form 69 Printed in USA
Rev 10/95

Gilbert Southern
(Company Name)

ADDRESS REPLY TO:

LETTER OF TRANSMITTAL

3301 Glenn Rd.
DURHAM, NC 27704

TO: Jay Jackson
Malcolm Pirnie

DATE 1/12/99 CO. NO. 044 JOB NO. 3124

TRANSMITTAL NO.

RE:

WE ARE SENDING ☒ Attached ☐ Under separate cover via _____ the following:

☐ Drawings ☐ Plans ☐ Progress Payment ☐ Subcontractor
☐ Prints ☐ Samples ☐ Specifications ☐ Change Order
☐ Payroll ☐ EEO Report ☐ Certificates of Compliance ☐ Copy of Letter

☐ _____ ☐ _____

COPIES	DATE	NO.	DESCRIPTION
3	1/12/99	037	Hasenger Veg, Support Conformance Test.

THESE ARE TRANSMITTED as checked below:

☒ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☐ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review and comment

☐ _____ ☐ _____

☐ FOR BIDS DUE _____ 19____ ☐ PRINTS RETURNED AFTER LOAN TO US.

RECEIVED
JAN 1 5 1999
MALCOLM PIRNIE
CHARLOTTE
ROUTE: JCJ
SAM

REMARKS

COPY TO: Barry Heyburg (1 copy)

SIGNED: [signature]

VAN DER HORST

GEOTECHNICAL ENGINEERING, PC
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

January 11, 1999

Andy Palabnuk
Gilbert Southern Corp.
Durham County Landfill
3301 Glenn Road
Durham, NC 27704

Re: Initial Conformance Testing
Hasenger Borrow Source - Vegetative Support
VNC-98-029.029

Dear Andy:

We are please find our laboratory analysis on four (4) soil samples for proposed Vegetative Support soil. The samples were collected by a VAN DER HORST representative on 1/6/99 fro the Hasenger borrow source. The samples were tested in accordance with ASTM D422 w/o a hydrometer. Included are laboratory test reports for each sample. Based on our laboratory tests for this sample the material meets the projects specifications for use as Vegetative Support soil..

Should you have any questions or need further assistance please do not hesitate to contact our office.

Respectfully submitted
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager / Senior Engineer

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

☑ APPROVED
☐ APPROVED AS CORRECTED
☐ REVISE AND RESUBMIT
☐ NOT APPROVED

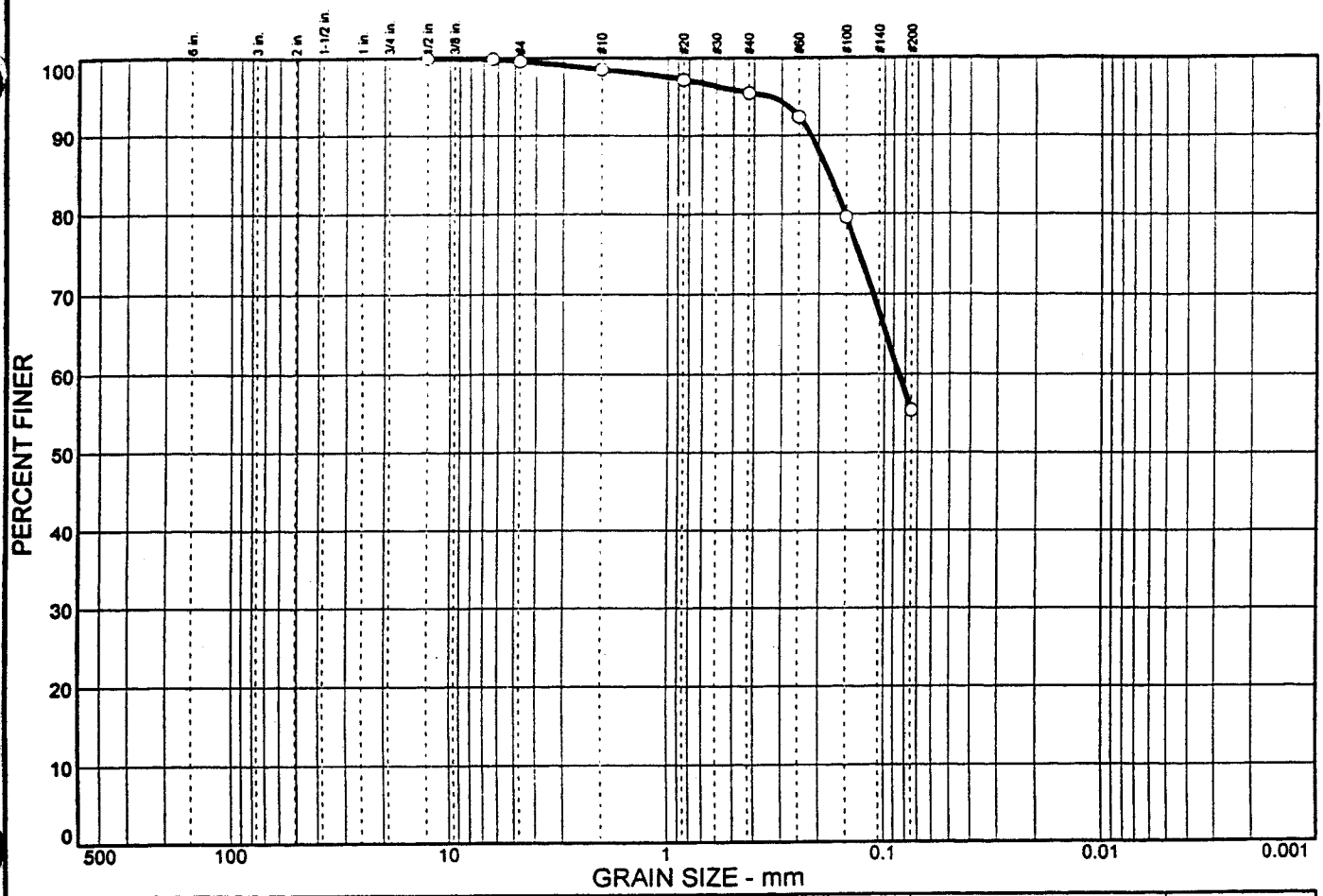
Checking is only for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

MALCOLM PIRNIE, INC.
Date 1/20/99 By JCJ

535 Summit Point Drive
Henrietta, NY 14467
716/359-2730
Fax 716/359-9668

[illegible] Drive, Suite 15[illegible]
[illegible] NC 27604
[illegible]-0405
[illegible]-0460

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.4	44.2	55.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	99.9		
#4	99.6		
#10	98.5		
#20	97.2		
#40	95.5		
#60	92.4		
#100	79.6		
#200	55.4		

* (no specification provided)

Soil Description

Silty Clay w/ Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.179 D_{60}= 0.0851 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

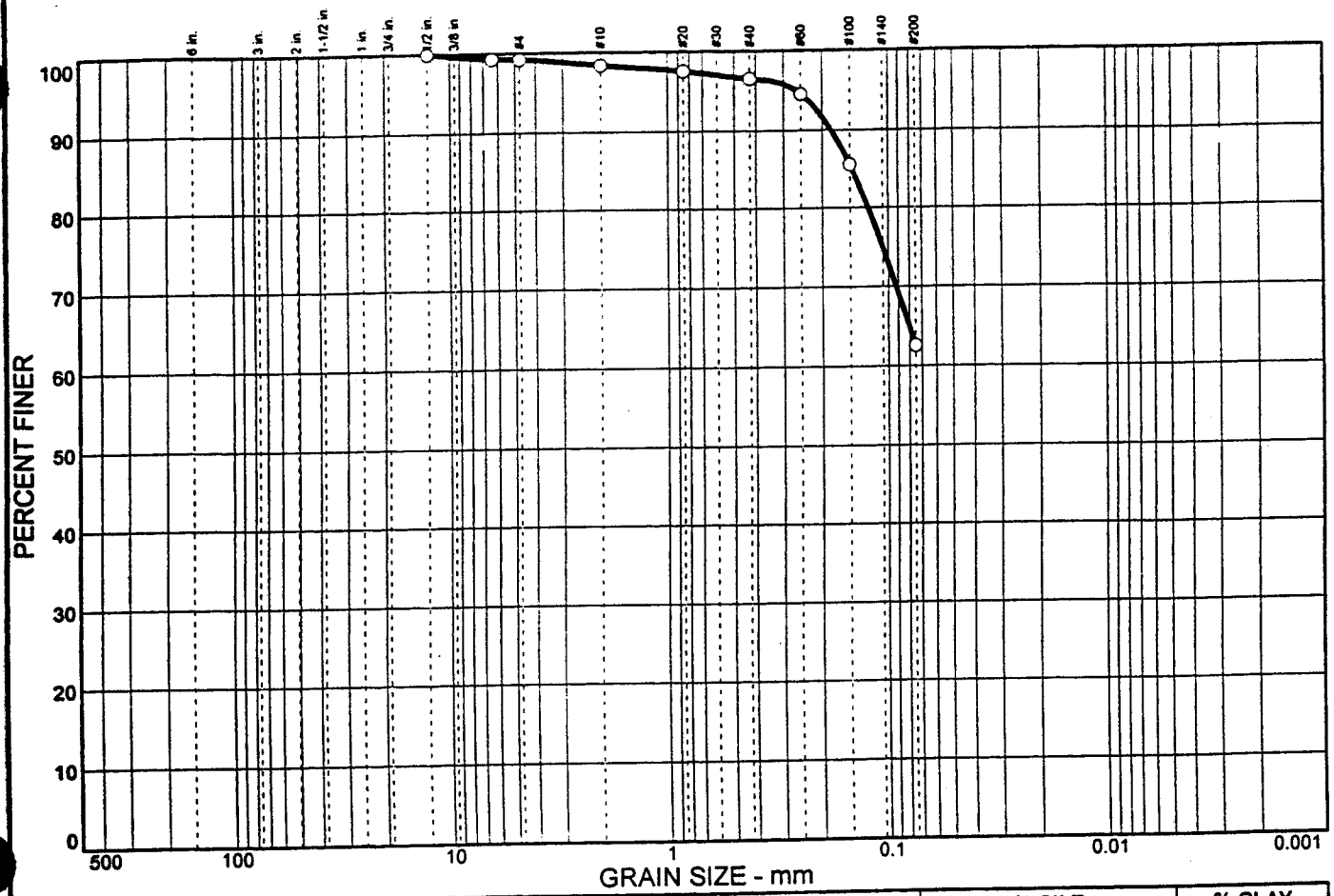
DL-291A, Cut Area-North End

Sample No.: DL-291A **Source of Sample:** Hasenger Borrow Source **Date:**
Location: Hasenger Borrow Source (Cut) **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.8	36.7	62.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	99.3		
#4	99.2		
#10	98.4		
#20	97.6		
#40	96.6		
#60	94.6		
#100	85.5		
#200	62.5		

* (no specification provided)

Soil Description

Silty CLAY w/ Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.147 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

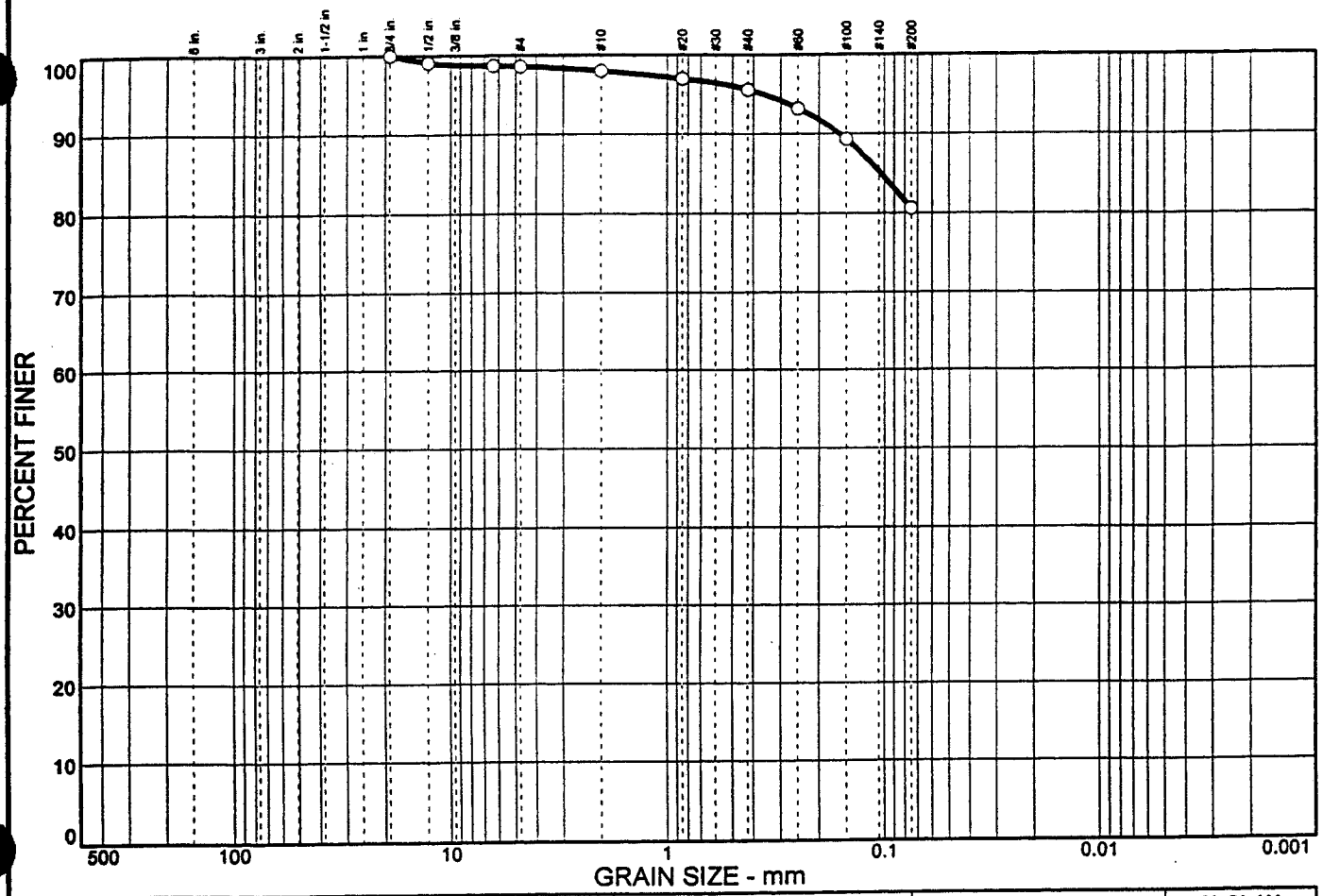
DL-291, Cut Face - South End

Sample No.: DL-291B **Source of Sample:** Hasenger Borrow Source **Date:**
Location: Hasenger Borrow Source (Cut) **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.4	18.0	80.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	99.1		
.25 in.	98.7		
#4	98.6		
#10	98.0		
#20	97.0		
#40	95.6		
#60	93.2		
#100	89.3		
#200	80.6		

