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# Technical Appendices

Submitted By:

The State of New Mexico
*Gary E. Johnson, Governor*

WCS

Waste Control Specialists, LLC

# APPENDIX 45.50-7

# JACK HOLT & ASSOCIATES REPORT

# GEOTECHNICAL INVESTIGATION

# AND

# ENGINEERING ANALYSIS

# FOR

## WASTE CONTROL SPECIALISTS INC.

## LANDFILL PROJECT

## ANDREWS COUNTY, TEXAS

REPORT FOR:

AM ENVIRONMENTAL, INC.

2525 WALLINGWOOD, SUITE 701

AUSTIN, TEXAS 78746

FILE NO.: 10-25792
12 MARCH 1993

JACK H. HOLT Ph.D. & ASSOCIATES INC.
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GEOTECHNICAL INVESTIGATION

ENGINEERING ANALYSIS

FOR

WASTE CONTROL SPECIALISTS INC.

LANDFILL PROJECT

ANDREWS COUNTY, TEXAS

## INTRODUCTION

A Geotechnical Investigation and Engineering Analysis for the above referenced project located in Andrews County, Texas was authorized by Mr. Allen Messenger of A.M. Environmental, Austin, Texas on 15 October 1992. The purpose of the investigation was to determine subsurface soil conditions and materials at the site and to obtain samples for laboratory testing. Based on our boring logs and laboratory tests an engineering analysis was performed to determine foundation stability, slope stability and soil permeability as well as other design parameters for the proposed hazardous waste landfill.

## SCOPE

The scope of the project included the following:

1. Reconnaissance of the project site to observe physical features, vegetation and access to the property.



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2. Surveying grid system on the site on 500 foot intervals and obtaining elevations at each grid point. Topographic survey of entire site and areas outside the site for a distance of 1000 feet.
3. Mobilization and demobilization of office trailer, storage building, electrical service, equipment, van truck, logging trailers, water tank and drill rigs to the site.
4. Drilling, logging and sampling 55 soil borings using air rotary and air coring to depths of 100 feet to 300 feet.
5. Drilling, logging and sampling 12 soil borings to depths of 45 feet to obtain rock cores.
6. Wrapping and packaging core samples in core boxes and properly storing on site prior to shipping to laboratory. Transporting samples to the laboratory in Austin, Texas.
7. Laboratory testing including but not limited to Unified Soils Classifications, Moisture Contents, Unit Weights, Atterberg Limits, Unconfined Compression Tests, Permeabilities, Triaxial Tests, Consolidation Tests, Moisture/Density Relationships and Direct Shear Tests.
8. Installation of eight monitor wells (4 inch PVC) and six piezometers (2 inch PVC) and coordinating the installation of wells with Terra Dynamics, Inc.
9. Monitoring groundwater levels in open bore holes prior to plugging and in water wells and piezometers.
10. Plugging of all bore holes with cement bentonite slurry.



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11. Preparing a written engineering report with grid survey, topographic survey, boring location plan, soil boring logs, laboratory test results and water level data. Preparing engineering analyses including soil permeability, slope stability, foundation stability, settlement analyses and recommendations for landfill design.

LOCATION AND SITE DESCRIPTION

The proposed landfill site is located in Andrews County, Texas approximately 34 miles west of Andrews, Texas on State Highway 176 (see location on State Highway Map - Figure 1). The site is located approximately 0.5 miles north of the Highway on the Flying "W" Diamond Ranch. The initial grid survey area consists of approximately 485 acres of undeveloped ranch land. The landfill area will be 100 acres in size with approximate dimensions of 1100 feet by 4000 feet. The terrain consists of gently sloping grass covered ranch land with scattered small mesquite trees. The proposed landfill site is bordered by a gravel ranch road on the west that parallels the Texas-New Mexico state line. An oil well location exists approximately 2500 feet south of the landfill site. An overhead power line borders the site on the east. The site slopes gradually from north to south changing in surface elevation from approximately 3480 feet to 3440 feet above mean sea level.



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Several surface depressions exist on the landfill site and are locally referred to as buffalo wallows. These depressions are believed to have been formed by the dissolution of the carbonaceous caliche deposits near the surface or from natural depressions in the Triassic red bed clay formation below.

SITE SURVEY AND GRID LAYOUT

The project site was selected by Mr. Allen Messenger after preliminary borings indicated shallow depths to red bed clay in the area. Grid layout with approximate size of 6000 feet by 4500 feet was surveyed by Mr. James E. Tompkins, (R.P.S.) Engineering and Surveying of Andrews, Texas. Grid points were staked on the site at 500 foot intervals. Grid points were lettered from north to south A through J and numbered from east to west 1 through 13. The Texas-New Mexico State line running north to south has a bearing of N 0° 0'0"W. The grid lines A through J have a bearing of S 65° 0' 0" E. The grid lines 1 through 13 have a bearing of S 25° 0'0" W.

Additional surveying was performed by Tompkins Engineering and Surveying to provide adequate topographical information both inside and outside the grid to depict surface physical features on a one foot contour interval. The benchmark for the project is located at the state line marker located 1600 feet north of State Highway 176 with an elevation of 3484.75 feet MSL. A Grid Survey and Topography Map is shown in Figure III.



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## FIELD INVESTIGATION

The drilling and sampling was accomplished with a 1974 Model Midway 1300 and 1977 Model Midway 1500 owned and operated by Scarborough Drilling, Inc. from Lamesa, Texas. These truck mounted rigs are equipped with direct rotary table, 550 CFM air compressors, mud pump, 2 7/8 inch diameter drill stem, 3 1/2 inch drill stem, tri-cone roller bits, drag bits, 3 foot core barrel and 10 foot core barrels.

Initially all holes were continuously sampled by air coring with 4 3/4 inch O.D. Christian Core barrels producing 2 1/8 inch diameter core samples. Where bit wear was excessive in hard limestone or conglomerate then tri-cone roller bits were used until hard layers were penetrated. Where soft layers were encountered and recovery using air coring was poor, split spoon (1.4 inch diameter) samples were obtained using rig pull-down.

The investigation consisted of drilling, logging and sampling a total of 55 bore holes (see Generalized Boring Location Plan - Figure IV). Of the 55 holes a total of 14 holes were continuously air cored in the upper caliche (hard limestone and sandstone deposits) to depths ranging from 9 feet to 53 feet deep. The remaining holes were drilled with straight air rotary in the upper caliche layers and cuttings were continuously sampled, logged and visually classified. All 55 holes were continuously sampled (air coring) from the top of the red bed (Triassic) using both split spoon samples and 2 1/8 I.D.



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Christianson core barrels. Continuous coring intervals varied from lengths of 4 feet to 10 feet depending on the type of soils encountered.

The initial investigation consisted of drilling and continuous air coring all bore holes to depths of 100 feet with selected holes extended to depths of 200 feet. At six piezometers and three monitor well locations the bore holes were extended to depths ranging from 260 feet to 300 feet and either continuously cored or air rotary drilled and cuttings were logged to accurately describe the geology and classify the soils. These nine holes were also used for geophysical logging that was coordinated by Terra-Dynamics, Austin, Texas. The geophysical logs and core logs were then compared and correlated by Terra-Dynamics. A total of 12 holes were drilled with a CME 55 Rig equipped with a mud rotary NXB Christianson Wireline system (1.875 diameter core) for the purpose of obtaining rock cores from the upper limestone (caliche) formation. These holes varied in depth from 12 feet to 36 feet below the existing grade. The total recovery as well as Rock Quality Designation (RQD) is shown on the individual boring logs. All rock cores were visually classified and logged in the field and samples were wrapped with plastic and stored in wooden core boxes and transported to the lab. A table depicting boring numbers, grid locations, boring depth and date of boring is shown in the Soil Boring Summary in Appendix II.



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All core samples were examined and visually classified, logged in the field prior to wrapping and placing in cardboard core boxes. Grab samples from air rotary cuttings were also visually classified and logged and placed in ziploc plastic bags and stored in cardboard boxes. All core boxes were properly labeled with boring number and grid location, date, sample intervals and transported to the laboratory of Jack H. Holt & Associates, Inc. in Austin, Texas for testing and storage.

## LABORATORY TESTING

The laboratory testing program included tests to determine the engineering characteristics and properties of the soil and rock samples obtained from the drilling and sampling program. These tests include soil classification, shear strength, plasticity, density, moisture, grain size analysis, and permeability. All laboratory tests were run in strict accordance with ASTM Standards using up-to-date calibrated testing equipment and apparatus as required by those standards. The laboratory testing program was performed under the supervision and direction of Dr. Jack H. Holt, Ph.D., P.E. Listed below is a list of the specific laboratory tests and their appropriate ASTM Designation:

1. Classification of soils according to the "Unified Soil Classification System" (ASTM D2487-90).
2. Sieve Analysis of soils including Minus No. 200 Mesh Sieve and Hydrometer Analysis (ASTM D-422-63).



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3. Moisture Content of Soils (ASTM D-2216-90).

4. Unit Weight Tests.

5. Atterberg Limits Tests including Liquid Limits, Plastic Limits (ASTM D-4318-84).

6. Unconfined Compressive Strength - clay soils (ASTM D-2166-91).

7. Unconfined Compression Tests - rock specimens (ASTM D-2938-68).

8. Triaxial Tests.

9. Permeability Tests using both flexible wall and rigid permeameters (ASTM D-5084-90).

10. Moisture-Density Relationship Tests using Modified Proctor (ASTM D-1557-91) and Standard Proctor (ASTM D-698-91).

11. Consolidation Tests.

The results of all laboratory tests can be found in Appendix I. Laboratory test results are also shown on the individual boring logs at the appropriate depth.

SUBSURFACE CONDITIONS

The subsurface soil conditions are described in more detail by the attached Logs of Borings found in Appendix II. In general the soil conditions consist of a thin (one foot or less) layer of brown organic sandy silt overlying a formation of white or tan caliche. The caliche consists of crumbly to very hard cemented sand, conglomerate limestone rock, sandy silt and



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gravel. At the base of the caliche strata lies a sand and gravel layer that varies in thickness from 0 feet to 20 feet. The depth of the caliche layer including the sand and gravel strata below ranges from approximately 9 feet to 53 feet across the investigated area.

Below the caliche lies a formation of reddish brown silty clay (red bed clay) that extends to termination of the borings at 100 feet to 300 feet below the existing grade. The red bed clay consists of a highly consolidated impervious mottled reddish brown-gray clay, purple-gray silty clay, and yellowish brown-gray silty clay. Siltstones and sandstones are found at various depths and thicknesses across the grid area and vary in color from red, tan, gray, pink and yellow. The depth to the top of the red bed (Triassic-Dockum Group) varies across the site from 9 feet (B-24) to 53 feet (B-1) and generally averages 12 feet to 30 feet deep through the center of the grid area between Grid Lines C and E.

The red, reddish brown or purple silty clay soils range in moisture content from 2.5% to 25% and generally average 8% to 12% in most of the borings.

Dry density of the clay soils range from 116 PCF to 145 PCF and average 132 PCF.

Liquid Limits of the clays range from 35% to 55%. Plasticity indices vary from 24 to 38. The clays vary in percent passing the #200 Mesh Sieve from 87% to 99.8%.



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A total of 36 vertical permeabilities and 6 horizontal permeabilities were run on the reddish brown silty clays, sandstones and siltstones. Vertical permeabilities range from $<1.00 \times 10^{-9}$ cm/sec to $1.76 \times 10^{-8}$ cm/sec for the clays. Horizontal permeabilities range from $1.63 \times 10^{-9}$ cm/sec to $1.10 \times 10^{-8}$ cm/sec. The siltstones and sandstones found at depths of 56 feet to 90 feet range in vertical permeability from $2.58 \times 10^{-8}$ cm/sec to $1.93 \times 10^{-6}$ cm/sec. The horizontal permeability averages $6.53 \times 10^{-7}$ cm/sec. The siltstone at a depth of 208 feet has a permeability of $2.06 \times 10^{-8}$. The permeability tests were run according to ASTM D-5084-90 using a flexible wall permeameter under a constant head. De-aired tap water and a .005N Ca $SO_4$ solution was used for the permeant liquid. The permeabilities were calculated on both the inflow and outflow and then averaged for the final result. The plot of Q x L vs T x A x H for selected tests are shown graphically in the Steady State Permeability Plots in Appendix I. Shown in each graph is the plot for both inflow and outflow through the sample. The slope of straight line is the permeability in cm/sec. A summary of permeability test results including boring number, grid location, soil classification, depth are shown in Permeability Test Results, Appendix I.

Unconfined compression test on the clay soils range from 13.9 TSF to 49.7 TSF with an average of 30 TSF.



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GROUNDWATER

Water level measurements were made on open bore holes at 24 hours and 48 hours after completion. All borings were found to be dry with the exception of B-7, B-4, B-10, B-20, B-30, B-20, B-41 and B-41S. Groundwater was found at a shallow depths only in borings B-41 and B-41S at 26 feet and 32.4 feet respectively. Groundwater or damp sandstone/siltstone was encountered during the drilling operation only in Borings B-7, B-21 and B-48 at depths ranging from 200 feet to 220 feet below the existing grade.

Piezometers (2 inch PVC pipe) were installed at four locations (B-4, B-7, B-10 and B-20) with screened intervals ranging in depths from 170 feet to 257 feet below the existing grade. Water level measurements ranged from 149.8 feet to 187.8 feet below the existing grade on 14 January 1993.

Additional piezometers were installed at boring B-30 and boring B-39 . These holes were dry at the time of this report. Monitor wells were installed at grid locations 4-G, 9-G, and 6-B to better define saturated zones and obtain hydrological data for various zones. Details on construction of these wells are depicted in the State of Texas Well Reports in Appendix III. Water level measurements for all piezometers and wells are found in the Water Level Measurements, Appendix III. The groundwater hydrology is discussed in more detail in the Terra Dynamics Report.



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## FOUNDATION STABILITY

The landfill floor elevation will be established at 3,400 feet. Maximum depth of the waste material will be 76 feet. A 16.5 foot thick cap is planned for the crest section which slopes at 3% grade back to the containment dike. The clay cap will be covered with a filter fabric and 2 feet of top soil. An 8 foot thick liner system will be placed between the waste material and the impervious clay formation. A typical landfill Section is shown below.

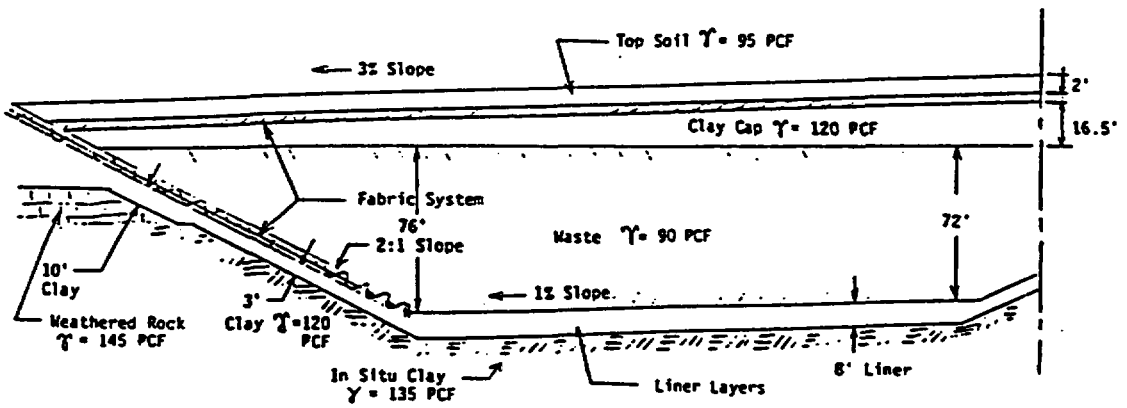


FIGURE VI

Typical Landfill Section



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Side walls of the slopes are lined with 10 feet of compacted clay where the sands, gravel and rock exists. The side wall is lined with 3 feet of compacted clay soil where cut into the existing red bed clay. The floor liner is 8 foot thick. Allowable bearing capacities for settlement and slope stability analysis are based on laboratory strength tests of the rock and in-situ clays, siltstones, sandstones and compacted clay liner. Allowable bearing capacities with each stratum are shown together with a corresponding Factor of Safety.

TABLE I

| Stratum Description | Allowable Bearing Capacity, PSF | Factor Safety |
|---|---|---|
| 1. Compacted silty clay | 10,100 | 2.3 |
| 2. Weathered limestone with layers of rock & sands | 35,000 | 3.5 |
| 3. Natural bedded clay | 14,600 | 3.0 |

Assuming a maximum waste height of 98.5 feet to include 16.5 feet of compacted clay at the crest and an 8 foot liner, the maximum pressure on the floor will be approximately 9,190 PSF. Considering these conditions, it is apparent the supporting soils have adequate strength to support the landfill with an acceptable margin of safety.

A. Slope Stability - The slope stability of the landfill containment section was analyzed for the periods during construction and after completion. An analysis was made considering a containment side slope of 2:1;



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1.5:1 and a slope of 1:1. Computations for stability were based on the following criteria developed from laboratory tests using conservative results.

SLOPE CRITERIA

| DEPTHS (FT.) | $\sigma'_3$ | $\sigma'_1$ | $\frac{\sigma'_1 + \sigma^1_3}{2}$ | $\frac{\sigma'_1 - \sigma'_3}{2}$ |
|---|---|---|---|---|
| 29 - 30 | 34.5 | 132.0 | 83.3 | 48.8 |
| | 51.0 | 208.0 | 129.5 | 78.5 |
| 23 - 25 | 34.5 | 154.0 | 94.3 | 59.8 |
| | 51.0 | 200.0 | 125.5 | 74.5 |

WHERE:
$\sigma'$ = Normal Stress (PSI)
$\sigma_3$ = Confining Stress (PSI)

Design parameters:

1. Friction Angle ($\phi$) = 36°
2. Unit Weight $\gamma$ = 135 PCF
3. Effective Cohesive Shear Strength C′ = 260 PSF

The slope stability analysis was made using the computer program (PC STABL 5M) adopted by the Federal Public Road Administration. This program was developed by the University of Purdue under a federal grant program and is widely used throughout the U.S.A.

The computer analysis calculates the ten most critical failure circles based on the selected slope, friction angle $\phi$, cohesion and whether or not a compacted clay liner is considered. The analysis computes the factor of safety for each



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failure circle. A graphical analysis depicting 10 failure circles for each of the failure planes at various slopes are shown in Appendix IV. The most critical condition is highlighted by arrows. Slope conditions were considered without the clay liner and omitting the effects of the cohesive strength of the clays. Listed below in Table II are the results of the analysis.

**TABLE II**

**SUMMARY OF SLOPE STABILITY ANALYSIS**

| COMPUTER NO. RUN | SLOPE (H:V | $\phi$ | C′ (PSF) | WITH LINER W/O LINER | MINIMUM FACTOR OF SAFETY |
|---|---|---|---|---|---|
| 1 | 1:1 | 36° | 260 | With Liner | 1.54 |
| 2 | 1.5:1 | 36° | 260 | W/O Liner | 1.52 |
| 3 | 1.5:1 | 36° | 260 | With Liner | 1.73 |
| 4 | 2:1 | 36° | No Cohesion | W/O Liner | 1.47 |
| 5 | 2:1 | 36° | No Cohesion | With Liner | 1.90 |
| 6 | 2:1 | 36° | 260 | W/O Liner | 2.36 |

C′ = Effective Cohesive Shear Strength

All of the computer analysis were run with an internal friction angle ($\phi$) of 36°. This is considered to be a conservative figure based on laboratory tests of the insitu clays. The analysis clearly shows that a 2:1 slope with or without the compacted clay liner will provide a safe stable condition with a safety factor of 2.36. Computer run number 4



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and 5 indicate even under saturated conditions the 2:1 slope would be stable.

B. Settlement Analysis - The groundwater table at the most shallow depth is 150 feet below existing ground surface (as of 2/15/93) and is not a consideration for calculation of settlement. Therefore only elastic settlement is considered and consolidation is not a factor. Since the waste repository is considered as a flexible foundation and therefore the elastic settlement is given by:

$$S_e = C_d \, qB \, (1 - \mu^2{}_s/E_s)$$

Where
- $S_e$ = elastic settlement
- $C_d$ = a parameter accounting for the shape of the load area
- $q$ = distributed load
- $B$ = width of the foundation
- $\mu_s$ = Poisson's ratio of the soil
- $E_s$ = Young's modulus of the soil

Based on the unit weights given in Figure VI, page 12, the maximum elastic settlement (Se) at the center of the waste repository when the complete landfill is loaded is calculated to be 2.45 inches (see Appendix IV for our calculations).

BORE HOLE GROUTING

All bore hoes were grouted with a cement/bentonite slurry. The bore holes were grouted after all water level measurement were made and drilling was completed on the site. Because of the hard dry clays and the absence of groundwater bore holes generally remained open and there was little or no problem with



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caving or sloughing. Each hole was measured prior to grouting to verify the depth was within one foot of the original drilling depth. If not, the holes were redrilled with air rotary and the bore hole was grouted immediately by pumping grout through a 2 inch PVC tremmie pipe from bottom to surface.

The grout mixture consisted of a ratio of 94 pounds portland cement per 5 pounds bentonite per 12 gallons of water. The grout was mixed at a local concrete redi-mix company within 2 miles of the site. The grout was poured into the open bore hole from the chute of the redi-mix truck. Where caving or sloughing of holes was a problem than centrifugal pump and tremmie line was used to ensure that grout was forced from bottom to top of the hole.

The original bore hole depth, the depth prior to grouting, date grouted, truck number and amount of cement/bentonite used was recorded by the technician.

REMARKS

This report has been prepared in order to aid in the evaluation of this property and to assist the architect and engineer in the design of the project. It is intended for use with regard to specific projects discussed in general herein and any substantial changes in locations or grades should be brought to our attention so that we may determine how this may affect our conclusions. If during the proposed construction, the soil strata are found to differ from that reported here, we should be



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notified immediately. This report contains soil boring logs which are for the purpose of arriving at foundation criteria and are not to be used by the excavation contractor in arriving at rock hardness or rock depth. The procedures, tests and recommendations of this investigation and report have been conducted and furnished in accordance with generally accepted professional engineering practices in the field of foundations, engineering soil mechanics and engineering geology. No other warranty is either expressed or implied.

STATE OF TEXAS
JACK HASTON HOLT
35732
REGISTERED
PROFESSIONAL ENGINEER

Jack H. Holt,
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JHH/mco



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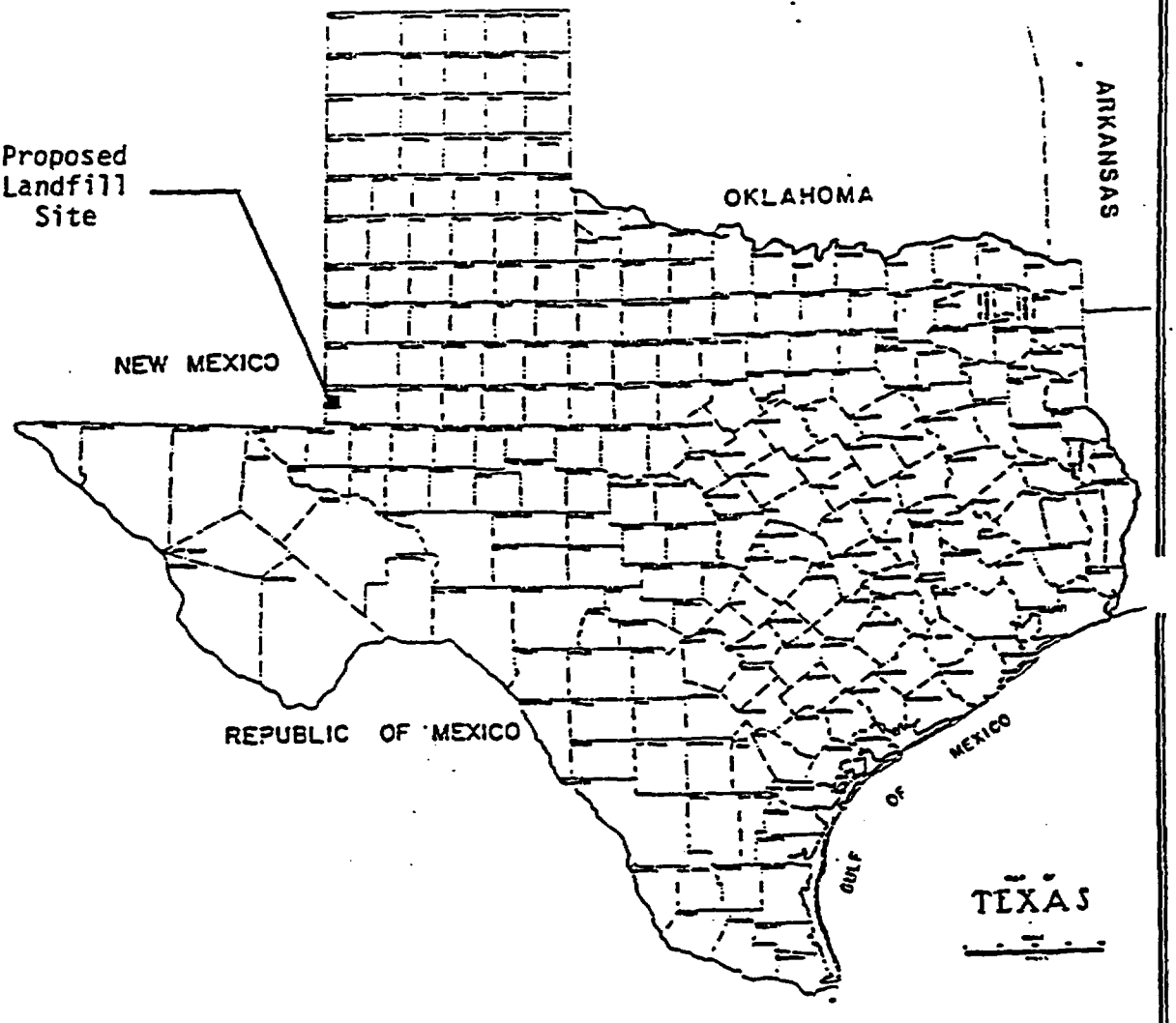


Proposed Andrews Landfill Site
on State of Texas Map
Andrews County, Texas

FIGURE I

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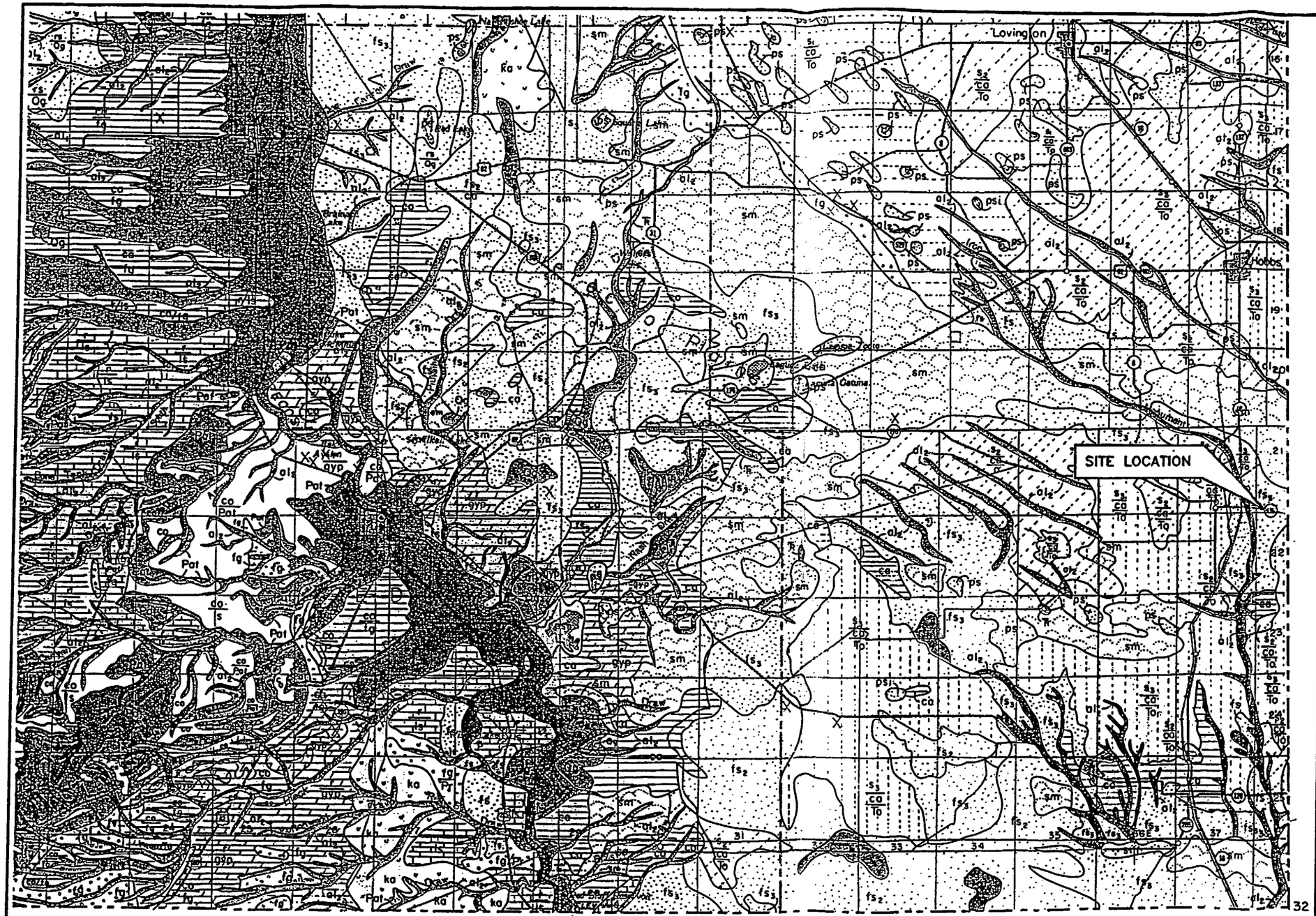


Geology by Charles B. Hunt, 1974 - 1976 Cartography by Neila M. Pearson, 1976

**SAND FACIES** — *Sandy alluvium with subordinate amounts of fine gravel, silt, and clay. Forms at least four kinds of ground: 1) On short, steep fans sloping from the mountains of granitic or gneissic rock (e.g., parts of the Florida Mountains), this facies may form a smooth sandy layer a few feet thick covering gravel below; slopes 5 to 20 percent; washes 1 to 10 ft deep may expose underlying gravel. 2) On other short fans, sand facies may form arcuate belt at toe of fan with slopes averaging 10 percent, commonly reworked into coppice dunes 3 to 7 ft high (sm). 3) Other belts of smooth sandy ground commonly slope 5 percent or less and consist of sand mounds approximately 1 ft high over caliche ($fs_2$). 4) Gypsiferous sand ($fs_3$), especially in the Jornada del Muerto, Tularosa Valley and east side of the Pecos Valley. Sand facies absent on the broad Las Palomas surface. Thin fan sand covering pediments is denoted by fs over subscript that identifies underlying formation. Boundary with residual sand, fan gravel, and fan silt is approximate*

**LOOSE SAND IN MOUNDS** — *Coppice dunes, commonly 3 to 7 ft high and 25 to 50 ft in diameter; generally elongated north of east but a local exception lies east of Columbus where elongation is south of east. Age is Holocene. Boundaries fairly accurate*

**THICK SAND ON CALICHE ON OGALLALA FORMATION** — *Sand 3 to 5 ft thick. Local mounds. Brownish-red, fine sandy loam over reddish-brown, sandy clay loam; noncalcareous to depths of 3 ft; calcareous subsoil contains filaments of lime carbonate. Where farmed, ground is subject to wind erosion. Boundaries approximate*

SOURCE: NEW MEXICO BUREAU OF MINES & MINERAL RESOURCES, 1977.

