32-01

RECEIVED
JUN 11 1999
DIVISION OF WASTE MANAGEMENT
FAYETTEVILLE REGIONAL OFFICE

CITY OF DURHAM
SANITARY LANDFILL
CONSTRUCTION QUALITY ASSURANCE REPORT

DURHAM
1869
CITY OF MEDICINE

SCANNED
Carmen Johnson 3/6/15

CITY OF DURHAM, NORTH CAROLINA

June 1999

Volume I of II

0759-043

ENVIRONMENTAL ENGINEERS, MALCOLM PIRNIE SCIENTISTS & PLANNERS

RECEIVED
JUN 11 1999
DIVISION OF WASTE MANAGEMENT
FAYETTEVILLE REGIONAL OFFICE

TABLE OF CONTENTS

VOLUME I

CERTIFICATION LETTER 1

SURVEY POINT FILE 2

- NORTH EAST QUAD
- NORTHWEST QUAD
- SOUTHEAST QUAD
- SOUTHWEST QUAD
- SOUTHWEST QUAD (ADDITIONAL POINTS)
- VENEER AREA
- CLAY SECTION AT ACCESS ROAD

AS BUILT TOPOGRAPHIC SURVEYS 3

- GENERAL FILL (CLAY SUBGRADE)
- TOP OF PERMEABILITY CLAY
- FINAL GRADE (VEGETATIVE COVER, ROADS, CHUTES)

CONSTRUCTION PHOTOGRAPHS 4

OVERALL SITE LOCATION MAP–SOILS TESTS 5

GENERAL FILL SOIL REPORTS 6

(LIFT 1) LOW PERMEABILITY SOIL REPORTS 7

(LIFT 2) LOW PERMEABILITY SOIL REPORTS 8

VOLUME II

(LIFT 3) LOW PERMEABILITY SOIL REPORTS 9

VEGETATIVE COVER SOIL REPORTS 10

MATERIAL TEST REPORTS (PRIOR TO PLACEMENT) 11

ADDITIONAL QUALITY ASSURANCE TESTS 12

1

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.
ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

June 1, 1999

Mr. James Coffey
Division of Solid Waste Management
Solid Waste Section
P. O. Box 27687
Raleigh, NC 27611-7687

Re: City of Durham, North Carolina
Solid Waste Landfill Closure

Dear Mr. Coffey:

Closure of the municipal solid waste landfill located on East Club Boulevard, in and for the City of Durham has been completed. As required by section .1624 (b) (15) of the North Carolina administrative code Title 15A sub-chapter 13B, enclosed herewith is the CQA Report. This report provides the following documentation:

1. As-built survey point files.
2. As-built topographic surveys of:
   a. General fill
   b. Top of low permeability clay cap
   c. Top of vegetative cover and final grades
3. Overall site grid map and sample maps which identify locations of all tested areas
4. Test reports, proctor curves, grain size distribution curves and compaction test results for the general fill.
5. Complete test results for the low permeability clay cap. These results and reports are divided into three sections, one for each of the three clay layer lifts required to attain the 18" finished depth.
6. Test results and reports for the vegetative cover.
7. Test data and reports for the materials to be utilized in construction to determine acceptability.

The contractor, Gilbert Southern, provided the surveying and soil testing data as the primary quality control. Additional quality assurance testing was performed by Malcolm Pirnie, Inc., and our subconsultant, NFE Technologies. These quality assurance data generally supported the contractor's quality control data, and are included in a separate section of the CQA report.

In general, all work described herein has been completed in accordance with the plans and specifications except as noted and reflect acceptable engineering practice. Where soil layers did not comply with the specifications for soil tests or thickness, the following corrective measures were taken in the field:

201 McCULLOUGH DRIVE SUITE 380 CHARLOTTE, NC 28262 704-547-8550 fax 704-547-8530 http://www.pirnie.com

MALCOLM PIRNIE

To ensure minimum thickness: Areas which by survey indicated a total clay layer depth of less than 18.00 inches were actually field measured to confirm that the clay was 18 inches thick or greater. Throughout the construction period, settlement of the landfill required additional fill of the required type of materials.

To ensure required permeability: When a six-inch low-permeability soil layer did not meet specifications, it was removed mechanically and reinstalled and compacted, correcting either moisture content or compaction effort as required. A second set of permeability and compaction tests was performed to ensure compliance in these instances.

The following exceptions to the specifications are noted: The as-built topographic survey taken at the top of the clay layer revealed only 24 points out of 821 where the surveyed depth of clay was fractionally less than 18.00 inches. The maximum deviation was –0.48 inches, which occurred at only one location. Two locations showed deviations of –0.36 inches, five locations were –0.24 inches and 16 locations were –0.12 inches. Given that less than 3 percent of the measured thickness values were less than the specified value, on-going settlement could result in measured thickness values that are less than actual and the average thickness of the low permeability layer exceeds the specification, it is our professional judgement that these exceptions do not materially impact the performance of the cap system.

In summary, to the best of our knowledge, belief and information, and based upon the data contained herein, the requirements of the closure design have been met.

We trust the enclosures are satisfactory. Please advise should you have any questions or comments.

Very truly yours,

Malcolm Pirnie, Inc.

Richard W. Stahr, Jr. P.E.
Project Manager

NORTH CAROLINA PROFESSIONAL SEAL 20550 ENGINEER RICHARD W. STAHR, JR.

6/1/99

kb
0759043

RWSL0526.doc

RECYCLED PAPER

2

Notice of Responsible Parties
For the Durham Landfill Survey Point Files

The survey point files were provided by Gilbert Southern and the associated as-built topographic surveys were prepared by Taylor, Wiseman & Taylor (Engineers, Surveyors, and Planners) and sealed by Jeffrey L. Bateman, RLS.

NORTH EAST QUAD TOPO

TWT	GS	NORTH	EAST	SG ELEV	CLAY ELEV	DEPTH	DIFF. +/-	VEG ELEV	DEPTH	DIFF. =/-
9333	1141	831219.05	2043172.17	416.3	417.8	1.50	0.00	418.3	0.5	0.0
9742	1458	830840.81	2043112.6	420.3	421.8	1.50	0.00	422.4	0.6	0.1
9743	1459	830840.1	2043175.1	407.0	408.5	1.51	0.01	409.1	0.6	0.1
9744	1460	830838.8	2043218.2	396.2	397.7	1.51	0.01	399.6	1.9	1.4
9745	1461	830839.64	2043243.31	389.5	391.0	1.51	0.01	393	2.0	1.5
9746	1462	830840.35	2043289.1	377.5	379.0	1.52	0.02	379.6	0.6	0.1
9747	1463	830840.51	2043325.71	367.6	369.1	1.53	0.03	369.8	0.7	0.2
9749	1464	830915.2	2043321.49	370.8	372.3	1.51	0.01	372.9	0.6	0.1
9750	1465	830914.96	2043299.69	376.5	378.0	1.50	0.00	378.5	0.5	0.0
9751	1466	830914.69	2043251.7	390.1	391.6	1.53	0.03	392.1	0.5	0.0
9752	1467	830914.98	2043220.9	398.3	399.8	1.51	0.01	401.4	1.6	1.1
9753	1468	830915.5	2043180.21	408.3	409.8	1.51	0.01	410.5	0.7	0.2
9754	1469	830913.55	2043125.51	418.6	420.1	1.51	0.01	420.7	0.6	0.1
9755	1470	830988.81	2043138.56	418.9	420.4	1.51	0.01	421.5	1.1	0.6
9756	1471	830964.75	2043165.71	414.2	415.7	1.50	0.00	416.3	0.6	0.1
9757	1472	830991.83	2043232	398.0	399.6	1.51	0.01	400.1	0.5	0.0
9758	1473	830992.56	2043260.88	390.0	391.5	1.51	0.01	392	0.5	0.0
9759	1474	830993.78	2043309.68	377.0	378.6	1.51	0.01	379.1	0.6	0.1
9760	1475	830994.55	2043344.16	367.9	369.4	1.51	0.01	370	0.6	0.1
9761	1476	831064.31	2043357.68	366.8	368.3	1.51	0.01	368.9	0.6	0.1
9762	1477	831065.42	2043313.98	378.7	380.2	1.51	0.01	380.8	0.6	0.1
9763	1478	831064.55	2043273.91	388.5	390.0	1.51	0.01	390.6	0.6	0.1
9764	1479	831064.28	2043230.7	400.0	401.5	1.50	0.00	402	0.5	0.0
9765	1480	831064.56	2043186.3	411.5	413.1	1.60	0.10	413.7	0.6	0.1
9766	1481	831066.16	2043153.52	418.3	419.8	1.51	0.01	420.5	0.7	0.2
9767	1482	831140.02	2043154.93	418.3	419.8	1.50	0.00	420.3	0.5	0.0
9768	1483	831140.6	2043190.45	411.8	413.3	1.50	0.00	413.8	0.5	0.0
9769	1484	831141.31	2043237.1	400.2	401.7	1.51	0.01	402.3	0.6	0.1
9770	1485	831141.56	2043278.5	389.2	390.7	1.51	0.01	391.2	0.5	0.0
9771	1486	831141.76	2043321.5	377.6	379.1	1.50	0.00	379.9	0.8	0.3
9772	1487	831141.74	2043364.6	366.0	367.5	1.52	0.02	368.1	0.6	0.1
9773	1488	831140.85	2043388.2	359.6	361.1	1.50	0.00	361.7	0.6	0.1
9774	1489	831217.48	2043426.9	348.3	349.8	1.52	0.02	350.4	0.6	0.1
9775	1490	831215.61	2043388.13	358.8	360.3	1.50	0.00	360.8	0.5	0.0
9776	1491	831210.64	2043355.4	367.8	369.3	1.51	0.01	369.9	0.6	0.1
9777	1492	831209.49	2043320.39	378.2	379.7	1.52	0.02	380.3	0.6	0.1
9778	1493	831209.16	2043277.81	389.6	391.2	1.52	0.02	391.7	0.5	0.0
9779	1494	831209.35	2043235.5	400.7	402.2	1.53	0.03	402.7	0.5	0.0
9780	1495	831209.48	2043193	411.8	413.3	1.51	0.01	413.9	0.6	0.1
9781	1496	831274.7	2043192.87	411.0	412.5	1.51	0.01	413.1	0.6	0.1
9782	1497	831277.96	2043236.18	400.5	402.0	1.50	0.00	402.5	0.5	0.0
9783	1498	831277.99	2043283.34	387.8	389.3	1.51	0.01	389.9	0.6	0.1
9784	1499	831276.9	2043323.1	377.7	379.2	1.50	0.00	379.7	0.5	0.0
9785	1500	831280.1	2043365.16	365.5	367.0	1.47	-0.03	367.5	0.5	0.0
9786	1501	831283.59	2043409.48	352.0	353.5	1.47	-0.03	354.1	0.6	0.1
9787	1502	831287.11	2043438.99	345.7	347.2	1.51	0.01	347.8	0.6	0.1
9788	1503	831365.5	2043447.1	344.8	346.3	1.51	0.01	346.8	0.5	0.0
9789	1504	831365.16	2043434.05	347.6	349.1	1.49	-0.01	349.6	0.5	0.0
9790	1505	831365.6	2043391.88	358.1	359.6	1.49	-0.01	360.2	0.6	0.1
9791	1506	831365.2	2043355.55	367.8	369.2	1.49	-0.01	369.8	0.6	0.1
9792	1507	831366.39	2043316.8	378.1	379.6	1.49	-0.01	380.1	0.5	0.0
9793	1508	831364.85	2043276.08	388.0	389.5	1.48	-0.02	390	0.5	0.0

9795	1509	831368.9	2004323.1	399.2	400.7	1.49	-0.01	401.2	0.5	0.0
9796	1510	831361.29	2043187.46	409.3	410.9	1.51	0.01	411.4	0.5	0.0
9797	1511	831461.6	2043183.99	408.0	409.6	1.52	0.02	410.1	0.5	0.0
9798	1512	831457.38	2043237.22	395.3	396.8	1.48	-0.02	397.4	0.6	0.1
9799	1513	831452.1	2043265.3	388.8	390.4	1.51	0.01	390.9	0.5	0.0
9800	1514	831446.56	2043307.11	378.4	379.9	1.50	0.00	380.5	0.6	0.1
9801	1515	831448.43	2043346.35	368.9	370.5	1.50	0.00	371	0.6	0.1
9802	1516	831444.4	2043388.42	358.0	359.5	1.49	-0.01	360	0.6	0.1
9803	1517	831447.2	2043437.6	346.3	347.8	1.53	0.03	348.4	0.6	0.1
9804	1518	831515.62	2043420.29	347.9	349.4	1.49	-0.01	350	0.6	0.1
9805	1519	831515.66	2043380.59	357.9	359.4	1.51	0.01	360	0.6	0.1
9806	1520	831514.71	2043339.17	369.1	370.6	1.51	0.01	371.1	0.5	0.0
9807	1521	831515.46	2043298.8	378.8	380.3	1.50	0.00	380.9	0.6	0.1
9808	1522	831515.76	2043260.88	388.2	389.8	1.54	0.04	390.3	0.5	0.0
9809	1523	831515.1	2043222.89	398.5	400.1	1.52	0.02	400.6	0.6	0.1
9810	1524	831515.8	2043177.72	410.0	411.5	1.48	-0.02	412.1	0.6	0.1
9815	1526	831560.38	2043174.5	411.2	412.7	1.53	0.03	413.3	0.6	0.1
9816	1527	831559.56	2043221.84	399.4	400.9	1.52	0.02	401.4	0.5	0.0
9817	1528	831558.69	2043262.16	388.4	390.0	1.51	0.01	390.5	0.5	0.0
9818	1529	831557.5	2043303.41	377.6	379.1	1.51	0.01	379.6	0.5	0.0
9819	1530	831557.47	2043341.49	367.1	368.6	1.51	0.01	369.1	0.5	0.0
9820	1531	831557.08	2043384.12	356.0	357.5	1.51	0.01	358	0.5	0.0
9821	1532	831553.9	2043407.6	350.1	351.6	1.51	0.01	352.1	0.5	0.0
9822	1533	831573.15	2043350.52	364.8	366.3	1.51	0.01	366.8	0.5	0.0
9823	1534	831579.06	2043303.4	377.1	378.6	1.49	-0.01	379.2	0.6	0.1
9824	1535	831589.53	2043248.89	391.9	393.4	1.49	-0.01	393.9	0.5	0.0
9825	1536	831604.5	2043224.51	397.8	399.3	1.51	0.01	399.8	0.5	0.0
9826	1537	831620.74	2043200.93	403.5	405.0	1.53	0.03	405.5	0.5	0.0
9827	1538	831596.09	2043195.11	405.6	407.1	1.50	0.00	407.7	0.6	0.1
9678	1544	830754.71	2042651.1	421.3	422.8	1.48	-0.02	423.4	0.6	0.1
9431	1546	830799.06	2042656.26	419.3	420.8	1.52	0.02	421.4	0.6	0.1
9432	1547	830800.69	2042725.47	421.9	423.5	1.53	0.03	424	0.6	0.1
9433	1548	830801.89	2042792.15	424.7	426.2	1.51	0.01	426.8	0.6	0.1
9434	1549	830802.09	2042859.32	426.0	427.5	1.51	0.01	428.1	0.6	0.1
9435	1550	830800.82	2042924.54	429.7	431.3	1.52	0.02	431.8	0.5	0.0
9436	1551	830800.2	2042967.04	430.6	432.1	1.50	0.00	432.9	0.8	0.3
9437	1552	830800.69	2042984.88	432.2	433.7	1.51	0.01	434.2	0.5	0.0
9438	1553	830801.84	2043003.26	431.8	433.3	1.50	0.00	434	0.7	0.2
9439	1554	830811.78	2043071.4	423.7	425.2	1.49	-0.01	425.7	0.5	0.0
9440	1555	830886.81	2043079.49	422.8	424.3	1.51	0.01	424.9	0.6	0.1
9441	1556	830896.08	2043051.28	427.4	428.9	1.53	0.03	429.5	0.6	0.1
9442	1557	830901.55	2043014.46	431.9	433.4	1.52	0.02	434	0.6	0.1
9443	1558	830896.8	2042995.35	431.5	433.0	1.51	0.01	433.6	0.6	0.1
9444	1559	830894.1	2042966.7	428.4	429.9	1.53	0.03	430.5	0.6	0.1
9445	1560	830854.31	2042970.65	428.6	430.1	1.53	0.03	430.9	0.8	0.3
9446	1561	830856.4	2042942.17	427.6	429.1	1.53	0.03	430	0.9	0.4
9447	1562	830828.73	2042951.4	427.7	429.2	1.51	0.01	429.8	0.6	0.1
9448	1563	830847.36	2042905.69	425.8	427.3	1.51	0.01	428	0.7	0.2
9449	1564	830898.76	2042914.13	424.0	425.6	1.53	0.03	426.5	0.9	0.4
9450	1565	830912.94	2042858.75	421.7	423.3	1.52	0.02	423.8	0.5	0.0
9451	1566	830851.96	2042838.75	423.4	424.9	1.52	0.02	425.5	0.6	0.1
9452	1567	830856.66	2042770.81	421.0	422.5	1.50	0.00	423.1	0.6	0.1
9453	1568	830903.2	2042778.1	418.6	420.1	1.49	-0.01	420.6	0.5	0.0
9454	1569	830906.05	2042722.61	415.5	417.0	1.52	0.02	417.5	0.5	0.0
9455	1570	830853.13	2042720.29	419.4	420.9	1.50	0.00	421.4	0.5	0.0
9460	1572	830910.6	2042652.52	411.5	413.0	1.49	-0.01	413.6	0.6	0.1
9467	1574	830990.54	2042757.54	412.7	414.2	1.52	0.02	414.8	0.6	0.1

9468	1575	830935.67	2042808.23	417.9	419.4	1.50	0.00	419.9	0.5	0.0
9469	1576	830952.09	2042822.55	417.6	419.1	1.51	0.01	419.6	0.5	0.0
9470	1577	830972.69	2042826.1	417.6	419.1	1.52	0.02	420.2	1.1	0.6
9471	1578	830956.11	2042887.33	421.4	422.9	1.48	-0.02	423.7	0.8	0.3
9472	1579	830956.3	2042937.93	424.0	425.6	1.51	0.01	426.2	0.6	0.1
9473	1580	830957.83	2043013.06	431.7	433.2	1.50	0.00	433.8	0.7	0.2
9474	1581	830960.2	2043034.46	430.9	432.4	1.49	-0.01	432.9	0.5	0.0
9475	1582	830961.71	2043048.64	429.8	431.3	1.51	0.00	431.8	0.5	0.0
9476	1583	830970.2	2043091.82	422.9	424.4	1.51	0.01	425	0.6	0.1
9477	1584	831006.78	2043097.09	422.9	424.5	1.51	0.01	425	0.6	0.1
9478	1585	831034.32	2043088.98	423.6	425.1	1.54	0.04	425.6	0.5	0.0
9479	1586	831032.61	2043057.15	428.0	429.5	1.51	0.01	430	0.5	0.0
9480	1587	831034.9	2043037.53	428.6	430.1	1.50	0.00	430.7	0.6	0.1
9481	1588	831036.97	2042989.62	425.8	427.3	1.50	0.00	427.9	0.6	0.1
9482	1589	831034.56	2042941.96	422.6	424.1	1.50	0.00	424.7	0.6	0.1
9483	1590	831036.15	2042893.81	419.6	421.1	1.53	0.03	421.7	0.6	0.1
9488	1593	831036.11	2042860.65	417.8	419.4	1.60	0.10	420	0.6	0.1
9489	1594	831045.2	2042807.22	414.1	415.6	1.51	0.01	416.2	0.6	0.1
9490	1595	831108.55	2042833.15	411.2	412.7	1.54	0.04	413.3	0.6	0.1
9491	1596	831107.8	2042902.2	418.1	419.6	1.52	0.02	420.5	0.9	0.4
9492	1597	831114.45	2042951.65	420.5	422.0	1.51	0.01	422.5	0.5	0.0
9493	1598	831114.8	2042994.88	422.4	423.9	1.52	0.02	424.4	0.5	0.0
9494	1599	831116.4	2043035.55	422.9	424.4	1.53	0.03	425	0.6	0.1
9495	1600	831117.35	2043081.28	423.9	425.4	1.53	0.03	425.9	0.5	0.0
9496	1601	831109.85	2043116.51	421.2	422.8	1.54	0.04	423.3	0.6	0.1
9503	1605	831184.64	2043102.1	421.1	422.6	1.50	0.00	423.1	0.5	0.0
9504	1606	831185.36	2043087.98	421.2	422.7	1.54	0.04	423.4	0.7	0.2
9505	1607	831236.81	2043084.45	419.8	421.4	1.51	0.01	421.9	0.5	0.0
9506	1608	831291.33	2043084.1	418.3	419.8	1.54	0.04	420.3	0.5	0.0
9507	1609	831346.65	2043082.2	416.9	418.5	1.56	0.06	419	0.5	0.0
9508	1610	831403.1	2043081.7	415.7	417.2	1.54	0.04	417.7	0.5	0.0
9509	1611	831460.9	2043080.07	415.5	417.1	1.56	0.06	417.6	0.6	0.1
9510	1612	831521	2043080.86	415.9	417.4	1.50	0.00	418	0.6	0.1
9511	1613	831559.55	2043080.71	416.2	417.7	1.50	0.00	418.3	0.6	0.1
9512	1614	831613.19	2043075.39	415.5	417.0	1.53	0.03	417.5	0.5	0.0
9516	1615	831573.38	2043137.25	415.0	416.5	1.52	0.02	417	0.5	0.0
9517	1616	831519.4	2043138.2	414.5	416.0	1.50	0.00	416.5	0.5	0.0
9518	1617	831464.6	2043142.58	413.0	414.5	1.51	0.01	415	0.5	0.0
9519	1618	831406.36	2043142.59	412.3	413.8	1.52	0.02	414.4	0.6	0.1
9520	1619	831361.99	2043148.69	412.9	414.4	1.52	0.02	414.9	0.5	0.0
9521	1620	831304.58	2043148.79	414.2	415.7	1.52	0.02	416.3	0.6	0.1
9522	1621	831262.48	2043149.68	415.5	417.0	1.50	0.00	417.5	0.5	0.0
9523	1622	831197.21	2043045.76	417.1	418.6	1.51	0.01	419.2	0.6	0.1
9524	1623	831255.84	2043038.07	414.0	415.5	1.51	0.01	416.1	0.6	0.1
9525	1624	831319.14	2043032.6	411.4	412.9	1.51	0.01	413.5	0.6	0.1
9526	1625	831383.26	2043027.95	410.1	411.6	1.52	0.02	412.1	0.5	0.0
9527	1626	831448.6	2043023.2	408.6	410.1	1.51	0.01	410.7	0.6	0.1
9528	1627	831511.38	2043023.54	408.1	409.6	1.53	0.03	410.1	0.5	0.0
9529	1628	831575.67	2043016.89	407.1	408.6	1.51	0.01	409.1	0.5	0.0
9530	1629	831612.11	2043014.21	406.4	407.9	1.52	0.02	408.5	0.6	0.1
9531	1630	831617.84	2043051.08	413.5	415.0	1.50	0.00	415.6	0.6	0.1
9534	1631	831664.88	2042960.18	393.5	395.1	1.55	0.05	395.6	0.6	0.1
9535	1632	831669.24	2042916.5	386.5	388.0	1.52	0.02	388.5	0.5	0.0
9536	1633	831606.6	2042904.18	386.2	387.7	1.52	0.02	388.2	0.5	0.0
9537	1634	831541.93	2042889.61	385.6	387.1	1.50	0.00	387.7	0.6	0.1
9538	1635	831507.93	2042948.18	396.0	397.5	1.51	0.01	398.1	0.6	0.1
9539	1636	831441.46	2042945.81	399.1	400.6	1.54	0.04	401.2	0.6	0.1

9540	1637	831452.81	2042860.98	385.4	386.9	1.52	0.02	387.5	0.6	0.1
9541	1638	831395.71	2042838.26	386.1	387.7	1.53	0.03	388.3	0.6	0.1
9542	1639	831339.06	2042821.21	388.4	390.0	1.51	0.01	390.5	0.5	0.0
9543	1640	831294.05	2042788.44	385.0	386.5	1.52	0.02	387.1	0.6	0.1
9544	1641	831275.2	2042806.25	386.3	387.8	1.52	0.02	388.5	0.7	0.2
9445	1642	831304.58	2042846.39	390.7	392.3	1.51	0.01	392.8	0.6	0.1
9546	1643	831329.27	2042890.73	395.3	396.8	1.53	0.03	397.3	0.5	0.0
9547	1644	831368.77	2042921.79	398.1	399.6	1.51	0.01	400.3	0.7	0.2
9548	1645	831346.21	2042991.18	406.2	407.7	1.52	0.02	408.3	0.6	0.1
9549	1646	831298.27	2042993.86	408.4	409.9	1.52	0.02	410.4	0.5	0.0
9550	1647	831262.91	2042987.72	411.1	412.6	1.51	0.01	413.2	0.6	0.1
9551	1648	831201.7	2042987.48	416.4	417.9	1.52	0.02	418.4	0.5	0.0
9552	1649	831159.97	2042956.84	418.6	420.1	1.52	0.02	420.7	0.6	0.1
9553	1650	831217.81	2042916.76	409.7	411.3	1.51	0.01	411.8	0.5	0.0
9554	1651	831265.19	2042943.38	407.9	409.4	1.51	0.01	410	0.6	0.1
9555	1652	831278.6	2042878.67	397.0	398.5	1.51	0.01	399	0.5	0.0
9556	1653	831237.28	2042831.71	393.6	395.2	1.51	0.01	395.7	0.6	0.1
9557	1654	831265.87	2042775.42	383.3	384.8	1.52	0.02	385.4	0.6	0.1
9558	1655	831236.2	2042732.25	380.9	382.4	1.52	0.02	383	0.6	0.1
9559	1656	831201.81	2042777.23	391.4	392.9	1.51	0.01	393.4	0.5	0.0
9560	1657	831159.32	2042827.45	405.0	406.5	1.51	0.01	407.1	0.6	0.1
9561	1658	831128.63	2042778.95	402.9	404.5	1.51	0.01	405	0.5	0.0
9562	1659	831168.5	2042740.18	391.8	393.3	1.51	0.01	393.9	0.6	0.1
9563	1660	831222.36	2042687.5	377.9	379.4	1.53	0.03	380	0.6	0.1
9566	1661	831105.01	2042656.03	394.8	396.3	1.51	0.01	396.9	0.6	0.1
9567	1662	831053.38	2042687.1	404.6	406.1	1.50	0.00	406.8	0.7	0.2
9568	1663	831320.46	2042940.09	401.7	403.2	1.52	0.02	403.8	0.6	0.1
233	1674	831643.8	2043375.78	356.0	359.1	3.04	1.54	359.6	0.5	0.0
10137	1142	831738.6	2042863.31	379.69	381.2	1.51	0.01	381.7	0.5	0.0
10138	1143	831670.6	2042856.11	377.12	378.61	1.49	-0.01	379.2	0.6	0.1
10139	1144	831663.65	2042887.82	387.17	388.67	1.50	0.00	389.2	0.5	0.0
10140	1272	831660.81	2042907.22	386.25	387.75	1.50	0.00	388.3	0.6	0.1
10141	1273	831659.56	2042930.98	384.31	385.83	1.52	0.02	386.3	0.5	0.0
10142	1308	831656.76	2042931.45	388.97	390.47	1.50	0.00	391	0.5	0.0
10143	1344	831591.21	2042919.56	388.59	390.09	1.50	0.00	390.6	0.5	0.0
10144	1358	831594.71	2042900.9	384.17	385.63	1.46	-0.04	386.2	0.6	0.1
10145	1359	831595.67	2042894.6	386.03	387.53	1.50	0.00	388.1	0.6	0.1
10146	1360	831599.59	2042876.81	386.78	388.31	1.53	0.03	388.9	0.6	0.1
10147	1377	831604.46	2042841.7	374.65	376.15	1.50	0.00	376.7	0.6	0.1
10152	1412	831558.8	2042770.8	358.64	360.15	1.51	0.01	360.7	0.6	0.1
10153	1413	831537.34	2042830.2	377.61	379.13	1.52	0.02	379.7	0.6	0.1
10154	1419	831531.42	2042859.66	385.26	387.76	2.50	1.00	388.3	0.5	0.0
10155	1420	831526.54	2042879.62	385.77	387.3	1.53	0.03	387.8	0.5	0.0
10156	1421	831524.77	2042886.48	384.03	385.52	1.49	-0.01	386.1	0.6	0.1
10157	1422	831520.88	2042903.22	388.47	389.98	1.51	0.01	390.5	0.5	0.0
10158	1423	831457.11	2042879.58	387.55	389.05	1.50	0.00	389.6	0.6	0.1
10159	1424	831463.18	2042861.47	383.42	384.93	1.51	0.01	385.5	0.6	0.1
10160	1432	831465.71	2042855.4	385.29	386.79	1.50	0.00	387.3	0.5	0.0
10161	1433	831472.1	2042837.89	386.14	387.65	1.51	0.01	388.2	0.6	0.1
10162	1434	831483.2	2042812.53	378.58	380.1	1.52	0.02	380.6	0.5	0.0
10163	1435	831496.31	2042775.8	366.07	367.59	1.52	0.02	368.1	0.5	0.0
10164	1436	831512.1	2042743.8	355.96	357.46	1.50	0.00	358	0.5	0.0
10165	1437	831456.56	2042718.5	355.44	356.94	1.50	0.00	357.5	0.6	0.1
10166	1438	831436	2042748.96	366.44	367.95	1.51	0.01	368.5	0.6	0.1
10167	1439	831409.11	2042775.5	378.32	379.82	1.50	0.00	380.4	0.6	0.1
10168	1440	831383.52	2042793.99	385.52	387.01	1.49	-0.01	387.6	0.6	0.1
10169	1441	831370.31	2042811.8	384.77	386.27	1.50	0.00	386.8	0.5	0.0

10170	1442	831366.81	2042817.31	384.26	385.76	1.50	0.00	386.3	0.5	0.0
10171	1443	831358.98	2042829.88	388.15	389.65	1.50	0.00	390.2	0.6	0.1
10172	1444	831307.6	2042785.79	384.82	386.32	1.50	0.00	386.9	0.6	0.1
10173	1445	831319.3	2042772.52	380.78	382.28	1.50	0.00	382.8	0.5	0.0
10174	1446	831323.86	2042768.9	382.64	384.14	1.50	0.00	384.7	0.6	0.1
10175	1447	831337.1	2042753.27	382.96	384.47	1.51	0.01	385	0.5	0.0
10176	1448	831358.38	2042729.7	374.62	376.13	1.51	0.01	376.7	0.6	0.1
10177	1449	831379.6	2042708.91	365.09	366.61	1.52	0.02	367.2	0.6	0.1
10178	1450	831402.02	2042686.21	355.43	356.93	1.50	0.00	357.5	0.6	0.1
10180	1451	831333.79	2042654.93	361.6	363.12	1.52	0.02	363.7	0.6	0.1
10181	1452	831311.1	2042668.58	369.31	370.81	1.50	0.00	371.4	0.6	0.1
10182	1453	831288.95	2042688.1	377.6	379.11	1.51	0.01	379.7	0.6	0.1
10183	1454	831272.99	2042699.2	376.88	378.4	1.52	0.02	378.9	0.5	0.0
10184	1455	831268.81	2042703.07	375.2	376.7	1.50	0.00	377.2	0.5	0.0
10185	1456	831257.89	2042711.21	378.3	379.8	1.50	0.00	380.3	0.5	0.0
10186	1457	831217.5	2042659.7	376.45	377.95	1.50	0.00	378.5	0.6	0.1

NORTH WEST QUAD TOPO

TWT	GS	NORTH	SG ELEV	EAST	CLAY ELEV	DEPTH	DIFF. +/-	VEG ELEV	DEPTH	DIFF. +/-
10190	1918	831282.24	367.0	2042621.69	368.5	1.5	0.0	369.1	0.6	0.1
10191	1919	831309.55	358.8	2042608.27	360.4	1.5	0.0	360.9	0.5	0.0
10192	1920	831287.22	356.0	2042550.2	357.6	1.5	0.0	358.1	0.5	0.0
10193	1921	831256.41	365.3	2042564.33	366.8	1.5	0.0	367.3	0.5	0.0
10202	1922	831237.24	361.7	2042493.77	363.3	1.5	0.0	363.8	0.6	0.1
10203	1923	831270.86	353.0	2042477.87	354.5	1.5	0.0	355	0.5	0.0
10204	1924	831244.32	352.7	2042411.41	354.2	1.5	0.0	354.7	0.5	0.0
10205	1925	831223.04	356.5	2042417.21	358.0	1.5	0.0	358.6	0.6	0.1
10208	1926	831174.95	363.9	2042364.53	365.4	1.5	0.0	365.9	0.5	0.0
10209	1927	831225.14	349.8	2042341.03	351.4	1.6	0.1	351.9	0.5	0.0
10188	1929	831238.8	373.5	2042646.27	375.0	1.5	0.0	375.6	0.6	0.1
10187	1930	831234.28	372.0	2042649.06	373.5	1.5	0.0	374.1	0.6	0.1
10197	1932	831191.12	374.9	2042595.86	376.4	1.5	0.0	377	0.6	0.1
10196	1933	831207.16	369.6	2042586.7	371.1	1.5	0.0	371.6	0.5	0.0
10195	1934	831212.37	371.2	2042583.3	372.7	1.5	0.0	373.2	0.5	0.0
10194	1935	831230.11	371.9	2042575.51	373.4	1.5	0.0	374	0.6	0.1
10201	1936	831204.46	370.2	2042512.39	371.7	1.5	0.0	372.2	0.5	0.0
10200	1937	831185.97	369.4	2042519.3	370.9	1.5	0.0	371.4	0.5	0.0
10199	1938	831180.8	368.0	2042522.03	369.5	1.5	0.0	370.1	0.6	0.1
10198	1939	831162.1	373.5	2042533.2	375.0	1.5	0.0	375.5	0.5	0.0
10206	1940	831175.89	367.8	2042436.75	369.3	1.5	0.0	369.9	0.6	0.1
10207	1941	831151.47	366.5	2042376.6	368.0	1.5	0.0	368.6	0.6	0.1
10213	1942	831131.4	365.2	2042323.01	366.7	1.5	0.0	367.2	0.5	0.0
10220	1945	831142.22	342.2	2042089.02	343.7	1.5	0.0	344.2	0.5	0.0
10221	1946	831089.6	354.4	2042105.36	355.9	1.5	0.0	356.5	0.6	0.1
10222	1947	831051.54	361.8	2042132.18	363.3	1.5	0.0	363.9	0.6	0.1
10217	1948	831082.09	362.5	2042203.5	364.0	1.5	0.0	364.6	0.6	0.1
10218	1949	831127.37	350.8	2042185.63	352.4	1.5	0.0	352.9	0.5	0.0
10219	1950	831178	340.9	2042168.63	342.5	1.5	0.0	343	0.6	0.1
10216	1951	831200.2	343.1	2042227.47	344.7	1.6	0.1	345.2	0.5	0.0
10215	1952	831140.85	353.8	2042247.48	355.3	1.5	0.0	355.8	0.5	0.0
10214	1953	831105.71	363.7	2042263.75	365.2	1.5	0.0	365.7	0.5	0.0
10212	1954	831154.28	362.5	2042314.1	364.1	1.5	0.0	364.6	0.5	0.0
10211	1955	831188.8	350.3	2042300.22	351.9	1.6	0.1	352.4	0.5	0.0
10210	1956	831219.61	346.3	2042290.37	347.9	1.5	0.0	348.4	0.5	0.0
9836	1975	831111.38	389.2	2042603.97	390.7	1.5	0.0	391.3	0.6	0.1
9835	1976	831057.65	399.8	2042626.95	401.3	1.5	0.0	401.9	0.6	0.1
9834	1977	831011.27	406.5	2042650.79	408.0	1.5	0.0	408.5	0.5	0.0
9842	1978	830992.87	403.3	2042562.27	404.9	1.5	0.0	405.4	0.5	0.0
9841	1979	831015.95	399.2	2042552.29	400.7	1.5	0.0	401.3	0.6	0.1
9840	1980	831058.43	389.5	2042532.3	391.0	1.5	0.0	391.5	0.5	0.0
9839	1981	831108.52	379.3	2042514.54	380.9	1.5	0.0	381.4	0.5	0.0
9846	1982	831080.44	380.6	2042484.53	382.1	1.5	0.0	382.6	0.5	0.0
9847	1983	831069.73	380.4	2042439.51	381.9	1.5	0.0	382.4	0.5	0.0
9845	1984	831038.84	385.8	2042462.55	387.3	1.5	0.0	387.9	0.6	0.1
9844	1985	830994.15	394.6	2042487.38	396.2	1.5	0.0	396.7	0.5	0.0
9843	1986	830943.96	404.2	2042515.94	405.7	1.5	0.0	406.2	0.5	0.0
9853	1988	830902.08	401.9	2042461.41	403.8	1.9	0.4	404.4	0.6	0.1
9852	1989	830944.14	395.0	2042430.75	396.5	1.5	0.0	397.1	0.6	0.1
9851	1990	830998.51	385.5	2042397	387.0	1.5	0.0	387.6	0.6	0.1
9850	1991	831041.54	381.1	2042379.31	382.7	1.5	0.0	383.2	0.5	0.0
9859	1992	831009.65	381.1	2042336.06	382.7	1.6	0.1	383.2	0.5	0.0
9857	1993	830964.37	387.3	2042366.75	388.9	1.5	0.0	389.4	0.5	0.0
9856	1994	830921.6	393.4	2042389.51	394.9	1.5	0.0	395.4	0.5	0.0
9855	1995	830868	401.2	2042424.08	402.8	1.6	0.1	403.3	0.5	0.0
9854	1996	830820.29	406.8	2042455.97	408.3	1.5	0.0	408.9	0.6	0.1

9868	1997	830813.53	402.0	2042394.25	403.6	1.5	0.0	404.1	0.5	0.0
9867	1998	830854.08	395.5	2042354.34	397.0	1.5	0.0	397.5	0.5	0.0
9866	1999	830890.4	390.1	2042311.49	391.6	1.5	0.0	392.2	0.6	0.1
9863	2000	830992.14	377.7	2042259.01	379.2	1.6	0.1	379.8	0.6	0.1
9875	2007	830960.66	372.1	2042161.03	373.7	1.6	0.1	374.2	0.5	0.0
9874	2008	830921.07	381.7	2042189.76	383.2	1.5	0.0	383.8	0.6	0.1
9873	2009	830898.45	384.1	2042206.43	385.6	1.5	0.0	386.2	0.6	0.1
9872	2010	830862.86	388.2	2042244.91	389.7	1.6	0.1	390.3	0.6	0.1
9871	2011	830826.61	393.2	2042287.35	394.7	1.5	0.0	395.2	0.5	0.0
9870	2012	830790.36	398.7	2042333.06	400.2	1.5	0.0	400.7	0.5	0.0
9869	2013	830754.9	404.2	2042379.02	405.7	1.5	0.0	406.3	0.6	0.1
9896	2014	830878.07	379.2	2042127.38	380.7	1.5	0.0	381.3	0.6	0.1
9897	2015	830845.7	384.7	2042157.67	386.2	1.6	0.1	386.8	0.6	0.1
9877	2019	830963.93	359.7	2042083.01	361.2	1.5	0.0	361.7	0.5	0.0
9878	2020	830934.86	370.6	2042113.98	372.1	1.5	0.0	372.7	0.6	0.1
9879	2021	830902.84	380.1	2042146.08	381.7	1.5	0.0	382.2	0.6	0.1

SOUTH EAST QUAD TOPO

TWT	GS	NORTH	EAST	SG ELEV	CLAY ELEV	DEPTH	DIFF. +/-	VEG ELEV	DEPTH	DIFF. +/-
317	17	830660.46	2042677.27	427.17	428.67	1.5	0	429.2	0.53	0.03
318	18	830615.14	2042671.24	425.43	426.94	1.51	0.01	427.5	0.56	0.06
319	19	830575.84	2042665.54	423.24	424.74	1.5	0	425.3	0.56	0.06
320	20	830528.94	2042659.62	420	421.54	1.54	0.04	422.1	0.56	0.06
9024	24	830490.07	2042698.62	418.56	420.11	1.55	0.05	421.9	1.79	1.29
325	25	830539.85	2042702.93	422.74	424.25	1.51	0.01	424.8	0.55	0.05
326	26	830579.09	2042710.92	425.47	427.02	1.55	0.05	427.6	0.58	0.08
327	27	830628.2	2042717.69	428.36	429.88	1.52	0.02	430.38	0.5	0.00
328	28	830674.44	2042729.29	429.63	431.16	1.53	0.03	431.7	0.54	0.04
329	29	830719.01	2042737.6	427.01	428.51	1.5	0	429.1	0.59	0.09
332	32	830721.58	2042777.07	428.57	430.07	1.5	0	430.59	0.52	0.02
333	33	830667.09	2042773.03	431.72	433.25	1.53	0.03	433.76	0.51	0.01
334	34	830619.55	2042769.26	430.42	431.94	1.52	0.02	432.45	0.51	0.01
335	35	830574.34	2042767.18	427.26	428.8	1.54	0.04	429.3	0.5	0.00
336	36	830524.91	2042760.79	423.76	425.28	1.52	0.02	425.8	0.52	0.02
337	37	830477.29	2042758.51	419.9	421.42	1.52	0.02	422.8	1.38	0.88
340	40	830503.46	2042807.31	422.84	424.38	1.54	0.04	425.1	0.72	0.22
341	41	830573	2042816.91	427.93	429.5	1.57	0.07	430.5	1	0.50
342	42	830628.47	2042824	432.09	433.61	1.52	0.02	434.5	0.89	0.39
343	43	830682.92	2042830.46	432.56	434.06	1.5	0	435.6	1.54	1.04
344	44	830730.67	2042839.68	430	431.57	1.57	0.07	432.2	0.63	0.13
345	45	830760.53	2042846.91	428.68	430.26	1.58	0.08	430.76	0.5	0.00
346	46	830765.25	2042895.37	431.62	433.12	1.5	0	433.63	0.51	0.01
347	47	830717.15	2042883.93	434.42	435.93	1.51	0.01	436.7	0.77	0.27
348	48	830667.56	2042872.35	435.38	436.91	1.53	0.03	437.8	0.89	0.39
349	49	830619.81	2042866.19	432.45	433.97	1.52	0.02	434.6	0.63	0.13
350	50	830570.73	2042859.26	428.52	430.06	1.54	0.04	431.1	1.04	0.54
351	51	830521.69	2042857.15	425.01	426.56	1.55	0.05	427.7	1.14	0.64
352	52	830477.37	2042850.41	422.03	423.55	1.52	0.02	424.1	0.55	0.05
9236	56	830465.32	2042907.37	422.08	423.6	1.52	0.02	424.2	0.6	0.10
9235	57	830518.1	2042914.58	425.5	427.02	1.52	0.02	427.7	0.68	0.18
9234	58	830571.17	2042921.41	429.04	430.56	1.52	0.02	431.1	0.54	0.04
9233	59	830620.4	2042926.38	433.01	434.51	1.5	0	435.2	0.69	0.19
9232	60	830668.53	2042932.43	436.82	438.32	1.5	0	438.9	0.58	0.08
9231	61	830712.94	2042943.53	436.86	438.38	1.52	0.02	439	0.62	0.12
9242	64	830718.41	2042986.33	434.02	435.53	1.51	0.01	436.1	0.57	0.07
9241	65	830671.24	2042981.49	432.65	434.24	1.59	0.09	434.8	0.56	0.06
9240	66	830620.22	2042977.83	432.7	434.22	1.52	0.02	434.8	0.58	0.08
9239	67	830568.25	2042969.88	429.86	431.36	1.5	0	431.9	0.54	0.04
9238	68	830517.22	2042962.72	426.12	427.62	1.5	0	428.2	0.58	0.08
9237	69	830466.21	2072953.58	422.6	424.2	1.6	0.1	424.7	0.5	0.00
9250	72	830448.34	2043000.23	422.17	423.85	1.68	0.18	424.4	0.55	0.05
9249	73	830502.79	2043003.94	425.82	427.32	1.5	0	427.9	0.58	0.08
9247	75	830604.1	2043017.04	427.35	428.87	1.52	0.02	429.4	0.53	0.03
9246	76	830652.78	2043025.58	426.85	428.4	1.55	0.05	428.9	0.5	0.00
9245	77	830701.5	2043033.53	426.84	428.34	1.5	0	428.9	0.56	0.06
9089	89	830368.23	2042731.92	406.1	407.61	1.51	0.01	408.2	0.59	0.09
9090	90	830441.98	2042746.93	416.48	417.98	1.5	0	418.5	0.52	0.02
9091	91	830433.73	2042797.5	417.37	418.87	1.5	0	419.4	0.53	0.03
9092	92	830360.64	2042788.02	406.98	408.49	1.51	0.01	409	0.51	0.01
9104	104	830424.7	2042849.83	417.41	418.92	1.51	0.01	419.5	0.58	0.08
9105	105	830415.58	2042896.1	418.27	419.78	1.51	0.01	420.3	0.52	0.02
9106	106	830346.59	2042880.31	407.62	409.12	1.5	0	409.63	0.51	0.01

9107	107	830300.32	2042872.24	397.39	398.89	1.5	0	399.4	0.51	0.01
9114	114	830211.85	2042920.15	378.86	380.36	1.5	0	380.9	0.54	0.04
9115	115	830251.68	2042925.14	388.51	390.04	1.53	0.03	390.55	0.51	0.01
9116	116	830291.45	2042930.01	398.57	400.13	1.56	0.06	400.63	0.5	0.00
9117	117	830329.67	2042935.12	407.44	408.95	1.51	0.01	409.45	0.5	0.00
9118	118	830406.32	2042944.11	418.52	420.07	1.55	0.05	420.6	0.53	0.03
9119	119	830402.32	2042995	419.42	420.98	1.56	0.06	421.5	0.52	0.02
9121	121	830311.71	2042983.56	405.94	407.5	1.56	0.06	408	0.5	0.00
9122	122	830283.31	2042981.09	398.46	399.96	1.5	0	400.5	0.54	0.04
9130	130	830235.79	2043029.51	388.85	390.35	1.5	0	390.9	0.55	0.05
9131	131	830276.73	2043029.13	399.02	400.57	1.55	0.05	401.1	0.53	0.03
9132	132	830307.2	2043029.48	407.7	409.21	1.51	0.01	409.9	0.69	0.19
9133	133	830395.33	2043027.65	419.41	420.93	1.52	0.02	421.5	0.57	0.07
9251	134	830417.7	2043032.03	421.18	422.68	1.5	0	423.2	0.52	0.02
9137	137	830304.63	2043073.2	408.84	410.34	1.5	0	410.9	0.56	0.06
9138	138	830272.78	2043074.36	400.02	401.54	1.52	0.02	402.1	0.56	0.06
9139	139	830232.24	2043073.79	389.56	391.12	1.56	0.06	391.7	0.58	0.08
9144	144	830228.09	2043127.11	388.18	389.7	1.52	0.02	390.3	0.6	0.10
9145	145	830265.83	2043112.43	398.08	399.61	1.53	0.03	400.2	0.59	0.09
9146	146	830311.42	2043099.2	409.99	411.53	1.54	0.04	412.1	0.57	0.07
9150	150	830248.37	2043164.6	391.38	392.9	1.52	0.02	393.5	0.6	0.10
9151	151	830206.4	2043190.53	381.32	382.82	1.5	0	383.4	0.58	0.08
9152	152	830241.72	2043206.07	382.78	384.35	1.57	0.07	384.9	0.55	0.05
9153	153	830269.84	2043219.28	380.63	382.14	1.51	0.01	382.7	0.56	0.06
9154	154	830289.26	2043192.93	389.33	390.87	1.54	0.04	391.5	0.63	0.13
9157	157	830371.61	2043087.53	416.81	418.33	1.52	0.02	418.9	0.57	0.07
9158	158	830395.42	2043090.24	416.86	418.37	1.51	0.01	419	0.63	0.13
9159	159	830396.31	2043129.91	407.68	409.23	1.55	0.05	409.8	0.57	0.07
9160	160	830392.64	2043154.69	401.85	403.38	1.53	0.03	403.9	0.52	0.02
9161	161	830386.61	2043190.24	392.39	393.91	1.52	0.02	394.6	0.69	0.19
9162	162	830344.2	2043195.32	390.19	391.7	1.51	0.01	392.3	0.6	0.10
9164	164	830336.13	2043257.3	373.54	375.11	1.57	0.07	375.7	0.59	0.09
9165	165	830385.08	2043301.29	362.78	365.33	2.55	1.05	365.9	0.57	0.07
9167	167	830394.44	2043232.77	381.15	382.69	1.54	0.04	383.2	0.51	0.01
9168	168	830457.59	2043333.61	356.19	357.71	1.52	0.02	358.4	0.69	0.19
9169	169	830460.82	2043289.93	367.13	368.67	1.54	0.04	369.3	0.63	0.13
9172	172	830458.54	2043197.55	390.72	392.26	1.54	0.04	392.8	0.54	0.04
9173	173	830458.33	2043155.48	401.82	403.36	1.54	0.04	403.9	0.54	0.04
9174	174	830457.21	2043114.83	411.88	413.43	1.55	0.05	414	0.57	0.07
9175	175	830457.79	2043074.65	418.98	420.53	1.55	0.05	421.1	0.57	0.07
9252	176	830458.86	2043032.14	422.78	424.3	1.52	0.02	424.8	0.5	0.00
9253	177	830510.25	2043036.85	424.33	425.9	1.57	0.07	426.4	0.5	0.00
9178	178	830507.58	2043089.08	417.21	418.79	1.58	0.08	419.4	0.61	0.11
9179	179	830505.83	2043123.96	409.85	411.43	1.58	0.08	412	0.57	0.07
9182	182	830509.16	2043246.99	379.45	380.96	1.51	0.01	381.5	0.54	0.04
9183	183	830512.08	2043288.2	369.39	370.93	1.54	0.04	371.5	0.57	0.07
9191	191	830615.8	2043220.34	389.15	390.71	1.56	0.06	391.3	0.59	0.09
9194	194	830616.29	2043096.13	417.61	419.12	1.51	0.01	419.7	0.58	0.08
9255	196	830616.11	2043049.68	423.8	425.32	1.52	0.02	425.9	0.58	0.08
9256	197	830659.02	2043052.79	424.24	425.81	1.57	0.07	426.4	0.59	0.09
9198	198	830662.38	2043112.7	415.35	416.87	1.52	0.02	417.5	0.63	0.13
9201	201	830666.94	2043222.05	390.09	391.6	1.51	0.01	392.2	0.6	0.10
9202	202	830658.92	2043265.88	378.76	380.33	1.57	0.07	380.9	0.57	0.07
9203	203	830656.13	2043303.16	368.35	369.85	1.5	0	370.4	0.55	0.05
9206	206	830709.03	2043314.28	366.53	368.07	1.54	0.04	368.6	0.53	0.03
9207	207	830715.54	2043272.29	379.09	380.6	1.51	0.01	381.1	0.5	0.00
9209	209	830723.69	2043193.11	398.71	400.28	1.57	0.07	400.8	0.52	0.02

9210	210	830725.46	2043147.43	409.92	411.48	1.56	0.06	412.1	0.62	0.12
9257	212	830730.27	2043062.84	423.92	425.43	1.51	0.01	426	0.57	0.07
9088	2583	830335.13	2042720.78	397.75	399.27	1.52	0.02	399.8	0.53	0.03
9087	2584	830290.94	2042705.93	386.56	388.07	1.51	0.01	388.7	0.63	0.13
9085	2585	830188.52	2042671.6	360.45	361.99	1.54	0.04	362.5	0.51	0.01
9096	2586	830194.74	2042764.3	367.89	369.42	1.53	0.03	370	0.58	0.08
9095	2587	830237.64	2042770.88	377.24	378.74	1.5	0	379.3	0.56	0.06
9094	2588	830217.14	2042776.33	387.3	388.85	1.55	0.05	389.5	0.65	0.15
9093	2589	830317.93	2042782.24	396.94	398.46	1.52	0.02	399	0.54	0.04
9102	2590	830310.57	2042826.49	397.58	399.11	1.53	0.03	399.7	0.59	0.09
9101	2591	830270.16	2042815.72	387.74	389.26	1.52	0.02	389.8	0.54	0.04
9100	2592	830227.03	2042813.98	377.36	378.9	1.54	0.04	379.5	0.6	0.10
9109	2593	830219.94	2042858.42	377.98	379.51	1.53	0.03	380.1	0.59	0.09
9108	2594	830261.52	2042864.72	388.38	389.88	1.5	0	390.5	0.62	0.12

SOUTH WEST QUAD TOPO

TWT	GS	NORTH	NORTH	EAST	SG ELEV	CLAY ELEV	DEPTH	DIFF. +/-	VEG ELEV	DEPTH	DIFF. +/-
9906	1748	830739.62	739.62	830081.32	365.04	366.55	1.51	0.01	367.1	0.55	0.1
9905	1791	830759.34	759.34	830129.22	375.77	377.31	1.55	0.05	377.9	0.59	0.1
9912	1792	830749.64	749.64	830210.91	390.29	391.80	1.51	0.01	392.4	0.60	0.1
9911	1829	830731.84	731.84	830171.24	381.29	382.82	1.53	0.03	383.8	0.98	0.5
9909	1830	830698.04	698.04	830082.58	371.54	373.06	1.52	0.02	373.6	0.54	0.0
9910	1831	830716.85	716.85	830127.58	362.23	363.78	1.55	0.05	364.3	0.52	0.0
9916	1834	830638.01	638.01	830111.98	361.05	362.57	1.52	0.02	363.1	0.53	0.0
9915	1835	830660.75	660.75	830154.83	370.10	371.63	1.53	0.03	372.6	0.97	0.5
9914	1836	830686.57	686.57	830200.55	381.55	383.07	1.52	0.02	384.1	1.03	0.5
9913	1837	830713	713	830239.54	393.29	394.79	1.50	0.00	395.3	0.51	0.0
9922	1838	830675.31	675.31	830282.8	396.44	397.96	1.52	0.02	398.5	0.54	0.0
9921	1839	830644.8	644.8	830231.29	381.80	383.32	1.52	0.02	383.9	0.58	0.1
9920	1840	830610.48	610.48	830189.3	368.78	370.28	1.50	0.00	370.9	0.62	0.1
9919	1841	830580.39	580.39	830147.38	359.46	360.98	1.52	0.02	361.6	0.62	0.1
9926	1844	830525.89	525.89	830191.36	357.44	358.96	1.52	0.02	359.5	0.54	0.0
9925	1845	830558.67	558.67	830229.56	366.78	368.30	1.52	0.02	368.9	0.60	0.1
9924	1846	830602.85	602.85	830280.56	382.64	384.16	1.53	0.03	384.8	0.64	0.1
9923	1847	830641.42	641.42	830322.18	396.34	397.85	1.51	0.01	398.4	0.55	0.0
9934	1848	830609.29	609.29	830381.04	400.41	401.93	1.52	0.02	402.5	0.57	0.1
9932	1849	830576.53	576.53	830330.75	386.46	388.00	1.54	0.04	388.9	0.90	0.4
9931	1850	830549.47	549.47	830294.37	376.62	378.14	1.52	0.02	378.7	0.56	0.1
9930	1851	830517.6	517.6	830252.89	364.47	366.00	1.53	0.03	366.6	0.60	0.1
9929	1852	830485.74	485.74	830218.21	354.78	356.30	1.52	0.02	356.8	0.50	0.0
9928	1853	830450.7	450.7	830174.09	342.97	344.48	1.51	0.01	345	0.52	0.0
9617	1855	830394.05	394.05	830226.22	337.67	339.64	1.97	0.47	340.2	0.56	0.1
9706	1856	830419.67	419.67	830254.56	348.35	349.88	1.53	0.03	350.5	0.62	0.1
9705	1857	830451.71	451.71	830289.95	358.88	360.40	1.52	0.02	360.9	0.50	0.0
9704	1858	830484.66	484.66	830324.8	370.94	372.47	1.53	0.03	373	0.53	0.0
9703	1859	830509.25	509.25	830350.35	378.19	379.70	1.51	0.01	380.4	0.70	0.2
9702	1860	830535.78	535.78	830379.48	388.06	389.56	1.50	0.00	390.1	0.54	0.0
9701	1861	830557.52	557.52	830398.42	395.53	397.05	1.52	0.02	397.6	0.55	0.1
9696	1862	830577.33	577.33	830443.02	407.87	409.39	1.52	0.02	409.9	0.51	0.0
9695	1863	830547.91	547.91	830483.7	408.88	410.38	1.50	0.00	411	0.62	0.1
9713	1864	830491.19	491.19	830441.08	390.62	392.14	1.52	0.02	392.8	0.66	0.2
9712	1865	830463.1	463.1	830411.18	380.30	381.81	1.51	0.01	382.4	0.59	0.1
9711	1866	830430.76	430.76	830383.34	370.30	371.85	1.55	0.05	372.5	0.65	0.1
9710	1867	830402.45	402.45	830344.06	358.71	360.25	1.54	0.04	360.8	0.55	0.1
9709	1868	830366.1	366.1	830311.3	346.40	347.90	1.50	0.00	348.4	0.50	0.0
9708	1869	830343.72	343.72	830286.14	337.91	339.44	1.53	0.03	340.3	0.86	0.4
9615	1870	830315.42	315.42	830268.76	329.57	331.07	1.50	0.00	334.2	3.13	2.6
9620	1871	830273.61	273.61	830274.02	324.24	325.77	1.53	0.03	328.4	2.63	2.1
9614	1872	830278.31	278.31	830292.9	327.57	329.09	1.52	0.02	330.7	1.61	1.1
9717	1873	830350.49	350.49	830401.02	357.84	359.86	2.02	0.52	360.5	0.64	0.1
9716	1874	830379.93	379.93	830435.36	369.00	370.54	1.54	0.04	371.1	0.56	0.1
9715	1875	830404.22	404.22	830459.38	377.87	379.40	1.53	0.03	379.9	0.50	0.0
9714	1876	830445.81	445.81	830503.78	393.38	394.90	1.52	0.02	395.5	0.60	0.1
9266	1877	830431.98	431.98	830601.36	407.62	409.12	1.50	0.00	409.7	0.58	0.1
9724	1878	830424.4	424.4	830534.9	395.51	397.04	1.53	0.03	397.6	0.56	0.1
9723	1879	830392.68	392.68	830510.93	384.88	386.40	1.52	0.02	387.7	1.30	0.8
9722	1880	830352.41	352.41	830483.31	372.57	374.07	1.50	0.00	374.8	0.73	0.2
9721	1881	830308.1	308.1	830445.68	358.86	360.38	1.52	0.02	361	0.62	0.1
9314	1882	830269.82	269.82	830414.72	347.26	348.77	1.51	0.01	349.3	0.53	0.0

9611	1883	830229.54	229.54	830402.51	338.03	339.55	1.52	0.02	340.2	0.65	0.1
9612	1884	830232.87	232.87	830360.46	332.16	333.67	1.51	0.01	334.4	0.73	0.2
9729	1885	830270.86	270.86	830489.99	358.66	360.18	1.52	0.02	360.7	0.52	0.0
9728	1886	830303.1	303.1	830512.11	367.67	369.17	1.50	0.00	369.7	0.53	0.0
9727	1887	830338.11	338.11	830535.96	377.95	379.48	1.53	0.03	380.4	0.92	0.4
9726	1888	830366.51	366.51	830556.02	387.35	388.88	1.53	0.03	389.5	0.62	0.1
9734	1889	830380.7	380.7	830612.99	397.67	399.19	1.52	0.02	399.7	0.51	0.0
9733	1890	830346.64	346.64	830596.03	388.13	389.93	1.80	0.30	390.4	0.47	0.0
9732	1891	830322.1	322.1	830580.9	380.28	381.80	1.53	0.03	382.7	0.90	0.4
9699	1892	830716.69	716.69	830405.83	408.31	409.83	1.52	0.02	410.4	0.57	0.1
9692	1893	830709.07	709.07	830471.76	412.41	413.92	1.51	0.01	414.5	0.58	0.1
9679	1894	830703.18	703.18	830649.2	423.77	425.29	1.52	0.02	425.8	0.51	0.0
9690	1895	830754.14	754.14	830530.28	414.87	416.41	1.54	0.04	417	0.59	0.1
9677	1896	830757.17	757.17	830600.49	418.82	420.31	1.50	0.00	420.9	0.59	0.1
9698	1897	830670.17	670.17	830401.63	407.78	409.30	1.53	0.03	409.9	0.60	0.1
9693	1898	830657.16	657.16	830478.6	412.88	414.40	1.52	0.02	415	0.60	0.1
9689	1899	830672.29	672.29	830544.63	417.69	419.22	1.53	0.03	419.8	0.58	0.1
9676	1900	830665.16	665.16	830600.78	421.54	423.08	1.54	0.04	423.7	0.62	0.1
9680	1901	830655.61	655.61	830650.63	425.05	426.59	1.54	0.04	427.2	0.61	0.1
9694	1903	830600.21	600.21	830488.98	412.33	413.93	1.60	0.10	414.5	0.57	0.1
9688	1904	830602.88	602.88	830577.5	417.70	419.25	1.55	0.05	419.8	0.55	0.1
9675	1905	830606.9	606.9	830600.81	420.74	422.24	1.50	0.00	422.8	0.56	0.1
9681	1906	830605.11	605.11	830649.55	423.59	425.17	1.58	0.08	425.8	0.63	0.1
9687	1907	830564.96	564.96	830562.85	416.27	417.79	1.52	0.02	418.4	0.61	0.1
9674	1908	830555.27	555.27	830598.7	418.38	419.93	1.55	0.05	420.5	0.57	0.1
9682	1909	830539.92	539.92	830649.95	419.96	421.49	1.53	0.03	422	0.51	0.0
9686	1910	830524.8	524.8	830564.68	413.63	415.15	1.52	0.02	415.7	0.55	0.1
9685	1911	830473.1	473.1	830563.91	409.15	410.71	1.56	0.06	411.3	0.59	0.1
9683	1912	830474.13	474.13	830647.22	415.53	417.05	1.52	0.02	417.6	0.55	0.1
9725	1913	830399.1	399.1	830578.45	397.90	399.41	1.51	0.01	400	0.59	0.1
9735	1914	830367.4	367.4	830638.2	397.43	398.96	1.53	0.03	399.5	0.54	0.0
9730	1915	830235.9	235.9	830467.32	349.30	350.82	1.52	0.02	351.4	0.58	0.1
9731	1916	830221.53	221.53	830520.41	352.86	354.41	1.55	0.05	355	0.59	0.1
9719	1917	830305.24	305.24	830354.33	342.87	344.38	1.51	0.01	344.9	0.52	0.0

SOUTH WEST QUAD TOPO (ADDITIONAL PTS)

TWT	GS	NORTH	EAST	SG ELEV	CLAY ELEV	DEPTH	DIFF. +/-	VEG ELEV	DEPTH	DIFF.
9584	2026	830112.70	2042693.37	355.83	357.37	1.54	0.04	357.92	0.55	0.05
9585	2027	830063.09	2042689.41	350.24	351.75	1.51	0.01	352.3	0.55	0.05
9586	2028	830043.73	2042632.03	342.33	343.83	1.50	0.00	344.4	0.57	0.07
9587	2029	830097.66	2042630.95	351.27	352.83	1.56	0.06	353.4	0.57	0.07
9588	2030	830149.63	2042639.71	356.31	357.83	1.52	0.02	358.4	0.57	0.07
9589	2031	830190.54	2042653.6	360.30	361.84	1.54	0.04	362.4	0.56	0.06
9590	2032	830214.48	2042604.65	360.11	361.66	1.55	0.05	362.2	0.54	0.04
9591	2033	830155.8	2042596.44	354.94	356.44	1.50	0.00	357.5	1.06	0.56
9592	2034	830095.1	2042589.49	348.35	349.87	1.52	0.02	351.4	1.53	1.03
9593	2035	830036.1	2042578.85	337.05	338.58	1.53	0.03	339.22	0.64	0.14
9594	2036	830024.66	2042534.54	333.64	335.16	1.52	0.02	335.8	0.64	0.14
9595	2037	830069.35	2042539.09	340.59	342.12	1.53	0.03	343.2	1.08	0.58
9597	2039	830165.72	2042545.48	351.94	353.44	1.50	0.00	354	0.56	0.06
9598	2040	830215.59	2042546.4	355.61	357.17	1.56	0.06	358.5	1.33	0.83
9602	2041	830016.2	2042533.88	331.58	333.10	1.52	0.02	333.6	0.50	0.00
9604	2043	830163.1	2042482.39	345.39	346.90	1.51	0.01	347.5	0.60	0.10
9605	2044	830104.1	2042474.79	338.38	339.90	1.52	0.02	340.4	0.50	0.00
9606	2045	830049.48	2042478.7	331.25	332.80	1.55	0.05	333.4	0.60	0.10
9607	2046	830006.4	2042473.8	324.70	326.22	1.52	0.02	326.8	0.58	0.08
9608	2047	830028.2	2042423.6	322.43	323.93	1.51	0.00	324.5	0.57	0.07
9609	2048	830087.05	2042417.31	328.06	329.58	1.52	0.02	330.1	0.52	0.02
9610	2049	830151.01	2042406.39	332.22	333.74	1.52	0.02	334.3	0.56	0.06
9613	2052	830245.51	2042325.08	327.71	329.24	1.54	0.04	330.6	1.36	0.86
9616	2055	830350.09	2042248.31	333.16	334.69	1.54	0.04	336.1	1.41	0.91
9619	2056	830326.31	2042240.81	327.48	329.00	1.52	0.02	332.9	3.90	3.40
9621	2058	830235.63	2042294.99	323.02	324.55	1.53	0.03	327.7	3.15	2.65
9622	2059	830183.59	2042321.67	322.51	324.05	1.54	0.04	324.6	0.55	0.05
9623	2060	830130.65	2042343.33	319.87	321.40	1.53	0.03	322	0.60	0.10
9624	2061	830086.77	2042357.76	317.49	319.02	1.53	0.03	319.7	0.68	0.18
9625	2062	830054.17	2042368.8	316.18	317.68	1.50	0.00	318.2	0.52	0.02

CLAY SECTION AT ACCESS ROAD WESTWARD

TWT	GS	NORTH	EAST	SG ELEV	CLAY ELEV	DEPTH	DIFF. +/-	VEG ELEV	DEPTH	DIFF. +/-
10129	2191	831017.34	2041732.53	351.24	352.76	1.52	0.02	353.4	0.64	0.14
10226	2192	831070.57	2041982.58	350.85	352.38	1.53	0.03	352.9	0.52	0.02
10227	2193	831047.63	2041929.77	350.52	352.06	1.54	0.04	352.6	0.54	0.04
10228	2194	831102.11	2041908.97	336.51	338.02	1.51	0.01	338.6	0.58	0.08
10229	2195	831090.69	2041839.74	332.86	334.42	1.56	0.06	335	0.58	0.08
10230	2196	831024.78	2041857.69	352.06	353.56	1.50	0.00	354.2	0.64	0.14
10231	2197	831018.99	2041792.76	351.62	353.14	1.52	0.02	353.7	0.56	0.06
10233	2199	831087.94	2041731.95	332.90	334.44	1.54	0.04	335	0.56	0.06
10234	2200	831059.3	2041729.85	341.75	343.29	1.54	0.04	343.8	0.51	0.01
10235	2201	831025.65	2041733.53	350.58	352.10	1.52	0.02	352.8	0.70	0.20
10236	2202	830993.89	2041702.6	350.39	351.92	1.53	0.03	352.7	0.78	0.28
10237	2203	831056.22	2041686.57	342.24	343.80	1.56	0.06	344.4	0.60	0.10
10238	2204	831079.06	2041700.88	335.97	337.47	1.50	0.00	338	0.53	0.03
10239	2205	831073.04	2041654.19	338.85	340.38	1.53	0.03	340.9	0.52	0.02
10240	2206	831071.17	2041611.75	336.96	338.48	1.52	0.02	339	0.52	0.02
10241	2207	831070.15	2041574.71	329.20	330.71	1.51	0.01	331.3	0.59	0.09
10242	2208	831048.49	2041519.72	324.72	326.25	1.53	0.03	326.8	0.55	0.05
10243	2209	830989.9	2041505.41	320.37	321.87	1.50	0.00	322.42	0.55	0.05
10244	2210	830943.32	2041524.47	319.46	320.99	1.53	0.03	321.59	0.60	0.10
10245	2211	830969.01	2041583.91	329.36	330.89	1.53	0.03	331.42	0.53	0.03
10246	2212	830996.15	2041632.32	340.05	341.57	1.52	0.02	342.1	0.53	0.03
10247	2213	831041.27	2041633.25	340.25	341.77	1.52	0.02	342.3	0.53	0.03
10248	2214	831021.72	2041567.69	330.35	331.89	1.54	0.04	332.4	0.51	0.01
10089	2218	830252.93	2042162.98	323.86	325.42	1.56	0.06	326	0.58	0.08
10090	2219	830228.56	2042116.64	323.43	324.96	1.53	0.03	325.5	0.54	0.04
10091	2220	830297.95	2042066.26	323.80	325.32	1.52	0.02	326	0.68	0.18
10092	2221	830338.06	2042117.26	324.31	325.84	1.53	0.03	327.7	1.86	1.36
10095	2222	830407.33	2042054.85	326.00	327.50	1.50	0.00	328	0.50	0.00
10096	2223	830370.76	2041999.35	323.18	324.70	1.52	0.02	325.6	0.90	0.40
10097	2224	830473.07	2041981.84	323.34	324.85	1.51	0.01	326.8	1.95	1.45
10100	2225	830540.39	2041926.99	322.05	323.58	1.53	0.03	325.8	2.22	1.72
10101	2226	830606.23	2041873	323.33	324.88	1.55	0.05	325.4	0.52	0.02
10102	2227	830678.45	2041941.78	348.65	350.19	1.54	0.04	350.7	0.51	0.01
10103	2228	830740.75	2041886.3	348.87	350.39	1.52	0.02	351.1	0.71	0.21
10104	2229	830706.22	2041847.79	337.20	338.75	1.55	0.05	339.3	0.55	0.05
10105	2230	830645.79	2041910.2	337.05	338.57	1.52	0.02	339.2	0.63	0.13
10106	2231	830667.3	2041803.38	322.57	324.10	1.53	0.03	325.2	1.10	0.60
10107	2232	830759.85	2041712.27	320.90	322.44	1.54	0.04	323.3	0.86	0.36
10108	2233	830801.36	2041754.32	335.52	337.07	1.55	0.05	337.6	0.53	0.03
10109	2234	830845.04	2041798.03	347.74	349.24	1.50	0.00	350.3	1.06	0.56
10110	2235	830912.83	2041740.65	348.36	349.88	1.52	0.02	350.4	0.52	0.02
10112	2237	830738.72	2041884.78	348.72	350.24	1.52	0.02	350.8	0.56	0.06
10113	2238	830982.59	2041711.15	350.94	352.47	1.53	0.03	353	0.53	0.03
10118	2240	830424.61	2041924.47	322.53	324.05	1.52	0.02	324.6	0.55	0.05
10120	2242	830897.47	2041551.18	319.71	321.23	1.52	0.02	322	0.77	0.27
10121	2243	830933.87	2041620.57	333.14	334.66	1.52	0.02	335.3	0.64	0.14
10122	2244	830971.97	2041694.49	349.07	350.59	1.52	0.02	351.3	0.71	0.21
10123	2245	830716.1	2041667.13	319.19	320.73	1.54	0.04	321.4	0.67	0.17
10124	2246	830617.82	2041741.5	320.20	321.70	1.50	0.00	322.3	0.60	0.10
10125	2247	830544	2041812.73	320.68	322.20	1.52	0.02	323.1	0.90	0.40
10126	2248	830485.88	2041862.46	321.13	322.66	1.53	0.03	323.3	0.64	0.14

20627	2249	830976.72	2042026.17	359.83	361.37	1.54	0.04	361.9	0.53	0.03
20628	2250	831012.04	2042000.53	356.64	358.18	1.54	0.04	358.7	0.52	0.02
20630	2251	830910.39	2041990.14	358.13	359.67	1.54	0.04	360.2	0.53	0.03
20631	2252	830895.37	2042013.39	357.11	358.62	1.51	0.01	359.2	0.58	0.08
20632	2253	830981.32	2042020.49	355.36	356.89	1.53	0.03	357.5	0.61	0.11
20633	2254	830885.7	2042035.37	358.80	360.30	1.50	0.00	360.9	0.60	0.10
20634	2255	830833.61	2042015.19	356.37	357.90	1.53	0.03	358.4	0.50	0.00
20635	2256	830838.56	2042001.39	353.59	355.12	1.53	0.03	355.7	0.58	0.08
20636	2257	830840	2041992.36	355.53	357.06	1.53	0.03	357.6	0.54	0.04
20637	2258	830847.72	2041973.83	356.11	357.68	1.57	0.07	358.3	0.62	0.12
20640	2259	830984.32	2041856.58	353.96	355.49	1.53	0.03	356	0.51	0.01
20641	2260	830972.91	2041796.02	352.84	354.34	1.50	0.00	354.9	0.56	0.06
20642	2261	830910.39	2041812.42	352.06	353.59	1.53	0.03	354.2	0.61	0.11
20644	2262	830801.3	2041883.01	350.44	351.98	1.54	0.04	352.5	0.52	0.02
20645	2263	830772.42	2041971.24	354.68	356.18	1.50	0.00	356.7	0.52	0.02
20646	2264	830772.96	2041992.19	353.79	355.32	1.53	0.03	355.9	0.58	0.08
20647	2265	830772.87	2042000.09	351.96	353.49	1.53	0.03	354	0.51	0.01
20648	2266	830772.42	2042013.39	355.04	356.56	1.52	0.02	357.1	0.54	0.04
20649	2267	830712.79	2042029.26	356.13	357.68	1.55	0.05	358.2	0.52	0.02
20650	2268	830707.53	2042009.11	350.75	352.27	1.52	0.02	352.9	0.63	0.13
20651	2269	830704.77	2042001.5	352.36	353.88	1.52	0.02	354.4	0.52	0.02
20652	2270	830700.84	2041980.25	353.01	354.51	1.50	0.00	355.1	0.59	0.09
20653	2271	830642.22	2041998.02	351.57	353.10	1.53	0.03	353.7	0.60	0.10
20654	2272	830649.48	2042018.4	350.79	352.32	1.53	0.03	352.9	0.58	0.08
20655	2273	830651.96	2042027.11	349.49	351.03	1.54	0.04	351.6	0.57	0.07
20656	2274	830656.17	2042041.12	354.22	355.75	1.54	0.04	356.3	0.55	0.05
20659	2275	830599.62	2042073.31	352.66	354.19	1.53	0.03	354.7	0.51	0.01
20660	2276	830591.74	2042057.05	348.34	349.86	1.52	0.02	350.4	0.54	0.04
20661	2277	830588.44	2042051.54	349.57	351.09	1.52	0.02	351.6	0.51	0.01
20662	2278	830578.31	2042033.07	350.24	351.78	1.54	0.04	352.3	0.52	0.02
20663	2279	830522.09	2042066.51	347.75	349.30	1.55	0.05	349.8	0.50	0.00
20664	2280	830531.2	2042081.41	346.88	348.38	1.51	0.00	348.9	0.52	0.02
20665	2281	830535.19	2042089.2	345.82	347.33	1.51	0.01	347.9	0.57	0.07
20666	2282	830541.83	2042101.33	349.01	350.53	1.52	0.02	351.1	0.57	0.07
20669	2283	830581.1	2042020.08	348.88	350.40	1.52	0.02	351	0.60	0.10
20673	2284	830475.43	2042122.32	341.04	342.58	1.54	0.04	343.1	0.52	0.02
20674	2285	830472.63	2042116.56	343.11	344.62	1.51	0.01	345.2	0.58	0.08
20675	2286	830464.7	2042101.04	343.93	345.47	1.54	0.04	346	0.53	0.03
20676	2287	830412.52	2042131.02	338.78	340.32	1.54	0.04	340.9	0.58	0.08
20677	2288	830420.82	2042146.58	338.10	339.64	1.54	0.04	340.2	0.56	0.06
20678	2289	830425.16	2042153.54	336.23	337.74	1.51	0.01	338.3	0.56	0.06
20680	2290	830372.92	2042199.41	331.29	332.84	1.55	0.05	333.4	0.56	0.06
20681	2291	830367.34	2042187.25	330.02	331.55	1.54	0.04	332.1	0.55	0.05
20682	2292	830363.53	2042181.69	332.07	333.60	1.53	0.03	334.2	0.60	0.10
20683	2293	830355.71	2042164.49	333.11	334.67	1.56	0.06	335.3	0.63	0.13
20684	2294	830277.41	2042207.29	327.68	329.22	1.54	0.04	329.8	0.58	0.08
20685	2295	830287.57	2042226.84	326.86	328.40	1.54	0.04	329	0.60	0.10
20686	2296	830291.76	2042234.09	324.57	326.08	1.51	0.01	326.6	0.52	0.02
20687	2297	830221.37	2042273.4	321.59	323.13	1.54	0.04	323.7	0.57	0.07
20688	2298	830217.49	2042267.79	323.35	324.86	1.51	0.01	325.4	0.54	0.04
20689	2299	830205.91	2042248.79	324.03	325.56	1.54	0.04	326.1	0.54	0.04
20691	2300	830096.06	2042278.91	319.36	320.90	1.54	0.04	321.4	0.50	0.00
20692	2301	830085.29	2042302.45	317.23	318.76	1.53	0.03	319.3	0.54	0.04
20693	2302	830072.62	2042333.09	316.20	317.70	1.50	0.00	318.2	0.50	0.00
22480	2304	830838.59	2041850.73	351.29	352.82	1.53	0.03	353.4	0.58	0.08
22484	2305	830983.03	2041986.07	357.27	358.80	1.54	0.04	359.3	0.50	0.00
22485	2306	830988.53	2041913.08	354.40	355.92	1.52	0.02	356.5	0.58	0.08

22486	2307	830953.96	2041937.62	356.76	358.30	1.54	0.04	358.8	0.50	0.00
22487	2308	830916.54	2041964.91	357.76	359.28	1.52	0.02	359.9	0.62	0.12
22488	2309	830879.68	2041911.17	355.86	357.37	1.51	0.01	357.9	0.53	0.03
22489	2310	830917.29	2041879.48	355.79	357.32	1.53	0.03	357.9	0.58	0.08
22490	2311	830950.22	2041849.41	353.71	355.24	1.53	0.03	355.8	0.56	0.06
22492	2312	830886.45	2041829.69	352.52	354.08	1.56	0.06	354.6	0.52	0.02
22493	2313	830851.25	2041868.71	353.29	354.82	1.53	0.03	355.4	0.58	0.08

VENEER

TWT	GS	NORTH	EAST	SG ELEV	CLAY ELEV	DEPTH	DIFF. +/-	VEG ELEV	DEPTH	DIFF. +/-
4003	2421	831731.4	2042879.6	383.207	383.75	0.54	0.04	384.3	0.55	0.05
4004	2422	831757.99	2042886.3	384.993	385.5	0.51	0.01	386	0.5	0
4005	2423	831790.51	2042899	385.765	386.26	0.50	0.00	386.8	0.54	0.04
4006	2424	831819.96	2042919.7	384.461	384.97	0.51	0.01	385.5	0.53	0.03
4007	2425	831839.3	2042959.4	382.596	383.1	0.50	0.00	383.6	0.5	0
4008	2426	831855.52	2043003.4	379.856	380.36	0.50	0.00	380.9	0.54	0.04
4009	2427	831873.34	2042994.3	371.988	372.82	0.83	0.33	374.1	1.28	0.78
4010	2428	831869.46	2042969.4	373.417	374.26	0.84	0.34	375.8	1.54	1.04
4011	2429	831860.56	2042931.4	375.461	376.02	0.56	0.06	376.63	0.61	0.11
4012	2430	831842.68	2042895.3	378.035	378.54	0.50	0.00	379.1	0.56	0.06
4013	2431	831817.53	2042876	380.618	381.12	0.50	0.00	381.7	0.58	0.08
4014	2432	831779.29	2042854.7	378.133	378.63	0.50	0.00	379.13	0.5	0
4015	2433	831747.59	2042843.1	374.845	375.35	0.50	0.00	375.9	0.55	0.05
4016	2434	831767.7	2042797.9	364.873	365.37	0.50	0.00	365.87	0.5	0
4017	2435	831808.84	2042815.9	368.514	369.01	0.50	0.00	369.55	0.54	0.04
4018	2436	831824.47	2042829	368.865	369.51	0.64	0.14	370.82	1.31	0.81
4019	2437	831844.77	2042839.9	371.313	371.81	0.50	0.00	372.31	0.5	0
4020	2438	831864.72	2042859.4	371.285	371.79	0.50	0.00	372.3	0.51	0.01
4021	2439	831898.9	2042914	364.617	365.29	0.67	0.17	366.15	0.86	0.36
4022	2440	831915	2042967.3	362.216	362.72	0.50	0.00	363.22	0.5	0
4023	2441	831960.33	2042939.8	349.883	350.38	0.50	0.00	350.9	0.52	0.02
4024	2442	831940.04	2042891.6	352.7	353.45	0.75	0.25	354.08	0.63	0.13
4025	2443	831912.02	2042850.4	357.404	357.9	0.50	0.00	358.4	0.5	0
4026	2444	831891.33	2042815.7	359.78	360.28	0.50	0.00	360.8	0.52	0.02
4027	2445	831875.67	2042800.6	359.673	360.17	0.50	0.00	360.8	0.63	0.13
4028	2446	831860.3	2042789.5	357.404	358.12	0.72	0.22	360.07	1.95	1.45
4029	2447	831843.88	2042779	357.499	358.14	0.64	0.14	359.08	0.94	0.44
4030	2448	831788.73	2042754.1	353.552	354.05	0.50	0.00	354.64	0.59	0.09
4031	2449	831801.16	2042730.1	350.1	350.6	0.50	0.00	351.1	0.5	0
4032	2450	831846.25	2042747.4	351.343	352.04	0.70	0.20	354.27	2.23	1.73
4033	2451	831873.88	2042758.9	352.772	353.38	0.61	0.11	355.28	1.9	1.4
4034	2452	831899.94	2042770.1	352.545	353.21	0.66	0.16	354.34	1.13	0.63
4035	2453	831925.11	2042794.6	350.835	351.56	0.73	0.23	353.13	1.57	1.07
4040	2454	831950.42	2042838.5	347.932	348.43	0.50	0.00	349	0.57	0.07
4041	2455	831964.39	2042876.3	346.506	347.01	0.50	0.00	347.6	0.59	0.09
4042	2456	831980.48	2042929.3	344.46	344.96	0.50	0.00	345.5	0.54	0.04
4044	2457	831984.99	2042858.7	344.368	346.82	2.45	1.95	348.34	1.52	1.02
4045	2458	831973.78	2042825.7	346.118	347.13	1.01	0.51	348.74	1.61	1.11
4046	2459	831952.83	2042815.8	346.438	347.56	1.12	0.62	348.59	1.03	0.53
4047	2460	831962.07	2042782.4	348.975	349.48	0.50	0.00	349.98	0.5	0
4048	2461	831934.61	2042740.5	350.594	351.09	0.50	0.00	351.7	0.61	0.11
4049	2462	831891.65	2042712.9	350.923	351.42	0.50	0.00	351.92	0.5	0
4050	2463	831854.14	2042702.6	350.172	350.78	0.61	0.11	352.08	1.3	0.8
4051	2464	831823.54	2042694.6	348.648	349.15	0.50	0.00	349.7	0.55	0.05
4052	2465	831844.49	2042643.1	339.705	340.31	0.61	0.11	340.9	0.59	0.09
4053	2466	831891.36	2042662.4	343.258	343.76	0.50	0.00	344.48	0.72	0.22
4054	2467	831892.12	2042699.8	350.176	350.68	0.50	0.00	351.18	0.5	0
4055	2468	831939.85	2042708	350.056	350.56	0.50	0.00	351.2	0.64	0.14
4056	2469	831954.09	2042733.9	350.153	350.65	0.50	0.00	351.2	0.55	0.05
4057	2470	831974.8	2042778.1	347.179	347.68	0.50	0.00	348.2	0.52	0.02
4058	2471	831939.39	2042667.2	343.794	344.29	0.50	0.00	345.15	0.86	0.36
4059	2472	831976.14	2042685.2	343.266	343.77	0.50	0.00	344.3	0.53	0.03

4060	2473	831994.92	2042722.1	340.579	341.08	0.50	0.00	341.7	0.62	0.12
4061	2474	832013.27	2042763.5	336.864	337.36	0.50	0.00	337.9	0.54	0.04
4062	2475	832006.6	2042809.6	338.638	339.14	0.50	0.00	339.7	0.56	0.06
4063	2476	832043.58	2042807.7	331.15	331.65	0.50	0.00	332.56	0.91	0.41
4064	2477	832017.93	2042839.1	336.093	336.59	0.50	0.00	337.26	0.67	0.17
4065	2478	832023.57	2042876.2	336.942	338.65	1.71	1.21	339.35	0.7	0.2
4066	2479	832021.38	2042906	338.224	338.82	0.60	0.10	340	1.18	0.68
4067	2480	832066.88	2042878.2	327.753	328.35	0.60	0.10	329.5	1.15	0.65
4068	2481	832050.65	2042832.7	329.775	330.42	0.65	0.15	331.47	1.05	0.55
4069	2482	832102.16	2042851	319.094	319.59	0.50	0.00	320.85	1.26	0.76
4070	2483	832080.08	2042804.8	323.853	324.35	0.50	0.00	324.85	0.5	0
4071	2484	832055.76	2042763.9	328.708	329.21	0.50	0.00	329.8	0.59	0.09
4072	2485	832031.97	2042717.6	333.232	333.73	0.50	0.00	334.4	0.67	0.17
4073	2486	832019.91	2042670.1	335.062	335.56	0.50	0.00	336.18	0.62	0.12
4074	2487	831992.24	2042639.2	338.206	338.71	0.50	0.00	339.21	0.5	0
4075	2488	831948.45	2042619.2	336.562	337.06	0.50	0.00	337.7	0.64	0.14
4076	2489	831897.71	2042618.7	334.874	335.39	0.52	0.02	336.11	0.72	0.22
4077	2490	831863.25	2042600.4	331.456	332.05	0.59	0.09	333.19	1.14	0.64
4078	2491	831885.63	2042555.9	321.397	321.9	0.50	0.00	323.1	1.2	0.7
4079	2492	831922.12	2042574.6	326.975	327.48	0.50	0.00	328	0.52	0.02
4080	2493	831967.89	2042582.9	330.502	331	0.50	0.00	331.5	0.5	0
4081	2494	832011.4	2042595.6	331.953	332.55	0.60	0.10	333.86	1.31	0.81
4082	2495	832045.76	2042630.5	329.115	329.62	0.50	0.00	330.2	0.58	0.08
4083	2496	832057.79	2042675.4	327.57	328.07	0.50	0.00	328.6	0.53	0.03
4084	2497	832079.05	2042716.4	323.401	323.92	0.52	0.02	324.53	0.61	0.11
4085	2498	832098.03	2042758.9	319.195	319.69	0.50	0.00	320.2	0.51	0.01
4086	2499	832125.67	2042791.5	313.722	314.22	0.50	0.00	314.8	0.58	0.08
4087	2500	832150.48	2042823.8	308.906	309.44	0.53	0.03	310.67	1.23	0.73
4088	2501	832166.61	2042809.9	304.715	305.23	0.52	0.02	306.1	0.87	0.37
4089	2502	832191.42	2042794.5	301.311	301.81	0.50	0.00	302.4	0.59	0.09
4090	2503	832161.14	2042759.7	306.598	307.11	0.51	0.01	307.97	0.86	0.36
4091	2504	832129.1	2042721.9	312.991	313.51	0.52	0.02	314.41	0.9	0.4
4092	2505	832107.72	2042680.2	316.98	317.48	0.50	0.00	318	0.52	0.02
4093	2506	832085.9	2042638.3	322.156	322.66	0.50	0.00	323.2	0.54	0.04
4094	2507	832044.41	2042487.6	323.396	323.9	0.50	0.00	324.4	0.5	0
4095	2508	832017.89	2042548.3	324.334	324.83	0.50	0.00	325.4	0.57	0.07
4096	2509	831971.77	2042537.2	321.084	321.63	0.55	0.05	322.34	0.71	0.21
4097	2510	831932.95	2042524.2	316.289	316.8	0.51	0.01	317.44	0.64	0.14
4098	2511	831903.83	2042515.1	313.112	313.63	0.52	0.02	314.23	0.6	0.1
4099	2512	831924.61	2042474.2	305.197	305.7	0.50	0.00	306.39	0.69	0.19
4100	2513	831970.32	2042487.6	310.483	310.98	0.50	0.00	311.5	0.52	0.02
4101	2514	832012.22	2042503	315.522	316.06	0.54	0.04	316.69	0.63	0.13
4102	2515	832043.16	2042509.1	317.628	318.16	0.53	0.03	319.03	0.87	0.37
4103	2516	832067.21	2042517.6	318.261	318.77	0.51	0.01	319.3	0.53	0.03
4104	2517	832089.21	2042534.8	317.792	318.29	0.50	0.00	318.9	0.61	0.11
4106	2518	832128.96	2042513.3	308.516	309.02	0.50	0.00	309.6	0.58	0.08
4107	2519	832110.02	2042493.9	310.086	310.6	0.51	0.01	311.1	0.5	0
4108	2520	832080.14	2042471.3	308.491	308.99	0.50	0.00	309.6	0.61	0.11
4109	2521	832051.38	2042458.7	307.28	307.79	0.51	0.01	308.3	0.51	0.01
4110	2522	832007.74	2042451.4	304.35	304.86	0.51	0.01	305.4	0.54	0.04
4111	2523	831978.37	2042443.8	301.611	302.12	0.51	0.01	302.7	0.58	0.08
4112	2524	831943.13	2042434.9	298.07	298.57	0.50	0.00	299.2	0.63	0.13
4113	2525	831951.42	2042415	293.661	294.17	0.51	0.01	294.7	0.53	0.03
4114	2526	831960.38	2042388.4	290.889	291.39	0.50	0.00	291.95	0.56	0.06
4115	2527	832007.59	2042376.2	290.868	291.37	0.50	0.00	291.9	0.53	0.03
4116	2528	832006.56	2042410.5	295.753	296.26	0.51	0.01	296.9	0.64	0.14
4117	2529	832050.79	2042415.6	298.208	298.71	0.50	0.00	299.3	0.59	0.09

4118	2530	832061.36	2042381.8	292.805	293.31	0.50	0.00	293.81	0.5	0
4119	2531	832061.78	2042369.6	291.604	292.11	0.51	0.01	292.75	0.64	0.14
4120	2532	832082.17	2042365.2	291.986	292.49	0.50	0.00	293	0.51	0.01
4121	2533	832083.78	204239[illegible].9	294.091	294.6	0.51	0.01	295.2	0.6	0.1
4122	2534	832086.55	2042424.3	298.833	299.34	0.51	0.01	299.9	0.56	0.06
4123	2535	832111.09	2042438.3	300.906	301.41	0.50	0.00	302	0.59	0.09
4124	2536	832120.5	2042399.2	294.305	294.81	0.50	0.00	295.31	0.5	0
4125	2537	832126.54	2042374.4	292.122	292.63	0.51	0.01	293.2	0.57	0.07
4126	2538	832152.2	2042404	291.803	292.31	0.51	0.01	292.9	0.59	0.09
4127	2539	832175.62	2042428.8	292.446	292.97	0.52	0.02	293.5	0.53	0.03
4128	2540	832160.83	2042432.7	292.93	293.44	0.51	0.01	294	0.56	0.06
4129	2541	832138.81	2042460.1	300.815	301.32	0.50	0.00	301.9	0.58	0.08
4130	2542	832161.92	2042491.7	300.785	301.29	0.50	0.00	301.8	0.51	0.01
4131	2543	832178.87	2042473.9	294.816	295.32	0.50	0.00	295.9	0.58	0.08
4132	2544	832194.8	2042461	293.387	293.89	0.50	0.00	294.4	0.51	0.01
4133	2545	832204.87	2042504.7	294.084	294.59	0.51	0.01	295.2	0.61	0.11
4134	2546	832187.54	2042509.6	295.68	296.19	0.51	0.01	296.7	0.51	0.01
4135	2547	832162.14	2042534.5	303.702	304.21	0.51	0.01	304.8	0.59	0.09
4136	2548	832135.52	2042551.1	309.752	310.26	0.51	0.01	310.8	0.54	0.04
4137	2549	832122.94	2042589.2	313.694	314.2	0.51	0.01	314.8	0.6	0.1
4138	2550	832167.75	2042576.4	303.641	304.14	0.50	0.00	304.7	0.56	0.06
4139	2551	832191.23	2042531.5	297.07	297.58	0.51	0.01	298.2	0.62	0.12
4140	2552	832211.52	2042529.2	295.287	295.79	0.50	0.00	296.3	0.51	0.01
4141	2553	832217.06	2042568	295.702	296.21	0.51	0.01	296.8	0.59	0.09
4142	2554	832196.08	2042571.5	297.243	297.75	0.51	0.01	298.3	0.55	0.05
4143	2555	832225.8	2042616.4	295.494	296	0.51	0.01	296.5	0.5	0
4144	2556	832192.07	2042617.7	298.807	299.31	0.50	0.00	299.9	0.59	0.09
4145	2557	832159.27	2042622.9	306.291	306.8	0.51	0.01	307.3	0.5	0
4146	2558	832129.75	2042636	312.841	313.35	0.51	0.01	313.9	0.55	0.05
4151	2559	832146.3	2042675.5	309.718	310.22	0.50	0.00	310.8	0.58	0.08
4152	2560	832174.69	2042657.5	304.291	304.8	0.51	0.01	305.3	0.5	0
4153	2561	832191.98	2042656.1	299.187	299.69	0.50	0.00	300.3	0.61	0.11
4154	2562	832230.41	2042647.1	295.028	295.53	0.50	0.00	296.1	0.57	0.07
4155	2563	832231.84	2042689.3	294.52	295.03	0.51	0.01	295.6	0.57	0.07
4156	2564	832202.44	2042692.5	298.39	298.9	0.51	0.01	299.4	0.5	0
4157	2565	832190.84	2042697.3	302.051	302.56	0.51	0.01	303.1	0.54	0.04
4158	2566	832162.67	2042711.9	306.369	306.88	0.51	0.01	307.5	0.62	0.12
4159	2567	832202.29	2042740.6	300.047	300.55	0.50	0.00	301.1	0.55	0.05
4160	2568	832223.17	2042731.9	295.303	295.81	0.51	0.01	296.4	0.59	0.09
4161	2569	832236.52	2042726.3	294.465	294.97	0.51	0.01	295.5	0.53	0.03
4162	2570	832240.87	2042749.9	294.36	294.87	0.51	0.01	295.4	0.53	0.03
4163	2571	832230.33	2042749.7	294.585	295.09	0.50	0.00	295.6	0.51	0.01
4164	2572	832235.51	2042786	293.177	293.68	0.50	0.00	294.3	0.62	0.12
4165	2573	832245.74	2042781.6	293.066	293.57	0.50	0.00	294.1	0.53	0.03
4166	2574	832228.83	2042787.7	296.581	297.09	0.51	0.01	297.7	0.61	0.11
4167	2575	832222.24	2042749.2	298.021	298.53	0.51	0.01	299.1	0.57	0.07
4168	2576	832206.43	2042772.8	298.597	299.1	0.50	0.00	299.6	0.5	0
4169	2577	832197.43	2042800	297.659	298.17	0.51	0.01	298.7	0.53	0.03
4170	2578	832199.18	2042787.4	298.449	298.95	0.50	0.00	299.5	0.55	0.05

Note:

All large drawings are at end of file

Photo's

10/14/98 Looking West

10/14/98 Looking South

10/14/98 Looking N/E

10/29/98 Inverted Looking North

10/29/98 Looking South

10/29/98 Looking West

11/23/98 Looking N/E

11/23/98 Looking South

11/23/98 Proj: Durham Landfill Closure -Clay Cap Liner

1/1/99 Looking N/E

1/1/99 Looking West

1/1/99 Looking South

1/26/99

1/26/99

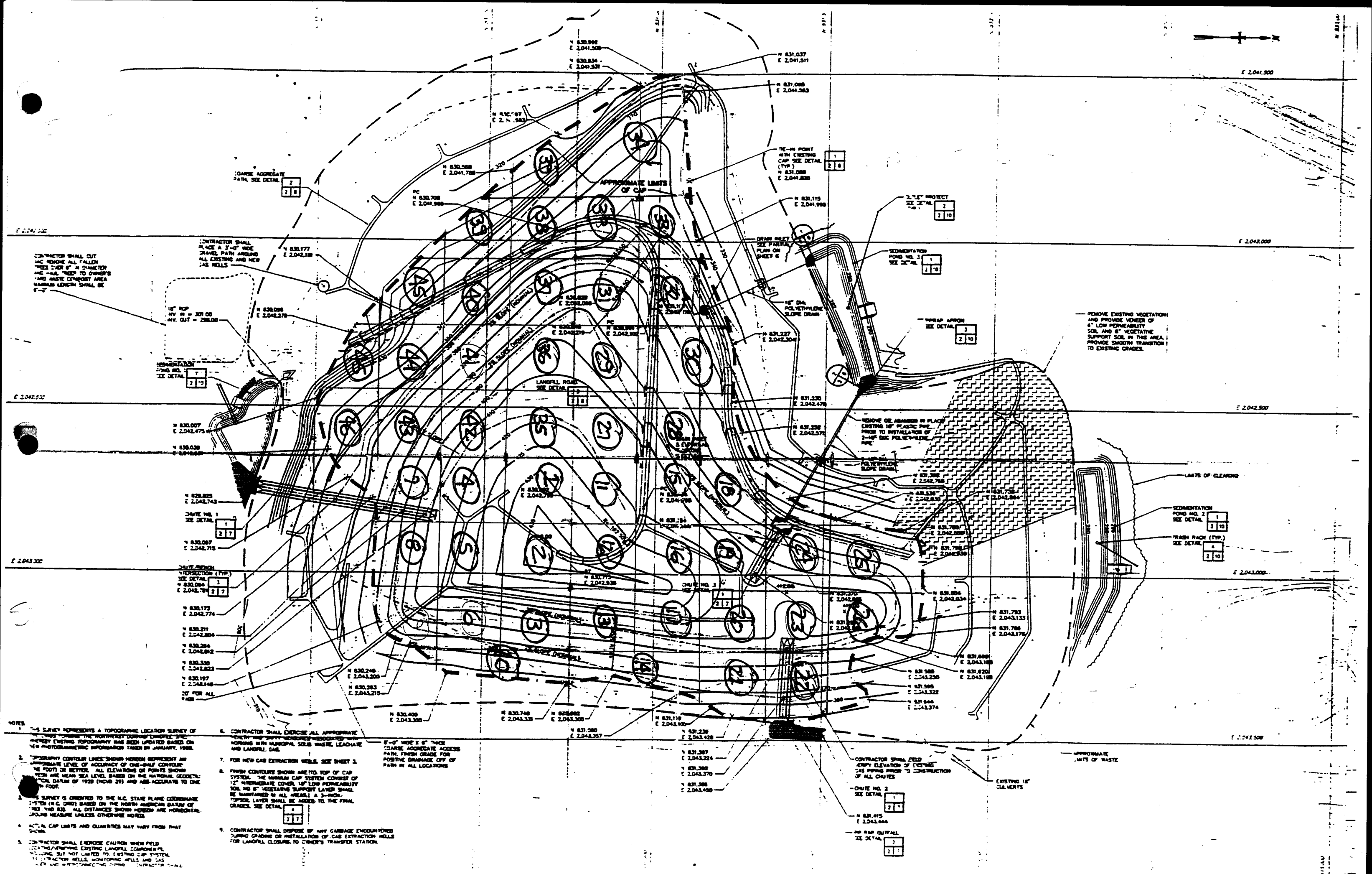
1/26/99

4/8/99 Looking North

4/8/99 Looking West

4/8/99 Looking South

5



NOTES:

1. THIS SURVEY REPRESENTS A TOPOGRAPHIC LOCATION SURVEY OF THE AREAS FORMING THE NORTHWEST DORMAN LANDFILL SITE. THE EXISTING TOPOGRAPHY WAS BEIN UPDATED BASED ON AERIAL PHOTOGRAMMETRIC INFORMATION TAKEN ON JANUARY, 1988.

2. TOPOGRAPHY CONTOUR LINES SHOWN HEREON REPRESENT AN APPROXIMATE LEVEL OF ACCURACY OF ONE-HALF CONTOUR (ONE FOOT) OR BETTER. ALL ELEVATIONS OR POINTS SHOWN HEREON ARE MEAN SEA LEVEL BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29) AND ARE ACCURATE TO ONE TENTH FOOT.

3. THIS SURVEY IS ORIENTED TO THE N.C. STATE PLANE COORDINATE SYSTEM (N.C. GRID) BASED ON THE NORTH AMERICAN DATUM OF 1983 AND 83. ALL DISTANCES SHOWN HEREON ARE HORIZONTAL GROUND MEASURE UNLESS OTHERWISE NOTED.

4. ACTUAL CAP LIMITS AND QUANTITIES MAY VARY FROM THAT SHOWN.

5. CONTRACTOR SHALL EXERCISE CAUTION WHEN FIELD LOCATING/REMOVING EXISTING LANDFILL COMPONENTS, INCLUDING, BUT NOT LIMITED TO, EXISTING CAP SYSTEM, EXTRACTION WELLS, MONITORING WELLS AND GAS VENTS AND INTERCONNECTING PIPING. CONTRACTOR SHALL

6. CONTRACTOR SHALL EXERCISE ALL APPROPRIATE SAFETY AND SAFETY MEASURES ASSOCIATED WITH WORKING WITH MUNICIPAL SOLID WASTE, LEACHATE AND LANDFILL GAS.

7. FOR NEW GAS EXTRACTION WELLS, SEE SHEET 3.

8. FINISH CONTOURS SHOWN ARE TO TOP OF CAP SYSTEM. THE MINIMUM CAP SYSTEM CONSIST OF 12" INTERMEDIATE COVER, 18" LOW PERMEABILITY SOIL AND 6" VEGETATIVE SUPPORT LAYER SHALL BE MAINTAINED IN ALL AREAS. A 3-INCH TOPSOIL LAYER SHALL BE ADDED TO THE FINAL GRADES. SEE DETAIL 4 (2 | 7)

9. CONTRACTOR SHALL DISPOSE OF ANY GARBAGE ENCOUNTERED DURING GRADING OR INSTALLATION OF GAS EXTRACTION WELLS FOR LANDFILL CLOSURE TO OWNER'S TRANSFER STATION.

6

VAN DER HORST

EOTECHNICAL ENGINEERING, P.C.
CONSTRUCTION MONITORING
MATERIALS TESTING
EXPLORATORY DRILLING

LETTER OF TRANSMITTAL

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

ATTENTION: Andy Palabnuk

REGARDING: Durham Landfill Closure
Subgrade Testing Summary

To: Gilbert Southern
3301 Glenn Road
Durham, NC 27704

WE ARE SENDING YOU X Attached ____ Under separate cover the following items:

COPIES	DATE	NO.	DESCRIPTION
3	11/09/98	---	Subgrade Summary Test Report

REMARKS

COPIES TO: File

SIGNED: [signature]

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

GEOTECHNICAL ENGINEERING, P.C.

CONSTRUCTION MONITORING

MATERIALS TESTING

EXPLORATORY DRILLING

November 8, 1998

Andy Palanbunk
Gilbert Southern Corporation
3301 Glenn Road
Durham, NC 27704

Re: Durham Landfill Closure
Subgrade Testing
VNC-98-029

Dear Andy:

VAN DER HORST Geotechnical Engineering, P.C. is pleased to present our summary report for subgrade testing at the Durham County Landfill Closure Project. Contained in Appendix A are the in-place density and moisture content tests. They are presented chronologically and each test indicates the Standard Proctor used to determine the compaction percentage. Appendix B contains three test location maps plotting the approximate location of each in-place density test. Appendix C contains a summary table of all Standard Proctor tests performed on the general fill materials during placement. Also contained in Appendix C are the proctor curves and grain-size distribution curves for each sample.

Should you have any questions or need additional information, 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

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

November 8, 1998

Andy Palanbunk
Gilbert Southern Corporation
3301 Glenn Road
Durham, NC 27704

Re: Durham Landfill Closure
Subgrade Testing
VNC-98-029

Dear Andy:

VAN DER HORST Geotechnical Engineering, P.C. is pleased to present our summary report for subgrade testing at the Durham County Landfill Closure Project. Contained in Appendix A are the in-place density and moisture content tests. They are presented chronologically and each test indicates the Standard Proctor used to determine the compaction percentage. Appendix B contains three test location maps plotting the approximate location of each in-place density test. Appendix C contains a summary table of all Standard Proctor tests performed on the general fill materials during placement. Also contained in Appendix C are the proctor curves and grain-size distribution curves for each sample.

Should you have any questions or need additional information, please do not hesitate to contact our office.

Respectfully submitted,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.
Regional Manager

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

Appendix A

In-place Density/Moisture Test Summary Tables

VAN DER HORST

GENERAL FILL TESTING

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

Project No.: VNC-98-029
Date: 10/27/98
Report No.: GF- 001

Material Source: As noted
Required Compaction: 90%

No.	Date Tested	Location	Elev.	Dry Density (pcf)	Moist. Content (%)	Compaction (%)	Proctor ID#
1	9/15/98	See Location Map "A"	-8'±	118.8	13.4	92.8	DL-001
2	9/15/98	See Location Map "A"	-7'±	115.7	14.4	90.4	DL-001
3	9/15/98	See Location Map "A"	-6'±	119.3	12.1	93.2	DL-001
4	9/15/98	See Location Map "A"	-5'±	108.6	16.0	93.8	DL-012
5	9/15/98	See Location Map "A"	-6'±	107.1	13.5	92.5	DL-012
6	9/15/98	See Location Map "A"	-6'±	112.1	11.6	96.8	DL-012
7	9/21/98	See Location Map "A"	-6'±	104.4	15.1	90.2	DL-012
8	9/21/98	See Location Map "A"	-6'±	107.9	14.1	93.1	DL-012
9	9/21/98	See Location Map "A"	-6'±	109.4	15.5	94.5	DL-012
10	9/21/98	See Location Map "A"	-5'±	105.7	10.7	91.3	DL-012
11	9/21/98	See Location Map "A"	-5'±	110.9	11.7	95.0	DL-012
12	9/21/98	See Location Map "A"	-5'±	105.4	17.5	91.0	DL-012
13	9/22/98	See Location Map "A"	-6'±	111.1	10.2	95.5	DL-008
14	9/22/98	See Location Map "A"	-6'±	115.3	10.1	99.1	DL-008
15	9/22/98	See Location Map "A"	-4'±	105.3	12.8	97.8	DL-016
16	9/22/98	See Location Map "A"	-4'±	104.8	14.7	97.3	DL-016
17	9/22/98	See Location Map "A"	-5'±	114.5	9.4	98.4	DL-008
18	9/22/98	See Location Map "A"	-5'±	118.1	9.9	100+	DL-008
19	9/23/98	See Location Map "A"	-4'±	116.0	10.6	99.7	DL-008
20	9/23/98	See Location Map "A"	-2'±	112.7	10.3	96.9	DL-008
21	9/23/98	See Location Map "A"	-2'±	113.2	9.8	97.3	DL-008
22	9/23/98	See Location Map "A"	-6'±	111.9	11.6	96.2	DL-008

Density (ASTM D2922) Moisture (ASTM D3017)

VAN DER HORST

GENERAL FILL TESTING

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

Project No.: VNC-98-029
Date: 10/27/98
Report No.: GF- 001

Material Source: As noted
Required Compaction: 90%

No.	Date Tested	Location	Elev.	Dry Density (pcf)	Moist. Content (%)	Compaction (%)	Proctor ID#
23	9/23/98	See Location Map "A"	-6'±	105.4	8.7	9.6	DL-008
24	9/23/98	See Location Map "A"	-5'±	104.3	8.8	90.0	DL-008
25	9/24/98	See Location Map "A"	-4'±	104.1	14.4	96.7	DL-016
26	9/24/98	See Location Map "A"	-4'±	106.0	11.9	98.4	DL-016
27	9/24/98	See Location Map "A"	-6'±	112.3	10.3	91.0	DL-040
28	9/24/98	See Location Map "A"	-5'±	111.5	12.1	90.4	DL-040
29	9/24/98	See Location Map "A"	-5'±	107.9	9.1	100+	DL-016
30	9/24/98	See Location Map "A"	-5'±	108.1	7.5	100+	DL-016
31	9/25/98	See Location Map "A"	-4'±	121.1	10.2	98.1	DL-040
32	9/25/98	See Location Map "A"	-4'±	110.7	10.3	99.5	DL-029
33	9/25/98	See Location Map "A"	-4'±	108.8	10.1	97.8	DL-029
34	9/25/98	See Location Map "A"	-4'±	110.9	14.2	99.6	DL-029
35	9/25/98	See Location Map "A"	-2'±	110.7	11.5	99.5	DL-029
36	9/25/98	See Location Map "A"	-3'±	120.2	7.7	97.4	DL-040
37	9/28/98	See Location Map "A"	-3'±	113.8	7.5	9.2.2	DL-040
38	9/28/98	See Location Map "A"	-2'±	119.1	7.8	96.5	DL-040
39	9/28/98	See Location Map "A"	-2'±	124.4	6.7	100+	DL-040
40	9/28/98	See Location Map "A"	-2'±	109.4	9.5	98.3	DL-029
41	9/28/98	See Location Map "A"	-2'±	107.4	11.4	96.5	DL-029
42	9/28/98	See Location Map "A"	-2'±	110.3	7.9	99.1	DL-029
43	9/29/98	See Location Map "A"	-fsg ±	119.2	8.5	96.6	DL-040
44	9/29/98	See Location Map "A"	-3'±	117.6	8.8	95.3	DL-040

Density (ASTM D2922) Moisture (ASTM D3017)

VAN DER HORST

GENERAL FILL TESTING

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

Project No.: VNC-98-029
Date: 10/27/98
Report No.: GF-001

Material Source: As noted
Required Compaction: 90%

No.	Date Tested	Location	Elev.	Dry Density (pcf)	Moist. Content (%)	Compaction (%)	Proctor ID#
45	9/29/98	See Location Map "A"	-4'±	110.9	9.6	90.0	DL-040
46	9/29/98	See Location Map "A"	-3'±	120.9	8.3	98.0	DL-040
47	9/29/98	See Location Map "A"	-2'±	109.7	11.0	98.6	DL-029
48	9/29/98	See Location Map "A"	-2'±	112.7	14.9	100+	DL-029
49	10/2/98	See Location Map "A"	-1'±	120.3	9.6	97.5	DL-040
50	10/2/98	See Location Map "A"	-2'±	111.8	6.5	90.6	DL-040
51	10/2/98	See Location Map "A"	-2'±	121.7	10.2	98.6	DL-040
52	10/2/98	See Location Map "A"	-2'±	119.6	12.6	96.9	DL-040
53	10/2/98	See Location Map "A"	-2'±	115.7	14.0	93.8	DL-040
54	10/2/98	See Location Map "A"	-2'±	117.7	9.8	95.4	DL-040
55	10/2/98	See Location Map "A"	-fsg'±	116.4	8.5	94.3	DL-040
56	10/2/98	See Location Map "A"	-fsg ±	115.4	10.1	93.5	DL-040
57	10/3/98	See Location Map "A"	-3'±	113.2	10.2	91.2	DL-041
58	10/3/98	See Location Map "A"	-3'±	118.3	9.8	95.3	DL-041
59	10/3/98	See Location Map "A"	-2'±	118.1	9.6	95.1	DL-041
60	10/3/98	See Location Map "A"	-2'±	112.6	11.3	90.7	DL-041
61	10/3/98	See Location Map "A"	-2'±	121.0	7.4	97.5	DL-041
62	10/5/98	See Location Map "A"	-1'±	113.4	10.4	91.4	DL-041
63	10/5/98	See Location Map "A"	-1'±	113.8	11.3	91.7	DL-041
64	10/5/98	See Location Map "A"	-fsg'±	116.3	9.8	93.7	DL-041
65	10/5/98	See Location Map "A"	-fsg'±	118.0	10.1	95.1	DL-041
66	10/5/98	See Location Map "A"	-fsg'±	117.4	9.6	94.6	DL-041

Density (ASTM D2922) Moisture (ASTM D3017)

VAN DER HORST

GENERAL FILL TESTING

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

Project No.: VNC-98-029
Date: 10/27/98
Report No.: GF-001

Material Source: As noted
Required Compaction: 90%

No.	Date Tested	Location	Elev.	Dry Density (pcf)	Moist. Content (%)	Compaction (%)	Proctor ID#
67	10/7/98	See Location Map "A"	-2'±	104.8	12.1	90.4	DL-049
68	10/7/98	See Location Map "A"	-2'±	106.2	12.4	91.6	DL-049
69	10/7/98	See Location Map "A"	-1'±	108.3	13.8	93.4	DL-049
70	10/7/98	See Location Map "A"	-1'±	116.9	9.2	94.2	DL-041
71	10/7/98	See Location Map "A"	-1'±	119.4	10.1	96.2	DL-041
72	10/7/98	See Location Map "A"	-1'±	115.2	8.8	92.8	DL-041
73	10/7/98	See Location Map "A"	-1'±	115.2	9.3	92.8	DL-041
74	10/12/98	See Location Map "A"	-2'±	110.2	12.8	95.1	DL-049
75	10/12/98	See Location Map "A"	-2'±	113.3	13.9	97.8	DL-049
76	10/12/98	See Location Map "B"	-2'±	106.1	10.4	91.5	DL-049
77	10/12/98	See Location Map "B"	-1'±	105.7	12.9	91.8	DL-049
78	10/12/98	See Location Map "B"	-1 ±	105.5	13.0	91.7	DL-049
79	10/12/98	See Location Map "B"	-1'±	114.3	12.3	99.3	DL-049
80	10/12/98	See Location Map "B"	-2'±	117.2	12.4	100+	DL-049
81	10/12/98	See Location Map "B"	-2'±	111.4	11.6	96.8	DL-049
82	10/12/98	See Location Map "B"	-2'±	105.0	13.2	91.2	DL-049
83	10/14/98	See Location Map "B"	-2'±	112.1	12.2	97.6	DL-054
84	10/14/98	See Location Map "B"	-2'±	117.3	10.3	100+	DL-054
85	10/14/98	See Location Map "B"	-2'±	106.8	16.1	93.0	DL-054
86	10/14/98	See Location Map "B"	-2'±	118.0	12.1	100+	DL-054
87	10/14/98	See Location Map "B"	-2'±	104.9	12.8	91.3	DL-054
88	10/14/98	See Location Map "B"	-2'±	108.0	12.0	94.0	DL-054

Density (ASTM D2922) Moisture (ASTM D3017)

VAN DER HORST

GENERAL FILL TESTING

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

Project No.: VNC-98-029
Date: 10 27/98
Report No.: GF- 001

Material Source: As noted
Required Compaction: 90%

No.	Date Tested	Location	Elev.	Dry Density (pcf)	Moist. Content (%)	Compaction (%)	Proctor ID#
89	10/16/98	See Location Map "A"	-3'±	104.2	16.4	95.9	DL-049
90	10/16/98	See Location Map "A"	-3'±	103.8	18.3	95.5	DL-049
91	10/16/98	See Location Map "B"	-2'±	116.1	10.6	93.6	DL-049
92	10/16/98	See Location Map "B"	-2'±	112.4	11.2	90.6	DL-041
93	10/16/98	See Location Map "B"	-2'±	122.4	10.8	98.6	DL-041
94	10/16/98	See Location Map "B"	-3'±	118.1	13.1	95.2	DL-041
95	10/19/98	See Location Map "A"	-fsg'±	117.5	6.7	94.7	DL-041
96	10/19/98	See Location Map "A"	-fsg'±	119.0	8.6	95.9	DL-049
97	10/19/98	See Location Map "A"	-fsg'±	122.4	8.9	98.6	DL-049
98	10/19/98	See Location Map "A"	-fsg'±	123.8	7.7	99.8	DL-049
99	10/19/98	See Location Map "A"	-fsg'±	115.0	10.3	92.7	DL-049
100	10/19/98	See Location Map "A"	-fsg ±	119.2	8.4	96.1	DL-049
101	10/19/98	See Location Map "A"	-fsg'±	124.4	9.3	100+	DL-049
102	10/19/98	See Location Map "A"	-fsg'±	120.3	7.1	96.9	DL-049
103	10/19/98	See Location Map "A"	-fsg'±	116.7	7.4	94.0	DL-049
104	10/19/98	See Location Map "A"	-fsg'±	124.0	7.5	99.9	DL-049
105	10/20/98	See Location Map "A"	-fsg'±	118.2	8.3	95.2	DL-054
106	10/20/98	See Location Map "A"	-fsg'±	112.4	10.0	90.6	DL-054
107	10/20/98	See Location Map "A"	-fsg'±	115.5	8.4	93.0	DL-054
108	10/20/98	See Location Map "A"	-fsg'±	115.4	8.0	93.0	DL-054
109	10/20/98	See Location Map "A"	-1'±	115.4	8.9	93.0	DL-054
110	10/20/98	See Location Map "A"	-1'±	118.9	9.6	95.8	DL-054

Density (ASTM D2922) Moisture (ASTM D3017)

VAN DER HORST

GENERAL FILL TESTING

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

Project No.: VNC-98-029
Date: 10 27/98
Report No.: GF- 001

Material Source: As noted
Required Compaction: 90%

No.	Date Tested	Location	Elev.	Dry Density (pcf)	Moist. Content (%)	Compaction (%)	Proctor ID#
111	10/22/98	See Location Map "A"	fsg	120.6	10.6	98.3	DL-101
112	10/22/98	See Location Map "A"	fsg	124.2	9.4	100+	DL-101
113	10/22/98	See Location Map "A"	fsg	117.3	8.7	95.6	DL-101
114	10/22/98	See Location Map "B"	-2'±	113.6	9.5	91.5	DL-101
115	10/22/98	See Location Map "B"	-2'±	116.7	9.1	95.1	DL-101
116	10/22/98	See Location Map "B"	-2'±	116.4	10.5	94.9	DL-101
117	10/22/98	See Location Map "B"	-2'±	118.8	10.3	96.8	DL-101
118	10/22/98	See Location Map "B"	-2'±	120.0	10.0	97.8	DL-101
119	10/23/98	See Location Map "B"	-1'±	121.1	11.2	98.7	DL-101
120	10/23/98	See Location Map "B"	-1'±	120.4	9.1	98.1	DL-101
121	10/23/98	See Location Map "B"	-1'±	117.5	11.3	95.8	DL-101
122	10/23/98	See Location Map "B"	-1' ±	112.6	9.8	91.8	DL-101
123	10/23/98	See Location Map "B"	-1'±	117.2	9.4	95.5	DL-101
124	10/23/98	See Location Map "B"	-1'±	116.4	8.0	94.9	DL-101
125	10/23/98	See Location Map "B"	-1'±	119.3	7.7	97.2	DL-101
126	10/23/98	See Location Map "B"	-1'±	124.3	7.9	100+	DL-101
127	10/23/98	See Location Map "B"	-1'±	121.8	8.0	99.3	DL-101
128	10/23/98	See Location Map "B"	-1'±	121.5	7.1	99.0	DL-101
129	10/24/98	See Location Map "B"	-1'±	115.2	7.4	93.9	DL-101
130	10/24/98	See Location Map "B"	-1'±	118.2	8.2	96.3	DL-101
131	10/24/98	See Location Map "B"	-1'±	118.5	8.0	96.6	DL-101
132	10/24/98	See Location Map "B"	-1'±	121.6	8.9	99.1	DL-101

Density (ASTM D2922) Moisture (ASTM D3017)

VAN DER HORST

GENERAL FILL TESTING

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

Project No.: VNC-98-029
Date: 10/27/98
Report No.: GF- 001

Material Source: As noted
Required Compaction: 90%

No.	Date Tested	Location	Elev.	Dry Density (pcf)	Moist. Content (%)	Compaction (%)	Proctor ID#
133	10/24/98	See Location Map "B"	-fsg'±	114.2	8.3	99.4	DL-054
134	10/24/98	See Location Map "B"	-fsg'±	116.4	9.3	100+	DL-054
135	10/24/98	See Location Map "B"	-fsg'±	118.7	9.1	100+	DL-054
136	10/24/98	See Location Map "B"	-fsg'±	108.8	8.6	94.7	DL-054
137	10/24/98	See Location Map "B"	-fsg'±	108.2	8.8	94.2	DL-054
138	10/24/98	See Location Map "B"	-fsg'±	107.1	10.4	93.2	DL-054
139	10/24/98	See Location Map "B"	-fsg'±	114.4	8.7	99.6	DL-054
140	10/24/98	See Location Map "B"	-fsg'±	109.2	9.3	95.0	DL-054
141	10/24/98	See Location Map "B"	-fsg'±	11.6	9.4	97.1	DL-054
142	10/24/98	See Location Map "B"	-fsg'±	116.3	10.6	100+	DL-054
143	10/24/98	See Location Map "A"	-fsg'±	118.5	9.3	100+	DL-054
144	10/29/98	See Location Map "A"	-fsg'±	118.2	8.3	100+	DL-054
145	10/29/98	See Location Map "A"	-fsg'±	118.0	10.7	100+	DL-054
146	10/29/98	See Location Map "B"	-fsg'±	108.9	11.2	94.8	DL-054
147	10/29/98	See Location Map "B"	-fsg'±	111.2	10.6	96.8	DL-054
148	10/29/98	See Location Map "B"	-fsg'±	116.2	7.9	100+	DL-054
149	10/29/98	See Location Map "B"	-fsg'±	114.9	8.2	100.0	DL-054
150	10/29/98	See Location Map "B"	-fsg'±	110.2	9.1	95.9	DL-054
151	10/29/98	See Location Map "B"	-fsg'±	112.6	9.6	98.0	DL-054
152	10/29/98	See Location Map "B"	-fsg'±	115.2	8.8	100+	DL-054
153	10/29/98	See Location Map "B"	-fsg'±	113.7	9.7	99.0	DL-054
154	10/29/98	See Location Map "B"	-fsg'±	109.6	10.4	95.4	DL-054

Density (ASTM D2922) Moisture (ASTM D3017)

VAN DER HORST

GENERAL FILL TESTING

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

Project No.: VNC-98-029
Date: 10 27/98
Report No.: GF- 001

Material Source: As noted
Required Compaction: 90%

No.	Date Tested	Location	Elev.	Dry Density (pcf)	Moist. Content (%)	Compaction (%)	Proctor ID#
155	10/26/98	See Location Map "B"	fsg+/-	117.2	8.9	100+	DL-054
156	11/7/98	See Location Map "C"	fsg+/-	111.0	14.6	95.8	DL-049
157	11/7/98	See Location Map "C"	fsg +/-	112.4	16.2	97.0	DL-049
158	11/8/98	See Location Map "C"	fsg +/-	124.3	8.0	100+	DL-049
159	11/8/98	See Location Map "C"	-1' +/-	116.4	8.8	100+	DL-049
160	11/8/98	See Location Map "C"	-2' +/-	115.8	9.0	99.9	DL-049
161	11/8/98	See Location Map "C"	fsg +/-	199.9	9.3	100+	DL-049
162	11/8/98	See Location Map "C"	-1' +/-	116.9	6.8	100+	DL-049
163	11/8/98	See Location Map "C"	-2' +/-	114.9	9.0	99.1	DL-049
164	11/8/98	See Location Map "C"	-1' +/-	115.6	8.2	99.7	DL-049
165	11/8/98	See Location Map "C"	-2' +/-	112.8	9.3	97.3	DL-049

Density (ASTM D2922) Moisture (ASTM D3017)

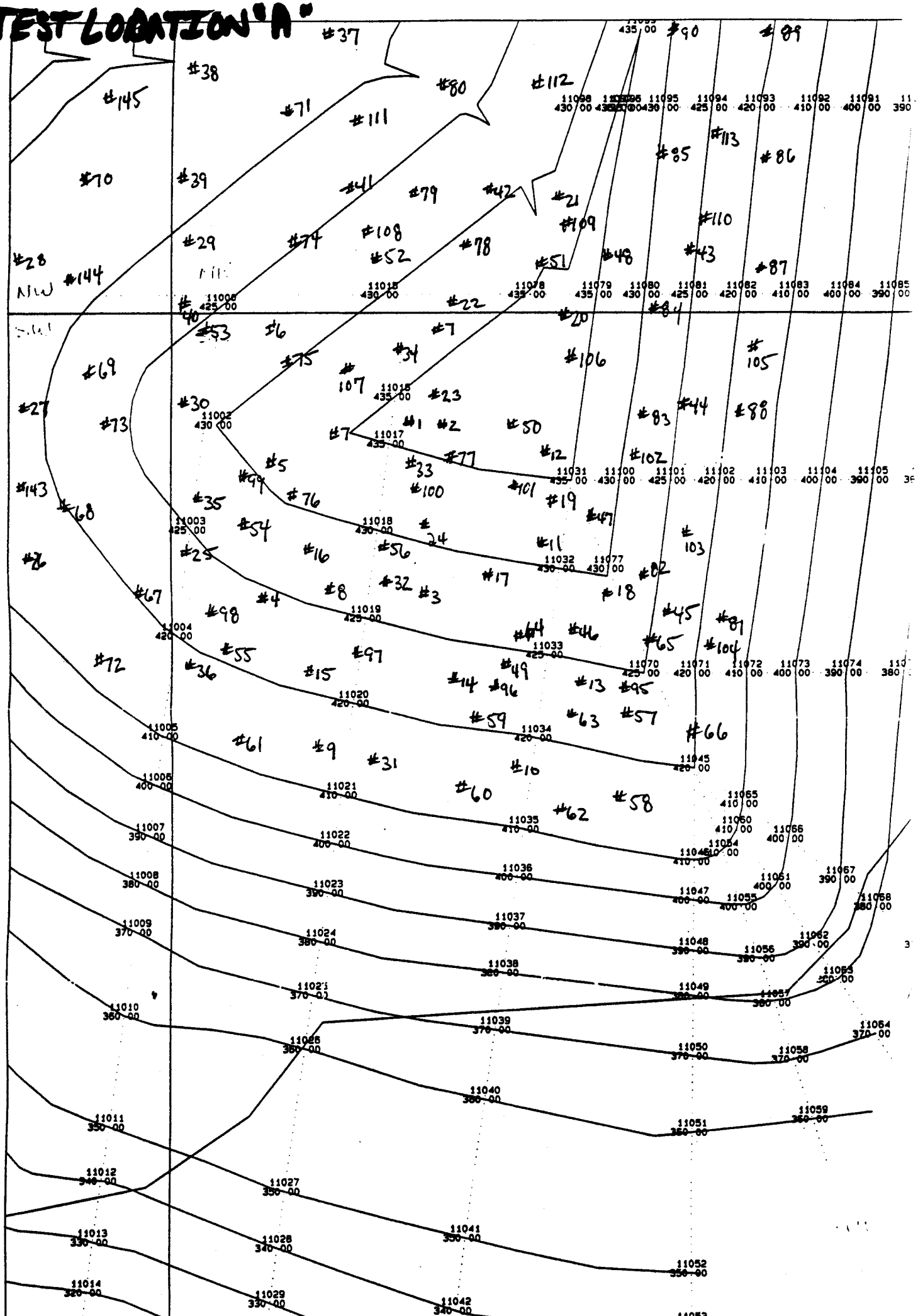
VAN DER HORST

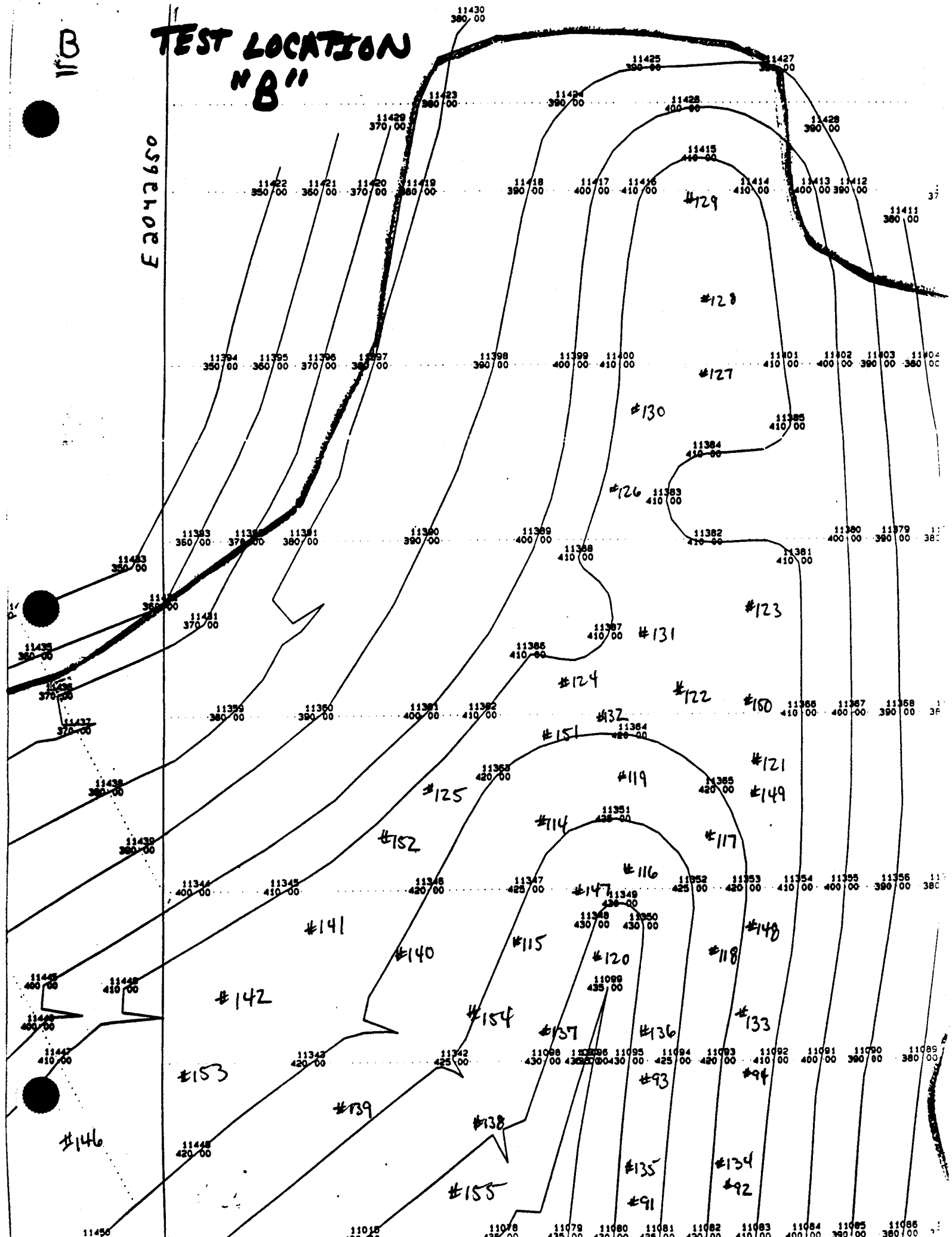
Appendix B

In-place Density/Moisture Test Location Plans

A

TEST LOCATION "A"




B
TEST LOCATION
"B"
E 20 43 650
#129
#128
#127
#130
#126
#123
#131
#124
#122
#150
#132
#151
#121
#119
#149
#125
#114
#117
#152
#116
#147
#148
#141
#115
#140
#120
#118
#142
#154
#137
#136
#133
#153
#93
#94
#139
#138
#146
#135
#134
#155
#92
#91

SW QUADRANT
Test Location "C"
SW QUADRANT
AC
E 2042650
N 8107150
35
36
37
38
39
40
41
42
43
44
45
46
47
48
2 ft
1 ft
3 ft
0 ft
1.5 ft
3.5 ft

VAN DER HORST

Appendix C

Standard Proctor Summary Table

Proctors Curves
Grain-size Distribution Curves

VAN DER HORST

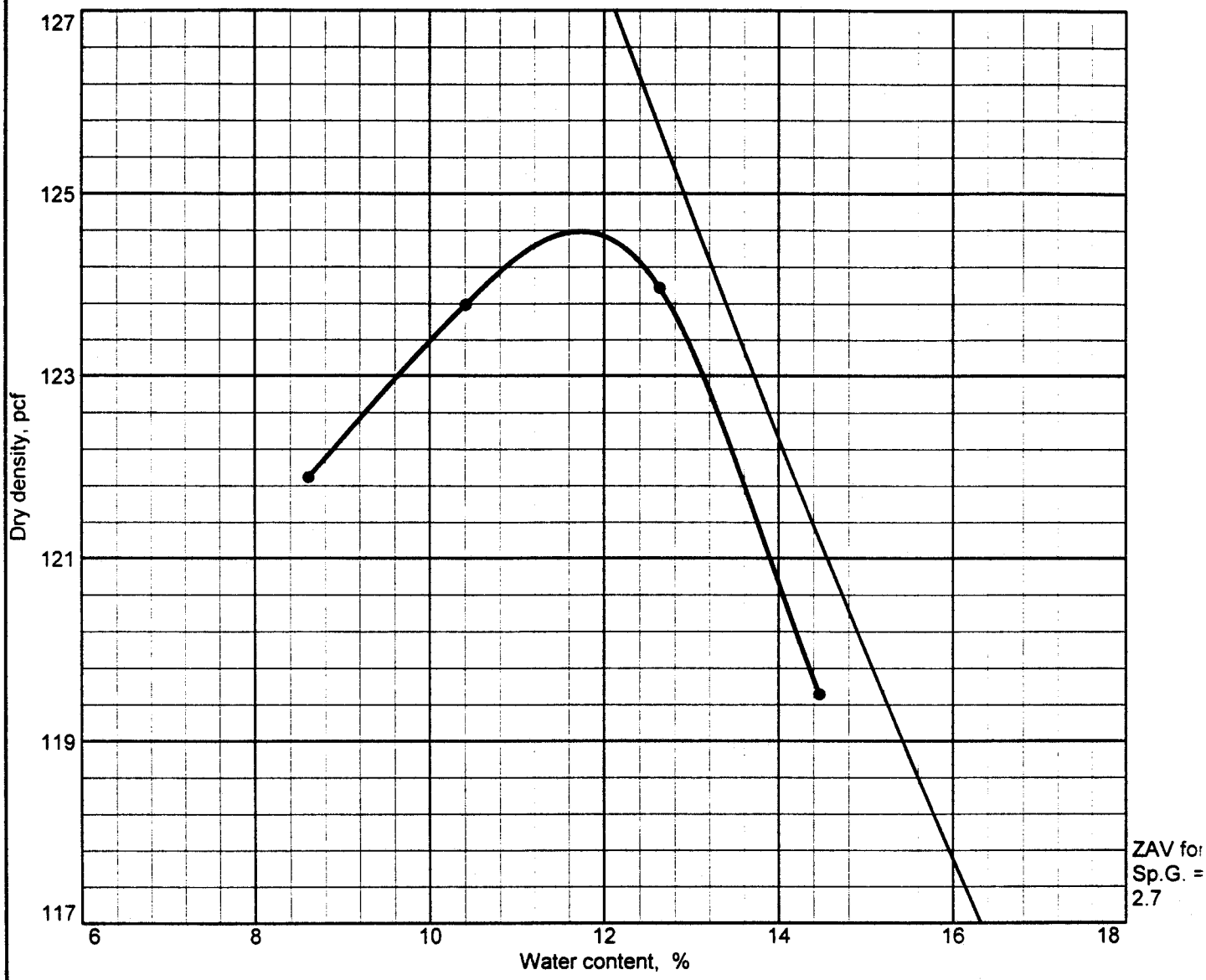
Durham Landfill Closure

VNC-98-029
November 6, 1998

General Fill Standard Proctor Summary

Sample	Date Sampled	Source	Max DD (pcf)	% Moist.
DL-001	9/1/98	On-site Stockpile (staging area)	128.0	10.6
DL-004	9/3/98	On-site Borrow Pit	124.9	11.0
DL-005	9/3/98	On-site Borrow Pit	109.2	16.9
DL-006	9/3/98	On-site Borrow Pit	109.5	18.0
DL-007	9/3/98	On-site Borrow Pit	121.2	10.9
DL-008	9/4/98	On-site Borrow Pit	116.3	12.5
DL-012	9/5/98	On-site Borrow Pit	115.8	14.4
DL-015	9/5/98	On-site Borrow Pit	106.5	17.7
DL-016	9/5/98	On-site Borrow Pit	107.7	17.7
DL-018	9/5/98	On-site Stockpile (staging area)	128.2	9.8
DL-021	9/9/98	On-site Borrow Pit	122.3	10.5
DL-029	9/11/98	On-site Borrow Pit	111.3	15.6
DL-030	9/18/98	On-Site Borrow Pit	121.3	9.2
DL-040	9/24/98	On-site Borrow Pit	123.4	10.8
DL-041	10/2/98	On-site Borrow Pit	124.1	9.9
DL-49	10/6/98	On-site Borrow - Transfer Station	115.9	13.7
DL-051	10/12/98	On-site Borrow - Transfer Station	118.2	13.3
DL-054	10/12/98	On-Site Borrow	114.9	13.5
DL-067	10/16/98	On-site Borrow	108.7	19.4
DL-099	10/21/98	On-site Borrow	121.6	12.0
DL-100	10/21/98	On-site Borrow	124.9	9.9
DL-101	10/21/98	On-site Borrow	122.7	11.2
DL-102	10/21/98	On-site Borrow	122.7	10.5
DL-103	10/21/98	On-site Borrow	120.8	12.1

COMPACTION TEST REPORT



Test specification: ASTM D 698-91 Procedure C Standard
Oversize correction applied to final results

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
	CL		13.8		40	21	10.8	62.9

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 128.0 pcf Optimum moisture = 10.6 %	Reddish Brown Sandy lean clay with gravel

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.
Project: Durham Landfill Closure
● **Location:** On-site Stockpile (Staging Area)

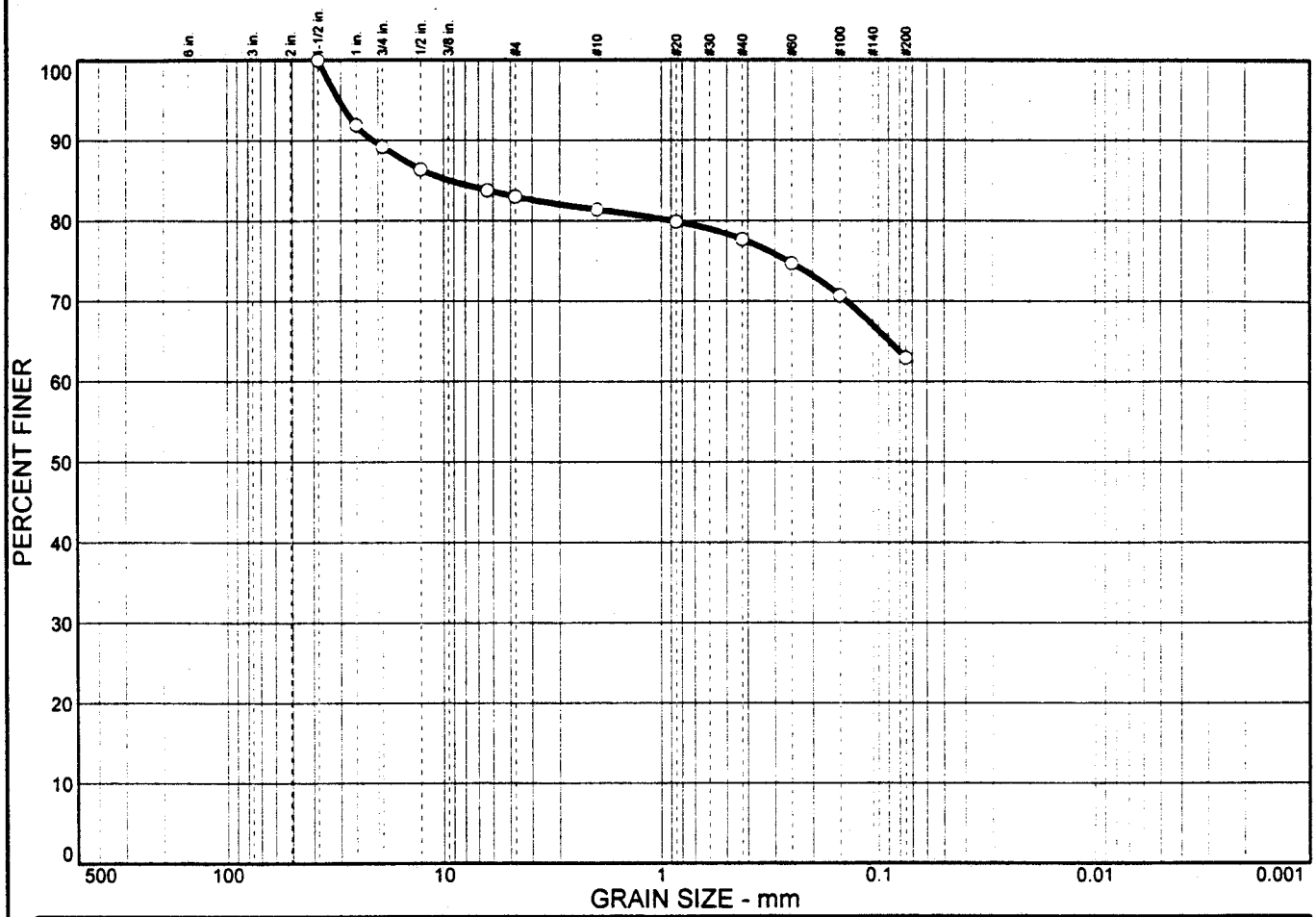
Remarks:
Sampled from on-site stockpile for use as General Fill

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	17.0	20.1	62.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	91.9		
.75 in.	89.2		
.5 in.	86.4		
.25 in.	83.8		
#4	83.0		
#10	81.4		
#20	79.9		
#40	77.7		
#60	74.7		
#100	70.7		
#200	62.9		

* (no specification provided)

Soil Description

Reddish Brown Sandy lean clay with gravel

Atterberg Limits

PL= 19 LL= 40 PI= 21

Coefficients

D_{85}= 9.38 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

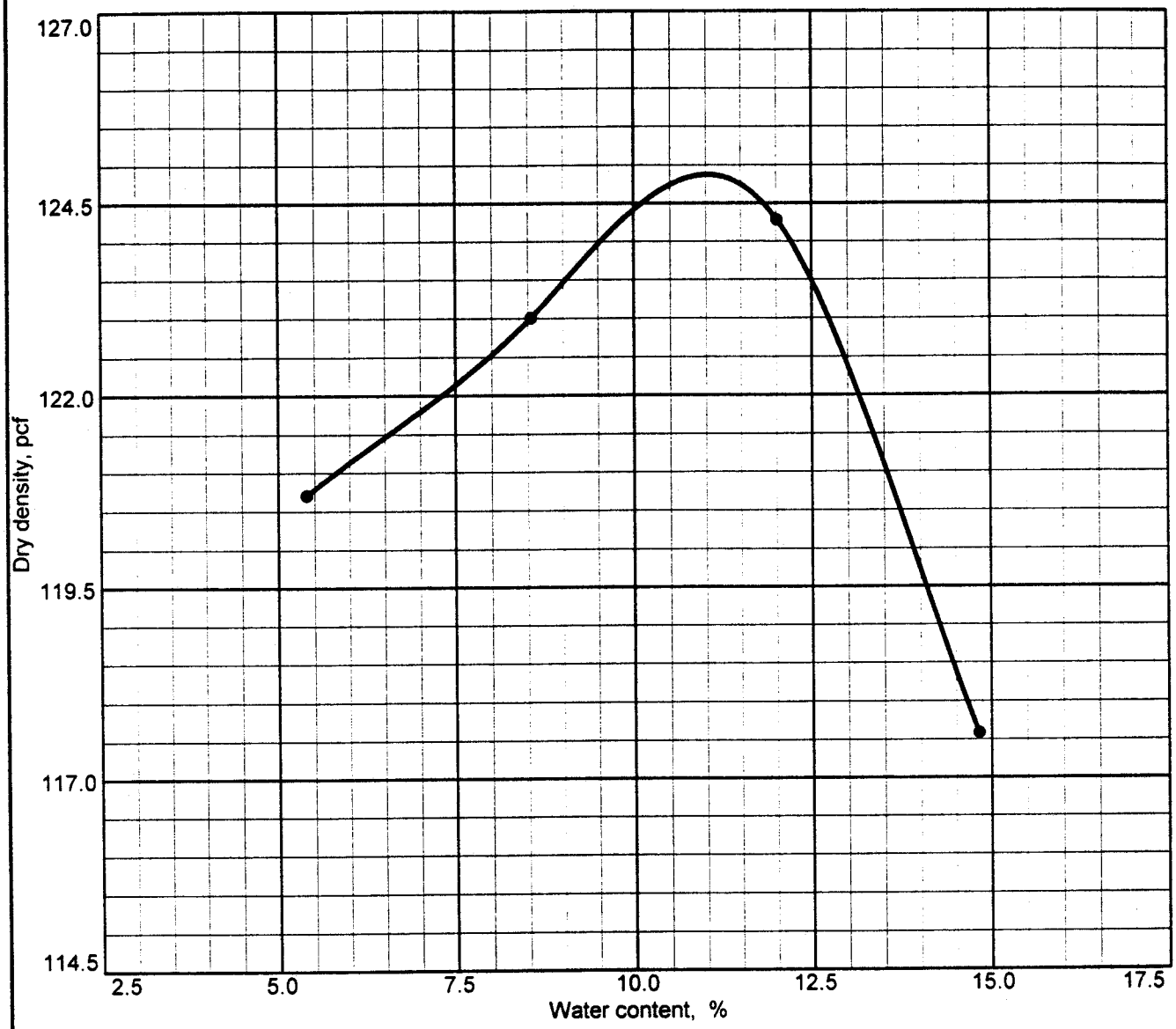
Sampled from on-site Stockpile (Staging Area) on 8/28/98.

Sample No.: DL-001 **Source of Sample:** on-site Stockpile **Date:** 9/9/98
Location: On-site Stockpile (Staging Area) **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							10.2	43.7

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 124.9 pcf Optimum moisture = 11.0 %	Dark reddish brown sandy SILT, little Gravel

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.
Project: Durham Landfill Closure
● **Location:** On-site Borrow Pit

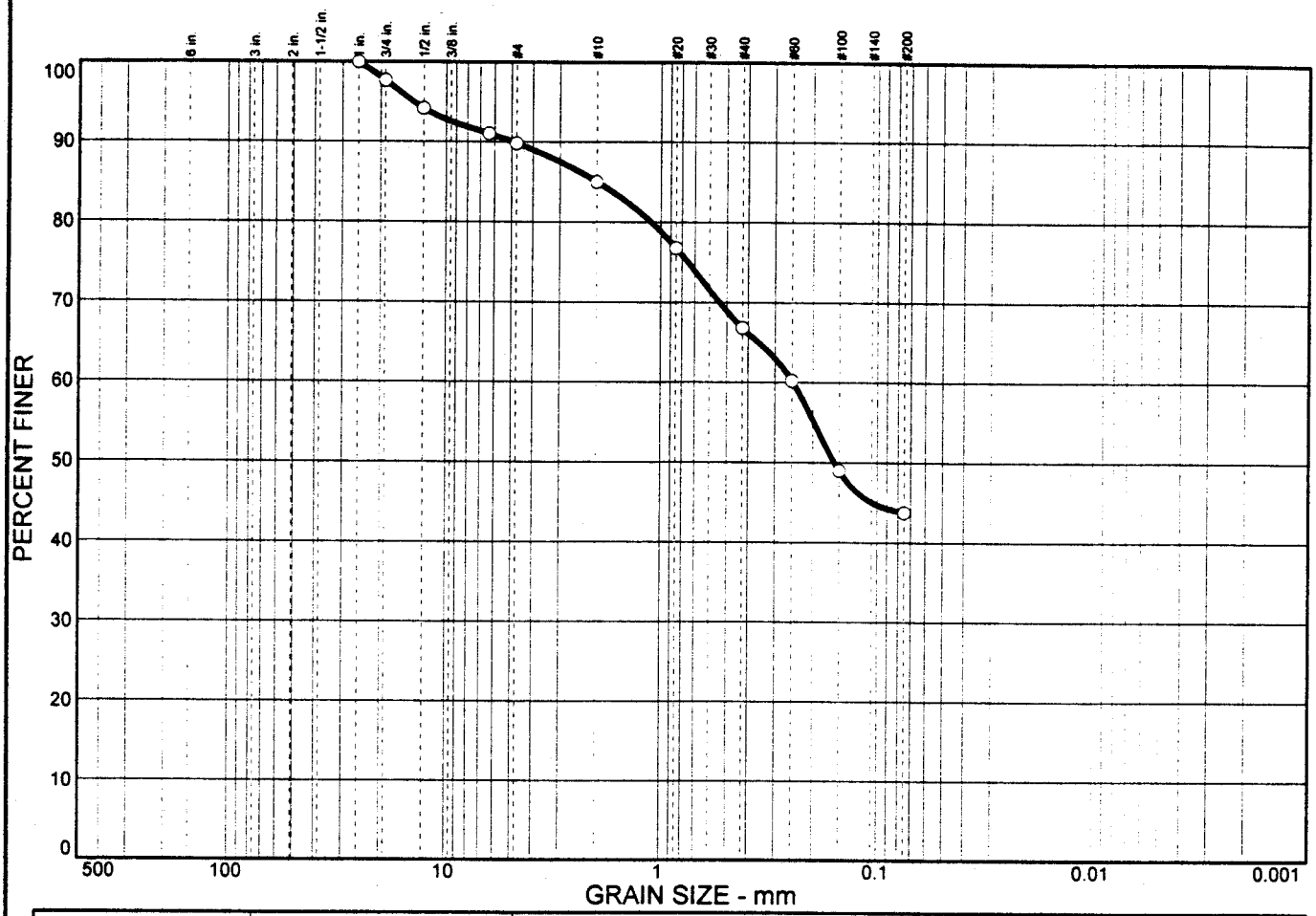
Remarks:
DL-004, Sampled from on-site Borrow Pit on 9/3/98

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	10.2	46.1	43.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	97.7		
.5 in.	94.2		
.25 in.	91.0		
#4	89.8		
#10	85.0		
#20	76.8		
#40	66.8		
#60	60.2		
#100	49.0		
#200	43.7		

* (no specification provided)

Soil Description

Dark reddish brown sandy SILT, little Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.00 D_{60}= 0.247 D_{50}= 0.158
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

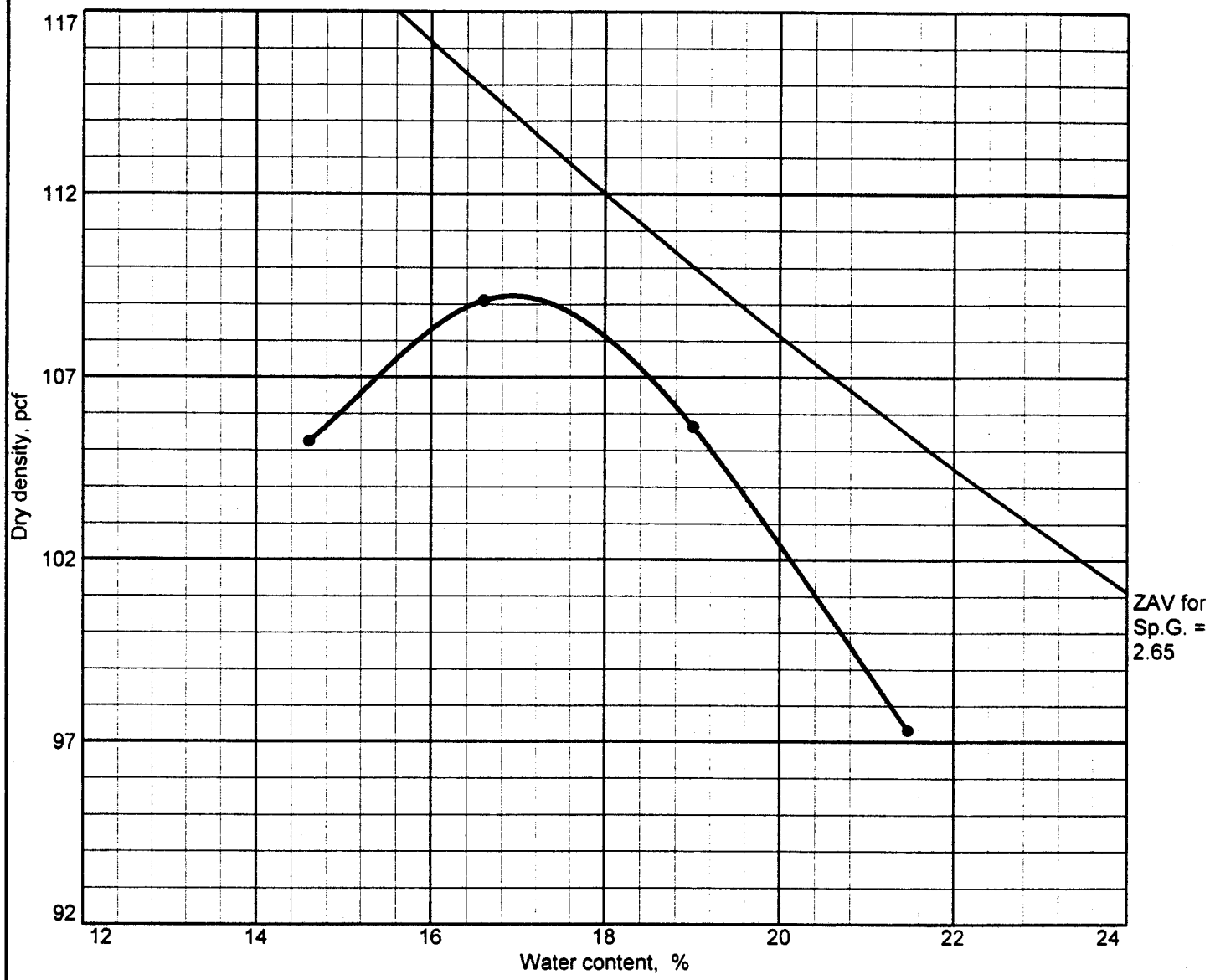
DL-004, Sampled from on-site borrow pit on 9/3/98

Sample No.: DL-004 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							8.3	48.6

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 109.2 pcf Optimum moisture = 16.9 %	Dark reddish brown clayey SILT, little sand and gravel

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

● **Location:** On-site Borrow Pit

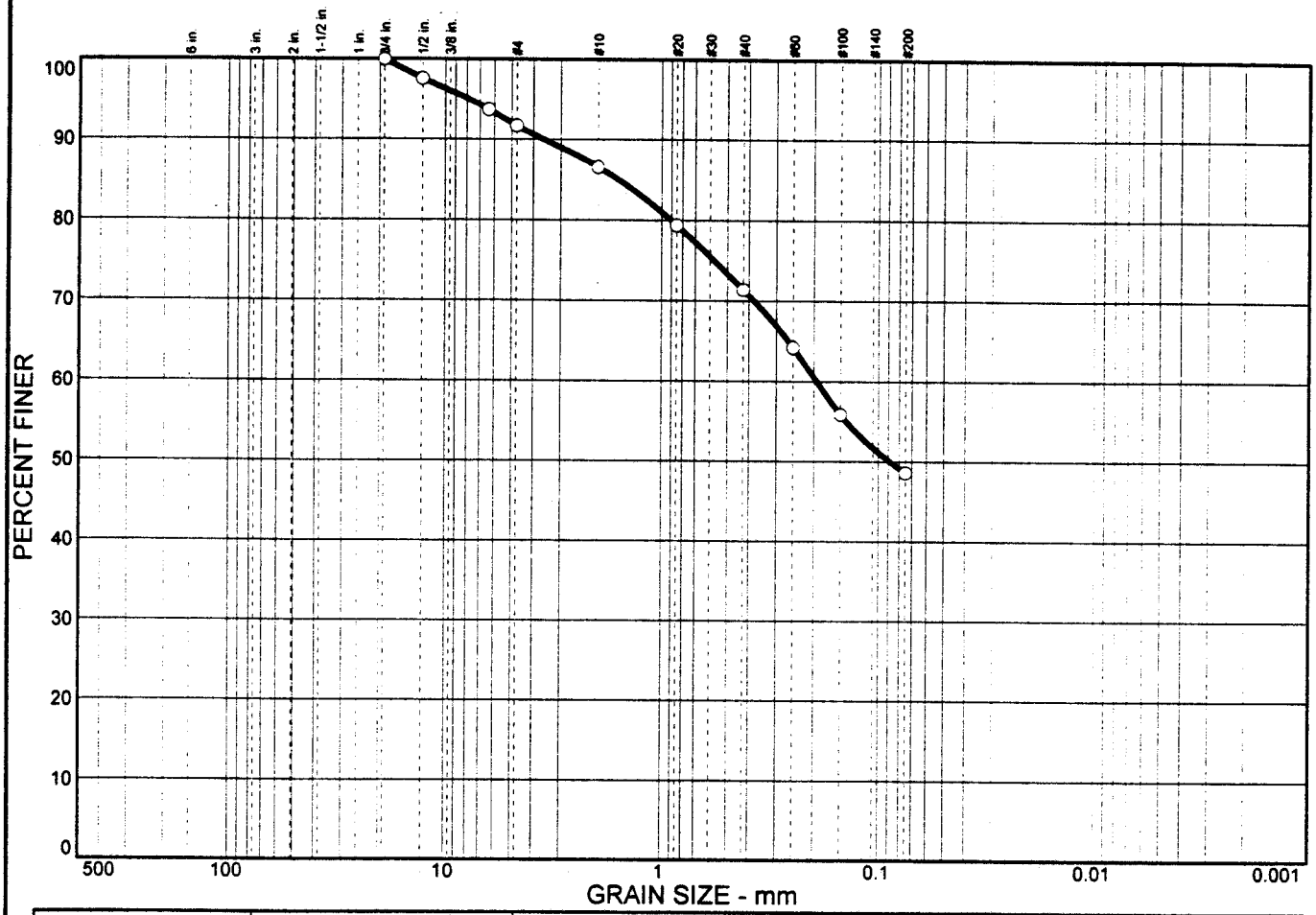
Remarks:
DL-005, Sampled from on-site Borrow Pit on 9/3/98

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.3	43.1	48.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	97.6		
.25 in.	93.7		
#4	91.7		
#10	86.6		
#20	79.4		
#40	71.4		
#60	64.2		
#100	55.9		
#200	48.6		

* (no specification provided)

Soil Description

Dark reddish brown clayey SILT, little sand and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.59 D_{60}= 0.194 D_{50}= 0.0881
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

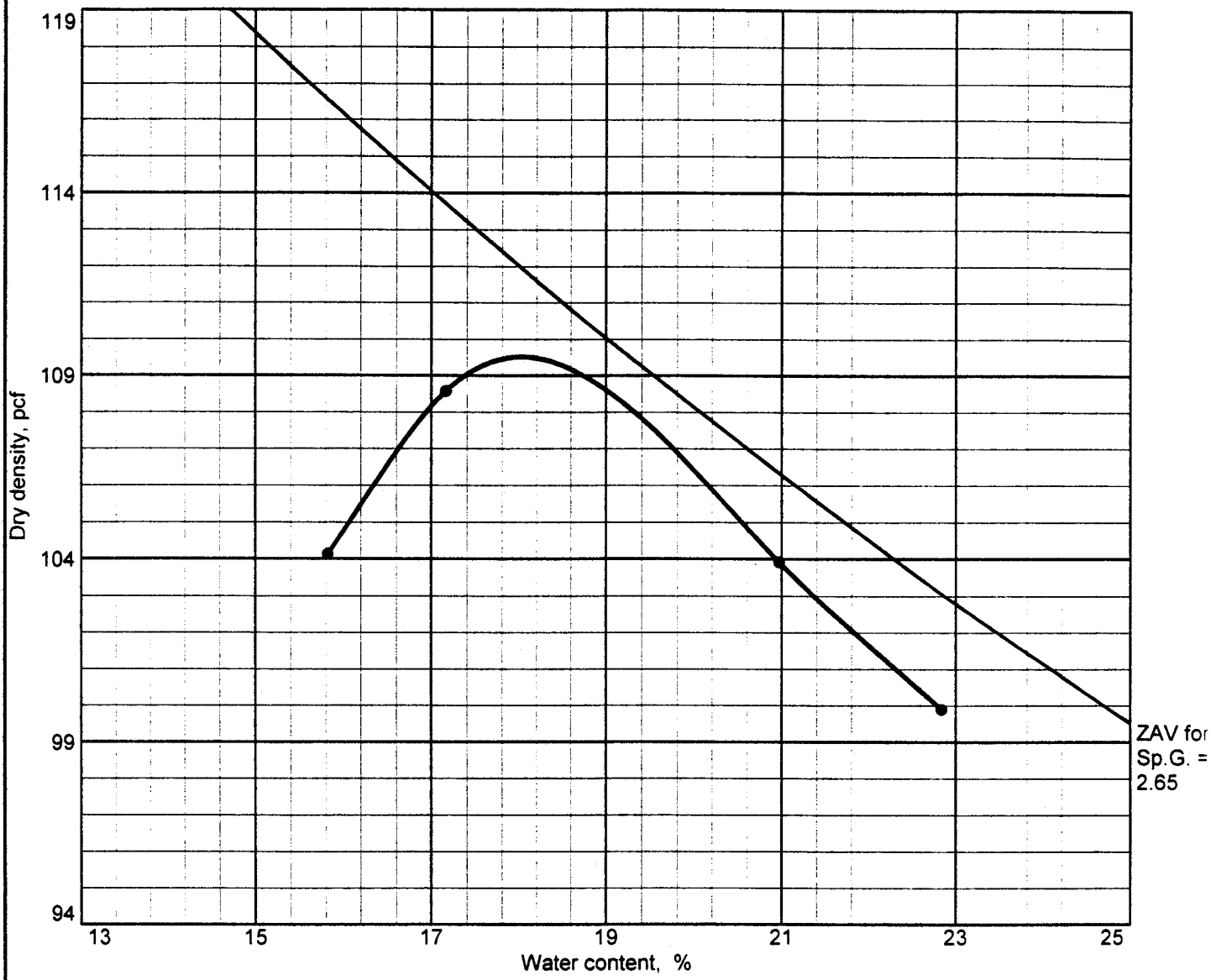
DL-005, Sampled from on-site borrow pit on 9/3/98

Sample No.: DL-005 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							4.2	54.9

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 109.5 pcf Optimum moisture = 18.0 %	Dark reddish brown clayey SILT, little sand and gravel

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.
Project: Durham Landfill Closure
● **Location:** On-site Borrow Pit

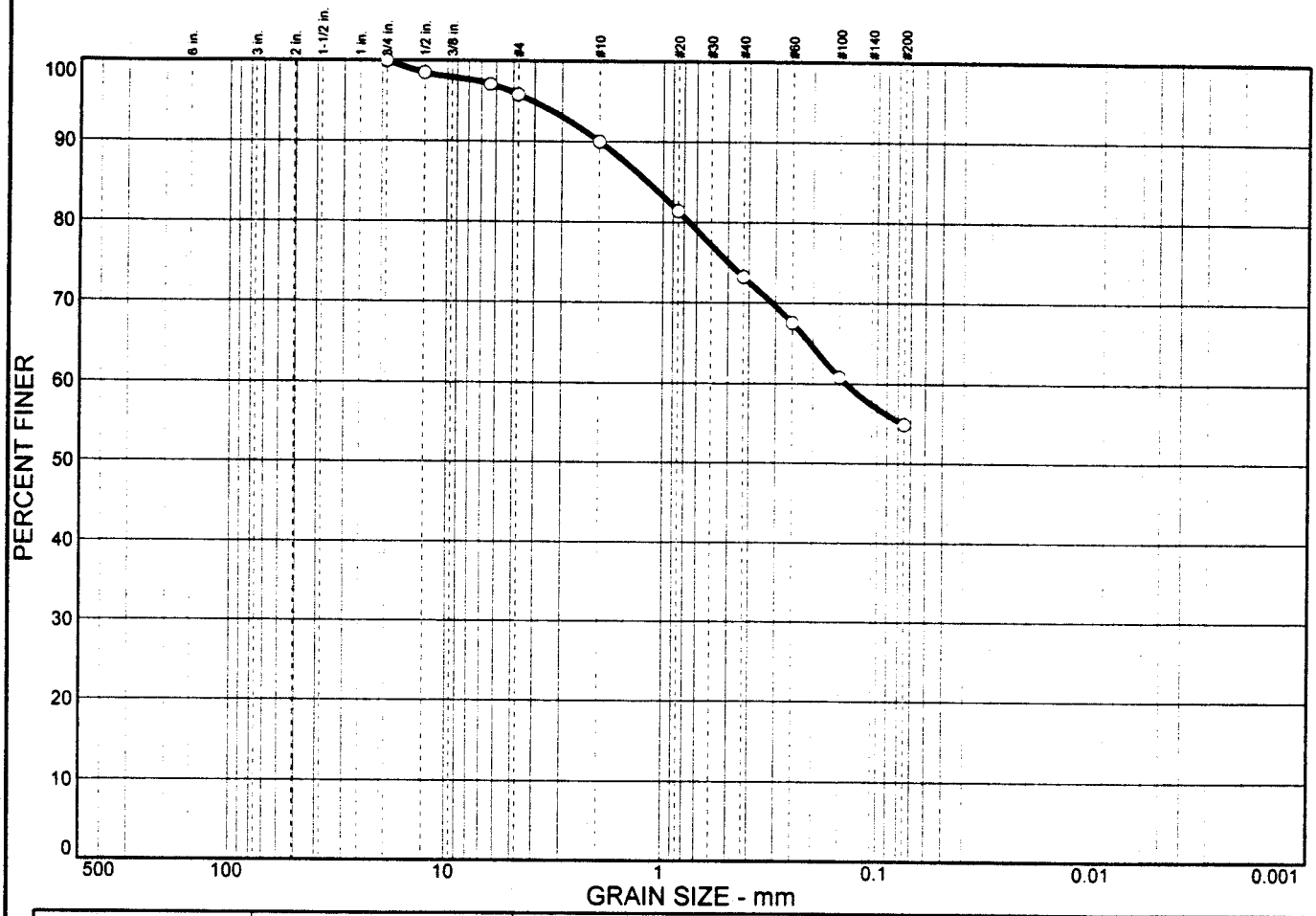
Remarks:
DL-006, Sampled from on-site Borrow Pit on 9/3/98

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.2	40.9	54.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	98.5		
.25 in.	97.1		
#4	95.8		
#10	90.0		
#20	81.4		
#40	73.2		
#60	67.5		
#100	60.8		
#200	54.9		

* (no specification provided)

Soil Description

Dark reddish brown clayey SILT, little sand and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.18 D_{60}= 0.140 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

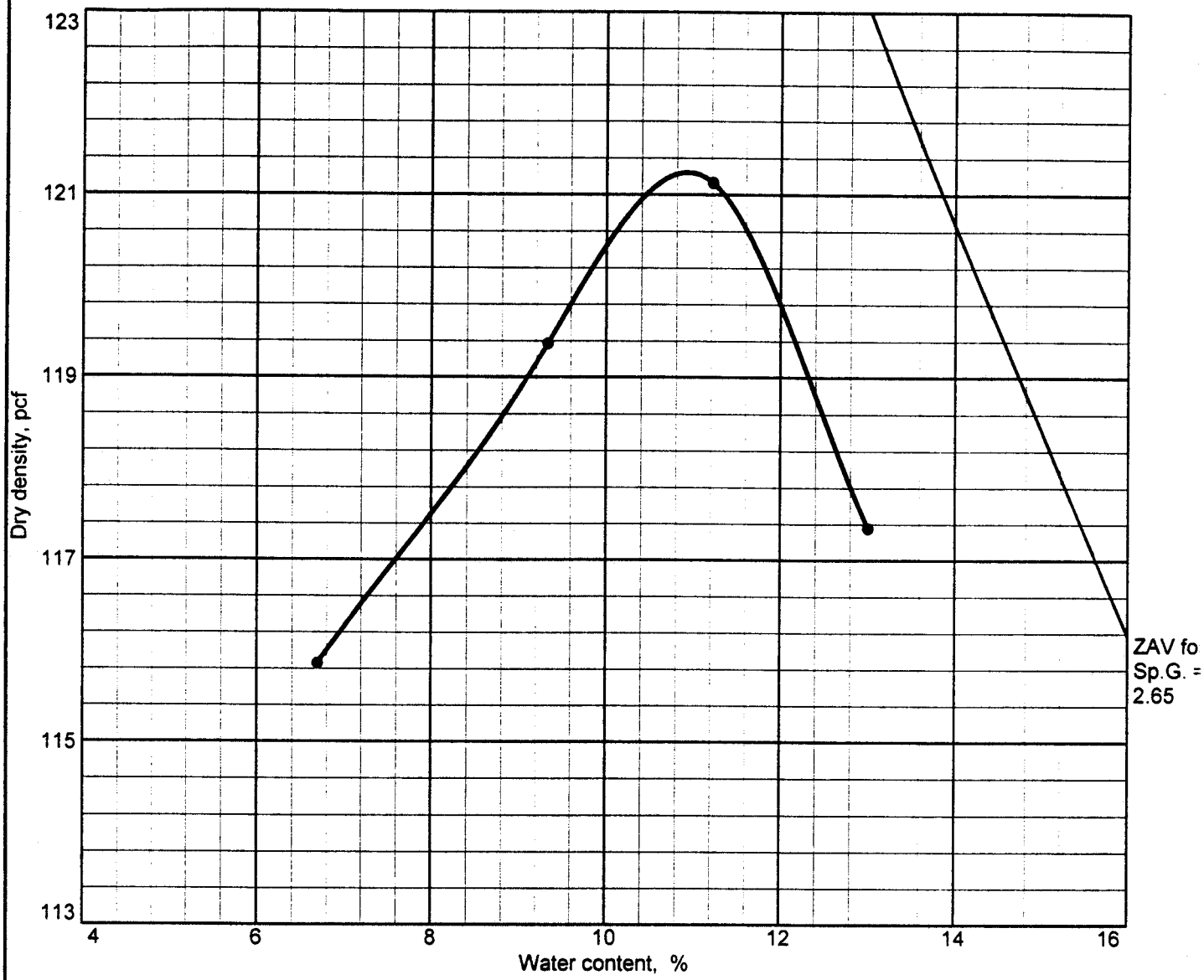
DL-006, Sampled from on-site borrow pit on 9/3/98

Sample No.: DL-006 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							9.4	40.9

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 121.2 pcf Optimum moisture = 10.9 %	Dark reddish brown silty SAND, little gravel

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

● **Location:** On-site Borrow Pit

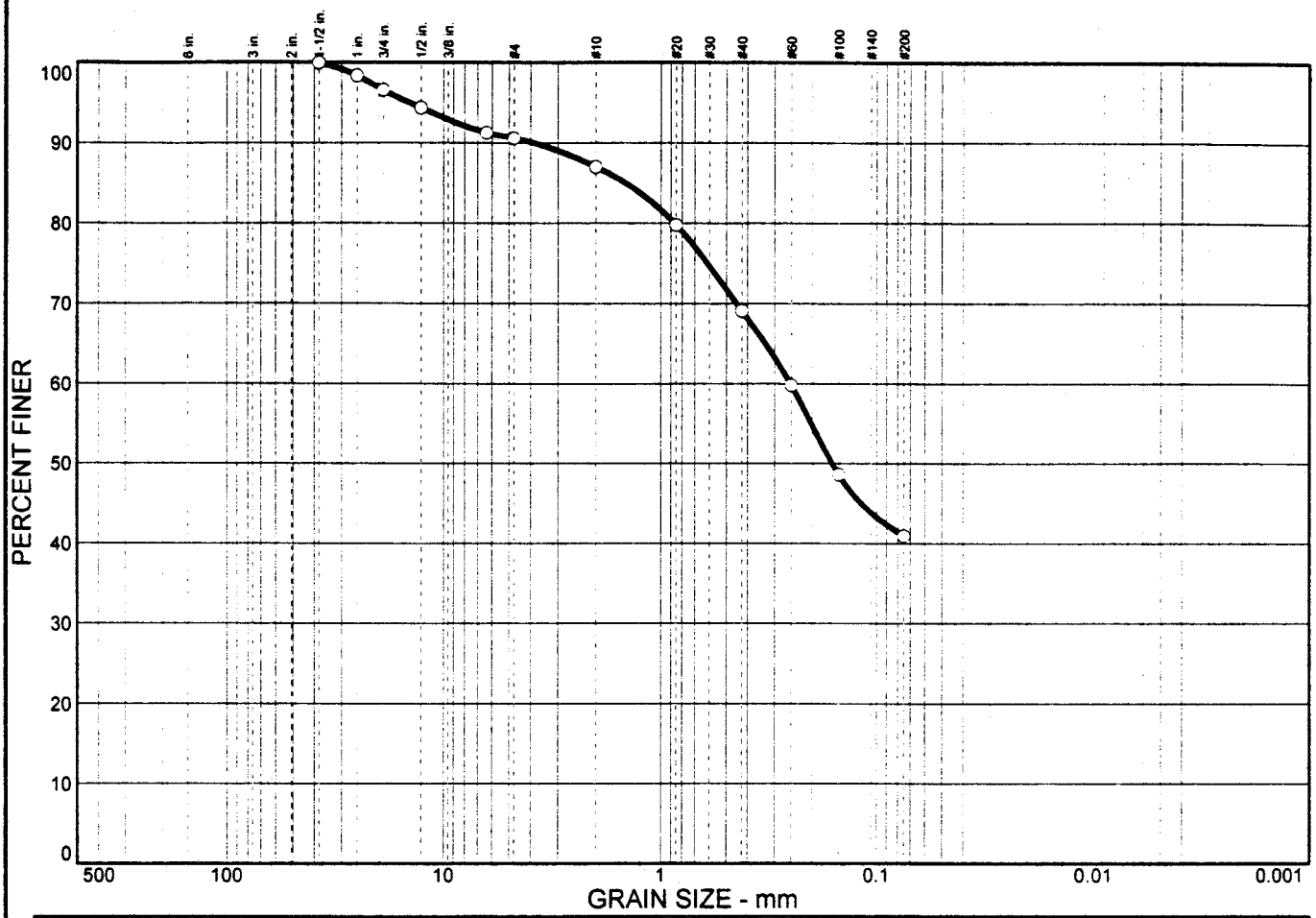
Remarks:
DL-007, Sampled from on-site Borrow Pit or
9/3/98