* (no specification provided)

Soil Description

Silty CLAY, trace sand & gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.104 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

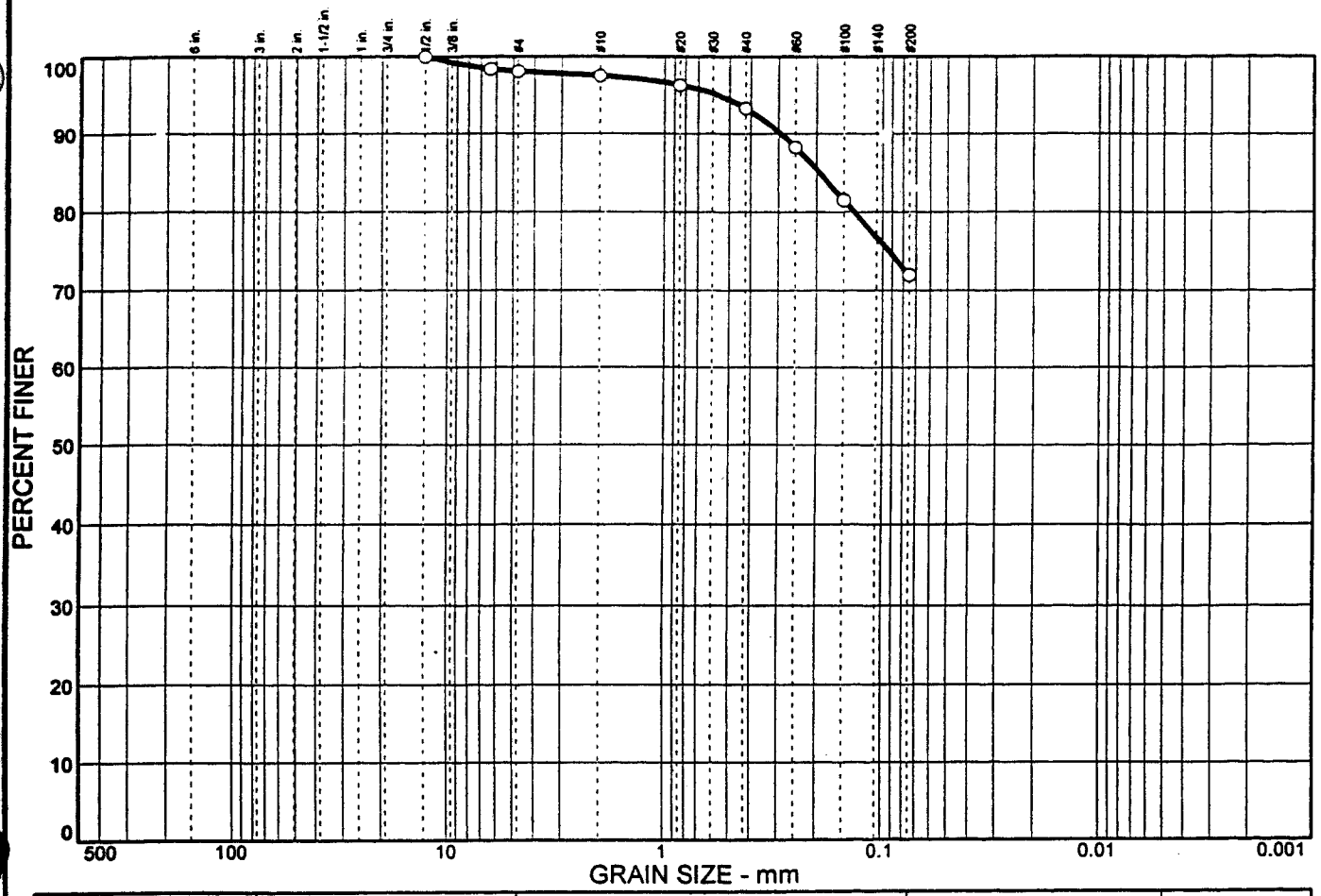
Remarks

DL-292A, Borrow Source Stockpile - South Face

Sample No.: DL-292A **Source of Sample:** Hasenger Borrow Source **Date:**
Location: Hasengert Borrow Source (Stockpile) **Elev./Depth:**

VAN DER HORST ENGINEERING	**Client:** Gilbert Southern **Project:** Durham County Landfill Closure **Project No:** VNC-98-029 **Figure #**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.9	26.2	71.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	98.4		
#4	98.1		
#10	97.5		
#20	96.3		
#40	93.3		
#60	88.2		
#100	81.5		
#200	71.9		

* (no specification provided)

Soil Description

silty CLAY, trace sand and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.194 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

DL-292B, Stockpile - North Face

Sample No.: DL-292B **Source of Sample:** Hasenger Borrow Source **Date:**
Location: Hasenger Borrow Source (Stockpile) **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

MALCOLM PIRNIE

LETTER OF TRANSMITTAL

: GILBERT SOUTHERN CORP
3301 GLENN ROAD
DURHAM, NC 27704

Transm'l Date : 02/03/99
Transm'l No. : 0039
Spec'n Section : 2250

Attention: ANDY PALAHNUK

Re: CITY OF DURHAM, NORTH CAROLINA
DURHAM MUNICIPAL SOLID WASTE LANDFILL FACILITY CLOSURE

Gentlemen:
We are sending you via, U.S. Mail the following items:

No.	Manufacturer's Name	Drawing Reference	Description	Act'n Taken
4	VAN DER HORST	18 PAGES	TEST PAD - ROUGEMONT	A

Our action relative to items submitted for approval has been noted above and on the drawings.

Remarks:

Copies to:
TOM GLENN, W/ENCL;
HARRY HERZBERG, W/ENCL; FILE

Very truly yours
MALCOLM PIRNIE, INC.

by ORIGINAL SIGNED BY
JAY JACKSON, PE

Form 69 Printed in USA
Rev 10/95

Gilbert Southern
(Company Name)

ADDRESS REPLY TO:

LETTER OF TRANSMITTAL

3301 GLENN Rd.
DURHAM, N.C. 27704

TO: JAY JACKSON
Malcolm Pinnie

DATE 1/20/99 CO. NO. 044 JOB NO. 3124

TRANSMITTAL NO. _____

RE: _____

WE ARE SENDING ☑ Attached
☐ Under separate cover via _____ the following:

☐ Drawings ☐ Plans ☐ Progress Payment ☐ Subcontractor
☐ Prints ☐ Samples ☐ Specifications ☐ Change Order
☐ Payroll ☐ EEO Report ☐ Certificates of Compliance ☐ Copy of Letter

☐ _____ ☐ _____

COPIES	DATE	NO.	DESCRIPTION
3	1/20/99	039	Test Pad Summary - Rougemont

THESE ARE TRANSMITTED as checked below:

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☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review and comment

☐ _____ ☐ _____

☐ FOR BIDS DUE _____ 19_____ ☐ PRINTS RETURNED AFTER LOAN TO US.

REMARKS _____

COPY TO: Barry Herzberg (1 copy)

SIGNED: James Bin

LETTER OF TRANSMITTAL

VAN DER HORST

GEOTECHNICAL ENGINEERINGING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

DATE: 01/20/99 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure

TO: Gilbert Southern
3301 Glen Road
Durham, NC 27704

WE ARE SENDING YOU x ATTACHED __ UNDER SEPARATE COVER THE FOLLOWING ITEMS:

COPIES	DATE	NO.	DESCRIPTION
2	01/20/99	VNC-98-029.030	Test Pad Summary Report - Rougemont Pit Clay Borrow

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST
GEOTECHNICAL ENGINEERING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

January 20, 1999

Mr. Andy Palabunk
Gilbert Southern Corp.
3301 Glenn Road
Durham, NC 27704

Re: Test Pad Summary Report - Rougemout Pit Clay Borrow
Durham Landfill Closure
VNC-98-029.030

Dear Andy:

VAN DER HORST Geotechnical Engineering, PC, is pleased to present our field and laboratory test results for the low permeability soil test pad. The test pad was constructed on November 22, 1998. The material placed for construction of the test pad was delivered from the Rougemount borrow source. Initial conformance testing was previously submitted for this borrow source.

The material was placed in loose lifts not exceeding 9" in loose thickness and compacted using a CAT 815 compactor. Generally compaction was obtained in two pass with the 815 and the compacted lift thickness ranged from 5 1/2 to 6 inches. A tabular summary is attached to this report which provides both loose and compacted lift thickness measurements taken during the test pad construction. During construction moisture content and in-place density testing was performed. The in-place density tests and in-place moisture content tests are presented on the attached in-place density test reports. In addition to the in-place moisture tests 10 random samples were collected at field moisture test locations for oven dried analysis. This data is also presented on the in-place density test reports. The second moisture content provided at a given location represents the oven dried test result.

Also during the test pad construction shelby tube samples and composite samples were obtained from each lift. The shelby tube samples were tested for hydraulic conductivity (permeability). Attached please find 4 permeability test reports presenting the permeability test data. The random bulk samples were tested for Atterberg Limits, Grain-size analysis and USCS soil classification. Our laboratory test reports are attached presenting our test results.

536 Summit Point Drive
Henrietta, NY 14467
716/359-2730
Fax 716/359-9668

3101 Stonybrook Drive, Suite [illegible]
Raleigh, NC 27604
919/876-0405
Fax 919/876-0[illegible]

VAN DER HORST

The attached table presents a summary of laboratory test results for, Atterberg Limits (ASTM D-4318), Grain-size (ASTM D-422), USCS soil classification and Permeability (ASTM D-5084).

At this time the Boutwell testing and associated laboratory testingreport is not complete. We will issue the Boutwell test data along with the associated additional laboratory testing in a separate report.

Should you have any questions or need additional information, please do not hesitate to contact our office.

Respectfully submitted,

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

1-28-99

Robert, Mashewske, P.E.
Regional Manger / Senior Engineer

VAN DER HORST

DURHAM LANDFILL CLOSURE
VNC-98-029.030

"Test Pad Evaluation Testing"
Rougemount Pit - Low Permeability Soil

Test Method	DL-204	DL-205	DL-206	DL-207
Location	Lift #1	Lift #2	Lift #3	Lift #4
Natural Moisture Content (%) (ASTM D-2216)	24.3	23.6	23.8	23.9
USCS Soil Classification	CL	CL	CL	CL
Grainsize Analysis (ASTM D422)				
% Gravel	0.1	0.0	0.0	0.1
%Sand	37.2	36.9	39.4	35.3
%Silt	22.5	21.4	22.8	20.3
% Clay	40.2	41.7	37.8	44.3
Atterberg Limits (ASTM D4318)				
LL	37	38	38	40
PL	18	19	19	19
PI	19	19	19	21
Hydraulic Conductivity (ASTM D-5084)				
Density (pcf)	100.4	99.4	98.9	98.7
Moisture (%)	24.3	23.6	23.8	23.9
Permeability (cm/sec)	4.2×10^{-8}	5.6×10^{-8}	2.4×10^{-8}	3.1×10^{-8}

VAN DER HORST

Lift Thickness Summary Table
Durham Landfill Closure - Test Pad
(Rougemount borrow clay)
VNC-98-029.030

	Lift #1		Lift #2		Lift #3		Lift #4	
Test	**Loose**	**Comp.**	**Loose**	**Comp.**	**Loose**	**Comp.**	**Loose**	**Comp.**
1	9.0	6.0	8.5	5.5	8.5	5.75	8.5	6.0
2	8.5	5.75	9.25	6.0	8.5	6.0	8.5	5.75
3	9.0	6.0	8.5	5.5	8.25	5.75	9.0	5.75
4	9.0	6.0	8.5	5.5	9.25	6.0	8.75	5.75
5	9.0	6.0	8.75	6.0	8.5	5.75	8.5	6.0
6	8.75	6.0	8.5	5.75	8.5	5.5	8.75	6.0
7	8.5	5.5	9.0	6.0	8.5	5.75	8.75	6.0
8	8.5	5.5	9.0	6.o	8.5	5.75	8.5	5.5
9	8.5	5.5	8.5	5.75	9.0	6.0	8.5	5.75
10	9.0	6.0	8.75	5.75	8.5	5.75	8.75	6.0

Note: All measurements are to the nearest 1/4"

VAN DER HORST

IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	11/22/98 pg. 1 of 4
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-31

GENERAL LOCATION: Rougemont Testpad (Benchmark)

TEST NO	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST CONTENT [%]	COMP %	SAMPLE NO.
1	See Attached Sketch	Lift 1	99.8	23.6	97.1	DL-150
2	See Attached Sketch	Lift 1	97.8	24.8/23.8	95.1	DL-150
3	See Attached Sketch	Lift 1	97.6	23.8	95.0	DL-150
4	See Attached Sketch	Lift 1	98.1	27.8	95.4	DL-150
5	See Attached Sketch	Lift 1	100.8	24.7/24.6	98.1	DL-150
6	See Attached Sketch	Lift 1	97.7	26.2	95.0	DL-150
7	See Attached Sketch	Lift 1	98.0	23.6/24.0	95.3	DL-150
8	See Attached Sketch	Lift 1	101.3	25.7	98.5	DL-150
9	See Attached Sketch	Lift 1	98.0	25.8/25.6	95.3	DL-150
10	See Attached Sketch	Lift 1	97.7	27.5	95.0	DL-150
11	See Attached Sketch	Lift 2	101.2	23.6	98.4	DL-150
12	See Attached Sketch	Lift 2	99.8	25.7/25.0	97.1	DL-150

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-150	102.8	23.6	Rougemont - Benchmark Borrow, Sandy Clay

REMARKS: Shelby Tube sample obtained near test location 7.

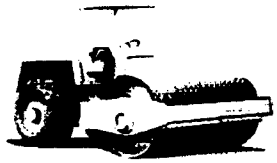
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

ARRIVED ON SITE: 7:00
LEFT SITE: 5:30
HOURS ON SITE: 10.0
TRAVEL TIME: 1.0
MILEAGE: 7.0

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	11/22/98 pg. 2 of 4
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-31

GENERAL LOCATION: Rougemont Testpad (Benchmark)

TEST NO	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST CONTENT [%]	COMP [%]	SAMPLE NO.
13	See Attached Sketch	Lift 2	98.6	27.1	95.9	DL-150
14	See Attached Sketch	Lift 2	97.6	27.7	95.0	DL-150
15	See Attached Sketch	Lift 2	98.6	27.2/26.5	95.9	DL-150
16	See Attached Sketch	Lift 2	98.5	24.1	95.8	DL-150
17	See Attached Sketch	Lift 2	98.2	27.6	95.5	DL-150
18	See Attached Sketch	Lift 2	98.3	25.1	95.6	DL-150
19	See Attached Sketch	Lift 2	98.1	27.6	95.4	DL-150
20	See Attached Sketch	Lift 2	97.9	27.1	95.2	DL-150
21	See Attached Sketch	Lift 3	98.0	23.2/23.5	95.3	DL-150
22	See Attached Sketch	Lift 3	98.4	27.6	95.7	DL-150
23	See Attached Sketch	Lift 3	100.4	24.5	97.7	DL-150
24	See Attached Sketch	Lift 3	100.1	26.7/26.9	97.4	DL-150

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-150	102.8	23.6	Rougemont - Benchmark Borrow, Sandy Clay

REMARKS: Shelby Tube sample obtained near test locations 16 & 26.