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# SURFICIAL GEOLOGY OF LEA COUNTY, NEW MEXICO


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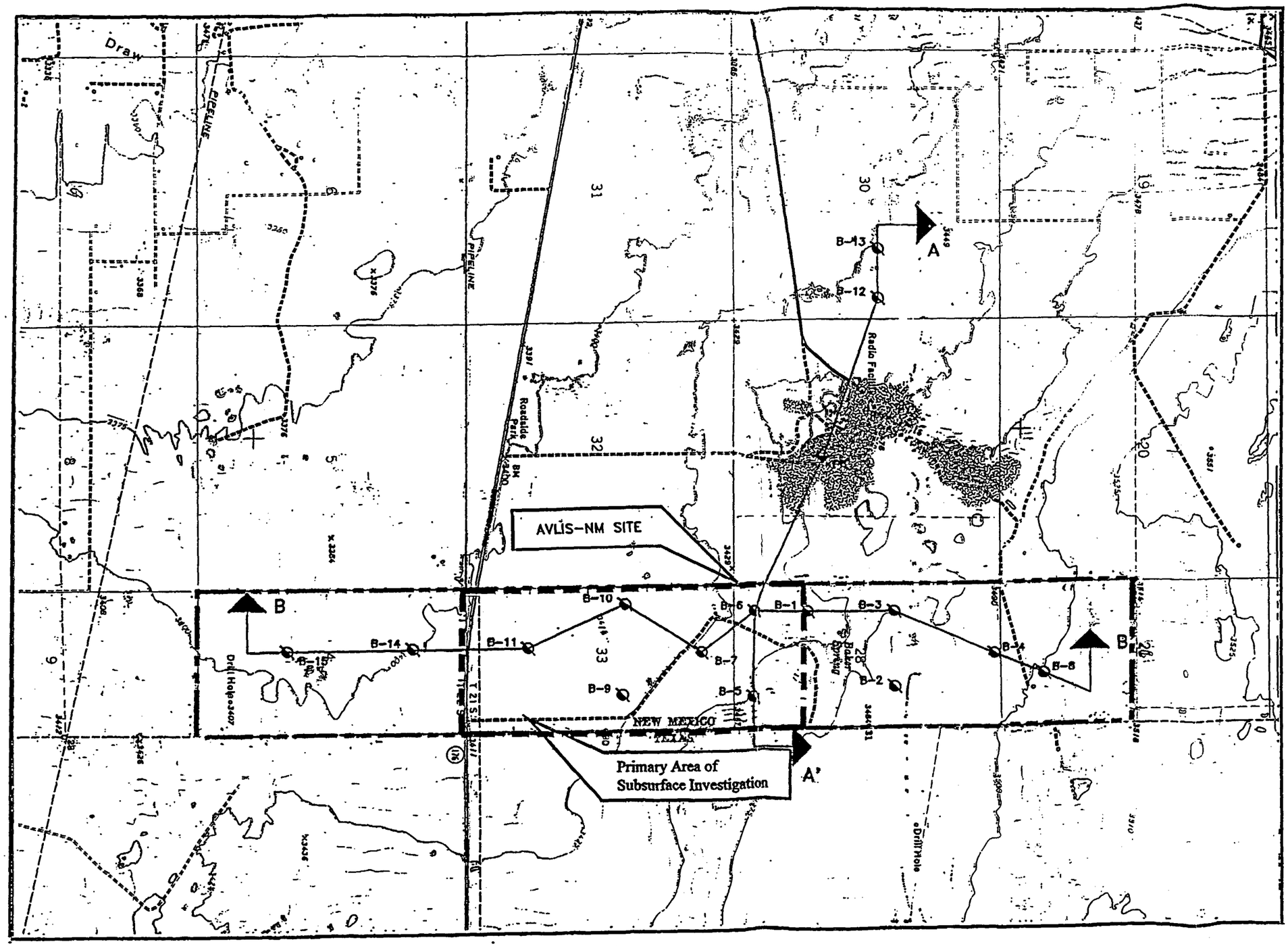
CHICAGO, IL (312) 922-1030 | GRIFFITH, IN (219) 923-9609 | ALBUQUERQUE, NM (505) 867-6990


| | | |
|---|---|---|
| PREPARED BY: SJS | DATE: 11/4/98 | FILE: 0090-02-01 |
| REVIEWED BY: TB | CAD: AVLIS4.DWG | FIGURE 5 |

SITE PLAN ADAPTED FROM THE EUNICE NE, TEX.–N. MEX. U.S.G.S. 7.5 MINUTE SERIES QUADRANGLE.




NORTH

SCALE

0 1000' 2000' 4000'

LEGEND

B-1 SOIL BORING LOCATION

A A' CROSS SECTION LOCATION

BORING LOCATION MAP

LEA COUNTY, NEW MEXICO

WEAVER BOOS & GORDON, INC.

| CHICAGO, IL (312) 922-1030 | GRIFFITH, IN (219) 923-9609 | ALBUQUERQUE, NM (505) 867-6990 |
|---|---|---|
| PREPARED BY: SJS | DATE: 11/4/98 | FILE: 0090-02-01 |
| REVIEWED BY: TB | CAD: AVLIS4.DWG | FIGURE 6 |

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B
SOUTH

B'
NORTH

NOTE: GROUNDWATER WAS NOT ENCOUNTERED IN ANY OF THE FIFTEEN (15) BORINGS.

3550
3500
3450
3400
3350
3300
3250
3200

HIGHWAY 176

AVLIS, NEW MEXICO SITE

SECTION 4 SITE

B-15 B-14 B-11 B-10 B-7 B-6 B-1 B-3 B-4 B-8

DUNE SAND

SOFT CALICHE

ALLUVIAL DEPOSITS

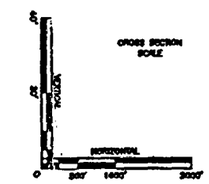
CALICHE CAPROCK

SANDSTONE

SANDY CLAY

CHINLE FORMATION RED BED

BT @ 250 FT.




NOTES:

THE DEPTH AND THICKNESS OF THE SUBSURFACE INFORMATION INDICATED ON THE SECTIONS WERE DEVELOPED FROM AND INTERPOLATED BETWEEN THE SOIL BORINGS TO PROVIDE A GENERAL CHOICE OF THE SUBSURFACE CONDITIONS. INFORMATION ON ACTUAL SUBSURFACE CONDITIONS EXISTS ONLY AT THE LOCATION AND ON THE DATE OF THE SOIL BORINGS AND IS IS POSSIBLE THAT SUBSURFACE CONDITIONS BETWEEN THE SOIL BORINGS MAY VARY FROM THOSE INDICATED. ALSO, THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN THE CONDITIONS AT THOSE BORING LOCATIONS. FOR MORE DETAILED INFORMATION REFER TO THE BORING LOGS AND LABORATORY TEST RESULTS.

☐ DRAFT
☐ PERMIT APPLICATION
☐ APPROVED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY: _____

DATE: 2/26/97
FILE: 93942.r9
CAD: 93D0005B.DWG

DRAWN BY: JRS
DESIGN BY: BKD
REVIEWED BY: BKD

REVISIONS

| NO. | DATE | DESCRIPTION |
|---|---|---|
| | | |

REUSE OF DOCUMENTS

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CROSS SECTION B–B'

PROPOSED AVLIS SITE
LEA COUNTY, NEW MEXICO

WEAVER BOOS CONSULTANTS, INC.

ALBUQUERQUE, NM (505) 890-8073 CHICAGO, IL (312) 922-1930 CRYSTAL, IN (219) 923-8400

FIGURE 7

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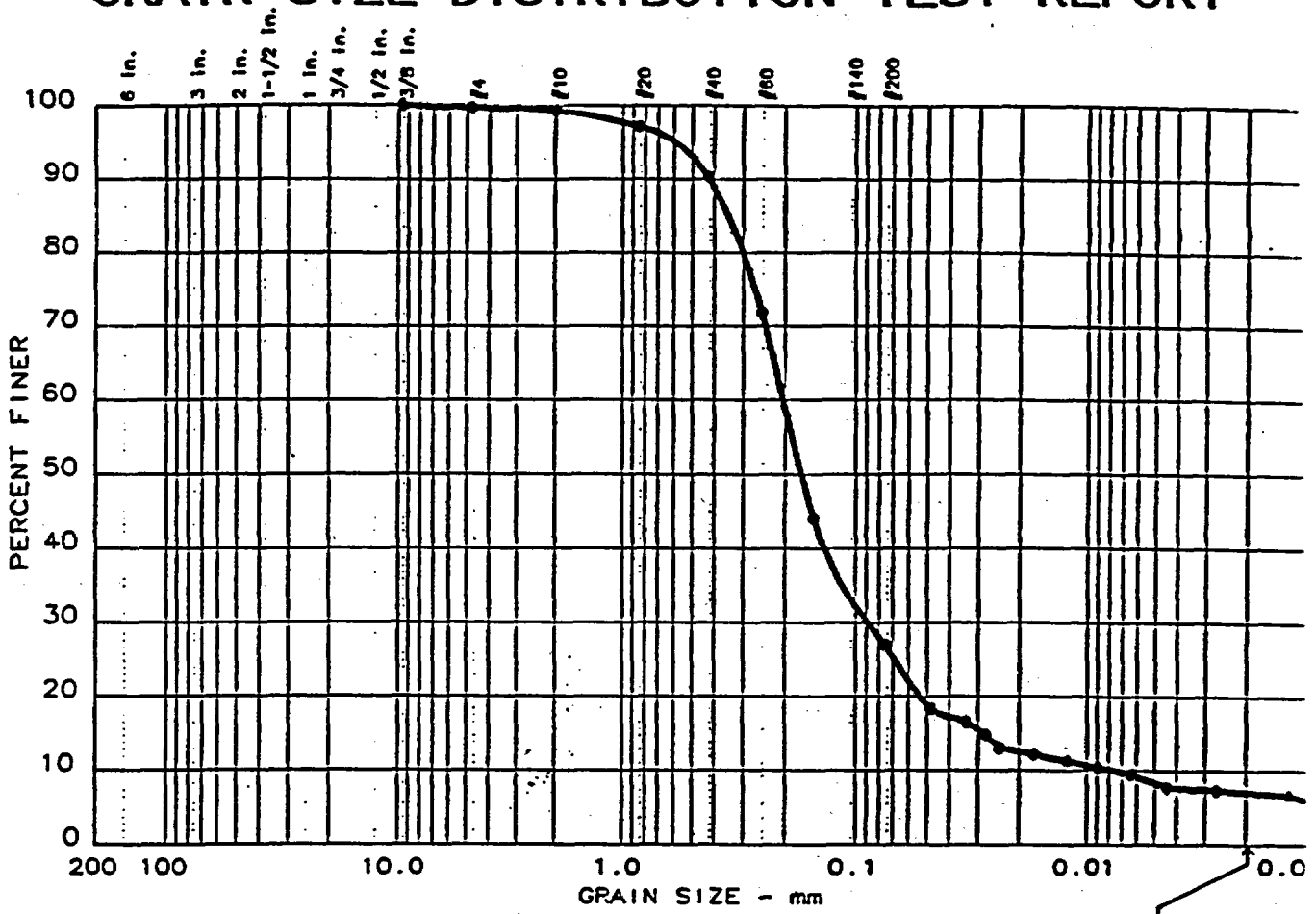
**Attachment IV.5.B**

**Soil Laboratory Analysis**

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| • | 19 | 0.0 | 0.3 | 72.7 | 19.9 | 7.1 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| • | NA | NA | 0.343 | 0.202 | 0.169 | 0.0878 | 0.0281 | 0.0071 | 5.35 | 28.3 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| • RED F/C SAND, LITTLE SILT, TR CLAY | SM | A-2-4 |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
• Location: HOBBS, NEW MEXICO

Date: 1-7-98

Remarks:
BORING: B-101
DEPTH: 20.0'

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

Date: 1-7-98
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED F/C SAND, LITTLE SILT, TR CLAY
USCS Class: SM  Liquid limit: NA
AASHTO Class: A-2-4  Plasticity index: NA

## Notes

Remarks: BORING: B-101 DEPTH: 20.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 436.70 |
| Tare = | 0.00 |
| Dry sample weight = | 436.70 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50 Tare = 0 Sample weight = 50
Cumulative weight retained tare= 0
e for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| 0.375 inches | 0.00 | 100.0 |
| # 4 | 1.20 | 99.7 |
| # 10 | 2.90 | 99.3 |
| # 20 | 1.10 | 97.2 |
| # 40 | 4.50 | 90.4 |
| # 60 | 13.80 | 71.9 |
| # 100 | 27.80 | 44.1 |
| # 200 | 36.40 | 27.0 |

## Hydrometer Analysis Data

Separation sieve is number 40
Percent -# 40 based on complete sample= 90.4
Weight of hydrometer sample: 50
Calculated biased weight= 55.31
Automatic temperature correction
Composite correction at 20 deg C =-4.5

Meniscus correction only= 1

Specific gravity correction factor= 0.978
Hydrometer type: 152H  Effective depth L= 16.294964 - 0.164 x Rm

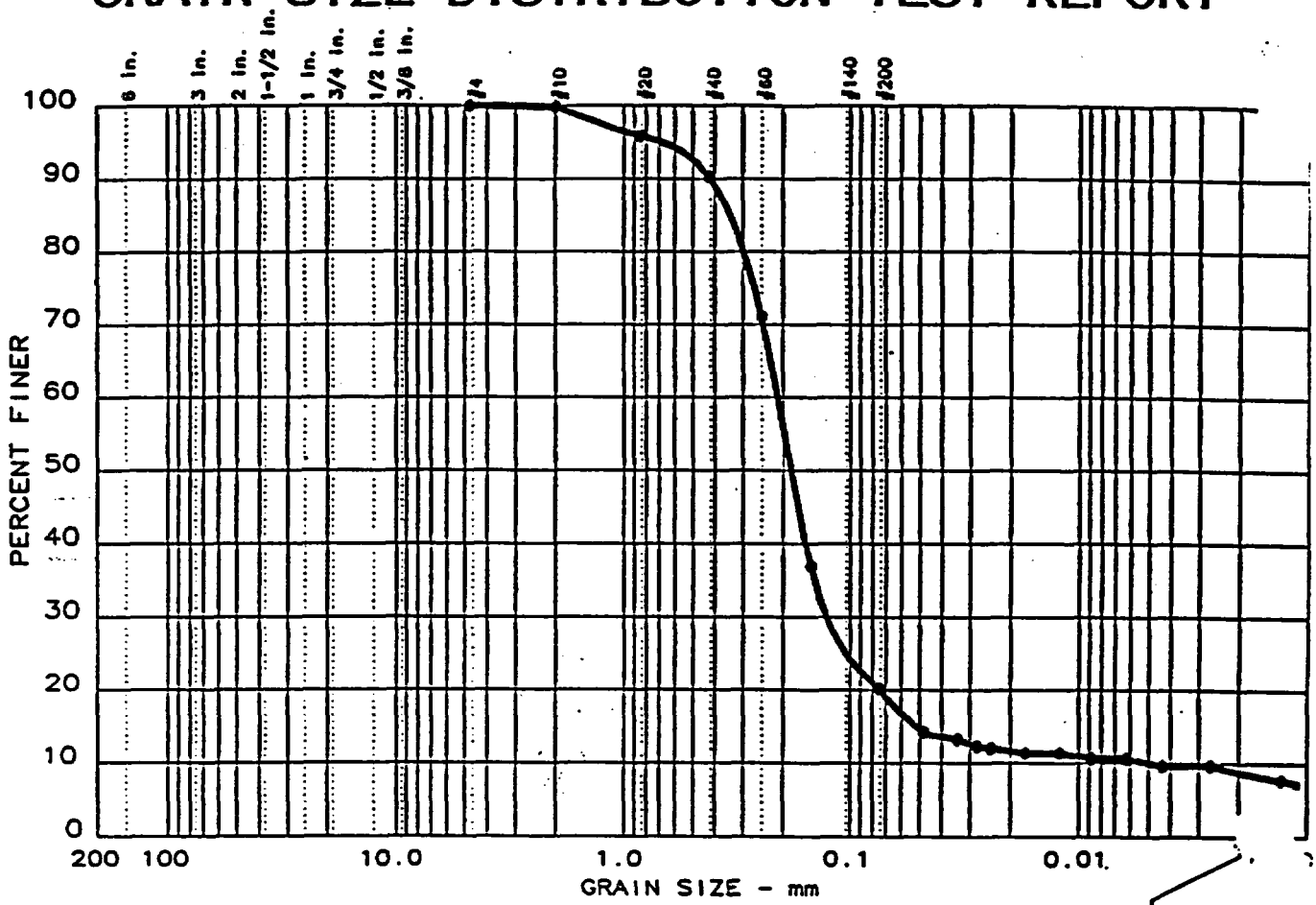
| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 22.0 | 14.5 | 10.4 | 0.0129 | 15.5 | 13.8 | 0.0479 | 18.4 |
| 2.0 | 22.0 | 13.5 | 9.4 | 0.0129 | 14.5 | 13.9 | 0.0341 | 16.6 |
| 3.0 | 22.0 | 12.5 | 8.4 | 0.0129 | 13.5 | 14.1 | 0.0280 | 14.9 |
| 4.0 | 22.0 | 11.5 | 7.4 | 0.0129 | 12.5 | 14.2 | 0.0244 | 13.1 |
| 8.0 | 22.0 | 11.0 | 6.9 | 0.0129 | 12.0 | 14.3 | 0.0173 | 12.2 |
| 16.0 | 22.0 | 10.5 | 6.4 | 0.0129 | 11.5 | 14.4 | 0.0123 | 11.3 |
| 30.0 | 22.0 | 10.0 | 5.9 | 0.0129 | 11.0 | 14.5 | 0.0090 | 10.5 |
| 60.0 | 22.0 | 9.5 | 5.4 | 0.0129 | 10.5 | 14.6 | 0.0064 | 9.6 |
| 125.0 | 22.0 | 8.5 | 4.4 | 0.0129 | 9.5 | 14.7 | 0.0044 | 7.8 |
| 330.0 | 23.0 | 8.0 | 4.2 | 0.0128 | 9.0 | 14.8 | 0.0027 | 7.4 |
| 1410.0 | 23.5 | 7.5 | 3.8 | 0.0127 | 8.5 | 14.9 | 0.0013 | 6.7 |
| 2850.0 | 22.5 | 7.0 | 3.0 | 0.0128 | 8.0 | 15.0 | 0.0009 | 5.4 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0  % GRAVEL = 0.3  % SAND = 72.7
% SILT = 19.9  % CLAY = 7.1  (% CLAY COLLOIDS = 5.7)

D85= 0.34  D60= 0.202  D50= 0.169
D30= 0.0878  D15= 0.02809  D10= 0.00714
Cc = 5.3518  Cu = 28.2813

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 9 | 0.0 | 0.0 | 79.8 | 11.4 | 8.8 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | 0.342 | 0.212 | 0.184 | 0.127 | 0.0519 | 0.0049 | 15.65 | 43.2 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● RED SAND, LITTLE SILT, TR CLAY | SC | A-2-4 |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 12-22-97

Remarks:
BORING: 102
DEPTH: 20.0'

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

Date: 12-22-97
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SAND, LITTLE SILT, TR CLAY
USCS Class: SC  Liquid limit: NA
AASHTO Class: A-2-4  Plasticity index: NA

## Notes

Remarks: BORING: 102 DEPTH: 20.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 123.00 |
| Tare = | 0.00 |
| Dry sample weight = | 123.00 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50 Tare = 0 Sample weight = 50
Cumulative weight retained tare= 0
e for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 4 | 0.00 | 100.0 |
| # 10 | 0.20 | 99.8 |
| # 20 | 2.00 | 95.8 |
| # 40 | 4.80 | 90.3 |
| # 60 | 14.40 | 71.1 |
| # 100 | 31.50 | 36.9 |
| # 200 | 39.90 | 20.2 |

## Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 99.8
Weight of hydrometer sample: 50
Calculated biased weight= 50.08
Automatic temperature correction
Composite correction at 20 deg C =-3.5

Meniscus correction only= 1
Specific gravity of solids= 2.75

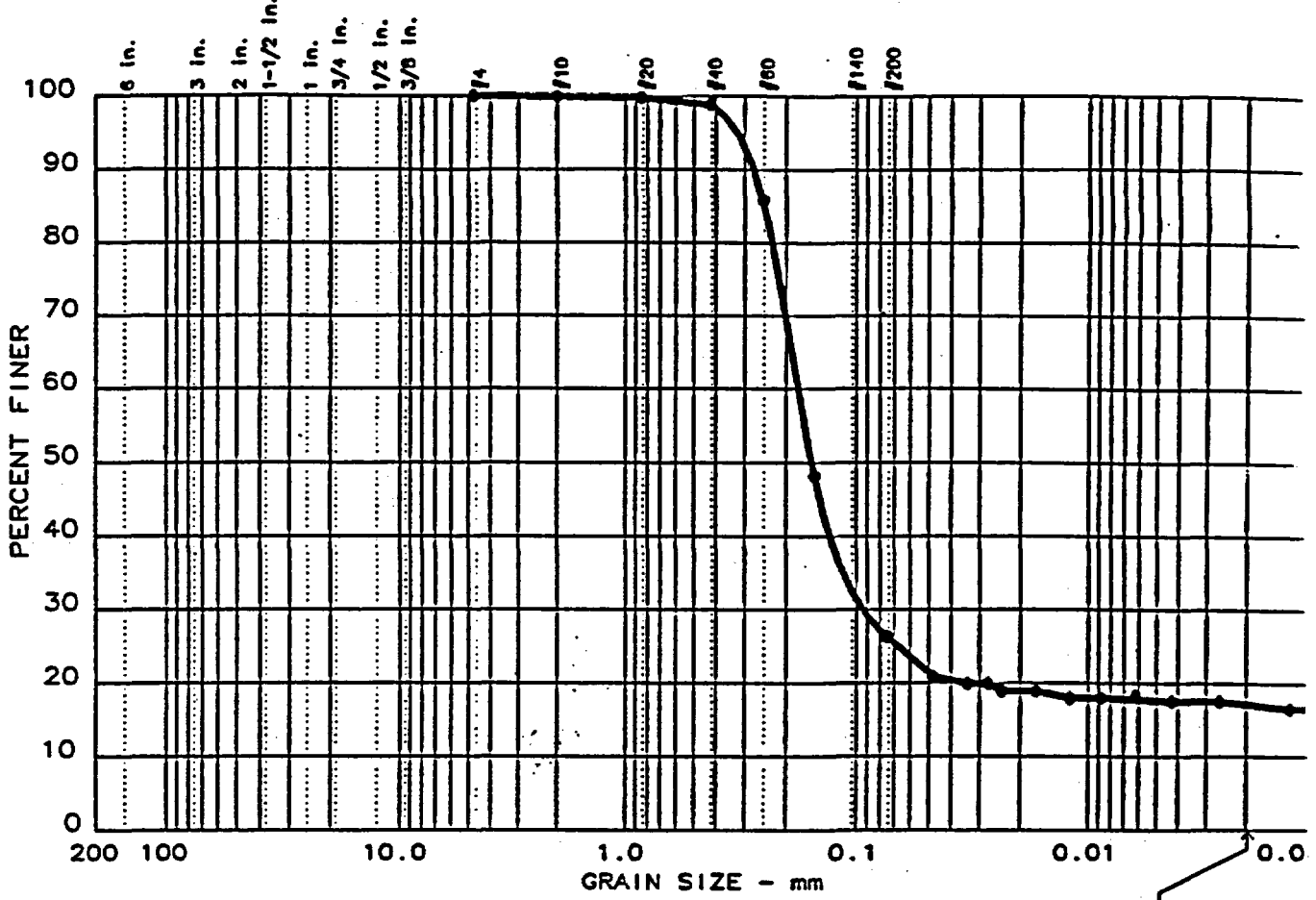
| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 23.5 | 10.0 | 7.3 | 0.0127 | 11.0 | 14.5 | 0.0483 | 14.3 |
| 2.0 | 23.5 | 9.5 | 6.8 | 0.0127 | 10.5 | 14.6 | 0.0343 | 13.3 |
| 3.0 | 23.5 | 9.0 | 6.3 | 0.0127 | 10.0 | 14.7 | 0.0281 | 12.3 |
| 4.0 | 23.0 | 9.0 | 6.2 | 0.0128 | 10.0 | 14.7 | 0.0244 | 12.0 |
| 8.0 | 23.5 | 8.5 | 5.8 | 0.0127 | 9.5 | 14.7 | 0.0172 | 11.3 |
| 16.0 | 23.5 | 8.5 | 5.8 | 0.0127 | 9.5 | 14.7 | 0.0122 | 11.3 |
| 30.0 | 24.0 | 8.0 | 5.5 | 0.0126 | 9.0 | 14.8 | 0.0089 | 10.6 |
| 60.0 | 24.0 | 8.0 | 5.5 | 0.0126 | 9.0 | 14.8 | 0.0063 | 10.6 |
| 125.0 | 24.0 | 7.5 | 5.0 | 0.0126 | 8.5 | 14.9 | 0.0044 | 9.7 |
| 330.0 | 24.0 | 7.5 | 5.0 | 0.0126 | 8.5 | 14.9 | 0.0027 | 9.7 |
| 1410.0 | 24.0 | 6.5 | 4.0 | 0.0126 | 7.5 | 15.1 | 0.0013 | 7.7 |
| 2850.0 | 24.0 | 6.0 | 3.5 | 0.0126 | 7.0 | 15.1 | 0.0009 | 6.7 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 79.8
% SILT = 11.4 % CLAY = 8.8 (% CLAY COLLOIDS = 7.0)

D85= 0.34 D60= 0.212 D50= 0.184
D30= 0.1274 D15= 0.05188 D10= 0.00490
Cc = 15.6495 Cu = 43.2016

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 10 | 0.0 | 0.0 | 73.6 | 9.2 | 17.2 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | 0.245 | 0.176 | 0.154 | 0.0929 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● REDISH BRN SAND, LITTLE CLAY, TR SILT | SC | A-2-4 |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 12-18-97

Remarks:
BORING: 103
DEPTH: 5.0'

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

Date: 12-18-97
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: REDISH BRN SAND, LITTLE CLAY, TR SILT
USCS Class: SC
AASHTO Class: A-2-4
Liquid limit: NA
Plasticity index: NA

## Notes

Remarks: BORING: 103 DEPTH: 5.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 100.50 |
| Tare = | 0.00 |
| Dry sample weight = | 100.50 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50 Tare = 0 Sample weight = 50
Cumulative weight retained tare= 0
-e for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 4 | 0.00 | 100.0 |
| # 10 | 0.10 | 99.9 |
| # 20 | 0.10 | 99.7 |
| # 40 | 0.50 | 98.9 |
| # 60 | 7.00 | 85.9 |
| # 100 | 25.90 | 48.2 |
| # 200 | 36.80 | 26.4 |

## Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 99.9
Weight of hydrometer sample: 50
Calculated biased weight= 50.05
Automatic temperature correction
Composite correction at 20 deg C =-3.5