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	9.4	49.7	40.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	98.4		
.75 in.	96.6		
.5 in.	94.4		
.25 in.	91.3		
#4	90.6		
#10	87.0		
#20	79.8		
#40	69.1		
#60	59.8		
#100	48.6		
#200	40.9		

* (no specification provided)

Soil Description

Dark reddish brown silty SAND. little gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.46 D_{60}= 0.252 D_{50}= 0.161
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

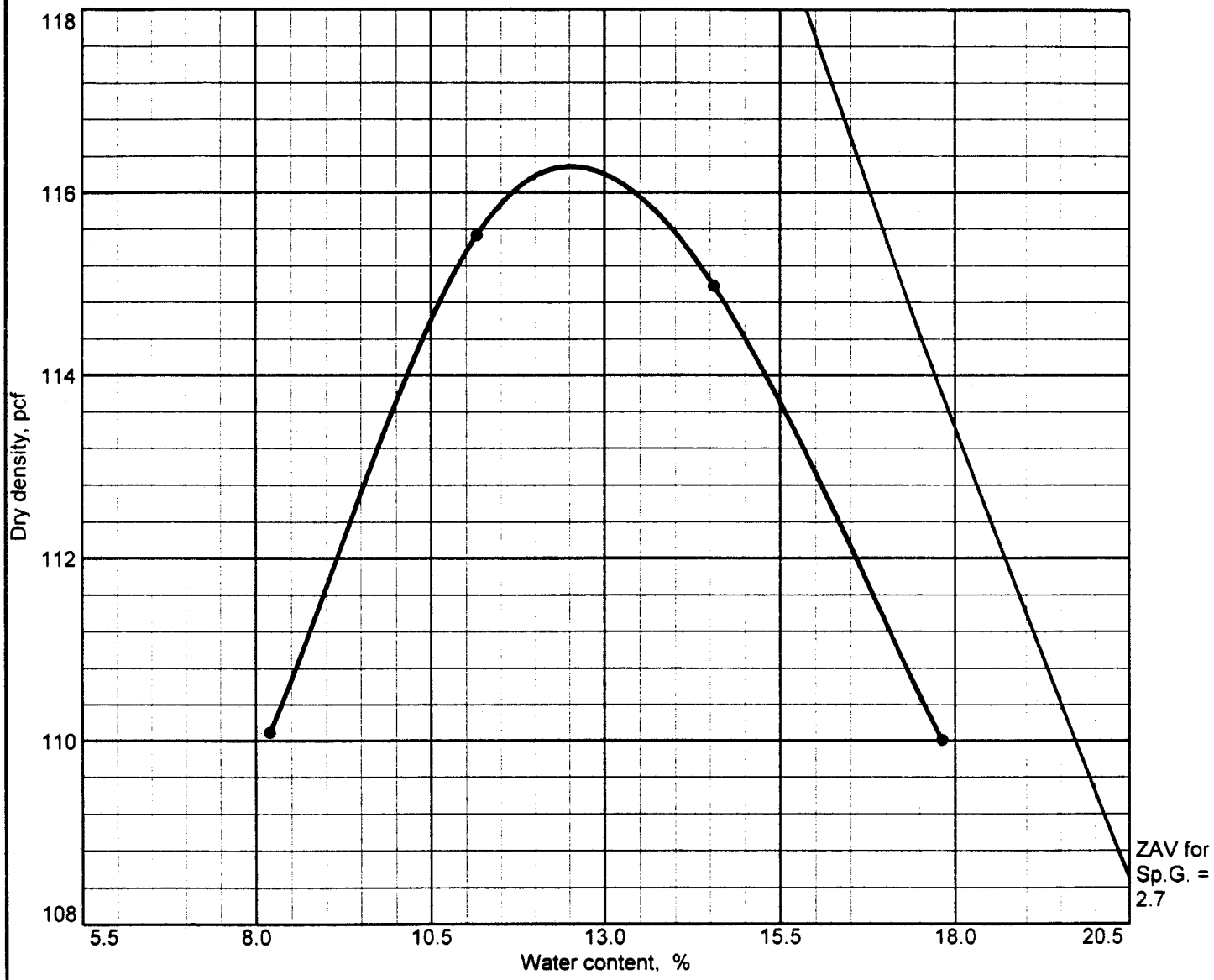
DL-007, Sampled from on-site borrow pit on 9/3/98

Sample No.: DL-007 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							2.8	56.6

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 116.3 pcf Optimum moisture = 12.5 %	Dark Red Lean clayey sand, little Gravel and Sand

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.
Project: Durham Landfill Closure
● **Location:** On-site Borrow Pit

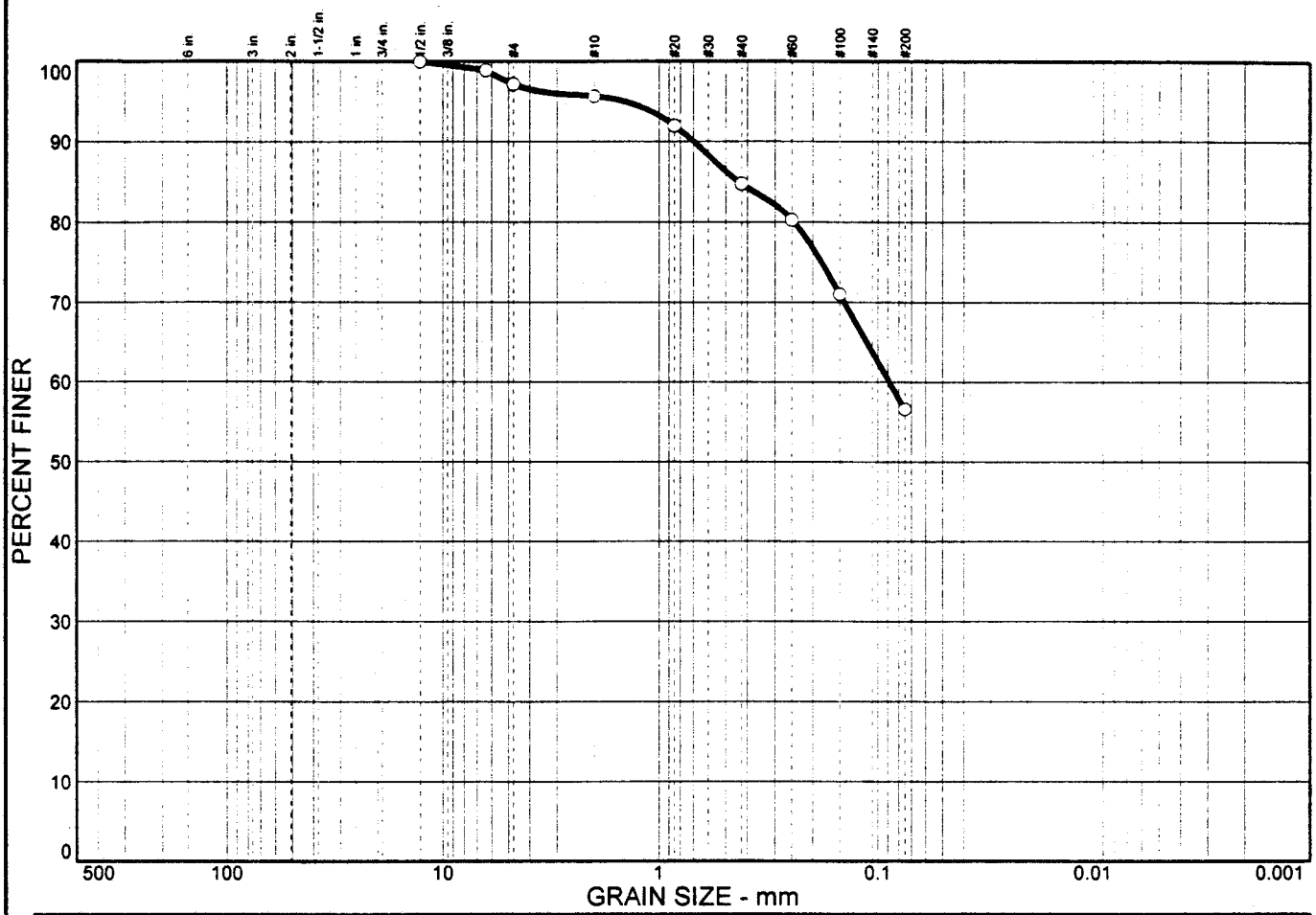
Remarks:
DL-082, Sampled from on-site borrow for General Fill on 9/4/98

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.8	40.6	56.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	98.9		
#4	97.2		
#10	95.7		
#20	92.0		
#40	84.8		
#60	80.3		
#100	71.0		
#200	56.6		

* (no specification provided)

Soil Description

Dark Red Lean clayey sand, little Gravel and Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.435 D_{60}= 0.0884 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

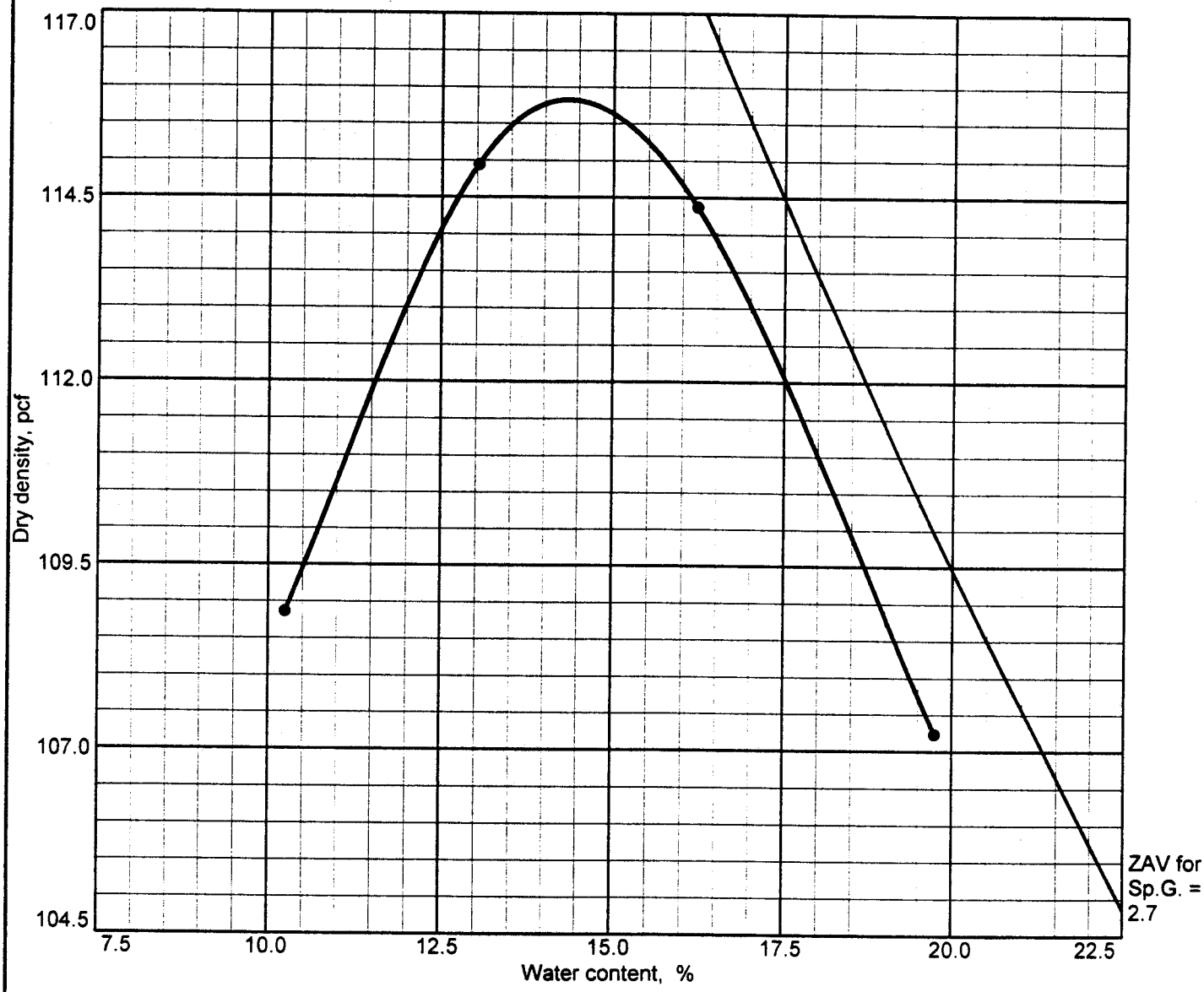
DL-008, Sampled for General Fill from on sit Borrow area on 94/98

Sample No.: DL-008 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							3.2	73.7

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 115.8 pcf Optimum moisture = 14.4 %	Dark Red Lean clay with sand, little Gravel

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

● **Location:** On-site Stockpile

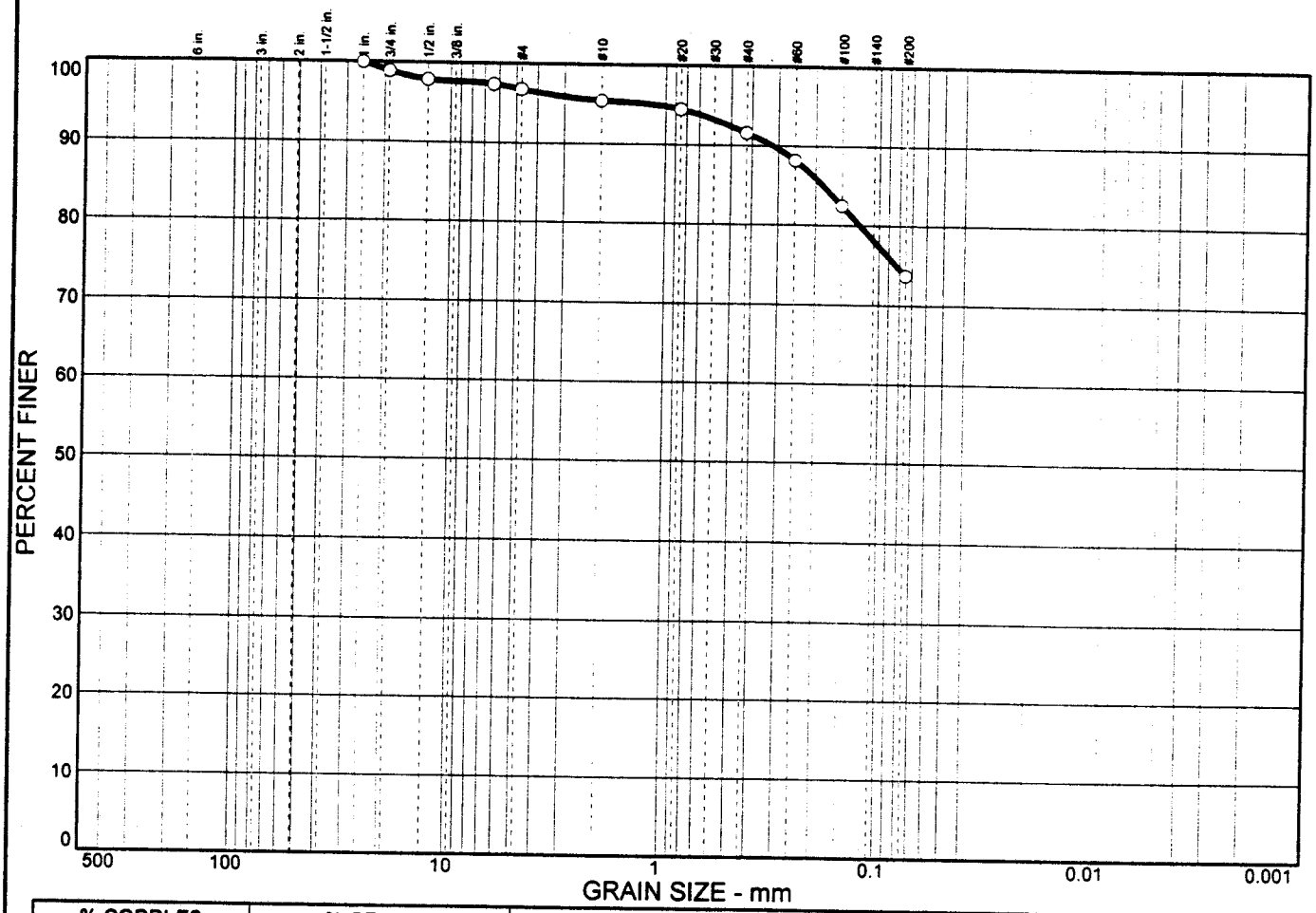
Remarks:
DL-012, Sampled from on-site stockpile on 5/98

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.2	23.1	73.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	98.9		
.5 in.	97.9		
.25 in.	97.4		
#4	96.8		
#10	95.5		
#20	94.5		
#40	91.6		
#60	88.2		
#100	82.5		
#200	73.7		

* (no specification provided)

Soil Description

Dark Red Lean clay with sand. little Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.184 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

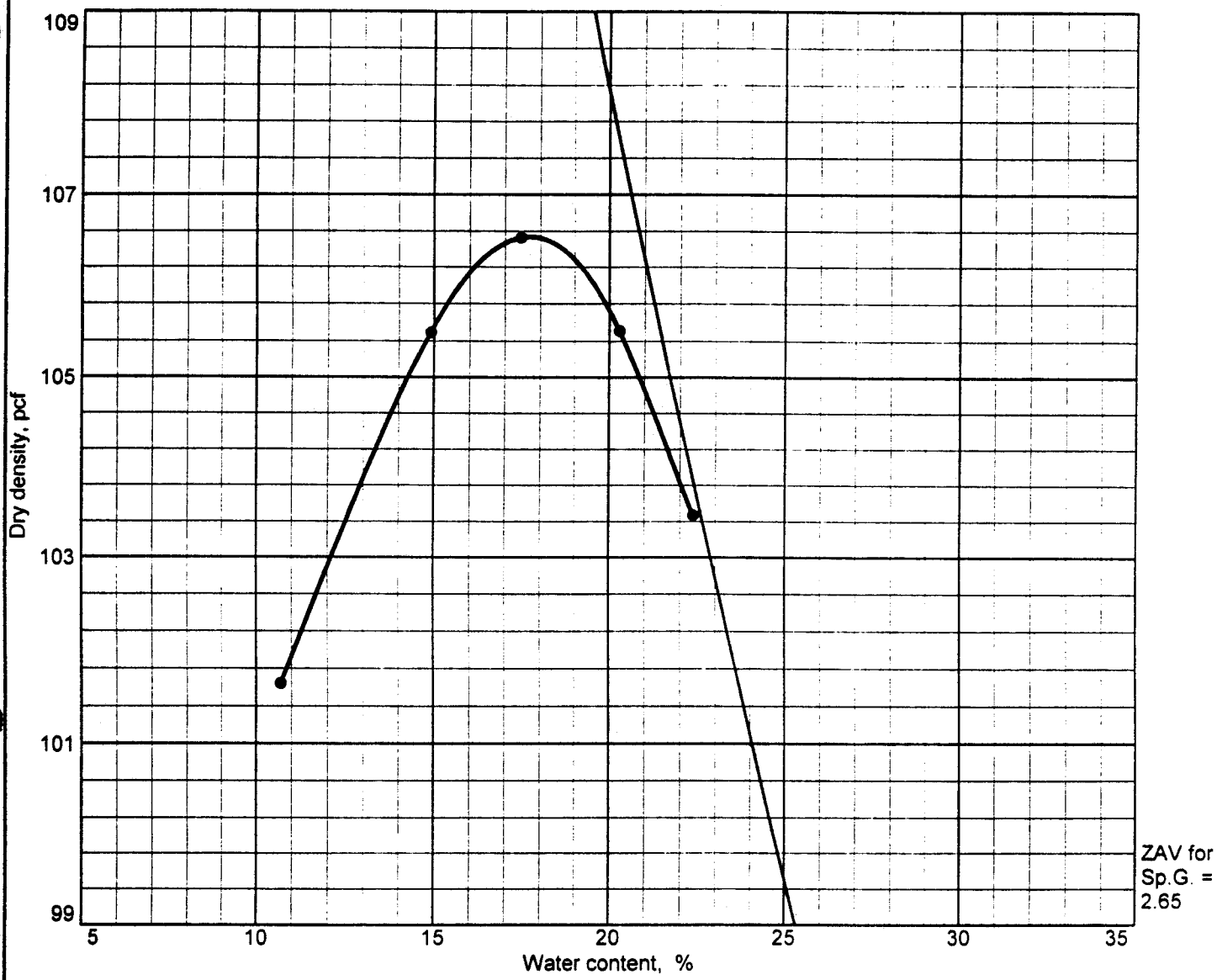
DL-012, Sampled for General Fill from on-site stockpile on 9/5/98

Sample No.: DL-012 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Stockpile **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **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						
	ML						0.1	54.9

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 106.5 pcf Optimum moisture = 17.7 %	Reddish Brown clayey SILT w/ Sand. Sample # DL-015

Project No. VNC-98-029 **Client:** Gilbert Southern
Project: Durham County Landfill Closure
Location: On-site Borrow

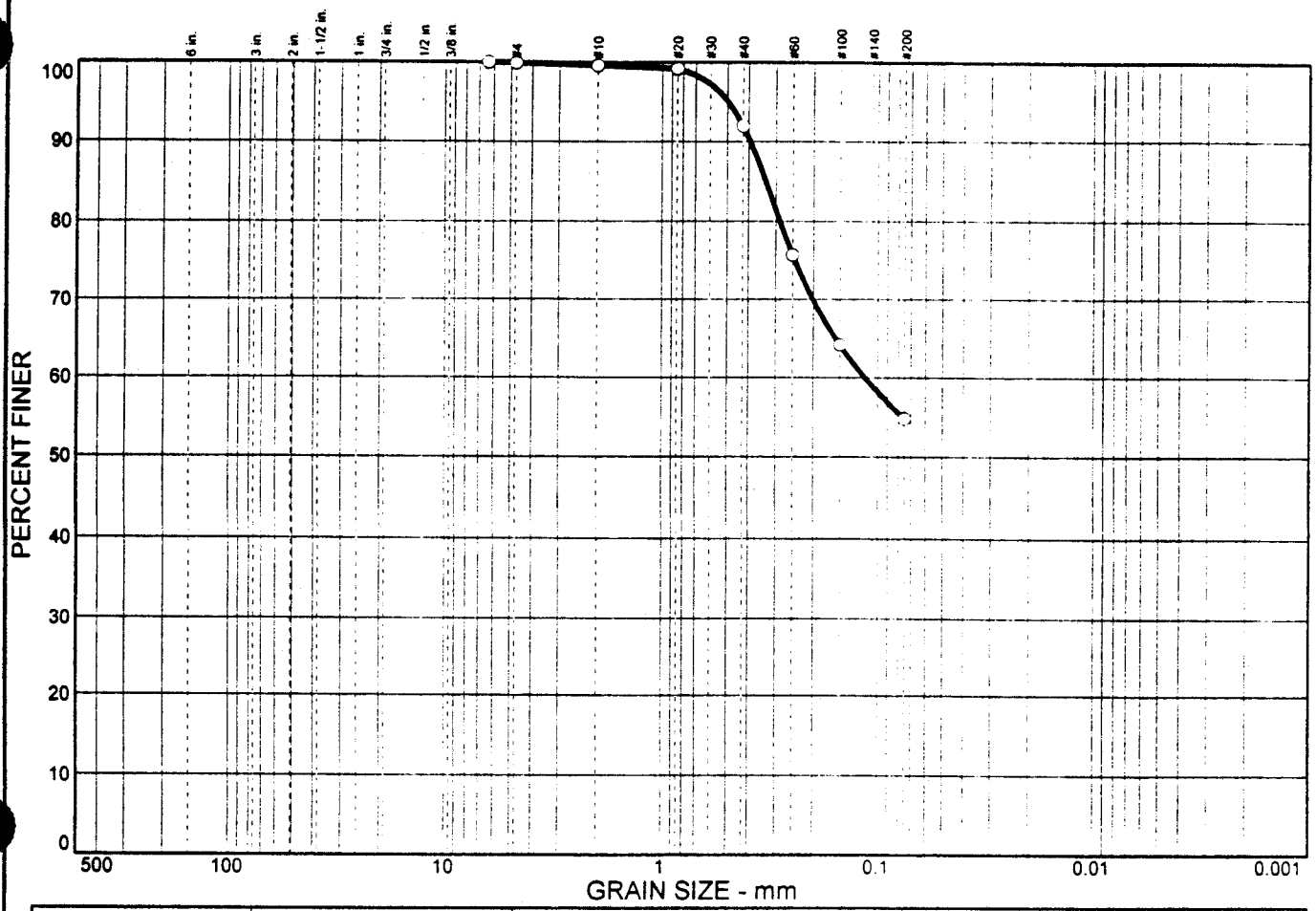
Remarks:
Sampled on 9-5-98 from on-site borrow for conformance testing of Common Fill.

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	45.0	54.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.6		
#20	99.2		
#40	92.0		
#60	75.7		
#100	64.1		
#200	54.9		

* (no specification provided)

Soil Description

Reddish Brown clayey SILT w/ Sand.
Sample # DL-015

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.333 D_{60}= 0.114 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

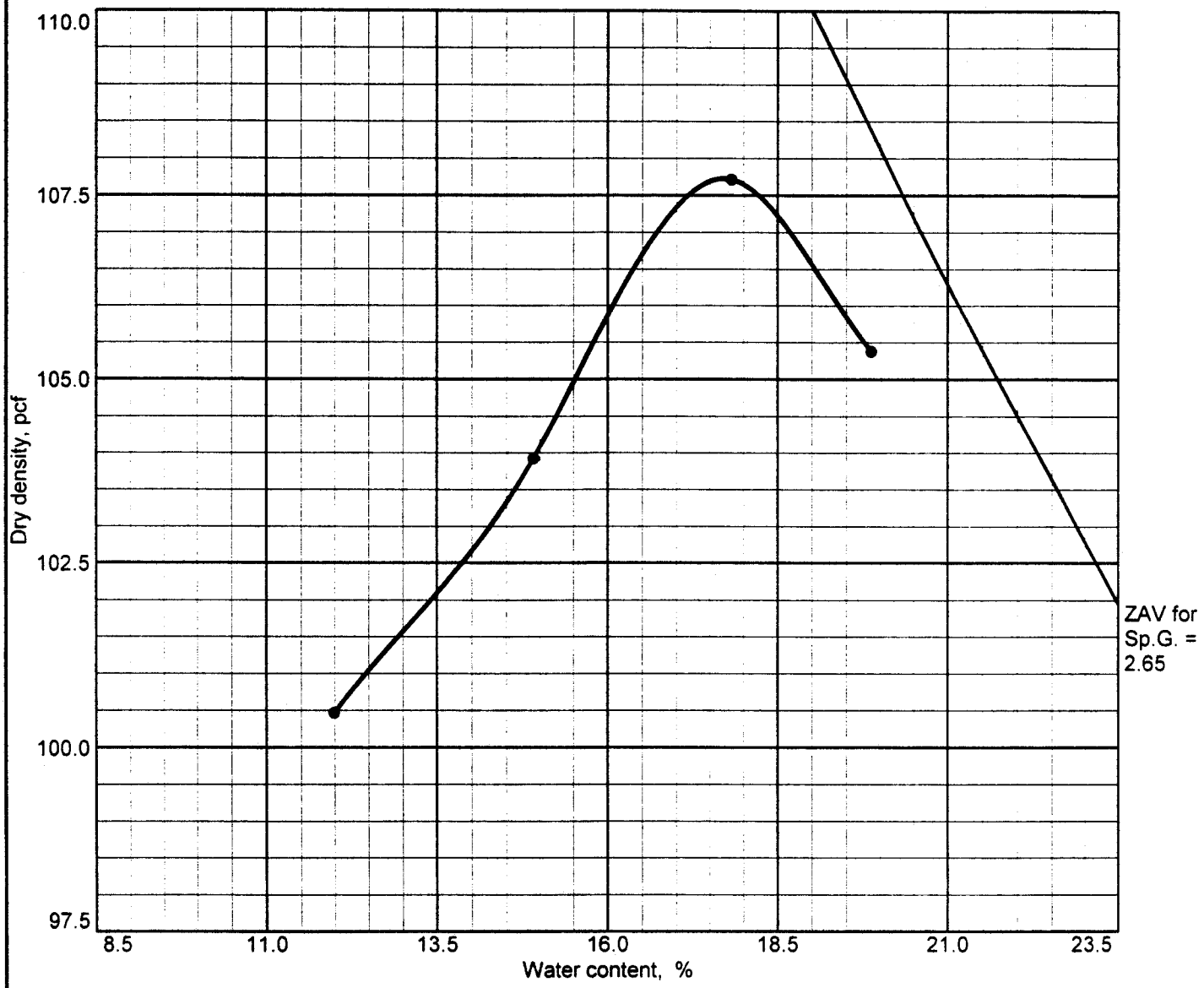
Sampled on 9-5-98 from on-site borrow for use as common fill.

Sample No.: DL-015 **Source of Sample:** common fill **Date:** 9-5-98
Location: On-site Borrow **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						
							1.1	45.5

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 107.7 pcf Optimum moisture = 17.7 %	

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.
Project: Durham Landfill Closure
● **Location:** On-site Borrow Pit

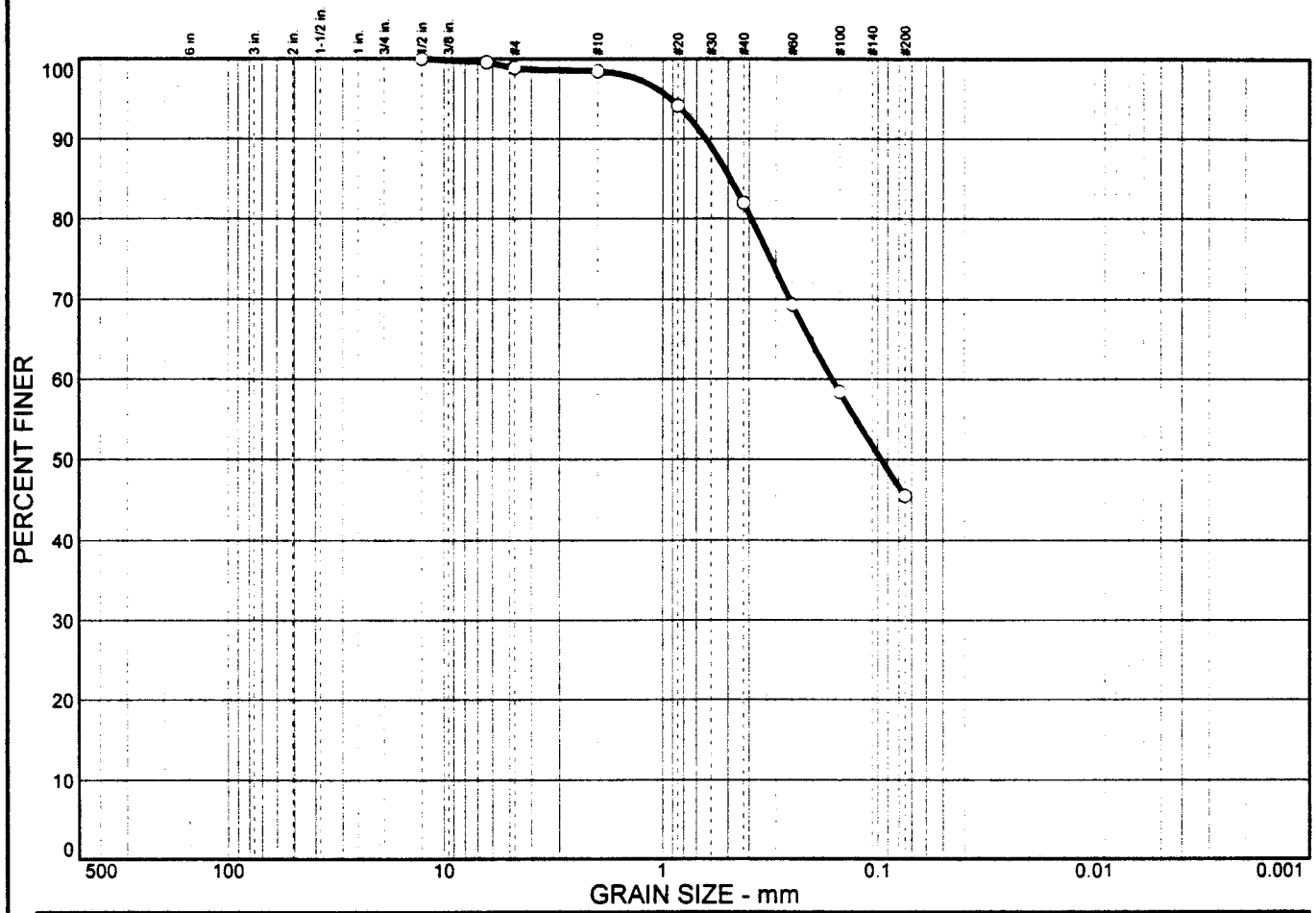
Remarks:
DL-016, Sampled from On-site borrow pit o
9/5/98

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.1	53.4	45.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	99.6		
#4	98.9		
#10	98.5		
#20	94.2		
#40	82.0		
#60	69.3		
#100	58.4		
#200	45.5		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.488 D_{60}= 0.163 D_{50}= 0.0961
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

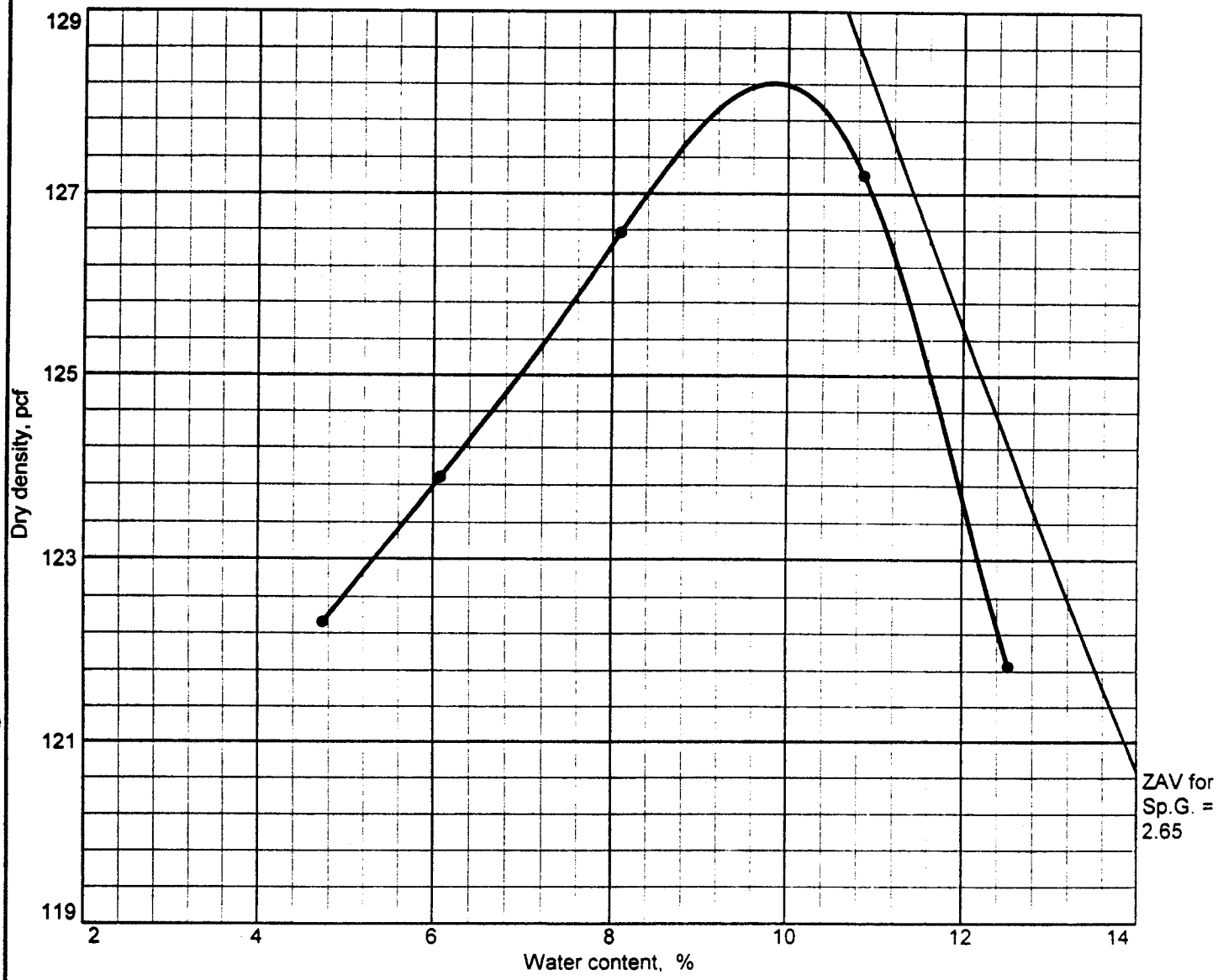
DL-016, Sampled from on-site borrow pit on 9/5/98

Sample No.: DL-016 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham Landfill Closure
Project No: VNC-98-029 **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						
							13.7	59.5

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 128.2 pcf Optimum moisture = 9.8 %	Reddish Brown Sandy SILT w/ Gravel Sample #DL-018

Project No. VNC-98-029 **Client:** Gilbert Southern
Project: Durham County Landfill Closure
Location: On-site Stockpile - West of Landfill

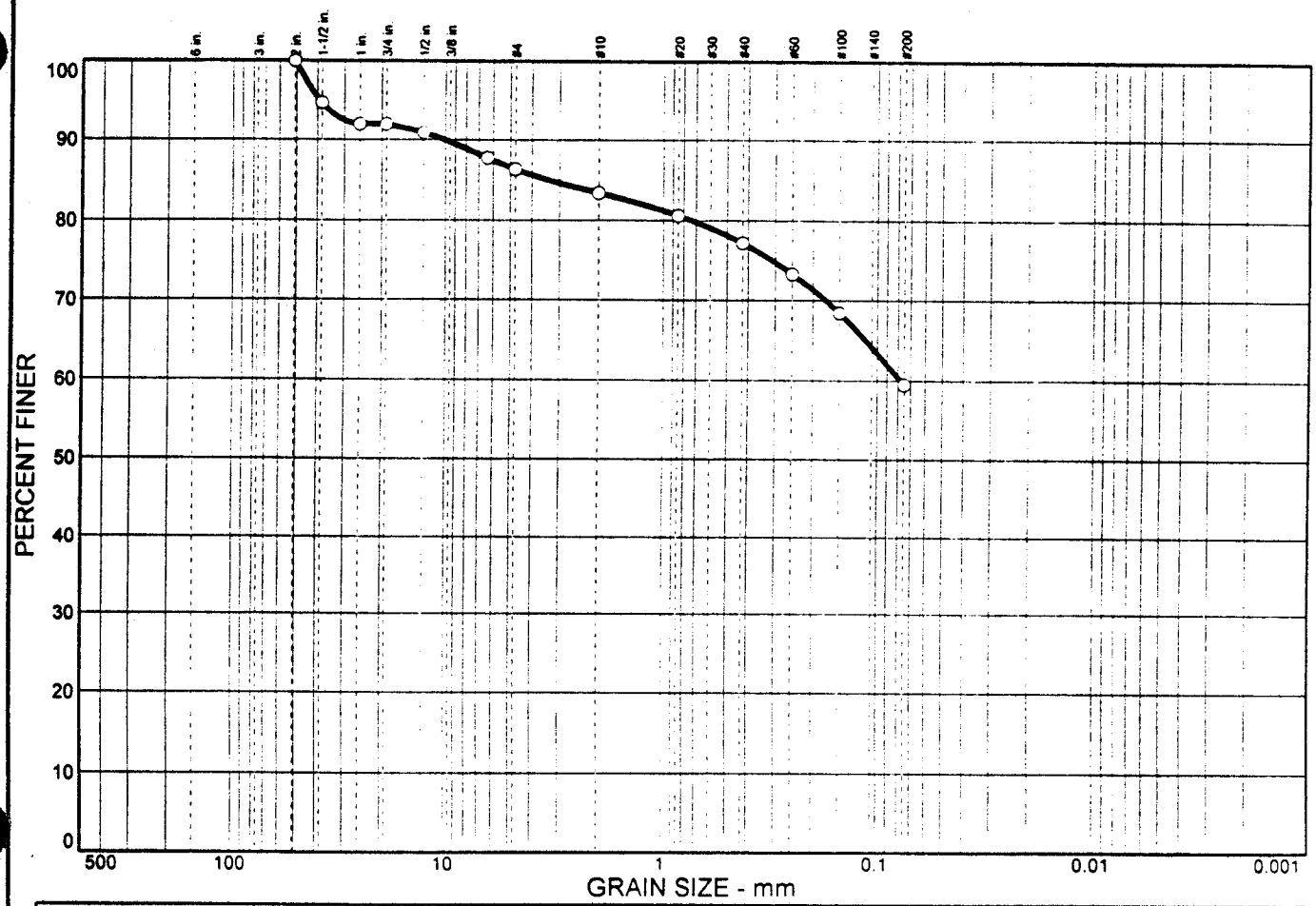
Remarks:
Sample #DL-018
Sampled from on-site stockpile west of landfill for conformance testing for Common Fill

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.7	26.8	59.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100.0		
1.5 in.	94.7		
1 in.	92.0		
.75 in.	92.0		
.5 in.	90.9		
.25 in.	87.7		
#4	86.3		
#10	83.4		
#20	80.6		
#40	77.2		
#60	73.3		
#100	68.4		
#200	59.5		

* (no specification provided)

Soil Description

Reddish Brown Sandy SILT w/ Gravel
Sample #DL-018

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.39 D_{60}= 0.0778 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

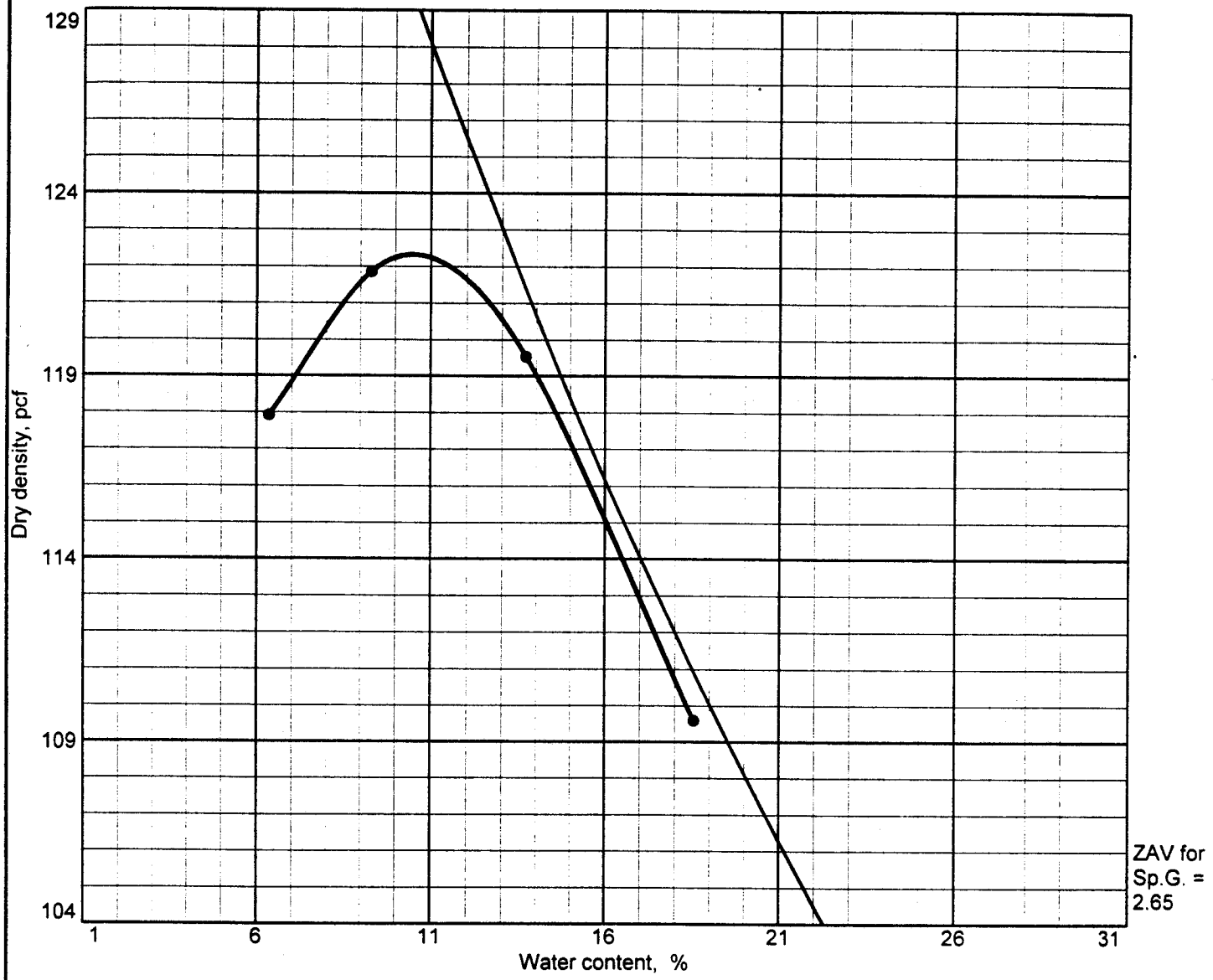
Sampled from on-site stockpile for conformance testing of Common Fill

Sample No.: DL-018 **Source of Sample:** common fill **Date:** 9-8-98
Location: On-site Stockpile - West of Landfill **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						
								41.4

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 122.3 pcf Optimum moisture = 10.5 %	Reddish-brown sandy SILT, little gravel

Project No. **Client:** Gilbert Southern Corp.

Project: Durham Landfill Closure

● **Location:** On-site Borrow Pit

Remarks:

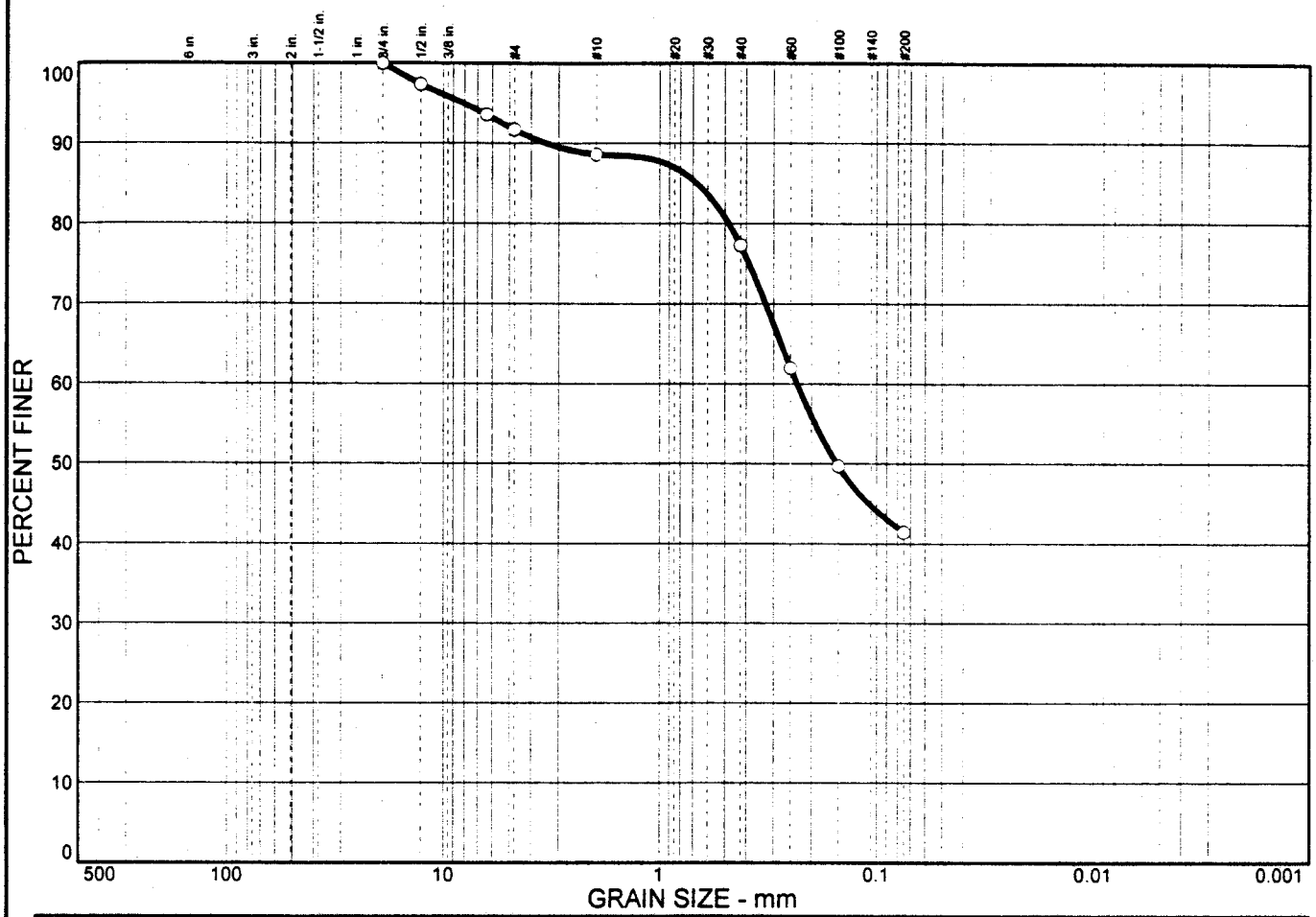
DL-021, Sampled from on-site borrow material on 9/9/98

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.3	50.3	41.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	97.4		
.25 in.	93.6		
#4	91.7		
#10	88.6		
#40	77.3		
#60	62.0		
#100	49.7		
#200	41.4		

* (no specification provided)

Soil Description

Reddish-brown sandy SILT, little gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.02 D_{60}= 0.234 D_{50}= 0.153
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

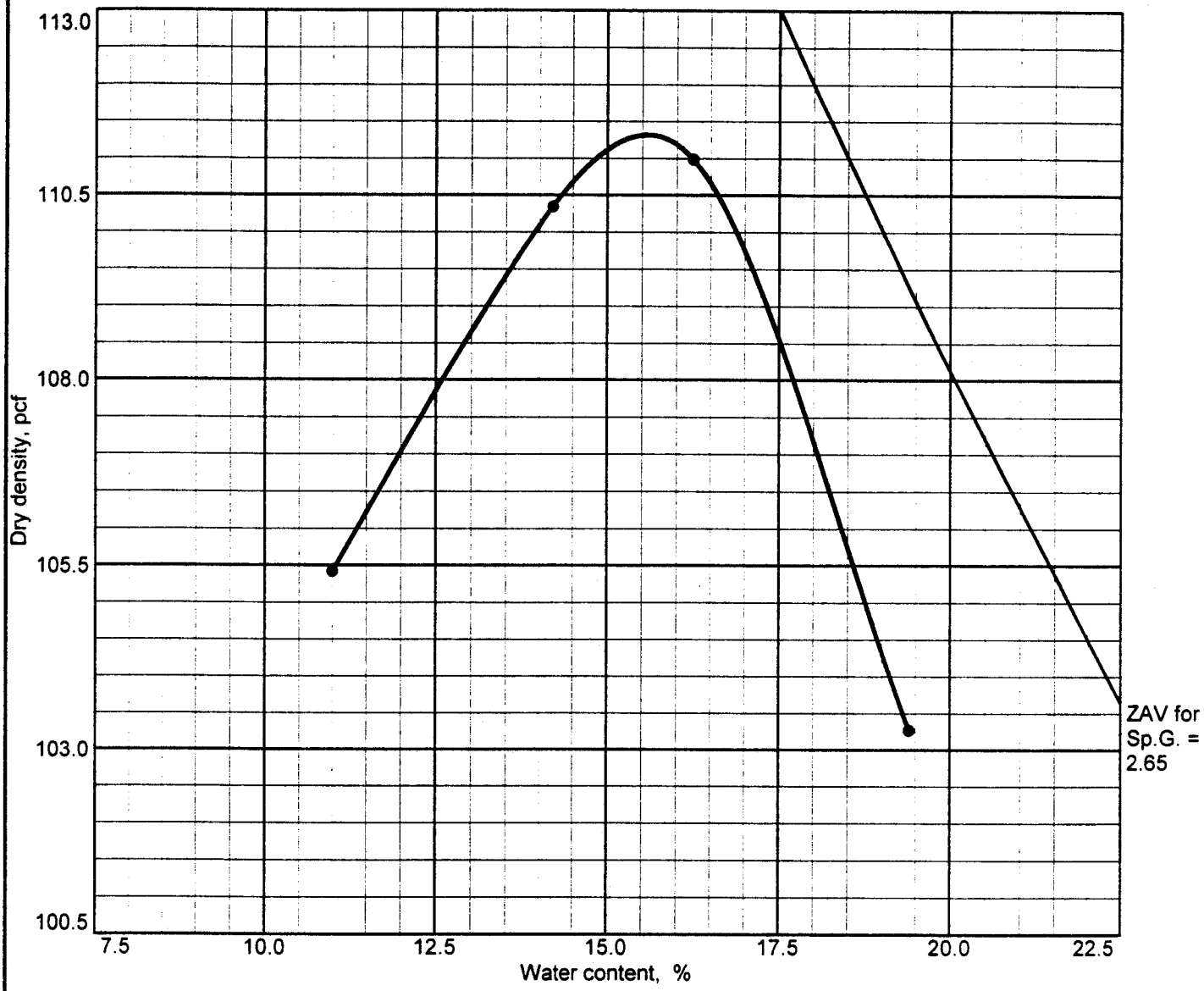
DL-021, Sampled from on-site borrow pit on 9/9/98

Sample No.: DL-021 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							7.3	53.4

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 111.3 pcf Optimum moisture = 15.6 %	Dark Red Lean silty clay with sand, little Gravel

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.
Project: Durham Landfill Closure
● **Location:** On-site Borrow Pit

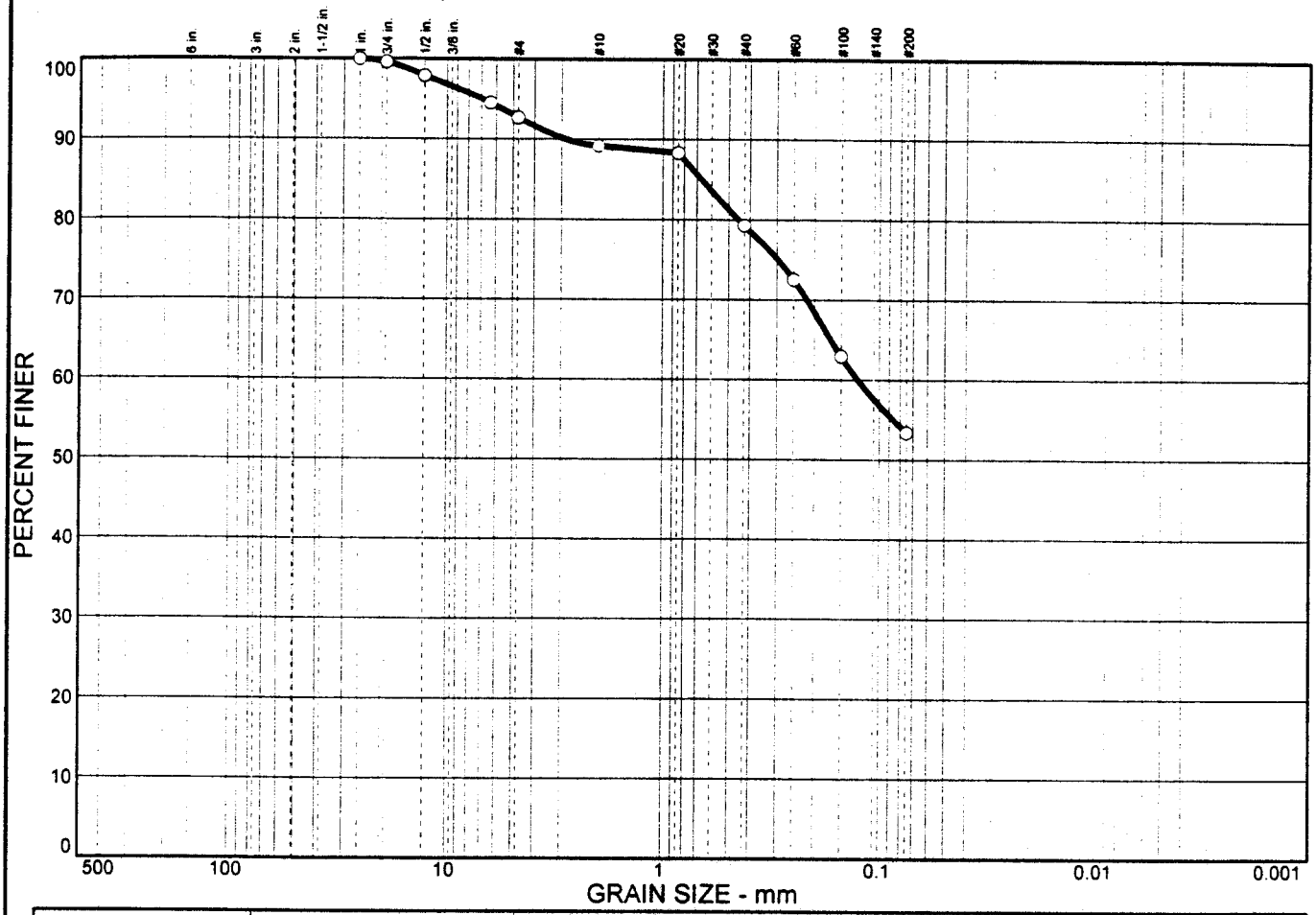
Remarks:
Sampled from on-site borrow for General Fill on 9/11/98
Sample DL-029

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.3	39.3	53.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	99.6		
.5 in.	97.9		
.25 in.	94.5		
#4	92.7		
#10	89.2		
#20	88.3		
#40	79.3		
#60	72.5		
#100	62.9		
#200	53.4		

* (no specification provided)

Soil Description

Dark Red Lean silty clay with sand. little Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.666 D_{60}= 0.126 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

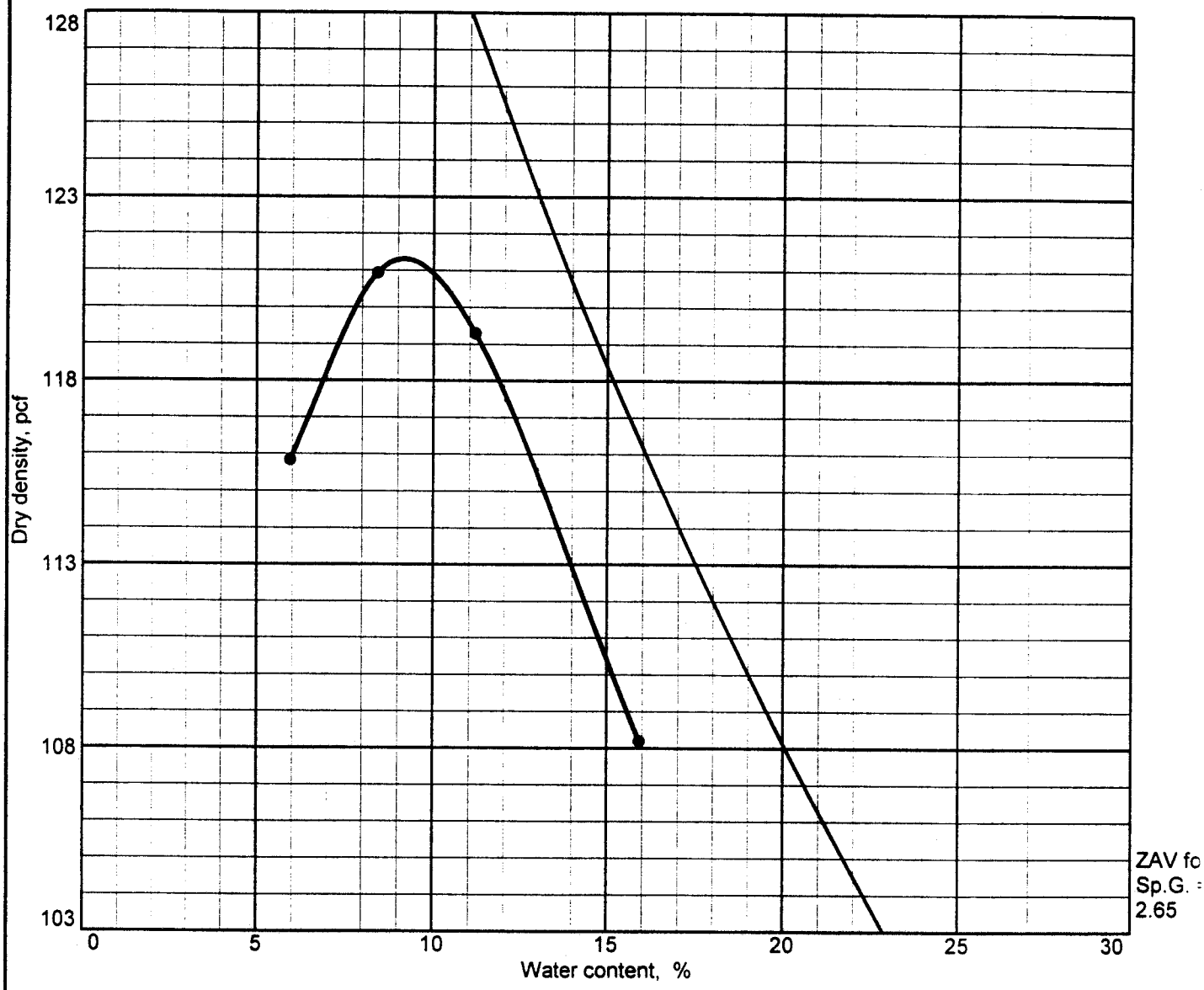
DL-029, Sampled for General Fill from on site borrow area on 9/11/98

Sample No.: DL-029 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							13.5	42.1

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 121.3 pcf Optimum moisture = 9.2 %	Dark reddish brown silty SAND, little grave

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

● **Location:** On-site Borrow Pit

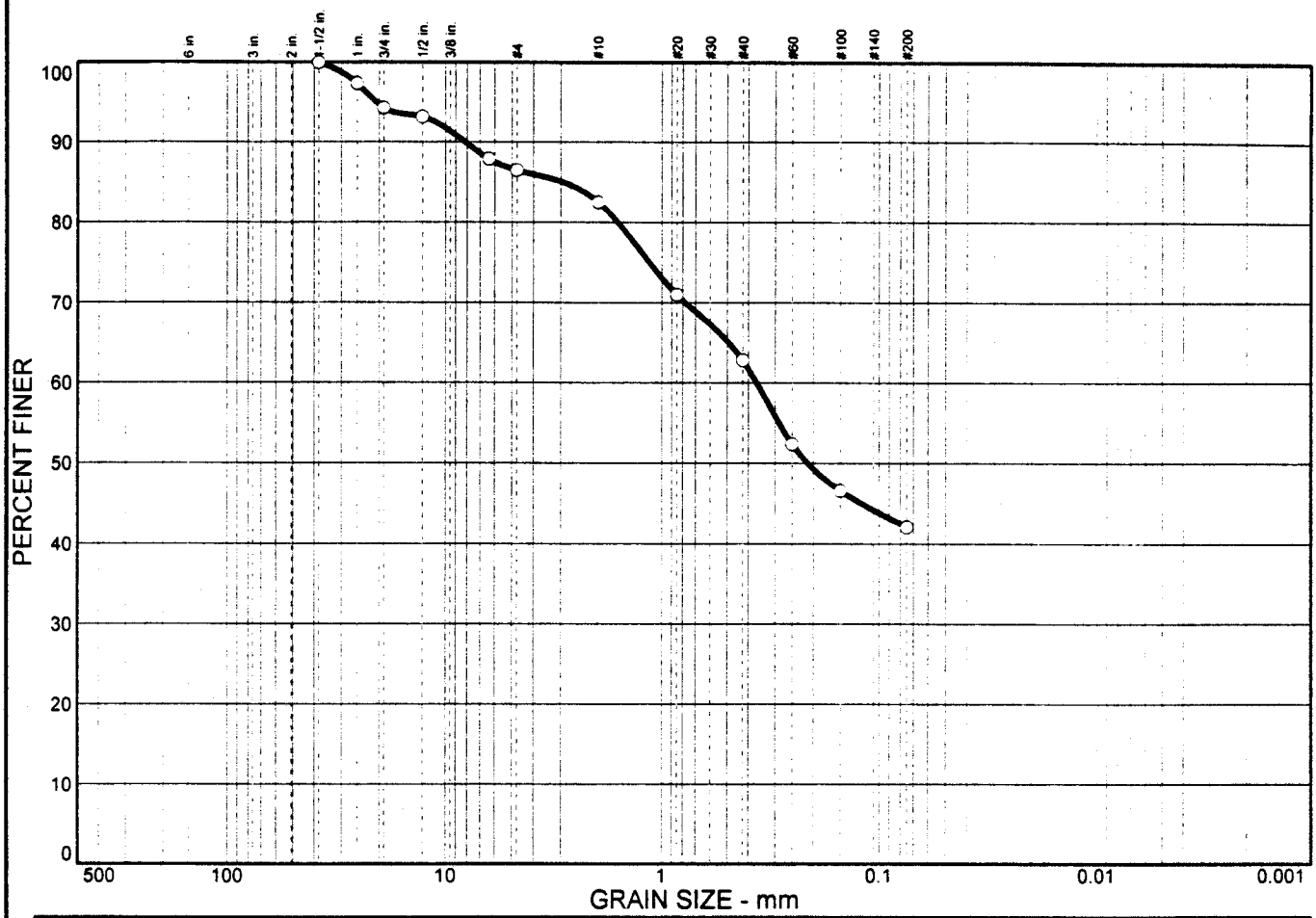
Remarks:
DL-030, Sampled from on-site Borrow Pit o
9/18/98

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.5	44.4	42.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	97.4		
.75 in.	94.3		
.5 in.	93.2		
.25 in.	87.9		
#4	86.5		
#10	82.5		
#20	71.0		
#40	62.8		
#60	52.4		
#100	46.6		
#200	42.1		

* (no specification provided)

Soil Description

Dark reddish brown silty SAND, little gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.94 D_{60}= 0.366 D_{50}= 0.212
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

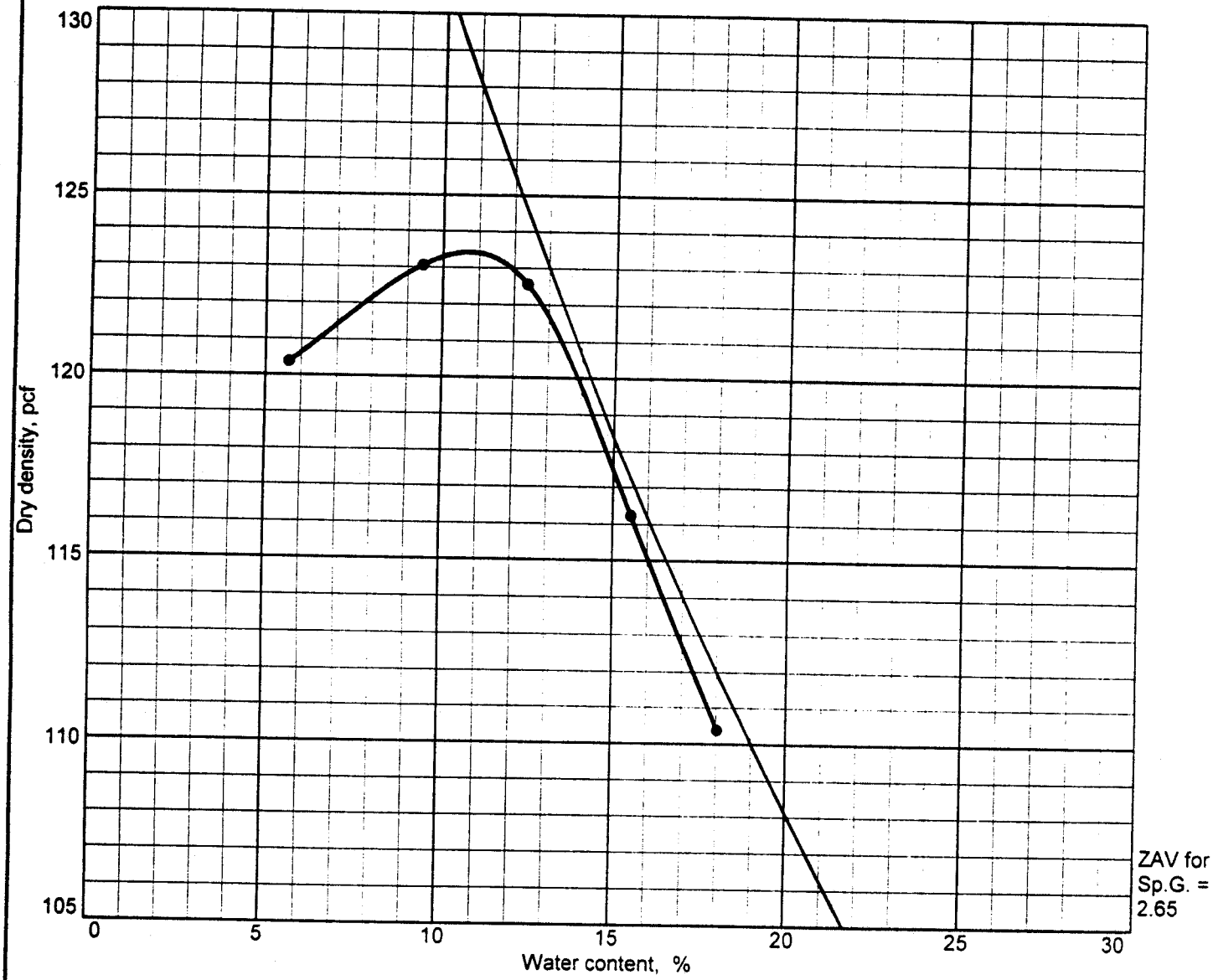
DL-030, Sampled from on-site borrow pit on 9/18/98

Sample No.: DL-030 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

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

COMPACTION TEST REPORT



Test specification: ASTM D 698-78 Method C Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
							0.3	62.3

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 123.4 pcf Optimum moisture = 10.8 %	Reddish beown clayey sandy SILT, little gravel. Sample #DL-040

Project No. VNC-98-029 **Client:** Gilbert Southern
Project: Durham County Landfill Closure
Location: On-site borrow

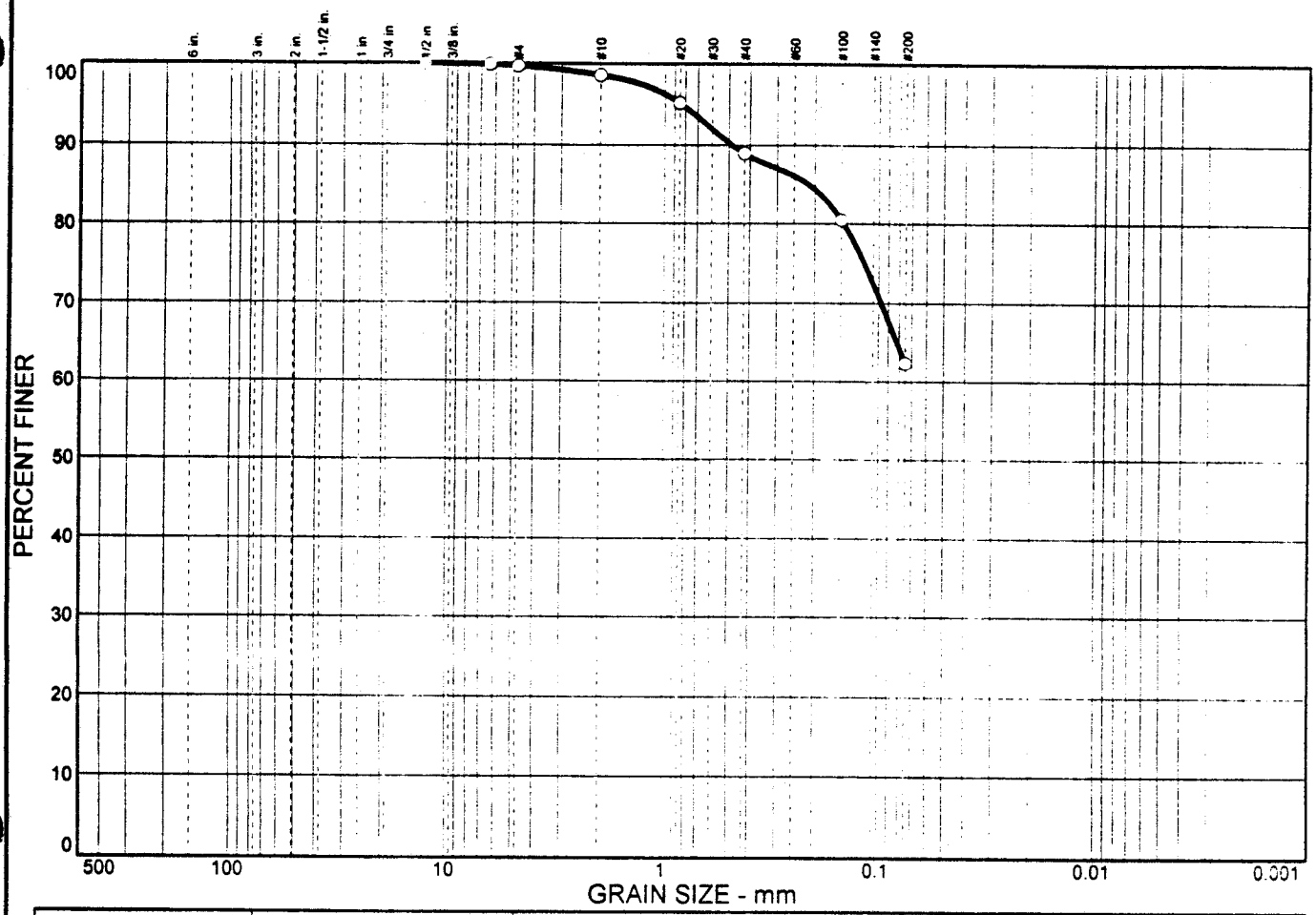
Remarks:
Sampled on 9-24-98 from on-site borrow source for conformance testing of Common Fill.

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	37.4	62.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	99.9		
#4	99.7		
#10	98.6		
#20	95.2		
#40	89.0		
#100	80.5		
#200	62.3		

* (no specification provided)

Soil Description

Reddish beown clayey sandy SILT, little gravel.
Sample #DL-040

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.214 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

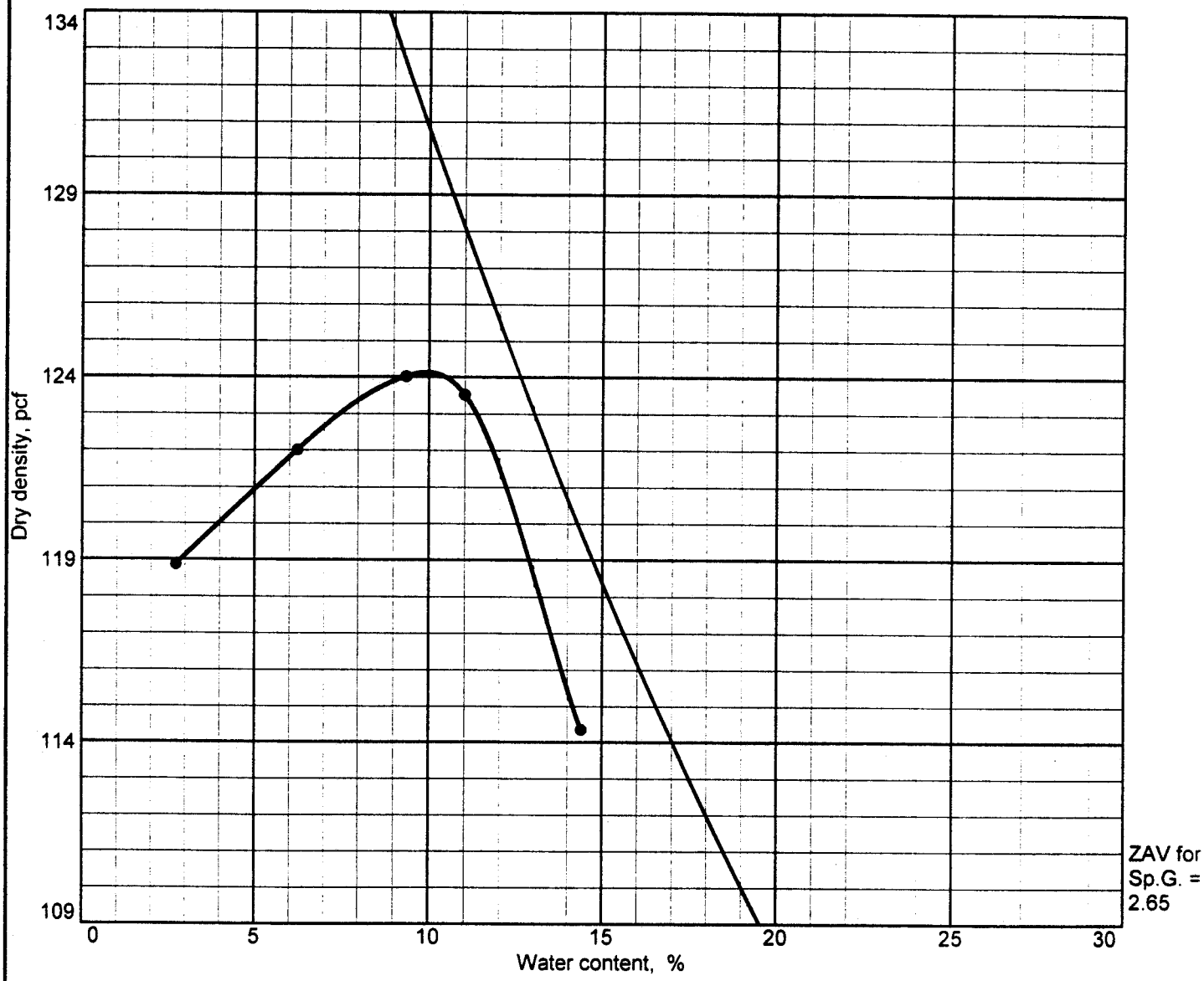
Sampled on 9-24-98 from on-site borrow source for conformance testing of Common Fill.

Sample No.: DL-040 **Source of Sample:** common fill **Date:** 9-24-98
Location: On-site borrow **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						
							4.8	40.9

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 124.1 pcf Optimum moisture = 9.9 %	Reddish-brown snady SILT, little clay and gravel

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.
Project: Durham Landfill Closure
● **Location:** On-site Borrow Pit

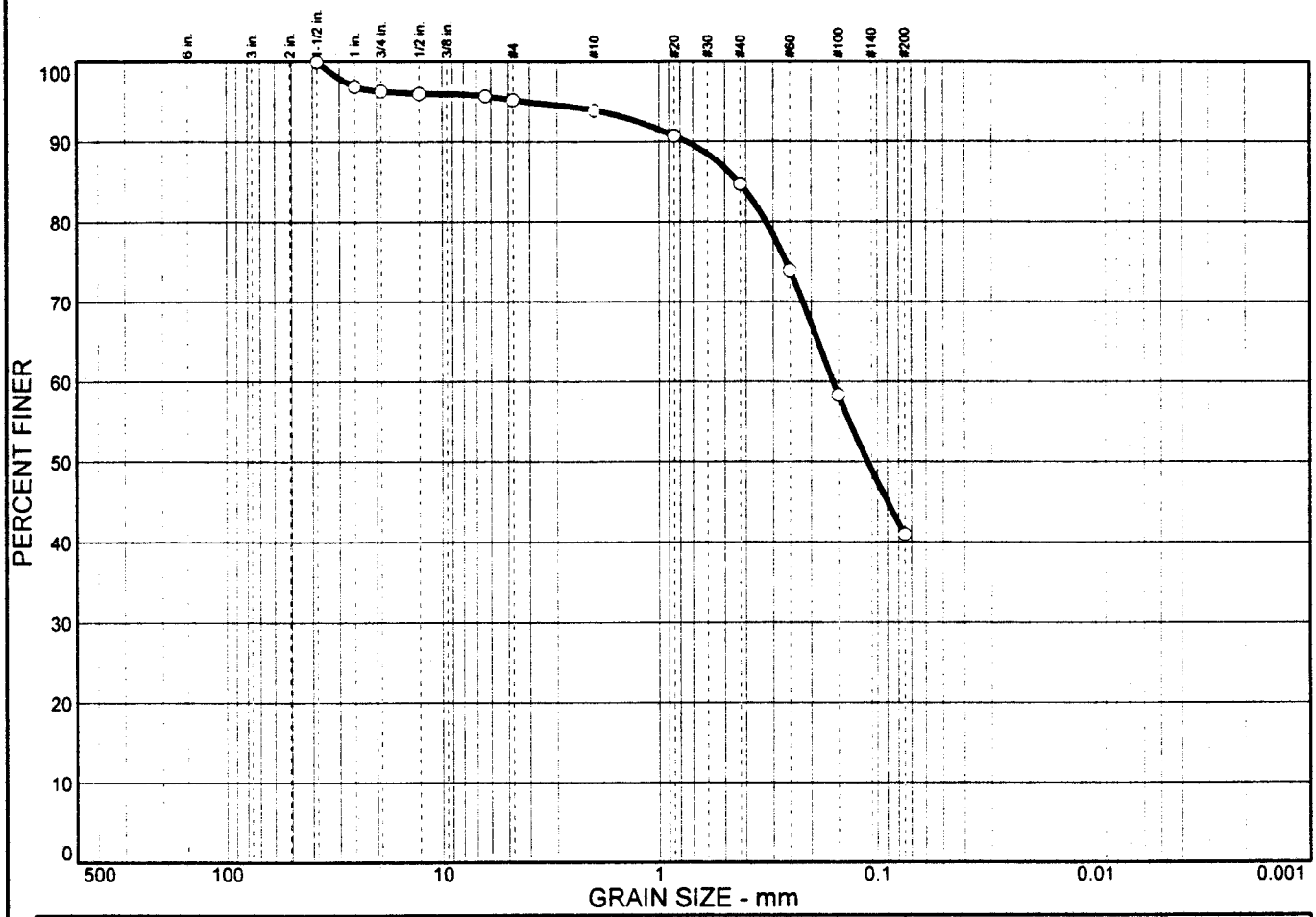
Remarks:
DL-041, Sampled from on-site borrow on 10 2/98.

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.8	54.3	40.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	96.9		
.75 in.	96.3		
.5 in.	96.0		
.25 in.	95.7		
#4	95.2		
#10	93.9		
#20	90.7		
#40	84.7		
#60	73.9		
#100	58.3		
#200	40.9		

* (no specification provided)

Soil Description

Reddish-brown snady SILT, little clay and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.434 D_{60}= 0.159 D_{50}= 0.110
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

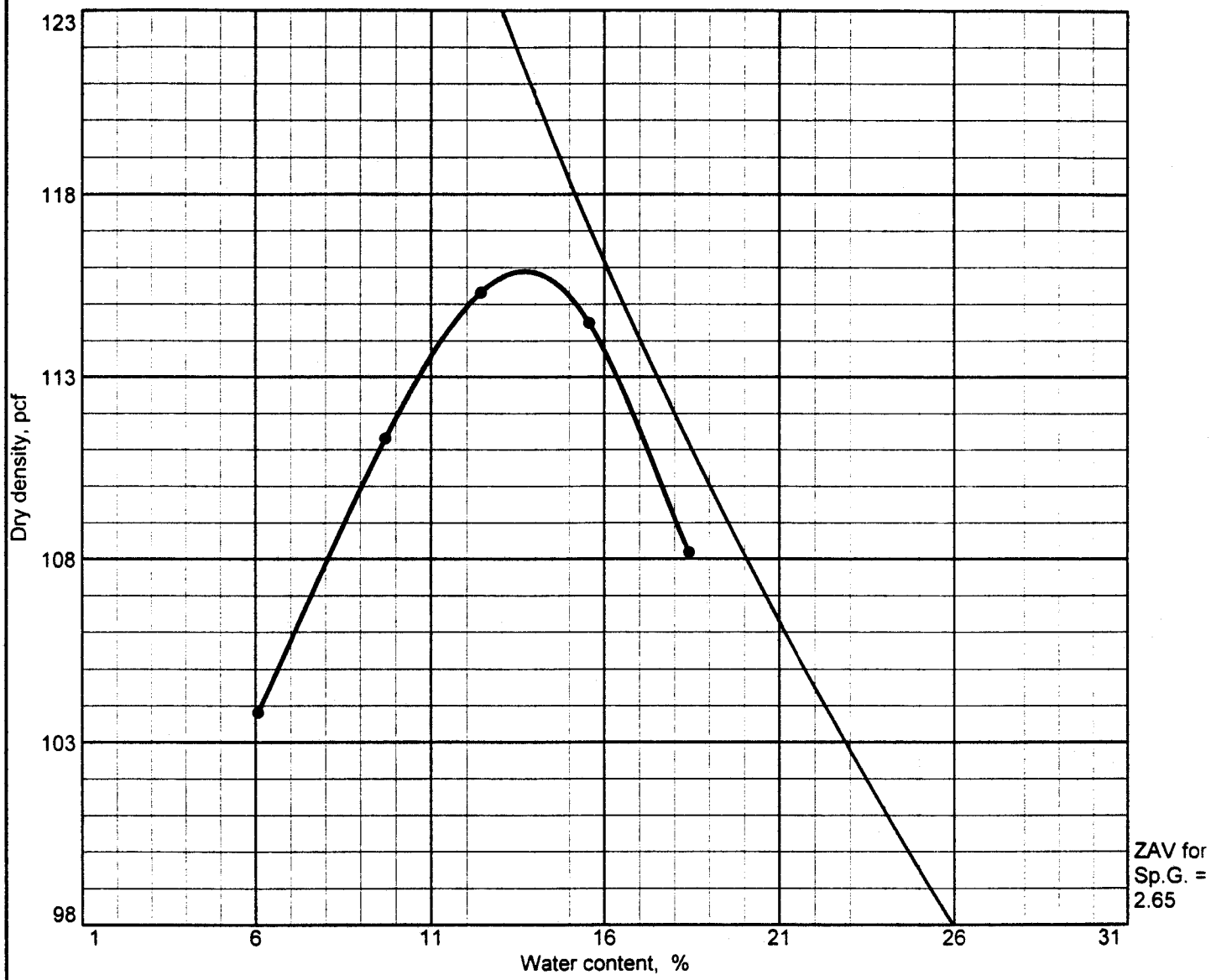
DL-041, Sampled from on-site borrow on 10/2/98.

Sample No.: DL-041 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							0.3	43.7

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 115.9 pcf Optimum moisture = 13.7 %	

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

● **Location:** On-site Borrow (Transfer Station)

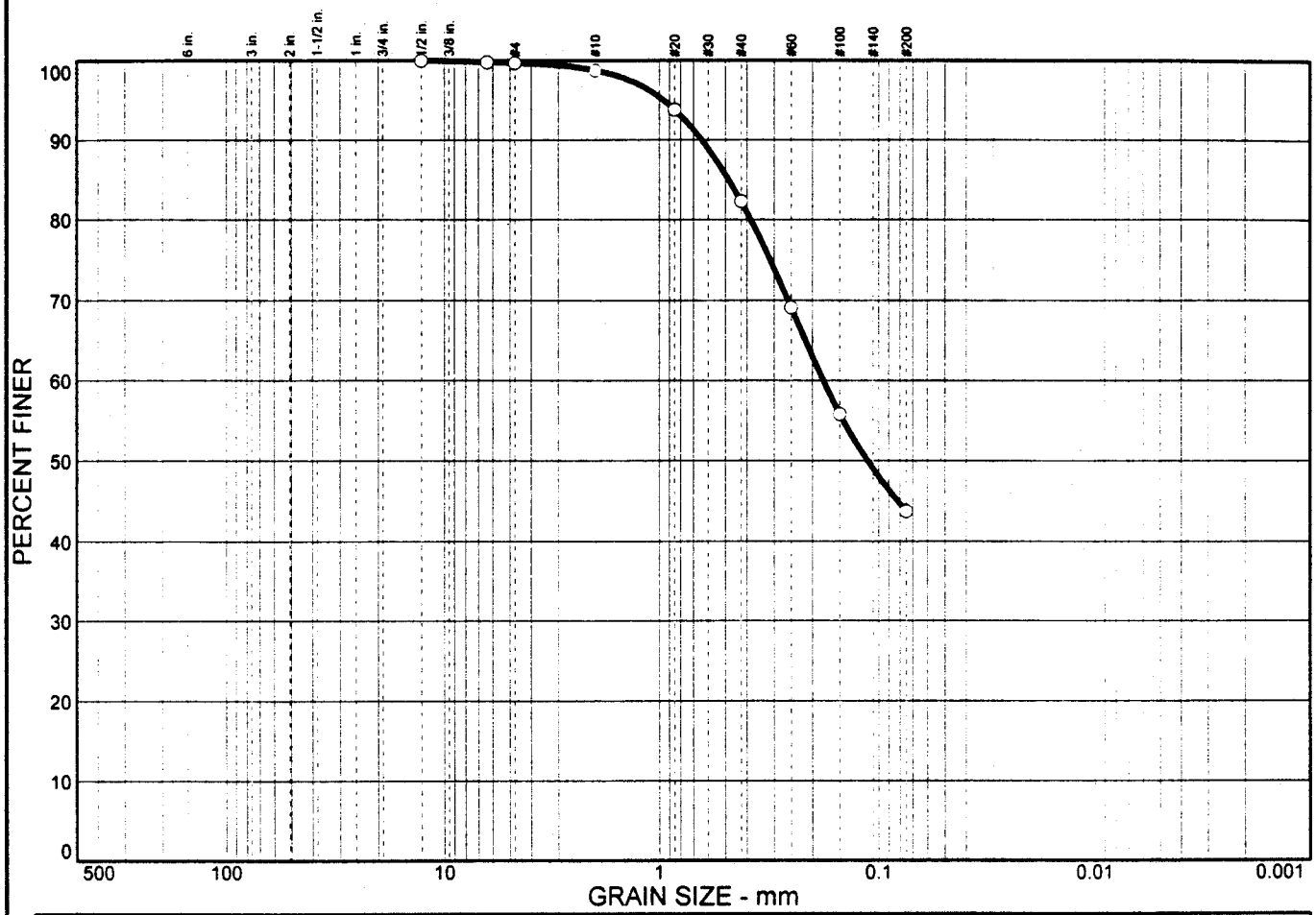
Remarks:
DL-049, Sampled from on-site borrow (Transfer Station) on 10/6/98.

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	56.0	43.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	99.8		
#4	99.7		
#10	98.8		
#20	93.8		
#40	82.3		
#60	69.1		
#100	55.8		
#200	43.7		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.484 D_{60}= 0.178 D_{50}= 0.112
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

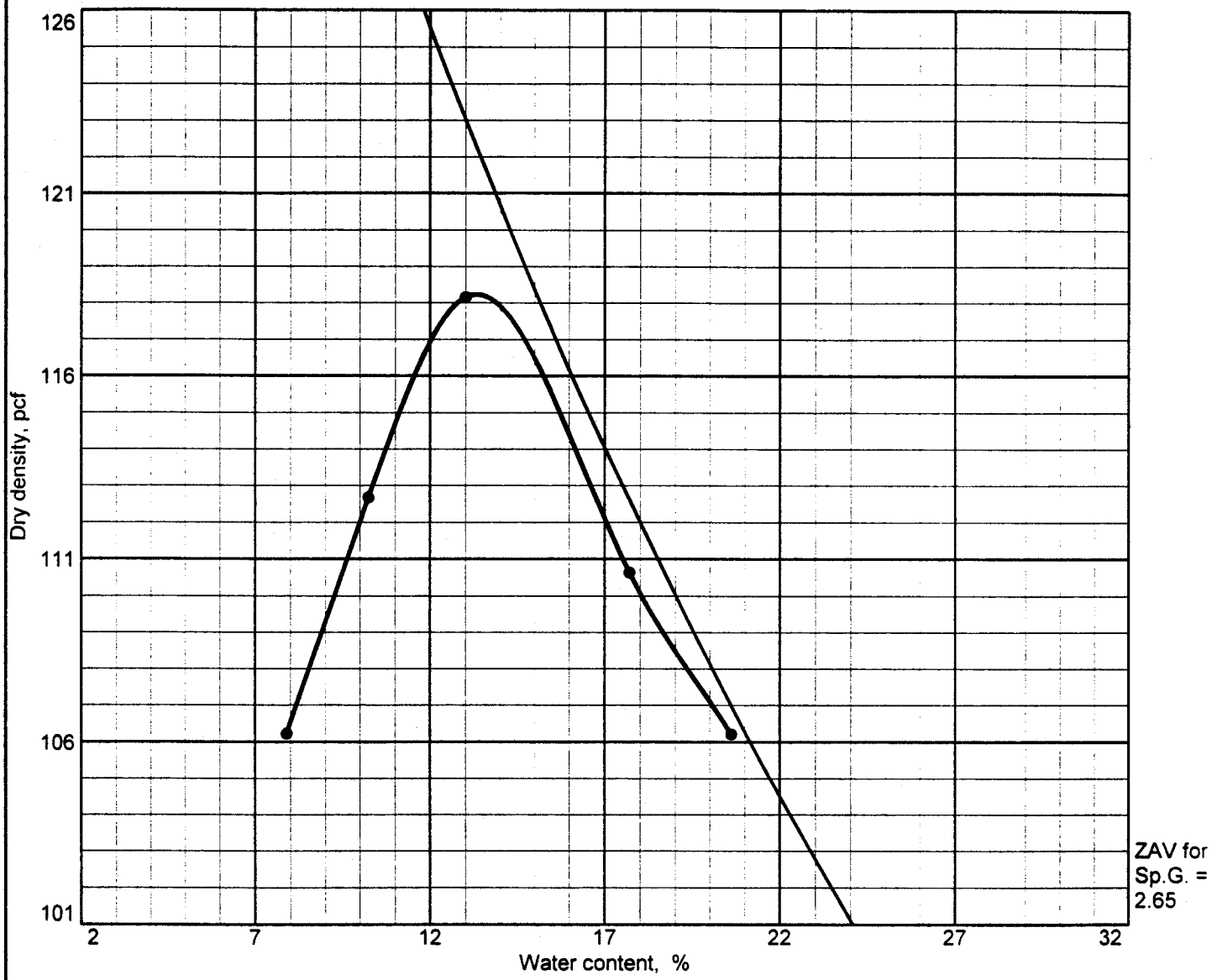
DL-049, Sampled from Transfer Station Borrow on 10/6/98.

Sample No.: DL-049 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow (Transfer Station) **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							0.7	

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 118.2 pcf Optimum moisture = 13.3 %	Brown clayey SAND, little silt, trace gravel

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.
Project: Durham Landfill Closure
● **Location:** On-site Borrow (Transfer Station)

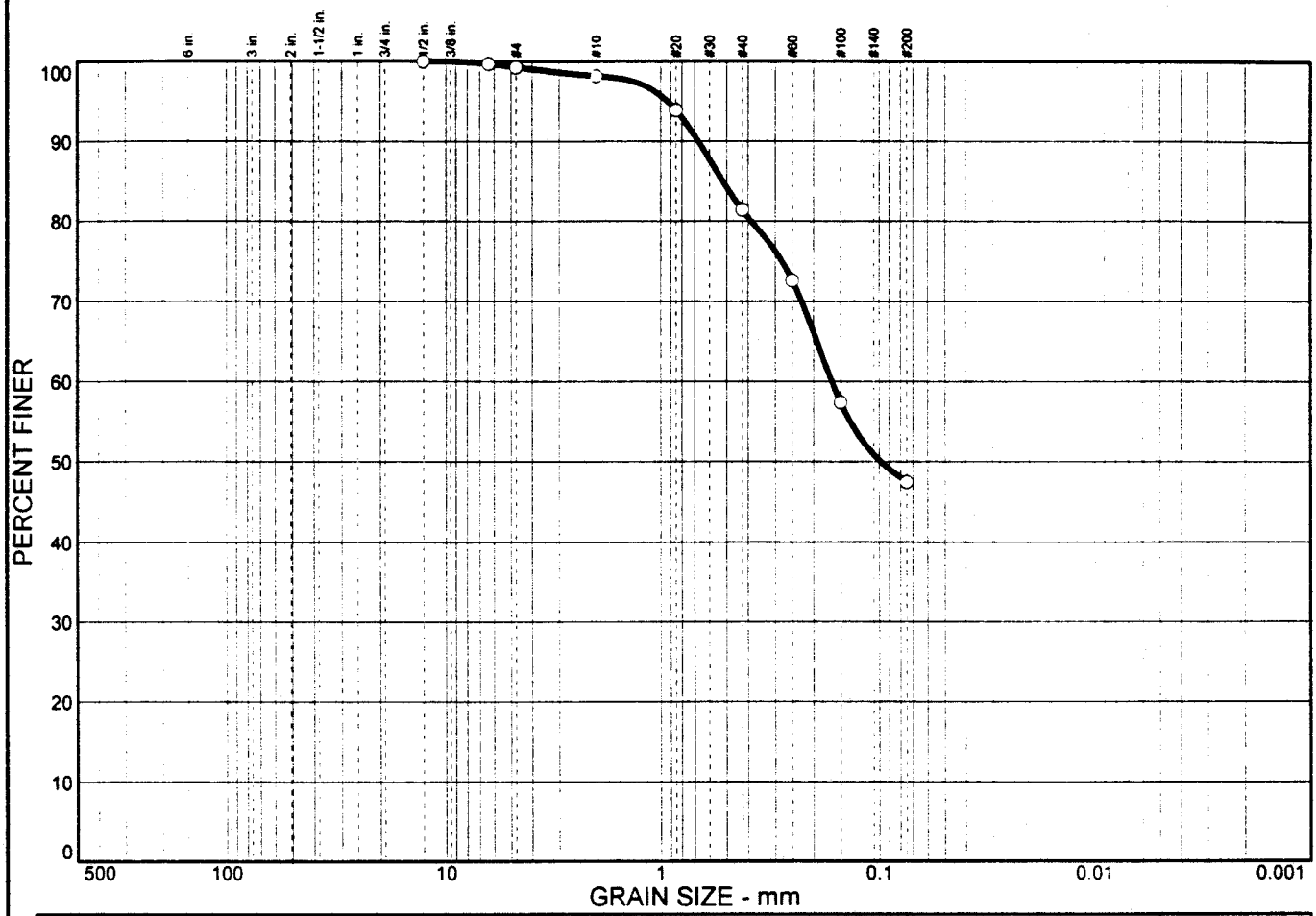
Remarks:
DL-051, Sampled from on-site borrow (Transfer Station) on 10/8/98.

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.7	51.8	47.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	99.7		
#4	99.3		
#10	98.2		
#20	93.9		
#40	81.4		
#60	72.6		
#100	57.4		
#200	47.5		

* (no specification provided)

Soil Description

Brown clayey SAND, little silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.520 D_{60}= 0.165 D_{50}= 0.0981
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

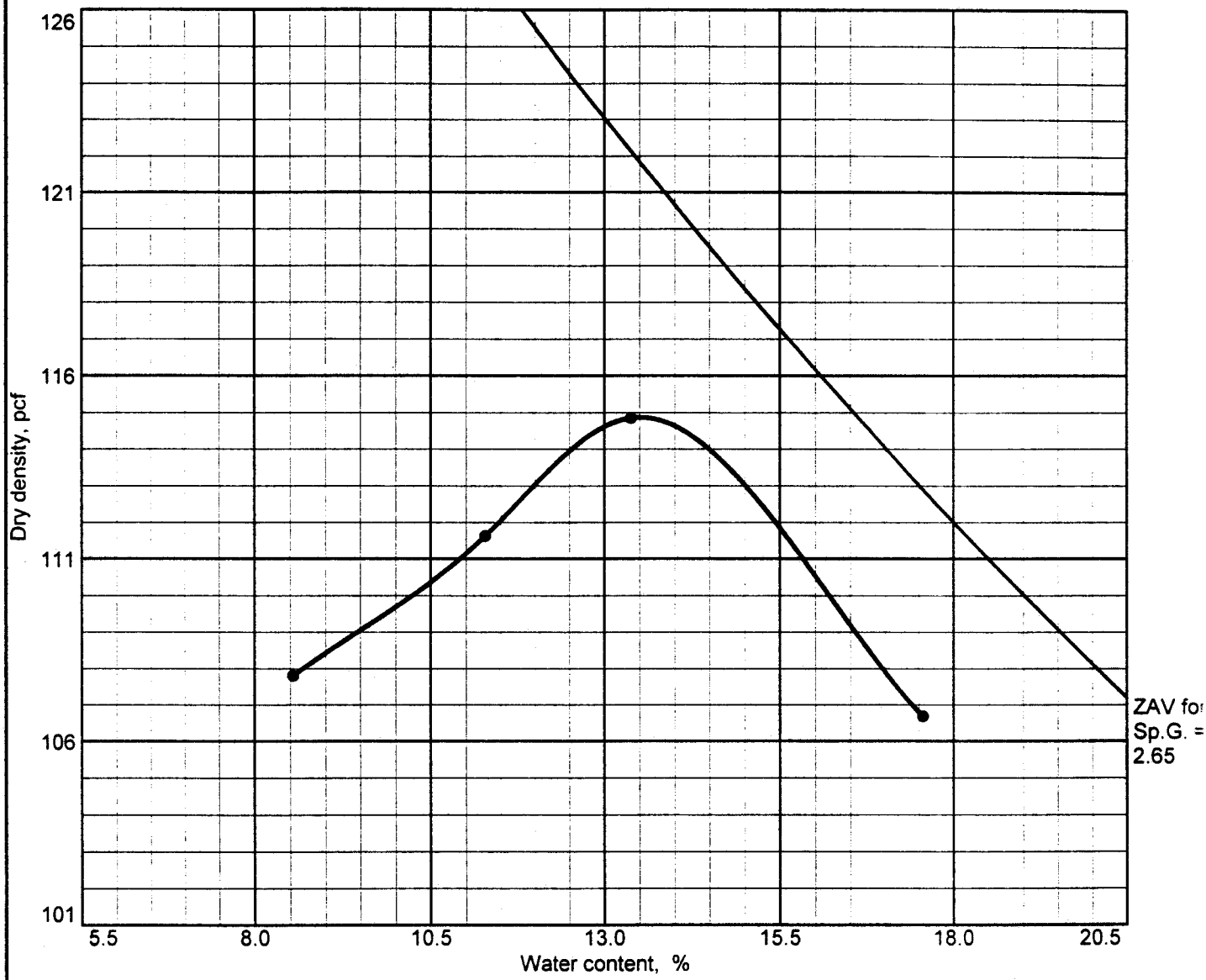
DL-051, Sampled from Transfer Station Borrow on 10/8/98.

Sample No.: DL-051 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow (Transfer Station) **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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	% >	% <
	USCS	AASHTO						No.200
							13.5	43.1

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 114.9 pcf Optimum moisture = 13.5 %	Dark reddish brown clayey Silty SAND, trace gravel

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.

Project: Durham Landfill Closure

● **Location:** On-site Borrow Pit

Remarks:

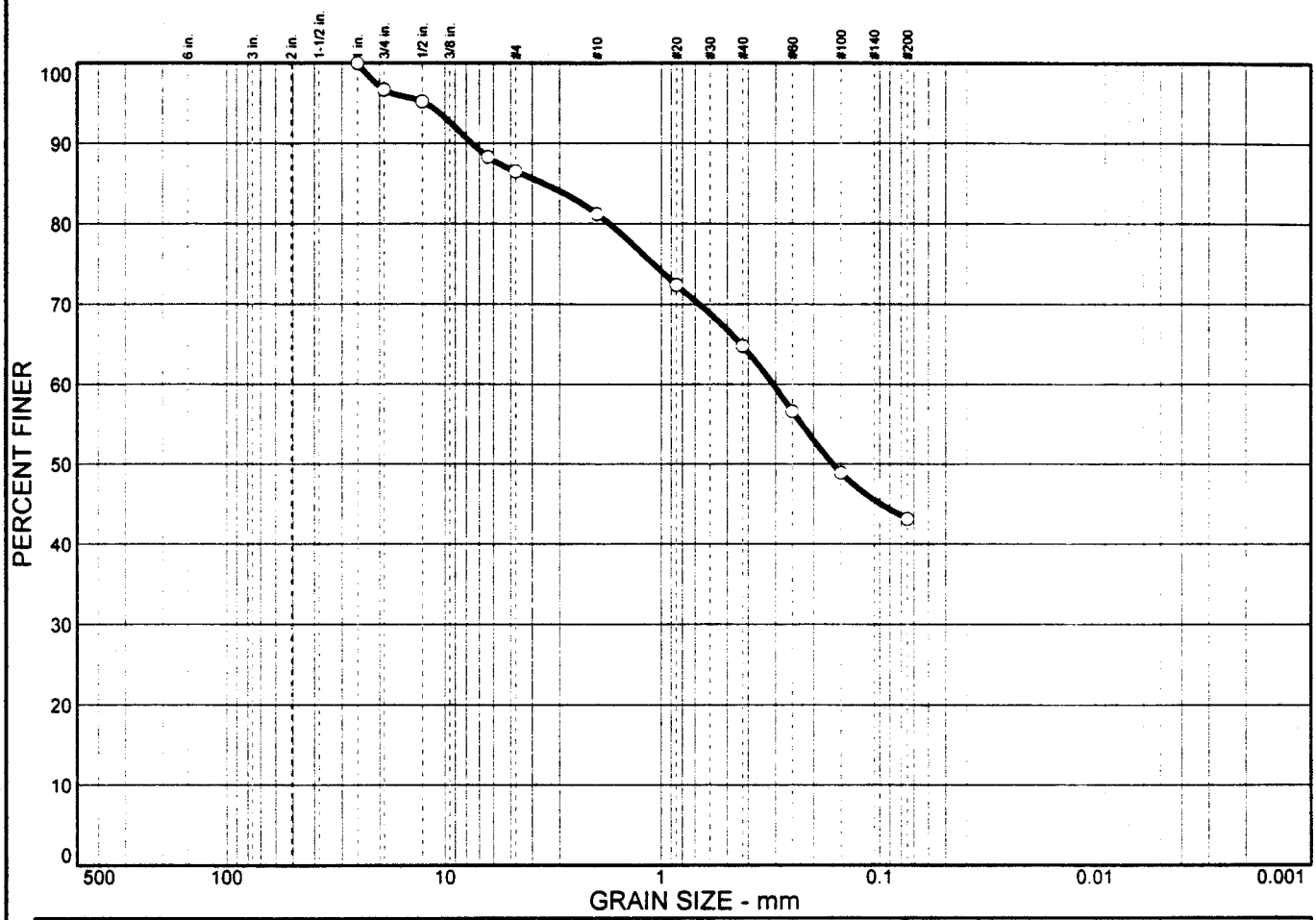
DL-054, Sampled from on-site Borrow Pit on10/12/98

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.5	43.4	43.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	96.7		
.5 in.	95.2		
.25 in.	88.3		
#4	86.5		
#10	81.2		
#20	72.4		
#40	64.8		
#60	56.6		
#100	48.9		
#200	43.1		

* (no specification provided)

Soil Description

Dark reddish brown clayey Silty SAND. trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.55 D_{60}= 0.308 D_{50}= 0.163
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

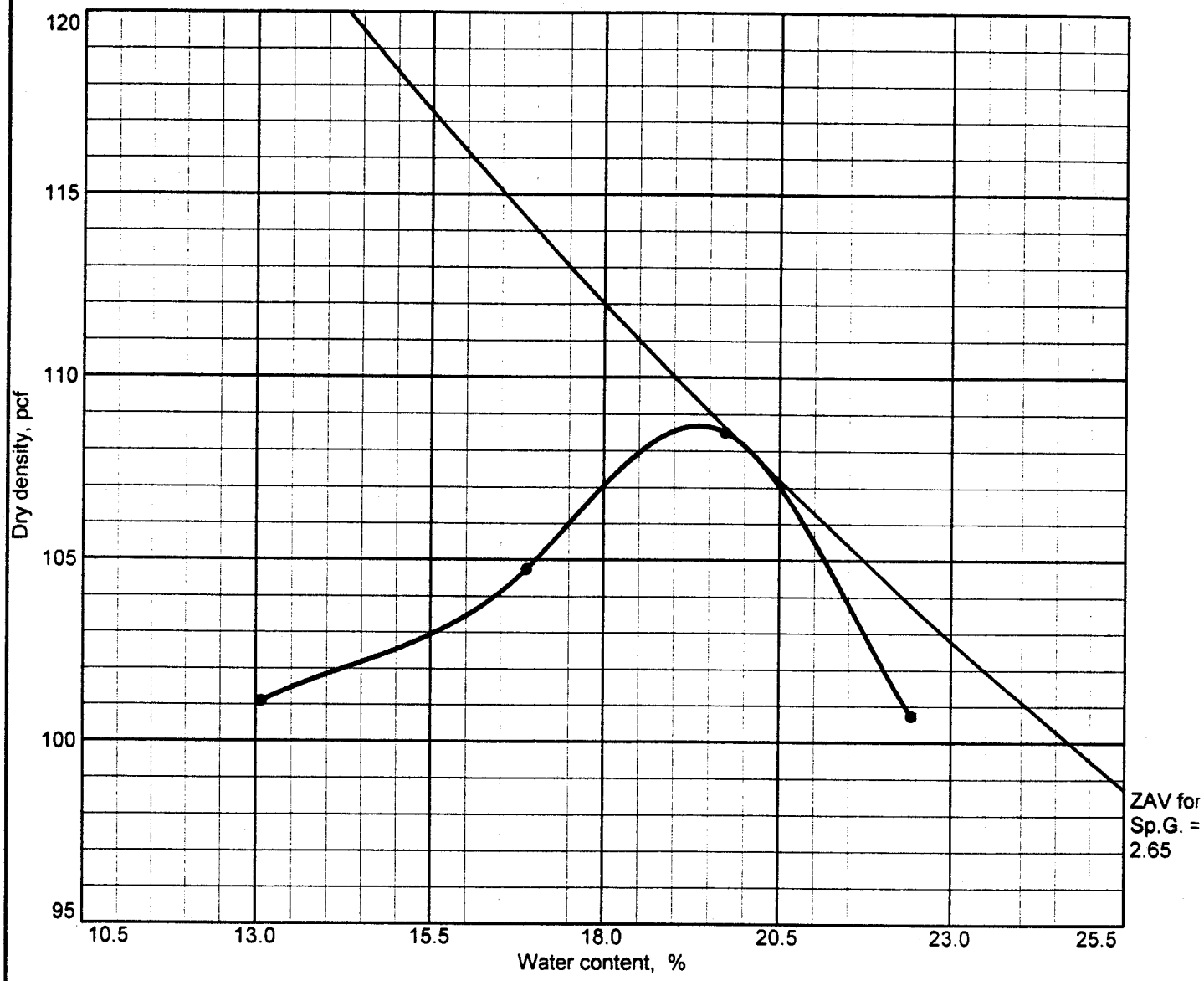
DL-054, Sampled from on-site borrow pit on 10/12/98

Sample No.: DL-054 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							1.4	51.3

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 108.7 pcf Optimum moisture = 19.4 %	Brown clayey SAND w/ silt.

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.
Project: Durham Landfill Closure
● **Location:** On-site Borrow Pit

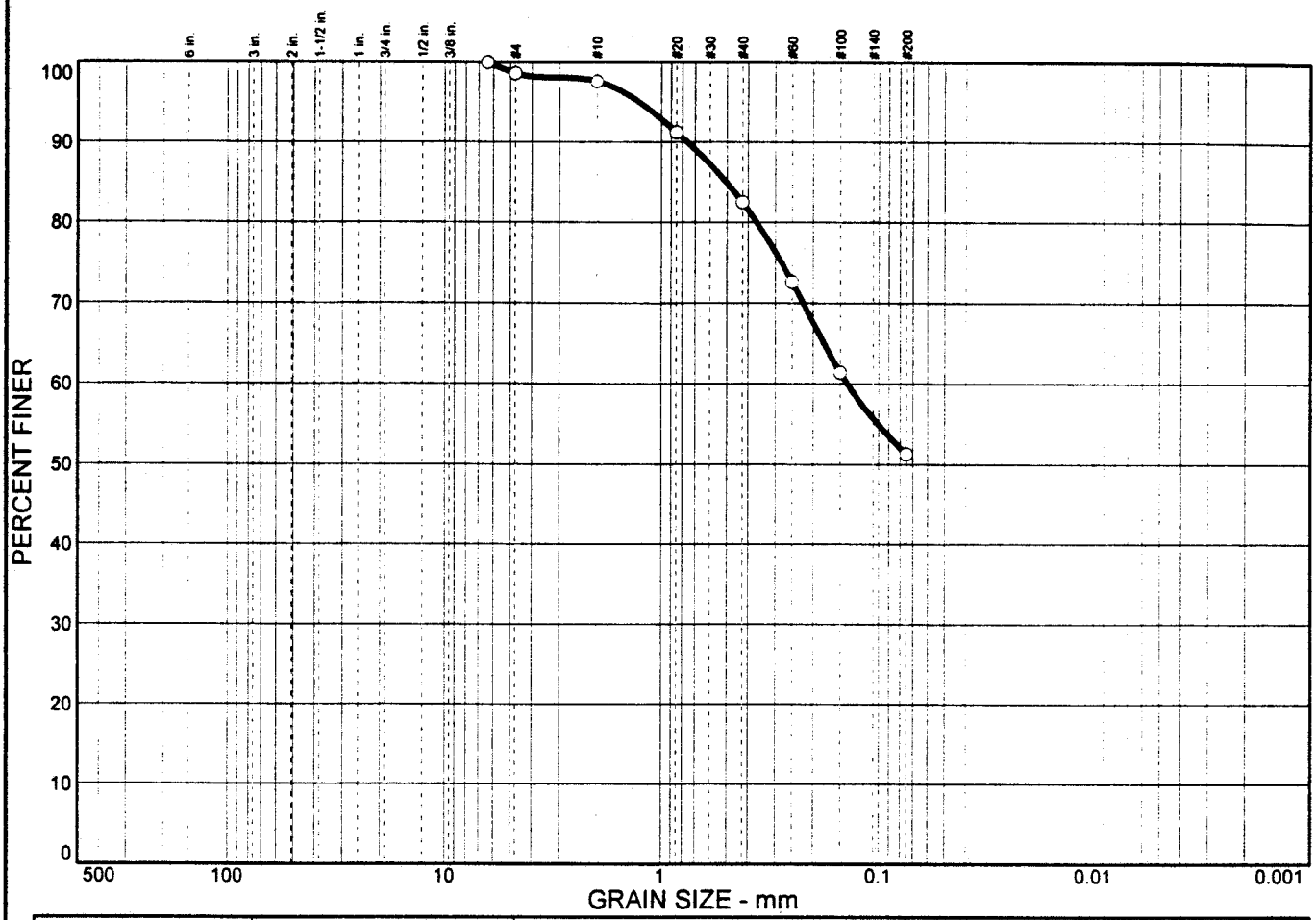
Remarks:
DL-067, Sampled from On-site borrow pit on 10/16/98

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.4	47.3	51.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	98.6		
#10	97.6		
#20	91.2		
#40	82.5		
#60	72.6		
#100	61.4		
#200	51.3		

* (no specification provided)

Soil Description

Brown clayey SAND w/ silt.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.504 D_{60}= 0.139 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

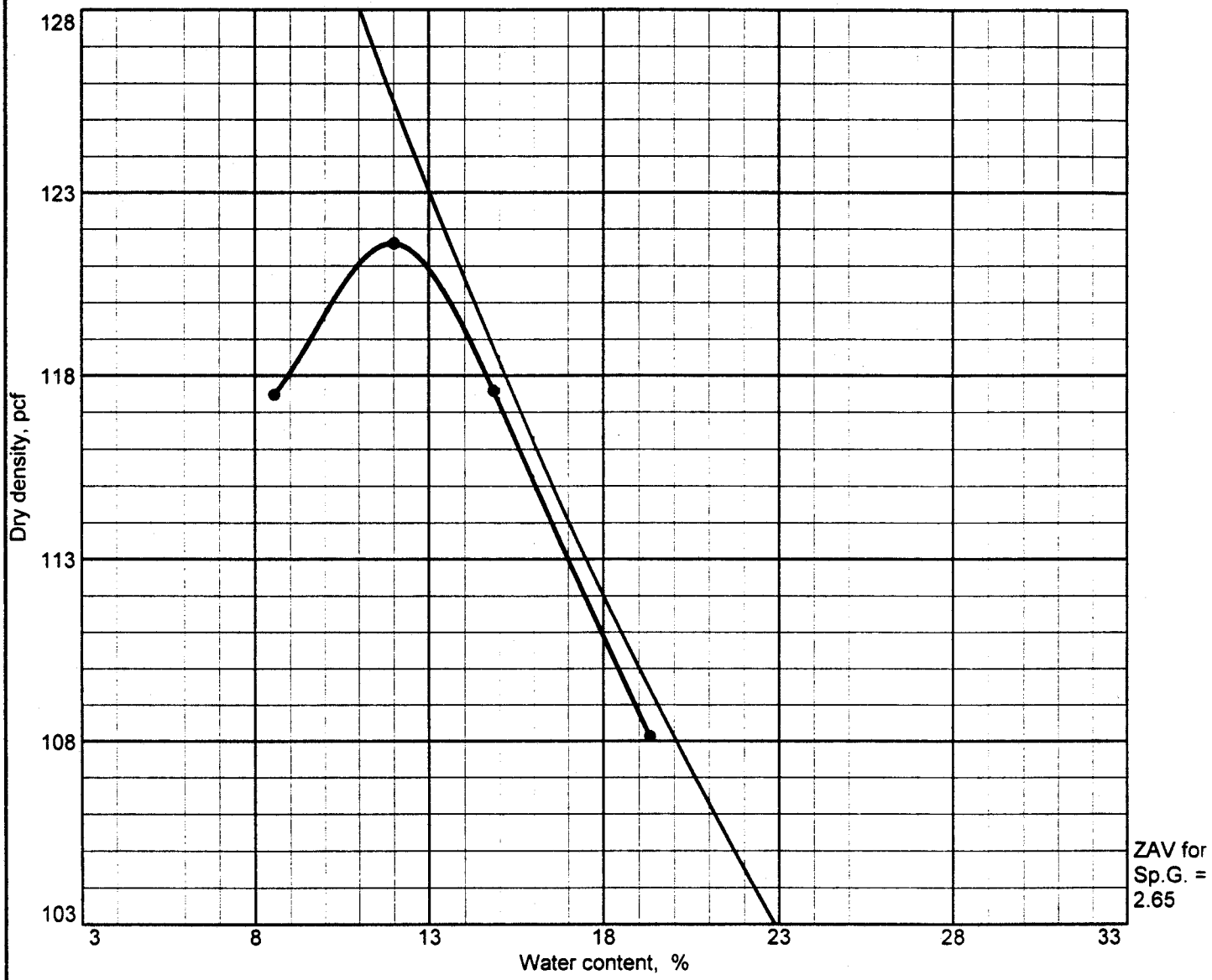
DL-067, Sampled from on-site borrow pit on 10/16/98.

Sample No.: DL-067 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							4.3	48.1

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 121.6 pcf Optimum moisture = 12.0 %	Dark brown-red silty SAND, little clay and gravel

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.
Project: Durham Landfill Closure
● **Location:** On-site Borrow Pit

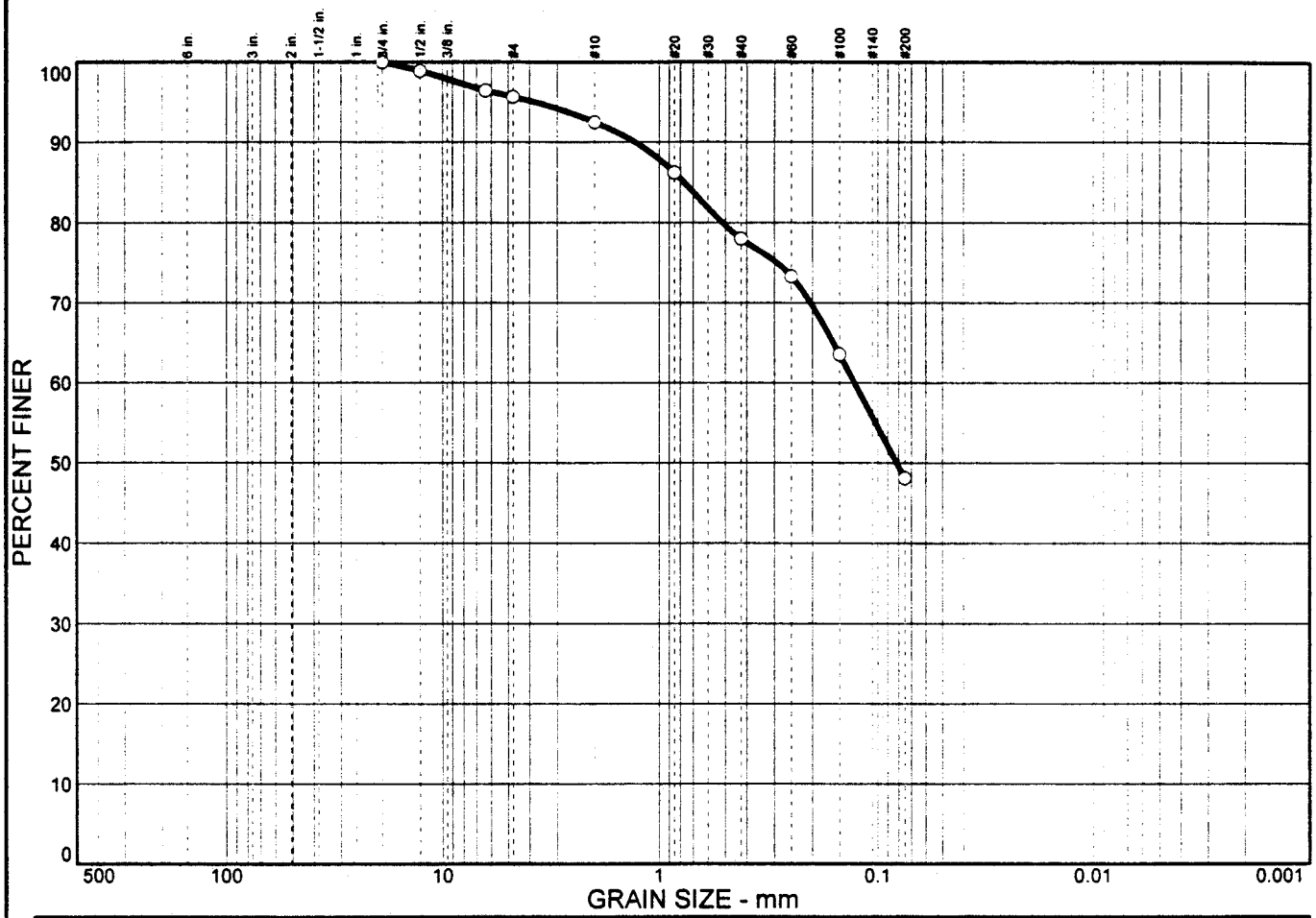
Remarks:
DL-099, Sampled from In-place Material (On-site Borrow) on 10/21/98.

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.3	47.6	48.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	98.9		
.25 in.	96.5		
#4	95.7		
#10	92.5		
#20	86.2		
#40	78.0		
#60	73.3		
#100	63.5		
#200	48.1		

* (no specification provided)

Soil Description

Dark brown-red silty SAND, little clay and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.767 D_{60}= 0.128 D_{50}= 0.0817
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

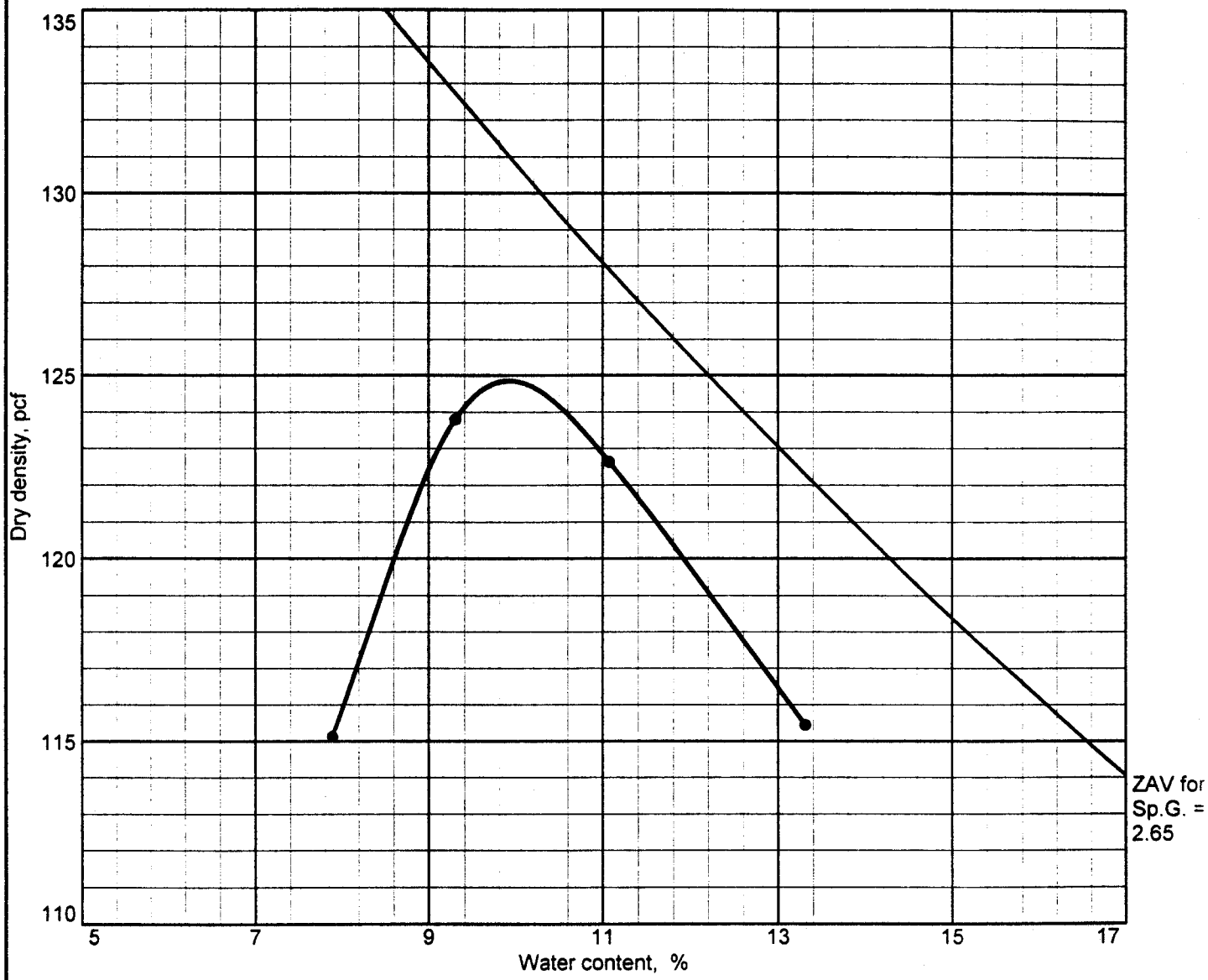
DL-099, Sampled from In-place material (On-site Borrow) on 10/21/98.

Sample No.: DL-099 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							3.6	43.5

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 124.9 pcf Optimum moisture = 9.9 %	Dark brown-red silty SAND, little clay and gravel

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.

Project: Durham Landfill Closure

● **Location:** On-site Borrow Pit

Remarks:

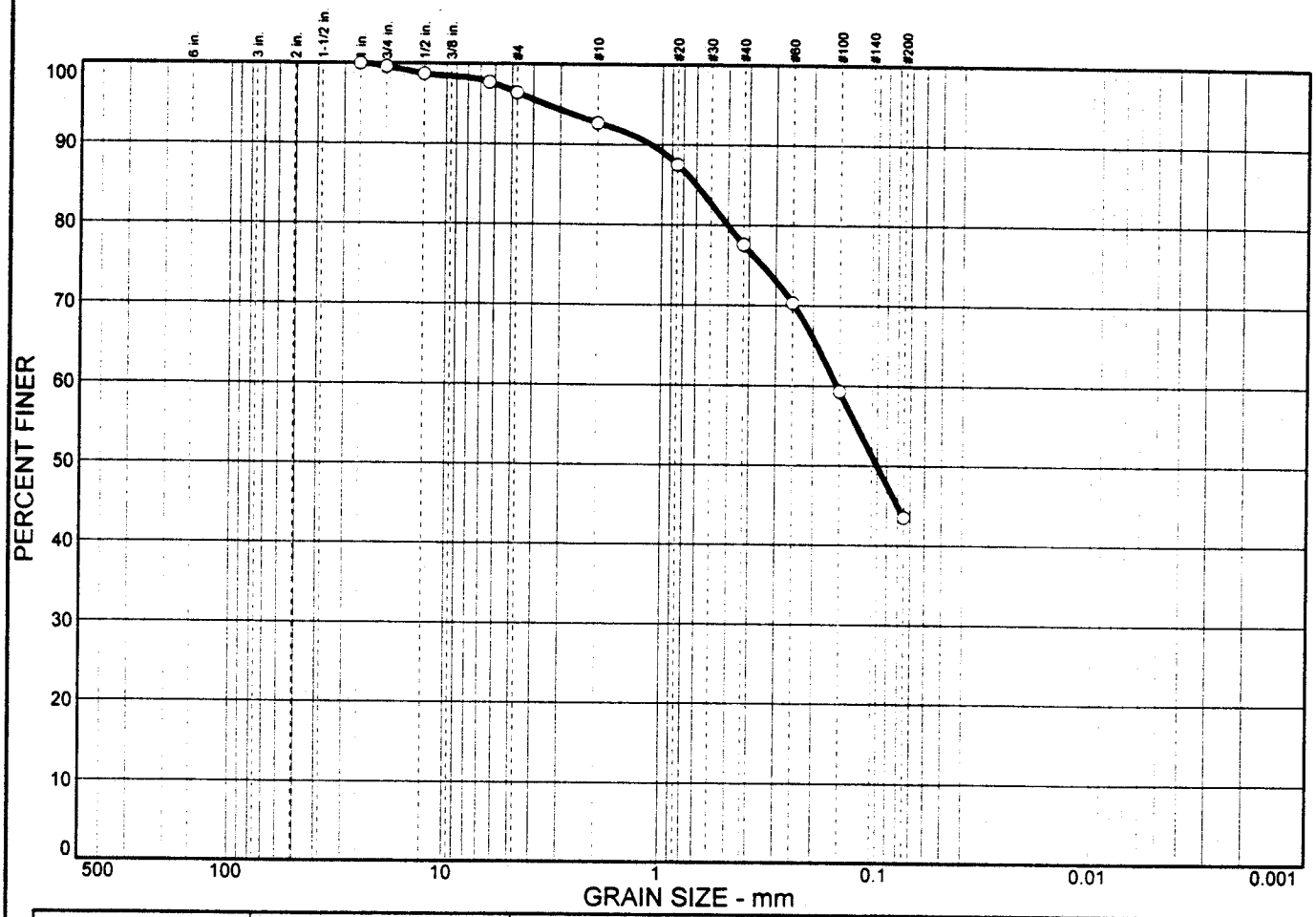
DL-100, Sampled from In-place Material (On-site Borrow) on 10/21/98.

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.6	52.9	43.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	99.6		
.5 in.	98.7		
.25 in.	97.7		
#4	96.4		
#10	92.7		
#20	87.5		
#40	77.6		
#60	70.3		
#100	59.3		
#200	43.5		

* (no specification provided)

Soil Description

Dark brown-red silty SAND, little clay and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.700 D_{60}= 0.155 D_{50}= 0.100
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

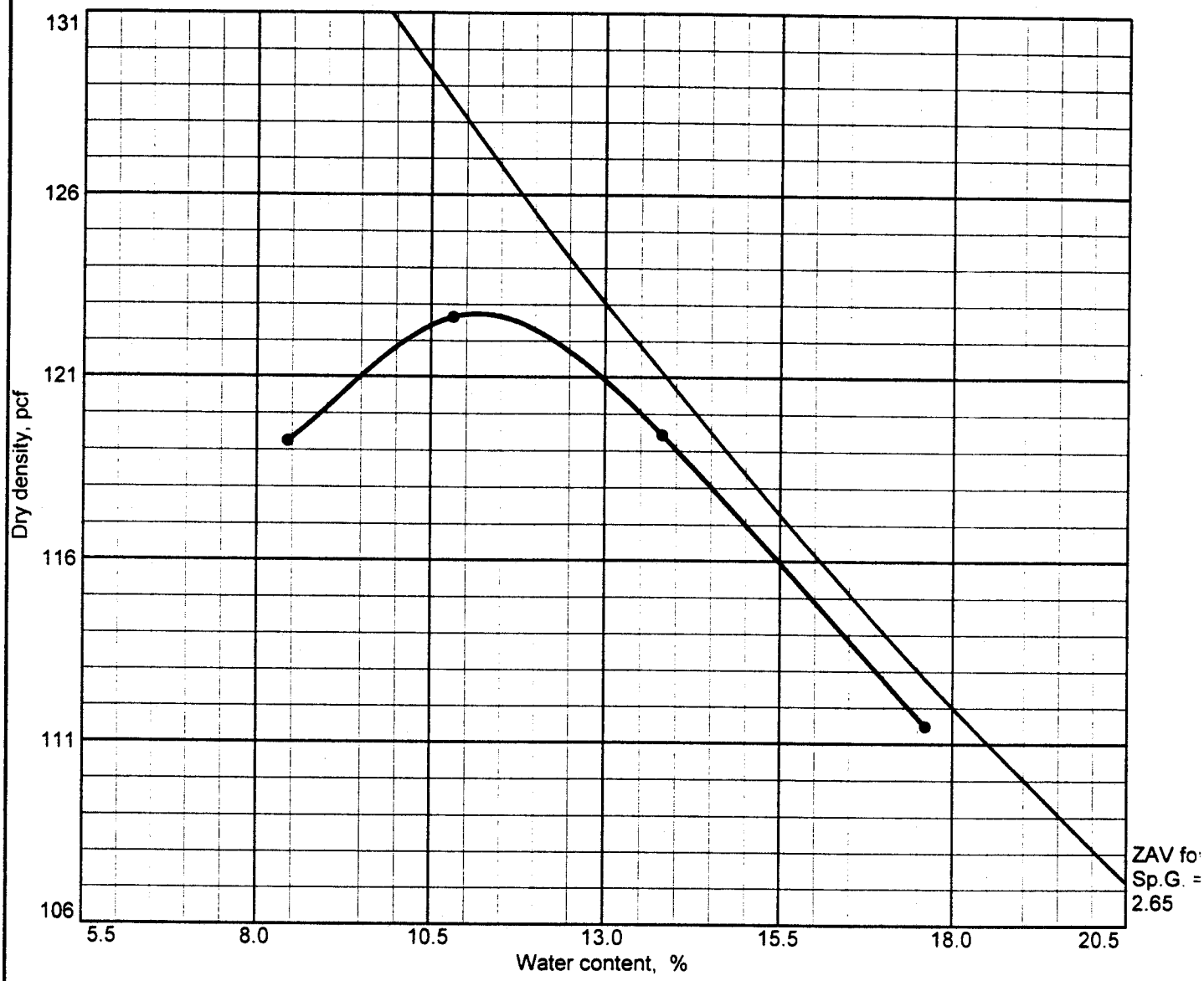
DL-100, Sampled from In-place material (On-site Borrow) on 10/21/98.

Sample No.: DL-100 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							5.1	50.5

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 122.7 pcf Optimum moisture = 11.2 %	Dark brown-red silty SAND, little clay and gravel

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.
Project: Durham Landfill Closure
● **Location:** On-site Borrow Pit

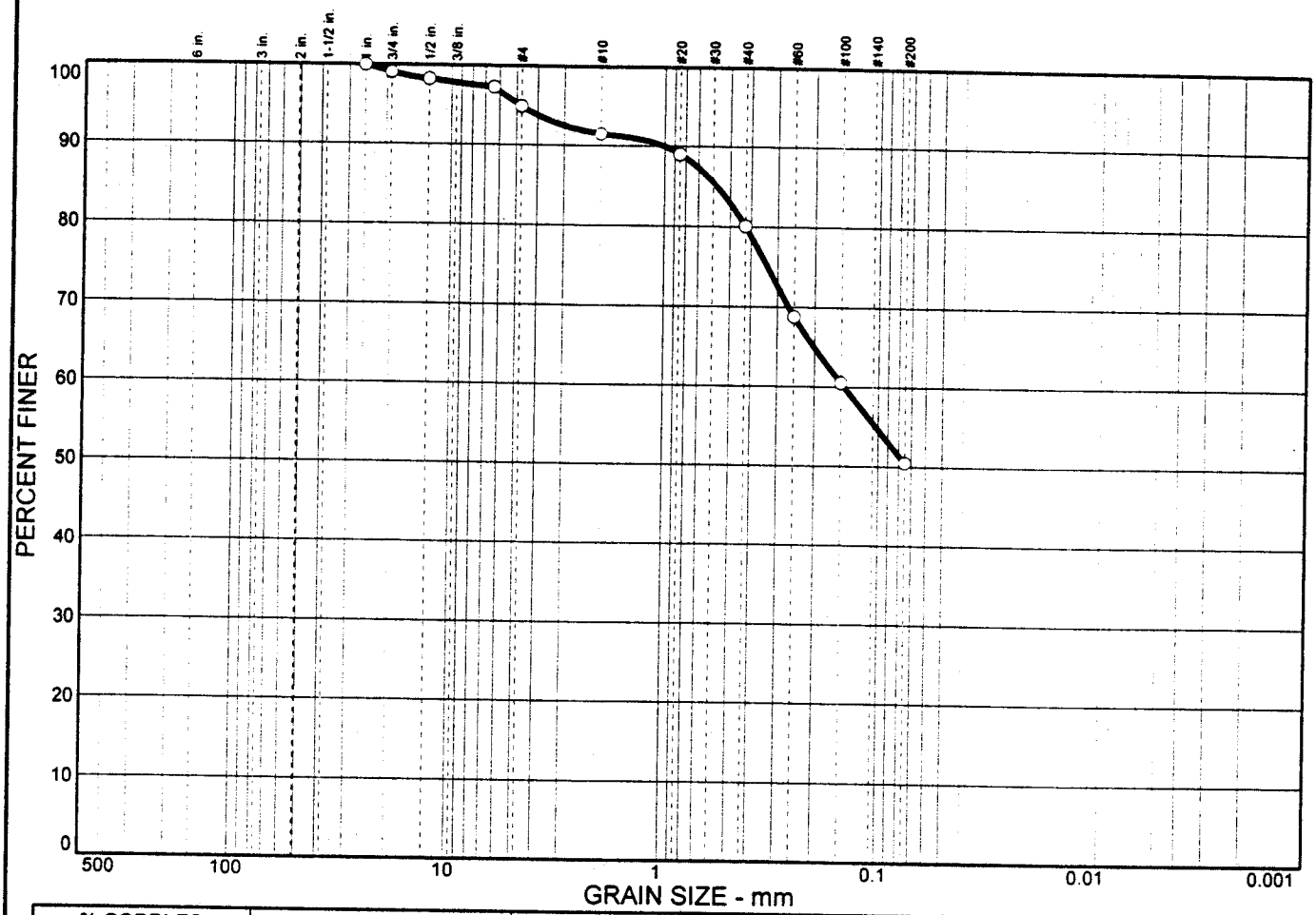
Remarks:
DL-101, Sampled from In-place Material (On-site Borrow) on 10/21/98.

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	5.1	44.4	50.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	99.1		
.5 in.	98.3		
.25 in.	97.3		
#4	94.9		
#10	91.5		
#20	89.0		
#40	80.1		
#60	68.8		
#100	60.5		
#200	50.5		

* (no specification provided)

Soil Description

Dark brown-red silty SAND, little clay and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.573 D_{60}= 0.145 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

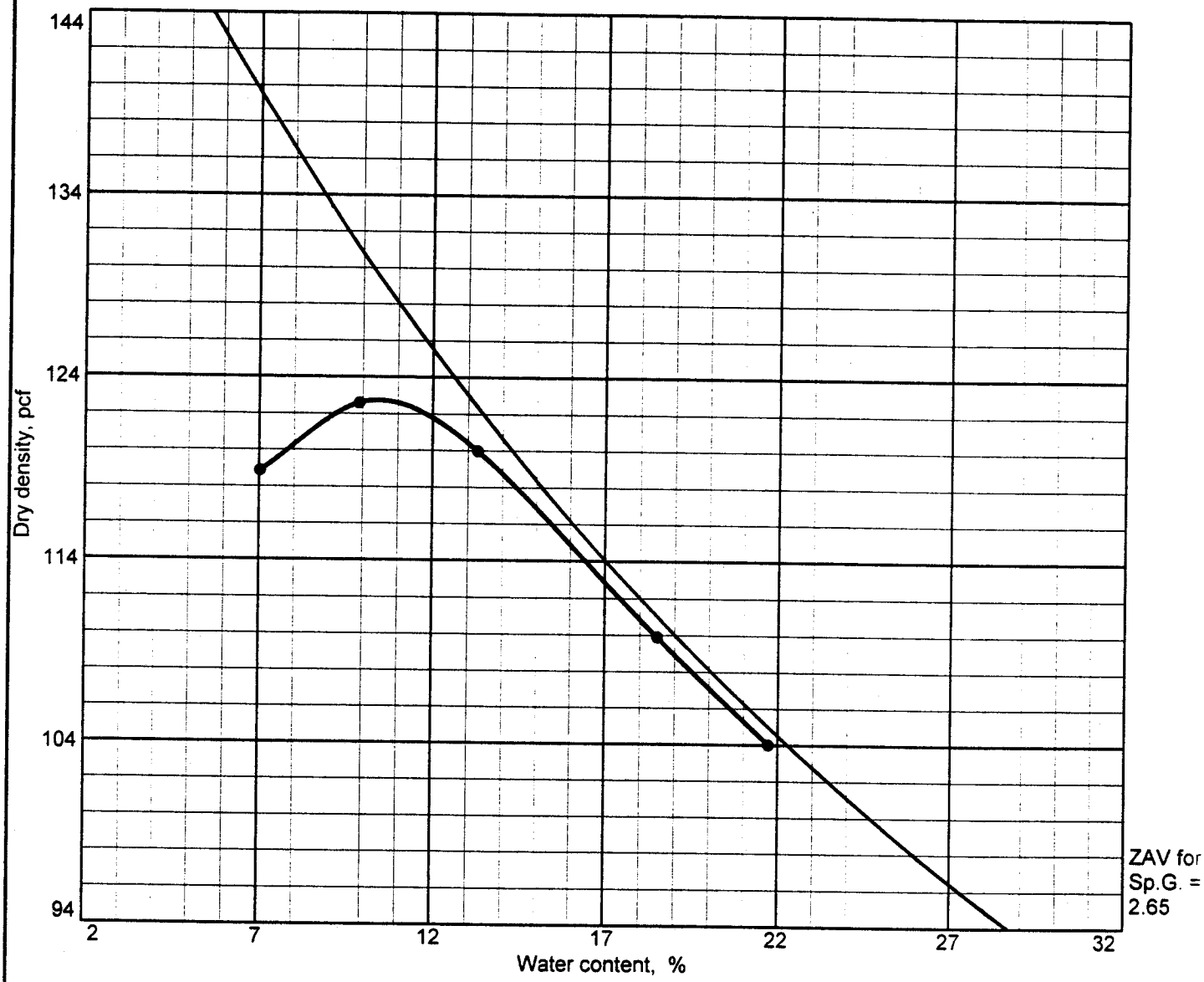
DL-101, Sampled from In-place material (On-site Borrow) on 10/21/98.

Sample No.: DL-101 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							5.5	

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 122.7 pcf Optimum moisture = 10.5 %	Dark brown-red silty SAND, little clay and gravel

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.
Project: Durham Landfill Closure
● **Location:** On-site Borrow Pit

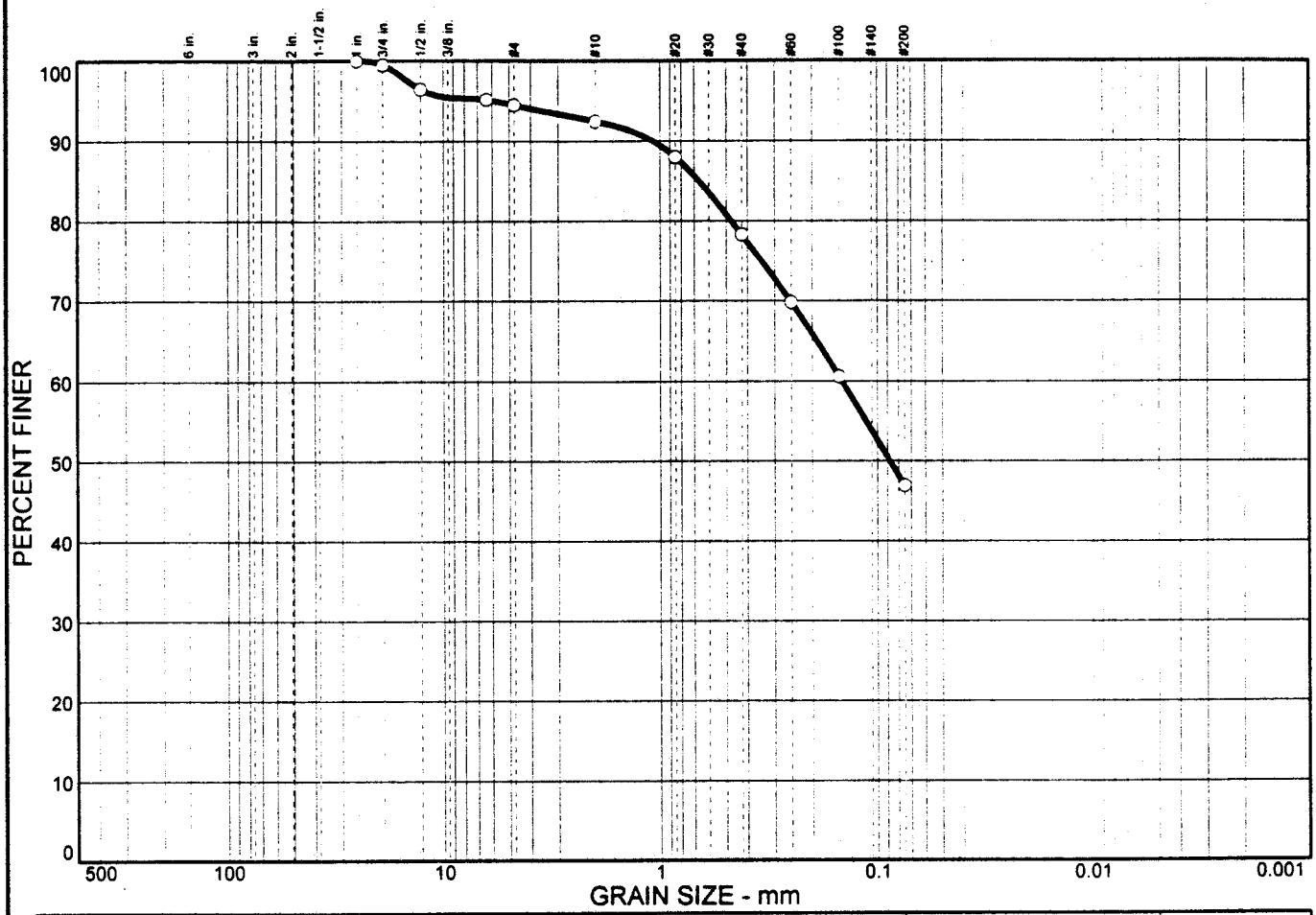
Remarks:
DL-102, Sampled from In-place Material (On-site Borrow) on 10/21/98.

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	5.5	47.6	46.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	99.5		
.5 in.	96.5		
.25 in.	95.2		
#4	94.5		
#10	92.5		
#20	88.0		
#40	78.3		
#60	69.8		
#100	60.6		
#200	46.9		

* (no specification provided)

Soil Description

Dark brown-red silty SAND, little clay and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.663 D_{60}= 0.145 D_{50}= 0.0875
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

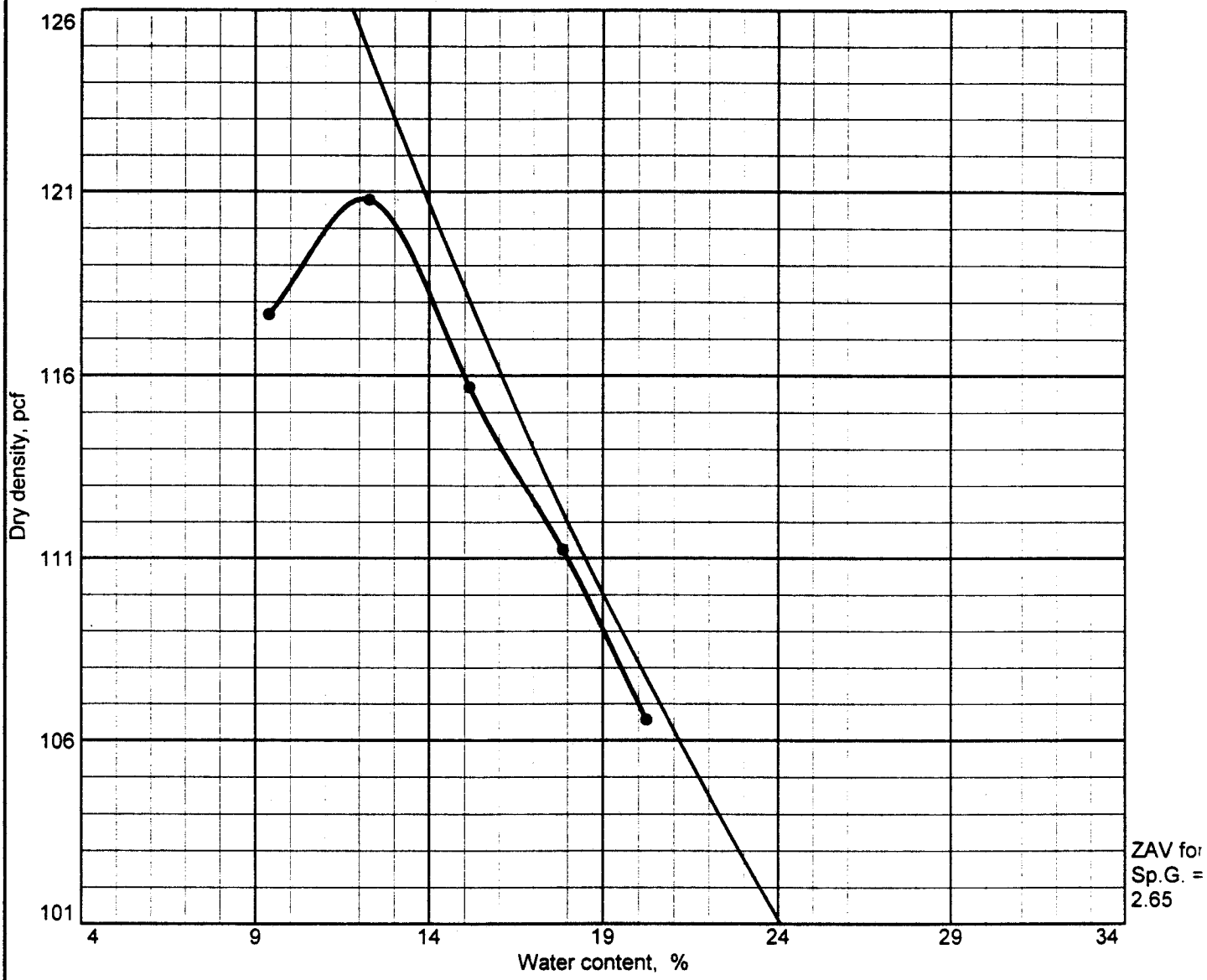
DL-102, Sampled from In-place material (On-site Borrow) on 10/21/98.

Sample No.: DL-102 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **Elev./Depth:**

VAN DER HORST ENGINEERING

Client: Gilbert Southern Corp.
Project: Durham 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						
							8.8	49.7

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 120.8 pcf Optimum moisture = 12.1 %	Dark brown-red silty SAND, little clay and gravel

Project No. VNC-98-029 **Client:** Gilbert Southern Corp.

Project: Durham Landfill Closure

● **Location:** On-site Borrow Pit

Remarks:

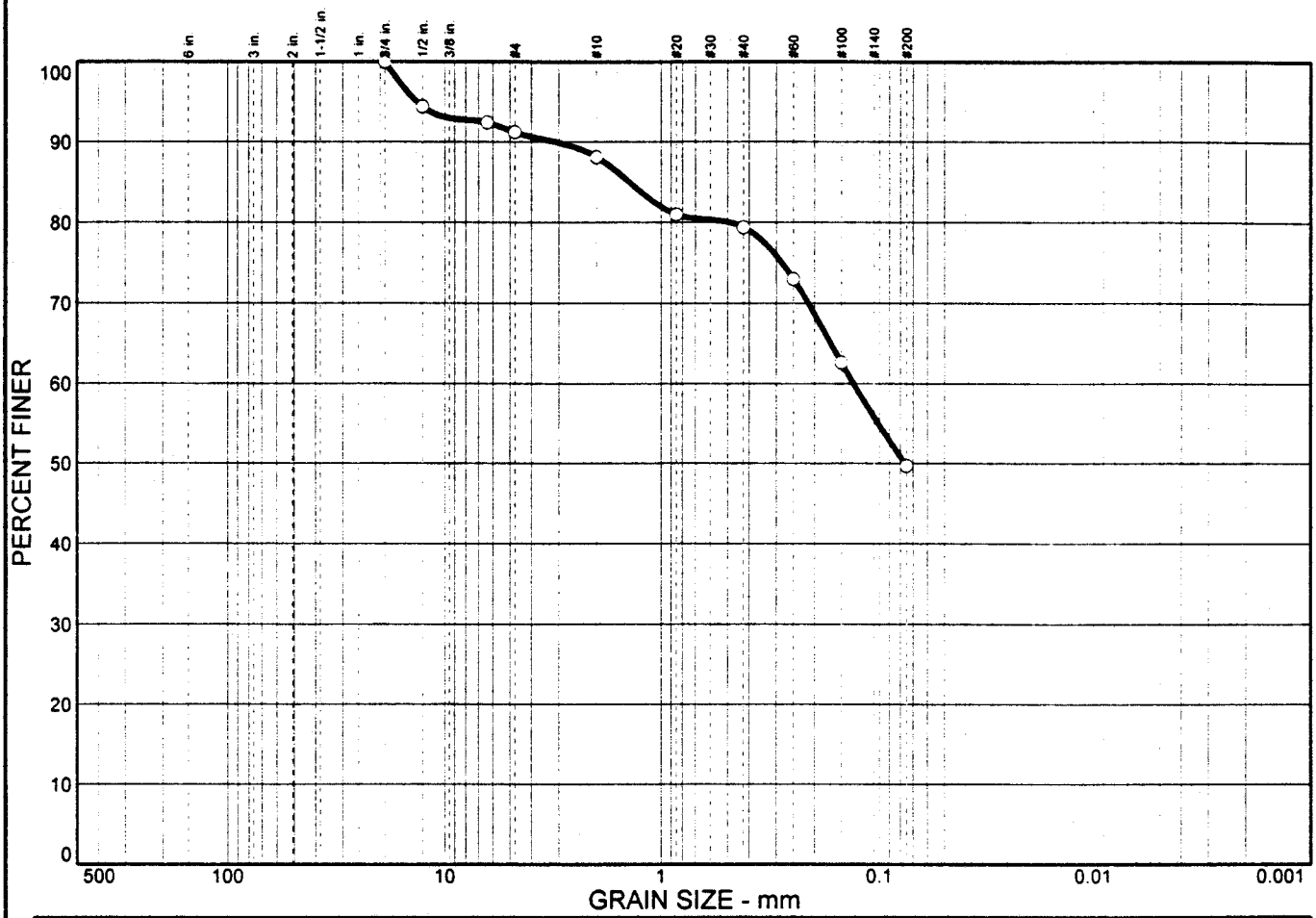
DL-103, Sampled from In-place Material (On-site Borrow) on 10/21/98.

COMPACTION TEST REPORT

VAN DER HORST ENGINEERING

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.8	41.5	49.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	94.4		
.25 in.	92.4		
#4	91.2		
#10	88.1		
#20	81.0		
#40	79.4		
#60	73.0		
#100	62.6		
#200	49.7		

* (no specification provided)

Soil Description

Dark brown-red silty SAND, little clay and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.40 D_{60}= 0.132 D_{50}= 0.0763
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

DL-103, Sampled from In-place material (On-site Borrow) on 10/21/98.

Sample No.: DL-103 **Source of Sample:** On-site Borrow **Date:**
Location: On-site Borrow Pit **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: 03/23/99 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:

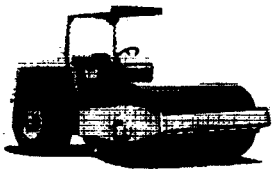
COPIES	DATE	NO.	DESCRIPTION
2	03/19/99	D-32	In-place Density Test Results

REMARKS:

COPIES

SIGNED: Dionne Boyd

VAN DER HORST



IN-PLACE DENS'TY TEST RESULTS

PROJECT:	**Durham Co. Landfill**	**PROJECT NO:**	**Vnc-98-029**
CLIENT:	**Gilbert Southern**	**DATE:**	**03/19/99 pg. 1 of 1**
CONTRACTOR:	**Gilbert Southern**	**REPORT NO:**	**D-32**

GENERAL LOCATION: **Main Landfill Roadway**

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
1	See Attached Test location Plan	Finished Grade	131.1	3.5	95.0	DL-245A
2	See Attached Test location Plan	Finished Grade	133.8	4.5	96.9	DL-245A
3	See Attached Test location Plan	Finished Grade	133.1	5.7	96.4	DL-245A
4	See Attached Test location Plan	Finished Grade	133.2	5.1	96.5	DL-245A
5	See Attached Test location Plan	Finished Grade	134.0	5.1	97.0	DL-245A
6	See Attached Test location Plan	Finished Grade	133.2	4.2	96.5	DL-245A
7	See Attached Test location Plan	Finished Grade	131.5	4.8	95.2	DL-245A
8	See Attached Test location Plan	Finished Grade	136.1	4.4	98.5	DL-245A
9	See Attached Test location Plan	Finished Grade	131.8	5.1	95.5	DL-245A
10	See Attached Test location Plan	Finished Grade	134.8	4.5	97.6	DL-245A

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-245A	138.1	7.3	Rougemont - Quarry ABC Stone

REMARKS:

ARRIVED ON SITE: 8:30
LEFT SITE: 11:30
HOURS ON SITE: 3.0
TRAVEL TIME: 1.0
MILEAGE: 70

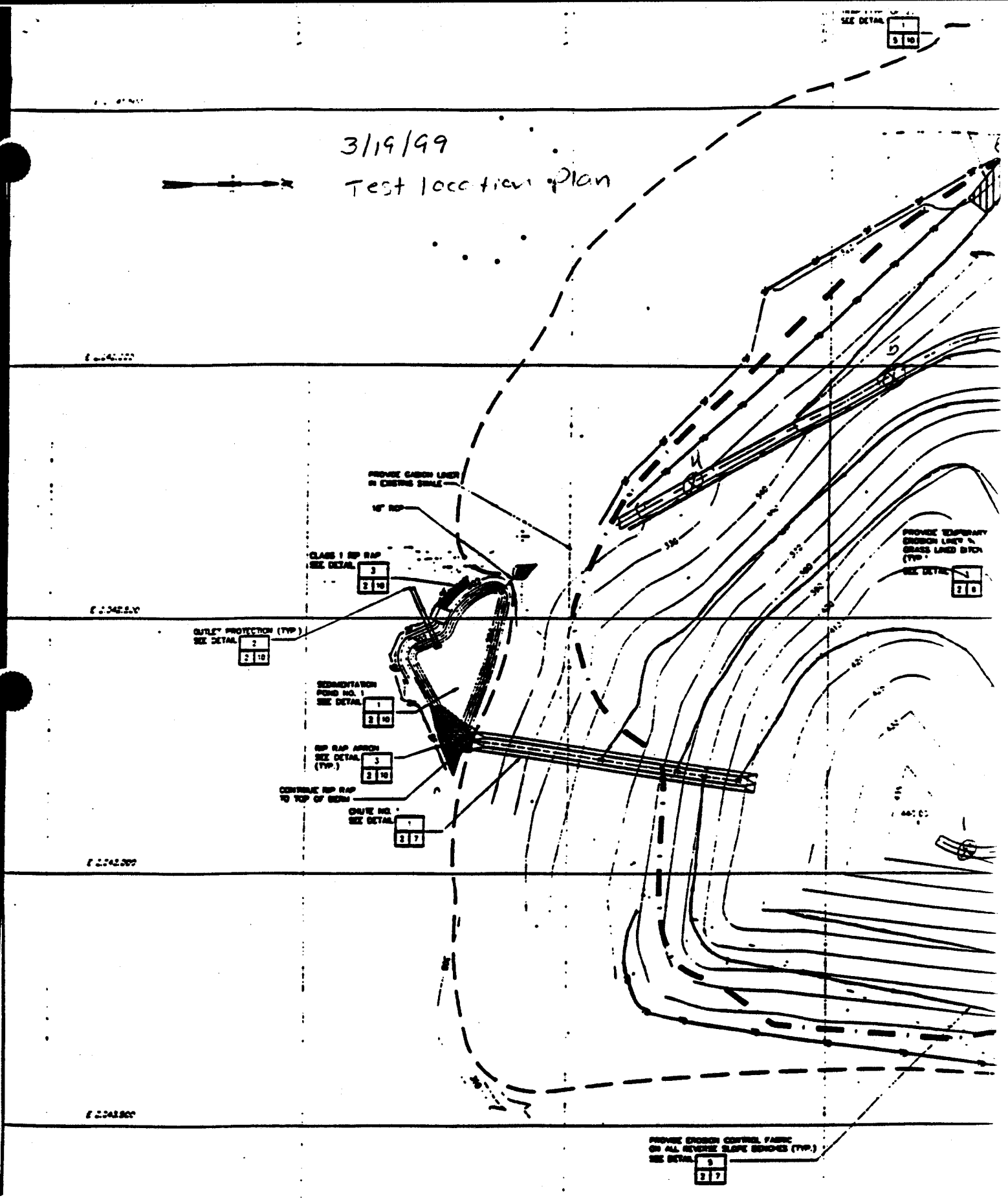
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

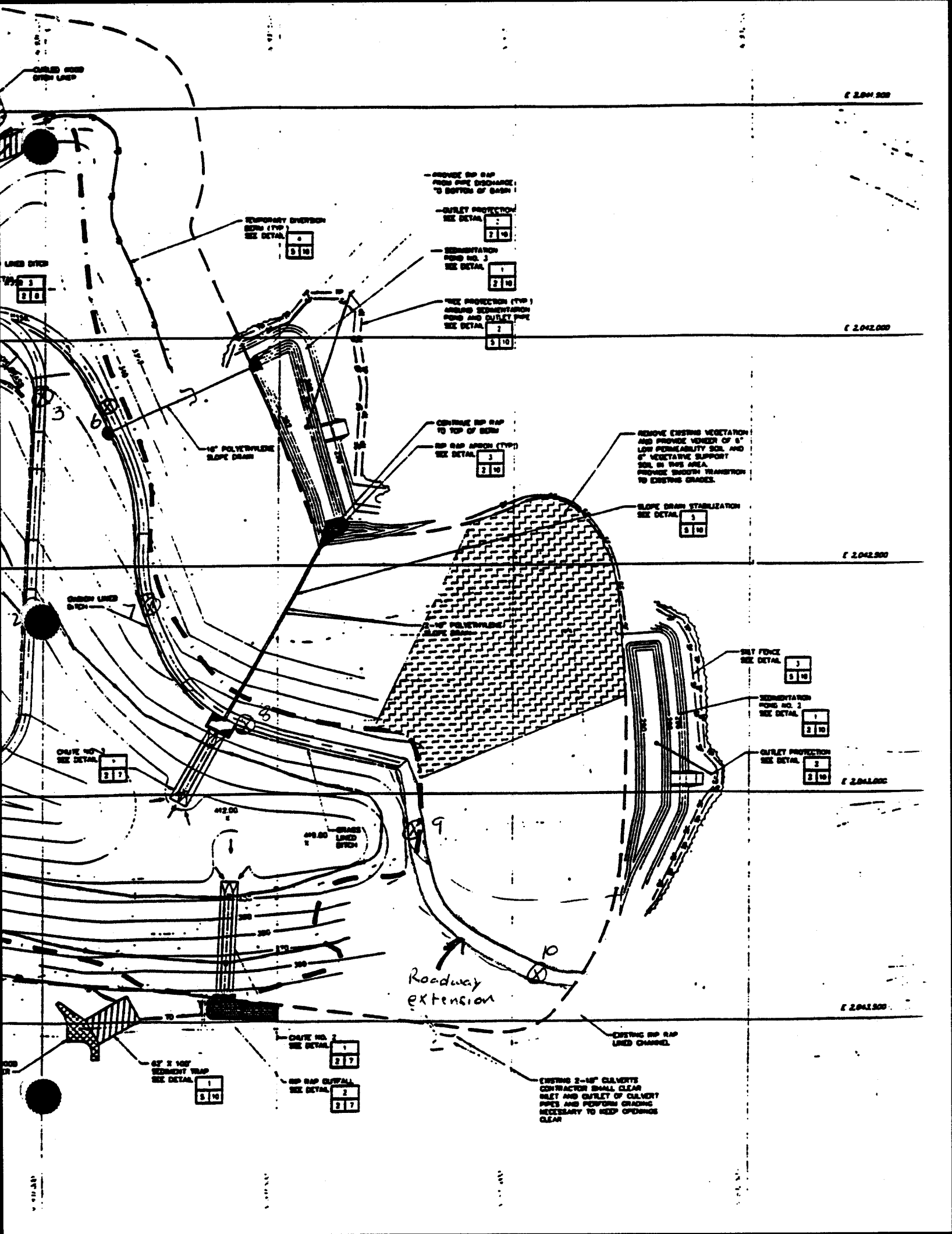
PERFORMED BY: Mark Potratz
PREVIEWED BY: Robert Mashewske, P.E.