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

ARRIVED ON SITE: 7:00
LEFT SITE: 5:30
HOURS ON SITE: 10.0
TRAVEL TIME: 1.0
MILEAGE: 7.0

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST

IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	11/22/98 pg. 3 of 4
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-31

GENERAL LOCATION: Rougemont Testpad (Benchmark)

TEST NO	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST CONTENT [%]	COMP [%]	SAMPLE NO.
25	See Attached Sketch	Lift 3	101.6	25.5	98.8	DL-150
26	See Attached Sketch	Lift 3	100.2	24.7	97.5	DL-150
27	See Attached Sketch	Lift 3	100.2	24.7	97.5	DL-150
28	See Attached Sketch	Lift 3	100.1	25.5	97.4	DL-150
29	See Attached Sketch	Lift 3	98.5	26.2	95.8	DL-150
30	See Attached Sketch	Lift 3	99.0	26.8	96.3	DL-150
31	See Attached Sketch	Lift 4	99.4	25.8	96.7	DL-150
32	See Attached Sketch	Lift 4	97.7	28.0/27.4	95.0	DL-150
33	See Attached Sketch	Lift 4	101.4	24.4	98.6	DL-150
34	See Attached Sketch	Lift 4	98.9	28.2	96.2	DL-150
35	See Attached Sketch	Lift 4	100.8	25.1/24.2	98.1	DL-150
36	See Attached Sketch	Lift 4	97.6	28.1	95.0	DL-150

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-150	102.8	23.6	Rougemont - Benchmark Borrow, Sandy Clay

REMARKS: Shelby Tube sample obtained near test location 37.

ARRIVED ON SITE: 7:00
LEFT SITE: 5:30
HOURS ON SITE: 10.0
TRAVEL TIME: 1.0
MILEAGE: 7.0

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460

VAN DER HORST

IN-PLACE DENSITY TEST RESULTS

PROJECT:	Durham Co. Landfill	PROJECT NO:	Vnc-98-029
CLIENT:	Gilbert Southern	DATE:	11/22/98 pg. 4 of 4
CONTRACTOR:	Gilbert Southern	REPORT NO:	D-31

GENERAL LOCATION: Rougemont Testpad (Benchmark)

TEST NO	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST CONTENT [%]	COMP. %	SAMPLE NO.
37	See Attached Sketch	Lift 4	98.4	24.7	95.7	DL-150
38	See Attached Sketch	Lift 4	97.7	23.8	95.0	DL-150
39	See Attached Sketch	Lift 4	99.0	25.4	96.3	DL-150
40	See Attached Sketch	Lift 4	98.9	25.7	96.2	DL-150

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-150	102.8	23.6	Rougemont - Benchmark Borrow, Sandy Clay

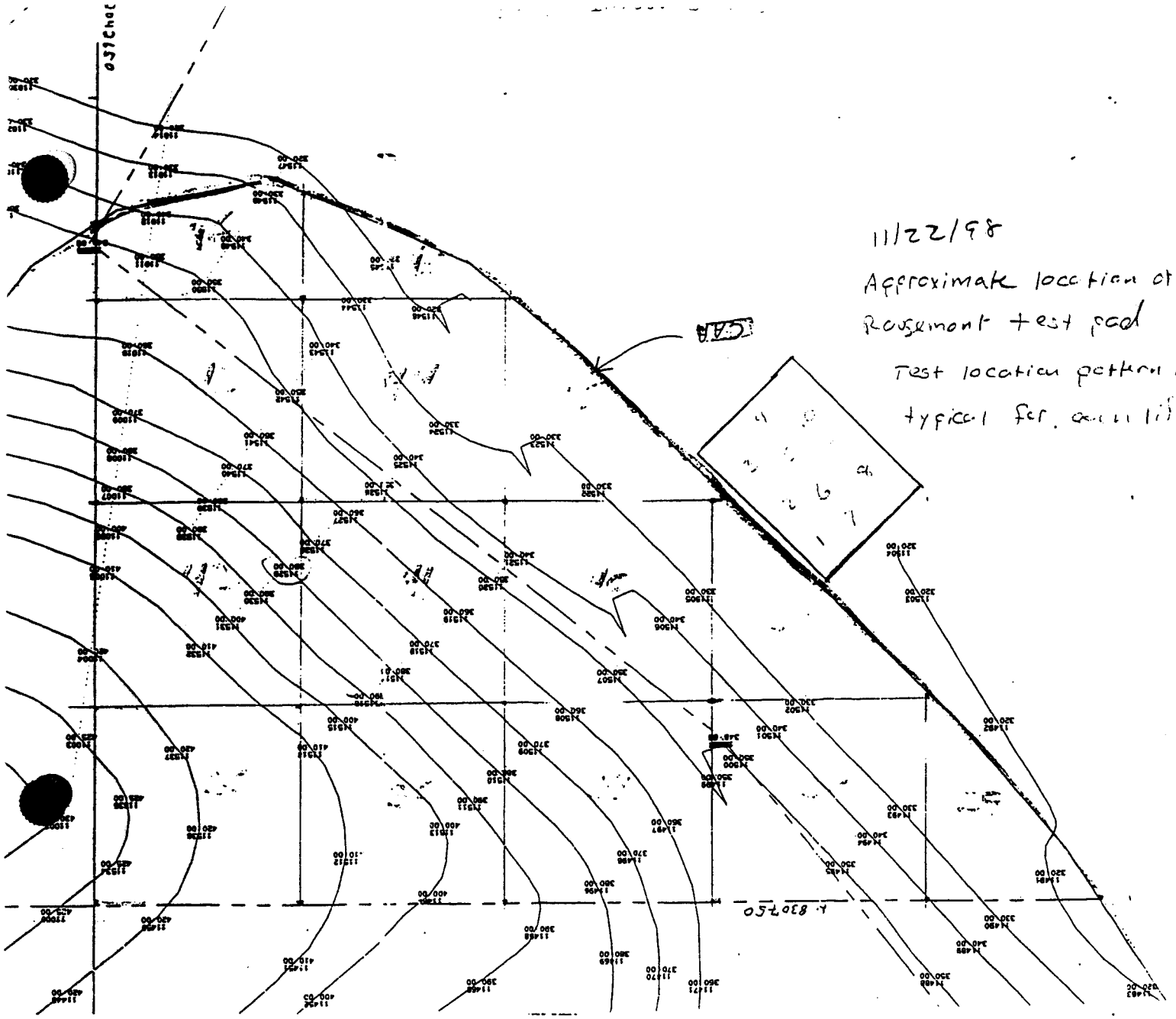
REMARKS: Shelby Tube sample obtained near test location 37.

ARRIVED ON SITE: 7:00
LEFT SITE: 5:30
HOURS ON SITE: 10.0
TRAVEL TIME: 1.0
MILEAGE: 7.0

TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_X_ DENSITY GAUGE

PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC●3101-156 Stonybrook Drive, Raleigh, NC 27604●(919) 876-0405●Fax (919) 876-0460



11/22/98

Approximate location of Rosemont test pad

Test location pattern is typical for all lift

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-156

Project No.: VNC-98-029
Sample No.: DL-204

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.2E-008	cm/sec
% Moisture	24.3	%
Dry Density	100.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 11/21/98
Location: Rougemont Test Pad #2, Lift 1

Specimen Data

Length (in):	3.055
Diameter (in.):	2.849
Area (sq. in.):	6.386
Volume (cu. in.):	19.51
Wet Weight (grams):	639.0
Dry Weight (grams):	514.0
Dry Density (pcf):	100.4

Moisture Content Test Data

Wet Weight	116.42
Dry Weight	97.94
Tare weight	21.95
% Moisture	24.3

Test Data

Confining Pressure 3.0 psi

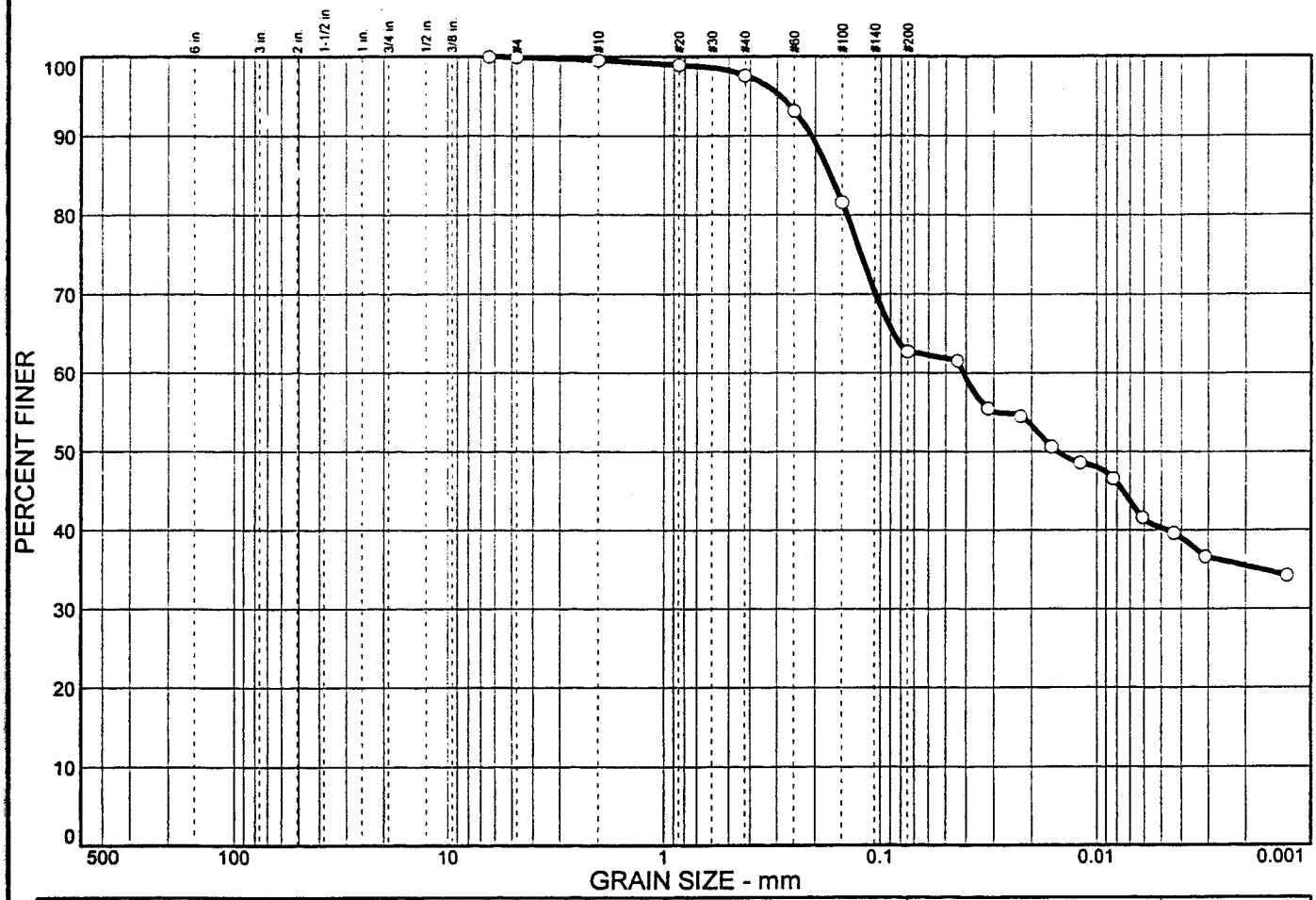
Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
375	110.77	1.35	1.60	1.19	1.48	4.42E-008
178	110.77	0.70	0.65	0.93	0.68	4.26E-008
181	110.77	0.65	0.65	1.00	0.65	4.03E-008
96	110.77	0.35	0.35	1.00	0.35	4.09E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **4.2E-008** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	37.2	22.5	40.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.5		
#20	98.9		
#40	97.6		
#60	93.1		
#100	81.6		
#200	62.7		

* (no specification provided)

Soil Description

Rougemount Borrow - Sandy lean clay

Atterberg Limits

PL= 18 LL= 37 PI= 19

Coefficients

D_{85}= 0.169 D_{60}= 0.0413 D_{50}= 0.0153
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-204, Test Pad - Lift #1

Sample No.: DL-204 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Test Pad - Lift #1 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-157

Project No.: VNC-98-029
Sample No.: DL-205

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.6E-008	cm/sec
% Moisture	23.6	%
Dry Density	99.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 11/22/98
Location: Rougemont Test Pad #2, Lift 2

Specimen Data

Length (in):	3.352
Diameter (in.):	2.856
Area (sq. in.):	6.417
Volume (cu. in.):	21.51
Wet Weight (grams):	693.3
Dry Weight (grams):	561.0
Dry Density (pcf):	99.4