Meniscus correction only= 1
Specific gravity of solids= 2.73

Hydrometer type: 152H  Effective depth L= 16.294964 - 0.164 x Rm

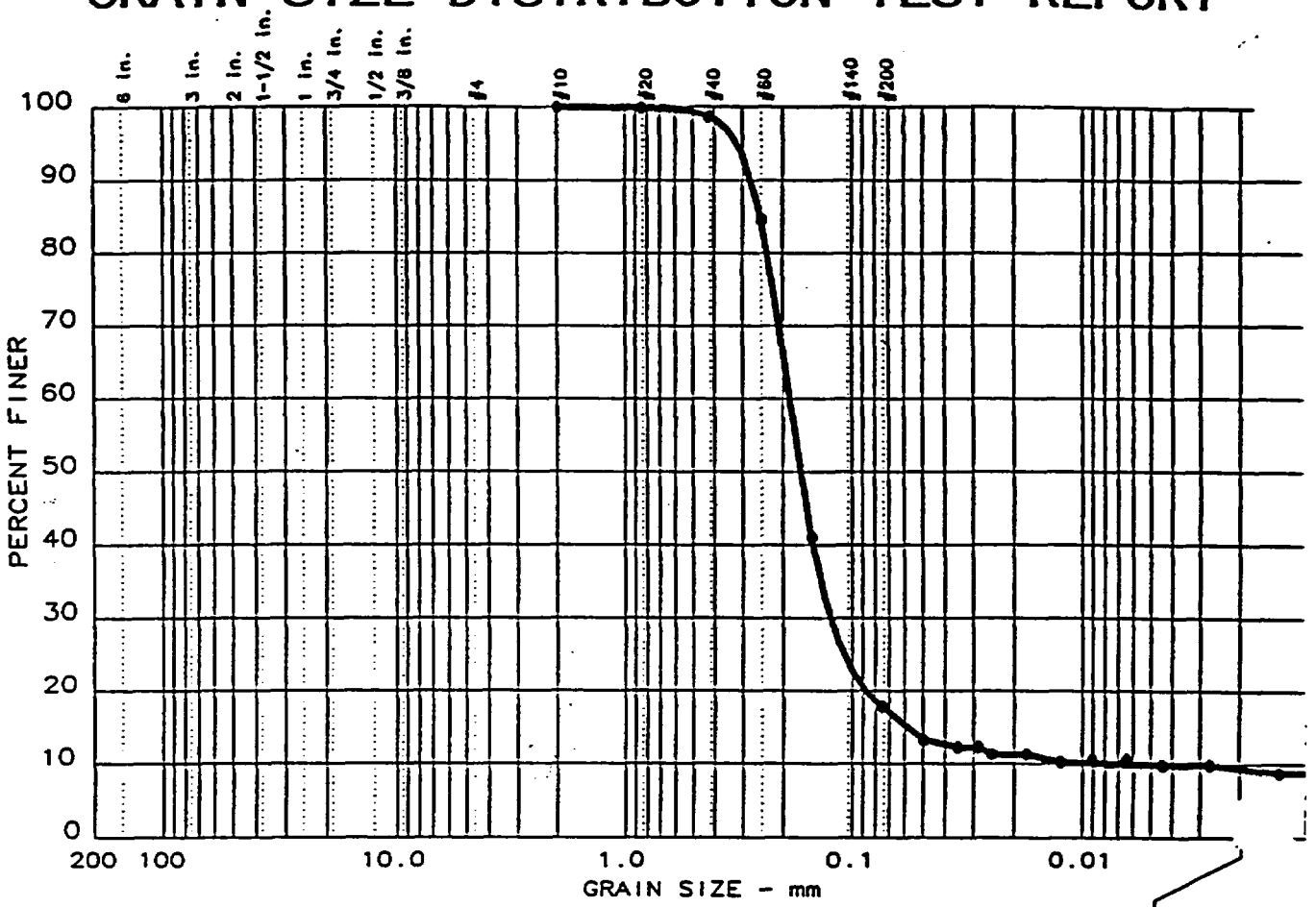
| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 23.0 | 13.5 | 10.7 | 0.0128 | 14.5 | 13.9 | 0.0479 | 20.9 |
| 2.0 | 23.0 | 13.0 | 10.2 | 0.0128 | 14.0 | 14.0 | 0.0340 | 20.0 |
| 3.0 | 23.0 | 13.0 | 10.2 | 0.0128 | 14.0 | 14.0 | 0.0277 | 20.0 |
| 4.0 | 23.0 | 12.5 | 9.7 | 0.0128 | 13.5 | 14.1 | 0.0241 | 19.0 |
| 8.0 | 23.0 | 12.5 | 9.7 | 0.0128 | 13.5 | 14.1 | 0.0170 | 19.0 |
| 16.0 | 23.0 | 12.0 | 9.2 | 0.0128 | 13.0 | 14.2 | 0.0121 | 18.0 |
| 30.0 | 23.0 | 12.0 | 9.2 | 0.0128 | 13.0 | 14.2 | 0.0088 | 18.0 |
| 60.0 | 23.5 | 12.0 | 9.3 | 0.0128 | 13.0 | 14.2 | 0.0062 | 18.3 |
| 125.0 | 24.0 | 11.5 | 9.0 | 0.0127 | 12.5 | 14.2 | 0.0043 | 17.6 |
| 330.0 | 24.0 | 11.5 | 9.0 | 0.0127 | 12.5 | 14.2 | 0.0026 | 17.6 |
| 1410.0 | 24.0 | 11.0 | 8.5 | 0.0127 | 12.0 | 14.3 | 0.0013 | 16.6 |
| 2850.0 | 24.0 | 11.0 | 8.5 | 0.0127 | 12.0 | 14.3 | 0.0009 | 16.6 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0  % GRAVEL = 0.0  % SAND = 73.6
% SILT = 9.2  % CLAY = 17.2  (% CLAY COLLOIDS = 16.6)

D85= 0.25  D60= 0.176  D50= 0.154
D30= 0.0929

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 11 | 0.0 | 0.0 | 82.2 | 8.4 | 9.4 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | 0.251 | 0.187 | 0.167 | 0.124 | 0.0580 | 0.0062 | 13.26 | 30.0 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● RED SAND, TR SILT & CLAY | SC | A-2-4 |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 12-18-97

Remarks:
BORING: 104
DEPTH: 4.0'

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

# GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 11

Date: 12-18-97
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SAND, TR SILT & CLAY
USCS Class: SC
Liquid limit: NA
AASHTO Class: A-2-4
Plasticity index: NA

## Notes

Remarks: BORING: 104 DEPTH: 4.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 160.90 |
| Tare = | 0.00 |
| Dry sample weight = | 160.90 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50 Tare = 0 Sample weight = 50
Cumulative weight retained tare= 0
e for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 10 | 0.00 | 100.0 |
| # 20 | 0.10 | 99.8 |
| # 40 | 0.70 | 98.6 |
| # 60 | 7.70 | 84.6 |
| # 100 | 29.50 | 41.0 |
| # 200 | 41.10 | 17.8 |

## Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 100.0
Weight of hydrometer sample: 50
Calculated biased weight= 50.00
Automatic temperature correction
Composite correction at 20 deg C =-3.5

Meniscus correction only= 1
Specific gravity of solids= 2.68
Specific gravity correction factor= 0.993

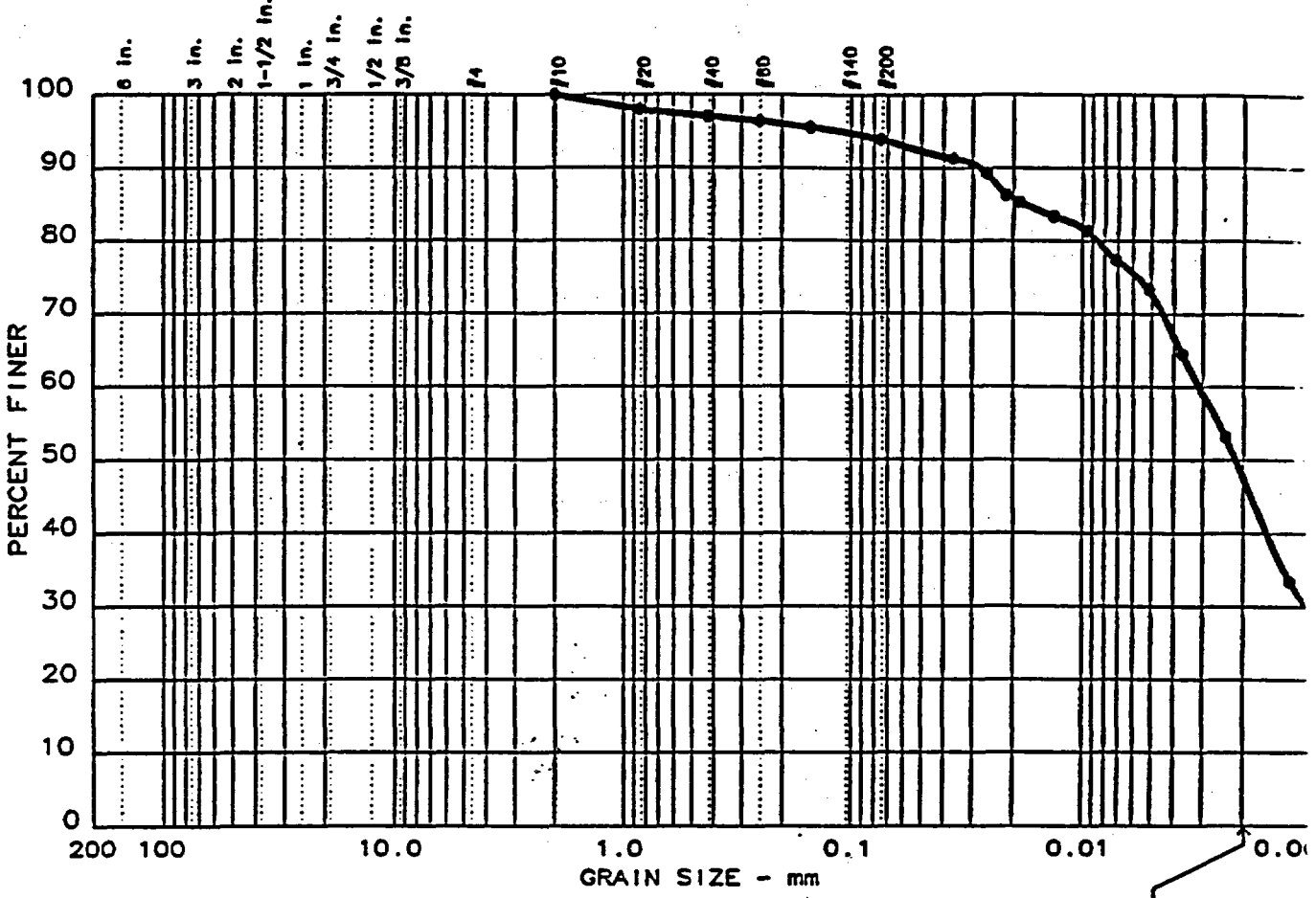
| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 23.0 | 9.5 | 6.7 | 0.0130 | 10.5 | 14.6 | 0.0498 | 13.2 |
| 2.0 | 23.0 | 9.0 | 6.2 | 0.0130 | 10.0 | 14.7 | 0.0353 | 12.2 |
| 3.0 | 23.0 | 9.0 | 6.2 | 0.0130 | 10.0 | 14.7 | 0.0288 | 12.2 |
| 4.0 | 23.0 | 8.5 | 5.7 | 0.0130 | 9.5 | 14.7 | 0.0250 | 11.3 |
| 8.0 | 23.0 | 8.5 | 5.7 | 0.0130 | 9.5 | 14.7 | 0.0177 | 11.3 |
| 16.0 | 23.0 | 8.0 | 5.2 | 0.0130 | 9.0 | 14.8 | 0.0125 | 10.3 |
| 30.0 | 23.5 | 8.0 | 5.3 | 0.0130 | 9.0 | 14.8 | 0.0091 | 10.5 |
| 60.0 | 23.5 | 8.0 | 5.3 | 0.0130 | 9.0 | 14.8 | 0.0064 | 10.5 |
| 125.0 | 24.0 | 7.5 | 5.0 | 0.0129 | 8.5 | 14.9 | 0.0044 | 9.8 |
| 330.0 | 24.0 | 7.5 | 5.0 | 0.0129 | 8.5 | 14.9 | 0.0027 | 9.8 |
| 1410.0 | 24.0 | 7.0 | 4.5 | 0.0129 | 8.0 | 15.0 | 0.0013 | 8.8 |
| 2850.0 | 24.0 | 7.0 | 4.5 | 0.0129 | 8.0 | 15.0 | 0.0009 | 8.8 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 82.2
% SILT = 8.4 % CLAY = 9.4 (% CLAY COLLOIDS = 8.8)

D85= 0.25 D60= 0.187 D50= 0.167
D30= 0.1240 D15= 0.05801 D10= 0.00622
Cc = 13.2587 Cu = 30.0262

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 1 | 0.0 | 0.0 | 6.0 | 46.3 | 47.7 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | | | 0.0022 | 0.0010 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● RED SILTY CLAY, TR SAND | CL | |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 12-10-97

Remarks:
BORING: 104
DEPTH: 60.0'

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

Date: 12-10-97
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SILTY CLAY, TR SAND
USCS Class: CL
AASHTO Class:
Liquid limit: NA
Plasticity index: NA

## Notes

Remarks: BORING: 104 DEPTH: 60.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 447.00 |
| Tare = | 0.00 |
| Dry sample weight = | 447.00 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50 Tare = 0 Sample weight = 50
Cumulative weight retained tare= 0
e for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 10 | 0.00 | 100.0 |
| # 20 | 1.00 | 98.0 |
| # 40 | 1.50 | 97.0 |
| # 60 | 1.80 | 96.4 |
| # 100 | 2.20 | 95.6 |
| # 200 | 3.00 | 94.0 |

## Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 100.0
Weight of hydrometer sample: 50
Calculated biased weight= 50.00
Automatic temperature correction
Composite correction at 20 deg C =-4.5

Meniscus correction only= 1
Specific gravity of solids= 2.7
Specific gravity correction factor= 0.989

| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 23.0 | 50.0 | 46.2 | 0.0130 | 51.0 | 7.9 | 0.0365 | 91.3 |
| 2.0 | 23.0 | 49.0 | 45.2 | 0.0130 | 50.0 | 8.1 | 0.0261 | 89.3 |
| 3.0 | 23.0 | 47.5 | 43.7 | 0.0130 | 48.5 | 8.3 | 0.0216 | 86.4 |
| 4.0 | 23.0 | 47.0 | 43.2 | 0.0130 | 48.0 | 8.4 | 0.0188 | 85.4 |
| 8.0 | 23.0 | 46.0 | 42.2 | 0.0130 | 47.0 | 8.6 | 0.0134 | 83.4 |
| 16.0 | 23.0 | 45.0 | 41.2 | 0.0130 | 46.0 | 8.8 | 0.0096 | 81.4 |
| 30.0 | 23.0 | 43.0 | 39.2 | 0.0130 | 44.0 | 9.1 | 0.0071 | 77.5 |
| 60.0 | 23.0 | 41.0 | 37.2 | 0.0130 | 42.0 | 9.4 | 0.0051 | 73.5 |
| 125.0 | 23.0 | 36.5 | 32.7 | 0.0130 | 37.5 | 10.1 | 0.0037 | 64.6 |
| 330.0 | 22.0 | 31.0 | 26.9 | 0.0131 | 32.0 | 11.0 | 0.0024 | 53.2 |
| 1410.0 | 22.0 | 21.0 | 16.9 | 0.0131 | 22.0 | 12.7 | 0.0012 | 33.4 |
| 2850.0 | 23.0 | 17.5 | 13.7 | 0.0130 | 18.5 | 13.3 | 0.0009 | 27.0 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 6.0
% SILT = 46.3 % CLAY = 47.7 (% CLAY COLLOIDS = 29.1)

D85= 0.02 D60= 0.003 D50= 0.002
D30= 0.0010

# PERMEABILITY TEST REPORT

**TEST DATA:**

Specimen Height (cm): 6.32
Specimen Diameter (cm): 6.39
Dry Unit Weight (pcf): 114.9
Moisture Before Test (%): 10.5
Moisture After Test (%): 17.5

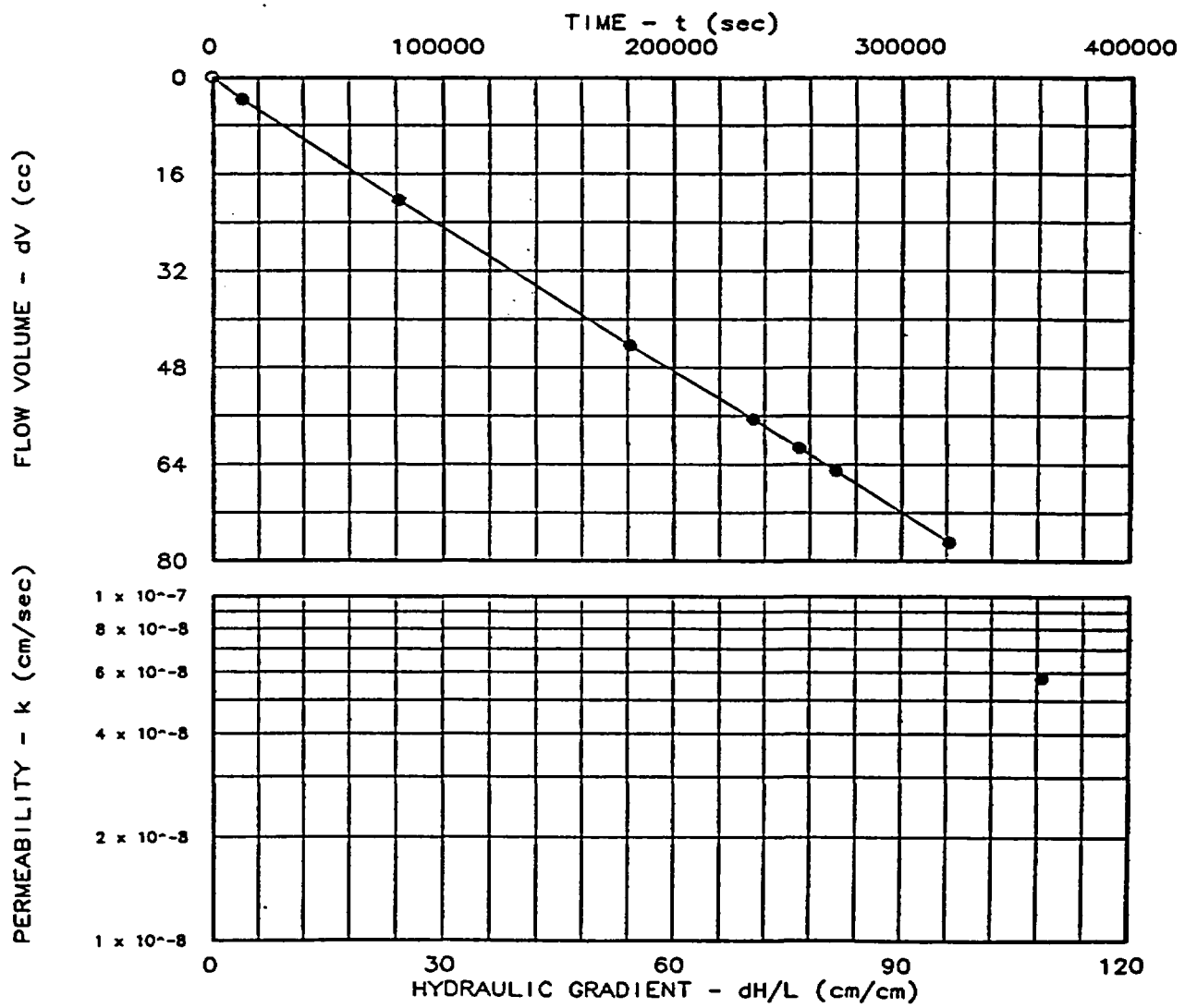
| Run Number: | 1 ● | 2 ▲ |
|---|---|---|
| Cell Pressure (psi): | 30.0 | |
| Test Pressure(psi): | 27.0 | |
| Back Pressure(psi): | 17.2 | |
| Diff. Head (psi): | 9.8 | |
| Flow Rate (cc/sec): | $2.37 \times 10^{-4}$ | |
| Perm. (cm/sec): | $5.79 \times 10^{-8}$ | |

**SAMPLE DATA:**

Sample Identification: BORING: 104
DEPTH: 60.0'
Visual Description: RED SILTY CLAY, TR SAND
Remarks:

Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: FLEXIBLE WALL
Sample type: CORE




Project: LEA COUNTY LANDFILL
Location: HOBBS, NEW MEXICO
Date: 12-8-97

PERMEABILITY TEST REPORT

WEAVER BOOS CONSULTANTS, INC.

Project No.: 95042.10
File No.: 95042.10
Lab No.: 4
Tested by: JWM
Checked by: WSG
Test: CH - Constant head

# PERMEABILITY TEST DATA

## PROJECT DATA

| | |
|---|---|
| Project Name: | LEA COUNTY LANDFILL |
| e No.: | 95042.10 |
| oject Location: | HOBBS, NEW MEXICO |
| Project No.: | 95042.10 |
| Sample Identification: | BORING: 104<br>DEPTH: 60.0' |
| Lab No.: | 4 |
| Description: | RED SILTY CLAY,<br>TR SAND |
| Sample Type: | CORE |
| Max. Dry Dens.: | |
| Method (D1557/D698): | |
| Opt. Water Content: | |
| Date: | 12-8-97 |
| Remarks: | |
| Permeameter Type: | FLEXIBLE WALL |
| Tested by: | JWM |
| Checked by: | WSG |
| Test type: | CH - Constant head |

## PERMEABILITY TEST SPECIMEN DATA

| | Before test: | | | After test: | | |
|---|---|---|---|---|---|---|
| ameter: | 1 | 2 | | 1 | 2 | |
| Top: | in | in | | in | in | |
| Middle: | 2.515 in | in | | 2.506 in | in | |
| Bottom: | in | in | | in | in | |
| Average: | 2.52 in | 6.39 cm | | 2.51 in | 6.37 cm | |
| Length: | 1 | 2 | 3 | 1 | 2 | 3 |
| | 2.488 in | in | in | 2.498 in | in | in |
| Average: | 2.49 in | 6.32 cm | | 2.50 in | 6.34 cm | |

Moisture, Density and Sample Parameters:

| | | |
|---|---|---|
| Specific Gravity: | 2.70 | |
| Wet Wt. & Tare: | 411.90 | 438.00 |
| Dry Wt. & Tare: | 372.70 | 372.70 |
| Tare Wt.: | 0.00 | 0.00 |
| Moisture Content: | 10.5 % | 17.5 % |
| Dry Unit Weight: | 114.9 pcf | 115.2 pcf |
| Porosity: | 0.3185 | 0.3163 |
| Saturation: | 60.8 % | 102.2 % |

Cell No.: 4 Panel No.: Positions:

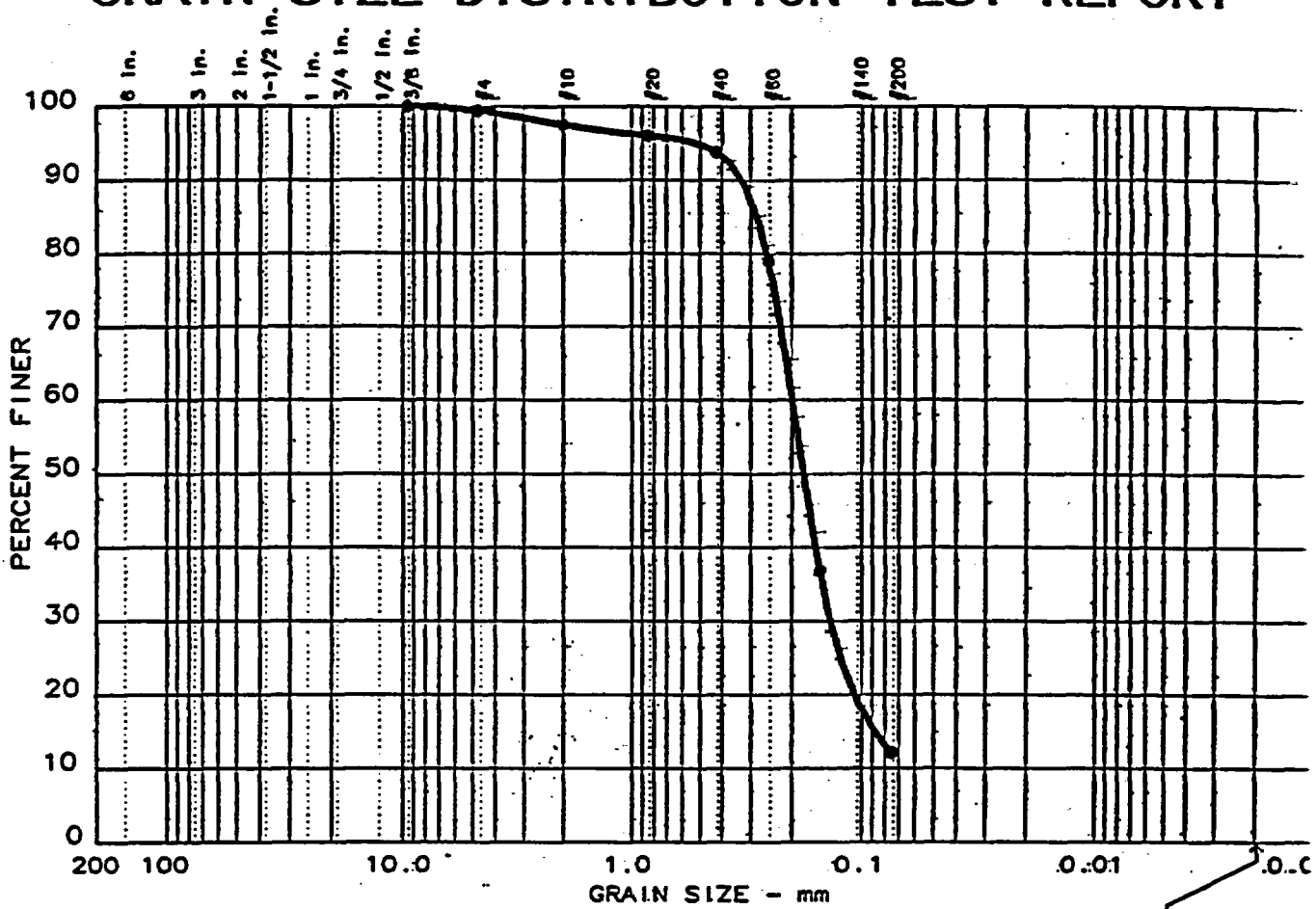
| Run Number: | 1 | 2 |
|---|---|---|
| Cell Pressure: | 30.0 psi | 0.0 psi |
| Saturation Pressure: | 30.0 psi | 0.0 psi |
| Inflow Corr. Factor: | 1.00 | 1.00 |
| Outflow Corr. Factor: | 1.00 | 1.00 |
| Test Temperature: | 27.0 °C | 0.0 °C |

PERMEABILITY TEST READINGS DATA

| CASE D X S R | DATE | TIME (24 hr) | ELAPSED TIME-sec | GAUGE PRESSURE-psi IN | OUT | BURET READING-cc IN | OUT | FLOW VOLUME-cc AVERAGE |
|---|---|---|---|---|---|---|---|---|
| S X | 12/12/97 | 13:19:00 | 0 | 27.0 | 17.0 | 5.80 | 84.60 | 0.00 |
| | 12/12/97 | 16:55:00 | 12,960 | 27.0 | 17.0 | 9.50 | 81.00 | 3.65 |
| | 12/13/97 | 11:46:00 | 80,820 | 27.0 | 17.0 | 26.50 | 64.80 | 20.25 |
| | 12/14/97 | 15:33:00 | 180,840 | 27.0 | 17.0 | 50.90 | 41.20 | 44.25 |
| | 12/15/97 | 6:32:00 | 234,780 | 27.0 | 17.0 | 63.40 | 29.20 | 56.50 |
| | 12/15/97 | 12:12:00 | 255,180 | 27.0 | 17.0 | 68.10 | 24.40 | 61.25 |
| | 12/15/97 | 16:36:00 | 271,020 | 27.0 | 17.0 | 72.00 | 20.80 | 65.00 |
| | 12/16/97 | 6:29:00 | 321,000 | 27.0 | 17.0 | 84.00 | 9.00 | 76.90 |

t Pressure = 27.0 psi Differential Head = 9.8 psi, 686.2 cm H2O
Gradient = 1.086E 02 Flow rate = 2.370E-04 cc/sec R squared = 0.99990
Permeability, K27.0° = 6.810E-08 cm/sec, K20° = 5.791E-08 cm/sec

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| • | 5 | 0.0 | 0.6 | 87.2 | 12.2 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| • | NA | NA | 0.279 | 0.197 | 0.176 | 0.135 | 0.0869 | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| • GRAYISH BRN F/C SAND,LITTLE SILT,TR FINE GRAVEL | SM | A-2-4 |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
• Location: HOBBS, NEW MEXICO

Date: 1-30-98

Remarks:
BORING: B-105
S-9

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 5

Date: 1-30-98
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: GRAYISH BRN F/C SAND,LITTLE SILT,TR FINE GRAVEL
USCS Class: SM Liquid limit: NA
AASHTO Class: A-2-4 Plasticity index: NA

## Notes

Remarks: BORING: B-105 S-9

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 105.70 |
| Tare = | 0.00 |
| Dry sample weight = | 105.70 |