VANDERHORST Geotechnical Engineering, PC@3101-156 Stonybrook Drive, Raleigh, NC 27604@(919) 876-0405@Fax (919) 876-0460

3/19/99

Test location plan




PROVIDE RIP RAP FROM PIPE DISCHARGE TO BOTTOM OF BASIN
OUTLET PROTECTION SEE DETAIL
SEDIMENTATION POND NO. 3 SEE DETAIL
TREE PROTECTION (TYP) AROUND SEDIMENTATION POND AND OUTLET PIPE SEE DETAIL
TEMPORARY DIVERSION BERM (TYP) SEE DETAIL
LINED DITCH
CONTINUE RIP RAP TO TOP OF BERM
RIP RAP APRON (TYP) SEE DETAIL
18" POLYETHYLENE SLOPE DRAIN
REMOVE EXISTING VEGETATION AND PROVIDE VENEER OF 6" LOW PERMEABILITY SOIL AND 6" VEGETATIVE SUPPORT SOIL IN THIS AREA. PROVIDE SMOOTH TRANSITION TO EXISTING GRADES.
SLOPE DRAIN STABILIZATION SEE DETAIL
GRADED LINED DITCH
18" POLYETHYLENE SLOPE DRAIN
SILT FENCE SEE DETAIL
SEDIMENTATION POND NO. 2 SEE DETAIL
OUTLET PROTECTION SEE DETAIL
CULVERT 18" SEE DETAIL
412.00
410.00
GRADED LINED DITCH
Roadway extension
CULVERT NO. 2 SEE DETAIL
RIP RAP OUTFALL SEE DETAIL
EXISTING RIP RAP LINED CHANNEL
EXISTING 2-18" CULVERTS CONTRACTOR SHALL CLEAR INLET AND OUTLET OF CULVERT PIPES AND PERFORM GRADING NECESSARY TO KEEP OPENINGS CLEAR

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

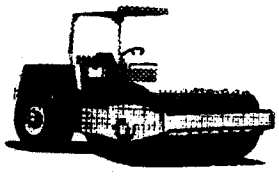
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

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

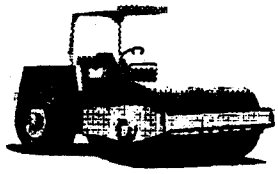
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

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

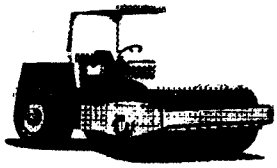
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

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:

ARRIVED ON SITE: 11:30

LEFT SITE: 3:30

HOURS ON SITE: 4.0

TRAVEL TIME: 1.0

MILEAGE: 70

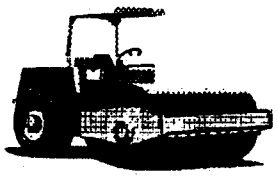
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

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 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

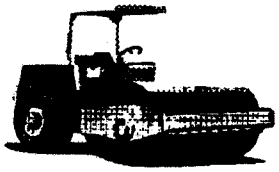
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

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

VAN DER HORST



IN-PLACE DENSITY TEST RESULTS

PROJECT: Durham Co. Landfill **PROJECT NO:** Vnc-98-029

CLIENT: Gilbert Southern **DATE:** 03/19/99 pg 1 of 4

CONTRACTOR: Gilbert Southern **REPORT NO:** D-34

GENERAL LOCATION: NE Quadrant

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
1	Acre 14 See test location Plan	Finished Grade	101.8	18.6	90.0	DL-294
2	Acre 14 See test location Plan	Finished Grade	106.7	17.2	94.3	DL-294
3	Acre 14 See test location Plan	Finished Grade	105.2	17.4	93.0	DL-294
4	Acre 14 See test location Plan	Finished Grade	114.0	14.5	100+	DL-294
5	Acre 21 See test location Plan	Finished Grade	112.6	14.6	99.6	DL-294
6	Acre 21 See test location Plan	Finished Grade	118.2	13.2	100+	DL-294
7	Acre 21 See test location Plan	Finished Grade	108.6	15.4	96.0	DL-294
8	Acre 21 See test location Plan	Finished Grade	118.5	12.6	100+	DL-294
9	Acre 22 See test location Plan	Finished Grade	117.5	13.0	100+	DL-294
10	Acre 22 See test location Plan	Finished Grade	117.3	13.7	100+	DL-294
11	Acre 22 See test location Plan	Finished Grade	111.1	14.6	98.2	DL-294
12	Acre 22 See test location Plan	Finished Grade	102.9	20.0	91.0	DL-294
13	Acre 20 See test location Plan	Finished Grade	114.0	15.2	100+	DL-294

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-294	113.1	14.0	Vegetative support soil

REMARKS:

ARRIVED ON SITE: 8:30

LEFT SITE: 11:30

HOURS ON SITE: 3.0

TRAVEL TIME: 1.0

MILEAGE: 70

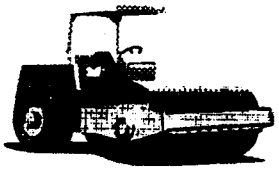
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

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:** 03/19/99 pg 2 of 4

CONTRACTOR: Gilbert Southern **REPORT NO:** D-34

GENERAL LOCATION: NE Quadrant

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
14	Acre 20 See test location Plan	Finished Grade	110.7	15.2	97.9	DL-294
15	Acre 20 See test location Plan	Finished Grade	110.4	15.4	97.6	DL-294
16	Acre 20 See test location Plan	Finished Grade	110.6	16.6	97.8	DL-294
17	Acre 23 See test location Plan	Finished Grade	105.6	18.5	93.4	DL-294
18	Acre 23 See test location Plan	Finished Grade	106.2	17.3	93.9	DL-294
19	Acre 23 See test location Plan	Finished Grade	114.9	14.6	100+	DL-294
20	Acre 23 See test location Plan	Finished Grade	113.1	15.1	100.0	DL-294
21	Acre 26 See test location Plan	Finished Grade	111.8	14.1	98.9	DL-294
22	Acre 26 See test location Plan	Finished Grade	101.8	19.6	90.0	DL-294
23	Acre 26 See test location Plan	Finished Grade	111.4	14.5	98.5	DL-294
24	Acre 25 See test location Plan	Finished Grade	116.9	13.4	100+	DL-294
25	Acre 25 See test location Plan	Finished Grade	118.0	13.4	100+	DL-294
26	Acre 25 See test location Plan	Finished Grade	110.3	15.9	97.5	DL-294

SAMPLE NO	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-294	113.1	14.0	Vegetative support soil

REMARKS:

ARRIVED ON SITE: 8:30

LEFT SITE: 11:30

HOURS ON SITE: 3.0

TRAVEL TIME: 1.0

MILEAGE: 70

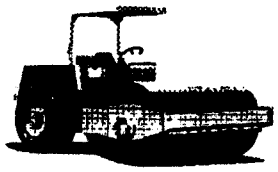
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

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:** 03/19/99 pg 3 of 4

CONTRACTOR: Gilbert Southern **REPORT NO:** D-34

GENERAL LOCATION: NE Quadrant

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
27	Acre 25 See test location Plan	Finished Grade	116.9	13.0	100+	DL-294
28	Acre 24 See test location Plan	Finished Grade	113.3	10.2	100+	DL-294
29	Acre 24 See test location Plan	Finished Grade	114.0	13.6	100+	DL-294
30	Acre 24 See test location Plan	Finished Grade	106.4	18.3	94.1	DL-294
31	Acre 24 See test location Plan	Finished Grade	115.1	15.7	100+	DL-294
32	Acre 24 See test location Plan	Finished Grade	115.7	15.6	100+	DL-294
33	Acre 19 See test location Plan	Finished Grade	116.2	15.6	100+	DL-294
34	Acre 19 See test location Plan	Finished Grade	110.4	16.1	97.6	DL-294
35	Acre 19 See test location Plan	Finished Grade	113.1	14.5	100.0	DL-294
36	Acre 19 See test location Plan	Finished Grade	111.0	15.7	98.1	DL-294
37	Acre 18 See test location Plan	Finished Grade	117.4	12.2	100+	DL-294
38	Acre 18 See test location Plan	Finished Grade	110.4	14.4	98.1	DL-294
39	Acre 18 See test location Plan	Finished Grade	114.4	13.3	100+	DL-294

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-294	113.1	14.0	Vegetative support soil

REMARKS:

ARRIVED ON SITE: 8:30

LEFT SITE: 11:30

HOURS ON SITE: 3.0

TRAVEL TIME: 1.0

MILEAGE: 70

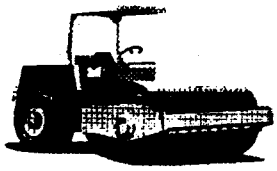
TEST METHOD: ___ SAND CONE
___ DRIVE TUBE
_x_ DENSITY GAUGE

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:** 03/19/99 pg 4 of 4

CONTRACTOR: Gilbert Southern **REPORT NO:** D-34

GENERAL LOCATION: NE Quadrant

TEST NO.	LOCATION	DEPTH OR ELEV.	DRY DENSITY [PCF]	MOIST. CONTENT [%]	COMP [%]	SAMPLE NO.
40	Acre 18 See test location Plan	Finished Grade	110.3	15.2	98.0	DL-294

SAMPLE NO.	MAXIMUM D.D (PCF)	OPT. % MOISTURE	SAMPLE DESCRIPTION
DL-294	113.1	14.0	Vegetative support soil

REMARKS:

ARRIVED ON SITE: 8:30

LEFT SITE: 11:30

HOURS ON SITE: 3.0

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

7

VAN DER HORST

CLAY COVER TESTING

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

Project No.: VNC-98-029
Date: 10/25/98
Report No.: 014

Acre 1 Lift 1

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	95.6	23.5	95.1	
2	See Test Location Plan	98.8	21.3	98.3	
3	See Test Location Plan	100.8	21.0	100+	
4	See Test Location Plan	95.6	22.3	95.1	
5	See Test Location Plan	98.4	21.4	97.9	
6	See Test Location Plan	99.0	21.0	98.5	
7	See Test Location Plan	95.8	25.3	95.3	
8	See Test Location Plan	101.3	21.6	100+	
9	See Test Location Plan	95.5	22.0	95.0	
10	See Test Location Plan	99.0	22.1	98.5	Perm/Sample (DL-107)
11	See Test Location Plan	95.6	23.4	95.1	
12	See Test Location Plan	98.8	22.6	98.3	
13	See Test Location Plan	99.3	21.7	98.8	
14	See Test Location Plan	99.2	22.0	99.7 98.7	
15	See Test Location Plan	96.1	24.6	95.6	
16	See Test Location Plan	97.0	23.6	96.5	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	2.6x10(-8)
Dry Density (pcf)	98.5
Moisture Content (%)	21.9

Atterberg Limits (ASTM D4318)

PL	24
LL	50
PI	26

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	25.1
%Silt	35.7
%Clay	39.2

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

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/28/98
Report No.: P-052

Project No.: VNC-98-029
Sample No. DL-107

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.6E-08	cm/sec
% Moisture	21.9	%
Dry Density	98.5	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/23/98
Location: Acre 1, Lift 1
Retest of DL-081

Specimen Data

Length (in):	3.780
Diameter (in.):	2.865
Area (sq. in.):	6.458
Volume (cu. in.):	24.41
Wet Weight (grams):	769.8
Dry Weight (grams):	631.3
Dry Density (pcf):	98.5

Moisture Content Test Data

Wet Weight	150.98
Dry Weight	127.76
Tare weight	21.91
% Moisture	21.9

Test Data

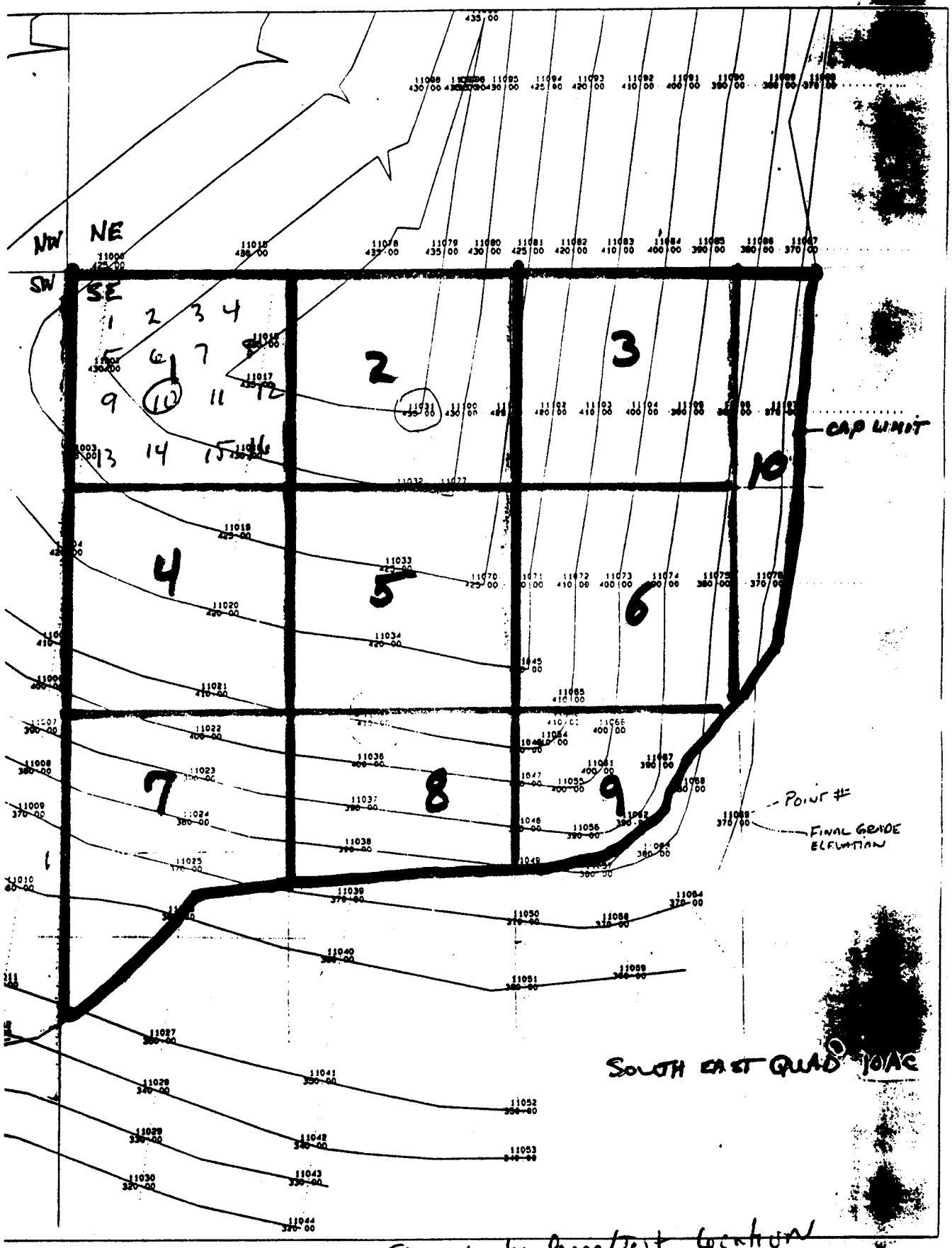
Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
202	83.08	0.30	0.35	1.17	0.33	2.95E-08
630	83.08	1.00	0.85	0.85	0.93	2.69E-08
385	83.08	0.50	0.60	1.20	0.55	2.62E-08
1126	83.08	1.40	1.20	0.86	1.30	2.11E-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)

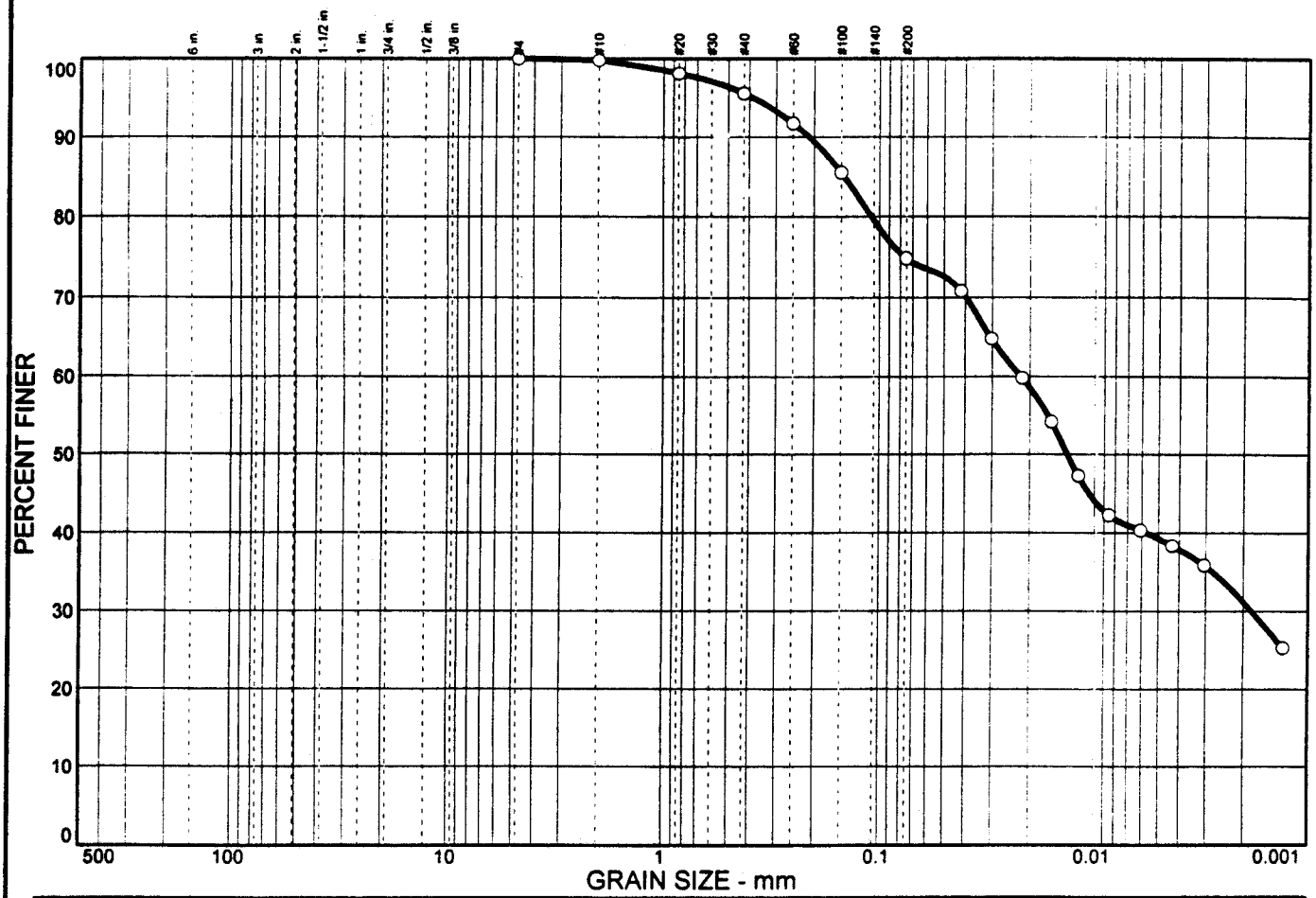
Permeability (k) **2.6E-08** cm/sec

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



(14) Indicates Perm/Test location
Acre 1, Lift 1
Report: 014

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	25.1	35.7	39.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	98.1		
#40	95.5		
#60	91.7		
#100	85.5		
#200	74.9		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand
Retest of DL-081

Atterberg Limits

PL= 24 LL= 50 PI= 26

Coefficients

D_{85}= 0.145 D_{60}= 0.0221 D_{50}= 0.0133
D_{30}= 0.0018 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-107, Sampled from In-situ Permeablity Test Location

Sample No.: DL-107 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 1, Lift 1 **Elev./Depth:**

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

CLAY COVER TESTING

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

Project No.: VNC-98-029
Date: 12/08/98
Report No.: 015 (Revised)

Acre 2 Lift 1

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	102.0	21.4	100+	
2	See Test Location Plan	97.0	23.1	96.5	
3	See Test Location Plan	101.3	22.3	100+	
4	See Test Location Plan	98.4	23.2	97.9	
5	See Test Location Plan	99.1	21.7	98.6	
6	See Test Location Plan	101.8	21.1	100+	
7	See Test Location Plan	95.7	25.7	95.2	
8	See Test Location Plan	103.4	22.4	100+	
9	See Test Location Plan	96.3	24.2	95.8	
10	See Test Location Plan	97.1	24.1	96.6	
11	See Test Location Plan	98.0	22.3	97.5	
12	See Test Location Plan	101.3	22.8	100+	
13	See Test Location Plan	96.5	21.9	96.0	Perm/Sample (DL-082)
14	See Test Location Plan	96.4	25.1	95.9	
15	See Test Location Plan	98.2	23.8	97.7	
16	See Test Location Plan	97.9	23.1	97.4	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	4.8x10(-8)
Dry Density (pcf)	99.9
Moisture Content (%)	21.7

Atterberg Limits (ASTM D4318)

PL	23
LL	50
PI	27
USCS Classification	CH

Grain-size Analysis (ASTM D422)

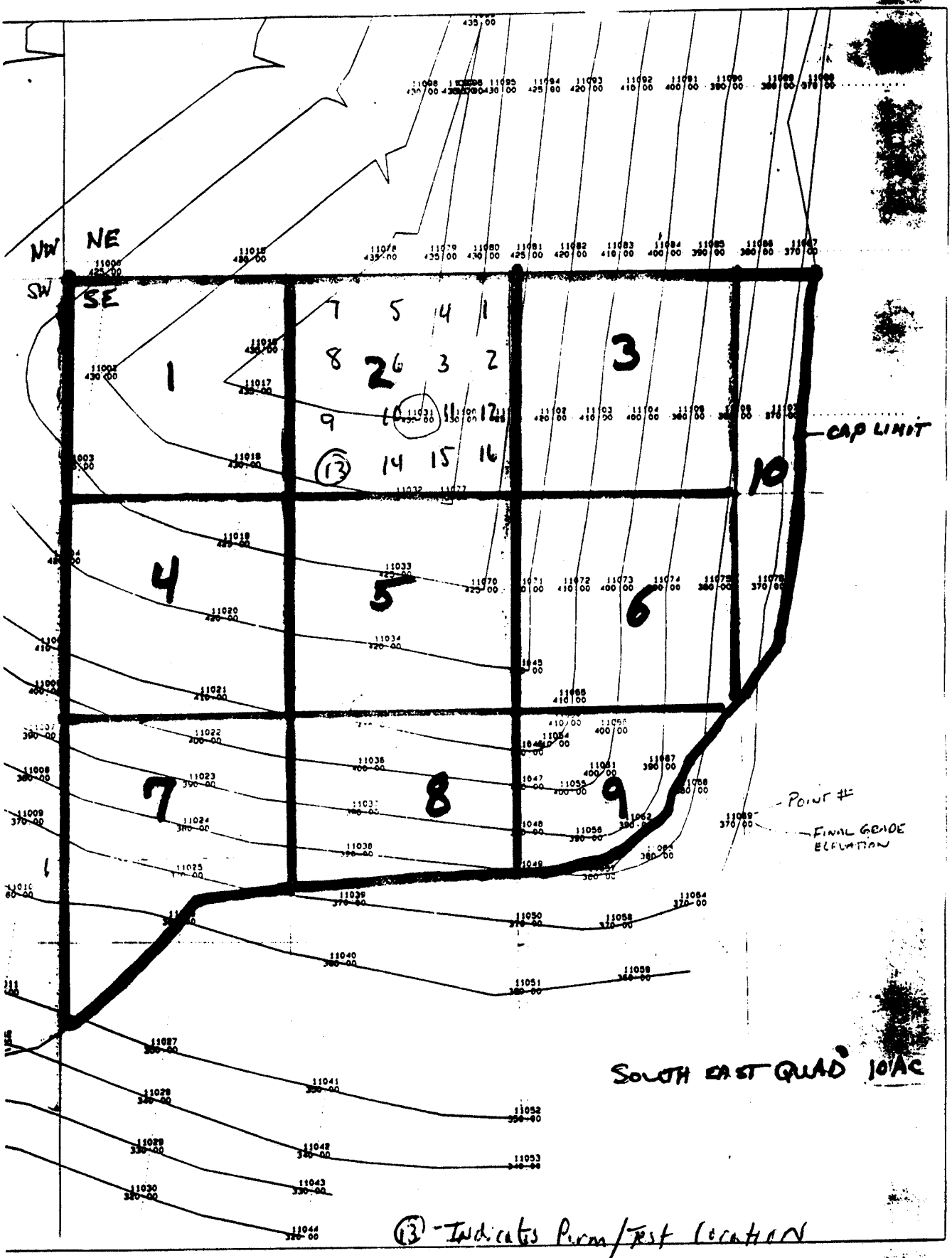
%Gravel	0.0
%Sand	18.9
%Silt	33.7
%Clay	47.4

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



(13) - Indicates Piezo/Test Location

Acc 2, Lift 1

Report: 015

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/28/98
Report No.: P-053

Project No.: VNC-98-029
Sample No. DL-082

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.8E-08	cm/sec
% Moisture	21.7	%
Dry Density	99.9	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/23/98
Location: Acre 2, Lift 1

Specimen Data

Length (in):	3.162
Diameter (in.):	2.875
Area (sq. in.):	6.503
Volume (cu. in.):	20.56
Wet Weight (grams):	655.9
Dry Weight (grams):	538.9
Dry Density (pcf):	99.9

Moisture Content Test Data

Wet Weight	142.13
Dry Weight	120.70
Tare weight	21.98
% Moisture	21.7

Test Data

Confining Pressure 3.0 psi

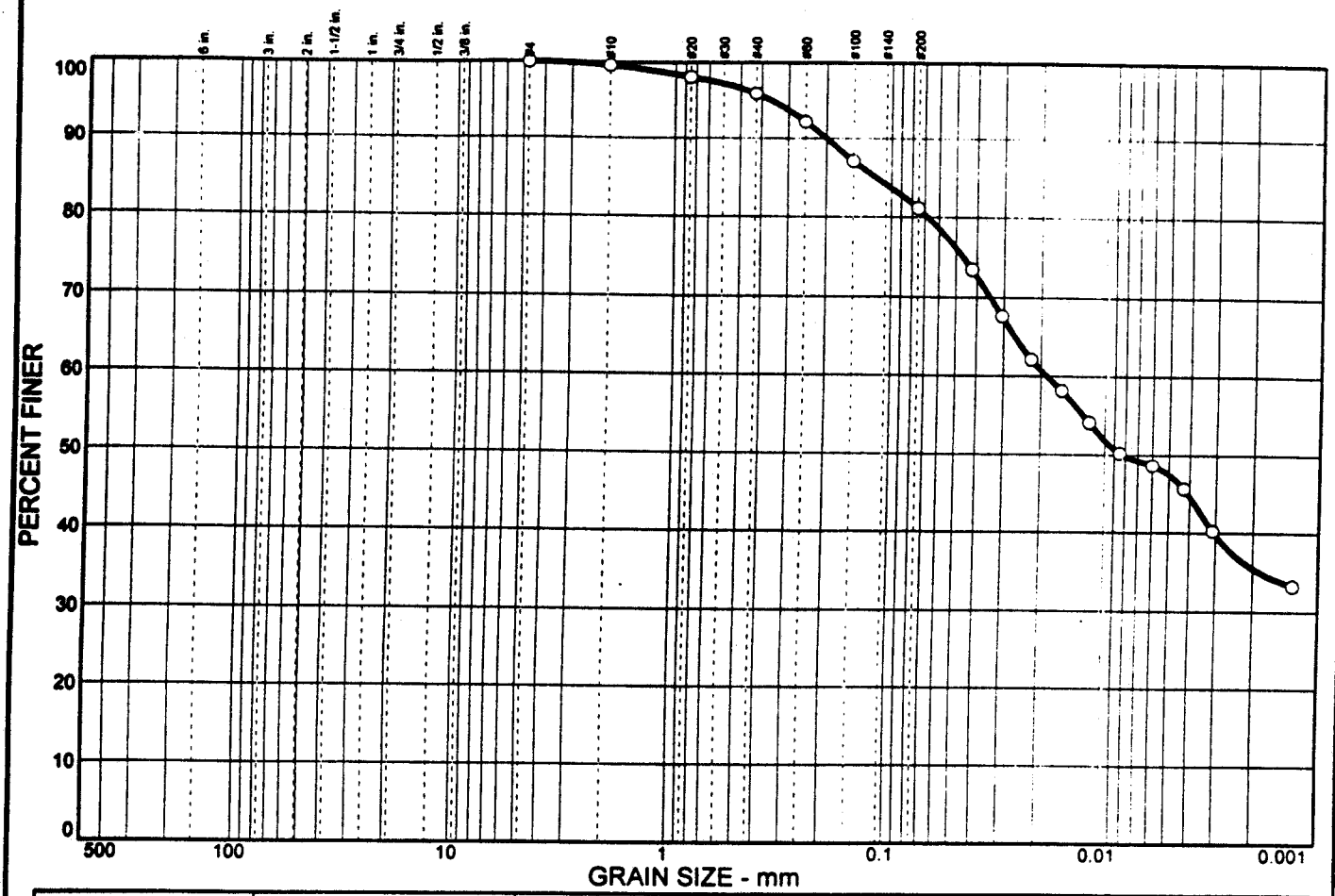
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
701	69.23	1.90	2.10	1.11	2.00	5.21E-08
197	69.23	0.50	0.45	0.90	0.48	4.40E-08
241	69.23	0.60	0.60	1.00	0.60	4.55E-08
949	69.23	2.50	2.70	1.08	2.60	5.00E-08

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) **4.8E-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	18.9	33.7	47.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#20	98.1		
#40	95.9		
#60	92.2		
#100	87.1		
#200	81.1		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 23 LL= 50 PI= 27

Coefficients

D_{85}= 0.118 D_{60}= 0.0188 D_{50}= 0.0082
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-082, Sampled from In-situ Permeablity Test Location

Sample No.: DL-082 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 2, Lift 1 **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: 10/25/98
Report No.: 005

Acre 3 Lift 1
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	98.3	25.3	97.8	
2	See Test Location Plan	97.8	23.7	97.4 97.3	
3	See Test Location Plan	98.9	22.7	98.4	
4	See Test Location Plan	100.5	23.6	100.0	
5	See Test Location Plan	100.7	22.0	100+	
6	See Test Location Plan	102.0	23.1	100+	
7	See Test Location Plan	99.3	23.1	98.8	
8	See Test Location Plan	97.4	24.7	96.9	
9	See Test Location Plan	99.7	23.4	99.2	
10	See Test Location Plan	98.6	22.8	98.1	
11	See Test Location Plan	99.5	21.1	99.0	
12	See Test Location Plan	99.1	21.4	98.6	
13	See Test Location Plan	98.7	22.6	98.2	
14	See Test Location Plan	102.3	22.0	100+	Test/Sample (DL-055)
15	See Test Location Plan	96.3	23.0	95.8	
16	See Test Location Plan	97.4	24.1	96.9	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	3.4x10(-8)
Dry Density (pcf)	105.0
Moisture Content (%)	21.4

Atterberg Limits (ASTM D4318)

PL	20
LL	66
PI	46
USCS Classification	CH

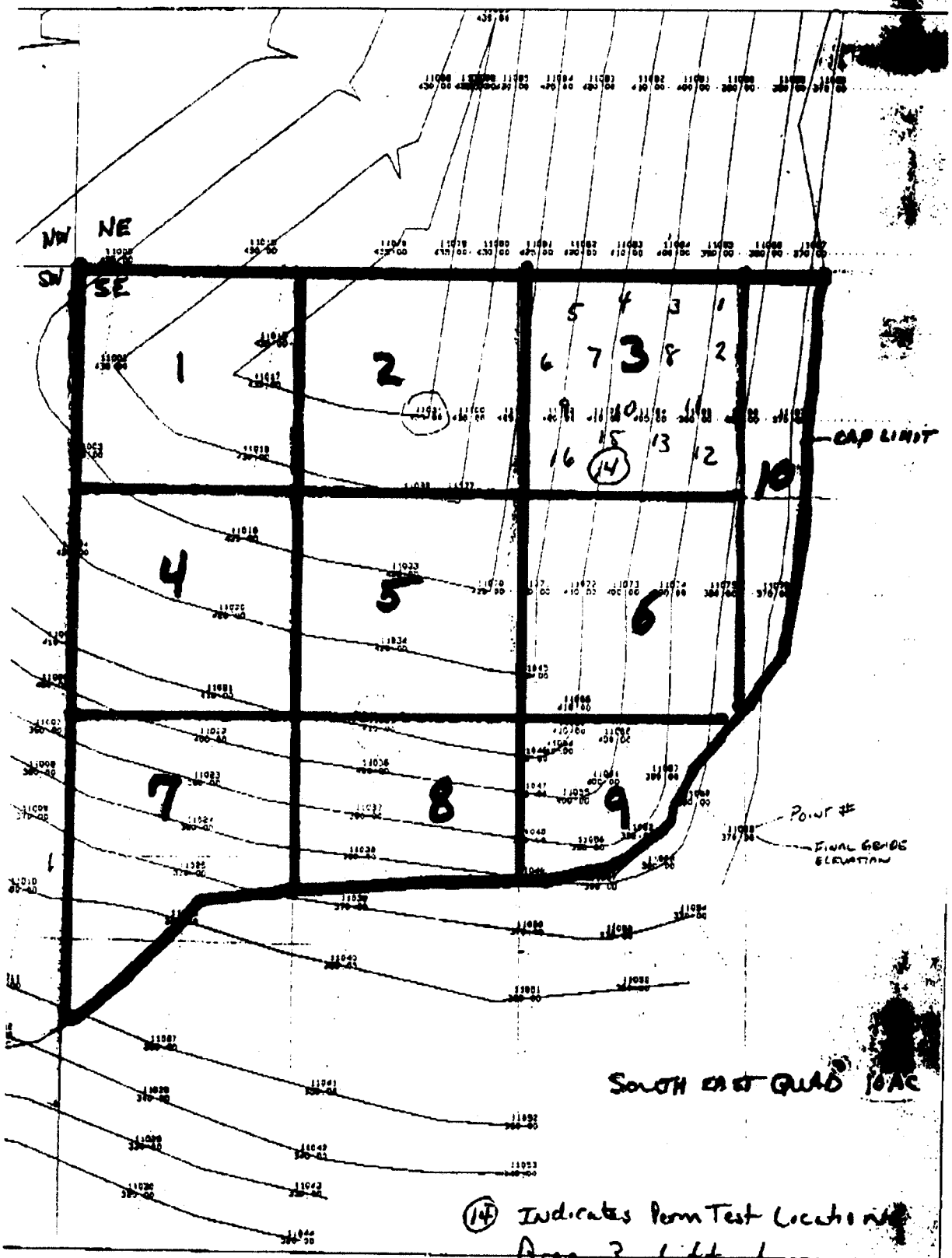
Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	36.6
%Silt	26.9
%Clay	36.5

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

Sincerely,
VAN DER HORTS Geotechnical Engineering, P.C
Robert L. Mashewske
Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE



(14) Indicates Perm Test Location

Area 3, Lift 1

Report: 005

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/25/98
Report No.: P-036

Project No.: VNC-98-029
Sample No. DL-055

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability 3.4E-08 cm/sec
% Moisture 21.4 %
Dry Density 105.0 pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled. 10/13/98
Location. Acre 3, Lift 1

Specimen Data

Length (in): 3.170
Diameter (in.): 2.840
Area (sq. in.): 6.346
Volume (cu. in.): 20.12
Wet Weight (grams): 673.0
Dry Weight (grams): 554.2
Dry Density (pcf): 105.0

Moisture Content Test Data

Wet Weight 120.36
Dry Weight 102.98
Tare weight 21.89
% Moisture 21.4

Test Data

Confining Pressure 3.0 psi

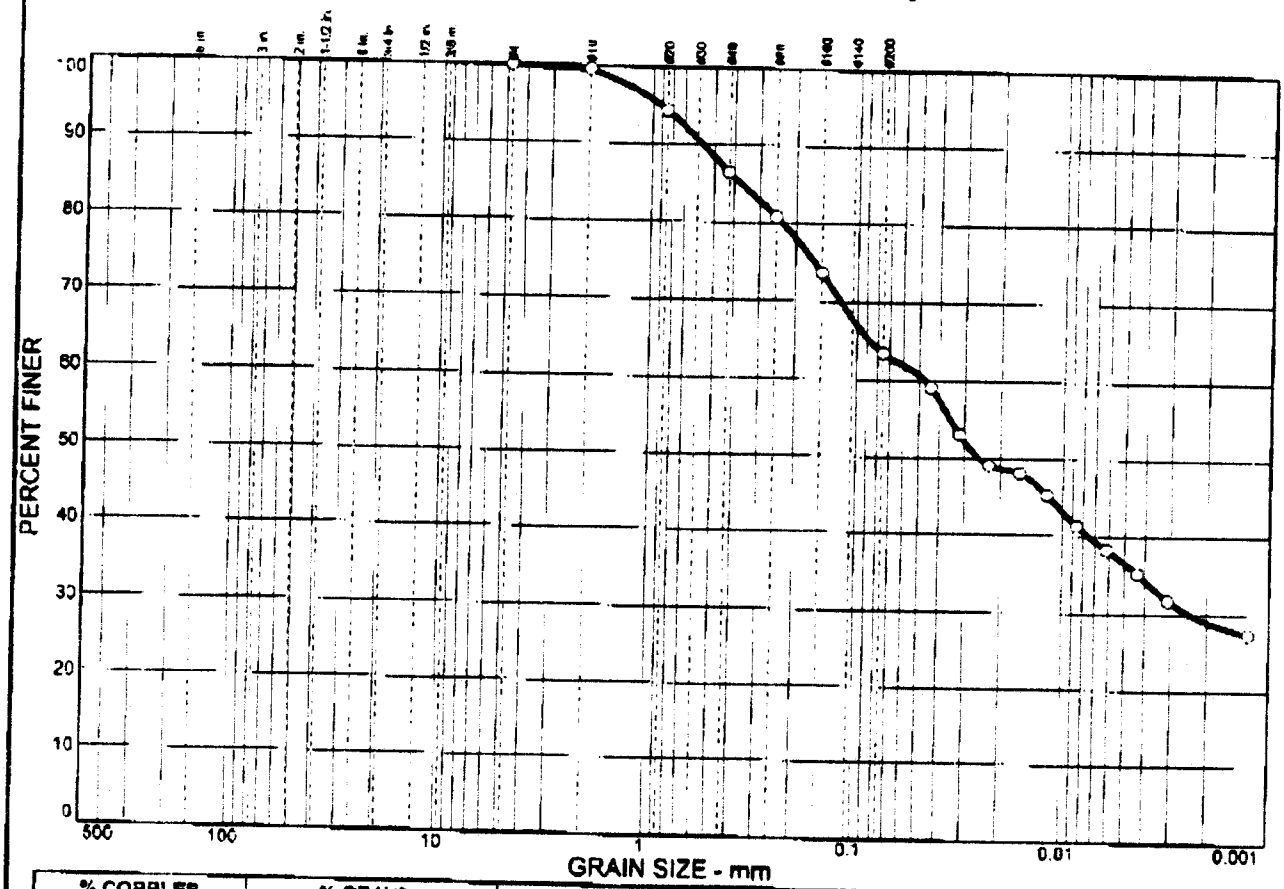
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
458	55.38	0.70	0.70	1.00	0.70	3.58E-08
1104	55.38	1.70	1.50	0.88	1.60	3.40E-08
1639	55.38	2.40	2.20	0.92	2.30	3.29E-08
674	55.38	1.00	0.90	0.90	0.95	3.31E-08

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) **3.4E-08** cm/sec

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

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	36.6	26.9	36.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#20	94.3		
#40	86.6		
#60	80.8		
#100	73.6		
#200	63.4		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 20 LL= 56 PI= 46

Coefficients

D_{85}= 0.367 D_{60}= 0.0472 D_{50}= 0.0256
D_{30}= 0.0024 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-055, Sampled from In-situ Permeability Test Location

Sample No.: DL-055 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 3, Lift 1 **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: 10/25/98
Report No.: 011

Acre 4 Lift 1

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	100.5	22.3	100+	
2	See Test Location Plan	97.8	21.4	97.3	
3	See Test Location Plan	98.5	21.0	98.0	
4	See Test Location Plan	100.8	21.0	100+	
5	See Test Location Plan	96.6	26.3	96.1	Perm / Sample(DL-073)
6	See Test Location Plan	99.3	22.5	98.8	
7	See Test Location Plan	95.5	21.0	95.0	
8	See Test Location Plan	97.7	21.2	97.2	
9	See Test Location Plan	98.3	21.2	97.6	
10	See Test Location Plan	99.3	21.9	98.8	
11	See Test Location Plan	97.4	22.0	96.9	
12	See Test Location Plan	102.3	22.4	100+	
13	See Test Location Plan	98.3	21.6	97.8	
14	See Test Location Plan	95.9	23.1	95.4	
15	See Test Location Plan	96.7	22.3	96.2	
16	See Test Location Plan	99.3	23.0	98.8	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	6.8x10(-8)
Dry Density (pcf)	100.1
Moisture Content (%)	21.2

Atterberg Limits (ASTM D4318)

PL	20
LL	42
PI	22
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	30.3
%Silt	27.3
%Clay	42.4

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

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/25/98
Report No.: P-043

Project No.: VNC-98-029
Sample No. DL-073

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.8E-08	cm/sec
% Moisture	21.2	%
Dry Density	100.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/20/98
Location: Acre 4, Lift 1

Specimen Data

Length (in):	3.860
Diameter (in.):	2.855
Area (sq. in.):	6.413
Volume (cu. in.):	24.75
Wet Weight (grams):	788.5
Dry Weight (grams):	650.5
Dry Density (pcf):	100.1

Moisture Content Test Data

Wet Weight	109.77
Dry Weight	94.39
Tare weight	21.92
% Moisture	21.2

Test Data

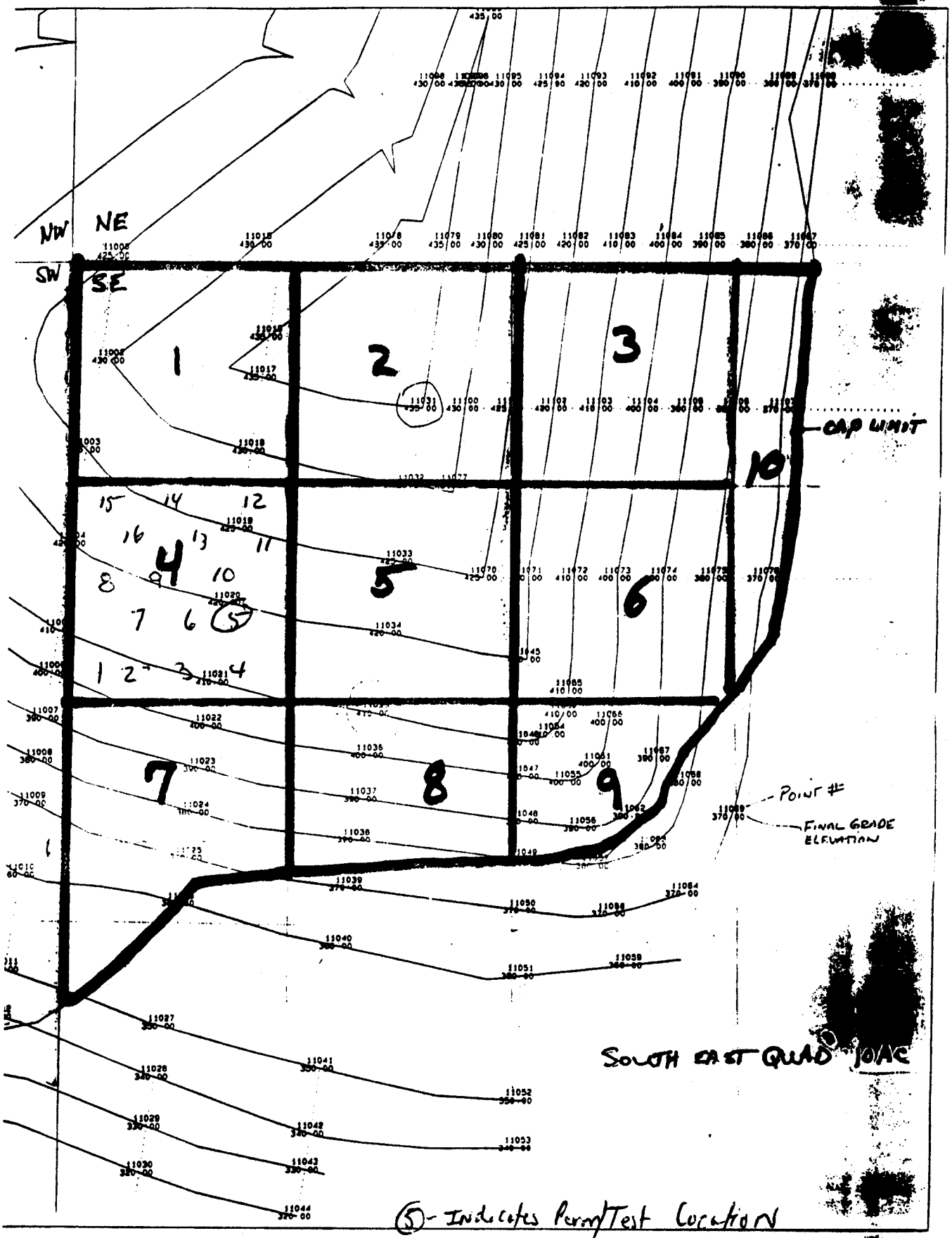
Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
282	83.08	1.00	1.00	1.00	1.00	6.68E-08
394	83.08	1.30	1.45	1.12	1.38	6.57E-08
516	83.08	1.90	1.80	0.95	1.85	6.75E-08
440	83.08	1.60	1.70	1.06	1.65	7.06E-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) **6.8E-08** cm/sec

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

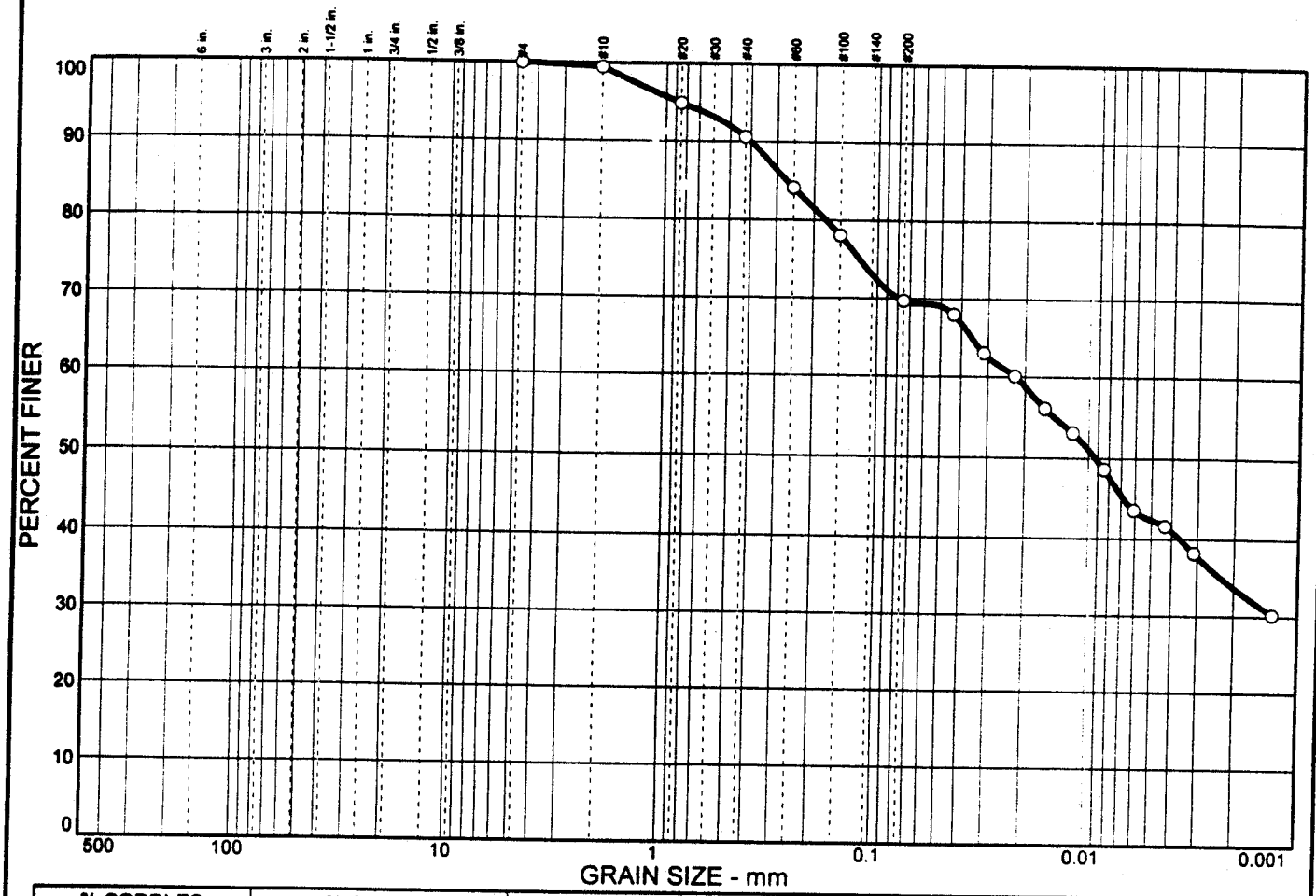


(5) - Indicates Perm/Test Location

Acre 4, Lift 1

Report: 011

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	30.3	27.3	42.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#20	94.9		
#40	90.6		
#60	84.2		
#100	78.0		
#200	69.7		

* (no specification provided)

Soil Description

Roberts Pit - Sandy lean clay

Atterberg Limits

PL= 20 LL= 42 PI= 22

Coefficients

D_{85}= 0.267 D_{60}= 0.0222 D_{50}= 0.0092
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-073, Sampled from In-situ Permeablity Test Location

Sample No.: DL-073 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 4, Lift 1 **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: 10/25/98
Report No.: 001

Acre 5 Lift 1
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	25.0	95.8	
2	See Test Location Plan	96.4	26.4	95.9	
3	See Test Location Plan	95.7	21.1	95.2	
4	See Test Location Plan	97.4	22.9	96.9	
5	See Test Location Plan	99.3	21.0	98.8	
6	See Test Location Plan	97.9	23.3	97.4	
7	See Test Location Plan	100.9	21.1	100+	
8	See Test Location Plan	97.1	25.3	96.6	Tube/Sample (DL-047)
9	See Test Location Plan	95.9	24.3	95.4	
10	See Test Location Plan	96.2	23.6	95.7	
11	See Test Location Plan	95.8	23.2	95.3	
12	See Test Location Plan	95.6	22.8	95.1	
13	See Test Location Plan	99.3	21.3	98.8	
14	See Test Location Plan	99.1	21.6	98.6	
15	See Test Location Plan	100.2	21.4	99.7	
16	See Test Location Plan	97.6	22.1	97.1	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec) 8.1 x 10(-8)

Dry Density (pcf) 96.9

Moisture Content (%) 24.6

Atterberg Limits (ASTM D4318)

PL 23
LL 51
PI 28

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel 0.0
%Sand 34.2
%Silt 19.8
%Clay 46.0

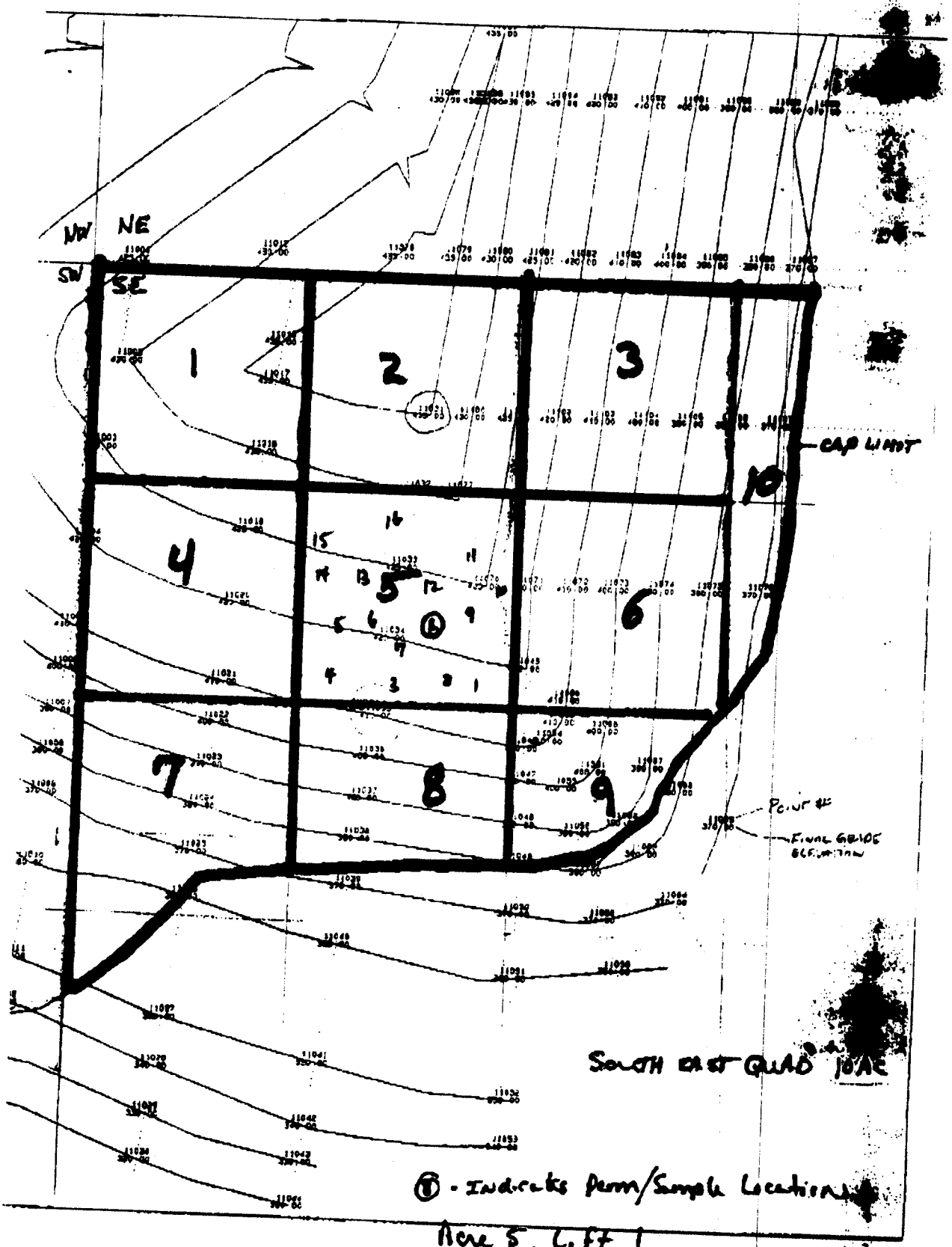
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

Sincerely,
VAN DER HORTS Geotechnical Engineers

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE



Acre 5, Lot 1
Report: 001

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/11/98
Report No.: P-023

Project No.: VNC-98-029
Sample No. DL-047

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.1E-08	cm/sec
% Moisture	24.6	%
Dry Density	96.9	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 10/06/98
Location: Acre 5, Lift #1
Roberts Borrow Source Clay

Specimen Data

Length (in):	3.402
Diameter (in.):	2.851
Area (sq. in.):	6.395
Volume (cu. in.):	21.76
Wet Weight (grams):	689.3
Dry Weight (grams):	553.2
Dry Density (pcf):	96.9

Moisture Content Test Data

Wet Weight	115.58
Dry Weight	97.08
Tare weight	21.91
% Moisture	24.6

Test Data

Confining Pressure 3.0 psi

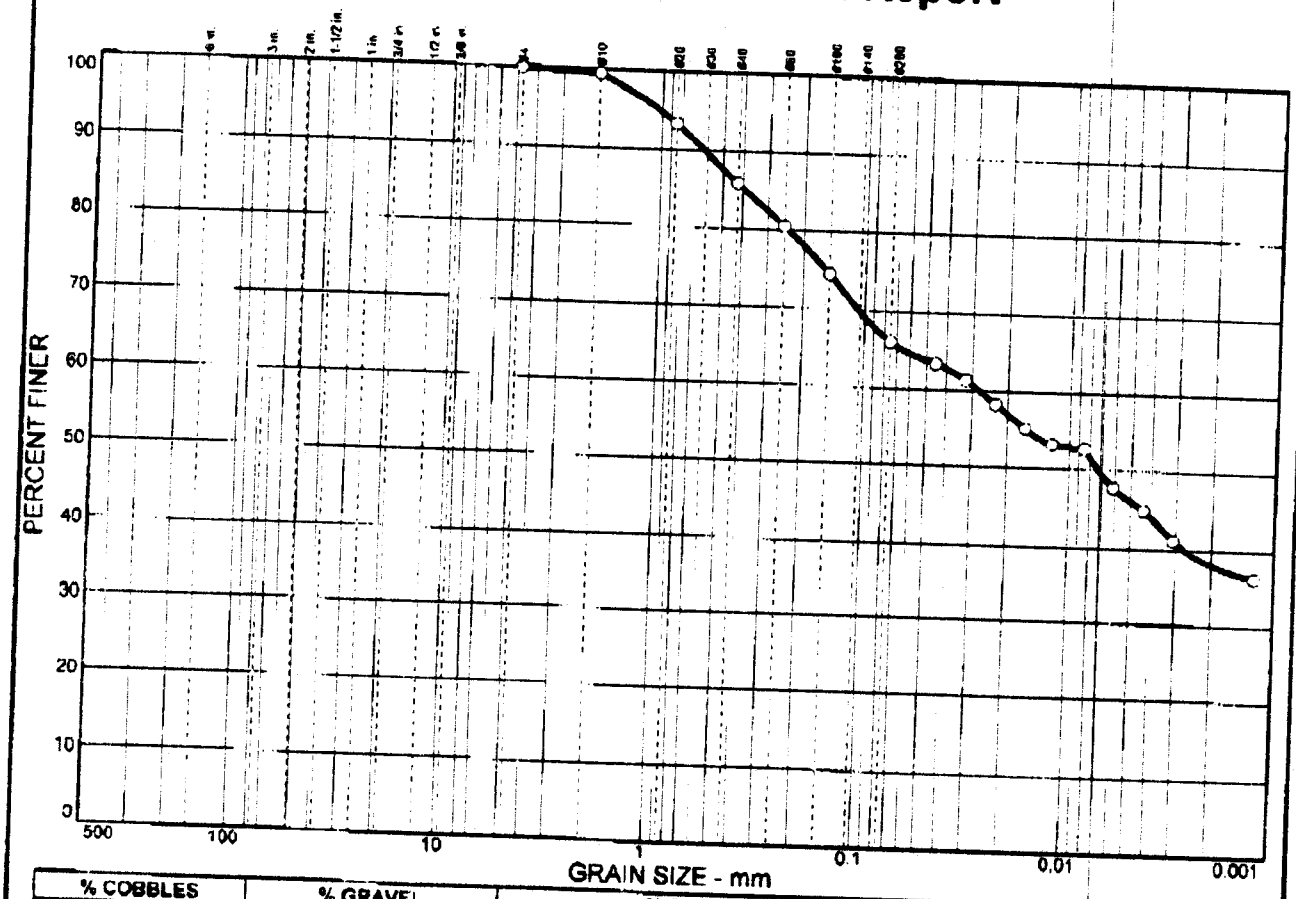
△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
590	33.23	1.10	1.20	1.09	1.15	8.11E-08
470	33.23	0.90	0.95	1.06	0.93	8.19E-08
1034	33.23	1.90	2.10	1.11	2.00	8.05E-08
295	33.23	0.55	0.60	1.09	0.58	8.11E-08

△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) 8.1E-08 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	34.2	19.8	46.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#20	93.3		
#40	85.8		
#60	80.4		
#100	74.5		
#200	65.8		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 23 LL= 51 PI= 28

Coefficients

D_{85}= 0.394 D_{60}= 0.0280 D_{50}= 0.0072
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-047 Sampled at In-situ Permeability Test Location

Sample No.: DL-047 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 5, Lift 1 **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: 10/25/98
Report No.: 004

Acre 6 Lift 1

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	96.8	26.8	96.5 96.3	Tube/Sample (DL-053)
2	See Test Location Plan	95.9	21.5	95.7 95.4	
3	See Test Location Plan	98.0	22.3	97.7 97.5	
4	See Test Location Plan	98.8	21.6	98.6 98.3	
5	See Test Location Plan	103.6	22.0	100+	
6	See Test Location Plan	101.2	23.8	100+	
7	See Test Location Plan	101.5	21.5	100+	
8	See Test Location Plan	99.9	21.4	99.6 99.4	
9	See Test Location Plan	99.3	21.6	99.0 98.8	
10	See Test Location Plan	98.6	22.4	98.1	
11	See Test Location Plan	98.6	22.8	98.1	
12	See Test Location Plan	97.4	23.1	96.9	
13	See Test Location Plan	100.3	21.6	99.8	
14	See Test Location Plan	102.3	21.4	100+	
15	See Test Location Plan	97.9	22.8	97.4	
16	See Test Location Plan	96.3	23.0	95.8	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	2.8x10(-8)
Dry Density (pcf)	98.4
Moisture Content (%)	23.6

Atterberg Limits (ASTM D4318)

PL	25
LL	88
PI	63

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	35.9
%Silt	17.7
%Clay	46.4

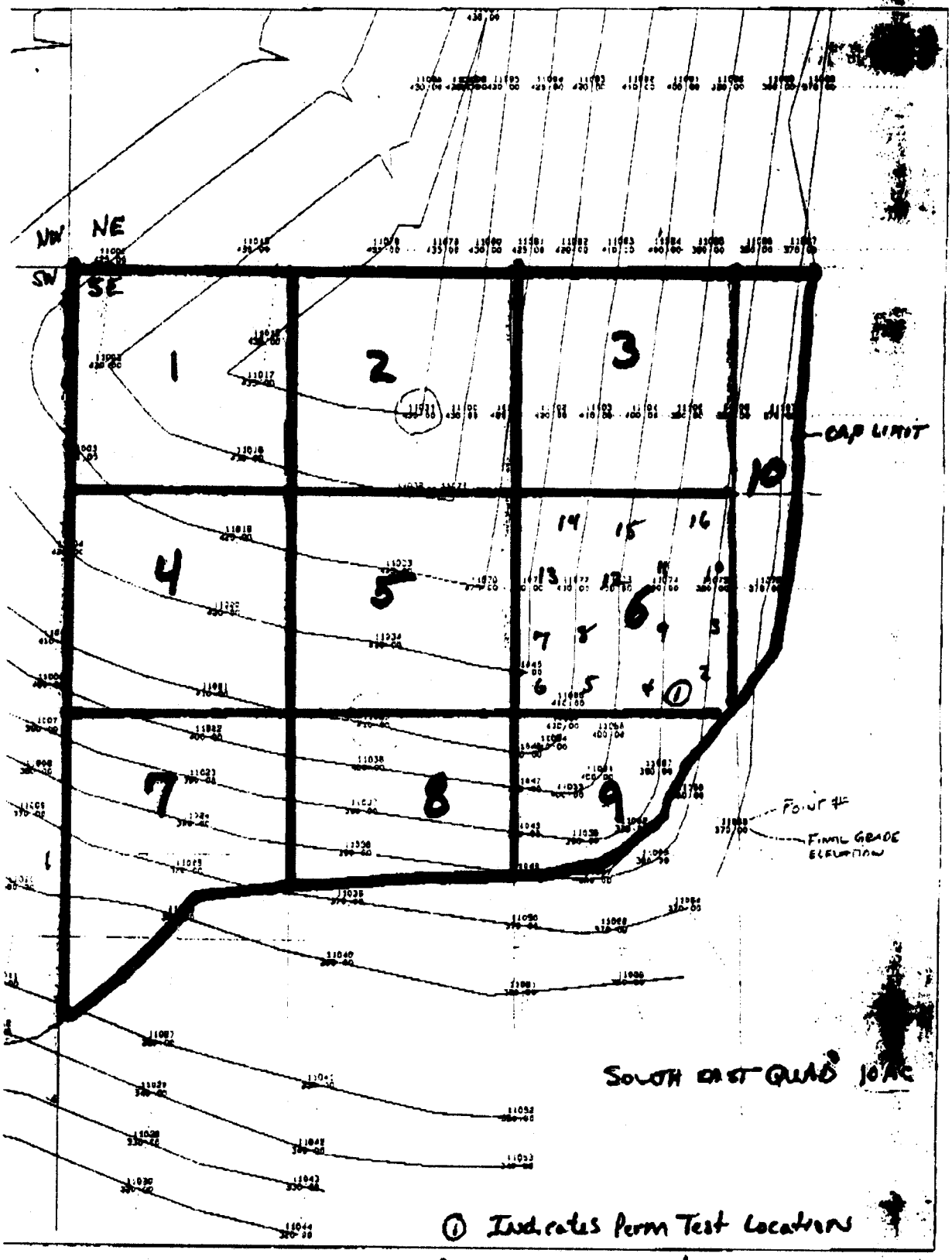
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

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

Robert L. Mashewske

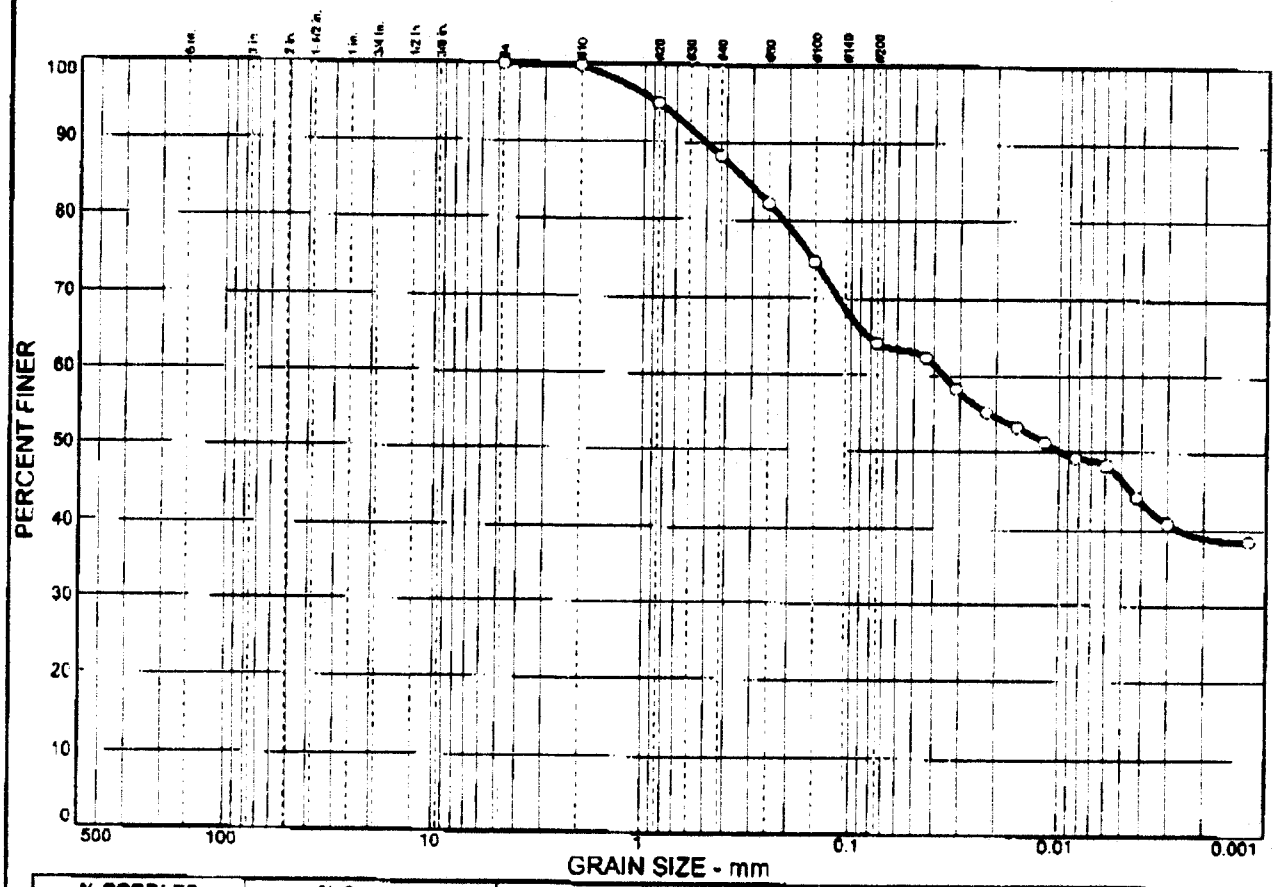
Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE



Area 6, Lift 1
Report: 004

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	35.9	17.7	46.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	95.0		
#40	88.2		
#60	82.1		
#100	74.8		
#200	64.1		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 25 LL= 88 PI= 63

Coefficients

D_{85}= 0.319 D_{60}= 0.0359 D_{50}= 0.0098
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-053, Sampled from In-situ permeability test location.

Sample No.: DL-053 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 6, Lift 1 **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: 10/25/98
Report No.: P-035

Project No.: VNC-98-029
Sample No. DL-053

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability 2.8E-08 cm/sec
% Moisture 23.6 %
Dry Density 98.4 pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 10/12/98
Location: Acre 6, Lift 1

Specimen Data

Length (in): 3.237
Diameter (in.): 2.845
Area (sq. in.): 6.368
Volume (cu. in.): 20.61
Wet Weight (grams): 657.8
Dry Weight (grams): 532.3
Dry Density (pcf): 98.4

Moisture Content Test Data

Wet Weight 149.72
Dry Weight 125.35
Tare weight 22.01
% Moisture 23.6

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
524	33.23	0.60	0.60	1.00	0.60	4.55E-08
279	80.31	0.40	0.50	1.25	0.45	2.65E-08
579	80.31	0.70	0.80	1.14	0.75	2.13E-08
629	80.31	0.80	0.70	0.88	0.75	1.96E-08

ΔT 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 Robert L Mashewske
Robert L. Mashewske, P.E.
Regional Manager

VAN DER HORST

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

LETTER OF TRANSMITTAL

DATE: 10-27-98 JOB NO. VNC-98-029

ATTENTION: Andy

REGARDING: Durham Landfill Closure
On-site Borrow Clay
Boutwell Perm. Test Report

To: Gilbert Southern
3301 Glenn Road
Durham, NC 27704

WE ARE SENDING YOU X Attached ____ Under separate cover the following items:

COPIES	DATE	NO.	DESCRIPTION
2	10/27/98	Clay.007	Clay Cover Test Report Acre 7, Lift 1

REMARKS

5 Pages Fax # 667-0514

COPIES TO: File

Hard Copy to follow in the mail

SIGNED: Robert Mashewske, P.E.

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

CLAY COVER TESTING

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

Project No.: VNC-98-029
Date: 10/26/98
Report No.: 007

Acre 7 Lift 1
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	102.2	22.3	100+	
2	See Test Location Plan	98.8	21.6	98.3	
3	See Test Location Plan	96.5	25.1	96.0	
4	See Test Location Plan	97.5	25.2	97.0	Test/Sample (DL-069)
5	See Test Location Plan	98.3	22.3	97.8	
6	See Test Location Plan	97.4	23.1	96.9	
7	See Test Location Plan	97.2	23.3	96.7	
8	See Test Location Plan	98.8	22.6	98.3	
9	See Test Location Plan	98.3	21.7	97.8	
10	See Test Location Plan	98.9	21.3	98.4	
11	See Test Location Plan	99.3	21.0	98.8	
12	See Test Location Plan	95.8	23.4	95.3	
13	See Test Location Plan	96.1	23.6	95.6	
14	See Test Location Plan	98.8	22.4	98.3	
15	See Test Location Plan	95.6	24.1	95.1	
16	See Test Location Plan	95.8	24.0	95.3	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	8.3x10(-8)
Dry Density (pcf)	99.2
Moisture Content (%)	23.0

Atterberg Limits (ASTM D4318)

PL	20
LL	53
PI	33

USCS Classification CH

Grain-size Analysis (ASTM D422)

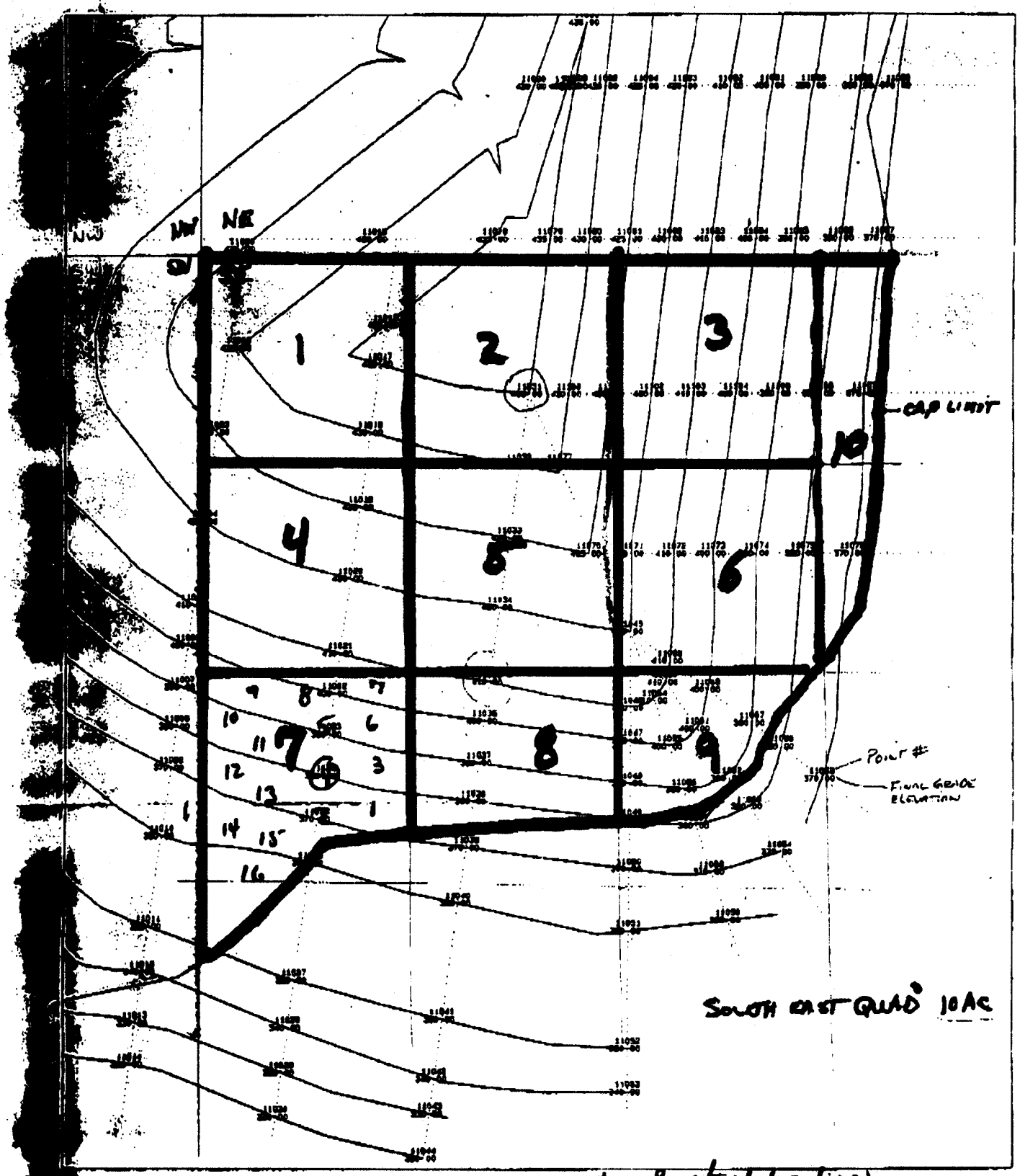
%Gravel	0.0
%Sand	22.8
%Silt	40.5
%Clay	36.7

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

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

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE



(4) - Indicates Perm/Test Location
Acre 7, Lift 1
Report: 007

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/25/98
Report No.: P-639

Project No.: VNC-98-029
Sample No. DL-069

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.3E-08	cm/sec
% Moisture	23.0	%
Dry Density	99.2	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 10/18/98
Location: Acre 7, Lift 1

Specimen Data

Length (in):	3.624
Diameter (in.):	2.873
Area (sq. in.):	6.494
Volume (cu. in.):	23.53
Wet Weight (grams):	753.4
Dry Weight (grams):	612.8
Dry Density (pcf):	99.2

Moisture Content Test Data

Wet Weight	111.72
Dry Weight	94.96
Tare weight	21.94
% Moisture	23.0

Test Data

Confining Pressure 3.0 psi

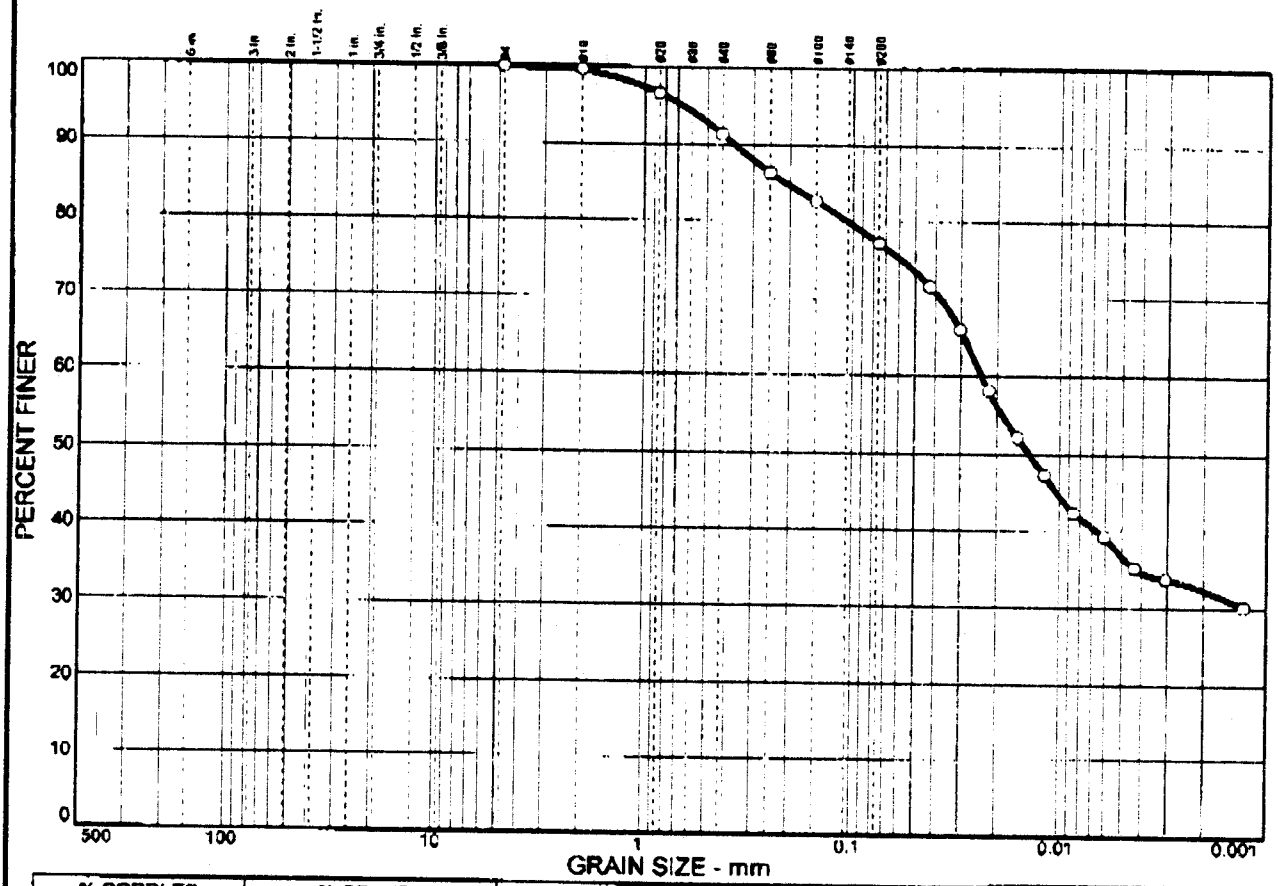
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
140	77.54	0.70	0.65	0.93	0.68	9.02E-08
181	77.54	0.90	0.80	0.89	0.85	8.79E-08
786	77.54	3.55	3.30	0.93	3.43	8.16E-08
279	77.54	1.10	1.10	1.00	1.10	7.38E-08

ΔT 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) 8.3E-08 cm/sec

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

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	22.8	40.5	36.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	96.6		
#40	91.3		
#60	86.4		
#100	82.7		
#200	77.2		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 20 LL= 53 PI= 33

Coefficients

D_{85}= 0.208 D_{60}= 0.0238 D_{50}= 0.0140
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-069, Sampled from In-situ Permeablity Test Location

Sample No.: DL-069 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 7, Lift 1 **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: 10/25/98
Report No.: 002

Acre 8 Lift 1

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	22.8	99.4	
2	See Test Location Plan	97.1	25.3	96.6	
3	See Test Location Plan	102.8	21.4	100+	
4	See Test Location Plan	98.2	21.0	97.7	
5	See Test Location Plan	96.0	23.4	95.5	
6	See Test Location Plan	96.6	22.1	96.1	
7	See Test Location Plan	96.0	25.1	95.5	Tube/Sample (DL-048)
8	See Test Location Plan	95.7	26.2	95.2	
9	See Test Location Plan	96.0	23.4	95.5	
10	See Test Location Plan	95.5	22.9	95.0	
11	See Test Location Plan	96.4	22.1	95.9	
12	See Test Location Plan	97.3	22.6	96.8	
13	See Test Location Plan	96.6	21.7	96.1	
14	See Test Location Plan	96.2	21.8	95.7	
15	See Test Location Plan	97.1	22.0	96.6	
16	See Test Location Plan	95.9	21.3	95.4	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 8.6 x 10(-8)

Dry Density (pcf) 21.7

Moisture Content (%) 100.4

Atterberg Limits (ASTM D4318)

PL 18
LL 62
PI 44

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel 0.0
%Sand 34.0
%Silt 20.8
%Clay 45.2

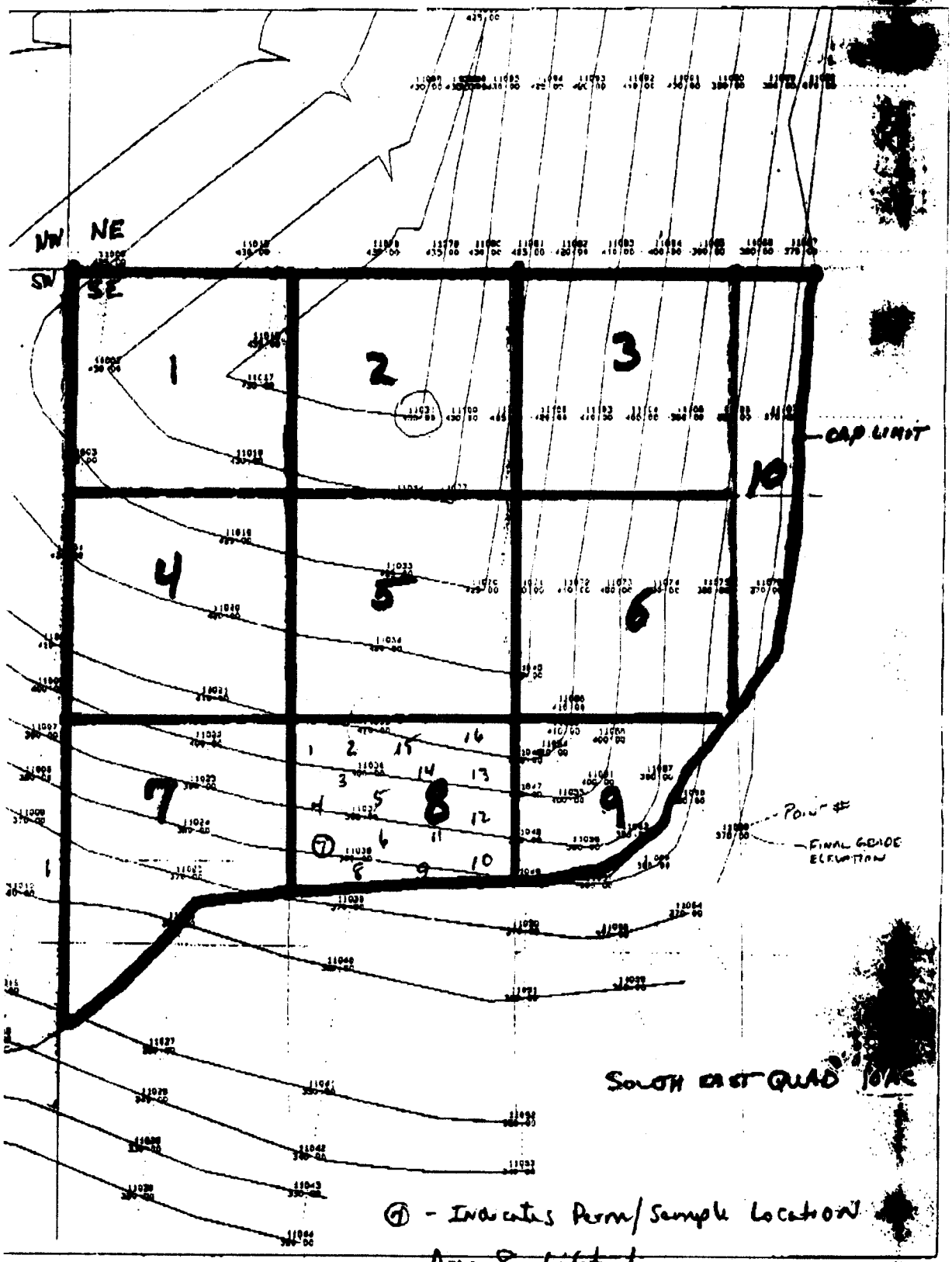
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

Sincerely,
VAN DER HORTS Geotechnical Engineering, PC

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE



Page 8, Lift 1
Report: 002

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/11/98
Report No.: P-024

Project No.: VNC-98-029
Sample No. DL-048

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.6E-08	cm/sec
% Moisture	21.7	%
Dry Density	100.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/06/98
Location: Acre 8, Lift #1
Roberts Borrow Source Clay

Specimen Data

Length (in):	3.359
Diameter (in.):	2.858
Area (sq. in.):	6.426
Volume (cu. in.):	21.59
Wet Weight (grams):	692.2
Dry Weight (grams):	568.9
Dry Density (pcf):	100.4

Moisture Content Test Data

Wet Weight	84.99
Dry Weight	73.74
Tare weight	21.85
% Moisture	21.7

Test Data

Confining Pressure 3.0 psi

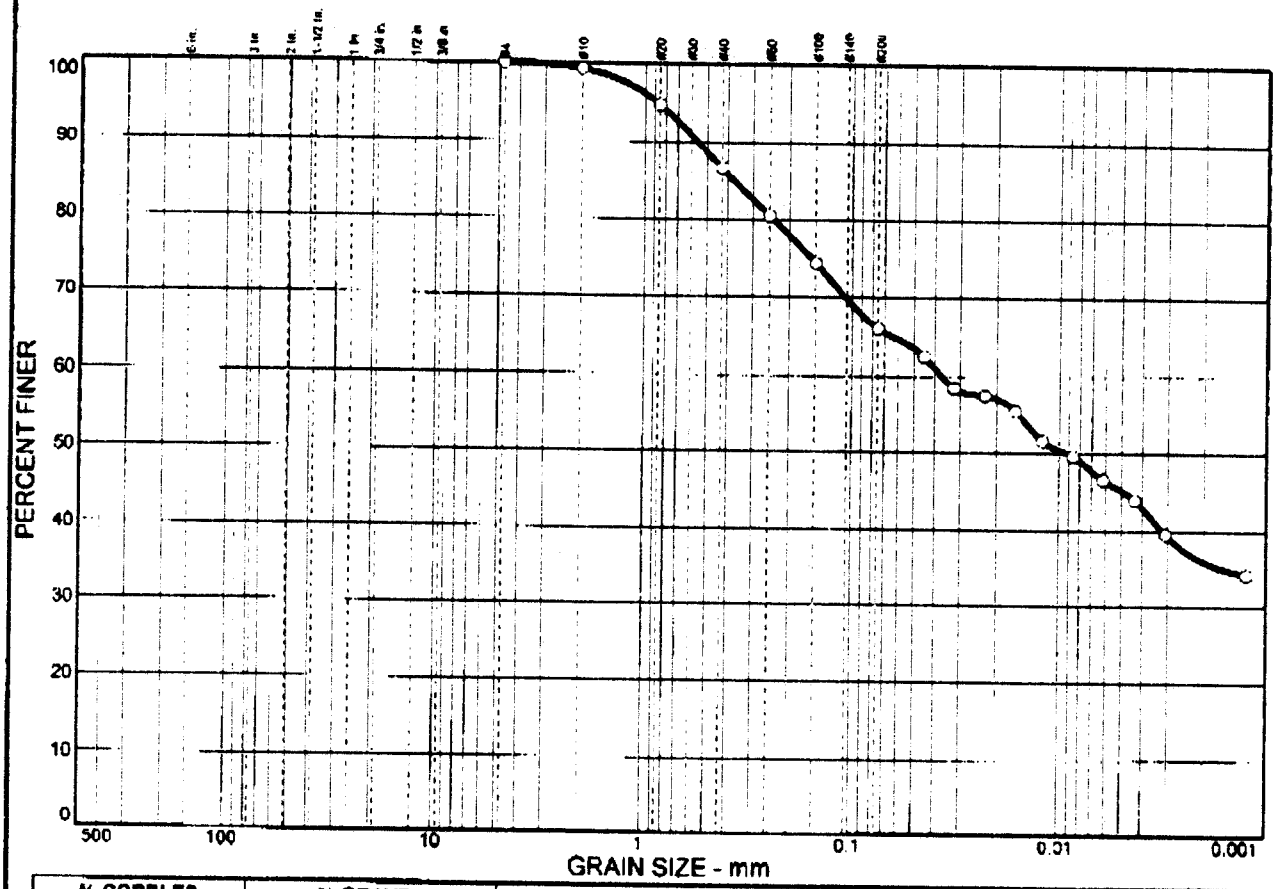
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
591	44.31	1.60	1.70	1.06	1.65	8.56E-08
472	44.31	1.40	1.35	0.96	1.38	8.93E-08
427	44.31	1.20	1.20	1.00	1.20	8.62E-08
605	44.31	1.60	1.70	1.06	1.65	8.36E-08

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) 8.6E-08 cm/sec

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

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	34.0	20.8	45.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.3		
#20	94.8		
#40	86.6		
#60	80.5		
#100	74.4		
#200	66.0		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 18 LL= 62 PI= 44

Coefficients

D_{85}= 0.372 D_{60}= 0.0369 D_{50}= 0.0092
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-047. Sampled from In-situ Permeablity Test Location

Sample No.: DL-048 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 8, Lift 1 **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: 10/25/98
Report No.: 003

Acre 9 Lift 1
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	99.1	21.2	98.6	
2	See Test Location Plan	97.8	21.2	97.3	
3	See Test Location Plan	95.5	24.6	95.0	
4	See Test Location Plan	99.4	21.0	98.9	
5	See Test Location Plan	101.7	21.5	100+	
6	See Test Location Plan	100.2	21.0	99.7	
7	See Test Location Plan	96.0	22.4	95.5	
8	See Test Location Plan	96.3	23.1	95.8	
9	See Test Location Plan	95.5	23.0	95.0	
10	See Test Location Plan	95.7	24.1	95.2	
11	See Test Location Plan	96.3	21.0	95.9	
12	See Test Location Plan	105.1	22.5	100+	Perm/Sample (DL-068)
13	See Test Location Plan	102.2	22.3	100+	
14	See Test Location Plan	98.3	23.1	97.8	
15	See Test Location Plan	96.9	23.31.9	96.4	
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)	2.1x10(-8)
Dry Density (pcf)	104.3
Moisture Content (%)	22.8

Atterberg Limits (ASTM D4318)

PL	16
LL	46
PI	30
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	39.8
%Silt	22.1
%Clay	38.1

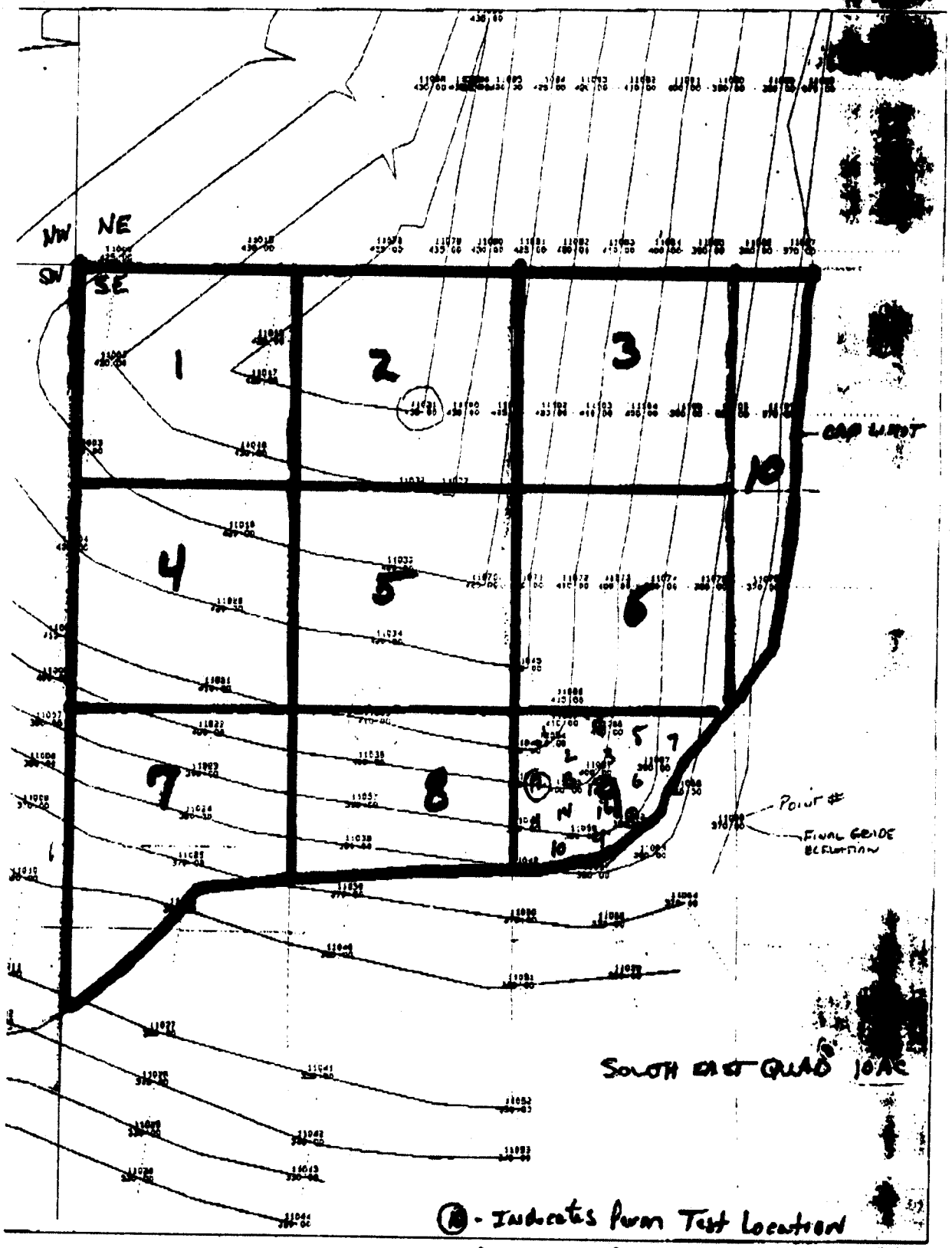
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

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

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE



Acc 9, Lift 1

Report: 003

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/25/98
Report No.: P-038

Project No.: VNC-98-029
Sample No. DL-068

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.1E-08	cm/sec
% Moisture	22.8	%
Dry Density	104.3	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 10/18/98
Location: Acre 9, Lift 1 Retest

Specimen Data

Length (in):	3.728
Diameter (in.):	2.843
Area (sq. in.):	6.359
Volume (cu. in.):	23.71
Wet Weight (grams):	796.9
Dry Weight (grams):	649.0
Dry Density (pcf):	104.3

Moisture Content Test Data

Wet Weight	109.19
Dry Weight	92.12
Tare weight	21.59
% Moisture	22.8

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
441	69.23	0.80	0.50	0.83	0.55	2.75E-08
966	69.23	1.00	1.00	1.00	1.00	2.28E-08
381	110.77	0.50	0.50	1.00	0.50	1.81E-08
833	110.77	1.00	0.90	0.90	0.95	1.57E-08

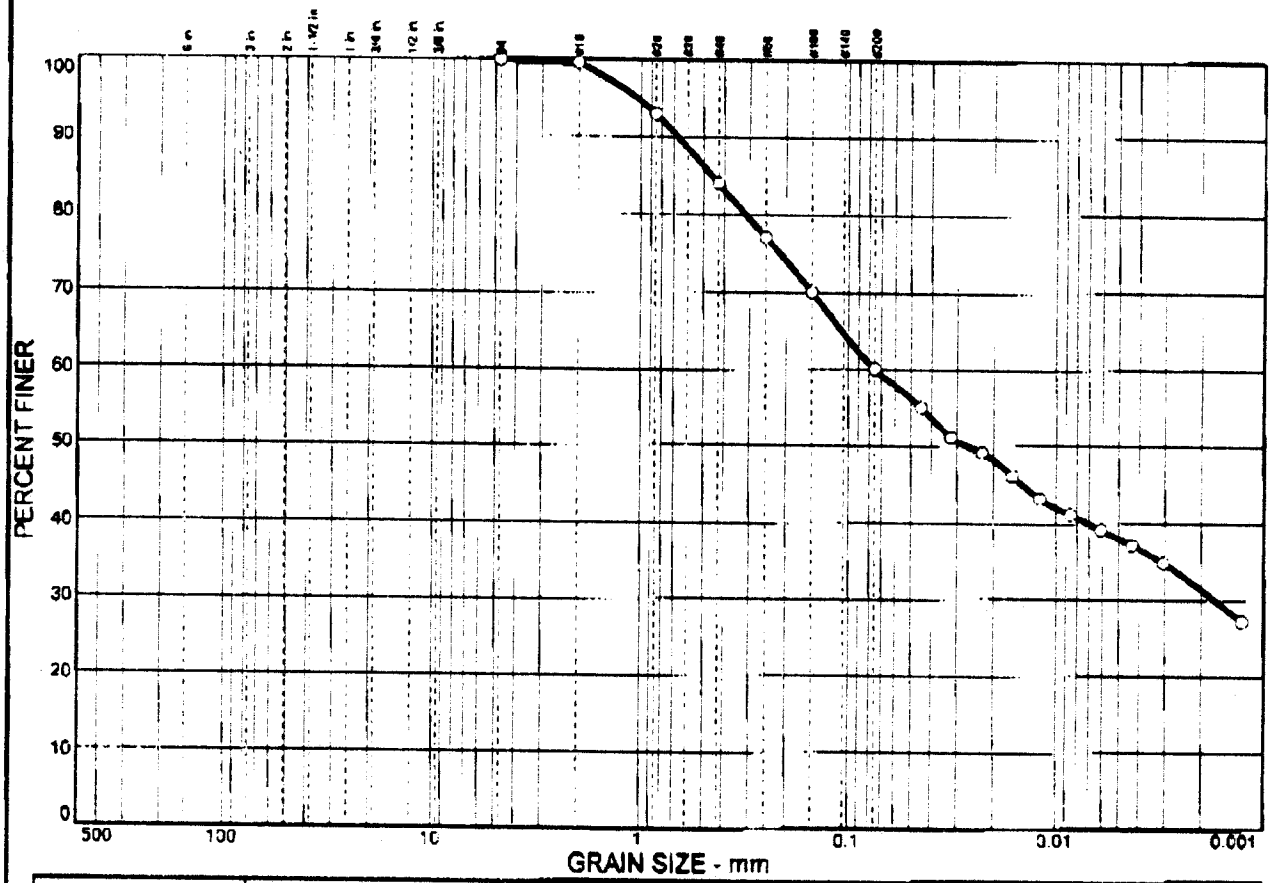
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 2.1E-08 cm/sec

Respectfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	39.8	22.1	38.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#20	93.1		
#40	84.0		
#60	77.2		
#100	70.1		
#200	60.2		

(no specification provided)

Soil Description

Roberts Pit - Sandy Lean Clay

Atterberg Limits

PL= 16 LL= 46 PI= 30

Coefficients

D_{85}= 0.458 D_{60}= 0.0736 D_{50}= 0.0271
D_{30}= 0.0017 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-068, Sampled from In-situ Permeablity Test Location

Sample No.: DL-068 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 9. Lift 1 **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: 10/25/98
Report No.: 006

Acre 10 Lift 1

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	24.0	97.3	Test/Sample (DL-056)
2	See Test Location Plan	98.1	21.0	97.7	
3	See Test Location Plan	102.8	21.3	100+	
4	See Test Location Plan	97.8	23.8	97.3	
5	See Test Location Plan	96.4	23.2	95.9	
6	See Test Location Plan	95.8	23.8	95.3	
7	See Test Location Plan	97.3	22.6	96.8	
8	See Test Location Plan	97.0	22.8	96.5	
9	See Test Location Plan	102.5	21.4	102.0	
10	See Test Location Plan	100.6	21.1	100+	
11	See Test Location Plan	98.6	22.0	98.1	
12	See Test Location Plan	95.5	22.6	95.0	
13	See Test Location Plan	96.8	21.4	96.3	
14	See Test Location Plan	99.3	22.8	98.8	
15	See Test Location Plan	96.4	21.3	95.9	
16	See Test Location Plan	96.1	21.9	95.6	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	4.4x10(-8)
Dry Density (pcf)	99.0
Moisture Content (%)	21.5

Atterberg Limits (ASTM D4318)

PL	24
LL	61
PI	37

USCS Classification CH

Grain-size Analysis (ASTM D422)

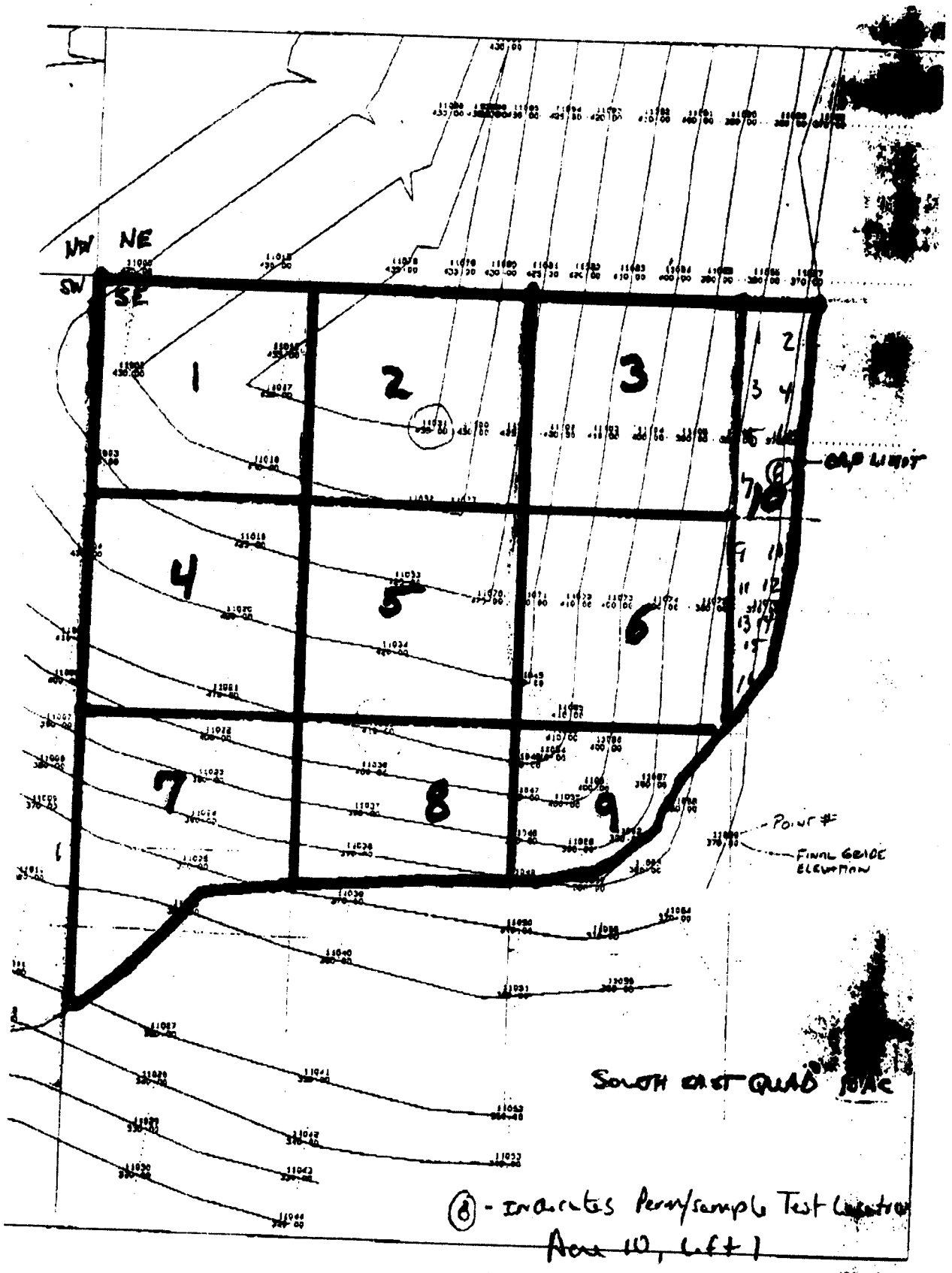
%Gravel	0.0
%Sand	32.6
%Silt	27.0
%Clay	40.4

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

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

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE



(8) - Indicates Perm/sample Test Location

Acre 10, Lot 1

Report : 006

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/25/98
Report No.: P-037

Project No.: VNC-98-029
Sample No. DL-056

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.4E-08	cm/sec
% Moisture	21.5	%
Dry Density	99.0	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/13/98
Location: Acre 10, Lift 1

Specimen Data

Length (in):	3.076
Diameter (in.):	2.855
Area (sq. in.):	6.413
Volume (cu. in.):	19.73
Wet Weight (grams):	622.5
Dry Weight (grams):	512.4
Dry Density (pcf)	99.0

Moisture Content Test Data

Wet Weight	81.39
Dry Weight	70.87
Tare weight	21.91
% Moisture	21.5

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
271	55.38	0.70	0.70	1.00	0.70	5.82E-08
253	55.38	0.50	0.50	1.00	0.50	4.45E-08
327	69.23	0.70	0.70	1.00	0.70	3.86E-08
627	69.23	1.30	1.20	0.92	1.25	3.59E-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)

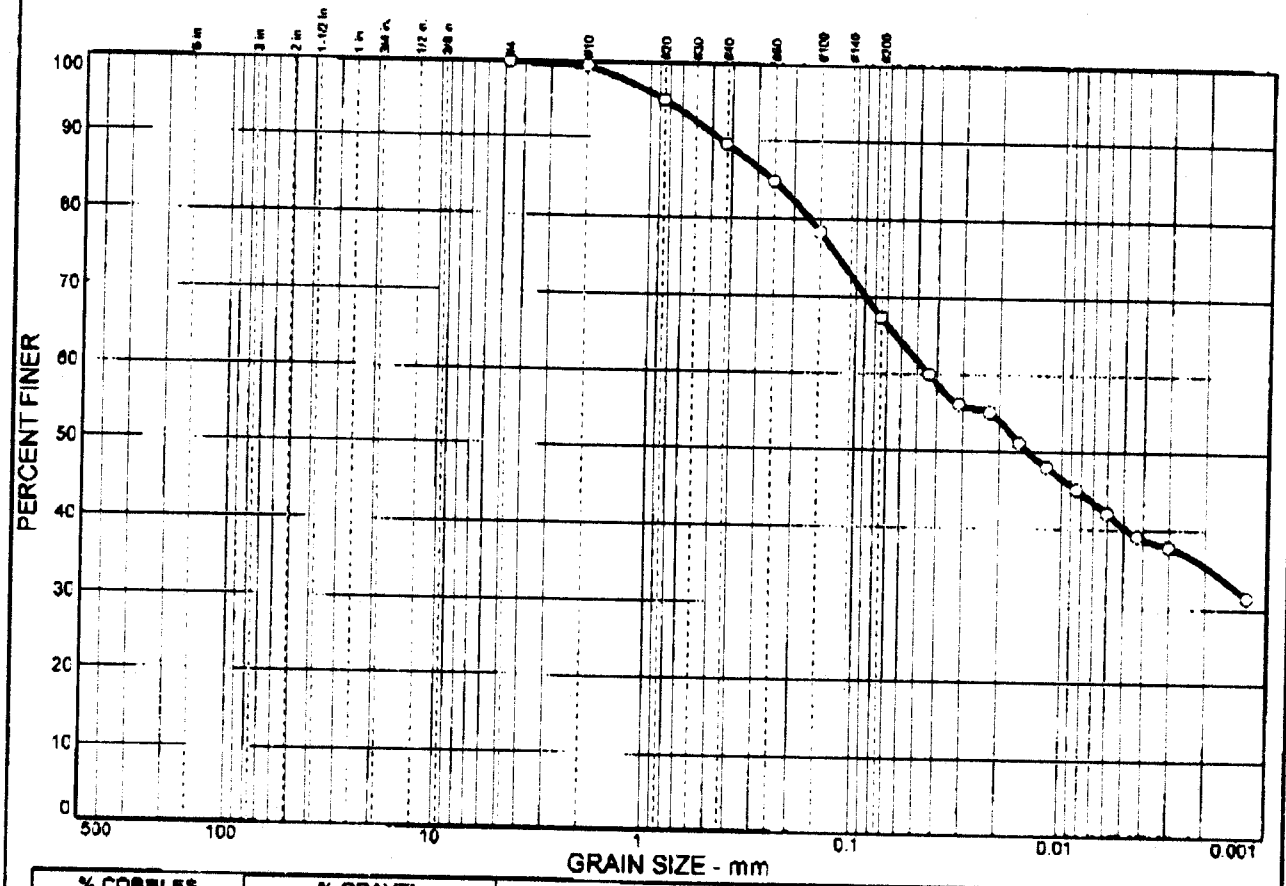
Permeability (k) 4.4E-08 cm/sec

Respecfully submitted

R. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	32.6	27.0	40.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#20	95.2		
#40	89.4		
#60	84.6		
#100	78.4		
#200	67.4		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 24 LL= 61 PI= 37

Coefficients

D_{85}= 0.260 D_{60}= 0.0436 D_{50}= 0.0145
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-056, Sampled from In-situ Permeability Test Location

Sample No.: DL-056 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 10, Lift 1 **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: 11/19/98
Report No.: 050

Acre 11 Lift 1

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	95.5	22.6	95.0	
2	See Test Location Plan	95.9	21.1	95.4	
3	See Test Location Plan	95.7	24.6	95.2	
4	See Test Location Plan	96.2	26.3	95.7	
5	See Test Location Plan	99.4	21.0	98.9	
6	See Test Location Plan	100.1	21.2	99.6	
7	See Test Location Plan	95.5	21.3	95.0	
8	See Test Location Plan	99.4	21.8	98.9	
9	See Test Location Plan	95.6	22.7	95.1	
10	See Test Location Plan	96.6	22.4	96.1	Tube Sample (DL-148)
11	See Test Location Plan	99.1	22.1	98.6	
12	See Test Location Plan	98.4	23.4	97.9	
13	See Test Location Plan	96.4	22.6	95.9	
14	See Test Location Plan	97.8	21.8	97.3	
15	See Test Location Plan	98.9	22.2	98.4	
16	See Test Location Plan	95.9	23.1	95.4	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	5.7 x 10(-8)
Dry Density (pcf)	97.8
Moisture Content (%)	24.8

Atterberg Limits (ASTM D4318)

PL	25
LL	67
PI	42
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.2
%Sand	25.9
%Silt	26.1
%Clay	47.8

Sincerely,

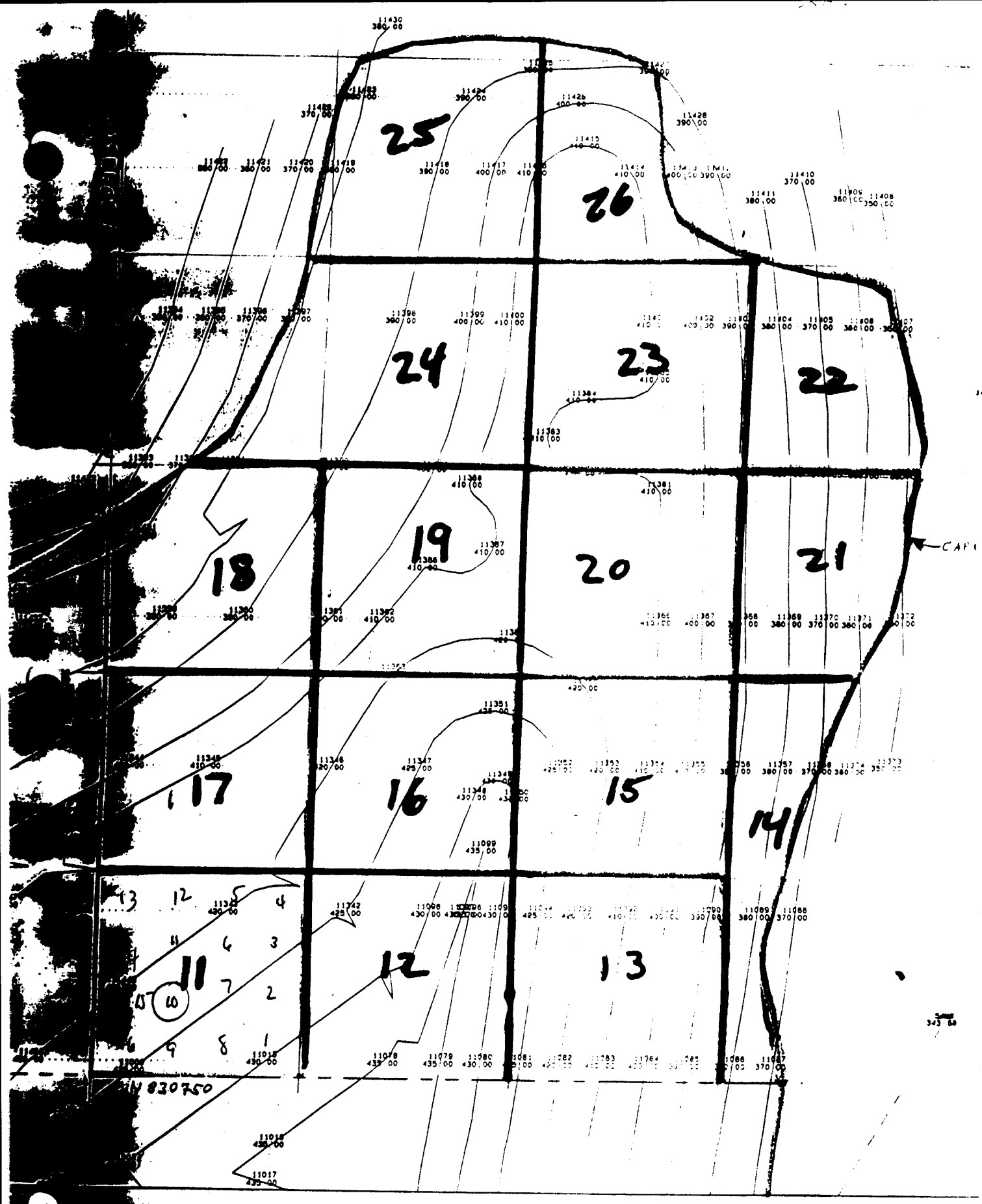
VAN DER HORST Geotechnical Engineering, P.C.

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 Point/Sample Location
Hole 11, Lift 1
Report : 050

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/19/98
Report No.: P-118

Project No.: VNC-98-029
Sample No. DL-148

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.7E-08	cm/sec
% Moisture	24.9	%
Dry Density	97.8	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 11/06/98
Location: ACRE 11, LIFT 1

Specimen Data

Length (in):	2.863
Diameter (in.):	2.848
Area (sq. in.):	6.381
Volume (cu. in.):	18.27
Wet Weight (grams):	585.8
Dry Weight (grams):	469.1
Dry Density (pcf):	97.8

Moisture Content Test Data

Wet Weight	107.45
Dry Weight	90.42
Tare weight	21.94
% Moisture	24.9

Test Data

Confining Pressure 3.0 psi

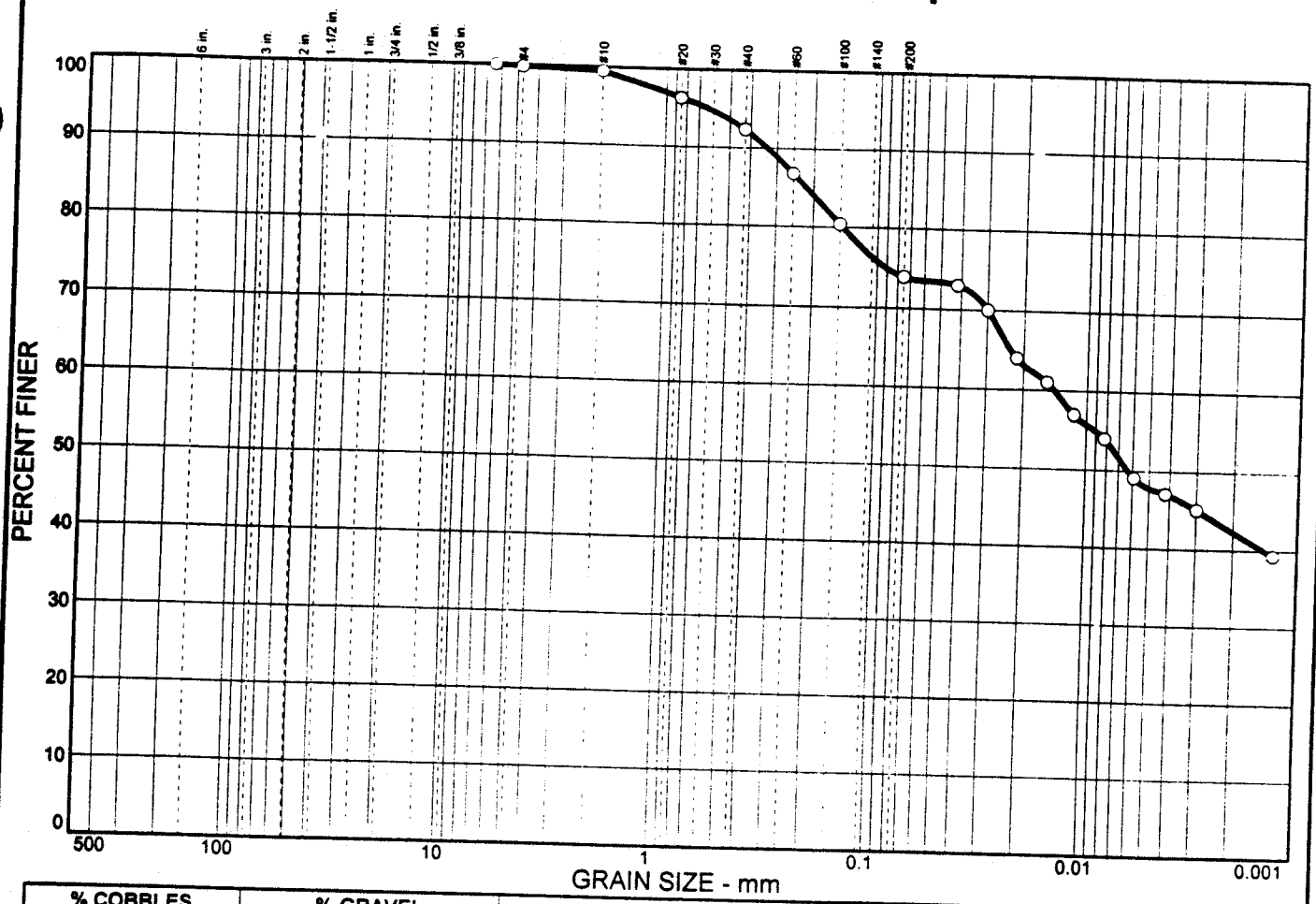
△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
360	96.92	1.85	2.00	1.08	1.93	6.44E-08
148	96.92	0.80	0.70	0.88	0.75	6.10E-08
407	96.92	1.80	1.90	1.06	1.85	5.47E-08
477	96.92	1.90	1.80	0.95	1.85	4.67E-08

△ 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) **5.7E-08** 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	25.9	26.1	47.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.5		
#20	96.2		
#40	92.3		
#60	86.8		
#100	80.4		
#200	73.9		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 25 LL= 67 PI= 42

Coefficients

D_{85}= 0.216 D_{60}= 0.0143 D_{50}= 0.0063
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-148, Acre 11, Lift 1

Sample No.: DL-148 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 11, Lift 1 **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: 11/13/98
Report No.: 039

Acre 12 Lift 1
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	99.8	24.1	99.3	
2	See Test Location Plan	96.6	27.5	96.1	Tube/Sample (DL-116)
3	See Test Location Plan	98.8	22.1	98.3	
4	See Test Location Plan	95.6	27.0	95.0	
5	See Test Location Plan	95.8	23.7	95.3	
6	See Test Location Plan	102.1	21.7	100+	
7	See Test Location Plan	102.3	21.0	100+	
8	See Test Location Plan	98.2	24.0	97.7	
9	See Test Location Plan	95.9	23.7	95.4	
10	See Test Location Plan	95.6	26.5	95.1	
11	See Test Location Plan	95.5	24.7	95.0	
12	See Test Location Plan	96.1	21.7	95.6	
13	See Test Location Plan	95.7	22.0	95.2	
14	See Test Location Plan	100.7	23.3	100+	
15	See Test Location Plan	96.9	27.8	96.4	
16	See Test Location Plan	95.6	22.2	95.0	

Density (ASTM D2922) Gilbert Southern 11/17/98 Const. Testing Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample)
Technical
Permeability (cm/sec) 8.4 x 10(-8)
Dry Density (pcf) 2250 104.5
Moisture Content (%) 2250-9 21.8

Atterberg Limits (ASTM D4318)

PL	30
LL	69
PI	39

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel	0.1
%Sand	28.2
%Silt	18.1
%Clay	53.6

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

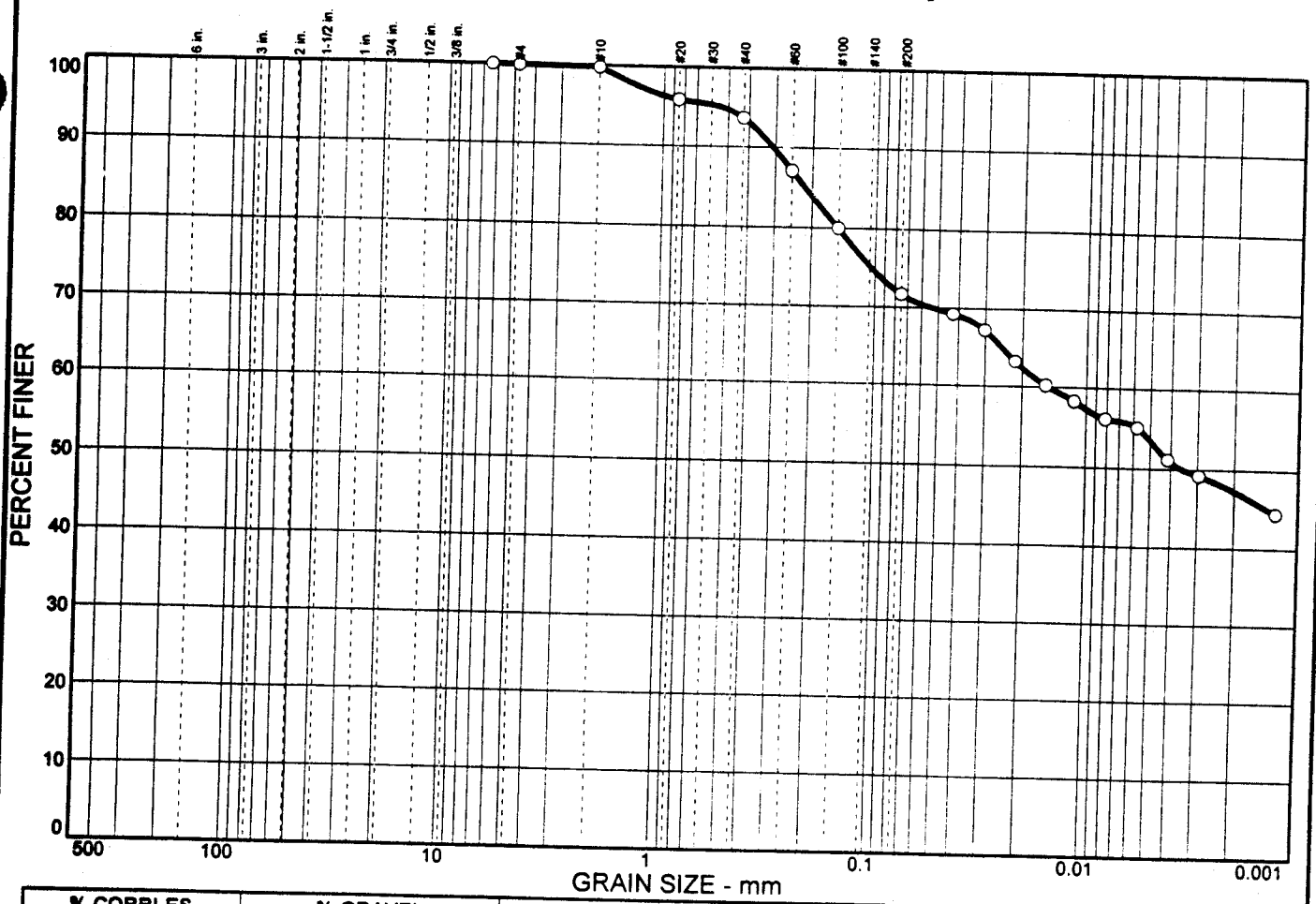
Robert L. Mashewske
Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

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

CT-013
James Bise

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	28.2	18.1	53.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.8		
#20	95.9		
#40	93.7		
#60	87.1		
#100	80.0		
#200	71.7		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 30 LL= 69 PI= 39

Coefficients

D_{85}= 0.215 D_{60}= 0.0150 D_{50}= 0.0035
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

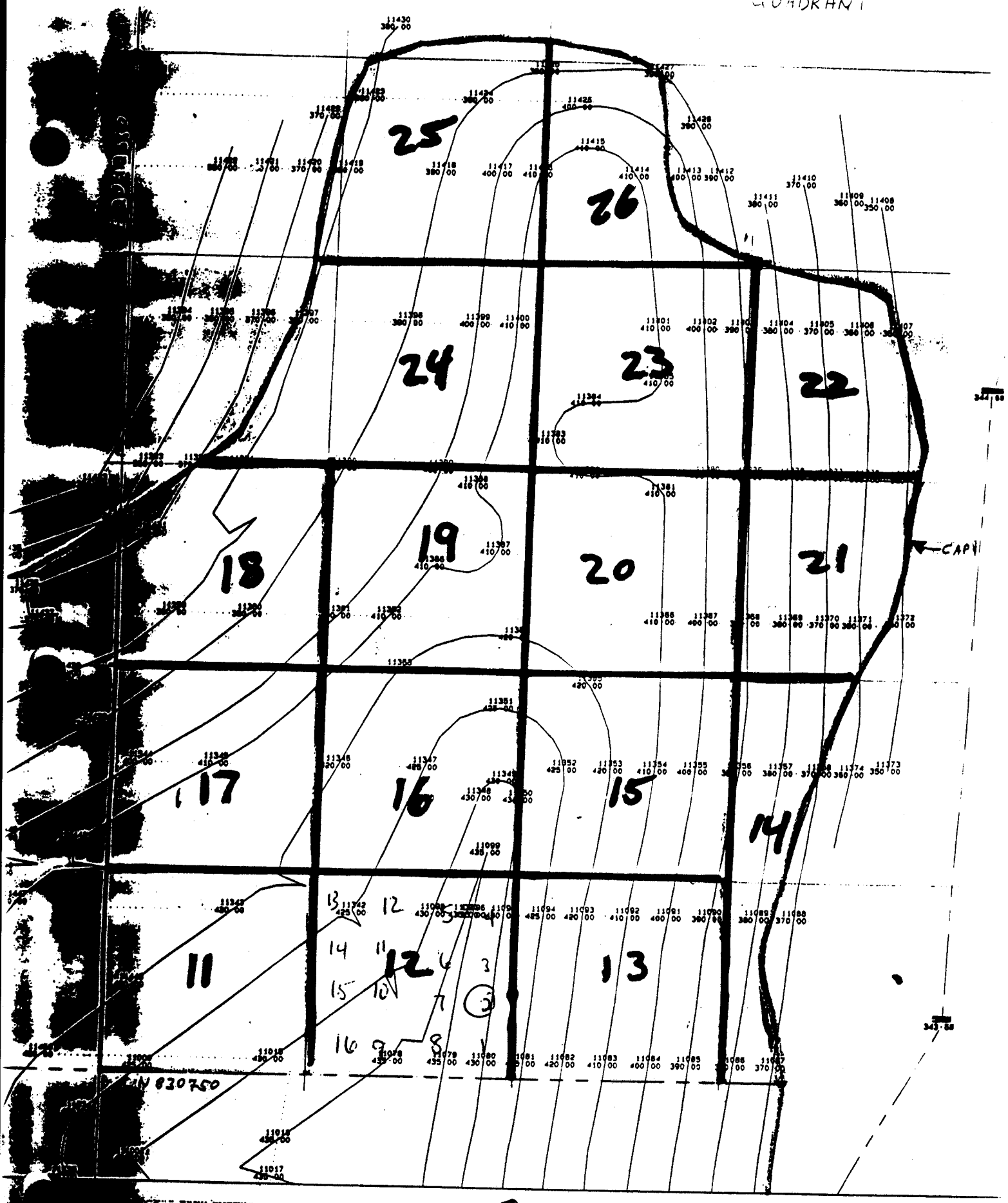
DL-116, Acre 12, Lift 1

Sample No.: DL-116 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 12, Lift 1 **Elev./Depth:**

VAN DER HORST ENGINEERING

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

QUADRANT



(2) - Indicates Perm / Sample Location
Acre 12, Lift 1
Report: 039

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/09/98
Report No.: P-091

Project No.: VNC-98-029
Sample No. DL-116

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	9.4E-08	cm/sec
% Moisture	21.8	%
Dry Density	104.5	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/28/98
Location: Acre 12, Lift 1

Length (in):	3.215
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	20.55
Wet Weight (grams):	686.2
Dry Weight (grams):	563.3
Dry Density (pcf):	104.5

Moisture Content Test Data

Wet Weight	89.23
Dry Weight	77.21
Tare weight	22.11
% Moisture	21.8

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
224	63.69	1.00	0.90	0.90	0.95	8.71E-08
496	63.69	2.30	2.30	1.00	2.30	9.52E-08
251	63.69	1.10	1.20	1.09	1.15	9.41E-08
711	63.69	3.40	3.40	1.00	3.40	9.82E-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) **9.4E-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

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 1

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 .032	Clay Cover Testing Acre 13, Lift 1
			Gilbert Southern
			11/17/98

REMARKS: Const. Testing
Technical

COPIES 2250
~~2250~~-9
32A

SIGNED: Dionne Boyd

CT-013
James Brier

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.: 032

Acre 13 Lift 1
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	26.2	95.6	
2	See Test Location Plan	95.5	26.5	95.0	
3	See Test Location Plan	98.9	24.2	98.4	Tube Sample (DL-104)
4	See Test Location Plan	97.1	25.8	96.6	
5	See Test Location Plan	98.4	25.1	97.9	
6	See Test Location Plan	95.6	27.1	95.1	
7	See Test Location Plan	97.4	24.6	96.9	
8	See Test Location Plan	100.8	23.7	100+	
9	See Test Location Plan	99.6	23.3	99.1	
10	See Test Location Plan	97.4	26.2	96.9	
11	See Test Location Plan	98.1	25.7	97.6	
12	See Test Location Plan	99.2	24.1	98.7	
13	See Test Location Plan	96.4	24.8	95.9	
14	See Test Location Plan	102.1	23.0	100+	
15	See Test Location Plan	97.4	23.4	96.9	
16	See Test Location Plan	99.5	23.1	99.0	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	8.5 x10(-8)
Dry Density (pcf)	98.9
Moisture Content (%)	22.3

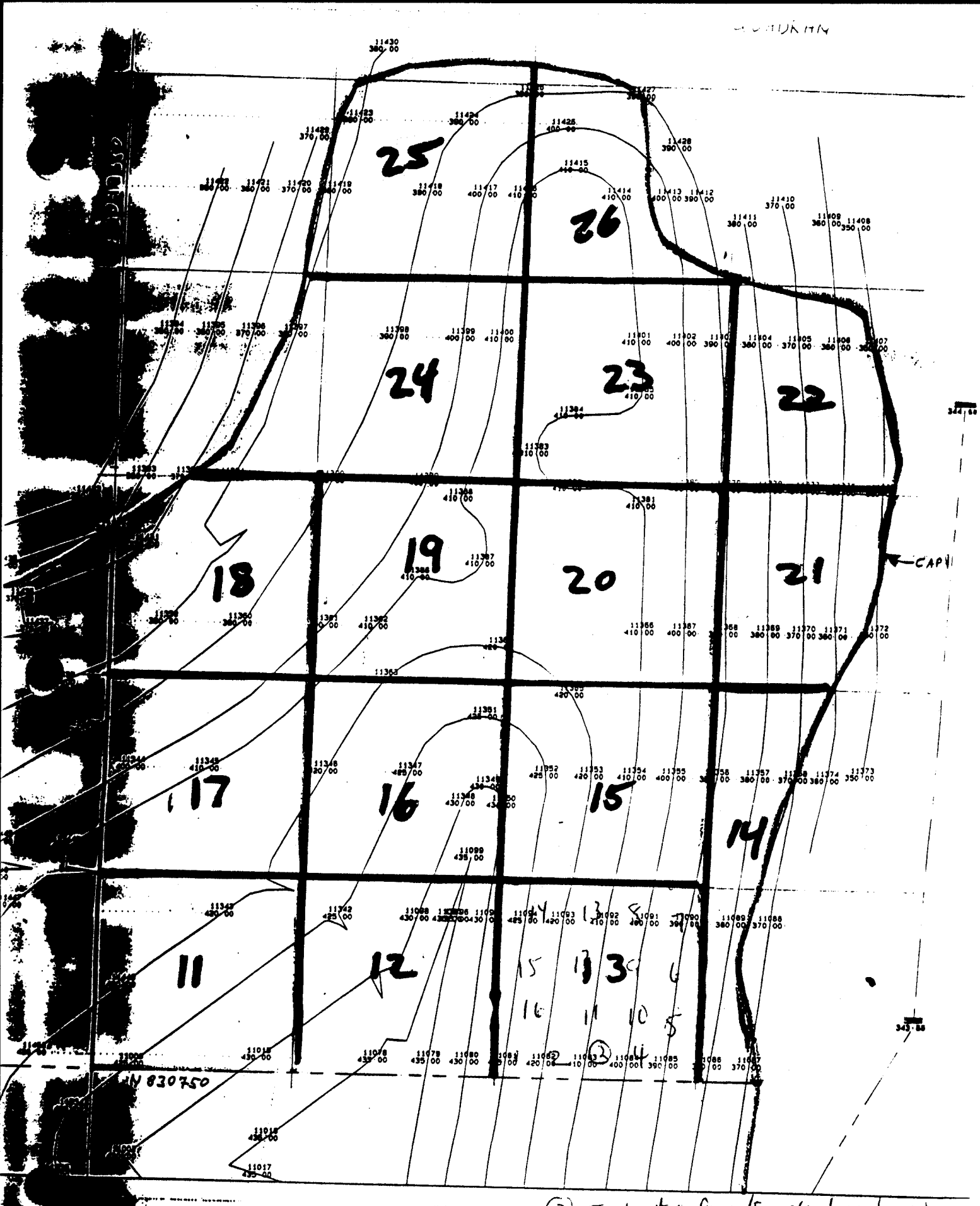
Atterberg Limits (ASTM D4318)		**Grain-size Analysis (ASTM D422)**	
PL	21	%Gravel	0.2
LL	56	%Sand	32.6
PI	35	%Silt	17.5
		%Clay	49.7
USCS Classification	CH		

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

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023033 ENGINEER ROBERT LEE MASHEWSKE

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



(3) Indicates Form/Sample Location
Acre 13, Lift 1
Report: 032

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/09/98
Report No.: P-084

Project No.: VNC-98-029
Sample No. DL-104

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.5E-08	cm/sec
% Moisture	22.3	%
Dry Density	98.9	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 10/26/98
Location: Acre 13, Lift 1

Length (in):	3.300
Diameter (in.):	2.835
Area (sq. in.):	6.323
Volume (cu. in.):	20.87
Wet Weight (grams):	662.7
Dry Weight (grams):	541.7
Dry Density (pcf):	98.9

Moisture Content Test Data

Wet Weight	121.53
Dry Weight	103.34
Tare weight	21.93
% Moisture	22.3

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
104	66.46	0.60	0.65	1.08	0.63	1.23E-07
161	77.54	0.70	0.70	1.00	0.70	7.61E-08
285	77.54	1.30	1.15	0.88	1.23	7.52E-08
845	77.54	3.50	2.90	0.83	3.20	6.63E-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)

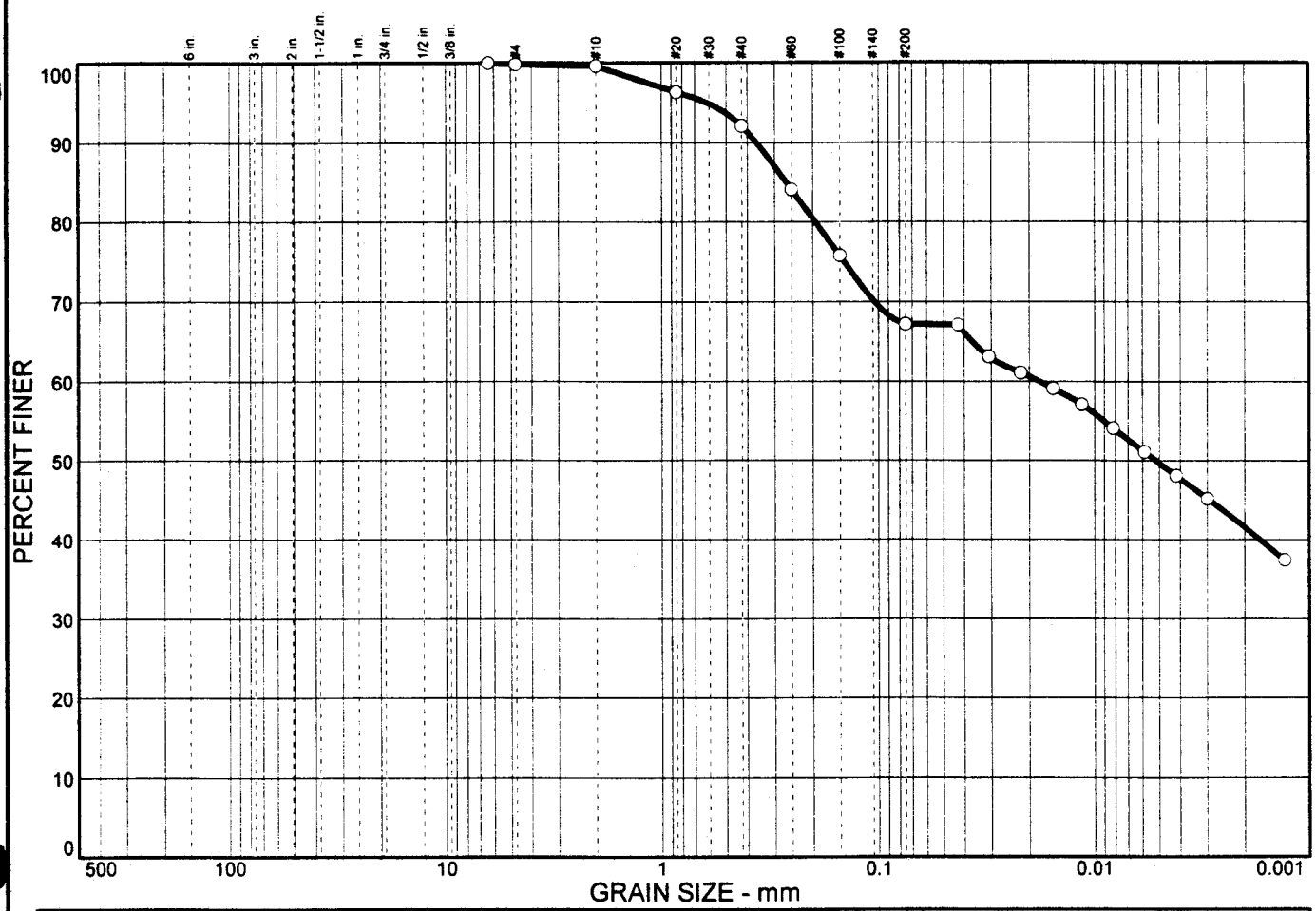
Permeability (k) **8.5E-08** cm/sec

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	0.2	32.6	17.5	49.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.6		
#20	96.3		
#40	92.1		
#60	84.1		
#100	75.8		
#200	67.2		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 21 LL= 56 PI= 35

Coefficients

D_{85}= 0.264 D_{60}= 0.0180 D_{50}= 0.0052
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-104, Acre 13, Lift 1

Sample No.: DL-104 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 13, Lift 1 **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 14, Lift 1

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 .033	Clay Cover Testing Acre 14, Lift 1
		Gilbert	Southern
		11/17/98	
		Const.	Testing

REMARKS: Technical
~~2250~~

COPIES 2250-9
~~32-A~~

SIGNED: Dionne Boyd

CT-013
James Bin

VAN DER HORST

CLAY COVER TESTING

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

Project No.: VNC-98-029
Date: 11/09/98
Report No.: 033

Acre 14 Lift 1

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	25.1	95.4	
2	See Test Location Plan	95.9	26.7	95.4	
3	See Test Location Plan	97.1	24.3	96.6	Tube Sample (DL-105)
4	See Test Location Plan	95.7	26.5	95.2	
5	See Test Location Plan	96.1	24.0	95.6	
6	See Test Location Plan	96.8	26.1	96.3	
7	See Test Location Plan	96.3	27.0	95.8	
8	See Test Location Plan	100.2	24.3	99.7	
9	See Test Location Plan	99.7	25.8	99.2	
10	See Test Location Plan	95.6	26.8	95.1	
11	See Test Location Plan	98.3	24.1	97.8	
12	See Test Location Plan	99.2	23.8	98.7	
13	See Test Location Plan	96.0	26.1	95.5	
14	See Test Location Plan	101.2	23.0	100+	
15	See Test Location Plan	101.9	22.4	100+	
16	See Test Location Plan	100.1	23.8	99.6	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	7.0 x 10(-8)
Dry Density (pcf)	101.3
Moisture Content (%)	23.0

Atterberg Limits (ASTM D4318)

PL	30
LL	71
PI	41

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel	0.5
%Sand	23.9
%Silt	23.4
%Clay	52.2

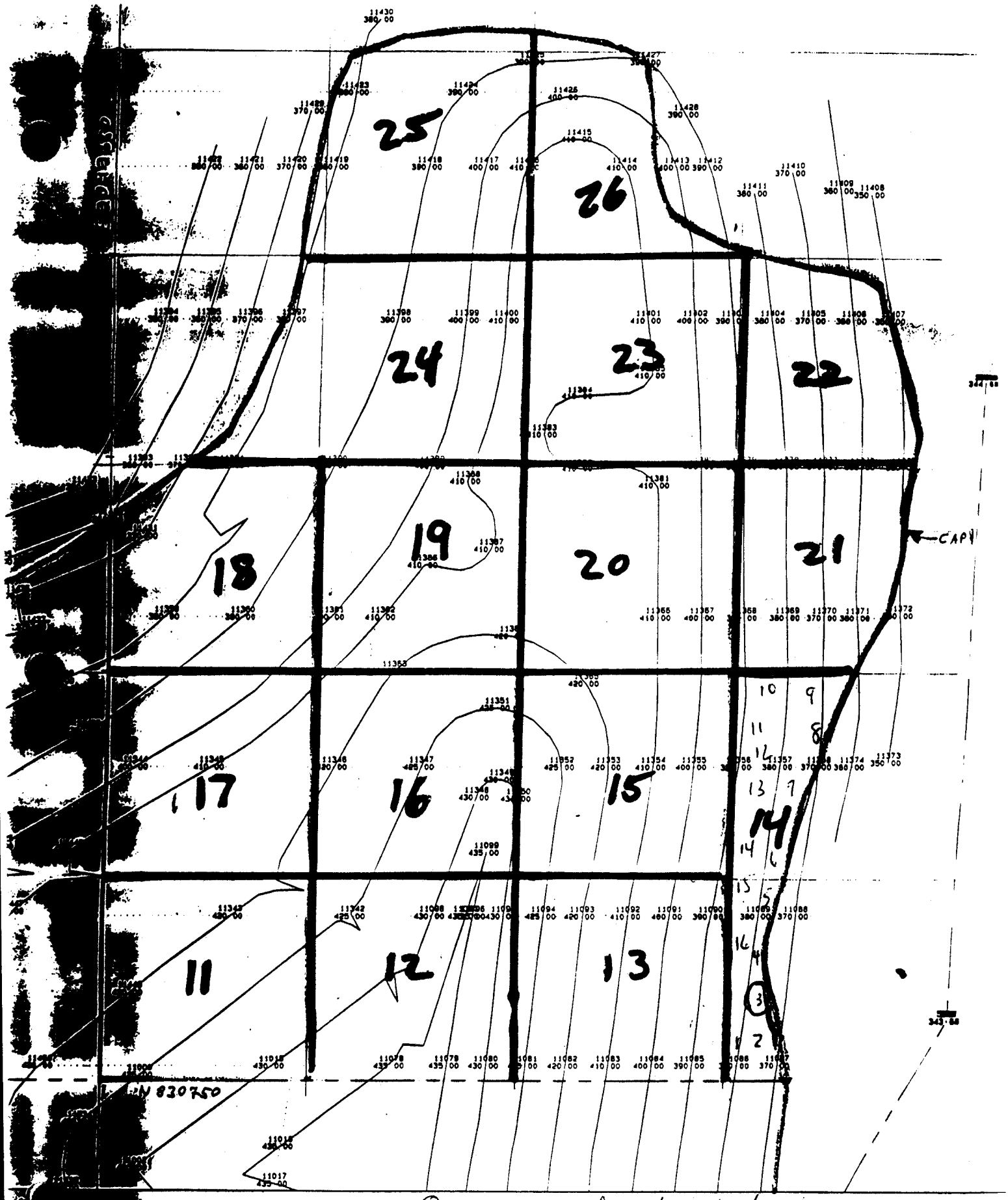
Sincerely,

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



③ - Indicates Perm/Sample Location

Acre 14, Lift 1

Report: 033

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/09/98
Report No.: P-085

Project No.: VNC-98-029
Sample No. DL-105

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	7.0E-08	cm/sec
% Moisture	23.0	%
Dry Density	101.3	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/26/98
Location: Acre 14, Lift 1

Length (in):	3.287
Diameter (in.):	2.840
Area (sq. in.):	6.346
Volume (cu. in.):	20.86
Wet Weight (grams):	682.2
Dry Weight (grams):	554.6
Dry Density (pcf):	101.3

Moisture Content Test Data

Wet Weight	138.18
Dry Weight	116.45
Tare weight	22.03
% Moisture	23.0

Test Data

Confining Pressure 3.0 psi

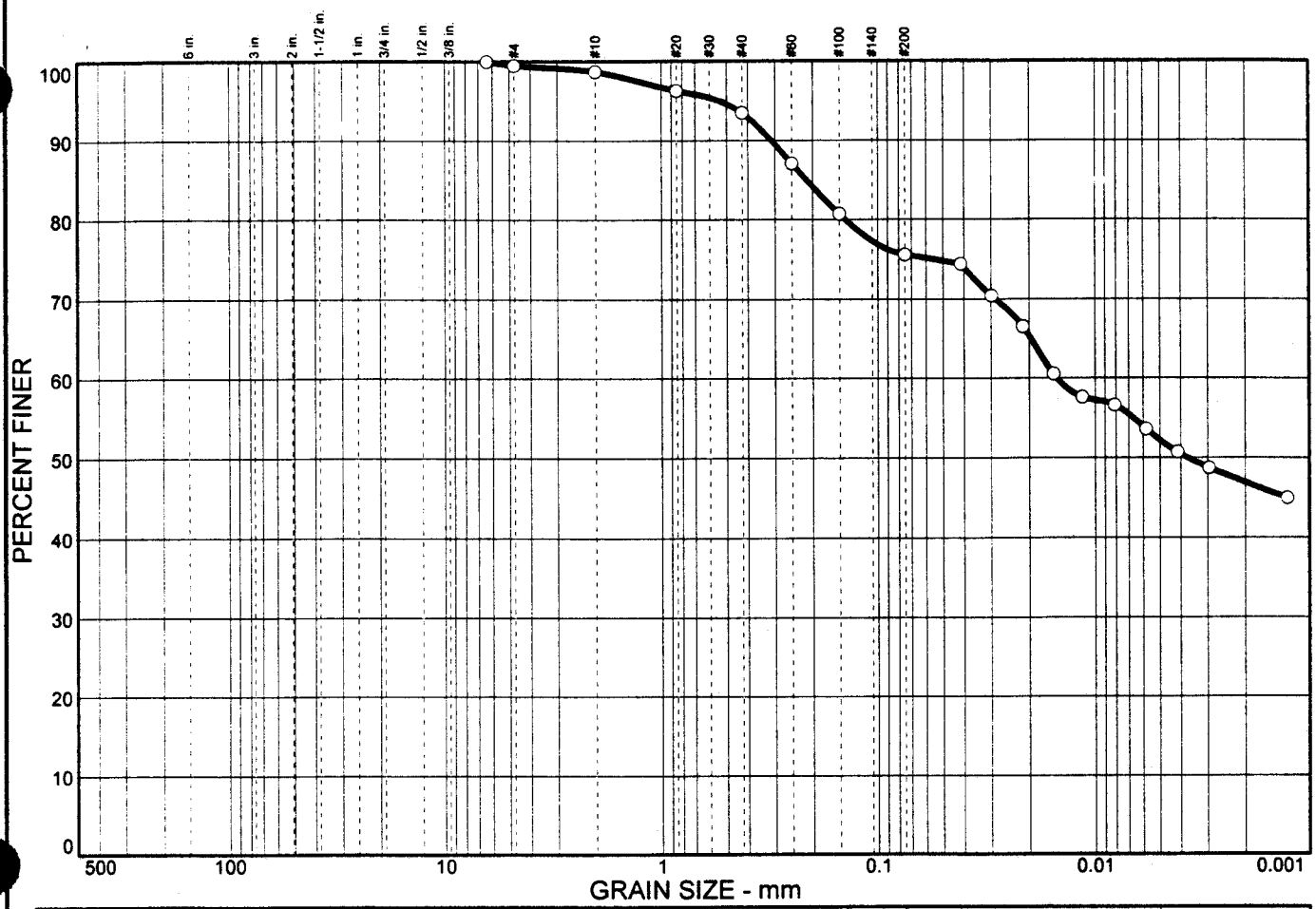
△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
211	66.46	0.70	0.70	1.00	0.70	6.72E-08
401	66.46	1.30	1.50	1.15	1.40	7.07E-08
387	66.46	1.40	1.40	1.00	1.40	7.33E-08
592	66.46	2.00	2.00	1.00	2.00	6.85E-08

△ 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) **7.0E-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	23.9	23.4	52.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.5		
#10	98.7		
#20	96.3		
#40	93.5		
#60	87.1		
#100	80.7		
#200	75.6		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 30 LL= 71 PI= 41

Coefficients

D_{85}= 0.213 D_{60}= 0.0150 D_{50}= 0.0037
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-105, Acre 14, Lift 1

Sample No.: DL-105 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 14, Lift 1 **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 15, Lift 1

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 .034	Clay Cover Testing Acre 15, Lift 1
		Gilbert	Southern
		11/17/98	
		Const.	Testing

REMARKS: Technical

COPIES 2250
~~2250-9~~
22 A

SIGNED: Dionne Boyd

CT-013
James Bien

VAN DER HORST

CLAY COVER TESTING

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

Project No.: VNC-98-029
Date: 11/09/98
Report No.: 034

Acre 15 Lift 1

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	95.6	26.1	95.1	
2	See Test Location Plan	95.5	26.3	95.0	
3	See Test Location Plan	95.9	26.8	95.4	
4	See Test Location Plan	97.0	25.3	96.5	
5	See Test Location Plan	96.5	22.7	96.0	
6	See Test Location Plan	99.2	24.0	98.7	
7	See Test Location Plan	98.1	25.7	97.6	
8	See Test Location Plan	100.3	22.5	99.8	
9	See Test Location Plan	96.7	25.1	96.2	
10	See Test Location Plan	97.6	24.3	97.1	
11	See Test Location Plan	95.8	21.8	95.3	Sample Perm (DL-106)
12	See Test Location Plan	95.7	23.2	95.2	
13	See Test Location Plan	98.3	23.5	97.8	
14	See Test Location Plan	101.4	22.6	100+	
15	See Test Location Plan	103.1	22.0	100+	
16	See Test Location Plan	99.0	22.9	98.5	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	1.0 x 10(-7)
Dry Density (pcf)	99.2
Moisture Content (%)	21.8

Atterberg Limits (ASTM D4318)

PL	31
LL	70
PI	39
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.3
%Sand	20.6
%Silt	25.7
%Clay	53.4

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

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/09/98
Report No.: P-086

Project No.: VNC-98-029
Sample No. DL-106

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.0E-07	cm/sec
% Moisture	21.8	%
Dry Density	99.2	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 10/26/98
Location: Acre 15, Lift 1

Length (in):	3.167
Diameter (in.):	2.825
Area (sq. in.):	6.279
Volume (cu. in.):	19.88
Wet Weight (grams):	630.9
Dry Weight (grams):	517.8
Dry Density (pcf):	99.2

Moisture Content Test Data

Wet Weight	131.79
Dry Weight	112.12
Tare weight	22.03
% Moisture	21.8

Test Data

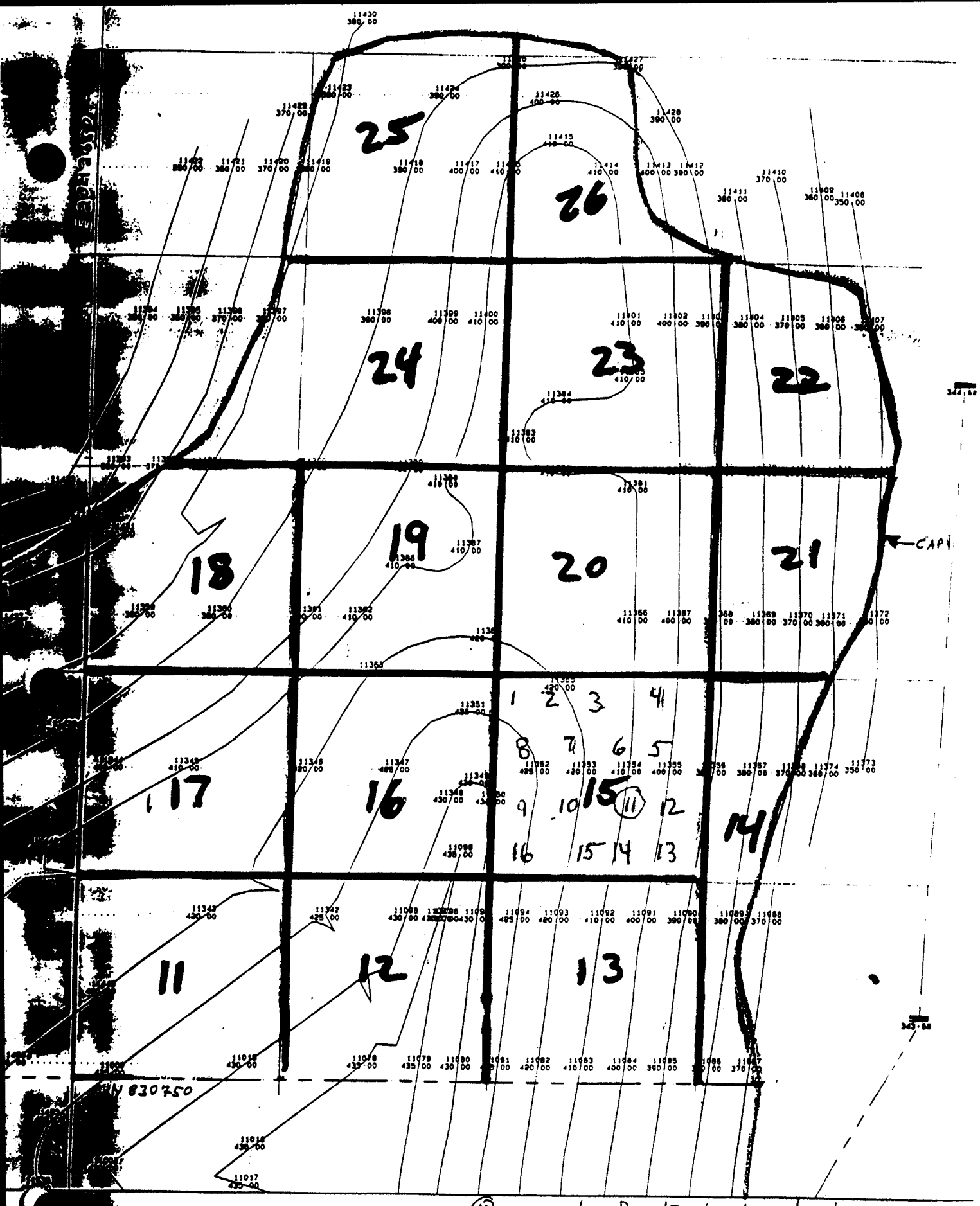
Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
166	96.92	1.35	1.25	0.93	1.30	1.06E-07
311	96.92	2.40	2.30	0.96	2.35	1.02E-07
851	96.92	6.70	6.20	0.93	6.45	1.03E-07
488	96.92	4.00	3.30	0.83	3.65	1.01E-07

△ 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-07** cm/sec

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

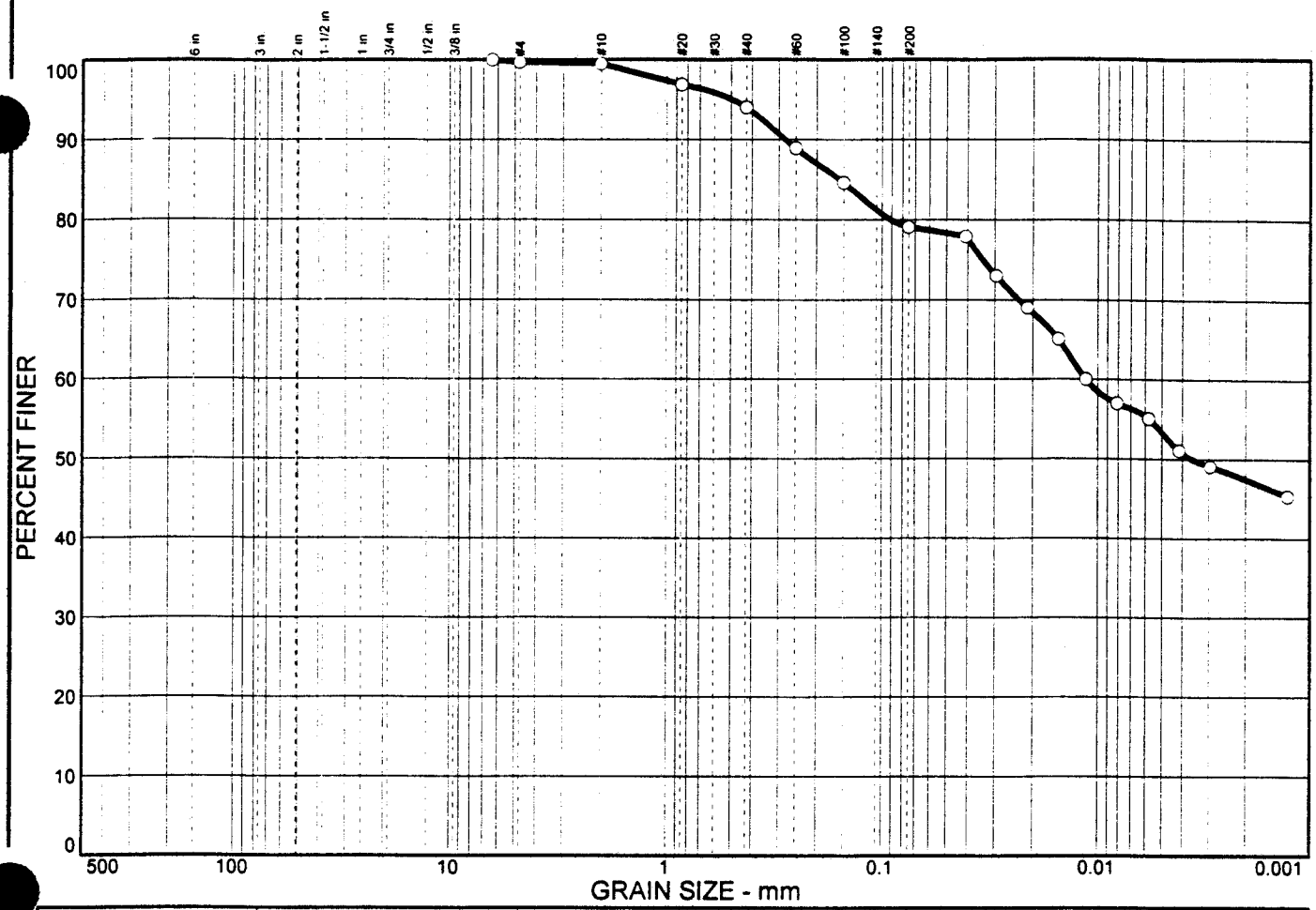


(11) : Indicates Rim/Sample Location

Acre 15, Lift 1

Report: 034

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	20.6	25.7	53.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.5		
#20	96.9		
#40	94.0		
#60	88.9		
#100	84.6		
#200	79.1		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 31 LL= 70 PI= 39

Coefficients

D_{85}= 0.157 D_{60}= 0.0113 D_{50}= 0.0036
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-106, Acre 15, Lift 1

Sample No.: DL-106 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 15, Lift 1 **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 16, Lift 1

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 .043	Clay Cover Testing Acre 16, Lift 1
			Southern
			Gilbert
			11/17/98
			Const. Testing
			Technical
			2250
			2250-9
			32A

REMARKS:

CT-013
James Dan

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: 11/13/98
Report No.: 043

Acre 16 Lift 1

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	101.7	22.8	100+	
2	See Test Location Plan	98.3	25.1	97.8	
3	See Test Location Plan	97.3	21.9	96.8	
4	See Test Location Plan	96.5	25.9	96.0	
5	See Test Location Plan	98.6	24.8	98.1	
6	See Test Location Plan	95.8	26.5	95.3	
7	See Test Location Plan	101.5	23.1	100+	
8	See Test Location Plan	98.2	24.0	97.7	Tube Sample (DL-120)
9	See Test Location Plan	96.2	26.2	95.7	
10	See Test Location Plan	101.7	23.1	100+	
11	See Test Location Plan	97.3	24.8	96.8	
12	See Test Location Plan	101.4	22.9	100+	
13	See Test Location Plan	97.5	25.5	97.0	
14	See Test Location Plan	95.9	27.5	95.4	
15	See Test Location Plan	95.7	27.3	95.2	
16	See Test Location Plan	96.3	25.7	95.8	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	913 10(-8)
Dry Density (pcf)	96.6
Moisture Content (%)	21.2

Atterberg Limits (ASTM D4318)

PL	30
LL	66
PI	36

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel	0.4
%Sand	34.7
%Silt	17.4
%Clay	47.5

Sincerely,

VAN DER HORST Geotechnical Engineering, P.C.

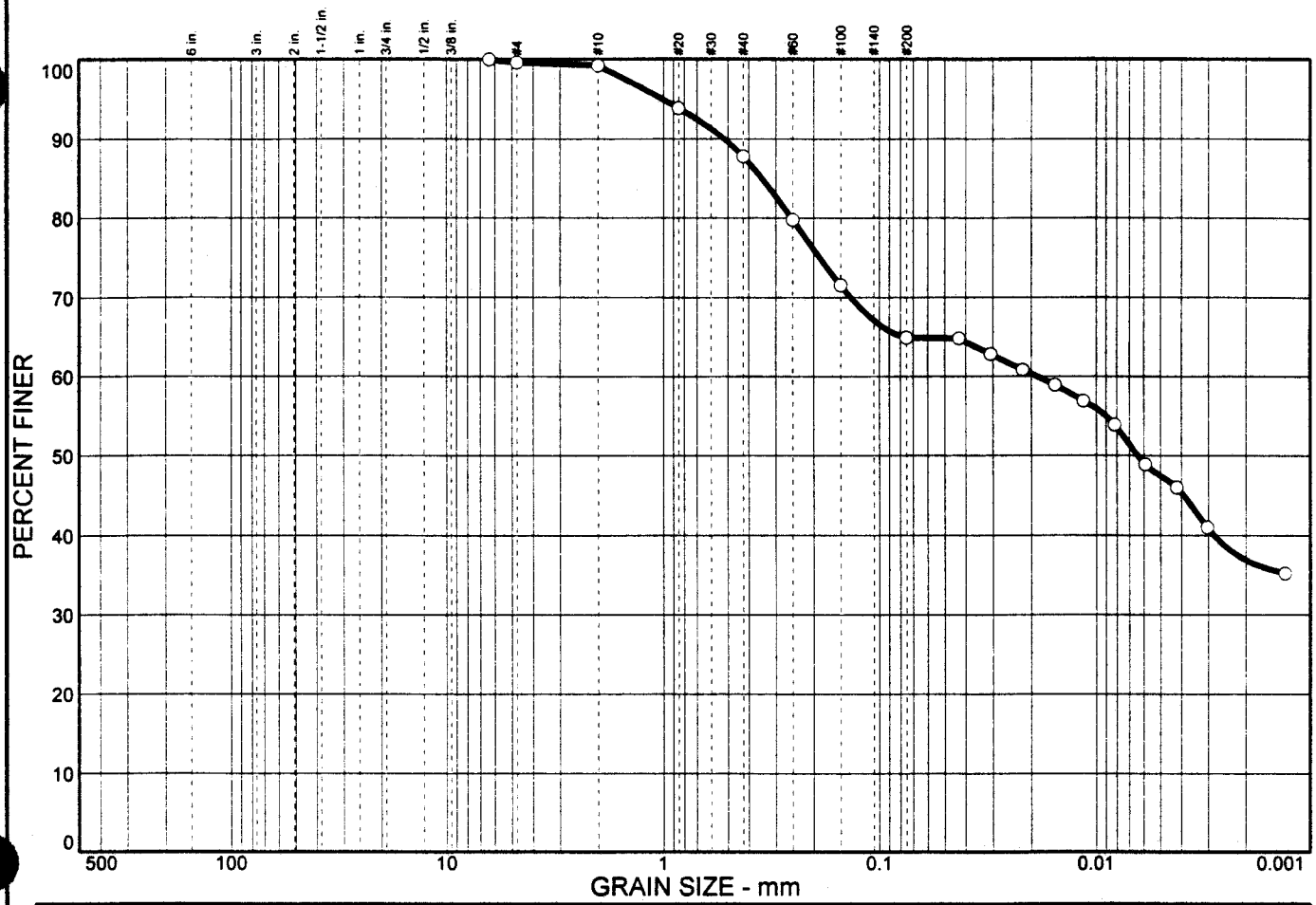
Robert L. Mashewske

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

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.4	34.7	17.4	47.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.6		
#10	99.2		
#20	93.9		
#40	87.8		
#60	79.8		
#100	71.5		
#200	64.9		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 30 LL= 66 PI= 36

Coefficients

D_{85}= 0.346 D_{60}= 0.0189 D_{50}= 0.0064
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

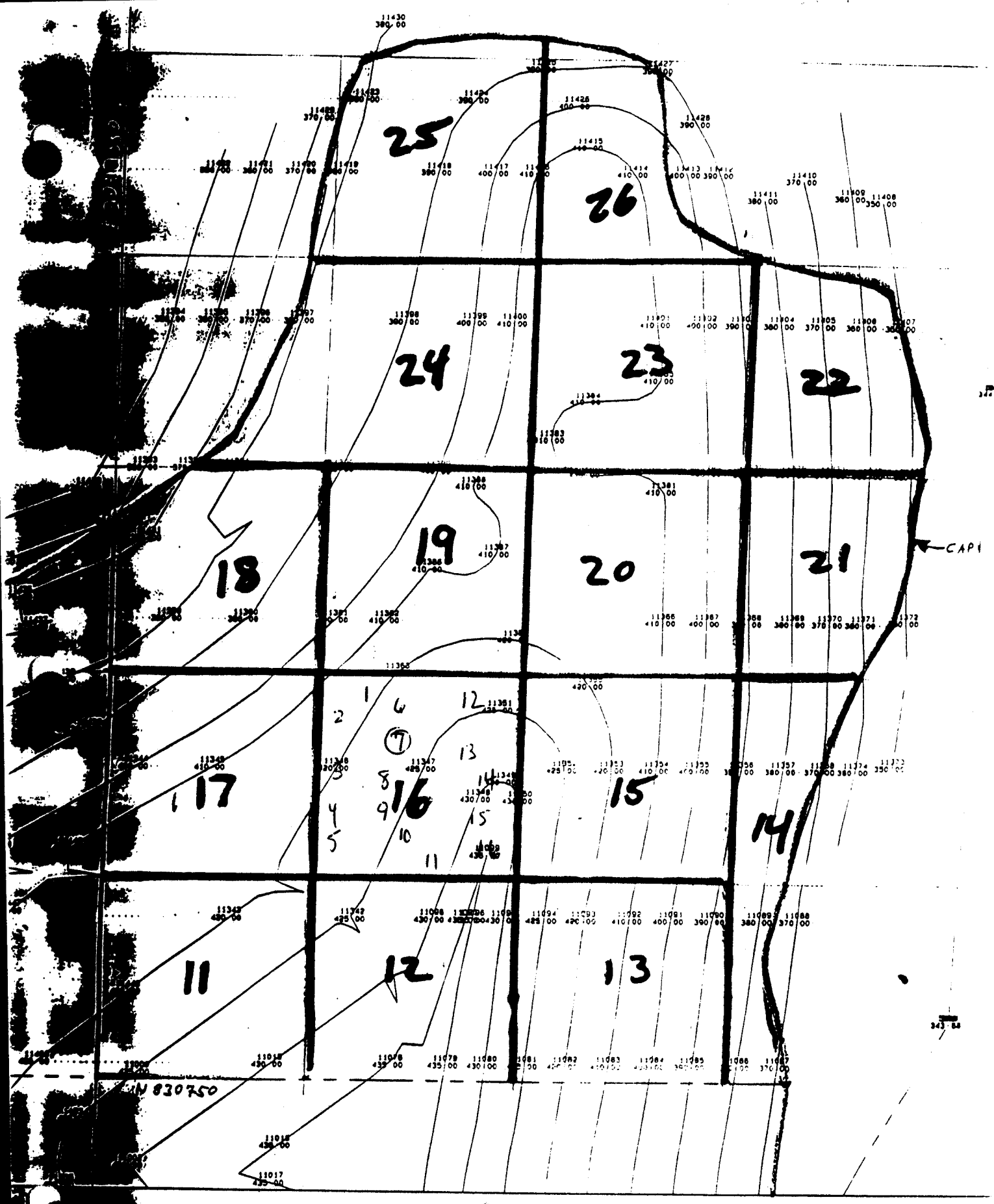
Remarks

DL-120, Acre 16, Lift 1

Sample No.: DL-120 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 16, Lift 1 **Elev./Depth:**

VAN DER HORST ENGINEERING

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



(7) Indicates Perm/simple location
Acre 16, Lift 1
Report : 043

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/09/98
Report No.: P-094

Project No.: VNC-98-029
Sample No. DL-120

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	9.3E-08	cm/sec
% Moisture	21.2	%
Dry Density	96.6	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 10/28/98
Location: Acre 16, Lift 1

Length (in):	3.690
Diameter (in.):	2.855
Area (sq. in.):	6.413
Volume (cu. in.):	23.66
Wet Weight (grams):	727.2
Dry Weight (grams):	600.1
Dry Density (pcf):	96.6

Moisture Content Test Data

Wet Weight	134.84
Dry Weight	115.12
Tare weight	22.02
% Moisture	21.2

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
144	91.38	0.85	0.75	0.88	0.80	9.10E-08
217	91.38	1.30	1.20	0.92	1.25	9.43E-08
187	91.38	1.00	1.05	1.05	1.03	8.97E-08
721	91.38	4.20	4.40	1.05	4.30	9.76E-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) **9.3E-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 17, Lift 1

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 .044	Clay Cover Testing Acre 17, Lift 1

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: 11/13/98
Report No.: 044

Acre 17 Lift 1

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	99.3	21.7	98.8	
2	See Test Location Plan	98.8	21.5	98.3	
3	See Test Location Plan	99.6	23.2	99.1	
4	See Test Location Plan	103.0	21.8	100+	
5	See Test Location Plan	98.5	23.0	98.0	
6	See Test Location Plan	101.5	22.5	100+	
7	See Test Location Plan	98.4	24.1	97.9	Tube sample (DL-155)
8	See Test Location Plan	101.4	21.1	100+	
9	See Test Location Plan	100.3	24.9	99.8	
10	See Test Location Plan	98.9	23.7	98.4	
11	See Test Location Plan	95.6	23.0	95.1	
12	See Test Location Plan	100.9	21.5	100+	
13	See Test Location Plan	98.7	22.7	98.3	
14	See Test Location Plan	95.3	22.3	95.0	
15	See Test Location Plan	105.0	21.1	100+	
16	See Test Location Plan	95.8	24.6	95.3	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	7.2 x 10(-8)
Dry Density (pcf)	97.3
Moisture Content (%)	25.7

Atterberg Limits (ASTM D4318)

PL	30
LL	74
PI	44
USCS Classification	CH

Grain-size Analysis (ASTM D422)

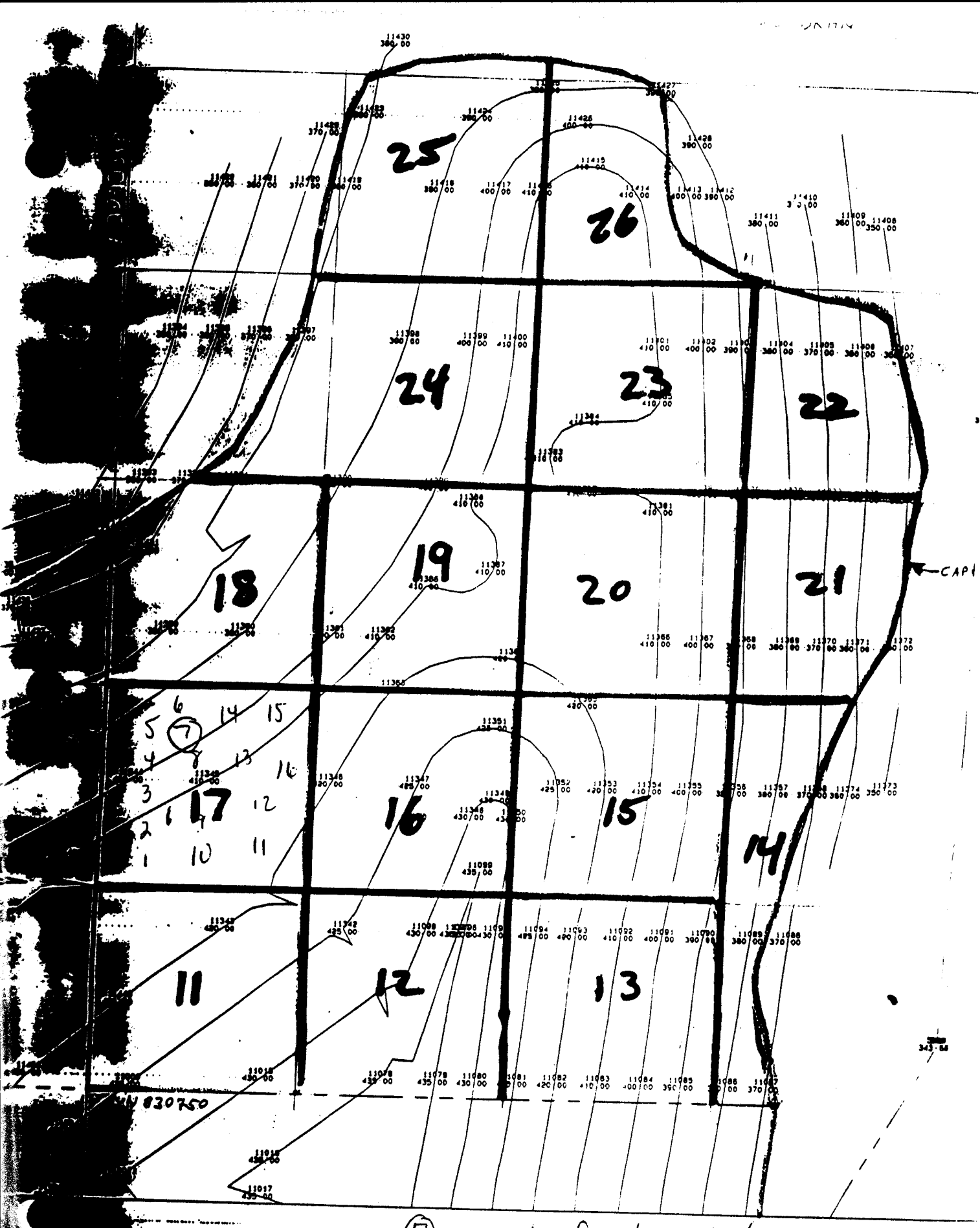
%Gravel	0.3
%Sand	24.6
%Silt	20.6
%Clay	54.5

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
Area 17, Gift #1
Report: 044

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/16/98
Report No.: P-111

Project No.: VNC-98-029
Sample No. DL-155

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	7.2E-08	cm/sec
% Moisture	25.7	%
Dry Density	97.3	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/06/98
Location: Acre 17, Lift 1
Retest of DL-123

Length (in):	3.081
Diameter (in.):	2.863
Area (sq. in.):	6.449
Volume (cu. in.):	19.87
Wet Weight (grams):	637.7
Dry Weight (grams):	507.5
Dry Density (pcf):	97.3

Moisture Content Test Data

Wet Weight	107.13
Dry Weight	89.77
Tare weight	22.10
% Moisture	25.7

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
125	124.62	1.10	1.00	0.91	1.05	8.37E-08
503	124.62	3.70	3.50	0.95	3.60	7.13E-08
445	124.62	3.00	2.90	0.97	2.95	6.61E-08
152	124.62	1.00	1.00	1.00	1.00	6.56E-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) **7.2E-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	0.3	24.6	20.6	54.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.4		
#20	97.3		
#40	93.8		
#60	88.1		
#100	82.4		
#200	75.1		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 30 LL= 74 PI= 44

Coefficients

D_{85}= 0.188 D_{60}= 0.0086 D_{50}= 0.0026
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-155, Acre 17, Lift 1

Sample No.: DL-155 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 17, Lift 1 **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.: 093

Acre 18 Lift 1

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	20.4	99.6	
2	See Test Location Plan	100.6	20.1	97.7	
3	See Test Location Plan	101.7	19.9	98.7	
4	See Test Location Plan	101.7	21.7	98.7	
5	See Test Location Plan	103.2	19.9	100+	
6	See Test Location Plan	102.6	21.6	99.6	
7	See Test Location Plan	103.1	22.0	100+	Tube/Sample (DL-221)
8	See Test Location Plan	101.1	21.9	98.2	
9	See Test Location Plan	99.4	21.7	96.5	
10	See Test Location Plan	98.8	21.6	95.9	
11	See Test Location Plan	100.6	20.9	97.7	
12	See Test Location Plan	99.7	22.4	96.8	
13	See Test Location Plan	99.1	21.6	96.2	
14	See Test Location Plan	101.6	20.7	98.6	
15	See Test Location Plan	102.4	19.9	99.4	
16	See Test Location Plan	102.0	22.2	99.0	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	1.5x10(-8)
Dry Density (pcf)	104.2
Moisture Content (%)	24.0

Atterberg Limits (ASTM D4318)

PL	18
LL	40
PI	22
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.6
%Sand	35.5
%Silt	24.6
%Clay	39.3

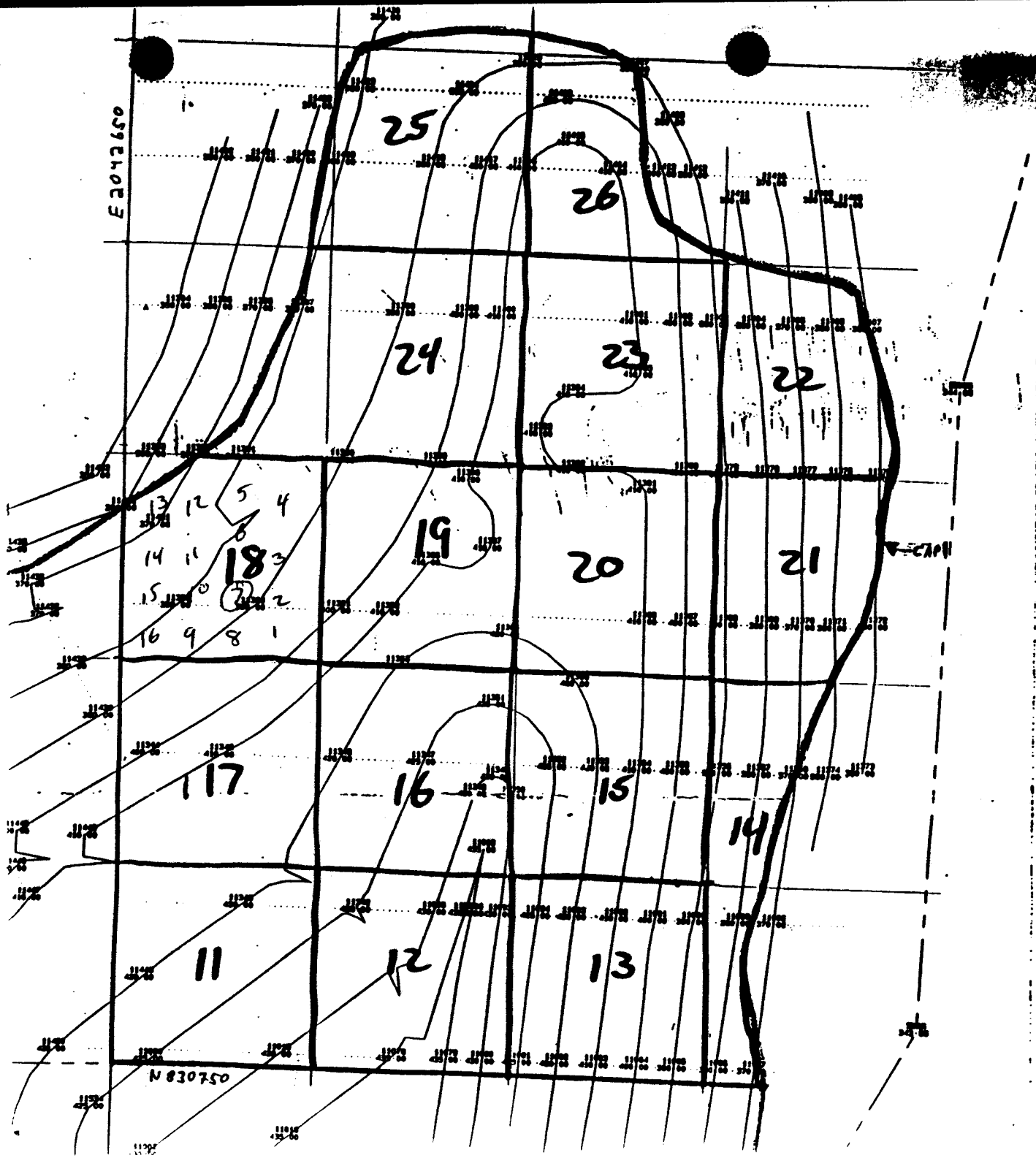
Sincerely,
VAN DER HORST Geotechnical Engineering, PC

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



11/30/98.