Moisture Content Test Data

Wet Weight	122.99
Dry Weight	103.69
Tare weight	21.88
% Moisture	23.6

Test Data

Confining Pressure 3.0 psi

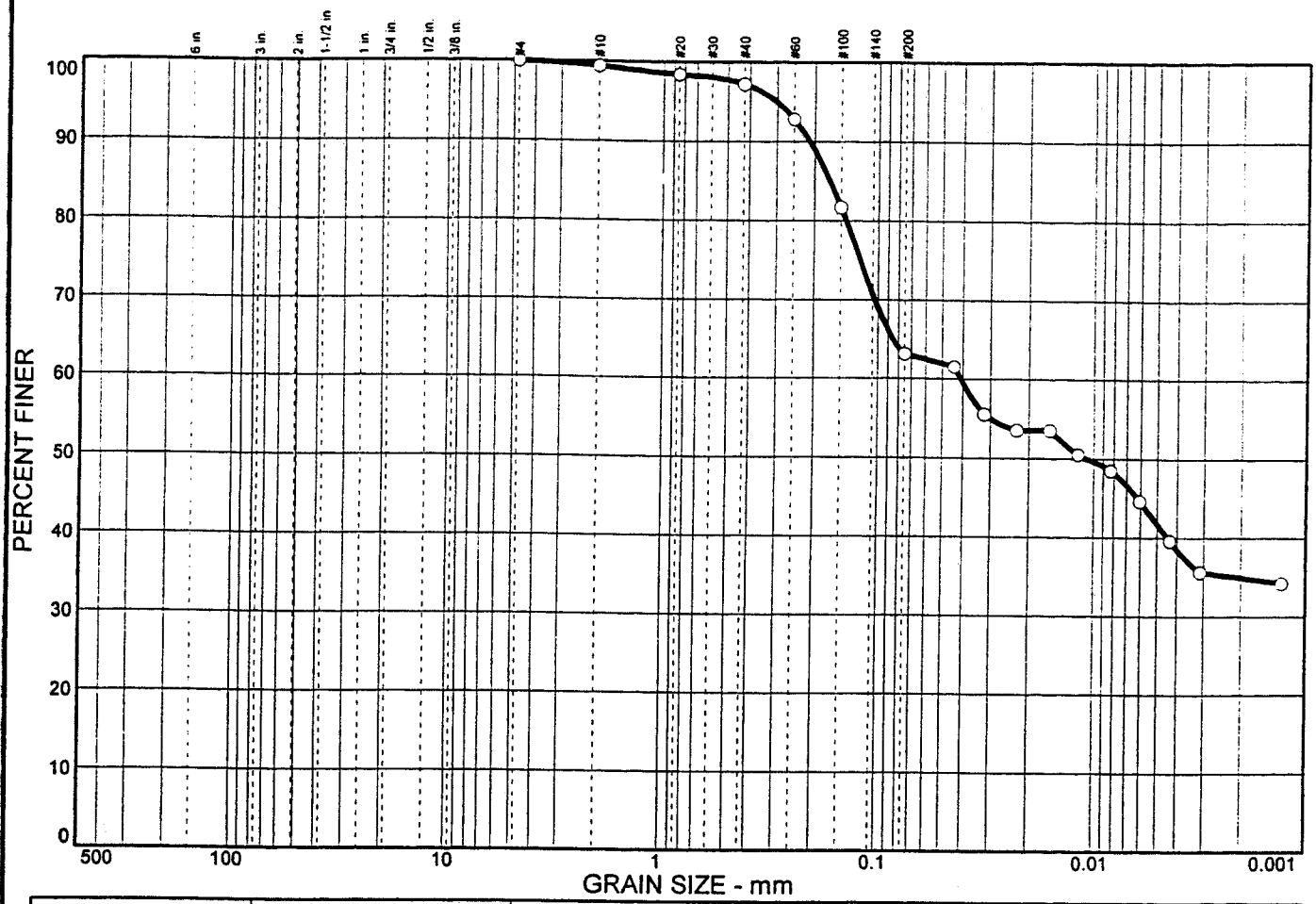
Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
251	110.77	1.15	1.20	1.04	1.18	5.74E-008
177	110.77	0.85	0.85	1.00	0.85	5.89E-008
181	110.77	0.80	0.85	1.06	0.83	5.59E-008
96	110.77	0.40	0.40	1.00	0.40	5.11E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **5.6E-008** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	36.9	21.4	41.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#20	98.4		
#40	97.2		
#60	92.8		
#100	81.7		
#200	63.1		

* (no specification provided)

Soil Description

Rougemount Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 38 PI= 19

Coefficients

D_{85}= 0.169 D_{60}= 0.0410 D_{50}= 0.0109
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-205, Test Pad - Lift #2

Sample No.: DL-205 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Test Pad - Lift #2 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-158

Project No.: VNC-98-029
Sample No.: DL-206

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.4E-008	cm/sec
% Moisture	23.8	%
Dry Density	98.9	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 11/22/98
Location: Rougemont Test Pad #2, Lift 3

Specimen Data

Length (in):	3.455
Diameter (in.):	2.848
Area (sq. in.):	6.381
Volume (cu. in.):	22.05
Wet Weight (grams):	708.2
Dry Weight (grams):	572.2
Dry Density (pcf):	98.9

Moisture Content Test Data

Wet Weight	134.10
Dry Weight	112.57
Tare weight	22.02
% Moisture	23.8

Test Data

Confining Pressure 3.0 psi

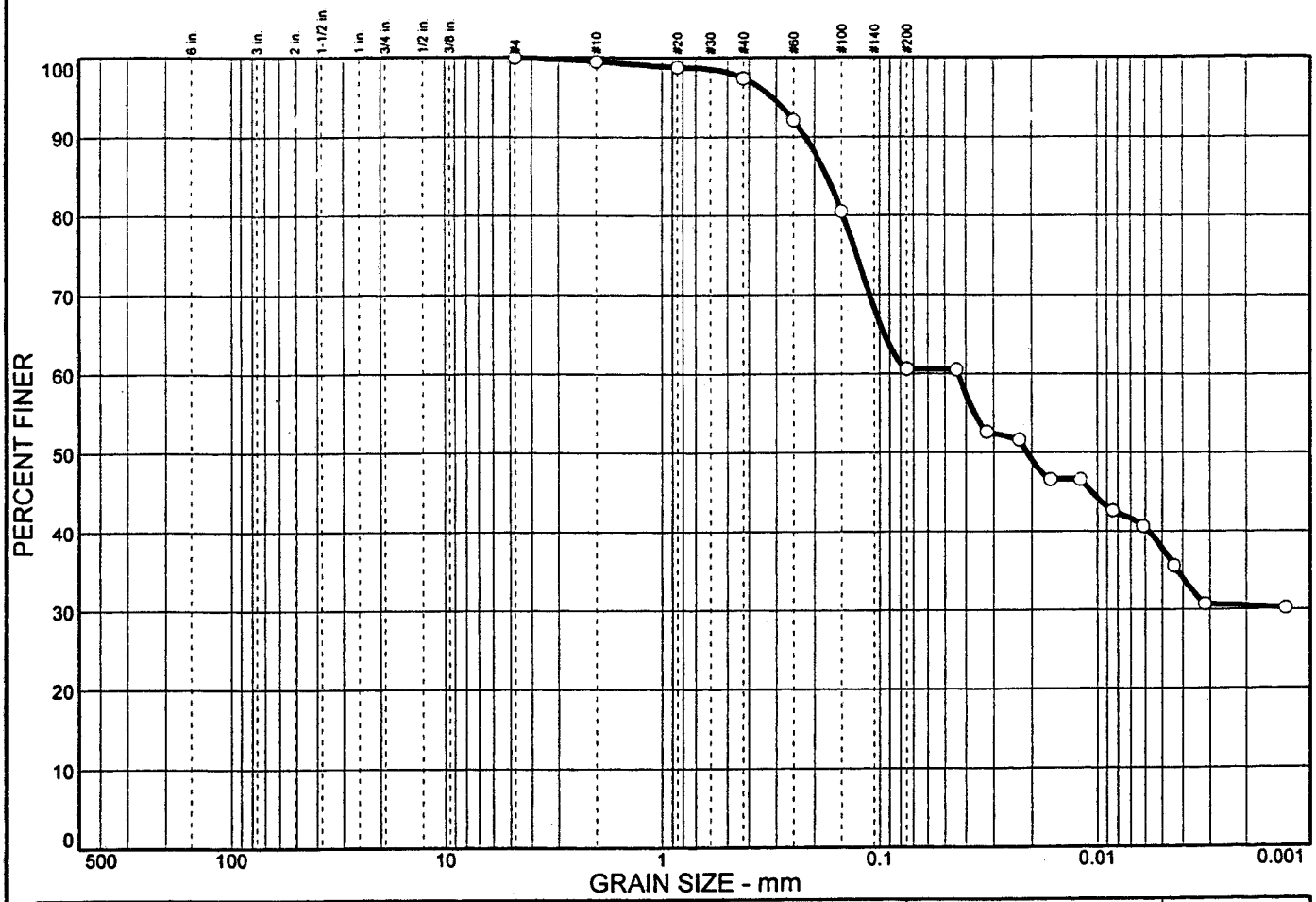
Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
246	124.62	0.55	0.55	1.00	0.55	2.53E-008
242	124.62	0.50	0.50	1.00	0.50	2.33E-008
520	124.62	1.20	1.00	0.83	1.10	2.39E-008
318	124.62	0.65	0.65	1.00	0.65	2.31E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.4E-008** cm/sec

Respecfully submitted R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	39.4	22.8	37.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#20	98.8		
#40	97.4		
#60	92.1		
#100	80.5		
#200	60.6		

* (no specification provided)

Soil Description

Rougemount Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 38 PI= 19

Coefficients

D_{85}= 0.175 D_{60}= 0.0436 D_{50}= 0.0211
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-206, Test Pad - Lift #3

Sample No.: DL-206 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Test Pad - Lift #3 **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern
Project: Durham County Landfill Closure
Project No: VNC-98-029 **Figure #**

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-159

Project No.: VNC-98-029
Sample No.: DL-207

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.1E-008	cm/sec
% Moisture	23.9	%
Dry Density	98.7	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/22/98
Location: Rougemont Test Pad #2, Lift 4

Specimen Data

Length (in):	3.248
Diameter (in.):	2.855
Area (sq. in.):	6.413
Volume (cu. in.):	20.83
Wet Weight (grams):	668.6
Dry Weight (grams):	539.6
Dry Density (pcf):	98.7

Moisture Content Test Data

Wet Weight	129.42
Dry Weight	108.68
Tare weight	21.94
% Moisture	23.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
487	132.90	1.40	1.70	1.21	1.55	3.15E-008
291	130.15	0.95	0.90	0.95	0.93	3.22E-008
181	132.90	0.55	0.50	0.91	0.53	2.87E-008
315	132.90	1.00	1.00	1.00	1.00	3.15E-008

Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **3.1E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

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MALCOLM PIRNIE

MALCOLM PIRNIE, INC.
ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

December 4, 1998

Malcolm Pirnie Inc.
Durham, North Carolina

Attn: Mr. Jay Jackson

Re: Soil Testing Analytical Report

Gentlemen:

In accordance with your request, we are pleased to present the results of the analysis of the samples from the Durham Landfill Project.

The samples were analyzed for the following parameter:

Parameter	Method
Permeability	ASTM D5084

The results are summarized on the following pages and the invoice is attached for your review.

If you should have any questions regarding these results or require additional information, please feel free to contact me at (716) 667-0900. We look forward to serving your analytical needs again in the near future.

Very truly yours,

MALCOLM PIRNIE, INC.

Anne Marie C. McManus

Anne Marie C. McManus, P.E., DEE
Soils Laboratory Manager

File: 0759-043

40 CENTRE DRIVE P.O. BOX 1938 BUFFALO, NY 14219-0138 716-667-0900 fax 716-667-0279 http://www.pirnie.com

RECYCLED PAPER

Malcolm Pirnie, Inc.

Project: Durham Landfill

Project No.: 0759-043

Sample	Permeability cm/sec
Test Pad Lift #4	1.3E-08
Acre 2 / Lift 1	2.9E-08
Acre 5 / Lift 2 (A)	2.4E-07
Acre 5 / Lift 2 (B)	8.8E-08
Acre 16 / Lift 1	3.2E-08
Acre 16 / Lift 2	1.0E-08
Acre 16 / Lift 3	3.0E-08

Malcolm Pirnie Inc.

Project: Durham Landfill
Project No.: 0759-043

Permeability Test Results

Sample: Test Pad / Lift 4

Sample Parameters	*Initial*	*Final*
Height (in)	2.14	2.16
Diameter (in)	2.87	2.90
Wet Density (pcf)	124.1	124.3
Moisture Content (%)	18.5	21.8
Optimum Moisture Content (%)	n/a	n/a
Dry Density (pcf)	104.7	102.0
Percent Compaction (%)	n/a	n/a

Test Parameters	
Test Type	Falling Head
Specimen Type	Undisturbed
Head Pressure (psi)	83.9
Back Pressure (psi)	80.0
Chamber Pressure (psi)	88.0
Fluid	Deaired Water
Permeation Time (Days)	5

Test Results

Coeffecient of Permeability, K (cm/sec) 1.3 E-08

Malcolm Pirnie Inc.

Project: Durham Landfill
Project No.: 0759-043

Permeability Test Results

Sample: Acre 2 / Lift 1

Sample Parameters	*Initial*	*Final*
Height (in)	1.77	1.75
Diameter (in)	2.86	2.92
Wet Density (pcf)	119.4	121.8
Moisture Content (%)	20.7	26.7
Optimum Moisture Content (%)	n/a	n/a
Dry Density (pcf)	99.0	96.1
Percent Compaction (%)	n/a	n/a

Test Parameters	
Test Type	Falling Head
Specimen Type	Undisturbed
Head Pressure (psi)	83.9
Back Pressure (psi)	80.5
Chamber Pressure (psi)	88.0
Fluid	Deaired Water
Permeation Time (Days)	4

Test Results

Coeffecient of Permeability, K (cm/sec) 2.9 E-08

Malcolm Pirnie Inc.

Project: Durham Landfill
Project No.: 0759-043

Permeability Test Results

Sample: Acre 5 / Lift 2 (A)

Sample Parameters	*Initial*	*Final*
Height (in)	2.48	2.48
Diameter (in)	2.86	2.90
Wet Density (pcf)	118.6	121.8
Moisture Content (%)	18.9	25.5
Optimum Moisture Content (%)	n/a	n/a
Dry Density (pcf)	99.8	97.1
Percent Compaction (%)	n/a	n/a

Test Parameters	
Test Type	Falling Head
Specimen Type	Undisturbed
Head Pressure (psi)	84.0
Back Pressure (psi)	79.9
Chamber Pressure (psi)	88.0
Fluid	Deaired Water
Permeation Time (Days)	5

Test Results

Coeffecient of Permeability, K (cm/sec) 2.4 E-07

Malcolm Pirnie Inc.

Project: Durham Landfill
Project No.: 0759-043

Permeability Test Results

Sample: Acre 5 / Lift 2 (B)

Sample Parameters	*Initial*	*Final*
Height (in)	2.76	2.73
Diameter (in)	2.87	2.88
Wet Density (pcf)	113.0	118.1
Moisture Content (%)	25.6	31.1
Optimum Moisture Content (%)	n/a	n/a
Dry Density (pcf)	90.0	90.1
Percent Compaction (%)	n/a	n/a

Test Parameters	
Test Type	Falling Head
Specimen Type	Undisturbed
Head Pressure (psi)	84.2
Back Pressure (psi)	80.1
Chamber Pressure (psi)	88.0
Fluid	Deaired Water
Permeation Time (Days)	5

Test Results

Coeffecient of Permeability, K (cm/sec) 8.8 E-08

Malcolm Pirnie Inc.

Project: Durham Landfill
Project No.: 0759-043

Permeability Test Results

Sample: Acre 16 / Lift 1

Sample Parameters	*Initial*	*Final*
Height (in)	2.28	2.24
Diameter (in)	2.87	2.88
Wet Density (pcf)	123.4	126.7
Moisture Content (%)	22.1	23.2
Optimum Moisture Content (%)	n/a	n/a
Dry Density (pcf)	101.1	102.8
Percent Compaction (%)	n/a	n/a

Test Parameters	
Test Type	Falling Head
Specimen Type	Undisturbed
Head Pressure (psi)	83.1
Back Pressure (psi)	79.8
Chamber Pressure (psi)	88.0
Fluid	Deaired Water
Permeation Time (Days)	5

Test Results

Coeffecient of Permeability, K (cm/sec) 3.2 E-08

Malcolm Pirnie Inc.