Tare for cumulative weight retained= 0

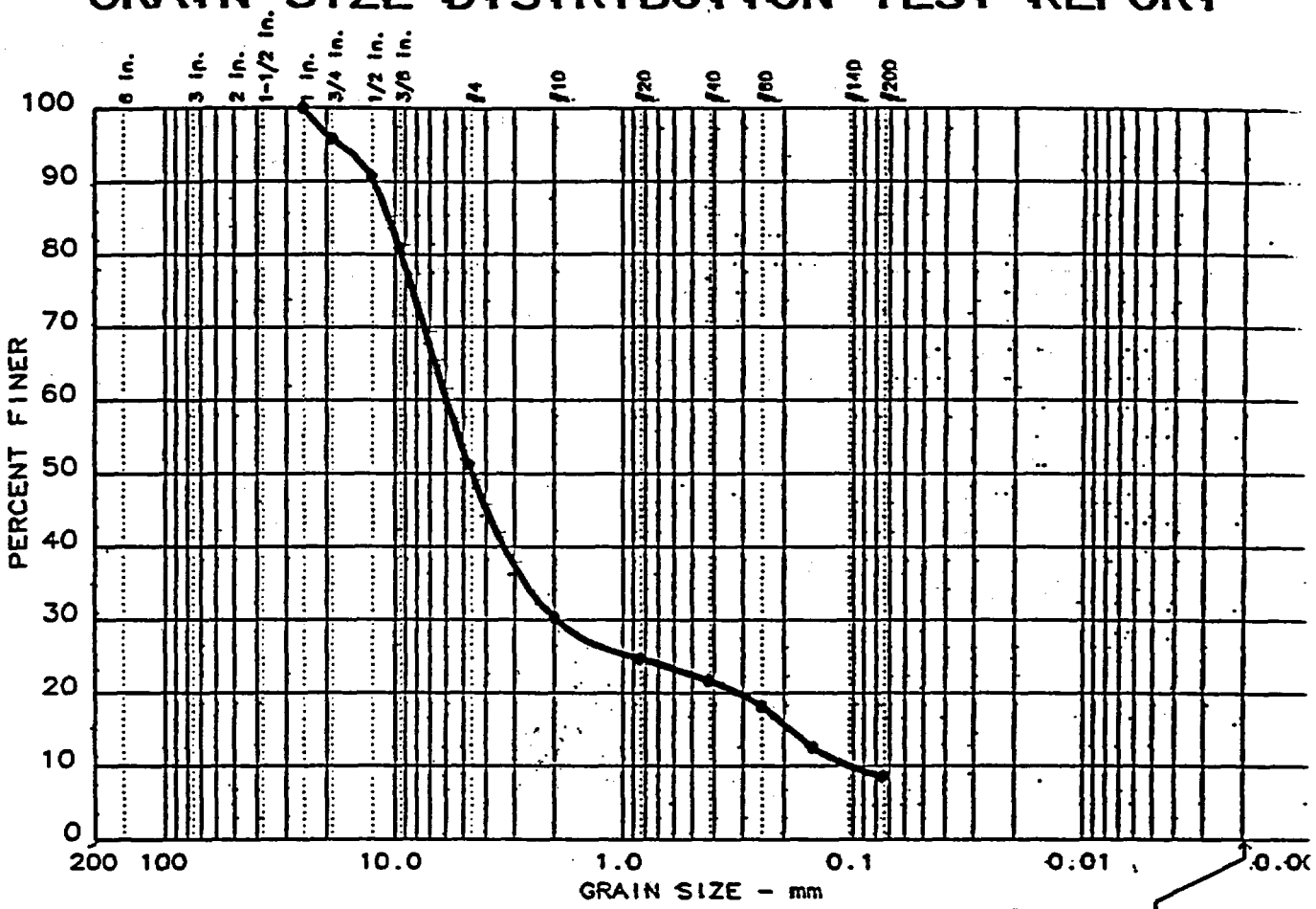
| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| 0.375 inches | 0.00 | 100.0 |
| 4 | 0.60 | 99.4 |
| # 10 | 2.60 | 97.5 |
| # 20 | 4.20 | 96.0 |
| # 40 | 6.50 | 93.9 |
| # 60 | 22.20 | 79.0 |
| # 100 | 66.70 | 36.9 |
| # 200 | 92.80 | 12.2 |

## Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.6 % SAND = 87.2
% FINES = 12.2

D85= 0.28 D60= 0.197 D50= 0.176
D30= 0.1346 D15= 0.08690

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 6 | 0.0 | 48.8 | 42.6 | 8.6 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | 10.6 | 5.90 | 4.58 | 1.95 | 0.186 | 0.102 | 6.31 | 57.5 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● ROSE & WHITE F/C GRAVEL & SAND, TR SILT | GP-GM | A-1-a |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 1-30-98

Remarks:
BORING: B-105
S-38

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

Date: 1-30-98
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: ROSE & WHITE F/C GRAVEL & SAND, TR SILT
USCS Class: GP-GM
AASHTO Class: A-1-a
Liquid limit: NA
Plasticity index: NA

## Notes

Remarks: BORING: B-105 S-38

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 229.10 |
| Tare = | 0.00 |
| Dry sample weight = | 229.10 |

Tare for cumulative weight retained= 0

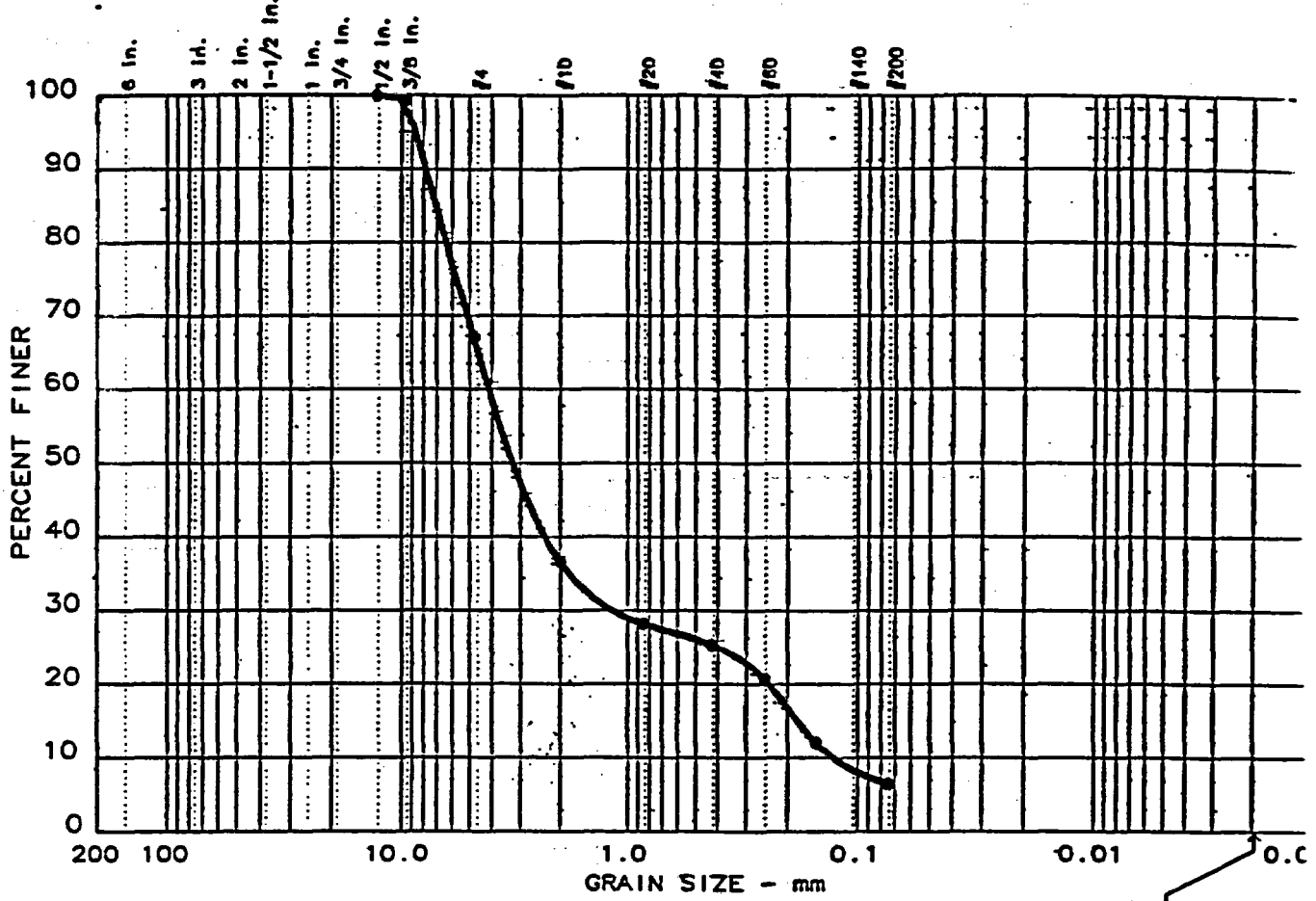
| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| 1 inches | 0.00 | 100.0 |
| .75 inches | 9.50 | 95.9 |
| 0.5 inches | 21.20 | 90.7 |
| 0.375 inches | 43.70 | 80.9 |
| # 4 | 111.70 | 51.2 |
| # 10 | 159.70 | 30.3 |
| # 20 | 172.40 | 24.7 |
| # 40 | 179.30 | 21.7 |
| # 60 | 187.30 | 18.2 |
| # 100 | 200.20 | 12.6 |
| # 200 | 209.30 | 8.6 |

## Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 48.8 % SAND = 42.6
% FINES = 8.6

D85= 10.56 D60= 5.895 D50= 4.576
D30= 1.9521 D15= 0.18642 D10= 0.10245
Cc = 6.3096 Cu = 57.5440

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| • | 4 | 0.0 | 32.9 | 60.6 | 6.5 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| • | NA | NA | 7.00 | 4.12 | 3.23 | 1.16 | 0.178 | 0.126 | 2.60 | 32.7 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| • ROSE & WHITE F/C SAND, SOME F/M GRAVEL, TR SILT | SW-SM | A-1-a |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
• Location: HOBBS, NEW MEXICO

Date: 1-30-98

Remarks:
BORING: B-105
S-39

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

Date: 1-30-98
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: ROSE & WHITE F/C SAND, SOME F/M GRAVEL, TR SILT
USCS Class: SW-SM  Liquid limit: NA
AASHTO Class: A-1-a  Plasticity index: NA

## Notes

Remarks: BORING: B-105 S-39

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 192.90 |
| Tare = | 0.00 |
| Dry sample weight = | 192.90 |

Tare for cumulative weight retained= 0

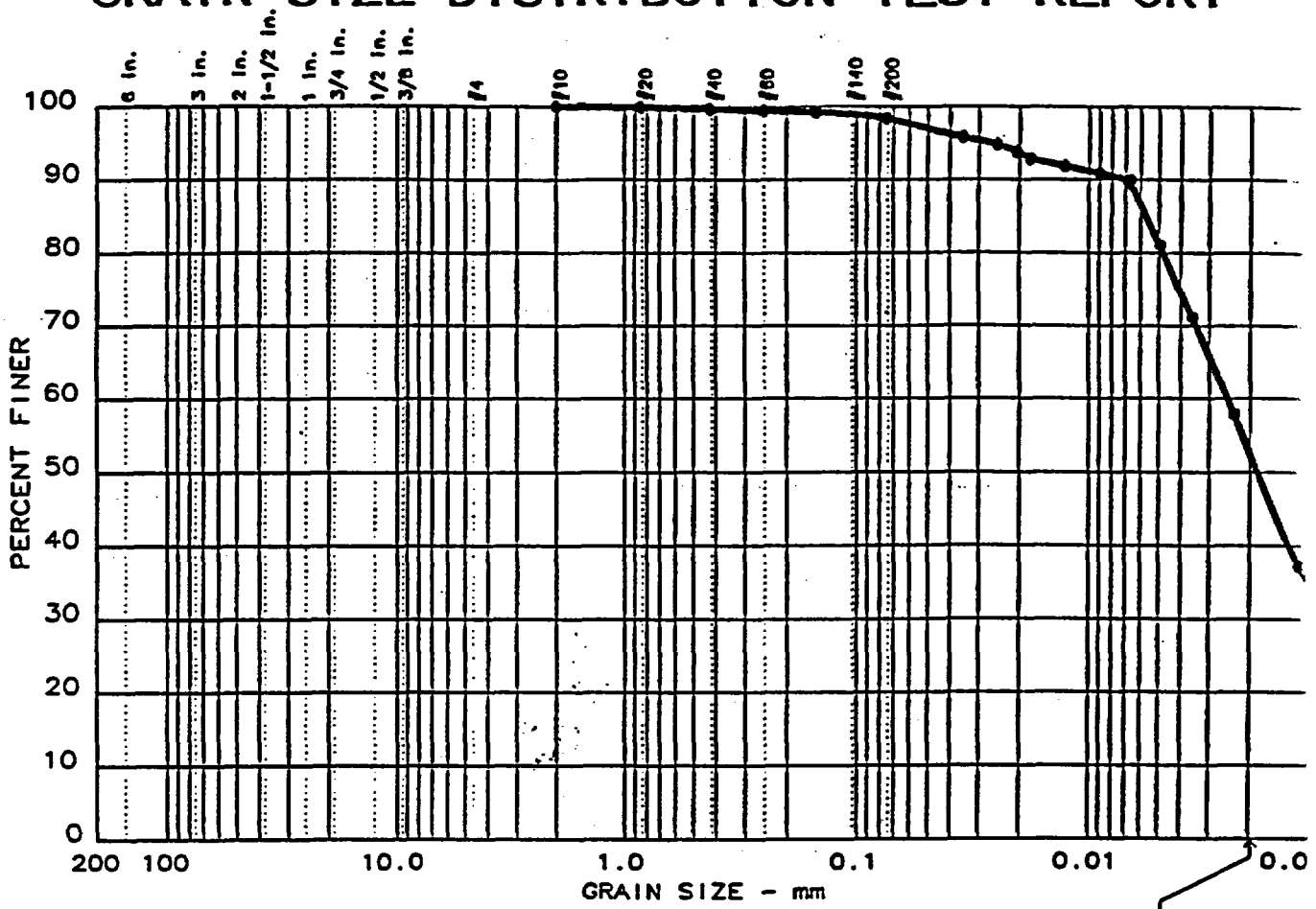
| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| 0.5 inches | 0.00 | 100.0 |
| .375 inches | 1.40 | 99.3 |
| # 4 | 63.50 | 67.1 |
| # 10 | 122.20 | 36.7 |
| # 20 | 138.40 | 28.3 |
| # 40 | 144.00 | 25.3 |
| # 60 | 153.00 | 20.7 |
| # 100 | 169.60 | 12.1 |
| # 200 | 180.40 | 6.5 |

## Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0  % GRAVEL = 32.9  % SAND = 60.6
% FINES = 6.5

D85= 7.00 D60= 4.116 D50= 3.232
D30= 1.1601 D15= 0.17762 D10= 0.12575
Cc = 2.6002 Cu = 32.7341

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 2 | 0.0 | 0.0 | 1.6 | 45.8 | 52.6 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | | | 0.0018 | 0.0009 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● RED SILTY CLAY, TR SAND | CL | |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 12-10-97

Remarks:
BORING: 108
DEPTH: 60.0'

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

Date: 12-10-97
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SILTY CLAY, TR SAND
USCS Class: CL
AASHTO Class:
Liquid limit: NA
Plasticity index: NA

## Notes

Remarks: BORING: 108 DEPTH: 60.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 293.70 |
| Tare = | 0.00 |
| Dry sample weight = | 293.70 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50 Tare = 0 Sample weight = 50
Cumulative weight retained tare= 0
e for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 10 | 0.00 | 100.0 |
| # 20 | 0.10 | 99.8 |
| # 40 | 0.20 | 99.6 |
| # 60 | 0.30 | 99.4 |
| # 100 | 0.40 | 99.2 |
| # 200 | 0.80 | 98.4 |

## Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 100.0
Weight of hydrometer sample: 50
Calculated biased weight= 50.00
Automatic temperature correction
Composite correction at 20 deg C =-4.5

Meniscus correction only= 1
Specific gravity of solids= 2.72
Specific gravity correction factor= 0.985

| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 23.0 | 52.5 | 48.7 | 0.0129 | 53.5 | 7.5 | 0.0353 | 95.8 |
| 2.0 | 23.0 | 52.0 | 48.2 | 0.0129 | 53.0 | 7.6 | 0.0251 | 94.8 |
| 3.0 | 23.0 | 51.5 | 47.7 | 0.0129 | 52.5 | 7.7 | 0.0206 | 93.9 |
| 4.0 | 23.0 | 51.0 | 47.2 | 0.0129 | 52.0 | 7.8 | 0.0180 | 92.9 |
| 8.0 | 23.0 | 50.5 | 46.7 | 0.0129 | 51.5 | 7.8 | 0.0128 | 91.9 |
| 16.0 | 23.0 | 50.0 | 46.2 | 0.0129 | 51.0 | 7.9 | 0.0091 | 90.9 |
| 30.0 | 23.0 | 49.5 | 45.7 | 0.0129 | 50.5 | 8.0 | 0.0067 | 89.9 |
| 60.0 | 23.0 | 45.0 | 41.2 | 0.0129 | 46.0 | 8.8 | 0.0049 | 81.1 |
| 125.0 | 23.0 | 40.0 | 36.2 | 0.0129 | 41.0 | 9.6 | 0.0036 | 71.2 |
| 330.0 | 22.0 | 33.5 | 29.4 | 0.0130 | 34.5 | 10.6 | 0.0023 | 57.9 |
| 1410.0 | 22.0 | 23.0 | 18.9 | 0.0130 | 24.0 | 12.4 | 0.0012 | 37.2 |
| 2850.0 | 23.0 | 19.0 | 15.2 | 0.0129 | 20.0 | 13.0 | 0.0009 | 29.9 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 1.6
% SILT = 45.8 % CLAY = 52.6 (% CLAY COLLOIDS = 32.7)

D85= 0.01 D60= 0.002 D50= 0.002
D30= 0.0009

# PERMEABILITY TEST REPORT

**TEST DATA:**

Specimen Height (cm): 6.97
Specimen Diameter (cm): 6.10
Dry Unit Weight (pcf): 137.7
Moisture Before Test (%): 4.7
Moisture After Test (%): 9.0

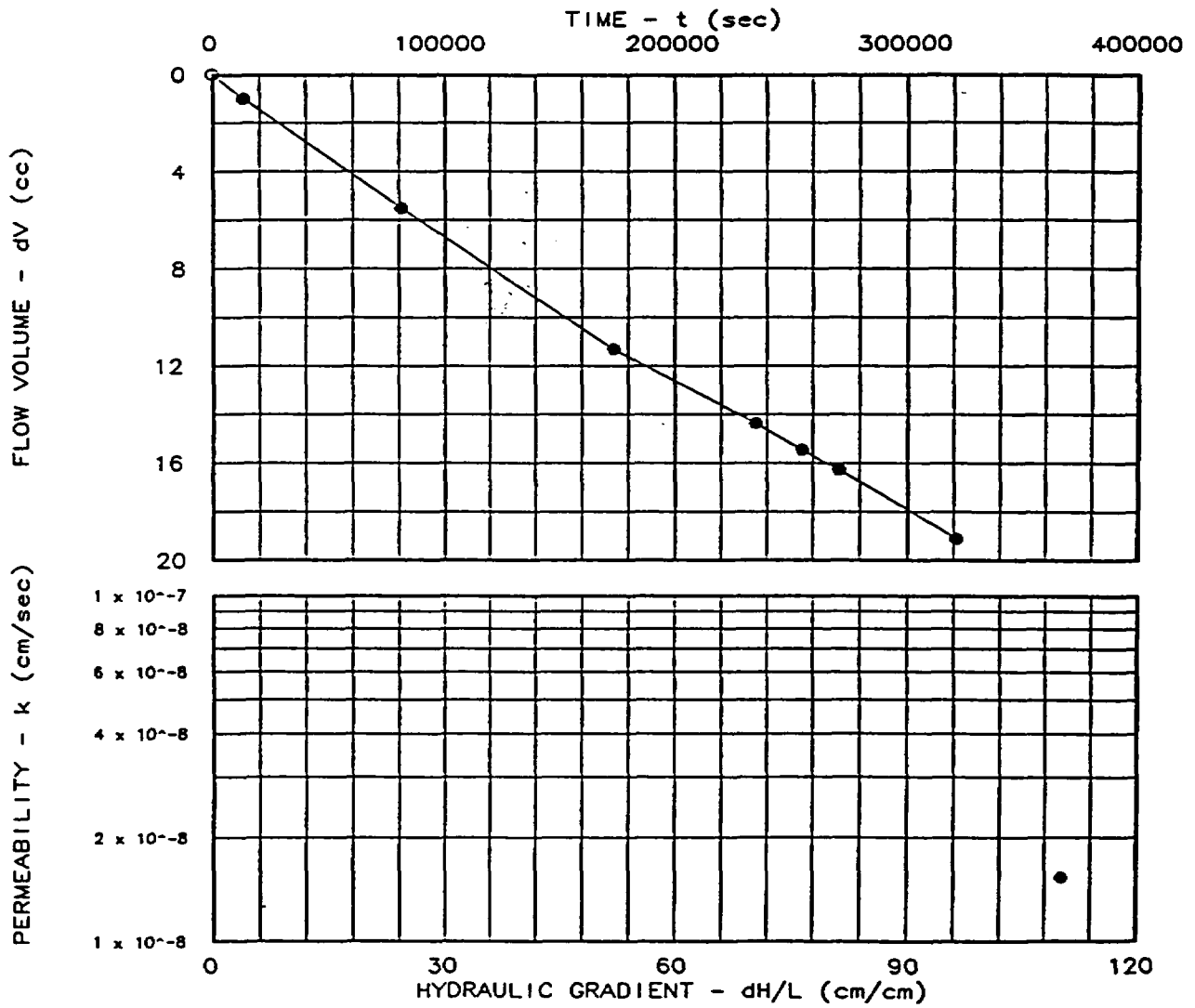
| Run Number: | 1 ● | 2 ▲ |
|---|---|---|
| Cell Pressure (psi): | 30.0 | |
| Test Pressure(psi): | 27.0 | |
| Back Pressure(psi): | 16.1 | |
| Diff. Head (psi): | 10.9 | |
| Flow Rate (cc/sec): | $5.82 \times 10^{-5}$ | |
| Perm. (cm/sec): | $1.54 \times 10^{-8}$ | |

**SAMPLE DATA:**

Sample Identification: BORING: 108
DEPTH: 60.0'
Visual Description: RED SILTY CLAY, TR SAND
Remarks:

Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: FLEXIBLE WALL
Sample type: CORE




Project: LEA COUNTY LANDFILL
Location: HOBBS, NEW MEXICO
Date: 12-8-97

PERMEABILITY TEST REPORT

WEAVER BOOS CONSULTANTS, INC.

Project No.: 95042.10
File No.: 95042.10
Lab No.: 2
Tested by: JWM
Checked by: WSG
Test: CH - Constant head

# PERMEABILITY TEST DATA

## PROJECT DATA

| | |
|---|---|
| Project Name: | LEA COUNTY LANDFILL |
| e No.: | 95042.10 |
| .oject Location: | HOBBS, NEW MEXICO |
| Project No.: | 95042.10 |
| Sample Identification: | BORING: 108<br>DEPTH: 60.0' |
| Lab No.: | 2 |
| Description: | RED SILTY CLAY,<br>TR SAND |
| Sample Type: | CORE |
| Max. Dry Dens.: | |
| Method (D1557/D698): | |
| Opt. Water Content: | |
| Date: | 12-8-97 |
| Remarks: | |
| Permeameter Type: | FLEXIBLE WALL |
| Tested by: | JWM |
| Checked by: | WSG |
| Test type: | CH - Constant head |

## PERMEABILITY TEST SPECIMEN DATA

| | Before test: | | After test: | |
|---|---|---|---|---|
| ..ameter: | 1 | 2 | 1 | 2 |
| Top: | in | in | in | in |
| Middle: | 2.403 in | in | 2.401 in | in |
| Bottom: | in | in | in | in |
| Average: | 2.40 in | 6.10 cm | 2.40 in | 6.10 cm |

| | | | | | | |
|---|---|---|---|---|---|---|
| Length: | 1 | 2 | 3 | 1 | 2 | 3 |
| | 2.745 in | in | in | 2.786 in | in | i |
| Average: | 2.75 in | 6.97 cm | | 2.79 in | 7.08 cm | |

Moisture, Density and Sample Parameters:

| | | |
|---|---|---|
| Specific Gravity: | 2.72 | |
| Wet Wt. & Tare: | 471.10 | 490.70 |
| Dry Wt. & Tare: | 450.10 | 450.10 |
| Tare Wt.: | 0.00 | 0.00 |
| Moisture Content: | 4.7 % | 9.0 % |
| Dry Unit Weight: | 137.7 pcf | 135.9 pcf |
| Porosity: | 0.1889 | 0.1995 |
| Saturation: | 54.5 % | 98.5 % |

Cell No.: 2 Panel No.: Positions:

| Run Number: | 1 | 2 |
|---|---|---|
| Cell Pressure: | 30.0 psi | 0.0 psi |
| Saturation Pressure: | 30.0 psi | 0.0 psi |
| Inflow Corr. Factor: | 1.00 | 1.00 |
| Outflow Corr. Factor: | 1.00 | 1.00 |
| Test Temperature: | 27.0 °C | 0.0 °C |

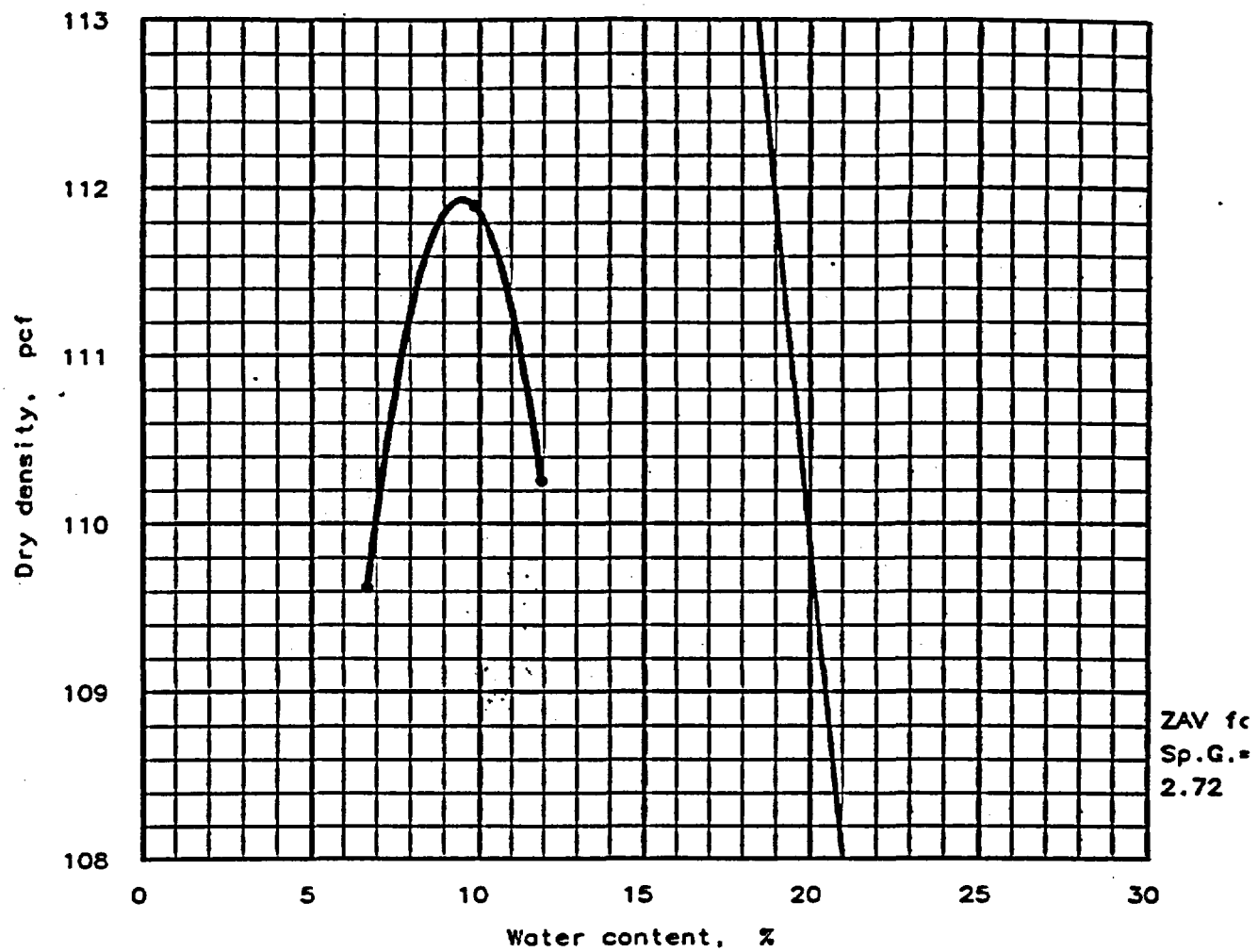
---

PERMEABILITY TEST READINGS DATA

| CASE D X S R | DATE | TIME (24 hr) | ELAPSED TIME-sec | GAUGE PRESSURE-psi IN | OUT | BURET READING-cc IN | OUT | FLOW VOLUME-cc AVERAGE |
|---|---|---|---|---|---|---|---|---|
| S X | 12/12/97 | 13:18:00 | 0 | 27.0 | 17.0 | 6.00 | 86.20 | 0.00 |
| | 12/12/97 | 16:54:00 | 12,960 | 27.0 | 17.0 | 7.00 | 85.20 | 1.00 |
| | 12/13/97 | 11:45:00 | 80,820 | 27.0 | 17.0 | 11.60 | 80.80 | 5.50 |
| | 12/14/97 | 13:32:00 | 173,640 | 27.0 | 17.0 | 17.70 | 75.30 | 11.30 |
| | 12/15/97 | 6:31:00 | 234,780 | 27.0 | 17.0 | 20.70 | 72.20 | 14.35 |
| | 12/15/97 | 12:11:00 | 255,180 | 27.0 | 17.0 | 21.80 | 71.10 | 15.45 |
| | 12/15/97 | 16:35:00 | 271,020 | 27.0 | 17.0 | 22.60 | 70.30 | 16.25 |
| | 12/16/97 | 6:28:00 | 321,000 | 27.0 | 17.0 | 25.40 | 67.40 | 19.10 |

[illegible]t Pressure = 27.0 psi Differential Head = 10.9 psi, 767.3 cm H20
[illegible]dient = 1.100E 02 Flow rate = 5.821E-05 cc/sec R squared = 0.99773
Permeability, K27.0° = 1.808E-08 cm/sec, K20° = 1.537E-08 cm/sec

# MOISTURE-DENSITY RELATIONSHIP TEST




Test specification: ASTM D 698-91 Procedure A, Standard

| Elev/ Depth | Classification | | Nat. Moist. | Sp.G. | LL | PI | % > No.4 | % < No.2 |
|---|---|---|---|---|---|---|---|---|
| | USCS | AASHTO | | | | | | |
| | CL | | | 2.72 | | | 0.0 % | 98. |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|---|
| Maximum dry density = 111.9 pcf<br>Optimum moisture = 9.5 % | RED SILTY CLAY,<br>TR SAND |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
Location: HOBBS, NEW MEXICO

Date: 12-16-97

Remarks:
BORING: 108
DEPTH: 60.0'

MOISTURE-DENSITY RELATIONSHIP TEST

WEAVER BOOS CONSULTANTS, INC.