Test location Plan

Acre 18/Lift 1

⑦ = Perm location

Report: 093

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.6	35.5	24.6	39.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.4		
#10	99.1		
#20	95.3		
#40	89.2		
#60	79.1		
#100	69.9		
#200	63.9		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 18 LL= 40 PI= 22

Coefficients

D_{85}= 0.334 D_{60}= 0.0389 D_{50}= 0.0177
D_{30}= 0.0015 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-221, Acre 18, Lift 1

Sample No.: DL-221 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 18, Lift 1 **Elev./Depth:**

VAN DER HORST ENGINEERING

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

VANDERHORST

PERMEABILITY TFST REPORT
ASTM D5084 - Method A

Date: 12/04/98
Report No.: P-174

Project No.: VNC-98-029
Sample No.: DL-221

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.5E-008	cm/sec
% Moisture	24.0	%
Dry Density	104.2	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/30/98
Location: Acre 18, Lift 1

Specimen Data

Length (in):	3.496
Diameter (in.):	2.860
Area (sq. in.):	6.435
Volume (cu. in.):	22.50
Wet Weight (grams):	763.3
Dry Weight (grams):	615.5
Dry Density (pcf):	104.2

Wet Weight	134.55
Dry Weight	112.74
Tare weight	21.90
% Moisture	24.0

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
514	138.46	1.00	0.90	0.90	0.95	1.89E-008
770	138.46	1.25	1.00	0.80	1.13	1.49E-008
393	138.46	0.55	0.50	0.91	0.53	1.36E-008
214	138.46	0.30	0.30	1.00	0.30	1.43E-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

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.: 100

Acre 19 Lift 1

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	104.6	20.8	100+	
2	See Test Location Plan	105.5	19.6	100+	
3	See Test Location Plan	105.2	19.8	100+	
4	See Test Location Plan	103.8	20.3	100+	
5	See Test Location Plan	100.8	21.9	97.9	Tube/Sample (DL223)
6	See Test Location Plan	101.0	20.8	98.0	
7	See Test Location Plan	103.4	21.1	100+	
8	See Test Location Plan	100.8	21.3	97.8	
9	See Test Location Plan	101.1	19.4	98.1	
10	See Test Location Plan	98.5	20.4	95.6	
11	See Test Location Plan	99.6	21.2	96.7	
12	See Test Location Plan	98.7	20.8	95.8	
13	See Test Location Plan	100.2	20.6	97.3	
14	See Test Location Plan	100.9	20.9	98.0	
15	See Test Location Plan	101.6	21.4	98.6	
16	See Test Location Plan	100.7	22.3	97.8	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	3.4x10(-8)
Dry Density (pcf)	107.1
Moisture Content (%)	20.0

Atterberg Limits (ASTM D4318)

PL	18
LL	44
PI	26
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.2
%Sand	40.9
%Silt	20.6
%Clay	38.3

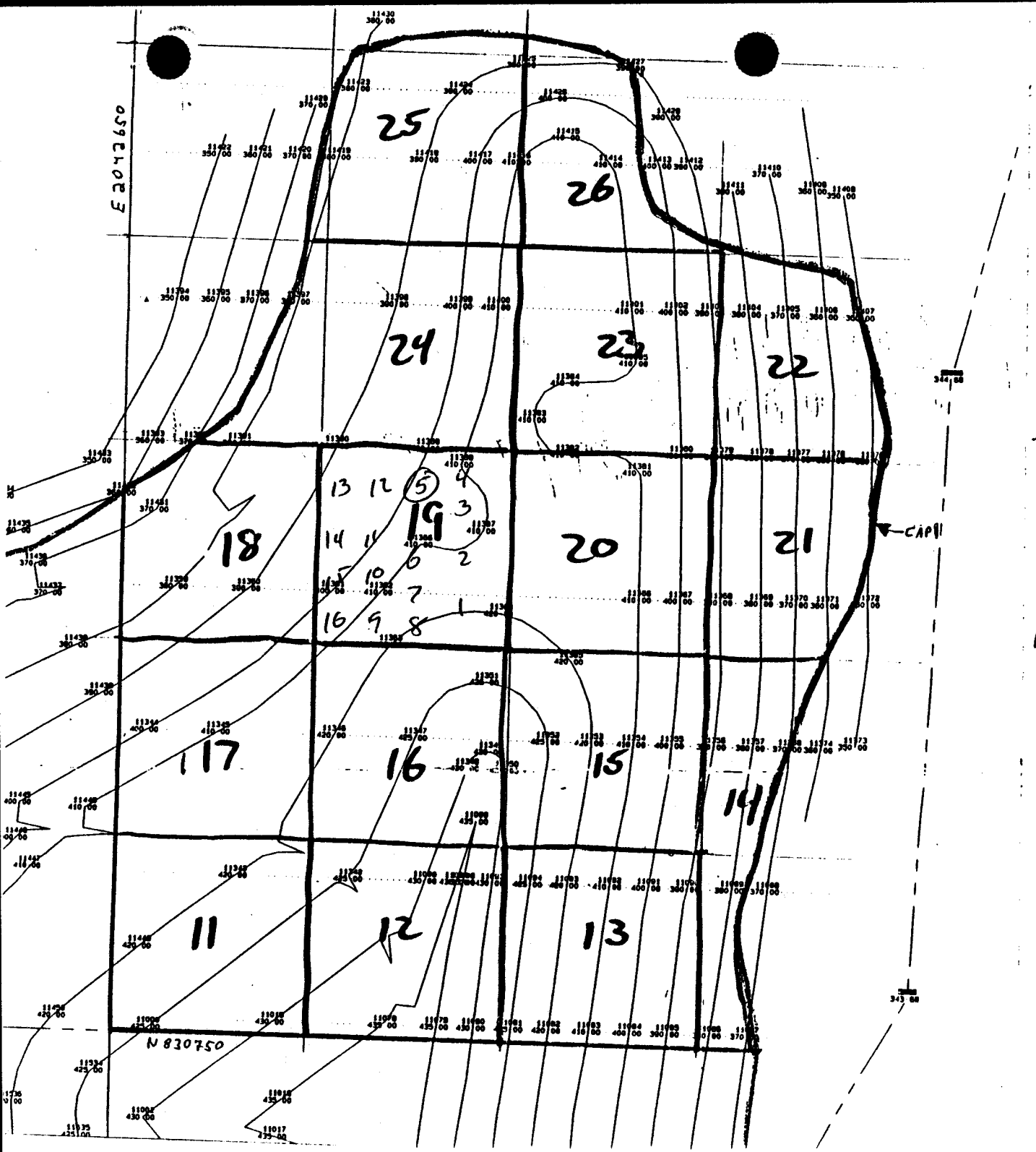
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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



11/30/98

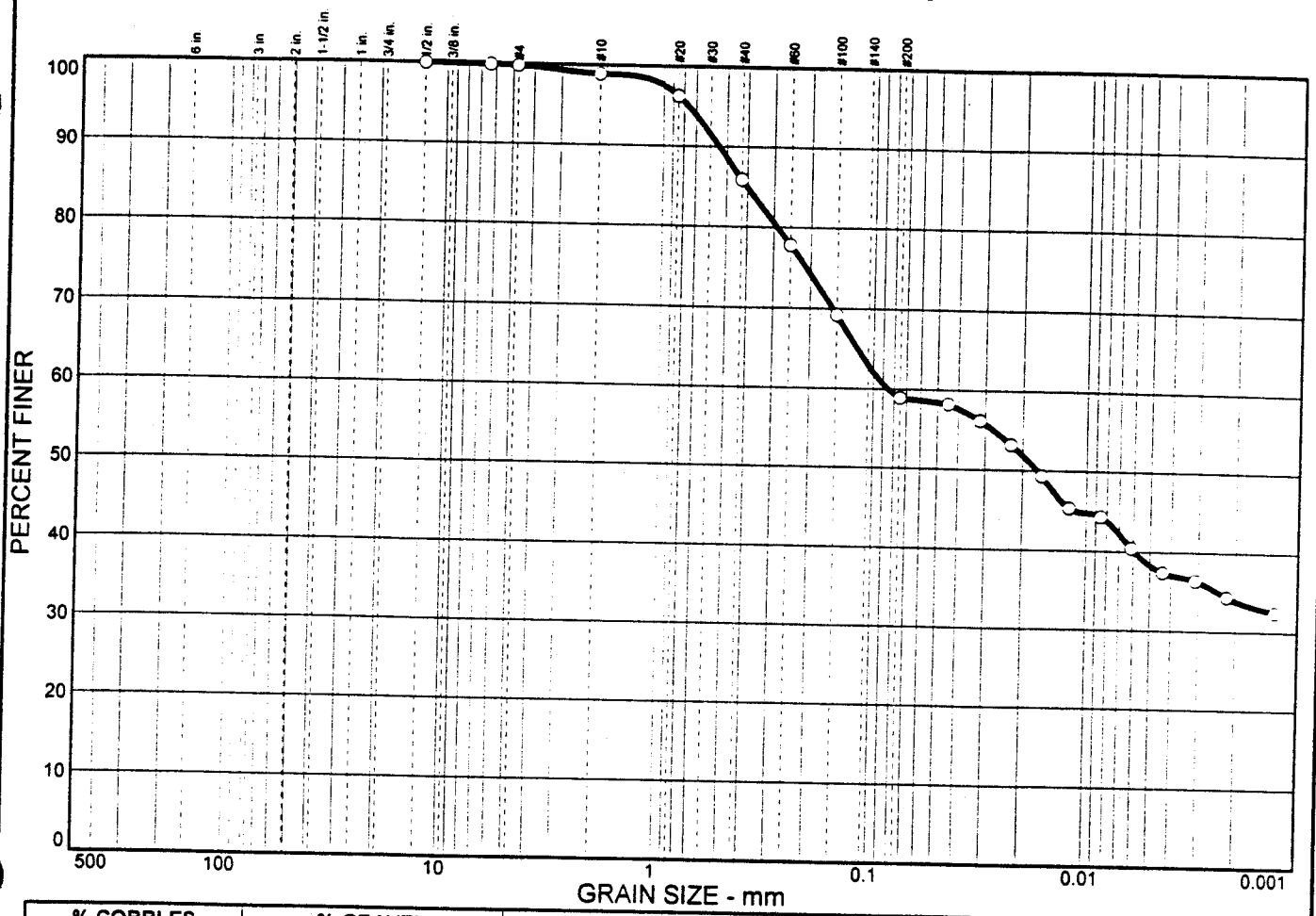
Test location Plan

Acre 19/Lift 1

5 = perm location

Report : 100

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	40.9	20.6	38.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	99.9		
#4	99.8		
#10	98.9		
#20	96.3		
#40	85.9		
#60	77.8		
#100	69.2		
#200	58.9		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 18 LL= 44 PI= 26

Coefficients

D_{85}= 0.402 D_{60}= 0.0853 D_{50}= 0.0171
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-223, Acre 19, Lift 1

Sample No.: DL-223 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 19, Lift 1 **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-176

Project No.: VNC-98-029
Sample No.: DL-223

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.4E-008	cm/sec
% Moisture	20.0	%
Dry Density	107.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 11/30/98
Location: Acre 19, Lift 1

Specimen Data

Length (in):	3.373
Diameter (in.):	2.817
Area (sq. in.):	6.243
Volume (cu. in.):	21.06
Wet Weight (grams):	710.4
Dry Weight (grams):	591.9
Dry Density (pcf):	107.1

Wet Weight	126.32
Dry Weight	108.93
Tare weight	22.08
% Moisture	20.0

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
284	138.46	0.90	1.00	1.11	0.95	3.39E-008
270	138.46	0.90	0.90	1.00	0.90	3.38E-008
731	138.46	2.30	2.30	1.00	2.30	3.19E-008
308	138.46	1.10	1.00	0.91	1.05	3.46E-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) **3.4E-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

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 20, Lift 1

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 .036	Clay Cover Testing Acre 20, Lift 1
			Gilbert Southern
			11/17/98

REMARKS: Const. Testing, Technical

COPIES 2250
2250-9
32 A

SIGNED: Dionne Boyd

CT-013
James Bin

VAN DER HORST

CLAY COVER TESTING

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

Project No.: VNC-98-029
Date: 11/09/98
Report No.: 036

Acre 20 Lift 1
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	23.7	95.3 2 ok	
2	See Test Location Plan	98.9	22.2	98.4	
3	See Test Location Plan	96.1	26.6	95.6	
4	See Test Location Plan	97.6	21.9	97.1	
5	See Test Location Plan	98.4	23.2	97.9	
6	See Test Location Plan	95.8	25.7	95.3	
7	See Test Location Plan	96.3	24.3	95.8	
8	See Test Location Plan	99.8	23.0	99.3	
9	See Test Location Plan	97.6	23.6	97.1	
10	See Test Location Plan	95.8	24.7	95.3	
11	See Test Location Plan	98.2	24.0	97.7	
12	See Test Location Plan	99.1	23.1	98.6	
13	See Test Location Plan	99.0	22.4	98.5	
14	See Test Location Plan	102.1	22.6	100+	
15	See Test Location Plan	101.6	21.7	100+	Tube Sample (DL-140)
16	See Test Location Plan	98.5	22.5	98.0	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	2.1 x 10(-8)
Dry Density (pcf)	105.8
Moisture Content (%)	21.1

Atterberg Limits (ASTM D4318)

PL	25
LL	60
PI	35

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel	0.3
%Sand	34.6
%Silt	19.6
%Clay	45.5

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

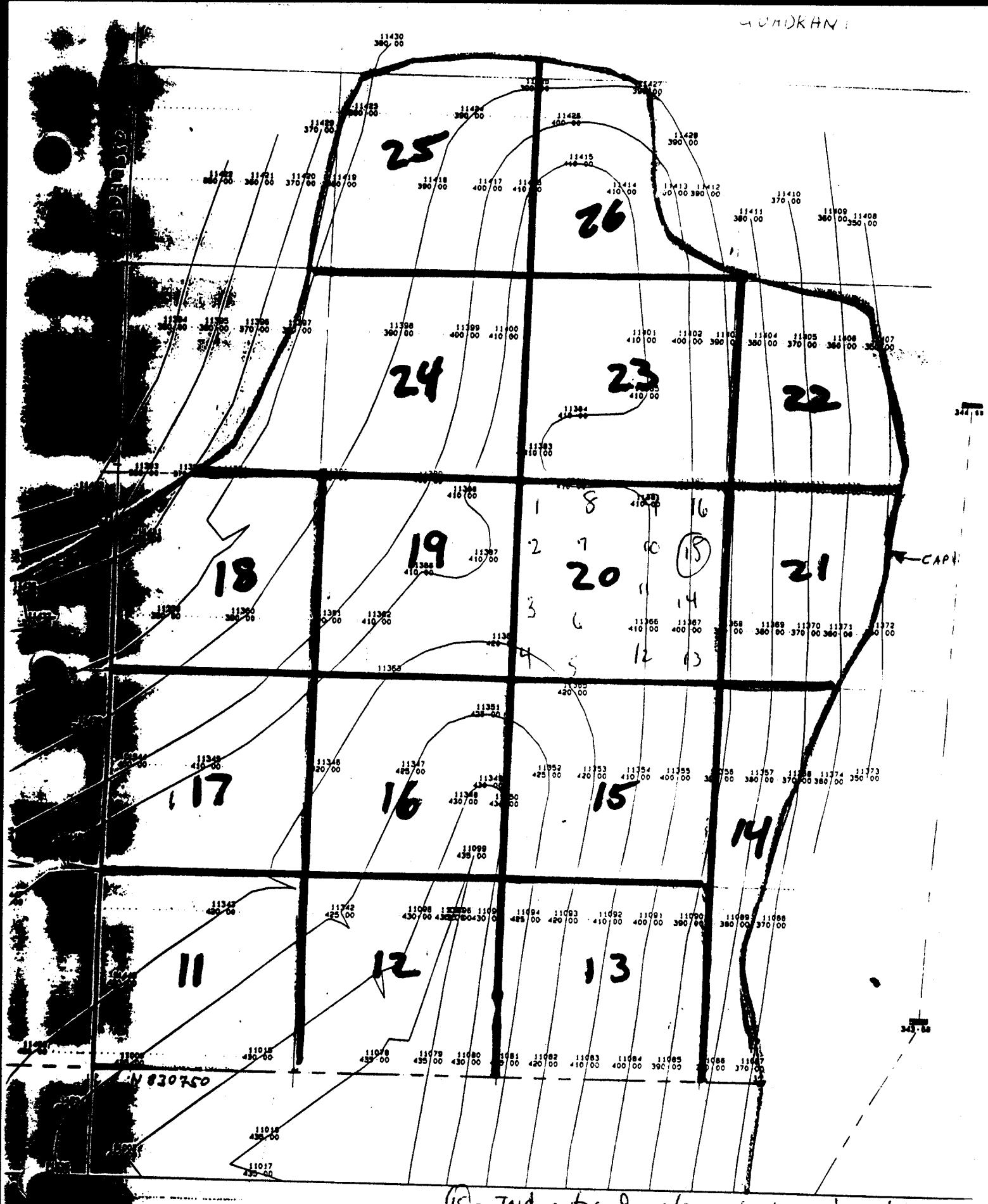
Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

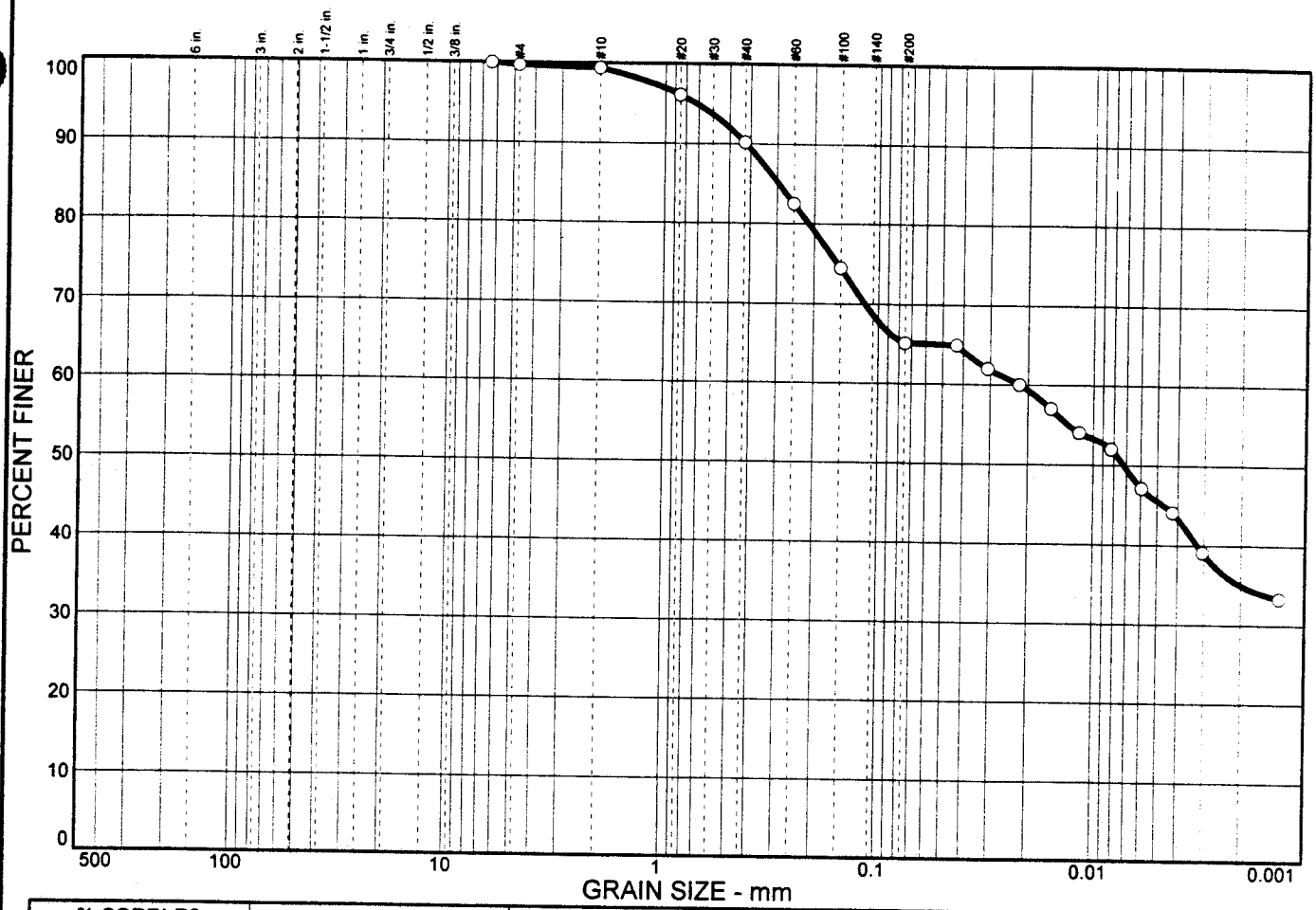
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

QUADRANT



(15) - Indicates Perm/Sample Location
Acre 20, Lift #1
Report : 036

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	34.6	19.6	45.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.4		
#20	96.1		
#40	90.2		
#60	82.5		
#100	74.5		
#200	65.1		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 25 LL= 60 PI= 35

Coefficients

D_{85}= 0.294 D_{60}= 0.0219 D_{50}= 0.0072
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

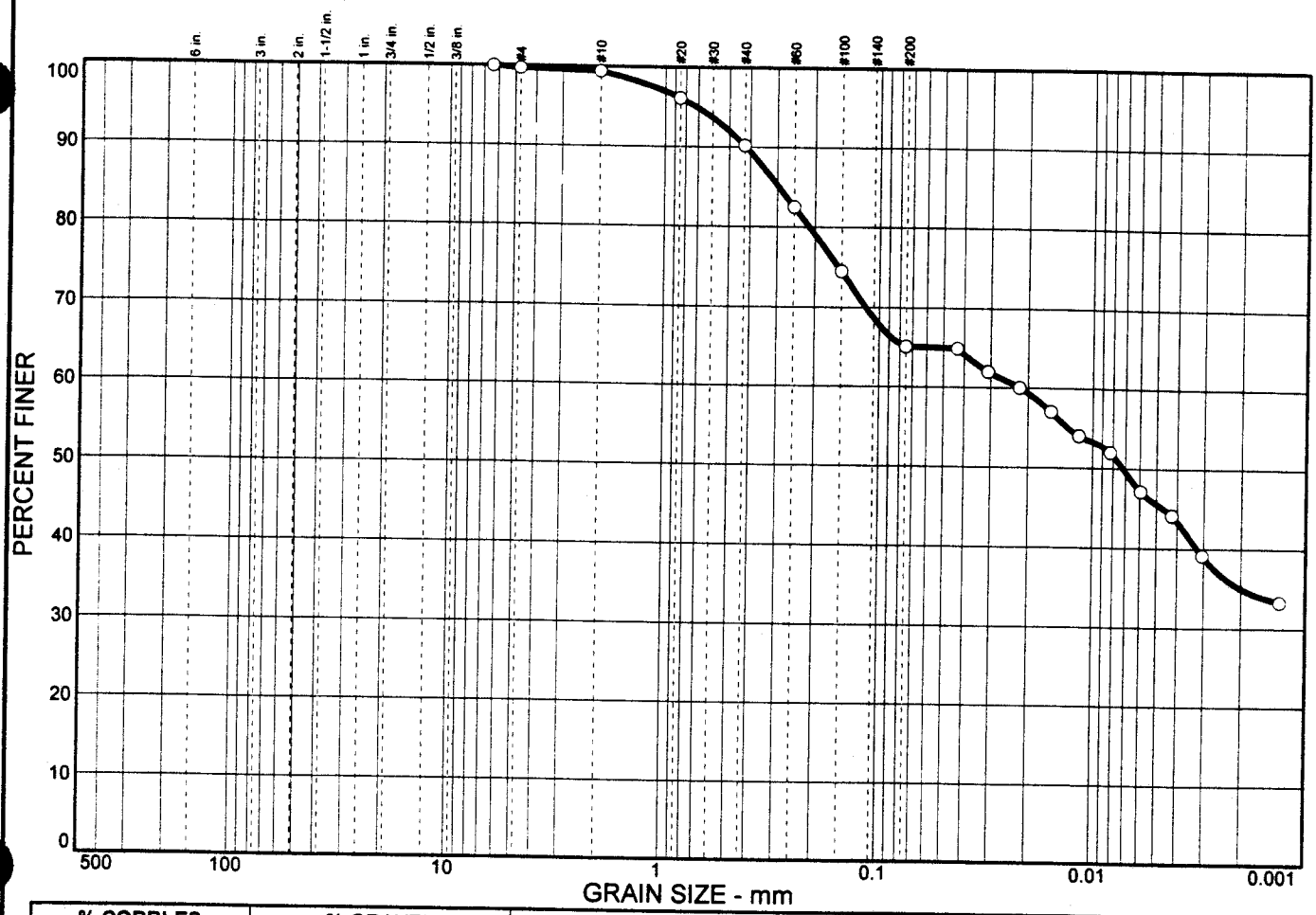
DL-140, Acre 20, Lift 1

Sample No.: DL-140 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 20, 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	0.3	34.6	19.6	45.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.4		
#20	96.1		
#40	90.2		
#60	82.5		
#100	74.5		
#200	65.1		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 25 LL= 60 PI= 35

Coefficients

D_{85}= 0.294 D_{60}= 0.0219 D_{50}= 0.0072
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-140, Acre 20, Lift 1

Sample No.: DL-140 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 20, Lift 1 **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-108

Project No.: VNC-98-029
Sample No. DL-140

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.1E-08	cm/sec
% Moisture	21.1	%
Dry Density	105.8	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 10/27/98
Location: Acre 20, Lift 1
Retest of DL-109

Length (in):	3.198
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	20.44
Wet Weight (grams):	687.0
Dry Weight (grams):	567.4
Dry Density (pcf):	105.8

Moisture Content Test Data

Wet Weight	125.27
Dry Weight	107.26
Tare weight	21.80
% Moisture	21.1

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
392	96.90	0.60	0.70	1.17	0.65	2.23E-08
1082	96.90	1.60	1.55	0.97	1.58	1.95E-08
581	96.90	0.90	0.90	1.00	0.90	2.08E-08
861	96.90	1.40	1.30	0.93	1.35	2.11E-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) **2.1E-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

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.: 072

Acre 21 Lift 1

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	97.2	22.8	96.7	
2	See Test Location Plan	96.8	24.7	96.3	
3	See Test Location Plan	95.7	26.4	95.2	
4	See Test Location Plan	96.2	26.0	95.7	
5	See Test Location Plan	95.8	22.6	95.3	
6	See Test Location Plan	97.2	24.4	96.7	
7	See Test Location Plan	98.3	26.9	97.8	Tube/Sample (DL-184)
8	See Test Location Plan	99.8	24.2	99.3	
9	See Test Location Plan	100.6	21.8	100+	
10	See Test Location Plan	100.3	21.7	99.8	
11	See Test Location Plan	98.4	22.6	97.9	
12	See Test Location Plan	97.2	23.9	96.7	
13	See Test Location Plan	96.9	24.1	96.4	
14	See Test Location Plan	98.8	21.9	98.3	
15	See Test Location Plan	97.9	23.1	97.4	
16	See Test Location Plan	98.0	22.7	97.5	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	1.6 x 10(-8)
Dry Density (pcf)	97.5
Moisture Content (%)	24.8

Atterberg Limits (ASTM D4318)

PL	28
LL	65
PI	37
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.3
%Sand	29.2
%Silt	19.8
%Clay	50.7

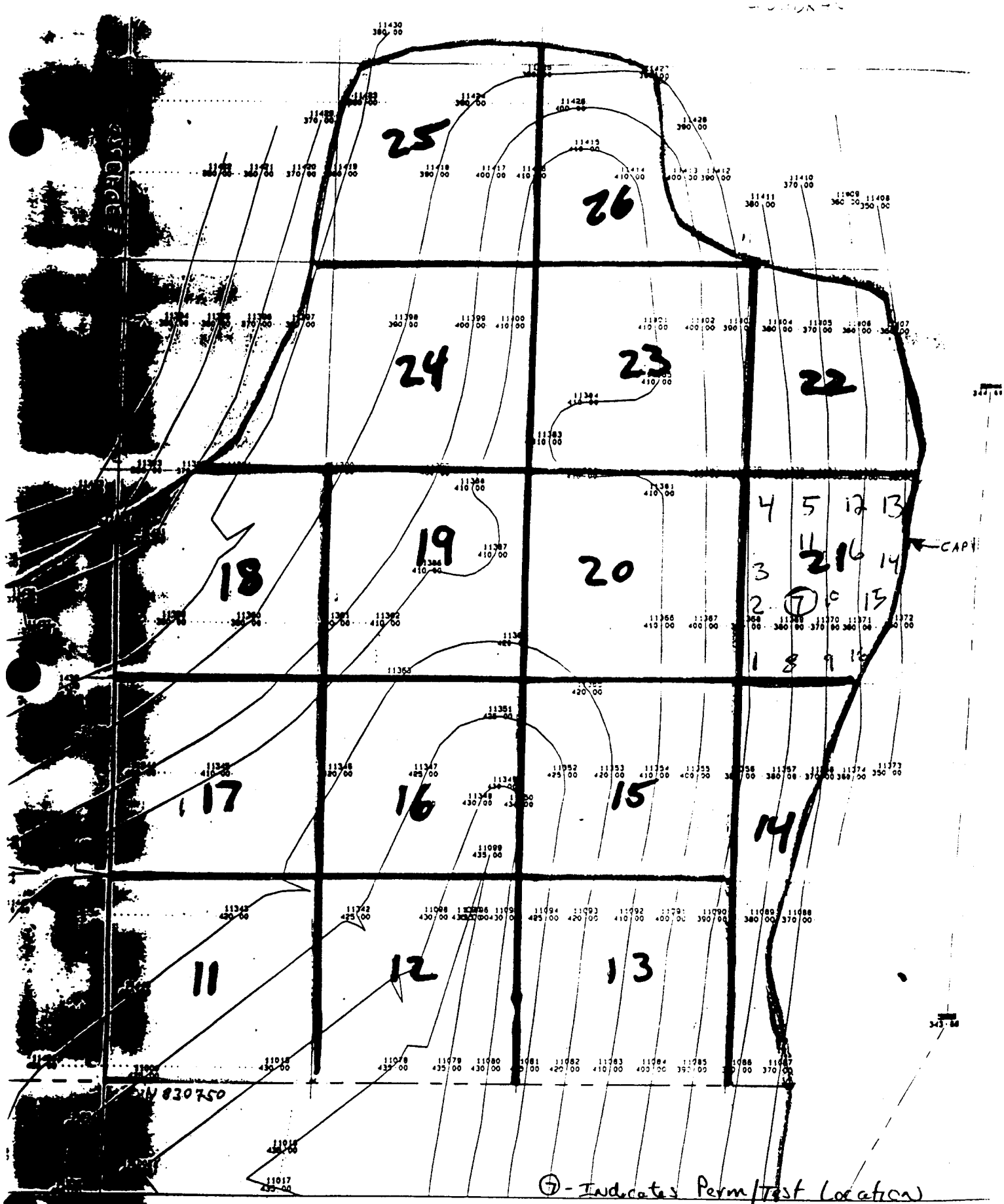
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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



⑦ - Indicates Perm/Test Location

Acre 21, Lift 1

Report:

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	29.2	19.8	50.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.5		
#20	93.4		
#40	87.9		
#60	82.9		
#100	77.6		
#200	70.5		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 28 LL= 65 PI= 37

Coefficients

D_{85}= 0.310 D_{60}= 0.0155 D_{50}= 0.0040
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-184, Acre 21, Lift 1

Sample No.: DL-184 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 21, Lift 1 **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: 12/02/98
Report No.: P-165

Project No.: VNC-98-029
Sample No.: DL-184

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.6E-008	cm/sec
% Moisture	24.8	%
Dry Density	97.5	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/18/98
Location: Acre 21, Lift 1

Specimen Data

Length (in):	3.203
Diameter (in.):	2.847
Area (sq. in.):	6.377
Volume (cu. in.):	20.43
Wet Weight (grams):	652.3
Dry Weight (grams):	522.5
Dry Density (pcf):	97.5

Moisture Content Test Data

Wet Weight	141.99
Dry Weight	118.12
Tare weight	21.99
% Moisture	24.8

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
407	152.31	0.70	0.90	1.29	0.80	1.69E-008
342	125.31	0.50	0.50	1.00	0.50	1.52E-008
575	125.31	0.90	0.80	0.89	0.85	1.54E-008
333	152.31	0.60	0.60	1.00	0.60	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) **1.6E-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

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.: 075

Acre 22 Lift 1
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	97.6	23.9	97.1	
2	See Test Location Plan	97.2	24.1	96.7	
3	See Test Location Plan	96.8	22.8	96.3	
4	See Test Location Plan	98.7	23.1	98.2	
5	See Test Location Plan	98.4	22.1	97.9	
6	See Test Location Plan	99.0	23.0	98.5	
7	See Test Location Plan	98.6	26.0	98.1	
8	See Test Location Plan	99.8	21.5	99.3	
9	See Test Location Plan	100.8	21.7	100+	
10	See Test Location Plan	100.4	24.8	99.9	Perm/Sample (DL-187)
11	See Test Location Plan	99.8	23.2	99.3	
12	See Test Location Plan	98.6	24.1	98.1	
13	See Test Location Plan	98.4	22.1	97.9	
14	See Test Location Plan	97.6	23.4	97.1	
15	See Test Location Plan	97.4	23.1	96.9	
16	See Test Location Plan	98.7	22.6	98.2	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	4.0 x 10(-8)
Dry Density (pcf)	97.4
Moisture Content (%)	24.8

Atterberg Limits (ASTM D4318)

PL	25
LL	61
PI	36
USCS Classification	CH

Grain-size Analysis (ASTM D422)

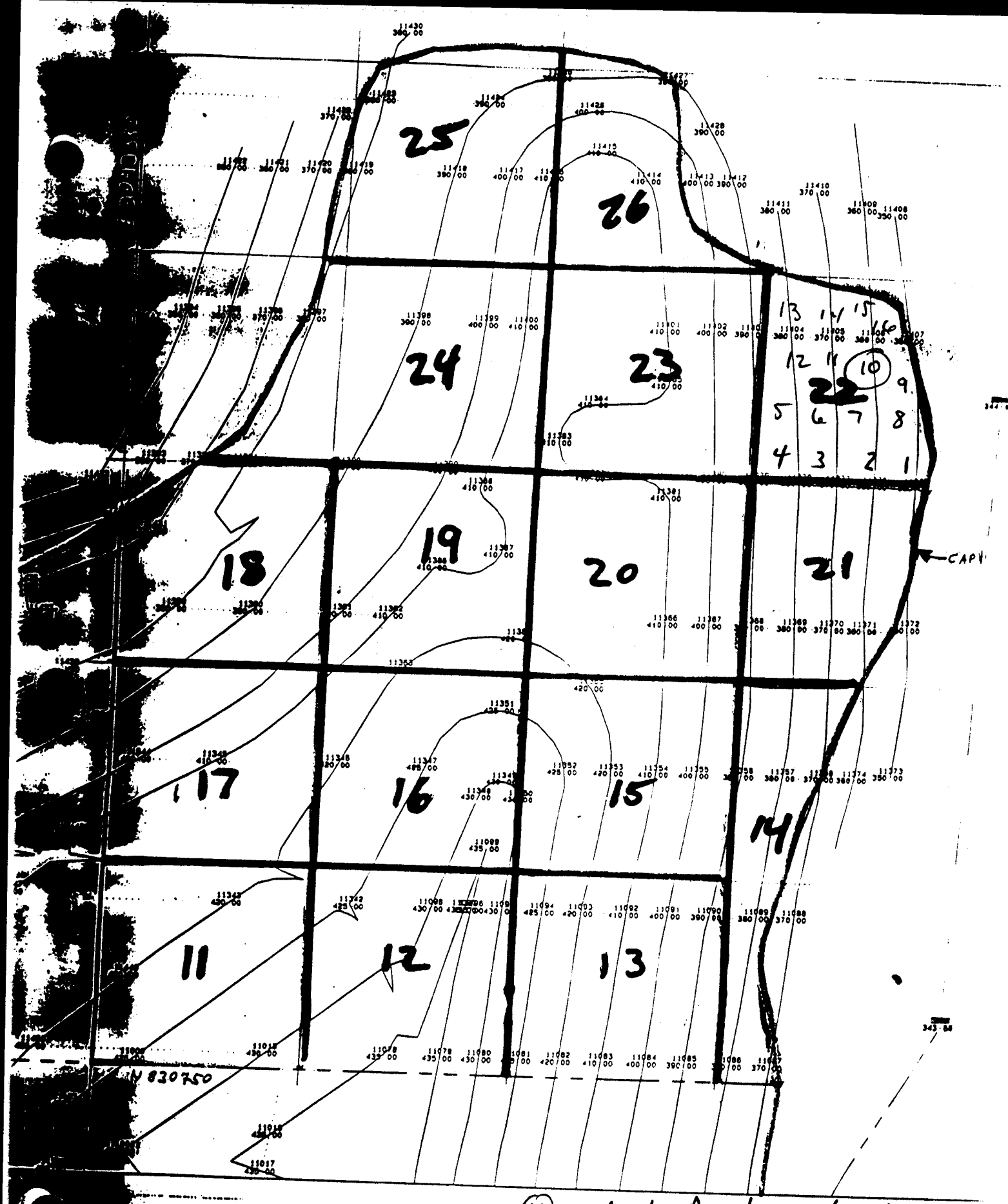
%Gravel	0.3
%Sand	32.6
%Silt	18.9
%Clay	48.2

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



(10) - Indicates Perm/Sample Location
Acre 22, Lift 1
Report:

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	32.6	18.9	48.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.5		
#20	94.6		
#40	89.1		
#60	82.9		
#100	75.1		
#200	67.1		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 25 LL= 61 PI= 36

Coefficients

D_{85}= 0.293 D_{60}= 0.0242 D_{50}= 0.0071
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-187, Acre 22, Lift 1

Sample No.: DL-187 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 22, Lift 1 **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: 12/02/98
Report No.: P-167

Project No.: VNC-98-029
Sample No.: DL-187

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.0E-008	cm/sec
% Moisture	24.8	%
Dry Density	97.4	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/18/98
Location: Acre 22, Lift 1

Specimen Data

Length (in):	2.933
Diameter (in.):	2.840
Area (sq. in.):	6.346
Volume (cu. in.):	18.61
Wet Weight (grams):	594.0
Dry Weight (grams):	476.0
Dry Density (pcf):	97.4

Moisture Content Test Data

Wet Weight	67.07
Dry Weight	58.10
Tare weight	21.91
% Moisture	24.8

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
285	85.80	0.85	0.80	0.94	0.83	4.05E-008
182	85.80	0.60	0.50	0.83	0.55	4.23E-008
222	85.80	0.65	0.60	0.92	0.63	3.94E-008
434	85.80	1.25	1.20	0.96	1.23	3.95E-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) **4.0E-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

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 23, Lift 1

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 .037	Clay Cover Testing Acre 23, Lift 1
			Gilbert Southern
			11/17/98

REMARKS: Const. Testing
Technical

COPIES 2250
~~2250-9~~
32 A

SIGNED: Dionne Boyd

CT-013
James Brin

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.: 037

Acre 23 Lift 1
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	97.1	22.5	96.0	
2	See Test Location Plan	99.7	21.7	99.2	
3	See Test Location Plan	96.1	26.6	95.6	
4	See Test Location Plan	101.9	24.3	100+	
5	See Test Location Plan	97.6	27.0	97.1	
6	See Test Location Plan	96.9	25.1	96.5	
7	See Test Location Plan	97.2	25.6	96.7	
8	See Test Location Plan	97.3	23.7	96.0	
9	See Test Location Plan	98.4	22.6	97.9	
10	See Test Location Plan	102.1	21.8	100+	
11	See Test Location Plan	102.1	23.4	100+	
12	See Test Location Plan	96.4	23.8	95.9	Tube Sample (DL-110)
13	See Test Location Plan	99.4	22.4	98.9	
14	See Test Location Plan	99.0	21.6	98.5	
15	See Test Location Plan	100.8	22.3	100+	
16	See Test Location Plan	97.4	22.8	96.9	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	3.6 x 10(-8)
Dry Density (pcf)	100.9
Moisture Content (%)	21.9

Atterberg Limits (ASTM D4318)

PL	30
LL	65
PI	35
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.3
%Sand	35.2
%Silt	19.1
%Clay	45.4

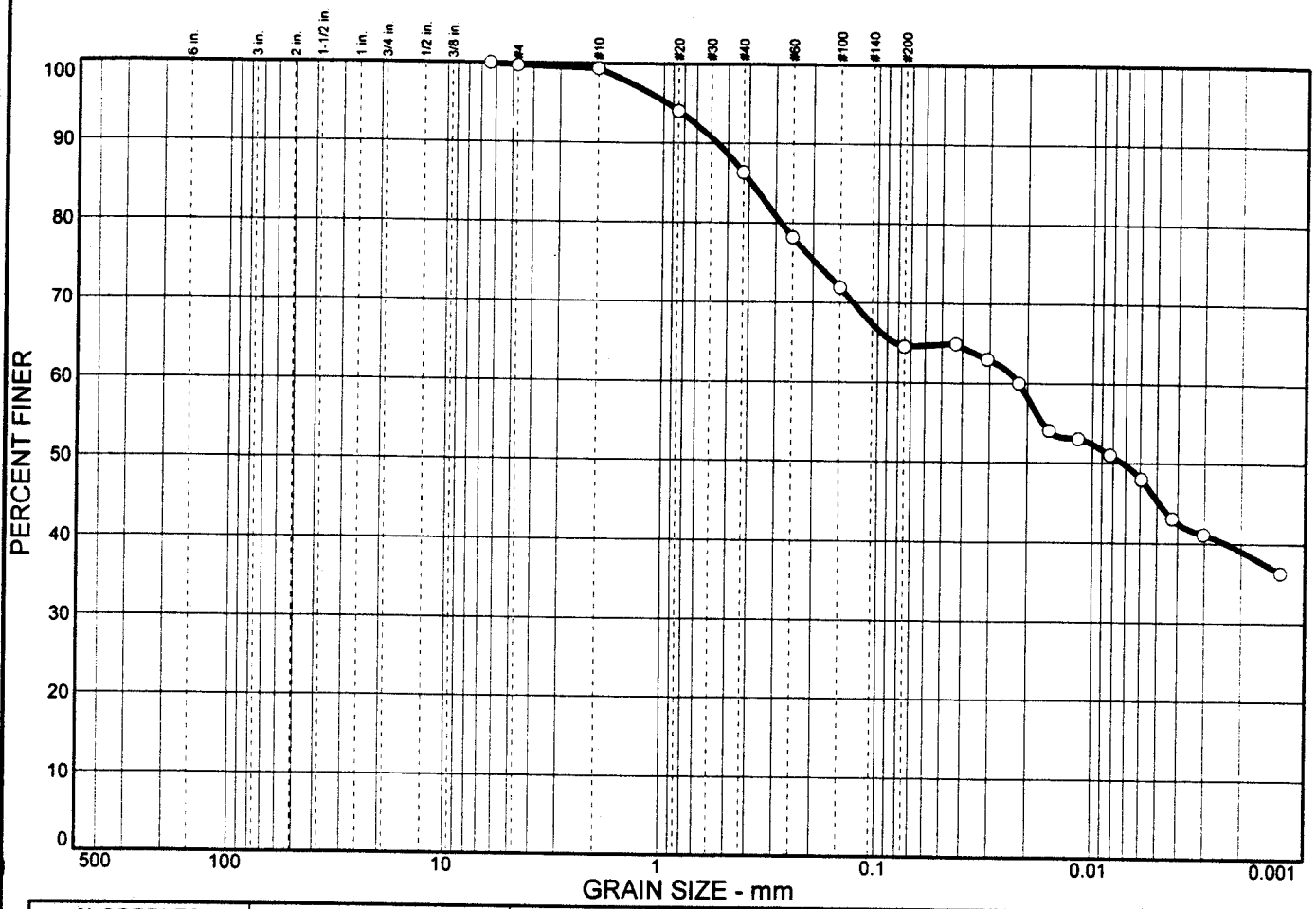
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	35.2	19.1	45.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.4		
#20	94.1		
#40	86.4		
#60	78.2		
#100	71.9		
#200	64.5		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 30 LL= 65 PI= 35

Coefficients

D_{85}= 0.387 D_{60}= 0.0219 D_{50}= 0.0072
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

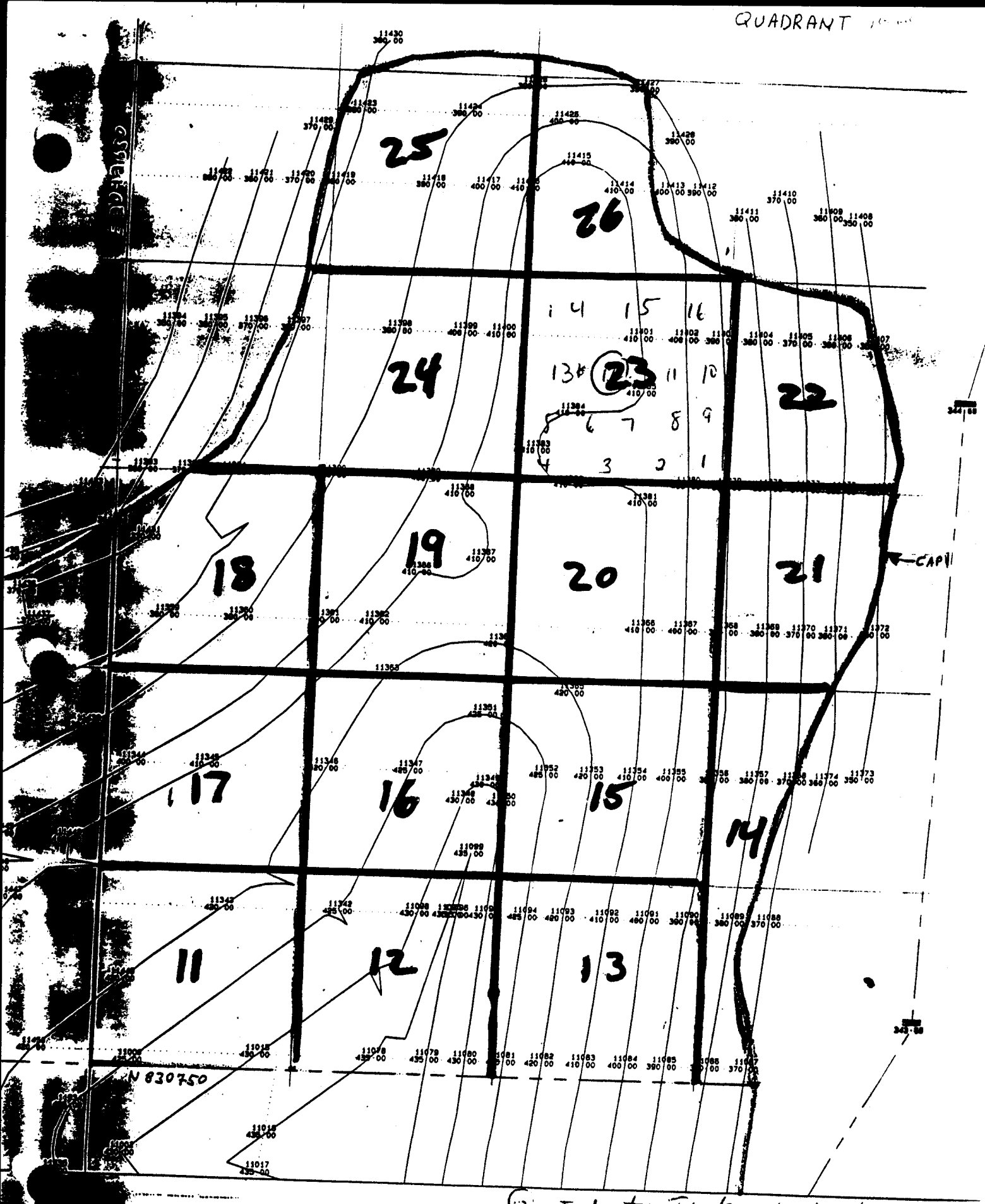
DL-110, Acre 23, Lift 1

Sample No.: DL-110 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 23, Lift 2 **Elev./Depth:**

VAN DER HORST ENGINEERING

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

QUADRANT



(12) - Indicates Tube/Sample Location

Acre 23, Lift 1
Report: 037

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/09/98
Report No.: P-088

Project No.: VNC-98-029
Sample No. DL-110

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.6E-08	cm/sec
% Moisture	21.9	%
Dry Density	100.9	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 10/27/98
Location: Acre 23, Lift 1

Length (in):	3.535
Diameter (in.):	2.846
Area (sq. in.):	6.372
Volume (cu. in.):	22.53
Wet Weight (grams):	727.0
Dry Weight (grams):	596.6
Dry Density (pcf):	100.9

Moisture Content Test Data

Wet Weight	111.89
Dry Weight	95.76
Tare weight	21.98
% Moisture	21.9

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1032	83.07	2.70	2.30	0.85	2.50	4.21E-08
639	83.07	1.40	1.20	0.86	1.30	3.53E-08
190	83.07	0.40	0.40	1.00	0.40	3.66E-08
717	83.07	1.40	1.20	0.86	1.30	3.15E-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) **3.6E-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

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.: 087

Acre 24 Lift 1

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	20.3	100+	
2	See Test Location Plan	102.7	20.6	99.7	
3	See Test Location Plan	100.6	21.4	97.7	
4	See Test Location Plan	101.4	21.0	98.4	
5	See Test Location Plan	99.5	22.7	96.6	
6	See Test Location Plan	101.6	22.2	98.6	Perm/Sample (DL-212)
7	See Test Location Plan	104.0	20.2	100+	
8	See Test Location Plan	100.9	21.3	98.0	
9	See Test Location Plan	102.3	20.2	99.3	
10	See Test Location Plan	98.2	23.6	95.3	
11	See Test Location Plan	98.7	21.4	95.8	
12	See Test Location Plan	99.4	20.7	96.5	
13	See Test Location Plan	100.6	21.0	97.7	
14	See Test Location Plan	104.2	19.7	100+	
15	See Test Location Plan	103.0	20.5	100.0	
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)	2.5x10(-8)
Dry Density (pcf)	102.1
Moisture Content (%)	23.0

Atterberg Limits (ASTM D4318)

PL	18
LL	37
PI	19

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel	0.1
%Sand	41.0
%Silt	17.9
%Clay	41.0

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

11/24/98

Test location plan

Ace 24 Lift 1

⊕ = perm location

Report: 087

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-161

Project No.: VNC-98-029
Sample No.: DL-212

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.5E-008	cm/sec
% Moisture	23.0	%
Dry Density	102.1	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/25/98
Location: Acre 24, Lift 1

Specimen Data

Length (in):	3.270
Diameter (in.):	2.820
Area (sq. in.):	6.257
Volume (cu. in.):	20.46
Wet Weight (grams):	674.4
Dry Weight (grams):	548.5
Dry Density (pcf):	102.1

Moisture Content Test Data

Wet Weight	70.85
Dry Weight	61.74
Tare weight	22.05
% Moisture	23.0

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
182	138.46	0.50	0.50	1.00	0.50	2.70E-008
254	138.46	0.65	0.60	0.92	0.63	2.41E-008
249	138.46	0.65	0.60	0.92	0.63	2.46E-008
441	138.46	1.15	1.00	0.87	1.08	2.39E-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)

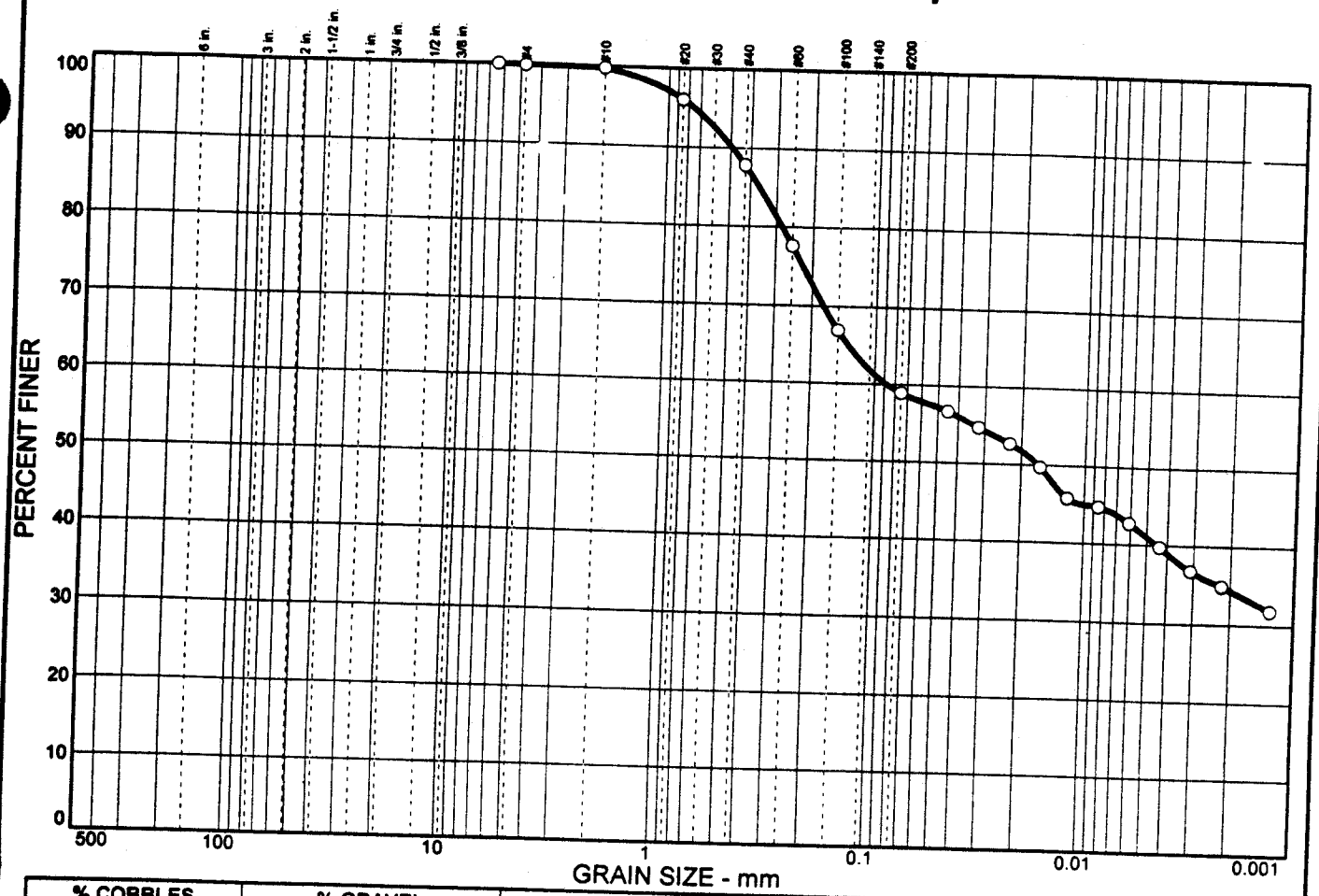
Permeability (k) **2.5E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

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

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	41.0	17.9	41.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.8		
#20	96.0		
#40	87.8		
#60	77.6		
#100	66.9		
#200	58.9		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 18 LL= 37 PI= 19

Coefficients

D_{85}= 0.361 D_{60}= 0.0878 D_{50}= 0.0167
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-212, Acre 24, Lift 1

Sample No.: DL-212 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 24, Lift 1 **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: 12/08/98
Report No.: 089

Acre 24a Lift 1
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	104.5	22.5	100+	
2	See Test Location Plan	100.0	24.8	97.1	Perm/Sample (DL-213)
3	See Test Location Plan	103.0	20.0	100.0	
4	See Test Location Plan	103.1	21.0	100+	
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)	4.3x10(-9)
Dry Density (pcf)	101.1
Moisture Content (%)	23.0

Atterberg Limits (ASTM D4318)

PL	21
LL	55
PI	34
USCS Classification	CH

Grain-size Analysis (ASTM D422)

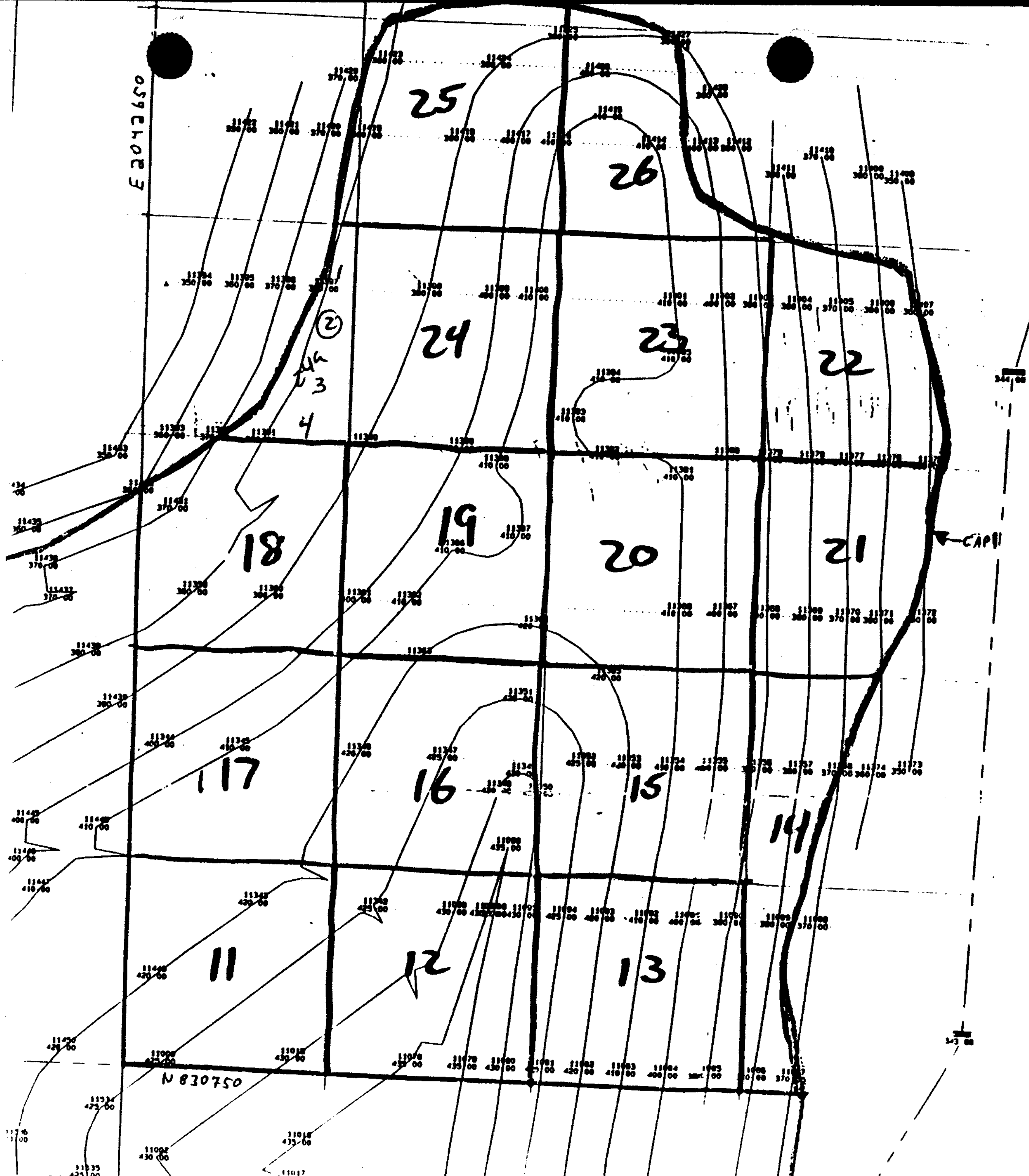
%Gravel	0.0
%Sand	40.0
%Silt	19.1
%Clay	40.9

Sincerely,
VAN DER HORST Geotechnical Engineers, PLLC.

Robert L. Mashewske, P.E.

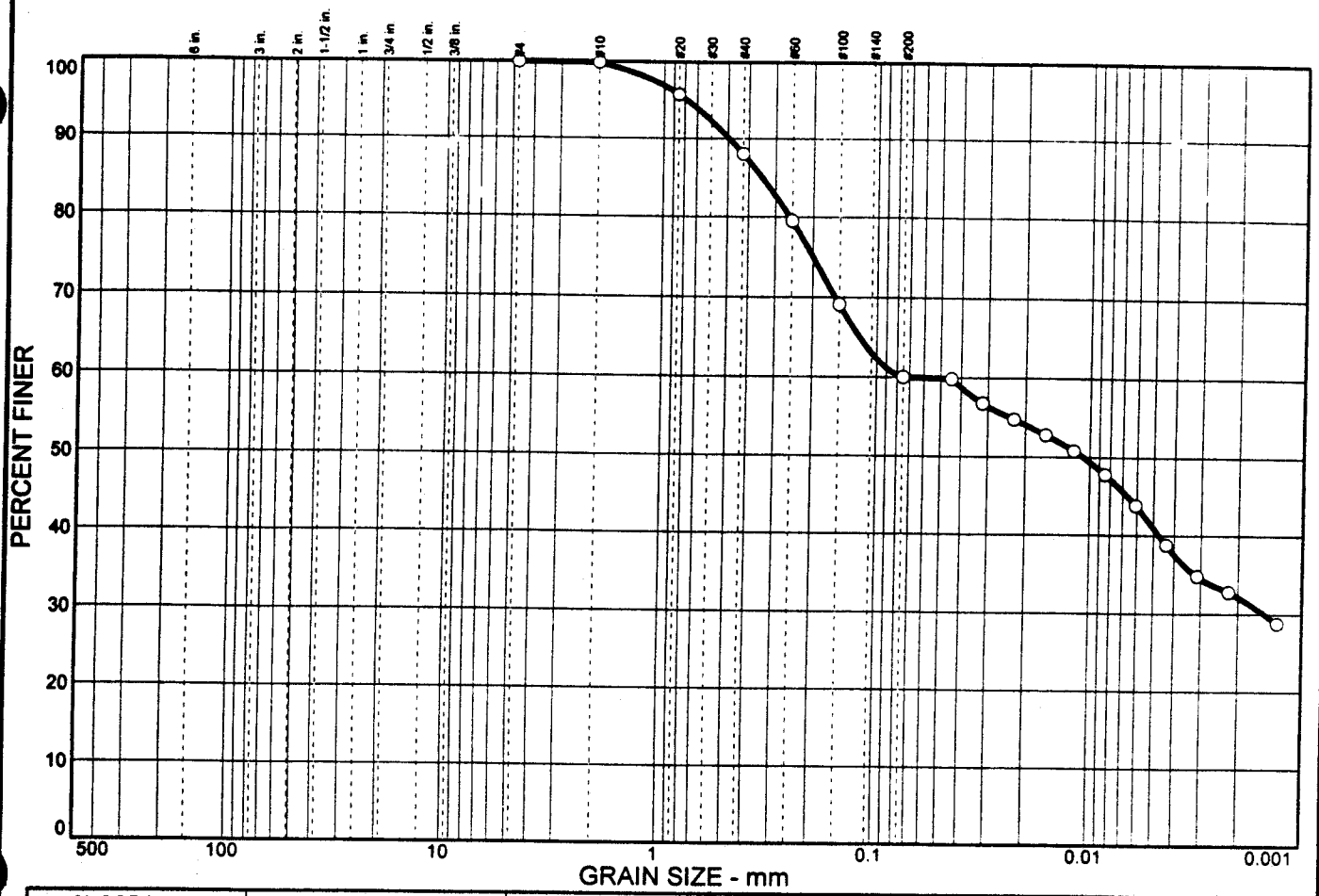
NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

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



11/24/98
Test location Plan
Acue 24a / Lift 1
② = Perm location
Report: 089

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	40.0	19.1	40.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	95.7		
#40	88.0		
#60	79.5		
#100	69.1		
#200	60.0		

* (no specification provided)

Soil Description

On-site Borrow - Sandy fat clay

Atterberg Limits

PL= 21 LL= 55 PI= 34

Coefficients

D_{85}= 0.346 D_{60}= 0.0750 D_{50}= 0.0107
D_{30}= 0.0015 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-213, Acre 24A, lift 1

Sample No.: DL-213 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 24A, Lift 1 **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-171

Project No.: VNC-98-029
Sample No.: DL-213

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.8E-009	cm/sec
% Moisture	23.0	%
Dry Density	101.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/24/98
Location: Acre 24A, Lift 1

Specimen Data

Length (in):	3.041
Diameter (in.):	2.852
Area (sq. in.):	6.399
Volume (cu. in.):	19.46
Wet Weight (grams):	634.8
Dry Weight (grams):	516.3
Dry Density (pcf):	101.1

Moisture Content Test Data

Wet Weight	144.36
Dry Weight	121.51
Tare weight	21.96
% Moisture	23.0

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1187	138.46	0.80	0.70	0.88	0.75	5.64E-009
935	138.46	0.50	0.45	0.90	0.48	4.53E-009
668	138.46	0.35	0.30	0.86	0.33	4.34E-009
644	138.46	0.35	0.35	1.00	0.35	4.85E-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

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.: 090

Acre 25 Lift 1

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	97.8	24.1	95.0	
2	See Test Location Plan	106.0	21.5	100+	
3	See Test Location Plan	101.6	20.8	98.7	
4	See Test Location Plan	102.3	20.2	99.3	
5	See Test Location Plan	97.9	25.9	95.0	Perm/Sample (DL-211)
6	See Test Location Plan	102.6	21.3	99.6	
7	See Test Location Plan	98.6	20.6	95.7	
8	See Test Location Plan	99.2	19.8	96.3	
9	See Test Location Plan	98.8	21.7	95.9	
10	See Test Location Plan	98.9	22.0	96.0	
11	See Test Location Plan	99.6	23.0	96.7	
12	See Test Location Plan	99.7	22.0	96.~~0~~ 8	
13	See Test Location Plan	101.4	21.5	98.4	
14	See Test Location Plan	101.9	19.8	99.0	
15	See Test Location Plan	105.7	19.7	100+	
16	See Test Location Plan	102.8	20.2	99.8	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	1.6x10(-8)
Dry Density (pcf)	101.4
Moisture Content (%)	22.5

Atterberg Limits (ASTM D4318)

PL	23
LL	48
PI	25
USCS Classification	CL

Grain-size Analysis (ASTM D422)

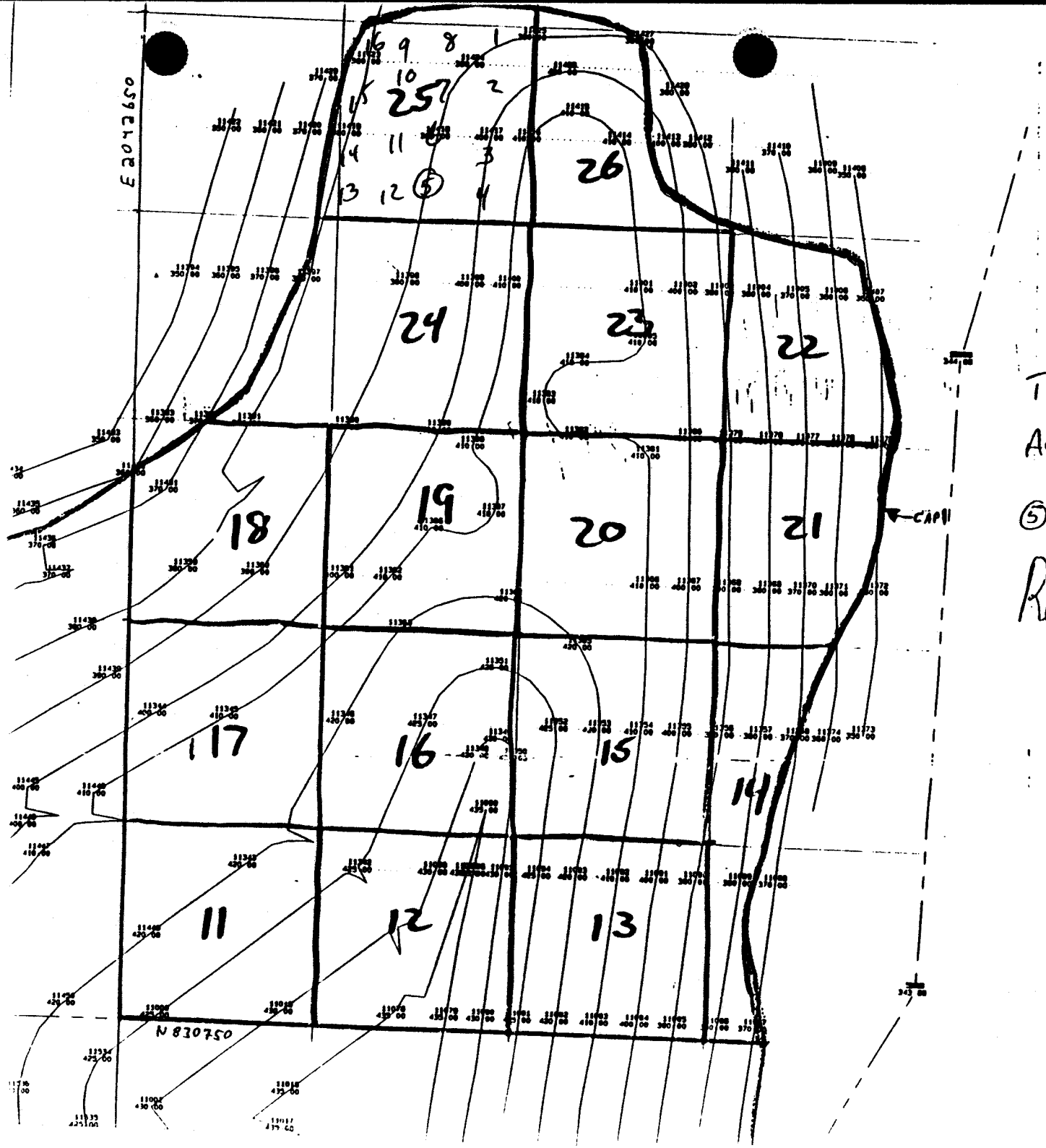
%Gravel	0.3
%Sand	48.6
%Silt	15.6
%Clay	35.5

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



11/24/98

Test location Plan

Acre 25/Lift 1

⑤ = Perm location

Report: 090

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-160

Project No.: VNC-98-029
Sample No.: DL-211

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.6E-008	cm/sec
% Moisture	22.5	%
Dry Density	101.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/24/98
Location: Acre 25, Lift 1

Specimen Data

Length (in):	2.800
Diameter (in.):	2.860
Area (sq. in.):	6.435
Volume (cu. in.):	18.02
Wet Weight (grams):	587.7
Dry Weight (grams):	479.7
Dry Density (pcf):	101.4

Moisture Content Test Data

Wet Weight	68.75
Dry Weight	60.19
Tare weight	22.16
% Moisture	22.5

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
441	135.50	0.75	0.90	1.20	0.83	1.56E-008
312	138.50	0.75	0.75	1.00	0.75	1.96E-008
425	138.25	0.70	0.85	1.21	0.78	1.49E-008
687	138.50	1.20	1.40	1.17	1.30	1.55E-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)

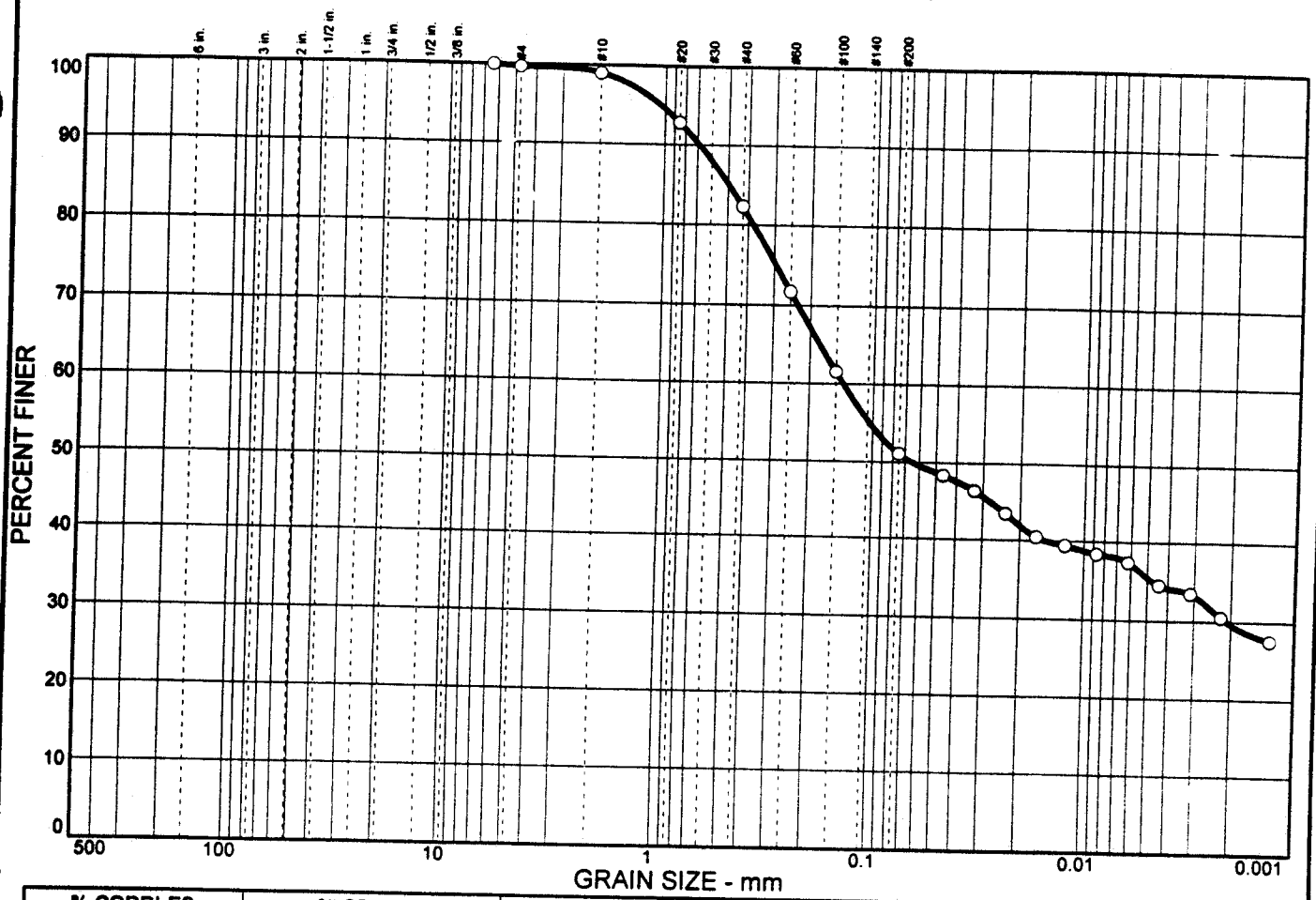
Permeability (k) **1.6E-008** cm/sec

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	48.6	15.6	35.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.0		
#20	92.8		
#40	82.3		
#60	71.7		
#100	61.5		
#200	51.1		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 23 LL= 48 PI= 25

Coefficients

D_{85}= 0.495 D_{60}= 0.138 D_{50}= 0.0649
D_{30}= 0.0021 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-211, Acre 25, Lift 1

Sample No.: DL-211 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 25, Lift 1 **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 26, Lift 1

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 .038	Clay Cover Testing Acre 26, Lift 1

Gilbert Southern
11/17/98
Const. Testing
Technical
2250
2250-9
32 1

REMARKS:

COPIES

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: 11/13/98
Report No.: 038

Acre 26 Lift 1
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	24.1	95.4	Sample Tube (DL-111)
2	See Test Location Plan	98.2	23.1	97.7	
3	See Test Location Plan	96.8	23.9	96.3	
4	See Test Location Plan	98.4	24.1	97.9	
5	See Test Location Plan	95.6	23.8	95.1	
6	See Test Location Plan	99.3	22.4	98.6	
7	See Test Location Plan	100.4	22.7	99.9	
8	See Test Location Plan	96.1	24.1	95.6	
9	See Test Location Plan	99.0	22.8	98.5	
10	See Test Location Plan	97.2	22.4	96.7	
11	See Test Location Plan	100.1	22.0	99.6	
12	See Test Location Plan	104.1	21.6	100+	
13	See Test Location Plan				
14	See Test Location Plan				
15	See Test Location Plan				
16	See Test Location Plan				

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	4.1 x 10(-8)
Dry Density (pcf)	96.9
Moisture Content (%)	24.5

Atterberg Limits (ASTM D4318)

PL	31
LL	67
PI	36
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.1
%Sand	26.7
%Silt	24.5
%Clay	48.7

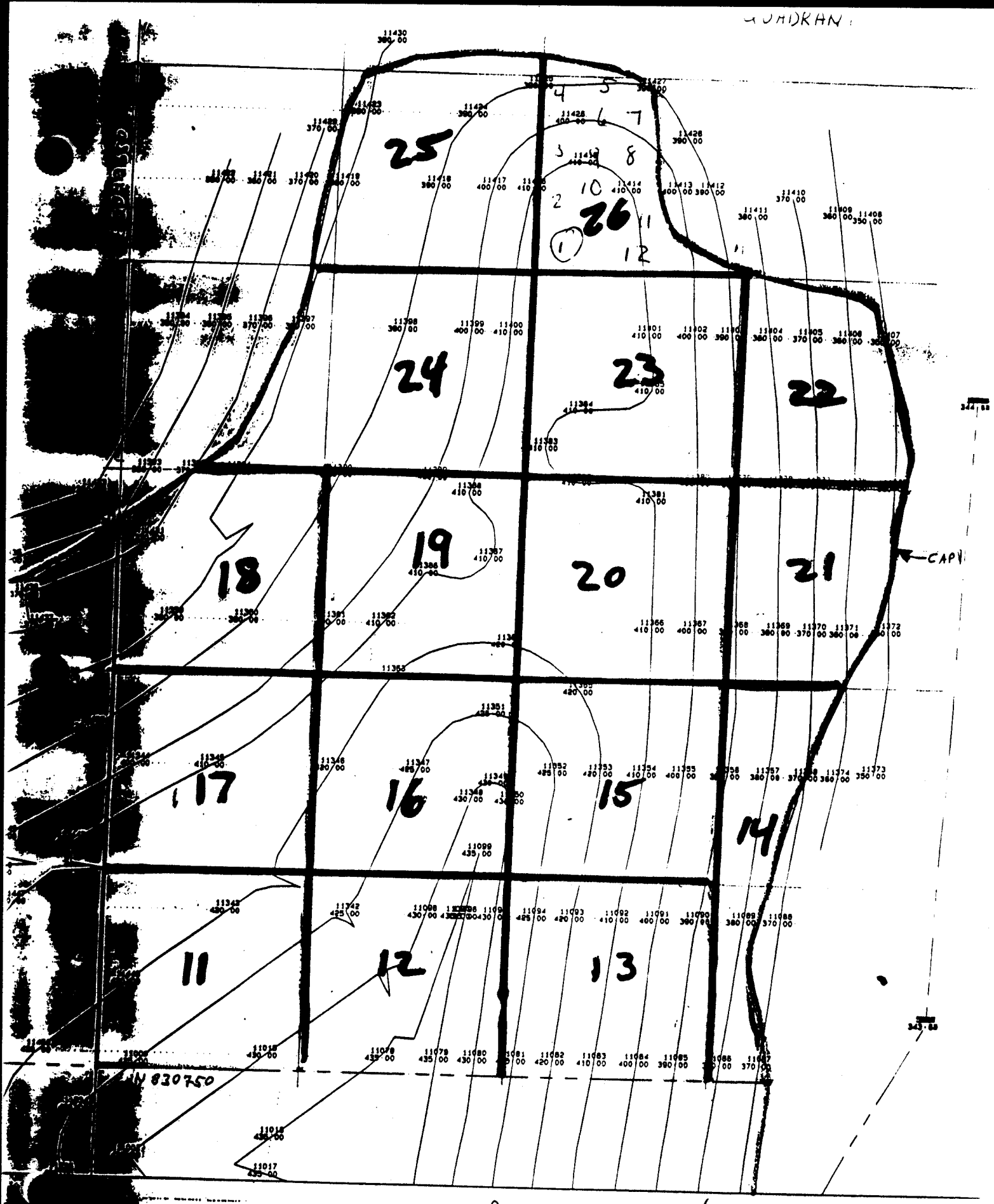
Sincerely,
VAN DER HORST Geotechnical Engineering, PLLC

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

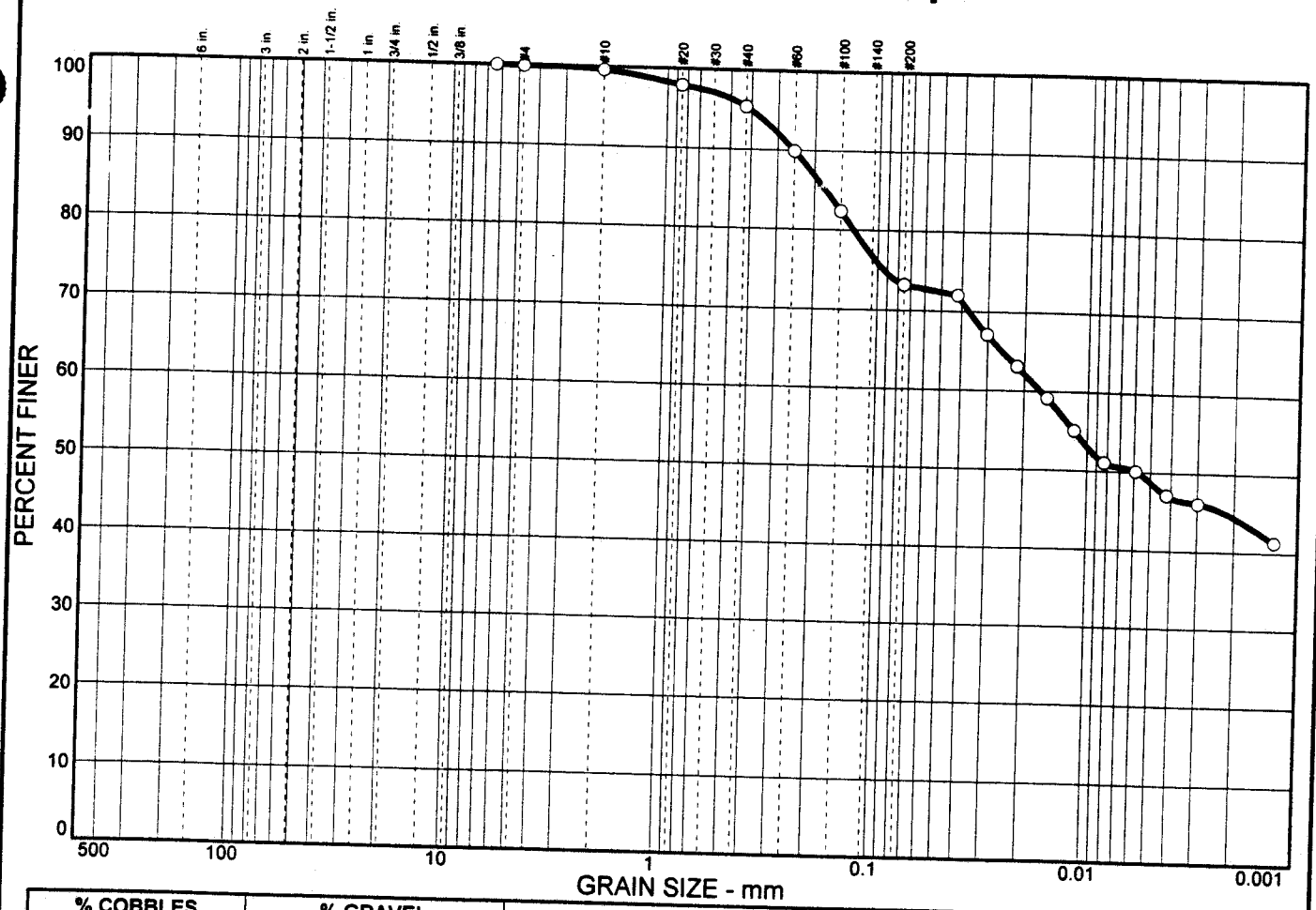
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

QUADRAN



(1) - Indicates Tube/Sample Location
Acre 26, Lift 1
Report : 038

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	26.7	24.5	48.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.6		
#20	97.9		
#40	95.4		
#60	89.9		
#100	82.4		
#200	73.2		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 31 LL= 67 PI= 36

Coefficients

D_{85}= 0.177 D_{60}= 0.0167 D_{50}= 0.0058
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-111, Acre 26, Lift 1

Sample No.: DL-111 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 26, Lift 1 **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-089

Project No.: VNC-98-029
Sample No. DL-111

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.1E-08	cm/sec
% Moisture	24.5	%
Dry Density	96.9	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/27/98
Location: Acre 26, Lift 1

Length (in):	3.541
Diameter (in.):	2.838
Area (sq. in.):	6.337
Volume (cu. in.):	22.44
Wet Weight (grams):	710.6
Dry Weight (grams):	570.8
Dry Density (pcf):	96.9

Moisture Content Test Data

Wet Weight	99.93
Dry Weight	84.58
Tare weight	21.88
% Moisture	24.5

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
156	83.02	0.40	0.40	1.00	0.40	4.49E-08
236	83.02	0.60	0.50	0.83	0.55	4.08E-08
466	83.02	1.10	1.00	0.91	1.05	3.94E-08
538	83.02	1.20	1.15	0.96	1.18	3.82E-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) **4.1E-08** 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: 11/19/98
Report No.: 057

Acre 27 Lift 1
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	22.1	96.4	
2	See Test Location Plan	98.2	25.2	97.7	
3	See Test Location Plan	96.6	23.5	96.1	
4	See Test Location Plan	96.6	24.0	96.0 10%	
5	See Test Location Plan	98.7	25.4	98.2	
6	See Test Location Plan	95.7	27.1	95.2	
7	See Test Location Plan	96.7	21.2	96.0 20%	
8	See Test Location Plan	97.0	25.2	96.0 5%	
9	See Test Location Plan	95.6	26.1	95.1	
10	See Test Location Plan	98.3	22.6	97.8	
11	See Test Location Plan	101.9	21.0	100+	
12	See Test Location Plan	97.1	25.4	96.6	Tube Sample (DL-149)
13	See Test Location Plan	98.4	22.1	97.9	
14	See Test Location Plan	96.2	23.6	95.7	
15	See Test Location Plan	97.9	24.9	97.4	
16	See Test Location Plan	97.8	23.1	97.3	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	1.5 x 10(-8)
Dry Density (pcf)	100.7
Moisture Content (%)	22.7

Atterberg Limits (ASTM D4318)

PL	22
LL	58
PI	36
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.7
%Sand	26.3
%Silt	23.3
%Clay	49.7

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

Robert L. Mashewske

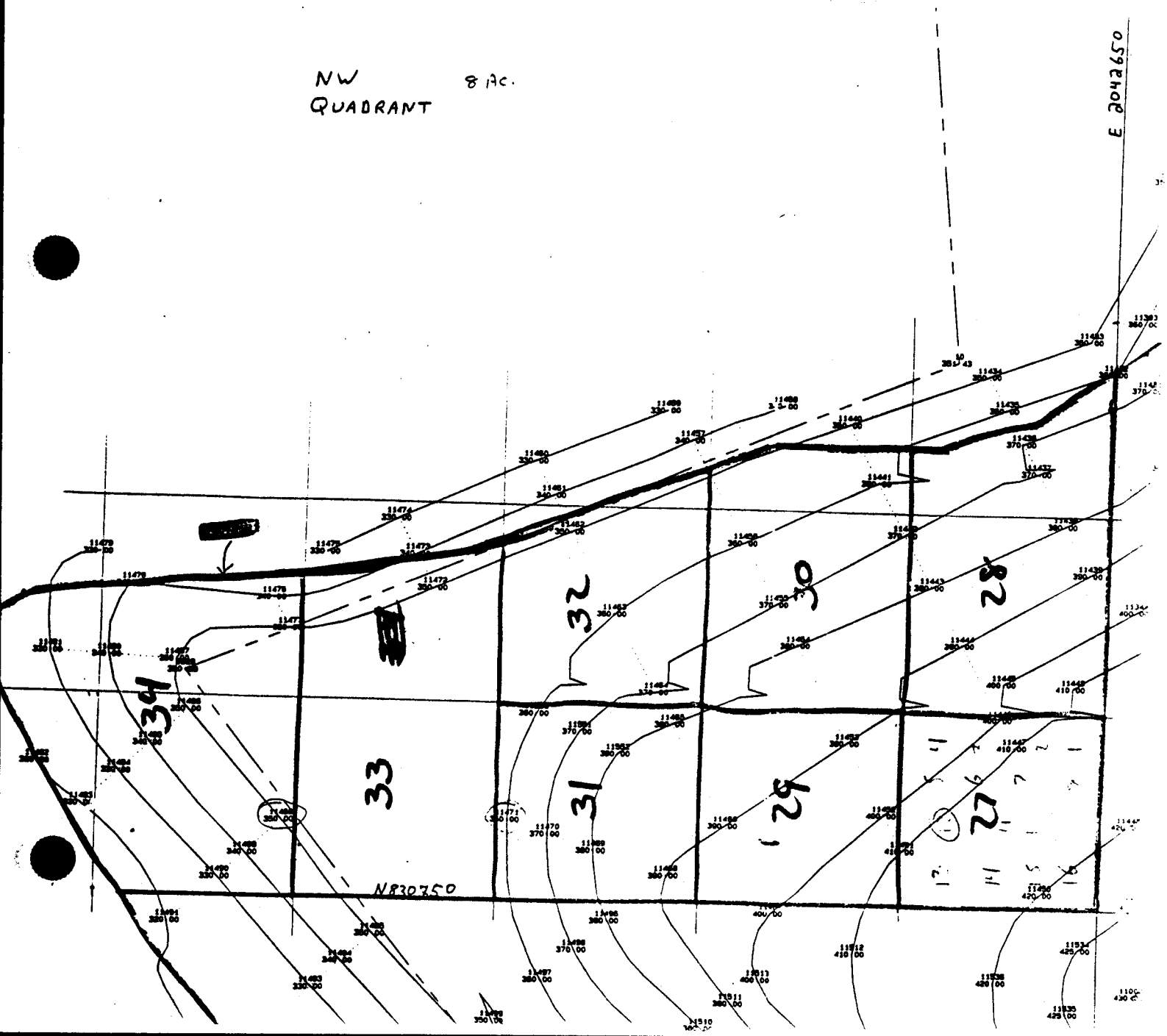
Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

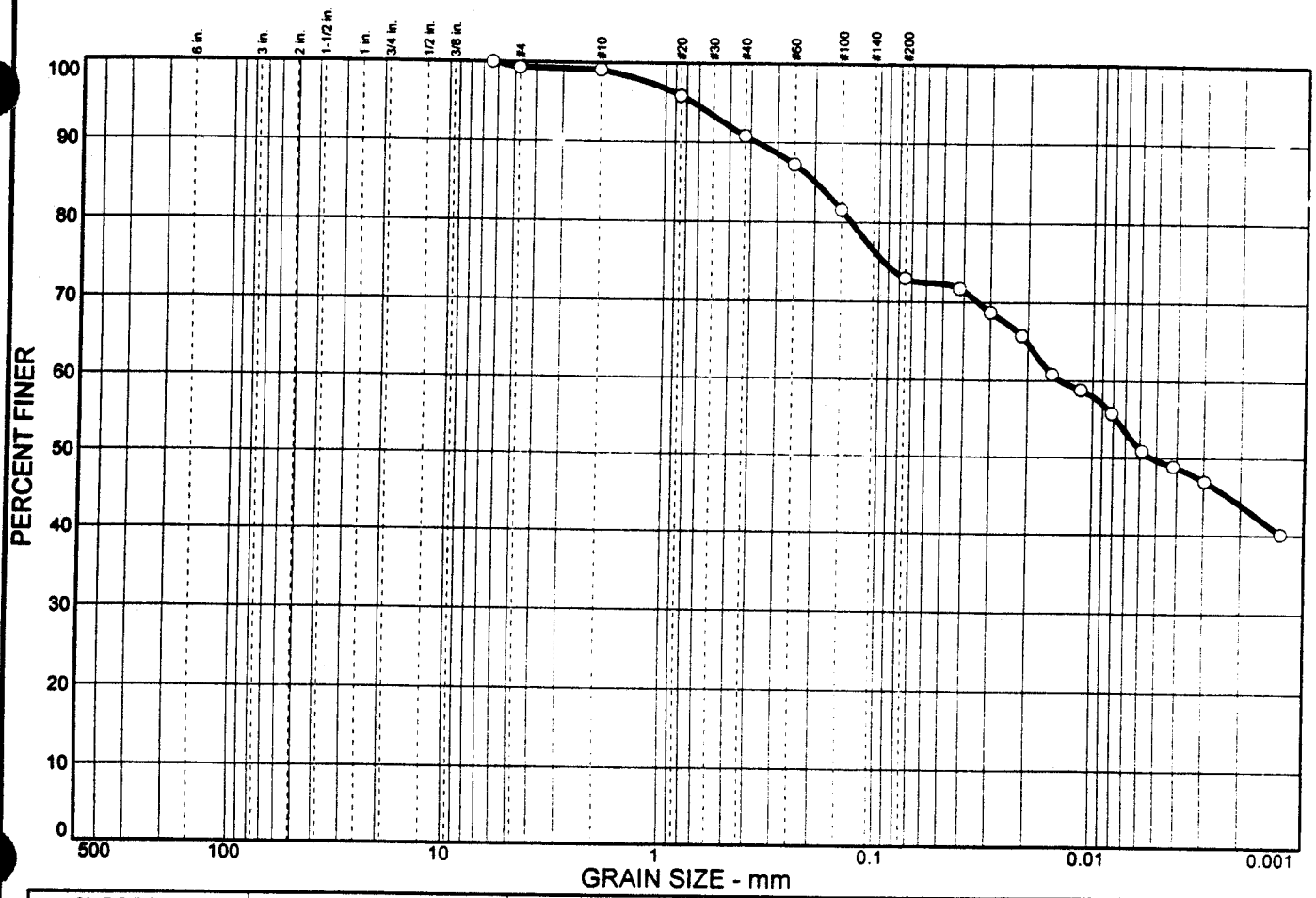
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

(12) - Indicates Tube/sample location
Area 27, Lift 1
Report: 057

NW QUADRANT 8 AC.



Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.7	26.3	23.3	49.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.3		
#10	99.1		
#20	95.8		
#40	90.8		
#60	87.3		
#100	81.6		
#200	73.0		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 22 LL= 58 PI= 36

Coefficients

D_{85}= 0.197 D_{60}= 0.0142 D_{50}= 0.0053
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-149, Acre 27, Lift 1

Sample No.: DL-149 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 27, Lift 1 **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-125

Project No.: VNC-98-029
Sample No. DL-149

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.5E-08	cm/sec
% Moisture	22.7	%
Dry Density	100.7	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/06/98
Location: ACRE 27, LIFT 1

Specimen Data

Length (in):	3.698
Diameter (in.):	2.849
Area (sq. in.):	6.386
Volume (cu. in.):	23.62
Wet Weight (grams):	765.9
Dry Weight (grams):	624.0
Dry Density (pcf):	100.7

Moisture Content Test Data

Wet Weight	90.43
Dry Weight	77.74
Tare weight	21.94
% Moisture	22.7

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
638	96.92	0.60	0.60	1.00	0.60	1.46E-08
760	96.92	0.70	0.70	1.00	0.70	1.43E-08
355	96.92	0.40	0.40	1.00	0.40	1.75E-08
1143	96.92	1.00	0.90	0.90	0.95	1.29E-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) **1.5E-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.: 111

Acre 28 Lift 1

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	103.1	19.3	100+	
2	See Test Location Plan	100.9	21.2	98.0	
3	See Test Location Plan	102.2	21.2	99.2	Tube/Sample (DL-235)
4	See Test Location Plan	101.6	20.1	98.6	
5	See Test Location Plan	102.1	20.5	99.1	
6	See Test Location Plan	102.3	20.7	99.3	
7	See Test Location Plan	102.7	20.7	99.7	
8	See Test Location Plan	103.3	19.7	100+	
9	See Test Location Plan	101.6	20.2	98.6	
10	See Test Location Plan	99.7	21.9	96.8	
11	See Test Location Plan	101.7	21.7	98.7	
12	See Test Location Plan	100.6	21.8	97.7	
13	See Test Location Plan	100.8	20.4	97.9	
14	See Test Location Plan	98.9	22.4	96.0	
15	See Test Location Plan	99.6	21.6	96.7	
16	See Test Location Plan	99.9	22.6	97.0	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	4.1x10(-8)
Dry Density (pcf)	102.1
Moisture Content (%)	22.2

Atterberg Limits (ASTM D4318)

PL	19
LL	42
PI	23

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel	0.1
%Sand	48.5
%Silt	15.9
%Clay	35.5

Sincerely,

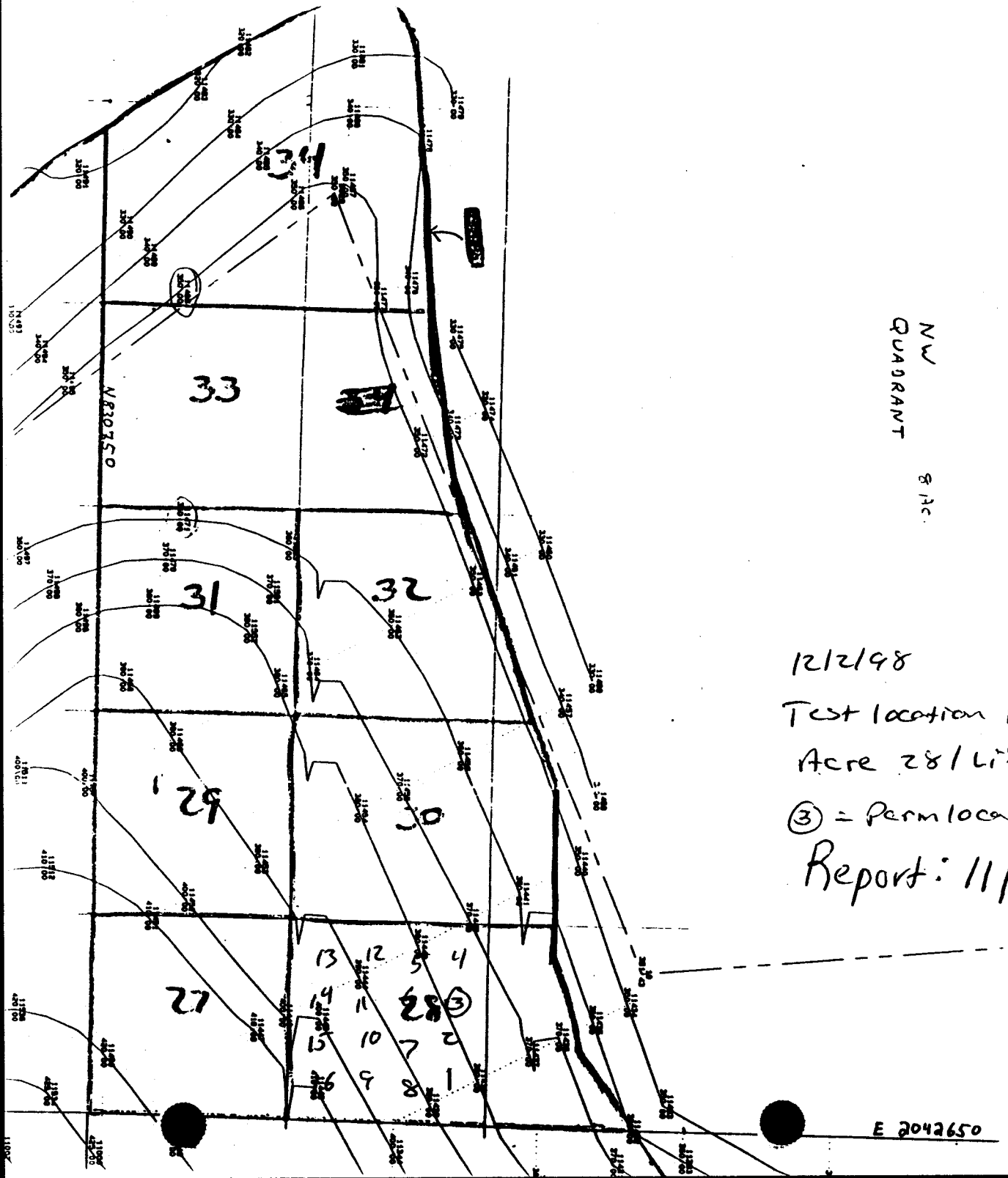
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

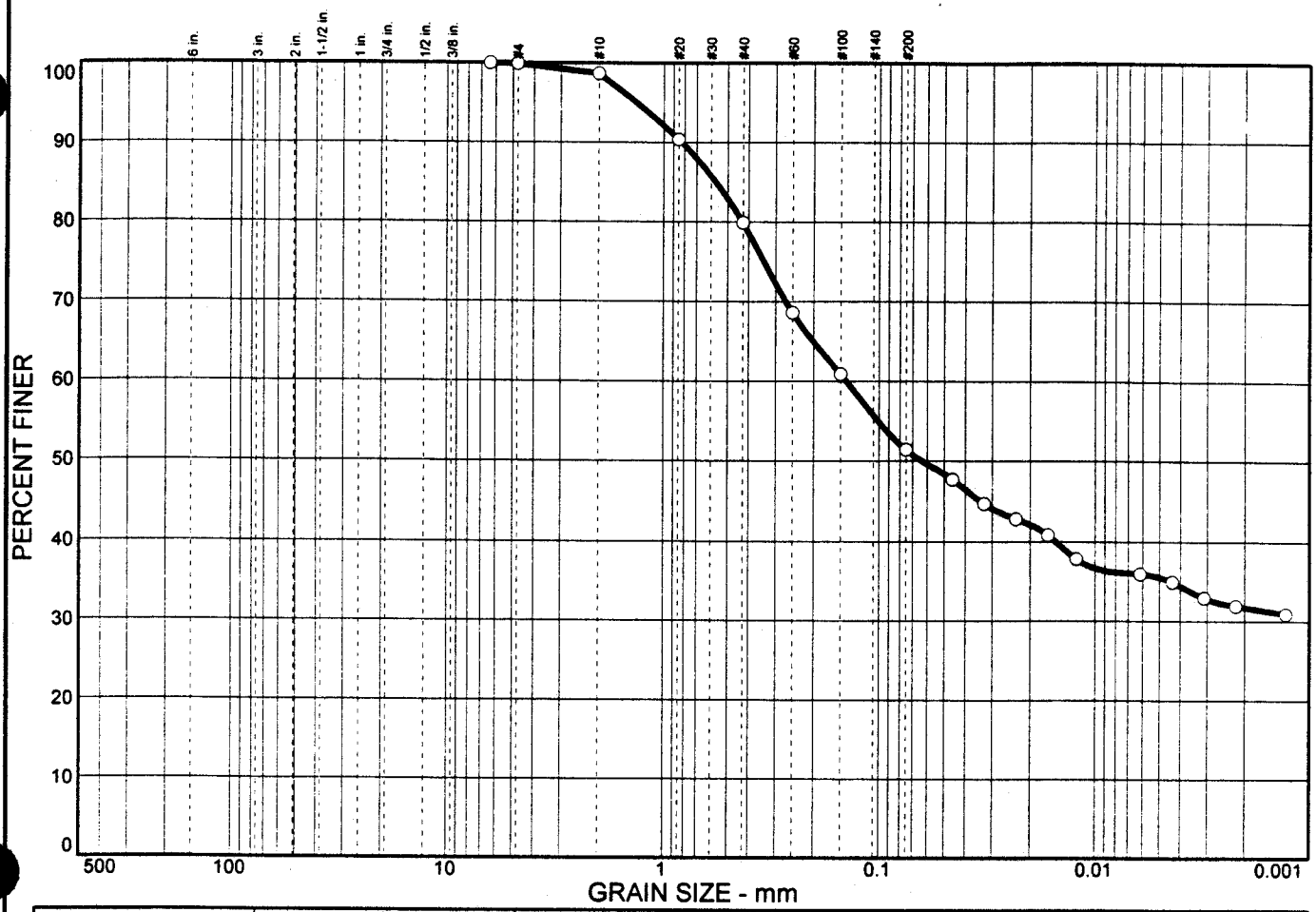
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



NW
QUADRANT

12/2/98
Test location Plan
Acre 28 / Lift 1
③ = Perm location
Report: 111

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	48.5	15.9	35.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	98.7		
#20	90.4		
#40	79.9		
#60	68.6		
#100	60.9		
#200	51.4		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 42 PI= 23

Coefficients

D_{85}= 0.566 D_{60}= 0.141 D_{50}= 0.0633
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-235, Acre 28, lift 1

Sample No.: DL-235 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 28, Lift 1 **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-180

Project No.: VNC-98-029
Sample No.: DL-235

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.1E-008	cm/sec
% Moisture	22.2	%
Dry Density	102.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/02/98
Location: Acre 28, Lift 1

Specimen Data

Length (in):	3.535
Diameter (in.):	2.851
Area (sq. in.):	6.395
Volume (cu. in.):	22.61
Wet Weight (grams):	739.8
Dry Weight (grams):	605.6
Dry Density (pcf):	102.1

Wet Weight	136.19
Dry Weight	115.50
Tare weight	22.16
% Moisture	22.2

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
237	138.46	0.90	1.05	1.17	0.98	4.27E-008
140	138.46	0.60	0.55	0.92	0.58	4.26E-008
168	138.46	0.70	0.75	1.07	0.73	4.48E-008
323	138.46	1.20	1.00	0.83	1.10	3.54E-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) **4.1E-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

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.: 095

Acre 28a Lift 1

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	99.7	20.4	96.7	
2	See Test Location Plan	102.6	20.7	99.6	
3	See Test Location Plan	102.5	22.5	99.5	Tube/Sample (DL-225)
4	See Test Location Plan	100.4	21.4	97.5	
5	See Test Location Plan	98.7	22.0	95.8	
6	See Test Location Plan	99.6	20.9	96.7	
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)	1.9x10(-8)
Dry Density (pcf)	99.4
Moisture Content (%)	27.7

Atterberg Limits (ASTM D4318)

PL	19
LL	42
PI	23
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	46.3
%Silt	15.9
%Clay	37.8

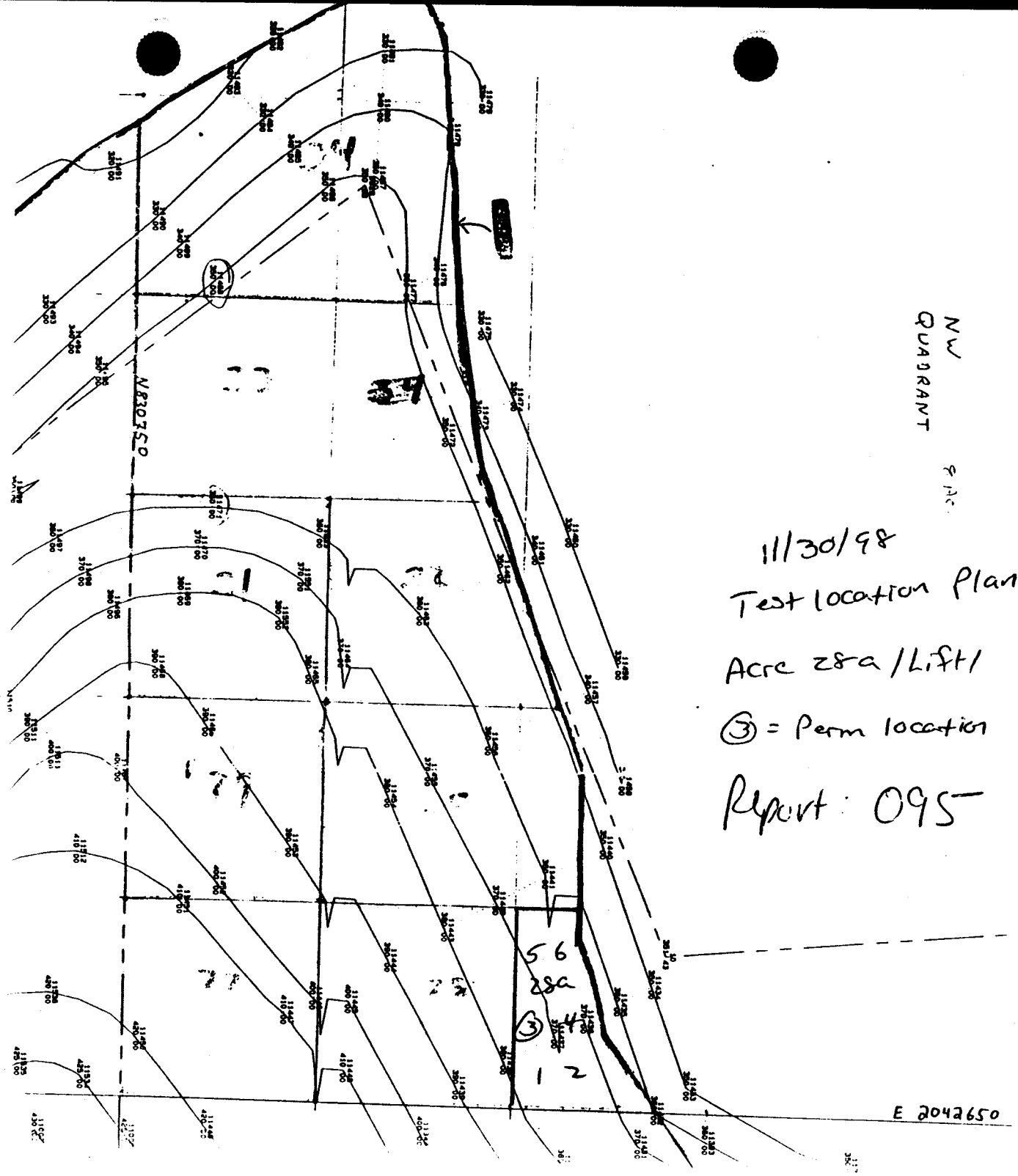
Sincerely,

VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

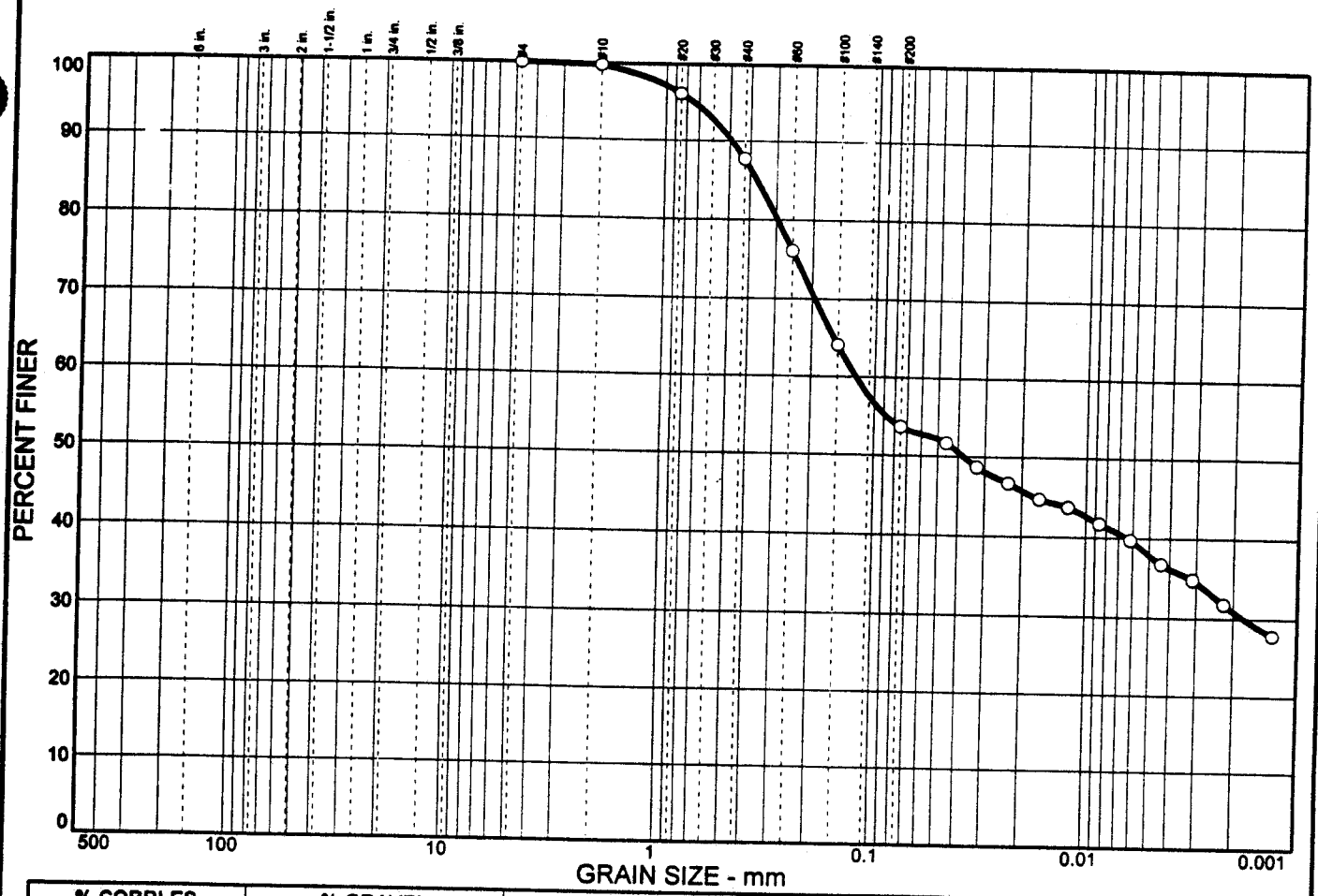
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan



NW
QUADRANT

11/30/98
Test location Plan
Acre 28a / Lift 1
③ = Perm location
Report: 095

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	46.3	15.9	37.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	96.1		
#40	87.7		
#60	76.1		
#100	64.1		
#200	53.7		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 42 PI= 23

Coefficients

D_{85}= 0.370 D_{60}= 0.122 D_{50}= 0.0376
D_{30}= 0.0018 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-225, Acre 28A, lift 1

Sample No.: DL-225 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 28A, Lift 1 **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-185

Project No.: VNC-98-029
Sample No.: DL-225

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.9E-008	cm/sec
% Moisture	27.7	%
Dry Density	99.4	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/30/98
Location: Acre 28a, Lift 1

Specimen Data

Length (in):	3.104
Diameter (in.):	2.846
Area (sq. in.):	6.372
Volume (cu. in.):	19.78
Wet Weight (grams):	659.3
Dry Weight (grams):	516.1
Dry Density (pcf):	99.4

Wet Weight	132.36
Dry Weight	108.43
Tare weight	22.19
% Moisture	27.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
418	138.46	0.80	0.90	1.13	0.85	1.86E-008
545	138.46	1.10	1.20	1.09	1.15	1.93E-008
482	138.46	1.00	1.10	1.10	1.05	1.99E-008
423	138.46	0.90	0.90	1.00	0.90	1.95E-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) **1.9E-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: 11/23/98
Report No.: 065

Acre 29 Lift 1

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	96.8	26.0	96.3	
2	See Test Location Plan	98.0	21.6	97.5	
3	See Test Location Plan	98.2	21.0	97.7	
4	See Test Location Plan	95.5	22.4	95.0	
5	See Test Location Plan	99.2	23.2	98.7	
6	See Test Location Plan	99.0	21.0	98.5	
7	See Test Location Plan	100.4	21.0	99.9	
8	See Test Location Plan	96.2	27.1	95.7	Perm/Sample (DL-136)
9	See Test Location Plan	98.2	23.1	97.7	
10	See Test Location Plan	97.4	24.0	96.9	
11	See Test Location Plan	97.9	22.8	97.4	
12	See Test Location Plan	96.2	23.6	95.7	
13	See Test Location Plan	98.4	22.2	97.9	
14	See Test Location Plan	99.6	22.0	99.1	
15	See Test Location Plan	100.0	21.2	99.5	
16	See Test Location Plan	98.6	23.1	98.1	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	3.0 x 10(-8)
Dry Density (pcf)	96.4
Moisture Content (%)	26.3

Atterberg Limits (ASTM D4318)

PL	24
LL	60
PI	36
USCS Classification	CH

Grain-size Analysis (ASTM D422)

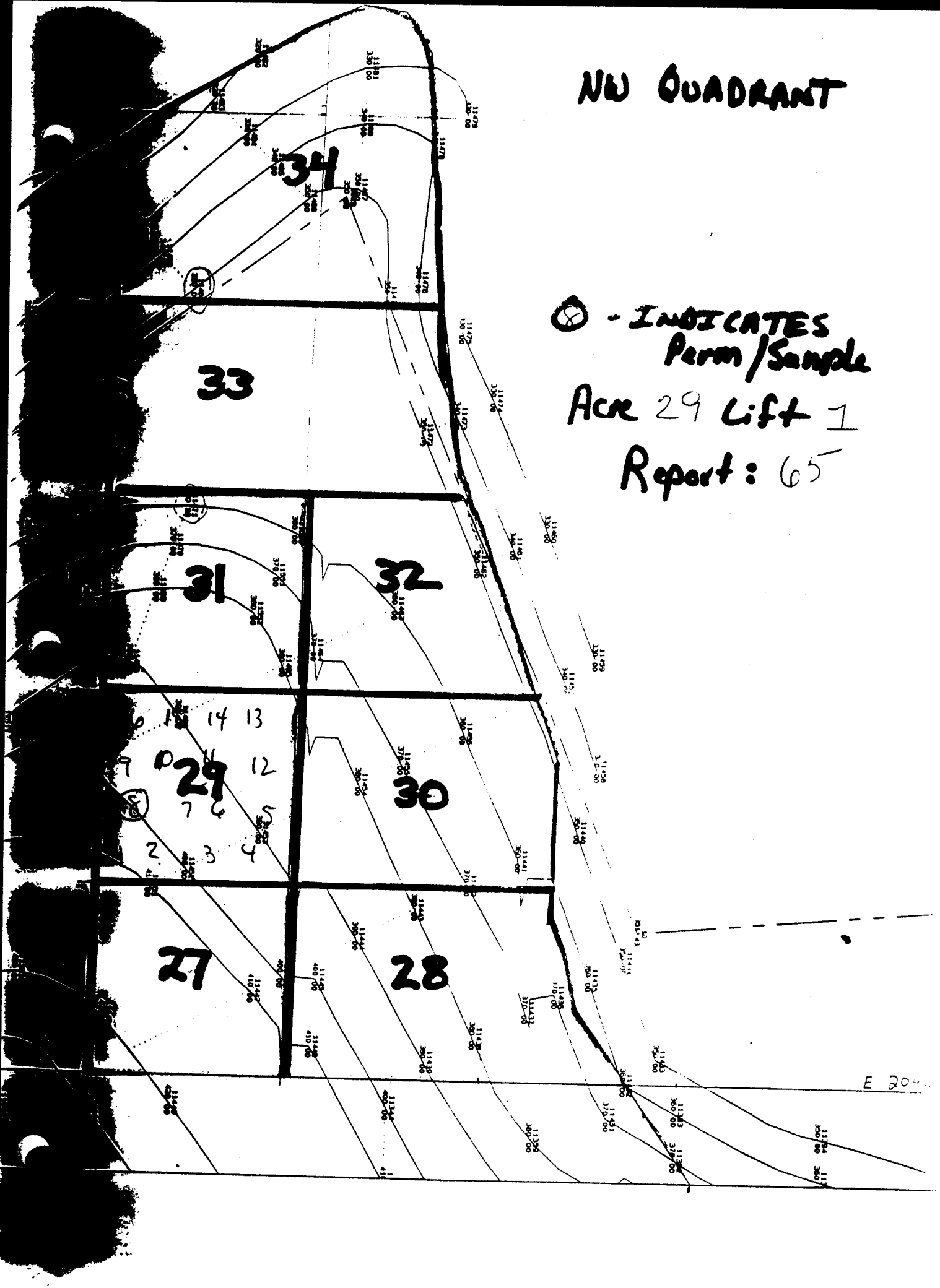
%Gravel	0.1
%Sand	27.5
%Silt	20.3
%Clay	52.1

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


NW QUADRANT
- INDICATES Perm/Sample
Acr 29 Lift 1
Report: 65
34
33
31
32
29
30
27
28
E 20

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/24/98
Report No.: P-105

Project No.: VNC-98-029
Sample No.: DL-136

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.0E-008	cm/sec
% Moisture	26.3	%
Dry Density	96.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/01/98
Location: Acre 29, Lift 1

Length (in):	3.070
Diameter (in.):	2.830
Area (sq. in.):	6.301
Volume (cu. in.):	19.34
Wet Weight (grams):	618.3
Dry Weight (grams):	489.5
Dry Density (pcf):	96.4

Moisture Content Test Data

Wet Weight	66.95
Dry Weight	57.60
Tare weight	22.08
% Moisture	26.3

Test Data

Confining Pressure 3.0 psi

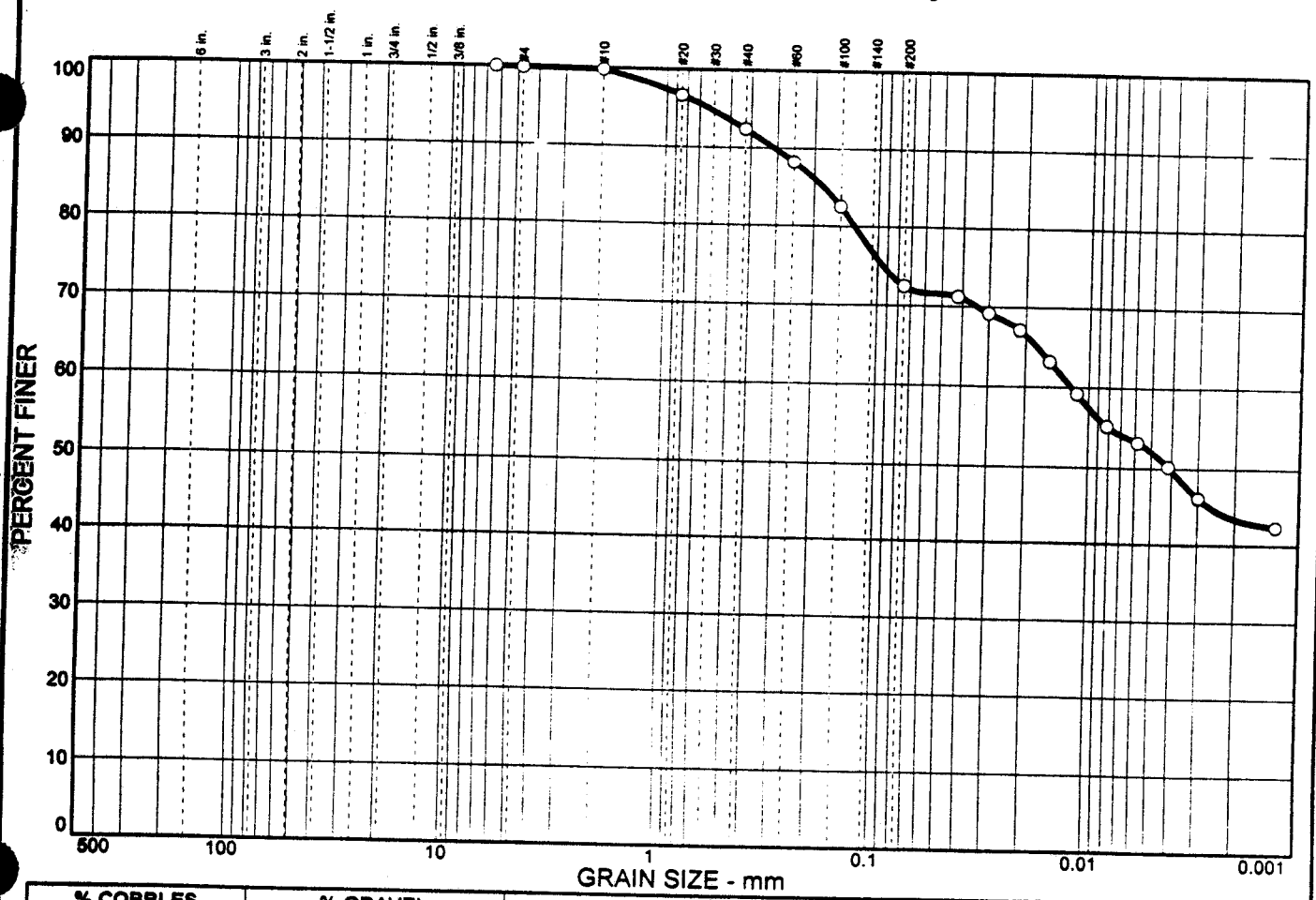
Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
395	85.80	0.80	1.00	1.25	0.90	3.36E-008
410	85.80	0.80	0.80	1.00	0.80	2.88E-008
448	85.80	0.95	0.85	0.89	0.90	2.97E-008
357	85.80	0.70	0.65	0.93	0.68	2.79E-008

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) **3.0E-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	27.5	20.3	52.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.8		
#20	96.7		
#40	92.4		
#60	88.2		
#100	82.5		
#200	72.4		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 24 LL= 60 PI= 36

Coefficients

D_{85}= 0.181 D_{60}= 0.0121 D_{50}= 0.0041
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-136, Acre 29, Lift 1

Sample No.: DL-136 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 29, Lift 1 **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.: 109

Acre 30 Lift 1
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	102.0	20.1	99.0	
2	See Test Location Plan	100.3	19.9	97.4	
3	See Test Location Plan	102.7	20.5	99.7	
4	See Test Location Plan	100.1	19.6	97.2	
5	See Test Location Plan	101.7	21.4	98.7	
6	See Test Location Plan	102.8	22.2	99.8	
7	See Test Location Plan	100.9	21.6	98.0	
8	See Test Location Plan	98.0	26.5	95.1	Tube/Sample (DL-237)
9	See Test Location Plan	101.4	23.4	98.4	
10	See Test Location Plan	103.0	19.6	100.0	
11	See Test Location Plan	98.6	23.9	95.7	
12	See Test Location Plan	103.3	19.3	100+	
13	See Test Location Plan	98.6	23.9	95.7	
14	See Test Location Plan	99.5	22.6	96.6	
15	See Test Location Plan	100.7	20.9	97.8	
16	See Test Location Plan	101.6	21.4	98.6	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	2.8x10(-8)
Dry Density (pcf)	100.5
Moisture Content (%)	22.5

Atterberg Limits (ASTM D4318)

PL	24
LL	64
PI	40
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	38.4
%Silt	19.5
%Clay	42.1

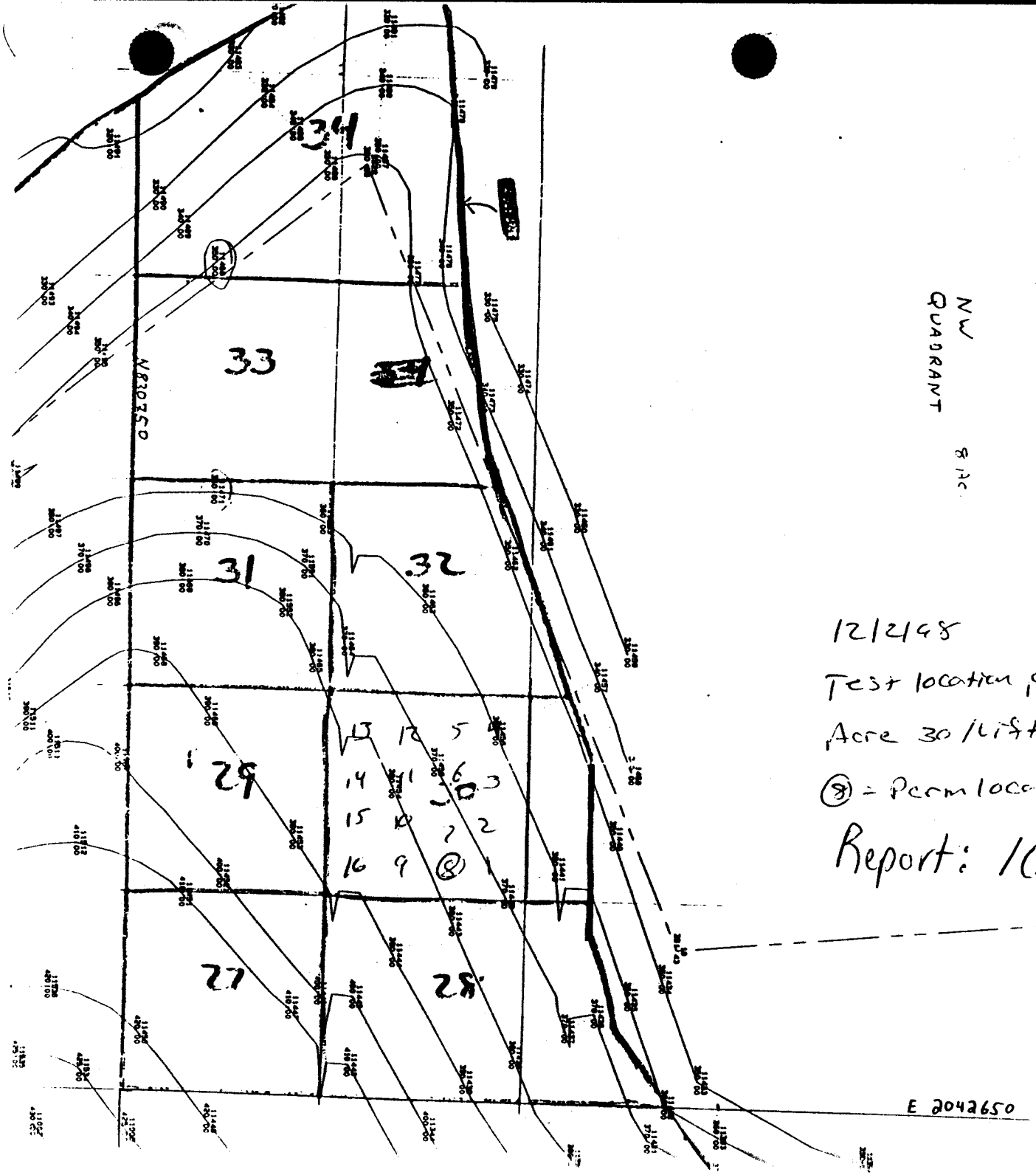
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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

12/2/98

Test location plan

Acre 30 / Lift 1

(8) = Perm location

Report: 109

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/08/98
Report No.: P-182

Project No.: VNC-98-029
Sample No.: DL-237

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.8E-008	cm/sec
% Moisture	22.5	%
Dry Density	100.5	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/02/98
Location: Acre 30, Lift 1

Specimen Data

Length (in):	3.390
Diameter (in.):	2.865
Area (sq. in.):	6.458
Volume (cu. in.):	21.89
Wet Weight (grams):	707.9
Dry Weight (grams):	577.7
Dry Density (pcf):	100.5

Wet Weight	125.05
Dry Weight	106.08
Tare weight	21.90
% Moisture	22.5

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
456	138.46	1.85	2.25	1.22	2.05	4.43E-008
140	138.46	0.35	0.35	1.00	0.35	2.46E-008
167	138.46	0.40	0.40	1.00	0.40	2.36E-008
326	138.46	0.70	0.70	1.00	0.70	2.12E-008

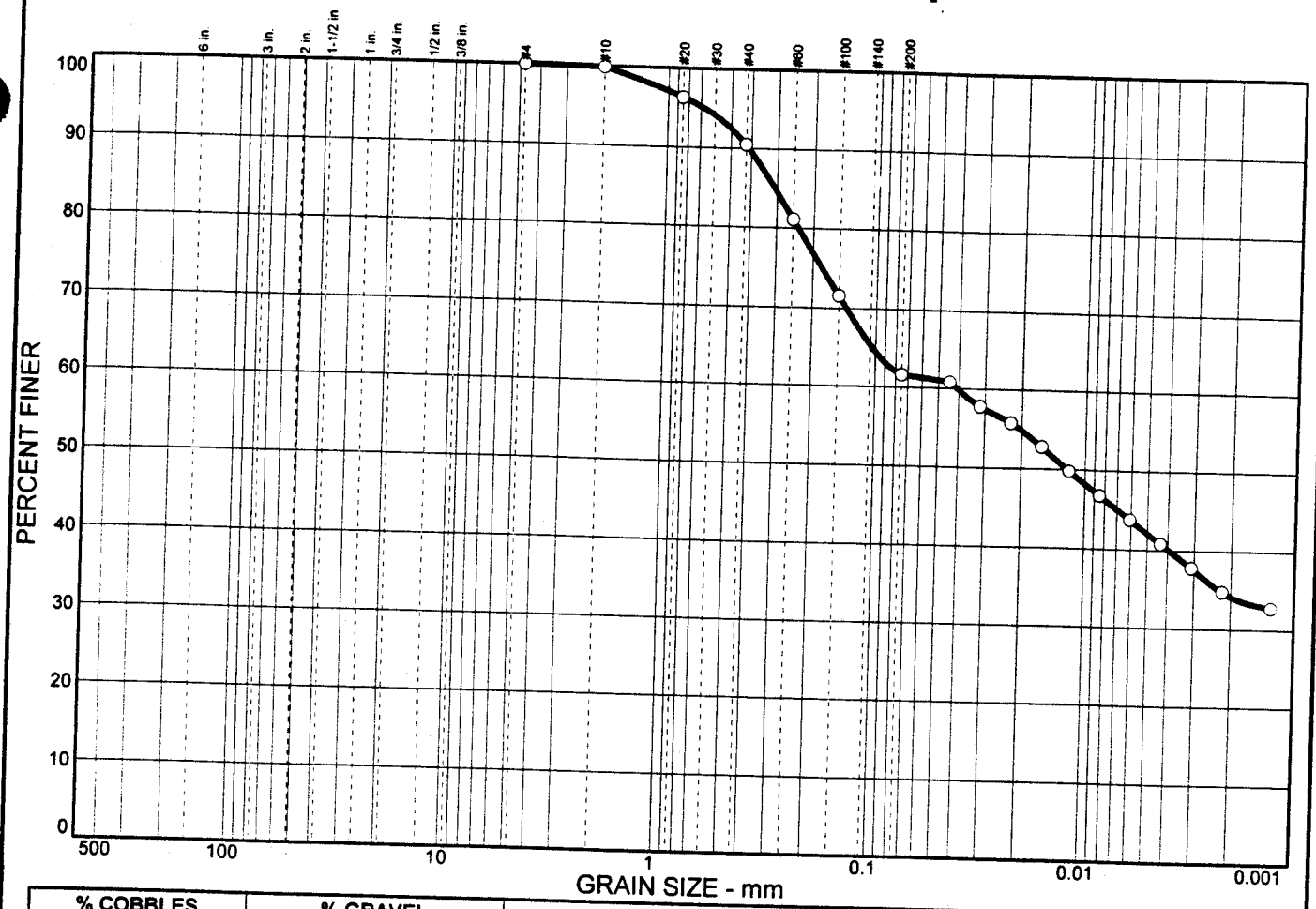
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.8E-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	0.0	38.4	19.5	42.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	96.3		
#40	90.5		
#60	81.1		
#100	71.6		
#200	61.6		

* (no specification provided)

Soil Description

On-site Borrow - Sandy fat clay

Atterberg Limits

PL= 24 LL= 64 PI= 40

Coefficients

D_{85}= 0.307 D_{60}= 0.0408 D_{50}= 0.0121
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-237, Acre 30, Lift 1

Sample No.: DL-237 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 30, Lift 1 **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.: 110

Acre 30a Lift 1

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	104.0	19.3	100+	
2	See Test Location Plan	100.5	20.5	97.5	
3	See Test Location Plan	98.0	24.0	95.1	Tube/Sample (DL-238)
4	See Test Location Plan	99.4	21.6	96.5	
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)	4.3x10(-8)
Dry Density (pcf)	104.9
Moisture Content (%)	21.1

Atterberg Limits (ASTM D4318)

PL	18
LL	43
PI	25
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	43.4
%Silt	16.7
%Clay	39.9

Sincerely,

VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

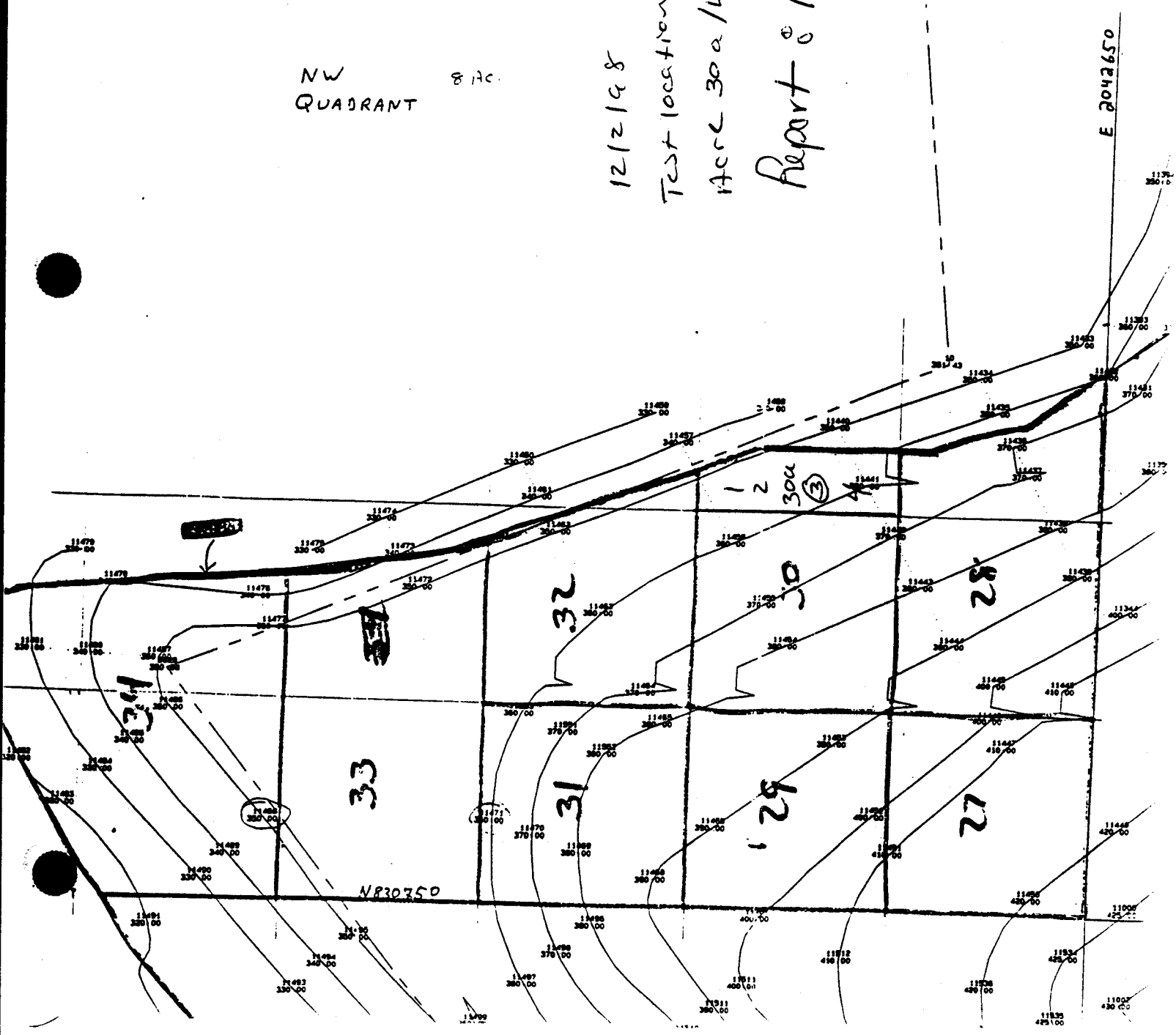
Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

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

NW QUADRANT 8 ac.

12/12/98
Test location Plan
Acre 30a / Lift
Report # 110



VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/08/98
Report No.: P-183

Project No.: VNC-98-029
Sample No.: DL-238

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.3E-008	cm/sec
% Moisture	21.1	%
Dry Density	104.9	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 12/02/98
Location: Acre 30A, Lift 1

Specimen Data

Length (in):	3.320
Diameter (in.):	2.825
Area (sq. in.):	6.279
Volume (cu. in.):	20.85
Wet Weight (grams):	695.4
Dry Weight (grams):	574.1
Dry Density (pcf):	104.9

Wet Weight	159.21
Dry Weight	135.31
Tare weight	22.17
% Moisture	21.1

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
149	138.46	0.65	0.55	0.85	0.60	4.00E-008
487	138.46	2.75	2.70	0.98	2.73	5.56E-008
160	138.46	0.50	0.55	1.10	0.53	3.26E-008
93	138.46	0.40	0.40	1.00	0.40	4.27E-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)

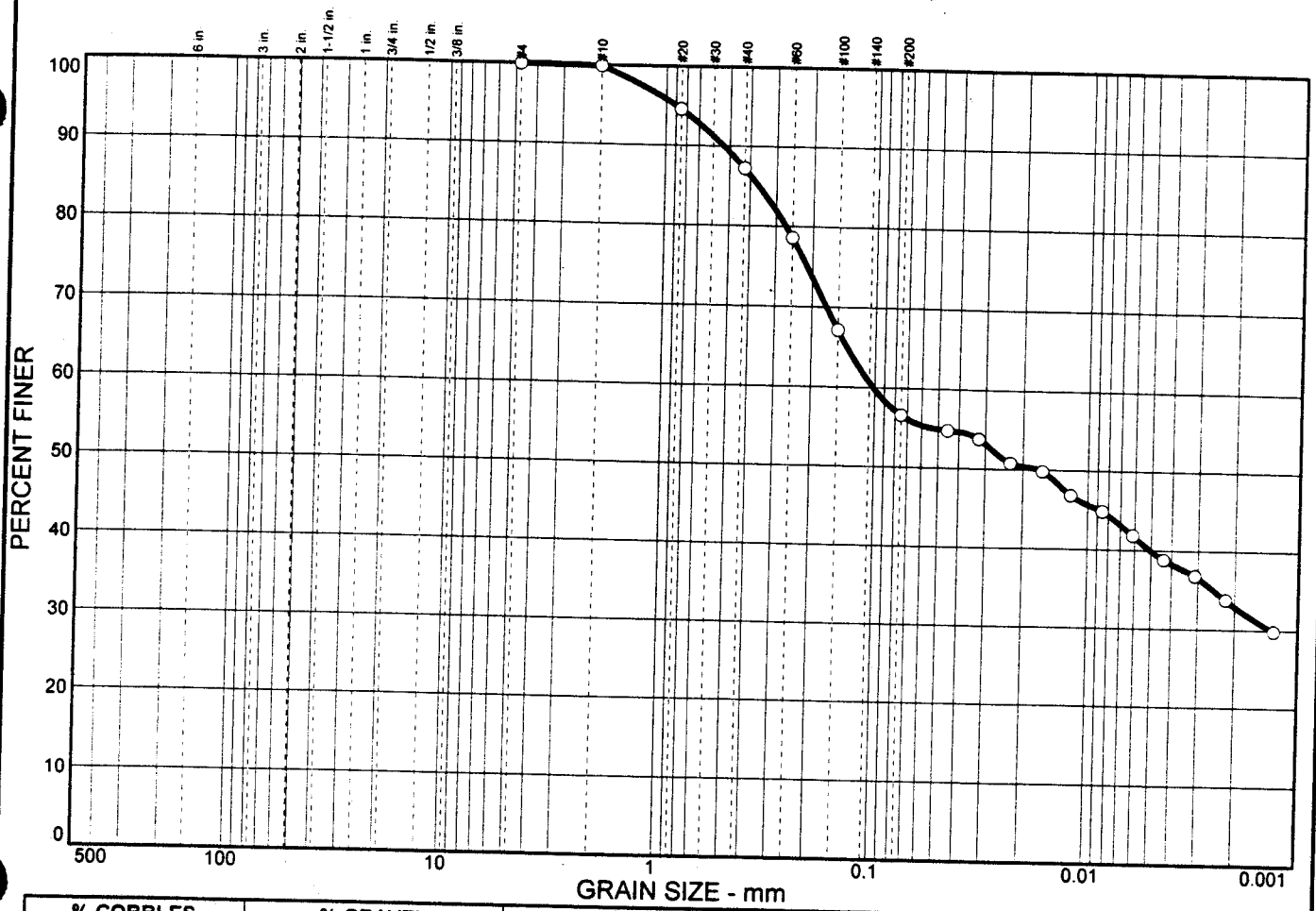
Permeability (k) **4.3E-008** cm/sec

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	43.4	16.7	39.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	94.6		
#40	87.2		
#60	78.6		
#100	67.1		
#200	56.6		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 18 LL= 43 PI= 25

Coefficients

D_{85}= 0.362 D_{60}= 0.101 D_{50}= 0.0169
D_{30}= 0.0013 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-238, Acre 30A, Lift 1

Sample No.: DL-238 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 30A, Lift 1 **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.: 059

Acre 31 Lift 1

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	100.4	22.6	99.9	
2	See Test Location Plan	99.8	23.4	99.3	
3	See Test Location Plan	97.4	24.1	96.9	
4	See Test Location Plan	97.6	23.7	97.1	
5	See Test Location Plan	98.2	22.8	97.7	
6	See Test Location Plan	99.4	23.1	98.9	
7	See Test Location Plan	98.9	25.9	98.4	Perm/Sample (DL-179)
8	See Test Location Plan	100.1	24.5	99.6	
9	See Test Location Plan	102.9	23.9	100+	
10	See Test Location Plan	100.2	22.6	99.7	
11	See Test Location Plan	99.4	23.4	98.9	
12	See Test Location Plan	99.7	22.9	99.2	
13	See Test Location Plan	98.6	23.6	98.1	
14	See Test Location Plan	97.1	23.7	96.6	
15	See Test Location Plan	96.1	24.8	95.6	
16	See Test Location Plan	96.9	24.1	96.4	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	7.6 x 10(-9)
Dry Density (pcf)	101.4
Moisture Content (%)	21.7

Atterberg Limits (ASTM D4318)		**Grain-size Analysis (ASTM D422)**	
PL	21	%Gravel	0.5
LL	55	%Sand	28.8
PI	34	%Silt	20.3
		%Clay	50.4
USCS Classification	CH		

Sincerely,

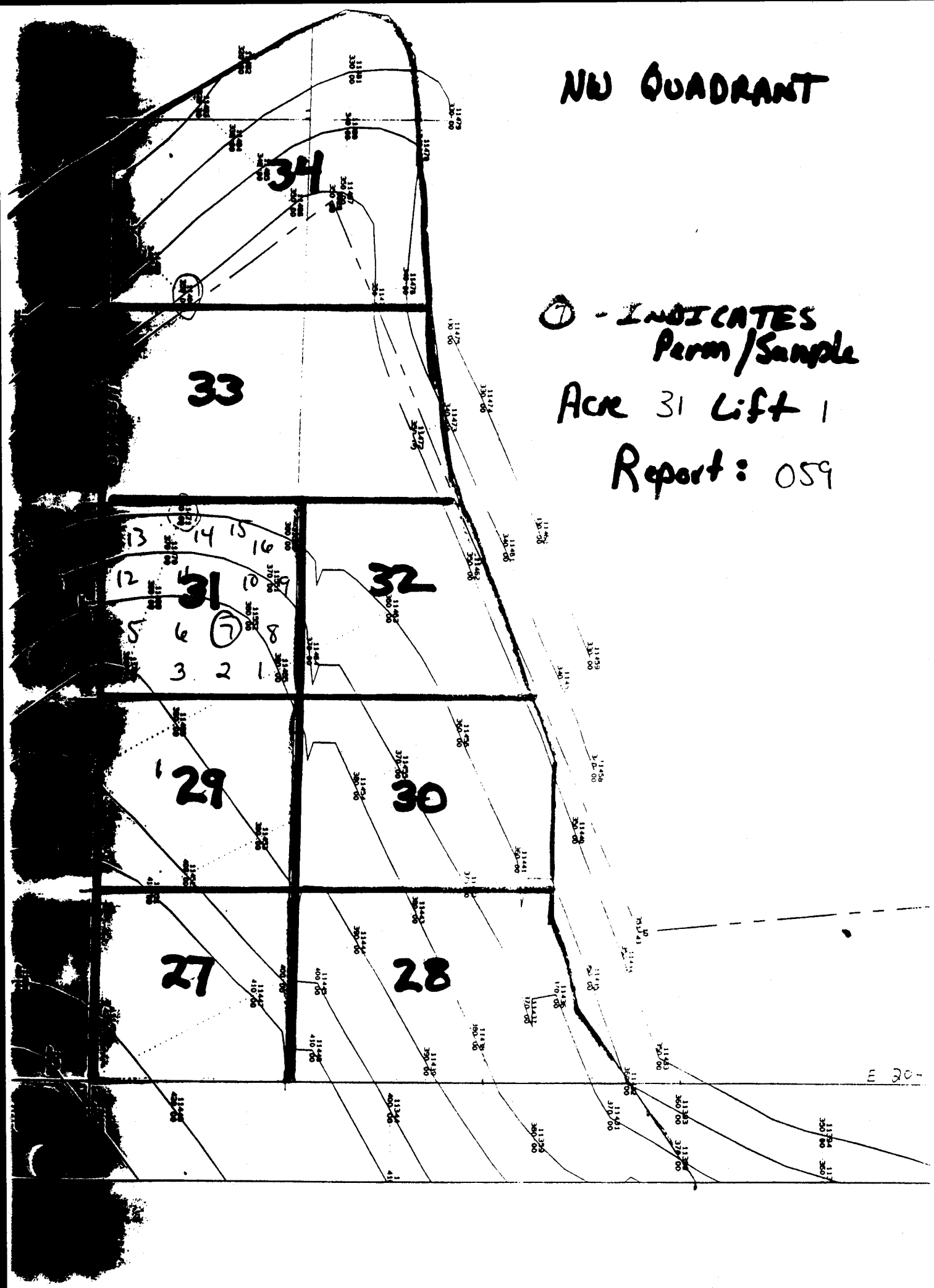
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 02309 ENGINEER ROBERT LEE MASHEWSKE

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

NW QUADRANT



7 - INDICATES Perm/Sample

Acre 31 Lift 1

Report: 059

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/24/98
Report No.: P-127

Project No.: VNC-98-029
Sample No.: DL-179

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	7.6E-009	cm/sec
% Moisture	21.7	%
Dry Density	101.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/16/98
Location: ACRE 31, LIFT 1

Specimen Data

Length (in):	3.380
Diameter (in.):	2.870
Area (sq. in.):	6.480
Volume (cu. in.):	21.90
Wet Weight (grams):	709.5
Dry Weight (grams):	583.1
Dry Density (pcf):	101.4

Moisture Content Test Data

Wet Weight	160.32
Dry Weight	135.69
Tare weight	22.03
% Moisture	21.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
880	152.31	0.80	0.85	1.06	0.83	8.35E-009
785	152.31	0.65	0.65	1.00	0.65	7.37E-009
567	152.31	0.50	0.45	0.90	0.48	7.46E-009
1412	152.31	1.10	1.15	1.05	1.13	7.09E-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, P.E.
Regional Manager

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.5	28.8	20.3	50.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.5		
#10	98.9		
#20	93.3		
#40	89.8		
#60	85.2		
#100	78.0		
#200	70.7		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 21 LL= 55 PI= 34

Coefficients

D_{85}= 0.246 D_{60}= 0.0142 D_{50}= 0.0048
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-179, Acre 31 Lift 1

Sample No.: DL-179 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 31 Lift 1 **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: 01/11/99
Report No.: 147

Acre 32 Lift 1

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	102.1	19.8	99.1	
2	See Test Location Plan	101.2	20.2	98.3	
3	See Test Location Plan	100.7	21.4	97.8	
4	See Test Location Plan	101.6	22.0	98.6	
5	See Test Location Plan	100.3	23.0	97.4	
6	See Test Location Plan	99.0	23.2	96.1	
7	See Test Location Plan	98.6	26.2	95.7	Perm/Sample (DL-275)
8	See Test Location Plan	99.5	25.1	96.6	
9	See Test Location Plan	100.1	22.0	97.7	
10	See Test Location Plan	100.5	21.7	97.6	
11	See Test Location Plan	101.6	21.2	98.6	
12	See Test Location Plan	100.2	22.6	97.3	
13	See Test Location Plan	99.7	23.0	96.8	
14	See Test Location Plan	98.8	23.3	95.9	
15	See Test Location Plan	100.6	21.6	97.7	
16	See Test Location Plan	100.0	20.3	97.1	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec) 3.0x10(-9)

Dry Density (pcf) 98.2

Moisture Content (%) 24.6

Atterberg Limits (ASTM D4318)

PL 21
LL 62
PI 41

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel 0.0
%Sand 34.9
%Silt 25.7
%Clay 39.4

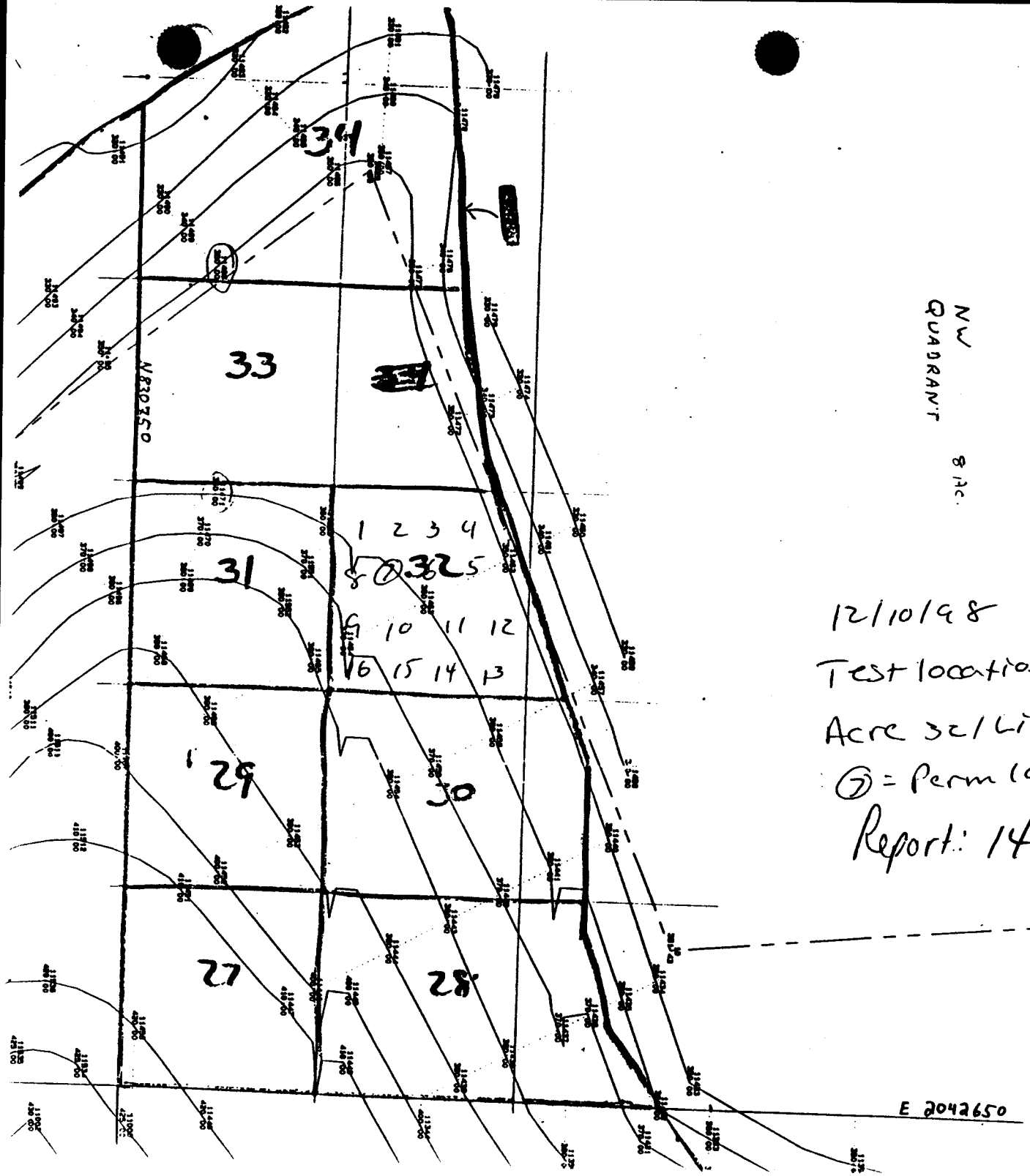
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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



NW QUADRANT

8 ac.

12/10/98

Test location Plan

Acre 32/Lift 1

⊙ = Perm locations

Report: 147

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/21/98
Report No.: P-227

Project No.: VNC-98-029
Sample No.: DL-275

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.0E-009	cm/sec
% Moisture	24.6	%
Dry Density	98.2	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/10/98
Location: Acre 32, Lift 1

Specimen Data

Length (in):	3.613
Diameter (in.):	2.853
Area (sq. in.):	6.404
Volume (cu. in.):	23.14
Wet Weight (grams):	743.4
Dry Weight (grams):	596.4
Dry Density (pcf):	98.2

Wet Weight	134.38
Dry Weight	112.15
Tare weight	21.93
% Moisture	24.6

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
596	155.07	0.30	0.30	1.00	0.30	4.76E-009
1757	240.92	0.90	0.70	0.78	0.80	2.77E-009
1195	240.92	0.50	0.40	0.80	0.45	2.29E-009
1463	240.92	0.50	0.50	1.00	0.50	2.08E-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) **3.0E-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	34.9	25.7	39.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#20	98.0		
#40	92.1		
#60	83.4		
#100	73.8		
#200	65.1		

* (no specification provided)

Soil Description

On-site Borrow - Sandy fat clay

Atterberg Limits

PL= 21 LL= 62 PI= 41

Coefficients

D_{85}= 0.273 D_{60}= 0.0300 D_{50}= 0.0156
D_{30}= 0.0020 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-275, Acre 32, Lift 1

Sample No.: DL-275 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 32, Lift 1 **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.: 150

Acre 33 Lift 1

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	104.0	19.8	100+	
2	See Test Location Plan	101.8	20.4	98.8	
3	See Test Location Plan	102.6	20.6	99.6	
4	See Test Location Plan	101.2	21.2	98.3	
5	See Test Location Plan	100.8	21.8	97.9	
6	See Test Location Plan	101.6	22.5	98.6	Perm/Sample (DL-278)
7	See Test Location Plan	100.5	21.8	97.6	
8	See Test Location Plan	100.3	22.0	97.4	
9	See Test Location Plan	99.8	22.3	96.9	
10	See Test Location Plan	101.3	21.6	98.4	
11	See Test Location Plan	102.6	19.9	99.6	
12	See Test Location Plan	101.8	21.3	98.8	
13	See Test Location Plan	103.0	20.2	100.0	
14	See Test Location Plan	102.2	20.7	99.2	
15	See Test Location Plan	100.6	22.0	97.7	
16	See Test Location Plan	101.0	21.6	98.1	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec) 2.2x10(-8)

Dry Density (pcf) 103.9

Moisture Content (%) 19.8

Atterberg Limits (ASTM D4318)

PL 18
LL 44
PI 26

USCS Classification CL

Grain-size Analysis (ASTM D422)

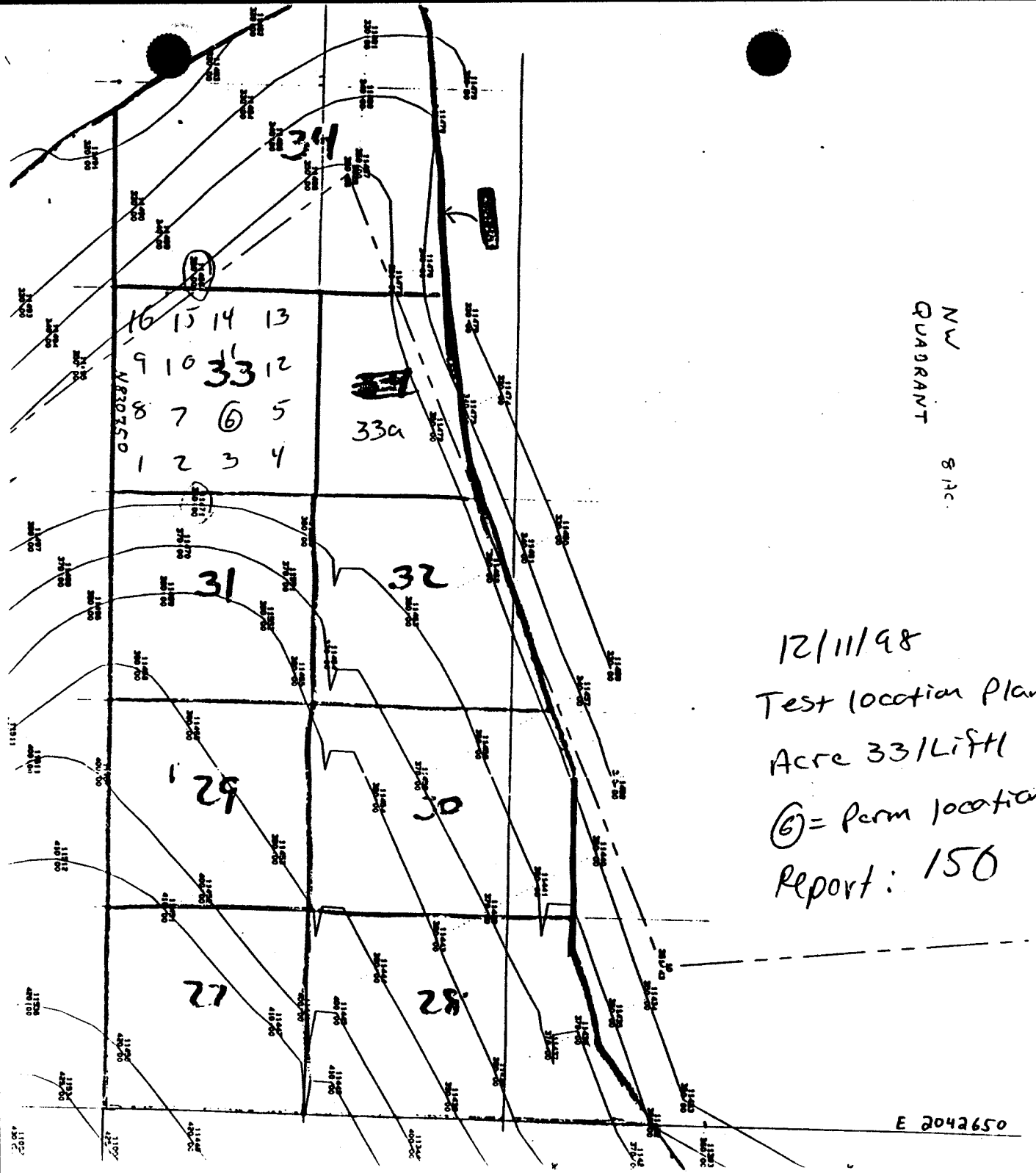
%Gravel 0.0
%Sand 44.1
%Silt 20.5
%Clay 35.4

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.