Project: Durham Landfill
Project No.: 0759-043

Permeability Test Results

Sample: Acre 16 / Lift 2

Sample Parameters	*Initial*	*Final*
Height (in)	2.19	2.17
Diameter (in)	2.86	2.88
Wet Density (pcf)	118.6	119.3
Moisture Content (%)	30.2	31.4
Optimum Moisture Content (%)	n/a	n/a
Dry Density (pcf)	91.1	90.8
Percent Compaction (%)	n/a	n/a

Test Parameters	
Test Type	Falling Head
Specimen Type	Undisturbed
Head Pressure (psi)	84.0
Back Pressure (psi)	79.8
Chamber Pressure (psi)	88.0
Fluid	Deaired Water
Permeation Time (Days)	5

Test Results

Coeffecient of Permeability, K (cm/sec) 1.0 E-08

Malcolm Pirnie Inc.

Project: Durham Landfill
Project No.: 0759-043

Permeability Test Results

Sample: Acre 16 / Lift 3

Sample Parameters	*Initial*	*Final*
Height (in)	2.45	2.49
Diameter (in)	2.87	2.93
Wet Density (pcf)	122.1	122.1
Moisture Content (%)	21.4	28.4
Optimum Moisture Content (%)	n/a	n/a
Dry Density (pcf)	100.6	95.2
Percent Compaction (%)	n/a	n/a

Test Parameters	
Test Type	Falling Head
Specimen Type	Undisturbed
Head Pressure (psi)	83.9
Back Pressure (psi)	80.3
Chamber Pressure (psi)	88.0
Fluid	Deaired Water
Permeation Time (Days)	5

Test Results

Coeffecient of Permeability, K (cm/sec) 3.0 E-08

Malcolm Pirnie Inc.

Project: Durham Landfill
Project No.: 0759-043

Permeability Test Results

Sample: Acre 41 / Lift 1

Sample Parameters	*Initial*	*Final*
Height (in)	2.91	2.88
Diameter (in)	2.86	2.86
Wet Density (pcf)	126.1	127.8
Moisture Content (%)	21.8	22.6
Optimum Moisture Content (%)	n/a	n/a
Dry Density (pcf)	103.5	104.3
Percent Compaction (%)	n/a	n/a

Test Parameters	
Test Type	Falling Head
Specimen Type	Undisturbed
Head Pressure (psi)	84.0
Back Pressure (psi)	80.0
Chamber Pressure (psi)	88.0
Fluid	Deaired Water
Permeation Time (Days)	5

Test Results

Coeffecient of Permeability, K (cm/sec) 9.1 E-09

Malcolm Pirnie Inc.

Project: Durham Landfill
Project No.: 0759-043

Permeability Test Results

Sample: Acre 41 / Lift 2

Sample Parameters	*Initial*	*Final*
Height (in)	2.94	2.88
Diameter (in)	2.86	2.86
Wet Density (pcf)	127.3	127.8
Moisture Content (%)	24.4	22.6
Optimum Moisture Content (%)	n/a	n/a
Dry Density (pcf)	102.4	104.3
Percent Compaction (%)	n/a	n/a

Test Parameters	
Test Type	Falling Head
Specimen Type	Undisturbed
Head Pressure (psi)	83.9
Back Pressure (psi)	79.8
Chamber Pressure (psi)	88.0
Fluid	Deaired Water
Permeation Time (Days)	5

Test Results

Coeffecient of Permeability, K (cm/sec) 1.1 E-08

Malcolm Pirnie Inc.

Project: Durham Landfill
Project No.: 0759-043

Permeability Test Results

Sample: Acre 41 / Lift 3

Sample Parameters	*Initial*	*Final*
Height (in)	2.96	2.94
Diameter (in)	2.88	2.87
Wet Density (pcf)	129.7	131.3
Moisture Content (%)	18.7	18.8
Optimum Moisture Content (%)	n/a	n/a
Dry Density (pcf)	109.3	110.6
Percent Compaction (%)	n/a	n/a

Test Parameters	
Test Type	Falling Head
Specimen Type	Undisturbed
Head Pressure (psi)	84.0
Back Pressure (psi)	80.0
Chamber Pressure (psi)	88.0
Fluid	Deaired Water
Permeation Time (Days)	5

Test Results

Coeffecient of Permeability, K (cm/sec) 6.1 E-09

NFE TECHNOLOGIES, INC.

Consulting Engineers & Contractors
Civil. Construction. Computers
Geotechnical. Environmental
8(a),SDB, MBE nationwide

Phone: (919) 469-4800
Fax: (919) 319-8400
E-Mail: Mailbox@nfetech.com
Home Page: www.nfetech.com

FAX TRANSMITTAL

Please deliver the following pages to:

Name: **Sonji Moseley**

Company: **Malcolm Pirnie**

Fax Number: (704) 547 8530

Total Number of Pages (including this page): 5

Our Philosophy:

Provide value-added, cost effective and efficient services to all our clients and to meet and exceed their expectations. We earn our clients' "TRUST".

Our Values:

. Do it Right, the First time.

. Avoid any Job claims or accidents.

. Environmental Protection and Improvement.

. Personalized attention to each individual client.

Our Belief:

Continued growth of NFE through repeat business.

Information Transmitted

December 11, 1998

Landfill Cap Monitoring

Herewith please find test reports for the following locations:

1. Grain Size Distribution for Acres 28A & 38A(1)
2. Grain Size Distribution for Acres 28A & 38A(2))
3. Nuclear Density Test Report LDF-04
4. Nuclear Density Test Report LDF-05

(Basanta Sengupta)

Should you have any questions, or error in this transmittal, please feel free to contact us at (919) 469-4800

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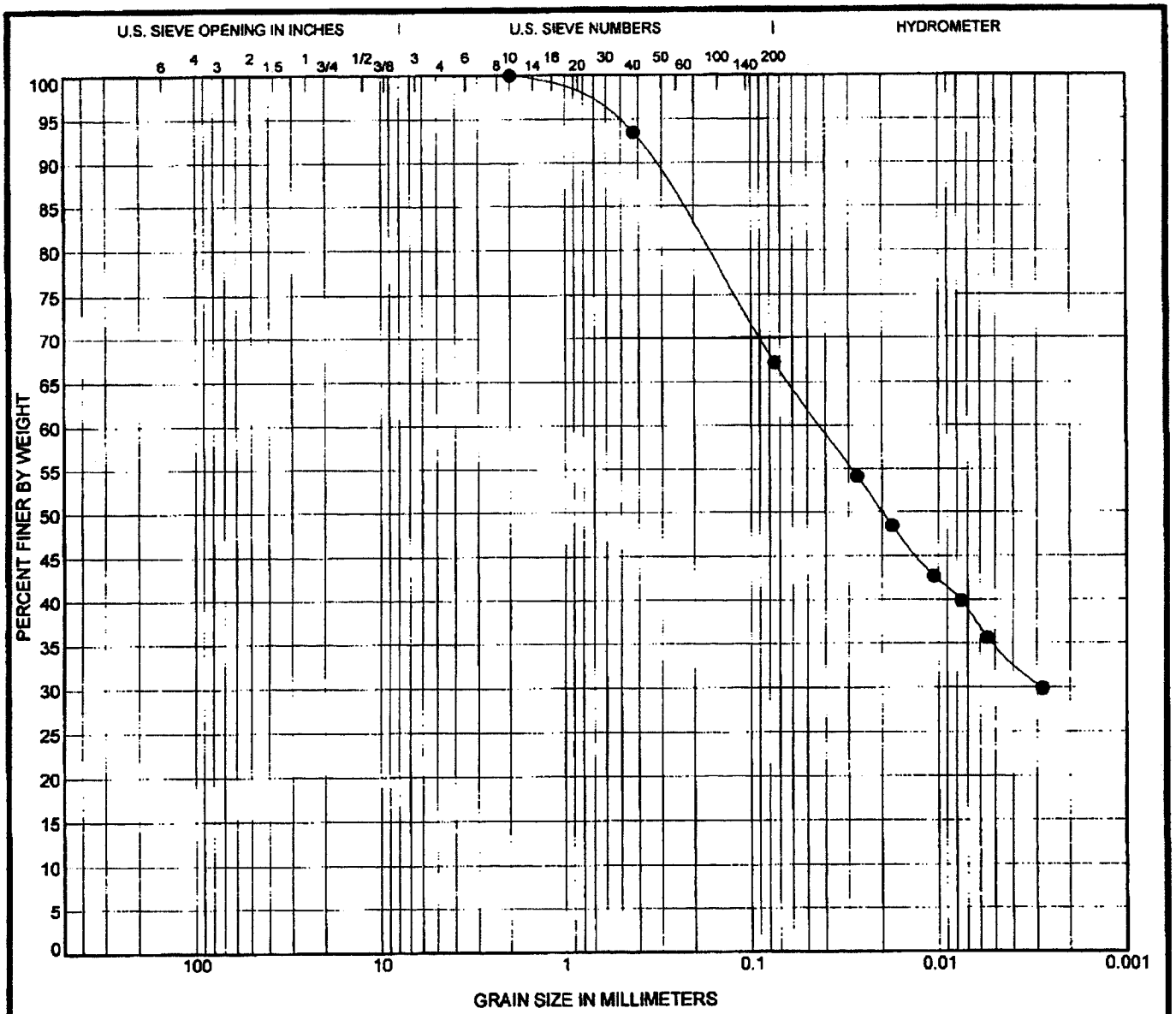


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	Acres 28A&38A(2)0.0	SANDY LEAN CLAY CL	31	16	15		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	Acres 28A&38A(2)0.0	2	0.043	0.003		0.0	32.8	32.4	34.8

NFE Technologies
250, Dominion Drive,
Morrisville, NC. 27560
Telephone: (919)469 4800
Fax: (919)319 8400

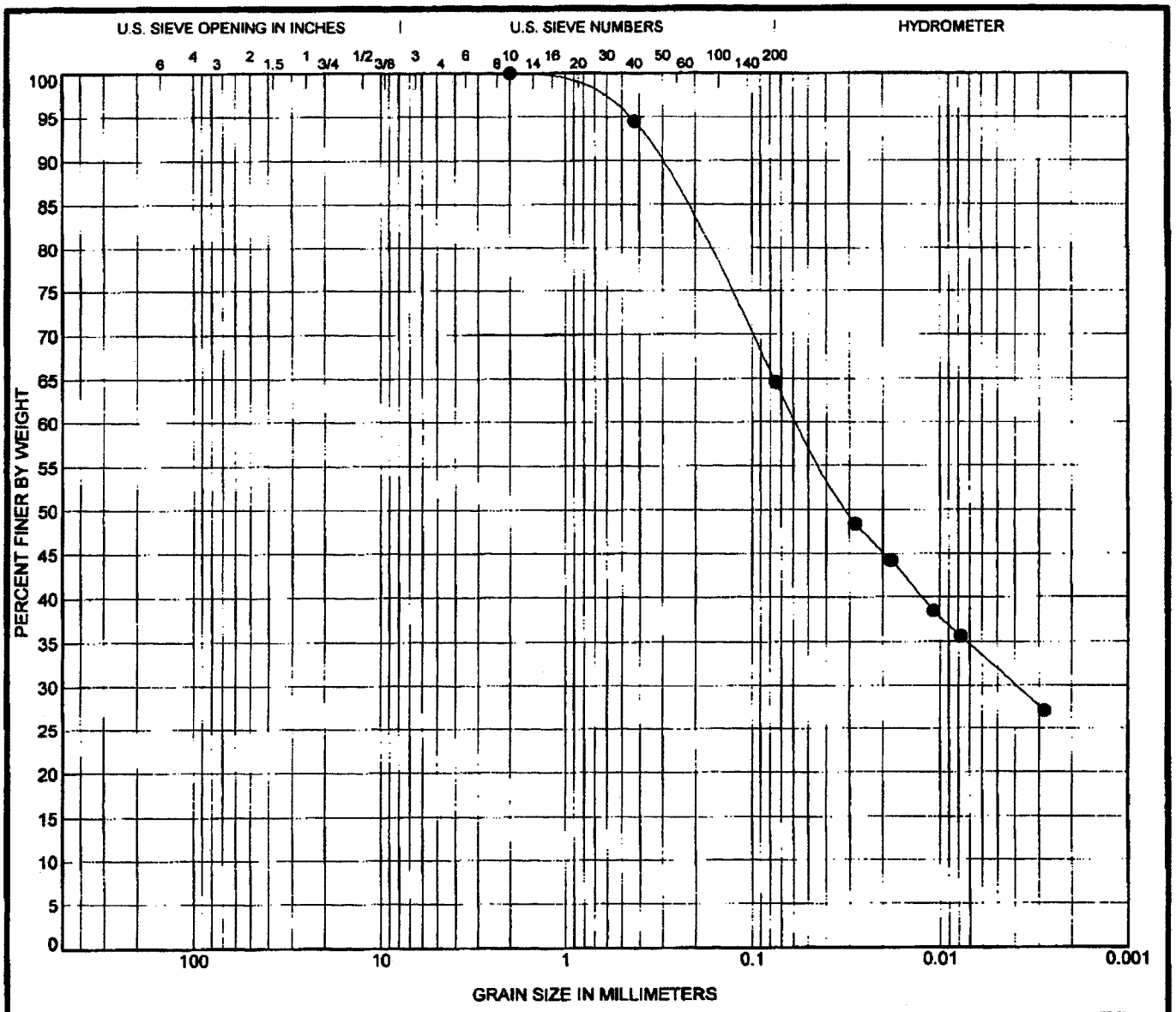
GRAIN SIZE DISTRIBUTION

Project: Landfill Cap Monitoring

Location: Durham, NC

Number: 98-340

US_GRAIN_SIZE_LANDFILL.GPJ US_LAB.GDT 12/10/98



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	Acres 28A&38A(1)0.0	SANDY LEAN CLAY CL	29	11	18		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	Acres 28A&38A(1)0.0	2	0.057	0.004		0.0	35.4	32.7	31.9

US GRAIN SIZE LANDFILL.GPJ US LAB.GDT 12/10/98

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250, Dominion Drive,
Morrisville, NC. 27560
Telephone: (919)469 4800
Fax: (919)319 8400

GRAIN SIZE DISTRIBUTION

Project: Landfill Cap Monitoring

Location: Durham, NC

Number: 98-340

NFE Technologies, Inc.
250 Dominion Drive, Raleigh, NC 27560

Phone 919-469-4800
Fax 919-319-8400

NUCLEAR DENSITY TEST DATA

CLIENT: Malcolm Pirnie, Inc
OWNER: City of Durham, solid waste department
NFE PROJECT #:98-340
PROJECT: Landfill closure cap construction at East club Blvd. Durham
WEATHER: Sunny