Fig. No. _____

## PROJECT DATA

| | |
|---|---|
| Date: | 12-16-97 |
| Project no.: | 95042.10 |
| Project: | LEA COUNTY LANDFILL |
| Location 1: | HOBBS, NEW MEXICO |
| 2: | |
| Remarks 1: | BORING: 108 |
| 2: | DEPTH: 60.0' |
| 3: | |
| Material 1: | RED SILTY CLAY, |
| description 2: | TR SAND |
| Elevation or depth: | |
| Fig no: | |

## SPECIMEN DATA

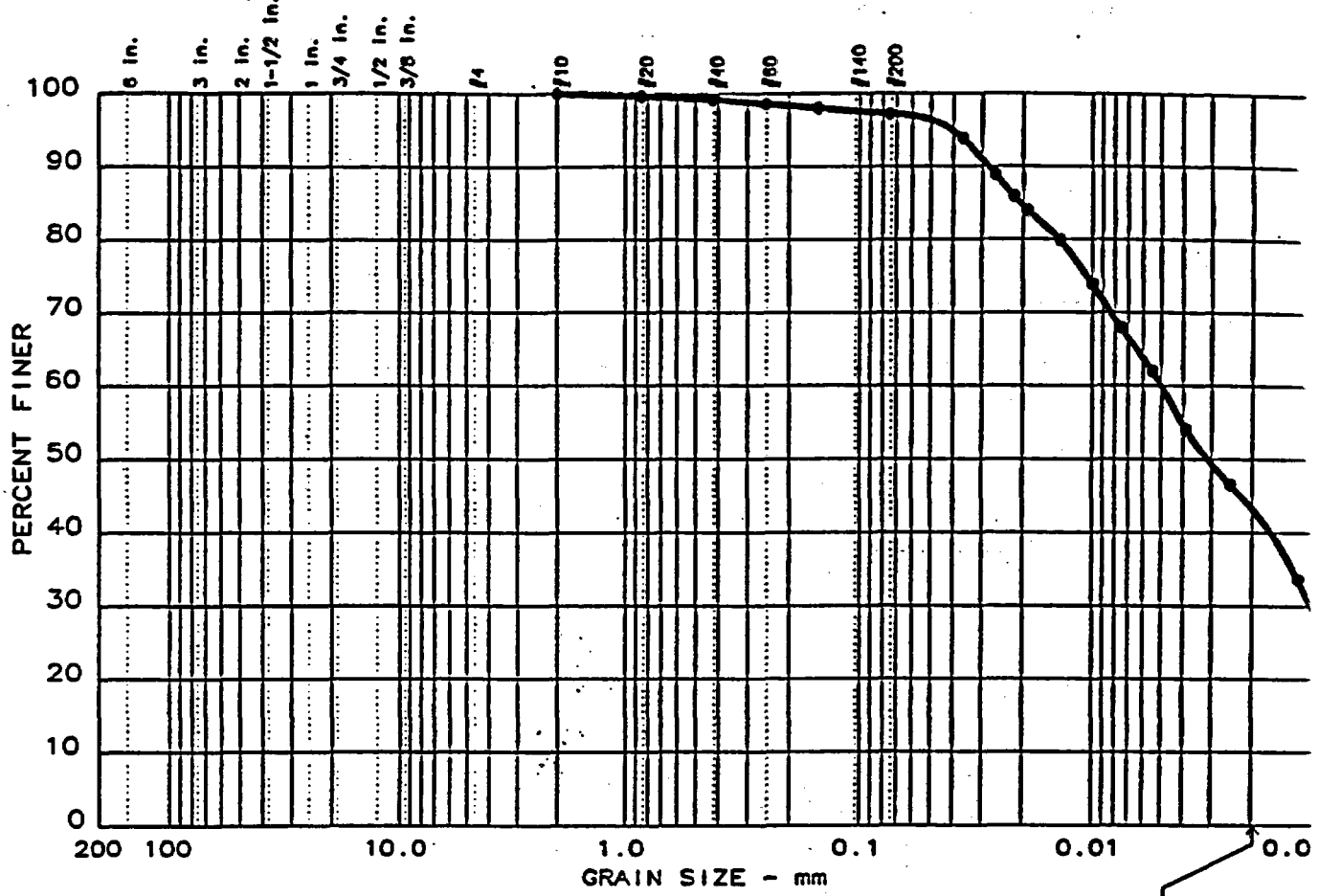
USCS classification: CL  AASHTO classification:
Natural moisture:  Specific gravity: 2.72
Percent retained on No.4 sieve: 0.0
Percent passing No. 200 sieve: 98.4
Liquid limit:  Plastic limit:  Plasticity index:

## TEST DATA AND RESULTS

Type of test: Standard, ASTM D 698-91 Procedure A

Max dry den= 111.9 pcf
Opt moisture= 9.5 %

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 3 | 0.0 | 0.0 | 2.8 | 53.8 | 43.4 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | | | 0.0031 | 0.0011 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● RED SILTY CLAY, TR SAND | CL | |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 12-10-97

Remarks:
BORING: 109
DEPTH: 80.0'

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

Date: 12-10-97
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SILTY CLAY, TR SAND
USCS Class: CL
AASHTO Class:
Liquid limit: NA
Plasticity index: NA

## Notes

Remarks: BORING: 109 DEPTH: 80.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 336.20 |
| Tare = | 0.00 |
| Dry sample weight = | 336.20 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50 Tare = 0 Sample weight = 50
Cumulative weight retained tare= 0
e for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 10 | 0.00 | 100.0 |
| # 20 | 0.20 | 99.6 |
| # 40 | 0.40 | 99.2 |
| # 60 | 0.70 | 98.6 |
| # 100 | 1.00 | 98.0 |
| # 200 | 1.40 | 97.2 |

## Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 100.0
Weight of hydrometer sample: 50
Calculated biased weight= 50.00
Automatic temperature correction
Composite correction at 20 deg C =-4.5

Meniscus correction only= 1
Specific gravity of solids= 2.67
Specific gravity correction factor= 0.995

| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 23.0 | 51.0 | 47.2 | 0.0131 | 52.0 | 7.8 | 0.0364 | 93.9 |
| 2.0 | 23.0 | 48.5 | 44.7 | 0.0131 | 49.5 | 8.2 | 0.0264 | 88.9 |
| 3.0 | 23.0 | 47.0 | 43.2 | 0.0131 | 48.0 | 8.4 | 0.0219 | 85.9 |
| 4.0 | 23.0 | 46.0 | 42.2 | 0.0131 | 47.0 | 8.6 | 0.0192 | 83.9 |
| 8.0 | 23.0 | 44.0 | 40.2 | 0.0131 | 45.0 | 8.9 | 0.0138 | 80.0 |
| 16.0 | 23.0 | 41.0 | 37.2 | 0.0131 | 42.0 | 9.4 | 0.0100 | 74.0 |
| 30.0 | 23.0 | 38.0 | 34.2 | 0.0131 | 39.0 | 9.9 | 0.0075 | 68.0 |
| 60.0 | 23.0 | 35.0 | 31.2 | 0.0131 | 36.0 | 10.4 | 0.0054 | 62.0 |
| 125.0 | 23.0 | 31.0 | 27.2 | 0.0131 | 32.0 | 11.0 | 0.0039 | 54.1 |
| 330.0 | 22.0 | 27.5 | 23.4 | 0.0132 | 28.5 | 11.6 | 0.0025 | 46.6 |
| 1410.0 | 22.0 | 21.0 | 16.9 | 0.0132 | 22.0 | 12.7 | 0.0013 | 33.7 |
| 2850.0 | 23.0 | 15.5 | 11.7 | 0.0131 | 16.5 | 13.6 | 0.0009 | 23.2 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 2.8
% SILT = 53.8 % CLAY = 43.4 (% CLAY COLLOIDS = 26.7)

D85= 0.02 D60= 0.005 D50= 0.003
D30= 0.0011

# PERMEABILITY TEST REPORT

**TEST DATA:**

Specimen Height (cm): 5.72
Specimen Diameter (cm): 6.43
Dry Unit Weight (pcf): 107.3
Moisture Before Test (%): 12.3
Moisture After Test (%): 21.8

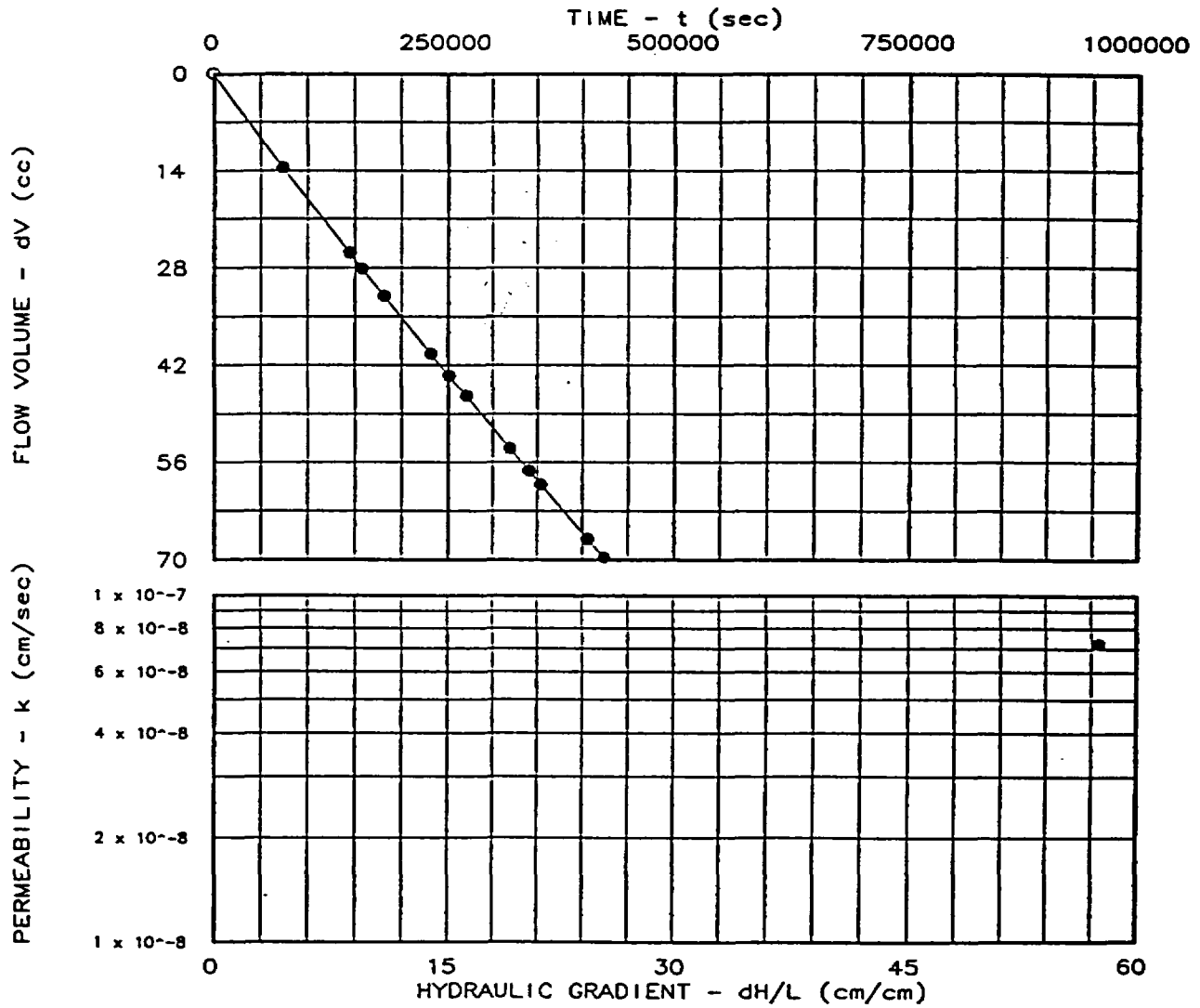
| Run Number: | 1 ● | 2 ▲ |
|---|---|---|
| Cell Pressure (psi): | 30.0 | |
| Test Pressure(psi): | 25.0 | |
| Back Pressure(psi): | 20.3 | |
| Diff. Head (psi): | 4.7 | |
| Flow Rate (cc/sec): | $1.59 \times 10^{-4}$ | |
| Perm. (cm/sec): | $7.25 \times 10^{-8}$ | |

**SAMPLE DATA:**

Sample Identification: BORING: 109
DEPTH: 80.0'
Visual Description: RED SILTY CLAY, TR SAND
Remarks:

Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: FLEXIBLE WALL
Sample type: CORE




Project: LEA COUNTY LANDFILL
Location: HOBBS, NEW MEXICO
Date: 12-3-97

PERMEABILITY TEST REPORT

WEAVER BOOS CONSULTANTS, INC.

Project No.: 95042.10
File No.: 95042.10
Lab No.: 1
Tested by: JWM
Checked by: WSG
Test: CH - Constant head

# PERMEABILITY TEST DATA

## PROJECT DATA

| | |
|---|---|
| Project Name: | LEA COUNTY LANDFILL |
| e No.: | 95042.10 |
| oject Location: | HOBBS, NEW MEXICO |
| Project No.: | 95042.10 |
| Sample Identification: | BORING: 109<br>DEPTH: 80.0' |
| Lab No.: | 1 |
| Description: | RED SILTY CLAY,<br>TR SAND |
| Sample Type: | CORE |
| Max. Dry Dens.: | |
| Method (D1557/D698): | |
| Opt. Water Content: | |
| Date: | 12-3-97 |
| Remarks: | |
| Permeameter Type: | FLEXIBLE WALL |
| Tested by: | JWM |
| Checked by: | WSG |
| Test type: | CH - Constant head |

## PERMEABILITY TEST SPECIMEN DATA

| | Before test: | | | After test: | | |
|---|---|---|---|---|---|---|
| Diameter: | 1 | 2 | | 1 | 2 | |
| Top: | in | in | | in | in | |
| Middle: | 2.531 in | in | | 2.508 in | in | |
| Bottom: | in | in | | in | in | |
| Average: | 2.53 in | 6.43 cm | | 2.51 in | 6.37 cm | |
| Length: | 1 | 2 | 3 | 1 | 2 | 3 |
| | 2.253 in | in | in | 2.301 in | in | in |
| Average: | 2.25 in | 5.72 cm | | 2.30 in | 5.84 cm | |

Moisture, Density and Sample Parameters:

| | | |
|---|---|---|
| Specific Gravity: | 2.67 | |
| Wet Wt. & Tare: | 358.70 | 389.00 |
| Dry Wt. & Tare: | 319.40 | 319.40 |
| Tare Wt.: | 0.00 | 0.00 |
| Moisture Content: | 12.3 % | 21.8 % |
| Dry Unit Weight: | 107.3 pcf | 107.0 pcf |
| Porosity: | 0.3560 | 0.3578 |
| Saturation: | 59.4 % | 104.4 % |

## CONSTANT HEAD PERMEABILITY TEST CONDITIONS DATA

Cell No.: 1 Panel No.: Positions:

| Run Number: | 1 | 2 |
|---|---|---|
| Cell Pressure: | 30.0 psi | 0.0 psi |
| Saturation Pressure: | 30.0 psi | 0.0 psi |
| Inflow Corr. Factor: | 1.00 | 1.00 |
| Outflow Corr. Factor: | 1.00 | 1.00 |
| Test Temperature: | 27.0 °C | 0.0 °C |

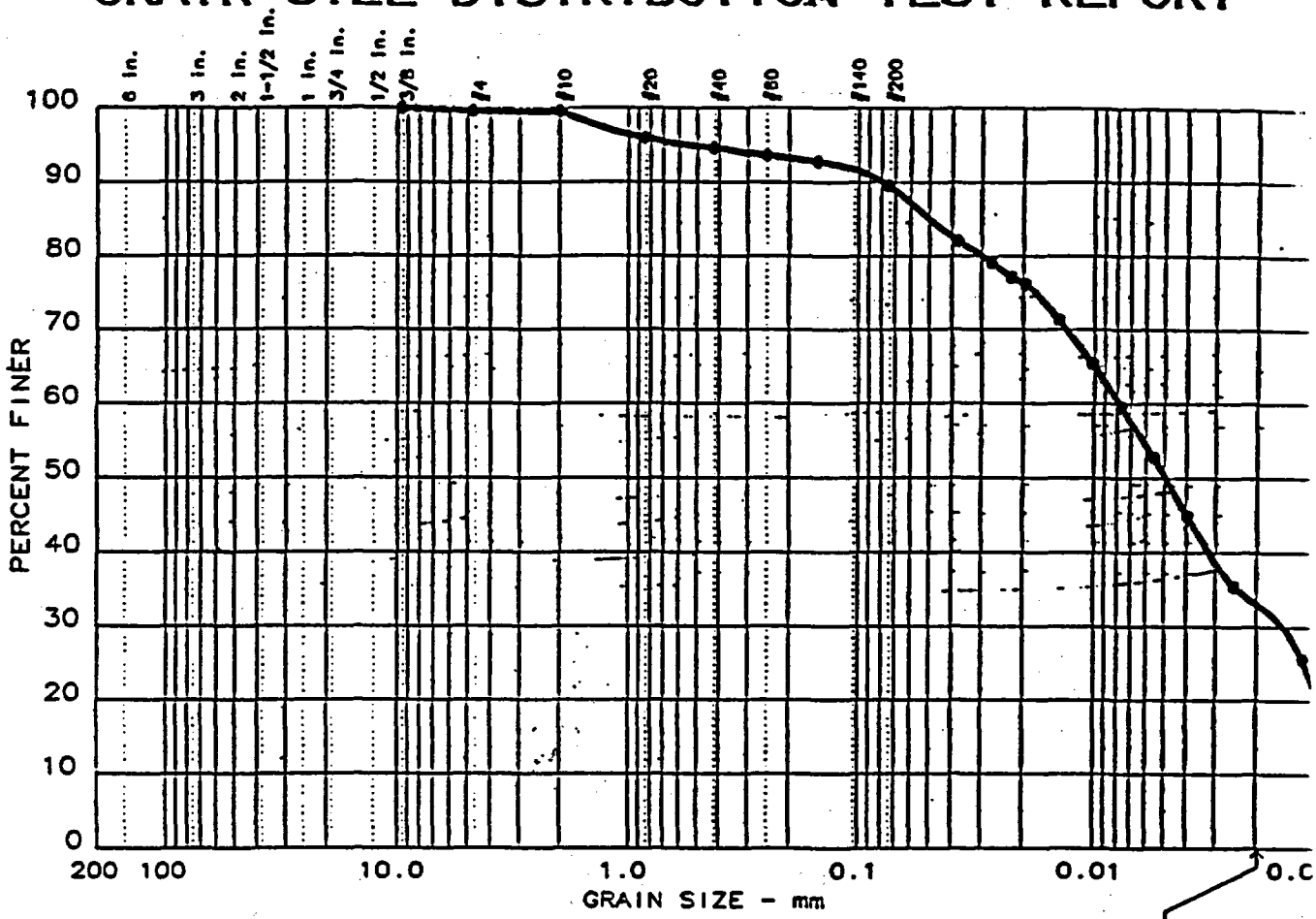
---

## PERMEABILITY TEST READINGS DATA

| CASE D X S R | DATE | TIME (24 hr) | ELAPSED TIME-sec | GAUGE PRESSURE-psi IN | GAUGE PRESSURE-psi OUT | BURET READING-cc IN | BURET READING-cc OUT | FLOW VOLUME-cc AVERAGE |
|---|---|---|---|---|---|---|---|---|
| S X | 12/ 6/97 | 14:51:00 | 0 | 25.0 | 20.0 | 12.00 | 81.40 | 0.00 |
| | 12/ 7/97 | 11:10:00 | 73,140 | 25.0 | 20.0 | 26.30 | 68.70 | 13.50 |
| | 12/ 8/97 | 6:50:00 | 143,940 | 25.0 | 20.0 | 38.80 | 56.60 | 25.80 |
| | 12/ 8/97 | 10:34:00 | 157,380 | 25.0 | 20.0 | 41.20 | 54.40 | 28.10 |
| | 12/ 8/97 | 17:08:00 | 181,020 | 25.0 | 20.0 | 45.10 | 50.50 | 32.00 |
| | 12/ 9/97 | 7:15:00 | 231,840 | 25.0 | 20.0 | 53.40 | 42.20 | 40.30 |
| | 12/ 9/97 | 12:39:00 | 251,280 | 25.0 | 20.0 | 56.70 | 39.20 | 43.45 |
| | 12/ 9/97 | 17:48:00 | 269,820 | 25.0 | 20.0 | 59.70 | 36.40 | 46.35 |
| | 12/10/97 | 7:25:00 | 318,840 | 25.0 | 20.0 | 67.30 | 28.80 | 53.9 |
| | 12/10/97 | 13:25:00 | 340,440 | 25.0 | 20.0 | 70.60 | 25.60 | 57.2 |
| | 12/10/97 | 17:01:00 | 353,400 | 25.0 | 20.0 | 72.60 | 23.60 | 59.20 |
| | 12/11/97 | 7:32:00 | 405,660 | 25.0 | 20.0 | 80.50 | 16.00 | 66.95 |
| | 12/11/97 | 12:37:00 | 423,960 | 25.0 | 20.0 | 83.20 | 13.40 | 69.60 |

Test Pressure = 25.0 psi Differential Head = 4.7 psi, 328.8 cm H2O
Gradient = 5.746E 01 Flow rate = 1.590E-04 cc/sec R squared = 0.99911
Permeability, K27.0° = 8.523E-08 cm/sec, K20° = 7.247E-08 cm/sec

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 15 | 0.0 | 0.4 | 10.0 | 56.5 | 33.1 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | | | 0.0049 | 0.0015 | 0.0010 | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● RED SILTY CLAY, LITTLE SAND | CL | A-4 |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 12-23-97

Remarks:
BORING: 110
DEPTH: 90.0'

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

Date: 12-23-97
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SILTY CLAY, LITTLE SAND
USCS Class: CL
Liquid limit: NA
AASHTO Class: A-4
Plasticity index: NA

## Notes

Remarks: BORING: 110 DEPTH: 90.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 427.40 |
| Tare = | 0.00 |
| Dry sample weight = | 427.40 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50 Tare = 0 Sample weight = 50
Cumulative weight retained tare= 0
e for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| 0.375 inches | 0.00 | 100.0 |
| # 4 | 1.80 | 99.6 |
| # 10 | 1.80 | 99.6 |
| # 20 | 1.80 | 96.0 |
| # 40 | 2.50 | 94.6 |
| # 60 | 3.00 | 93.6 |
| # 100 | 3.40 | 92.8 |
| # 200 | 5.00 | 89.6 |

## Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 99.6
Weight of hydrometer sample: 50
Calculated biased weight= 50.21
Automatic temperature correction
Composite correction at 20 deg C =-4

Meniscus correction only= 1

Specific gravity of solids= 2.74
Specific gravity correction factor= 0.980
Hydrometer type: 152H  Effective depth L= 16.294964 - 0.164 x Rm

| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 22.5 | 45.5 | 42.0 | 0.0129 | 46.5 | 8.7 | 0.0379 | 82.1 |
| 2.0 | 22.5 | 44.0 | 40.5 | 0.0129 | 45.0 | 8.9 | 0.0272 | 79.1 |
| 3.0 | 22.5 | 43.0 | 39.5 | 0.0129 | 44.0 | 9.1 | 0.0224 | 77.2 |
| 4.0 | 22.5 | 42.5 | 39.0 | 0.0129 | 43.5 | 9.2 | 0.0195 | 76.2 |
| 8.0 | 22.5 | 40.0 | 36.5 | 0.0129 | 41.0 | 9.6 | 0.0141 | 71.3 |
| 16.0 | 22.5 | 37.0 | 33.5 | 0.0129 | 38.0 | 10.1 | 0.0102 | 65.5 |
| 30.0 | 22.5 | 34.0 | 30.5 | 0.0129 | 35.0 | 10.6 | 0.0076 | 59.6 |
| 60.0 | 22.5 | 30.5 | 27.0 | 0.0129 | 31.5 | 11.1 | 0.0055 | 52.8 |
| 125.0 | 22.5 | 26.5 | 23.0 | 0.0129 | 27.5 | 11.8 | 0.0040 | 45.0 |
| 330.0 | 23.0 | 21.5 | 18.2 | 0.0128 | 22.5 | 12.6 | 0.0025 | 35.5 |
| 1410.0 | 23.0 | 16.5 | 13.2 | 0.0128 | 17.5 | 13.4 | 0.0012 | 25.7 |
| 2850.0 | 23.0 | 10.0 | 6.7 | 0.0128 | 11.0 | 14.5 | 0.0009 | 13.0 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0  % GRAVEL = 0.4  % SAND = 10.0
% SILT = 56.5  % CLAY = 33.1  (% CLAY COLLOIDS = 17.1)

D85= 0.05  D60= 0.008  D50= 0.005
D30= 0.0015  D15= 0.00095

# PERMEABILITY TEST REPORT

**TEST DATA:**

Specimen Height (cm): 7.10
Specimen Diameter (cm): 6.36
Dry Unit Weight (pcf): 103.0
Moisture Before Test (%): 13.8
Moisture After Test (%): 24.4

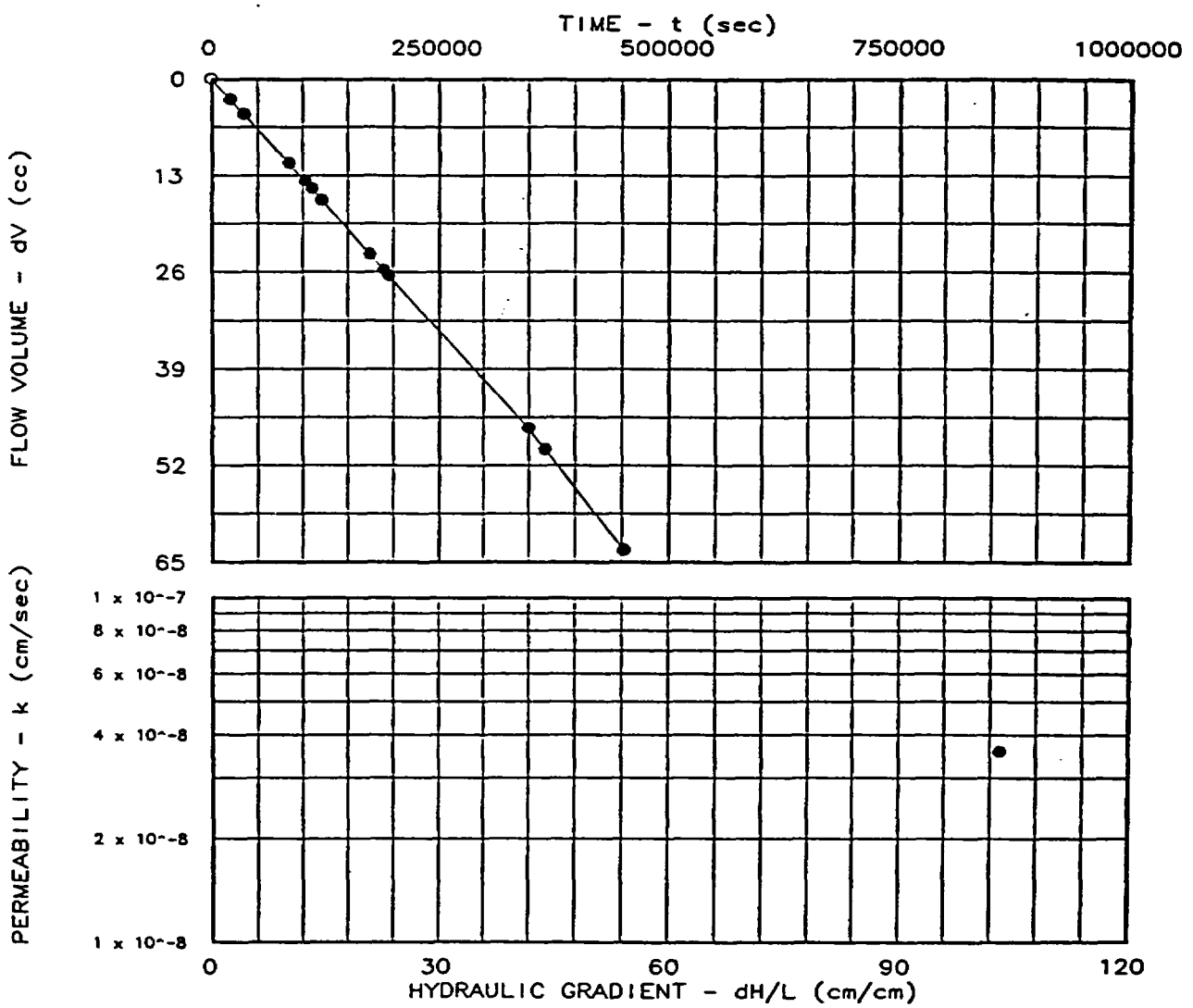
| Run Number: | 1 ● | 2 ▲ |
|---|---|---|
| Cell Pressure (psi): | 35.0 | |
| Test Pressure(psi): | 27.0 | |
| Back Pressure(psi): | 16.6 | |
| Diff. Head (psi): | 10.4 | |
| Flow Rate (cc/sec): | $1.38 \times 10^{-4}$ | |
| Perm. (cm/sec): | $3.58 \times 10^{-8}$ | |

**SAMPLE DATA:**

Sample Identification: BORING: 110
DEPTH: 90.0'
Visual Description: RED SILTY CLAY, LI'.
SAND
Remarks:

Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: FLEXIBLE WALL
Sample type: CORE




Project: LEA COUNTY LANDFILL
Location: HOBBS, NEW MEXICO
Date: 12-18-97

PERMEABILITY TEST REPORT

WEAVER BOOS CONSULTANTS, INC.