12/11/98

Test location Plan

Acre 33/Lift1

6 = Perm location

Report: 150

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/15/98
Report No.: P-210

Project No.: VNC-98-029
Sample No.: DL-278

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.2E-008	cm/sec
% Moisture	19.8	%
Dry Density	103.9	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/11/98
Location: Acre 33, Lift 1

Specimen Data

Length (in):	3.123
Diameter (in.):	2.853
Area (sq. in.):	6.404
Volume (cu. in.):	20.00
Wet Weight (grams):	653.5
Dry Weight (grams):	545.5
Dry Density (pcf):	103.9

Wet Weight	146.40
Dry Weight	125.87
Tare weight	22.14
% Moisture	19.8

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
250	135.69	0.70	0.80	1.14	0.75	2.80E-008
424	135.69	0.95	1.05	1.11	1.00	2.20E-008
660	138.46	1.60	1.25	0.78	1.43	1.98E-008
345	138.46	0.70	0.70	1.00	0.70	1.86E-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 R. Mashewske
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	44.1	20.5	35.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#20	93.1		
#40	85.1		
#60	76.6		
#100	66.6		
#200	55.9		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 18 LL= 44 PI= 26

Coefficients

D_{85}= 0.422 D_{60}= 0.106 D_{50}= 0.0279
D_{30}= 0.0030 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-278, Acre 33, Lift 1

Sample No.: DL-278 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 33, Lift 1 **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: 12/17/98
Report No.: 123

Acre 33a Lift 1

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	101.6	23.7	98.8	
2	See Test Location Plan	97.7	24.0	95.0	
3	See Test Location Plan	98.7	23.9	96.0	
4	See Test Location Plan	97.8	26.7	95.1	
5	See Test Location Plan	97.9	24.4	95.2	Perm/Sample (DL-251)
6	See Test Location Plan	99.5	23.9	96.8	
7	See Test Location Plan	100.8	24.1	98.1	
8	See Test Location Plan	98.2	23.7	95.5	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 2.9x10(-8)

Dry Density (pcf) 97.7

Moisture Content (%) 23.5

Atterberg Limits (ASTM D4318)

PL 23
LL 40
PI 17

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel 2.4
%Sand 36.5
%Silt 20.0
%Clay 41.1

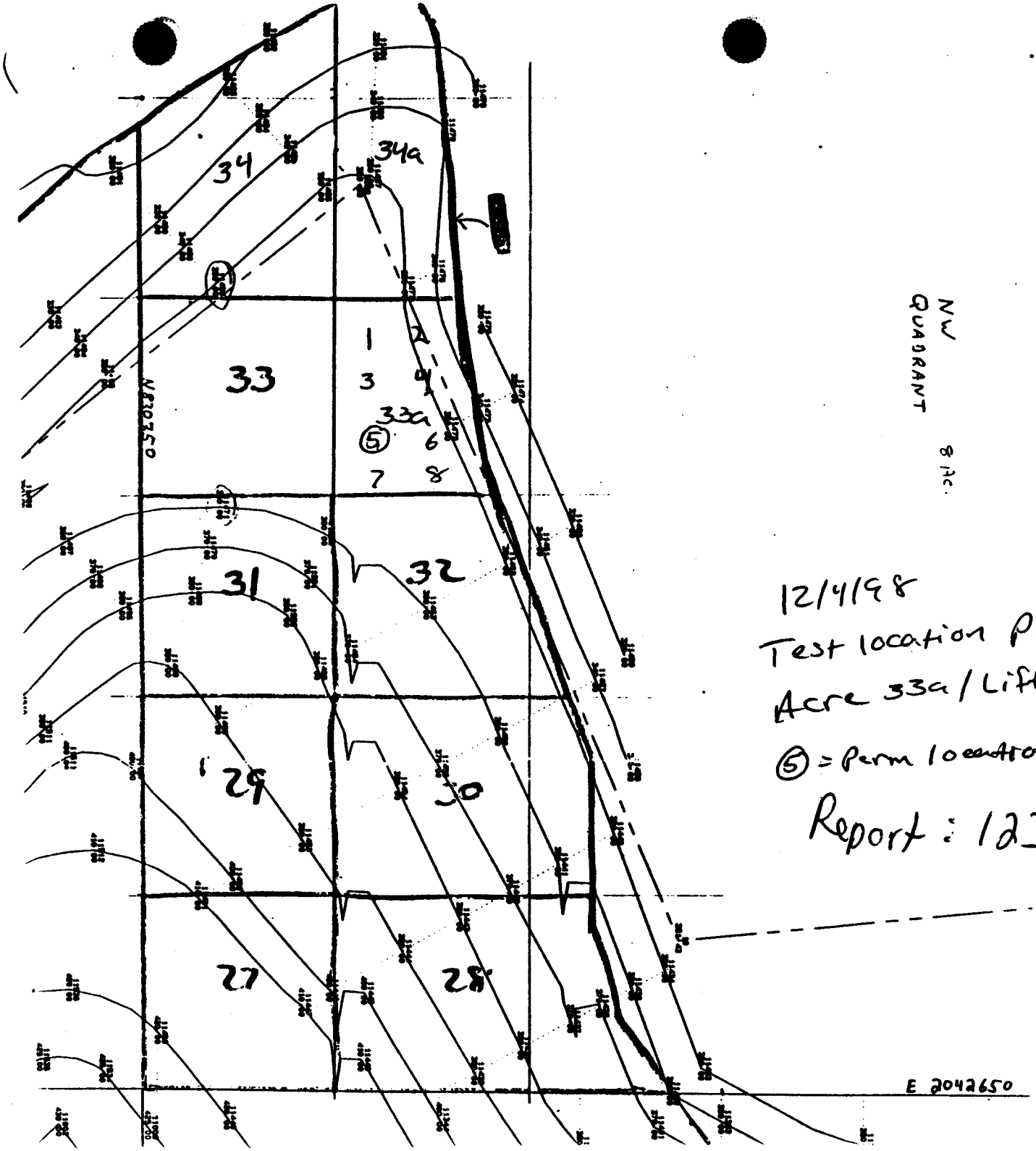
Sincerely,
VAN DER HORST Geotechnical Engineering, P.A.

R. 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.

12/4/98

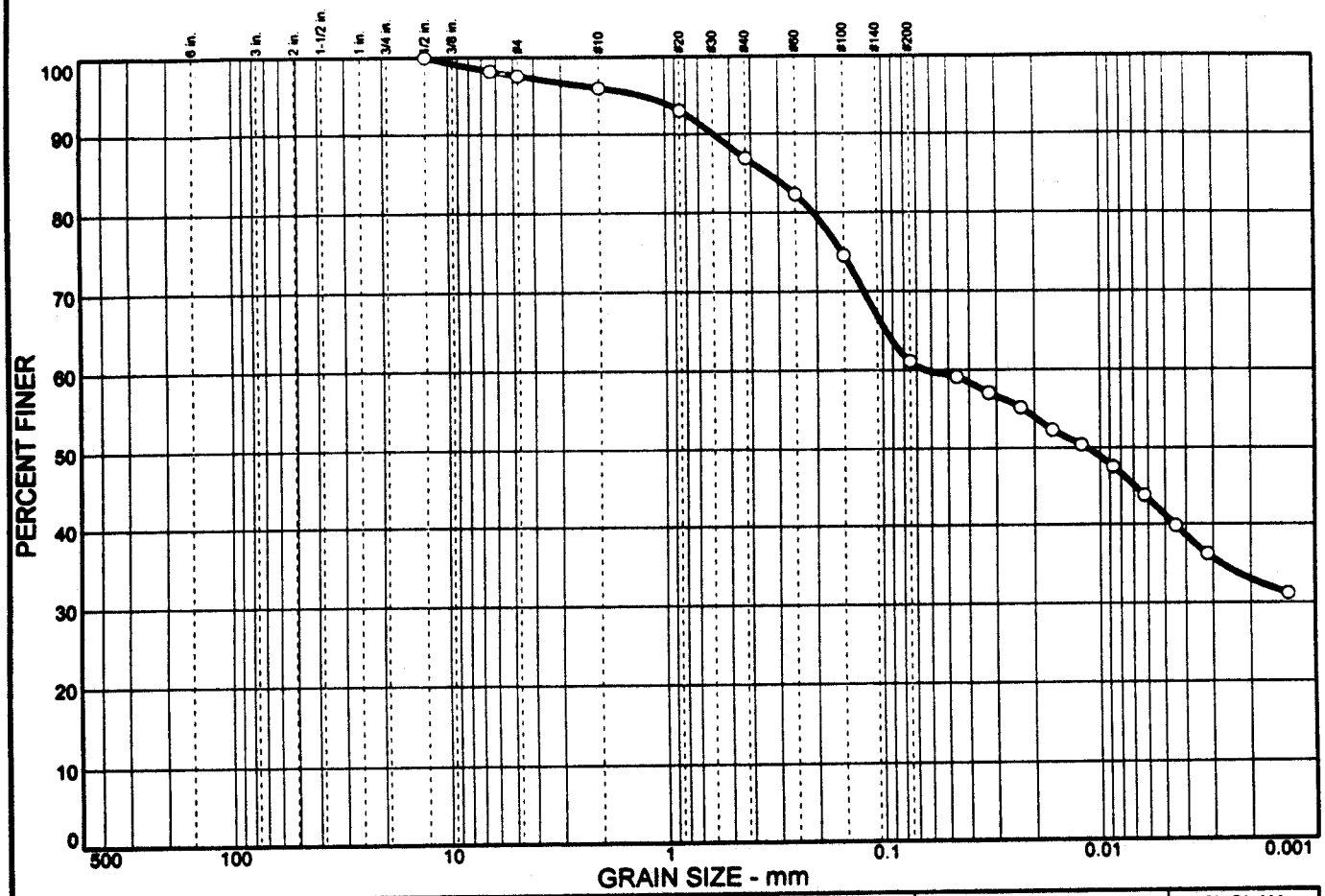
Test location Plan

Acre 33a / Lift 1

5 = Perm location

Report : 123

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.4	36.5	20.0	41.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	98.2		
#4	97.6		
#10	96.0		
#20	93.0		
#40	86.9		
#60	82.3		
#100	74.5		
#200	61.1		

* (no specification provided)

Soil Description

Rougemount Borrow Source - Sandy lean clay

Atterberg Limits

PL= 23 LL= 40 PI= 17

Coefficients

D_{85}= 0.336 D_{60}= 0.0640 D_{50}= 0.0115
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-251, Acre 33A, Lift 1

Sample No.: DL-251 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Acre 33A, 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: 12/17/98
Report No.: P-215

Project No.: VNC-98-029
Sample No.: DL-251

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.9E-008	cm/sec
% Moisture	23.5	%
Dry Density	97.7	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 12/04/98
Location: Acre 33a, Lift 1

Specimen Data

Length (in):	3.047
Diameter (in.):	2.807
Area (sq. in.):	6.199
Volume (cu. in.):	18.89
Wet Weight (grams):	598.4
Dry Weight (grams):	484.3
Dry Density (pcf):	97.7

Wet Weight	249.21
Dry Weight	208.86
Tare weight	37.52
% Moisture	23.5

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
960	91.38	2.05	1.90	0.93	1.98	2.88E-008
450	91.38	0.95	0.95	1.00	0.95	2.95E-008
995	91.38	2.10	1.90	0.90	2.00	2.81E-008
365	91.38	0.70	0.85	1.21	0.78	2.97E-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) **2.9E-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: 12/17/98
Report No.: 125

Acre 34 Lift 1

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	99.4	23.9	95.3 96.7	
2	See Test Location Plan	100.3	24.3	97.6	
3	See Test Location Plan	98.0	26.4	95.3	
4	See Test Location Plan	99.7	25.7	97.0	
5	See Test Location Plan	98.3	25.5	95.6	
6	See Test Location Plan	98.6	24.9	95.9	
7	See Test Location Plan	98.7	24.0	96.0	Perm/Sample (DL-253)
8	See Test Location Plan	99.2	24.6	96.5	
9	See Test Location Plan	97.8	25.2	95.6	
10	See Test Location Plan	100.3	24.3	97.6	
11	See Test Location Plan	98.3	25.7	95.6	
12	See Test Location Plan	98.7	25.2	96.0	
13	See Test Location Plan	98.2	25.7	95.5	
14	See Test Location Plan	98.5	25.6	95.8	
15	See Test Location Plan	97.7	25.1	95.0	
16	See Test Location Plan	99.3	24.2	96.6	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	4.2x10(-8)
Dry Density (pcf)	99.3
Moisture Content (%)	23.8

Atterberg Limits (ASTM D4318)

PL	18
LL	39
PI	21
USCS Classification	CL

Grain-size Analysis (ASTM D422)

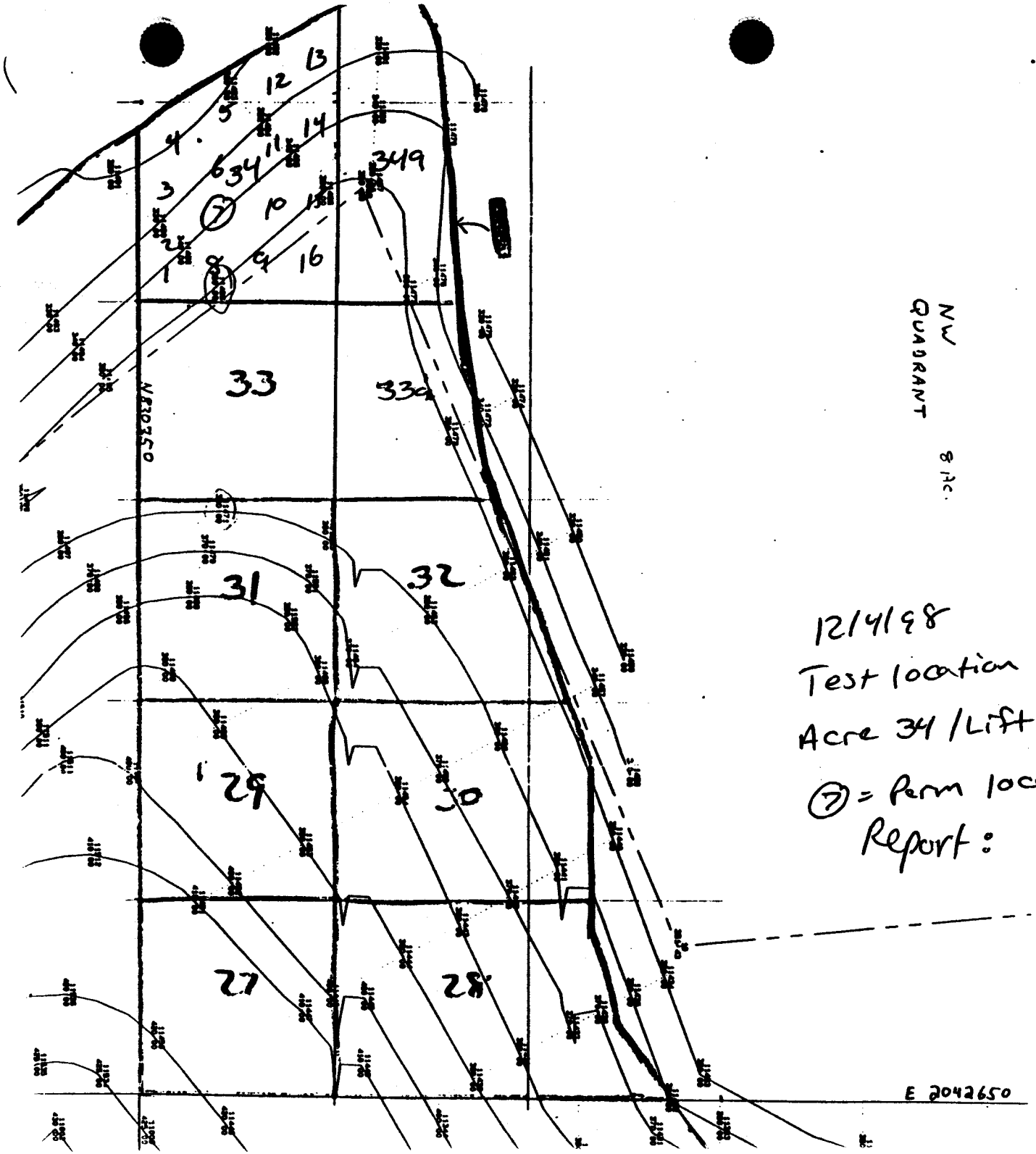
%Gravel	1.5
%Sand	42.7
%Silt	15.5
%Clay	40.3

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.

12/4/98

Test location Plan

Acre 34 / Lift 1

⑦ = Perm location

Report: 125

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/17/98
Report No.: P-217

Project No.: VNC-98-029
Sample No.: DL-253

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.2E-008	cm/sec
% Moisture	23.8	%
Dry Density	99.3	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 12/04/98
Location: Acre 34, Lift 1

Specimen Data

Length (in):	3.497
Diameter (in.):	2.802
Area (sq. in.):	6.177
Volume (cu. in.):	21.60
Wet Weight (grams):	697.4
Dry Weight (grams):	563.2
Dry Density (pcf):	99.3

Wet Weight	240.98
Dry Weight	201.85
Tare weight	37.69
% Moisture	23.8

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
300	105.23	1.00	0.90	0.90	0.95	4.43E-008
960	105.23	3.10	2.65	0.85	2.88	4.19E-008
450	105.23	1.35	1.30	0.96	1.33	4.12E-008
995	105.23	3.00	2.75	0.92	2.88	4.04E-008

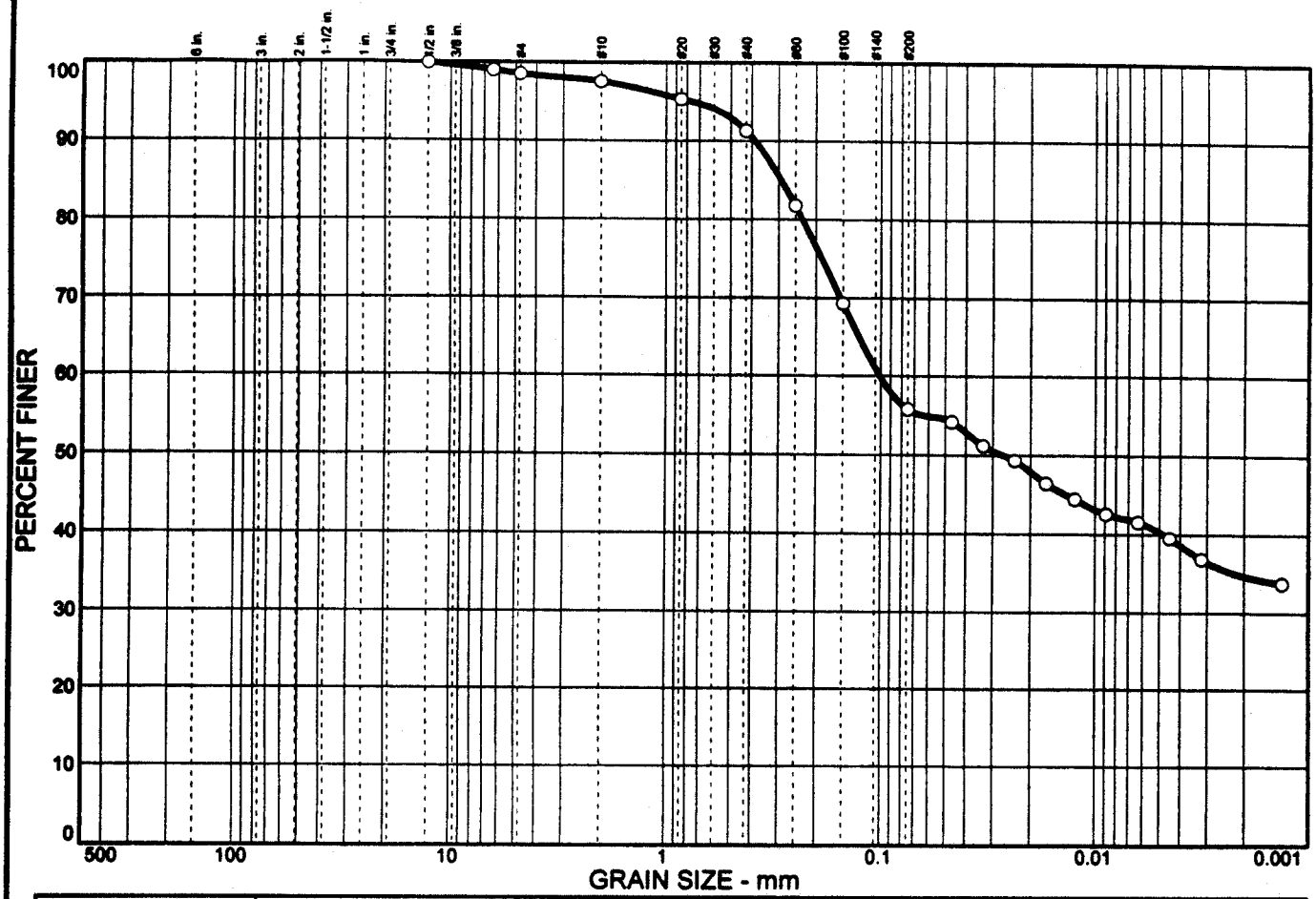
x

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) **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	1.5	42.7	15.5	40.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	99.0		
#4	98.5		
#10	97.6		
#20	95.3		
#40	91.3		
#60	81.8		
#100	69.3		
#200	55.8		

* (no specification provided)

Soil Description

Rougemount Borrow Source - Sandy lean clay

Atterberg Limits

PL= 18 LL= 39 PI= 21

Coefficients

D_{85}= 0.290 D_{60}= 0.101 D_{50}= 0.0269
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-253, Acre 34, Lift 1

Sample No.: DL-253 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Acre 34, Lift 1 **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.: 127

Acre 34a Lift 1

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	98.2	25.8	95.5	
2	See Test Location Plan	97.9	24.2	95.2	
3	See Test Location Plan	97.7	26.4	95.0	
4	See Test Location Plan	98.3	24.2	95.8	Perm/Sample (DL-255)
5	See Test Location Plan	100.3	23.8	97.6	
6	See Test Location Plan	101.6	24.1	98.8	
7	See Test Location Plan	99.8	24.0	97.1	
8	See Test Location Plan	98.7	24.3	96.0	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	3.9x10(-8)
Dry Density (pcf)	99.9
Moisture Content (%)	23.3

Atterberg Limits (ASTM D4318)

PL	19
LL	45
PI	26
USCS Classification	CL

Grain-size Analysis (ASTM D422)

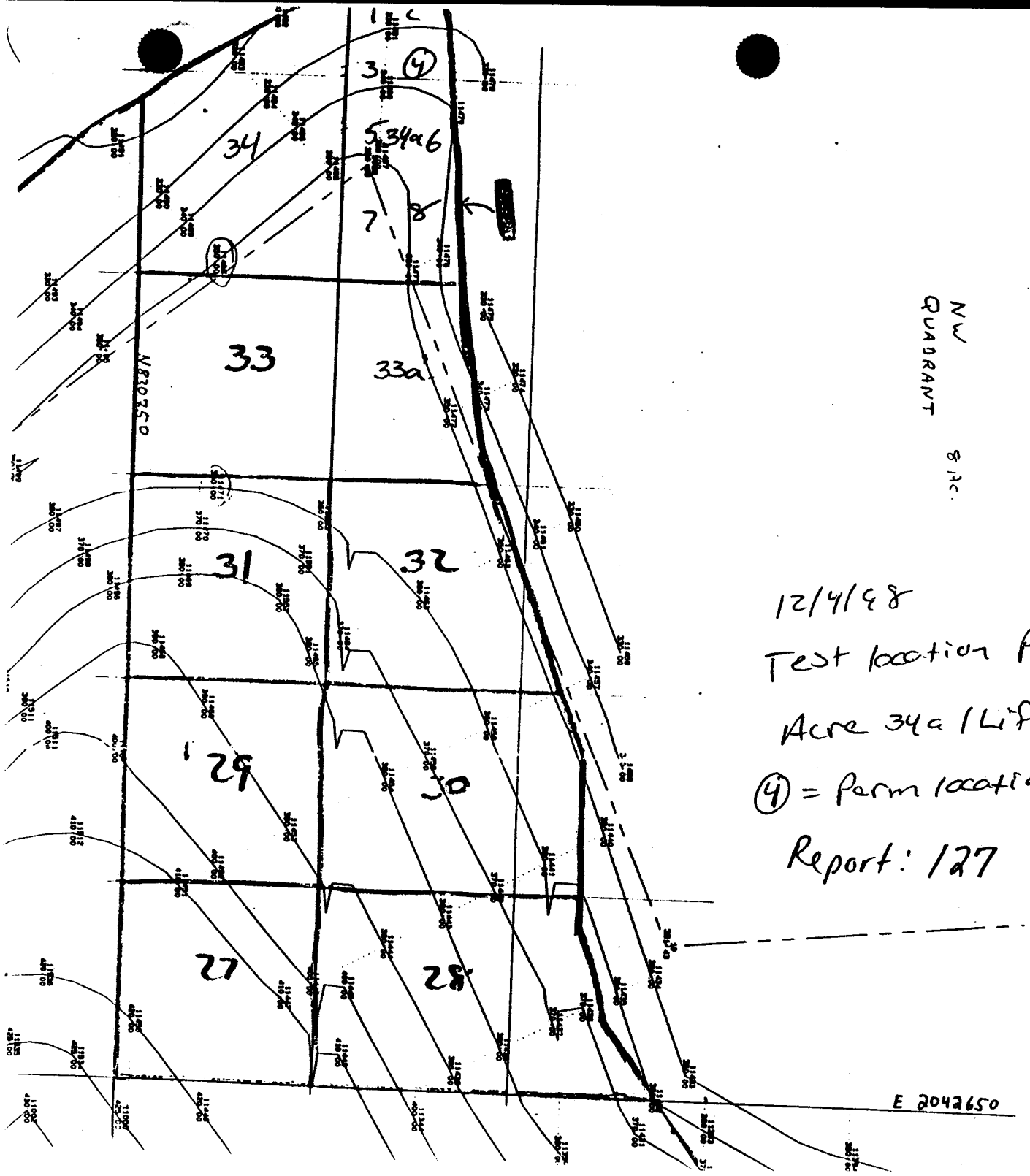
%Gravel	2.7
%Sand	46.5
%Silt	13.8
%Clay	37.0

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



NW QUADRANT

8 12C

12/4/98

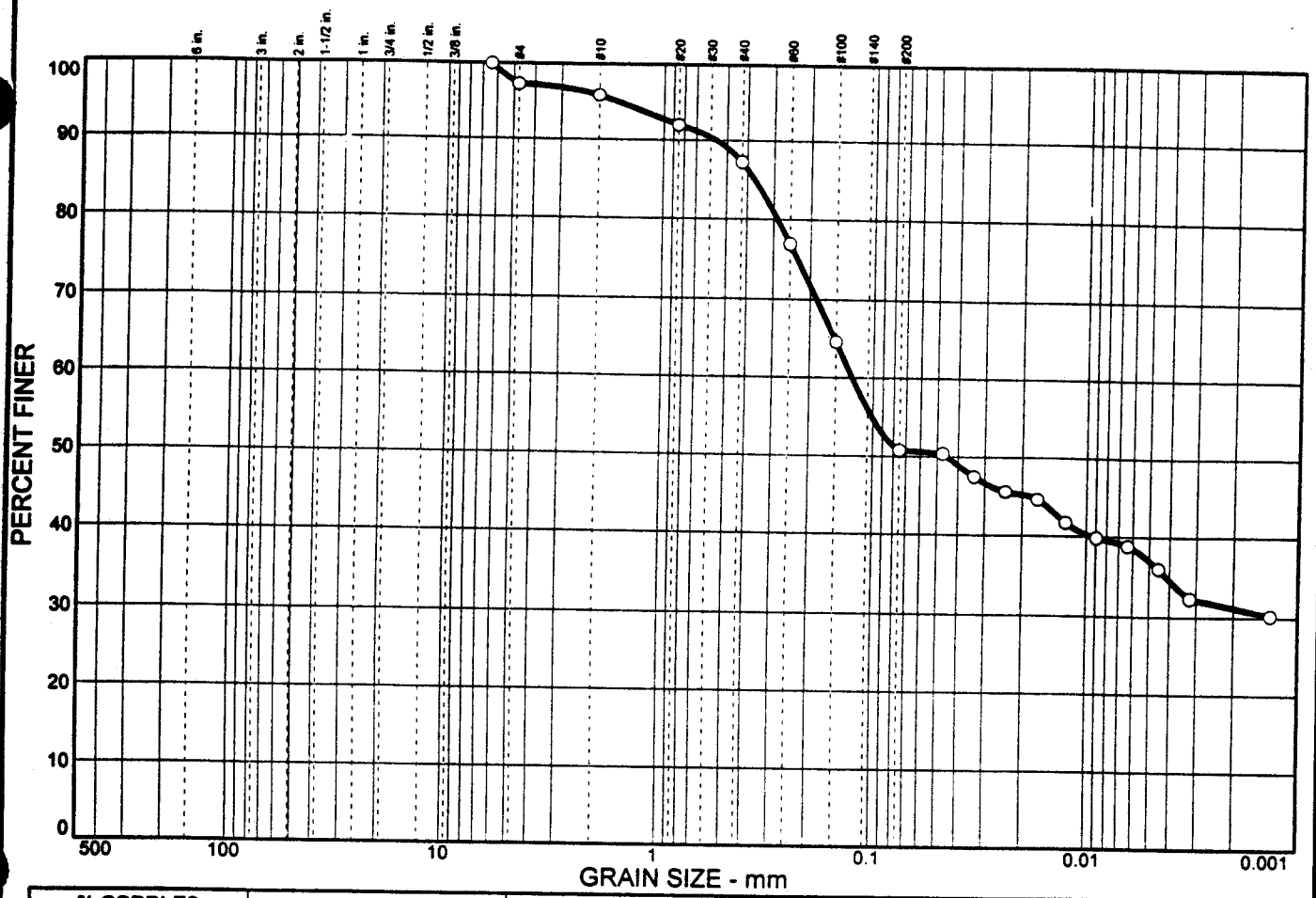
Test location Plan

Acre 34a / Lift 1

4 = Perm location

Report: 127

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.7	46.5	13.8	37.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	97.3		
#10	95.9		
#20	92.0		
#40	87.2		
#60	76.9		
#100	64.6		
#200	50.8		

* (no specification provided)

Soil Description

Rougemount Borrow Source - Sandy lean clay

Atterberg Limits

PL= 19 LL= 45 PI= 26

Coefficients

D_{85}= 0.369 D_{60}= 0.125 D_{50}= 0.0451
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-255, Acre 34A, Lift 1

Sample No.: DL-255 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Acre 34A, 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: 01/05/99
Report No.: P-193

Project No.: VNC-98-029
Sample No.: DL-255

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.9E-008	cm/sec
% Moisture	23.3	%
Dry Density	99.9	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/04/98
Location: Acre 34a, Lift 1

Specimen Data

Length (in):	3.377
Diameter (in.):	2.863
Area (sq. in.):	6.449
Volume (cu. in.):	21.78
Wet Weight (grams):	704.7
Dry Weight (grams):	571.3
Dry Density (pcf):	99.9

Wet Weight	152.91
Dry Weight	128.17
Tare weight	22.20
% Moisture	23.3

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
150	138.46	0.65	0.55	0.85	0.60	3.93E-008
139	138.46	0.55	0.60	1.09	0.58	4.07E-008
576	138.46	2.15	1.85	0.86	2.00	3.41E-008
521	138.46	2.25	2.00	0.89	2.13	4.01E-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 Robert R 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: 11/19/98
Report No.: 054

Acre 35 Lift 1

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	99.1	25.4	98.6	
2	See Test Location Plan	95.6	27.4	95.1	
3	See Test Location Plan	98.1	23.0	97.6	
4	See Test Location Plan	100.5	21.7	100.0	
5	See Test Location Plan	96.3	23.8	95.8	
6	See Test Location Plan	99.4	22.6	98.9	
7	See Test Location Plan	99.6	21.0	99.1	
8	See Test Location Plan	96.7	22.2	96.2	
9	See Test Location Plan	99.9	21.2	99.4	
10	See Test Location Plan	104.9	21.9	100+	
11	See Test Location Plan	98.8	25.4	98.3	Tube sample (DL-153)
12	See Test Location Plan	98.4	24.9	97.9	
13	See Test Location Plan	97.8	23.1	97.3	
14	See Test Location Plan	97.5	24.1	97.0	
15	See Test Location Plan	100.2	21.8	99.7	
16	See Test Location Plan	96.9	23.2	96.4	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	8.6 x 10(-8)
Dry Density (pcf)	100.5
Moisture Content (%)	23.1

Atterberg Limits (ASTM D4318)

PL	29
LL	68
PI	39

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel	0.2
%Sand	24.4
%Silt	23.2
%Clay	52.2

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

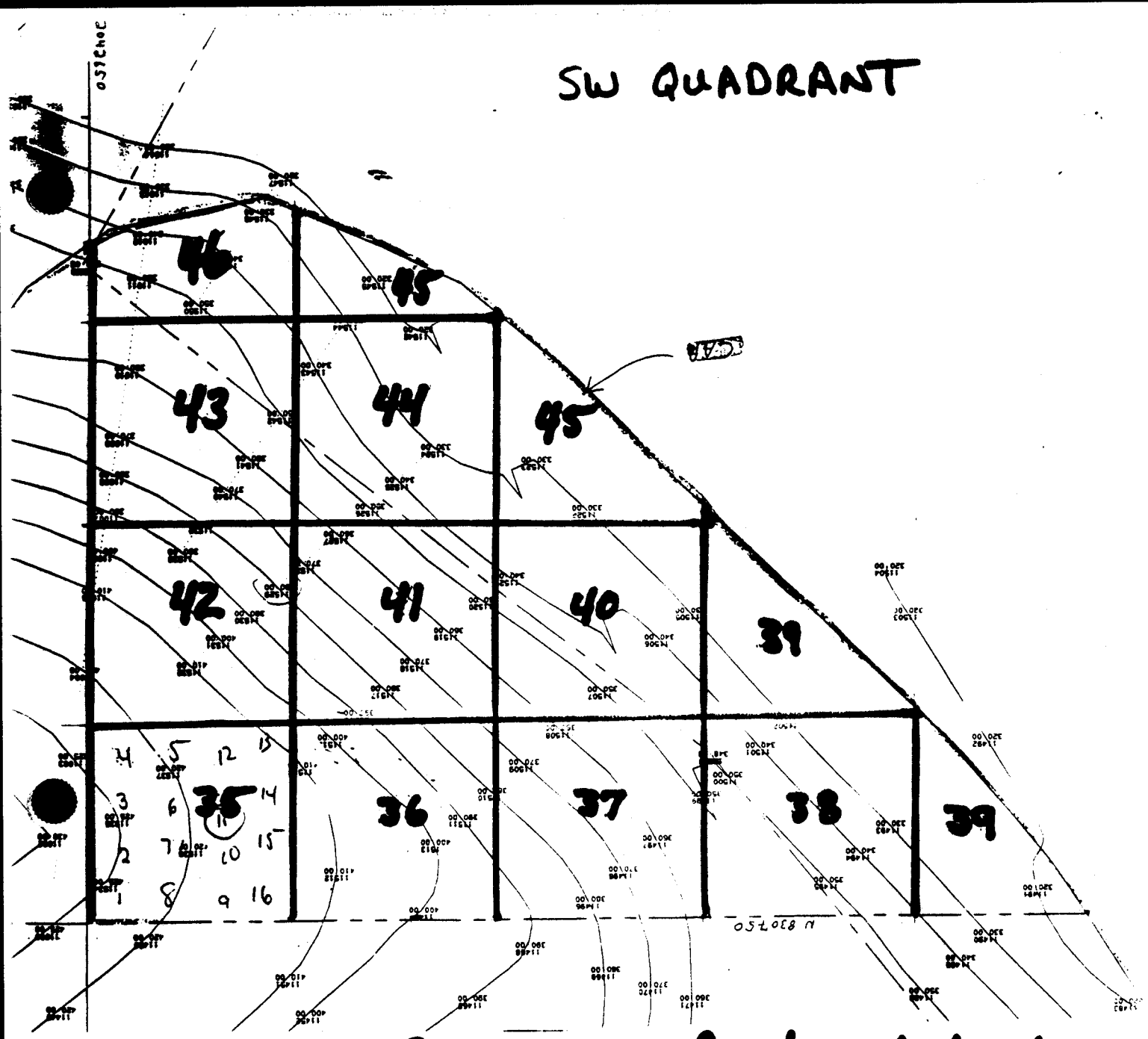
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

SW QUADRANT



(11) - Indicates Perm/Sample Location

Area 35 Lift 1

Report : 054

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/19/98
Report No.: P-122

Project No.: VNC-98-029
Sample No. DL-153

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.6E-08	cm/sec
% Moisture	23.1	%
Dry Density	100.5	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/07/98
Location: ACRE 35, LIFT 1

Specimen Data

Length (in):	3.620
Diameter (in.):	2.849
Area (sq. in.):	6.386
Volume (cu. in.):	23.12
Wet Weight (grams):	750.5
Dry Weight (grams):	609.8
Dry Density (pcf):	100.5

Moisture Content Test Data

Wet Weight	108.06
Dry Weight	91.93
Tare weight	22.05
% Moisture	23.1

Test Data

Confining Pressure 3.0 psi

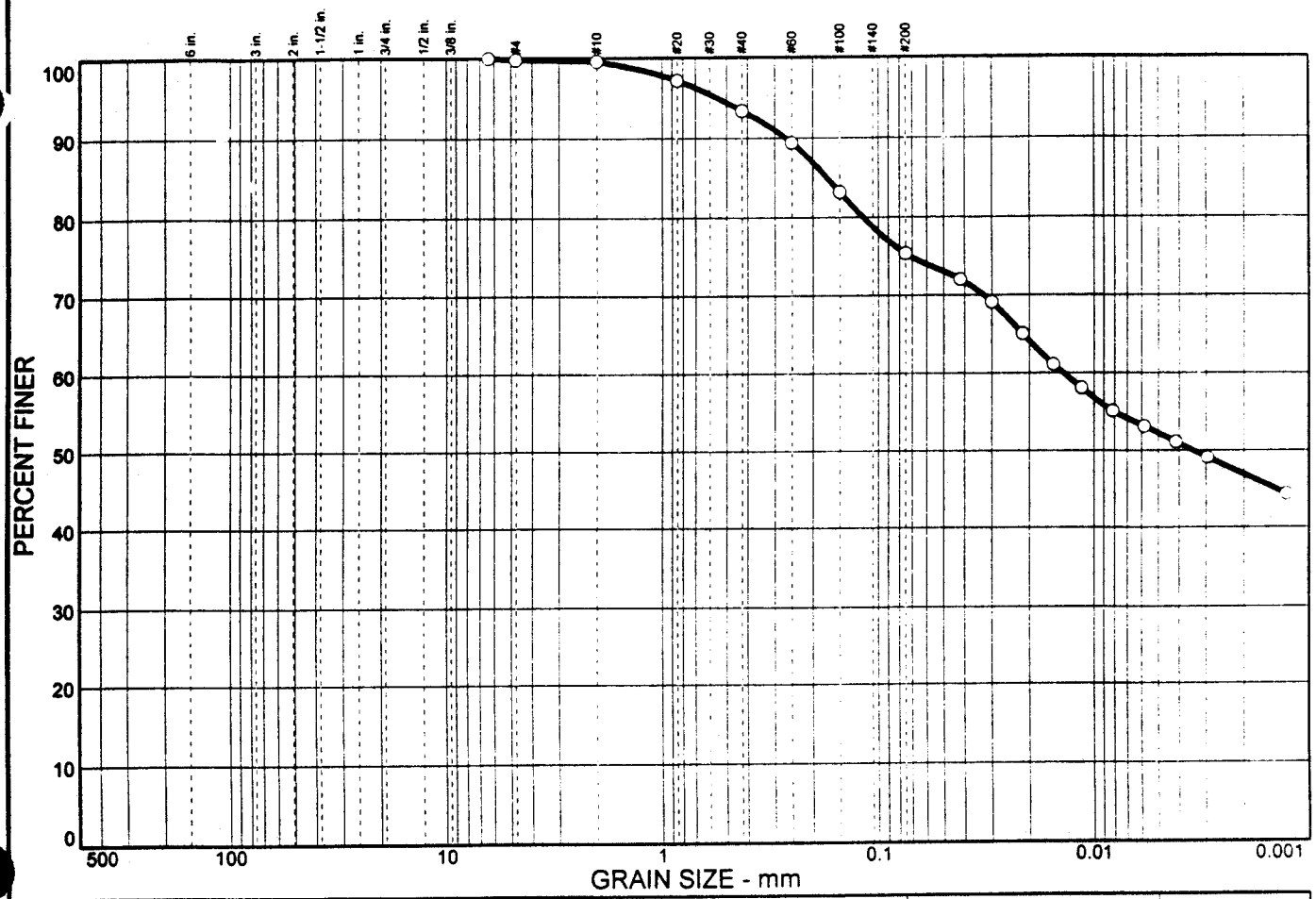
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
233	83.08	1.10	1.20	1.09	1.15	8.76E-08
788	83.08	3.80	3.90	1.03	3.85	8.67E-08
228	83.08	1.10	1.10	1.00	1.10	8.56E-08
876	83.08	4.20	4.20	1.00	4.20	8.51E-08

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) **8.6E-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	24.4	23.2	52.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.6		
#20	97.2		
#40	93.4		
#60	89.4		
#100	83.2		
#200	75.4		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 29 LL= 68 PI= 39

Coefficients

D_{85}= 0.172 D_{60}= 0.0139 D_{50}= 0.0034
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-153, Acre 35, Lift 1

Sample No.: DL-153 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 35, Lift 1 **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.: 042

Acre 36 Lift 1
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	25.1	95.3	
2	See Test Location Plan	97.6	22.6	97.1	
3	See Test Location Plan	96.3	23.6	95.8	
4	See Test Location Plan	103.3	21.8	100+	
5	See Test Location Plan	98.5	21.4	98.0	
6	See Test Location Plan	100.3	22.3	99.8	
7	See Test Location Plan	103.4	23.3	100+	
8	See Test Location Plan	96.8	27.4	96.3	
9	See Test Location Plan	100.3	25.5	99.8	Perm/Sample (DL-181)
10	See Test Location Plan	99.4	24.2	98.9	
11	See Test Location Plan	96.8	25.8	96.3	
12	See Test Location Plan	98.4	25.1	97.9	
13	See Test Location Plan	100.3	22.6	99.8	
14	See Test Location Plan	101.2	22.4	100+	
15	See Test Location Plan	99.8	22.8	99.3	
16	See Test Location Plan	97.3	23.2	96.8	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 2.9 x 10(-8)

Dry Density (pcf) 101.7

Moisture Content (%) 22.0

Atterberg Limits (ASTM D4318)

PL 25
LL 68
PI 43

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel 0.1
%Sand 33.9
%Silt 16.2
%Clay 49.8

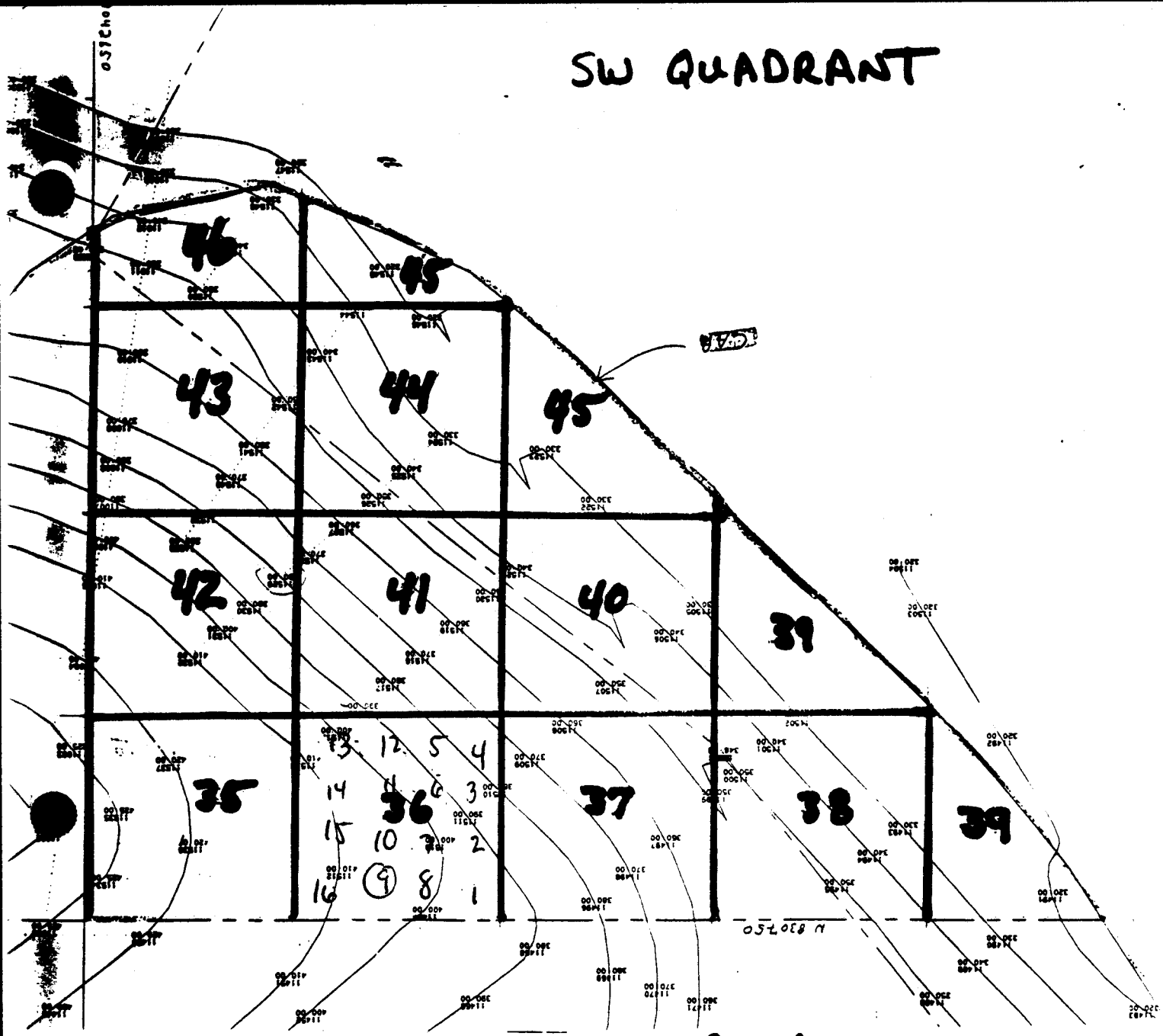
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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

SW QUADRANT



9 - Indicates Perm/Sample Location
Area 36 Lift 1
Report : 62

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	33.9	16.2	49.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.5		
#20	95.8		
#40	89.9		
#60	81.4		
#100	73.5		
#200	66.0		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 25 LL= 68 PI= 43

Coefficients

D_{85}= 0.309 D_{60}= 0.0219 D_{50}= 0.0051
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-181, Acre 36, Lift 1

Sample No.: DL-181 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 36, Lift 1 **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-130

Project No.: VNC-98-029
Sample No.: DL-181

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.9E-008	cm/sec
% Moisture	22.0	%
Dry Density	101.7	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/16/98
Location: ACRE 36, LIFT 1

Specimen Data

Length (in):	3.155
Diameter (in.):	2.870
Area (sq. in.):	6.480
Volume (cu. in.):	20.45
Wet Weight (grams):	666.1
Dry Weight (grams):	546.0
Dry Density (pcf):	101.7

Moisture Content Test Data

Wet Weight	164.79
Dry Weight	139.05
Tare weight	22.07
% Moisture	22.0

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
409	146.78	1.30	1.60	1.23	1.45	3.06E-008
342	146.78	1.10	1.10	1.00	1.10	2.77E-008
575	146.78	1.80	1.70	0.94	1.75	2.62E-008
332	146.78	1.15	1.15	1.00	1.15	2.99E-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) **2.9E-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: 01/05/99
Report No.: 129

Acre 37 Lift 1

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	20.0	99.4	
2	See Test Location Plan	103.7	20.3	100+	
3	See Test Location Plan	102.0	21.2	99.0	
4	See Test Location Plan	102.9	21.2	99.9	
5	See Test Location Plan	101.8	20.9	98.8	
6	See Test Location Plan	101.6	20.6	98.6	
7	See Test Location Plan	101.1	21.3	98.2	Perm/Sample (DL-257)
8	See Test Location Plan	100.0	22.2	97.1	
9	See Test Location Plan	100.8	21.6	97.9	
10	See Test Location Plan	103.0	19.8	100.0	
11	See Test Location Plan	102.6	19.7	99.6	
12	See Test Location Plan	104.1	19.9	100+	
13	See Test Location Plan	101.7	21.2	98.7	
14	See Test Location Plan	99.6	20.2	96.7	
15	See Test Location Plan	100.3	20.4	97.4	
16	See Test Location Plan	100.8	21.7	97.9	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	2.7x10(-8)
Dry Density (pcf)	99.4
Moisture Content (%)	22.8

Atterberg Limits (ASTM D4318)

PL	18
LL	40
PI	22
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	41.7
%Silt	17.3
%Clay	41.0

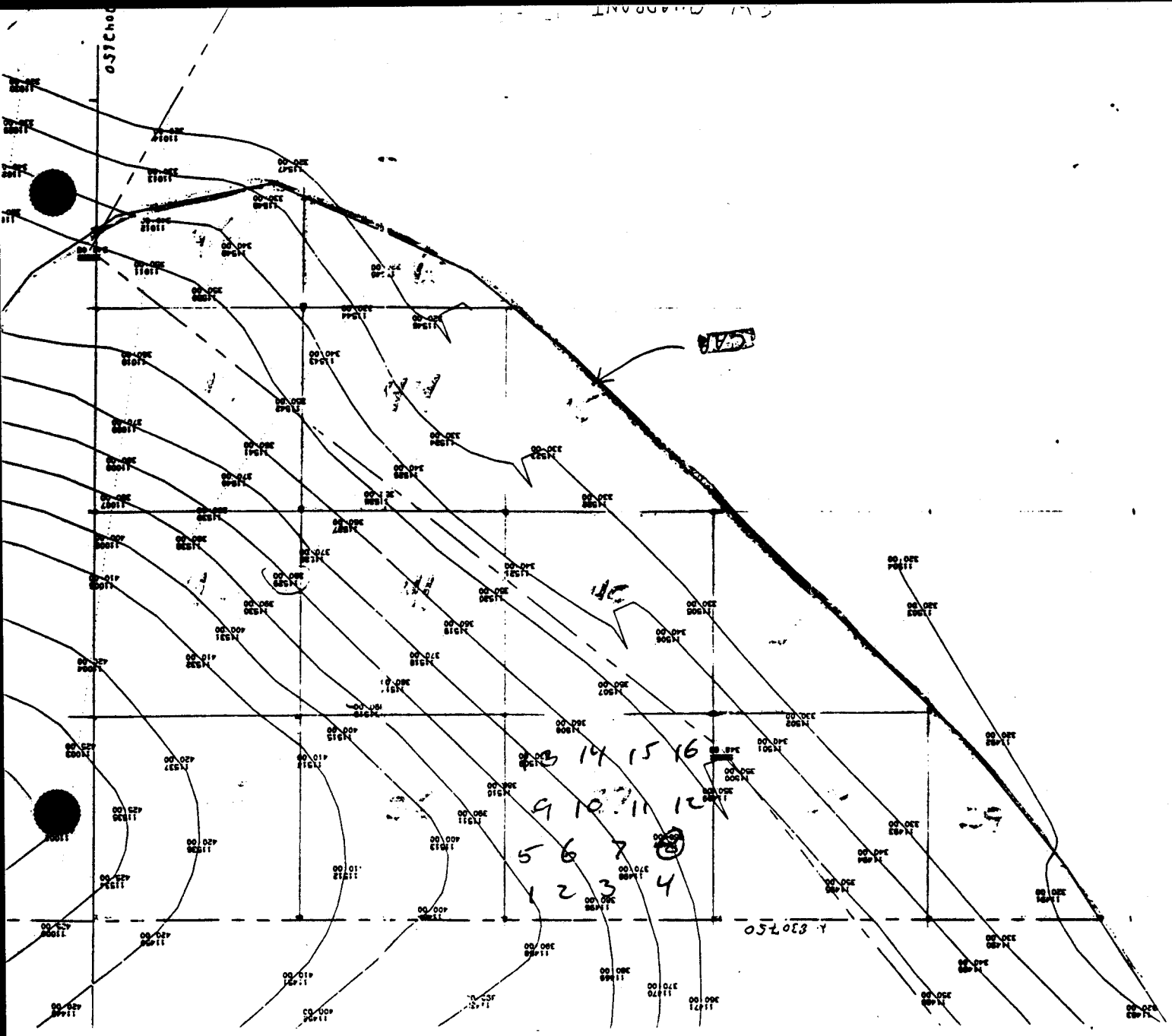
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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



12/4/98

Test location Plan

Acre 37 / Lift 1

⑧ = Perm location

Report: 129

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	41.7	17.3	41.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	94.8		
#40	87.7		
#60	79.2		
#100	70.9		
#200	58.3		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 18 LL= 40 PI= 22

Coefficients

D_{85}= 0.356 D_{60}= 0.0877 D_{50}= 0.0150
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-257, Acre 37, Lift 1

Sample No.: DL-257 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 37, 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: 01/05/99
Report No.: P-194

Project No.: VNC-98-029
Sample No.: DL-257

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.7E-008	cm/sec
% Moisture	22.8	%
Dry Density	99.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/04/98
Location: Acre 37, Lift 1

Specimen Data

Length (in):	3.581
Diameter (in.):	2.849
Area (sq. in.):	6.386
Volume (cu. in.):	22.87
Wet Weight (grams):	732.3
Dry Weight (grams):	596.3
Dry Density (pcf):	99.4

Wet Weight	123.14
Dry Weight	104.34
Tare weight	21.88
% Moisture	22.8

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
330	138.46	0.70	0.90	1.29	0.80	2.55E-008
603	138.46	1.60	1.80	1.13	1.70	2.97E-008
434	138.46	1.10	1.20	1.09	1.15	2.79E-008
369	138.46	0.80	0.90	1.13	0.85	2.43E-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
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: 01/05/99
Report No.: 135

Acre 38 Lift 1

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	101.3	20.0	98.3	
2	See Test Location Plan	101.0	20.6	98.1	
3	See Test Location Plan	98.7	25.2	95.8	
4	See Test Location Plan	99.7	22.6	96.8	
5	See Test Location Plan	98.6	21.3	95.7	
6	See Test Location Plan	99.5	23.0	96.6	
7	See Test Location Plan	100.8	22.6	97.9	
8	See Test Location Plan	100.2	22.8	97.3	
9	See Test Location Plan	98.9	23.3	96.0	Perm/Sample (DL-263)
10	See Test Location Plan	101.6	22.6	98.6	
11	See Test Location Plan	102.6	20.7	99.6	
12	See Test Location Plan	102.0	20.2	99.0	
13	See Test Location Plan	102.2	19.9	99.2	
14	See Test Location Plan	101.6	21.3	98.6	
15	See Test Location Plan	100.8	21.8	97.9	
16	See Test Location Plan	101.2	21.0	98.3	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	2.8x10(-8)
Dry Density (pcf)	98.5
Moisture Content (%)	24.4

Atterberg Limits (ASTM D4318)

PL	19
LL	55
PI	36

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	47.5
%Silt	12.7
%Clay	39.8

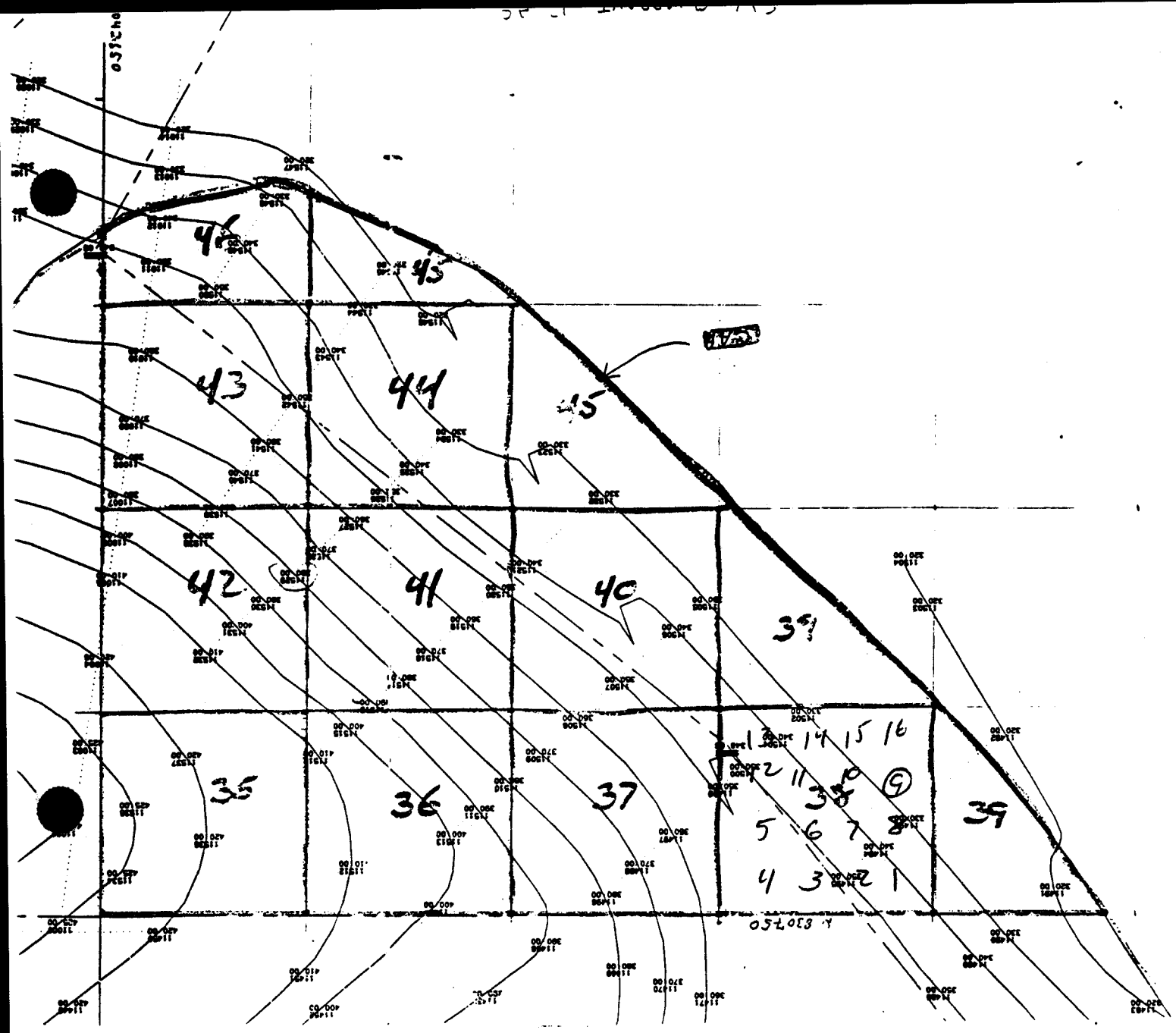
USCS Classification CH

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

Robert L. Mashewske

Robert L. Mashewske, P.E.

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



12/7/98

Test location Plan

Acre 38/Lift 1

⑨ = Perm location

Report: 135

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	47.5	12.7	39.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	95.8		
#40	87.5		
#60	76.9		
#100	64.3		
#200	52.5		

* (no specification provided)

Soil Description

On-site Borrow - Sandy fat clay

Atterberg Limits

PL= 19 LL= 55 PI= 36

Coefficients

D_{85}= 0.368 D_{60}= 0.125 D_{50}= 0.0282
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-263, Acre 38, Lift 1

Sample No.: DL-263 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 38, 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: 01/05/99
Report No.: P-198

Project No.: VNC-98-029
Sample No.: DL-263

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.8E-008	cm/sec
% Moisture	24.4	%
Dry Density	98.5	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/07/98
Location: Acre 38, Lift 1

Specimen Data

Length (in):	3.633
Diameter (in.):	2.857
Area (sq. in.):	6.422
Volume (cu. in.):	23.33
Wet Weight (grams):	750.0
Dry Weight (grams):	603.0
Dry Density (pcf):	98.5

Wet Weight	108.39
Dry Weight	91.49
Tare weight	22.15
% Moisture	24.4

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
586	138.46	1.55	1.60	1.03	1.58	2.86E-008
530	138.46	1.45	1.60	1.10	1.53	3.06E-008
365	138.46	0.80	0.85	1.06	0.83	2.40E-008
1140	138.46	3.00	3.30	1.10	3.15	2.94E-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) **2.8E-008** cm/sec

Respecfully submitted Robert 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: 12/17/98
Report No.: 120

Acre 39 Lift 1
Clay Source: Fogelman 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	25.8	100+	
2	See Test Location Plan	95.5	29.2	98.7	
3	See Test Location Plan	95.9	22.9	99.1	
4	See Test Location Plan	95.5	25.6	98.7	
5	See Test Location Plan	95.9	27.3	99.1	
6	See Test Location Plan	99.9	25.0	100+	Perm/Sample (DL-194)
7	See Test Location Plan	98.4	26.1	100+	
8	See Test Location Plan	96.4	24.7	99.6	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	1.7x10(-8)
Dry Density (pcf)	95.6
Moisture Content (%)	24.4

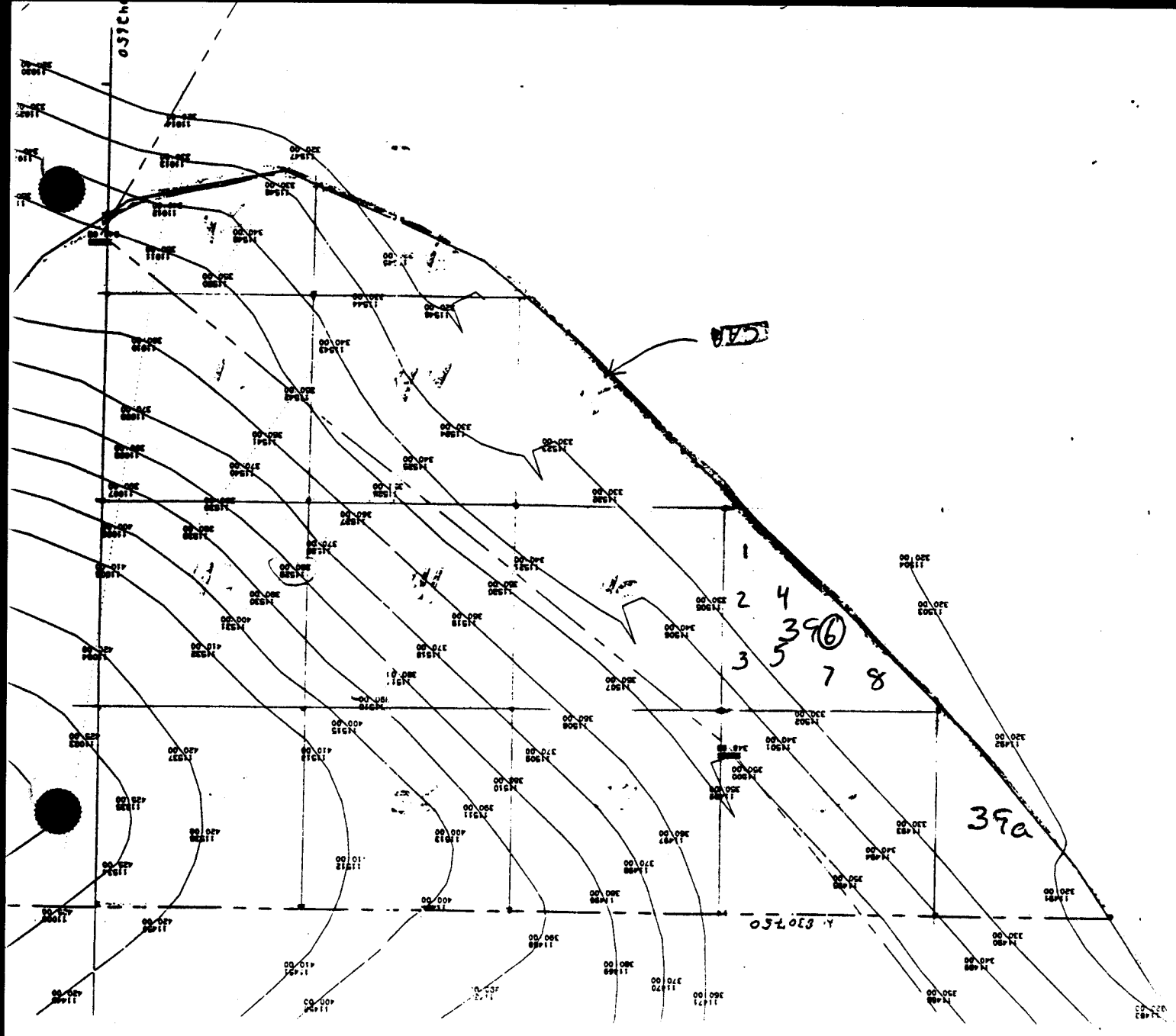
Atterberg Limits (ASTM D4318)		**Grain-size Analysis (ASTM D422)**	
PL	26	%Gravel	0.0
LL	85	%Sand	15.3
PI	59	%Silt	25.9
		%Clay	58.8
USCS Classification	CH		

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



11/19/98

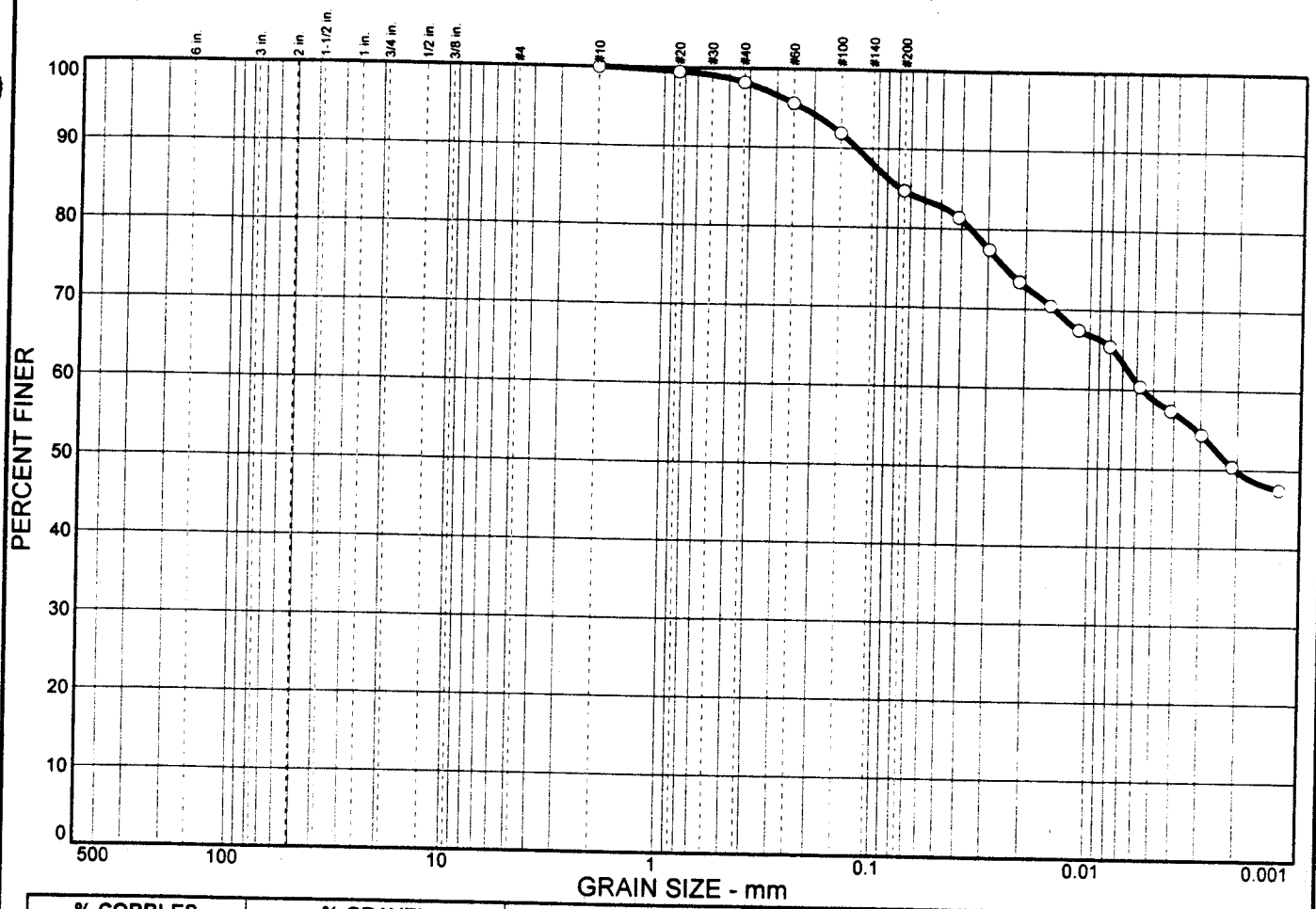
Test location Plan

Acre 39 / Lift 1

6 = Perm location

Report: 120

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	15.3	25.9	58.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.5		
#40	98.2		
#60	95.6		
#100	91.9		
#200	84.7		

* (no specification provided)

Soil Description

Fogelman - Fat clay with sand

Atterberg Limits

PL= 26 LL= 85 PI= 59

Coefficients

D_{85}= 0.0781 D_{60}= 0.0056 D_{50}= 0.0020
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-194, Fogleman - Acre 39, Lift 1

Sample No.: DL-194 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Foggelman borrow pit - Acre 39, Lift 1 **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-146

Project No.: VNC-98-029
Sample No.: DL-194

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.7E-008	cm/sec
% Moisture	24.4	%
Dry Density	95.6	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 11/19/98
Location: Acre 39, Lift 1

Specimen Data

Length (in):	3.252
Diameter (in.):	2.866
Area (sq. in.):	6.462
Volume (cu. in.):	21.02
Wet Weight (grams):	656.1
Dry Weight (grams):	527.4
Dry Density (pcf):	95.6

Moisture Content Test Data

Wet Weight	82.62
Dry Weight	70.72
Tare weight	21.94
% Moisture	24.4

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
312	138.46	1.00	1.20	1.20	1.10	3.33E-008
668	138.46	1.05	0.80	0.76	0.93	1.31E-008
245	138.46	0.35	0.30	0.86	0.33	1.25E-008
257	138.46	0.30	0.30	1.00	0.30	1.10E-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
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: 01/05/99
Report No.: 138

Acre 39a Lift 1
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	98.9	26.1	96.0	
2	See Test Location Plan	98.4	24.6	95.5	
3	See Test Location Plan	99.3	25.8	96.4	
4	See Test Location Plan	98.5	26.9	95.6	Perm/Sample (DL-266)
5	See Test Location Plan	100.2	21.9	97.3	
6	See Test Location Plan	101.6	22.0	98.6	
7	See Test Location Plan	99.6	22.9	96.7	
8	See Test Location Plan	100.4	21.6	97.5	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 5.7x10(-9)

Dry Density (pcf) 100.4

Moisture Content (%) 25.2

Atterberg Limits (ASTM D4318)

PL 18
LL 57
PI 39

USCS Classification CH

Grain-size Analysis (ASTM D422)

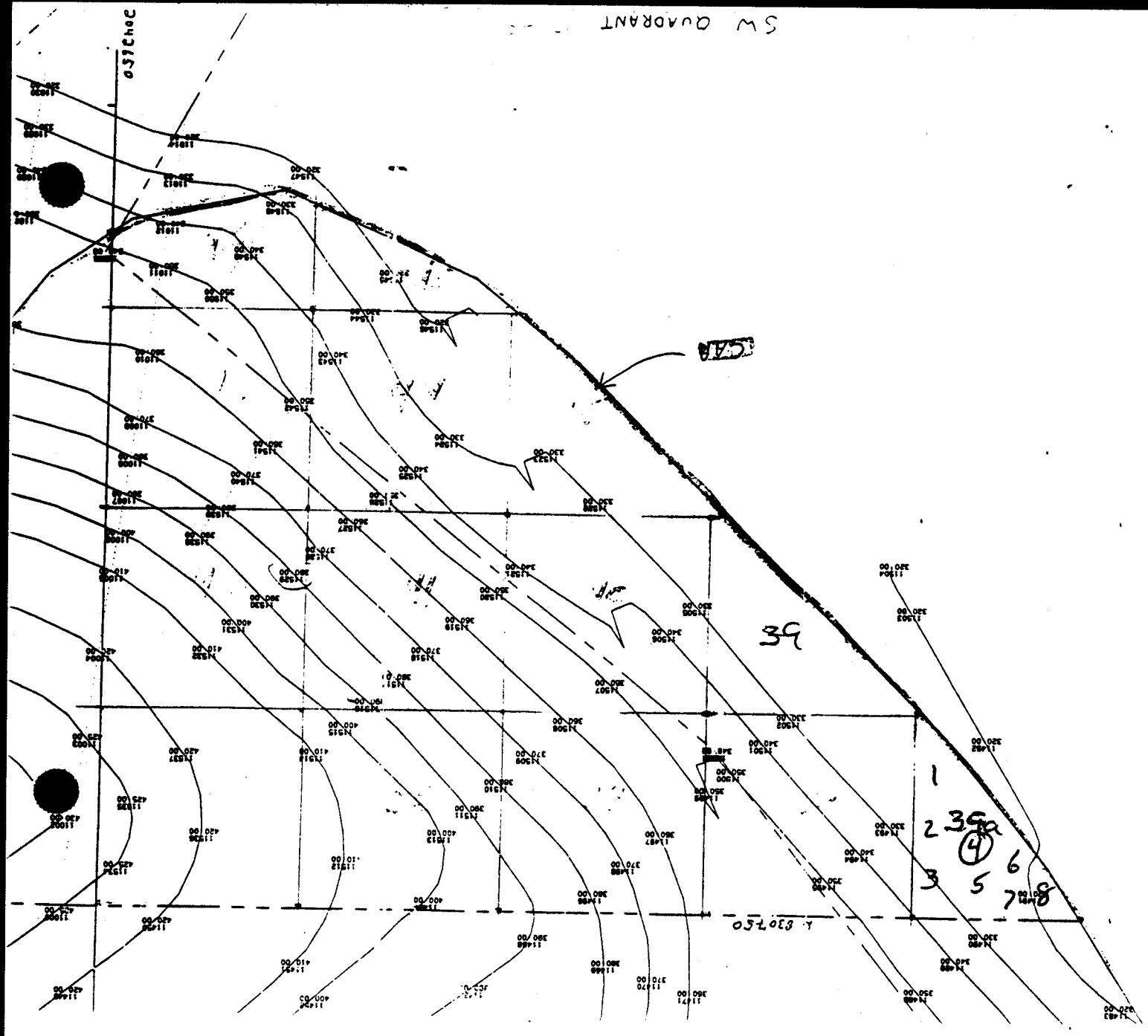
%Gravel 0.1
%Sand 30.0
%Silt 24.4
%Clay 45.5

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

Robert L. Mashewske

Robert L. Mashewske, P.E.

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



12/7/98

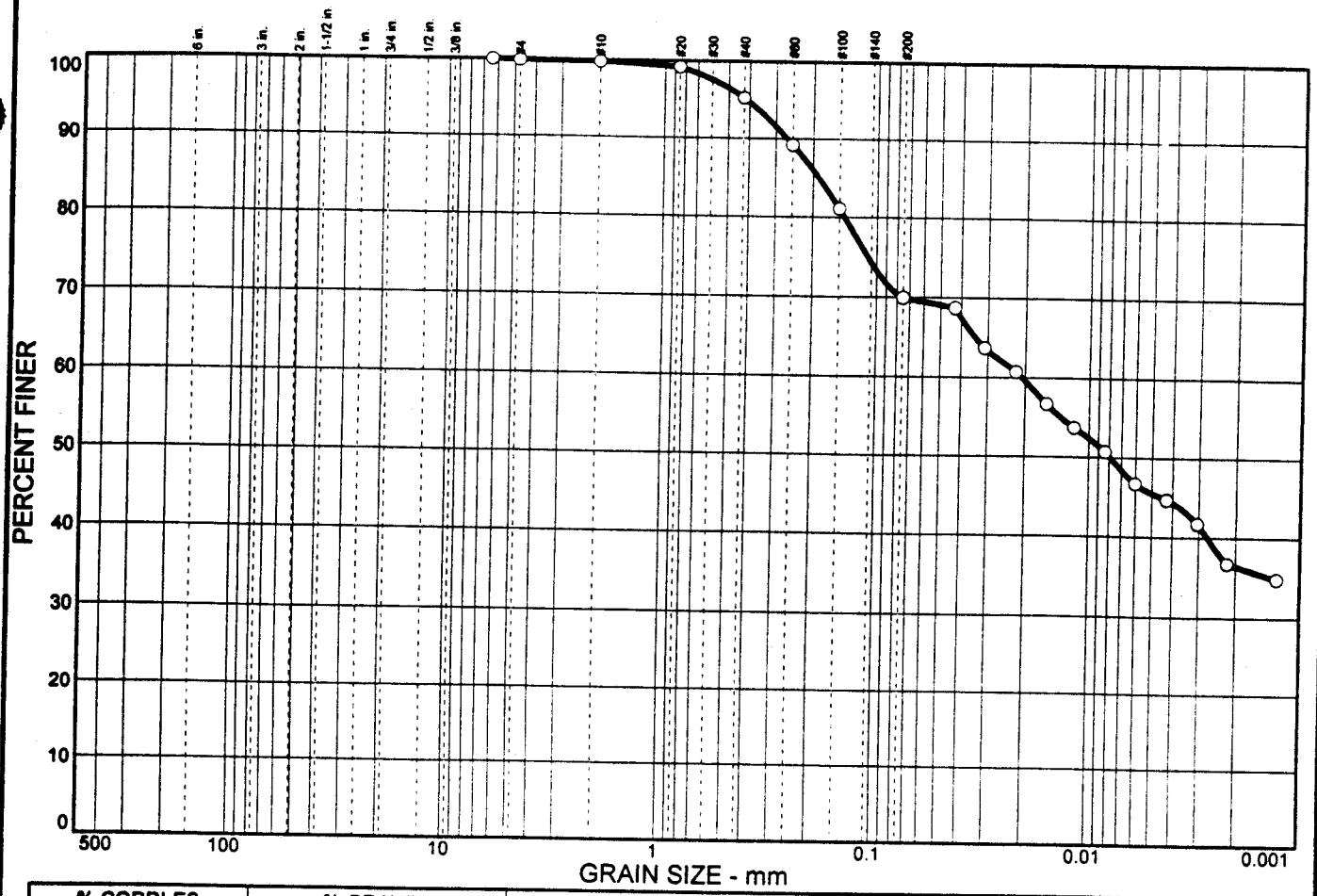
Test location Plan

Acre 39a / Lift 1

(4) = Perm location

Report: 138

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	30.0	24.4	45.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.8		
#20	99.2		
#40	95.3		
#60	89.2		
#100	81.1		
#200	69.9		

* (no specification provided)

Soil Description

On-site Borrow - Sandy fat clay

Atterberg Limits

PL= 18 LL= 57 PI= 39

Coefficients

D_{85}= 0.188 D_{60}= 0.0207 D_{50}= 0.0079
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-266, Acre 39A, Lift 1

Sample No.: DL-266 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 39A, 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: 01/05/99
Report No.: P-221

Project No.: VNC-98-029
Sample No.: DL-266

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.7E-009	cm/sec
% Moisture	25.2	%
Dry Density	100.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/07/98
Location: Acre 38a, Lift 1

Specimen Data

Length (in):	3.517
Diameter (in.):	2.854
Area (sq. in.):	6.408
Volume (cu. in.):	22.54
Wet Weight (grams):	743.5
Dry Weight (grams):	593.9
Dry Density (pcf):	100.4

Wet Weight	106.77
Dry Weight	89.74
Tare weight	22.13
% Moisture	25.2

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
830	132.92	0.45	0.40	0.89	0.43	5.50E-009
1253	132.92	0.65	0.60	0.92	0.63	5.35E-009
877	132.92	0.50	0.50	1.00	0.50	6.12E-009
911	132.92	0.50	0.50	1.00	0.50	5.89E-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) **5.7E-009** 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

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.: 140

Acre 40 Lift 1

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	104.6	20.2	100+	
2	See Test Location Plan	102.7	20.6	99.7	
3	See Test Location Plan	100.9	24.8	98.0	
4	See Test Location Plan	101.3	21.2	98.4	
5	See Test Location Plan	98.3	20.3	95.5	
6	See Test Location Plan	99.9	22.1	97.0	
7	See Test Location Plan	97.9	22.5	95.0	Perm/Sample (DL-268)
8	See Test Location Plan	100.2	21.6	97.3	
9	See Test Location Plan	99.0	20.7	96.1	
10	See Test Location Plan	100.7	20.9	97.8	
11	See Test Location Plan	101.1	21.0	98.2	
12	See Test Location Plan	102.0	20.1	99.0	
13	See Test Location Plan	100.6	21.6	97.7	
14	See Test Location Plan	100.1	21.4	97.2	
15	See Test Location Plan	99.7	22.3	96.8	
16	See Test Location Plan	101.6	21.0	98.6	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 5.9x10(-9)

Dry Density (pcf) 104.3

Moisture Content (%) 23.7

Atterberg Limits (ASTM D4318)

PL 16
LL 40
PI 24

USCS Classification CL

Grain-size Analysis (ASTM D422)

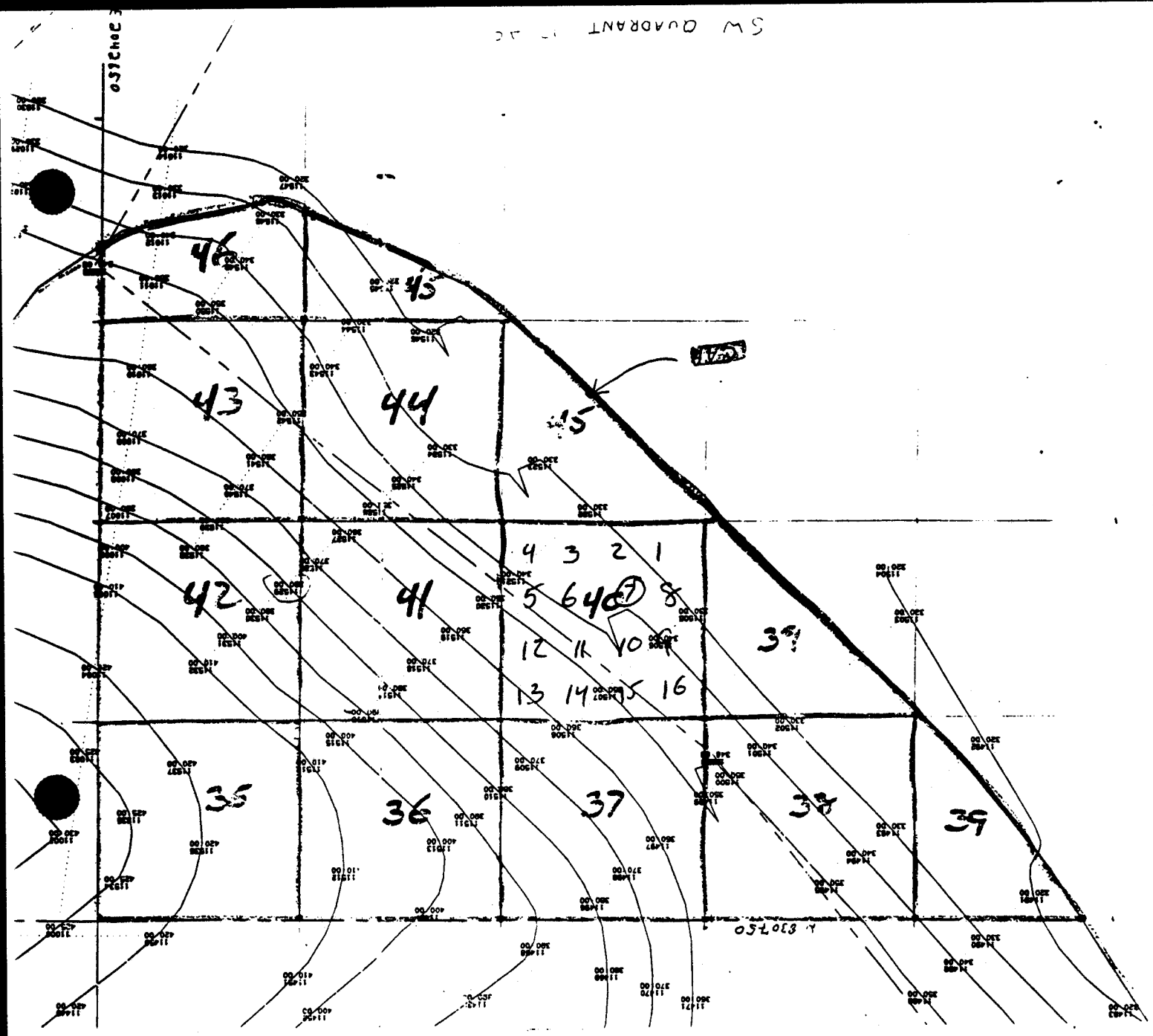
%Gravel 0.1
%Sand 62.7
%Silt 19.7
%Clay 37.5

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



12/7/98

Test location Plan

Acre 40 / Lift 1

⑦ = Perm location

Report: 140

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/15/98
Report No.: P-209

Project No.: VNC-98-029
Sample No.: DL-268

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.9E-009	cm/sec
% Moisture	23.7	%
Dry Density	104.3	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 12/07/98
Location: Acre 40, Lift 1

Specimen Data

Length (in):	3.593
Diameter (in.):	2.864
Area (sq. in.):	6.453
Volume (cu. in.):	23.19
Wet Weight (grams):	785.2
Dry Weight (grams):	634.9
Dry Density (pcf):	104.3

Wet Weight	107.79
Dry Weight	91.35
Tare weight	21.92
% Moisture	23.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
785	138.46	0.45	0.50	1.11	0.48	6.33E-009
1287	138.46	0.80	0.70	0.88	0.75	6.09E-009
782	138.46	0.35	0.40	1.14	0.38	5.01E-009
1003	138.46	0.60	0.60	1.00	0.60	6.25E-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) **5.9E-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	0.1	42.7	19.7	37.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.7		
#20	95.6		
#40	87.1		
#60	77.5		
#100	67.6		
#200	57.2		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 16 LL= 40 PI= 24

Coefficients

D_{85}= 0.375 D_{60}= 0.0981 D_{50}= 0.0222
D_{30}= 0.0021 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-268, Acre 40, lift 1

Sample No.: DL-268 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 40, Lift 1 **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.: 132

Acre 41 Lift 1

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	21.8	100+	
2	See Test Location Plan	102.7	20.8	99.7	
3	See Test Location Plan	100.7	20.1	97.8	
4	See Test Location Plan	101.6	21.7	98.0 98.0	
5	See Test Location Plan	98.8	25.1	95.9	Perm/Sample (DL-260)
6	See Test Location Plan	99.8	23.6	96.9	
7	See Test Location Plan	102.9	20.2	99.9	
8	See Test Location Plan	102.8	19.9	99.8	
9	See Test Location Plan	102.1	20.1	99.1	
10	See Test Location Plan	101.3	21.5	98.4	
11	See Test Location Plan	101.6	20.9	98.6	
12	See Test Location Plan	99.8	22.9	96.9	
13	See Test Location Plan	100.5	21.8	97.6	
14	See Test Location Plan	100.0	22.3	97.1	
15	See Test Location Plan	103.1	20.0	100+	
16	See Test Location Plan	102.1	20.6	99.1	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	1.5x10(-8)
Dry Density (pcf)	103.8
Moisture Content (%)	21.7

Atterberg Limits (ASTM D4318)

PL	16
LL	45
PI	29

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	44.6
%Silt	21.3
%Clay	34.1

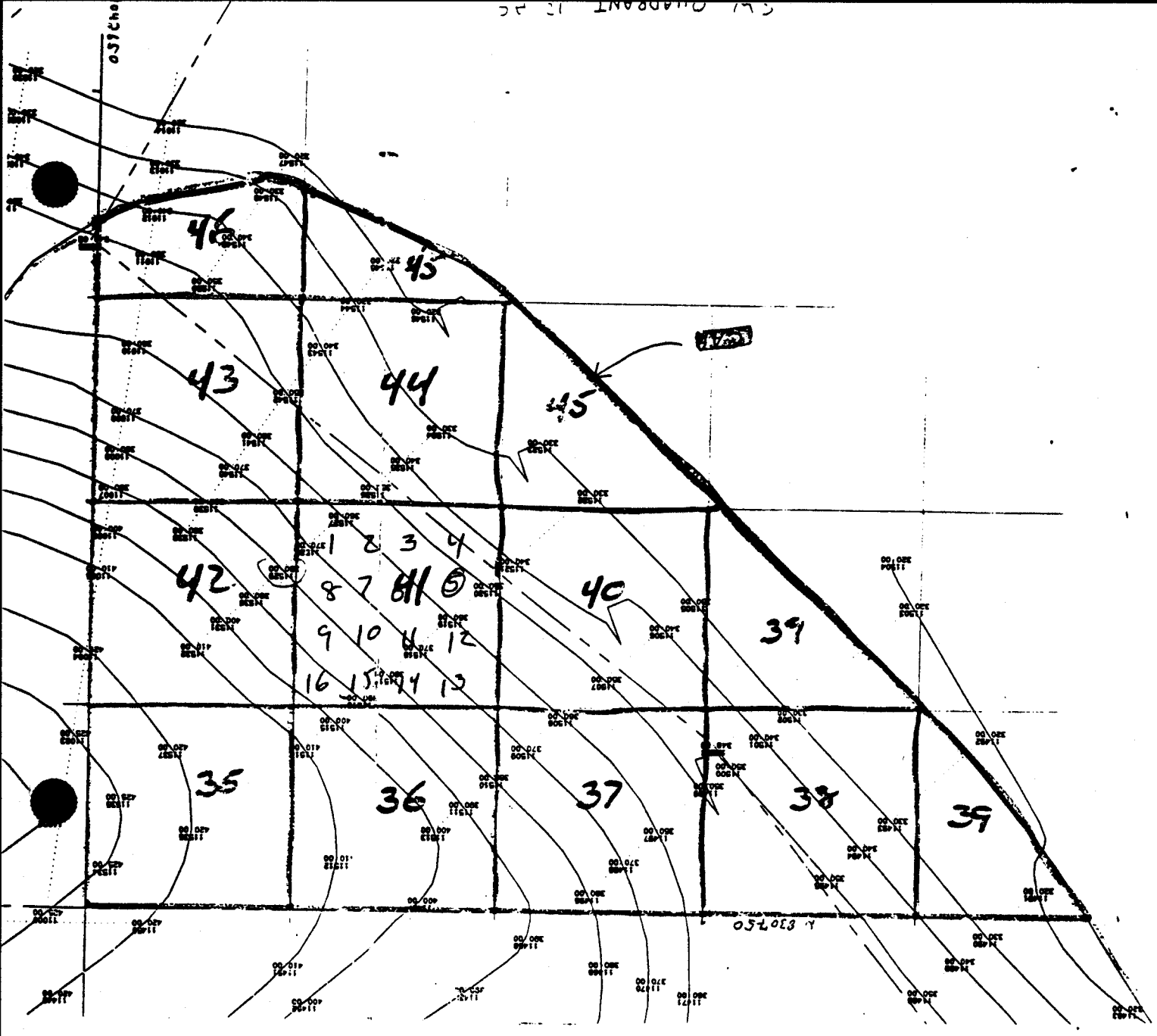
Sincerely,
VAN DER HORST Geotechnical Engineers, P.C.

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



12/5/98

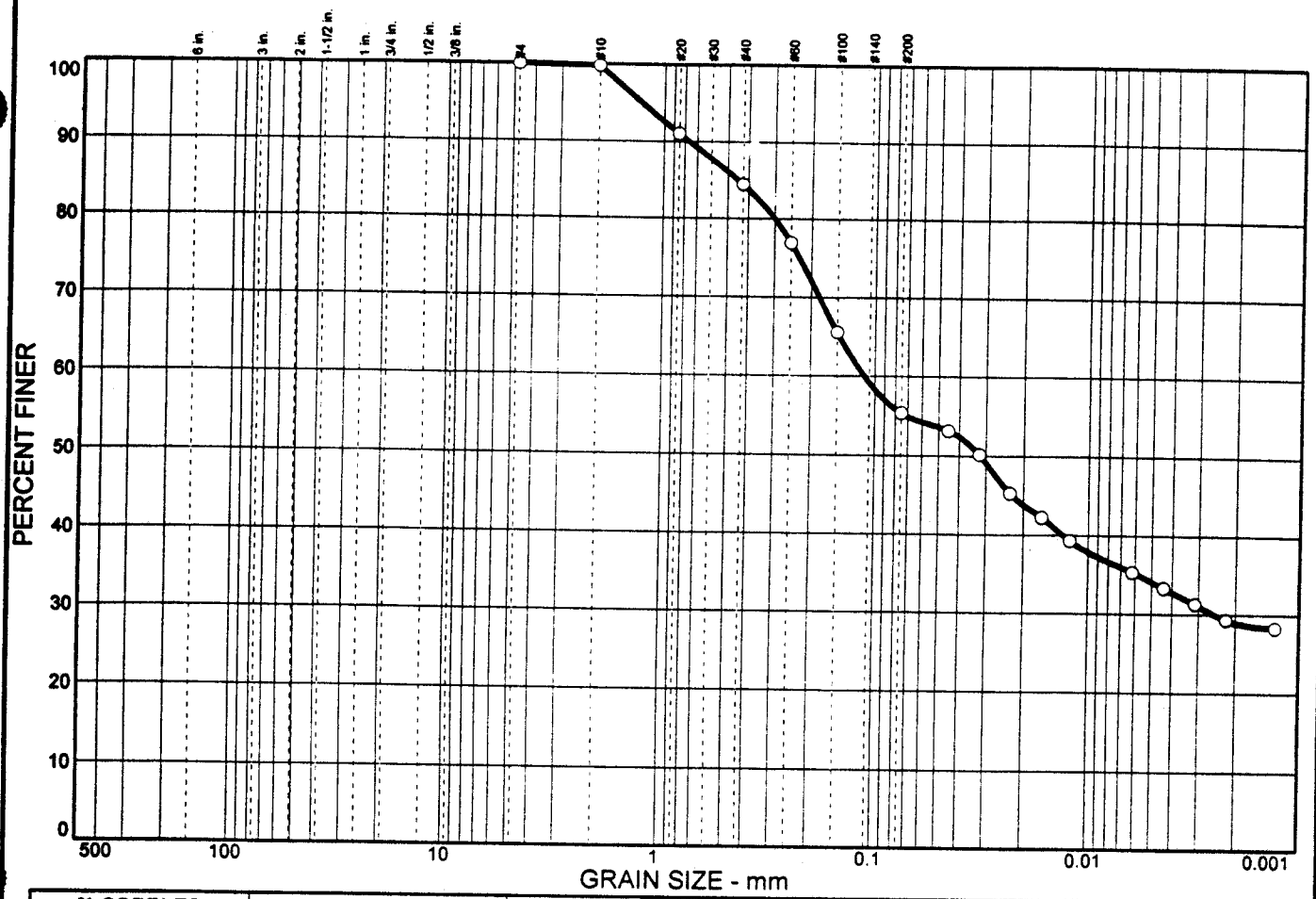
Test location Plan

Acre 41 /Lift1

(5) - Perm location

Report: 132

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	44.6	21.3	34.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	91.0		
#40	84.5		
#60	76.9		
#100	65.5		
#200	55.4		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 16 LL= 45 PI= 29

Coefficients

D_{85}= 0.446 D_{60}= 0.112 D_{50}= 0.0317
D_{30}= 0.0025 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-260, Acre 41, lift 1

Sample No.: DL-260 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 41, 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: 01/05/99
Report No.: P-195

Project No.: VNC-98-029
Sample No.: DL-260

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.5E-008	cm/sec
% Moisture	21.7	%
Dry Density	103.8	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/05/98
Location: Acre 41, Lift 1

Specimen Data

Length (in):	3.130
Diameter (in.):	2.864
Area (sq. in.):	6.453
Volume (cu. in.):	20.20
Wet Weight (grams):	670.2
Dry Weight (grams):	550.5
Dry Density (pcf):	103.8

Wet Weight	117.94
Dry Weight	100.84
Tare weight	22.19
% Moisture	21.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
955	135.69	1.65	1.55	0.94	1.60	1.56E-008
488	135.69	0.70	0.80	1.14	0.75	1.43E-008
514	135.69	0.85	0.80	0.94	0.83	1.49E-008
556	135.69	0.90	0.80	0.89	0.85	1.42E-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) **1.5E-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

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.: 06?

Acre 42 Lift 1
Clay Source: Fogleman Borrow Pit – need borrow info
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	23.4	100+	
2	See Test Location Plan	98.2	24.5	100+	
3	See Test Location Plan	98.4	25.1	100+	Perm/Sample (DL-159)
4	See Test Location Plan	95.9	25.5	99.1	
5	See Test Location Plan	97.1	24.3	100+	
6	See Test Location Plan	96.1	24.0	99.3	
7	See Test Location Plan	95.3	25.1	98.5	
8	See Test Location Plan	93.9	26.0	97.0	
9	See Test Location Plan	94.6	25.3	97.7	
10	See Test Location Plan	94.2	24.8	97.3	
11	See Test Location Plan	96.9	22.7	100+	
12	See Test Location Plan	96.0	23.4	99.2	
13	See Test Location Plan	95.5	26.2	98.7	
14	See Test Location Plan	95.7	25.8	98.9	
15	See Test Location Plan	97.1	22.5	100+	
16	See Test Location Plan	95.0	23.7	98.1	

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)	95.3
Moisture Content (%)	28.0

Atterberg Limits (ASTM D4318)		Grain-size Analysis (ASTM D422)	
PL	27	%Gravel	0.1
LL	61	%Sand	25.2
PI	34	%Silt	24.1
		%Clay	50.6
USCS Classification	CH		

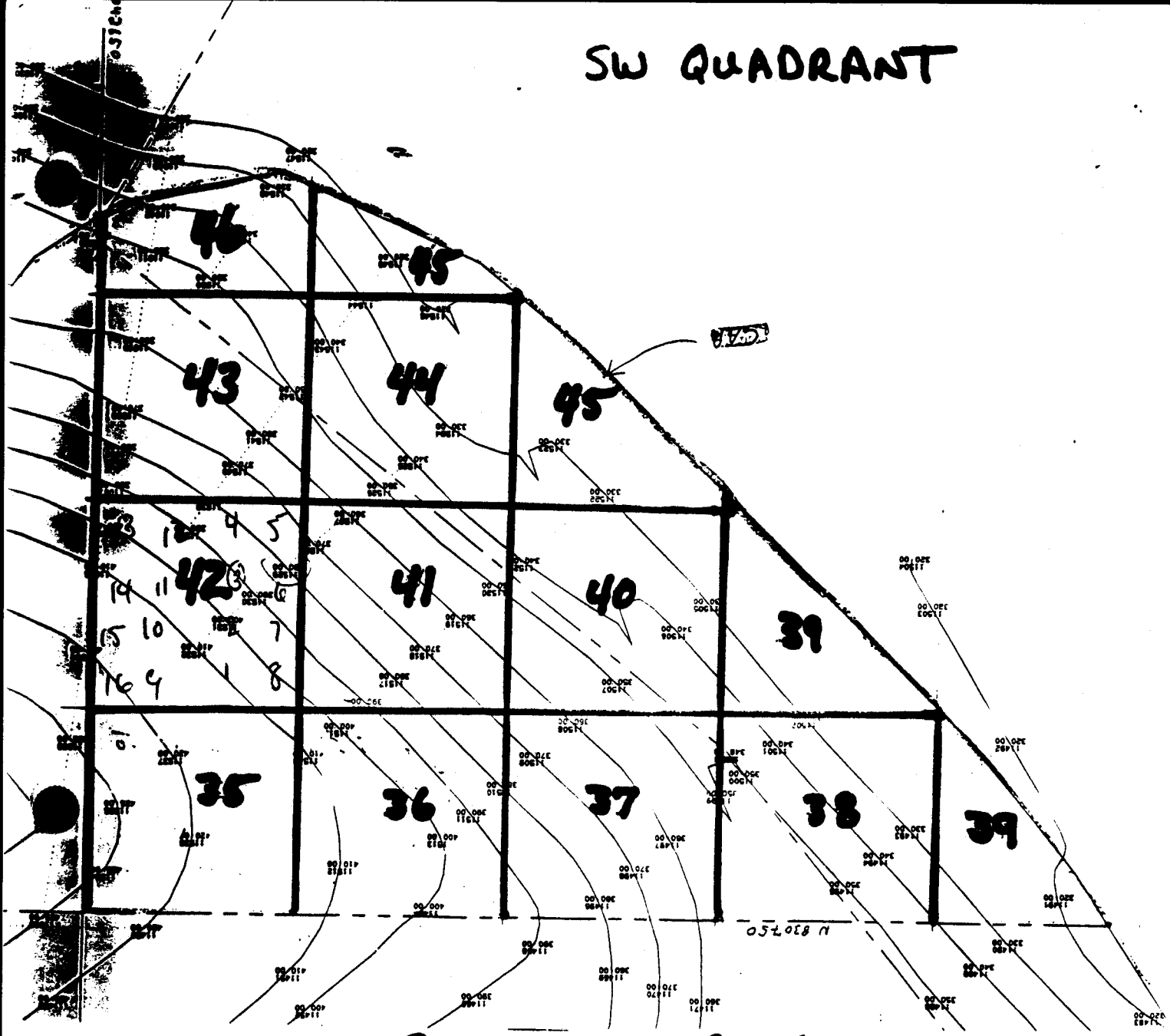
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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

SW QUADRANT



③ - Indicates Perm/Sample Location
Area 42 Lift 1
Report : 62

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	25.2	24.1	50.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.8		
#20	96.9		
#40	93.4		
#60	87.9		
#100	80.7		
#200	74.7		

* (no specification provided)

Soil Description

Fogelman Pit - Fat clay with sand

Atterberg Limits

PL= 27 LL= 61 PI= 34

Coefficients

D_{85}= 0.203 D_{60}= 0.0166 D_{50}= 0.0038
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-159, Acre 42, Lift 1

Sample No.: DL-159 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 42, Lift 1 **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-131

Project No.: VNC-98-029
Sample No.: DL-159

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.3E-008	cm/sec
% Moisture	28.0	%
Dry Density	95.3	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/09/98
Location: ACRE 42, LIFT 1

Specimen Data

Length (in):	3.290
Diameter (in.):	2.855
Area (sq. in.):	6.413
Volume (cu. in.):	21.10
Wet Weight (grams):	675.0
Dry Weight (grams):	527.5
Dry Density (pcf):	95.3

Moisture Content Test Data

Wet Weight	96.11
Dry Weight	78.43
Tare weight	15.21
% Moisture	28.0

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
256	66.46	0.95	0.80	0.84	0.88	6.86E-008
886	66.46	2.90	2.60	0.90	2.75	6.23E-008
261	66.46	0.85	0.80	0.94	0.83	6.34E-008
1130	66.46	3.40	3.15	0.93	3.28	5.82E-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) **6.3E-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: 11/25/98
Report No.: 080

Acre 43 Lift 1
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	94.8	25.2	97.9	
2	See Test Location Plan	93.6	24.6	96.7	
3	See Test Location Plan	95.2	23.8	98.3	
4	See Test Location Plan	96.7	23.5	99.9	
5	See Test Location Plan	96.9	22.7	100+	
6	See Test Location Plan	95.8	24.0	99.0	
7	See Test Location Plan	92.4	29.1	95.4	Tube/Sample (DL-200)
8	See Test Location Plan	93.6	25.9	96.7	
9	See Test Location Plan	94.0	23.4	97.1	
10	See Test Location Plan	93.9	26.8	97.0	
11	See Test Location Plan	95.2	24.7	98.3	
12	See Test Location Plan	96.5	25.2	99.7	
13	See Test Location Plan	95.0	26.0	98.1	
14	See Test Location Plan	94.8	25.1	97.9	
15	See Test Location Plan	93.7	26.1	96.8	
16	See Test Location Plan	94.3	24.8	97.4	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	8.3 x 10(-8)
Dry Density (pcf)	98.3
Moisture Content (%)	27.7

Atterberg Limits (ASTM D4318)

PL	28
LL	77
PI	49
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	19.6
%Silt	20.3
%Clay	60.1

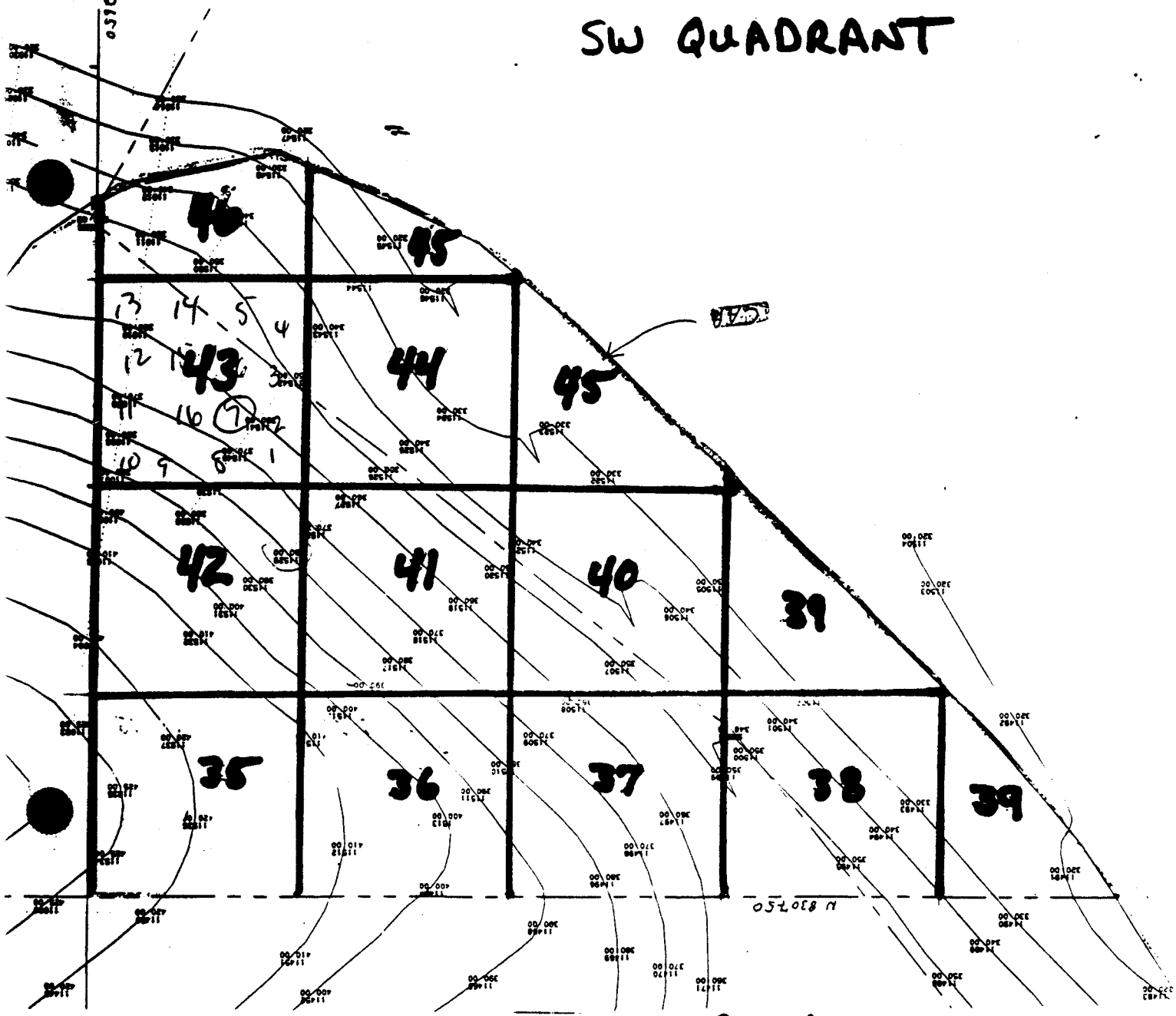
Sincerely,
VAN DER HORST Geotechnical Engineering, P.A.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

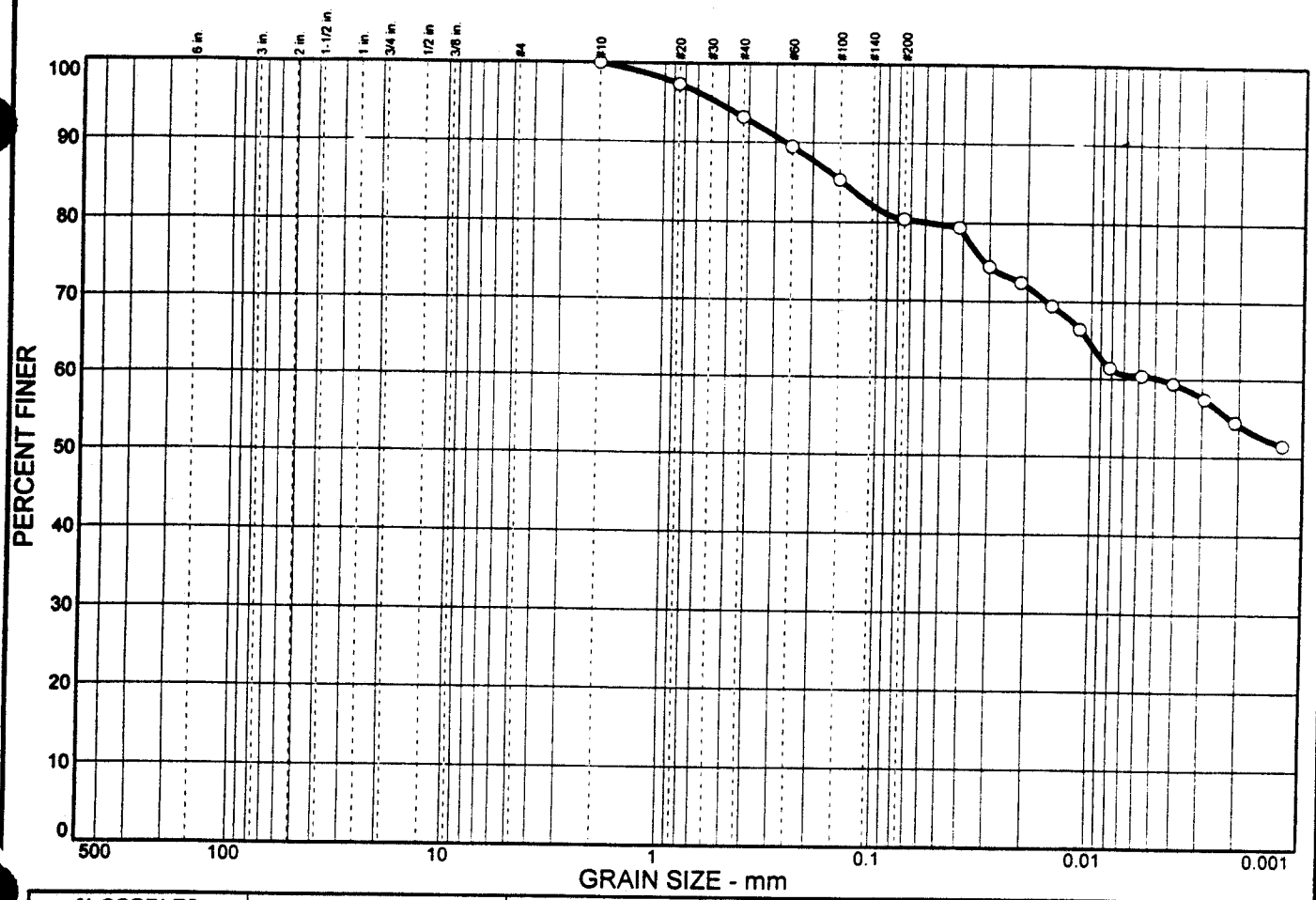
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

SW QUADRANT



7 - Indicates Perm/Sample Location
Area 43 Lift 1
Report : 080

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	19.6	20.3	60.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	97.3		
#40	93.2		
#60	89.5		
#100	85.4		
#200	80.4		

* (no specification provided)

Soil Description

Fogelman - Fat clay with sand

Atterberg Limits

PL= 28 LL= 77 PI= 49

Coefficients

D_{85}= 0.144 D_{60}= 0.0048 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-200, Fogleman - Acre 43, Lift 1

Sample No.: DL-200 **Source of Sample:** Foggelman Borrow Pit **Date:**
Location: Foggelman borrow pit - Acre 43, Lift 1 **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-152

Project No.: VNC-98-029
Sample No.: DL-200

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.3E-008	cm/sec
% Moisture	27.7	%
Dry Density	93.8	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/21/98
Location: Acre 43, Lift 1

Specimen Data

Length (in):	3.242
Diameter (in.):	2.858
Area (sq. in.):	6.426
Volume (cu. in.):	20.83
Wet Weight (grams):	655.2
Dry Weight (grams):	513.1
Dry Density (pcf):	93.8

Moisture Content Test Data

Wet Weight	116.31
Dry Weight	95.86
Tare weight	22.04
% Moisture	27.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
290	83.08	1.80	2.05	1.14	1.93	1.05E-007
356	83.08	1.70	1.75	1.03	1.73	7.65E-008
168	83.08	0.85	0.85	1.00	0.85	7.99E-008
320	83.08	1.50	1.35	0.90	1.43	7.03E-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) **8.3E-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.: 117

Acre 44 Lift 1
Clay Source: Fogelman 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	98.7	25.7	100+	
2	See Test Location Plan	95.0	23.1	98.1	
3	See Test Location Plan	97.1	22.6	100+	
4	See Test Location Plan	96.9	22.7	100+	Perm/Sample (DL-163)
5	See Test Location Plan	97.4	22.6	100+	
6	See Test Location Plan	96.5	23.6	99.7	
7	See Test Location Plan	96.0	23.1	99.2	
8	See Test Location Plan	95.3	24.0	98.5	
9	See Test Location Plan	93.7	25.7	96.8	
10	See Test Location Plan	94.0	25.2	97.1	
11	See Test Location Plan	94.6	24.9	97.7	
12	See Test Location Plan	93.0	26.4	96.1	
13	See Test Location Plan	93.5	25.3	96.6	
14	See Test Location Plan	95.3	24.2	98.~~8~~ 5	
15	See Test Location Plan	95.6	24.0	98.8	
16	See Test Location Plan	96.1	22.2	99.3	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	8.4x10(-8)
Dry Density (pcf)	98.3
Moisture Content (%)	26.7

Atterberg Limits (ASTM D4318)		**Grain-size Analysis (ASTM D422)**	
PL	22	%Gravel	0.0
LL	50	%Sand	47.8
PI	28	%Silt	18.4
		%Clay	33.8
USCS Classification	CL		

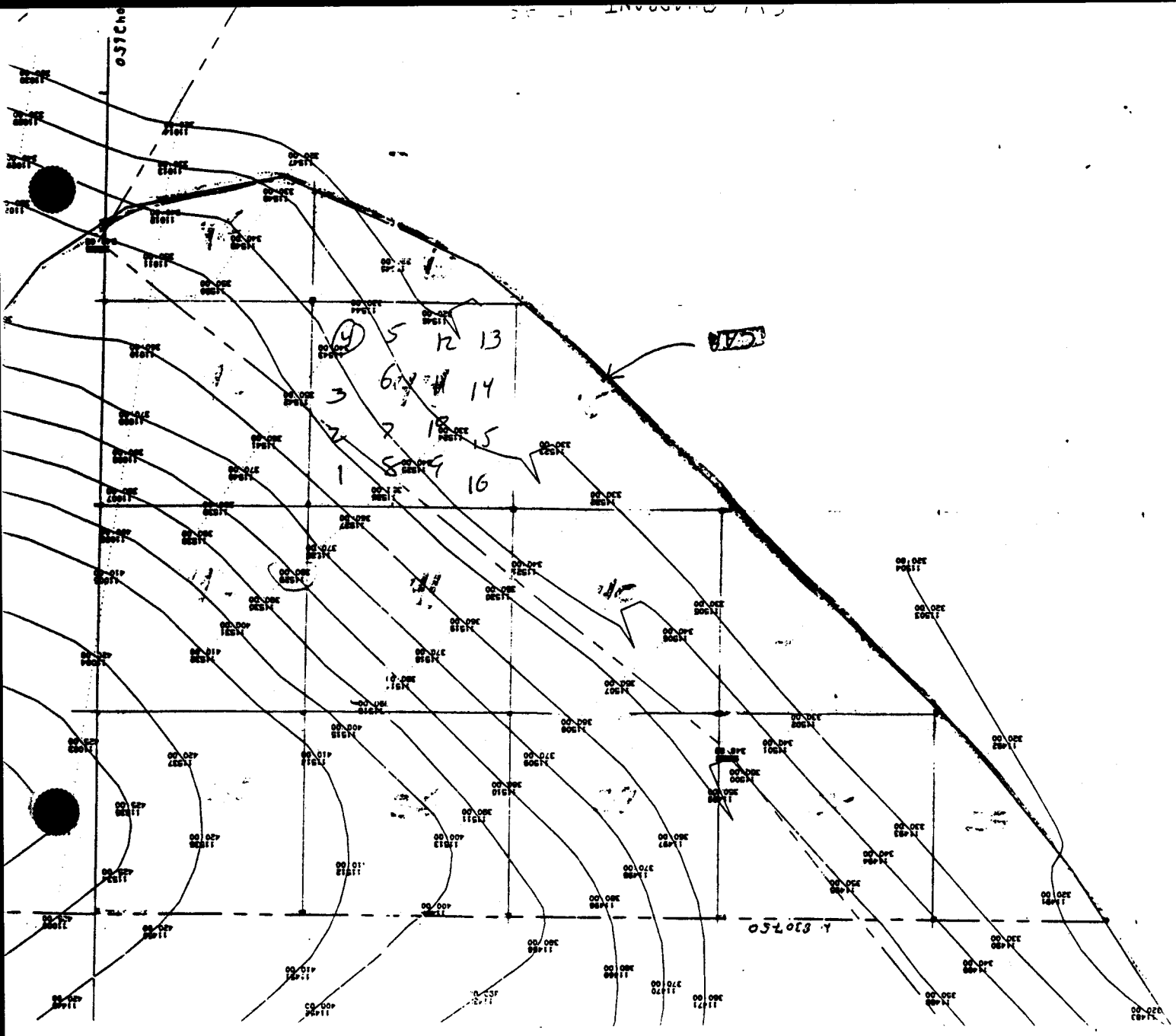
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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



11/11/98

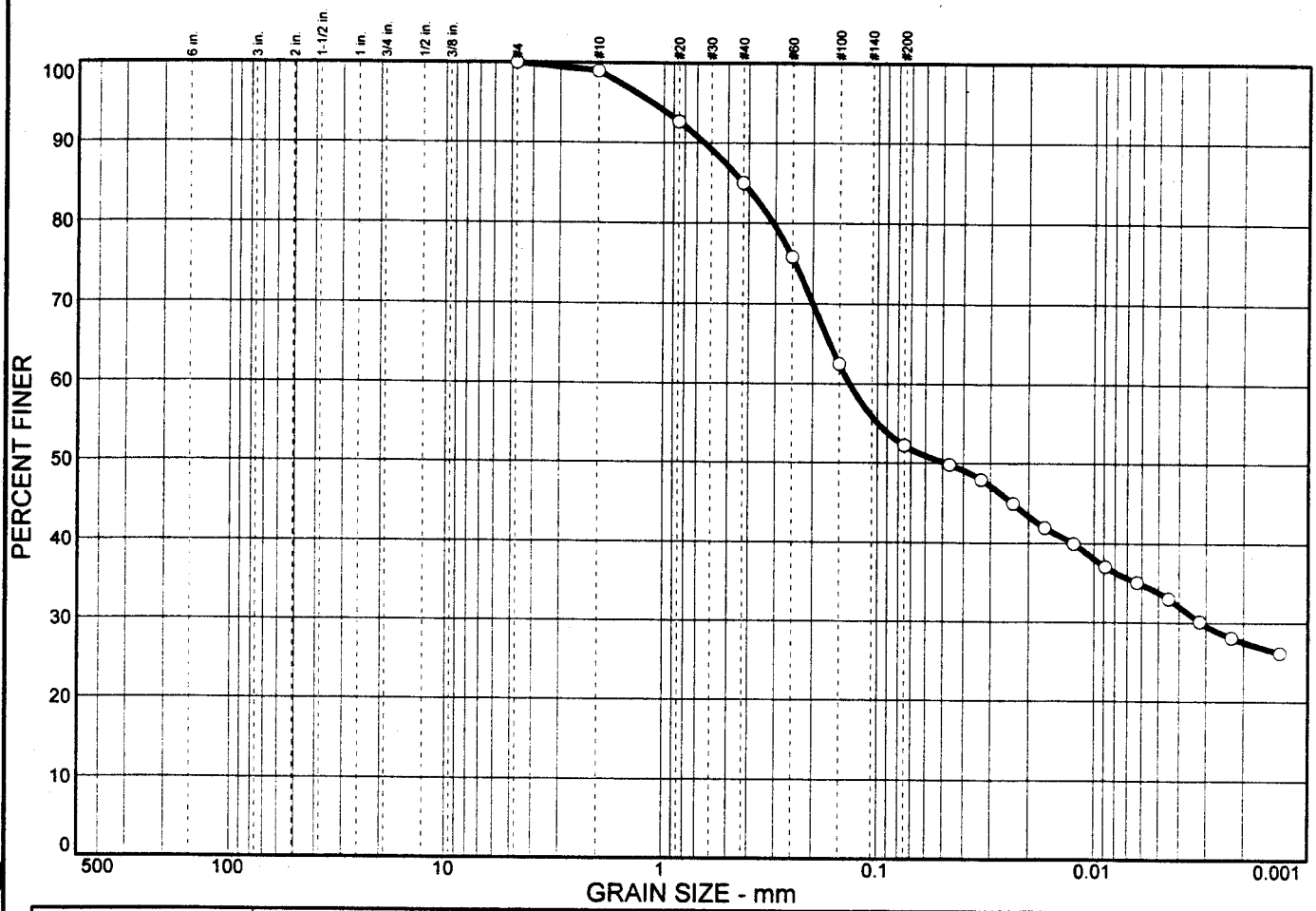
Test location Plan

Acre 44 / Lift 1

4 = Perm location

Report: 117

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	47.8	18.4	33.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.0		
#20	92.7		
#40	85.0		
#60	75.8		
#100	62.5		
#200	52.2		

* (no specification provided)

Soil Description

Fogelman - Sandy fat clay

Atterberg Limits

PL= 22 LL= 50 PI= 28

Coefficients

D_{85}= 0.425 D_{60}= 0.134 D_{50}= 0.0487
D_{30}= 0.0032 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-163, Fogleman - Acre 44, Lift 1

Sample No.: DL-163 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman borrow pit - Acre 44, Lift 1 **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-109

Project No.: VNC-98-029
Sample No.: DL-163

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.4E-008	cm/sec
% Moisture	26.7	%
Dry Density	98.3	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/08/98
Location: Acre 44, Lift 1

Length (in):	3.780
Diameter (in.):	2.830
Area (sq. in.):	6.301
Volume (cu. in.):	23.82
Wet Weight (grams):	778.7
Dry Weight (grams):	614.6
Dry Density (pcf):	98.3

Moisture Content Test Data

Wet Weight	91.62
Dry Weight	76.94
Tare weight	21.97
% Moisture	26.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
165	83.08	0.75	0.70	0.93	0.73	8.25E-008
382	83.08	1.80	1.40	0.78	1.60	7.86E-008
120	83.08	0.50	0.60	1.20	0.55	8.60E-008
235	83.08	1.15	1.10	0.96	1.13	8.99E-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) **8.4E-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: 12/17/98
Report No.: 118

Acre 45 Lift 1
Clay Source: Fogelman 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	99.2	22.7	100+	
2	See Test Location Plan	96.78	22.9	100.0	
3	See Test Location Plan	94.9	23.9	98.0	
4	See Test Location Plan	96.9	23.9	100+	Perm/Sample (DL-171)
5	See Test Location Plan	96.0	23.0	99.2	
6	See Test Location Plan	95.4	23.6	98.6	
7	See Test Location Plan	95.7	24.1	98.9	
8	See Test Location Plan	94.6	24.3	97.7	
9	See Test Location Plan	94.0	24.6	97.1	
10	See Test Location Plan	96.2	22.7	99.4	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 3.4x10(-8)

Dry Density (pcf) 104.4

Moisture Content (%) 21.6

Atterberg Limits (ASTM D4318)

PL 23
LL 47
PI 24

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel 0.0
%Sand 32.9
%Silt 17.8
%Clay 49.3

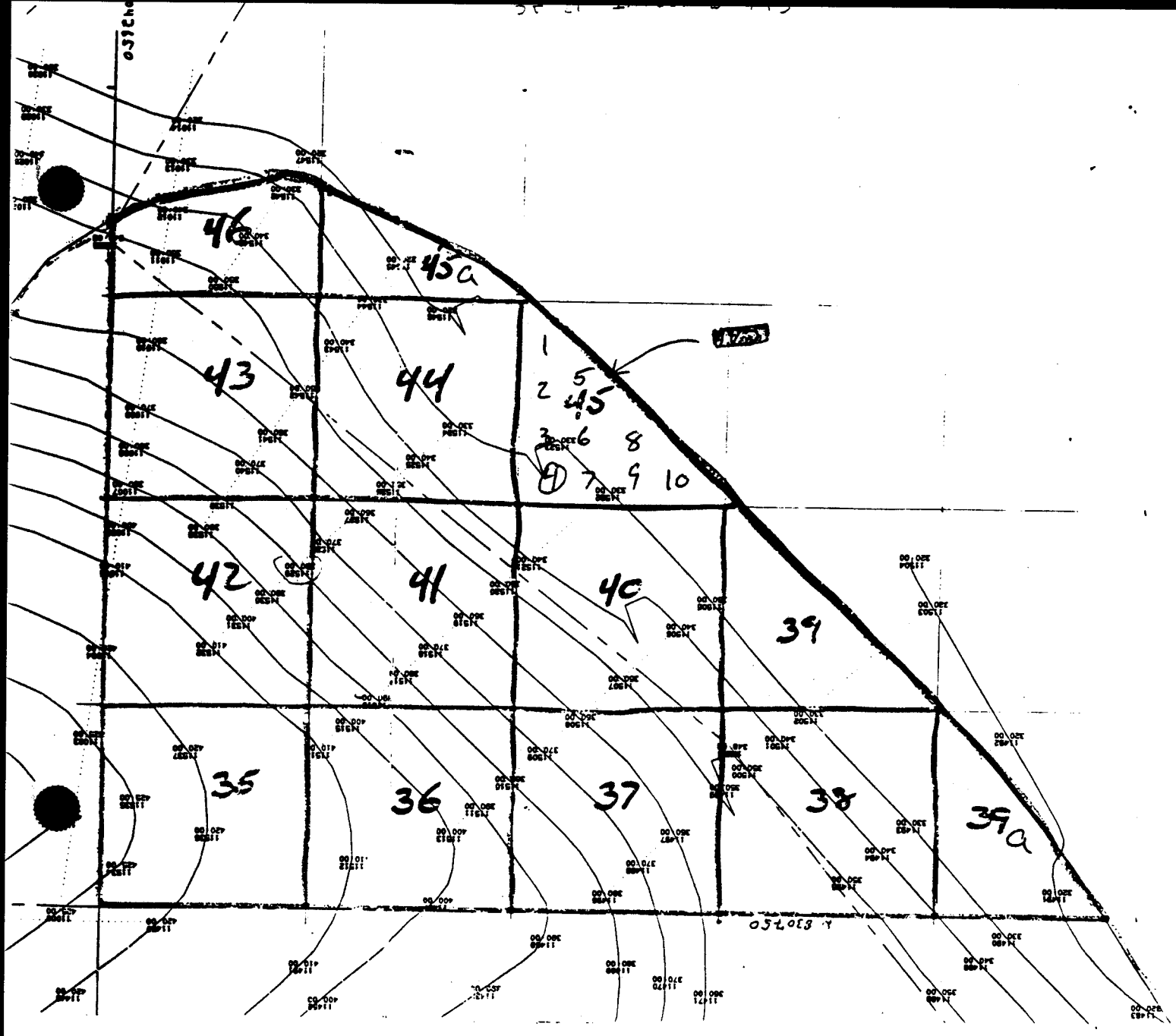
Sincerely,
VAN DER HORST Geotechnical Engineering P.C.

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



12/13/98

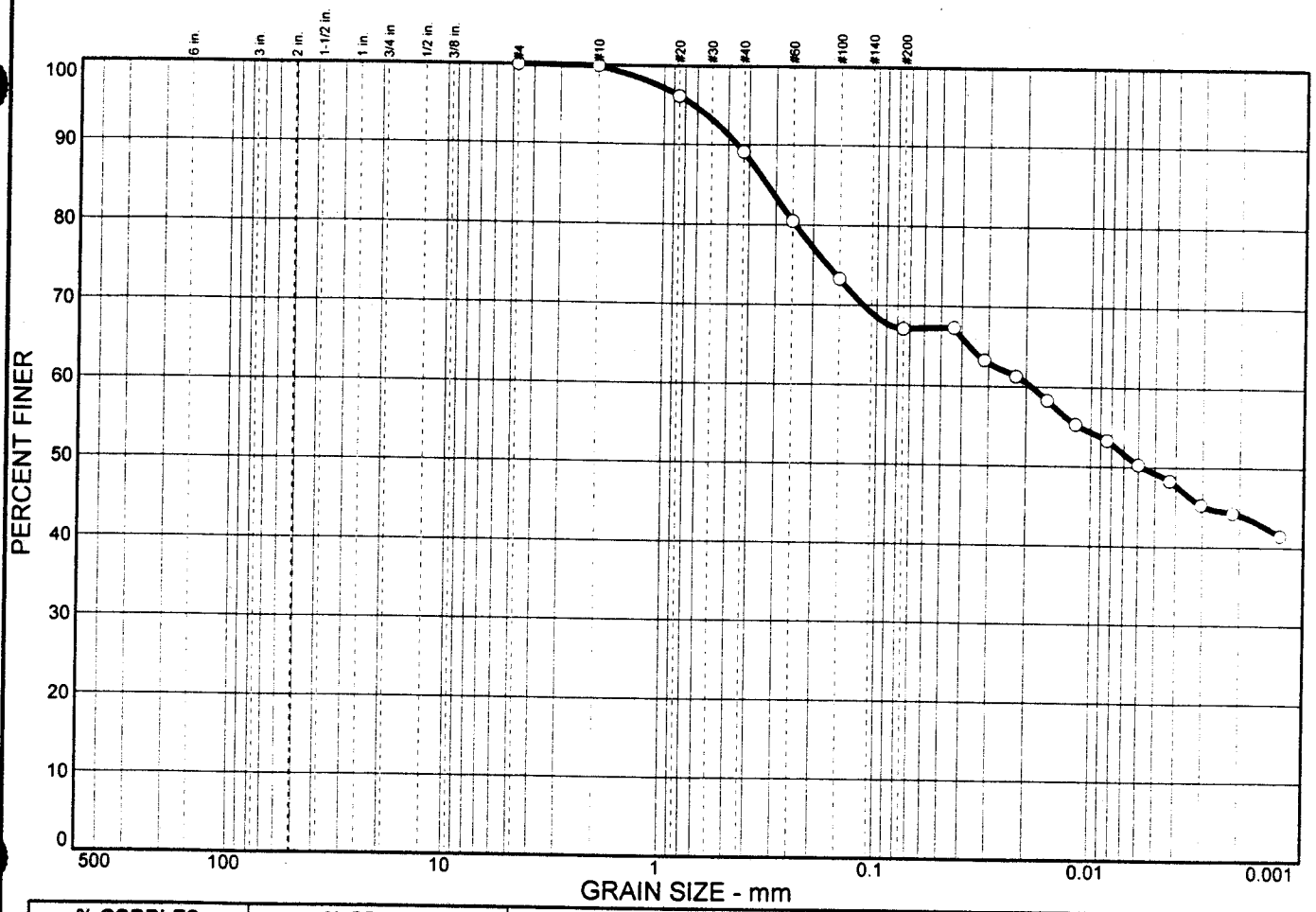
Test location Plan

Acre 45 / List 1

④ = Perm location

Report: 118

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	32.9	17.8	49.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	96.2		
#40	89.1		
#60	80.5		
#100	73.3		
#200	67.1		

* (no specification provided)

Soil Description

Fogelman - Sandy lean clay

Atterberg Limits

PL= 23 LL= 47 PI= 24

Coefficients

D_{85}= 0.328 D_{60}= 0.0189 D_{50}= 0.0057
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-171, Fogleman - Acre 45, Lift 1

Sample No.: DL-171 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Foggelman borrow pit - Acre 45, Lift 1 **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: 12/03/98
Report No.: P-170

Project No.: VNC-98-029
Sample No.: DL-171

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.4E-008	cm/sec
% Moisture	21.6	%
Dry Density	104.4	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/13/98
Location: Acre 45, Lift 1

Specimen Data

Length (in):	3.429
Diameter (in.):	2.866
Area (sq. in.):	6.462
Volume (cu. in.):	22.16
Wet Weight (grams):	738.3
Dry Weight (grams):	607.0
Dry Density (pcf):	104.4

Moisture Content Test Data

Wet Weight	90.84
Dry Weight	78.57
Tare weight	21.83
% Moisture	21.6

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
920	94.15	2.25	2.00	0.89	2.13	3.38E-008
558	94.15	1.35	1.20	0.89	1.28	3.35E-008
335	94.15	0.80	0.70	0.88	0.75	3.28E-008
506	94.15	1.20	1.20	1.00	1.20	3.48E-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) **3.4E-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

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 1

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.155	Clay Cover Testing Report Acre 45a, Lift 1

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.: 155

Acre 45a Lift 1

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	104.0	20.0	100+	
2	See Test Location Plan	100.8	21.1	97.9	
3	See Test Location Plan	100.3	23.1	97.4	
4	See Test Location Plan	98.2	23.7	95.3	Perm/Sample (DL-283)
5	See Test Location Plan	99.7	22.4	96.8	
6	See Test Location Plan	100.6	21.6	97.7	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 4.0x10(-9)

Dry Density (pcf) 100.0

Moisture Content (%) 24.1

Atterberg Limits (ASTM D4318)

PL 19
LL 47
PI 28

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel 0.2
%Sand 30.7
%Silt 29.7
%Clay 39.4

Sincerely,

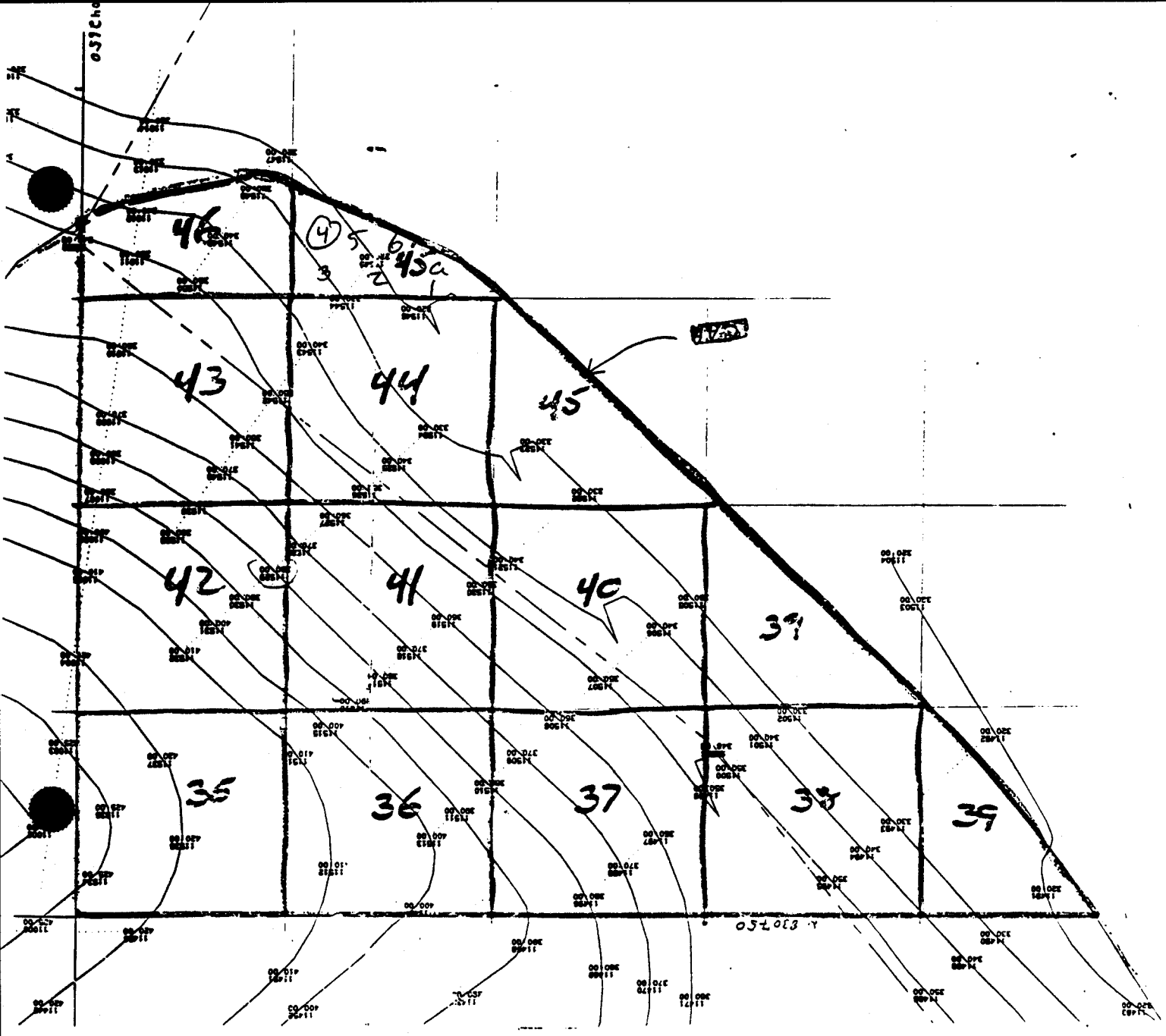
VAN DER HORST Geotechnical Engineering, P.C.

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 45a / Lift 1

(1) = Perm location

Report: 155

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/22/98
Report No.: P-228

Project No.: VNC-98-029
Sample No.: DL-283

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.0E-009	cm/sec
% Moisture	24.1	%
Dry Density	100.0	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/11/98
Location: Acre 45a, Lift 1

Specimen Data

Length (in):	3.091
Diameter (in.):	2.855
Area (sq. in.):	6.413
Volume (cu. in.):	19.82
Wet Weight (grams):	646.1
Dry Weight (grams):	520.5
Dry Density (pcf):	100.0

Wet Weight	177.84
Dry Weight	147.52
Tare weight	21.89
% Moisture	24.1

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1462	138.46	0.65	0.60	0.92	0.63	3.87E-009
1547	138.46	0.95	0.80	0.84	0.88	5.12E-009
1390	157.84	0.60	0.50	0.83	0.55	3.14E-009
1418	163.38	0.70	0.70	1.00	0.70	3.79E-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) **4.0E-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	0.2	30.7	29.7	39.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.7		
#20	96.8		
#40	90.7		
#60	84.4		
#100	77.4		
#200	69.1		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 47 PI= 28

Coefficients

D_{85}= 0.262 D_{60}= 0.0271 D_{50}= 0.0121
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-283, Acre 45A, Lift 1

Sample No.: DL-283 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 45A, Lift 1 **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.: 081

Acre 46 Lift 1
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	21.5	100+	
2	See Test Location Plan	98.3	24.5	97.8	
3	See Test Location Plan	100.4	23.5	99.9	
4	See Test Location Plan	100.4	23.5	99.9	
5	See Test Location Plan	100.7	22.2	100+	
6	See Test Location Plan	97.2	23.7	96.7	
7	See Test Location Plan	95.5	23.5	95.0	Tube/Sample (DL-202)
8	See Test Location Plan	98.4	22.7	97.9	
9	See Test Location Plan	97.2	23.9	96.7	
10	See Test Location Plan	97.7	23.6	97.2	
11	See Test Location Plan	99.4	22.0	98.9	
12	See Test Location Plan	96.2	23.8	95.7	
13	See Test Location Plan	95.8	24.2	95.3	
14	See Test Location Plan	100.2	21.8	99.7	
15	See Test Location Plan	98.7	22.6	98.2	
16	See Test Location Plan	96.5	23.0	96.0	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	6.4 x 10(-8)
Dry Density (pcf)	98.3
Moisture Content (%)	25.4

Atterberg Limits (ASTM D4318)

PL	26
LL	71
PI	45
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	26.5
%Silt	20.4
%Clay	53.1

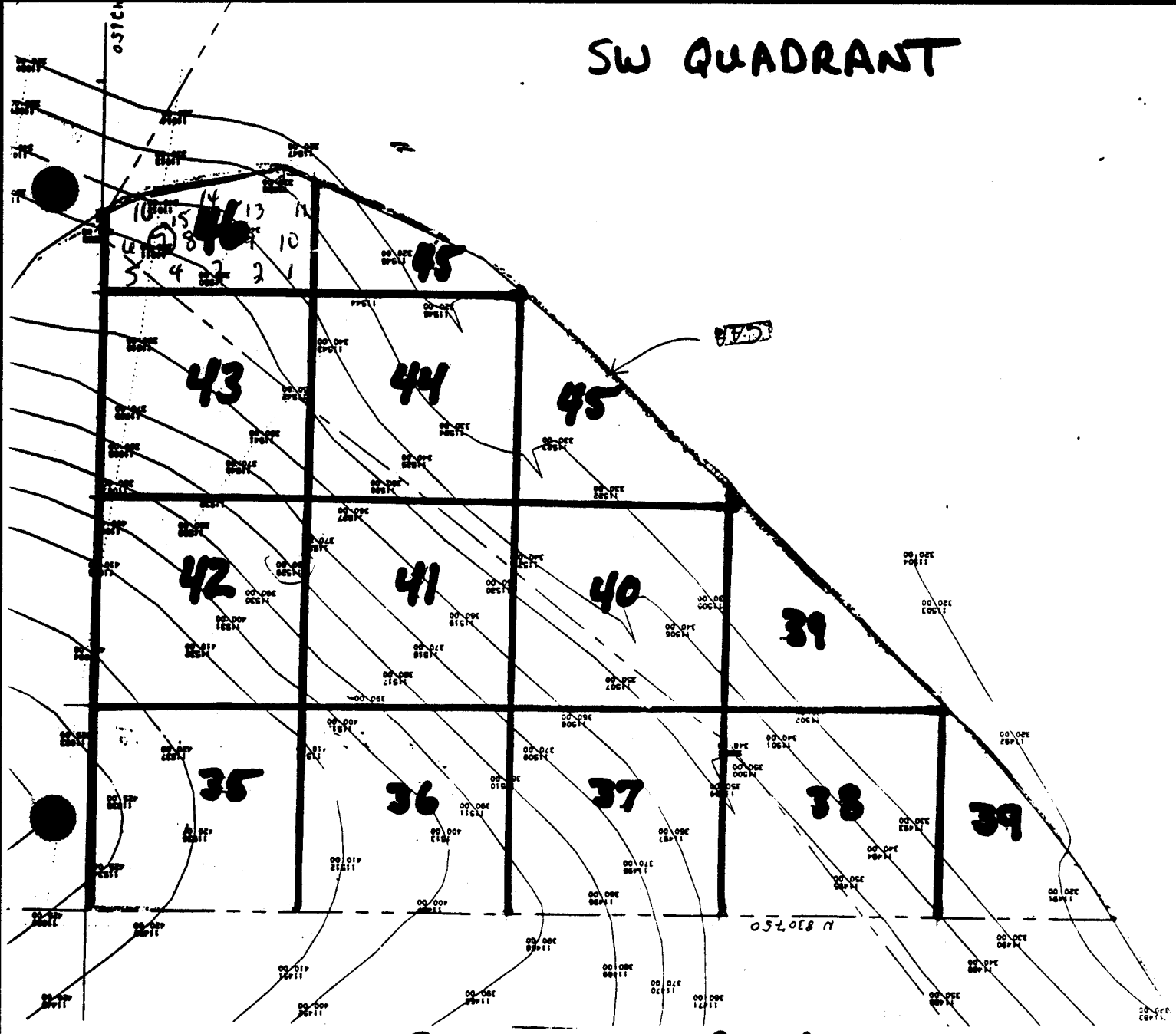
Sincerely,
VAN DER HORST Geotechnical Engineering, P.A.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

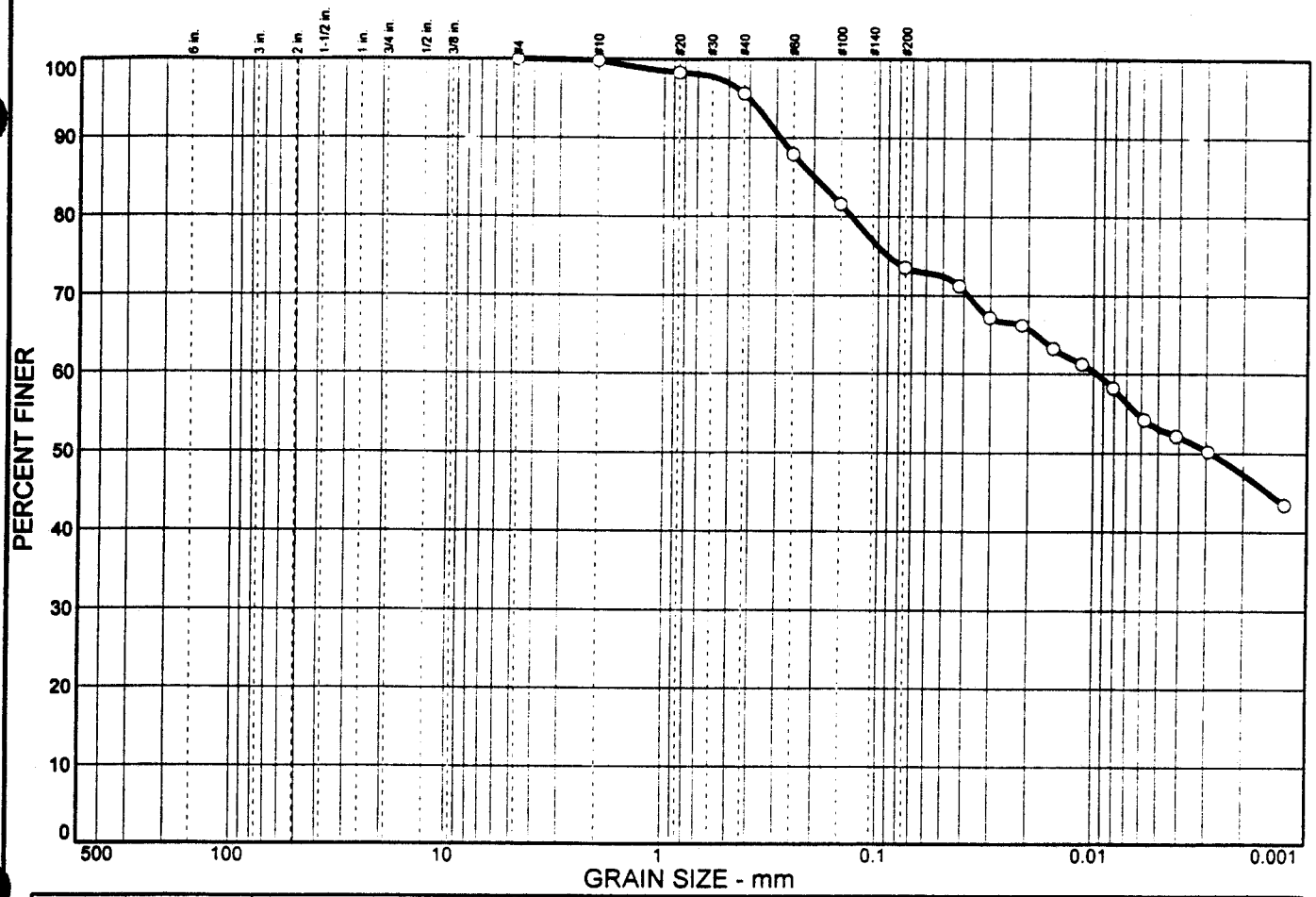
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

SW QUADRANT



⑦ - Indicates Perm/Sample Location
Area 46 Lift 1
Report : 081

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	26.5	20.4	53.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	98.3		
#40	95.6		
#60	87.9		
#100	81.6		
#200	73.5		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 26 LL= 71 PI= 45

Coefficients

D_{85}= 0.199 D_{60}= 0.0096 D_{50}= 0.0029
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-202, Acre 46, Lift 1

Sample No.: DL-202 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 46, Lift 1 **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-154

Project No.: VNC-98-029
Sample No.: DL-202

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.4E-008	cm/sec
% Moisture	25.4	%
Dry Density	98.3	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/21/98
Location: Acre 46, Lift 1

Specimen Data

Length (in):	2.986
Diameter (in.):	2.864
Area (sq. in.):	6.453
Volume (cu. in.):	19.27
Wet Weight (grams):	623.4
Dry Weight (grams):	497.0
Dry Density (pcf):	98.3

Moisture Content Test Data

Wet Weight	98.66
Dry Weight	83.11
Tare weight	21.97
% Moisture	25.4

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
63	138.46	0.60	0.50	0.83	0.55	7.59E-008
66	138.46	0.50	0.45	0.90	0.48	6.25E-008
250	138.46	1.90	1.55	0.82	1.73	6.00E-008
179	138.46	1.20	1.10	0.92	1.15	5.58E-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) **6.4E-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: 10/30/98
Report No.: 021 Page 1 of 2

Clay Veneer
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	24.3	100+	
2	See Test Location Plan	109.7	19.3	100+	Perm/sample (DL-076)
3	See Test Location Plan	108.7	19.5	100+	
4	See Test Location Plan	102.9	20.9	99.9	
5	See Test Location Plan	101.1	21.6	98.2	
6	See Test Location Plan	101.2	23.6	98.3	
7	See Test Location Plan	104.6	21.7	100+	Perm/sample (DL-077)
8	See Test Location Plan	103.8	19.7	100+	
9	See Test Location Plan	101.9	22.0	98.9	
10	See Test Location Plan	101.3	22.1	98.3	
11	See Test Location Plan	99.5	22.6	96.6	
12	See Test Location Plan	100.2	21.3	97.3	
13	See Test Location Plan	104.2	21.1	100+	
14	See Test Location Plan	103.2	22.9	100+	
15	See Test Location Plan	99.1	22.7	96.2	Perm/Sample (DL-078)
16	See Test Location Plan	104.1	21.4	100+	

Density (ASTM D2922) Moisture (ASTM D3017)

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

	076	077	078
Permeability (cm/sec)	3.8	5.7	5.6
	(x10**-8)		
Dry Density (pcf)	100.4	102.8	101.8
Moisture Content (%)	24.6	20.2	22.6

Atterberg Limits (ASTM D4318)

	076	077	078
PL	25	23	21
LL	52	53	57
PI	27	30	36
USCS Classification			

Grain-size Analysis (ASTM D422)

	076	077	078
%Gravel	0.0	0.0	0.0
%Sand	13.3	19.2	21.8
%Silt	38.4	33.2	33.6
%Clay	48.3	47.6	44.6

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

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

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 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: 10/30/98
Report No.: 021A 2 of 2

Clay Veneer
Clay Source: Hillsbourgh/Lasalle Clay
ASTM D698 : 90.0 Max. Dry Density @ 25.1 Optimum Moisture
Required Compaction: 95% @ +25.1% Moisture

No.	Location	Dry Density (pcf).	Moisture Content (%)	Compaction (%)	Remarks
1	See Test Location Plan	93.8	27.8	100+	
2	See Test Location Plan	87.8	31.8	97.6	
3	See Test Location Plan	88.3	30.4	98.2	Perm/sample (DL-078)
4	See Test Location Plan	90.5	28.6	100+	
5	See Test Location Plan	92.1	29.2	100+	
6	See Test Location Plan	92.4	30.2	100+	
7	See Test Location Plan	89.3	32.3	99.2	
8	See Test Location Plan	93.6	28.7	100+	
9	See Test Location Plan	93.0	29.0	100+	
10	See Test Location Plan	88.1	30.8	97.9	Perm/sample (DL-079)
11	See Test Location Plan	88.0	32.1	97.8	
12	See Test Location Plan	92.5	28.7	100+	
13	See Test Location Plan	94.8	27.2	100+	
14	See Test Location Plan	93.0	28.4	100+	

Density (ASTM D2922) Moisture (ASTM D3017)

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

	079	080
Permeability (cm/sec)	4.1	5.2
	(x10**-8)	
Dry Density (pcf)	86.9	89.7
Moisture Content (%)	27.7	28.1

Atterberg Limits (ASTM D4318)

	079	080
PL	23	22
LL	63	60
PI	40	38
USCS Classification	CH	CH

Grain-size Analysis (ASTM D422)

	079	080
%Gravel	0.0	0.0
%Sand	15.5	20.7
%Silt	27.6	24.0
%Clay	56.9	55.3

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

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/31/98
Report No.: P-070

Project No.: VNC-98-029
Sample No. DL-076

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.8E-08	cm/sec
% Moisture	24.6	%
Dry Density	100.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/23/98
Location: Clay Veneer - On-site Borrow Pit
See Attached Sketch

Length (in):	3.133
Diameter (in.):	2.851
Area (sq. in.):	6.395
Volume (cu. in.):	20.04
Wet Weight (grams):	657.8
Dry Weight (grams):	528.1
Dry Density (pcf):	100.4

Moisture Content Test Data

Wet Weight	94.34
Dry Weight	80.10
Tare weight	22.12
% Moisture	24.6

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
213	83.08	0.50	0.60	1.20	0.55	3.96E-08
576	83.08	1.40	1.55	1.11	1.48	3.93E-08
412	83.08	0.95	0.95	1.00	0.95	3.54E-08
187	83.08	0.45	0.45	1.00	0.45	3.69E-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) **3.8E-08** cm/sec

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

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/31/98
Report No.: P-071

Project No.: VNC-98-029
Sample No. DL-077

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.7E-08	cm/sec
% Moisture	20.2	%
Dry Density	102.8	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/21/98
Location: Clay Veneer - On-site Borrow Pit
See Attached Sketch

Length (in):	3.367
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	21.52
Wet Weight (grams):	698.2
Dry Weight (grams):	580.8
Dry Density (pcf):	102.8

Moisture Content Test Data

Wet Weight	154.34
Dry Weight	132.10
Tare weight	22.02
% Moisture	20.2

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
282	83.08	0.90	1.05	1.17	0.98	5.70E-08
987	83.08	3.20	3.25	1.02	3.23	5.39E-08
200	83.08	0.70	0.70	1.00	0.70	5.77E-08
363	83.08	1.30	1.30	1.00	1.30	5.91E-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
Robert L. Mashewske, P.E.
Regional Manager

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/31/98
Report No.: P-072

Project No.: VNC-98-029
Sample No. DL-078

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.6E-08	cm/sec
% Moisture	22.6	%
Dry Density	101.8	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/21/98
Location: Clay Veneer - On-site Borrow Pit
See Attached Sketch

Length (in):	3.095
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	19.78
Wet Weight (grams):	647.4
Dry Weight (grams):	528.2
Dry Density (pcf):	101.8

Moisture Content Test Data

Wet Weight	114.33
Dry Weight	97.34
Tare weight	22.02
% Moisture	22.6

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
325	88.62	1.30	1.30	1.00	1.30	5.68E-08
532	88.62	2.00	1.90	0.95	1.95	5.21E-08
267	88.62	1.00	1.05	1.05	1.03	5.45E-08
388	88.62	1.60	1.60	1.00	1.60	5.86E-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) **5.6E-08** cm/sec

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

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/31/98
Report No.: P-073

Project No.: VNC-98-029
Sample No. DL-079

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.1E-08	cm/sec
% Moisture	27.7	%
Dry Density	86.9	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/21/98
Location: Clay Veneer - Hillsborough/LaSalle Stockpile
See Attached Sketch

Length (in):	3.765
Diameter (in.):	2.845
Area (sq. in.):	6.368
Volume (cu. in.):	23.98
Wet Weight (grams):	698.2
Dry Weight (grams):	546.7
Dry Density (pcf):	86.9

Moisture Content Test Data

Wet Weight	125.78
Dry Weight	103.27
Tare weight	22.02
% Moisture	27.7

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
187	91.38	0.40	0.50	1.25	0.45	4.05E-08
1106	91.38	2.50	2.75	1.10	2.63	3.99E-08
1037	91.38	2.50	2.50	1.00	2.50	4.06E-08
415	91.38	1.10	1.10	1.00	1.10	4.46E-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) **4.1E-08** cm/sec

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

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/31/98
Report No.: P-074

Project No.: VNC-98-029
Sample No. DL-080

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.2E-08	cm/sec
% Moisture	28.1	%
Dry Density	89.7	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/21/98
Location: Clay Veneer - Hillsborough/LaSalle Stockpile
See Attached Sketch

Length (in):	3.502
Diameter (in.):	2.851
Area (sq. in.):	6.395
Volume (cu. in.):	22.39
Wet Weight (grams):	674.9
Dry Weight (grams):	527.0
Dry Density (pcf):	89.7

Moisture Content Test Data

Wet Weight	113.25
Dry Weight	93.26
Tare weight	22.02
% Moisture	28.1

Test Data

Confining Pressure 3.0 psi

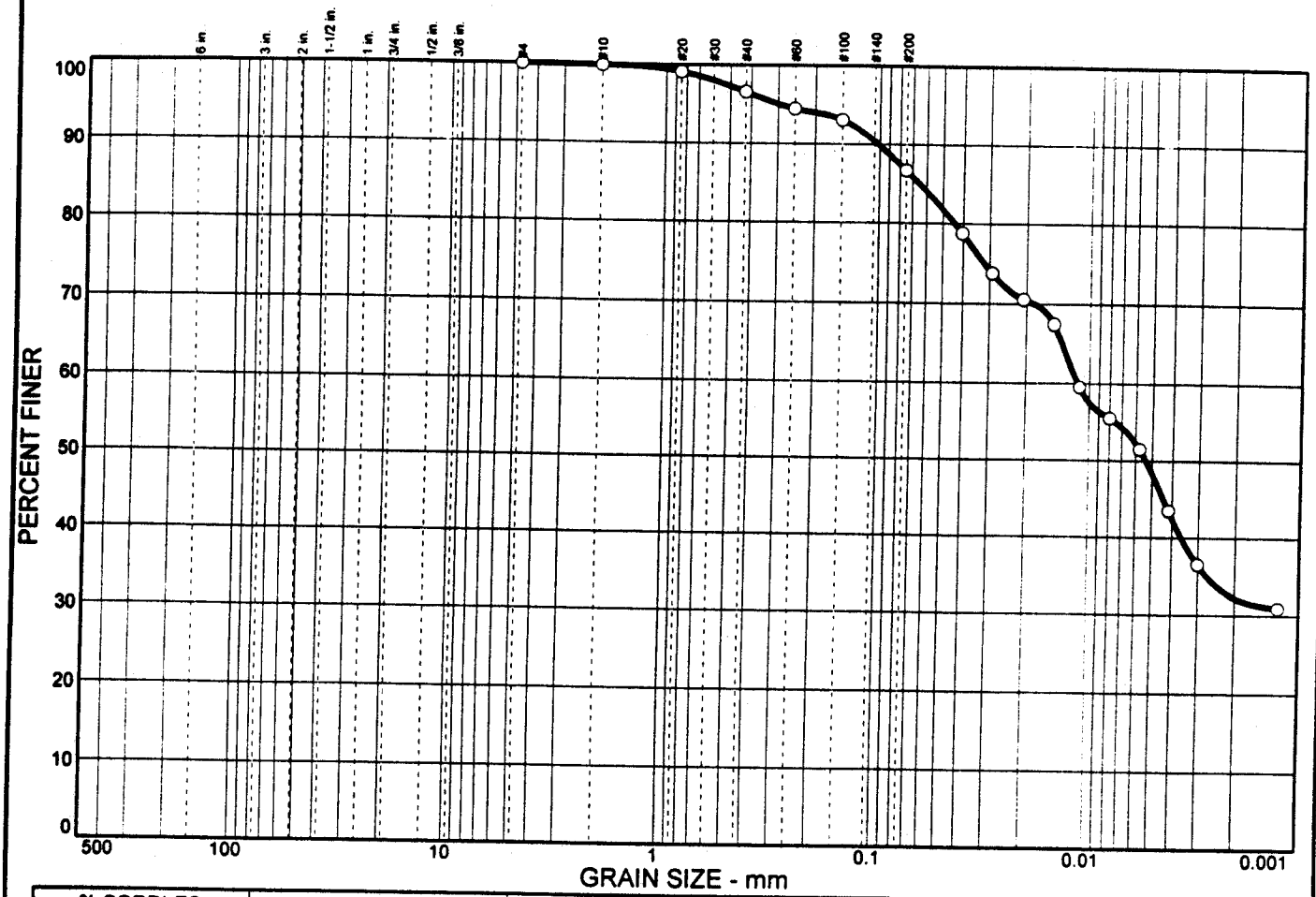
△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
215	91.38	0.80	0.75	0.94	0.78	5.62E-08
932	91.38	3.10	2.90	0.94	3.00	5.02E-08
1140	91.38	3.70	3.80	1.03	3.75	5.13E-08
500	91.38	1.60	1.70	1.06	1.65	5.14E-08

△ 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) **5.2E-08** 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	13.3	38.4	48.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.1		
#40	96.6		
#60	94.5		
#100	93.1		
#200	86.7		

* (no specification provided)

Soil Description

Onsite borrow - Fat clay

Atterberg Limits

PL= 25 LL= 52 PI= 27

Coefficients

D_{85}= 0.0647 D_{60}= 0.0114 D_{50}= 0.0053
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

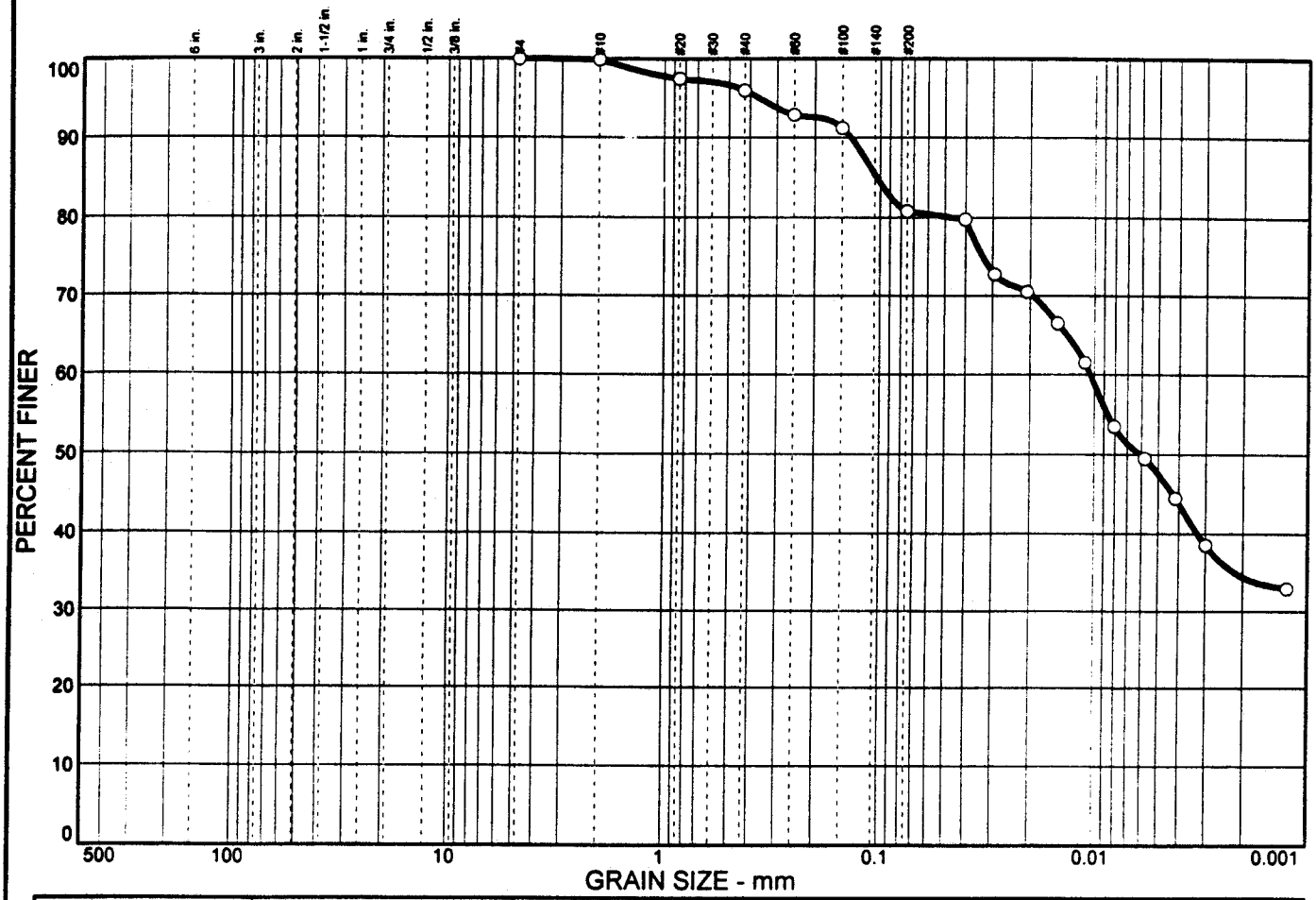
Veneer (DL-076)

Sample No.: DL-076 **Source of Sample:** On-site Borrow Clay **Date:**
Location: Veneer-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	19.2	33.2	47.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	97.5		
#40	96.0		
#60	92.9		
#100	91.2		
#200	80.8		

* (no specification provided)

Soil Description

Onsite borrow - Fat clay

Atterberg Limits

PL= 23 LL= 53 PI= 30

Coefficients

D_{85}= 0.103 D_{60}= 0.0104 D_{50}= 0.0061
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

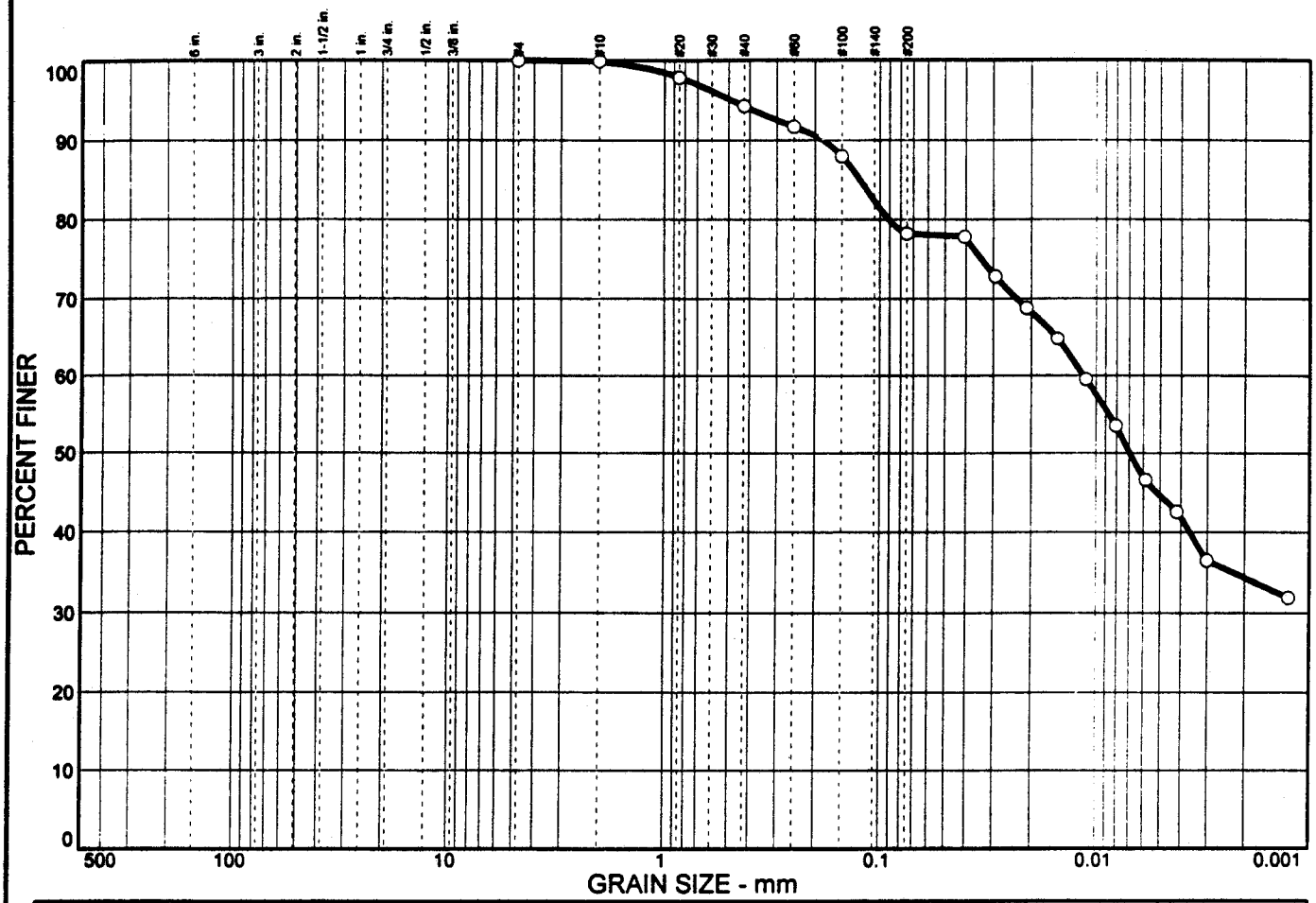
Veneer (DL-077

Sample No.: DL-077 **Source of Sample:** On-site Borrow Clay **Date:**
Location: Veneer-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	21.8	33.6	44.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	97.9		
#40	94.3		
#60	91.7		
#100	88.0		
#200	78.2		

* (no specification provided)

Soil Description

Onsite borrow - Fat clay

Atterberg Limits

PL= 21 LL= 57 PI= 36

Coefficients

D_{85}= 0.123 D_{60}= 0.0115 D_{50}= 0.0069
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

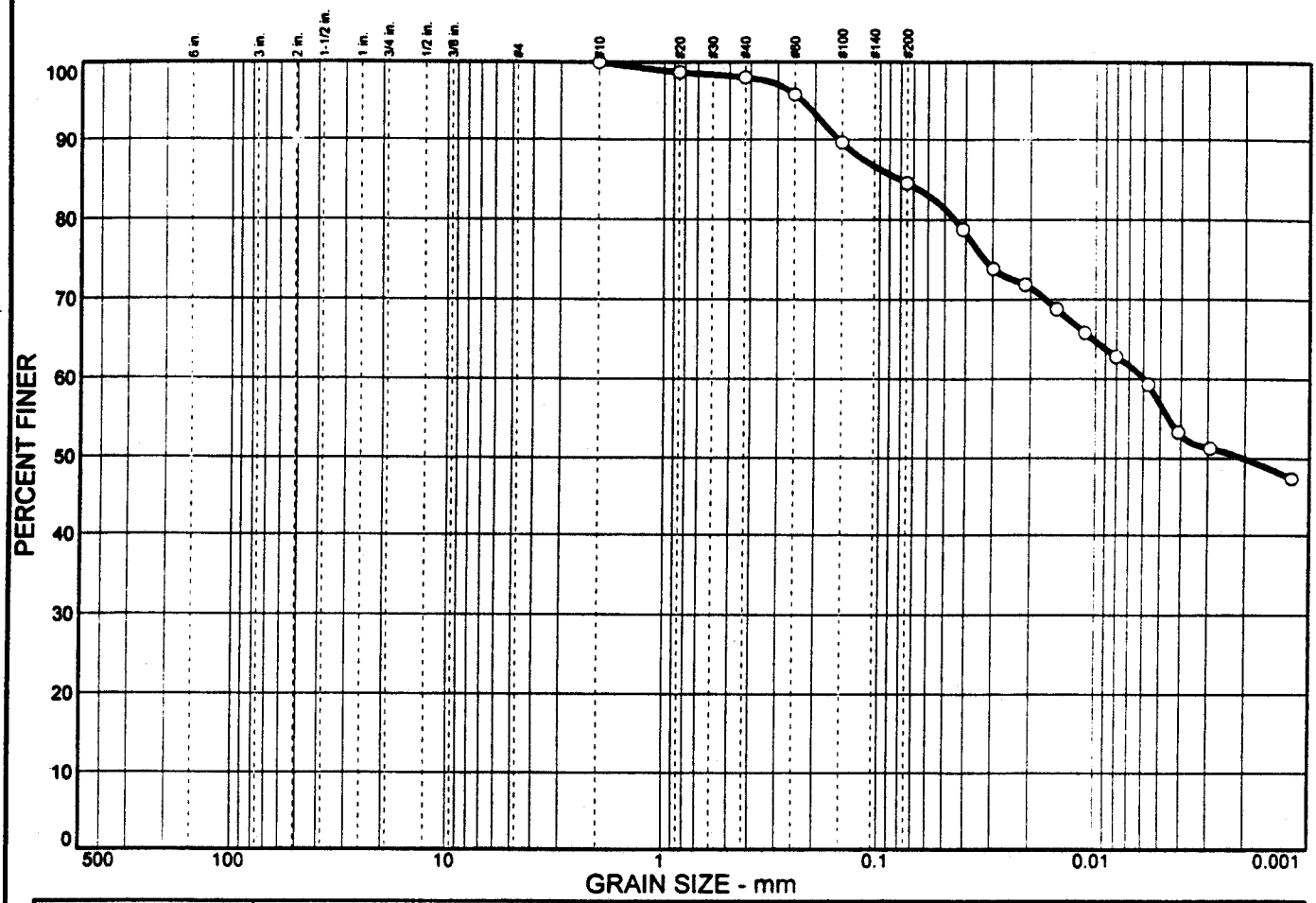
Remarks

Veneer (DL-078)

Sample No.: DL-078 **Source of Sample:** On-site Borrow Clay **Date:**
Location: Veneer-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	15.5	27.6	56.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	98.7		
#40	98.0		
#60	95.8		
#100	89.6		
#200	84.5		

* (no specification provided)

Soil Description

Hillborough/LaSalle- Dark Brown silty fat CLAY

Atterberg Limits

PL= 23 LL= 63 PI= 40

Coefficients

D_{85}= 0.0816 D_{60}= 0.0060 D_{50}= 0.0020
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