DATE: 12/03/98

REPORT NO: LDF-04d

TEST NUMBER	1	2	3	4	5	6
TEST LOCATION	Acre 28A and 30A					
ELEVATION						
SOIL TYPE	Clay	Clay	Clay	Clay	Clay	Clay
SOURCE DEPTH	6"	6"	6"	6"	6"	6"
WET DENSITY P.C.F	123.5	119.6	123.2	124.4	125.6	122.4
MOISTURE P.C.F.	23	20.3	21.1	20.3	21.2	22.5
DRY DENSITY P.C.F.	100.5	108.6	102.9	103.3	104.4	99.9
MOISTURE %	22.9	19.2	19.4	19.7	20.3	20.3
MAX. Density From Supplier Lab reports P.C.F.	103	103	103	103	103	103
OPTIMUM M.C.%	19.3	19.3	19.3	19.3	19.3	19.3
RELATIVE COMPACTION %	97.6	+100	99.9	+100	+100	97
REQUIRED COMPACTION %	95	95	95	95	95	95
TEST COMMENTS	Pass	Pass	Pass	Pass	Pass	Pass

Comments:
Work Shift: Morning
Field Inspector : IR

NFE Technologies, Inc.
250 Dominion Drive, Raleigh, NC 27560

Phone 919-469-4800
Fax 919-319-8400

NUCLEAR DENSITY TEST DATA

CLIENT: Malcolm Pirnie, Inc
OWNER: City of Durham, solid waste department
NFE PROJECT #:98-340
PROJECT: Landfill closure cap construction at East club Blvd. Durham
WEATHER: Sunny

DATE: 12/10/98

REPORT NO: LDF-05d

TEST NUMBER	1	2	3	4	5	6
TEST LOCATION	Vegetation Cover					
ELEVATION						
SOIL TYPE	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand
SOURCE DEPTH	6"	6"	6"	6"	6"	6"
WET DENSITY P.C.F	129.8	121.8	125.4	127.4	130.9	134.6
MOISTURE P.C.F.	17.6	17	20.2	18.8	15,8	14.7
DRY DENSITY P.C.F.	112.2	104.6	105.2	108.6	115.1	119.9
MOISTURE %	15.7	16.3	19.2	17.3	13.7	12.3
MAX. Density From Supplier Lab reports P.C.F.	115.8	115.8	115.8	115.8	115.8	115.8
OPTIMUM M.C.%	14.4	14.4	14.4	14.4	14.4	14.4
RELATIVE COMPACTION %	96.9	90.3	90.8	93.8	99.4	100+
REQUIRED COMPACTION %	90	90	90	90	90	90
TEST COMMENTS	Pass	Pass	Pass	Pass	Pass	Pass

Comments:
Work Shift: Morning
Field Inspector : IR

NFE TECHNOLOGIES, INC.

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Geotechnical. Environmental
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Company: **Malcolm Pirnie**

Fax Number: (704) 547 8530

Total Number of Pages (including this page): 13

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. Do it Right, the First time.

. Avoid any Job claims or accidents.

. Environmental Protection and Improvement.

. Personalized attention to each individual client.

Our Belief:

Continued growth of NFE through repeat business.

Information Transmitted

Landfill Cap Monitoring

Herewith please find lab results for the following locations;

1. Acres 39, 40 and 45
2. Southeast Quadrant
3. Acre 19

(Basanta Sengupta)

Should you have any questions, or error in this transmittal, please feel free to contact us at (919) 469-4800

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Phone 919-469-4800
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NUCLEAR DENSITY TEST DATA

CLIENT: Malcolm Pirnie, Inc
OWNER: City of Durham, solid waste department
NFE PROJECT #:98-340
PROJECT: Landfill closure cap construction at East club Blvd. Durham
EATHER: Foggy

DATE: 11/19/98
Sheet#1
REPORT NO: LDF-01d

TEST NUMBER	1	2	3	4	5	6
TEST LOCATION	Acres 39, 40, 45					
ELEVATION						
SOIL TYPE	Clay	Clay	Clay	Clay	Clay	Clay
SOURCE DEPTH	6"	6"	6"	6"	6"	6"
WET DENSITY P.C.F	123.7	126.8	127.3	122.1	124.8	124.1
MOISTURE P.C.F.	24.1	24.1	23.8	26.2	24.9	25.7
DRY DENSITY P.C.F.	99.7	102.7	103.5	95.9	99.9	98.4
MOISTURE %	24.1	23.4	23	27.3	25	26.1
MAX. Density From Supplier Lab reports P.C.F.	96.8	96.8	96.8	96.8	96.8	96.8
OPTIMUM M.C.%	22.5	22.5	22.5	22.5	22.5	22.5
RELATIVE COMPACTION %	99.4	100+	100+	99.1	100+	100+
REQUIRED COMPACTION %	95	95	95	95	95	95
TEST COMMENTS	Pass	Pass	Pass	Pass	Pass	Pass

Comments:
Work Shift: Morning
Field Inspector : IR

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NUCLEAR DENSITY TEST DATA

CLIENT: Malcolm Pirnie, Inc
OWNER: City of Durham, solid waste department
NFE PROJECT #:98-340
PROJECT: Landfill closure cap construction at East club Blvd. Durham
WEATHER: Foggy

DATE: 11/19/98
Sheet#2
REPORT NO: LDF-01d

TEST NUMBER	1	2	3	4	5	6
TEST LOCATION	Acres 39, 40, 45					
ELEVATION						
SOIL TYPE	Clay	Clay	Clay	Clay	Clay	
SOURCE DEPTH	6"	6"	6"	6"	6"	
WET DENSITY P.C.F	120.3	124.8	125.7	119.8	122	
MOISTURE P.C.F.	23.9	23.7	24.3	24.3	25.3	
DRY DENSITY P.C.F.	96.4	101.1	101.3	95.5	96.6	
MOISTURE %	24.7	23.4	24	25.5	26.2	
MAX. Density From Supplier Lab reports P.C.F.	96.8	96.8	96.8	96.8	96.8	
OPTIMUM M.C.%	22.5	22.5	22.5	22.5	22.5	
RELATIVE COMPACTION %	99.6	100+	100+	98.6	99.9	
REQUIRED COMPACTION %	95	95	95	95	95	
TEST COMMENTS	Pass	Pass	Pass	Pass	Pass	

Comments:
Work Shift: Morning
Field Inspector : IR

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NUCLEAR DENSITY TEST DATA

CLIENT: Malcolm Pirnie, Inc
OWNER: City of Durham, solid waste department
NFE PROJECT #:98-340
PROJECT: Landfill closure cap construction at East club Blvd. Durham
WEATHER: Sunny

DATE: 11/24/98
Sheet#1
REPORT NO: LDF-02d

TEST NUMBER	1	2	3	4	5	6
TEST LOCATION	South east quadrant vegetative support soil					
ELEVATION						
SOIL TYPE	Silty sand	Silty sand	Silty sand	Silty sand	Silty sand	Silty sand
SOURCE DEPTH	6"	6"	6"	6"	6"	6"
WET DENSITY P.C.F	124.8	133.6	127.7	122.7	134.4	137.4
MOISTURE P.C.F.	10.4	11.5	10	9.3	11.5	10.1
DRY DENSITY P.C.F.	114.4	122	117.7	113.4	122.9	127.3
MOISTURE %	9.1	9.5	8.5	8.2	9.4	8
MAX. Density From Supplier Lab reports P.C.F.	115.8	115.8	115.8	115.8	115.8	115.8
OPTIMUM M.C.%						
RELATIVE COMPACTION %	100+	100+	100+	100+	100+	100+
REQUIRED COMPACTION %	95	95	95	95	95	95
TEST COMMENTS	Pass	Pass	Pass	Pass	Pass	Pass

Comments:
Work Shift: Morning
Field Inspector : IR

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NUCLEAR DENSITY TEST DATA

CLIENT: Malcolm Pirnie, Inc
OWNER: City of Durham, solid waste department
NFE PROJECT #:98-340
PROJECT: Landfill closure cap construction at East club Blvd. Durham
WEATHER: Sunny

DATE: 11/24/98
Sheet#2
REPORT NO: LDF-02d

TEST NUMBER	1	2	3	4	5	6
TEST LOCATION	South east quadrant vegetative support soil					
ELEVATION						
SOIL TYPE	Silty sand	Silty sand	Silty sand	Silty sand		
SOURCE DEPTH	6"	6"	6"	6"		
WET DENSITY P.C.F	129.9	136.2	127.6	131		
MOISTURE P.C.F.	15.1	11.2	16.2	10.4		
DRY DENSITY P.C.F.	114.8	125	111.6	120.6		
MOISTURE %	13.1	8.9	14.5	8.6		
MAX. Density From Supplier Lab reports P.C.F.	115.8	115.8	115.8	115.8		
OPTIMUM M.C.%						
RELATIVE COMPACTION %	100+	100+	100+	100+		
REQUIRED COMPACTION %	95	95	95	95		
TEST COMMENTS	Pass	Pass	Pass	Pass		

Comments:
Work Shift: Morning
Field Inspector : IR

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FIELD INSPECTION REPORT

CLIENT : Malcolm Pirnie, Inc
DATE :11/27/98
OWNER: City of Durham, solid waste department
NFE JOB # : 98-340
REPORT # : LDF-01f
PROJECT : Landfill closure cap construction at east club Blvd
WEATHER : Sunny

WORK IN PROGRESS:

Type of Field Activity :

Activity Location :

Comments : The area was checked by the NFE inspector.The site was not ready for the inspector. The site will be visited next week.

1

Work Shift :
Field Inspector :

NFE Technologies, Inc.
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NUCLEAR DENSITY TEST DATA

CLIENT: Malcolm Pirnie, Inc
OWNER: City of Durham, solid waste department
NFE PROJECT #:98-340
PROJECT: Landfill closure cap construction at East club Blvd. Durham
WEATHER: Sunny

DATE: 11/30/98
Sheet#1
REPORT NO: LDF-03d

TEST NUMBER	1	2	3	4	5	6
TEST LOCATION	Acres 19					
ELEVATION						
SOIL TYPE	Clay	Clay	Clay	Clay	Clay	Clay
SOURCE DEPTH	6"	6"	6"	6"	6"	6"
WET DENSITY P.C.F	126.4	126.2	126.1	127.3	122.9	122.3
MOISTURE P.C.F.	21	20.7	20.9	21.5	22	21.3
DRY DENSITY P.C.F.	104.6	105.5	105.2	105.8	100.8	101
MOISTURE %	20.5	19.6	19.8	21	21.9	21
MAX. Density From Supplier Lab reports P.C.F.	103	103	103	103	103	103
OPTIMUM M.C.%	19.3	19.3	19.3	19.3	19.3	19.3
RELATIVE COMPACTION %	100+	100+	100+	100+	97.8	98.8
REQUIRED COMPACTION %	95	95	95	95	95	95
TEST COMMENTS	Pass	Pass	Pass	Pass	Pass	Pass

Comments:
Work Shift: Morning
Field Inspector : IR

NFE Technologies, Inc.
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Phone 919-469-4800
Fax 919-319-8400

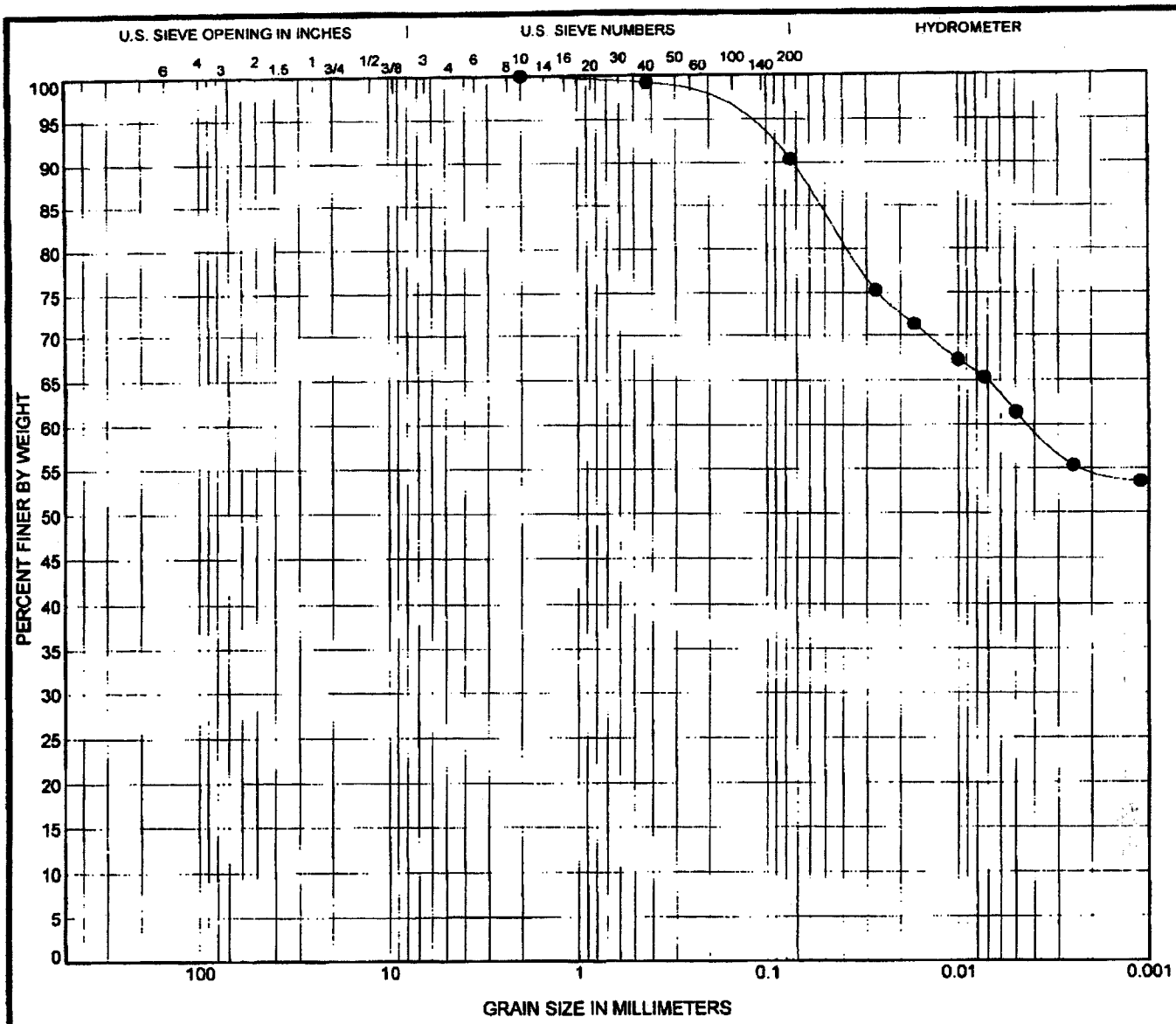
NUCLEAR DENSITY TEST DATA

CLIENT: Malcolm Pirnie, Inc
OWNER: City of Durham, solid waste department
NFE PROJECT #:98-340
PROJECT: Landfill closure cap construction at East club Blvd. Durham
WEATHER: Sunny