Project No.: 95042.10
File No.: 95042.10
Lab No.: 1
Tested by: JWM
Checked by: WSG
Test: CH - Constant head

## PERMEABILITY TEST DATA

### PROJECT DATA

| | |
|---|---|
| Project Name: | LEA COUNTY LANDFILL |
| e No.: | 95042.10 |
| Project Location: | HOBBS, NEW MEXICO |
| Project No.: | 95042.10 |
| Sample Identification: | BORING: 110<br>DEPTH: 90.0' |
| Lab No.: | 1 |
| Description: | RED SILTY CLAY, LITTLE SAND |
| Sample Type: | CORE |
| Max. Dry Dens.: | |
| Method (D1557/D698): | |
| Opt. Water Content: | |
| Date: | 12-18-97 |
| Remarks: | |
| Permeameter Type: | FLEXIBLE WALL |
| Tested by: | JWM |
| Checked by: | WSG |
| Test type: | CH - Constant head |

### PERMEABILITY TEST SPECIMEN DATA

| | Before test: | | | After test: | | |
|---|---|---|---|---|---|---|
| Diameter: | 1 | 2 | | 1 | 2 | |
| Top: | in | in | | in | in | |
| Middle: | 2.502 in | in | | 2.505 in | in | |
| Bottom: | in | in | | in | in | |
| Average: | 2.50 in | 6.36 cm | | 2.51 in | 6.36 cm | |
| Length: | 1 | 2 | 3 | 1 | 2 | 3 |
| | 2.795 in | in | in | 2.802 in | in | in |
| Average: | 2.80 in | 7.10 cm | | 2.80 in | 7.12 cm | |

Moisture, Density and Sample Parameters:

| | | |
|---|---|---|
| Specific Gravity: | 2.74 | |
| Wet Wt. & Tare: | 422.80 | 462.00 |
| Dry Wt. & Tare: | 371.50 | 371.50 |
| Tare Wt.: | 0.00 | 0.00 |
| Moisture Content: | 13.8 % | 24.4 % |
| Dry Unit Weight: | 103.0 pcf | 102.5 pcf |
| Porosity: | 0.3979 | 0.4009 |
| Saturation: | 57.3 % | 99.8 % |

CONSTANT HEAD PERMEABILITY TEST CONDITIONS DATA

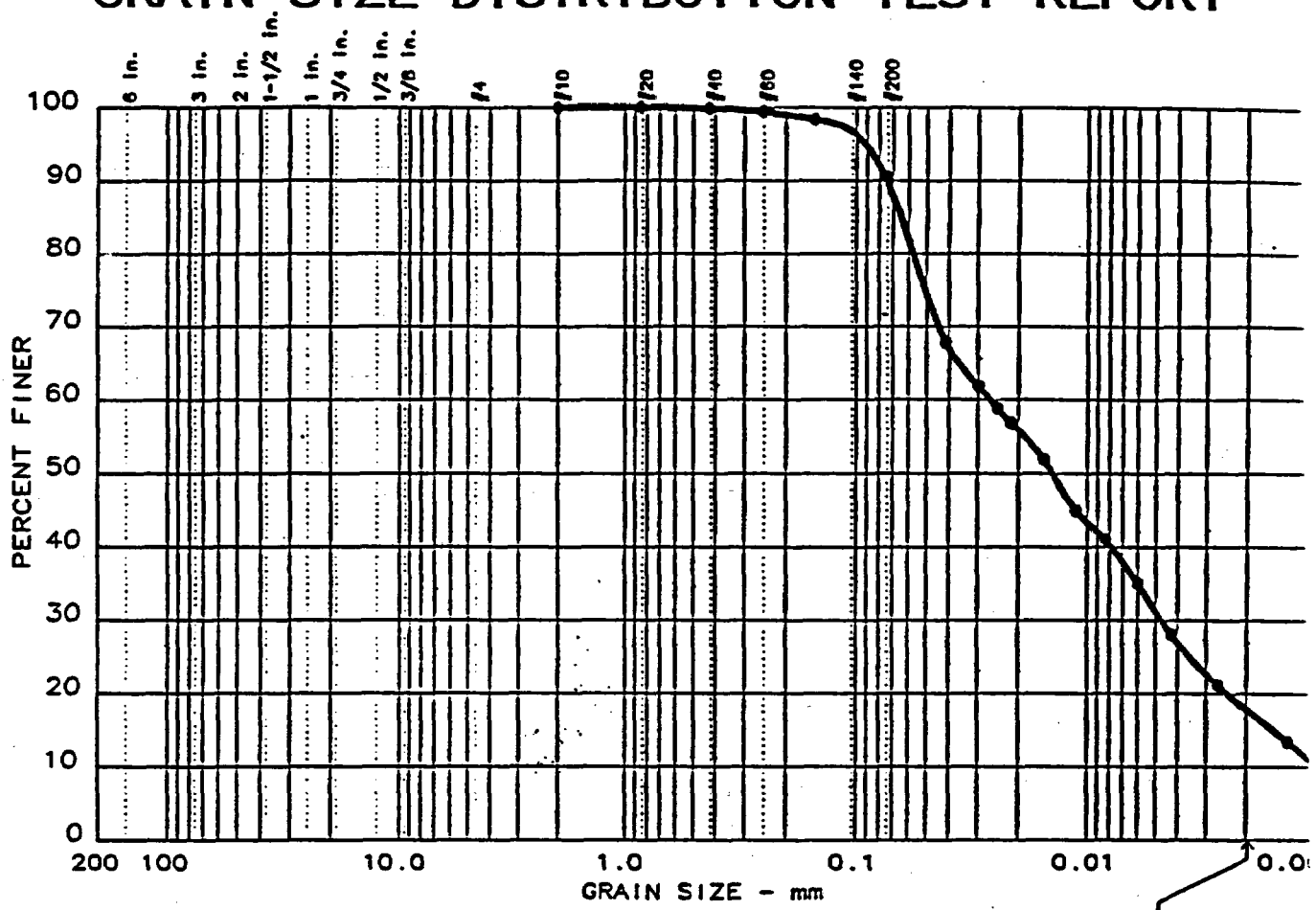
| Cell No.: 1 | Panel No.: | Positions: |
|---|---|---|
| Run Number: | 1 | 2 |
| Cell Pressure: | 35.0 psi | 0.0 psi |
| Saturation Pressure: | 35.0 psi | 0.0 psi |
| Inflow Corr. Factor: | 1.00 | 1.00 |
| Outflow Corr. Factor: | 1.00 | 1.00 |
| Test Temperature: | 27.0 °C | 0.0 °C |

PERMEABILITY TEST READINGS DATA

| CASE D X S R | DATE | TIME (24 hr) | ELAPSED TIME-sec | GAUGE PRESSURE-psi IN | OUT | BURET READING-cc IN | OUT | FLOW VOLUME-cc AVERAGE |
|---|---|---|---|---|---|---|---|---|
| S X | 12/22/97 | 7:32:00 | 0 | 27.0 | 17.0 | 4.40 | 80.60 | 0.00 |
| | 12/22/97 | 13:04:00 | 19,920 | 27.0 | 17.0 | 7.20 | 78.00 | 2.70 |
| | 12/22/97 | 17:15:00 | 34,980 | 27.0 | 17.0 | 9.20 | 76.00 | 4.70 |
| | 12/23/97 | 6:47:00 | 83,700 | 27.0 | 17.0 | 15.90 | 69.60 | 11.25 |
| | 12/23/97 | 11:57:00 | 102,300 | 27.0 | 17.0 | 18.40 | 67.20 | 13.70 |
| | 12/23/97 | 14:02:00 | 109,800 | 27.0 | 17.0 | 19.40 | 66.20 | 14.70 |
| | 12/23/97 | 17:03:00 | 120,660 | 27.0 | 17.0 | 21.00 | 64.70 | 16.25 |
| | 12/24/97 | 7:48:00 | 173,760 | 27.0 | 17.0 | 28.50 | 57.60 | 23.55 |
| | 12/24/97 | 12:10:00 | 189,480 | 27.0 | 17.0 | 30.60 | 55.40 | 25.7[illegible] |
| | 12/24/97 | 13:30:00 | 194,280 | 27.0 | 17.0 | 31.40 | 54.80 | 26.4[illegible] |
| | 12/26/97 | 8:38:00 | 349,560 | 27.0 | 17.0 | 52.60 | 35.00 | 46.90 |
| | 12/26/97 | 13:36:00 | 367,440 | 27.0 | 17.0 | 55.00 | 31.60 | 49.80 |
| | 12/27/97 | 13:08:00 | 452,160 | 27.0 | 17.0 | 69.60 | 19.20 | 63.30 |

Test Pressure = 27.0 psi Differential Head = 10.4 psi, 733.0 cm H2O
Gradient = 1.033E 02 Flow rate = 1.380E-04 cc/sec R squared = 0.99924
Permeability, K27.0° = 4.213E-08 cm/sec, K20° = 3.582E-08 cm/sec

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 5 | 0.0 | 0.0 | 9.4 | 72.7 | 17.9 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | | | 0.0141 | 0.0047 | 0.0015 | 0.0010 | 0.86 | 27.2 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● RED SILTY CLAY, TR SAND | CL | |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 12-10-97

Remarks:
BORING: 110
DEPTH: 230.0'

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST DATA

Date: 12-10-97
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SILTY CLAY, TR SAND
USCS Class: CL
AASHTO Class:
Liquid limit: NA
Plasticity index: NA

## Notes

Remarks: BORING: 110 DEPTH: 230.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 335.30 |
| Tare = | 0.00 |
| Dry sample weight = | 335.30 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50 Tare = 0 Sample weight = 50
Cumulative weight retained tare= 0
e for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 10 | 0.00 | 100.0 |
| # 20 | 0.00 | 100.0 |
| # 40 | 0.10 | 99.8 |
| # 60 | 0.30 | 99.4 |
| # 100 | 0.80 | 98.4 |
| # 200 | 4.70 | 90.6 |

## Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 100.0
Weight of hydrometer sample: 50
Calculated biased weight= 50.00
Automatic temperature correction
Composite correction at 20 deg C =-4

Meniscus correction only= 1
Specific gravity of solids= 2.68
Specific gravity correction factor= 0.993

Hydrometer type: 152H  Effective depth L= 16.294904 - 0.164 x Rm

| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 23.0 | 37.5 | 34.2 | 0.0130 | 38.5 | 10.0 | 0.0412 | 67.9 |
| 2.0 | 23.0 | 34.5 | 31.2 | 0.0130 | 35.5 | 10.5 | 0.0298 | 61.9 |
| 3.0 | 23.0 | 33.0 | 29.7 | 0.0130 | 34.0 | 10.7 | 0.0246 | 58.9 |
| 4.0 | 23.0 | 32.0 | 28.7 | 0.0130 | 33.0 | 10.9 | 0.0215 | 56.9 |
| 8.0 | 23.0 | 29.5 | 26.2 | 0.0130 | 30.5 | 11.3 | 0.0155 | 52.0 |
| 16.0 | 23.0 | 26.0 | 22.7 | 0.0130 | 27.0 | 11.9 | 0.0112 | 45.0 |
| 30.0 | 23.0 | 24.0 | 20.7 | 0.0130 | 25.0 | 12.2 | 0.0083 | 41.1 |
| 60.0 | 23.0 | 21.0 | 17.7 | 0.0130 | 22.0 | 12.7 | 0.0060 | 35.1 |
| 125.0 | 23.0 | 17.5 | 14.2 | 0.0130 | 18.5 | 13.3 | 0.0042 | 28.1 |
| 330.0 | 23.0 | 14.0 | 10.7 | 0.0130 | 15.0 | 13.8 | 0.0027 | 21.2 |
| 1410.0 | 23.5 | 10.0 | 6.8 | 0.0130 | 11.0 | 14.5 | 0.0013 | 13.5 |
| 2850.0 | 23.5 | 8.0 | 4.8 | 0.0130 | 9.0 | 14.8 | 0.0009 | 9.5 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0  % GRAVEL = 0.0  % SAND = 9.4
% SILT = 72.7  % CLAY = 17.9  (% CLAY COLLOIDS = 10.4)

D85= 0.06  D60= 0.026  D50= 0.014
D30= 0.0047  D15= 0.00150  D10= 0.00097
Cc = 0.8610  Cu = 27.2270

# PERMEABILITY TEST REPORT

**TEST DATA:**

Specimen Height (cm): 4.82
Specimen Diameter (cm): 6.17
Dry Unit Weight (pcf): 118.6
Moisture Before Test (%): 9.6
Moisture After Test (%): 15.3

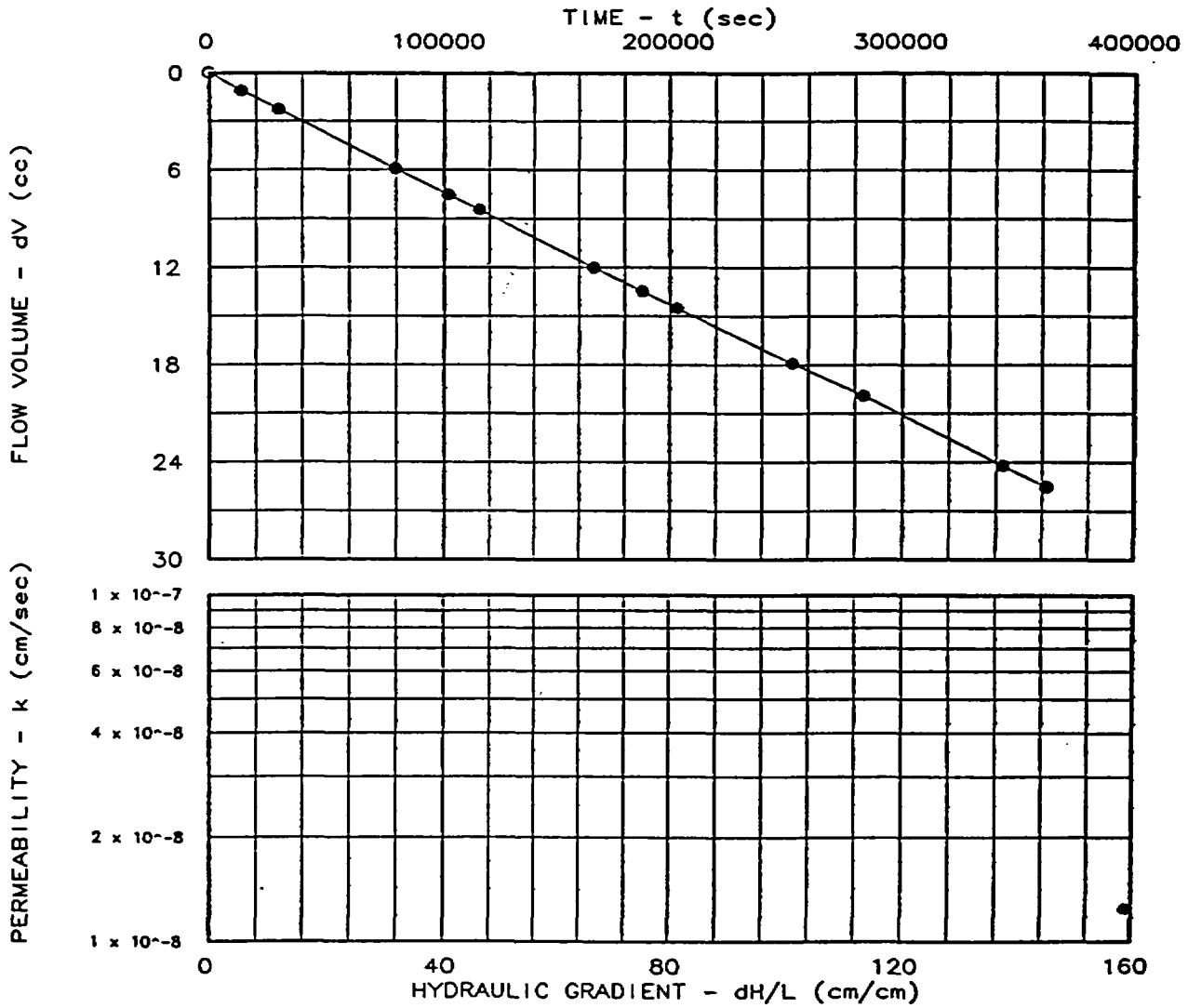
| Run Number: | 1 ● | 2 ▲ |
|---|---|---|
| Cell Pressure (psi): | 30.0 | |
| Test Pressure(psi): | 27.0 | |
| Back Pressure(psi): | 16.1 | |
| Diff. Head (psi): | 10.9 | |
| Flow Rate (cc/sec): | $6.97 \times 10^{-5}$ | |
| Perm. (cm/sec): | $1.25 \times 10^{-8}$ | |

**SAMPLE DATA:**

Sample Identification: BORING: 110
DEPTH: 230.0'
Visual Description: RED SILTY CLAY, TR SAND
Remarks:

Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: FLEXIBLE WALL
Sample type: CORE




Project: LEA COUNTY LANDFILL
Location: HOBBS, NEW MEXICO
Date: 12-12-97

PERMEABILITY TEST REPORT

WEAVER BOOS CONSULTANTS, INC.

Project No.: 95042.10
File No.: 95042.10
Lab No.: 5
Tested by: JWM
Checked by: WSG
Test: CH - Constant head

## PERMEABILITY TEST DATA

### PROJECT DATA

| | |
|---|---|
| Project Name: | LEA COUNTY LANDFILL |
| e No.: | 95042.10 |
| Project Location: | HOBBS, NEW MEXICO |
| Project No.: | 95042.10 |
| Sample Identification: | BORING: 110<br>DEPTH: 230.0' |
| Lab No.: | 5 |
| Description: | RED SILTY CLAY,<br>TR SAND |
| Sample Type: | CORE |
| Max. Dry Dens.: | |
| Method (D1557/D698): | |
| Opt. Water Content: | |
| Date: | 12-12-97 |
| Remarks: | |
| Permeameter Type: | FLEXIBLE WALL |
| Tested by: | JWM |
| Checked by: | WSG |
| Test type: | CH - Constant head |

### PERMEABILITY TEST SPECIMEN DATA

| | Before test: | | | After test: | | |
|---|---|---|---|---|---|---|
| Diameter: | 1 | 2 | | 1 | 2 | |
| Top: | in | in | | in | in | |
| Middle: | 2.431 in | in | | 2.456 in | in | |
| Bottom: | in | in | | in | in | |
| Average: | 2.43 in | 6.17 cm | | 2.46 in | 6.24 cm | |
| Length: | 1 | 2 | 3 | 1 | 2 | 3 |
| | 1.899 in | in | in | 1.873 in | in | in |
| Average: | 1.90 in | 4.82 cm | | 1.87 in | 4.76 cm | |

Moisture, Density and Sample Parameters:

| | | |
|---|---|---|
| Specific Gravity: | 2.68 | |
| Wet Wt. & Tare: | 300.50 | 316.30 |
| Dry Wt. & Tare: | 274.30 | 274.30 |
| Tare Wt.: | 0.00 | 0.00 |
| Moisture Content: | 9.6 % | 15.3 % |
| Dry Unit Weight: | 118.6 pcf | 117.8 pcf |
| Porosity: | 0.2914 | 0.2961 |
| Saturation: | 62.2 % | 97.5 % |

## CONSTANT HEAD PERMEABILITY TEST CONDITIONS DATA

Cell No.: 5 Panel No.: Positions:

| Run Number: | 1 | 2 |
|---|---|---|
| Cell Pressure: | 30.0 psi | 0.0 psi |
| Saturation Pressure: | 30.0 psi | 0.0 psi |
| Inflow Corr. Factor: | 1.00 | 1.00 |
| Outflow Corr. Factor: | 1.00 | 1.00 |
| Test Temperature: | 27.0 °C | 0.0 °C |

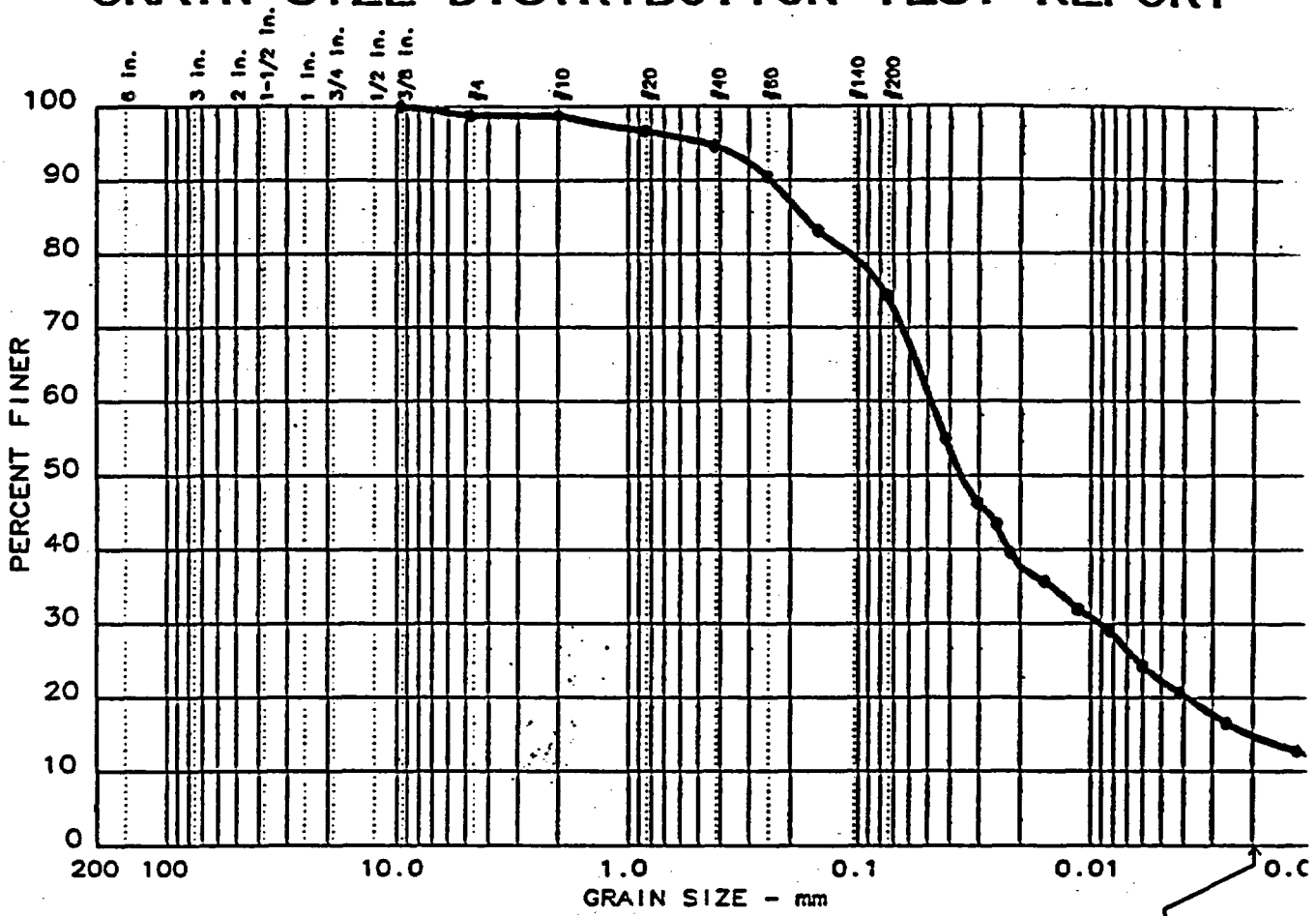
---

## PERMEABILITY TEST READINGS DATA

| CASE D X S R | DATE | TIME (24 hr) | ELAPSED TIME-sec | GAUGE PRESSURE-psi IN | OUT | BURET READING-cc IN | OUT | FLOW VOLUME-cc AVERAGE |
|---|---|---|---|---|---|---|---|---|
| S X | 12/15/97 | 8:26:00 | 0 | 27.0 | 17.0 | 4.10 | 84.70 | 0.00 |
| | 12/15/97 | 12:13:00 | 13,620 | 27.0 | 17.0 | 5.30 | 83.70 | 1.10 |
| | 12/15/97 | 16:37:00 | 29,460 | 27.0 | 17.0 | 6.50 | 82.60 | 2.25 |
| | 12/16/97 | 6:30:00 | 79,440 | 27.0 | 17.0 | 10.30 | 79.10 | 5.90 |
| | 12/16/97 | 12:45:00 | 101,940 | 27.0 | 17.0 | 12.00 | 77.60 | 7.50 |
| | 12/16/97 | 16:27:00 | 115,260 | 27.0 | 17.0 | 13.00 | 76.70 | 8.45 |
| | 12/17/97 | 6:39:00 | 166,380 | 27.0 | 17.0 | 16.60 | 73.20 | 12.00 |
| | 12/17/97 | 12:34:00 | 187,680 | 27.0 | 17.0 | 18.10 | 71.80 | 13.45 |
| | 12/17/97 | 16:47:00 | 202,860 | 27.0 | 17.0 | 19.20 | 70.80 | 14.50 |
| | 12/18/97 | 6:43:00 | 253,020 | 27.0 | 17.0 | 22.60 | 67.40 | 17.90 |
| | 12/18/97 | 15:09:00 | 283,380 | 27.0 | 17.0 | 24.60 | 65.40 | 19.90 |
| | 12/19/97 | 7:41:00 | 342,900 | 27.0 | 17.0 | 29.00 | 61.20 | 24.20 |
| | 12/19/97 | 12:54:00 | 361,680 | 27.0 | 17.0 | 30.30 | 59.90 | 25.50 |

Test Pressure = 27.0 psi Differential Head = 10.9 psi, 765.7 cm H2O
Gradient = 1.588E 02 Flow rate = 6.970E-05 cc/sec R squared = 0.99986
Permeability, K27.0° = 1.466E-08 cm/sec, K20° = 1.247E-08 cm/sec

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 6 | 0.0 | 1.1 | 24.4 | 59.6 | 14.9 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | 0.170 | | 0.0357 | 0.0090 | 0.0020 | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● RED SILTY CLAY, SOME SAND, TR FINE GRAVEL | CL | |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 12-15-97

Remarks:
BORING: 110
DEPTH: 350.0'

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 6

Date: 12-15-97
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SILTY CLAY, SOME SAND, TR FINE GRAVEL
USCS Class: CL Liquid limit: NA
AASHTO Class: Plasticity index: NA

## Notes

Remarks: BORING: 110 DEPTH: 350.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 444.50 |
| Tare = | 0.00 |
| Dry sample weight = | 444.50 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50 Tare = 0 Sample weight = 50
Cumulative weight retained tare= 0
e for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| 0.375 inches | 0.00 | 100.0 |
| # 4 | 5.00 | 98.9 |
| # 10 | 5.20 | 98.8 |
| # 20 | 1.10 | 96.7 |
| # 40 | 2.10 | 94.7 |
| # 60 | 4.20 | 90.5 |
| # 100 | 7.90 | 83.2 |
| # 200 | 12.30 | 74.5 |

## Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 98.8
Weight of hydrometer sample: 50
Calculated biased weight= 50.59
Automatic temperature correction
Composite correction at 20 deg C =-4