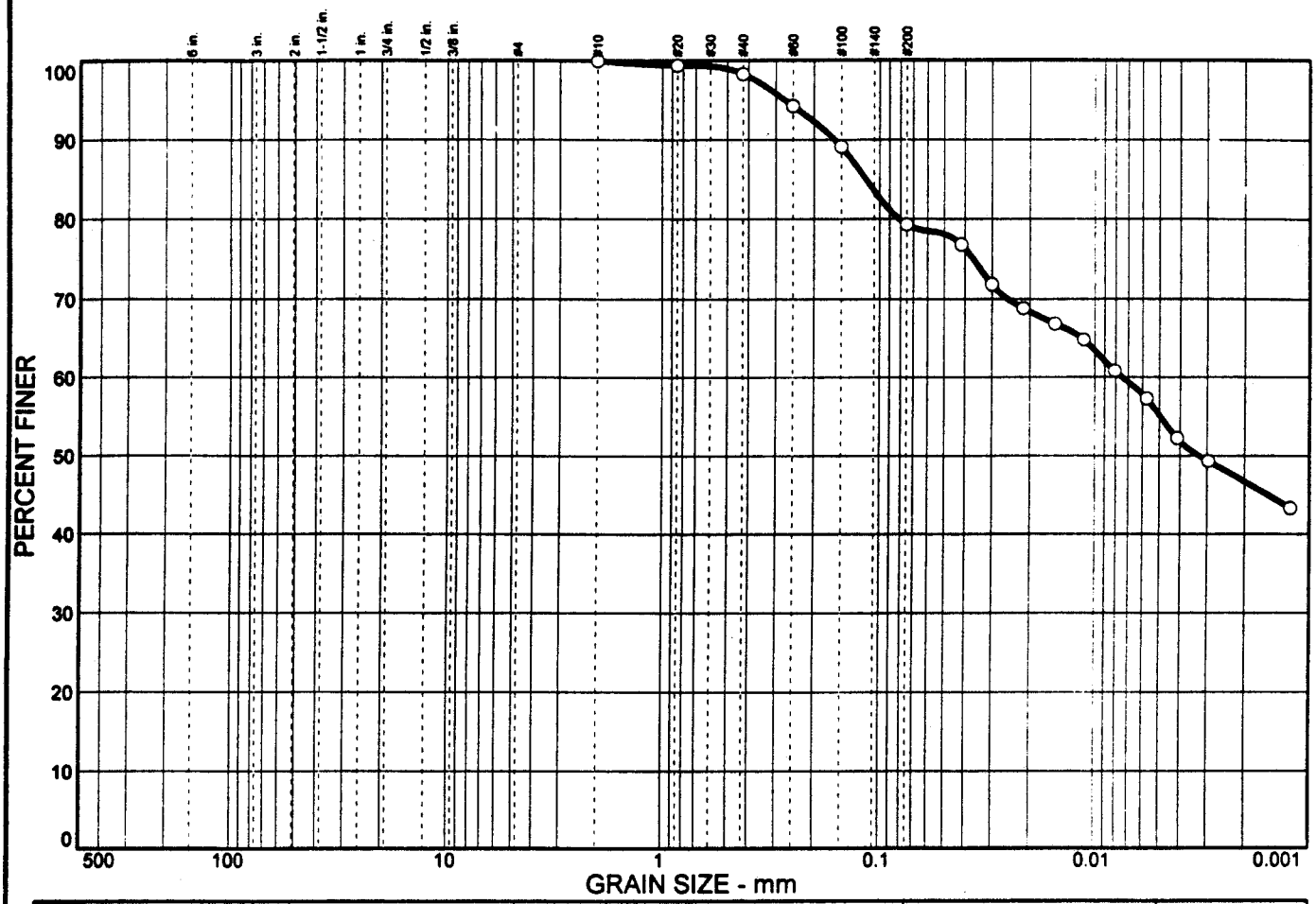
Remarks

Veneer (DL-079)

Sample No.: DL-079 **Source of Sample:** Hillsborough Clay Source **Date:**
Location: Veneer-4 **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	20.7	24.0	55.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.4		
#40	98.3		
#60	94.2		
#100	89.1		
#200	79.3		

* (no specification provided)

Soil Description

Hillborough/LaSalle- Dark Brown silty fat CLAY

Atterberg Limits

PL= 22 LL= 60 PI= 38

Coefficients

D_{85}= 0.115 D_{60}= 0.0075 D_{50}= 0.0033
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

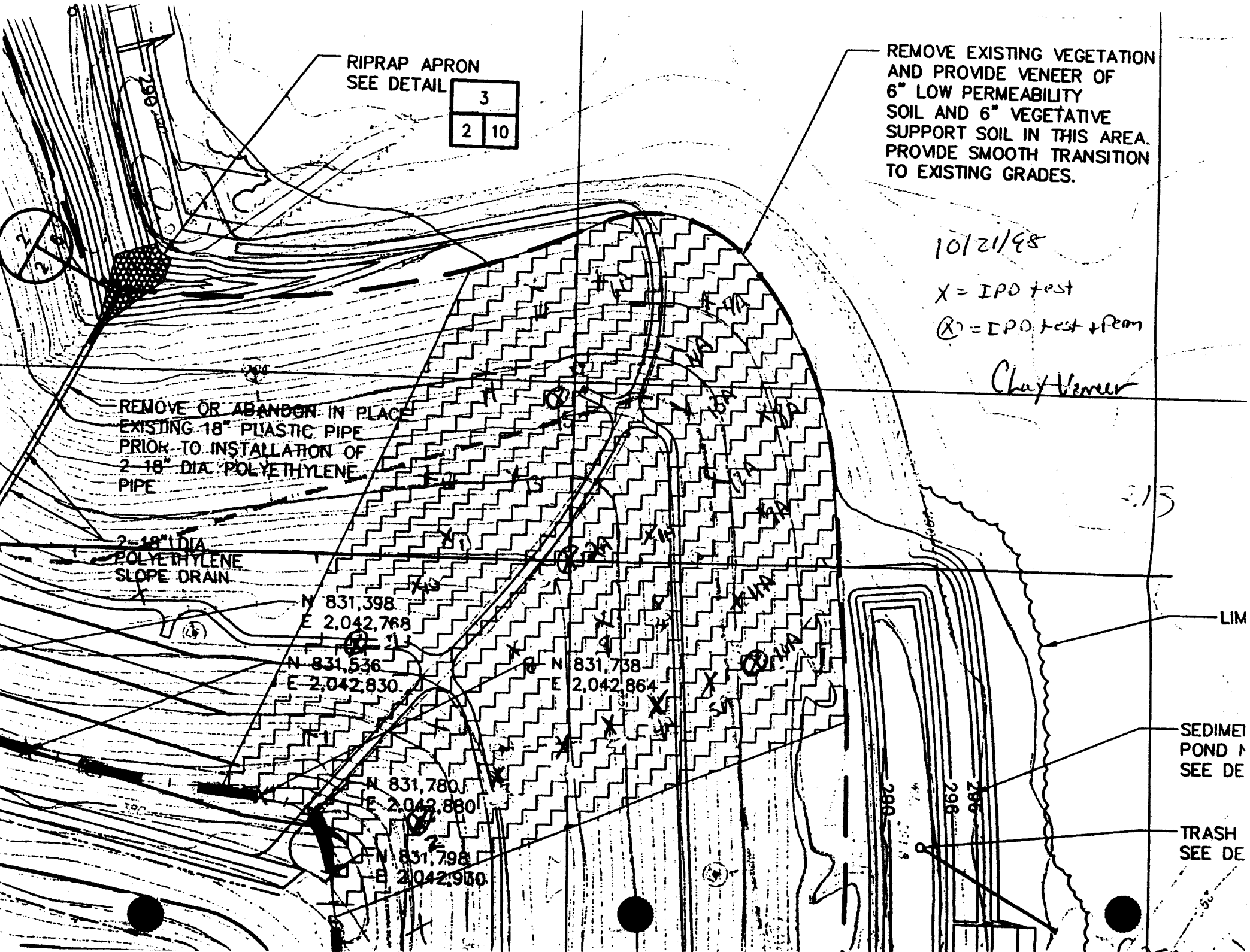
USCS= CH AASHTO=

Remarks

Veneer (DL-080)

Sample No.: DL-080 **Source of Sample:** Hillsborough Clay Source **Date:**
Location: Veneer-5 **Elev./Depth:**

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


RIPRAP APRON
SEE DETAIL
3
2
10
REMOVE EXISTING VEGETATION AND PROVIDE VENEER OF 6" LOW PERMEABILITY SOIL AND 6" VEGETATIVE SUPPORT SOIL IN THIS AREA. PROVIDE SMOOTH TRANSITION TO EXISTING GRADES.
10/21/98
X = IPD test
⊗ = IPD test + Perm
Clay Veneer
REMOVE OR ABANDON IN PLACE EXISTING 18" PLASTIC PIPE PRIOR TO INSTALLATION OF 2-18" DIA. POLYETHYLENE PIPE
2-18" DIA. POLYETHYLENE SLOPE DRAIN
N 831,398
E 2,042,768
N 831,536
E 2,042,830
N 831,738
E 2,042,864
N 831,780
E 2,042,880
N 831,798
E 2,042,930
296
LIM
SEDIME
POND
SEE DE
TRASH
SEE DE

8

VAN DER HORST

CLAY COVER TESTING

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

Project No.: VNC-98-029
Date: 10/25/98
Report No.: 016

Acre 1 Lift 2
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	100.5	22.3	100*	
2	See Test Location Plan	97.8	21.4	97.3	
3	See Test Location Plan	98.5	21.0	98.0	
4	See Test Location Plan	100.8	21.0	98.0 100%	Perm/Sample (DL-084)
5	See Test Location Plan	96.6	26.3	96.1	
6	See Test Location Plan	99.3	22.5	98.8	
7	See Test Location Plan	95.5	21.0	95.0	
8	See Test Location Plan	97.1	21.2	97.2 96.6	
9	See Test Location Plan	98.3	21.2	97.0 97.8	
10	See Test Location Plan	96.3	25.0	95.8	
11	See Test Location Plan	96.4	26.4	95.9	
12	See Test Location Plan	95.7	21.1	95.2	
13	See Test Location Plan	97.4	22.9	96.9	
14	See Test Location Plan	100.7	21.2	100+	
15	See Test Location Plan	99.6	21.0	99.1	
16	See Test Location Plan	98.5	21.3	98.0	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	7.6x10(-8)
Dry Density (pcf)	104.4
Moisture Content (%)	21.2

Atterberg Limits (ASTM D4318)

PL	23
LL	45
PI	22
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	30.1
%Silt	30.6
%Clay	39.3

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

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/28/98
Report No.: P-054

Project No.: VNC-98-029
Sample No. DL-084

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	7.6E-08	cm/sec
% Moisture	21.2	%
Dry Density	104.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/23/98
Location: Acre 1, Lift 2

Specimen Data

Length (in):	3.227
Diameter (in.):	2.868
Area (sq. in.):	6.471
Volume (cu. in.):	20.88
Wet Weight (grams):	693.2
Dry Weight (grams):	572.0
Dry Density (pcf):	104.4

Moisture Content Test Data

Wet Weight	99.59
Dry Weight	86.02
Tare weight	21.98
% Moisture	21.2

Test Data

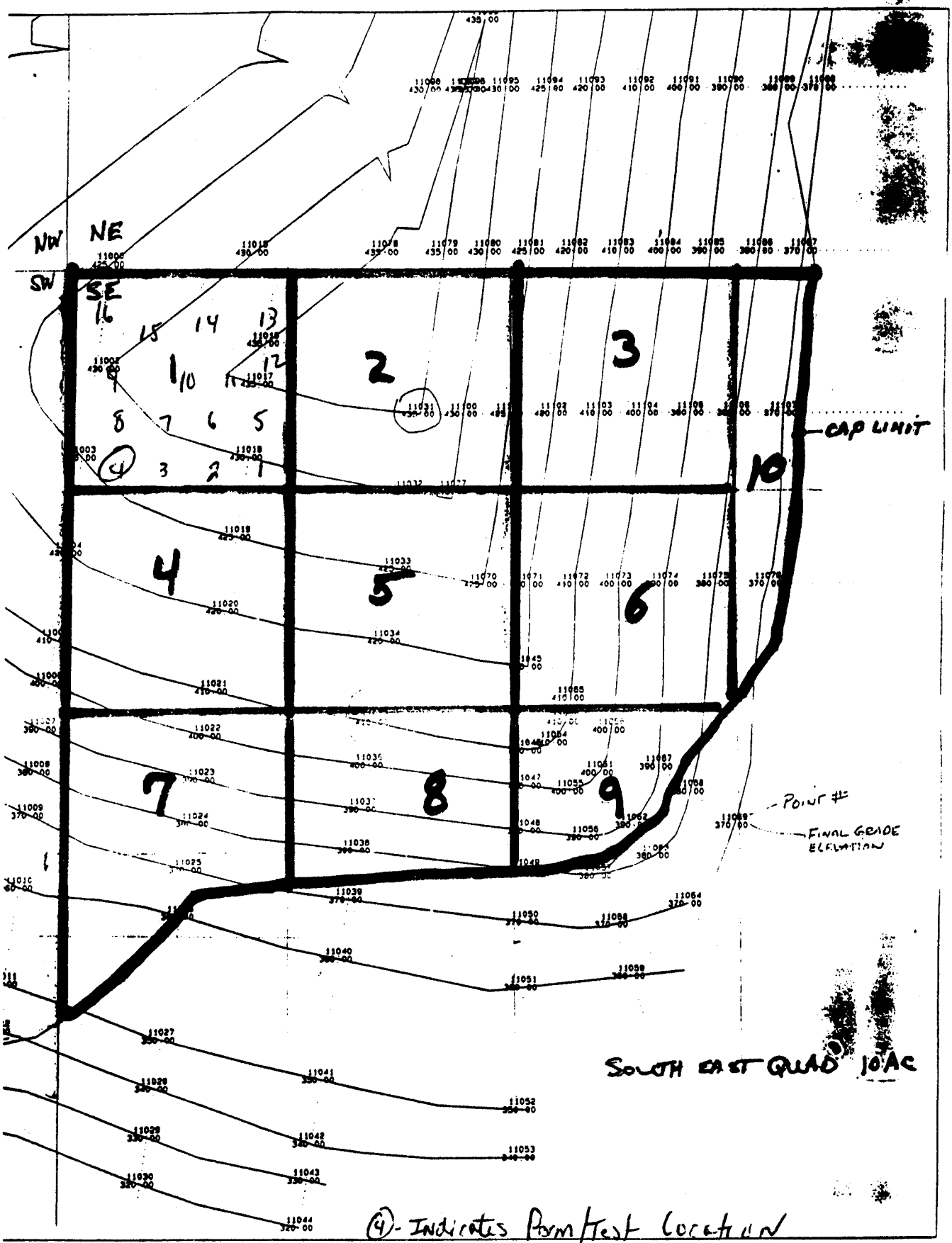
Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
204	83.82	1.00	0.90	0.90	0.95	7.20E-08
313	96.92	1.80	1.90	1.06	1.85	7.91E-08
665	96.92	3.80	3.90	1.03	3.85	7.74E-08
110	96.92	0.60	0.65	1.08	0.63	7.60E-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) **7.6E-08** cm/sec

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

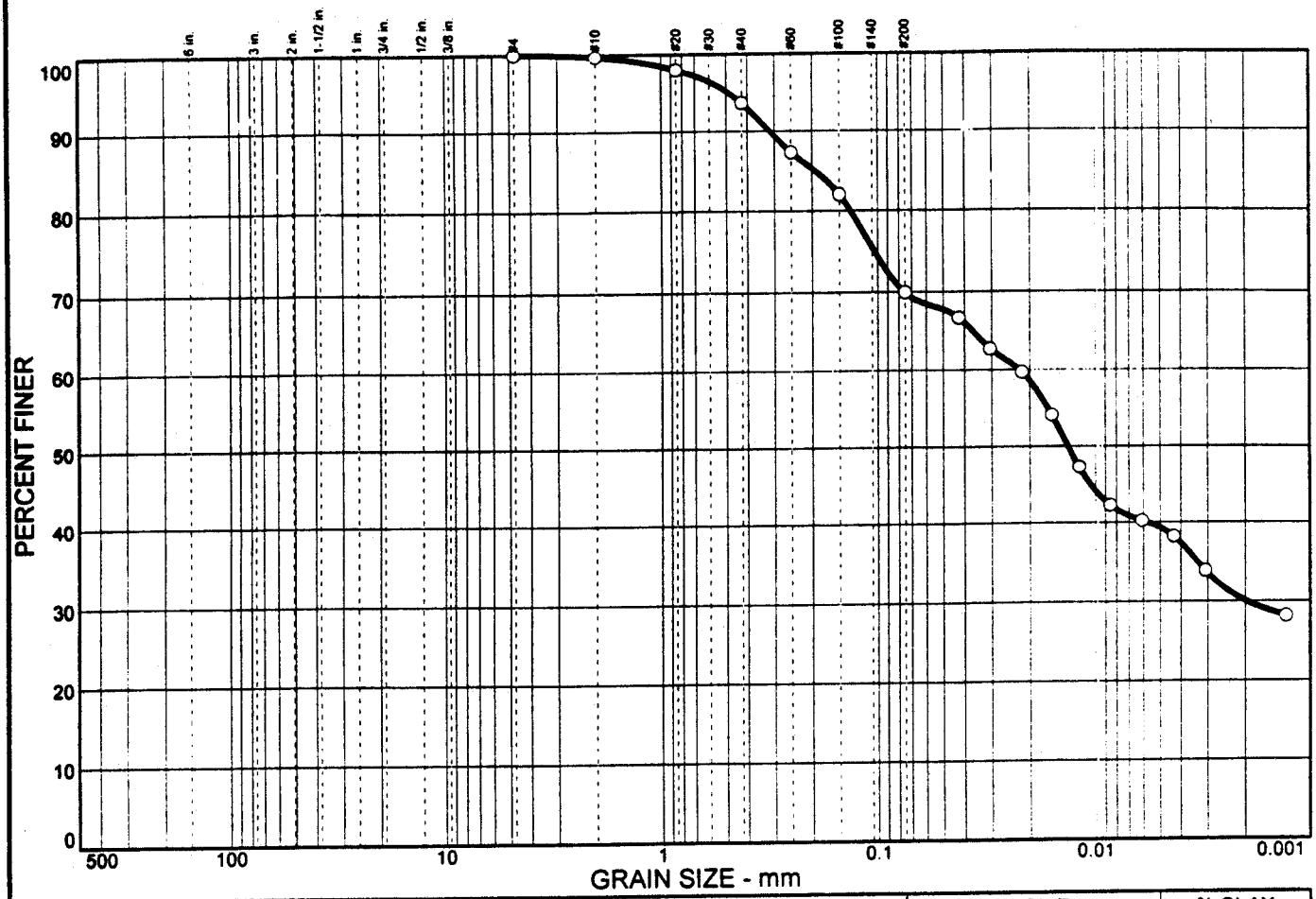


(4) - Indicates Perm/Test Location

Panel, Lift 2

Report: 016

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	30.1	30.6	39.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	98.0		
#40	93.7		
#60	87.3		
#100	82.0		
#200	69.9		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 23 LL= 45 PI= 22

Coefficients

D_{85}= 0.195 D_{60}= 0.0224 D_{50}= 0.0134
D_{30}= 0.0020 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-071, Sampled from In-situ Permeablity Test Location

Sample No.: DL-084 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 1, Lift 2 **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: 10/30/98
Report No.: 017

Acre 2 Lift 2

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	102.0	21.0	100+	
2	See Test Location Plan	97.0	23.1	96.5	
3	See Test Location Plan	101.3	22.3	100+	
4	See Test Location Plan	98.4	23.2	97.9	
5	See Test Location Plan	99.1	21.7	98.6	
6	See Test Location Plan	101.3	21.1	100+	
7	See Test Location Plan	100.5	21.6	100.0	
8	See Test Location Plan	95.5	25.1	95.0	
9	See Test Location Plan	102.1	21.1	100+	Perm/Test (DC-112)
10	See Test Location Plan	96.3	21.6	95.8	
11	See Test Location Plan	103.0	21.0	100+	
12	See Test Location Plan	97.1	22.6	96.6	
13	See Test Location Plan	98.1	22.3	97.6	
14	See Test Location Plan	97.4	23.1	96.9	
15	See Test Location Plan	99.8	22.4	99.3	
16	See Test Location Plan	95.9	24.1	95.4	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	9.2x10(-8)
Dry Density (pcf)	99.1
Moisture Content (%)	21.1

Atterberg Limits (ASTM D4318)

PL	23
LL	50
PI	27
USCS Classification	CH

Grain-size Analysis (ASTM D422)

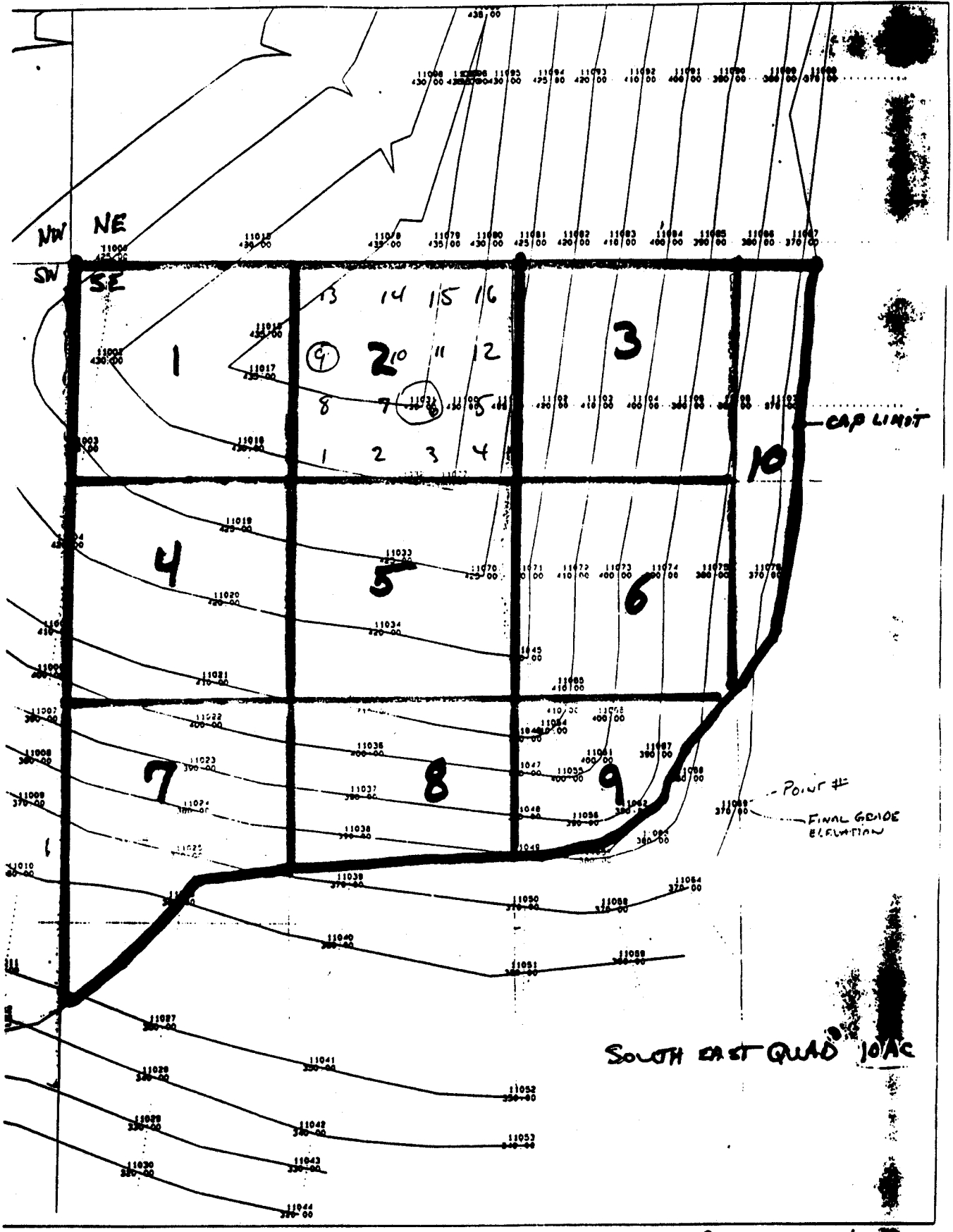
%Gravel	0.0
%Sand	18.9
%Silt	33.7
%Clay	47.4

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



(9) - Indicates Perm/Test Location
Acre 2, Lift 2
Report; 017

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/31/98
Report No.: P-064

Project No.: VNC-98-029
Sample No. DL-112

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	9.2E-08	cm/sec
% Moisture	21.1	%
Dry Density	99.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/27/98
Location: Acre 2, Lift 2
Retest of DL-085

Length (in):	3.443
Diameter (in.):	2.855
Area (sq. in.):	6.413
Volume (cu. in.):	22.08
Wet Weight (grams):	695.7
Dry Weight (grams):	574.4
Dry Density (pcf):	99.1

Moisture Content Test Data

Wet Weight	126.22
Dry Weight	108.04
Tare weight	21.92
% Moisture	21.1

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
104	69.23	0.60	0.55	0.92	0.58	1.11E-07
163	69.23	0.80	0.70	0.88	0.75	9.28E-08
248	69.23	1.20	1.00	0.83	1.10	8.94E-08
891	69.23	3.60	3.00	0.83	3.30	7.47E-08

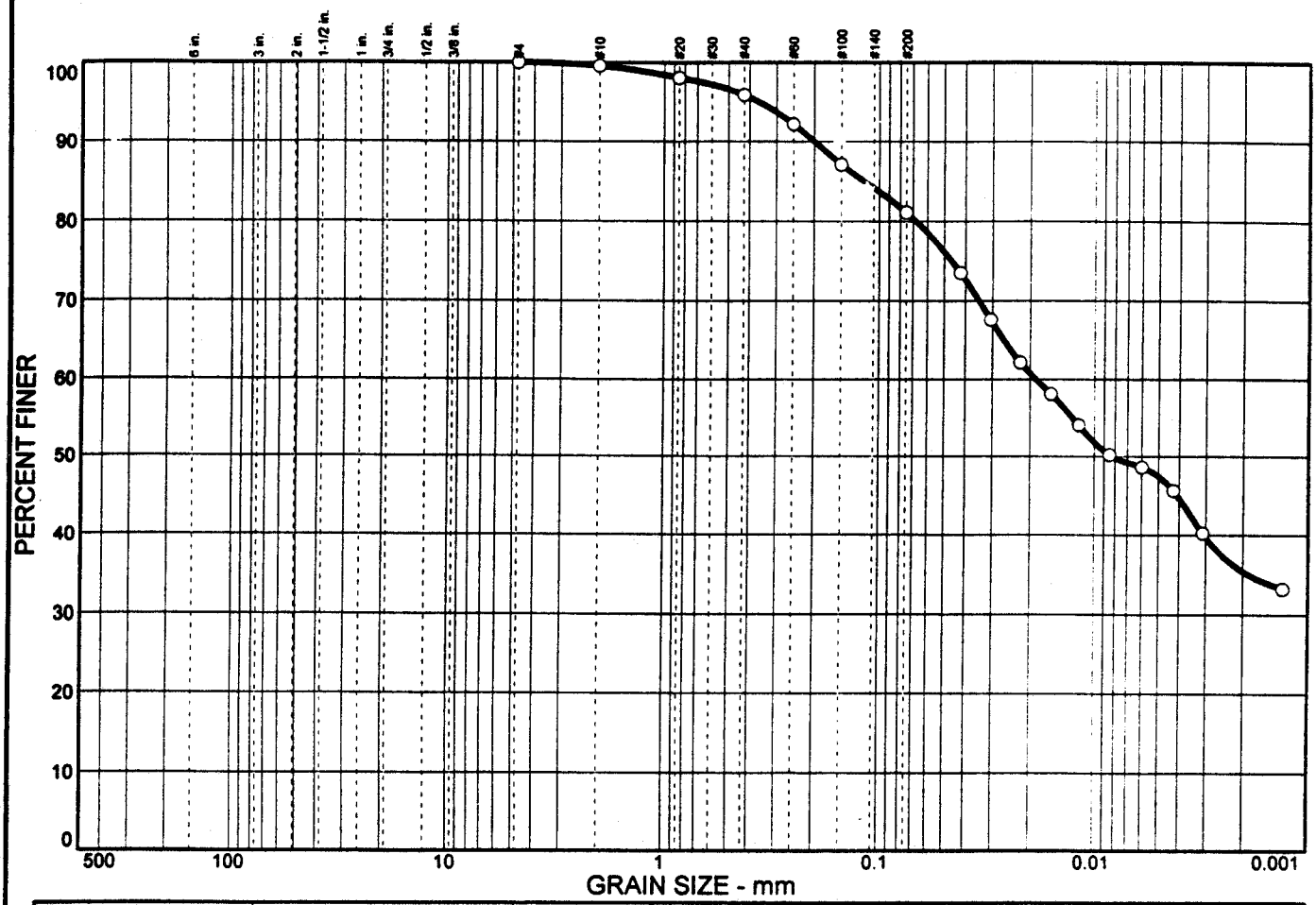
△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **9.2E-08** 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	18.9	33.7	47.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#20	98.1		
#40	95.9		
#60	92.2		
#100	87.1		
#200	81.1		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 23 LL= 50 PI= 27

Coefficients

D_{85}= 0.118 D_{60}= 0.0188 D_{50}= 0.0082
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-112, Sampled from In-situ Permeablity Test Location

Sample No.: DL-112 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 2, Lift 2 **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: 10/25/98
Report No.: 010

Acre 3 Lift 2

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	22.8	95.4	
2	See Test Location Plan	102.0	23.0	100+	Test/Sample (DL-072)
3	See Test Location Plan	99.5	24.1	99.0	
4	See Test Location Plan	101.9	22.6	100+	
5	See Test Location Plan	97.3	21.3	96.8	
6	See Test Location Plan	95.6	25.0	95.1	
7	See Test Location Plan	97.2	21.0	96.7	
8	See Test Location Plan	96.3	25.0	95.8	
9	See Test Location Plan	97.8	21.4	97.3	
10	See Test Location Plan	97.2	22.1	96.7	
11	See Test Location Plan	99.3	21.4	96.7 98.8	
12	See Test Location Plan	99.9	21.1	99.4	
13	See Test Location Plan	96.3	23.6	95.8	
14	See Test Location Plan	97.1	23.0	96.6	
15	See Test Location Plan	95.8	24.1	95.3	
16	See Test Location Plan	99.8	22.6	99.3	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	7.9x10(-8)
Dry Density (pcf)	100.8
Moisture Content (%)	21.4

Atterberg Limits (ASTM D4318)

PL	22
LL	51
PI	29
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	34.3
%Silt	22.8
%Clay	42.9

Sincerely,
VAN DER HORST Geotechnical Engineering

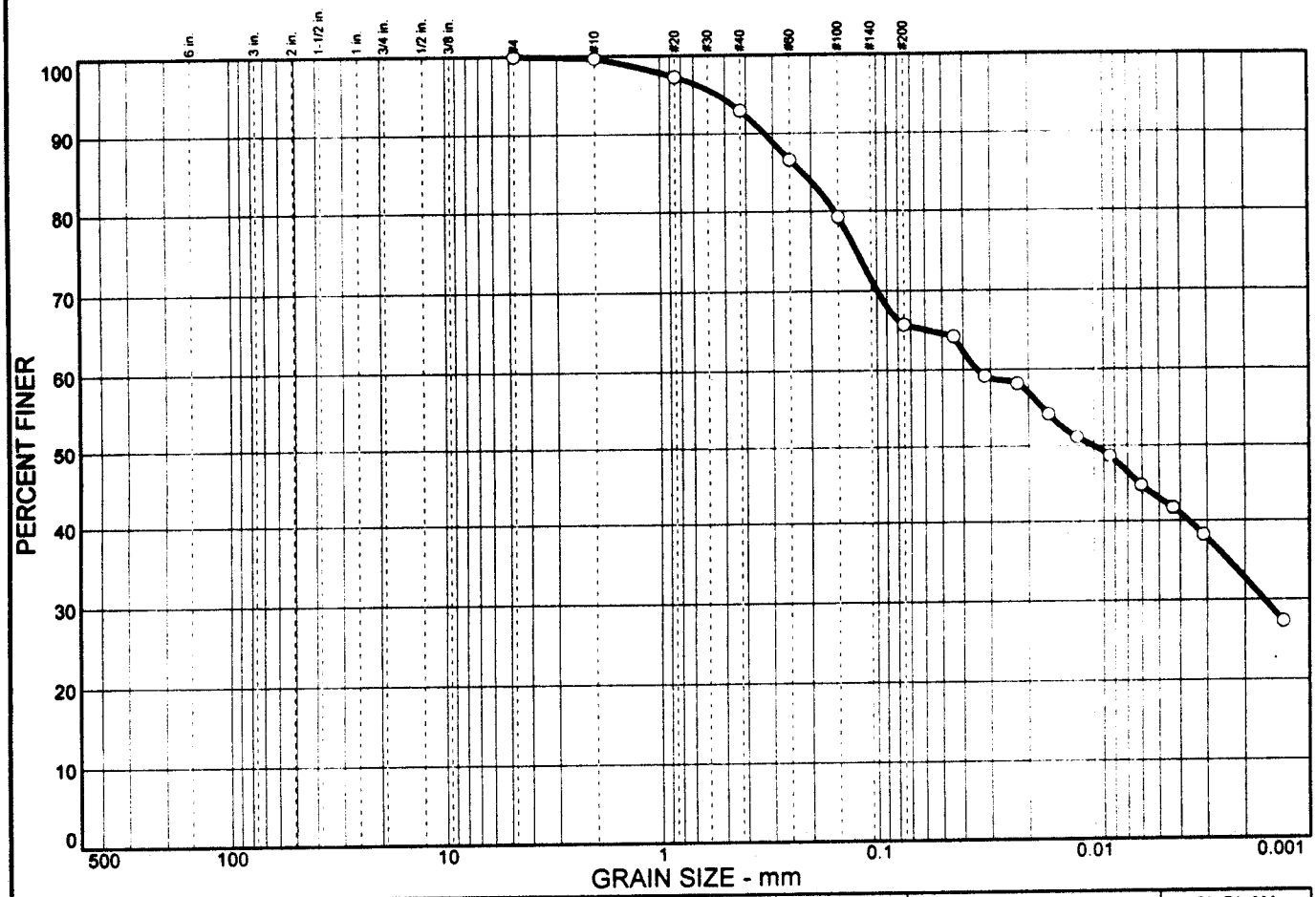
Robert L. Mashewske

Robert L. Mashewske, PE

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	0.0	34.3	22.8	42.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	97.3		
#40	93.0		
#60	86.6		
#100	79.3		
#200	65.7		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 22 LL= 51 PI= 29

Coefficients

D_{85}= 0.219 D_{60}= 0.0344 D_{50}= 0.0099
D_{30}= 0.0016 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-072, Sampled from In-situ Permeablity Test Location

Sample No.: DL-072 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 3, Lift 2 **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: 10/25/98
Report No.: P-042

Project No.: VNC-98-029
Sample No. DL-072

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	7.9E-08	cm/sec
% Moisture	21.4	%
Dry Density	100.8	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 10/20/98
Location: Acre 3, Lift 2

Specimen Data

Length (in):	3.398
Diameter (in.):	2.861
Area (sq. in.):	6.440
Volume (cu. in.):	21.88
Wet Weight (grams):	702.9
Dry Weight (grams):	579.1
Dry Density (pcf):	100.8

Moisture Content Test Data

Wet Weight	112.29
Dry Weight	96.37
Tare weight	21.93
% Moisture	21.4

Test Data

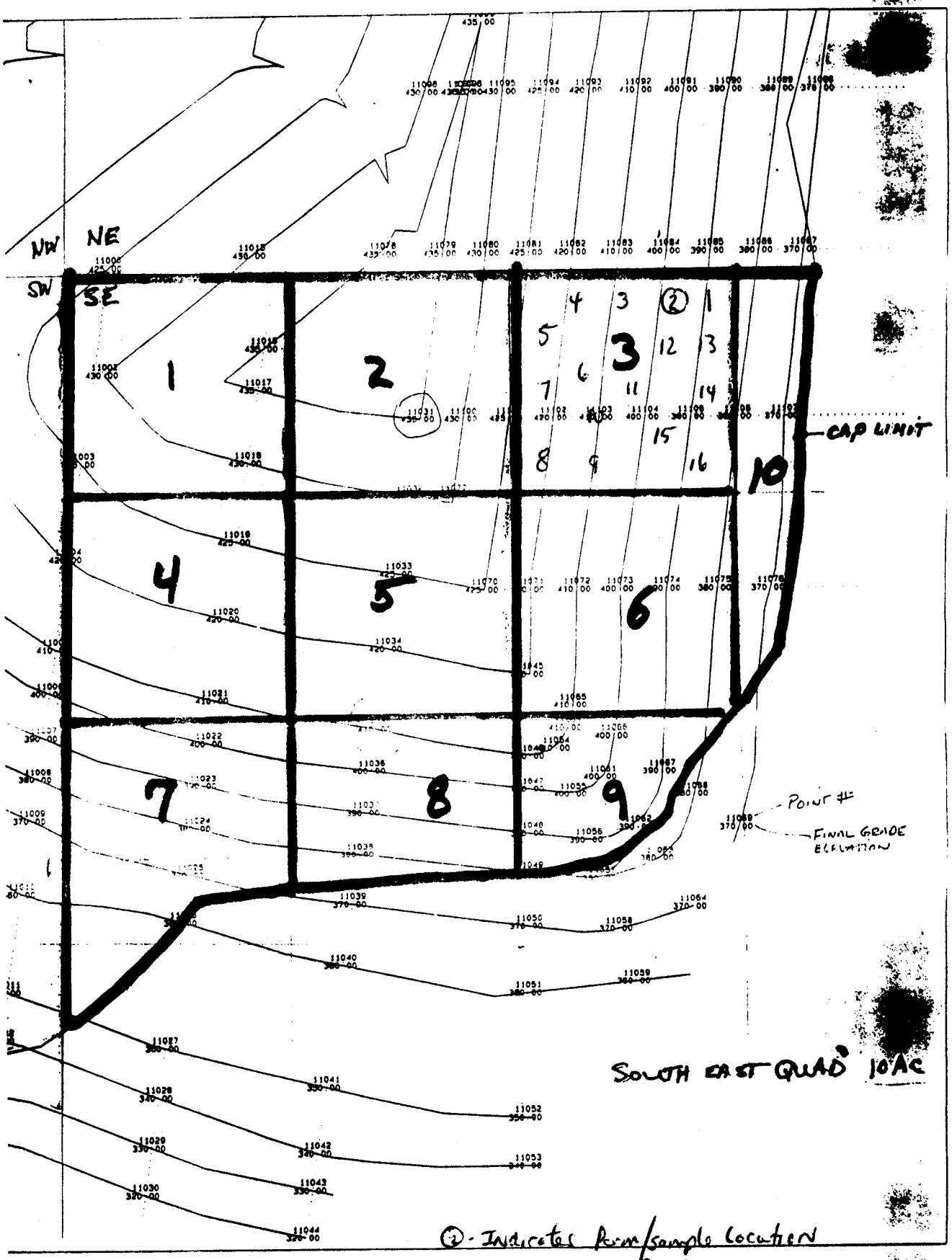
Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
398	55.38	1.20	1.20	1.00	1.20	7.47E-08
770	55.38	2.50	2.60	1.04	2.55	8.20E-08
542	55.38	1.90	2.00	1.05	1.95	8.91E-08
398	55.38	1.10	1.20	1.09	1.15	7.16E-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) **7.9E-08** cm/sec

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



② - Indicates Rum/Sample Location

Acre 3, L.ft 2

Report :010

VAN DER HORST

CLAY COVER TESTING

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

Project No.: VNC-98-029
Date: 10/30/98
Report No.: 018

Acre 4 Lift 2

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	100.8	21.6	100+	
2	See Test Location Plan	100.9	21.1	100+	
3	See Test Location Plan	101.2	22.7	100+	
4	See Test Location Plan	101.0	21.0	100+	
5	See Test Location Plan	95.8	26.5	95.3	
6	See Test Location Plan	96.3	21.6	95.8	
7	See Test Location Plan	103.0	21.0	100+	Perm/Test (DC-086)
8	See Test Location Plan	100.0	21.2	99.5	
9	See Test Location Plan	102.1	21.6	100+	
10	See Test Location Plan	96.3	24.2	95.8	
11	See Test Location Plan	103.6	21.7	100+	
12	See Test Location Plan	95.7	25.7	95.2	
13	See Test Location Plan	98.0	22.1	97.5	
14	See Test Location Plan	95.7	23.2	95.2	
15	See Test Location Plan	103.4	22.4	100+	
16	See Test Location Plan	97.1	24.4	96.6	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	8.5x10(-8)
Dry Density (pcf)	101.1
Moisture Content (%)	21.3

does not correspond w/ perm test report

Atterberg Limits (ASTM D4318)

PL	23
LL	52
PI	29
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	24.0
%Silt	37.8
%Clay	38.2

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

R. 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

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/31/98
Report No.: P-065

Project No.: VNC-98-029
Sample No. DL-086

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	7.7E-08	cm/sec
% Moisture	21.3	%
Dry Density	101.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/23/98
Location: Acre 4, Lift 2

Length (in):	3.878
Diameter (in.):	2.869
Area (sq. in.):	6.476
Volume (cu. in.):	25.11
Wet Weight (grams):	808.1
Dry Weight (grams):	666.2
Dry Density (pcf):	101.1

Moisture Content Test Data

Wet Weight	119.85
Dry Weight	102.70
Tare weight	22.15
% Moisture	21.3

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
135	83.08	0.50	0.60	1.20	0.55	7.64E-08
259	83.08	1.20	1.00	0.83	1.10	7.96E-08
666	83.08	2.70	2.50	0.93	2.60	7.32E-08
311	83.08	1.50	1.60	1.07	1.55	7.73E-08

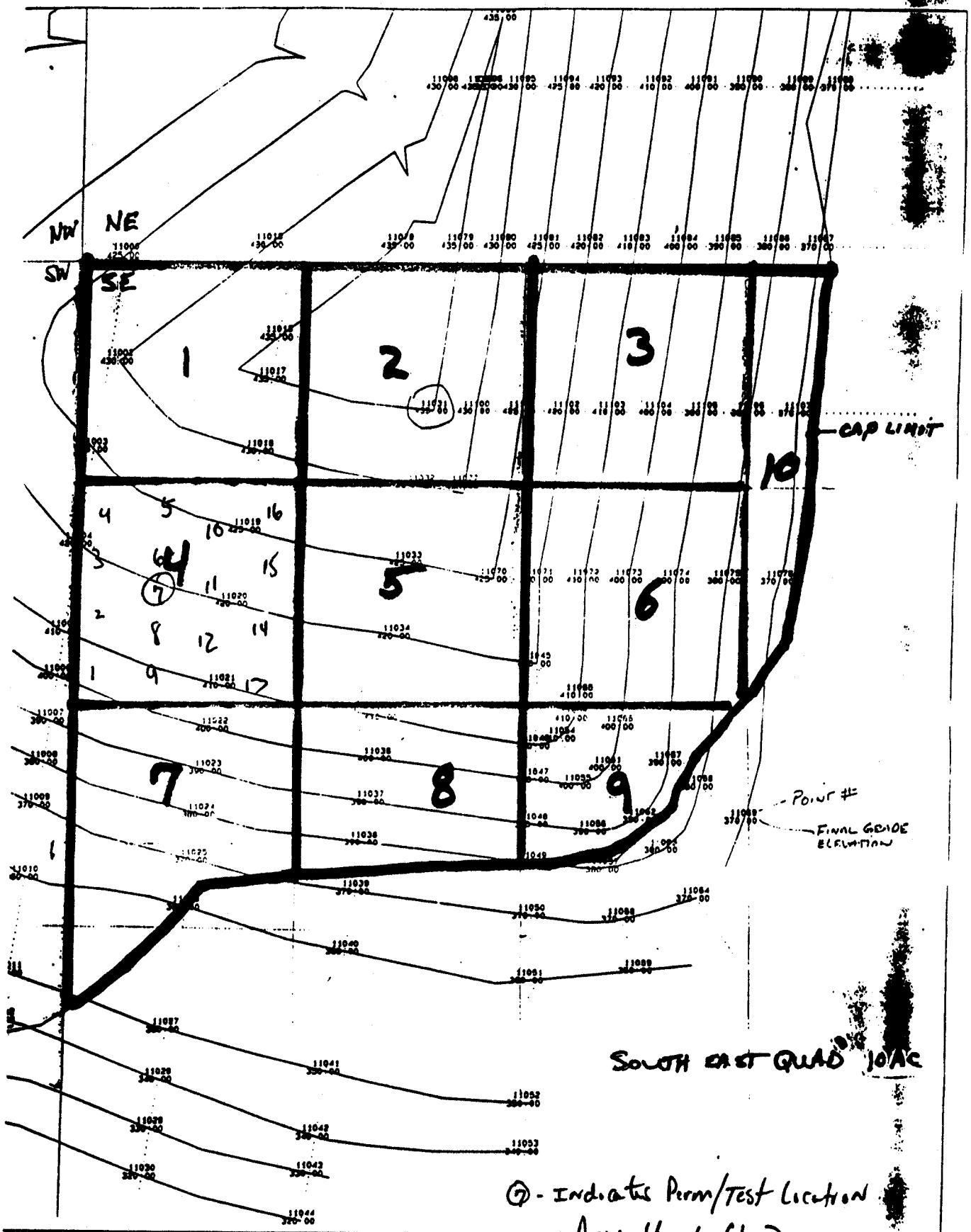
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) 7.7E-08 cm/sec

Perm Test does not correspond w/ clay cover testing results.

Respecfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager



⑦ - Indicates Perm/Test Location

Acc 4, c.ft 2

Report : 018

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	24.0	37.8	38.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	98.3		
#40	96.1		
#60	90.3		
#100	84.1		
#200	76.0		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 23 LL= 52 PI= 29

Coefficients

D_{85}= 0.161 D_{60}= 0.0220 D_{50}= 0.0108
D_{30}= 0.0015 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-86, Sampled from In-situ Permeablity Test Location

Sample No.: DL-86 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 4, Lift 2 **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: 10/30/98
Report No.: 019

Acre 5 Lift 2

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	97.9	23.9	97.4	
2	See Test Location Plan	96.5	21.4	96.0	
3	See Test Location Plan	96.1	25.5	95.6	
4	See Test Location Plan	98.1	21.4	97.0 97.6	
5	See Test Location Plan	98.6	23.8	98.1	
6	See Test Location Plan	98.8	21.8	98.3	Perm/Test (DC-114)
7	See Test Location Plan	103.2	21.4	100+	
8	See Test Location Plan	97.1	22.6	96.6	
9	See Test Location Plan	97.0	25.1	96.6 96.5	
10	See Test Location Plan	95.7	24.1	95.2	
11	See Test Location Plan	102.4	21.0	100+	
12	See Test Location Plan	104.9	21.2	100+	
13	See Test Location Plan	96.8	21.4	96.4 96.3	
14	See Test Location Plan	97.3	22.3	96.8	
15	See Test Location Plan	98.0	23.1	97.5	
16	See Test Location Plan	99.3	23.6	98.8	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	8.6x10(-8)
Dry Density (pcf)	98.6
Moisture Content (%)	26.9

Atterberg Limits (ASTM D4318)

PL	26
LL	49
PI	23
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	24.8
%Silt	28.9
%Clay	46.3

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

R. 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

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	24.8	28.9	46.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	97.6		
#40	93.4		
#60	88.1		
#100	82.9		
#200	75.2		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 26 LL= 49 PI= 23

Coefficients

D_{85}= 0.183 D_{60}= 0.0207 D_{50}= 0.0070
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-114, Sampled from In-situ Permeablity Test Location

Sample No.: DL-114 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 5, Lift 2 **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: 10/31/98
Report No.: P-066

Project No.: VNC-98-029
Sample No. DL-114

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.6E-08	cm/sec
% Moisture	26.9	%
Dry Density	98.6	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/27/98
Location: Acre 5, Lift 2
Retest of DL-087

Length (in):	3.610
Diameter (in.):	2.845
Area (sq. in.):	6.368
Volume (cu. in.):	22.99
Wet Weight (grams):	754.7
Dry Weight (grams):	594.9
Dry Density (pcf):	98.6

Moisture Content Test Data

Wet Weight	85.01
Dry Weight	71.67
Tare weight	22.02
% Moisture	26.9

Test Data

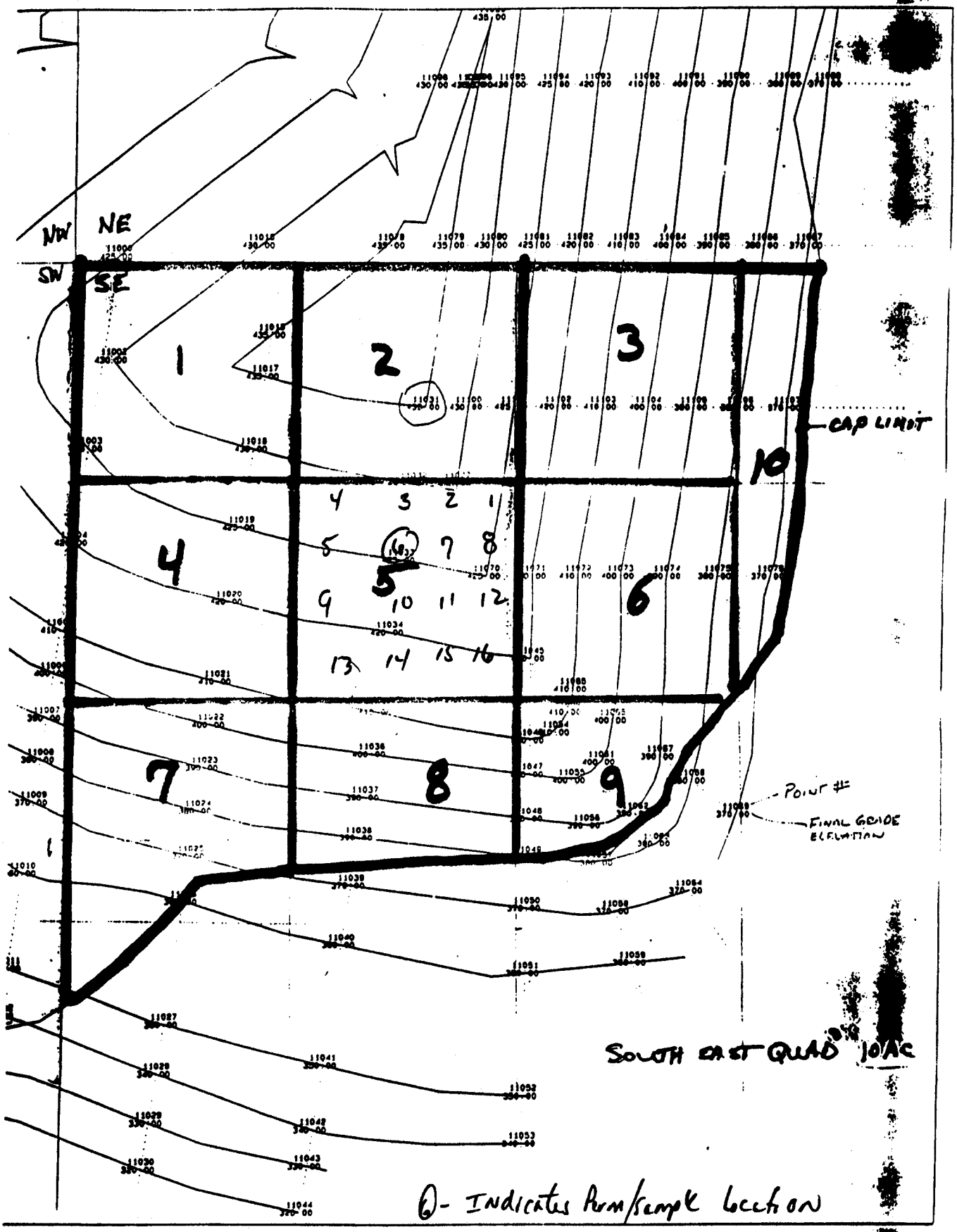
Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
201	72.00	0.90	0.90	1.00	0.90	9.17E-08
673	72.00	2.80	2.60	0.93	2.70	8.21E-08
342	72.00	1.40	1.50	1.07	1.45	8.68E-08
612	72.00	2.50	2.50	1.00	2.50	8.36E-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) **8.6E-08** cm/sec

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



Q- Indicates Perm/sample location

Acre 5, Lift 2

Report : 019

VAN DER HORST

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

LETTER OF TRANSMITTAL

DATE: 10-27-98 JOB NO. VNC-98-029

ATTENTION: Andy

REGARDING: Durham Landfill Closure
Roberts Clay - Acre 6, Lift 2

To: Gilbert Southern
3301 Glenn Road
Durham, NC 27704

WE ARE SENDING YOU X Attached ____ Under separate cover the following items:

COPIES	DATE	NO.	DESCRIPTION
2	10/27/98	Clay.009	Clay Cover Test Report Acre 6, Lift 2

REMARKS

Pages 5 Fax # 667-0514

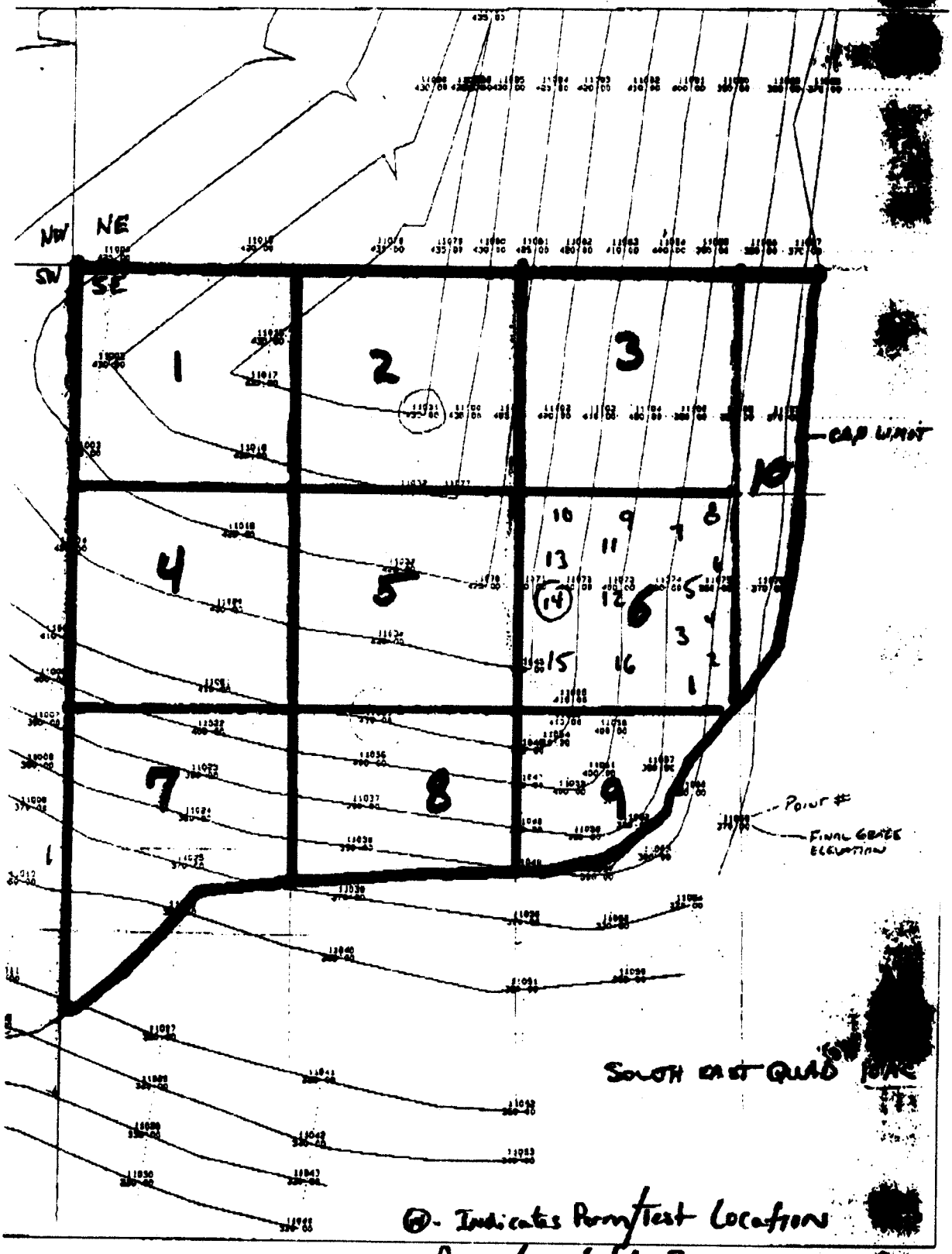
COPIES TO: File

Hard Copy to follow in the mail

SIGNED: Robert Mashewske, P.E.

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



(14) - Indicates Perm/Test Location

Acre 6, Lot 2

Report : 009

VAN DER HORST

CLAY COVER TESTING

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

Project No.: VNC-98-029
Date: 10/27/98
Report No.: 009

Acre 6 Lift 2
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	97.7	26.6	97.0 97.2	
2	See Test Location Plan	101.3	22.7	100+	
3	See Test Location Plan	96.7	22.3	100+ 96.2	
4	See Test Location Plan	95.9	24.3	95.1 95.4	
5	See Test Location Plan	98.4	24.0	97.6 97.9	
6	See Test Location Plan	97.1	23.1	100+ 96.6	
7	See Test Location Plan	97.6	24.8	100+ 97.1	
8	See Test Location Plan	99.7	22.2	98.5 99.2	
9	See Test Location Plan	98.9	24.6	95.3 98.4	
10	See Test Location Plan	99.9	24.5	96.7 99.4	
11	See Test Location Plan	101.7	21.0	100+	
12	See Test Location Plan	98.2	24.3	100+ 97.7	
13	See Test Location Plan	97.3	23.3	95.9 96.8	
14	See Test Location Plan	96.2	22.8	96.7 95.7	Test/Sample (DL-071)
15	See Test Location Plan	99.8	21.3	95.8 99.3	
16	See Test Location Plan	100.3	22.0	97.7 99.8	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	8.8x10(-8)
Dry Density (pcf)	98.3
Moisture Content (%)	22.1

Atterberg Limits (ASTM D4318)

PL	26
LL	57
PI	31
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	22.7
%Silt	37.7
%Clay	[illegible]

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

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/25/98
Report No.: P-041

Project No.: VNC-98-029
Sample No. DL-071

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.8E-08	cm/sec
% Moisture	22.1	%
Dry Density	98.3	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled:
Location: Area 6, Lift 2

Specimen Data

Length (in)	3.755
Diameter (in.)	2.866
Area (sq. in.)	6.462
Volume (cu. in.)	24.27
Wet Weight (grams)	764.3
Dry Weight (grams)	626.2
Dry Density (pcf)	98.3

Moisture Content Test Data

Wet Weight	88.97
Dry Weight	76.88
Tare weight	22.07
% Moisture	22.1

Test Data

Confining Pressure 3.0 psi

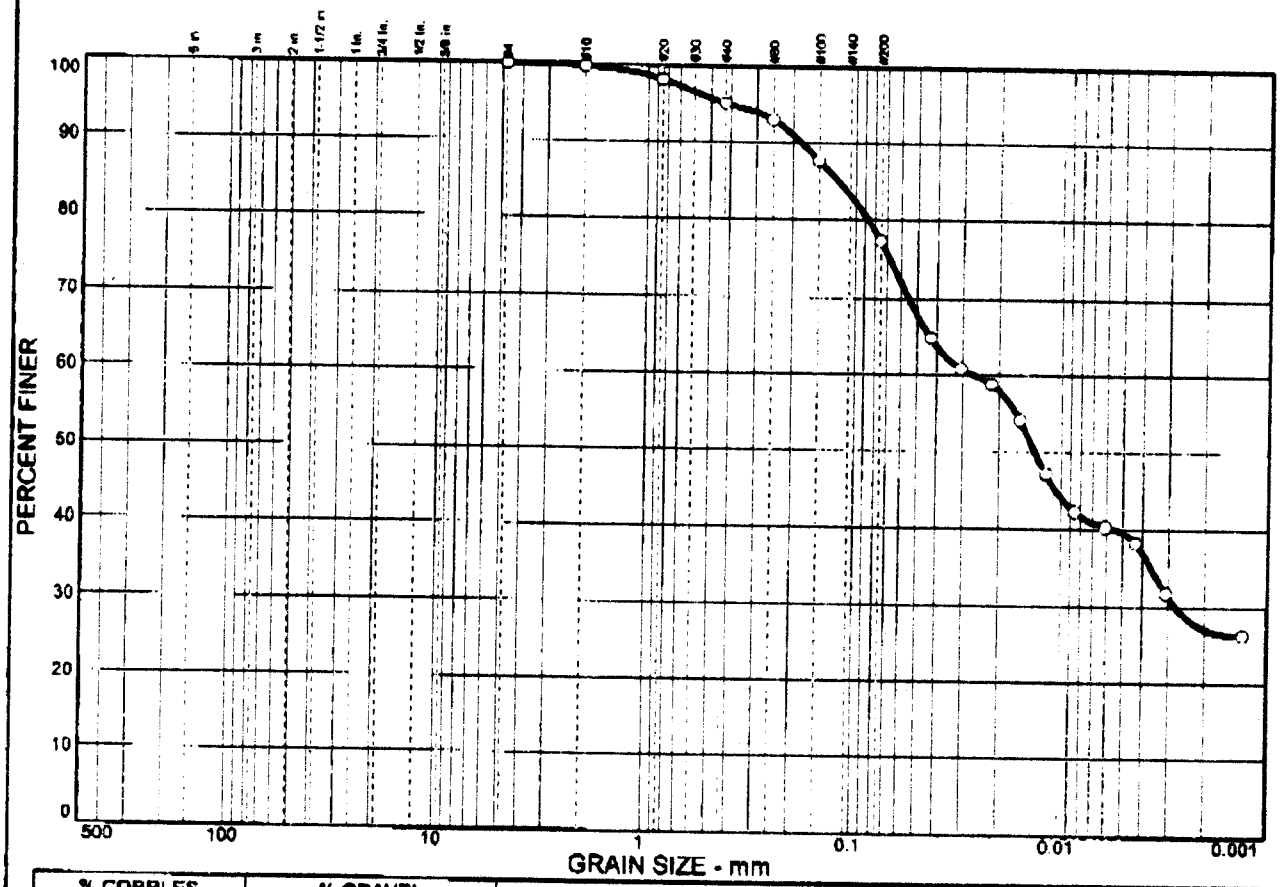
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
934	55.38	3.90	3.25	0.83	3.58	1.04E-07
242	55.38	0.80	0.70	0.88	0.75	8.45E-08
184	55.38	0.50	0.50	1.00	0.50	7.41E-08
500	55.38	1.60	1.60	1.00	1.60	8.73E-08

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

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	22.7	37.7	39.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	98.1		
#40	95.0		
#60	92.9		
#100	87.7		
#200	77.3		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 26 LL= 57 PI= 31

Coefficients

D_{85}= 0.120 D_{60}= 0.0267 D_{50}= 0.0133
D_{30}= 0.0028 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-071, Sampled from In-situ Permeablity Test Location

Sample No.: DL-071 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 6, Lift 2 **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: 10/30/98
Report No.: 020

Acre 7 Lift 2

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	95.5	25.4	95.0	
2	See Test Location Plan	100.0	21.2	99.5	
3	See Test Location Plan	99.4	22.9	98.9	
4	See Test Location Plan	98.6	24.1	98.2 98.1	
5	See Test Location Plan	99.8	21.6	99.3	
6	See Test Location Plan	100.9	21.1	100+	
7	See Test Location Plan	101.2	21.2	100+	
8	See Test Location Plan	101.0	23.9	100+	
9	See Test Location Plan	96.4	21.9	96.0	Perm/Test (DC-088)
10	See Test Location Plan	101.3	22.1	100+	
11	See Test Location Plan	99.5	22.3	99.0	
12	See Test Location Plan	102.1	21.6	100+	
13	See Test Location Plan	100.3	22.0	99.8	
14	See Test Location Plan	96.4	23.8	95.9	
15	See Test Location Plan	99.1	22.7	98.6	
16	See Test Location Plan	99.9	22.3	99.4	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	6.7x10(-8)
Dry Density (pcf)	104.4
Moisture Content (%)	21.6

Atterberg Limits (ASTM D4318)

PL	25
LL	50
PI	25
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	27.2
%Silt	32.6
%Clay	40.2

Sincerely,
VAN DER HORST Geotechnical Engineering

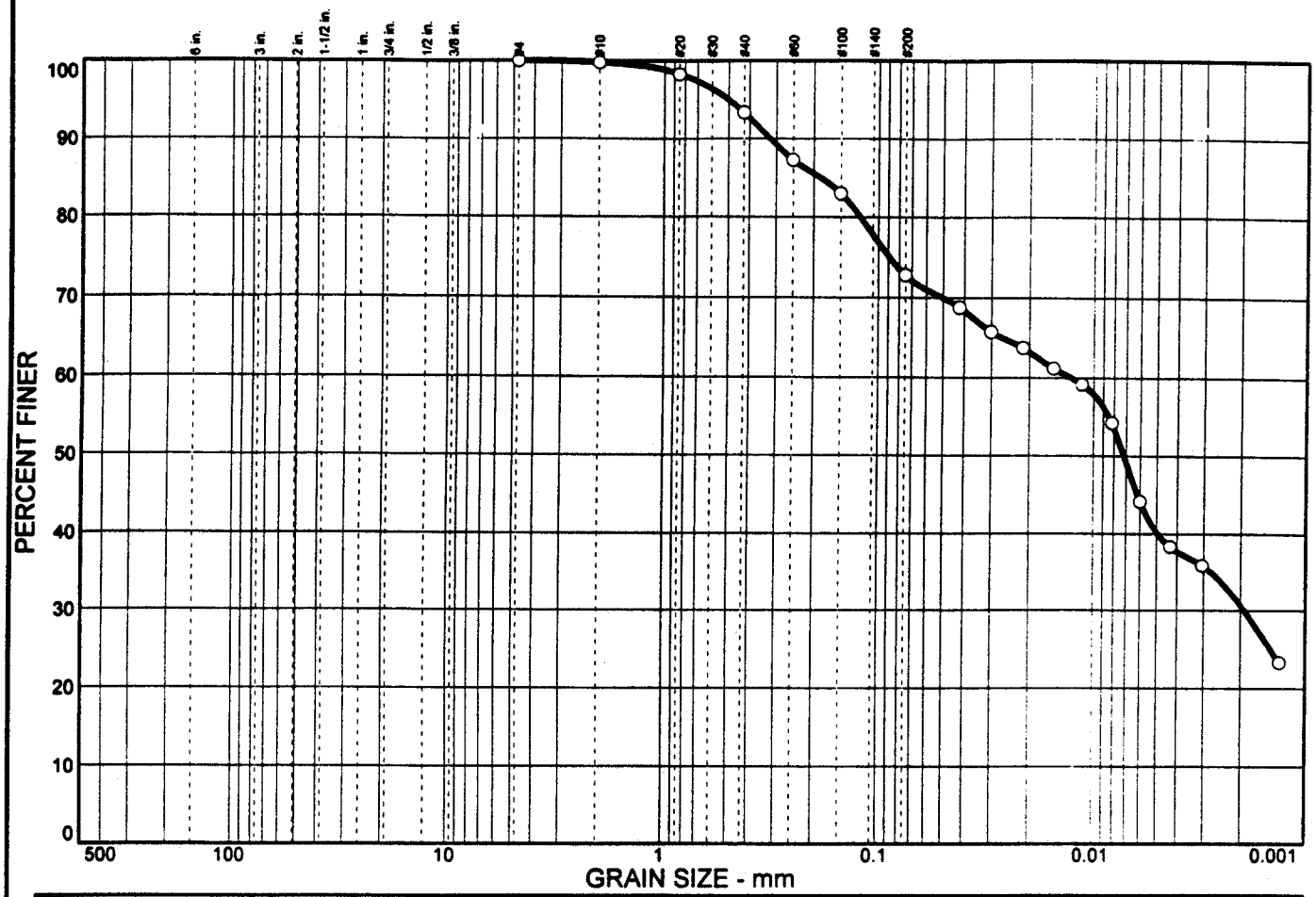
R. Mashewske

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

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	27.2	32.6	40.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	98.3		
#40	93.4		
#60	87.3		
#100	83.0		
#200	72.8		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 25 LL= 50 PI= 25

Coefficients

D_{85}= 0.186 D_{60}= 0.0128 D_{50}= 0.0072
D_{30}= 0.0019 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-88, Sampled from In-situ Permeablity Test Location

Sample No.: DL-88 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 7, Lift 2 **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:	10/31/98
Report No.:	P-067

Project No.:	VNC-98-029	Project:	Durham Landfill Closure
Sample No.	DL-088	Client:	Gilbert Southern Corp.

Test Summary

Permeability	6.7E-08	cm/sec
% Moisture	21.6	%
Dry Density	104.4	pcf

Sample Information

Specimen Type:		Date Sampled:	10/23/98
Remolded		Location:	Acre 7, Lift 2
Tube	X		

Length (in):	3.689
Diameter (in.):	2.856
Area (sq. in.):	6.417
Volume (cu. in.):	23.67
Wet Weight (grams):	788.3
Dry Weight (grams):	648.4
Dry Density (pcf):	104.4

Moisture Content Test Data

Wet Weight	101.44
Dry Weight	87.34
Tare weight	21.99
% Moisture	21.6

Test Data

Confining Pressure 3.0 psi

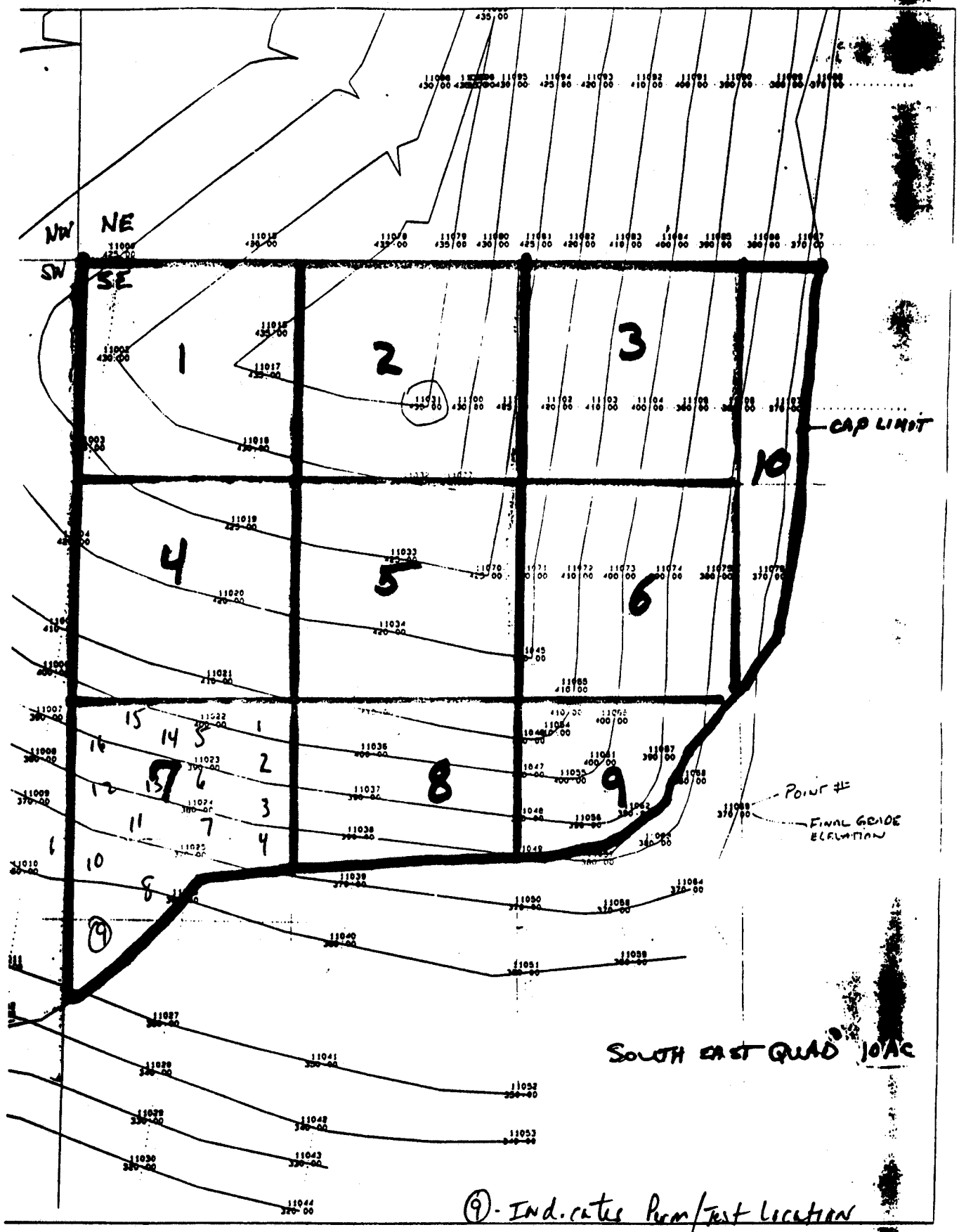
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
136	83.08	0.50	0.50	1.00	0.50	6.61E-08
270	83.08	1.00	1.10	1.10	1.05	7.00E-08
180	83.08	0.60	0.70	1.17	0.65	6.50E-08
159	83.08	0.60	0.60	1.00	0.60	6.79E-08

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) **6.7E-08** cm/sec

Respecfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager



(9) - Indicates Perm/Test Location

Acre 7, Lift 2

Report : 020

VAN DER HORST

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

LETTER OF TRANSMITTAL

DATE: 10-27-98 JOB NO. VNC-98-029

ATTENTION: Andy

REGARDING: Durham Landfill Closure
Roberts Clay - Acre 8, Lift 2
Boutwell Perm. Test Report

To: Gilbert Southern
3301 Glenn Road
Durham, NC 27704

WE ARE SENDING YOU X Attached ____ Under separate cover the following items:

COPIES	DATE	NO.	DESCRIPTION
2	10/27/98	Clay.008	Clay Cover Test Report Acre 8, Lift 2

REMARKS

#Pages 5 Fax# 667-0514

COPIES TO: File

Hard Copy to follow in the mail

SIGNED: Robert Mashewske, P.E.

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

CLAY COVER TESTING

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

Project No.: VNC-98-029
Date: 10/27/98
Report No.: 008

Acre 8 Lift 2

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	97.5	21.3	97.0	
2	See Test Location Plan	100.9	21.6	100+	
3	See Test Location Plan	100.6	21.5	100+	
4	See Test Location Plan	95.1	24.6	95.1 94.6	Test/Sample (DL-069)
5	See Test Location Plan	98.1	23.3	97.6	
6	See Test Location Plan	100.6	22.6	100+	
7	See Test Location Plan	103.3	22.8	100+	
8	See Test Location Plan	98.9	24.6	98.5 96.4	
9	See Test Location Plan	95.8	23.9	95.3	
10	See Test Location Plan	97.2	23.1	96.7	
11	See Test Location Plan	101.2	22.1	100+	
12	See Test Location Plan	100.9	22.0	100+	
13	See Test Location Plan	96.4	23.7	95.9	
14	See Test Location Plan	97.2	24.0	96.7	
15	See Test Location Plan	96.3	23.6	95.8	
16	See Test Location Plan	98.2	24.3	97.7	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	3.9x10(-8)
Dry Density (pcf)	95.7
Moisture Content (%)	23.7

Atterberg Limits (ASTM D4318)

PL	23
LL	54
PI	31
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	25.2
%Silt	34.8
%Clay	40.0

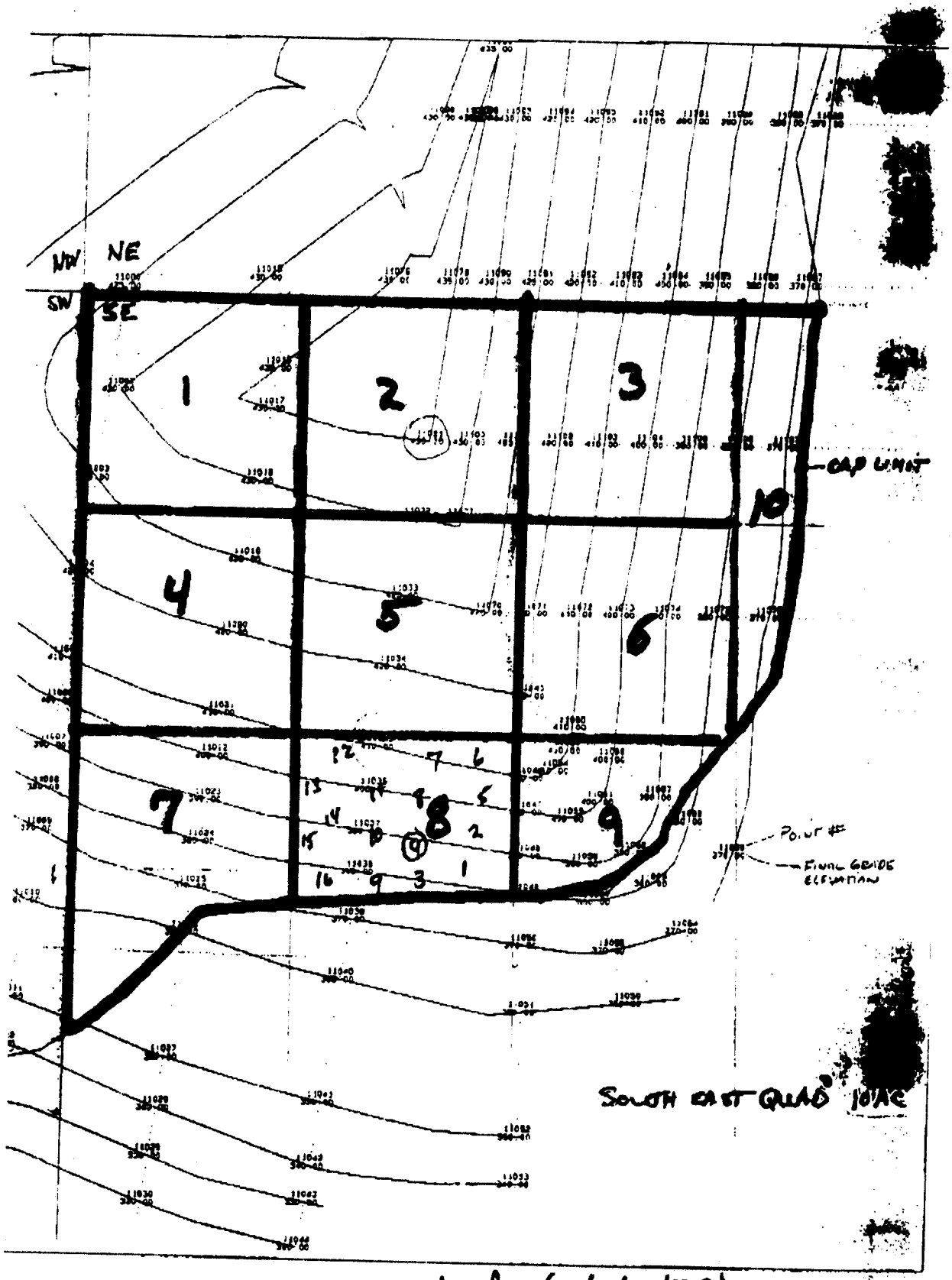
Sincerely,
VAN DER HORST Geotechnical Engineers, P.C.

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



(4) - Indicates Perm/Test Location
Area 8, Lift 2
Report : 008

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/25/98
Report No.: P-040

Project No.: VNC-98-029
Sample No. DL-070

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.9E-08	cm/sec
% Moisture	23.7	%
Dry Density	95.7	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/19/98
Location: Acre 8, Lift 2

Specimen Data

Length (in):	3.398
Diameter (in.):	2.859
Area (sq. in.):	6.431
Volume (cu. in.):	21.85
Wet Weight (grams):	679.1
Dry Weight (grams):	548.9
Dry Density (pcf):	95.7

Moisture Content Test Data

Wet Weight	143.29
Dry Weight	120.02
Tare weight	21.95
% Moisture	23.7

Test Data

Confining Pressure 3.0 psi

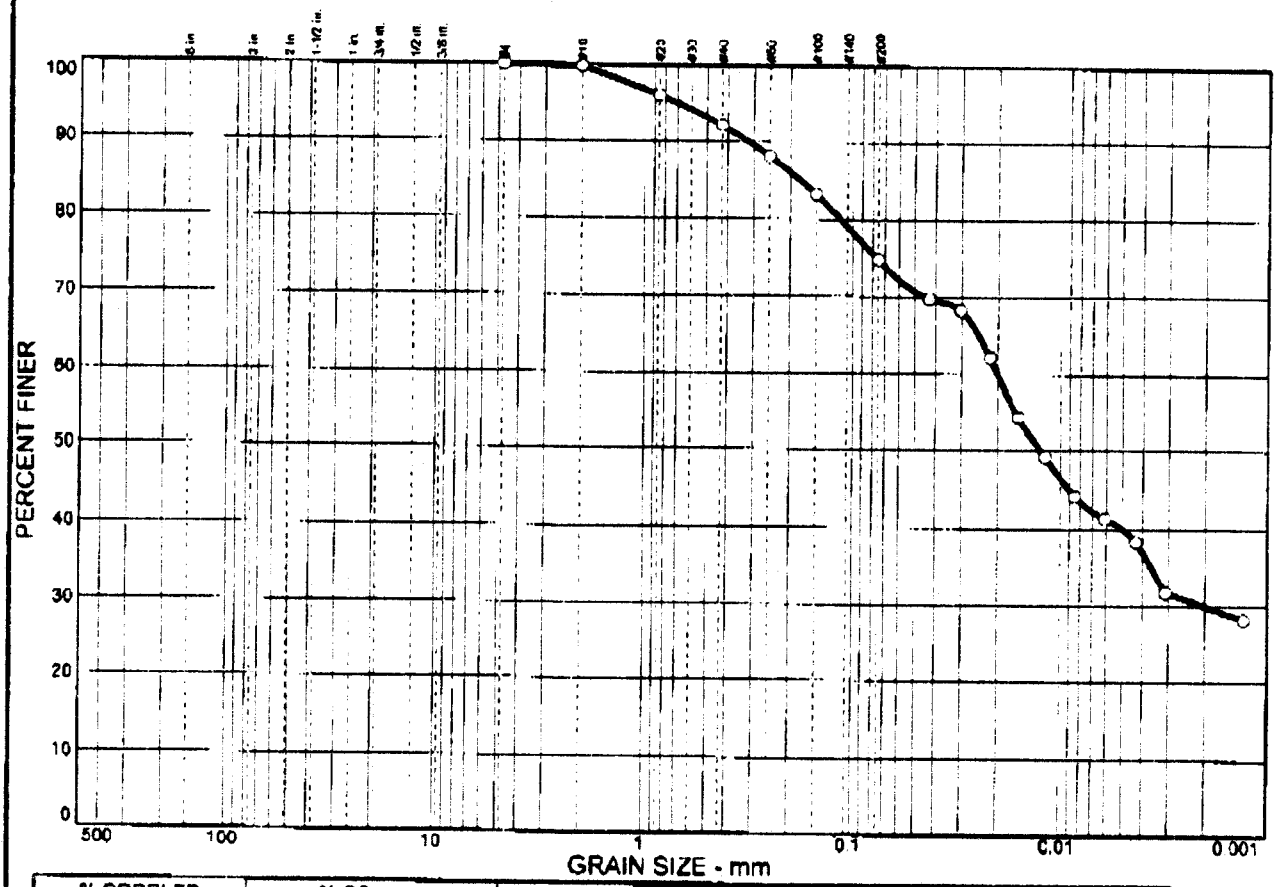
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
846	55.38	1.05	1.20	1.14	1.13	3.30E-08
510	55.38	0.80	0.70	0.88	0.75	3.65E-08
935	55.38	1.75	1.65	0.94	1.70	4.51E-08
427	55.38	0.70	0.70	1.00	0.70	4.07E-08

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) 3.9E-08 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	25.2	34.8	40.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	96.1		
#40	92.2		
#60	88.1		
#100	83.2		
#200	74.8		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 23 LL= 54 PI= 31

Coefficients

D_{85}= 0.178 D_{60}= 0.0200 D_{50}= 0.0124
D_{30}= 0.0020 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-070, Sampled from In-situ Permeablity Test Location

Sample No.: DL-070 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 8, Lift 2 **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: 10/25/98
Report No.: 012

Acre 9 Lift 2

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	97.9	23.3	97.4	
2	See Test Location Plan	99.3	21.0	98.8	
3	See Test Location Plan	100.0	22.7	99.5	
4	See Test Location Plan	101.3	21.2	100+	
5	See Test Location Plan	101.2	23.3	100+	
6	See Test Location Plan	103.1	21.0	100+	
7	See Test Location Plan	98.3	21.6	97.8	
8	See Test Location Plan	95.5	25.3	95.0	Perm/Sample (DL-074)
9	See Test Location Plan	100.7	21.2	100+	
10	See Test Location Plan	99.6	21.0	99.1	
11	See Test Location Plan	97.2	22.0	95.7 96.7 ok	
12	See Test Location Plan	99.5	24.1	99.0	
13	See Test Location Plan	95.6	22.8	95.1	
14	See Test Location Plan	99.3	22.6	98.8	
15	See Test Location Plan	97.2	23.1	96.7	
16	See Test Location Plan	101.3	21.6	100+	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	5.2x10(-8)
Dry Density (pcf)	101.1
Moisture Content (%)	22.4

Atterberg Limits (ASTM D4318)

PL	24
LL	47
PI	23

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	27.8
%Silt	22.0
%Clay	50.2

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

R. 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

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/28/98
Report No.: P-050

Project No.: VNC-98-029
Sample No. DL-074

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.2E-08	cm/sec
% Moisture	22.4	%
Dry Density	101.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/20/98
Location: Acre 9, Lift 2

Specimen Data

Length (in):	3.944
Diameter (in.):	2.853
Area (sq. in.):	6.404
Volume (cu. in.):	25.26
Wet Weight (grams):	820.9
Dry Weight (grams):	670.5
Dry Density (pcf):	101.1

Moisture Content Test Data

Wet Weight	104.66
Dry Weight	89.53
Tare weight	22.07
% Moisture	22.4

Test Data

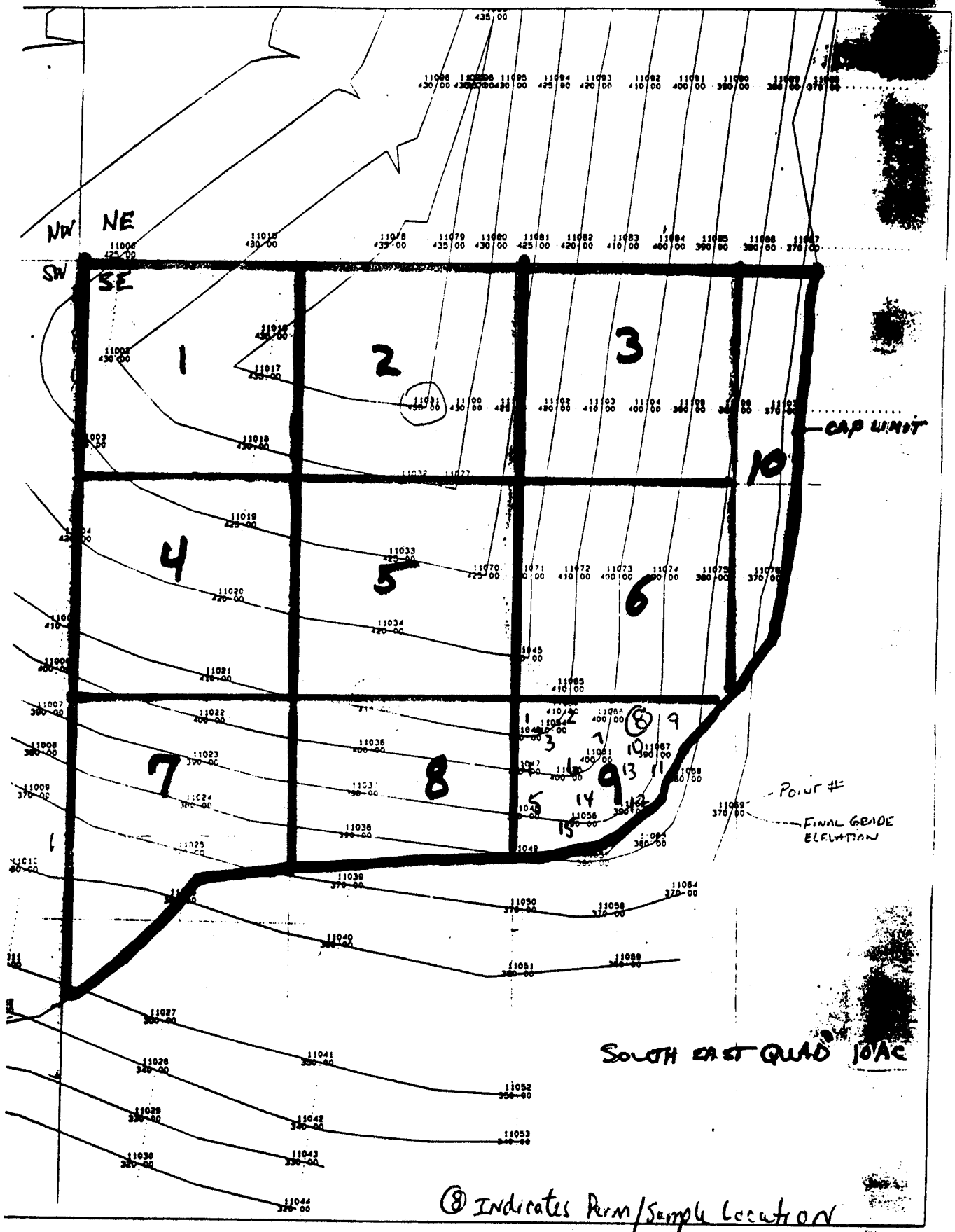
Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
282	83.08	0.70	0.80	1.14	0.75	5.13E-08
359	83.08	0.90	1.05	1.17	0.98	5.23E-08
143	83.08	0.40	0.40	1.00	0.40	5.39E-08
586	83.08	1.60	1.50	0.94	1.55	5.10E-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) **5.2E-08** cm/sec

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

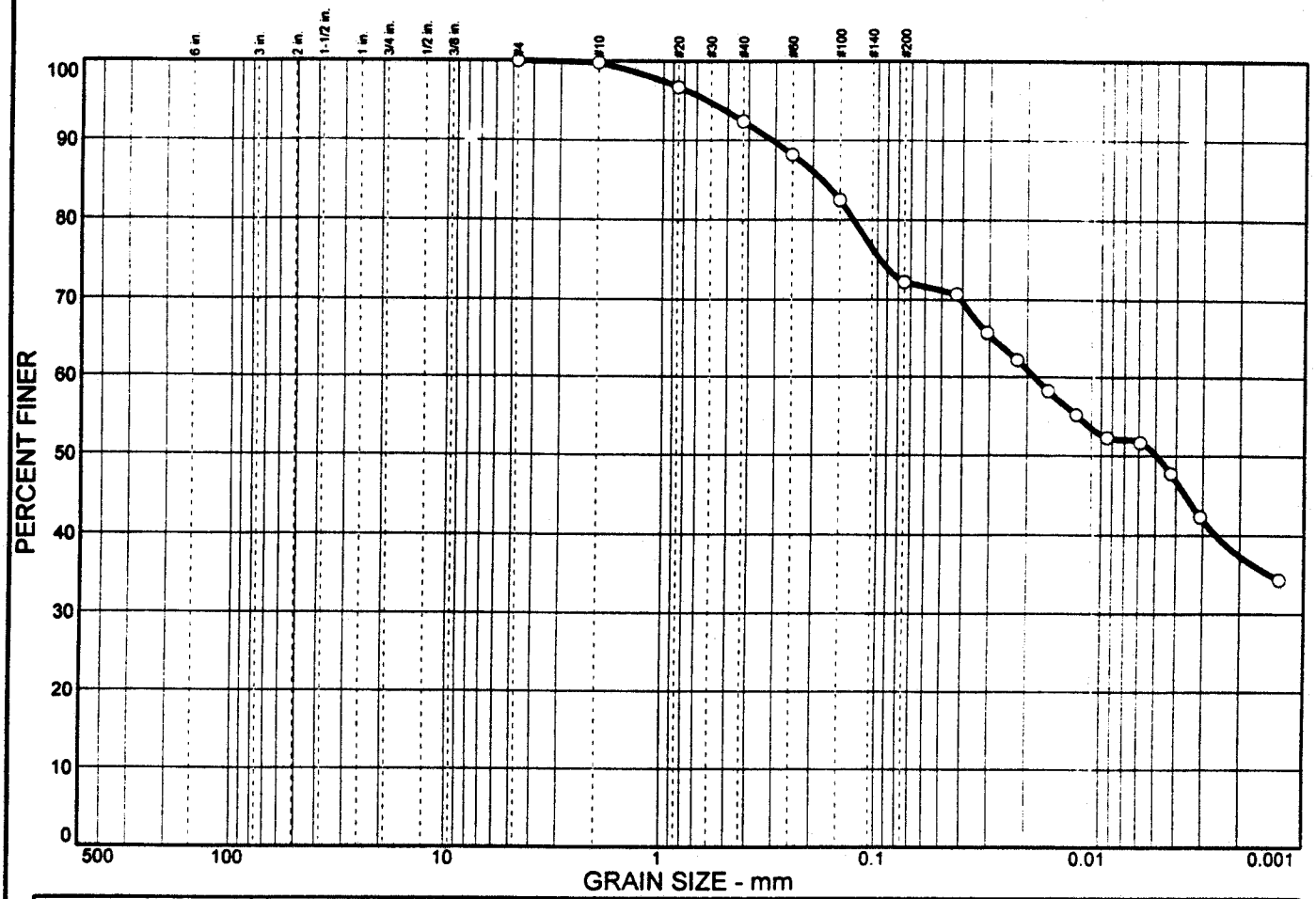


(8) Indicates Perm/Sample Location

Area 9, Lift 2

Report: 012

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	27.8	22.0	50.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	96.7		
#40	92.4		
#60	88.2		
#100	82.5		
#200	72.2		

* (no specification provided)

Soil Description

Roberts Pit - Lean clay with sand

Atterberg Limits

PL= 24 LL= 47 PI= 23

Coefficients

D_{85}= 0.181 D_{60}= 0.0185 D_{50}= 0.0049
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-074, Sampled from In-situ Permeablity Test Location

Sample No.: DL-074 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 9, Lift 2 **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: 10/25/98
Report No.: 013

Acre 10 Lift 2

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	21.3	98.0	
2	See Test Location Plan	97.2	21.6	96.7	
3	See Test Location Plan	105.7	21.4	100+	
4	See Test Location Plan	103.2	21.7	100+	
5	See Test Location Plan	99.6	22.4	99.1	
6	See Test Location Plan	99.3	24.0	98.8	Perm/Sample (DL-075)
7	See Test Location Plan	101.4	21.1	100+	
8	See Test Location Plan	95.6	22.8	95.1	
9	See Test Location Plan	98.3	23.2	97.8	
10	See Test Location Plan	99.2	22.0	98.7	
11	See Test Location Plan	96.4	23.5	95.9	
12	See Test Location Plan	97.8	24.1	97.3	
13	See Test Location Plan	96.1	24.0	95.6	
14	See Test Location Plan	100.5	22.3	100.0	
15					
16					

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	8.4x10(-8)
Dry Density (pcf)	99.9
Moisture Content (%)	21.5

Atterberg Limits (ASTM D4318)

PL	52
LL	22
PI	30
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	26.0
%Silt	24.7
%Clay	49.3

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

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 10/28/98
Report No.: P-051

Project No.: VNC-98-029
Sample No. DL-075

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.4E-08	cm/sec
% Moisture	21.5	%
Dry Density	99.9	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/20/98
Location: Acre 10, Lift 2

Specimen Data

Length (in):	2.961
Diameter (in.):	2.843
Area (sq. in.):	6.359
Volume (cu. in.):	18.83
Wet Weight (grams):	599.6
Dry Weight (grams):	493.5
Dry Density (pcf):	99.9

Moisture Content Test Data

Wet Weight	106.03
Dry Weight	91.15
Tare weight	21.91
% Moisture	21.5

Test Data

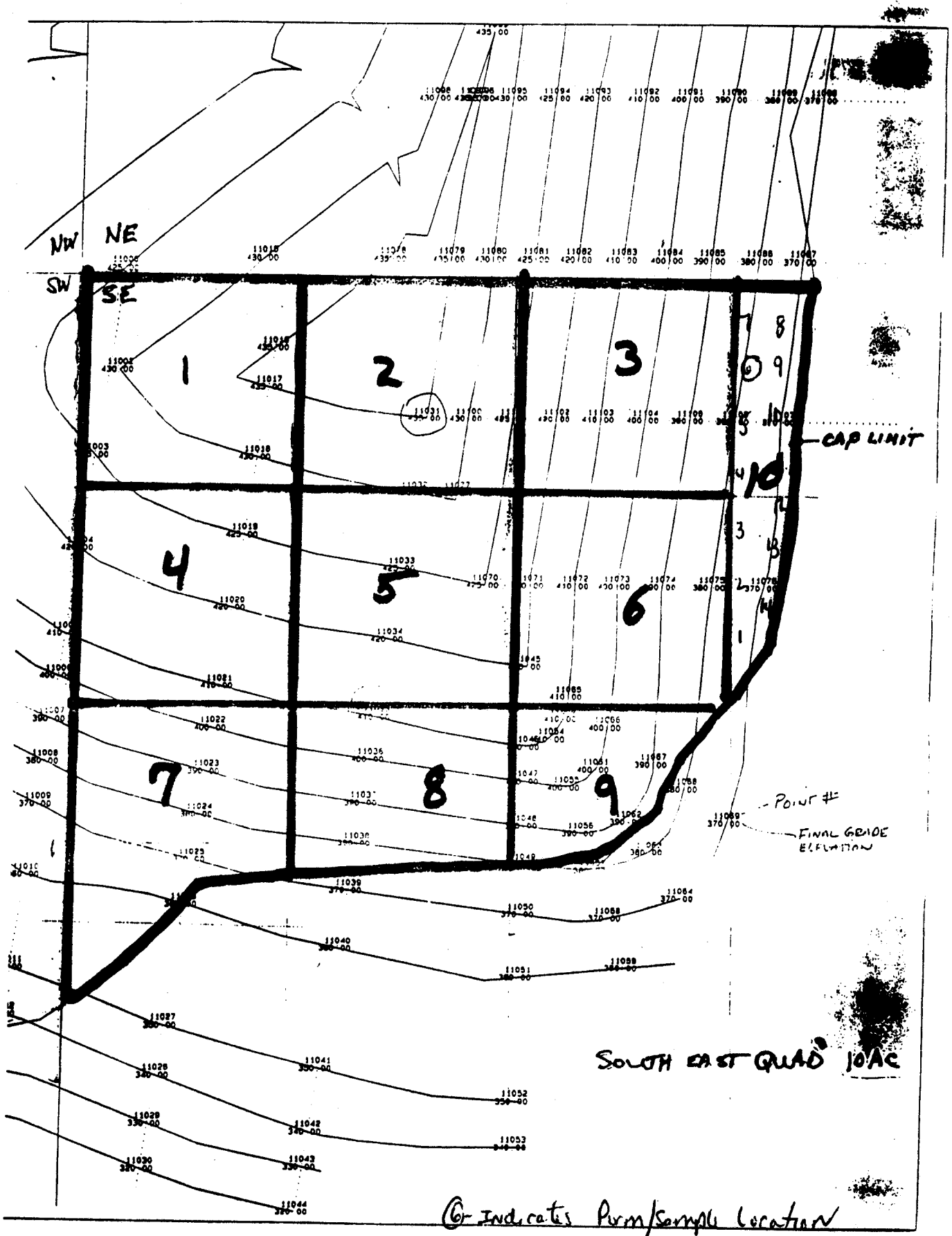
Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
155	88.62	1.00	1.00	1.00	1.00	8.81E-08
202	88.62	1.25	1.30	1.04	1.28	8.62E-08
146	99.69	1.00	0.90	0.90	0.95	7.90E-08
586	99.69	3.90	3.90	1.00	3.90	8.08E-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) **8.4E-08** cm/sec

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

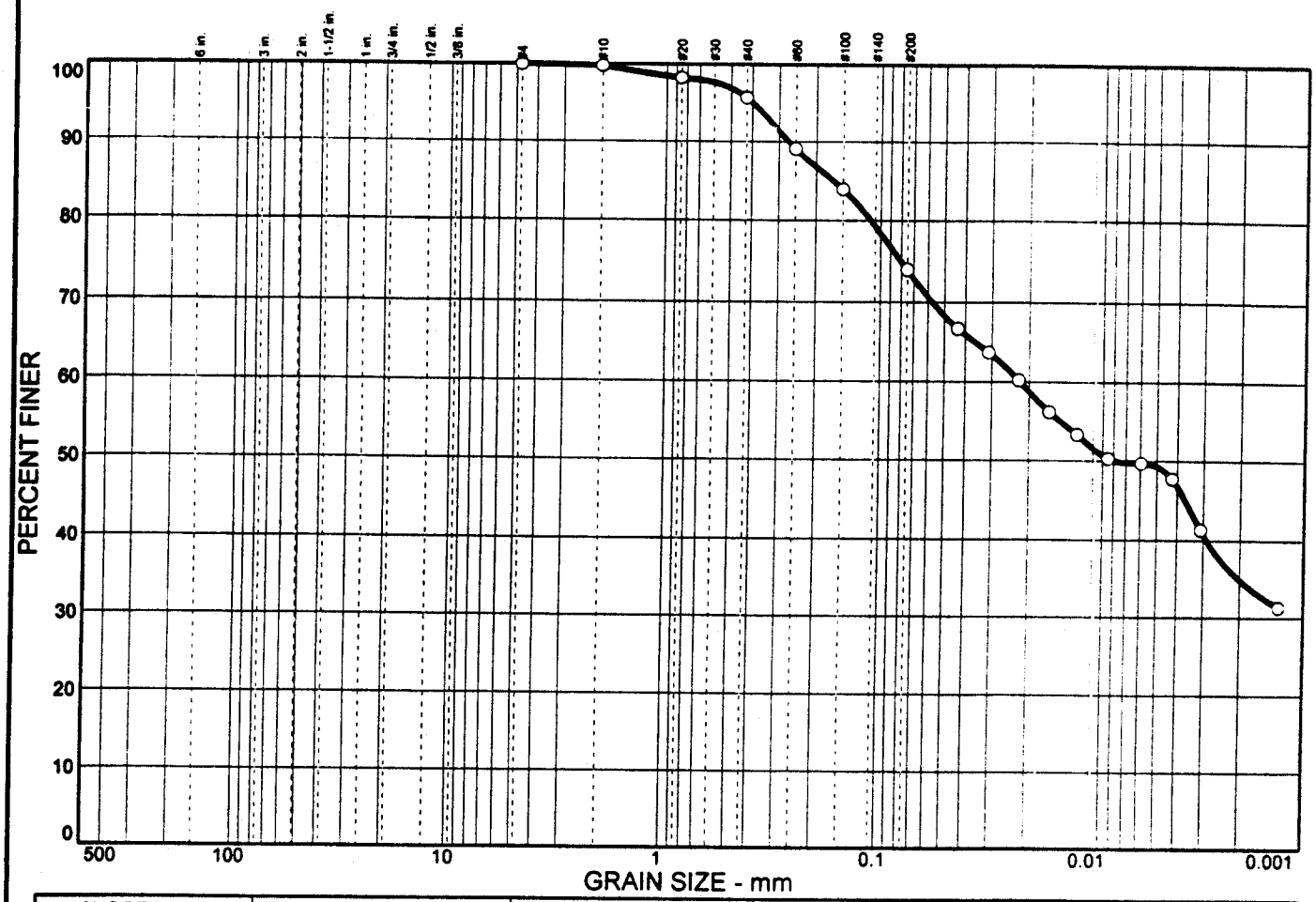


⊙ Indicates Perm/Sample Location

Acre 10, 1 of 2

Report : 013

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	26.0	24.7	49.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	98.2		
#40	95.6		
#60	89.1		
#100	84.0		
#200	74.0		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 22 LL= 52 PI= 30

Coefficients

D_{85}= 0.165 D_{60}= 0.0220 D_{50}= 0.0079
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-075, Sampled from In-situ Permeablity Test Location

Sample No.: DL-075 **Source of Sample:** Roberts Borrow Source **Date:**
Location: Acre 10, Lift 2 **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: 11/19/98
Report No.: 051

Acre 11 Lift 2

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	97.3	22.8	96.8	
2	See Test Location Plan	98.3	21.3	97.8	
3	See Test Location Plan	99.1	23.8	98.6	
4	See Test Location Plan	95.6	25.5	95.1	
5	See Test Location Plan	96.4	24.9	95.9	
6	See Test Location Plan	96.1	26.7	95.6	
7	See Test Location Plan	97.3	25.2	96.8	
8	See Test Location Plan	95.8	23.0	95.3	
9	See Test Location Plan	96.2	24.9	95.7	
10	See Test Location Plan	97.9	22.0	97.4	
11	See Test Location Plan	95.7	23.4	95.3	
12	See Test Location Plan	99.0	21.5	98.5	
13	See Test Location Plan	100.4	24.6	99.9	
14	See Test Location Plan	96.6	25.9	96.1	Tube Sample (DL-151)
15	See Test Location Plan	96.3	25.2	95.8	
16	See Test Location Plan	97.4	24.2	96.9	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	2.0 x 10(-8)
Dry Density (pcf)	98.0
Moisture Content (%)	23.1

Atterberg Limits (ASTM D4318)

PL	23
LL	61
PI	38

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel	0.4
%Sand	30.6
%Silt	20.6
%Clay	48.4

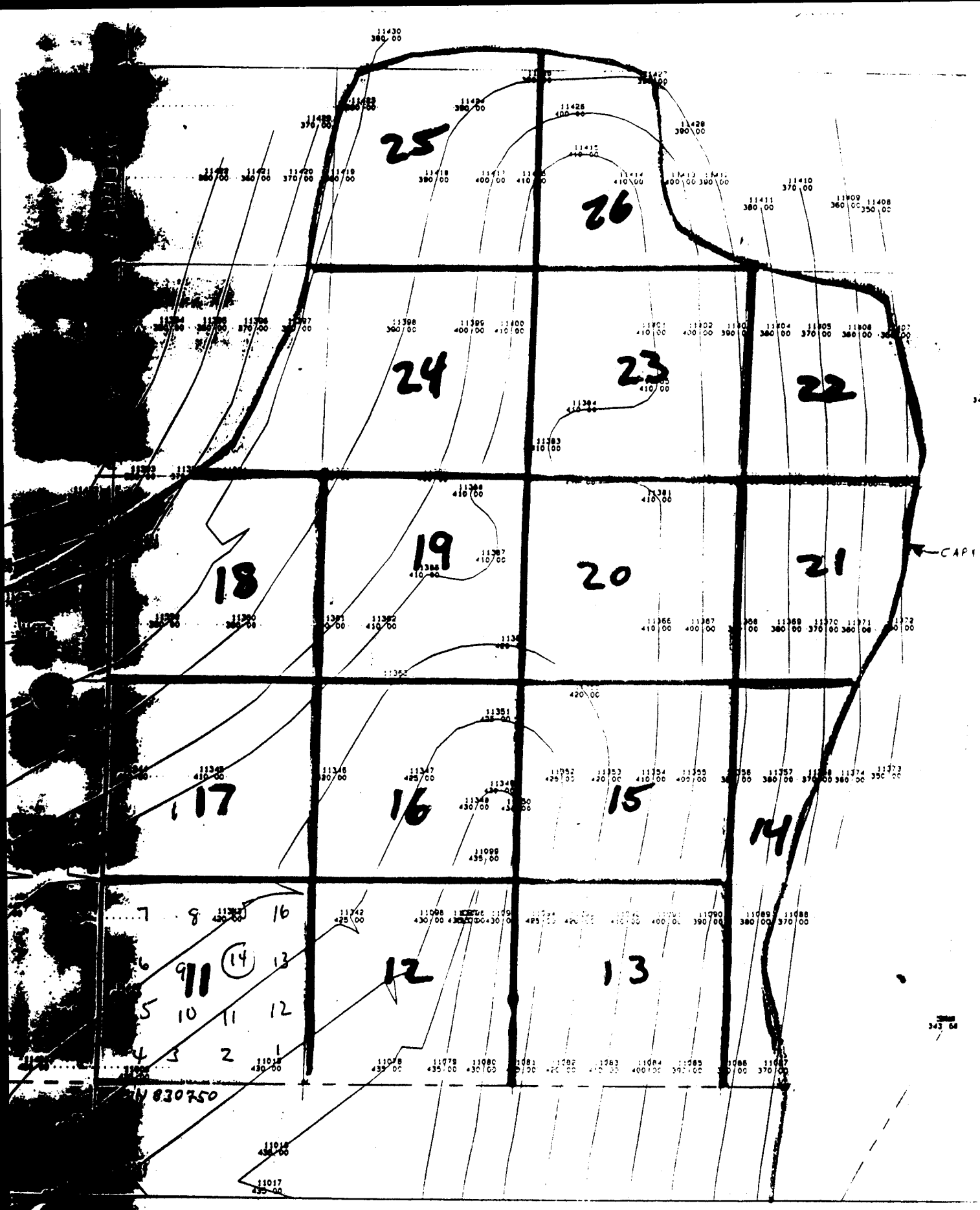
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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



(14) - Indicates Perm / Sample Location
Area 11, Lift 2
Report: 051

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/19/98
Report No.: P-119

Project No.: VNC-98-029
Sample No. DL-151

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.0E-08	cm/sec
% Moisture	23.1	%
Dry Density	98.0	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

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

Specimen Data

Length (in):	3.240
Diameter (in.):	2.870
Area (sq. in.):	6.480
Volume (cu. in.):	21.00
Wet Weight (grams):	664.5
Dry Weight (grams):	539.9
Dry Density (pcf):	98.0

Moisture Content Test Data

Wet Weight	134.90
Dry Weight	113.72
Tare weight	21.91
% Moisture	23.1

Test Data

Confining Pressure 3.0 psi

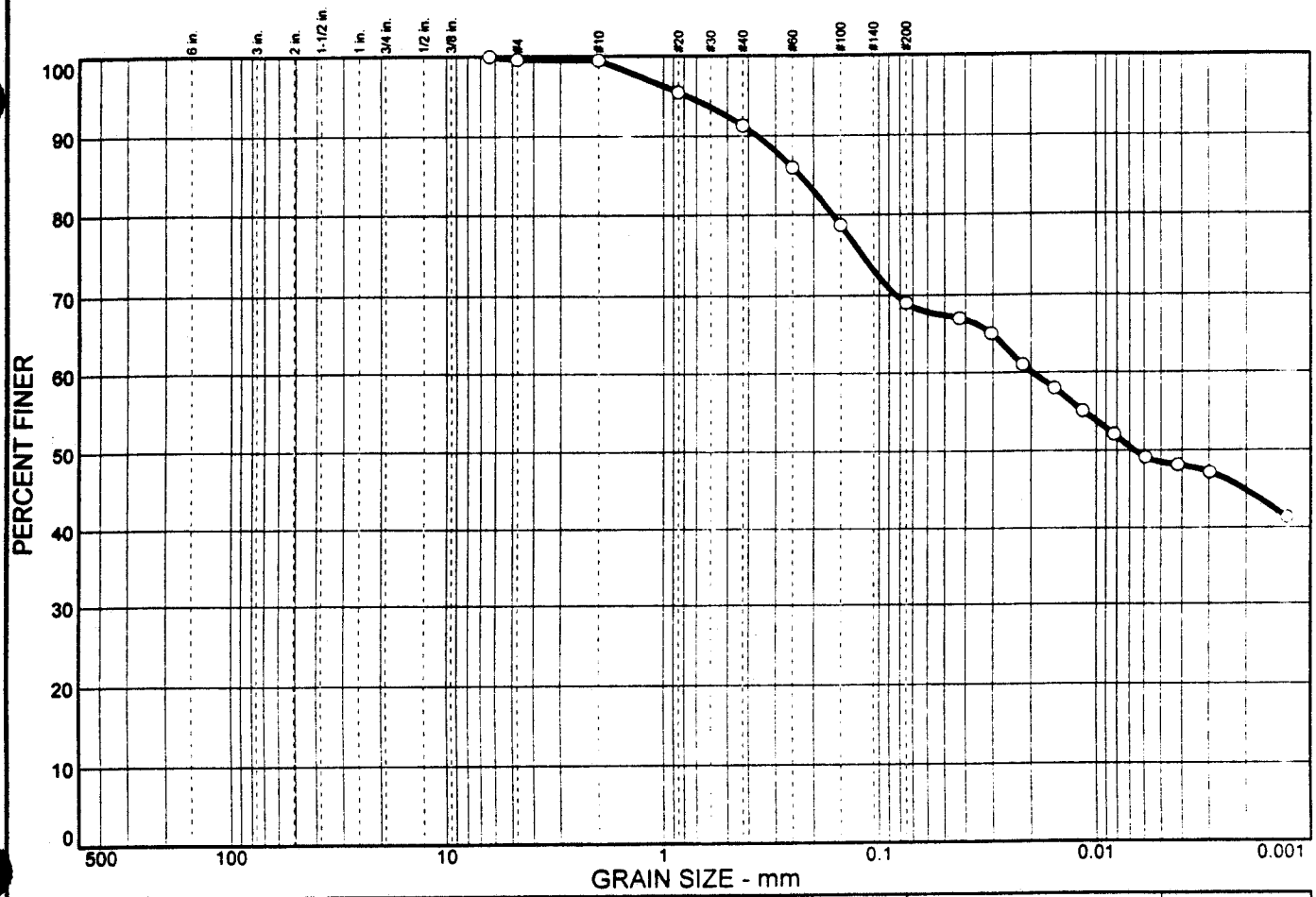
ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
993	110.77	1.50	1.70	1.13	1.60	1.89E-08
805	110.77	1.75	1.70	0.97	1.73	2.51E-08
619	110.77	0.95	0.90	0.95	0.93	1.75E-08
451	110.77	0.70	0.70	1.00	0.70	1.82E-08

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

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.4	30.6	20.6	48.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.6		
#10	99.5		
#20	95.4		
#40	91.3		
#60	86.0		
#100	78.7		
#200	69.0		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 23 LL= 61 PI= 38

Coefficients

D_{85}= 0.231 D_{60}= 0.0198 D_{50}= 0.0066
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-151, Acre 11, Lift 2

Sample No.: DL-151 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 11, Lift 2 **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: 11/17/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
Roberts Clay Acre 12, Lift 2

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 .048	Clay Cover Testing Acre 12, Lift 2

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.: 048

Acre 12 Lift 2

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	98.9	23.4	98.4	
2	See Test Location Plan	97.2	22.6	96.7	
3	See Test Location Plan	98.8	24.4	98.3	
4	See Test Location Plan	99.3	22.7	98.8	
5	See Test Location Plan	102.5	21.2	100+	
6	See Test Location Plan	99.7	22.3	99.2	
7	See Test Location Plan	100.1	21.7	99.6	
8	See Test Location Plan	99.8	22.0	99.3	
9	See Test Location Plan	101.7	21.0	100+	
10	See Test Location Plan	97.5	25.3	97.4	
11	See Test Location Plan	95.5	23.0	95.0	
12	See Test Location Plan	100.0	26.6	99.5	Perm. Sample (DL-126)
13	See Test Location Plan	101.0	22.0	100+	
14	See Test Location Plan	97.6	23.1	97.1	
15	See Test Location Plan	98.8	24.6	98.3	
16	See Test Location Plan	96.1	22.3	95.6	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	1.4 x 10(-8)
Dry Density (pcf)	96.6
Moisture Content (%)	23.5

Atterberg Limits (ASTM D4318)

PL	26
LL	71
PI	45

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel	0.2
%Sand	24.5
%Silt	23.3
%Clay	52.0

Sincerely,

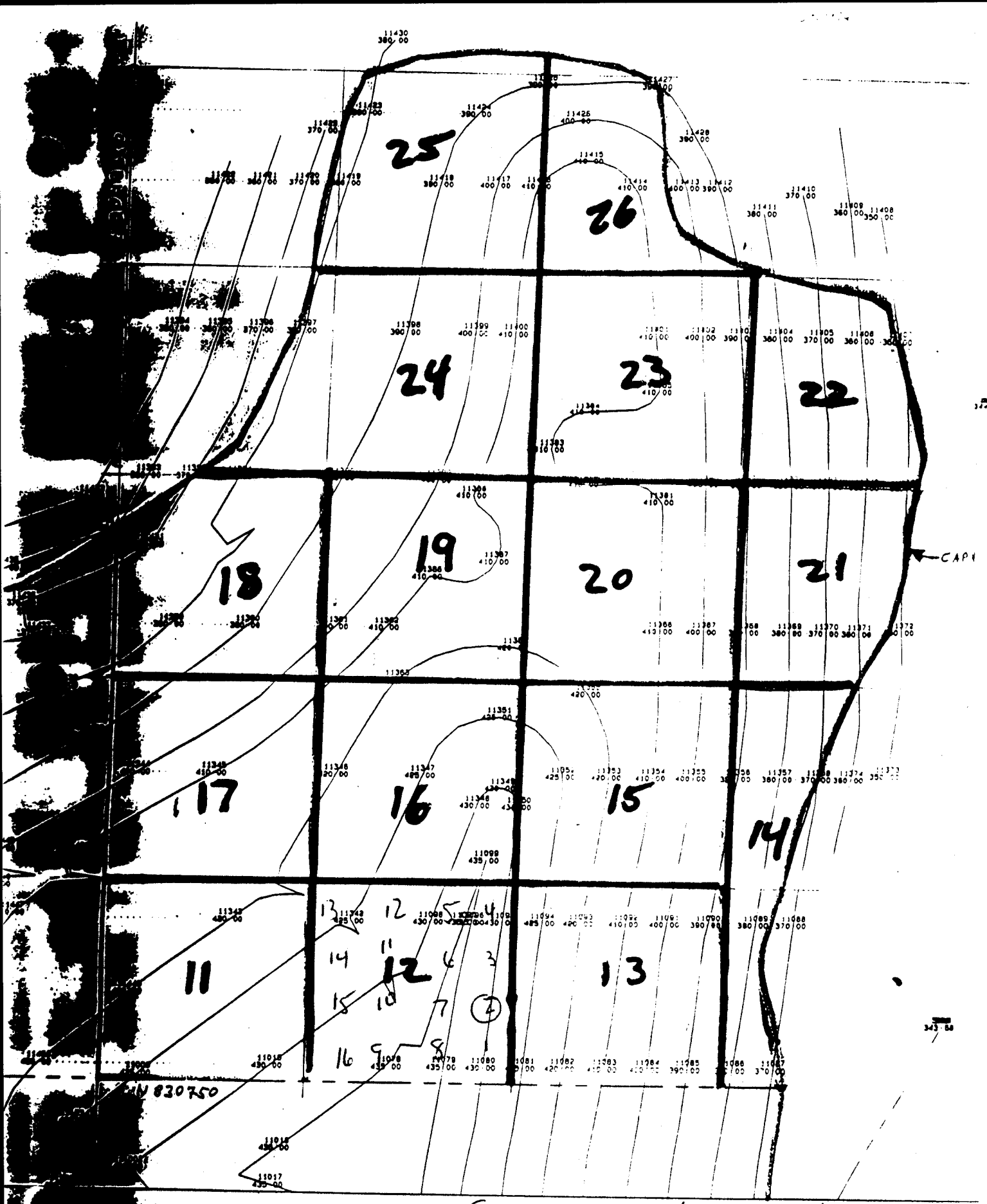
VAN DER HORST Geotechnical Engineering, P.C.

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



(2) - Indicates Firm/Sample Location
Acre 12, Lift 2
Report: C48

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/09/98
Report No.: P-097

Project No.: VNC-98-029
Sample No. DL-126

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.4E-08	cm/sec
% Moisture	23.5	%
Dry Density	96.6	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 10/29/98
Location: Acre 12, Lift 2

Length (in):	3.085
Diameter (in.):	2.851
Area (sq. in.):	6.395
Volume (cu. in.):	19.73
Wet Weight (grams):	617.8
Dry Weight (grams):	500.3
Dry Density (pcf):	96.6

Moisture Content Test Data

Wet Weight	106.11
Dry Weight	90.10
Tare weight	21.94
% Moisture	23.5

Test Data

Confining Pressure 3.0 psi

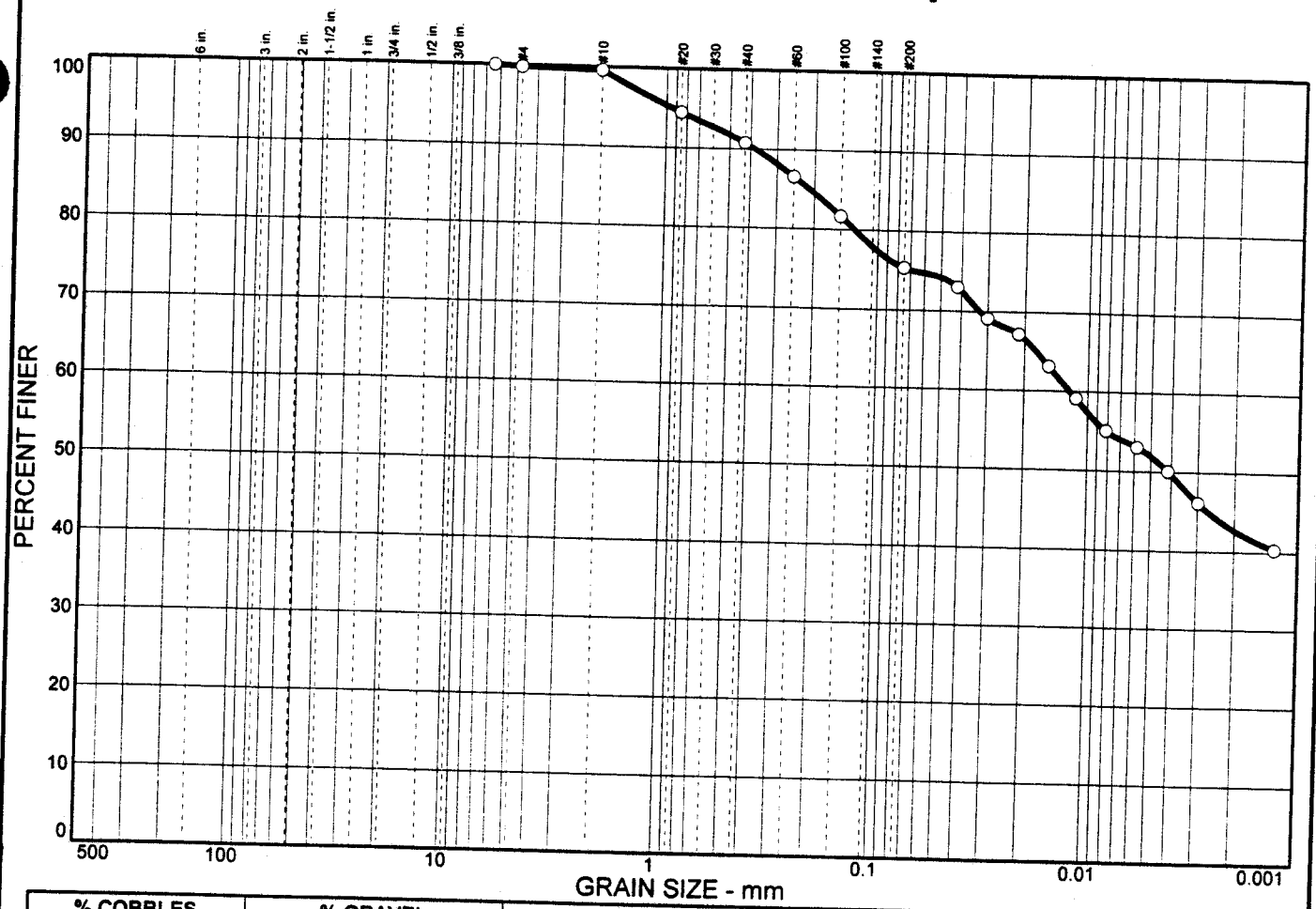
△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
345	83.10	0.35	0.40	1.14	0.38	1.64E-08
345	83.10	0.30	0.30	1.00	0.30	1.31E-08
562	83.10	0.50	0.40	0.80	0.45	1.21E-08
501	83.10	0.50	0.45	0.90	0.48	1.43E-08

△ 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) **1.4E-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	0.2	24.5	23.3	52.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.6		
#20	94.5		
#40	90.8		
#60	86.6		
#100	81.7		
#200	75.3		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 26 LL= 71 PI= 45

Coefficients

D_{85}= 0.209 D_{60}= 0.0122 D_{50}= 0.0041
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-126, Acre 12, Lift 2

Sample No.: DL-126 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 12, Lift 2 **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 2

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 .035	Clay Cover Testing Acre 13, Lift 2
			Gilbert Southern
			11/17/98

REMARKS: Const. Testing, Technical

COPIES 2250
2250-9
37A

SIGNED: Dionne Boyd

CT-013

VAN DER HORST

CLAY COVER TESTING

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

Project No.: VNC-98-029
Date: 11/09/98
Report No.: 035

Acre 13 Lift 2

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	96.7	27.1	96.2	
2	See Test Location Plan	98.8	21.6	98.3	
3	See Test Location Plan	96.1	26.6	95	
4	See Test Location Plan	97.6	21.9	97.1	
5	See Test Location Plan	99.4	23.2	98.9	
6	See Test Location Plan	97.3	24.1	96.8	Sample Tube (DL-108)
7	See Test Location Plan	97.2	24.0	96.7	
8	See Test Location Plan	98.8	23.6	98.3	
9	See Test Location Plan	102.1	22.4	100+	
10	See Test Location Plan	96.8	22.9	96.3	
11	See Test Location Plan	97.0	23.8	96.5	
12	See Test Location Plan	100.6	22.5	100+	
13	See Test Location Plan	101.3	22.0	100+	
14	See Test Location Plan	99.4	21.6	98.9	
15	See Test Location Plan	96.5	23.0	96.0	
16	See Test Location Plan	98.3	23.6	97.8	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	5.9 x 10(-8)
Dry Density (pcf)	99.2
Moisture Content (%)	23.6

Atterberg Limits (ASTM D4318)

PL	26
LL	68
PI	42

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel	0.1
%Sand	23.4
%Silt	25.2
%Clay	51.3

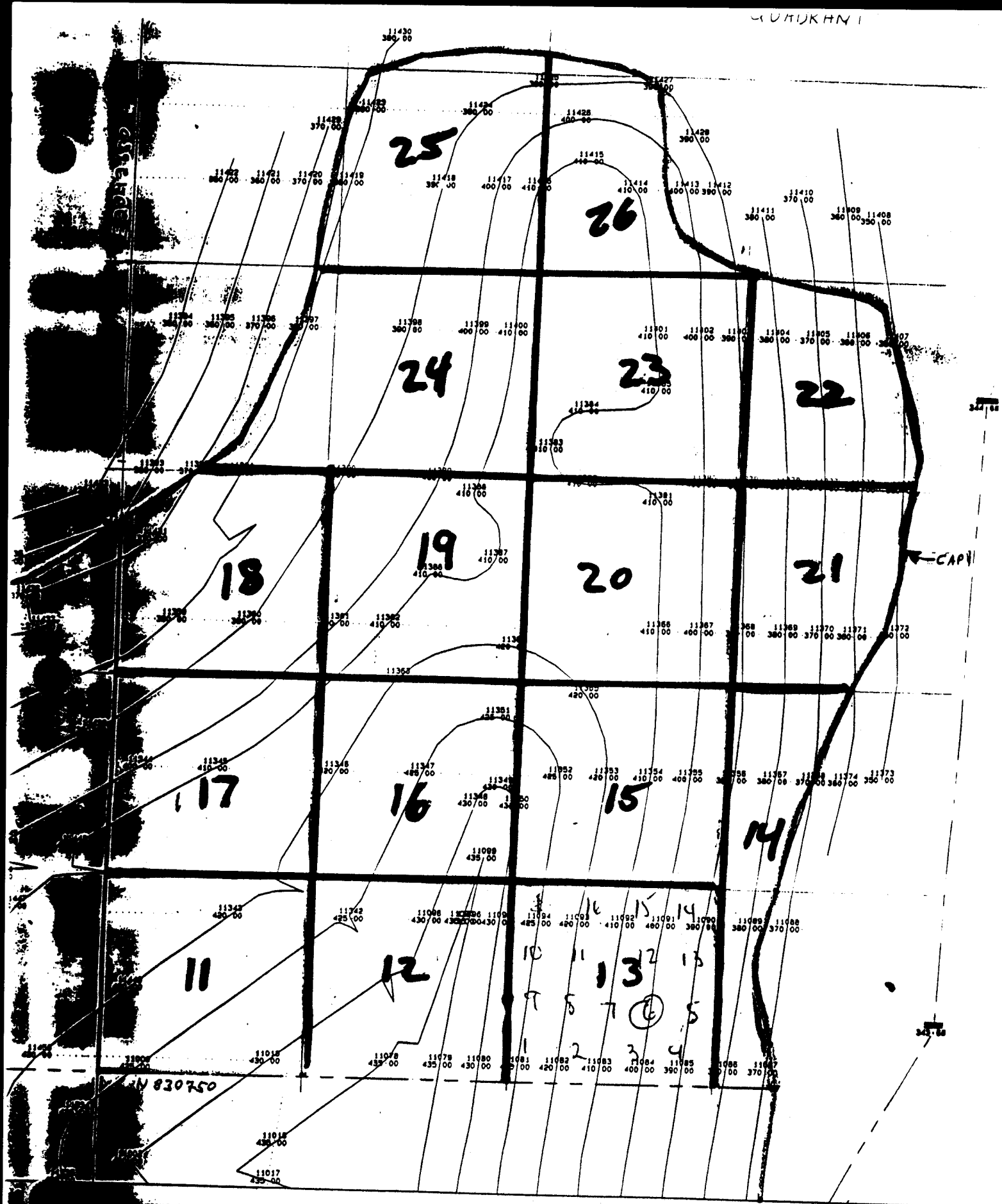
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

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

Robert L. Mashewske, P.E.

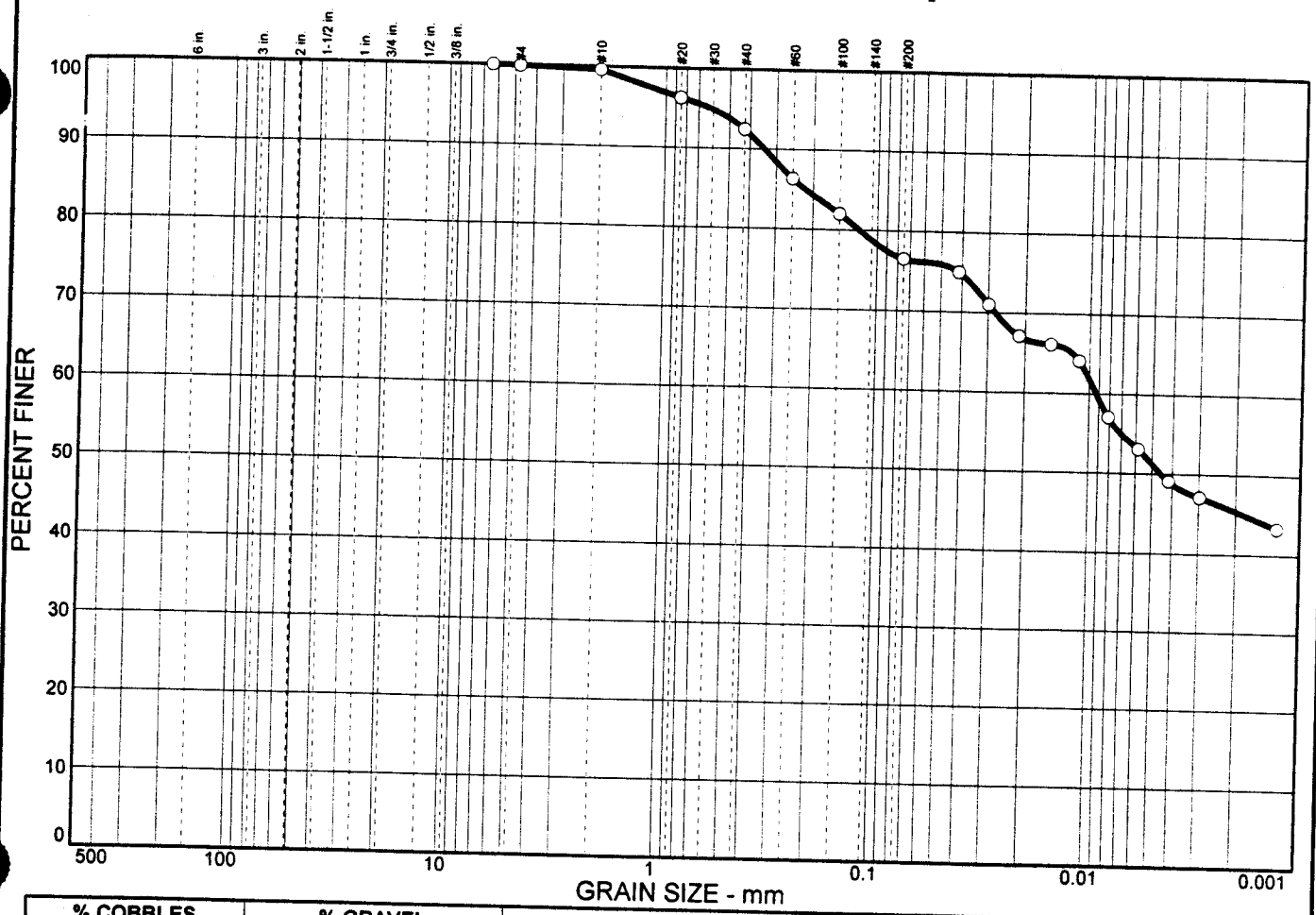
NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

QUADRANT



(6) Indicates Approximate Tube/Sample location
Area 13, Lift 2
Report: 035

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	23.4	25.2	51.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.6		
#20	96.3		
#40	92.5		
#60	86.3		
#100	82.0		
#200	76.5		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 26 LL= 68 PI= 42

Coefficients

D_{85}= 0.218 D_{60}= 0.0092 D_{50}= 0.0045
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-108, Acre 13, Lift 2

Sample No.: DL-108 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 13, Lift 2 **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-087

Project No.: VNC-98-029
Sample No. DL-108

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.9E-08	cm/sec
% Moisture	23.6	%
Dry Density	99.2	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 10/27/98
Location: Acre 13, Lift 2

Length (in):	4.440
Diameter (in.):	2.837
Area (sq. in.):	6.332
Volume (cu. in.):	28.12
Wet Weight (grams):	904.9
Dry Weight (grams):	732.0
Dry Density (pcf):	99.2

Moisture Content Test Data

Wet Weight	125.86
Dry Weight	106.05
Tare weight	22.16
% Moisture	23.6

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
162	83.07	0.40	0.50	1.25	0.45	6.10E-08
221	83.07	0.70	0.55	0.79	0.63	6.21E-08
372	83.07	1.00	1.15	1.15	1.08	6.34E-08
655	83.07	1.60	1.30	0.81	1.45	4.86E-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) **5.9E-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

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

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
Roberts Clay Acre 14, Lift 2

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 .041	Clay Cover Testing Acre 14, Lift 2
		Gilbert Southern	
		11/17/98	

REMARKS: Const. Testing
Technical

COPIES 2250-
2250-9
32A

SIGNED: Dionne Boyd

CT-013
James Brian

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.: 041

Acre 14 Lift 2

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	95.6	27.1	95.1	
2	See Test Location Plan	96.3	27.5	95.8	
3	See Test Location Plan	95.7	22.9	95.2	
4	See Test Location Plan	97.4	23.1	96.9	Tube Sample (DL-118)
5	See Test Location Plan	95.5	23.6	95.0	
6	See Test Location Plan	98.7	22.3	98.2	
7	See Test Location Plan	99.0	21.0	98.5	
8	See Test Location Plan	98.1	23.1	97.6	
9	See Test Location Plan	98.7	22.6	98.2	
10	See Test Location Plan	99.8	22.7	99.3	
11	See Test Location Plan	97.4	24.1	96.9	
12	See Test Location Plan	96.6	24.0	96.1	
13	See Test Location Plan	95.9	26.1	95.6 -4 ok	
14	See Test Location Plan	96.2	25.4	95.7	
15	See Test Location Plan	95.9	24.2	95.6 -4 ok	
16	See Test Location Plan	102.8	24.0	100+	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	3.8 x 10(-8)
Dry Density (pcf)	96.8
Moisture Content (%)	23.3

Atterberg Limits (ASTM D4318)

PL	29
LL	69
PI	40
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.2
%Sand	24.1
%Silt	23.7
%Clay	52.0

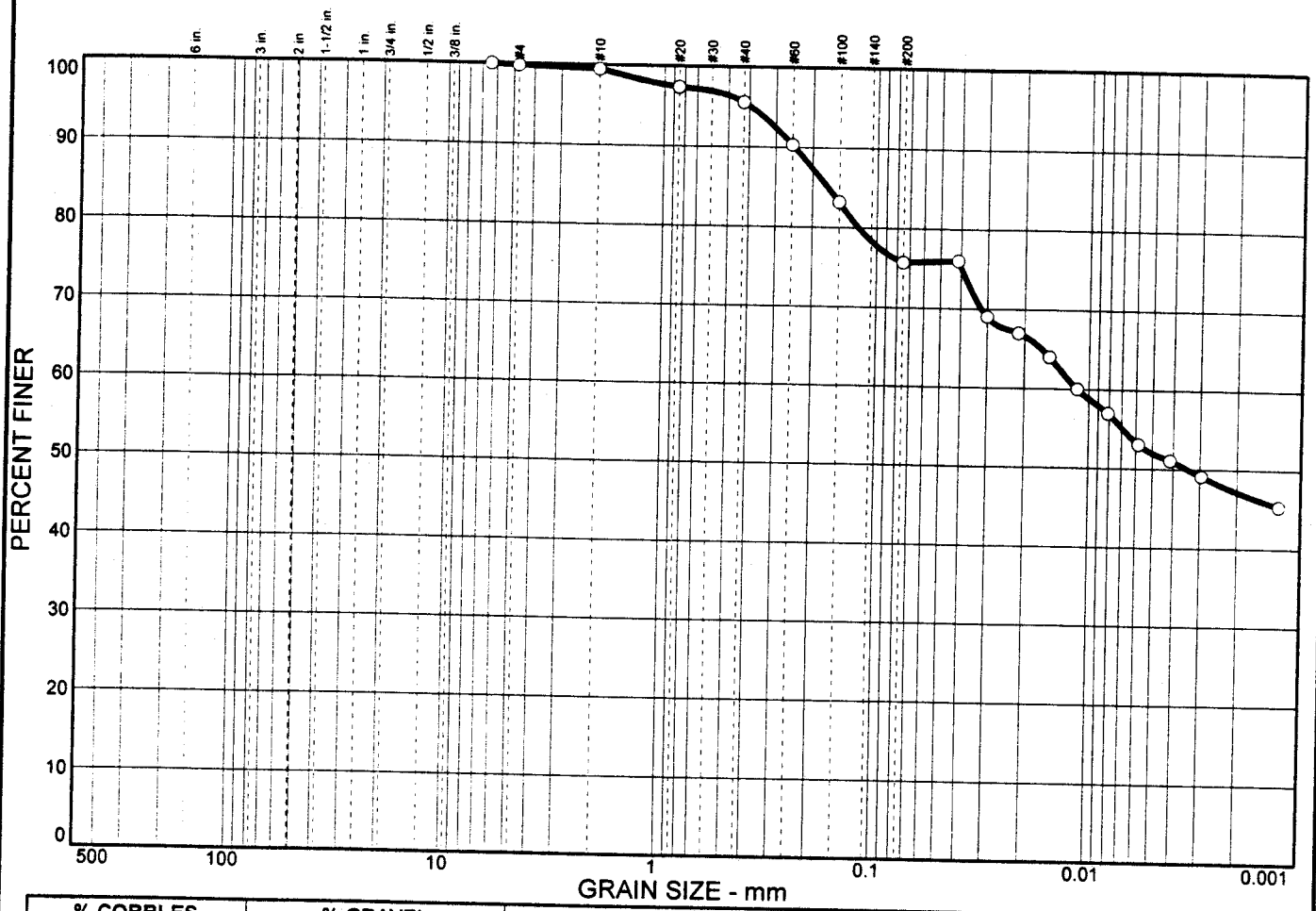
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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	0.2	24.1	23.7	52.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.5		
#20	97.4		
#40	95.6		
#60	90.3		
#100	83.2		
#200	75.7		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 29 LL= 69 PI= 40

Coefficients

D_{85}= 0.169 D_{60}= 0.0113 D_{50}= 0.0034
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

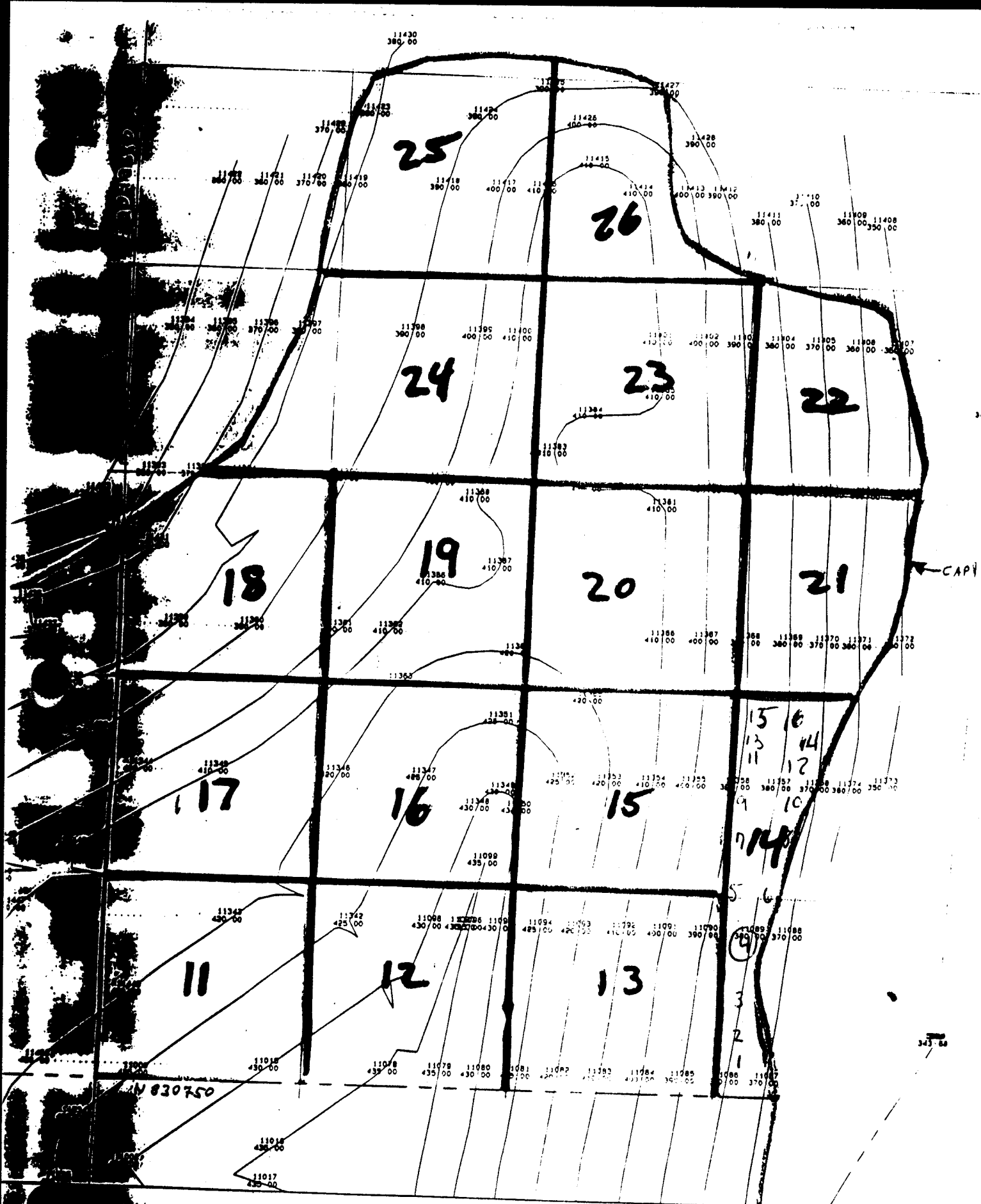
Remarks

DL-118, Acre 14, Lift 2

Sample No.: DL-118 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 14, Lift 2 **Elev./Depth:**

VAN DER HORST ENGINEERING

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



④ = Indicates Perm/Sample Location
Acre 19, Lift 2
Report . C41

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/09/98
Report No.: P-092

Project No.: VNC-98-029
Sample No. DL-118

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.8E-08	cm/sec
% Moisture	23.3	%
Dry Density	96.8	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 10/28/98
Location: Acre 14, Lift 2

Length (in):	3.500
Diameter (in.):	2.852
Area (sq. in.):	6.399
Volume (cu. in.):	22.40
Wet Weight (grams):	701.5
Dry Weight (grams):	569.1
Dry Density (pcf):	96.8

Moisture Content Test Data

Wet Weight	138.57
Dry Weight	116.60
Tare weight	22.15
% Moisture	23.3

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
185	88.62	0.40	0.50	1.25	0.45	3.90E-08
455	88.62	1.05	1.05	1.00	1.05	3.70E-08
194	88.62	0.50	0.45	0.90	0.48	3.93E-08
713	88.62	1.65	1.70	1.03	1.68	3.77E-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

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: 11/13/98
Report No.: 042

Acre 15 Lift 2
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	95.6	26.2	95.1	
2	See Test Location Plan	99.2	26.1	98.7	
3	See Test Location Plan	101.5	25.1	100+	
4	See Test Location Plan	97.6	26.6	97.1	
5	See Test Location Plan	95.6	27.0	95.1	
6	See Test Location Plan	97.1	25.0	96.0 ok	
7	See Test Location Plan	99.8	26.9	99.3	
8	See Test Location Plan	96.2	24.4	95.7	
9	See Test Location Plan	95.7	26.2	95.2	
10	See Test Location Plan	96.3	25.4	95.8	
11	See Test Location Plan	97.4	24.3	96.9	
12	See Test Location Plan	99.7	25.4	99.2	Tube/Sample (DL-119)
13	See Test Location Plan	96.3	24.9	95.8	
14	See Test Location Plan	99.4	23.5	98.9	
15	See Test Location Plan	97.4	24.7	96.9	
16	See Test Location Plan	97.1	23.8	96.0 ok	

Density (ASTM D2922) Gilbert Southern 11/17/98 Const. Testing Moisture (ASTM D3017)

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

Permeability (cm/sec)	6.1 x 10(-8)
Dry Density (pcf)	101.5 2250
Moisture Content (%)	21.5 2250-9

321

Atterberg Limits (ASTM D4318)

PL	29
LL	65
PI	36
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.5
%Sand	34.5
%Silt	16.4
%Clay	48.6

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

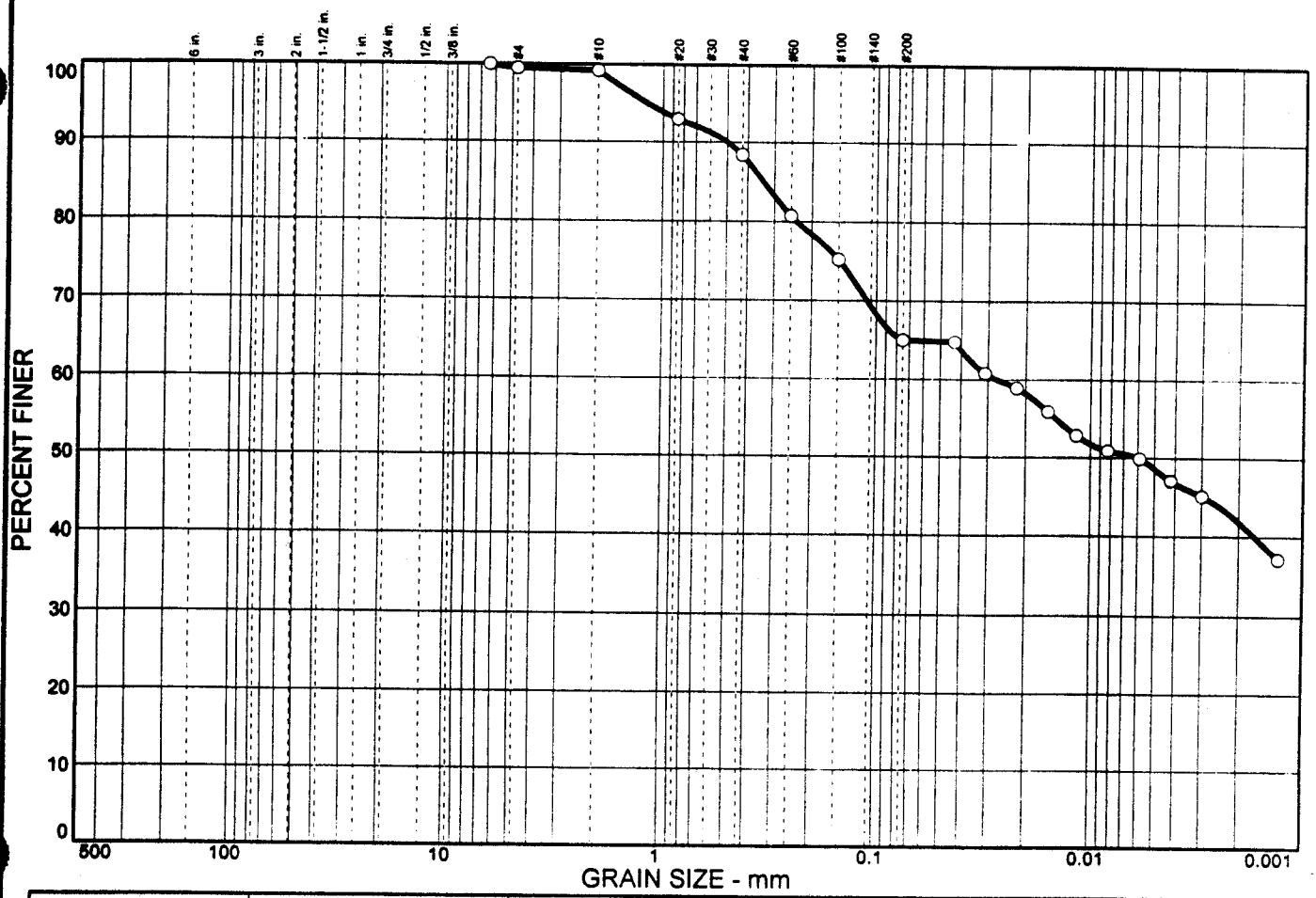
Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

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

CT-013
James Bri

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.5	34.5	16.4	48.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.5		
#10	99.2		
#20	93.0		
#40	88.4		
#60	80.7		
#100	75.2		
#200	65.0		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 29 LL= 65 PI= 36

Coefficients

D_{85}= 0.335 D_{60}= 0.0273 D_{50}= 0.0060
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

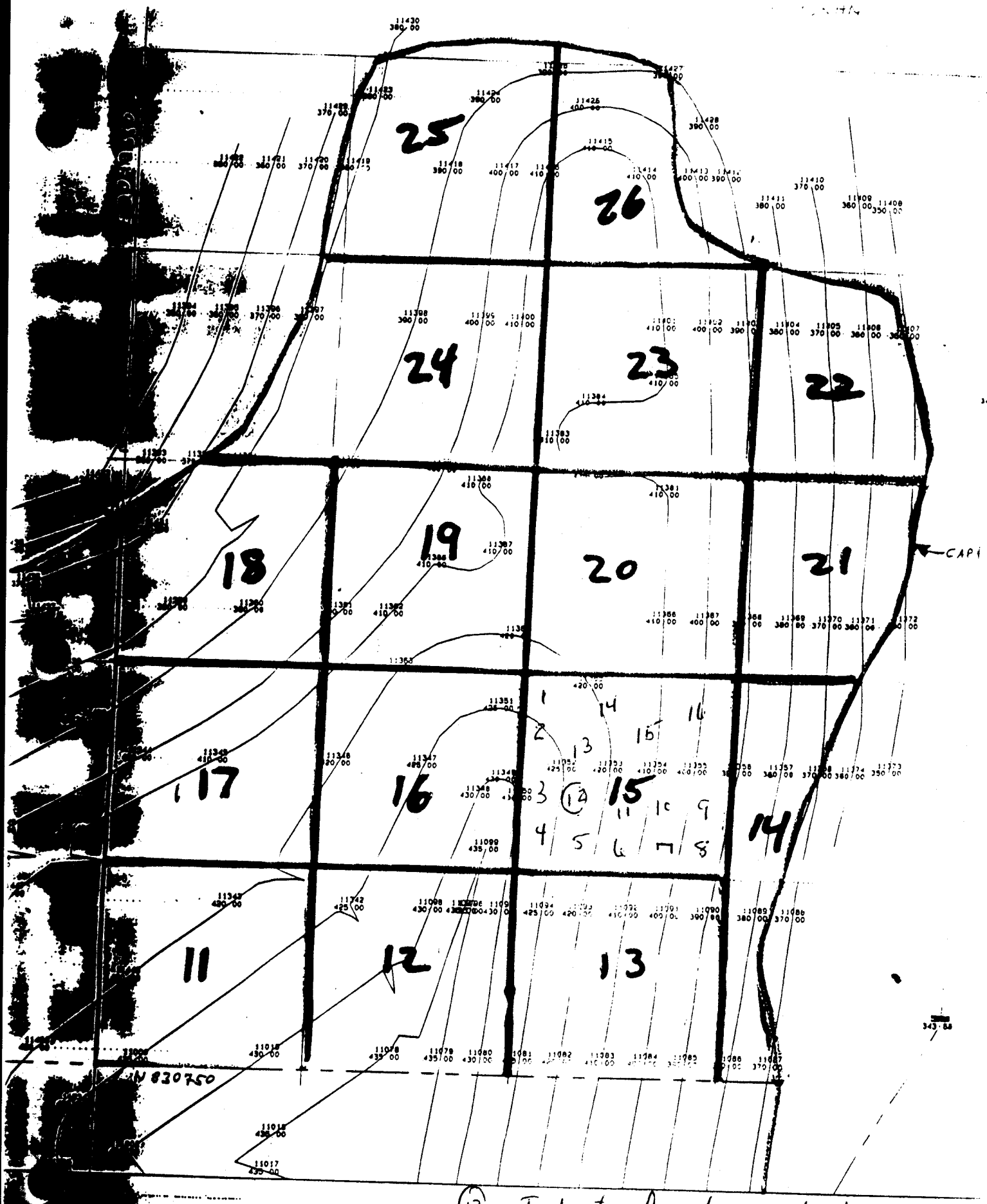
Remarks

DL-119, Acre 15, Lift 2

Sample No.: DL-119 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 15, Lift 2 **Elev./Depth:**

VAN DER HORST ENGINEERING

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



(12) - Indicates Plum / Sample Location
Acre 15, Lift 2
Report: 042

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/09/98
Report No.: P-093

Project No.: VNC-98-029
Sample No. DL-119

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.1E-08	cm/sec
% Moisture	21.5	%
Dry Density	101.5	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/28/98
Location: Acre 15, Lift 2

Length (in):	3.462
Diameter (in.):	2.865
Area (sq. in.):	6.458
Volume (cu. in.):	22.36
Wet Weight (grams):	723.6
Dry Weight (grams):	595.5
Dry Density (pcf):	101.5

Moisture Content Test Data

Wet Weight	123.13
Dry Weight	105.26
Tare weight	22.15
% Moisture	21.5

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
83	88.62	0.40	0.40	1.00	0.40	7.58E-08
358	88.62	1.20	1.30	1.08	1.25	5.49E-08
192	88.62	0.70	0.65	0.93	0.68	5.53E-08
715	88.62	2.50	2.70	1.08	2.60	5.72E-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) **6.1E-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

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.: 066

Acre 16 Lift 2
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	98.7	22.6	98.2	
2	See Test Location Plan	101.9	21.9	100+	
3	See Test Location Plan	96.7	27.1	96.2	
4	See Test Location Plan	96.2	24.7	95.7	
5	See Test Location Plan	96.2	27.1	95.7	
6	See Test Location Plan	104.1	21.3	100+	
7	See Test Location Plan	97.9	26.4	97.4	Perm/Sample (DL-134)
8	See Test Location Plan	98.4	23.1	97.9	
9	See Test Location Plan	101.5	23.2	100+	
10	See Test Location Plan	99.5	24.3	99.0	
11	See Test Location Plan	97.4	23.7	96.9	
12	See Test Location Plan	99.7	23.1	98.7 99.2	
13	See Test Location Plan	96.8	25.1	96.3	
14	See Test Location Plan	100.6	21.8	100+	
15	See Test Location Plan	98.4	24.1	97.9	
16	See Test Location Plan	100.7	21.8	100+	
Density (ASTM D2922) D3017)					Moisture (ASTM

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

Permeability (cm/sec) 1.6 E-008

Dry Density (pcf) ~~27.4~~ 99.6

Moisture Content (%) 27.4

Atterberg Limits (ASTM D4318)

PL - 22
LL - 55
PI - 33

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel 0.3
%Sand 34.7
%Silt 19.2
%Clay 45.8

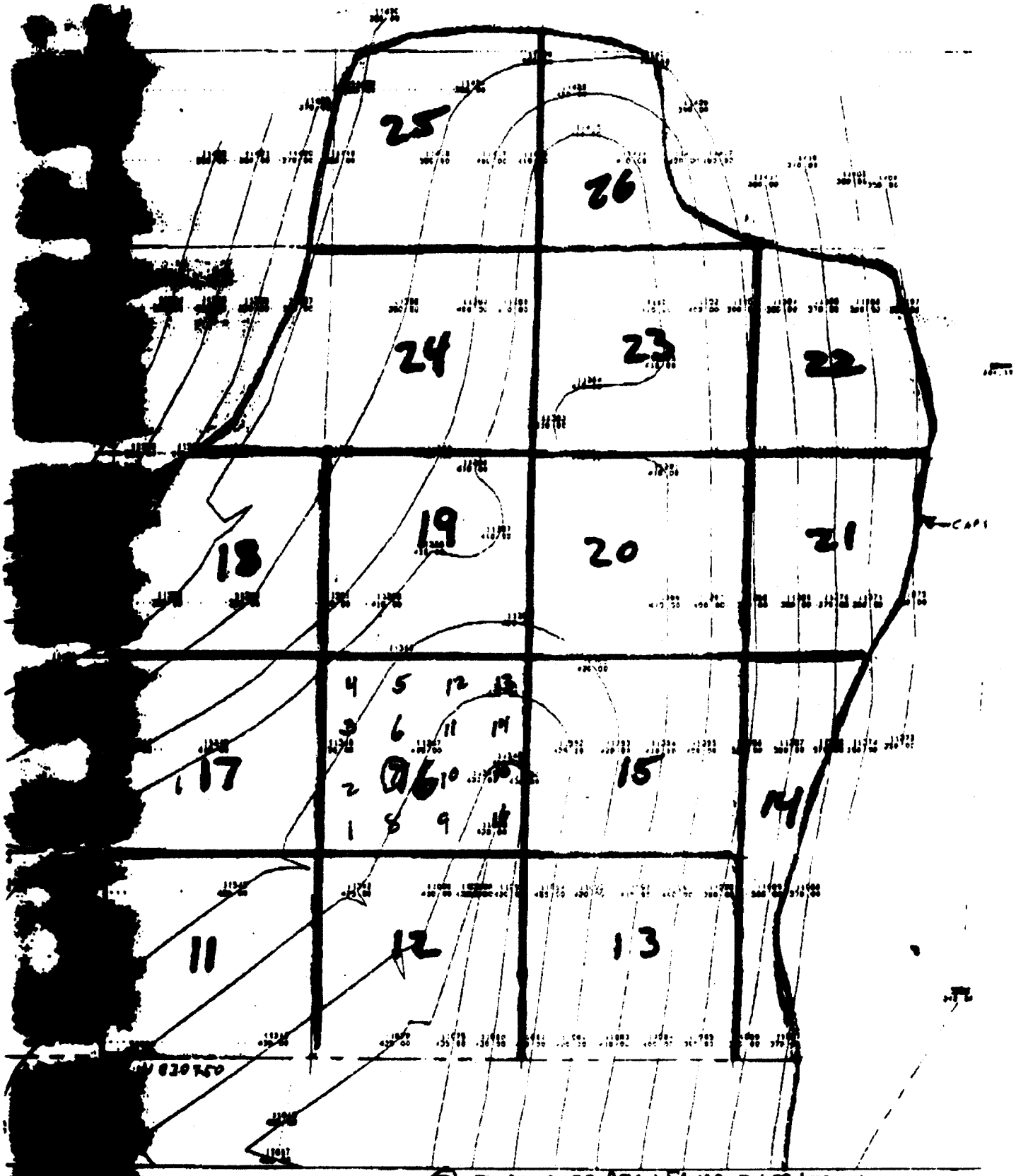
Sincerely,
VAN DER HORST Geotechnical Engineers

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) - INDICATES PERM SAMPLE LOCATION

ACRE 16, LIFT 2

Report: 65

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/24/98
Report No.: P-103

Project No.: VNC-98-029
Sample No.: DL-134

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.6E-008	cm/sec
% Moisture	27.4	%
Dry Density	99.6	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/31/98
Location: Acre 16, Lift 2

Length (in):	4.290
Diameter (in.):	2.850
Area (sq. in.):	6.390
Volume (cu. in.):	27.41
Wet Weight (grams):	912.8
Dry Weight (grams):	716.5
Dry Density (pcf):	99.6

Moisture Content Test Data

Wet Weight	80.11
Dry Weight	67.62
Tare weight	22.02
% Moisture	27.4

Test Data

Confining Pressure 3.0 psi

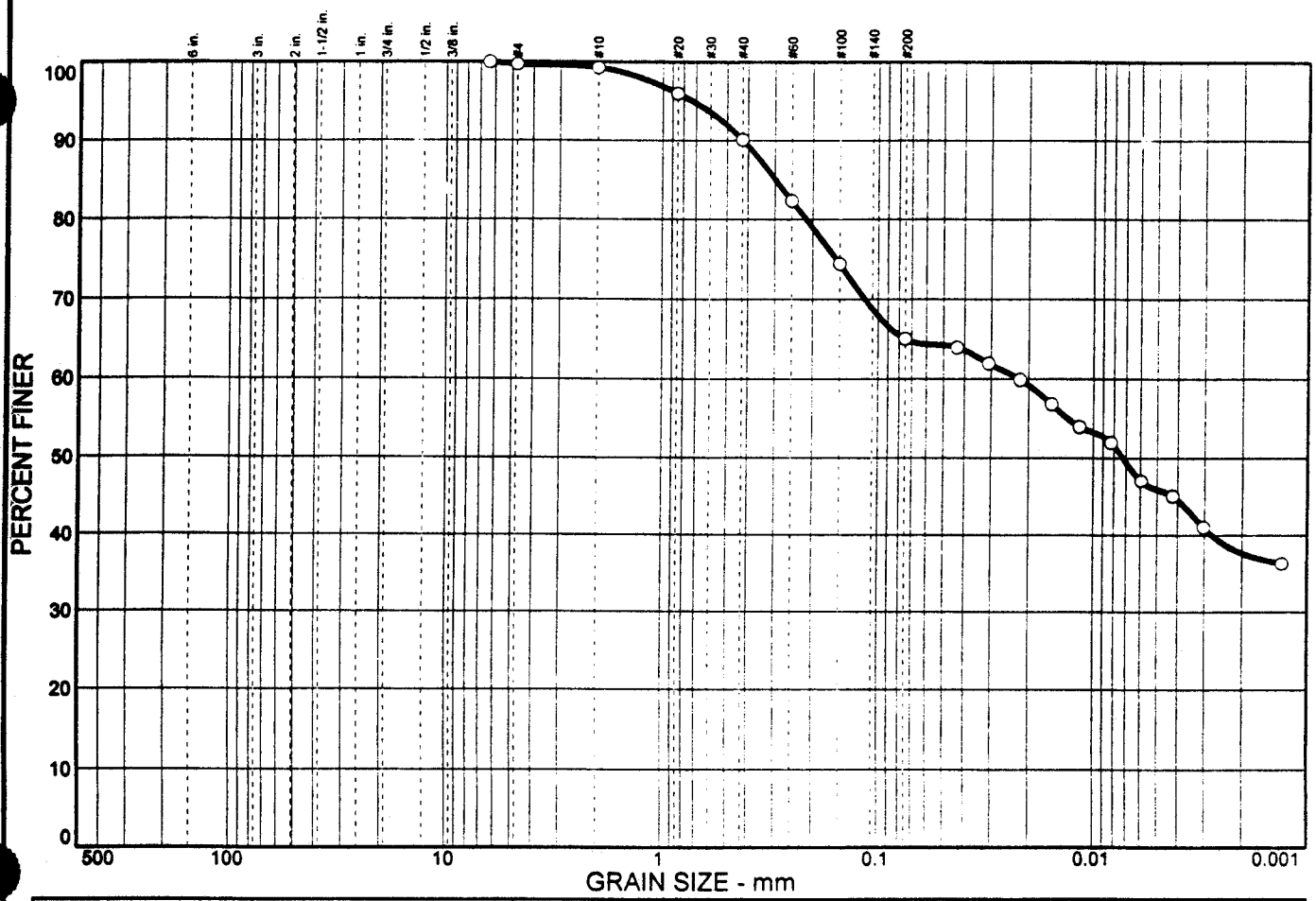
Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
286	88.60	0.30	0.30	1.00	0.30	2.07E-008
403	88.60	0.30	0.25	0.83	0.28	1.34E-008
436	91.40	0.35	0.35	1.00	0.35	1.53E-008
360	91.40	0.25	0.25	1.00	0.25	1.33E-008

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) **1.6E-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	0.3	34.7	19.2	45.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.3		
#20	96.0		
#40	90.1		
#60	82.4		
#100	74.4		
#200	65.0		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 22 LL= 55 PI= 33

Coefficients

D_{85}= 0.296 D_{60}= 0.0223 D_{50}= 0.0072
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-134, Acre 16, Lift 2

Sample No.: DL-134 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 16, Lift 2 **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.: 049

Acre 17 Lift 2

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	96.7	25.8	96.2	
2	See Test Location Plan	99.7	24.0	99.2	
3	See Test Location Plan	98.1	21.0	98.6 97.6	
4	See Test Location Plan	95.7	25.4	95.3	
5	See Test Location Plan	96.1	22.4	95.6	
6	See Test Location Plan	98.8	22.6	98.3	
7	See Test Location Plan	96.0	23.9	95.5	
8	See Test Location Plan	100.6	24.1	100+	Tube/Sample (DL-154)
9	See Test Location Plan	99.9	22.0	99.4	
10	See Test Location Plan	102.8	22.4	100+	
11	See Test Location Plan	101.8	22.2	100+	
12	See Test Location Plan	98.6	22.1	98.1	
13	See Test Location Plan	100.2	21.8	99.7	
14	See Test Location Plan	99.7	22.4	99.2	
15	See Test Location Plan	96.9	23.6	96.4	
16	See Test Location Plan	98.6	24.1	98.1	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	4.4 x 10(-8)
Dry Density (pcf)	96.8
Moisture Content (%)	22.5

Atterberg Limits (ASTM D4318)

PL	21
LL	50
PI	29
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.1
%Sand	35.2
%Silt	18.3
%Clay	46.4

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

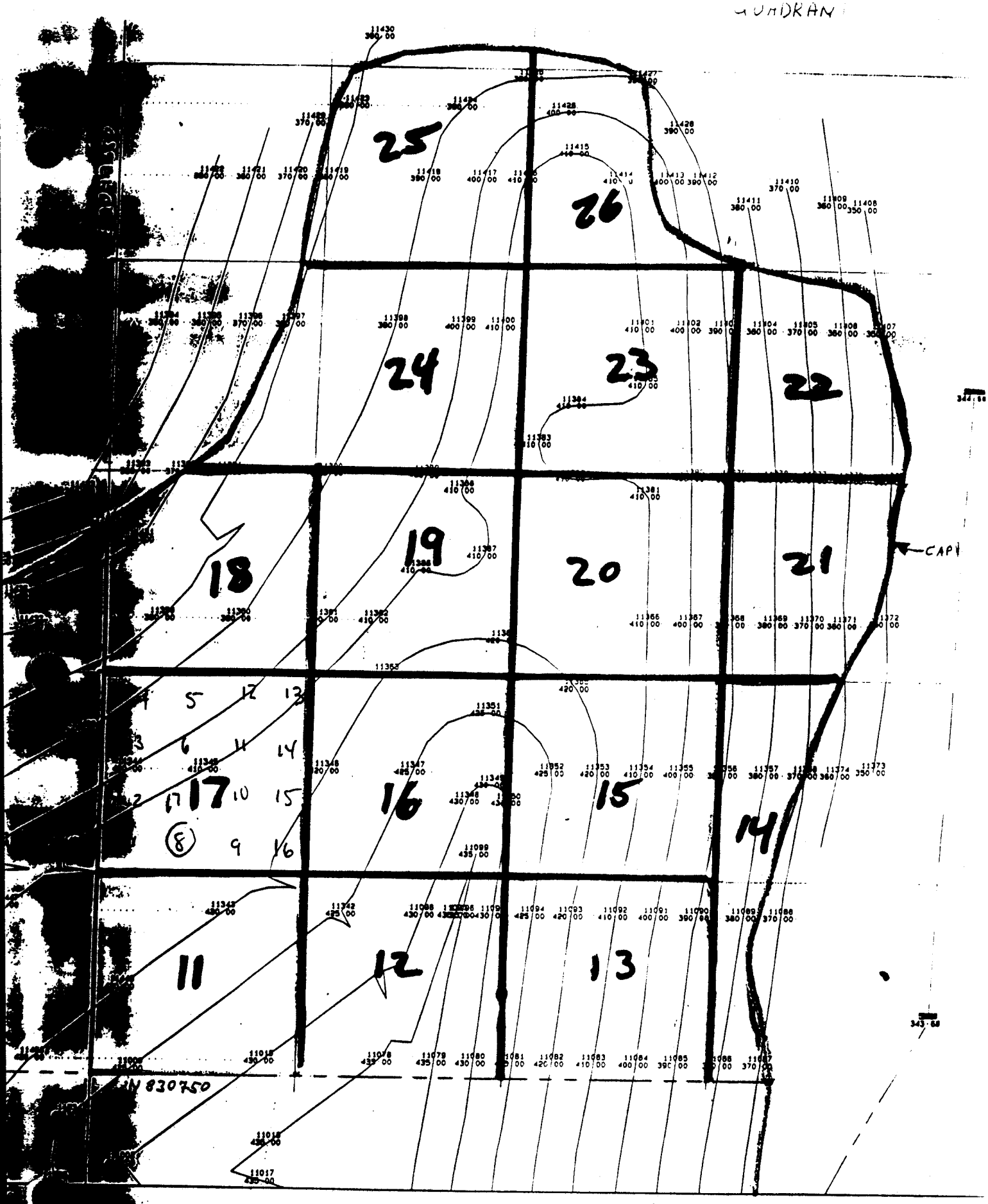
Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

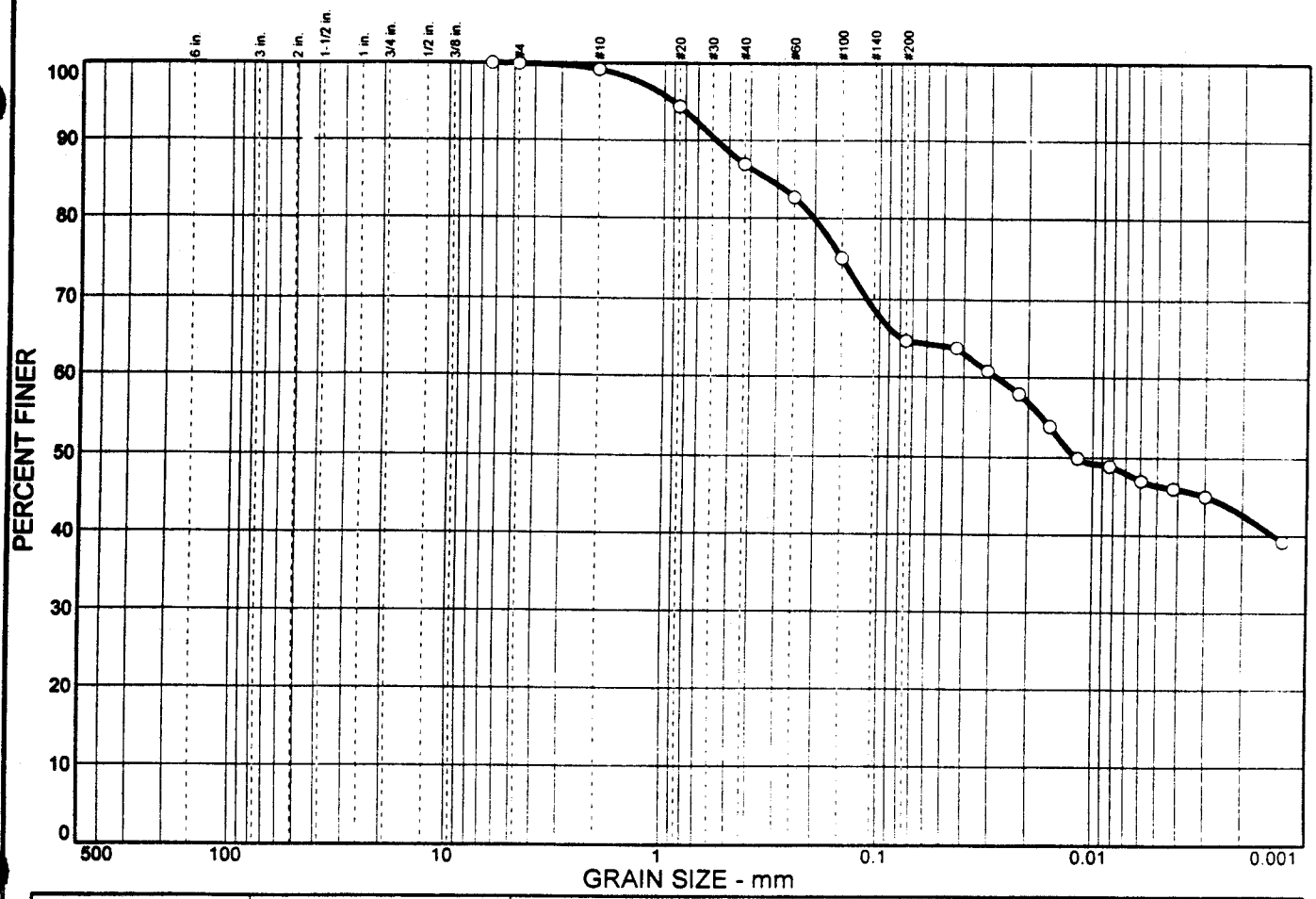
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

QUADRAN



(8) - Indicates Perm/Test Location
Acre 17, Lift 2
Report: 049

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	35.2	18.3	46.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.2		
#20	94.4		
#40	86.9		
#60	82.7		
#100	75.0		
#200	64.7		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 21 LL= 50 PI= 29

Coefficients

D_{85}= 0.329 D_{60}= 0.0281 D_{50}= 0.0119
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-154, Acre 17, Lift 2

Sample No.: DL-154 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 17, Lift 2 **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-117

Project No.: VNC-98-029
Sample No. DL-154

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.4E-08	cm/sec
% Moisture	22.5	%
Dry Density	96.8	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 11/07/98
Location: ACRE 17, LIFT 2

Specimen Data

Length (in):	3.940
Diameter (in.):	2.853
Area (sq. in.):	6.404
Volume (cu. in.):	25.23
Wet Weight (grams):	785.0
Dry Weight (grams):	641.0
Dry Density (pcf):	96.8

Moisture Content Test Data

Wet Weight	122.25
Dry Weight	103.83
Tare weight	21.85
% Moisture	22.5

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
618	110.77	2.20	1.70	0.77	1.95	4.56E-08
451	110.77	1.40	1.60	1.14	1.50	4.80E-08
1011	110.77	3.00	2.70	0.90	2.85	4.07E-08
377	110.77	1.10	1.00	0.91	1.05	4.02E-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) **4.4E-08** 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.: 094

Acre 18 Lift 2

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	23.2	99.3	
2	See Test Location Plan	102.9	22.2	99.9	
3	See Test Location Plan	102.8	22.6	99.8	
4	See Test Location Plan	101.3	23.8	98.3	
5	See Test Location Plan	101.4	23.4	98.4	
6	See Test Location Plan	100.5	23.9	97.6	
7	See Test Location Plan	102.6	21.6	99.6	Tube/Sample (DL-222)
8	See Test Location Plan	101.7	19.9	98.7	
9	See Test Location Plan	100.6	21.1	97.7	
10	See Test Location Plan	102.6	20.4	99.6	
11	See Test Location Plan	103.4	19.7	100+	
12	See Test Location Plan	102.0	20.6	99.0	
13	See Test Location Plan	102.6	21.4	99.6	
14	See Test Location Plan	101.3	21.6	98.3	
15	See Test Location Plan	100.8	22.4	97.9	
16	See Test Location Plan	102.1	20.6	99.1	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	1.0x10(-8)
Dry Density (pcf)	105.0
Moisture Content (%)	23.1

Atterberg Limits (ASTM D4318)

PL	18
LL	40
PI	22
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	44.2
%Silt	21.3
%Clay	34.5

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

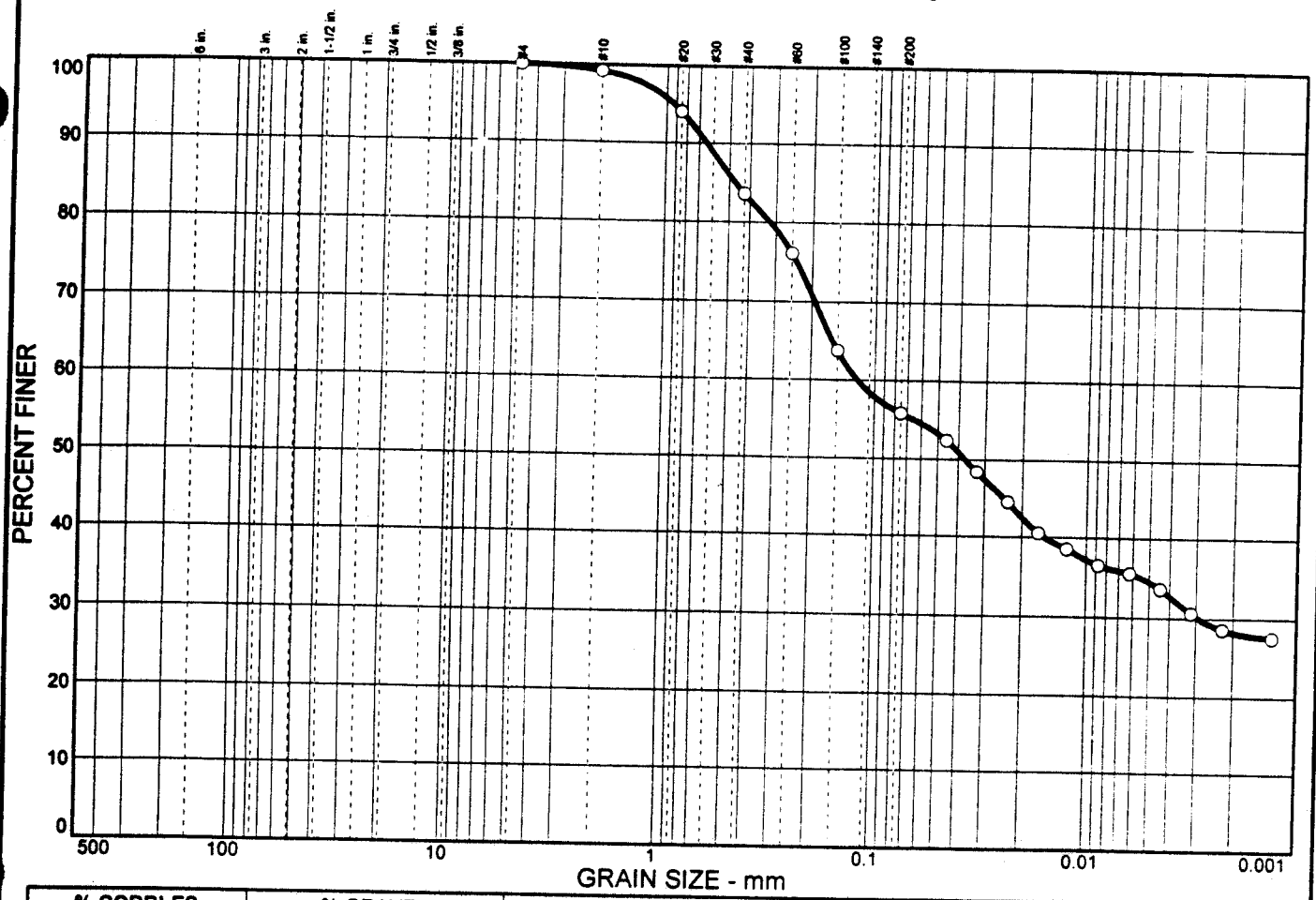
Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

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

11/30/98
Test location Plan
⊘ = Perm location
Acre 18, 6 ft 2
Report: 094

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	44.2	21.3	34.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.2		
#20	94.1		
#40	83.6		
#60	76.1		
#100	63.8		
#200	55.8		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 18 LL= 40 PI= 22

Coefficients

D_{85}= 0.469 D_{60}= 0.120 D_{50}= 0.0371
D_{30}= 0.0029 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-222, Acre 18, Lift 2

Sample No.: DL-222 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 18, Lift 2 **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-175

Project No.: VNC-98-029
Sample No.: DL-222

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.0E-008	cm/sec
% Moisture	23.1	%
Dry Density	105.0	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/30/98
Location: Acre 18, Lift 2

Specimen Data

Length (in):	3.639
Diameter (in.):	2.846
Area (sq. in.):	6.372
Volume (cu. in.):	23.19
Wet Weight (grams):	786.3
Dry Weight (grams):	638.9
Dry Density (pcf):	105.0

Wet Weight	128.67
Dry Weight	108.69
Tare weight	22.09
% Moisture	23.1

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
580	138.46	0.65	0.60	0.92	0.63	1.16E-008
583	138.46	0.60	0.65	1.08	0.63	1.15E-008
690	138.46	0.65	0.55	0.85	0.60	9.32E-009
994	138.46	0.95	0.80	0.84	0.88	9.44E-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

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: 12/10/98
Report No.: 102

Acre 19 Lift 2

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	101.3	20.0	98.3	
2	See Test Location Plan	102.9	21.5	99.9	
3	See Test Location Plan	103.3	21.7	100+	
4	See Test Location Plan	100.6	22.9	97.7	
5	See Test Location Plan	102.7	20.9	99.7	
6	See Test Location Plan	99.8	23.4	96.9	
7	See Test Location Plan	100.3	24.1	97.4	Tube Sample (DL-227)
8	See Test Location Plan	101.0	21.6	98.1	
9	See Test Location Plan	98.9	26.4	96.0	
10	See Test Location Plan	100.9	23.0	98.0	
11	See Test Location Plan	99.3	26.3	96.4	
12	See Test Location Plan	100.6	22.3	97.7	
13	See Test Location Plan	99.2	25.3	96.3	
14	See Test Location Plan	98.4	24.6	95.5	
15	See Test Location Plan	100.3	24.9	97.4	
16	See Test Location Plan	101.2	22.0	98.3	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 1.4x10(-8)

Dry Density (pcf) 104.6

Moisture Content (%) 22.3

Atterberg Limits (ASTM D4318)

PL 16
LL 36
PI 20

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel 0.0
%Sand 45.9
%Silt 18.1
%Clay 36.0

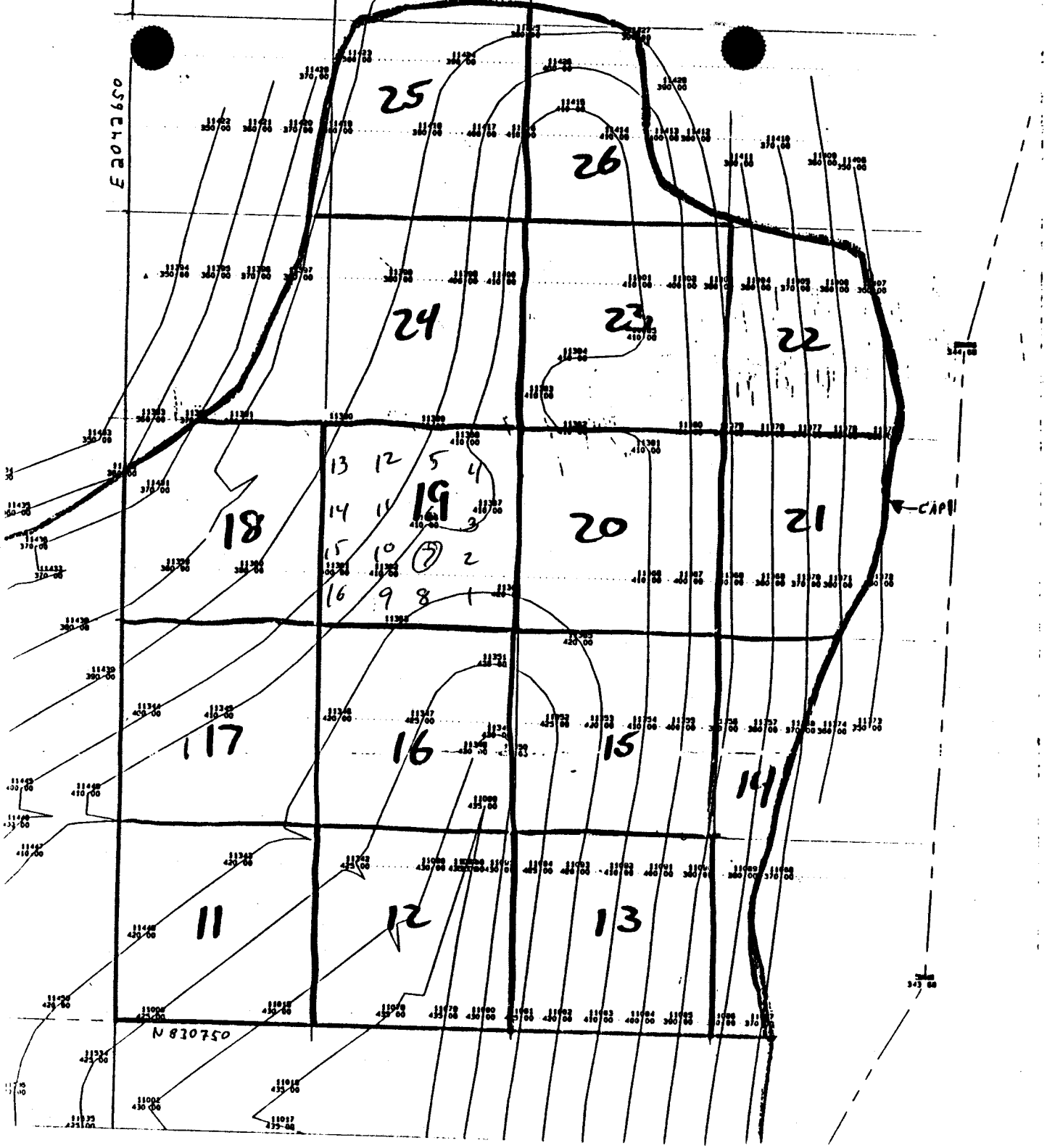
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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

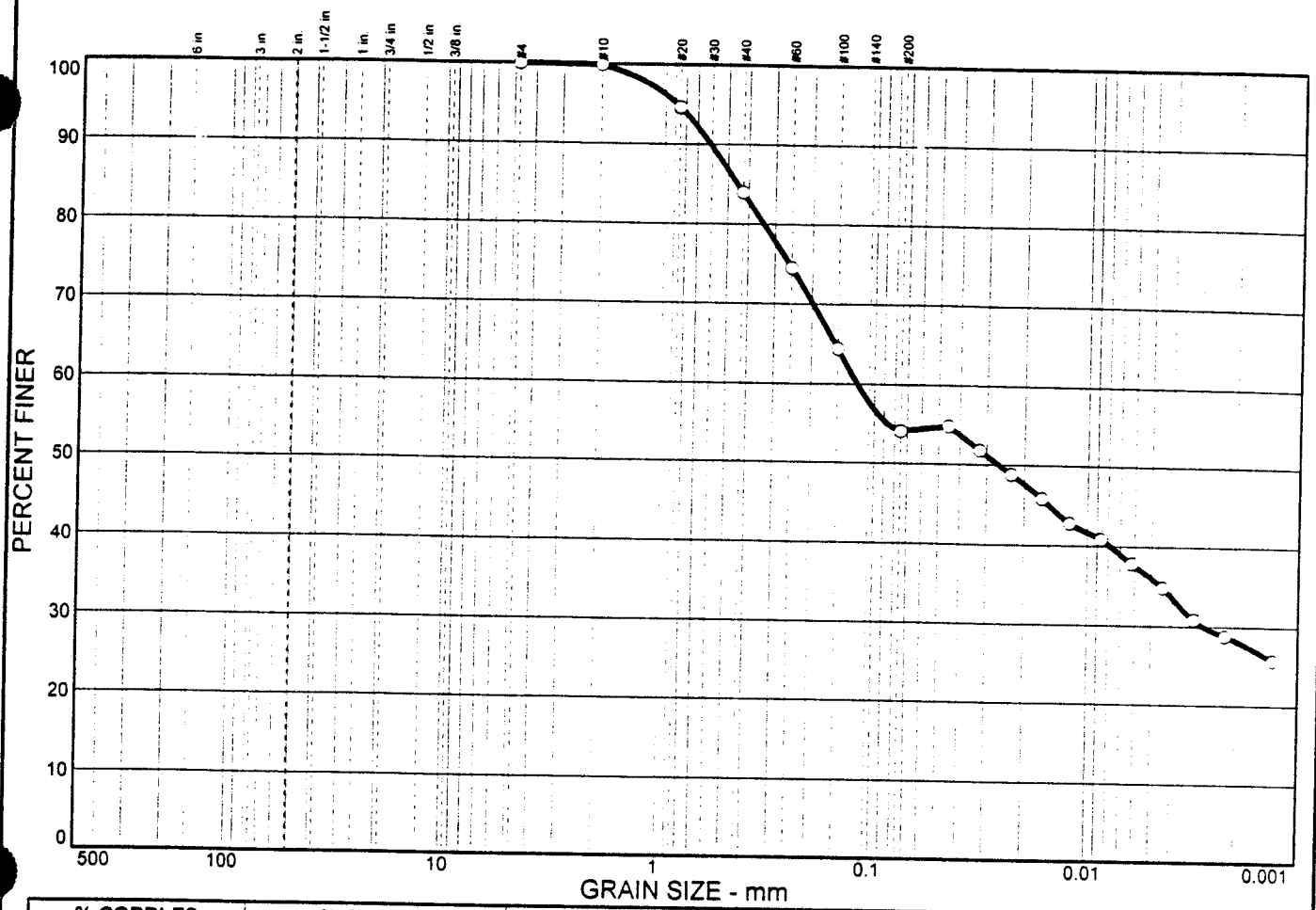
Test location plan

Acre 19/Lift 2

⑦ = Perm location

Report: 102

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	45.9	18.1	36.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	94.6		
#40	84.0		
#60	74.5		
#100	64.4		
#200	54.1		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 16 LL= 36 PI= 20

Coefficients

D_{85}= 0.450 D_{60}= 0.121 D_{50}= 0.0265
D_{30}= 0.0029 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-227, Acre 19, Lift 2

Sample No.: DL-227 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 19, Lift 2 **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: 11/17/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
Roberts Clay Acre 20, Lift 2

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 .045	Clay Cover Testing Acre 20, Lift 2

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.: 045

Acre 20 Lift 2

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	96.4	27.6	95.9	
2	See Test Location Plan	97.4	24.3	96.9	
3	See Test Location Plan	100.3	25.5	99.8	
4	See Test Location Plan	102.5	23.6	100+	
5	See Test Location Plan	100.8	24.6	100+	
6	See Test Location Plan	102.8	23.4	102.2	
7	See Test Location Plan	98.6	27.0	98.1	
8	See Test Location Plan	95.7	27.2	95.2	Sample Perm (DL-122)
9	See Test Location Plan	96.5	25.9	96.0	
10	See Test Location Plan	98.0	23.3	97.5	
11	See Test Location Plan	95.6	23.9	95.1	
12	See Test Location Plan	97.4	24.6	96.9	
13	See Test Location Plan	95.9	23.8	95.4	
14	See Test Location Plan	97.2	26.3	96.8	
15	See Test Location Plan	103.1	23.4	100+	
16	See Test Location Plan	100.3	22.6	99.8	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	3.0 x 10(-8)
Dry Density (pcf)	26.0
Moisture Content (%)	95.7

Atterberg Limits (ASTM D4318)

PL	22
LL	63
PI	41
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.3
%Sand	30.2
%Silt	18.0
%Clay	51.5

Sincerely,

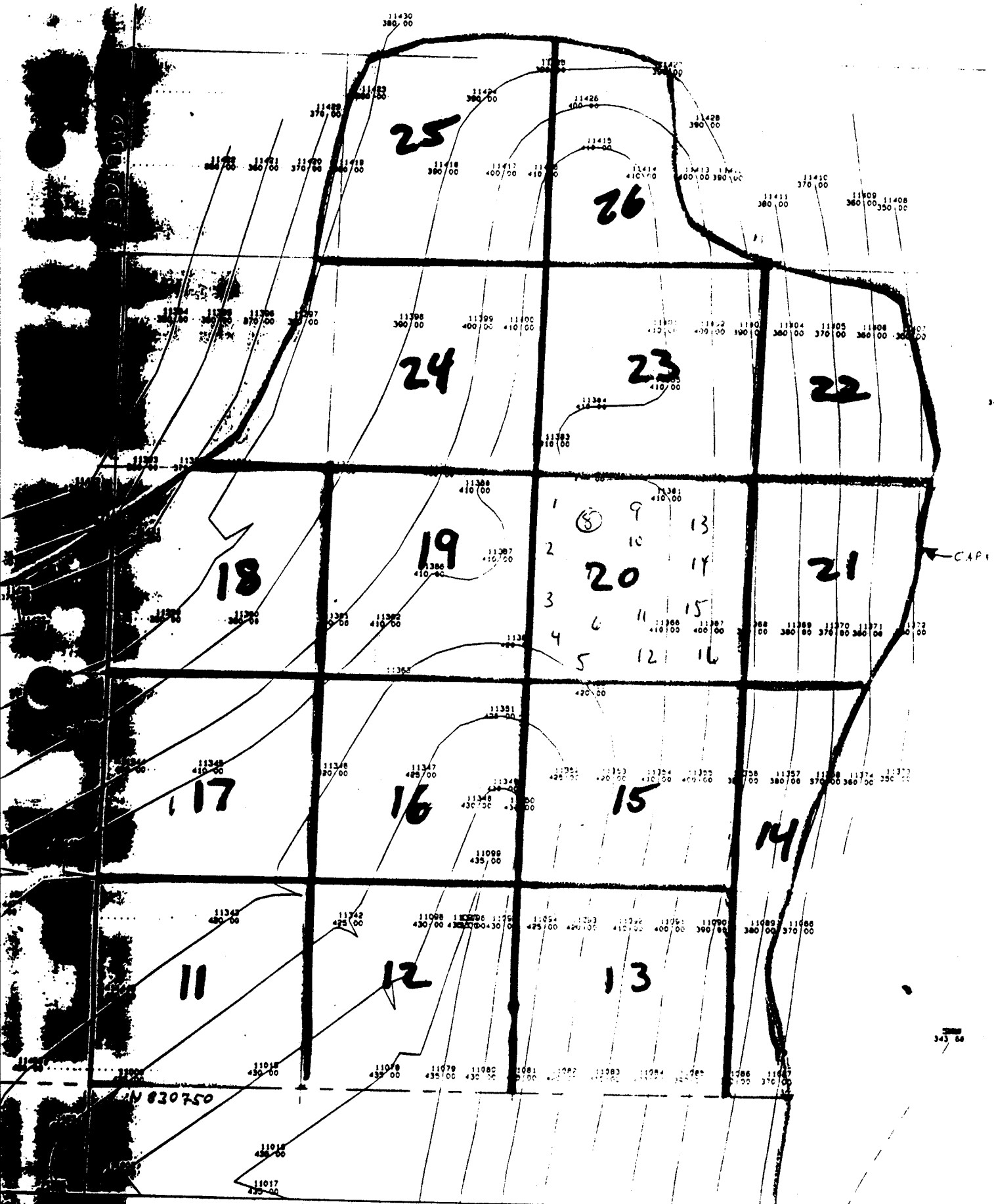
VAN DER HORST Geotechnical Engineering, P.C.