DATE: 11/30/98
Sheet#2
REPORT NO: LDF-03d

TEST NUMBER	1	2	3	4	5	6
TEST LOCATION	Acres 19					
ELEVATION						
SOIL TYPE	Clay	Clay	Clay	Clay		
SOURCE DEPTH	6"	6"	6"	6"		
WET DENSITY P.C.F	125.2	125.9	124.4	118.6		
MOISTURE P.C.F.	21.8	22.1	20.9	20.1		
DRY DENSITY P.C.F.	103.4	103.8	104.2	98.5		
MOISTURE %	21	21.3	19.4	20.4		
MAX. Density From Supplier Lab reports P.C.F.	103	103	103	103		
OPTIMUM M.C.%	19.3	19.3	19.3	19.3		
RELATIVE COMPACTION %	100+	100+	100+	95.6		
REQUIRED COMPACTION %	95	95	95	95		
TEST COMMENTS	Pass	Pass	Pass	Pass		

Comments:
Work Shift: Morning
Field Inspector : IR



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● Acre 39-40-45	0.0	FAT CLAY CH	60	28	32		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● Acre 39-40-45	0.0	2	0.004			0.0	9.6	29.0	61.4

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Fax: (919)319 8400

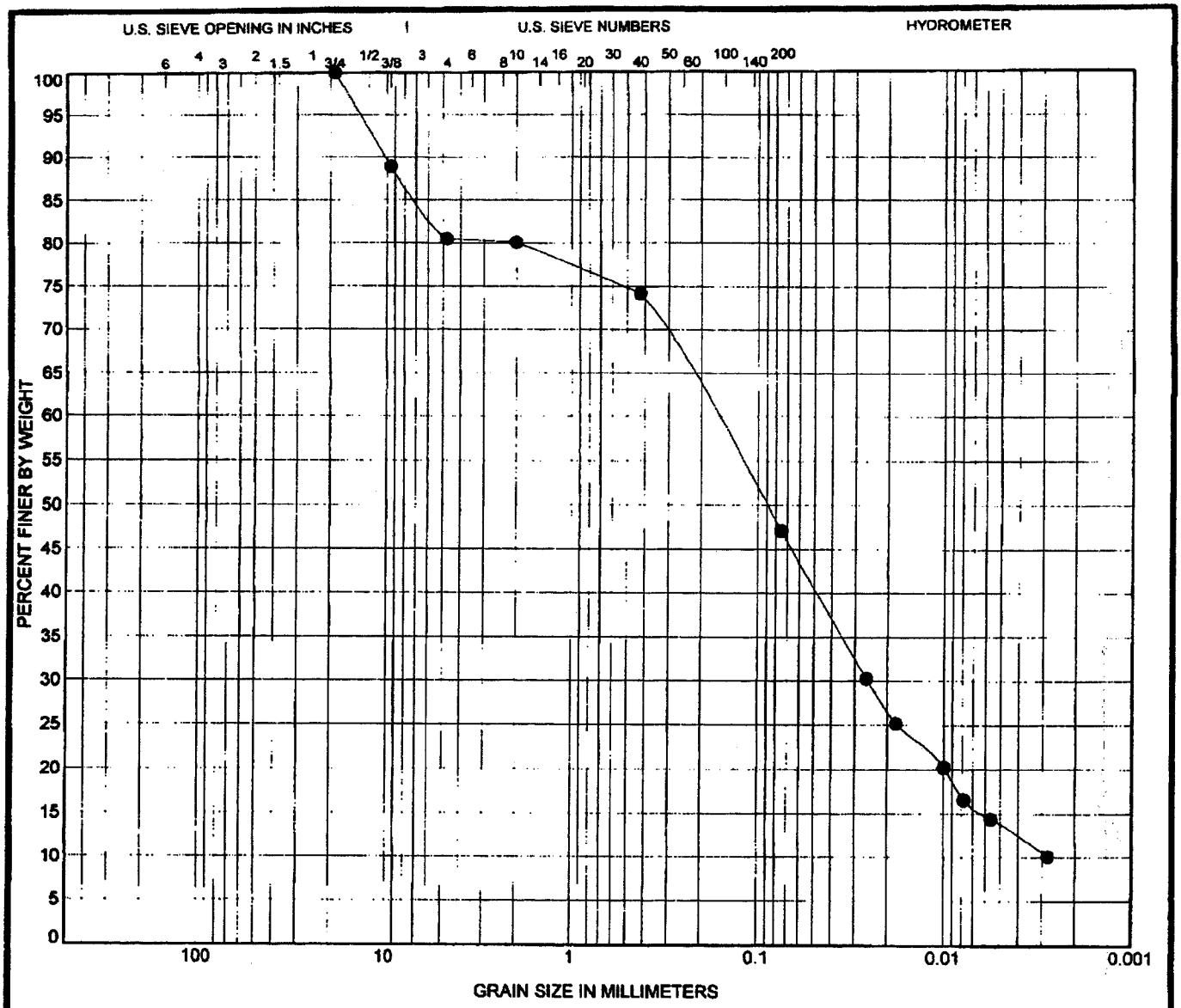
GRAIN SIZE DISTRIBUTION

Project: Landfill Cap Monitoring

Location: Durham, NC

Number: 98-340

US GRAIN SIZE LANDFILL.GPJ US LAB.GDT 12/7/98



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● Southeast Quadrant 0-1	CLAYEY SAND with GRAVEL SC	28	15	13		

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● Southeast Quadrant 0-1	19	0.171	0.025		19.5	33.4	33.4	13.7

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Fax: (919)319 8400

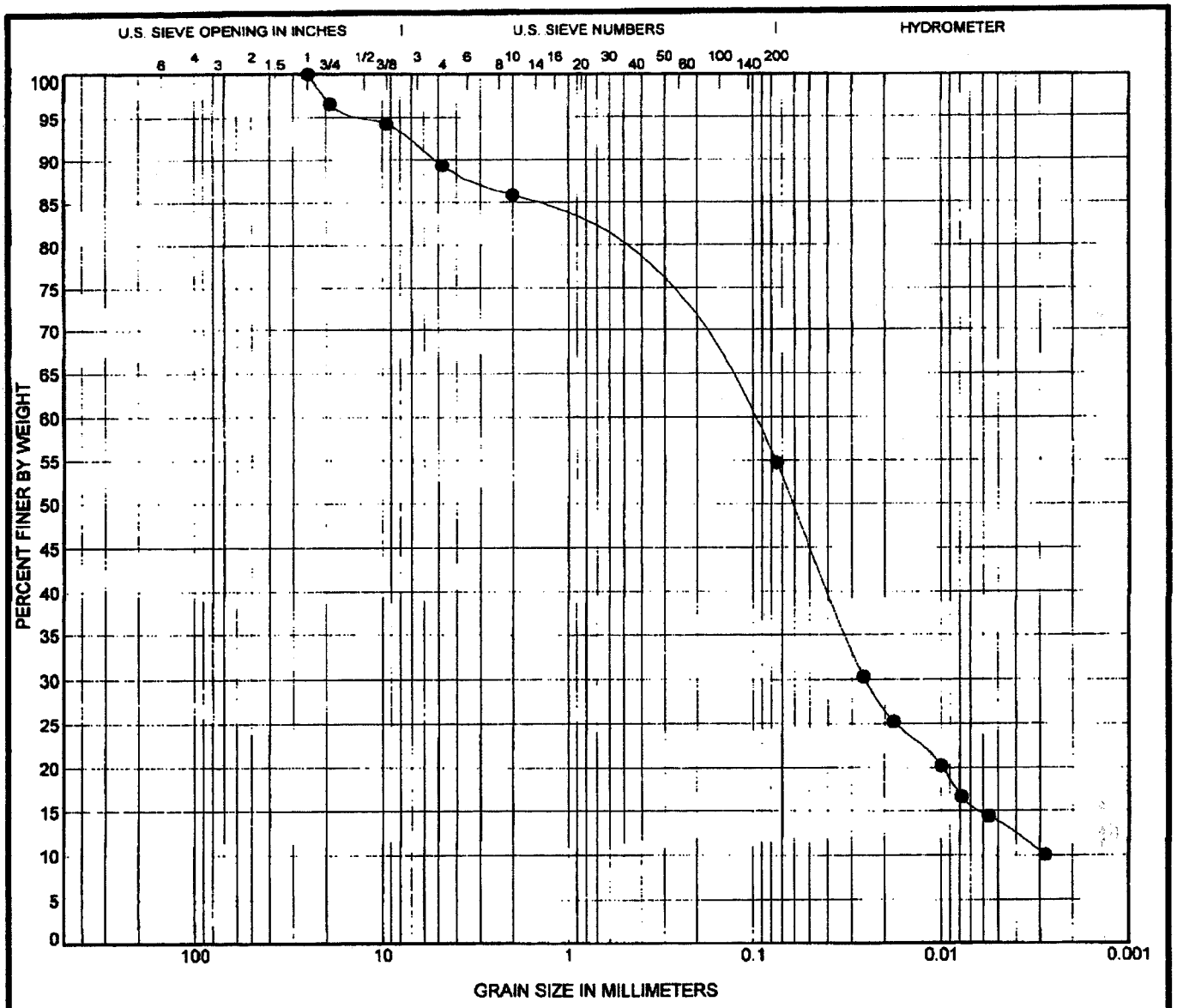
GRAIN SIZE DISTRIBUTION

Project: Landfill Cap Monitoring

Location: Durham, NC

Number: 98-340

US GRAIN SIZE LANDFILL.GPJ US LAB.GDT 12/7/98



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● Southeast Quadrant-2	SANDY LEAN CLAY CL	28	13	15		

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● Southeast Quadrant-2	25	0.131	0.025		10.7	34.6	41.0	13.7

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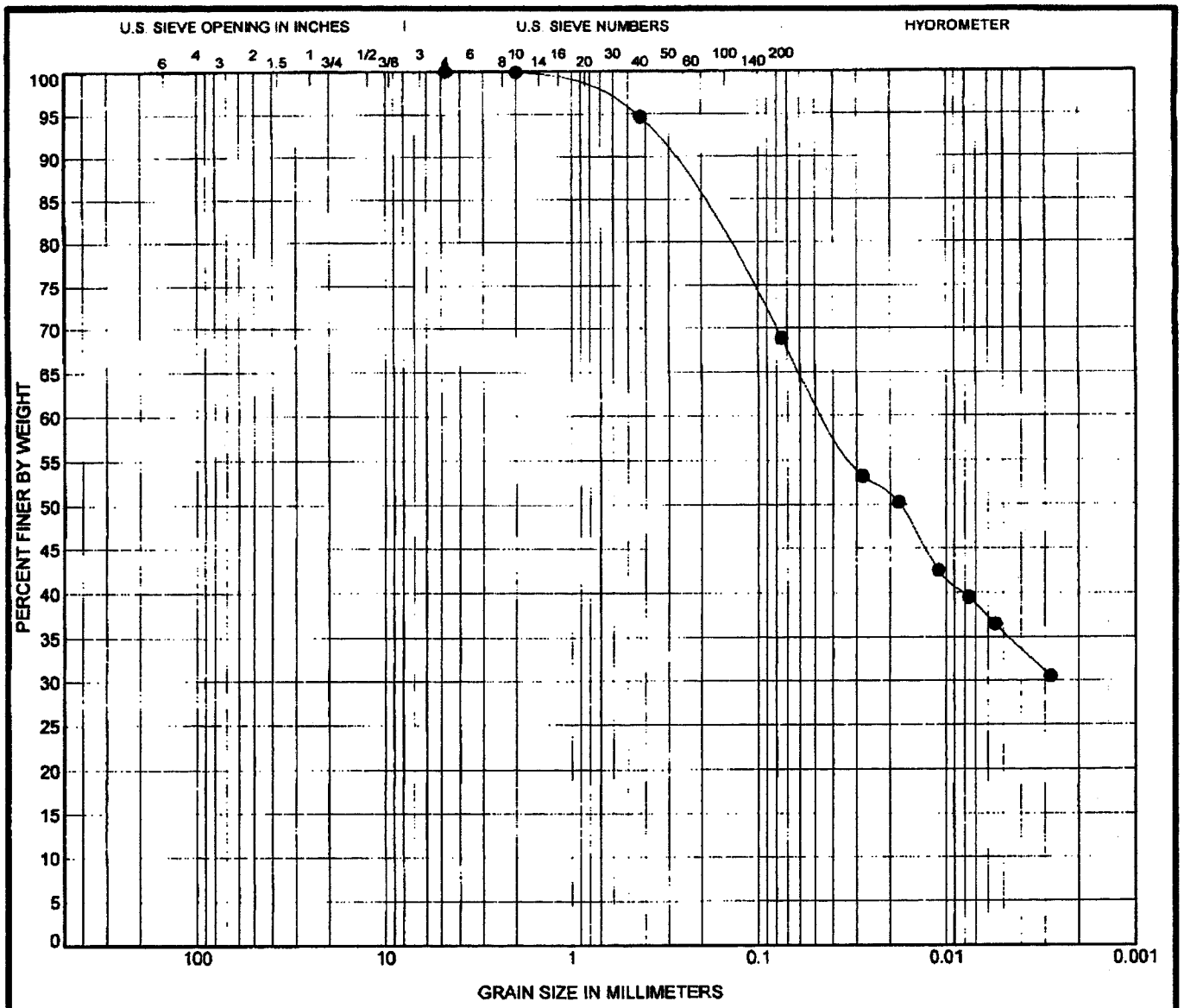
GRAIN SIZE DISTRIBUTION

Project: Landfill Cap Monitoring

Location: Durham, NC

Number: 98-340

US GRAIN SIZE LANDFILL.GPJ US LAB.GDT 12/7/98



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	Acre-19-1	0.0	SANDY LEAN CLAY CL	38	20	18		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	Acre-19-1	0.0	4.75	0.043			0.0	31.2	33.2	35.7

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Morrisville, NC. 27560
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Fax: (919)319 8400