Meniscus correction only= 1

Specific gravity correction factor= 0.970
Hydrometer type: 152H  Effective depth L= 16.294964 - 0.164 x Rm

| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 23.0 | 32.0 | 28.7 | 0.0126 | 33.0 | 10.9 | 0.0417 | 55.0 |
| 2.0 | 23.0 | 27.5 | 24.2 | 0.0126 | 28.5 | 11.6 | 0.0304 | 46.4 |
| 3.0 | 23.0 | 26.0 | 22.7 | 0.0126 | 27.0 | 11.9 | 0.0251 | 43.5 |
| 4.0 | 23.0 | 24.0 | 20.7 | 0.0126 | 25.0 | 12.2 | 0.0221 | 39.6 |
| 8.0 | 23.0 | 22.0 | 18.7 | 0.0126 | 23.0 | 12.5 | 0.0158 | 35.8 |
| 16.0 | 23.0 | 20.0 | 16.7 | 0.0126 | 21.0 | 12.9 | 0.0113 | 32.0 |
| 30.0 | 23.0 | 18.5 | 15.2 | 0.0126 | 19.5 | 13.1 | 0.0083 | 29.1 |
| 60.0 | 23.0 | 16.0 | 12.7 | 0.0126 | 17.0 | 13.5 | 0.0060 | 24.3 |
| 125.0 | 23.5 | 14.0 | 10.8 | 0.0126 | 15.0 | 13.8 | 0.0042 | 20.7 |
| 330.0 | 23.0 | 12.0 | 8.7 | 0.0126 | 13.0 | 14.2 | 0.0026 | 16.6 |
| 1410.0 | 23.0 | 10.0 | 6.7 | 0.0126 | 11.0 | 14.5 | 0.0013 | 12.8 |
| 2850.0 | 23.5 | 9.0 | 5.8 | 0.0126 | 10.0 | 14.7 | 0.0009 | 11.1 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0  % GRAVEL = 1.1  % SAND = 24.4
% SILT = 59.6  % CLAY = 14.9  (% CLAY COLLOIDS = 11.6)

D85= 0.17  D60= 0.048  D50= 0.036
D30= 0.0090  D15= 0.00203

# PERMEABILITY TEST REPORT

**TEST DATA:**

Specimen Height (cm): 5.93
Specimen Diameter (cm): 6.15
Dry Unit Weight (pcf): 106.8
Moisture Before Test (%): 13.4
Moisture After Test (%): 21.9

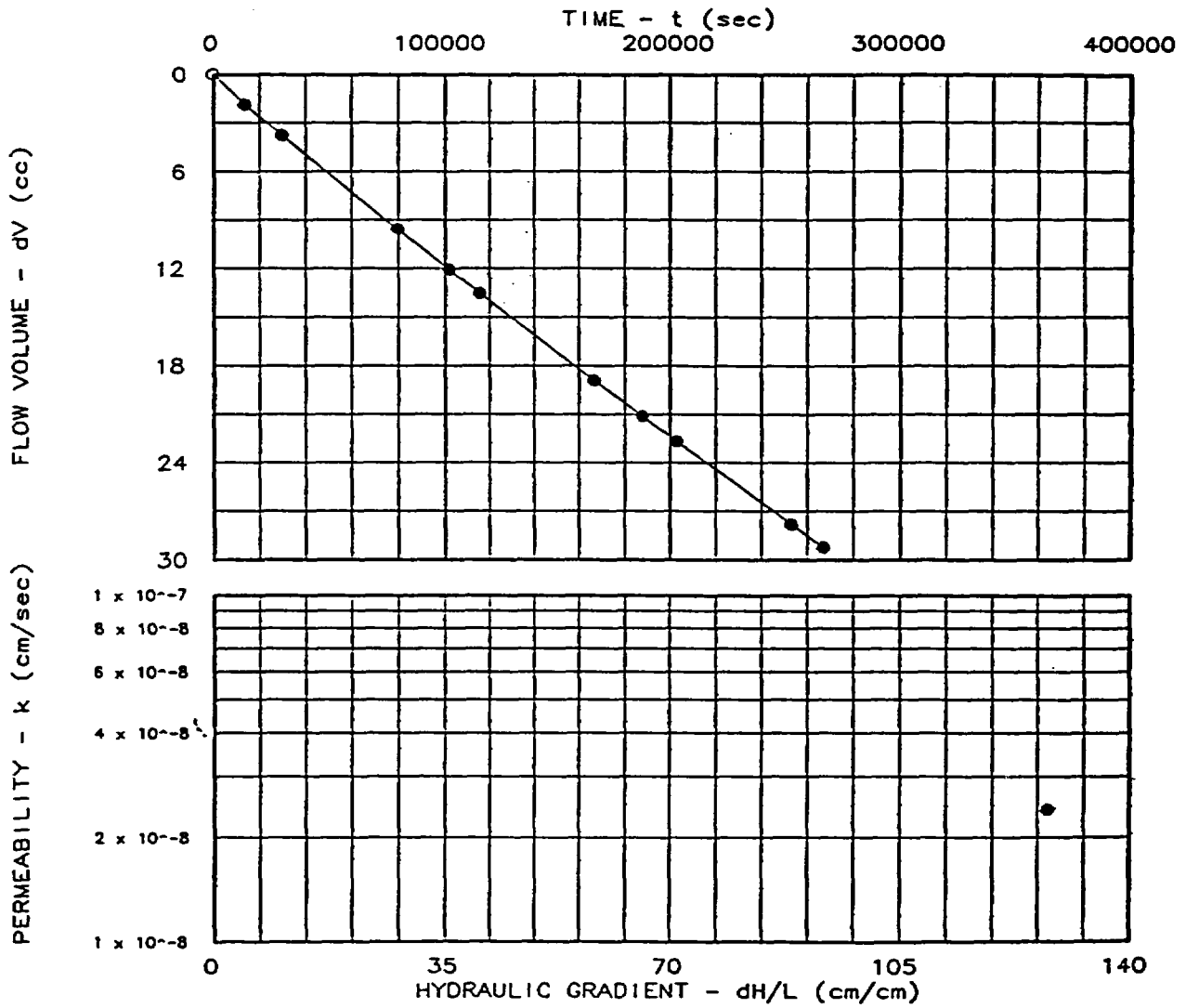
| Run Number: | 1 ● | 2 ▲ |
|---|---|---|
| Cell Pressure (psi): | 30.0 | |
| Test Pressure(psi): | 27.0 | |
| Back Pressure(psi): | 16.3 | |
| Diff. Head (psi): | 10.7 | |
| Flow Rate (cc/sec): | $1.07 \times 10^{-4}$ | |
| Perm. (cm/sec): | $2.41 \times 10^{-8}$ | |

**SAMPLE DATA:**

Sample Identification: BORING: 110
DEPTH: 350.0'
Visual Description: RED SILTY CLAY, SOME SAND, TR FINE GRAVEL
Remarks:

Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: FLEXIBLE WALL
Sample type: CORE




Project: LEA COUNTY LANDFILL
Location: HOBBS, NEW MEXICO
Date: 12-11-97

PERMEABILITY TEST REPORT

WEAVER BOOS CONSULTANTS, INC.

Project No.: 95042.10
File No.: 95042.10
Lab No.: 1
Tested by: JWM
Checked by: WSG
Test: CH - Constant head

# PERMEABILITY TEST DATA

## PROJECT DATA

| | |
|---|---|
| Project Name: | LEA COUNTY LANDFILL |
| e No.: | 95042.10 |
| Project Location: | HOBBS, NEW MEXICO |
| Project No.: | 95042.10 |
| Sample Identification: | BORING: 110<br>DEPTH: 350.0' |
| Lab No.: | 1 |
| Description: | RED SILTY CLAY, SOME SAND, TR FINE GRAVEL |
| Sample Type: | CORE |
| Max. Dry Dens.: | |
| Method (D1557/D698): | |
| Opt. Water Content: | |
| Date: | 12-11-97 |
| Remarks: | |
| Permeameter Type: | FLEXIBLE WALL |
| Tested by: | JWM |
| Checked by: | WSG |
| Test type: | CH - Constant head |

## PERMEABILITY TEST SPECIMEN DATA

| | Before test: | | After test: | |
|---|---|---|---|---|
| ameter: | 1 | 2 | 1 | 2 |
| Top: | in | in | in | in |
| Middle: | 2.423 in | in | 2.408 in | in |
| Bottom: | in | in | in | in |
| Average: | 2.42 in | 6.15 cm | 2.41 in | 6.12 cm |

| Length: | 1 | 2 | 3 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| | 2.334 in | in | in | 2.350 in | in | in |
| Average: | 2.33 in | 5.93 cm | | 2.35 in | 5.97 cm | |

Moisture, Density and Sample Parameters:

| | | |
|---|---|---|
| Specific Gravity: | 2.79 | |
| Wet Wt. & Tare: | 342.00 | 367.50 |
| Dry Wt. & Tare: | 301.60 | 301.60 |
| Tare Wt.: | 0.00 | 0.00 |
| Moisture Content: | 13.4 % | 21.9 % |
| Dry Unit Weight: | 106.8 pcf | 107.4 pcf |
| Porosity: | 0.3870 | 0.3836 |
| Saturation: | 59.2 % | 98.0 % |

## CONSTANT HEAD PERMEABILITY TEST CONDITIONS DATA

Cell No.: 1 Panel No.: Positions:

| Run Number: | 1 | 2 |
|---|---|---|
| Cell Pressure: | 30.0 psi | 0.0 psi |
| Saturation Pressure: | 30.0 psi | 0.0 psi |
| Inflow Corr. Factor: | 1.00 | 1.00 |
| Outflow Corr. Factor: | 1.00 | 1.00 |
| Test Temperature: | 27.0 °C | 0.0 °C |

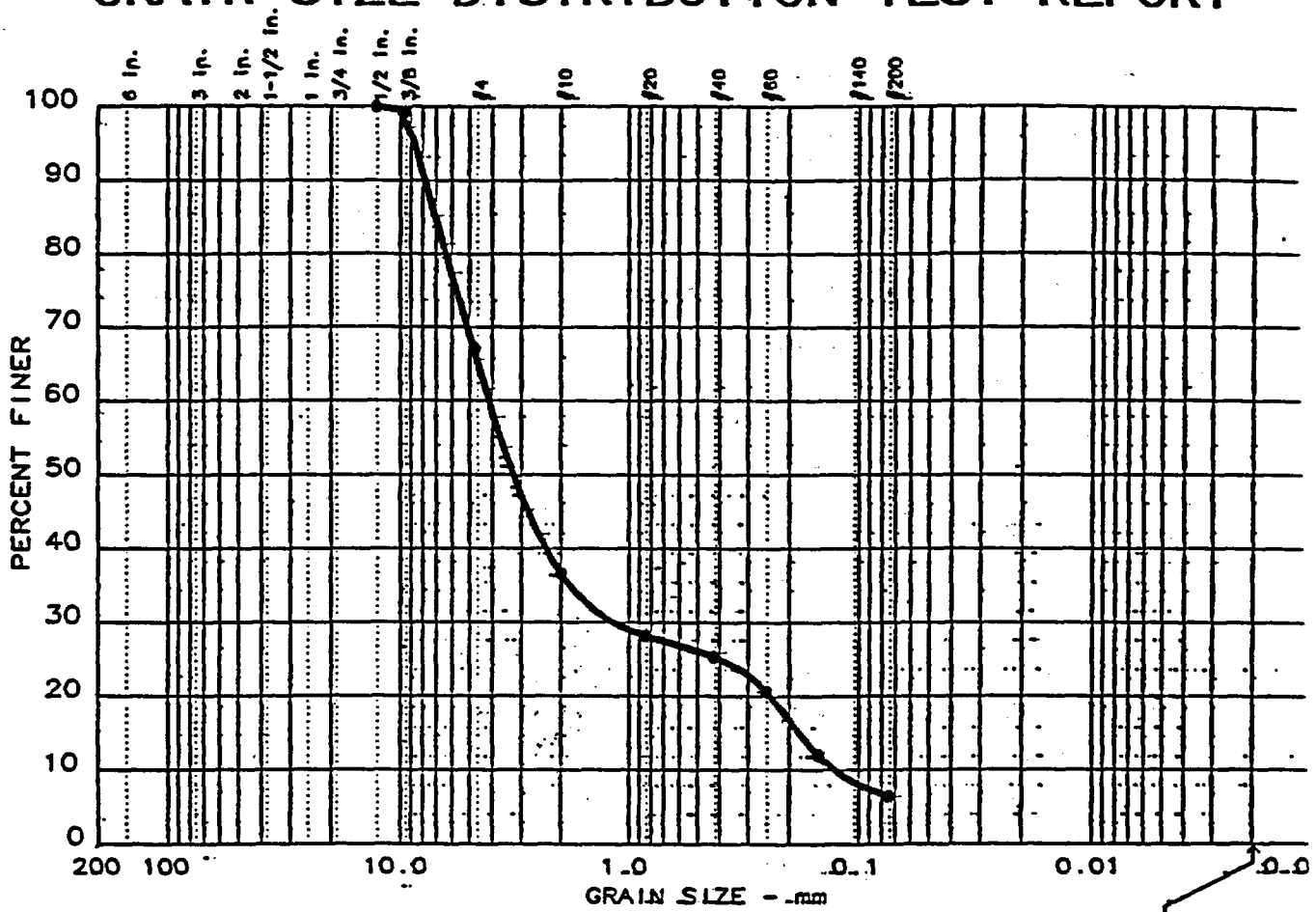
---

## PERMEABILITY TEST READINGS DATA

| CASE D X S R | DATE | TIME (24 hr) | ELAPSED TIME-sec | GAUGE PRESSURE-psi IN | GAUGE PRESSURE-psi OUT | BURET READING-cc IN | BURET READING-cc OUT | FLOW VOLUME-cc AVERAGE |
|---|---|---|---|---|---|---|---|---|
| S X | 12/15/97 | 8:25:00 | 0 | 27.0 | 17.0 | 5.50 | 83.60 | 0.00 |
| | 12/15/97 | 12:11:00 | 13,560 | 27.0 | 17.0 | 7.50 | 81.90 | 1.85 |
| | 12/15/97 | 16:35:00 | 29,400 | 27.0 | 17.0 | 9.50 | 80.10 | 3.75 |
| | 12/16/97 | 6:28:00 | 79,380 | 27.0 | 17.0 | 15.40 | 74.40 | 9.55 |
| | 12/16/97 | 12:43:00 | 101,880 | 27.0 | 17.0 | 18.00 | 72.00 | 12.05 |
| | 12/16/97 | 16:25:00 | 115,200 | 27.0 | 17.0 | 19.50 | 70.60 | 13.50 |
| | 12/17/97 | 6:37:00 | 166,320 | 27.0 | 17.0 | 25.00 | 65.30 | 18.90 |
| | 12/17/97 | 12:32:00 | 187,620 | 27.0 | 17.0 | 27.20 | 63.10 | 21.10 |
| | 12/17/97 | 16:45:00 | 202,800 | 27.0 | 17.0 | 28.80 | 61.60 | 22.65 |
| | 12/18/97 | 6:41:00 | 252,960 | 27.0 | 17.0 | 34.00 | 56.50 | 27.80 |
| | 12/18/97 | 10:32:00 | 266,820 | 27.0 | 17.0 | 35.40 | 55.10 | 29.20 |

Test Pressure = 27.0 psi Differential Head = 10.7 psi, 755.4 cm H2O
Gradient = 1.274E 02 Flow rate = 1.075E-04 cc/sec R squared = 0.99922
Permeability, K27.0° = 2.836E-08 cm/sec, K20° = 2.411E-08 cm/sec

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 3 | 0.0 | 32.9 | 60.6 | 6.5 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | 7.00 | 4.12 | 3.23 | 1.16 | 0.178 | 0.126 | 2.60 | 32.7 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● LIGHT PINK COARSE SAND, SOME FINE GRAVEL, TR SILT | SW-SM- | A-1-a |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 1-30-98

Remarks:
BORING: B-111
S-35

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 3

Date: 1-30-98
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: LIGHT PINK COARSE SAND,SOME FINE GRAVEL,TR SILT
USCS Class: SW-SM Liquid limit: NA
AASHTO Class: A-1-a Plasticity index: NA

## Notes

Remarks: BORING: B-111 S-35

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 192.90 |
| Tare = | 0.00 |
| Dry sample weight = | 192.90 |

Tare for cumulative weight retained= 0

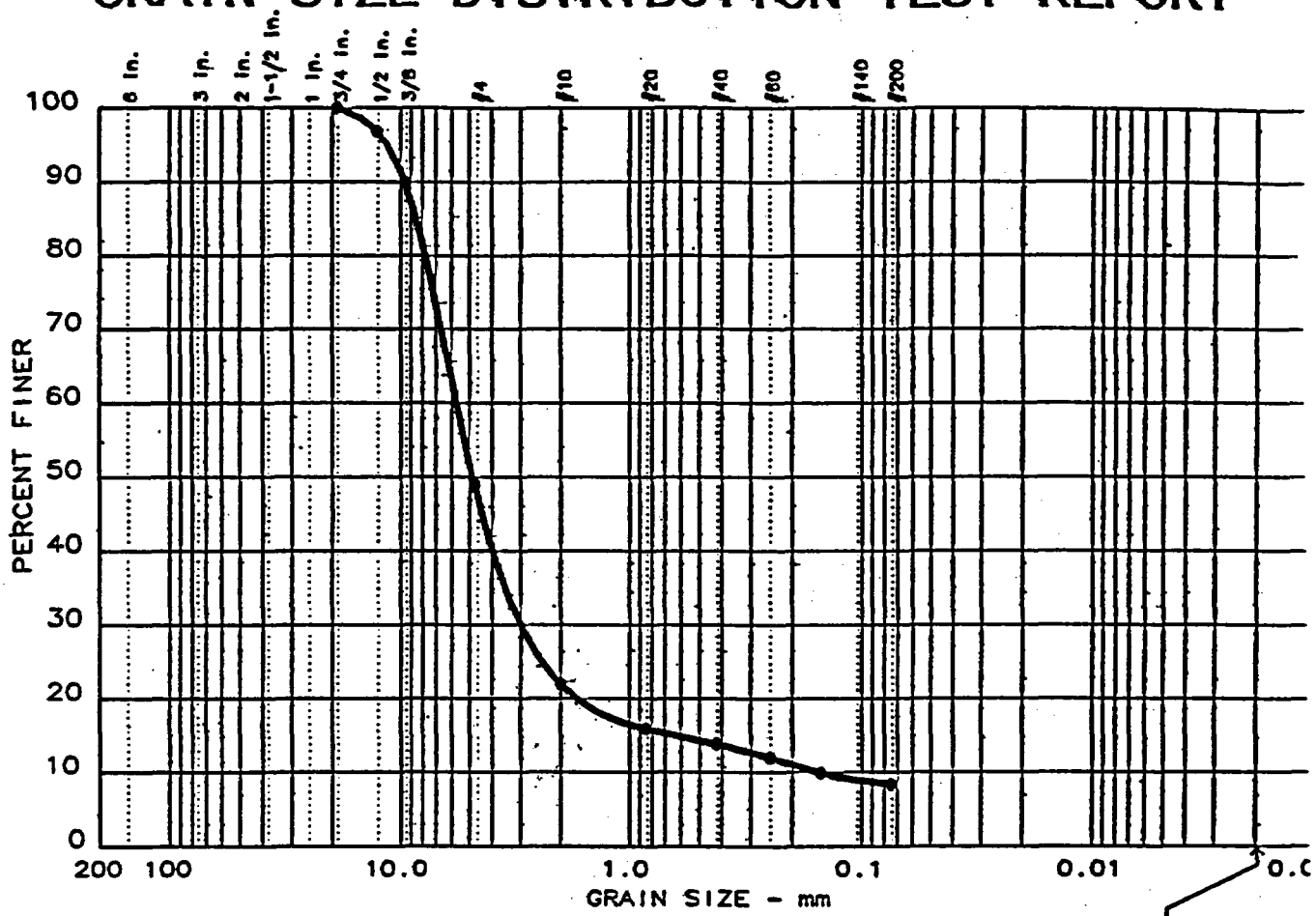
| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| 0.5 inches | 0.00 | 100.0 |
| 0.375 inches | 1.40 | 99.3 |
| # 4 | 63.50 | 67.1 |
| # 10 | 122.20 | 36.7 |
| # 20 | 138.40 | 28.3 |
| # 40 | 144.00 | 25.3 |
| # 60 | 153.00 | 20.7 |
| # 100 | 169.60 | 12.1 |
| # 200 | 180.40 | 6.5 |

## Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 32.9 % SAND = 60.6
% FINES = 6.5

D85= 7.00 D60= 4.116 D50= 3.232
D30= 1.1601 D15= 0.17762 D10= 0.12575
Cc = 2.6002 Cu = 32.7341

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 2 | 0.0 | 51.0 | 40.6 | 8.4 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | 8.51 | 5.68 | 4.83 | 2.98 | 0.601 | 0.153 | 10.22 | 37.2 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● ROSE & WHITE F/M GRAVEL & SAND, TR SILT | GP-GM | A-1-a |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 1-30-98

Remarks:
BORING: B-111
S-39

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 2

Date: 1-30-98
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: ROSE & WHITE F/M GRAVEL & SAND, TR SILT
USCS Class: GP-GM Liquid limit: NA
AASHTO Class: A-1-a Plasticity index: NA

## Notes

Remarks: BORING: B-111 S-39

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 212.70 |
| Tare = | 0.00 |
| Dry sample weight = | 212.70 |

Tare for cumulative weight retained= 0

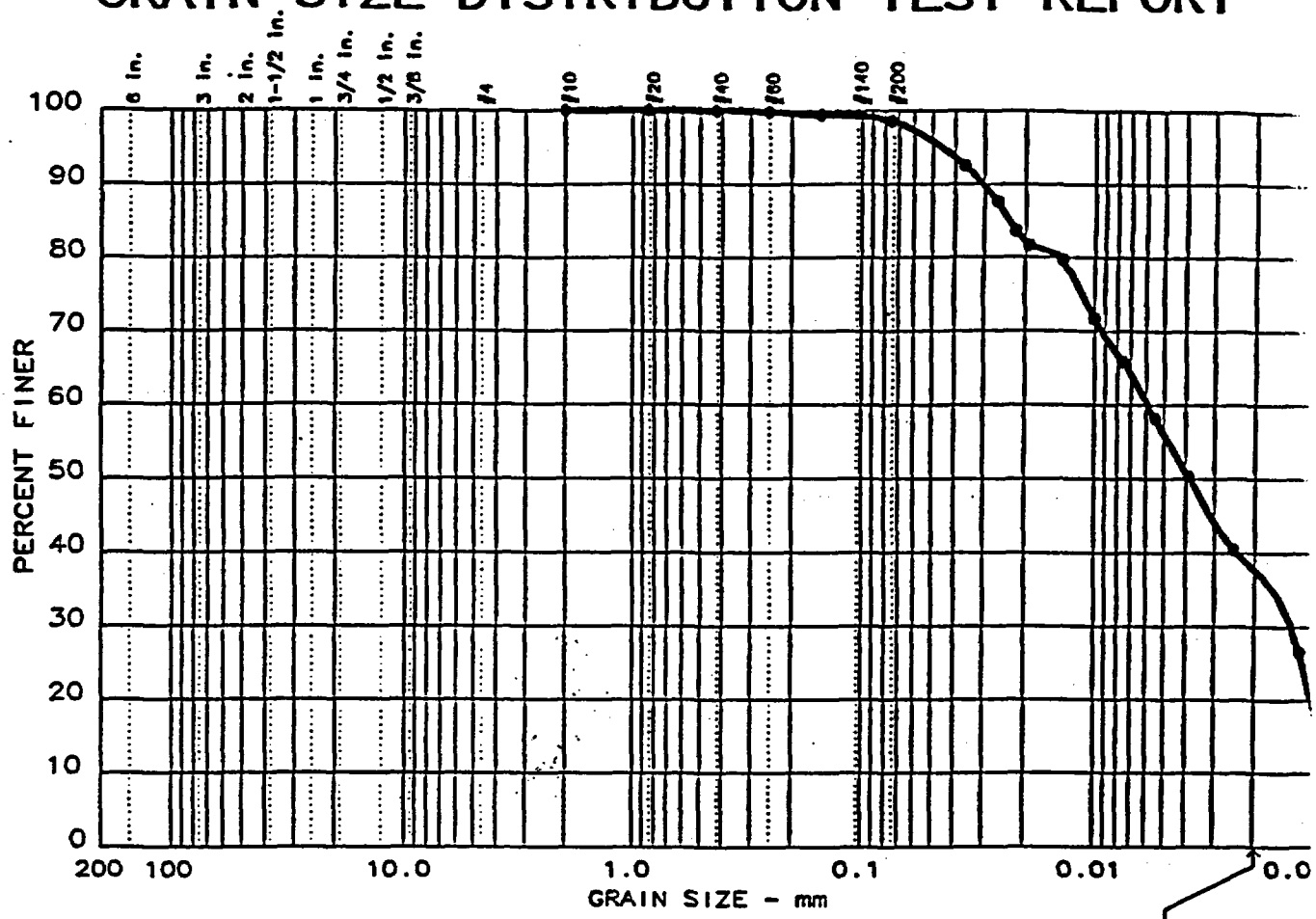
| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| 0.75 inches | 0.00 | 100.0 |
| .5 inches | 6.80 | 96.8 |
| 0.375 inches | 21.30 | 90.0 |
| # 4 | 108.50 | 49.0 |
| # 10 | 165.90 | 22.0 |
| # 20 | 178.80 | 15.9 |
| # 40 | 183.20 | 13.9 |
| # 60 | 187.10 | 12.0 |
| # 100 | 191.60 | 9.9 |
| # 200 | 194.90 | 8.4 |

## Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 51.0 % SAND = 40.6
% FINES = 8.4

D85= 8.51 D60= 5.682 D50= 4.831
D30= 2.9785 D15= 0.60117 D10= 0.15276
Cc = 10.2212 Cu = 37.1963

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 12 | 0.0 | 0.0 | 1.4 | 60.9 | 37.7 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | | | 0.0038 | 0.0014 | 0.0010 | 0.0009 | 0.34 | 6.2 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● RED SILTY CLAY, TR SAND | CL | |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 12-18-97

Remarks:
BORING: 111
DEPTH: 80.0'

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 12

Date: 12-18-97
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SILTY CLAY, TR SAND
USCS Class: CL Liquid limit: NA
AASHTO Class: Plasticity index: NA

## Notes

Remarks: BORING: 111 DEPTH: 80.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 396.10 |
| Tare = | 0.00 |
| Dry sample weight = | 396.10 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50 Tare = 0 Sample weight = 50
Cumulative weight retained tare= 0
-e for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 10 | 0.00 | 100.0 |
| # 20 | 0.00 | 100.0 |
| # 40 | 0.00 | 100.0 |
| # 60 | 0.10 | 99.8 |
| # 100 | 0.30 | 99.4 |
| # 200 | 0.70 | 98.6 |

## Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 100.0
Weight of hydrometer sample: 50
Calculated biased weight= 50.00
Automatic temperature correction
Composite correction at 20 deg C =-3.5

Meniscus correction only= 1
Specific gravity of solids= 2.7
Specific gravity correction factor= 0.989