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



(8) - Indicates Run/Sample Location
Acre 20, Lot 2
Report: 045

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/09/98
Report No.: P-095

Project No.: VNC-98-029
Sample No. DL-122

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.0E-08	cm/sec
% Moisture	26.0	%
Dry Density	95.7	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 10/29/98
Location: Acre 20, Lift 2

Length (in):	3.003
Diameter (in.):	2.875
Area (sq. in.):	6.503
Volume (cu. in.):	19.53
Wet Weight (grams):	617.8
Dry Weight (grams):	490.5
Dry Density (pcf):	95.7

Moisture Content Test Data

Wet Weight	105.63
Dry Weight	88.37
Tare weight	21.89
% Moisture	26.0

Test Data

Confining Pressure 3.0 psi

△T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
338	108.00	0.95	1.30	1.37	1.13	3.70E-08
352	108.00	1.00	1.00	1.00	1.00	3.16E-08
489	110.80	1.30	1.10	0.85	1.20	2.66E-08
261	110.80	0.60	0.60	1.00	0.60	2.49E-08

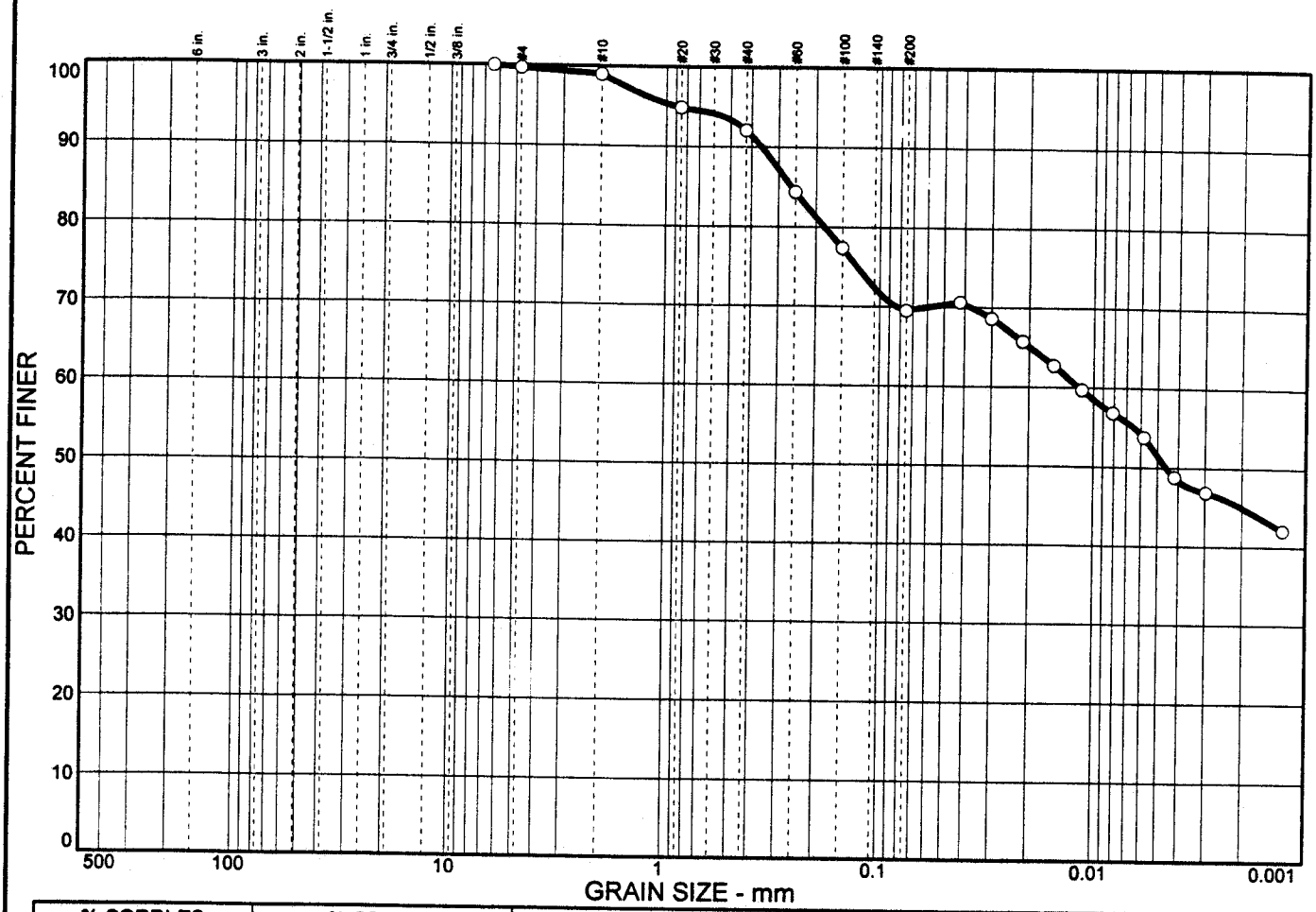
△ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **3.0E-08** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	30.2	18.0	51.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.0		
#20	94.9		
#40	92.1		
#60	84.4		
#100	77.4		
#200	69.5		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 22 LL= 63 PI= 41

Coefficients

D_{85}= 0.260 D_{60}= 0.0117 D_{50}= 0.0046
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-122, Acre 20, Lift 2

Sample No.: DL-122 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 20, Lift 2 **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.: 073

Acre 21 Lift 2

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	100.7	21.9	100+	
2	See Test Location Plan	96.9	23.1	96.4	
3	See Test Location Plan	97.8	22.8	97.3	
4	See Test Location Plan	98.2	22.0	97.7	
5	See Test Location Plan	100.4	21.9	99.9	
6	See Test Location Plan	98.0	23.8	97.5	
7	See Test Location Plan	99.9	22.8	99.4	
8	See Test Location Plan	98.4	23.7	97.9	
9	See Test Location Plan	99.1	24.2	98.6	
10	See Test Location Plan	97.5	23.0	97.0	Tube/Sample (DL-185)
11	See Test Location Plan	98.4	23.1	97.9	
12	See Test Location Plan	100.2	21.6	99.7	
13	See Test Location Plan	99.6	22.0	99.1	
14	See Test Location Plan	98.4	22.6	97.9	
15	See Test Location Plan	96.8	23.8	96.3	
16	See Test Location Plan	97.4	24.1	96.9	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	6.4 x 10 (-9)
Dry Density (pcf)	99.6
Moisture Content (%)	26.6

Atterberg Limits (ASTM D4318)

PL	26
LL	79
PI	53
USCS Classification	CH

Grain-size Analysis (ASTM D422)

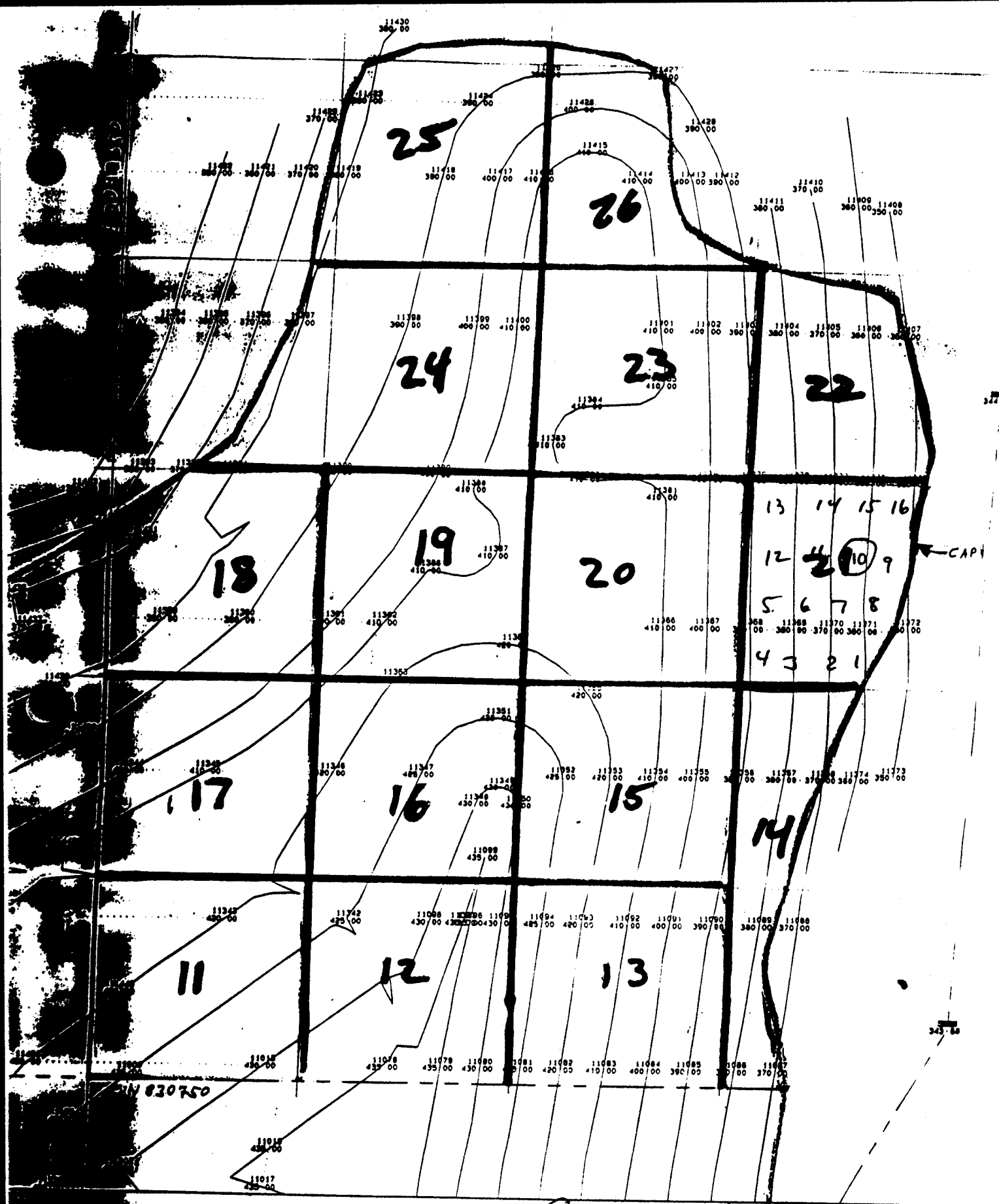
%Gravel	0.1
%Sand	23.7
%Silt	23.3
%Clay	52.9

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



(10) Indicates Drum/Sample Location
Acre 21, Lift 2.
Report:

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-142

Project No.: VNC-98-029
Sample No.: DL-185

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.4E-009	cm/sec
% Moisture	26.6	%
Dry Density	99.6	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/18/98
Location: Acre 21, Lift 2

Specimen Data

Length (in):	3.252
Diameter (in.):	2.871
Area (sq. in.):	6.485
Volume (cu. in.):	21.09
Wet Weight (grams):	698.0
Dry Weight (grams):	551.4
Dry Density (pcf):	99.6

Moisture Content Test Data

Wet Weight	151.68
Dry Weight	124.48
Tare weight	22.19
% Moisture	26.6

Test Data

Confining Pressure 3.0 psi

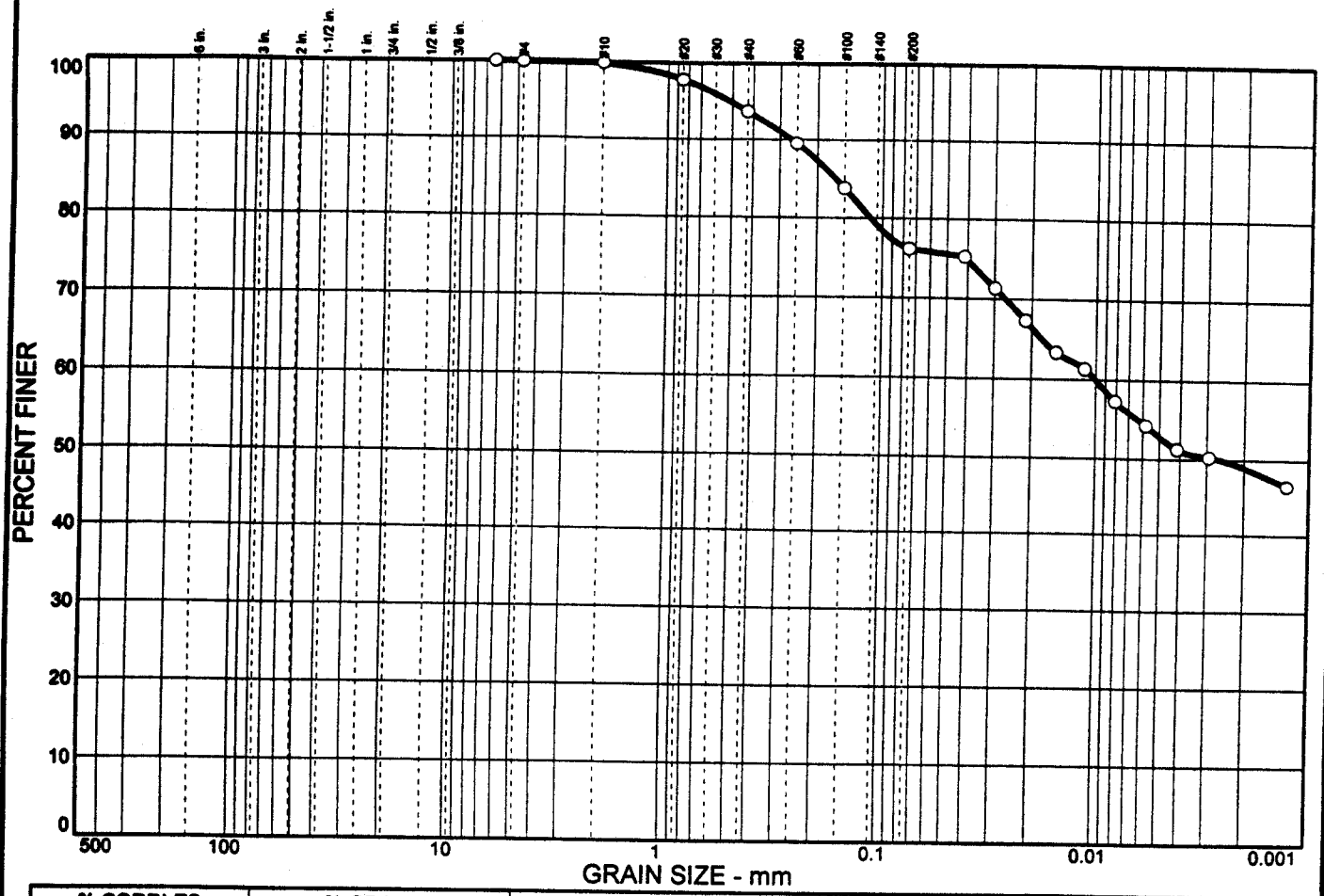
Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
966	138.46	0.80	0.65	0.81	0.73	7.07E-009
789	138.46	0.50	0.45	0.90	0.48	5.67E-009
635	138.46	0.50	0.50	1.00	0.50	7.41E-009
537	138.46	0.30	0.30	1.00	0.30	5.26E-009

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	0.1	23.7	23.3	52.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.9		
#20	97.8		
#40	93.7		
#60	89.5		
#100	83.8		
#200	76.2		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 26 LL= 79 PI= 53

Coefficients

D_{85}= 0.165 D_{60}= 0.0100 D_{50}= 0.0026
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-185, Acre 21, Lift 2

Sample No.: DL-185 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 21, Lift 2 **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.: 076

Acre 22 Lift 2

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	100.4	22.6	99.9	
2	See Test Location Plan	99.4	21.8	98.9	
3	See Test Location Plan	96.9	23.1	96.4	
4	See Test Location Plan	95.8	24.0	95.3	
5	See Test Location Plan	98.4	22.0	97.9	
6	See Test Location Plan	97.2	21.8	96.8 ~~8~~ 9 on	
7	See Test Location Plan	98.4	22.0	97.9	
8	See Test Location Plan	96.3	23.1	95.8	
9	See Test Location Plan	101.0	22.0	100+	
10	See Test Location Plan	100.0	21.6	99.5	Perm/Sample (DL-188)
11	See Test Location Plan	98.5	22.4	98.0	
12	See Test Location Plan	98.7	22.0	98.2	
13	See Test Location Plan	97.4	22.6	96.9	
14	See Test Location Plan	100.2	21.6	99.7	
15	See Test Location Plan	99.1	22.1	98.6	
16	See Test Location Plan	97.4	23.0	96.9	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec) 1.3 x 10(-8)

Dry Density (pcf) 97.5

Moisture Content (%) 25.4

Atterberg Limits (ASTM D4318)

PL 23
LL 58
PI 35

USCS Classification CH

Grain-size Analysis (ASTM D422)

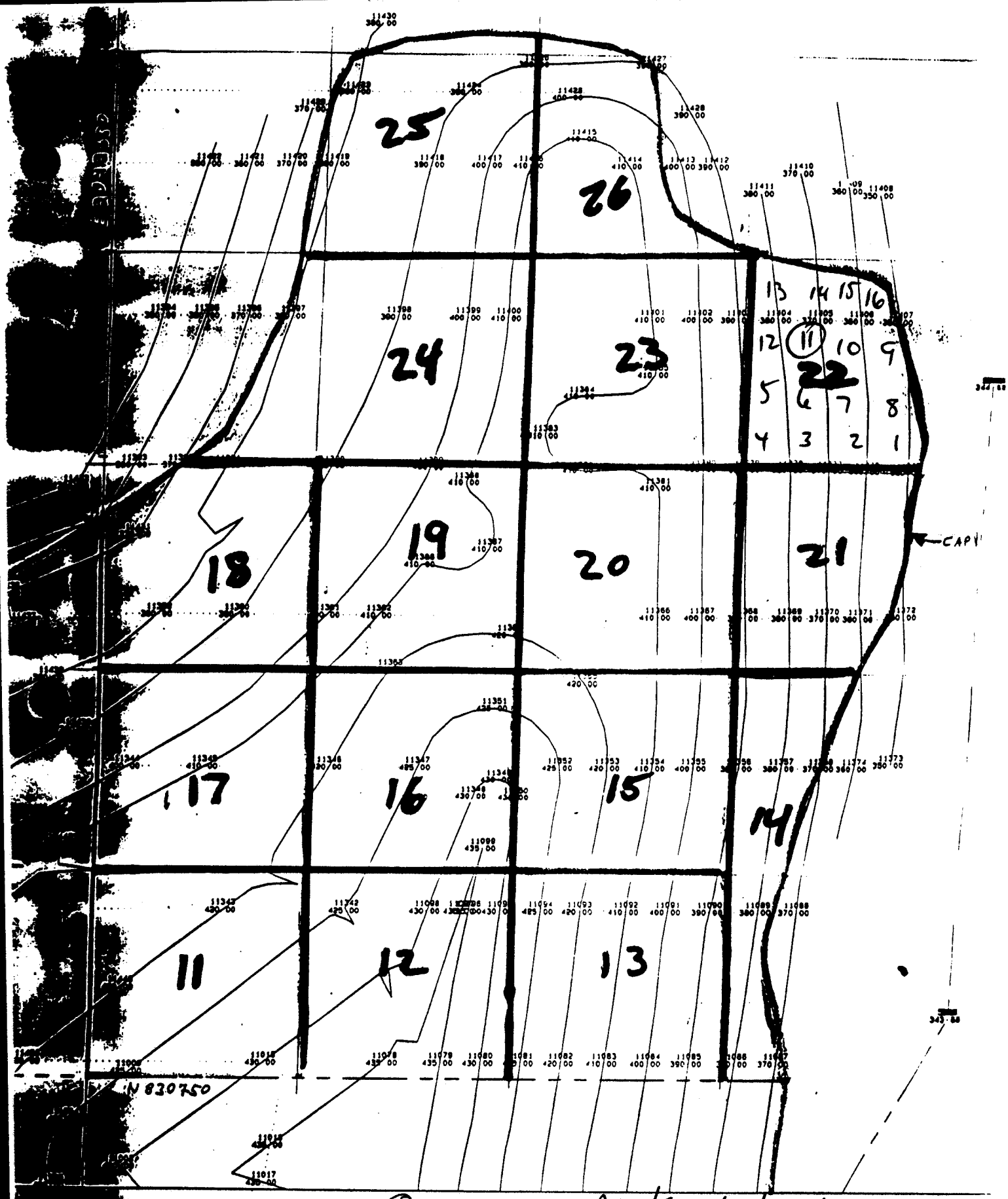
%Gravel 0.1
%Sand 30.6
%Silt 19.5
%Clay 49.8

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

Robert L. Mashewske, P.E.

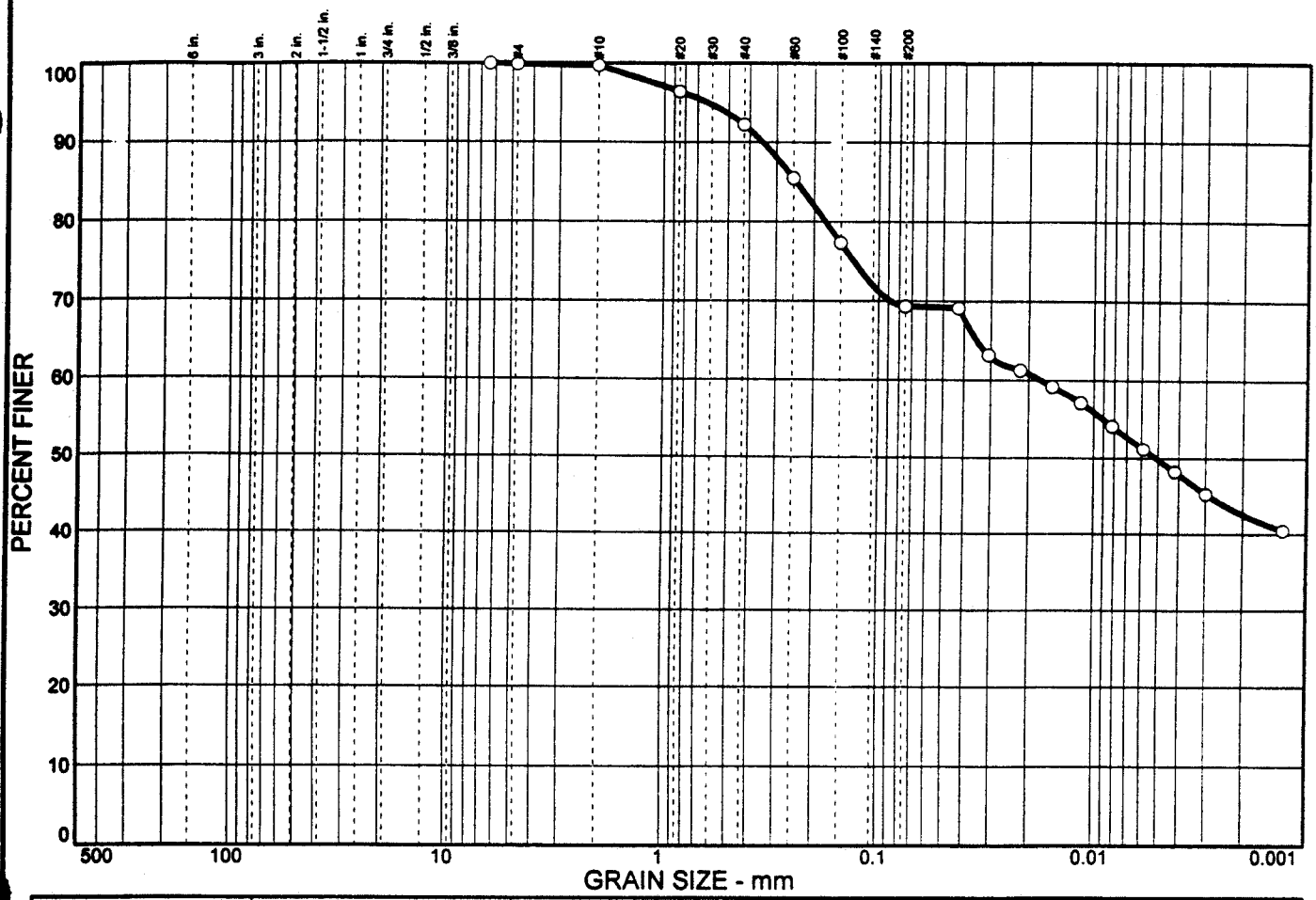
NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

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



(11) - INDICATES PERM/Sample Location
Acre 22, Lift 2
Report:

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	30.6	19.5	49.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.7		
#20	96.4		
#40	92.2		
#60	85.5		
#100	77.3		
#200	69.3		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 23 LL= 58 PI= 35

Coefficients

D_{85}= 0.242 D_{60}= 0.0176 D_{50}= 0.0051
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-188, Acre 22, Lift 2

Sample No.: DL-188 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 22, Lift 2 **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-143

Project No.: VNC-98-029
Sample No.: DL-188

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.3E-008	cm/sec
% Moisture	25.4	%
Dry Density	97.5	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/18/98
Location: Acre 22, Lift 2

Specimen Data

Length (in):	3.099
Diameter (in.):	2.865
Area (sq. in.):	6.458
Volume (cu. in.):	20.01
Wet Weight (grams):	642.8
Dry Weight (grams):	512.4
Dry Density (pcf):	97.5

Moisture Content Test Data

Wet Weight	111.82
Dry Weight	93.62
Tare weight	22.10
% Moisture	25.4

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
273	135.69	0.45	0.40	0.89	0.43	1.43E-008
500	135.69	0.70	0.75	1.07	0.73	1.33E-008
724	135.69	0.80	0.85	1.06	0.83	1.05E-008
268	135.69	0.40	0.45	1.13	0.43	1.46E-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

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.: 070

Acre 23 Lift 2

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	100.7	21.0	100+	
2	See Test Location Plan	95.5	28.0	95.0	
3	See Test Location Plan	101.2	21.8	100+	
4	See Test Location Plan	99.0	22.0	98.5	
5	See Test Location Plan	99.7	21.6	99.2	
6	See Test Location Plan	96.5	25.6	96.0	
7	See Test Location Plan	99.7	22.6	99.2	Perm/Sample (DL-129)
8	See Test Location Plan	97.2	26.0	96.7	
9	See Test Location Plan	100.1	21.5	99.6	
10	See Test Location Plan	95.6	22.0	95.1	
11	See Test Location Plan	97.2	21.8	96.7	
12	See Test Location Plan	96.8	22.4	96.3	
13	See Test Location Plan	99.1	22.6	98.6	
14	See Test Location Plan	99.4	22.2	98.9	
15	See Test Location Plan	98.3	23.9	97.8	
16	See Test Location Plan	95.7	23.4	95.2	

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)	99.1
Moisture Content (%)	22.9

Atterberg Limits (ASTM D4318)

PL	30
LL	76
PI	46
USCS Classification	CH

Grain-size Analysis (ASTM D422)

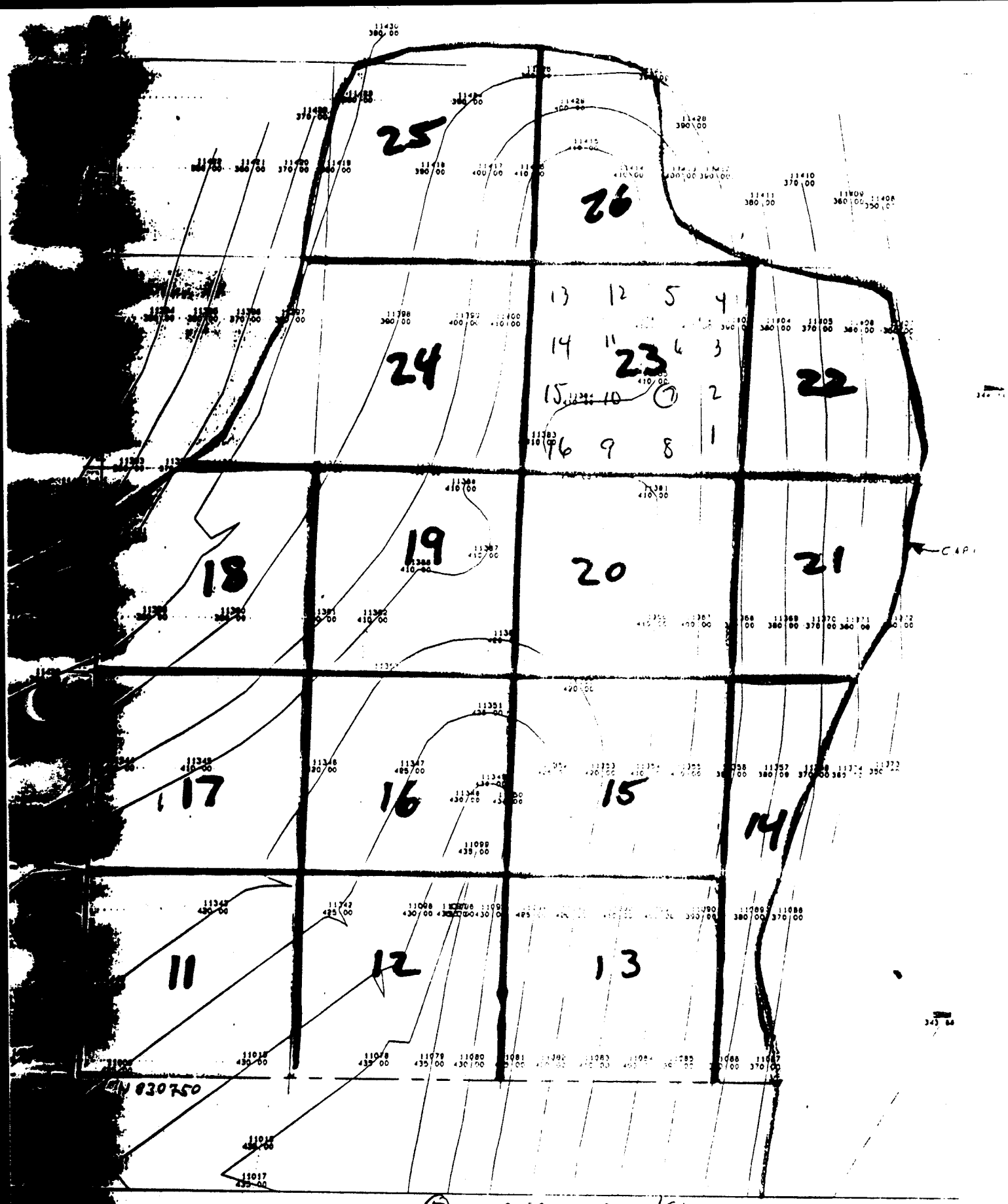
%Gravel	0.0
%Sand	27.3
%Silt	20.0
%Clay	52.7

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

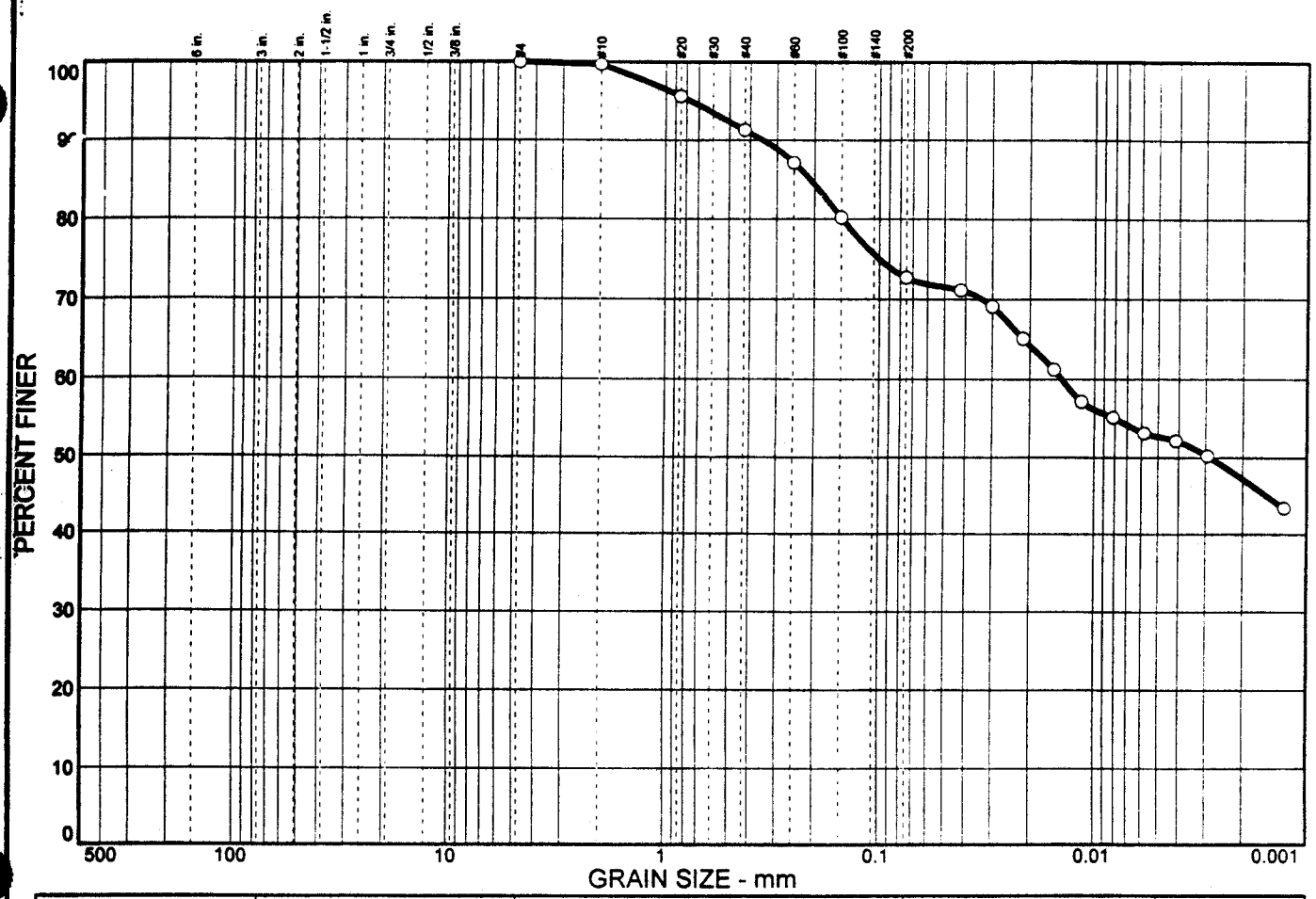


(7) - INDICATES PERM/SAMPLE LOCATION

ACRE 23, LIFT 2

REPORT: 069

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	27.3	20.0	52.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	95.6		
#40	91.3		
#60	87.1		
#100	80.2		
#200	72.7		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 30 LL= 76 PI= 46

Coefficients

D_{85}= 0.211 D_{60}= 0.0142 D_{50}= 0.0029
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-129, Acre 23, Lift 2

Sample No.: DL-129 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 23, Lift 2 **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-100

Project No.: VNC-98-029
Sample No.: DL-129

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.9E-008	cm/sec
% Moisture	22.9	%
Dry Density	99.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/30/98
Location: Acre 23, Lift 2

Length (in):	3.675
Diameter (in.):	2.840
Area (sq. in.):	6.346
Volume (cu. in.):	23.32
Wet Weight (grams):	745.5
Dry Weight (grams):	606.4
Dry Density (pcf):	99.1

Moisture Content Test Data

Wet Weight	79.86
Dry Weight	69.09
Tare weight	22.15
% Moisture	22.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
115	83.10	0.55	0.50	0.91	0.53	8.27E-008
291	83.10	1.25	1.15	0.92	1.20	7.47E-008
437	83.10	1.30	1.50	1.15	1.40	5.81E-008
195	83.10	0.65	0.65	1.00	0.65	6.04E-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) **6.9E-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: 12/08/98
Report No.: 088

Acre 24 Lift 2
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	23.1	99.6	
2	See Test Location Plan	104.6	21.8	100+	
3	See Test Location Plan	105.2	21.9	102.2	
4	See Test Location Plan	99.0	21.2	96.1	
5	See Test Location Plan	102.2	24.1	99.2	
6	See Test Location Plan	102.5	23.4	99.5	
7	See Test Location Plan	98.0	22.8	95 ~~2~~ 1 02	
8	See Test Location Plan	102.5	22.5	99.5	
9	See Test Location Plan	104.6	20.8	101.6	
10	See Test Location Plan	102.8	22.4	99.8	
11	See Test Location Plan	101.3	24.7	98.3	Perm/Sample (DL-217)
12	See Test Location Plan	98.2	25.6	95.3	
13	See Test Location Plan	103.1	22.0	100.1	
14	See Test Location Plan	104.0	20.9	101.0	
15	See Test Location Plan	102.4	24.7	99.4	
16	See Test Location Plan	102.9	22.6	99.9	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	2.5x10(-8)
Dry Density (pcf)	106.1
Moisture Content (%)	22.6

Atterberg Limits (ASTM D4318)

PL	19
LL	44
PI	25
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.2
%Sand	39.0
%Silt	21.8
%Clay	39.0

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

11/27/88
Acre 24 1/4 ft 2
Test location Plan
Ⓜ = Perm location
Report: OSS
E 2013650
N 8370750
12
22
23
32
92
52
20
51
61
81
71
91
111
13
21
11
24
1 8 9 16
2 7 10 15
3 4 5 6
11 12 13 14

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-164

Project No.: VNC-98-029
Sample No.: DL-217

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.0E-008	cm/sec
% Moisture	22.6	%
Dry Density	106.1	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/25/98
Location: Acre 24, Lift 2

Specimen Data

Length (in):	3.450
Diameter (in.):	2.800
Area (sq. in.):	6.168
Volume (cu. in.):	21.28
Wet Weight (grams):	726.3
Dry Weight (grams):	592.5
Dry Density (pcf):	106.1

Moisture Content Test Data

Wet Weight	99.62
Dry Weight	85.34
Tare weight	22.10
% Moisture	22.6

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
398	138.46	0.95	0.85	0.89	0.90	2.38E-008
338	138.46	0.65	0.60	0.92	0.63	1.94E-008
660	138.46	1.30	1.00	0.77	1.15	1.83E-008
243	138.46	0.45	0.45	1.00	0.45	1.95E-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)

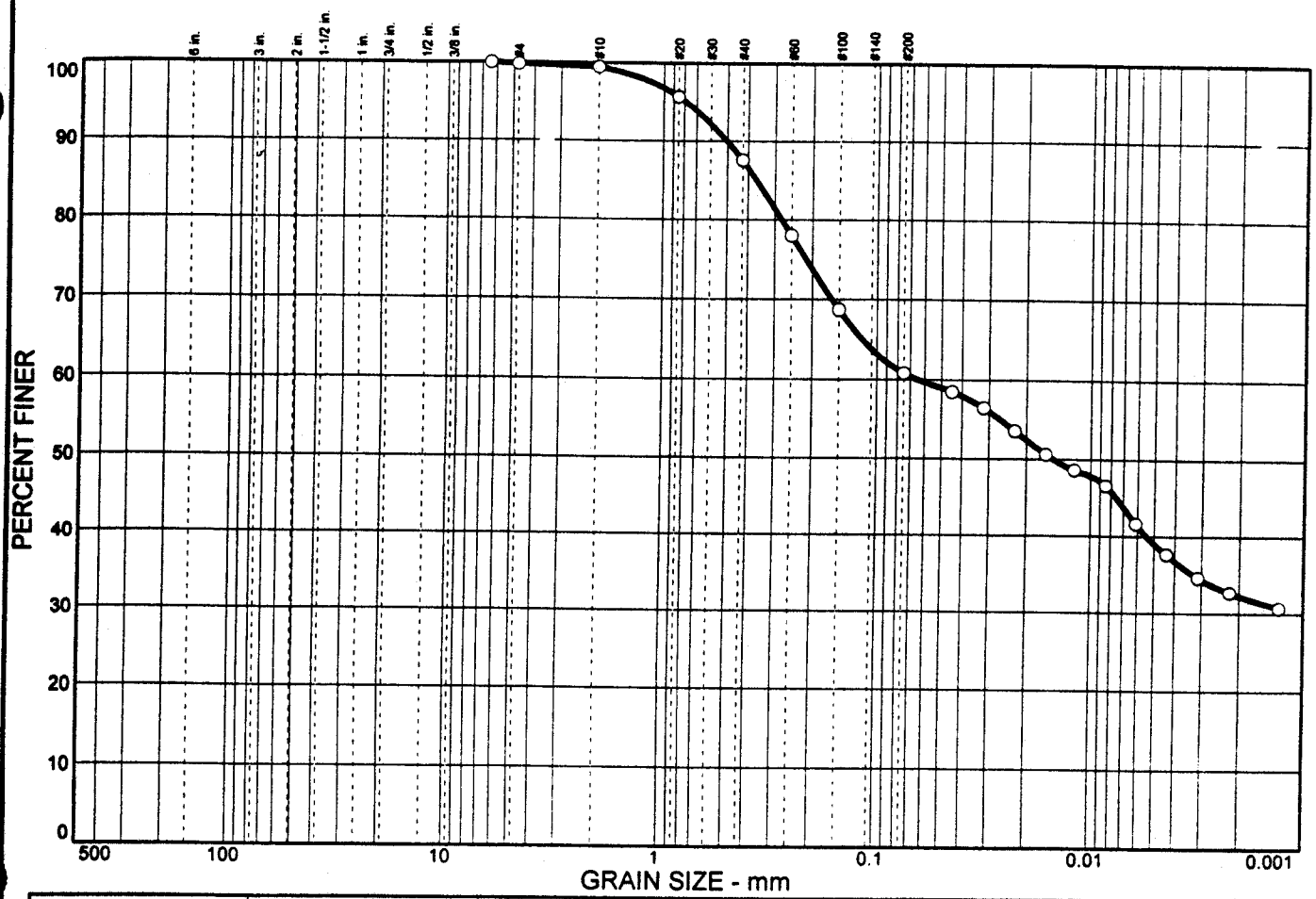
Permeability (k) **2.0E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

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	39.0	21.8	39.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.5		
#20	95.7		
#40	87.5		
#60	78.0		
#100	68.7		
#200	60.8		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 44 PI= 25

Coefficients

D_{85}= 0.366 D_{60}= 0.0647 D_{50}= 0.0150
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-217, Acre 24, Lift 2

Sample No.: DL-217 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 24, Lift 2 **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.: 097

Acre 24a Lift 2
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	102.0	19.9	99.0 101	
2	See Test Location Plan	99.9	22.1	97.0 98.5	
3	See Test Location Plan	102.9	21.6	99.9 100+	
4	See Test Location Plan	102.7	20.8	99.7 100+	Tube/Sample (DL-224)
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)	6.7x10(-8)
Dry Density (pcf)	103.4
Moisture Content (%)	24.2

Atterberg Limits (ASTM D4318)

PL	18
LL	40
PI	22
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.3
%Sand	48.2
%Silt	13.9
%Clay	37.6

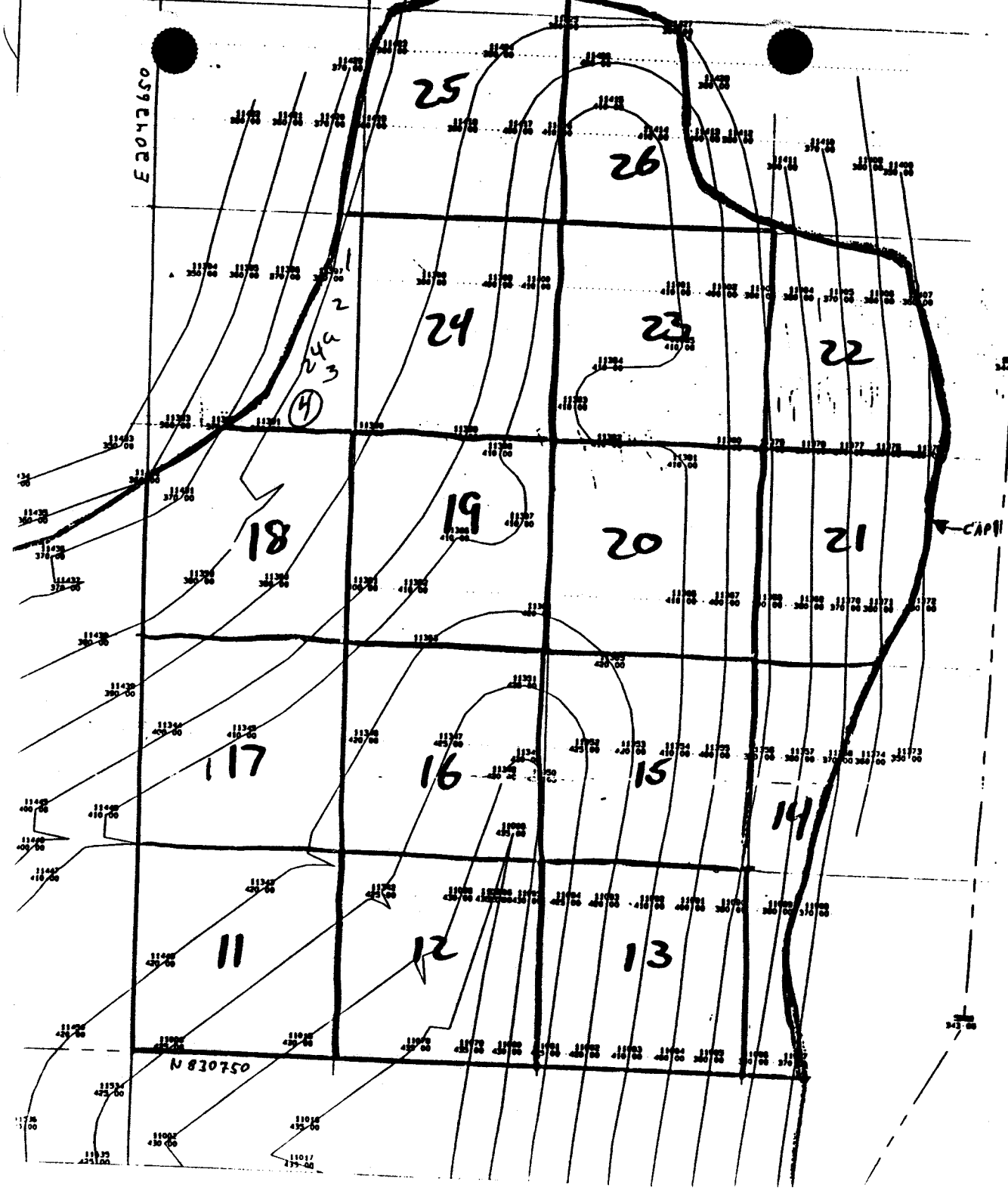
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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



11/27/98

Test location Plan

Acre 24a/Lift 2

④ = Perm location

Report: 097

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/08/98
Report No.: P-177

Project No.: VNC-98-029
Sample No.: DL-224

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.7E-008	cm/sec
% Moisture	24.2	%
Dry Density	103.4	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/30/98
Location: Acre 24A, Lift 2

Specimen Data

Length (in):	3.079
Diameter (in.):	2.827
Area (sq. in.):	6.288
Volume (cu. in.):	19.36
Wet Weight (grams):	652.6
Dry Weight (grams):	525.5
Dry Density (pcf):	103.4

Wet Weight	128.34
Dry Weight	107.62
Tare weight	21.94
% Moisture	24.2

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
77	138.46	0.60	0.60	1.00	0.60	7.17E-008
184	138.46	1.45	1.20	0.83	1.33	6.62E-008
182	138.46	1.30	1.35	1.04	1.33	6.69E-008
550	138.46	3.95	3.65	0.92	3.80	6.35E-008

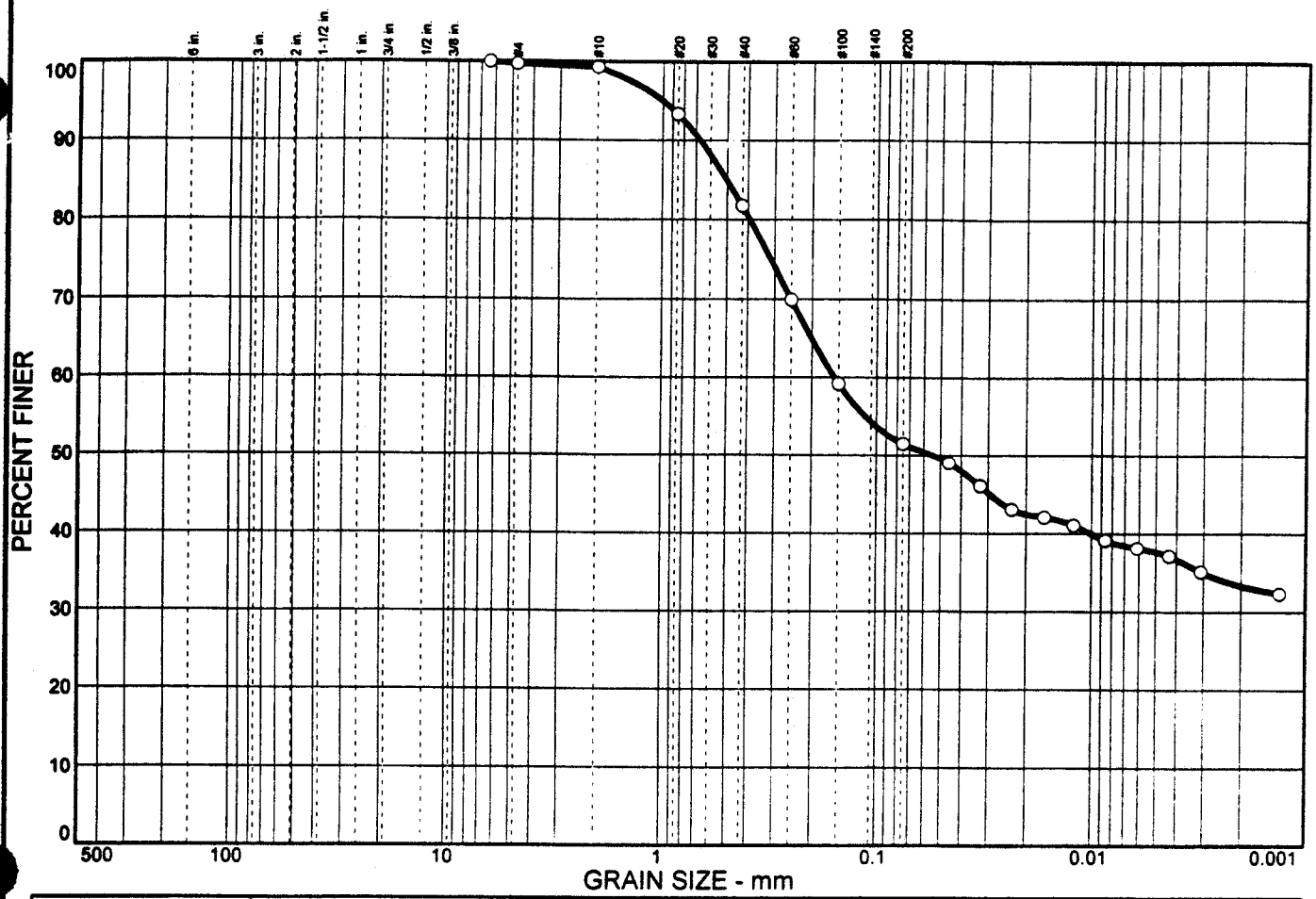
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **6.7E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	48.2	13.9	37.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.3		
#20	93.3		
#40	81.8		
#60	69.9		
#100	59.2		
#200	51.5		

* (no specification provided)

Soil Description

Roberts Pit - Sandy lean clay

Atterberg Limits

PL= 18 LL= 40 PI= 22

Coefficients

D_{85}= 0.499 D_{60}= 0.157 D_{50}= 0.0545
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-224, Acre 24A, Lift 2

Sample No.: DL-224 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 24A, Lift 2 **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: 12/08/98
Report No.: 091

Acre 25 Lift 2

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	100.7	22.7	97.7	
2	See Test Location Plan	103.5	21.9	100+	
3	See Test Location Plan	103.2	22.0	100+	
4	See Test Location Plan	102.6	22.3	99.6	
5	See Test Location Plan	101.7	22.6	98.7	
6	See Test Location Plan	103.4	21.7	100+	
7	See Test Location Plan	100.9	22.6	97.9	
8	See Test Location Plan	100.0	23.8	97.1	Perm/Sample (DL-214)
9	See Test Location Plan	102.6	19.9	99.6	
10	See Test Location Plan	102.4	20.6	99.4	
11	See Test Location Plan	101.8	21.3	98.8	
12	See Test Location Plan	101.7	23.0	98.7	
13	See Test Location Plan	100.4	22.8	97.5	
14	See Test Location Plan	101.3	21.6	98.3	
15	See Test Location Plan	102.6	22.0	99.6	
16	See Test Location Plan	102.1	21.4	99.1	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	5.4x10(-9)
Dry Density (pcf)	101.5
Moisture Content (%)	23.9

Atterberg Limits (ASTM D4318)

PL	19
LL	45
PI	26

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	41.8
%Silt	18.8
%Clay	39.4

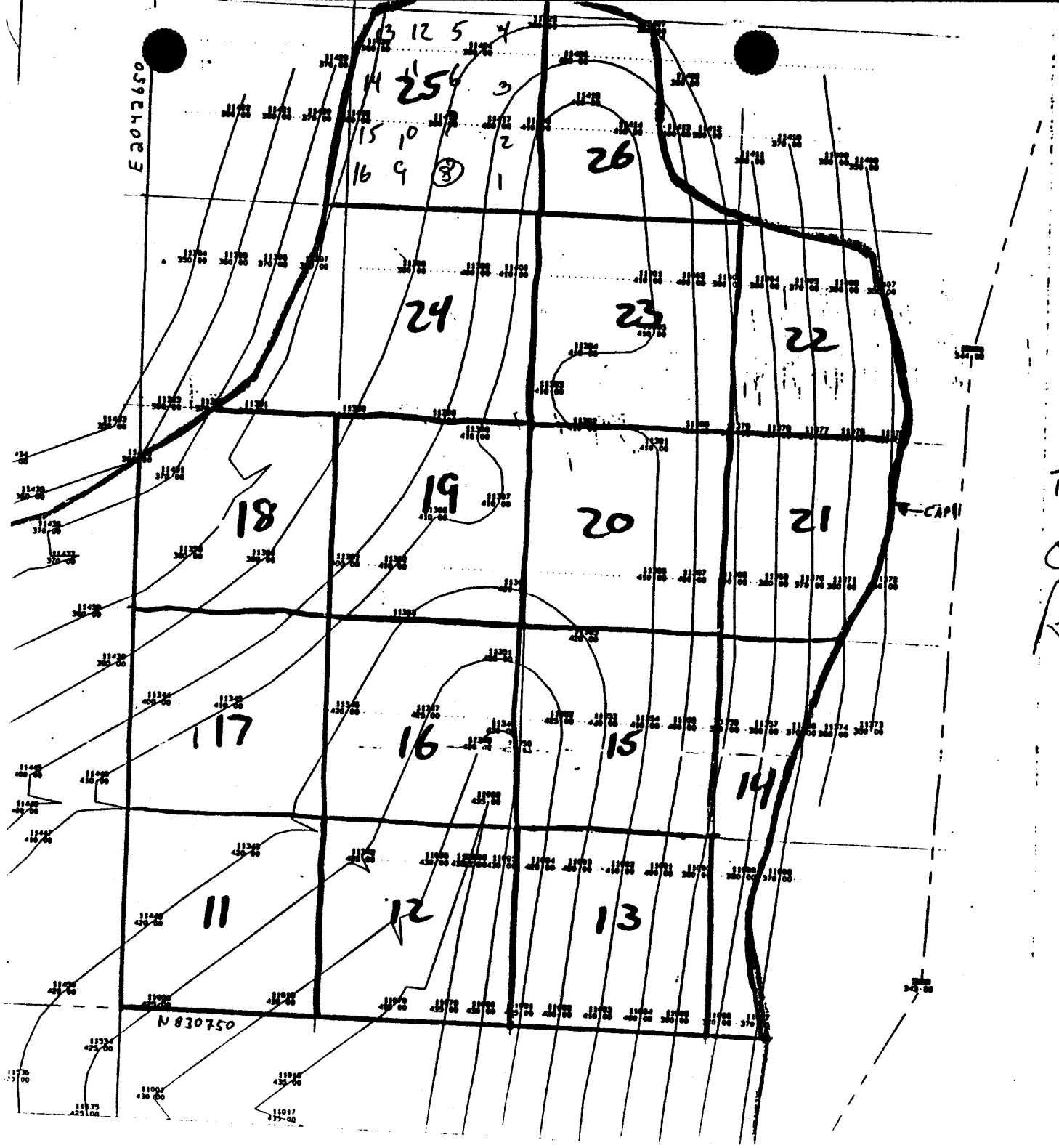
USCS Classification CL

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



11/25/98

Ace 25 / 14ft 2

Test location Plan

(8) = Perm location

Report : 091

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/04/98
Report No.: P-173

Project No.: VNC-98-029
Sample No.: DL-214

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.4E-009	cm/sec
% Moisture	23.9	%
Dry Density	101.5	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/25/98
Location: Acre 25, Lift 2

Specimen Data

Length (in):	3.051
Diameter (in.):	2.857
Area (sq. in.):	6.422
Volume (cu. in.):	19.59
Wet Weight (grams):	646.3
Dry Weight (grams):	521.8
Dry Density (pcf):	101.5

Moisture Content Test Data

Wet Weight	162.82
Dry Weight	135.69
Tare weight	22.02
% Moisture	23.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
933	138.46	0.50	0.50	1.00	0.50	4.78E-009
535	138.46	0.35	0.30	0.86	0.33	5.42E-009
1322	138.46	0.80	0.80	1.00	0.80	5.40E-009
452	138.46	0.30	0.30	1.00	0.30	5.92E-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)

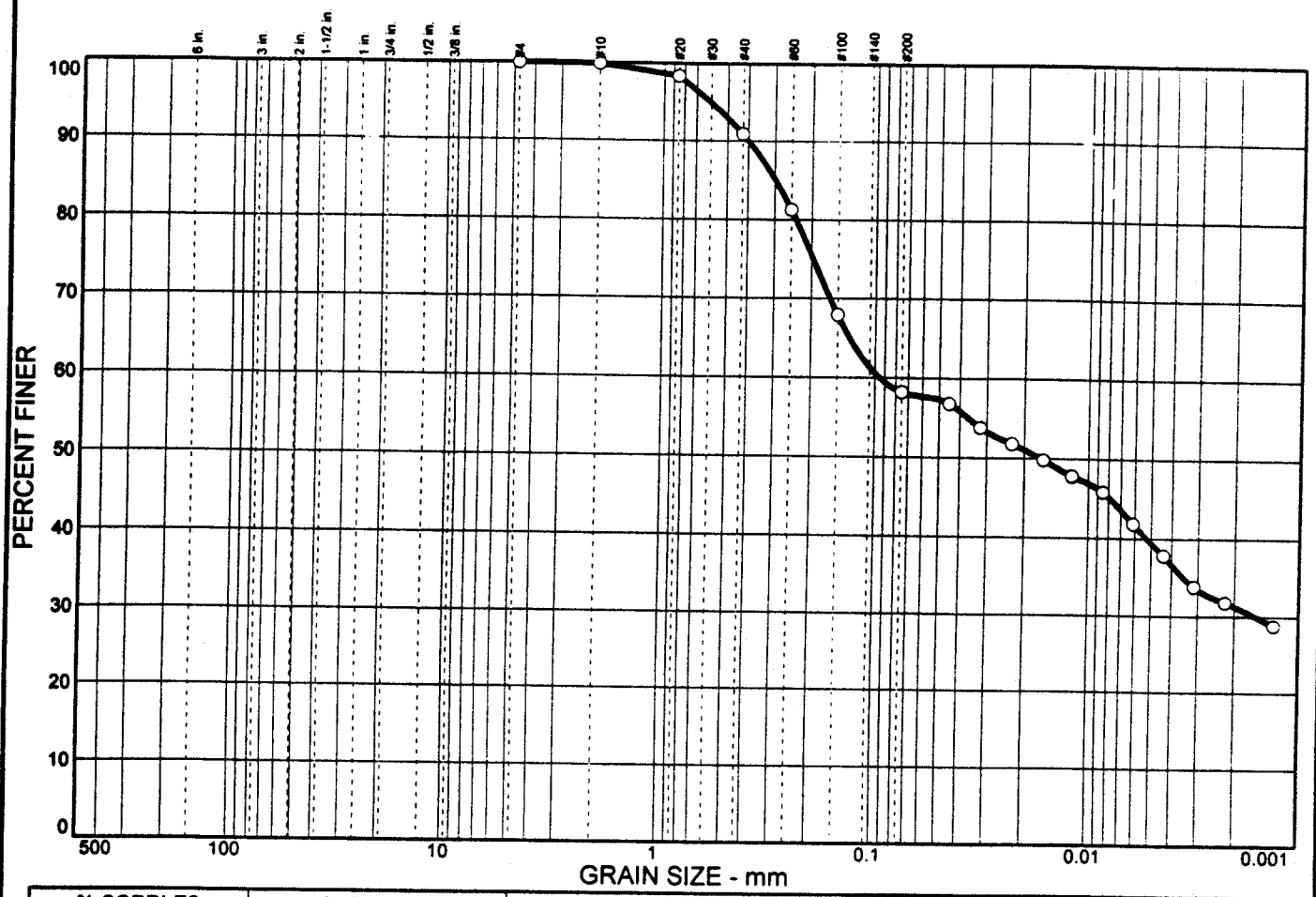
Permeability (k) **5.4E-009** cm/sec

Respecfully submitted Robert L. Mashewske

Robert L. Mashewske, P.E.
Regional Manager

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	41.8	18.8	39.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	98.4		
#40	90.9		
#60	81.3		
#100	67.9		
#200	58.2		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 45 PI= 26

Coefficients

D_{85}= 0.296 D_{60}= 0.0949 D_{50}= 0.0168
D_{30}= 0.0016 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-214, Acre 25, Lift 2

Sample No.: DL-214 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 25, Lift 2 **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.: 071

Acre 26 Lift 2

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	98.6	24.1	98.1	
2	See Test Location Plan	100.3	21.9	99.8	
3	See Test Location Plan	101.5	21.0	100+	
4	See Test Location Plan	101.7	22.3	100+	
5	See Test Location Plan	99.4	21.0	98.9	
6	See Test Location Plan	96.8	23.2	96.3	
7	See Test Location Plan	97.7	24.0	97.2	
8	See Test Location Plan	97.6	21.0	97.1	
9	See Test Location Plan	98.3	24.0	97.8	Perm/Sample (DL-130)
10	See Test Location Plan	99.4	22.3	98.9	
11	See Test Location Plan	99.7	23.0	97.2 99.2	
12	See Test Location Plan	98.0	23.6	97.5	
13	See Test Location Plan	97.8	24.2	97.3	
14	See Test Location Plan	99.6	21.9	99.1	
15	See Test Location Plan	98.4	21.6	97.9	
16	See Test Location Plan	100.5	22.0	100.0	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	1.1 x 10(-8)
Dry Density (pcf)	101.3
Moisture Content (%)	23.3

Atterberg Limits (ASTM D4318)

PL	24
LL	62
PI	38
USCS Classification	CH

Grain-size Analysis (ASTM D422)

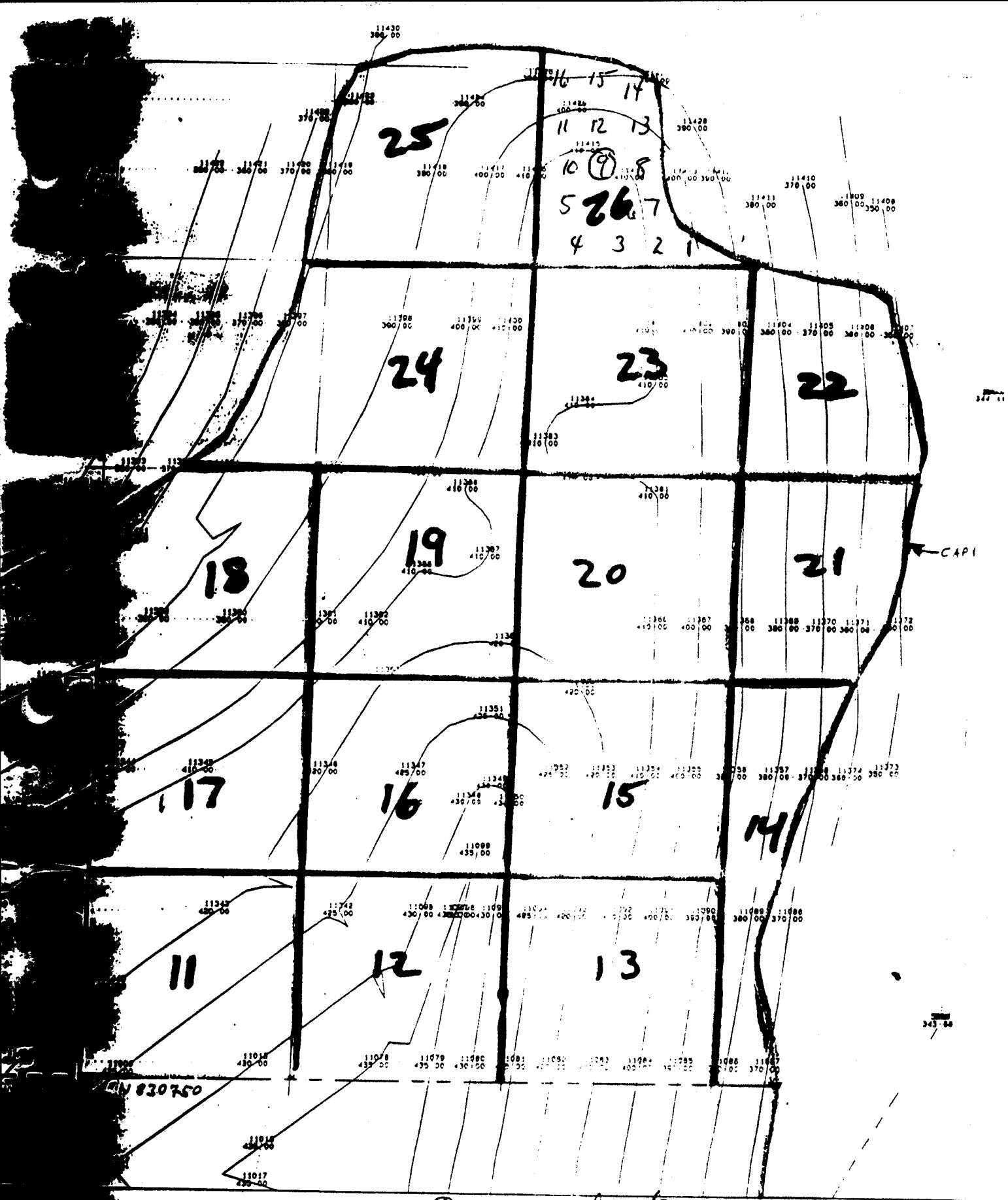
%Gravel	0.3
%Sand	34.1
%Silt	19.4
%Clay	46.2

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



(9) - INDICATES PERM/SAMPLE LOCATION

Acre 26, Lift 2

Report: 070

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/24/98
Report No.: P-101

Project No.: VNC-98-029
Sample No.: DL-130

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.1E-008	cm/sec
% Moisture	23.3	%
Dry Density	101.3	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 10/30/98
Location: Acre 26, Lift 2

Length (in):	3.810
Diameter (in.):	2.835
Area (sq. in.):	6.323
Volume (cu. in.):	24.09
Wet Weight (grams):	789.6
Dry Weight (grams):	640.6
Dry Density (pcf):	101.3

Moisture Content Test Data

Wet Weight	71.40
Dry Weight	62.05
Tare weight	21.84
% Moisture	23.3

Test Data

Confining Pressure 3.0 psi

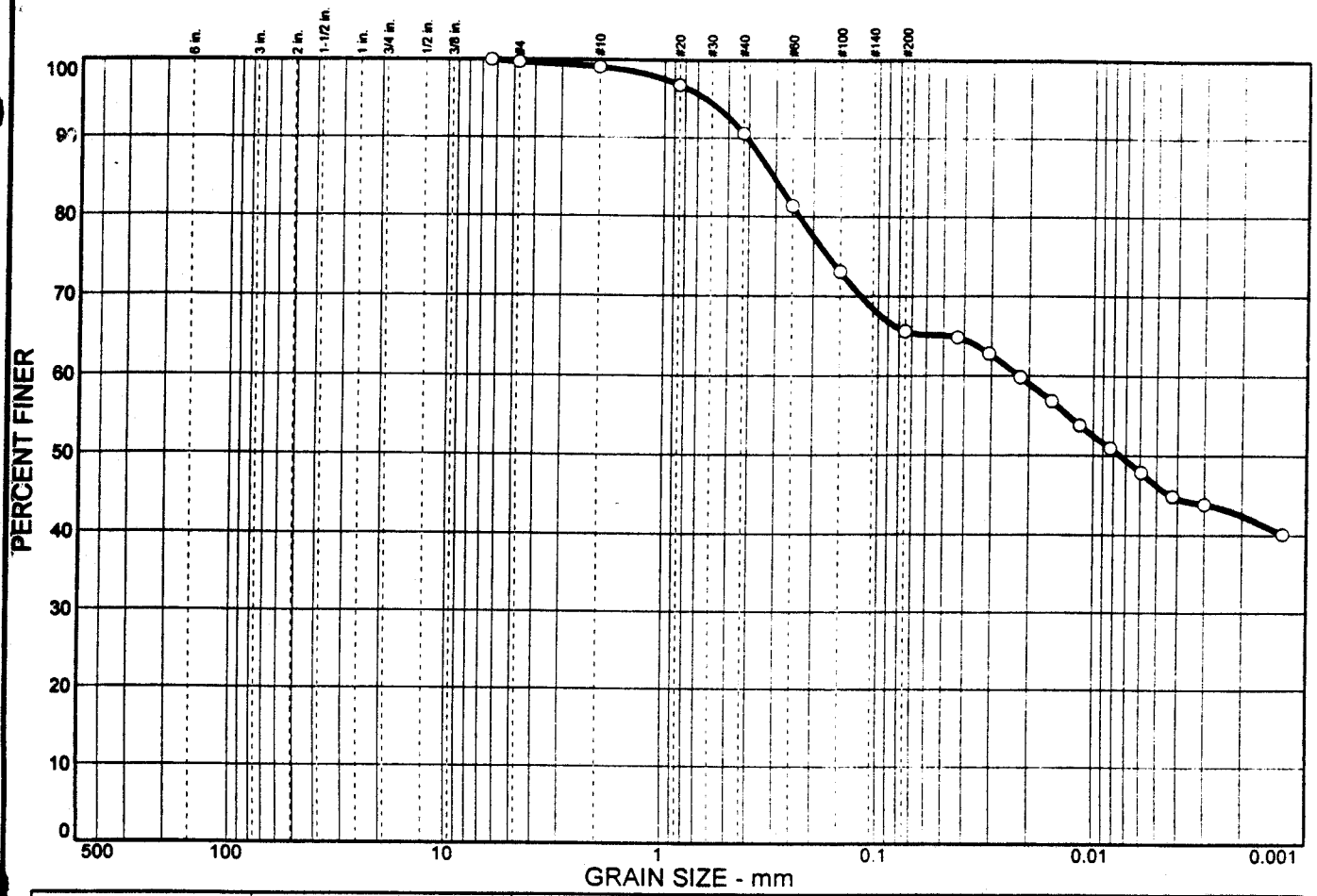
Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
394	83.10	0.25	0.25	1.00	0.25	1.20E-008
295	138.50	0.30	0.35	1.17	0.33	1.25E-008
436	138.50	0.40	0.40	1.00	0.40	1.04E-008
364	138.50	0.30	0.30	1.00	0.30	9.32E-009

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) **1.1E-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	0.3	34.1	19.4	46.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.1		
#20	96.8		
#40	90.6		
#60	81.3		
#100	73.1		
#200	65.6		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 24 LL= 62 PI= 38

Coefficients

D_{85}= 0.306 D_{60}= 0.0224 D_{50}= 0.0074
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-130, Acre 26, Lift 2

Sample No.: DL-130 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 26, Lift 2 **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.: 058

Acre 27 Lift 2
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	98.8	25.3	98.3	
2	See Test Location Plan	97.2	26.8	96.7	
3	See Test Location Plan	98.3	26.5	97.8	
4	See Test Location Plan	97.3	23.7	96.8	
5	See Test Location Plan	98.9	25.4	98.4	Perm/Sample (DL-177)
6	See Test Location Plan	97.6	25.6	97.1	
7	See Test Location Plan	99.9	25.8	99.4	
8	See Test Location Plan	95.9	26.2	95.4	
9	See Test Location Plan	97.3	26.8	96.8	
10	See Test Location Plan	99.9	24.8	99.4	
11	See Test Location Plan	99.4	24.1	98.9	
12	See Test Location Plan	98.6	24.2	98.1	
13	See Test Location Plan	97.9	23.8	97.4	
14	See Test Location Plan	96.8	26.2	96.3	
15	See Test Location Plan	97.2	24.1	96.7	
16	See Test Location Plan	97.5	23.6	97.0	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	1.3 x 10(-8)
Dry Density (pcf)	104.5
Moisture Content (%)	21.1

Atterberg Limits (ASTM D4318)

PL	26
LL	63
PI	37
USCS Classification	CH

Grain-size Analysis (ASTM D422)

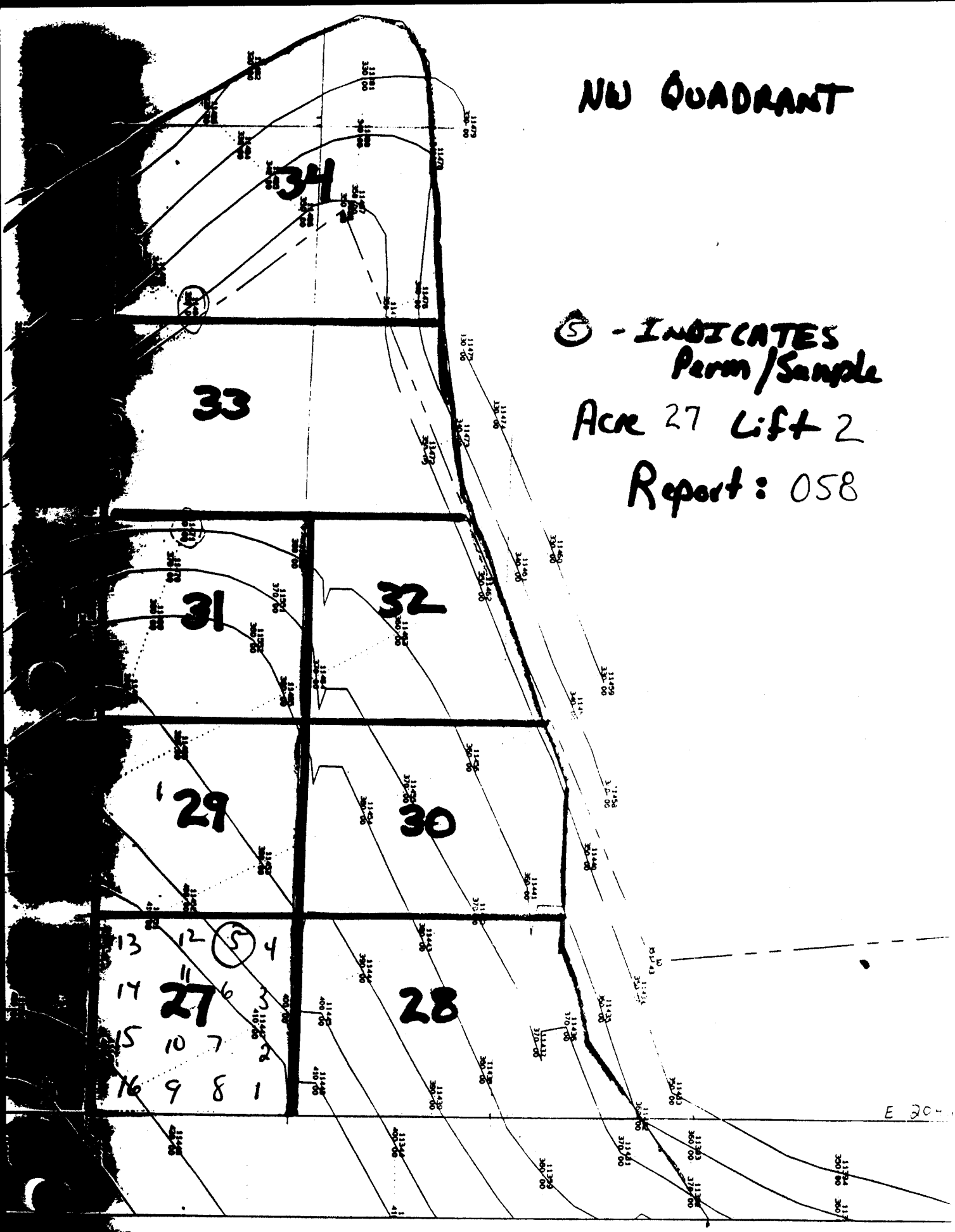
%Gravel	0.1
%Sand	27.8
%Silt	19.9
%Clay	52.2

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

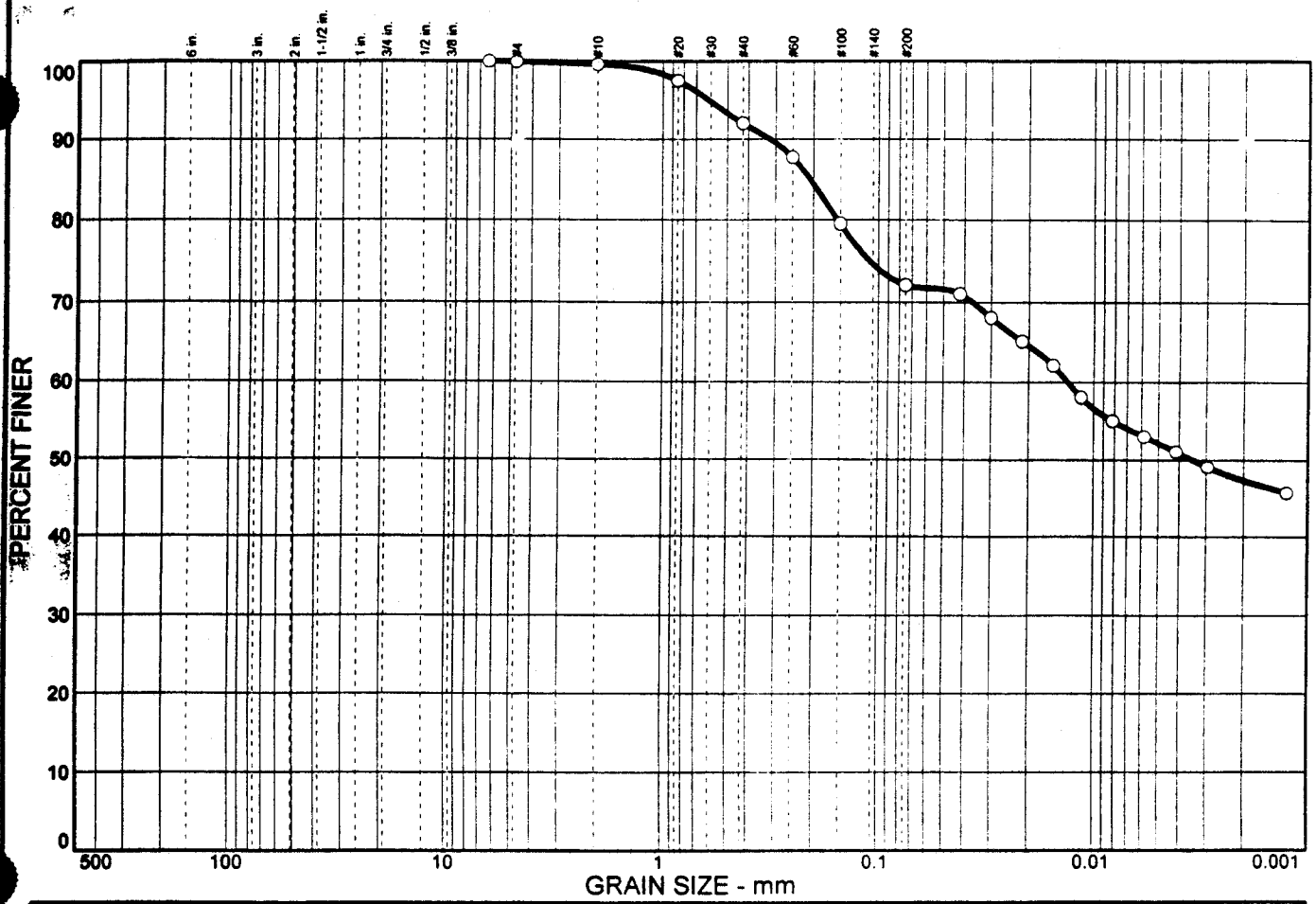
Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

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


NW QUADRANT
5 - INDICATES Perm/Sample
Acre 27 Lift 2
Report: 058
34
33
31
32
29
30
28
27
13
12
5
4
14
11
6
3
15
10
7
2
16
9
8
1
E 20

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	27.8	19.9	52.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.6		
#20	97.5		
#40	92.0		
#60	87.7		
#100	79.5		
#200	72.1		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 26 LL= 63 PI= 37

Coefficients

D_{85}= 0.207 D_{60}= 0.0131 D_{50}= 0.0034
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-177, Acre 27 Lift 2

Sample No.: DL-177 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 27, Lift 2 **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-126

Project No.: VNC-98-029
Sample No.: DL-177

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.3E-008	cm/sec
% Moisture	21.1	%
Dry Density	104.5	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/16/98
Location: ACRE 29, LIFT 2

Specimen Data

Length (in):	3.595
Diameter (in.):	2.855
Area (sq. in.):	6.413
Volume (cu. in.):	23.05
Wet Weight (grams):	766.0
Dry Weight (grams):	632.5
Dry Density (pcf):	104.5

Moisture Content Test Data

Wet Weight	161.91
Dry Weight	137.52
Tare weight	21.94
% Moisture	21.1

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
920	138.46	1.00	0.95	0.95	0.98	1.12E-008
504	138.46	0.70	0.60	0.86	0.65	1.36E-008
366	138.46	0.50	0.55	1.10	0.53	1.51E-008
633	138.46	0.75	0.70	0.93	0.73	1.21E-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) **1.3E-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: 12/10/98
Report No.: 096

Acre 28 Lift 2

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	105.6	19.7	100+	
2	See Test Location Plan	102.7	19.8	99.7	
3	See Test Location Plan	102.6	19.3	99.6	
4	See Test Location Plan	101.8	22.0	98.8	
5	See Test Location Plan	101.4	21.6	98.4	
6	See Test Location Plan	100.5	21.6	97.6	
7	See Test Location Plan	99.9	25.0	97.0	Tube/Sample (DL-236)
8	See Test Location Plan	100.6	22.1	97.7	
9	See Test Location Plan	100.3	22.2	97.4	
10	See Test Location Plan	101.4	21.2	98.4	
11	See Test Location Plan	103.6	19.7	100+	
12	See Test Location Plan	101.9	21.7	98.9	
13	See Test Location Plan	102.3	20.4	99.3	
14	See Test Location Plan	100.8	22.2	97.9	
15	See Test Location Plan	100.5	21.8	97.6	
16	See Test Location Plan	101.2	22.0	98.3	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	6.1x10(-8)
Dry Density (pcf)	104.6
Moisture Content (%)	27.4

Atterberg Limits (ASTM D4318)		Grain-size Analysis (ASTM D422)	
PL	19	%Gravel	0.0
LL	51	%Sand	47.1
PI	32	%Silt	19.3
		%Clay	33.6
USCS Classification	CL		

Sincerely,
VAN DER HORST Geotechnical Engineering, PC

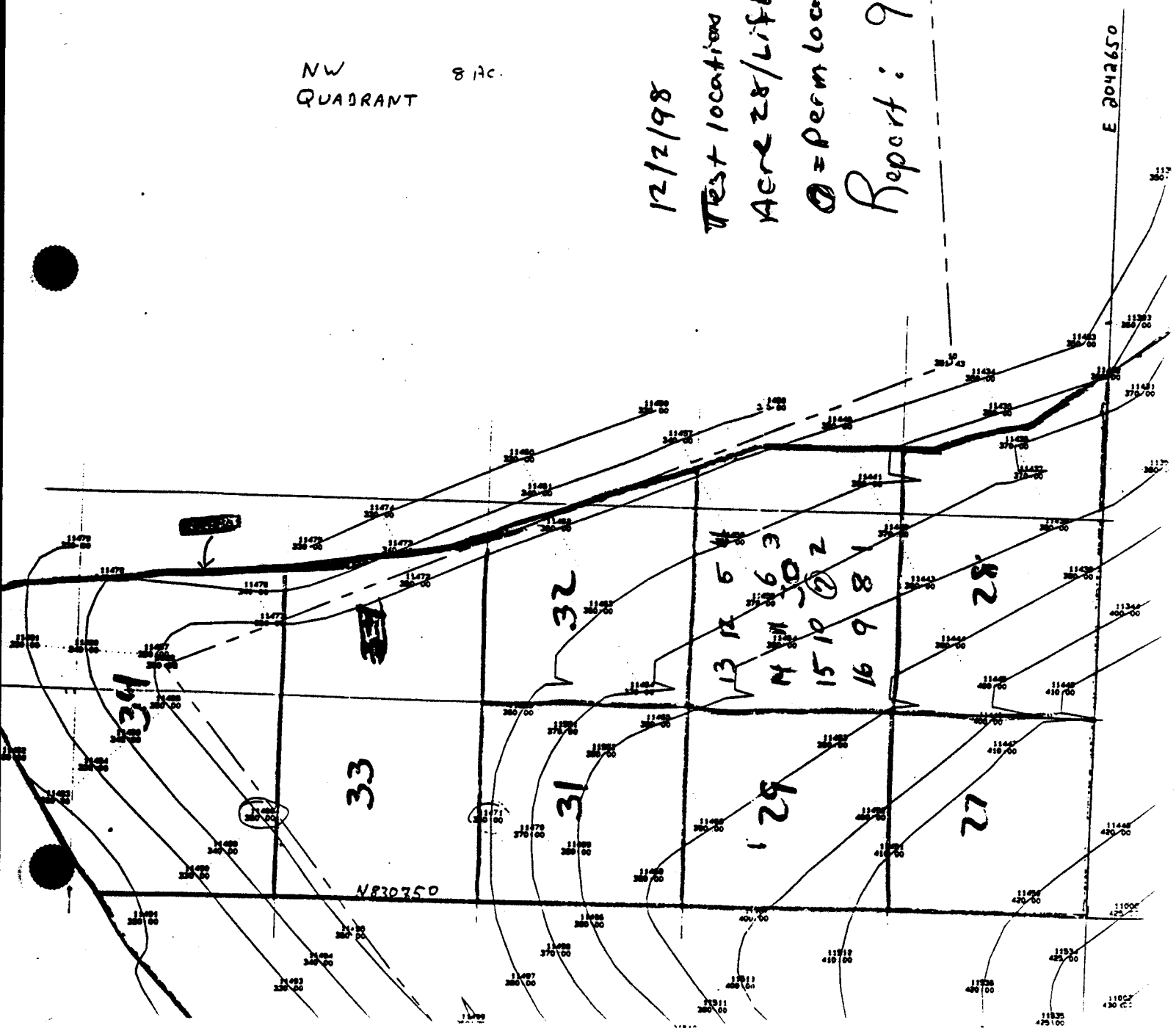
Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

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

NW QUADRANT 8 ac.

12/12/98
Test location Plan
Acre 28/Lift 2
⊘ = Perm Location
Report: 96



VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/08/98
Report No.: P-181

Project No.: VNC-98-029
Sample No.: DL-236

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.1E-009	cm/sec
% Moisture	27.4	%
Dry Density	104.6	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/02/98
Location: Acre 28, Lift 2

Specimen Data

Length (in):	3.095
Diameter (in.):	2.844
Area (sq. in.):	6.363
Volume (cu. in.):	19.70
Wet Weight (grams):	688.7
Dry Weight (grams):	540.5
Dry Density (pcf):	104.6

Wet Weight	112.32
Dry Weight	92.88
Tare weight	21.99
% Moisture	27.4

Test Data

Confining Pressure 3.0 psi

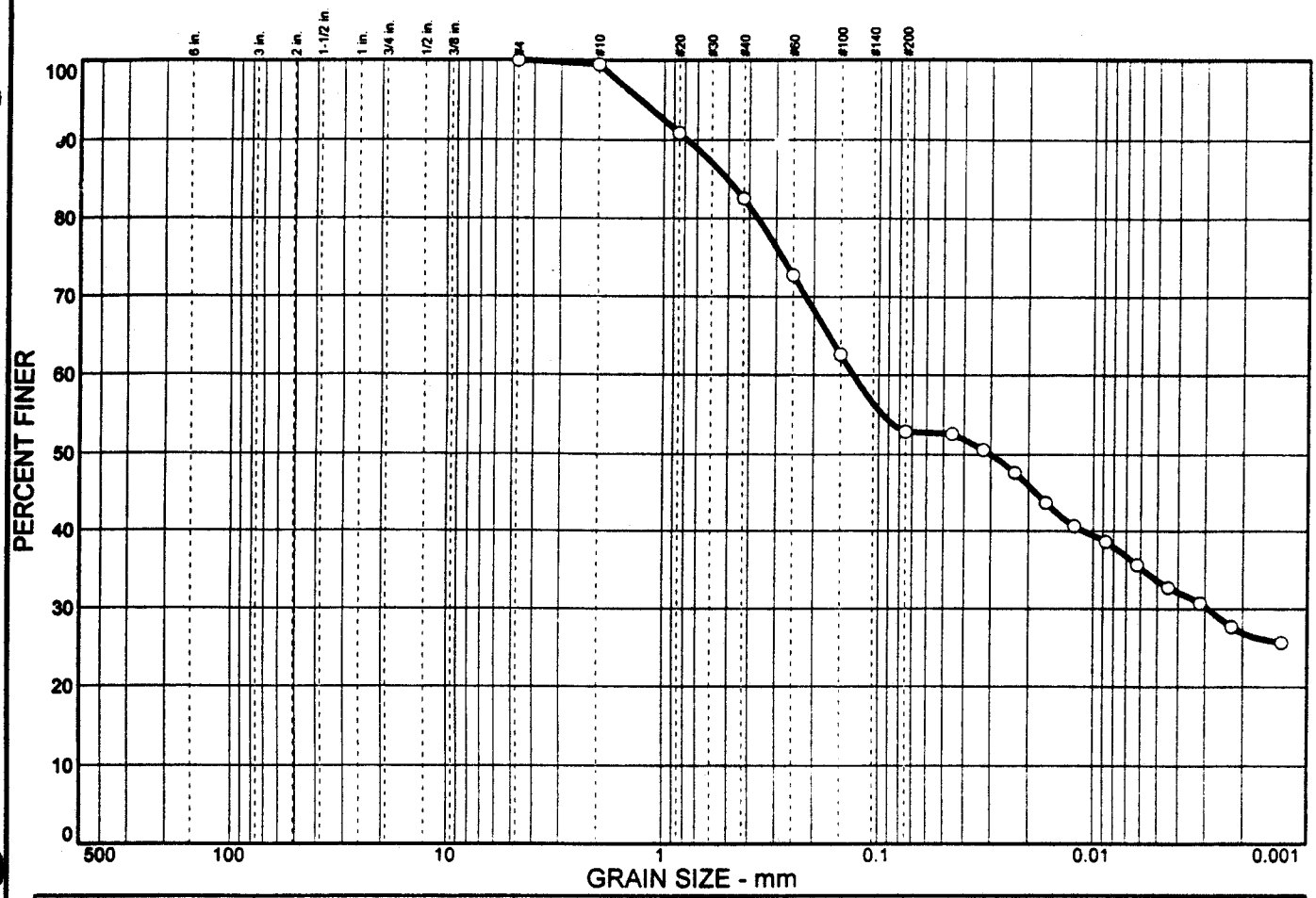
Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
867	138.46	0.60	0.65	1.08	0.63	6.58E-009
915	138.46	0.60	0.55	0.92	0.58	5.74E-009
533	138.46	0.35	0.35	1.00	0.35	6.00E-009
539	138.46	0.35	0.35	1.00	0.35	5.93E-009

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) **6.1E-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	47.1	19.3	33.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#20	90.9		
#40	82.6		
#60	72.7		
#100	62.6		
#200	52.9		

* (no specification provided)

Soil Description

On-site Borrow - Sandy fat clay

Atterberg Limits

PL= 19 LL= 51 PI= 32

Coefficients

D_{85}= 0.501 D_{60}= 0.131 D_{50}= 0.0299
D_{30}= 0.0029 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-226, Acre 28, Lift 2

Sample No.: DL-226 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 28, Lift 2 **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 28a. Lift 2

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.106	Clay Cover Test Report Acre 28a. Lift 2

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.: 106

Acre 28a Lift 2
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	23.0	100+	
2	See Test Location Plan	100.4	24.8	97.5	
3	See Test Location Plan	101.2	22.0	98.3	
4	See Test Location Plan	98.6	24.2	958	
5	See Test Location Plan	98.4	26.5	95.5	Tube/Sample (DL-226)
6	See Test Location Plan	103.4	21.0	100+	
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)	2.2x10(-8)
Dry Density (pcf)	104.0
Moisture Content (%)	25.3

Atterberg Limits (ASTM D4318)

PL	19
LL	51
PI	32
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	47.1
%Silt	19.3
%Clay	33.6

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

Robert L. Mashewske

Robert L. Mashewske, P.E.

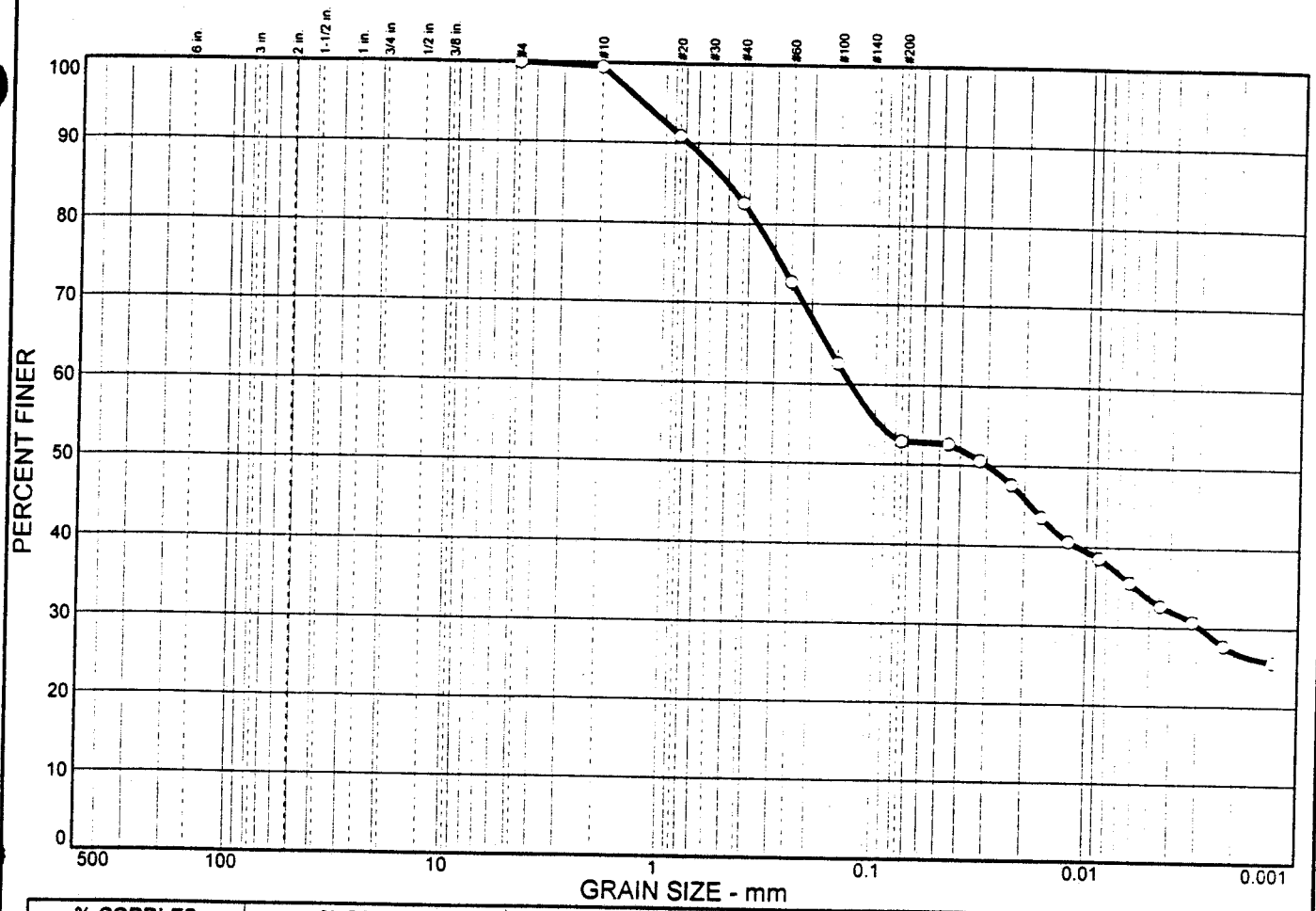
NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

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

NW
QUADRANT

11/30/98
Test location Plan
Acre 28a 1 Lift
⑤ = Perm location
Report: 106

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	47.1	19.3	33.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#20	90.9		
#40	82.6		
#60	72.7		
#100	62.6		
#200	52.9		

* (no specification provided)

Soil Description

On-site Borrow - Sandy fat clay

Atterberg Limits

PL= 19 LL= 51 PI= 32

Coefficients

D_{85}= 0.501 D_{60}= 0.131 D_{50}= 0.0299
D_{30}= 0.0029 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-226, Acre 28A, Lift 2

Sample No.: DL-226 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 28A, Lift 2 **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-186

Project No.: VNC-98-029
Sample No.: DL-226

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.2E-008	cm/sec
% Moisture	25.3	%
Dry Density	104.0	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 11/30/98
Location: Acre 28a, Lift 2

Specimen Data

Length (in):	3.206
Diameter (in.):	2.852
Area (sq. in.):	6.399
Volume (cu. in.):	20.52
Wet Weight (grams):	701.3
Dry Weight (grams):	559.9
Dry Density (pcf):	104.0

Wet Weight	124.28
Dry Weight	103.68
Tare weight	22.11
% Moisture	25.3

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
361	138.46	0.80	0.90	1.13	0.85	2.22E-008
492	138.46	1.20	1.30	1.08	1.25	2.39E-008
574	138.46	1.30	1.40	1.08	1.35	2.21E-008
363	138.46	0.80	0.80	1.00	0.80	2.07E-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) **2.2E-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: 11/23/98
Report No.: 061

Acre 29 Lift 2

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	96.0	27.0	95.5	
2	See Test Location Plan	101.9	22.6	100+	
3	See Test Location Plan	103.9	21.8	100+	
4	See Test Location Plan	103.0	23.3	100+	
5	See Test Location Plan	102.5	23.3	100+	
6	See Test Location Plan	100.3	26.8	99.8	Perm/Sample (DL-178)
7	See Test Location Plan	96.7	26.0	96.2	
8	See Test Location Plan	100.3	24.5	99.8	
9	See Test Location Plan	95.6	27.1	95.1	
10	See Test Location Plan	96.2	26.9	95.7	
11	See Test Location Plan	97.2	23.8	96.7	
12	See Test Location Plan	96.7	24.2	96.2	
13	See Test Location Plan	96.9	24.1	96.5 4	
14	See Test Location Plan	97.8	23.2	98.3 97.3	
15	See Test Location Plan	98.6	23.4	98.1	
16	See Test Location Plan	99.1	22.6	98.6 or	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	1.4 x 10(-8 0
Dry Density (pcf)	98.4
Moisture Content (%)	25.9

Atterberg Limits (ASTM D4318)

PL	24
LL	56
PI	32
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	27.1
%Silt	20.5
%Clay	52.4

Sincerely,
VAN DER HORST Geotechnical Engineering, PLLC

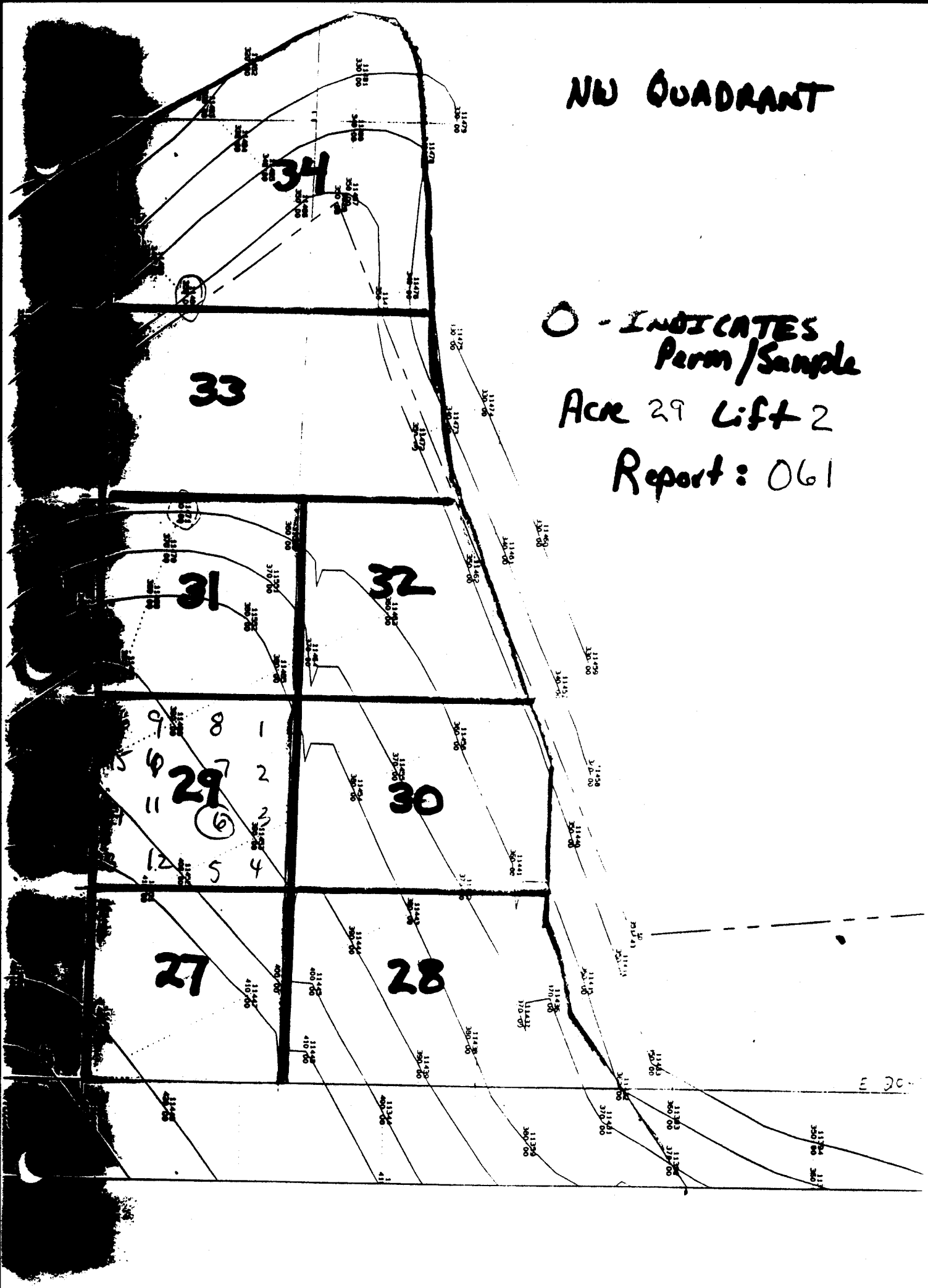
Robert L. Mashewske

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 022083 ENGINEER ROBERT LEE MASHEWSKE

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

NW QUADRANT

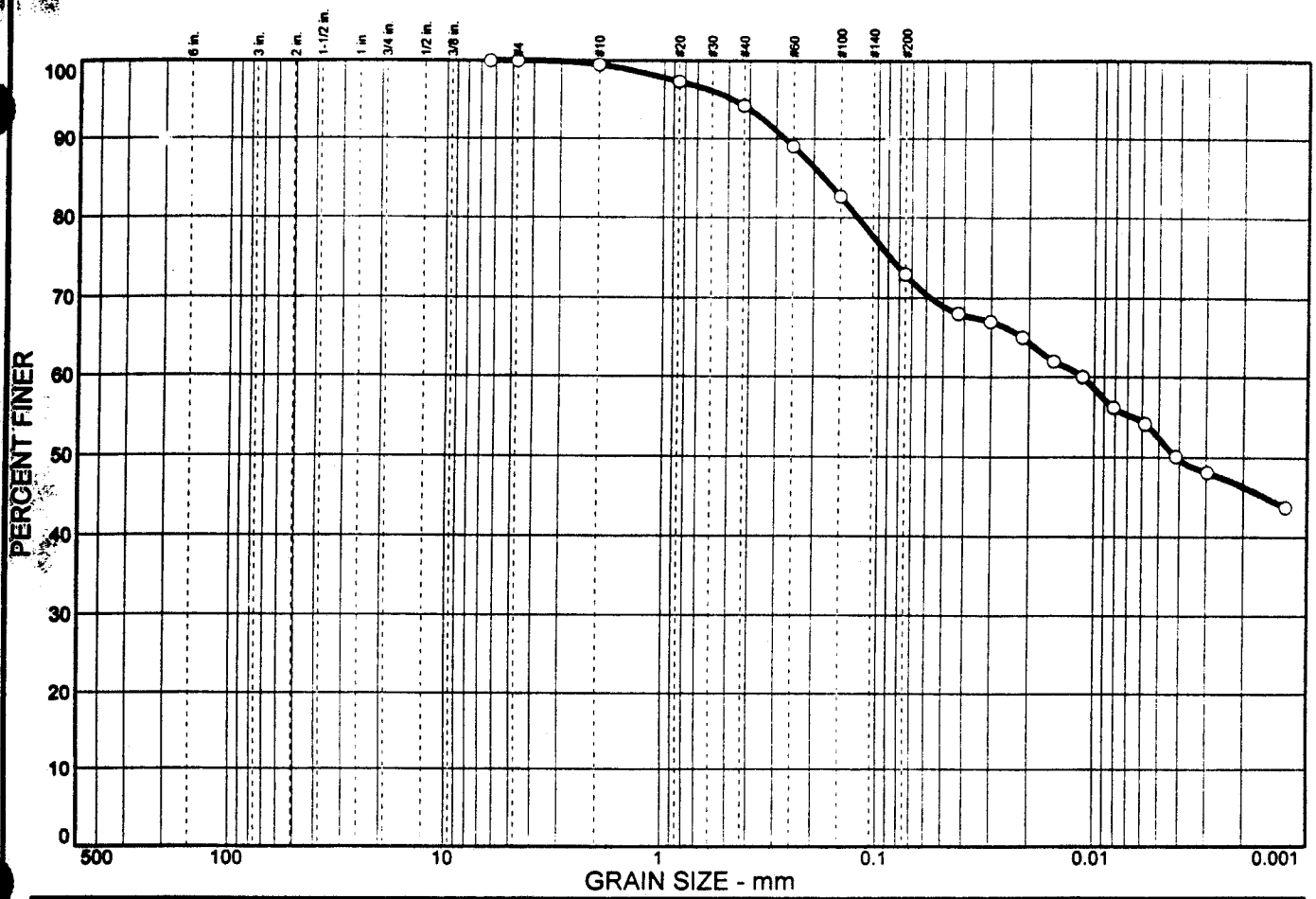


O - INDICATES Perm/Sample

Acre 29 Lift 2

Report: 061

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	27.1	20.5	52.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	100.0		
#10	99.5		
#20	97.3		
#40	94.2		
#60	89.0		
#100	82.7		
#200	72.9		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 24 LL= 56 PI= 32

Coefficients

D_{85}= 0.179 D_{60}= 0.0113 D_{50}= 0.0041
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-178, Acre 29 Lift 2

Sample No.: DL-178 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 29 Lift 2 **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-129

Project No.: VNC-98-029
Sample No.: DL-178

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.4E-008	cm/sec
% Moisture	25.9	%
Dry Density	98.4	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/16/98
Location: ACRE 27, LIFT 2

Specimen Data

Length (in):	3.248
Diameter (in.):	2.855
Area (sq. in.):	6.413
Volume (cu. in.):	20.83
Wet Weight (grams):	676.8
Dry Weight (grams):	537.7
Dry Density (pcf):	98.4

Moisture Content Test Data

Wet Weight	111.77
Dry Weight	93.31
Tare weight	21.92
% Moisture	25.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
879	152.31	1.60	1.40	0.88	1.50	1.48E-008
677	152.31	1.00	1.00	1.00	1.00	1.28E-008
675	152.31	1.15	1.10	0.96	1.13	1.44E-008
353	152.31	0.55	0.50	0.91	0.53	1.29E-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) **1.4E-008** cm/sec

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

LETTER OF TRANSMITTAL

VAN DER HORST

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

DATE: 12/17/98 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
On-Site Borrow Pit Acre 30, Lift 2

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.112	Clay cover test report Acre 30, Lift 2

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.: 112

Acre 30 Lift 2

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	100.8	20.0	97.9	
2	See Test Location Plan	101.4	19.9	97.4	2 ok
3	See Test Location Plan	102.1	19.8	99.1	
4	See Test Location Plan	101.6	21.9	98.6	
5	See Test Location Plan	101.1	21.4	98.2	
6	See Test Location Plan	100.7	22.2	97.8	
7	See Test Location Plan	102.3	21.0	99.3	
8	See Test Location Plan	102.9	21.0	99.9	
9	See Test Location Plan	102.7	22.5	99.7	Tube/Sample (DL-239)
10	See Test Location Plan	103.4	20.6	100+	
11	See Test Location Plan	102.0	20.2	99.0	
12	See Test Location Plan	100.9	21.6	98.0	
13	See Test Location Plan	98.4	22.9	95.5	
14	See Test Location Plan	99.6	23.4	96.7	
15	See Test Location Plan	101.0	21.2	98.1	
16	See Test Location Plan	101.3	20.9	98.3	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec) 6.0x10(-9)

Dry Density (pcf) 104.4

Moisture Content (%) 22.5

Atterberg Limits (ASTM D4318)

PL 18
LL 45
PI 27

USCS Classification CL

Grain-size Analysis (ASTM D422)

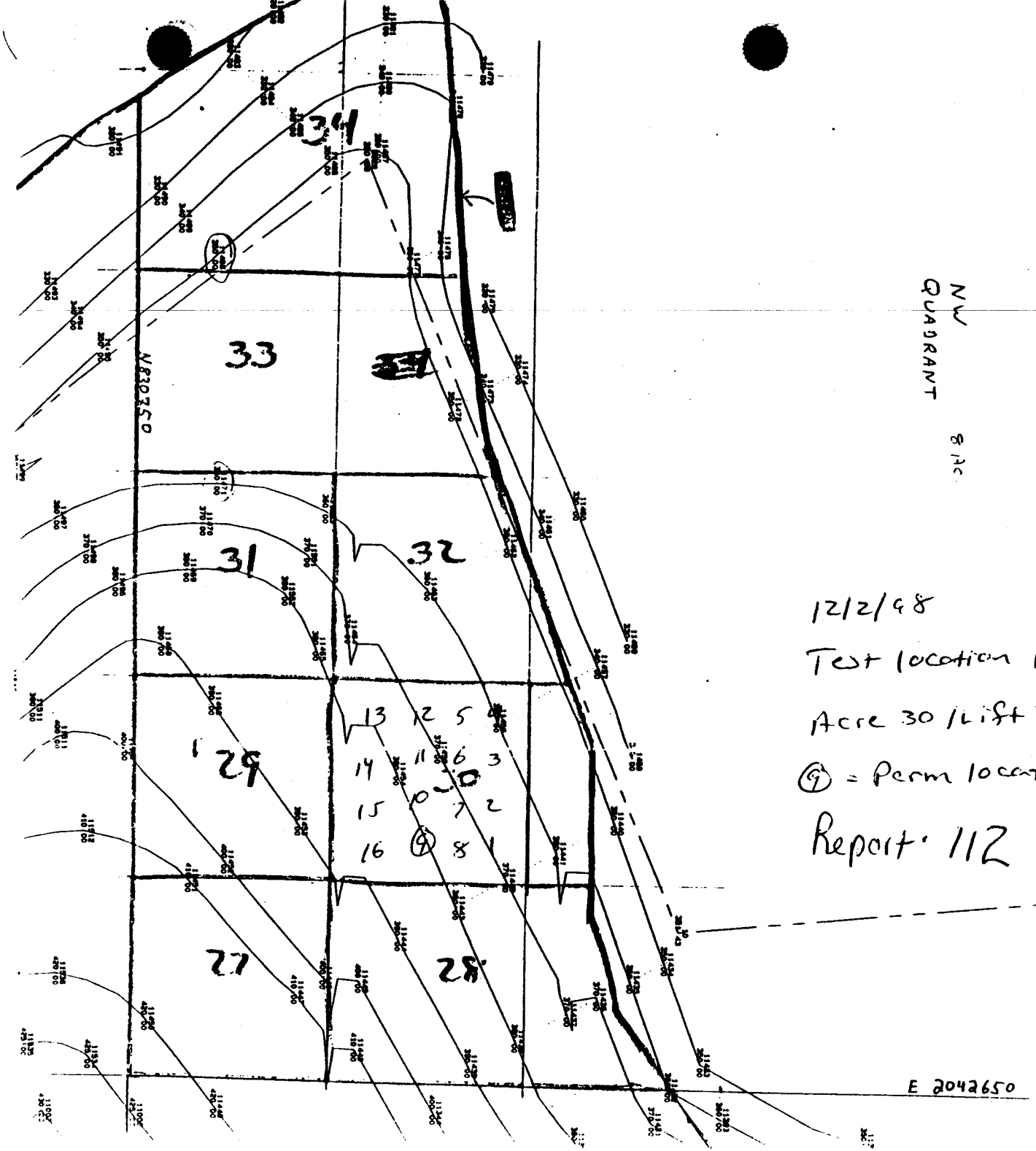
%Gravel 0.0
%Sand 38.2
%Silt 23.0
%Clay 38.8

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

12/2/98

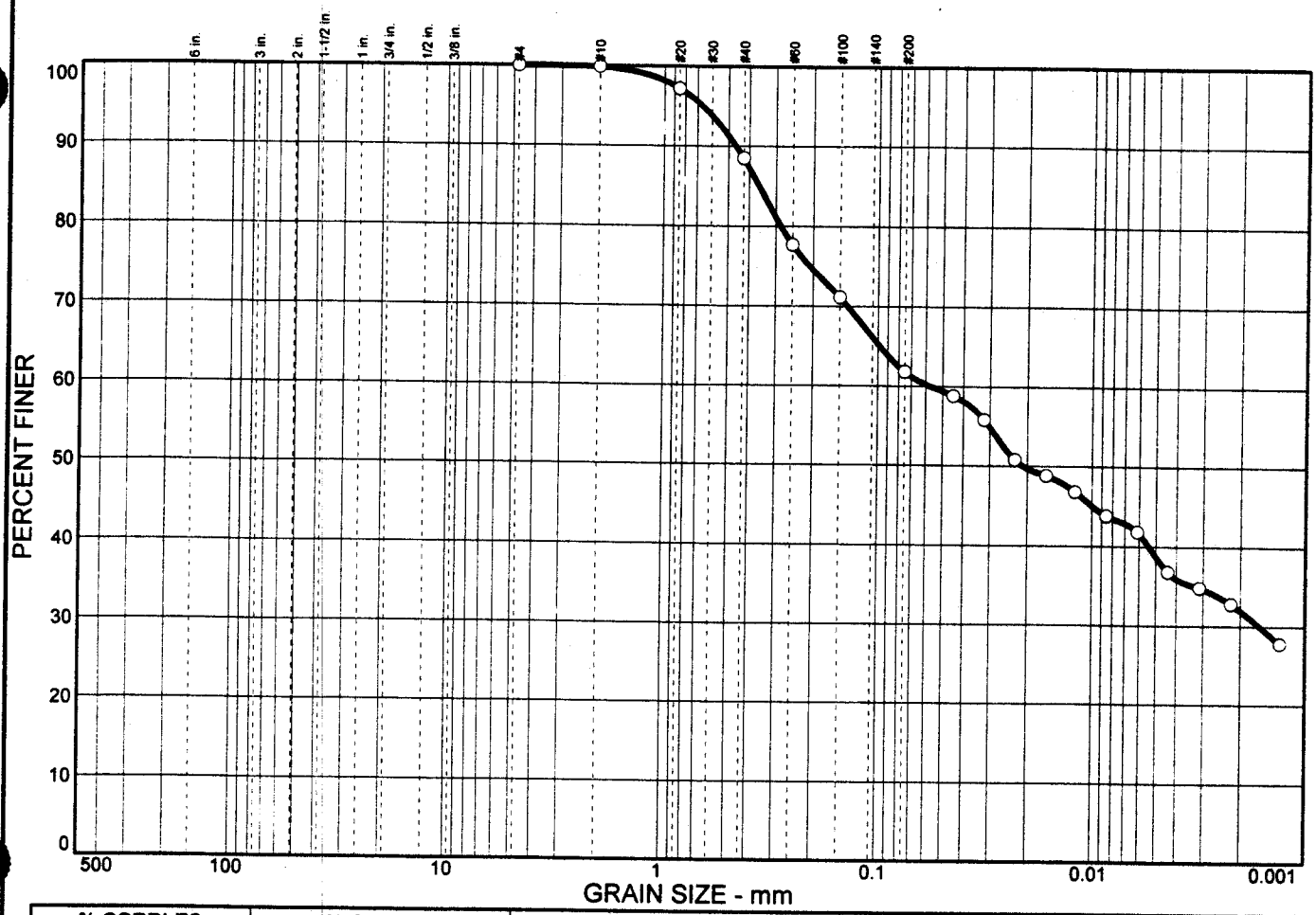
Test location Plan

Acre 30 / Lift 2

9 = Perm location

Report: 112

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	38.2	23.0	38.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	97.2		
#40	88.5		
#60	77.7		
#100	71.1		
#200	61.8		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 18 LL= 45 PI= 27

Coefficients

D_{85}= 0.359 D_{60}= 0.0572 D_{50}= 0.0210
D_{30}= 0.0016 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-239, Acre 30, Lift 2

Sample No.: DL-239 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 30, Lift 2 **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-187

Project No.: VNC-98-029
Sample No.: DL-239

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	6.0E-009	cm/sec
% Moisture	22.5	%
Dry Density	104.4	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/12/98
Location: Acre 30, Lift 2

Specimen Data

Length (in):	3.032
Diameter (in.):	2.855
Area (sq. in.):	6.413
Volume (cu. in.):	19.44
Wet Weight (grams):	652.5
Dry Weight (grams):	532.7
Dry Density (pcf):	104.4

Wet Weight	142.55
Dry Weight	120.43
Tare weight	22.08
% Moisture	22.5

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
823	138.46	0.65	0.60	0.92	0.63	6.74E-009
825	138.46	0.50	0.50	1.00	0.50	5.38E-009
1148	144.00	0.80	0.75	0.94	0.78	5.76E-009
902	144.00	0.60	0.65	1.08	0.63	5.92E-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) **6.0E-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: 12/10/98
Report No.: 114

Acre 30a Lift 2
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	101.9	20.3	98.9	Tube/Sample (DL-240)
2	See Test Location Plan	102.4	19.8	99.4	
3	See Test Location Plan	99.8	20.8	96.9	
4	See Test Location Plan	99.3	20.6	96.4	
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)	1.1x10(-8)
Dry Density (pcf)	99.5
Moisture Content (%)	25.3

Atterberg Limits (ASTM D4318)

PL	25
LL	62
PI	37
USCS Classification	CL

Grain-size Analysis (ASTM D422)

%Gravel	0.1
%Sand	33.3
%Silt	20.4
%Clay	46.2

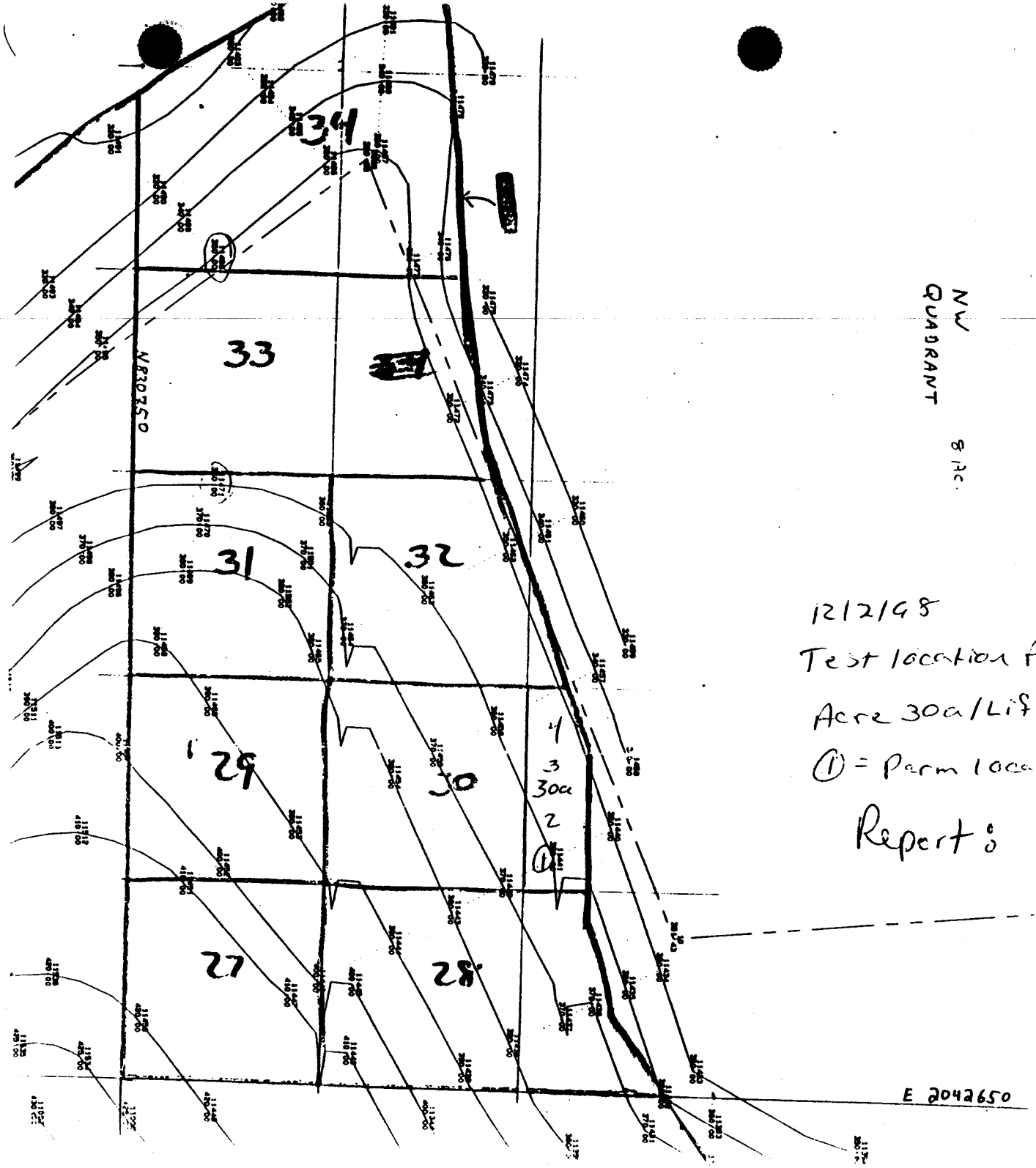
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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



NW QUADRANT

8 Ac.

12/2/98

Test location Plan

Acre 30a/Lift 2

① = Perm location

Report: 114

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	33.3	20.4	46.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.7		
#20	97.7		
#40	93.4		
#60	87.0		
#100	76.3		
#200	66.6		

* (no specification provided)

Soil Description

On-site Borrow - Sandy fat clay

Atterberg Limits

PL= 25 LL= 62 PI= 37

Coefficients

D_{85}= 0.225 D_{60}= 0.0206 D_{50}= 0.0086
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-240, Acre 30A, Lift 2

Sample No.: DL-240 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 30A, Lift 2 **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-189

Project No.: VNC-98-029
Sample No.: DL-240

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.1E-008	cm/sec
% Moisture	25.3	%
Dry Density	99.5	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/02/98
Location: Acre 30a, Lift 2

Specimen Data

Length (in):	3.218
Diameter (in.):	2.825
Area (sq. in.):	6.279
Volume (cu. in.):	20.21
Wet Weight (grams):	660.8
Dry Weight (grams):	527.6
Dry Density (pcf):	99.5

Wet Weight	103.55
Dry Weight	87.09
Tare weight	21.92
% Moisture	25.3

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
760	138.46	0.80	1.00	1.25	0.90	1.14E-008
807	138.46	0.90	1.00	1.11	0.95	1.13E-008
1148	138.46	1.10	1.15	1.05	1.13	9.43E-009
360	138.46	0.40	0.45	1.13	0.43	1.14E-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

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.: 084

Acre 31 Lift 2

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	100.4	24.2	99.9	
2	See Test Location Plan	99.6	23.1	99.1	
3	See Test Location Plan	96.9	26.0	96.4	
4	See Test Location Plan	97.9	26.8	97.4	
5	See Test Location Plan	98.2	24.2	97.7	
6	See Test Location Plan	96.5	24.8	96.0	
7	See Test Location Plan	99.8	22.0	99.3	
8	See Test Location Plan	99.2	22.3	98.7	
9	See Test Location Plan	97.4	24.6	96.9	
10	See Test Location Plan	96.9	26.0	96.4	Tube Sample (DL-197)
11	See Test Location Plan	98.4	24.2	97.9	
12	See Test Location Plan	98.8	23.4	98.3	
13	See Test Location Plan	97.6	23.0	97.1	
14	See Test Location Plan	96.7	24.1	96.2	
15	See Test Location Plan	99.2	22.4	98.7	
16	See Test Location Plan	100.6	22.1	100+	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	2.5x10(-8)
Dry Density (pcf)	98.7
Moisture Content (%)	26.0

Atterberg Limits (ASTM D4318)

PL	20
LL	55
PI	35
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.3
%Sand	26.9
%Silt	23.0
%Clay	49.8

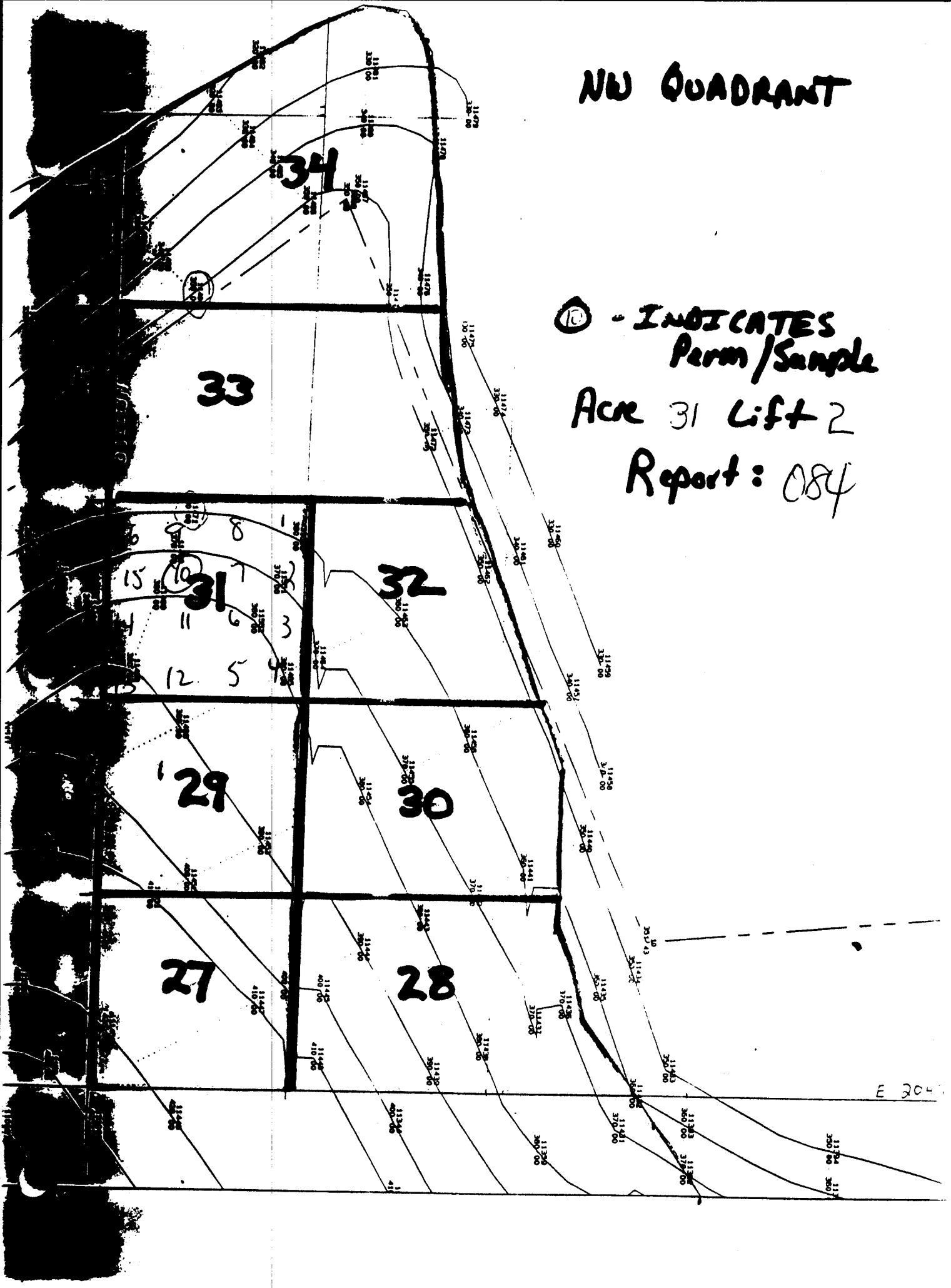
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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

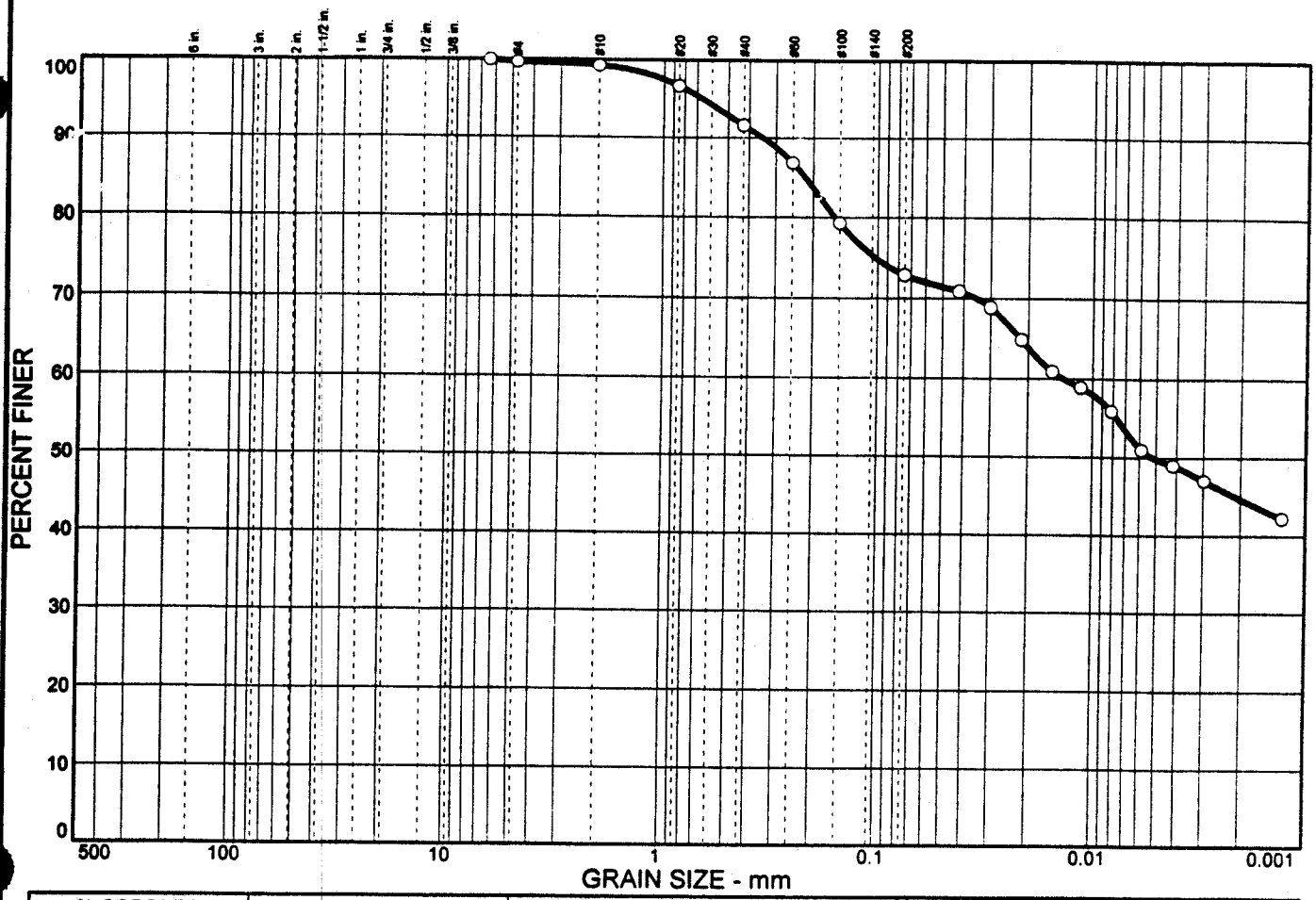


(10) - INDICATES Perm/Sample

Acre 31 Lift 2

Report: 084

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	26.9	23.0	49.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.3		
#20	96.6		
#40	91.6		
#60	86.8		
#100	79.3		
#200	72.8		

* (no specification provided)

Soil Description

Roberts Pit - Fat clay with sand

Atterberg Limits

PL= 20 LL= 55 PI= 35

Coefficients

D_{85}= 0.219 D_{60}= 0.0137 D_{50}= 0.0052
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-197, Acre 31, Lift 2

Sample No.: DL-197 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 31, Lift 2 **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-149

Project No.: VNC-98-029
Sample No.: DL-197

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.5E-008	cm/sec
% Moisture	26.0	%
Dry Density	98.7	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/20/98
Location: Acre 31, Lift 2

Specimen Data

Length (in):	3.080
Diameter (in.):	2.853
Area (sq. in.):	6.404
Volume (cu. in.):	19.72
Wet Weight (grams):	643.8
Dry Weight (grams):	510.9
Dry Density (pcf):	98.7

Moisture Content Test Data

Wet Weight	115.96
Dry Weight	96.50
Tare weight	21.63
% Moisture	26.0

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
502	138.46	1.45	1.50	1.03	1.48	2.65E-008
723	138.46	2.10	2.05	0.98	2.08	2.59E-008
266	138.46	0.75	0.65	0.87	0.70	2.38E-008
455	138.46	1.10	1.10	1.00	1.10	2.18E-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) **2.5E-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: 01/11/99
Report No.: 148

Acre 32 Lift 2

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	20.7	99.6	
2	See Test Location Plan	103.1	19.9	100+	
3	See Test Location Plan	100.7	22.0	97.8	
4	See Test Location Plan	100.2	22.3	97.3	
5	See Test Location Plan	101.3	23.0	98.4	
6	See Test Location Plan	99.6	24.0	96.7	Perm/Sample (DL-276)
7	See Test Location Plan	100.6	21.9	97.7	
8	See Test Location Plan	99.7	20.6	96.8	
9	See Test Location Plan	99.5	22.7	96.6	
10	See Test Location Plan	99.2	25.1	96.3	
11	See Test Location Plan	100.6	23.6	97.7	
12	See Test Location Plan	100.0	22.7	97.1	
13	See Test Location Plan	101.7	21.3	98.7	
14	See Test Location Plan	102.4	20.0	99.4	
15	See Test Location Plan	102.1	20.2	99.1	
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) 4.4x10(-8)

Dry Density (pcf) 98.4

Moisture Content (%) 22.9

Atterberg Limits (ASTM D4318)

PL 19
LL 39
PI 20

USCS Classification CL

Grain-size Analysis (ASTM D422)

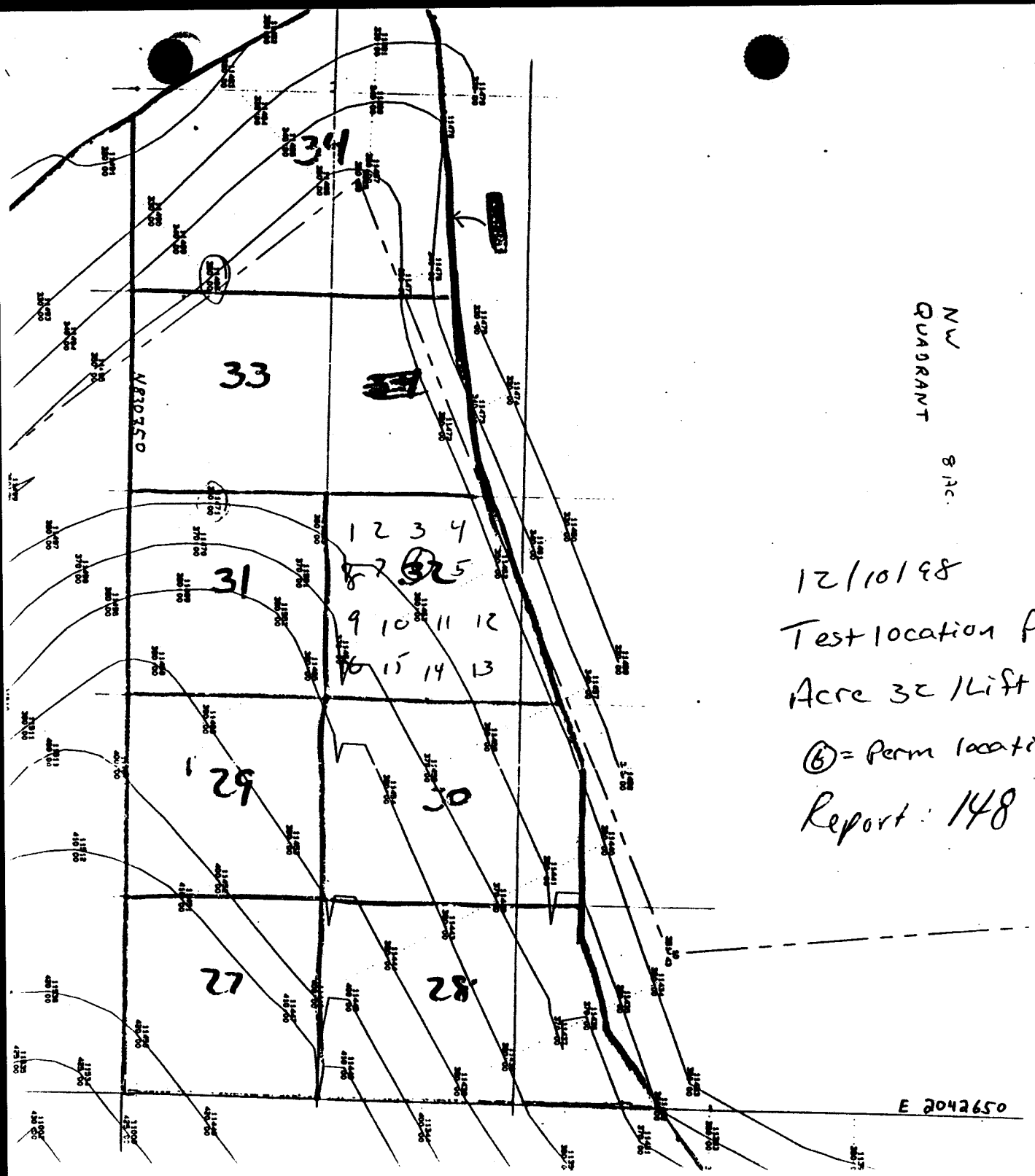
%Gravel 0.0
%Sand 44.8
%Silt 21.7
%Clay 33.5

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



NW QUADRANT

8 ac.

12/10/98

Test location Plan

Acre 32 / Lift 2

(6) = Perm location

Report: 148

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/14/98
Report No.: P-201

Project No.: VNC-98-029
Sample No.: DL-276

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.4E-008	cm/sec
% Moisture	22.9	%
Dry Density	98.4	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/10/98
Location: Acre 32, Lift 2

Specimen Data

Length (in):	3.543
Diameter (in.):	2.841
Area (sq. in.):	6.350
Volume (cu. in.):	22.50
Wet Weight (grams):	713.8
Dry Weight (grams):	580.9
Dry Density (pcf):	98.4

Wet Weight	120.43
Dry Weight	102.11
Tare weight	22.03
% Moisture	22.9

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
426	138.46	0.80	1.00	1.25	0.90	2.21E-008
535	138.46	1.10	1.00	0.91	1.05	2.06E-008
489	138.46	0.90	0.90	1.00	0.90	1.93E-008
460	138.46	1.00	9.00	9.00	5.00	1.14E-007

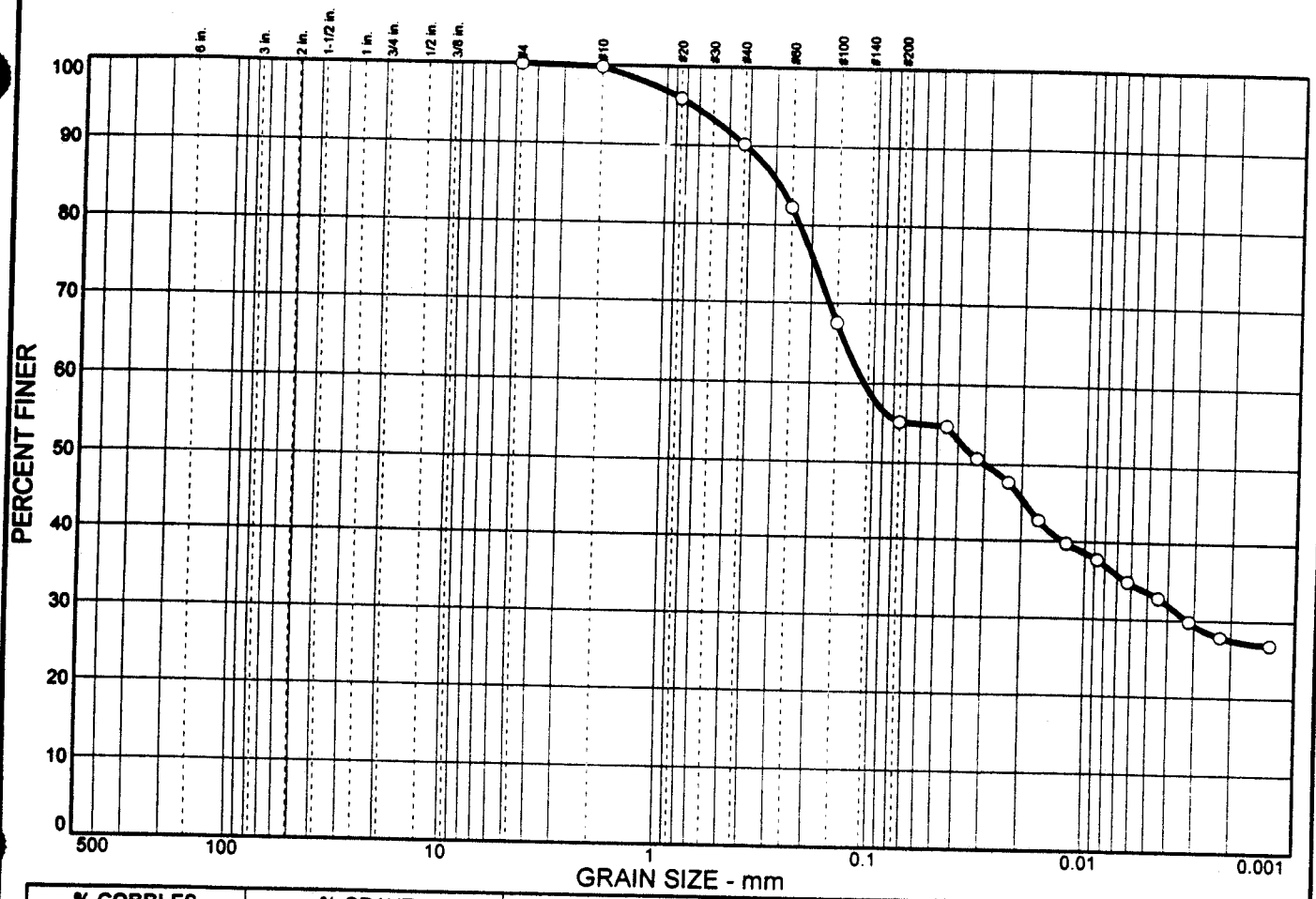
x

ΔT	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-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	44.8	21.7	33.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	95.9		
#40	90.2		
#60	82.2		
#100	67.5		
#200	55.2		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 39 PI= 20

Coefficients

D_{85}= 0.287 D_{60}= 0.111 D_{50}= 0.0299
D_{30}= 0.0032 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-276, Acre 32, Lift 2

Sample No.: DL-276 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 32, Lift 2 **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.: 151

Acre 33 Lift 2

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	20.7	98.3	
2	See Test Location Plan	103.5	20.2	100+	
3	See Test Location Plan	100.7	21.3	97.8	
4	See Test Location Plan	99.2	22.0	96.3	
5	See Test Location Plan	100.0	20.7	97.1	
6	See Test Location Plan	101.2	21.0	98.3	
7	See Test Location Plan	100.6	21.8	97.7	Perm/Sample (DL-279)
8	See Test Location Plan	102.3	20.3	99.3	
9	See Test Location Plan	102.8	19.9	99.8	
10	See Test Location Plan	101.6	21.0	98.6	
11	See Test Location Plan	100.9	21.2	98.0	
12	See Test Location Plan	101.3	20.7	98.4	
13	See Test Location Plan	99.7	21.8	96.8	
14	See Test Location Plan	99.0	22.3	96.1	
15	See Test Location Plan	100.6	22.0	97.7	
16	See Test Location Plan	101.2	21.6	98.3	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 2.0x10(-8)

Dry Density (pcf) 104.6

Moisture Content (%) 22.3

Atterberg Limits (ASTM D4318)

PL 19
LL 42
PI 23

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel 0.1
%Sand 34.6
%Silt 25.9
%Clay 39.4

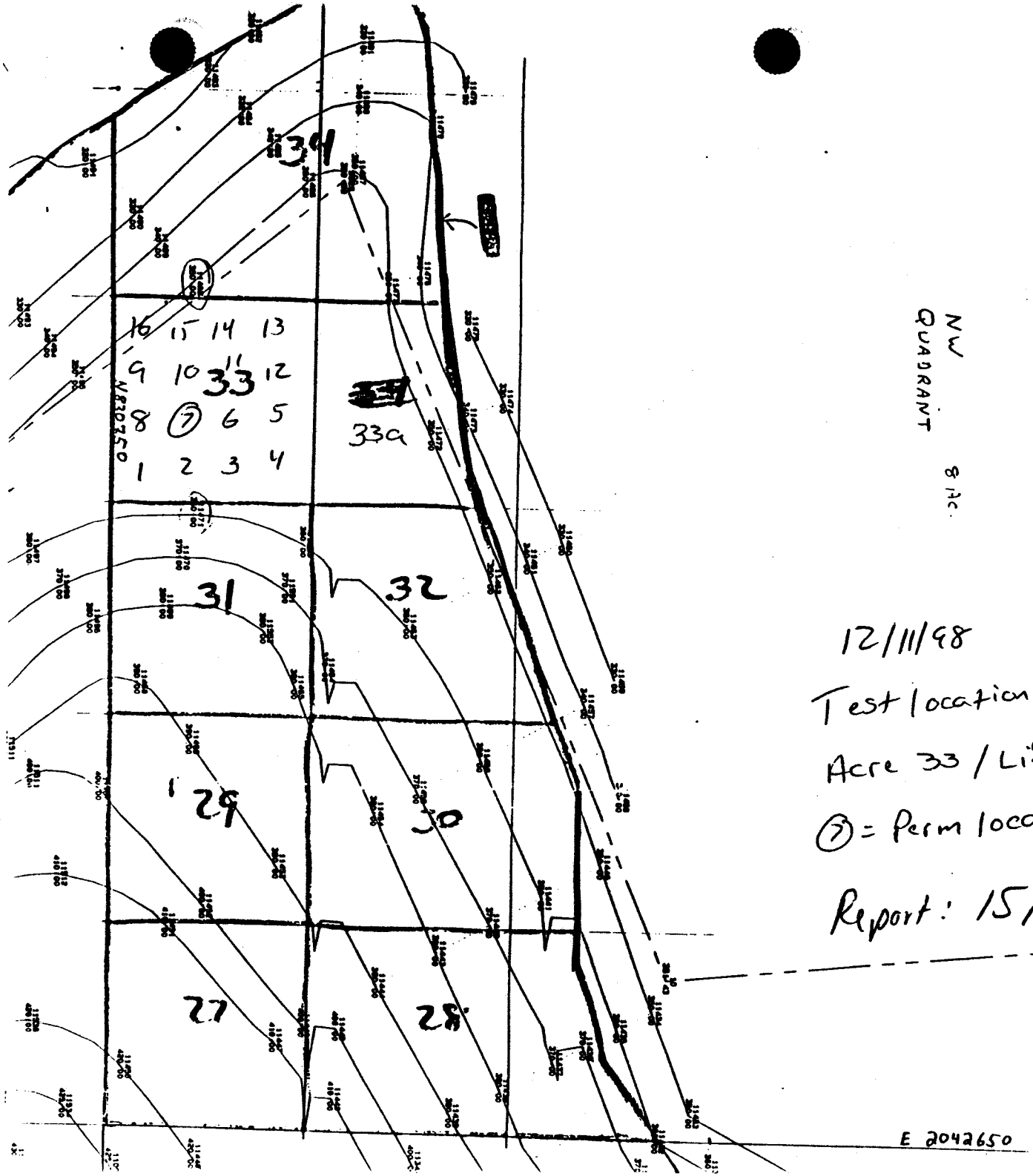
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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



NW QUADRANT

8 ac.