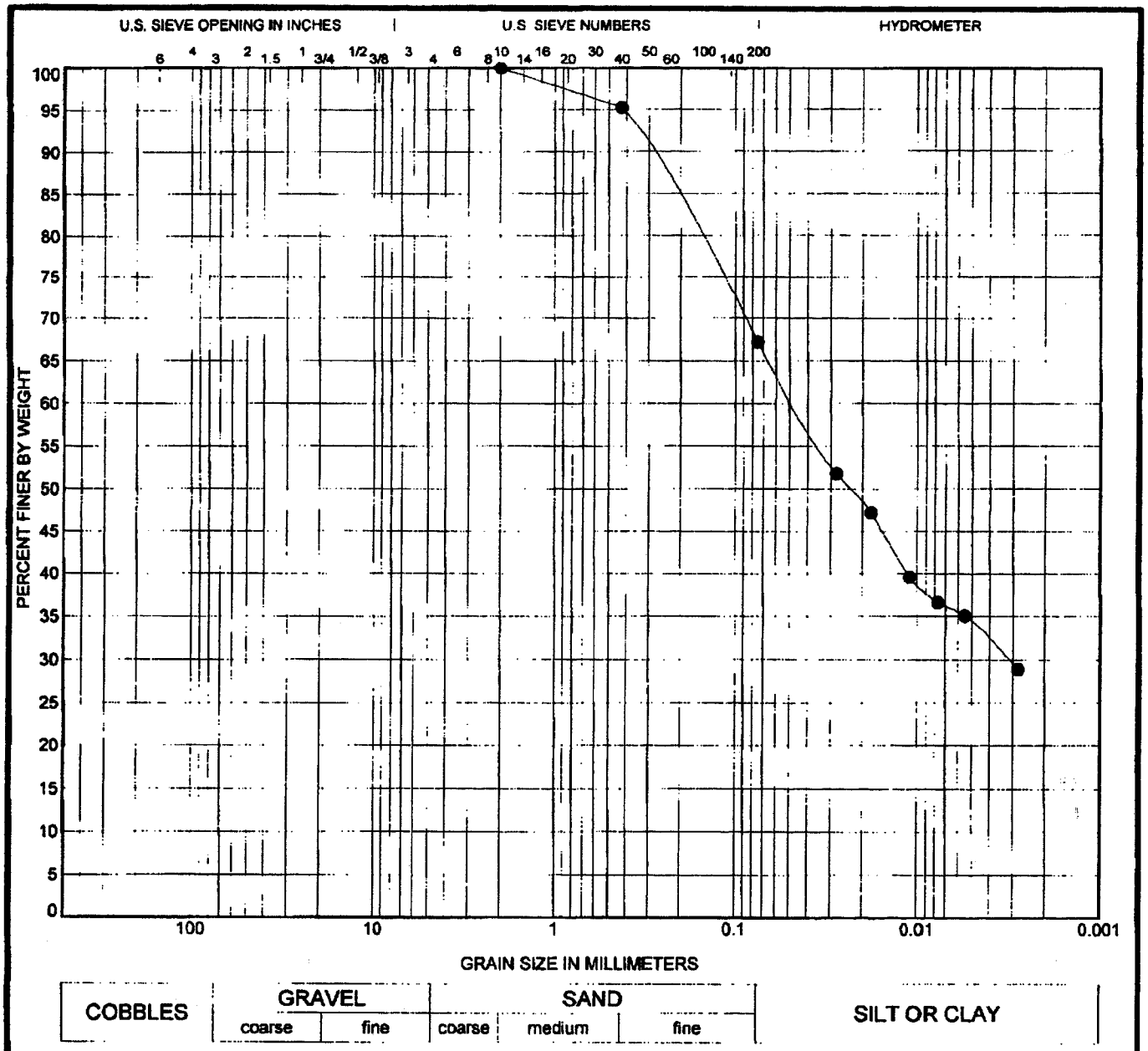
GRAIN SIZE DISTRIBUTION

Project: Landfill cap monitoring

Location: Durham, NC

Number: 98340

US GRAIN SIZE LANDFILL.GPJ US LAB.GDT 12/7/98



Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● Acre-19-2	0.0	SANDY LEAN CLAY CL	39	21	18		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● Acre-19-2	0.0	2	0.047	0.003		0.0	32.8	33.1	34.1

NFE Technologies
250, Dominion Drive,
Morrisville, NC. 27560
Telephone: (919)469 4800
Fax: (919)319 8400

GRAIN SIZE DISTRIBUTION

Project: Landfill Cap Monitoring

Location: Durham, NC

Number: 98-340

US GRAIN SIZE LANDFILL.GPJ US LAB.GDT 12/7/98

NFE TECHNOLOGIES, INC.

Consulting Engineers & Contractors
Civil. Construction. Computers
Geotechnical. Environmental
8(a),SDB, MBE nationwide

Phone: (919) 469-4800
Fax: (919) 319-8400
E-Mail: Mailbox@nfetech.com
Home Page: www.nfetech.com

FAX TRANSMITTAL

Please deliver the following pages to:

Name: **Sonji Moseley**

Company: **Malcolm Pirnie**

Fax Number: (704) 547 8530

Total Number of Pages (including this page): 5

Our Philosophy:

Provide value-added, cost effective and efficient services to all our clients and to meet and exceed their expectations. We earn our clients' "TRUST".

Our Values:

. Do it Right, the First time.

. Avoid any Job claims or accidents.

. Environmental Protection and Improvement.

. Personalized attention to each individual client.

Our Belief:

Continued growth of NFE through repeat business.

Information Transmitted

December 18, 1998

Landfill Cap Monitoring

Herewith please find test reports for the following locations:

1. Grain Size Distribution for Vegetation Support (1)
2. Grain Size Distribution for Vegetation Support (2)
3. Report LDF-06d
4. Report LDF-07d

I acknowledge receipt of the site plan and will be sending you the desired information shortly.

(Basanta Sengupta)

Should you have any questions, or error in this transmittal, please feel free to contact us at (919) 469-4800

Remarks: This information ( ) will be mailed (X) will not be mailed. ( ) will be e-mailed

You may also visit our Home Page @ http:\www.nfetech.com

Note:The information transmitted in this facsimile may be confidential. If you are not the intended recipient and received it in error, please notify us immediately and return this information to us without any copying, distribution, or dissemination. Thank you.

NFE Technologies, Inc.
850 Dominion Drive Morrisville, NC 27560

Phone 919-469-4800
Fax 919-319-8400

FIELD INSPECTION REPORT

CLIENT : Malcolm Pirnie, Inc
DATE :12/08/98
OWNER: City of Durham, solid waste department
NFE JOB # : 98-340
REPORT # : LDF-06f
PROJECT : Landfill closure cap construction at east club Blvd
WEATHER : Rainy

WORK IN PROGRESS:

Type of Field Activity :

Activity Location :

Comments : The area was checked by the NFE inspector.The site was not ready because of the rain. The site will be visited on Thursday DEC.10.

1

Work Shift : Morning
Field Inspector : IR

NFE Technologies, Inc.
250 Dominion Drive Morrisville, NC 27560

Phone 919-469-4800
Fax 919-319-8400

FIELD INSPECTION REPORT

CLIENT : Malcolm Pirnie, Inc
OWNER: City of Durham, solid waste department
NFE JOB # : 98-340
PROJECT : Landfill closure cap construction at east club Blvd
WEATHER : Rainy

DATE :12/17/98

REPORT # : LDF-07f

WORK IN PROGRESS:

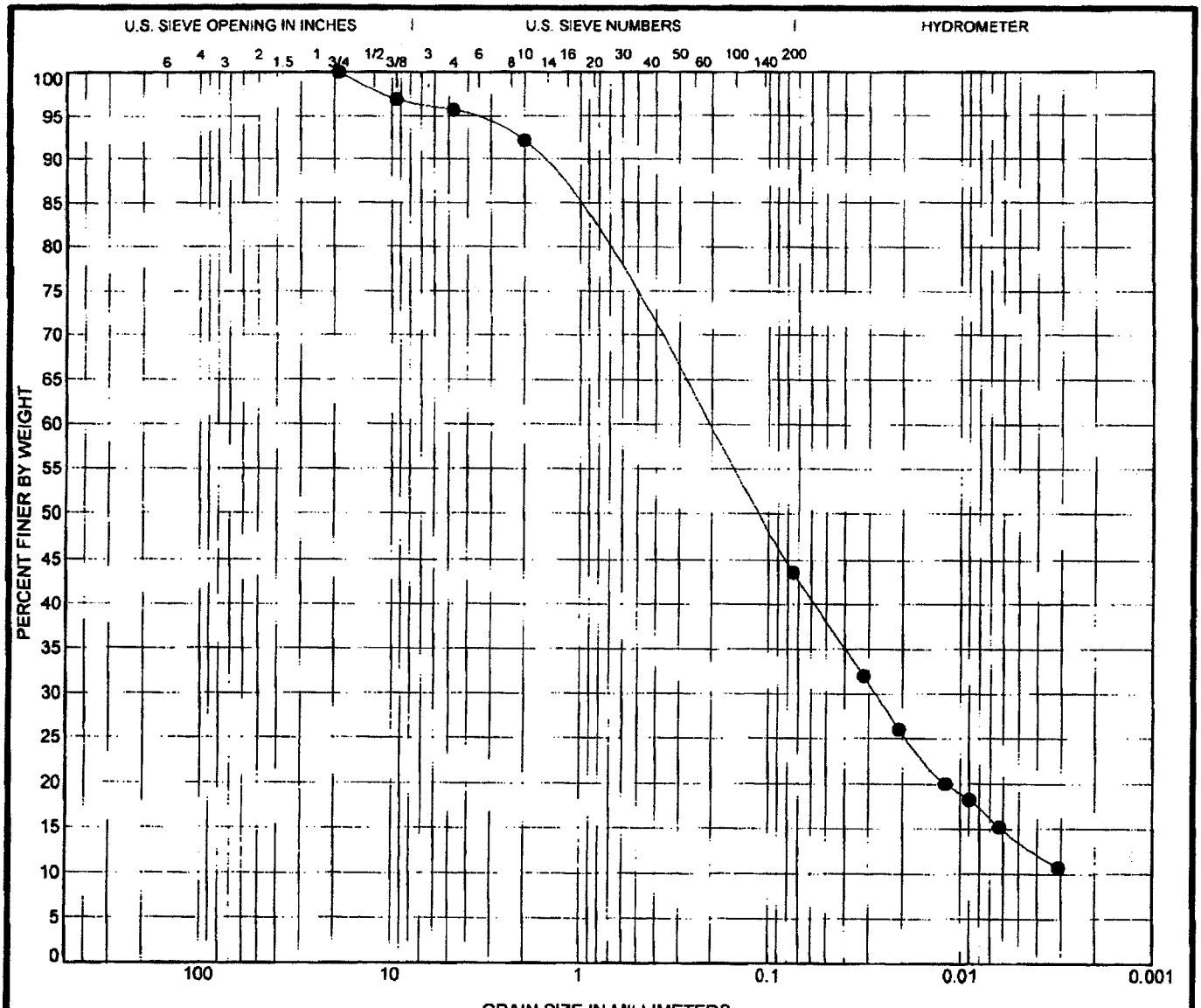
Type of Field Activity :

Activity Location :

Comments : The site visit was postponed because of the rain.

1

Work Shift : Morning
Field Inspector : IR



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● Veg. Support#2 0.0	SILTY, CLAYEY SAND SC-SM	25	20	5		

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● Veg. Support#2 0.0	19	0.227	0.028		4.3	52.1	29.9	13.7

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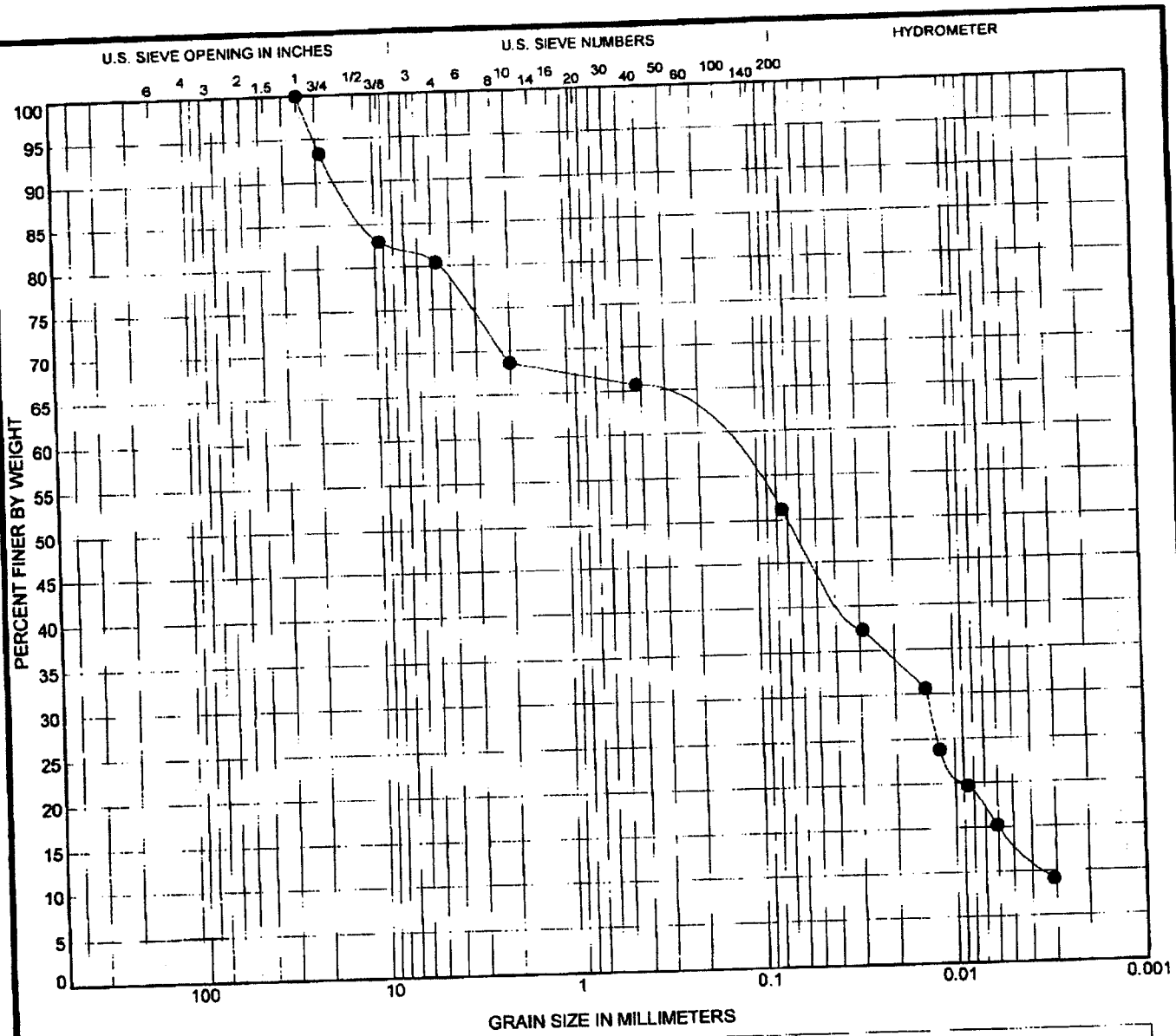
GRAIN SIZE DISTRIBUTION

Project: Landfill Cap Monitoring

Location: Durham, NC

Number: 98-340

US_GRAIN_SIZE_LANDFILL.GPJ US_LAB.GDT 12/11/98



COBBLES	GRAVEL coarse	GRAVEL fine	SAND coarse	SAND medium	SAND fine	SILT OR CLAY

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● Veg. Support#1 0.0	SANDY SILTY CLAY with GRAVEL CL-ML	27	20	7	0.26	62.74

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● Veg. Support#1 0.0	25	0.215	0.014	0.003	19.6	29.2	37.8	13.4

US_GRAIN_SIZE_LANDFILL.GPJ US_LAB.GDT 12/16/98

NFE

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Fax: (919)319 8400

GRAIN SIZE DISTRIBUTION

Project: Landfill Cap Monitoring

Location: Durham, NC

Number: 98-340