12/11/98

Test location Plan

Acre 33 / Lift 2

7 = Perm location

Report: 151

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/15/98
Report No.: P-211

Project No.: VNC-98-029
Sample No.: DL-279

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.0E-008	cm/sec
% Moisture	22.3	%
Dry Density	104.6	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 12/11/98
Location: Acre 33, Lift 2

Specimen Data

Length (in):	3.140
Diameter (in.):	2.867
Area (sq. in.):	6.467
Volume (cu. in.):	20.31
Wet Weight (grams):	682.2
Dry Weight (grams):	557.7
Dry Density (pcf):	104.6

Wet Weight	159.86
Dry Weight	134.68
Tare weight	21.93
% Moisture	22.3

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
326	132.69	0.75	0.70	0.93	0.73	2.12E-008
276	132.92	0.60	0.60	1.00	0.60	2.06E-008
661	130.15	1.45	1.20	0.83	1.33	1.94E-008
344	130.15	0.60	0.60	1.00	0.60	1.69E-008

x

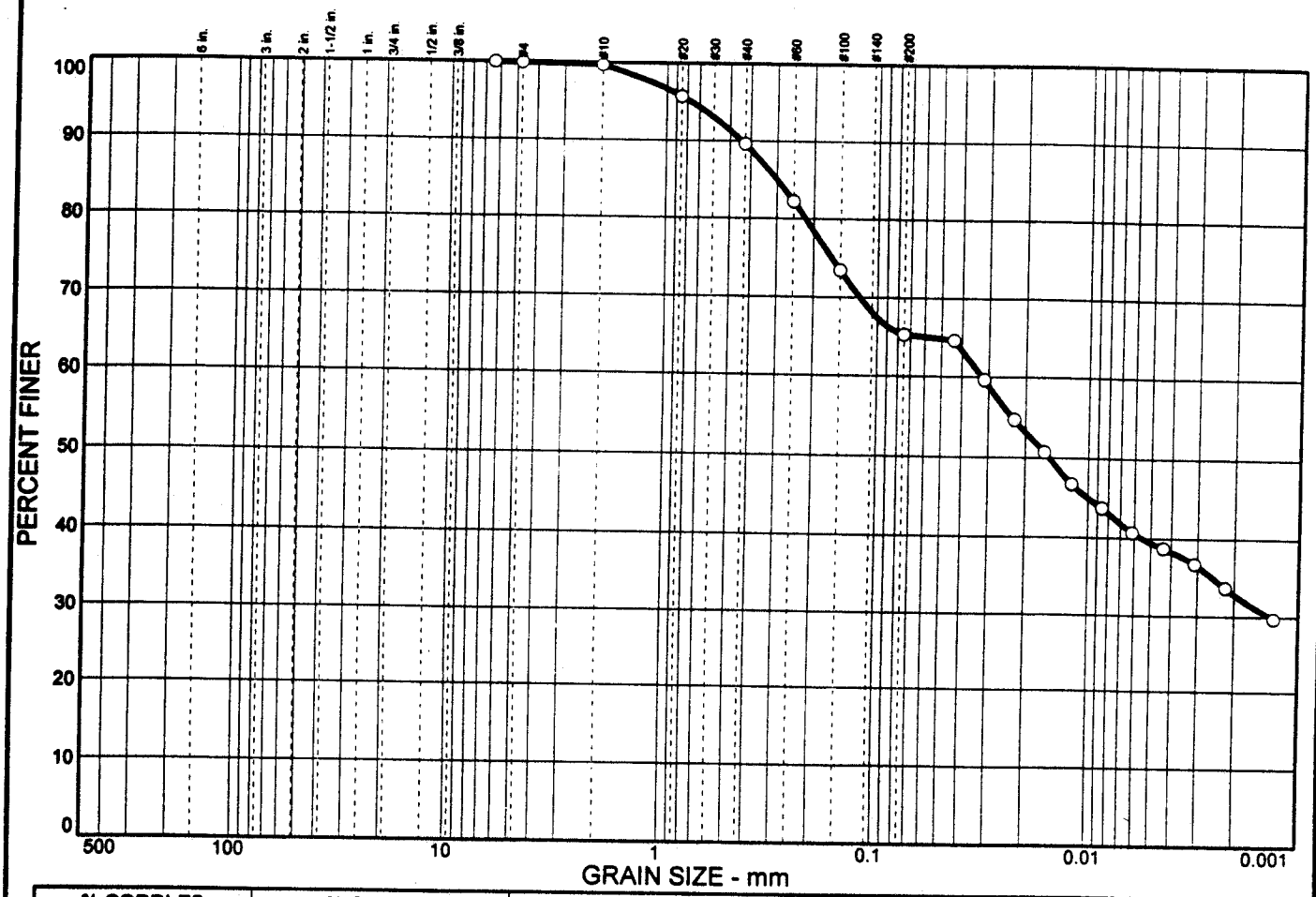
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **2.0E-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	34.6	25.9	39.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.7		
#20	95.7		
#40	89.6		
#60	82.2		
#100	73.5		
#200	65.3		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 42 PI= 23

Coefficients

D_{85}= 0.300 D_{60}= 0.0322 D_{50}= 0.0154
D_{30}= 0.0014 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-279, Acre 33, Lift 2

Sample No.: DL-279 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 33, Lift 2 **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: 12/17/98
Report No.: 124

Acre 33a Lift 2

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	99.6	24.6	96.9	
2	See Test Location Plan	100.3	25.1	97.6	
3	See Test Location Plan	98.4	24.9	95.7	
4	See Test Location Plan	97.9	24.3	95.2	
5	See Test Location Plan	98.6	24.0	95.9	Perm/Sample (DL-252)
6	See Test Location Plan	98.7	24.3	96.0	
7	See Test Location Plan	98.6	25.1	95.9	
8	See Test Location Plan	99.2	25.2	96.5	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 3.8x10(-8)

Dry Density (pcf) 98.3

Moisture Content (%) 24.4

Atterberg Limits (ASTM D4318)

PL 17
LL 40
PI 23

USCS Classification CL

Grain-size Analysis (ASTM D422)

%Gravel 3.1
%Sand 36.6
%Silt 20.3
%Clay 40.0

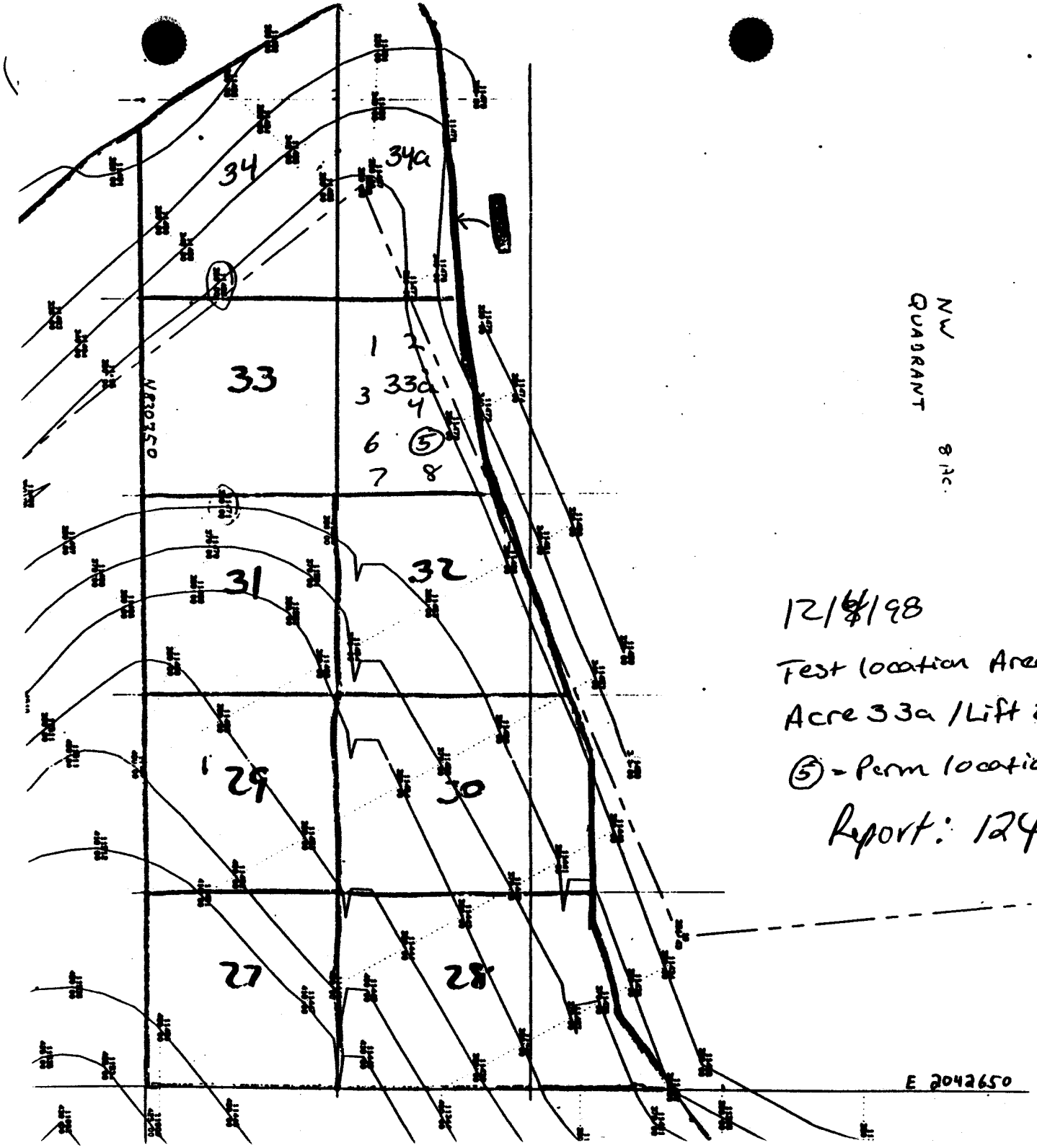
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

R. 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.

12/8/98

Test location Area

Acre 33a / Lift 2

5 - Perm location

Report: 124

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/17/98
Report No.: P-216

Project No.: VNC-98-029
Sample No.: DL-252

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.8E-008	cm/sec
% Moisture	24.4	%
Dry Density	98.3	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 12/04/98
Location: Acre 33a, Lift 2

Specimen Data

Length (in):	2.733
Diameter (in.):	2.831
Area (sq. in.):	6.305
Volume (cu. in.):	17.23
Wet Weight (grams):	553.5
Dry Weight (grams):	444.8
Dry Density (pcf):	98.3

Wet Weight	240.98
Dry Weight	201.09
Tare weight	37.90
% Moisture	24.4

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
300	83.08	0.95	0.80	0.84	0.88	3.96E-008
960	83.08	2.85	2.35	0.89	2.50	3.53E-008
450	83.08	1.25	1.30	1.04	1.28	3.84E-008
995	83.08	2.80	2.75	0.98	2.78	3.78E-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) **3.8E-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	3.1	36.6	20.3	40.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	97.8		
#4	96.9		
#10	95.4		
#20	90.4		
#40	82.7		
#60	75.3		
#100	70.1		
#200	60.3		

* (no specification provided)

Soil Description

Rougemount Borrow Source - Sandy lean clay

Atterberg Limits

PL= 17 LL= 40 PI= 23

Coefficients

D_{85}= 0.506 D_{60}= 0.0605 D_{50}= 0.0117
D_{30}= 0.0016 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-252, Acre 33A, Lift 2

Sample No.: DL-252 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Acre 33A, Lift 2 **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.: 126

Acre 34 Lift 2
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	99.6	24.4	96.9	
2	See Test Location Plan	99.0	24.9	96.3	
3	See Test Location Plan	99.1	25.1	96.4	
4	See Test Location Plan	100.2	23.9	97.5	
5	See Test Location Plan	98.0	26.6	95.3	Perm/Sample (DL-254)
6	See Test Location Plan	100.7	24.3	98.0	
7	See Test Location Plan	98.7	24.2	96.0	
8	See Test Location Plan	101.4	23.8	98.6	
9	See Test Location Plan	99.3	24.0	96.6	
10	See Test Location Plan	98.7	24.9	96.0	
11	See Test Location Plan	97.9	26.0	95.2	
12	See Test Location Plan	98.6	25.2	95.9	
13	See Test Location Plan	98.2	23.8	95.5	
14	See Test Location Plan	100.6	24.0	97.9	
15	See Test Location Plan	98.8	25.6	96.1	
16	See Test Location Plan	100.9	23.8	98.2	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	2.0x10(-8)
Dry Density (pcf)	98.2
Moisture Content (%)	26.0

Atterberg Limits (ASTM D4318)

PL	16
LL	36
PI	20
USCS Classification	CL

Grain-size Analysis (ASTM D422)

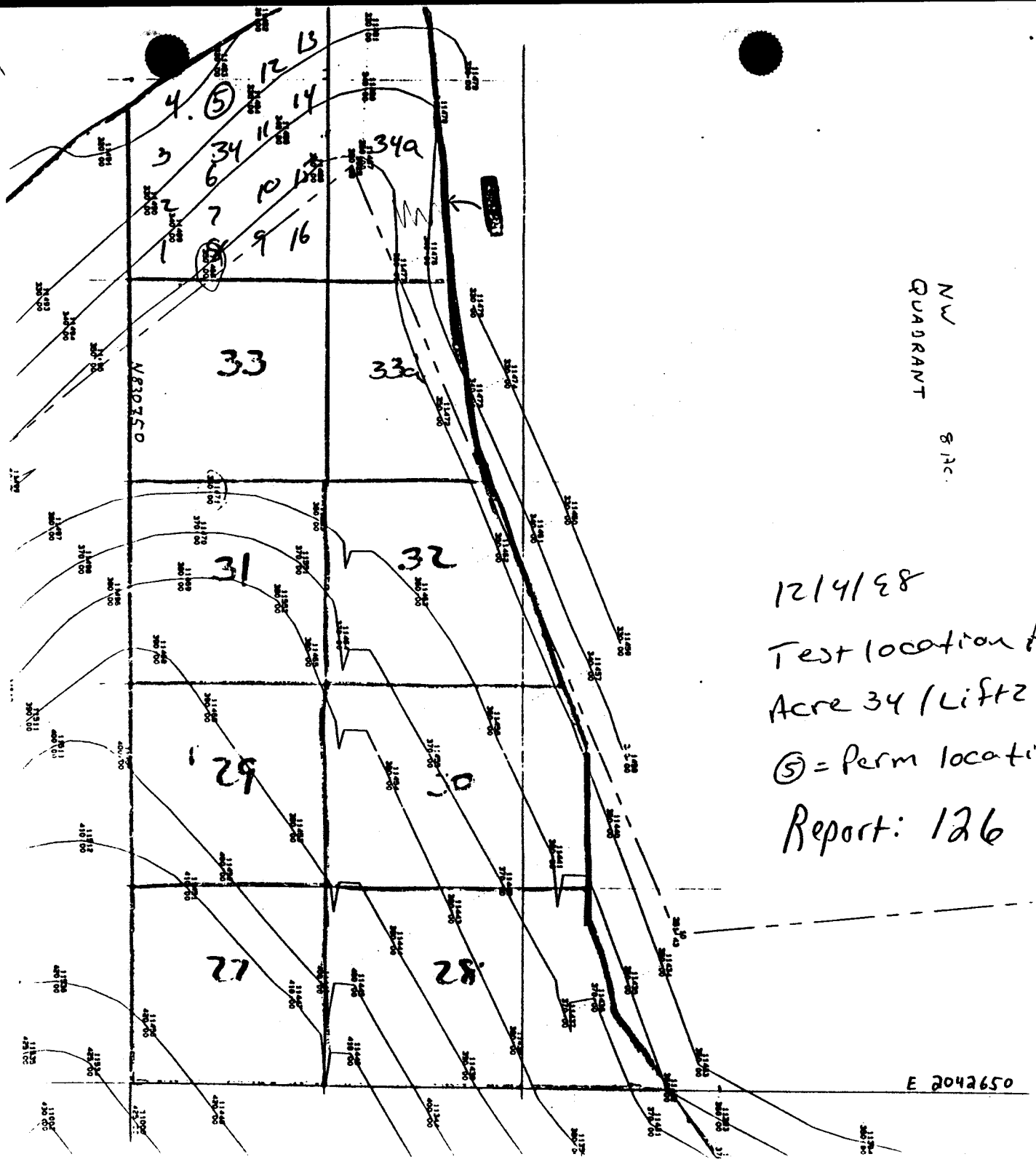
%Gravel	2.7
%Sand	33.1
%Silt	23.8
%Clay	40.4

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

12/4/98

Test location Plan

Acre 34 / Lift 2

⑤ = Perm location

Report: 126

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.7	33.1	23.8	40.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	97.3		
#10	95.6		
#20	93.6		
#40	88.6		
#60	79.4		
#100	72.0		
#200	64.2		

* (no specification provided)

Soil Description

Rougemount Borrow Source - Sandy lean clay

Atterberg Limits

PL= 16 LL= 36 PI= 20

Coefficients

D_{85}= 0.341 D_{60}= 0.0354 D_{50}= 0.0147
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-254, Acre 34, Lift 2

Sample No.: DL-254 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Acre 34, 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: 01/05/99
Report No.: P-218

Project No.: VNC-98-029
Sample No.: DL-254

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.0E-008	cm/sec
% Moisture	26.0	%
Dry Density	98.2	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/04/98
Location: Acre 34, Lift 2

Specimen Data

Length (in):	3.402
Diameter (in.):	2.818
Area (sq. in.):	6.248
Volume (cu. in.):	21.25
Wet Weight (grams):	690.4
Dry Weight (grams):	548.0
Dry Density (pcf):	98.2

Wet Weight	224.69
Dry Weight	192.30
Tare weight	67.65
% Moisture	26.0

Test Data

Confining Pressure 3.0 psi

ΔT	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
960	102.46	1.30	1.45	1.12	1.38	1.98E-008
450	102.46	0.70	0.65	0.93	0.68	2.07E-008
995	102.46	1.50	1.35	0.90	1.43	1.98E-008
365	102.46	0.55	0.50	0.91	0.53	1.99E-008

x

ΔT	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

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.: 128

Acre 34a Lift 2
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	100.1	24.1	97.4	
2	See Test Location Plan	100.3	23.8	97.6	
3	See Test Location Plan	98.8	23.8	96.1	Perm/Sample (DL-256)
4	See Test Location Plan	99.2	24.9	96.5	
5	See Test Location Plan	98.4	25.0	95.7	
6	See Test Location Plan	101.9	23.9	99.1	
7	See Test Location Plan	99.6	24.8	96.9	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 3.9x10(-8)

Dry Density (pcf) 98.3

Moisture Content (%) 25.3

Atterberg Limits (ASTM D4318)

PL 18
LL 33
PI 15

USCS Classification CL

Grain-size Analysis (ASTM D422)

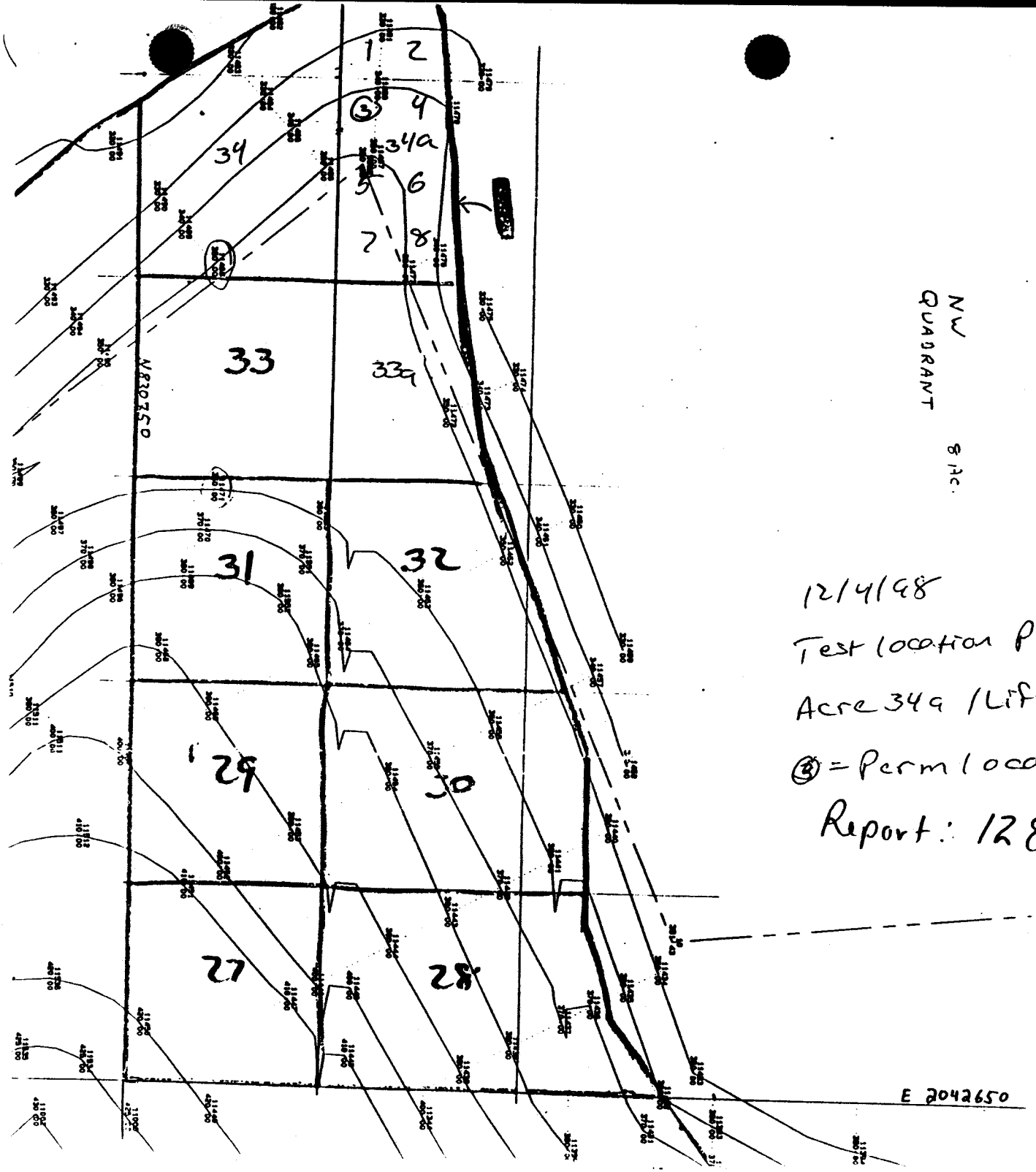
%Gravel 3.7
%Sand 38.5
%Silt 17.9
%Clay 39.9

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



NW QUADRANT

8 ac.

12/4/98

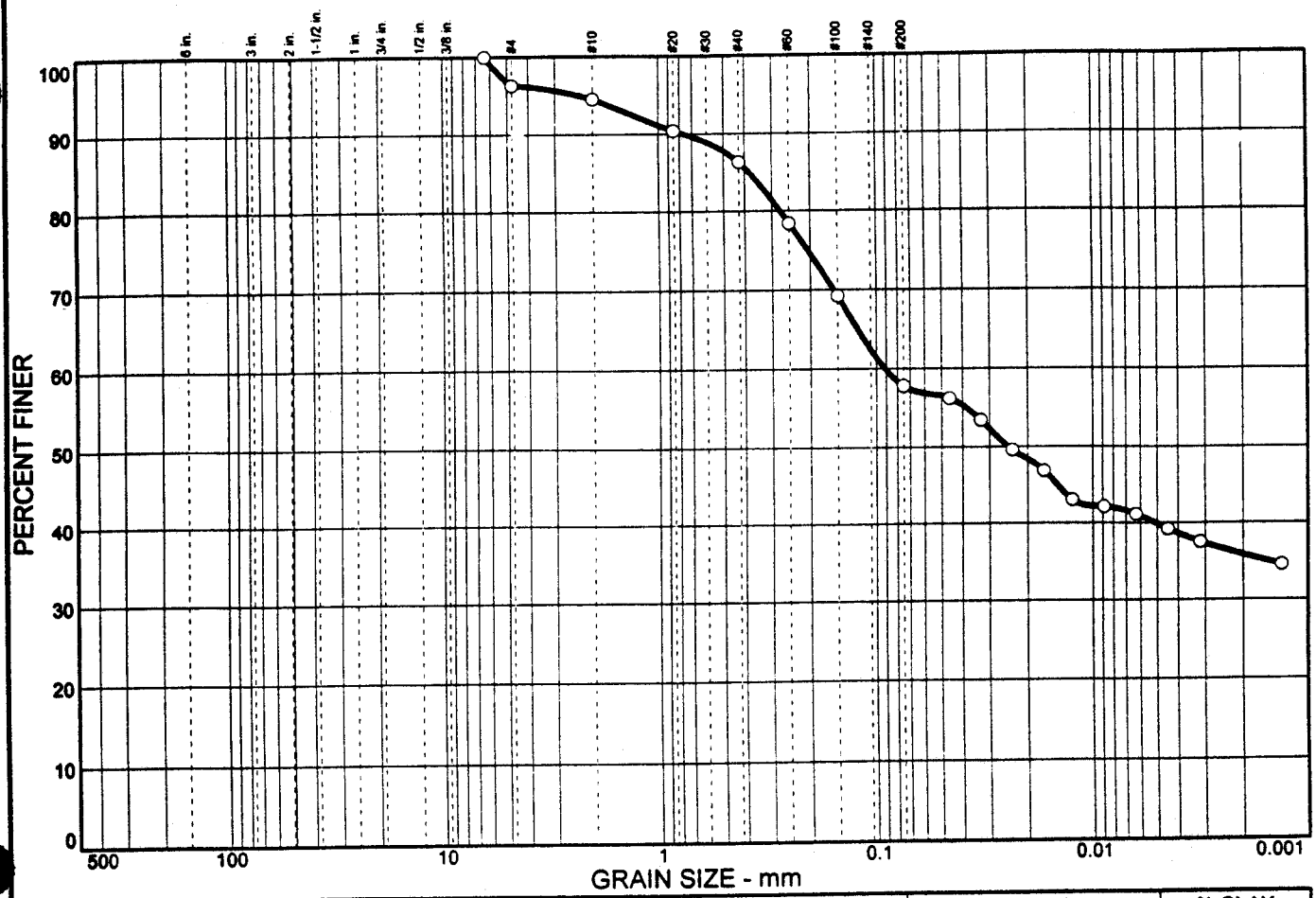
Test location Plan

Acre 34a / Lift 2

③ = Perm location

Report: 128

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.7	38.5	17.9	39.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	96.3		
#10	94.5		
#20	90.4		
#40	86.3		
#60	78.4		
#100	69.2		
#200	57.8		

* (no specification provided)

Soil Description

Rougemount Borrow Source - Sandy lean clay

Atterberg Limits

PL= 18 LL= 33 PI= 15

Coefficients

D_{85}= 0.381 D_{60}= 0.0911 D_{50}= 0.0245
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-256, Acre 34A, Lift 2

Sample No.: DL-256 **Source of Sample:** Rougemount Borrow Pit **Date:**
Location: Acre 34A, 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: 01/05/99
Report No.: P-219

Project No.: VNC-98-029
Sample No.: DL-256

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.9E-008	cm/sec
% Moisture	25.3	%
Dry Density	98.3	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/04/98
Location: Acre 34a, Lift 2

Specimen Data

Length (in):	3.764
Diameter (in.):	2.812
Area (sq. in.):	6.221
Volume (cu. in.):	23.42
Wet Weight (grams):	756.5
Dry Weight (grams):	604.0
Dry Density (pcf):	98.3

Wet Weight	238.91
Dry Weight	198.34
Tare weight	37.69
% Moisture	25.3

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
300	113.54	0.90	1.00	1.11	0.95	4.39E-008
960	113.54	2.80	2.50	0.89	2.65	3.82E-008
450	113.54	1.25	1.20	0.96	1.23	3.77E-008
995	113.54	2.65	2.50	0.94	2.58	3.59E-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) **3.9E-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: 11/23/98
Report No.: 060

Acre 35 Lift 2

Clay Source: Fogelman 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	95.6	24.5	98.8	
2	See Test Location Plan	100.0	27.0	100+	
3	See Test Location Plan	100.5	26.1	100+	
4	See Test Location Plan	96.0	27.0	99.2	
5	See Test Location Plan	99.2	23.3	100+	
6	See Test Location Plan	99.3	22.9	100+	
7	See Test Location Plan	95.9	27.5	99.1	Perm/Sample (DL-180)
8	See Test Location Plan	96.8	26.1	100.0	
9	See Test Location Plan	100.2	22.8	100+	
10	See Test Location Plan	99.4	26.4	100+	
11	See Test Location Plan	99.8	25.1	100+	
12	See Test Location Plan	98.7	23.8	100+	
13	See Test Location Plan	97.6	24.2	100+	
14	See Test Location Plan	98.1	24.2	100+	
15	See Test Location Plan	96.4	24.6	99.6	
16	See Test Location Plan	97.2	23.1	100+	

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)	94.6
Moisture Content (%)	27.3

Atterberg Limits (ASTM D4318)

PL	23
LL	55
PI	32
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.2
%Sand	29.9
%Silt	17.2
%Clay	52.7

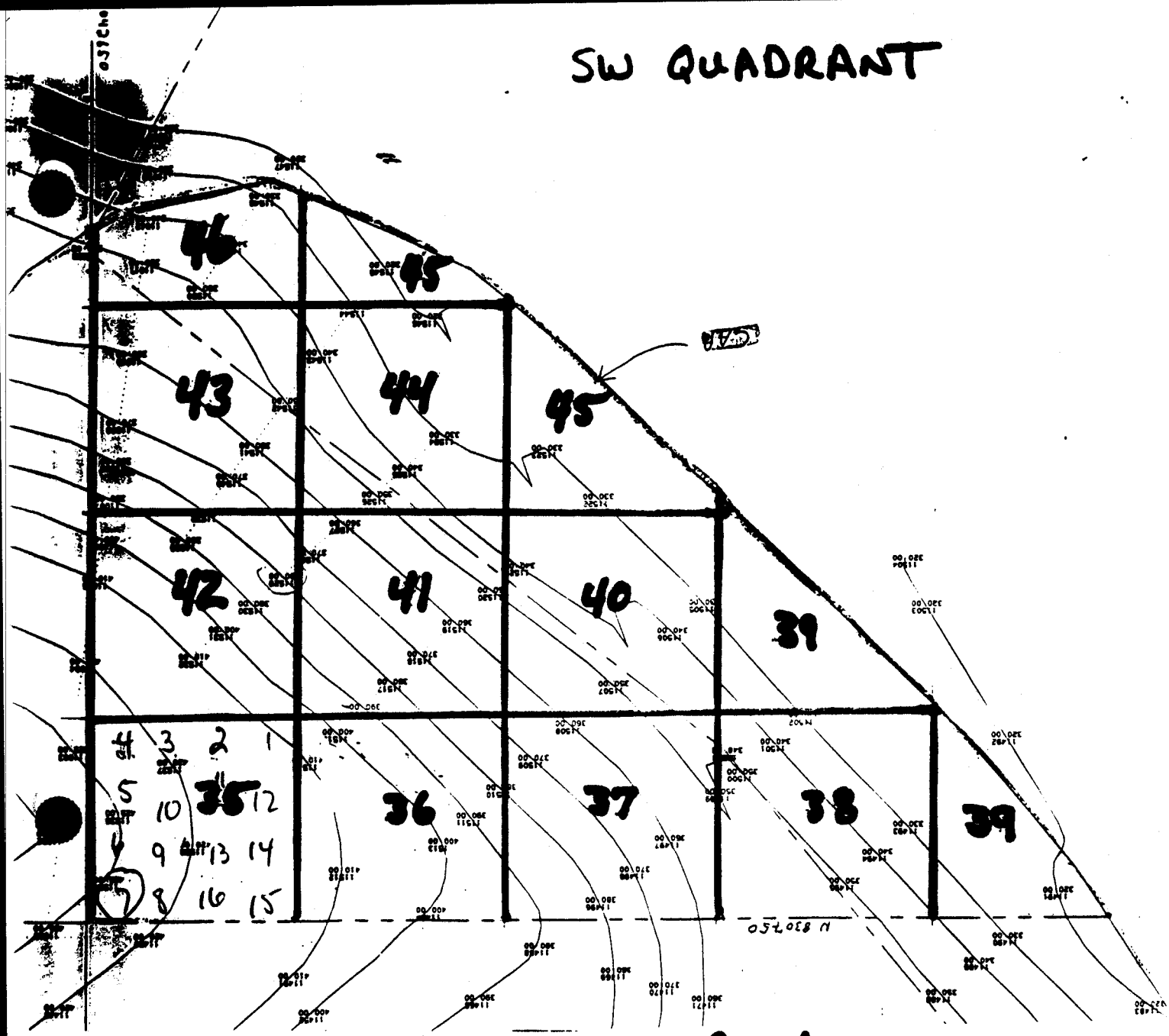
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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

SW QUADRANT



⑦ - Indicates Perm/Sample Location
Area 35 Lift 2
Report : C60

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/24/98
Report No.: P-128

Project No.: VNC-98-029
Sample No.: DL-180

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.3E-008	cm/sec
% Moisture	27.3	%
Dry Density	94.6	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/16/98
Location: ACRE 35, LIFT 2

Specimen Data

Length (in):	3.099
Diameter (in.):	2.870
Area (sq. in.):	6.480
Volume (cu. in.):	20.08
Wet Weight (grams):	634.3
Dry Weight (grams):	498.5
Dry Density (pcf):	94.6

Moisture Content Test Data

Wet Weight	164.47
Dry Weight	133.96
Tare weight	22.00
% Moisture	27.3

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
392	95.15	1.25	1.10	0.88	1.18	3.92E-008
345	94.15	0.95	0.90	0.95	0.93	3.54E-008
574	94.15	2.10	2.40	1.14	2.25	5.18E-008
333	94.15	1.20	1.20	1.00	1.20	4.76E-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

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	29.9	17.2	52.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.8		
#10	99.7		
#20	96.0		
#40	91.7		
#60	86.0		
#100	78.2		
#200	69.9		

* (no specification provided)

Soil Description

Fogelman Pit - Fat clay with sand

Atterberg Limits

PL= 23 LL= 55 PI= 32

Coefficients

D_{85}= 0.233 D_{60}= 0.0125 D_{50}= 0.0027
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-180, Acre 35 Lift 2

Sample No.: DL-180 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 35 Lift 2 **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: 11/25/98
Report No.: 086

Acre 36 Lift 2

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	98.9	24.7	100+	
2	See Test Location Plan	101.7	22.5	100+	
3	See Test Location Plan	95.2	24.3	98.3	
4	See Test Location Plan	96.0	23.0	99.2	
5	See Test Location Plan	93.0	26.2	96.1	
6	See Test Location Plan	96.5	23.1	99.7	
7	See Test Location Plan	94.6	23.6	99.7	
8	See Test Location Plan	94.9	23.0	98.0	
9	See Test Location Plan	95.8	24.1	99.0	
10	See Test Location Plan	97.0	23.5	100+	
11	See Test Location Plan	98.9	24.7	100+	
12	See Test Location Plan	96.3	24.7	100+	Tube Sample (DL-199)
13	See Test Location Plan	95.4	24.5	98.6	
14	See Test Location Plan	93.0	26.8	96.1	
15	See Test Location Plan	95.2	24.5	98.3	
16	See Test Location Plan	96.1	23.2	99.3	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	9.0x10(-9)
Dry Density (pcf)	100.9
Moisture Content (%)	21.2

Atterberg Limits (ASTM D4318)

PL	21
LL	53
PI	32

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel	0.0
%Sand	32.2
%Silt	14.9
%Clay	52.9

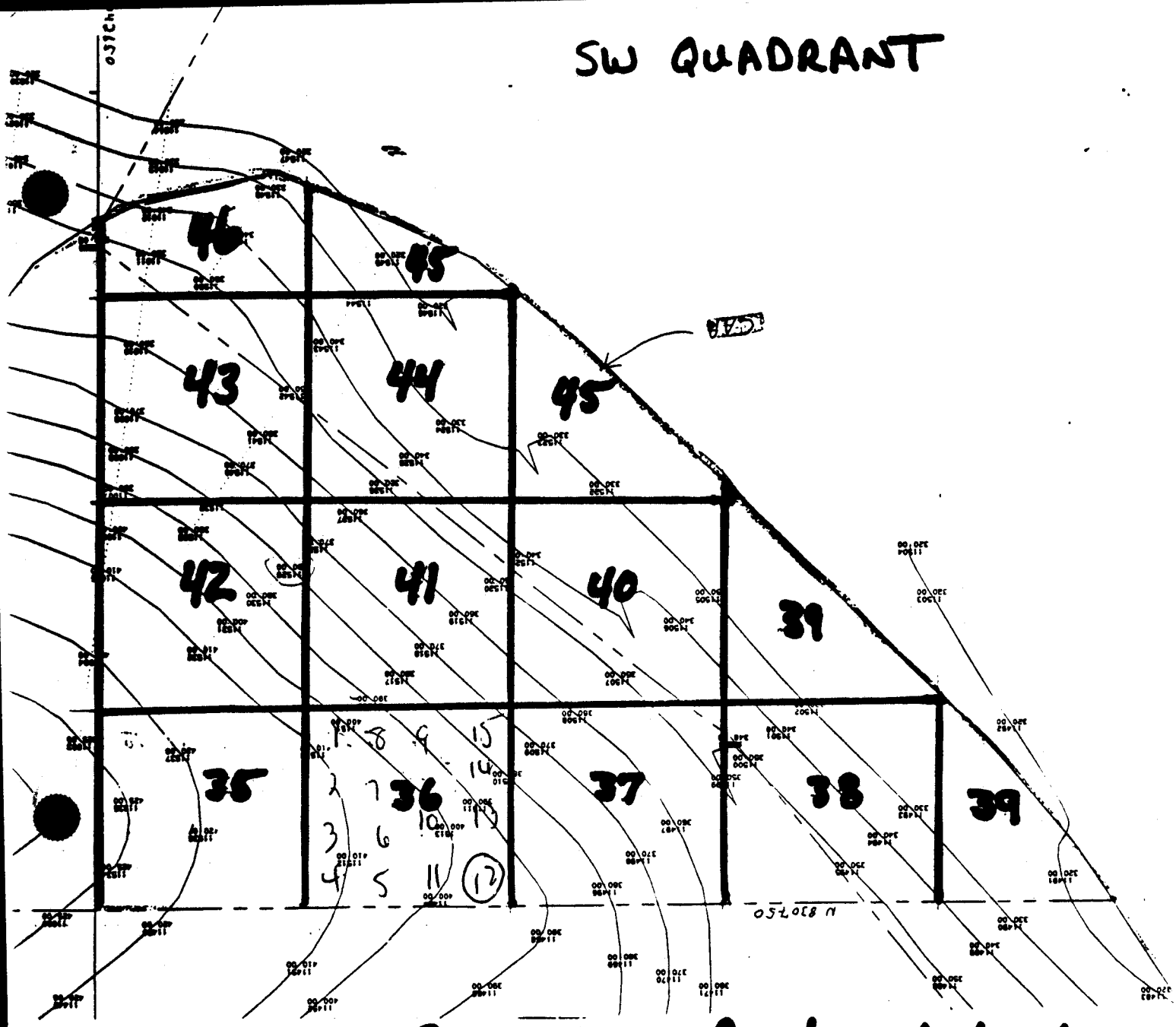
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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

SW QUADRANT

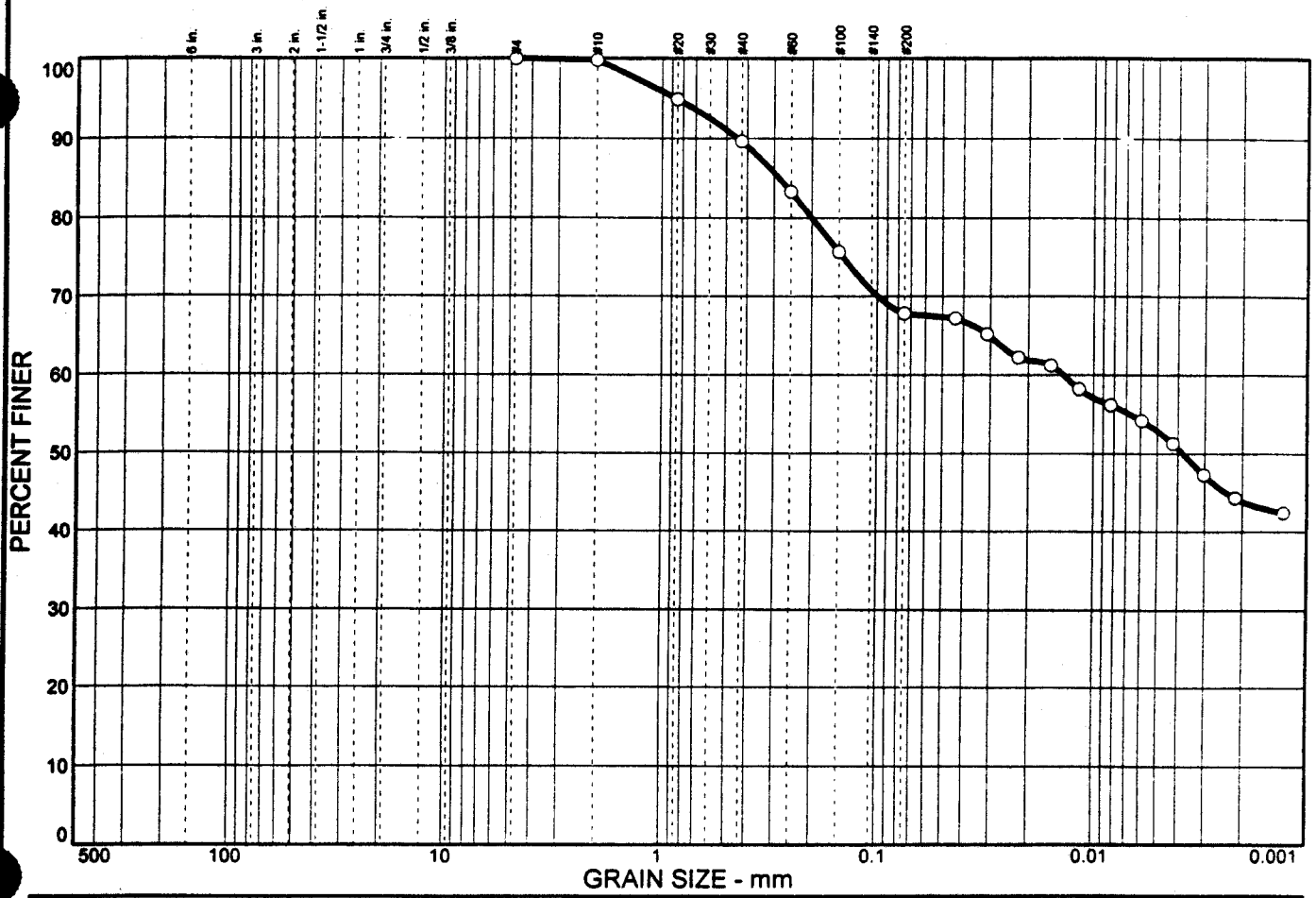


(12) - Indicates Perm/Sample Location

Area 36 Lift 2

Report: 086

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	32.2	14.9	52.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	94.9		
#40	89.6		
#60	83.3		
#100	75.6		
#200	67.8		

* (no specification provided)

Soil Description

Fogelman - Sandy fat clay

Atterberg Limits

PL= 21 LL= 53 PI= 32

Coefficients

D_{85}= 0.284 D_{60}= 0.0138 D_{50}= 0.0038
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-199, Fogleman - Acre 36, Lift 2

Sample No.: DL-199 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman borrow pit - Acre 36, Lift 2 **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-151

Project No.: VNC-98-029
Sample No.: DL-199

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	9.0E-009	cm/sec
% Moisture	21.2	%
Dry Density	100.9	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 11/20/98
Location: Acre 36, Lift 2

Specimen Data

Length (in):	3.085
Diameter (in.):	2.873
Area (sq. in.):	6.494
Volume (cu. in.):	20.03
Wet Weight (grams):	642.9
Dry Weight (grams):	530.6
Dry Density (pcf):	100.9

Moisture Content Test Data

Wet Weight	135.00
Dry Weight	115.18
Tare weight	21.58
% Moisture	21.2

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
461	138.46	0.55	0.55	1.00	0.55	1.06E-008
648	138.46	0.75	0.65	0.87	0.70	9.64E-009
413	138.46	0.40	0.35	0.88	0.38	8.10E-009
357	138.46	0.30	0.30	1.00	0.30	7.50E-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) **9.0E-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: 01/05/99
Report No.: 130

Acre 37 Lift 2

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	20.8	98.6	
2	See Test Location Plan	100.4	21.9	97.5	
3	See Test Location Plan	101.8	20.0	98.9	
4	See Test Location Plan	101.6	22.7	98.6	
5	See Test Location Plan	100.0	20.6	97.1	
6	See Test Location Plan	101.6	21.0	98.0 0-6 in	
7	See Test Location Plan	98.4	23.9	95.5 5 in	Perm/Sample (DL-258)
8	See Test Location Plan	99.9	22.4	97.0	
9	See Test Location Plan	102.2	21.4	99.2	
10	See Test Location Plan	101.5	21.0	98.5	
11	See Test Location Plan	103.6	19.9	100+	
12	See Test Location Plan	102.6	20.0	99.6	
13	See Test Location Plan	101.6	20.6	98.6	
14	See Test Location Plan	102.1	20.7	99.1	
15	See Test Location Plan	100.8	22.1	97.9	
16	See Test Location Plan	100.4	21.7	97.5	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	1.5x10(-8)
Dry Density (pcf)	99.6
Moisture Content (%)	21.7

Atterberg Limits (ASTM D4318)

PL	17
LL	47
PI	30
USCS Classification	CL

Grain-size Analysis (ASTM D422)

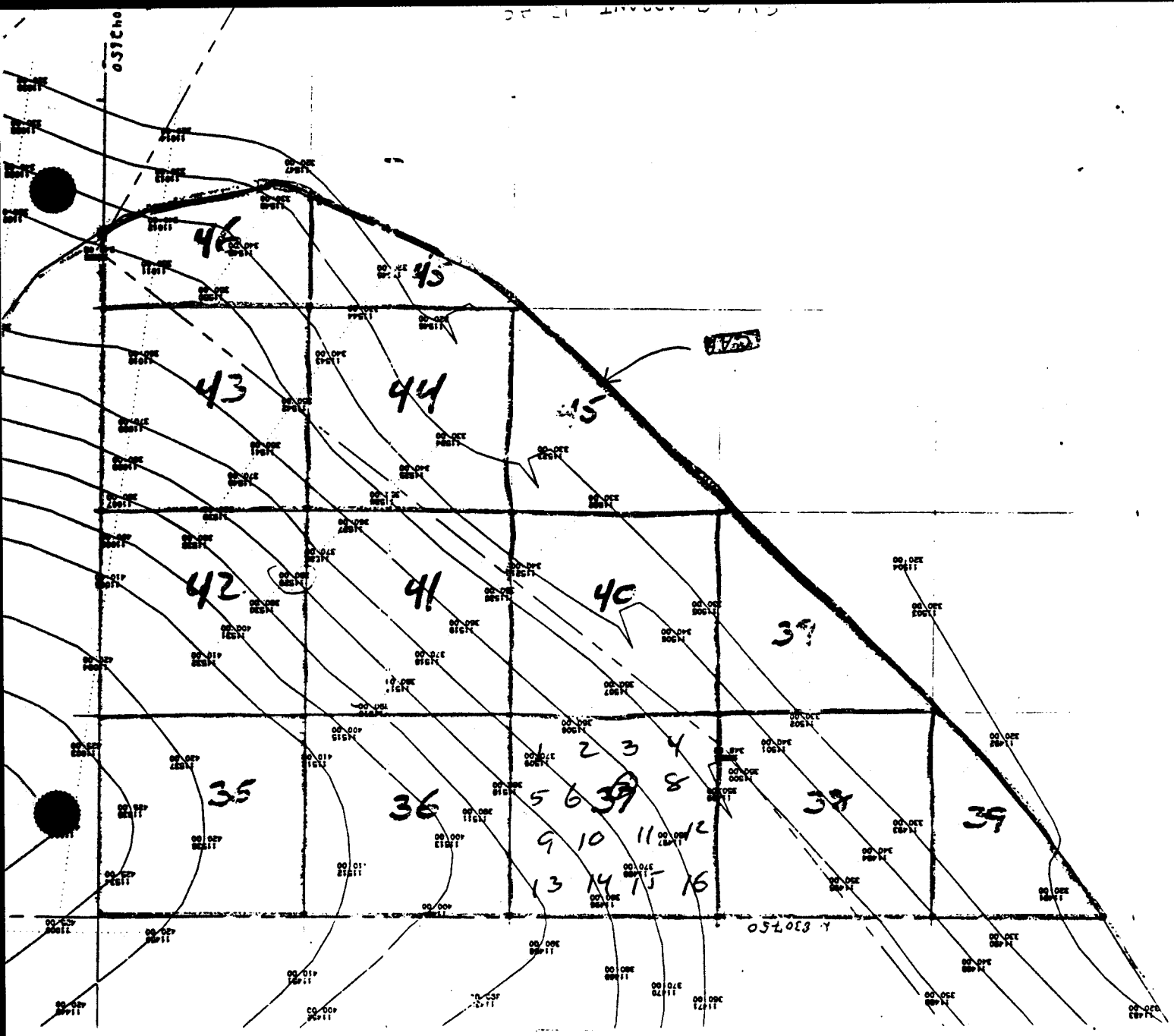
%Gravel	0.0
%Sand	37.5
%Silt	21.6
%Clay	40.9

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

Robert L. Mashewske

Robert L. Mashewske, P.E.

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



12/4/98

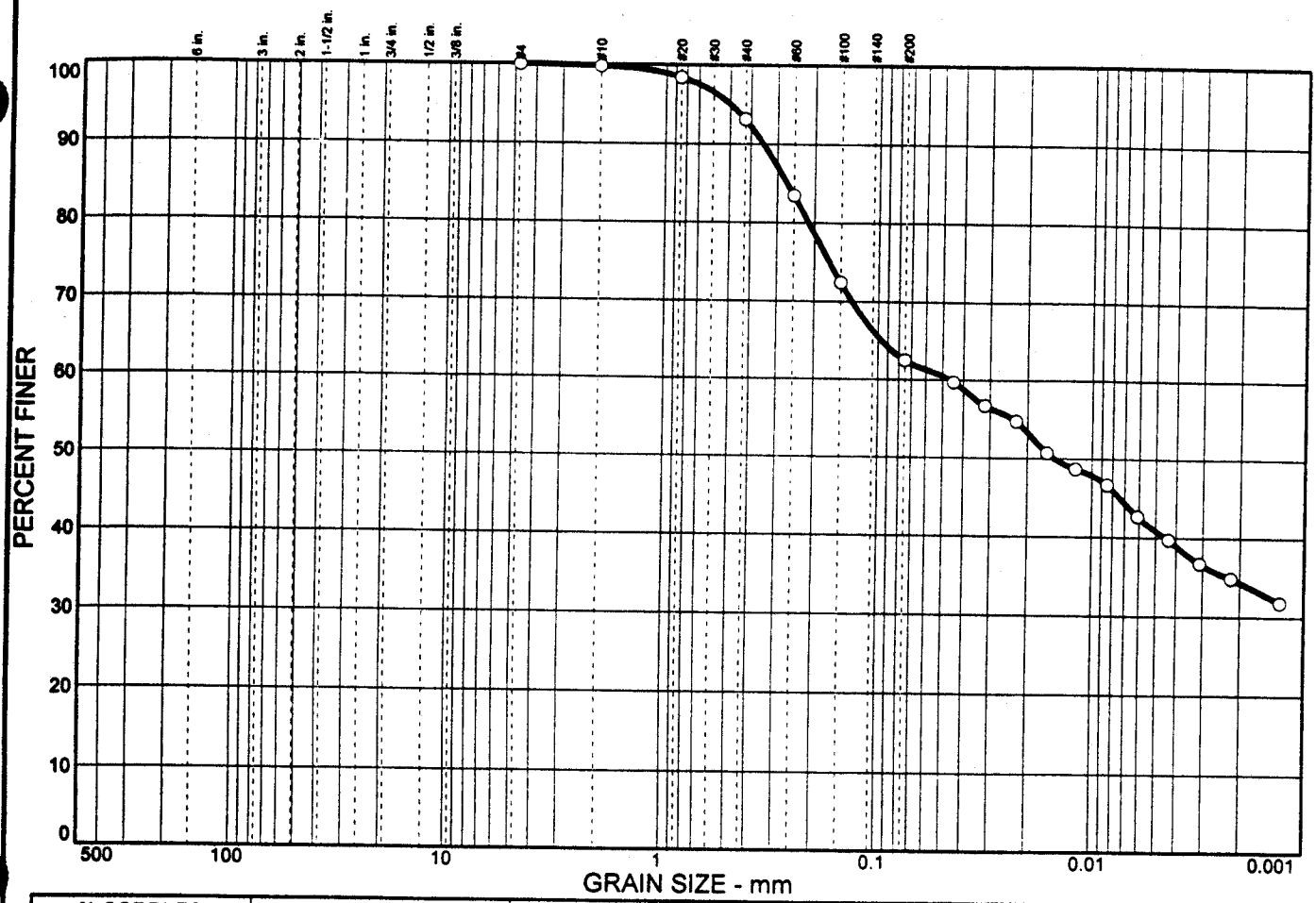
Test location plan

Acre 37 / Lift 2

⑦ = Perm location

Report: 130

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	37.5	21.6	40.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	98.4		
#40	93.1		
#60	83.5		
#100	72.4		
#200	62.5		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 17 LL= 47 PI= 30

Coefficients

D_{85}= 0.268 D_{60}= 0.0463 D_{50}= 0.0150
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-258, Acre 37, Lift 2

Sample No.: DL-258 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 37, 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: 01/05/99
Report No.: P-192

Project No.: VNC-98-029
Sample No.: DL-258

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.5E-008	cm/sec
% Moisture	21.7	%
Dry Density	99.6	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/04/98
Location: Acre 37, Lift 2

Specimen Data

Length (in):	2.954
Diameter (in.):	2.843
Area (sq. in.):	6.359
Volume (cu. in.):	18.78
Wet Weight (grams):	597.8
Dry Weight (grams):	491.1
Dry Density (pcf):	99.6

Wet Weight	90.04
Dry Weight	77.93
Tare weight	22.22
% Moisture	21.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
381	138.46	0.60	0.70	1.17	0.65	1.49E-008
565	138.46	1.05	0.85	0.81	0.95	1.47E-008
525	138.46	1.00	0.95	0.95	0.98	1.62E-008
364	138.46	0.60	0.50	0.83	0.55	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) **1.5E-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: 01/05/99
Report No.: 136

Acre 38 Lift 2

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	19.8	97.1	
2	See Test Location Plan	101.8	20.6	98.8	
3	See Test Location Plan	102.3	24.9	99.3	
4	See Test Location Plan	102.0	20.2	99.0	
5	See Test Location Plan	100.6	21.6	97.7	
6	See Test Location Plan	99.5	22.9	96.6	
7	See Test Location Plan	100.4	24.2	97.5	Perm/Sample (DL-264)
8	See Test Location Plan	99.9	23.1	97.0	
9	See Test Location Plan	100.2	22.6	97.3	
10	See Test Location Plan	101.6	21.4	98.6	
11	See Test Location Plan	102.3	20.3	99.3	
12	See Test Location Plan	103.2	20.0	100+	
13	See Test Location Plan	102.4	21.6	99.4	
14	See Test Location Plan	100.6	21.4	97.7	
15	See Test Location Plan	101.2	21.9	98.3	
16	See Test Location Plan	100.3	22.2	97.4	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	2.5x10(-8)
Dry Density (pcf)	93.2
Moisture Content (%)	23.0

Atterberg Limits (ASTM D4318)

PL	19
LL	43
PI	24
USCS Classification	CL

Grain-size Analysis (ASTM D422)

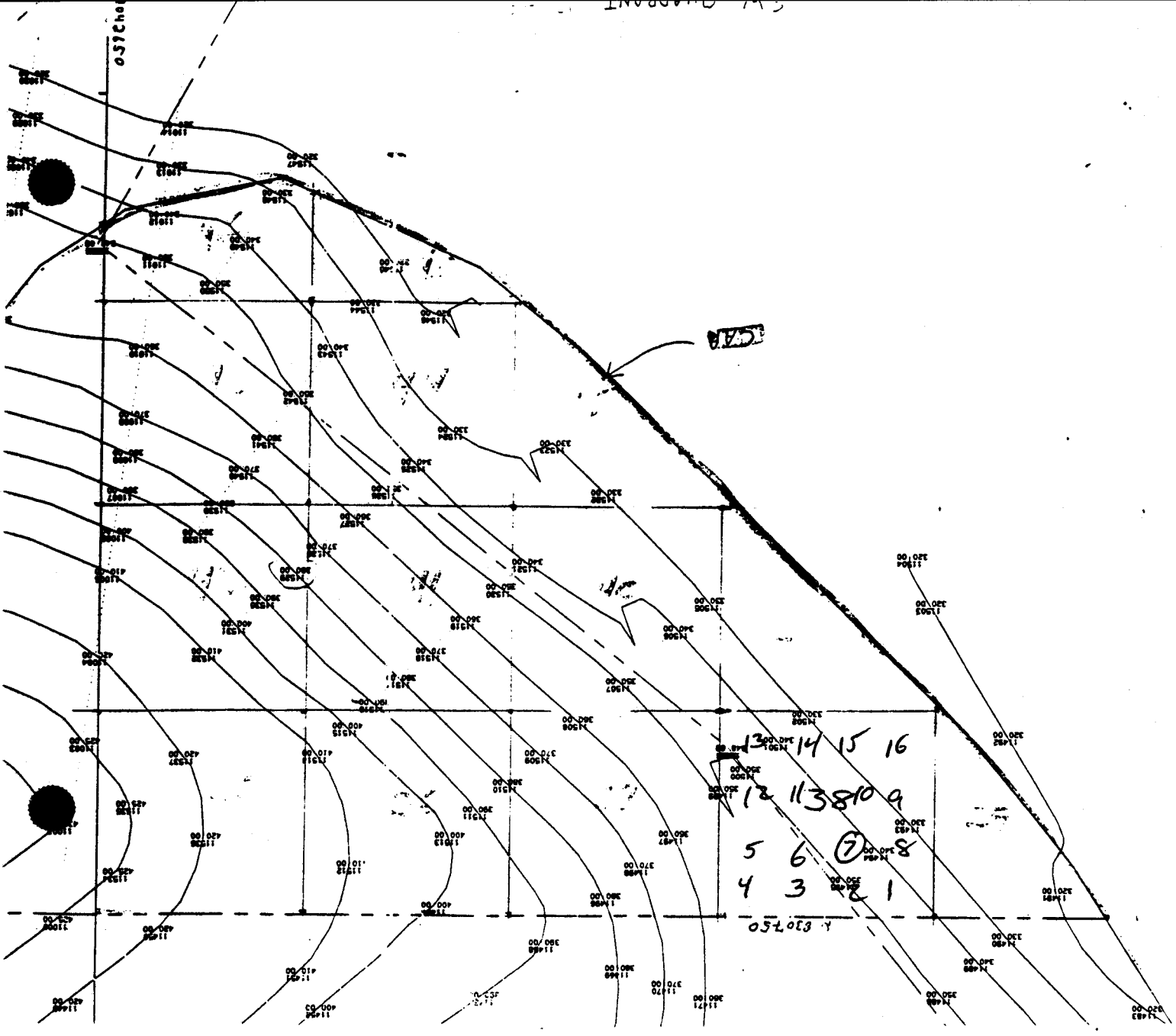
%Gravel	0.0
%Sand	38.1
%Silt	20.3
%Clay	41.6

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

Robert L. Mashewske

Robert L. Mashewske, P.E.

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



12/7/98

Test location Plan

Acre 38 / Lift 2

7 = Perm location

Report: 136

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 01/05/98
Report No.: P-199

Project No.: VNC-98-029
Sample No.: DL-264

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.5E-008	cm/sec
% Moisture	23.0	%
Dry Density	93.2	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/07/98
Location: Acre 38, Lift 2

Specimen Data

Length (in):	4.052
Diameter (in.):	2.840
Area (sq. in.):	6.346
Volume (cu. in.):	25.71
Wet Weight (grams):	773.6
Dry Weight (grams):	629.0
Dry Density (pcf):	93.2

Wet Weight	128.66
Dry Weight	108.70
Tare weight	21.90
% Moisture	23.0

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
358	138.46	0.90	0.70	0.78	0.80	2.68E-008
775	138.46	1.90	1.55	0.82	1.73	2.67E-008
406	138.46	0.95	0.85	0.89	0.90	2.66E-008
981	138.46	1.85	1.60	0.86	1.73	2.11E-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
Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	38.1	20.3	41.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	97.8		
#40	91.0		
#60	82.7		
#100	72.7		
#200	61.9		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 43 PI= 24

Coefficients

D_{85}= 0.285 D_{60}= 0.0359 D_{50}= 0.0121
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-264, Acre 38, Lift 2

Sample No.: DL-264 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 38, Lift 2 **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.: 137

Acre 39 Lift 2
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	102.1	20.9	99.1	
2	See Test Location Plan	101.4	20.5	98.5	
3	See Test Location Plan	103.9	20.4	100+	
4	See Test Location Plan	98.0	26.6	95.2	
5	See Test Location Plan	98.4	26.1	95.5	Perm/Sample (DL-265)
6	See Test Location Plan	99.3	25.2	96.4	
7	See Test Location Plan	104.3	19.9	100+	
8	See Test Location Plan	103.0	20.1	100.0	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec) 2.9x10(-9)

Dry Density (pcf) 102.1

Moisture Content (%) 24.4

Atterberg Limits (ASTM D4318)

PL 22
LL 68
PI 46

USCS Classification CH

Grain-size Analysis (ASTM D422)

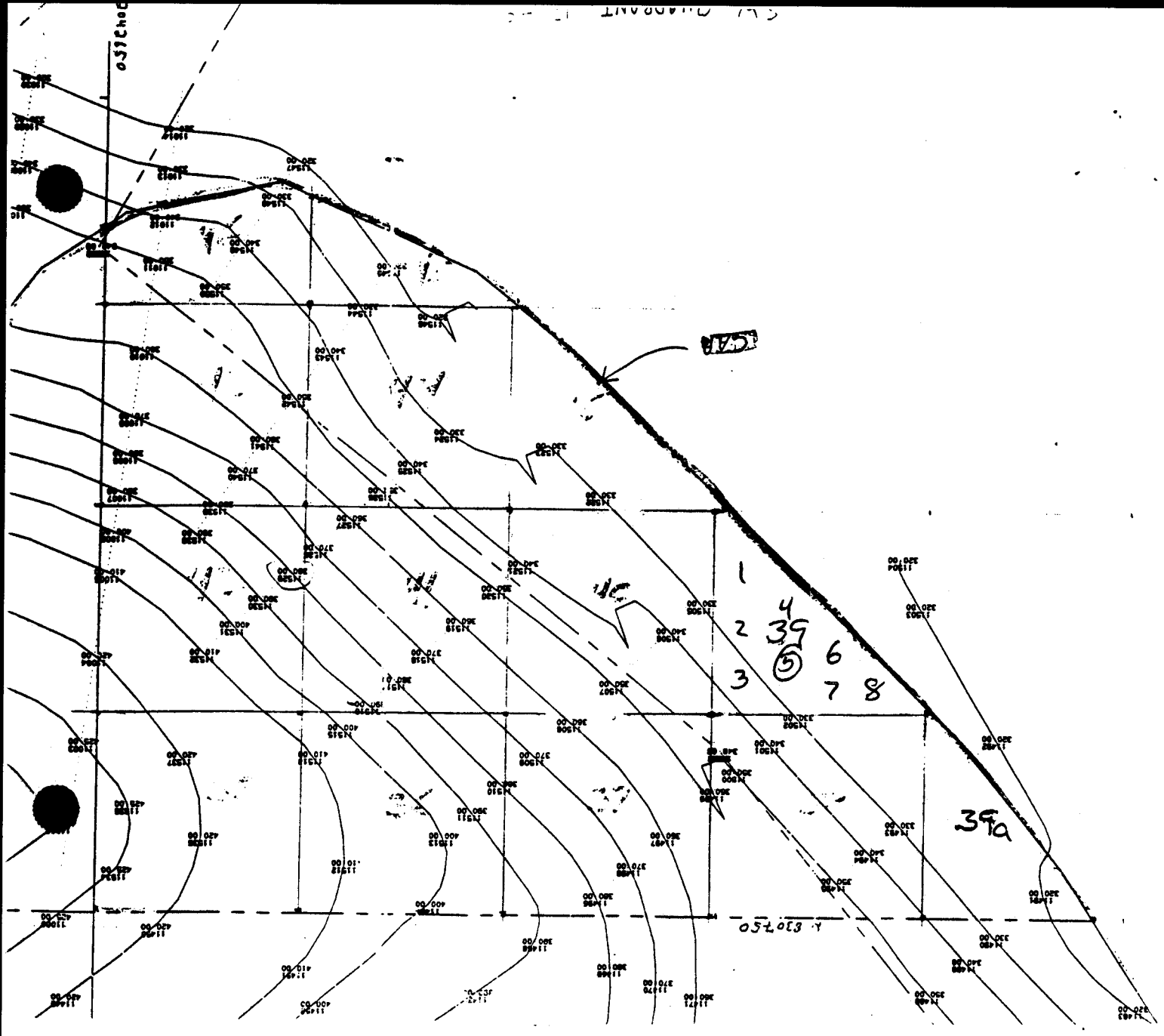
%Gravel 0.3
%Sand 33.5
%Silt 22.8
%Clay 43.4

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

Robert L. Mashewske

Robert L. Mashewske, P.E.

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



12/7/98

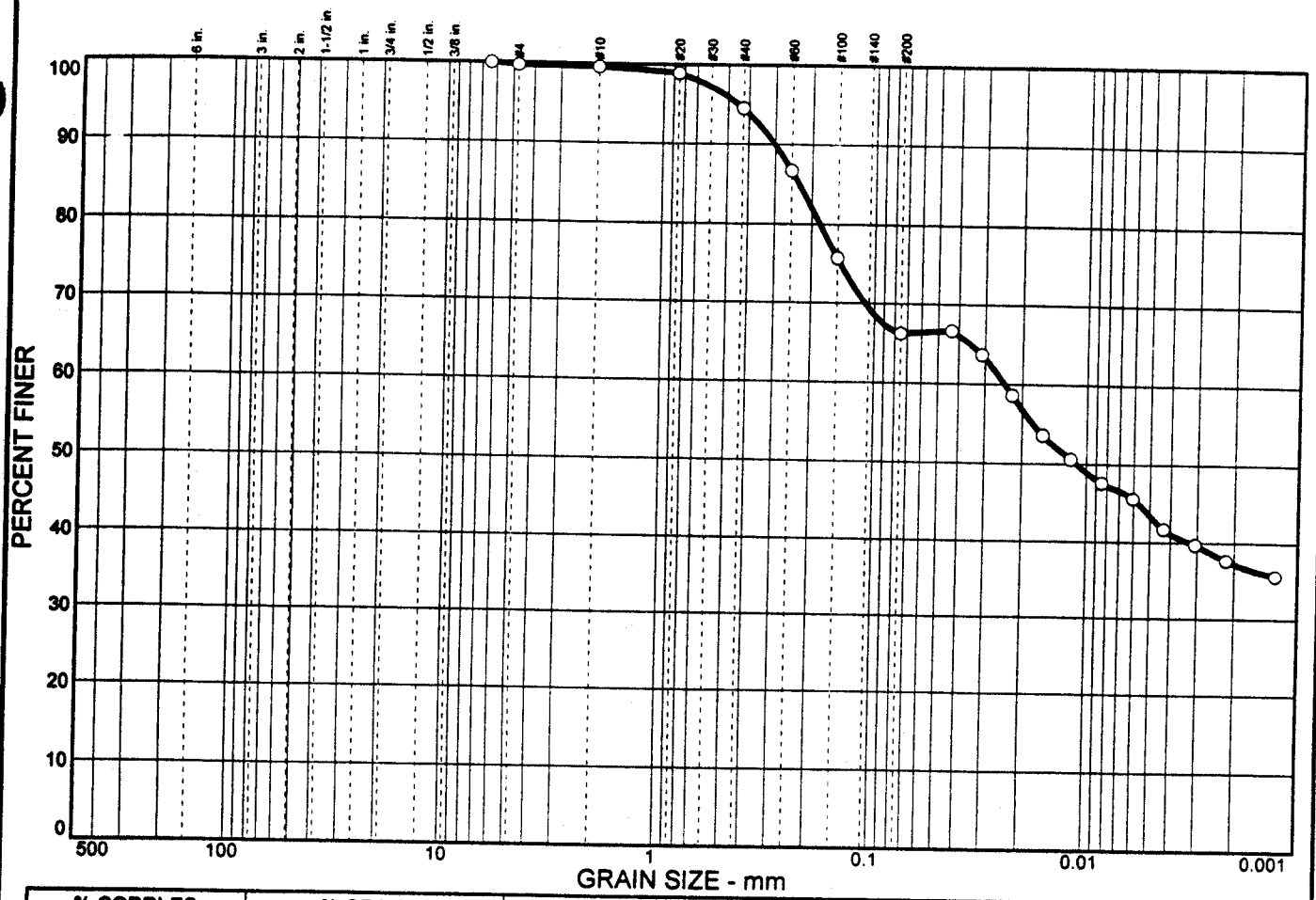
Test location Plan

Acre 39 / Lift 2

5 = Perm location

Report: 137

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	33.5	22.8	43.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.6		
#20	98.9		
#40	94.5		
#60	86.7		
#100	75.7		
#200	66.2		

* (no specification provided)

Soil Description

On-site Borrow - Sandy fat clay

Atterberg Limits

PL= 22 LL= 68 PI= 46

Coefficients

D_{85}= 0.230 D_{60}= 0.0242 D_{50}= 0.0111
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-265, Acre 39, Lift 2

Sample No.: DL-265 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 39, 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: 01/05/99
Report No.: P-226

Project No.: VNC-98-029
Sample No.: DL-265

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.9E-009	cm/sec
% Moisture	24.4	%
Dry Density	102.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/07/98
Location: Acre 39, Lift 2

Specimen Data

Length (in):	3.478
Diameter (in.):	2.842
Area (sq. in.):	6.355
Volume (cu. in.):	22.10
Wet Weight (grams):	736.4
Dry Weight (grams):	592.1
Dry Density (pcf):	102.1

Wet Weight	115.33
Dry Weight	97.07
Tare weight	22.13
% Moisture	24.4

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1442	204.92	0.60	0.60	1.00	0.60	2.89E-009
1509	204.92	0.60	0.60	1.00	0.60	2.76E-009
1458	204.92	0.60	0.60	1.00	0.60	2.86E-009
1552	204.92	0.70	0.70	1.00	0.70	3.13E-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) **2.9E-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: 01/05/99
Report No.: 139

Acre 39a Lift 2
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	99.2	26.5	96.3	
2	See Test Location Plan	104.3	20.1	100+	
3	See Test Location Plan	98.0	25.2	95.2	
4	See Test Location Plan	101.4	20.9	98.5	
5	See Test Location Plan	102.5	23.2	99.5	Perm/Sample (DL-267)
6	See Test Location Plan	101.2	22.0	98.3	
7	See Test Location Plan	100.7	22.4	97.8	
8	See Test Location Plan	102.6	20.7	99.6	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 1.8x10(-8)

Dry Density (pcf) 106.0

Moisture Content (%) 19.9

Atterberg Limits (ASTM D4318)

PL 18
LL 61
PI 43

USCS Classification CH

Grain-size Analysis (ASTM D422)

%Gravel 0.0
%Sand 29.4
%Silt 21.3
%Clay 49.3

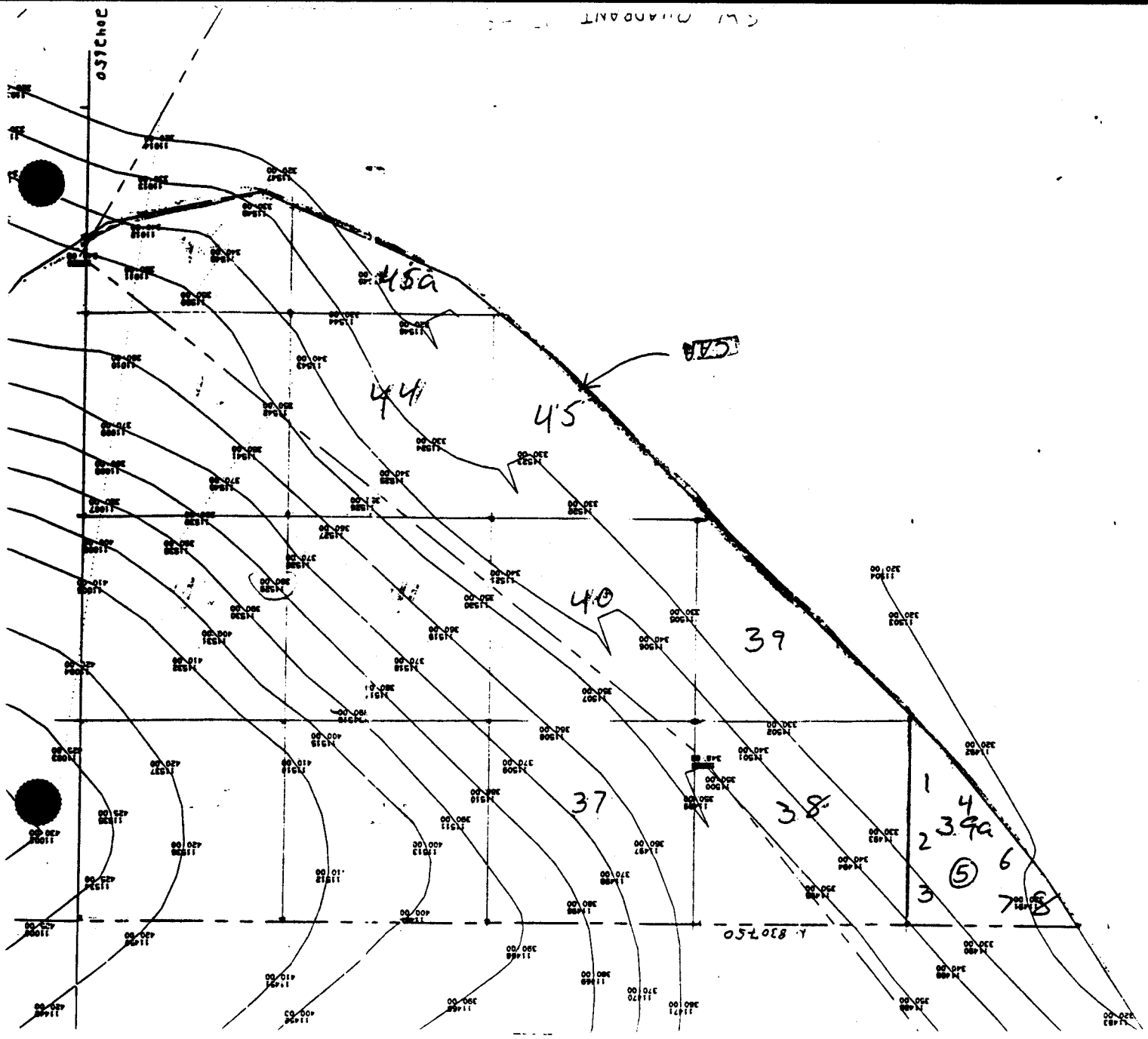
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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



12/7/98

Test location Plan

Acre 39a / Lift 2

5 = Perm location

Report: 139

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	29.4	21.3	49.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.1		
#40	95.0		
#60	87.8		
#100	79.6		
#200	70.6		

* (no specification provided)

Soil Description

On-site Borrow - Fat clay with sand

Atterberg Limits

PL= 18 LL= 61 PI= 43

Coefficients

D_{85}= 0.209 D_{60}= 0.0143 D_{50}= 0.0052
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-267, Acre 39A, lift 2

Sample No.: DL-267 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 39A, 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: 01/05/99
Report No.: P-200

Project No.: VNC-98-029
Sample No.: DL-267

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	1.8E-008	cm/sec
% Moisture	19.9	%
Dry Density	106.0	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/07/98
Location: Acre 39a, Lift 2

Specimen Data

Length (in):	2.808
Diameter (in.):	2.833
Area (sq. in.):	6.314
Volume (cu. in.):	17.73
Wet Weight (grams):	591.5
Dry Weight (grams):	493.5
Dry Density (pcf):	106.0

Wet Weight	108.99
Dry Weight	94.58
Tare weight	22.04
% Moisture	19.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
514	138.46	1.20	1.30	1.08	1.25	2.03E-008
972	138.46	1.70	1.80	1.06	1.75	1.50E-008
301	138.46	0.70	0.60	0.86	0.65	1.80E-008
482	138.46	1.00	1.10	1.10	1.05	1.82E-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) **1.8E-008** 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: 01/11/99
Report No.: 141

Acre 40 Lift 2

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	103.0	20.1	100.0	
2	See Test Location Plan	101.7	21.2	98.7	
3	See Test Location Plan	102.6	20.1	99.6	
4	See Test Location Plan	101.0	20.6	98.1	
5	See Test Location Plan	102.0	19.9	99.0	
6	See Test Location Plan	101.9	20.0	98.9	Perm/Sample (DL-269)
7	See Test Location Plan	99.8	21.9	96.9	
8	See Test Location Plan	99.0	21.8	96.1	
9	See Test Location Plan	97.9	22.6	95.0	
10	See Test Location Plan	100.6	20.4	97.7	
11	See Test Location Plan	100.0	21.6	97.1	
12	See Test Location Plan	101.6	21.0	98.6	
13	See Test Location Plan	102.4	22.1	99.4	
14	See Test Location Plan	101.7	21.6	98.7	
15	See Test Location Plan	103.1	20.6	100+	
16	See Test Location Plan	102.4	21.4	99.4	
Density (ASTM D2922)					Moisture (ASTM D3017)

Hydraulic Conductivity (ASTM D5084)
In-situ (Shelby Tube Sample) 5.3Ex10(-9)

Permeability (cm/sec) 5.3x10(-9)

Dry Density (pcf) 105.0

Moisture Content (%) 19.9

Atterberg Limits (ASTM D4318)

PL 16
LL 42
PI 26

USCS Classification CL

Grain-size Analysis (ASTM D422)

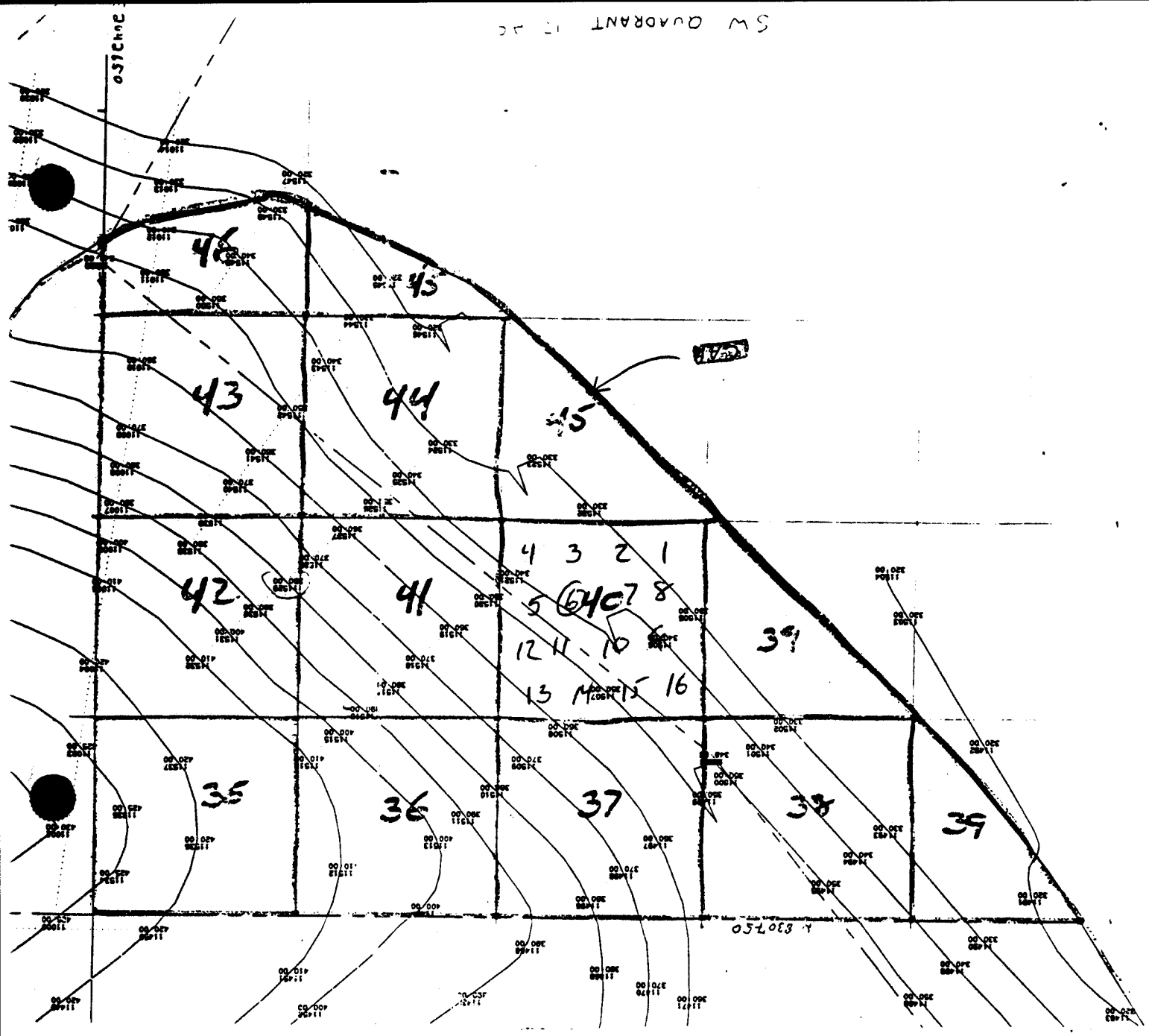
%Gravel 0.0
%Sand 25.5
%Silt 29.3
%Clay 45.2

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

Robert L. Mashewske, PE

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

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



12/7/88

Test location plan

Acre 40 / Lift 2

⑥ = Perm location

Report: 141

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 01/01/98
Report No.: P-234

Project No.: VNC-98-029
Sample No.: DL-269

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	5.3E-009	cm/sec
% Moisture	19.9	%
Dry Density	105.0	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/07/98
Location: Acre 40, Lift 2

Specimen Data

Length (in):	3.518
Diameter (in.):	2.820
Area (sq. in.):	6.257
Volume (cu. in.):	22.01
Wet Weight (grams):	727.3
Dry Weight (grams):	606.6
Dry Density (pcf):	105.0

Wet Weight	227.56
Dry Weight	196.02
Tare weight	37.52
% Moisture	19.9

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1275	105.23	0.55	0.65	1.18	0.60	6.54E-009
1465	105.23	0.55	0.45	0.82	0.50	4.74E-009
1495	105.23	0.60	0.45	0.75	0.53	4.88E-009
1460	105.23	0.55	0.50	0.91	0.53	5.00E-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)

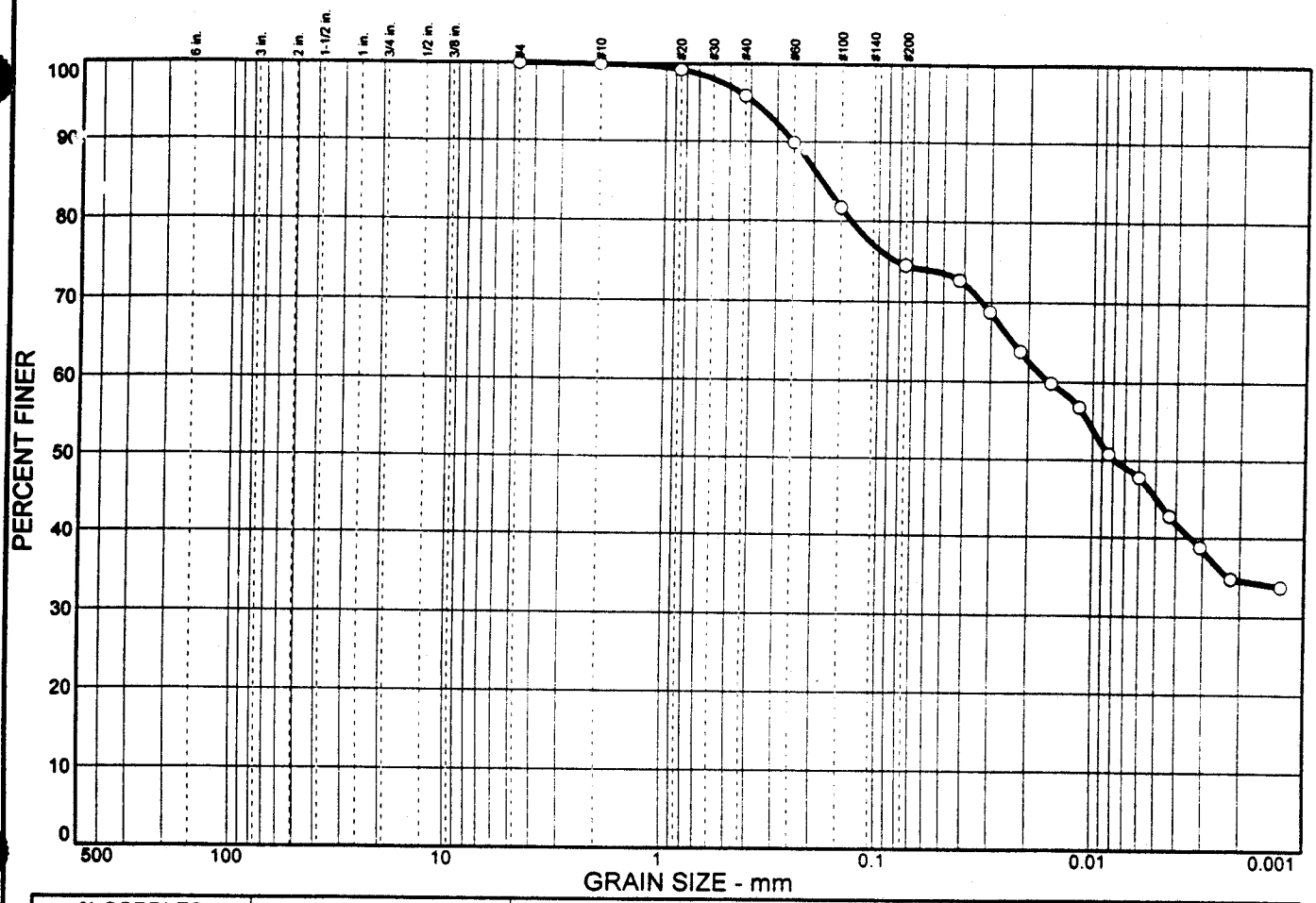
Permeability (k) **5.3E-009** cm/sec

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	25.5	29.3	45.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.2		
#40	95.9		
#60	89.9		
#100	81.7		
#200	74.5		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 16 LL= 42 PI= 26

Coefficients

D_{85}= 0.184 D_{60}= 0.0160 D_{50}= 0.0078
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-269, Acre 40, Lift 3

Sample No.: DL-269 **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.: 133

Acre 41 Lift 2

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	104.1	22.0	100+	
3	See Test Location Plan	102.0	22.3	99.0	
4	See Test Location Plan	101.5	20.6	98.5	
5	See Test Location Plan	101.8	20.2	98.8	
6	See Test Location Plan	99.1	22.2	96.2	Perm/Sample (DL-261)
7	See Test Location Plan	100.6	20.9	97.7	
8	See Test Location Plan	102.9	19.9	99.9	
9	See Test Location Plan	102.0	20.0	99.0	
10	See Test Location Plan	102.5	20.6	99.5	
11	See Test Location Plan	100.6	21.2	97.7	
12	See Test Location Plan	101.8	21.6	98.8	
13	See Test Location Plan	100.7	22.0	97.8	
14	See Test Location Plan	99.8	23.0	96.9	
15	See Test Location Plan	101.1	21.0	98.2	
16	See Test Location Plan	101.5	20.9	98.5	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec) 2.5x10(-8)

Dry Density (pcf) 102.6

Moisture Content (%) 21.0

Atterberg Limits (ASTM D4318)

PL 19
LL 44
PI 25

USCS Classification CL

Grain-size Analysis (ASTM D422)

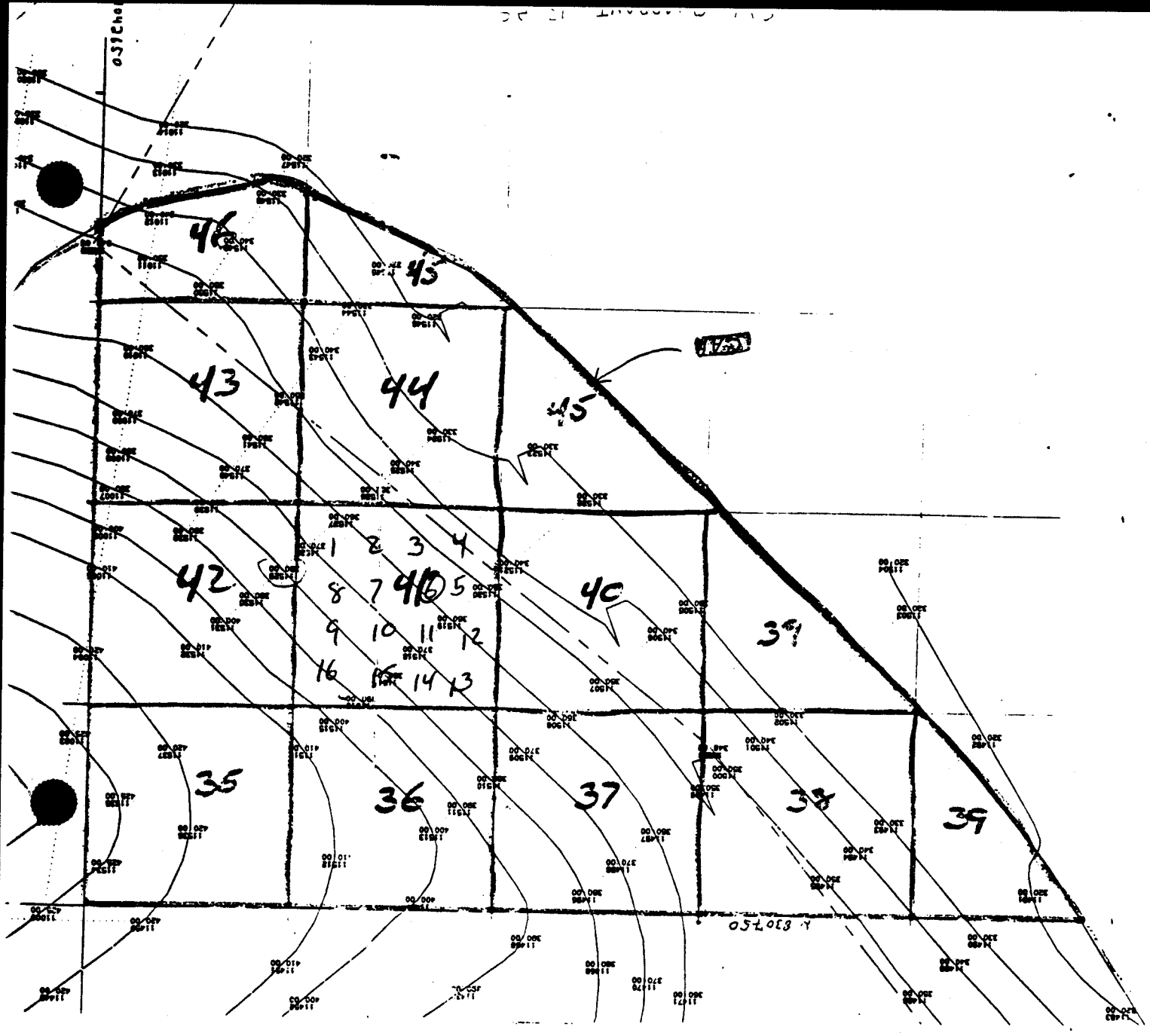
%Gravel 0.0
%Sand 41.8
%Silt 17.0
%Clay 41.2

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

Robert L. Mashewske

Robert L. Mashewske, P.E.

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



12/5/98

Test location plan

Acre 41 / Lift 2

⑥ = Perm location

Report: 133

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	41.8	17.0	41.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	95.9		
#40	87.7		
#60	77.6		
#100	68.9		
#200	58.2		

* (no specification provided)

Soil Description

On-site Borrow - Sandy lean clay

Atterberg Limits

PL= 19 LL= 44 PI= 25

Coefficients

D_{85}= 0.366 D_{60}= 0.0906 D_{50}= 0.0148
D_{30}= 0.0014 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

DL-261, Acre 41, Lift 2

Sample No.: DL-261 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 41, 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: 01/05/99
Report No.: P-196

Project No.: VNC-98-029
Sample No.: DL-261

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.5E-008	cm/sec
% Moisture	21.0	%
Dry Density	102.6	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/05/98
Location: Acre 41, Lift 2

Specimen Data

Length (in):	3.002
Diameter (in.):	2.853
Area (sq. in.):	6.404
Volume (cu. in.):	19.22
Wet Weight (grams):	625.9
Dry Weight (grams):	517.5
Dry Density (pcf):	102.6

Wet Weight	146.60
Dry Weight	125.01
Tare weight	21.96
% Moisture	21.0

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
195	138.46	0.65	0.60	0.92	0.63	2.82E-008
433	138.46	1.40	1.20	0.86	1.30	2.64E-008
581	141.23	1.65	1.30	0.79	1.48	2.19E-008
260	141.23	0.75	0.65	0.87	0.70	2.32E-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
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.: 064

Acre 42 Lift 2

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	96.8	22.9	100.0	
2	See Test Location Plan	99.2	23.6	100+	
3	See Test Location Plan	96.1	24.8	99.3	
4	See Test Location Plan	97.9	26.1	100+	Perm/Sample (DL-162)
5	See Test Location Plan	94.7	22.7	97.8	
6	See Test Location Plan	93.2	25.0	96.3	
7	See Test Location Plan	93.9	26.8	97.0	
8	See Test Location Plan	94.1	26.2	97.2	
9	See Test Location Plan	93.6	25.3	96.7	
10	See Test Location Plan	94.8	25.0	97.9	
11	See Test Location Plan	95.0	23.8	98.1	
12	See Test Location Plan	95.3	24.6	98.5	
13	See Test Location Plan	96.8	23.1	100.0	
14	See Test Location Plan	96.0	22.6	99.2	
15	See Test Location Plan	96.1	22.7	99.3	
16	See Test Location Plan	95.6	24.0	98.8	

Density (ASTM D2922)
D3017)

Moisture (ASTM

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

Permeability (cm/sec)	3.0 x 10(-8)
Dry Density (pcf)	97.6
Moisture Content (%)	25.0

Atterberg Limits (ASTM D4318)

PL	30
LL	80
PI	50
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.1
%Sand	19.8
%Silt	21.5
%Clay	58.6

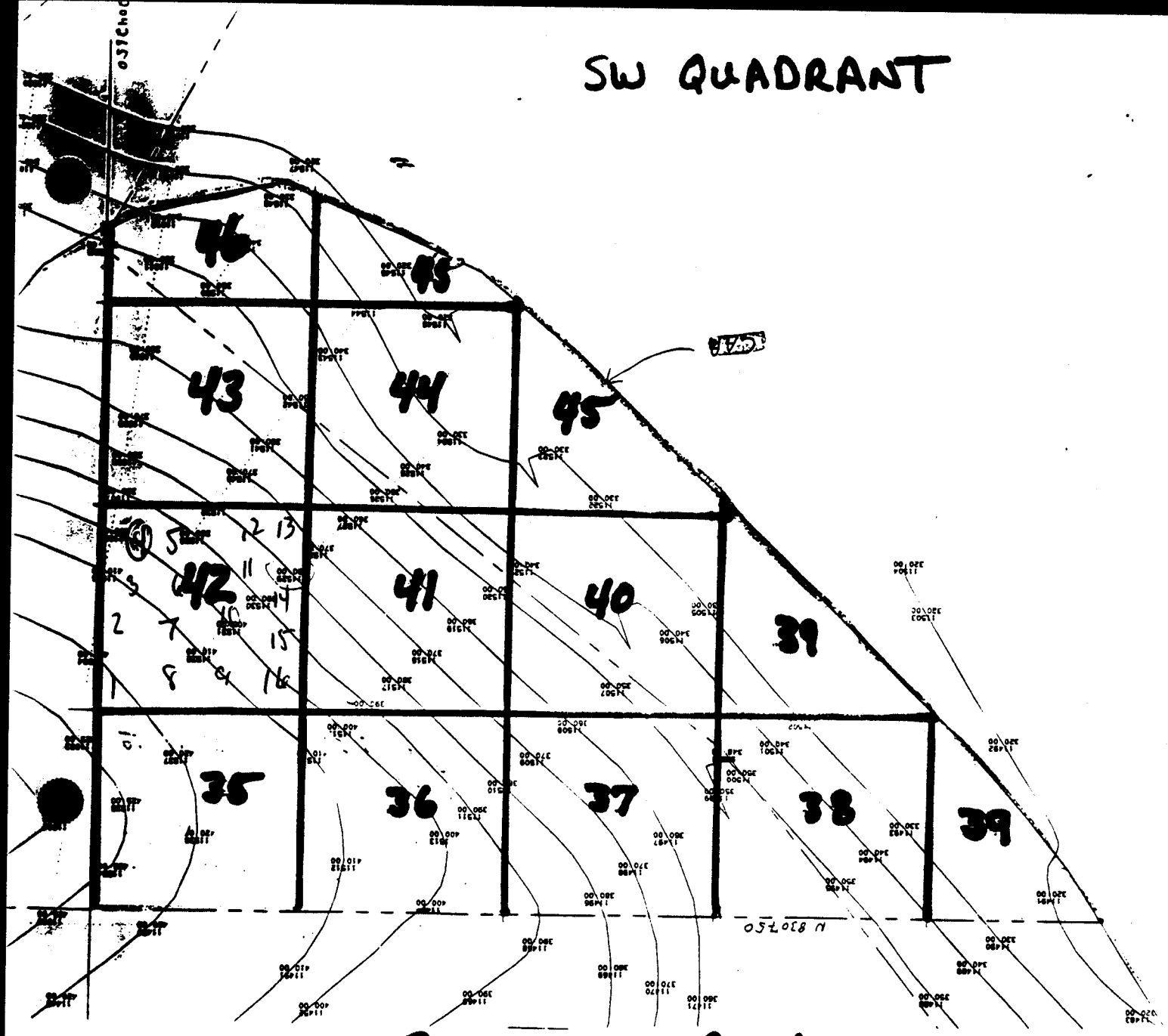
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023083 ENGINEER ROBERT LEE MASHEWSKE

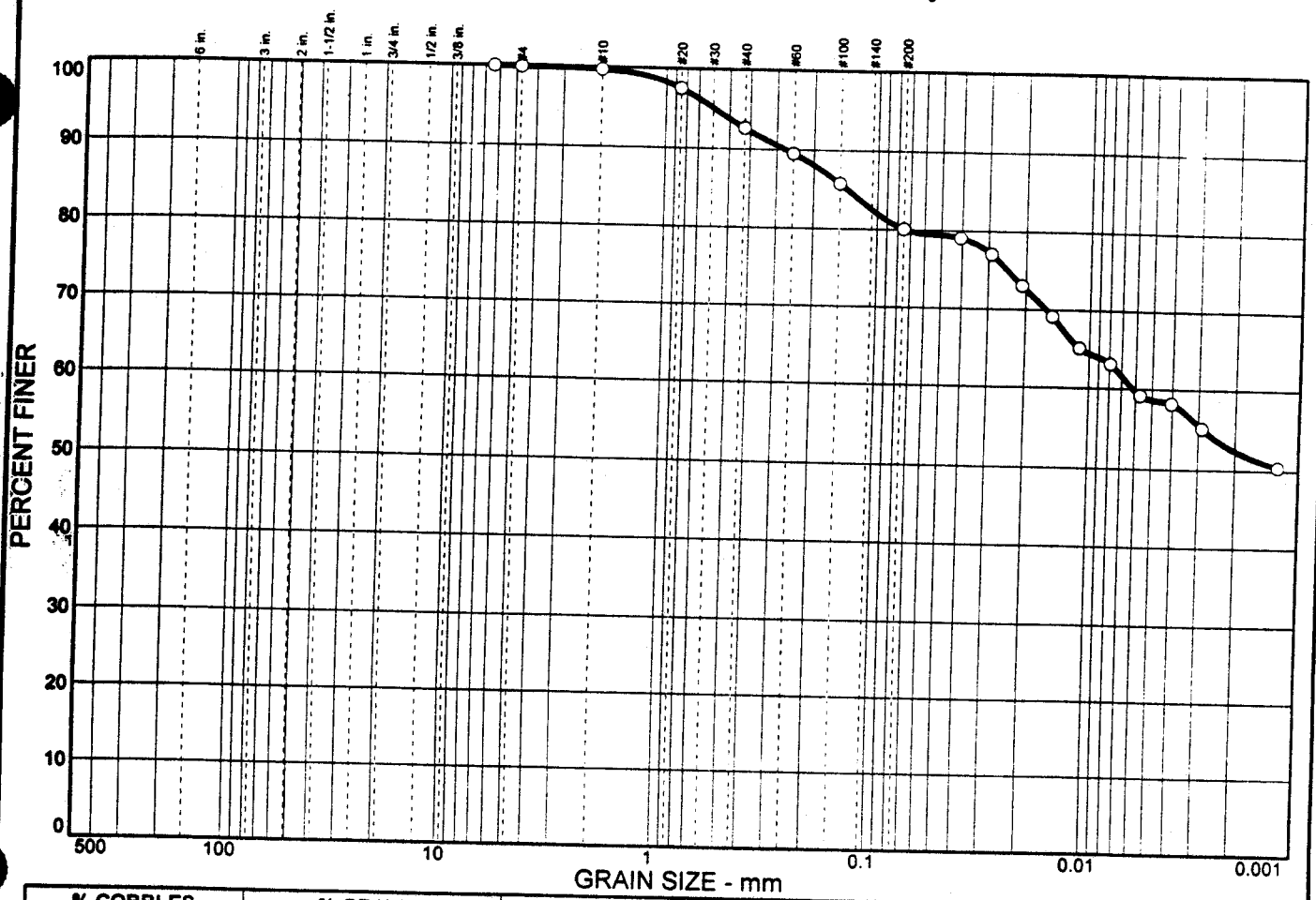
Attachments:
- Grain-size Test Report
- Permeability Test Report
- Test Location Plan

SW QUADRANT



(4) - Indicates Perm/Sample Location
Area 42 Lift 2
Report : 63

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	19.8	21.5	58.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.7		
#20	97.5		
#40	92.6		
#60	89.5		
#100	85.8		
#200	80.1		

* (no specification provided)

Soil Description

Fogelman Pit - Fat clay with sand

Atterberg Limits

PL= 30 LL= 80 PI= 50

Coefficients

D_{85}= 0.137 D_{60}= 0.0062 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-162, Acre 42, Lift 2

Sample No.: DL-162 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 42, Lift 2 **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-132

Project No.: VNC-98-029
Sample No.: DL-162

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.0E-008	cm/sec
% Moisture	25.0	%
Dry Density	97.6	pcf

Sample Information

Specimen Type:
Remolded ____
Tube X

Date Sampled: 11/10/98
Location: ACRE 12, LIFT 2

Specimen Data

Length (in):	3.520
Diameter (in.):	2.843
Area (sq. in.):	6.359
Volume (cu. in.):	22.38
Wet Weight (grams):	716.7
Dry Weight (grams):	573.3
Dry Density (pcf):	97.6

Moisture Content Test Data

Wet Weight	110.38
Dry Weight	92.73
Tare weight	22.14
% Moisture	25.0

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
314	83.08	0.60	0.60	1.00	0.60	3.31E-008
573	83.08	1.20	0.90	0.75	1.05	3.17E-008
510	83.08	0.90	0.85	0.94	0.88	2.97E-008
939	83.08	1.20	1.60	1.33	1.40	2.58E-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) **3.0E-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: 12/03/98
Report No.: 078

Acre 43 Lift 2

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	23.7	100+	
2	See Test Location Plan	94.9	23.8	98.0	
3	See Test Location Plan	95.3	24.1	98.5	
4	See Test Location Plan	97.8	22.7	100+	
5	See Test Location Plan	96.8	22.9	100.0	
6	See Test Location Plan	95.7	23.2	98.9	
7	See Test Location Plan	96.0	23.6	99.2	
8	See Test Location Plan	97.2	22.6	100+	
9	See Test Location Plan	95.4	24.9	98.6	
10	See Test Location Plan	94.2	26.8	97.3	Perm location (DL-201)
11	See Test Location Plan	94.8	25.2	97.9	
12	See Test Location Plan	96.2	25.8	99.4	
13	See Test Location Plan	93.9	26.2	97.0	
14	See Test Location Plan	95.8	24.8	99.0	
15	See Test Location Plan	94.3	26.3	97.4	
16	See Test Location Plan	96.1	25.9	99.3	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	3.3 x 10(-8)
Dry Density (pcf)	94.2
Moisture Content (%)	26.7

Atterberg Limits (ASTM D4318)

PL	24
LL	68
PI	44
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.3
%Sand	25.5
%Silt	19.6
%Clay	54.6

Sincerely,

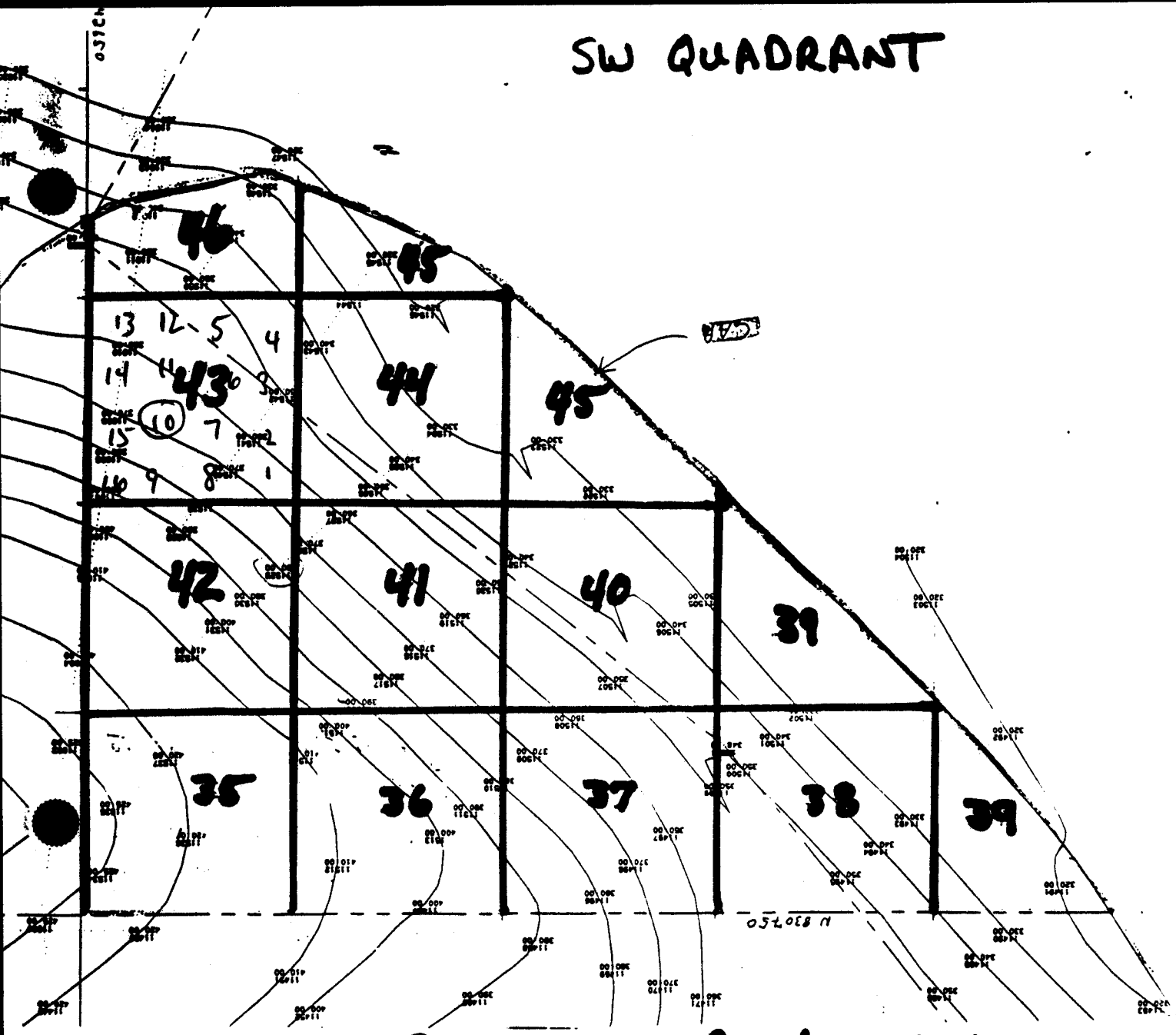
VAN DER HORST Geotechnical Engineering, P.C.

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

SW QUADRANT



(10) - Indicates Perm/Sample Location
Acre 43 Lift 2
Report : 078

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-153

Project No.: VNC-98-029
Sample No.: DL-201

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	3.3E-008	cm/sec
% Moisture	26.7	%
Dry Density	94.2	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/21/98
Location: Acre 43, Lift 2

Specimen Data

Length (in):	3.386
Diameter (in.):	2.854
Area (sq. in.):	6.408
Volume (cu. in.):	21.70
Wet Weight (grams):	679.4
Dry Weight (grams):	536.3
Dry Density (pcf):	94.2

Moisture Content Test Data

Wet Weight	118.84
Dry Weight	98.35
Tare weight	21.56
% Moisture	26.7

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
374	91.38	0.80	0.90	1.13	0.85	3.42E-008
490	91.38	1.10	1.30	1.18	1.20	3.68E-008
281	91.38	0.60	0.65	1.08	0.63	3.34E-008
270	91.38	0.50	0.50	1.00	0.50	2.78E-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)

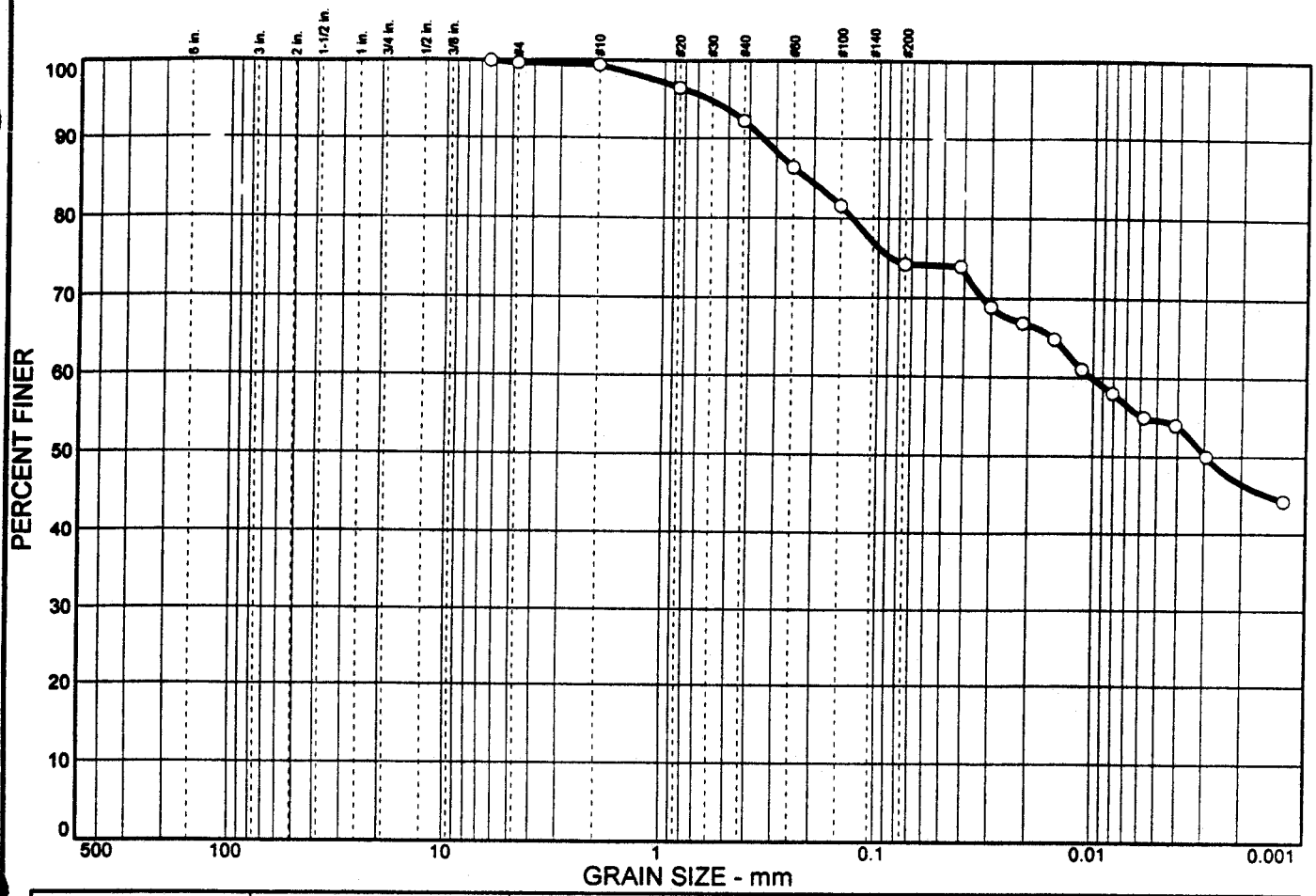
Permeability (k) **3.3E-008** cm/sec

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	25.5	19.6	54.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.7		
#10	99.4		
#20	96.5		
#40	92.2		
#60	86.4		
#100	81.6		
#200	74.2		

* (no specification provided)

Soil Description

Fogelman Pit - Fat clay with sand

Atterberg Limits

PL= 24 LL= 68 PI= 44

Coefficients

D_{85}= 0.215 D_{60}= 0.0102 D_{50}= 0.0029
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-201, Acre 43, Lift 2

Sample No.: DL-201 **Source of Sample:** **Date:**
Location: Acre 43, Lift 2 **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: 01/20/99 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
On-Site Borrow Pit Acre 44, Lift 2

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.153	Clay Cover Testing Report Acre 44, Lift 2

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.: 153

Acre 44 Lift 2

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	98.0	27.4	95.1	
2	See Test Location Plan	99.6	24.6	96.7	
3	See Test Location Plan	100.8	23.9	97.9	
4	See Test Location Plan	100.3	22.6	97.4	
5	See Test Location Plan	101.6	21.7	98.6	
6	See Test Location Plan	102.3	20.8	99.3	
7	See Test Location Plan	101.3	21.0	98.3	Perm/Sample (DL-281)
8	See Test Location Plan	99.3	22.3	96.4	
9	See Test Location Plan	99.8	23.2	96.9	
10	See Test Location Plan	100.7	21.7	97.8	
11	See Test Location Plan	101.6	22.6	98.6	
12	See Test Location Plan	101.2	22.3	98.3	
13	See Test Location Plan	102.8	20.3	99.8	
14	See Test Location Plan	103.1	20.1	100+	
15	See Test Location Plan	101.6	22.2	98.6	
16	See Test Location Plan	101.1	22.8	98.2	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 8.4x10(-9)

Dry Density (pcf) 98.1

Moisture Content (%) 24.0

Atterberg Limits (ASTM D4318)

PL 20
LL 53
PI 33

USCS Classification CH

Grain-size Analysis (ASTM D422)

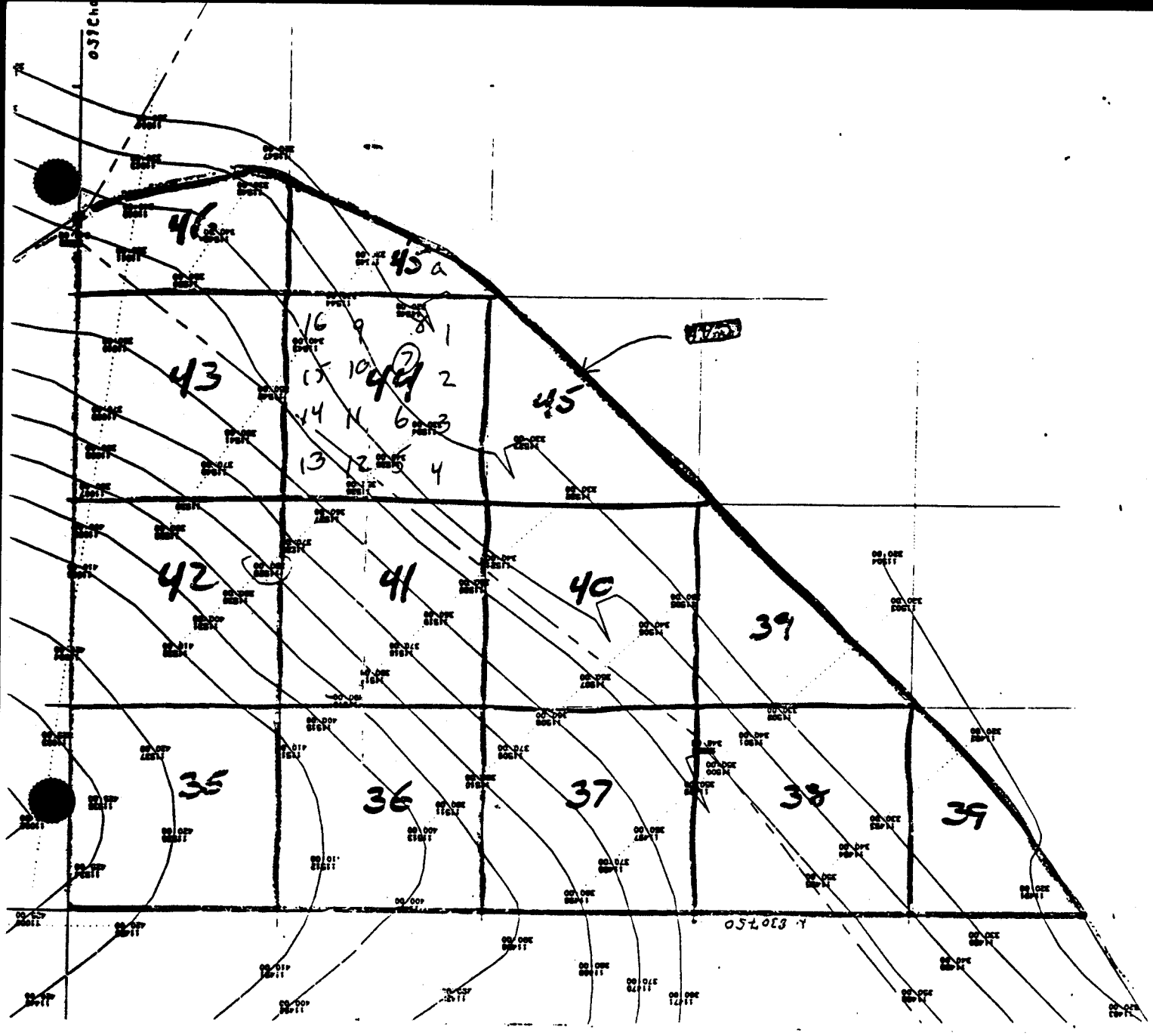
%Gravel 0.6
%Sand 27.2
%Silt 24.5
%Clay 47.7

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

Robert L. Mashewske, P.E.

NORTH CAROLINA PROFESSIONAL SEAL 023033 ENGINEER ROBERT LEE MASHEWSKE

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



12/11/98

Test location Plan

Acre 44 / Lift 2

⊗ = Perm location

Report: 153

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 12/31/98
Report No.: P-232

Project No.: VNC-98-029
Sample No.: DL-281

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	8.4E-009	cm/sec
% Moisture	24.0	%
Dry Density	98.1	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/11/98
Location: Acre 44, Lift 2

Specimen Data

Length (in):	3.180
Diameter (in.):	2.864
Area (sq. in.):	6.453
Volume (cu. in.):	20.52
Wet Weight (grams):	655.6
Dry Weight (grams):	528.6
Dry Density (pcf):	98.1

Wet Weight	124.59
Dry Weight	104.73
Tare weight	22.03
% Moisture	24.0

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1062	221.53	0.65	1.45	2.23	1.05	5.72E-009
516	221.53	1.30	1.20	0.92	1.25	1.40E-008
923	221.53	1.15	1.05	0.91	1.10	6.89E-009
1411	221.53	1.75	1.60	0.91	1.68	6.87E-009

x

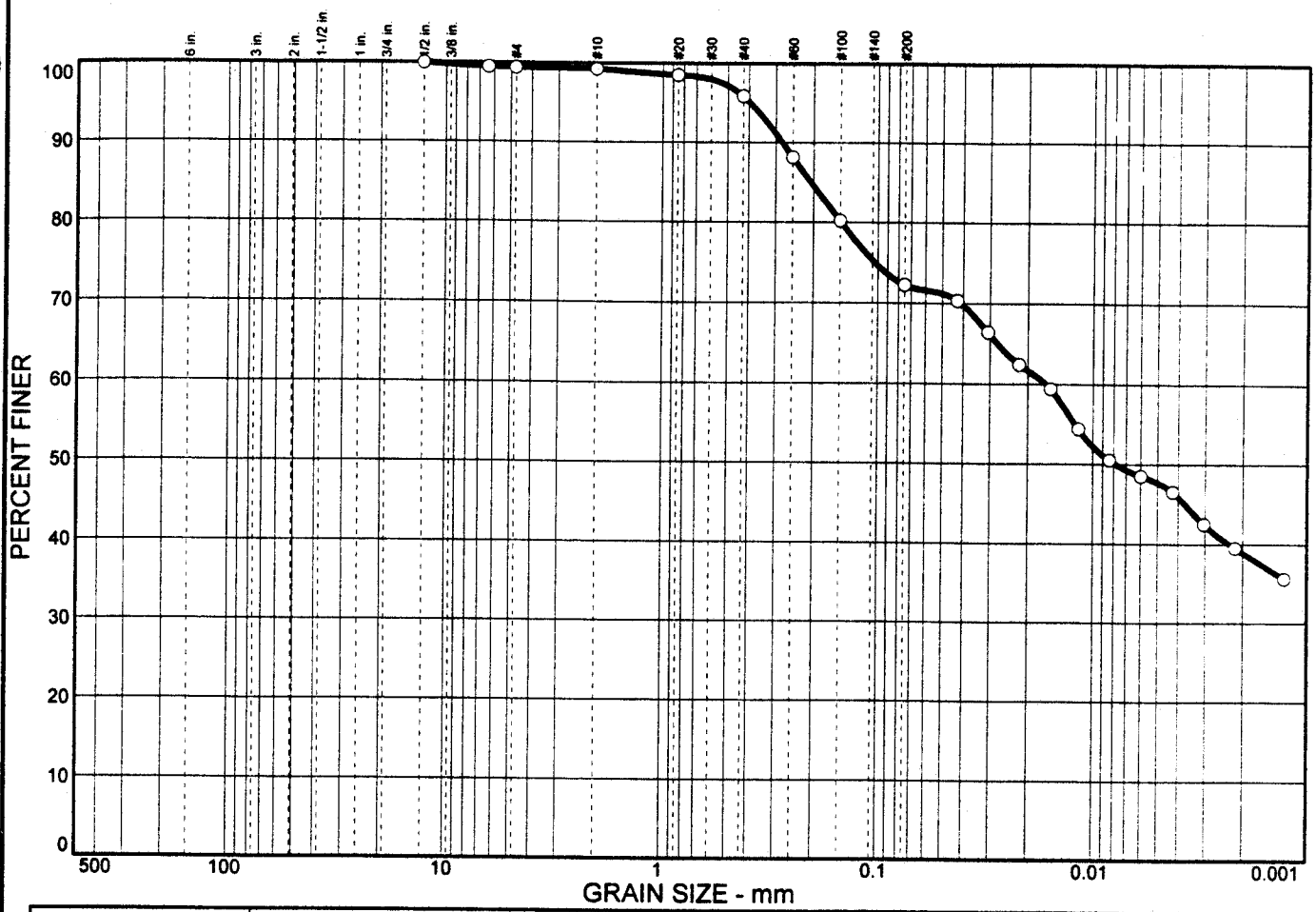
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **8.4E-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	0.6	27.2	24.5	47.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	99.5		
#4	99.4		
#10	99.3		
#20	98.5		
#40	95.9		
#60	88.2		
#100	80.2		
#200	72.2		

* (no specification provided)

Soil Description

On-site Borrow - Fat clay with sand

Atterberg Limits

PL= 20 LL= 53 PI= 33

Coefficients

D_{85}= 0.205 D_{60}= 0.0165 D_{50}= 0.0078
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-281, Acre 44, Lift 2

Sample No.: DL-281 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 44, Lift 2 **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: 12/17/98
Report No.: 119

Acre 45 Lift 2

Clay Source: Fogelman 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	96.7	26.2	99.9	
2	See Test Location Plan	95.5	25.5	98.6	
3	See Test Location Plan	92.6	26.3	95.7	
4	See Test Location Plan	101.3	24.0	100+	
5	See Test Location Plan	101.1	23.4	100+	
6	See Test Location Plan	99.7	24.1	100+	Perm/Sample (DL-193)
7	See Test Location Plan	102.7	23.4	100+	
8	See Test Location Plan	103.5	23.0	100+	
9	See Test Location Plan	96.4	23.6	99.6	
10	See Test Location Plan	95.9	24.1	99.1	
Density (ASTM D2922)					Moisture (ASTM D3017)

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

Permeability (cm/sec)	7.7x10(-9)
Dry Density (pcf)	99.9
Moisture Content (%)	23.6

Atterberg Limits (ASTM D4318)		**Grain-size Analysis (ASTM D422)**	
PL	18	%Gravel	0.0
LL	50	%Sand	32.4
PI	32	%Silt	14.6
		%Clay	53.0
USCS Classification	CH		

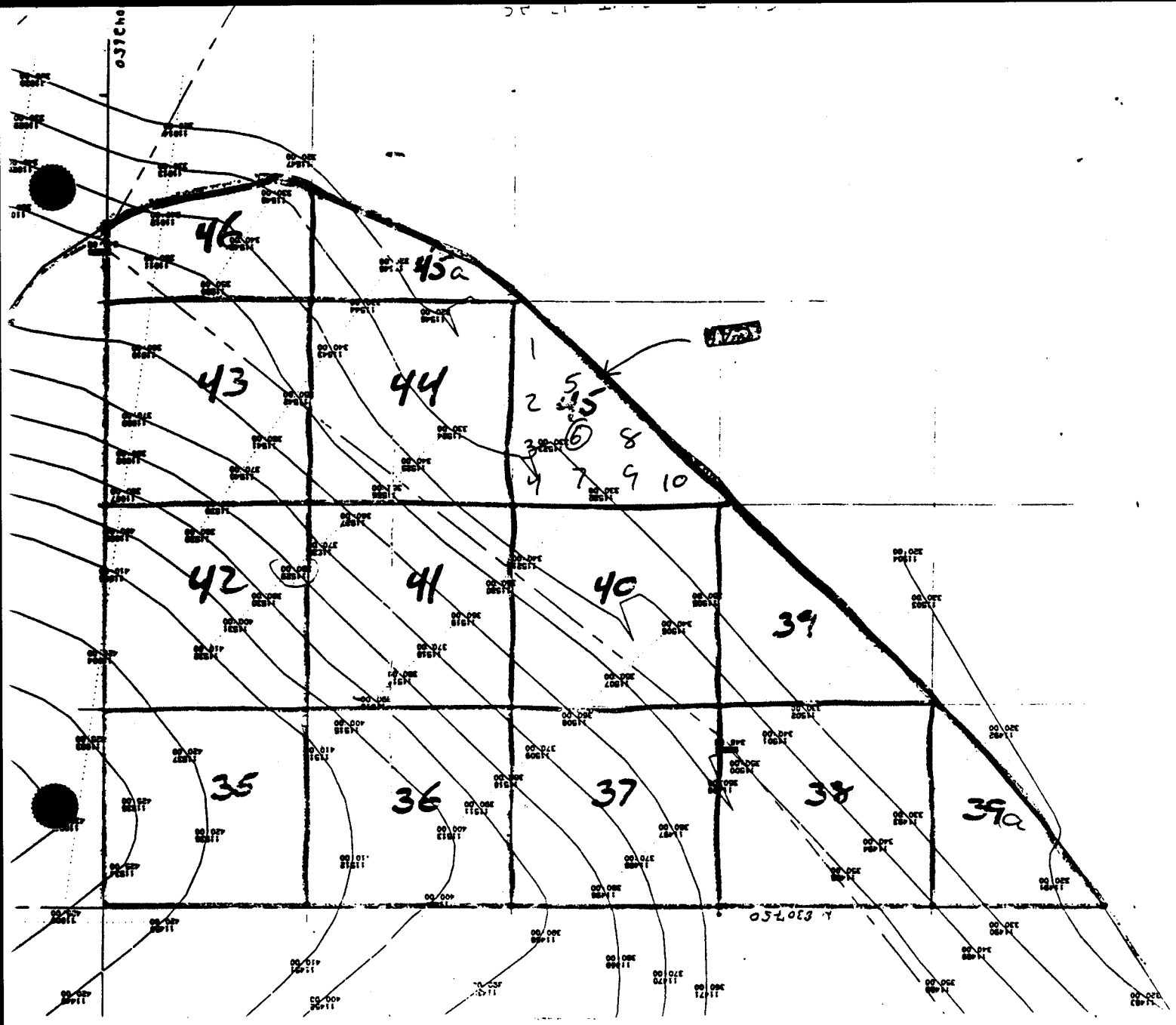
Sincerely,
VAN DER HORST Geotechnical Engineering, P.C.

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



11/19/98

Test location Plan

Acre 45 / Lift 2

⑥ = Perm location

Report: 119

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-145

Project No.: VNC-98-029
Sample No.: DL-193

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	7.7E-009	cm/sec
% Moisture	23.6	%
Dry Density	99.9	pcf

Sample Information

Specimen Type:
Remolded
Tube x

Date Sampled: 11/19/98
Location: Acre 45, Lift 2

Specimen Data

Length (in):	3.247
Diameter (in.):	2.846
Area (sq. in.):	6.372
Volume (cu. in.):	20.69
Wet Weight (grams):	670.3
Dry Weight (grams):	542.3
Dry Density (pcf):	99.9

Moisture Content Test Data

Wet Weight	111.09
Dry Weight	94.05
Tare weight	21.85
% Moisture	23.6

Test Data

Confining Pressure 3.0 psi

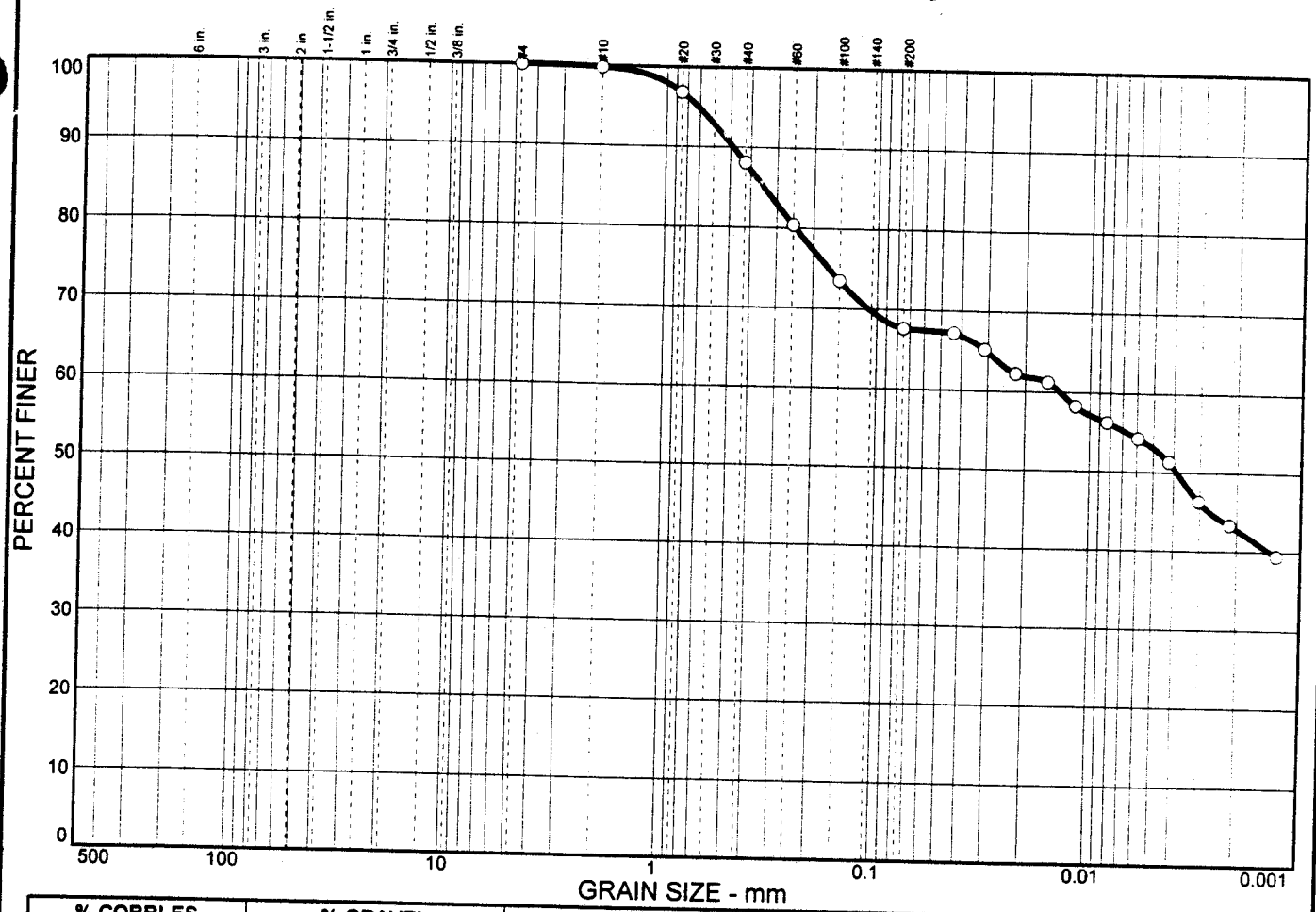
Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
526	141.23	0.40	0.50	1.25	0.45	8.03E-009
971	141.23	0.90	0.75	0.83	0.83	7.97E-009
719	141.23	0.55	0.55	1.00	0.55	7.18E-009
651	141.23	0.55	0.50	0.91	0.53	7.56E-009

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) **7.7E-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	32.4	14.6	53.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	96.8		
#40	88.1		
#60	80.4		
#100	73.5		
#200	67.6		

* (no specification provided)

Soil Description

Fogelman - Sandy fat clay

Atterberg Limits

PL= 18 LL= 50 PI= 32

Coefficients

D_{85}= 0.344 D_{60}= 0.0138 D_{50}= 0.0039
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-193, Fogleman - Acre 45, Lift 2

Sample No.: DL-193 **Source of Sample:** Fogelman Borrow Pit **Date:**
Location: Fogelman borrow pit - Acre 45, Lift 2 **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: 01/20/99 JOB NO.: VNC-98-029

ATTENTION: Andy Palabnuk

REGARDING: Durham County Landfill Closure
On-Site Borrow Pit Acre 45a, Lift 2

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.156	Clay Cover Testing Report Acre 45a, Lift 2

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.: 156

Acre 45a Lift 2
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	102.0	22.1	99.0	
2	See Test Location Plan	102.3	22.6	99.3	
3	See Test Location Plan	101.0	24.4	98.1	Perm/Sample (DL-284)
4	See Test Location Plan	100.7	22.3	97.8	
5	See Test Location Plan	99.8	23.0	96.9	
6	See Test Location Plan	101.4	21.6	98.4	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec) 2.1x10(-9)

Dry Density (pcf) 100.5

Moisture Content (%) 24.5

Atterberg Limits (ASTM D4318)

PL 21
LL 56
PI 35

USCS Classification CH

Grain-size Analysis (ASTM D422)

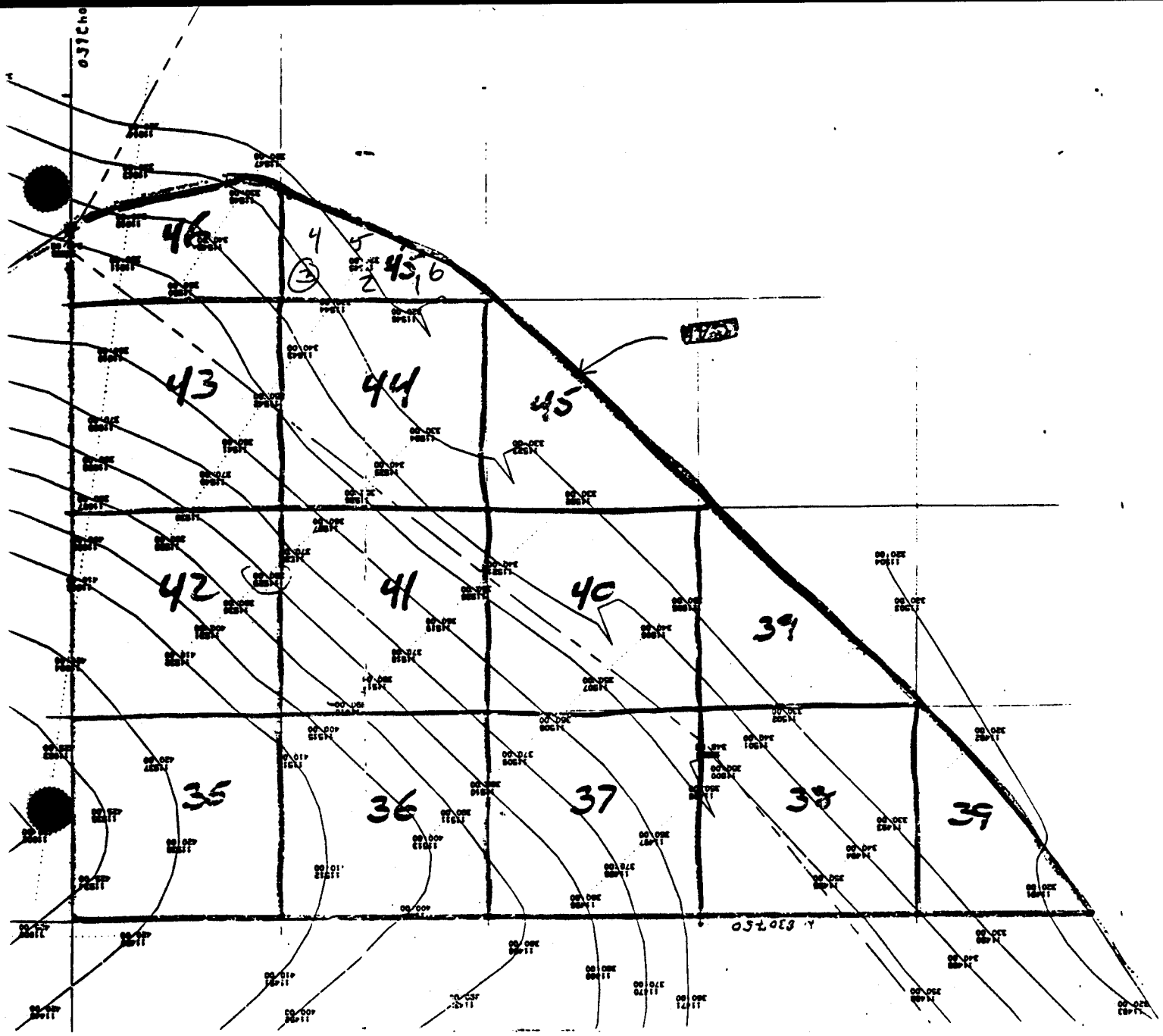
%Gravel 0.0
%Sand 22.8
%Silt 27.0
%Clay 50.2

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



12/11/98

Test location Plan

Acre 45a/Lift 2

③ = Perm location

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 01/01/98
Report No.: P-233

Project No.: VNC-98-029
Sample No.: DL-284

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	2.1E-009	cm/sec
% Moisture	24.5	%
Dry Density	100.5	pcf

Sample Information

Specimen Type:
Remolded ____
Tube x

Date Sampled: 12/11/98
Location: Acre 45A, Lift 2

Specimen Data

Length (in):	3.137
Diameter (in.):	2.870
Area (sq. in.):	6.480
Volume (cu. in.):	20.33
Wet Weight (grams):	667.3
Dry Weight (grams):	536.1
Dry Density (pcf):	100.5

Wet Weight	140.75
Dry Weight	117.39
Tare weight	21.98
% Moisture	24.5

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
1794	210.46	0.50	0.55	1.10	0.53	1.75E-009
1630	207.69	0.95	0.80	0.84	0.88	3.25E-009
1611	207.69	0.50	0.45	0.90	0.48	1.79E-009
2160	207.69	0.55	0.55	1.00	0.55	1.54E-009

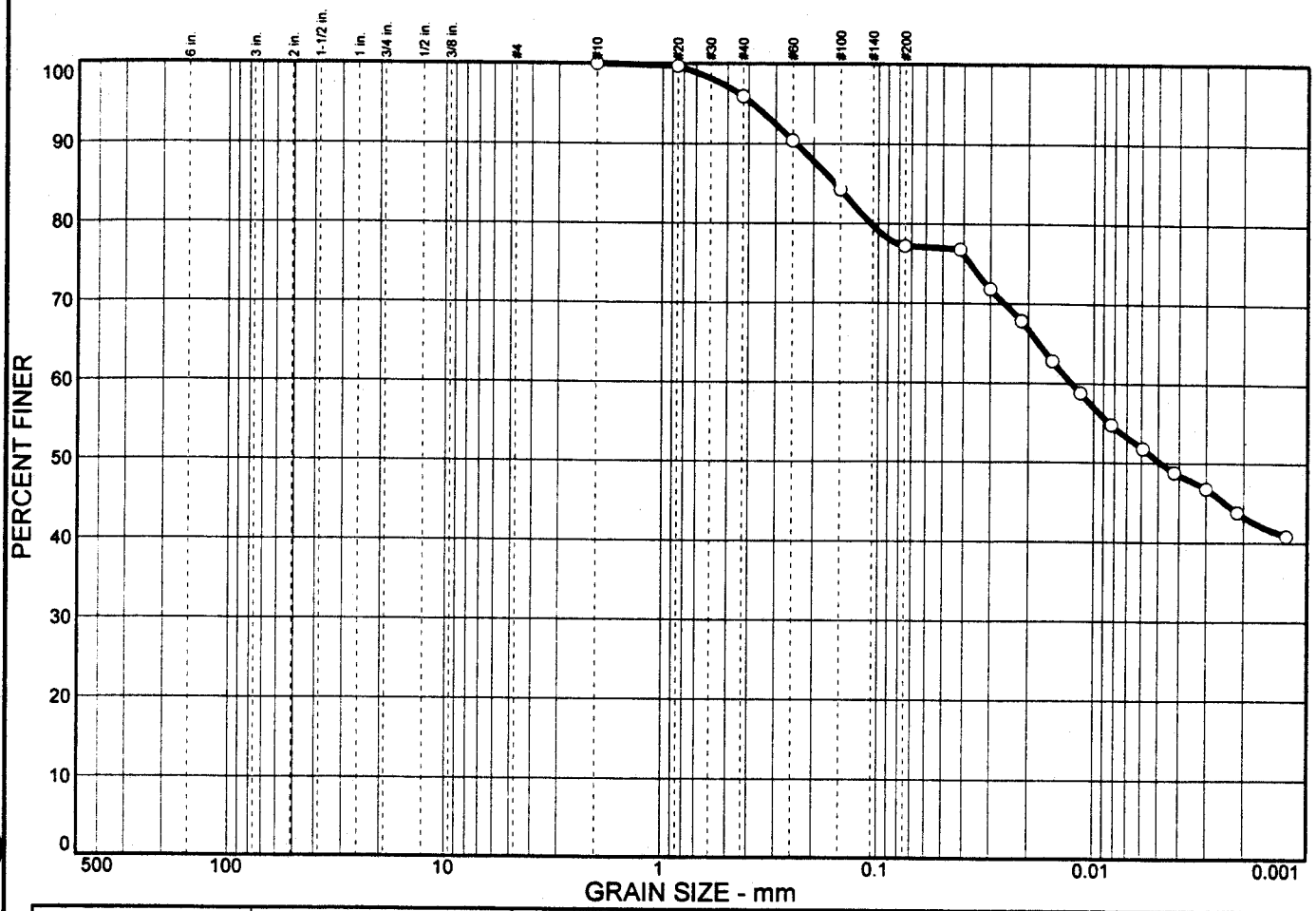
x

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) **2.1E-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	22.8	27.0	50.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.7		
#40	95.9		
#60	90.4		
#100	84.3		
#200	77.2		

* (no specification provided)

Soil Description

On-site Borrow - Fat clay with sand

Atterberg Limits

PL= 21 LL= 56 PI= 35

Coefficients

D_{85}= 0.158 D_{60}= 0.0126 D_{50}= 0.0049
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

DL-284, Acre 45A, lift 2

Sample No.: DL-284 **Source of Sample:** On-site borrow pit clay **Date:**
Location: Acre 45A, Lift 2 **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.: 079

Acre 46 Lift 2

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	97.7	23.0	97.2	
2	See Test Location Plan	96.2	23.4	95.7	
3	See Test Location Plan	102.2	21.8	100+	
4	See Test Location Plan	101.4	21.2	100+	
5	See Test Location Plan	100.6	21.4	100+	
6	See Test Location Plan	99.8	22.1	99.3	
7	See Test Location Plan	99.0	22.4	98.5	
8	See Test Location Plan	98.6	23.2	98.1	
9	See Test Location Plan	98.9	23.1	98.4	
10	See Test Location Plan	99.8	24.5	99.3	Tube/Sample (DL-203)
11	See Test Location Plan	97.9	23.8	97.4	
12	See Test Location Plan	98.0	22.8	97.5	
13	See Test Location Plan	96.7	24.1	96.2	
14	See Test Location Plan	95.8	24.6	95.3	
15	See Test Location Plan	96.9	23.8	96.4	
16	See Test Location Plan	97.6	23.0	97.1	

Density (ASTM D2922) Moisture (ASTM D3017)

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

Permeability (cm/sec)	4.0 x 10(-8)
Dry Density (pcf)	101.3
Moisture Content (%)	21.4

Atterberg Limits (ASTM D4318)

PL	20
LL	51
PI	31
USCS Classification	CH

Grain-size Analysis (ASTM D422)

%Gravel	0.1
%Sand	33.0
%Silt	22.7
%Clay	44.2

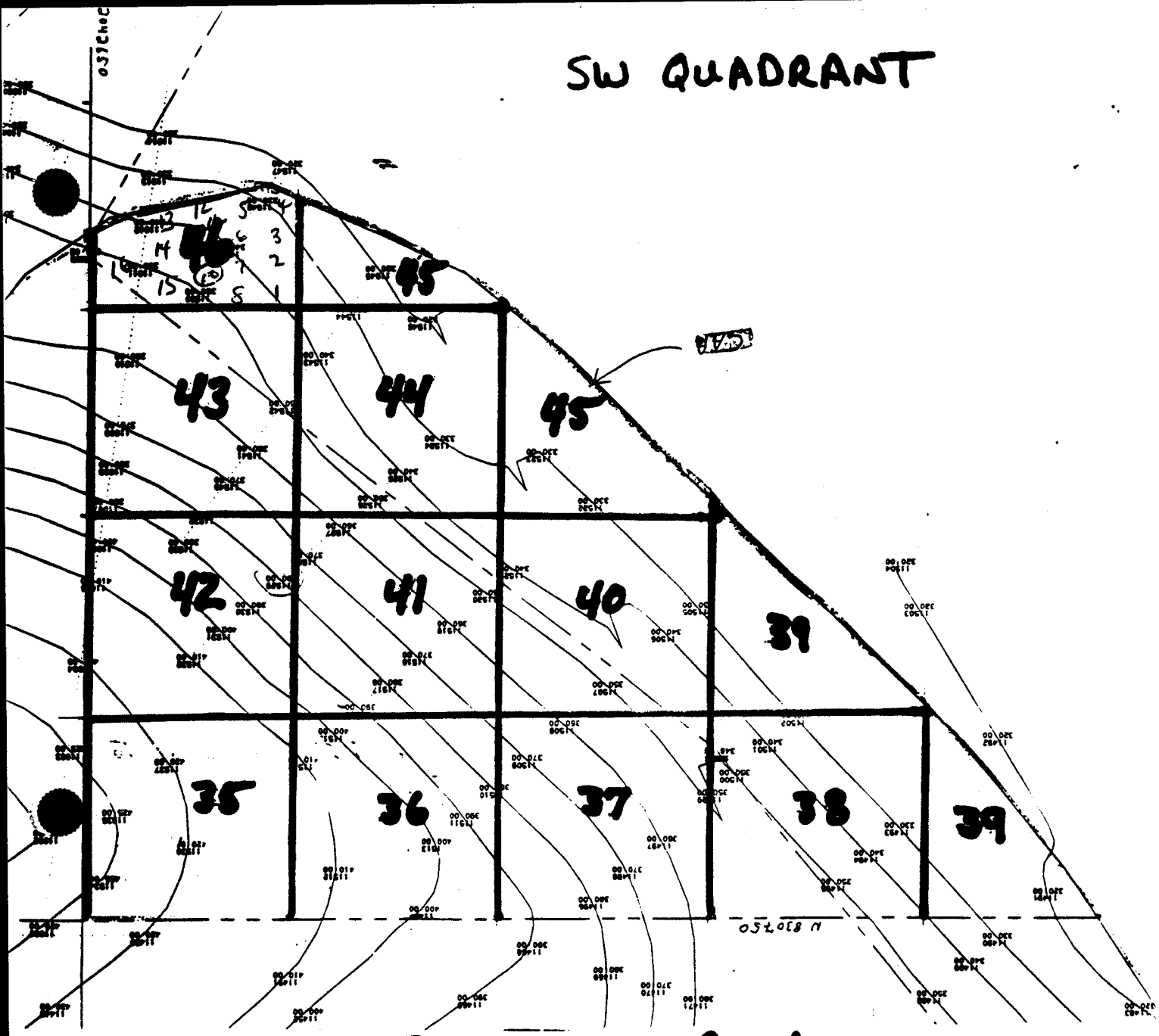
Sincerely,
VAN DER HORST Geotechnical Engineering, P.A.

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

SW QUADRANT



(10) - Indicates Perm/Sample Location

Area 46 Lift 2

Report : 079

VANDERHORST

PERMEABILITY TEST REPORT
ASTM D5084 - Method A

Date: 11/30/98
Report No.: P-155

Project No.: VNC-98-029
Sample No.: DL-203

Project: Durham Landfill Closure
Client: Gilbert Southern Corp.

Test Summary

Permeability	4.0E-008	cm/sec
% Moisture	21.4	%
Dry Density	101.3	pcf

Sample Information

Specimen Type:
Remolded
Tube X

Date Sampled: 11/21/98
Location: Acre 46, Lift 2

Specimen Data

Length (in):	3.223
Diameter (in.):	2.848
Area (sq. in.):	6.381
Volume (cu. in.):	20.57
Wet Weight (grams):	663.9
Dry Weight (grams):	546.9
Dry Density (pcf):	101.3

Moisture Content Test Data

Wet Weight	128.62
Dry Weight	109.84
Tare weight	22.04
% Moisture	21.4

Test Data

Confining Pressure 3.0 psi

Δ T	H	Inflow (B)	Outflow (C)	C/B ratio	Q	k
129	138.46	0.60	0.65	1.08	0.63	4.59E-008
249	138.46	1.10	0.90	0.82	1.00	3.81E-008
179	138.46	0.75	0.65	0.87	0.70	3.71E-008
181	138.46	0.75	0.75	1.00	0.75	3.93E-008

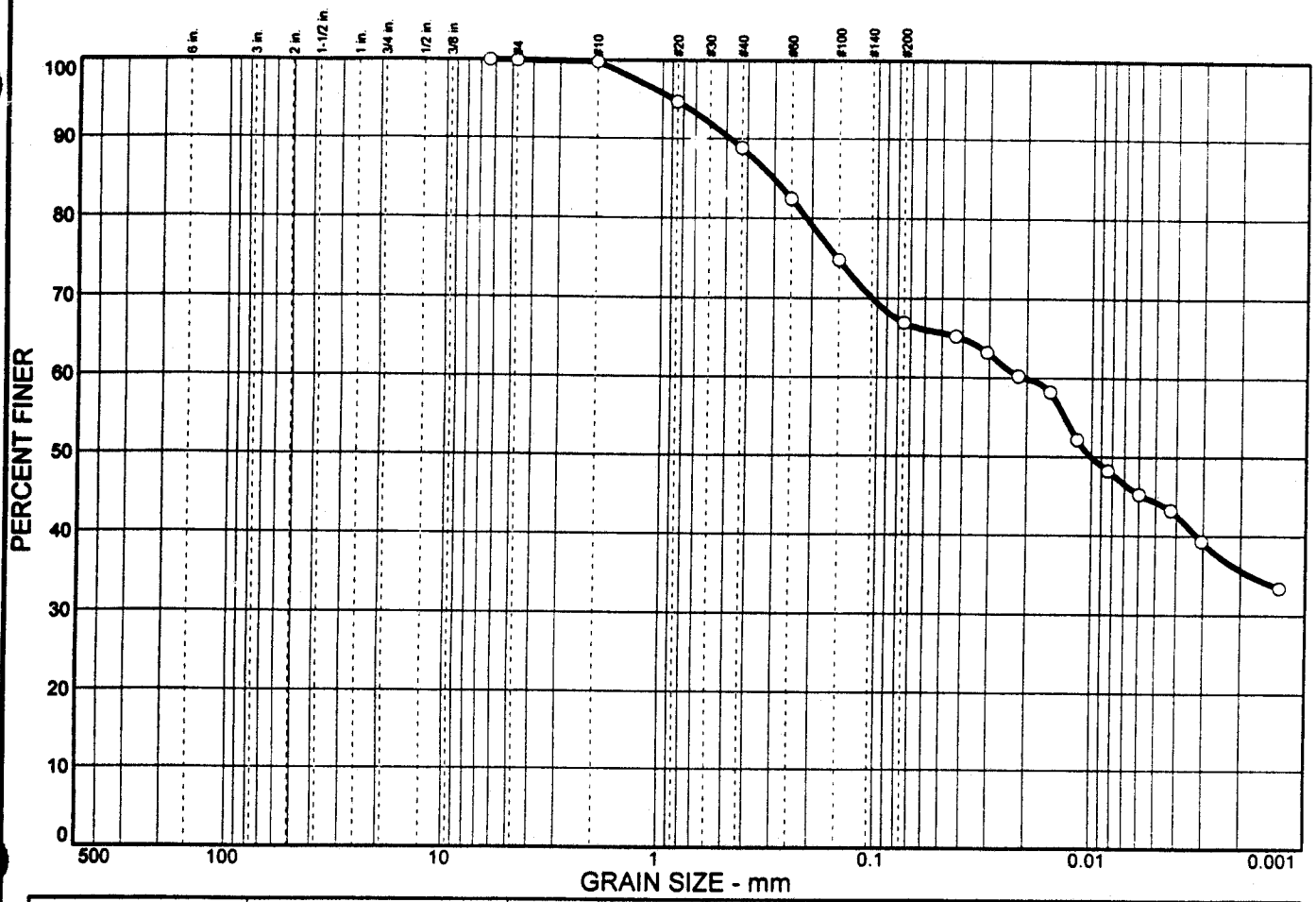
Δ T	Change in time (minutes)
H	Driving head (inches)
Inflow (B)	Flow in (cubic centimeters)
Inflow (C)	Flow out (cubic centimeters)
Q	Flow (cubic centimeters)

Permeability (k) **4.0E-008** cm/sec

Respecfully submitted

Robert L. Mashewske, P.E.
Regional Manager

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	33.0	22.7	44.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	99.9		
#10	99.8		
#20	94.7		
#40	88.8		
#60	82.4		
#100	74.8		
#200	66.9		

* (no specification provided)

Soil Description

Roberts Pit - Sandy fat clay

Atterberg Limits

PL= 20 LL= 51 PI= 31

Coefficients

D_{85}= 0.304 D_{60}= 0.0210 D_{50}= 0.0100
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

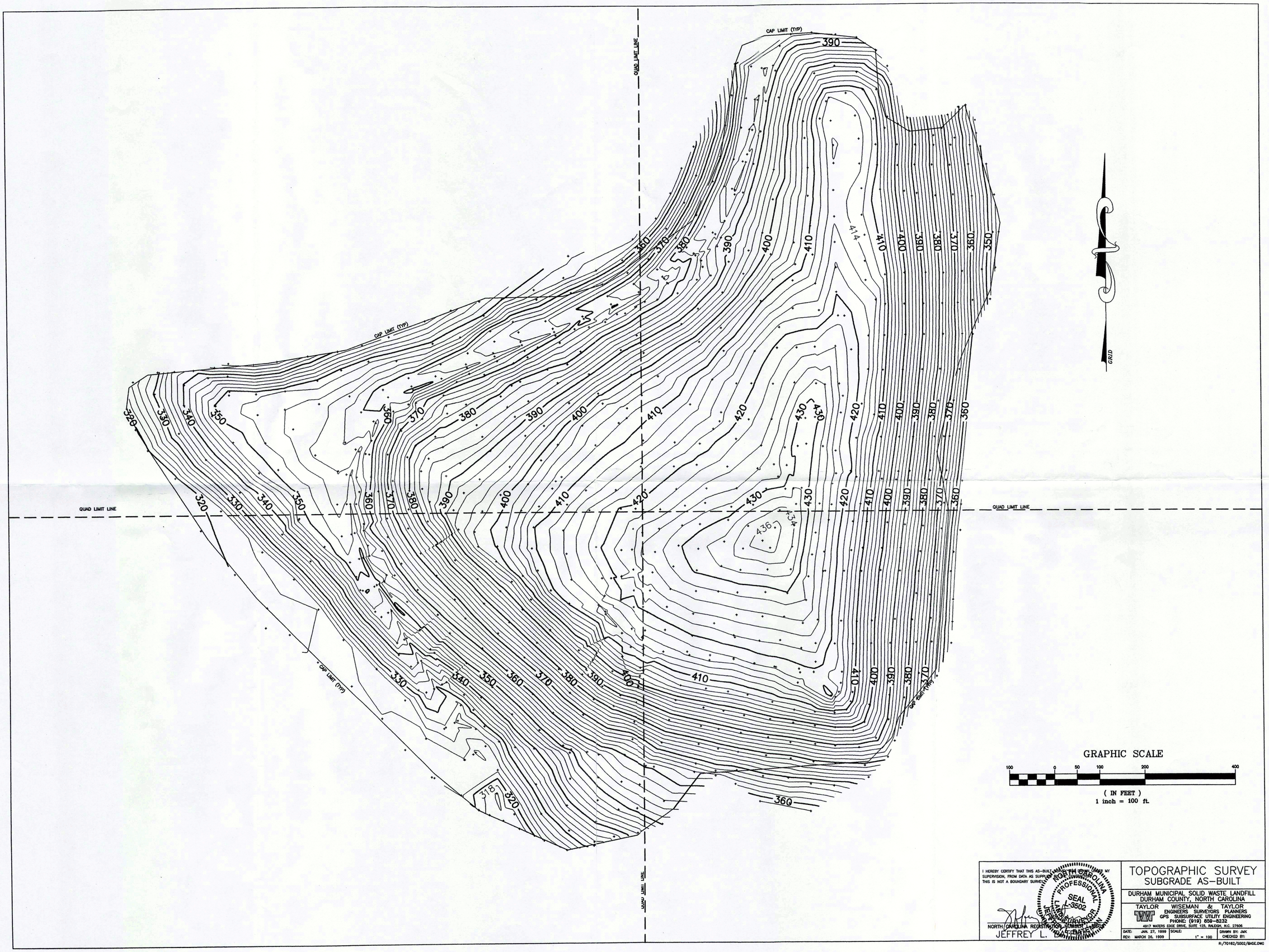
Remarks

DL-203, Acre 46, Lift 2

Sample No.: DL-203 **Source of Sample:** Roberts Pit Clay **Date:**
Location: Acre 46, Lift 2 **Elev./Depth:**

VAN DER HORST ENGINEERING

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



I HEREBY CERTIFY THAT THIS AS-BUILT WAS MADE UNDER MY SUPERVISION, FROM DATA AS SUPPLIED BY OTHERS. THIS IS NOT A BOUNDARY SURVEY.

NORTH CAROLINA REGISTRATION NUMBER L-3502

JEFFREY L. BAILEY

NORTH CAROLINA PROFESSIONAL SEAL L-3502 LAND SURVEYOR JEFFREY L. BAILEY

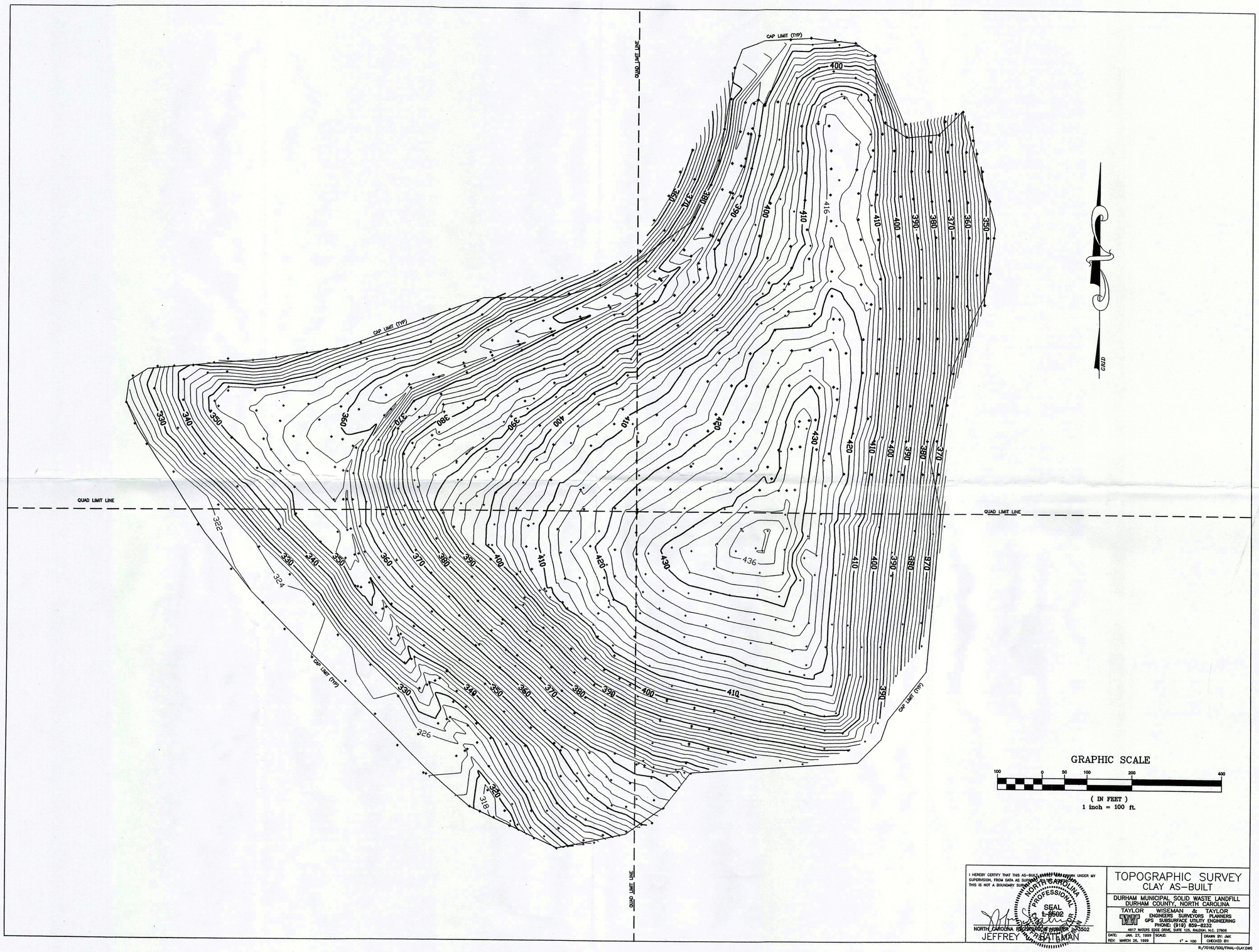
TOPOGRAPHIC SURVEY
SUBGRADE AS-BUILT

DURHAM MUNICIPAL SOLID WASTE LANDFILL
DURHAM COUNTY, NORTH CAROLINA

TAYLOR WISEMAN & TAYLOR
ENGINEERS SURVEYORS PLANNERS
GPS SUBSURFACE UTILITY ENGINEERING
PHONE: (919) 859-8232
4917 WATERS EDGE DRIVE, SUITE 125, RALEIGH, N.C. 27606

DATE: JAN. 27, 1999	SCALE: 1" = 100	DRAWN BY: JMK
REV: MARCH 26, 1999		CHECKED BY:

R:/70162/5002/BASE.DWG



I HEREBY CERTIFY THAT THIS AS-BUILT [illegible] WAS DRAWN UNDER MY SUPERVISION, FROM DATA AS SUPPLIED BY [illegible] THIS IS NOT A BOUNDARY SURVEY.

NORTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 19502
JEFFREY [illegible] SEATEMAN

NORTH CAROLINA PROFESSIONAL SEAL L-9502 ENGINEER

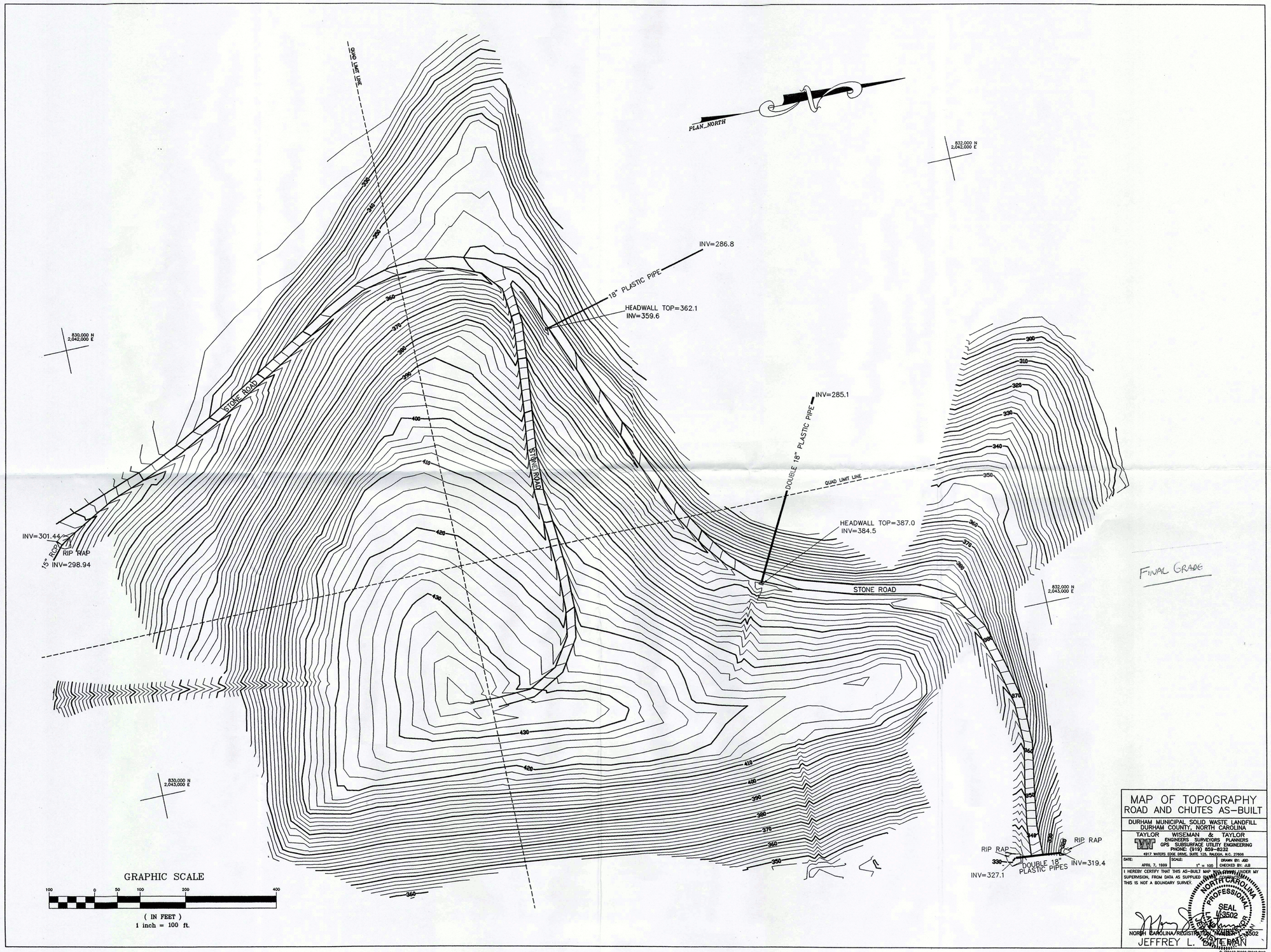
TOPOGRAPHIC SURVEY
CLAY AS-BUILT

DURHAM MUNICIPAL SOLID WASTE LANDFILL
DURHAM COUNTY, NORTH CAROLINA

TAYLOR WISEMAN & TAYLOR
ENGINEERS SURVEYORS PLANNERS
GPS SUBSURFACE UTILITY ENGINEERING
PHONE: (919) 859-8232
4917 WATERS EDGE DRIVE, SUITE 125, RALEIGH, N.C. 27606

DATE: JAN. 27, 1999	SCALE: 1" = 100	DRAWN BY: JMC	
REV: MARCH 26, 1999		CHECKED BY:	

R:/70162/500/FINAL-CLAY.DWG



MAP OF TOPOGRAPHY
ROAD AND CHUTES AS-BUILT

DURHAM MUNICIPAL SOLID WASTE LANDFILL
DURHAM COUNTY, NORTH CAROLINA

TAYLOR WISEMAN & TAYLOR
ENGINEERS SURVEYORS PLANNERS
GPS SUBSURFACE UTILITY ENGINEERING
PHONE: (919) 859-8232
4917 WATERS EDGE DRIVE, SUITE 125, RALEIGH, N.C. 27606

DATE:	SCALE:	DRAWN BY: JBD
APRIL 7, 1999	1" = 100	CHECKED BY: JLB

I HEREBY CERTIFY THAT THIS AS-BUILT MAP WAS PREPARED UNDER MY SUPERVISION, FROM DATA AS SUPPLIED BY OTHERS. THIS IS NOT A BOUNDARY SURVEY.

NORTH CAROLINA PROFESSIONAL SEAL L-3502 LAND SURVEYOR

NORTH CAROLINA REGISTRATION NUMBER L-3502
JEFFREY L. BUNTEMAN

R:/70162/5002/ROAD.DWG