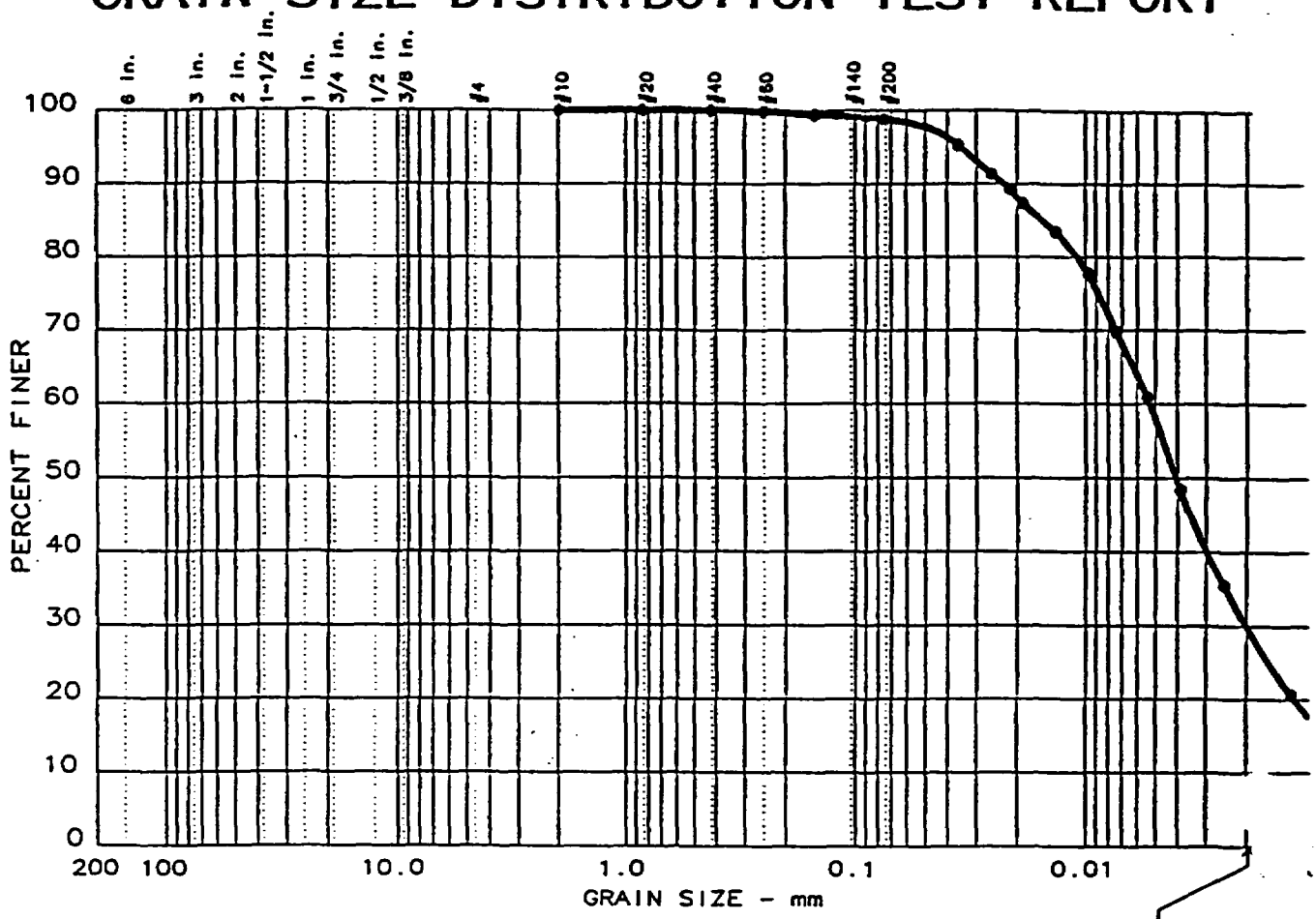
| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 23.5 | 49.5 | 46.8 | 0.0129 | 50.5 | 8.0 | 0.0365 | 92.6 |
| 2.0 | 23.5 | 47.0 | 44.3 | 0.0129 | 48.0 | 8.4 | 0.0264 | 87.6 |
| 3.0 | 23.5 | 45.0 | 42.3 | 0.0129 | 46.0 | 8.8 | 0.0220 | 83.7 |
| 4.0 | 23.5 | 44.0 | 41.3 | 0.0129 | 45.0 | 8.9 | 0.0192 | 81.7 |
| 8.0 | 23.5 | 43.0 | 40.3 | 0.0129 | 44.0 | 9.1 | 0.0137 | 79.7 |
| 16.0 | 23.5 | 39.0 | 36.3 | 0.0129 | 40.0 | 9.7 | 0.0100 | 71.8 |
| 30.0 | 23.5 | 36.0 | 33.3 | 0.0129 | 37.0 | 10.2 | 0.0075 | 65.9 |
| 60.0 | 24.0 | 32.0 | 29.5 | 0.0128 | 33.0 | 10.9 | 0.0055 | 58.2 |
| 125.0 | 24.0 | 28.0 | 25.5 | 0.0128 | 29.0 | 11.5 | 0.0039 | 50.3 |
| 330.0 | 24.0 | 23.0 | 20.5 | 0.0128 | 24.0 | 12.4 | 0.0025 | 40.4 |
| 1410.0 | 24.0 | 16.0 | 13.5 | 0.0128 | 17.0 | 13.5 | 0.0013 | 26.6 |
| 2850.0 | 24.0 | 7.0 | 4.5 | 0.0128 | 8.0 | 15.0 | 0.0009 | 8.8 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 1.4
% SILT = 60.9 % CLAY = 37.7 (% CLAY COLLOIDS = 13.7)

D85= 0.02 D60= 0.006 D50= 0.004
D30= 0.0014 D15= 0.00102 D10= 0.00095
Cc = 0.3361 Cu = 6.1589

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 13 | 0.0 | 0.0 | 1.2 | 68.9 | 29.9 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | | | 0.0041 | 0.0020 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● RED SILTY CLAY, TR SAND | CL | |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 12-18-97

Remarks:
BORING: 111
DEPTH: 140.0'

GRAIN SIZE DISTRIBUTION TEST REPORT

**WEAVER BOOS CONSULTANTS, INC.**

Figure No. _____

# GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 13

Date: 12-18-97
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SILTY CLAY, TR SAND
USCS Class: CL
AASHTO Class:
Liquid limit: NA
Plasticity index: NA

## Notes

Remarks: BORING: 111 DEPTH: 140.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 456.80 |
| Tare = | 0.00 |
| Dry sample weight = | 456.80 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50 Tare = 0 Sample weight = 50
Cumulative weight retained tare= 0
:e for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 10 | 0.00 | 100.0 |
| # 20 | 0.00 | 100.0 |
| # 40 | 0.00 | 100.0 |
| # 60 | 0.10 | 99.8 |
| # 100 | 0.30 | 99.4 |
| # 200 | 0.60 | 98.8 |

## Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 100.0
Weight of hydrometer sample: 50
Calculated biased weight= 50.00
Automatic temperature correction
Composite correction at 20 deg C =-3.5

Meniscus correction only= 1
Specific gravity of solids= 2.7
Specific gravity correction factor= 0.989

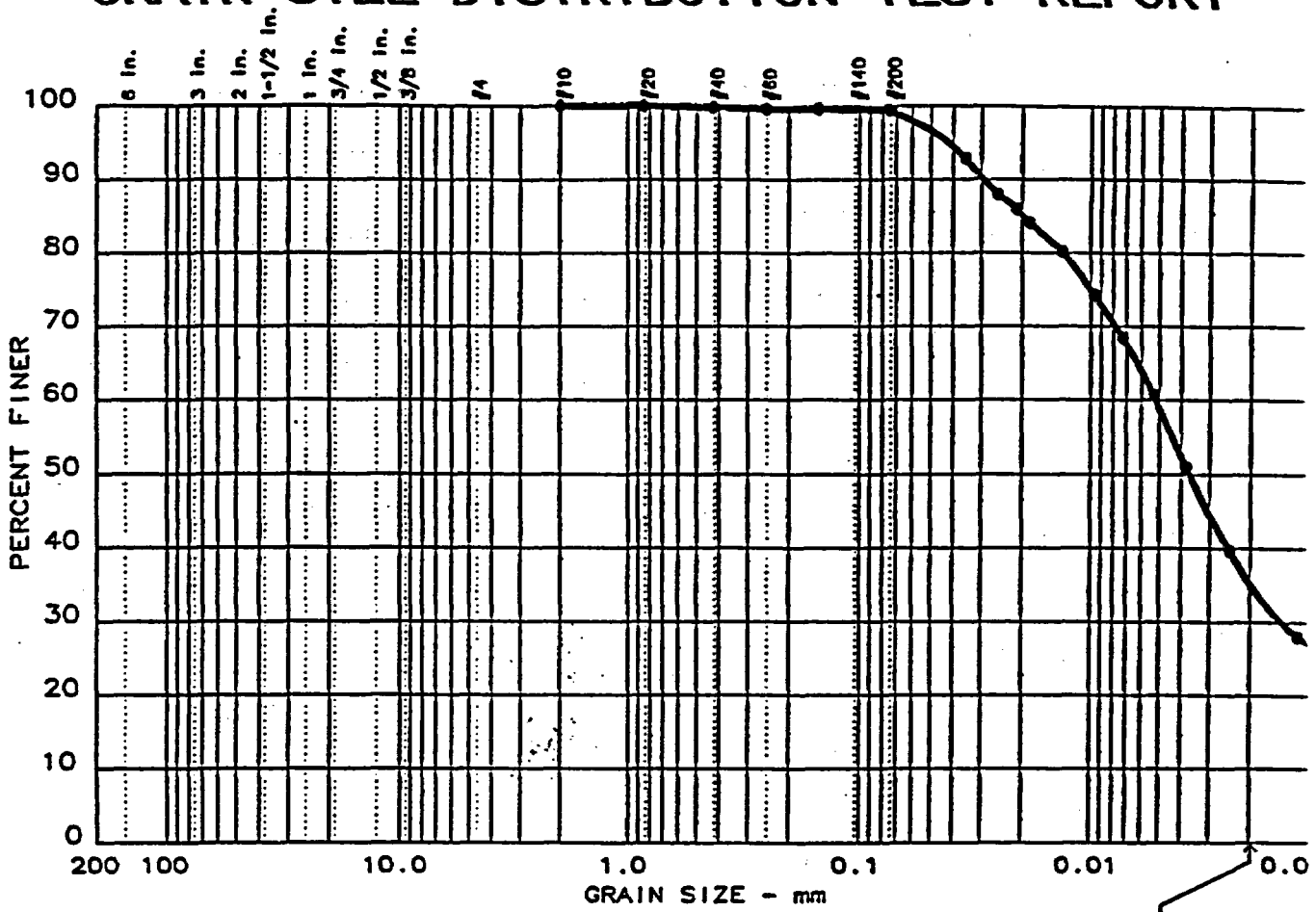
| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 23.0 | 51.0 | 48.2 | 0.0130 | 52.0 | 7.8 | 0.0361 | 95.3 |
| 2.0 | 23.0 | 49.0 | 46.2 | 0.0130 | 50.0 | 8.1 | 0.0261 | 91.7 |
| 3.0 | 23.0 | 48.0 | 45.2 | 0.0130 | 49.0 | 8.3 | 0.0215 | 89.3 |
| 4.0 | 23.0 | 47.0 | 44.2 | 0.0130 | 48.0 | 8.4 | 0.0188 | 87.3 |
| 8.0 | 23.0 | 45.0 | 42.2 | 0.0130 | 46.0 | 8.8 | 0.0136 | 83.4 |
| 16.0 | 23.5 | 42.0 | 39.3 | 0.0129 | 43.0 | 9.2 | 0.0098 | 77.7 |
| 30.0 | 23.5 | 38.0 | 35.3 | 0.0129 | 39.0 | 9.9 | 0.0074 | 69.8 |
| 60.0 | 23.5 | 33.5 | 30.8 | 0.0129 | 34.5 | 10.6 | 0.0054 | 60.9 |
| 125.0 | 24.0 | 27.0 | 24.5 | 0.0128 | 28.0 | 11.7 | 0.0039 | 48.4 |
| 330.0 | 24.0 | 20.5 | 18.0 | 0.0128 | 21.5 | 12.8 | 0.0025 | 35.5 |
| 1410.0 | 24.0 | 13.0 | 10.5 | 0.0128 | 14.0 | 14.0 | 0.0013 | 20.7 |
| 2850.0 | 24.0 | 10.5 | 8.0 | 0.0128 | 11.5 | 14.4 | 0.0009 | 15.7 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 1.2
% SILT = 68.9 % CLAY = 29.9 (% CLAY COLLOIDS = 17.0)

D85= 0.02 D60= 0.005 D50= 0.004
D30= 0.0020

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 7 | 0.0 | 0.0 | 0.6 | 64.1 | 35.3 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | | | 0.0037 | 0.0014 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● RED SILTY CLAY, TR SAND | CL | |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 12-4-97

Remarks:
BORING: 111
DEPTH: 200.0'

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

Date: 12-4-97
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SILTY CLAY, TR SAND
USCS Class: CL  Liquid limit: NA
AASHTO Class:  Plasticity index: NA

## Notes

Remarks: BORING: 111  DEPTH: 200.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 372.50 |
| Tare = | 0.00 |
| Dry sample weight = | 372.50 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50  Tare = 0  Sample weight = 50
Cumulative weight retained tare= 0
Tare for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 10 | 0.00 | 100.0 |
| # 20 | 0.00 | 100.0 |
| # 40 | 0.10 | 99.8 |
| # 60 | 0.20 | 99.6 |
| # 100 | 0.20 | 99.6 |
| # 200 | 0.30 | 99.4 |

## Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 100.0
Weight of hydrometer sample: 50
Calculated biased weight= 50.00
Automatic temperature correction
Composite correction at 20 deg C =-4.5

Meniscus correction only= 1
Specific gravity of solids= 2.77
Specific gravity correction factor= 0.974

| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 23.0 | 51.5 | 47.7 | 0.0127 | 52.5 | 7.7 | 0.0352 | 92.9 |
| 2.0 | 23.0 | 49.0 | 45.2 | 0.0127 | 50.0 | 8.1 | 0.0256 | 88.0 |
| 3.0 | 23.0 | 48.0 | 44.2 | 0.0127 | 49.0 | 8.3 | 0.0211 | 86.1 |
| 4.0 | 23.0 | 47.0 | 43.2 | 0.0127 | 48.0 | 8.4 | 0.0184 | 84.1 |
| 8.0 | 23.0 | 45.0 | 41.2 | 0.0127 | 46.0 | 8.8 | 0.0133 | 80.2 |
| 16.0 | 23.0 | 42.0 | 38.2 | 0.0127 | 43.0 | 9.2 | 0.0097 | 74.4 |
| 30.0 | 23.0 | 39.0 | 35.2 | 0.0127 | 40.0 | 9.7 | 0.0072 | 68.5 |
| 60.0 | 23.0 | 35.0 | 31.2 | 0.0127 | 36.0 | 10.4 | 0.0053 | 60.7 |
| 125.0 | 23.0 | 30.0 | 26.2 | 0.0127 | 31.0 | 11.2 | 0.0038 | 51.0 |
| 330.0 | 22.0 | 24.5 | 20.4 | 0.0129 | 25.5 | 12.1 | 0.0025 | 39.8 |
| 1410.0 | 22.0 | 18.5 | 14.4 | 0.0129 | 19.5 | 13.1 | 0.0012 | 28.1 |
| 2850.0 | 23.0 | 17.0 | 13.2 | 0.0127 | 18.0 | 13.3 | 0.0009 | 25.7 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 0.6
% SILT = 64.1 % CLAY = 35.3 (% CLAY COLLOIDS = 26.4)

D85= 0.02 D60= 0.005 D50= 0.004
D30= 0.0014

# PERMEABILITY TEST REPORT

**TEST DATA:**

Specimen Height (cm): 5.32
Specimen Diameter (cm): 6.15
Dry Unit Weight (pcf): 115.6
Moisture Before Test (%): 9.7
Moisture After Test (%): 17.1

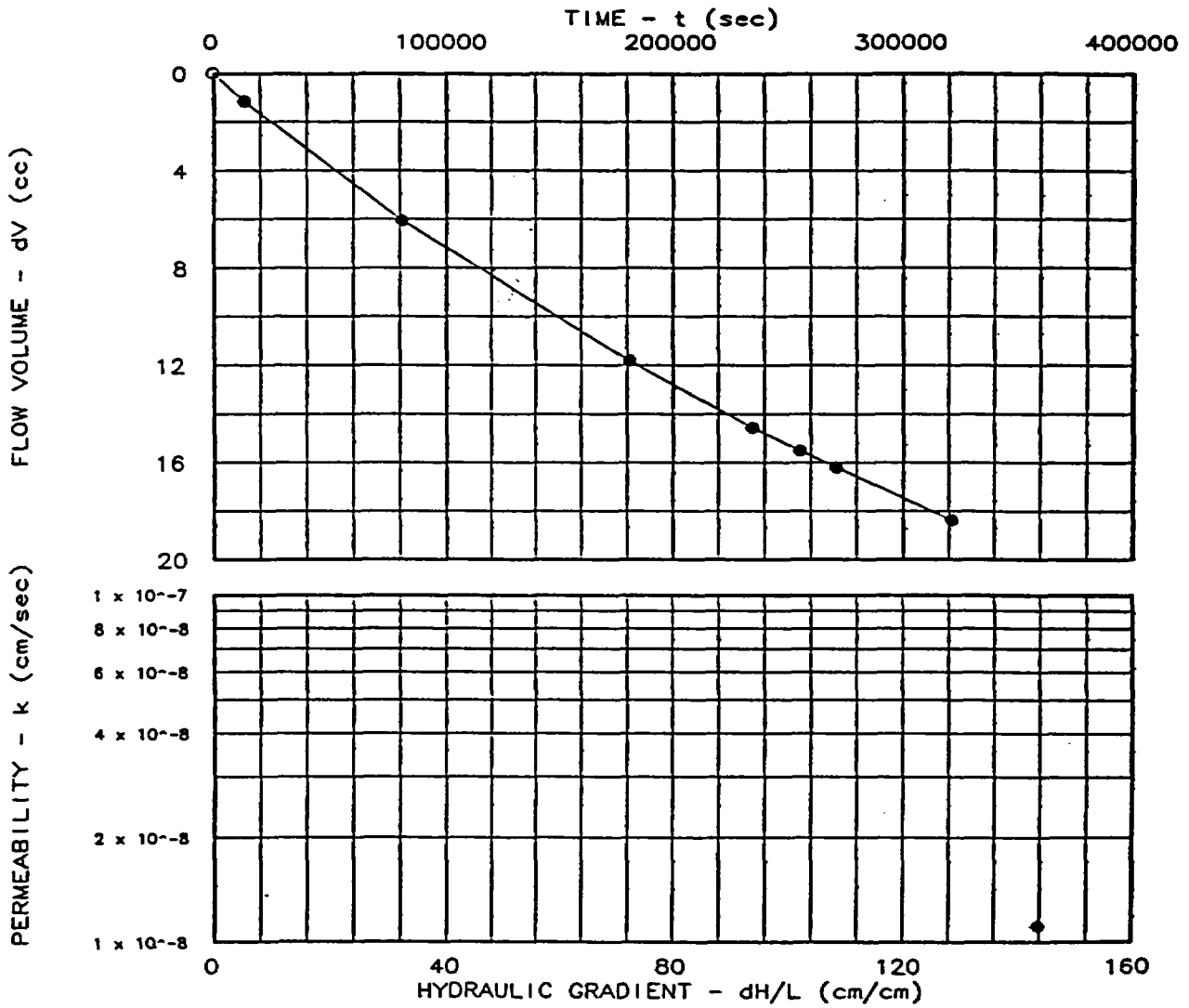
| Run Number: | 1 ● | 2 ▲ |
|---|---|---|
| Cell Pressure (psi): | 30.0 | |
| Test Pressure(psi): | 27.0 | |
| Back Pressure(psi): | 16.1 | |
| Diff. Head (psi): | 10.9 | |
| Flow Rate (cc/sec): | $5.58 \times 10^{-5}$ | |
| Perm. (cm/sec): | $1.11 \times 10^{-8}$ | |

**SAMPLE DATA:**

Sample Identification: BORING: 111
DEPTH: 200.0'
Visual Description: RED SILTY CLAY, TR SAND
Remarks:

Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: FLEXIBLE WALL
Sample type: CORE




Project: LEA COUNTY LANDFILL
Location: HOBBS, NEW MEXICO
Date: 12-8-97

PERMEABILITY TEST REPORT

WEAVER BOOS CONSULTANTS, INC.

Project No.: 95042.10
File No.: 95042.10
Lab No.: 3
Tested by: JWM
Checked by: WSG
Test: CH - Constant head

# PERMEABILITY TEST DATA

## PROJECT DATA

| | |
|---|---|
| Project Name: | LEA COUNTY LANDFILL |
| Site No.: | 95042.10 |
| Project Location: | HOBBS, NEW MEXICO |
| Project No.: | 95042.10 |
| Sample Identification: | BORING: 111<br>DEPTH: 200.0' |
| Lab No.: | 3 |
| Description: | RED SILTY CLAY,<br>TR SAND |
| Sample Type: | CORE |
| Max. Dry Dens.: | |
| Method (D1557/D698): | |
| Opt. Water Content: | |
| Date: | 12-8-97 |
| Remarks: | |
| Permeameter Type: | FLEXIBLE WALL |
| Tested by: | JWM |
| Checked by: | WSG |
| Test type: | CH - Constant head |

## PERMEABILITY TEST SPECIMEN DATA

| | Before test: | | | After test: | | |
|---|---|---|---|---|---|---|
| Diameter: | 1 | 2 | | 1 | 2 | |
| Top: | in | in | | in | in | |
| Middle: | 2.420 in | in | | 2.431 in | in | |
| Bottom: | in | in | | in | in | |
| Average: | 2.42 in | 6.15 cm | | 2.43 in | 6.17 cm | |
| Length: | 1 | 2 | 3 | 1 | 2 | 3 |
| | 2.094 in | in | in | 2.073 in | in | in |
| Average: | 2.09 in | 5.32 cm | | 2.07 in | 5.27 cm | |

Moisture, Density and Sample Parameters:

| | | |
|---|---|---|
| Specific Gravity: | 2.77 | |
| Wet Wt. & Tare: | 320.70 | 342.30 |
| Dry Wt. & Tare: | 292.30 | 292.30 |
| Tare Wt.: | 0.00 | 0.00 |
| Moisture Content: | 9.7 % | 17.1 % |
| Dry Unit Weight: | 115.6 pcf | 115.7 pcf |
| Porosity: | 0.3314 | 0.3307 |
| Saturation: | 54.3 % | 95.9 % |

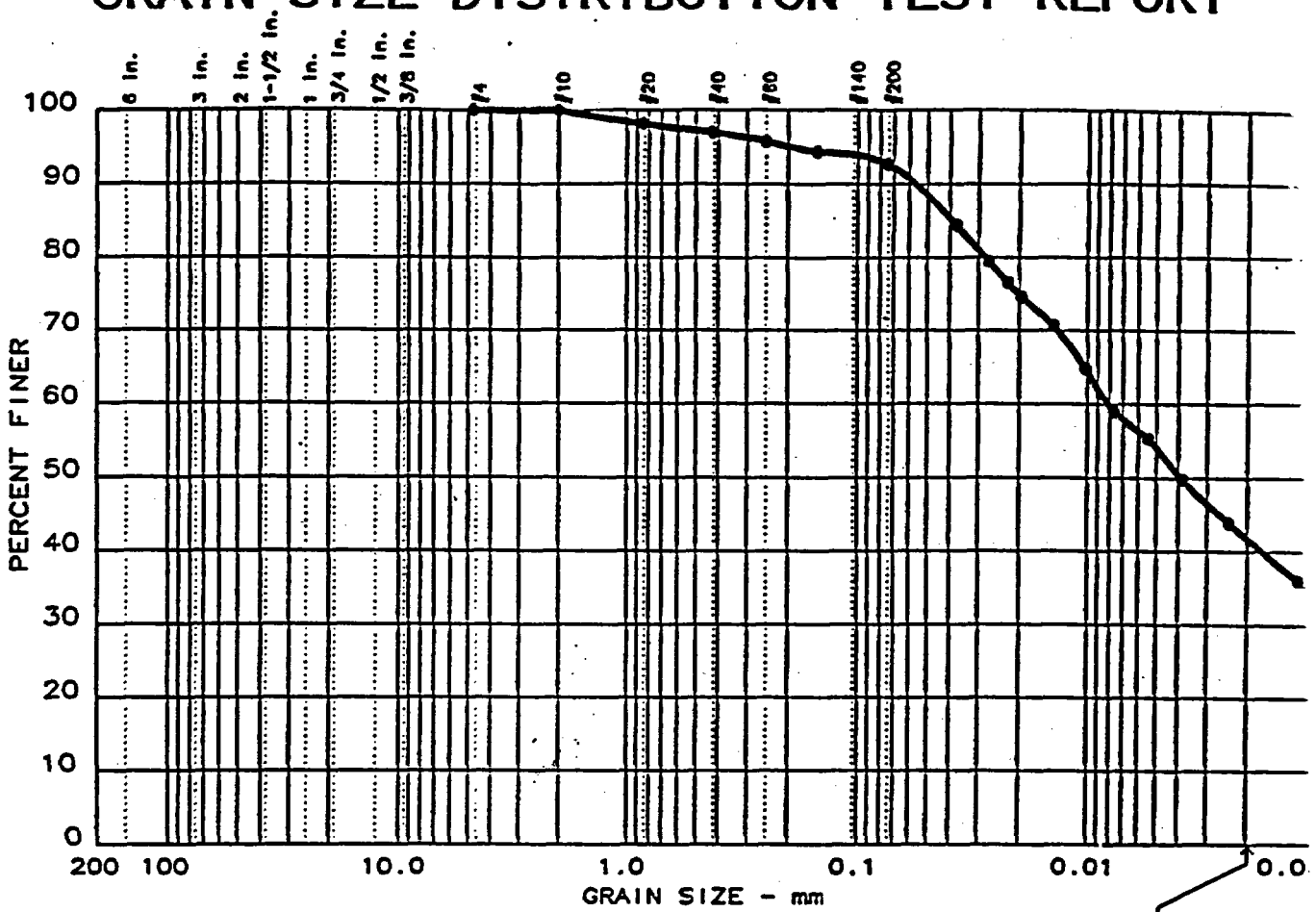
| Cell No.: 3 | Panel No.: | Positions: |
|---|---|---|
| Run Number: | 1 | 2 |
| Cell Pressure: | 30.0 psi | 0.0 psi |
| Saturation Pressure: | 30.0 psi | 0.0 psi |
| Inflow Corr. Factor: | 1.00 | 1.00 |
| Outflow Corr. Factor: | 1.00 | 1.00 |
| Test Temperature: | 27.0 °C | 0.0 °C |

## PERMEABILITY TEST READINGS DATA

| CASE D X S R | DATE | TIME (24 hr) | ELAPSED TIME-sec | GAUGE PRESSURE-psi IN | GAUGE PRESSURE-psi OUT | BURET READING-cc IN | BURET READING-cc OUT | FLOW VOLUME-cc AVERAGE |
|---|---|---|---|---|---|---|---|---|
| S X | 12/12/97 | 13:19:00 | 0 | 27.0 | 17.0 | 8.10 | 85.40 | 0.00 |
| | 12/12/97 | 16:55:00 | 12,960 | 27.0 | 17.0 | 9.20 | 84.20 | 1.15 |
| | 12/13/97 | 11:46:00 | 80,820 | 27.0 | 17.0 | 14.40 | 79.60 | 6.05 |
| | 12/14/97 | 15:33:00 | 180,840 | 27.0 | 17.0 | 20.40 | 74.10 | 11.80 |
| | 12/15/97 | 6:32:00 | 234,780 | 27.0 | 17.0 | 23.20 | 71.40 | 14.55 |
| | 12/15/97 | 12:12:00 | 255,180 | 27.0 | 17.0 | 24.20 | 70.50 | 15.50 |
| | 12/15/97 | 16:36:00 | 271,020 | 27.0 | 17.0 | 25.00 | 69.90 | 16.20 |
| | 12/16/97 | 6:29:00 | 321,000 | 27.0 | 17.0 | 27.20 | 67.80 | 18.35 |

[illegible]t Pressure = 27.0 psi Differential Head = 10.9 psi, 763.8 cm H2O
[illegible]dient = 1.436E 02 Flow rate = 5.583E-05 cc/sec R squared = 0.99305
Permeability, K27.0° = 1.310E-08 cm/sec, K20° = 1.114E-08 cm/sec

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 14 | 0.0 | 0.0 | 7.2 | 51.0 | 41.8 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | | | 0.0038 | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● RED SILTY CLAY, TR SAND | CL | |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 12-18-97

Remarks:
BORING: 111
DEPTH: 485.0'

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

Date: 12-18-97
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SILTY CLAY, TR SAND
USCS Class: CL  Liquid limit: NA
AASHTO Class: A-4  Plasticity index: NA

## Notes

Remarks: BORING: 111 DEPTH: 485.0'

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 409.50 |
| Tare = | 0.00 |
| Dry sample weight = | 409.50 |

Sample split on number 10 sieve
Split sample data:
Sample and tare = 50 Tare = 0 Sample weight = 50
Cumulative weight retained tare= 0
e for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 4 | 0.00 | 100.0 |
| # 10 | 0.10 | 100.0 |
| # 20 | 0.90 | 98.2 |
| # 40 | 1.50 | 97.0 |
| # 60 | 2.10 | 95.8 |
| # 100 | 2.80 | 94.4 |
| # 200 | 3.60 | 92.8 |

## Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 100.0
Weight of hydrometer sample: 50
Calculated biased weight= 50.01
Automatic temperature correction
Composite correction at 20 deg C =-3.5

Meniscus correction only= 1
Specific gravity of solids= 2.75

Hydrometer type: 152H  Effective depth L= 16.294964 - 0.164 x Rm

| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 1.0 | 23.0 | 46.0 | 43.2 | 0.0128 | 47.0 | 8.6 | 0.0374 | 84.4 |
| 2.0 | 23.0 | 43.5 | 40.7 | 0.0128 | 44.5 | 9.0 | 0.0271 | 79.6 |
| 3.0 | 23.0 | 42.0 | 39.2 | 0.0128 | 43.0 | 9.2 | 0.0224 | 76.6 |
| 4.0 | 23.0 | 41.0 | 38.2 | 0.0128 | 42.0 | 9.4 | 0.0196 | 74.7 |
| 8.0 | 23.0 | 39.0 | 36.2 | 0.0128 | 40.0 | 9.7 | 0.0141 | 70.8 |
| 16.0 | 23.0 | 36.0 | 33.2 | 0.0128 | 37.0 | 10.2 | 0.0102 | 64.9 |
| 30.0 | 23.0 | 33.0 | 30.2 | 0.0128 | 34.0 | 10.7 | 0.0076 | 59.0 |
| 60.0 | 23.5 | 31.0 | 28.3 | 0.0127 | 32.0 | 11.0 | 0.0054 | 55.4 |
| 125.0 | 24.0 | 28.0 | 25.5 | 0.0126 | 29.0 | 11.5 | 0.0038 | 49.8 |
| 330.0 | 24.0 | 25.0 | 22.5 | 0.0126 | 26.0 | 12.0 | 0.0024 | 43.9 |
| 1410.0 | 24.0 | 21.0 | 18.5 | 0.0126 | 22.0 | 12.7 | 0.0012 | 36.1 |
| 2850.0 | 24.0 | 19.5 | 17.0 | 0.0126 | 20.5 | 12.9 | 0.0009 | 33.2 |

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0  % GRAVEL = 0.0  % SAND = 7.2
% SILT = 51.0  % CLAY = 41.8  (% CLAY COLLOIDS = 34.5)

D85= 0.04  D60= 0.008  D50= 0.004

**WEAVER BOOS CONSULTANTS, INC.**
ENVIRONMENTAL AND GEOTECHNICAL ENGINEERS
520 N. Michigan Ave., Chicago, IL 60611 • (312) 670-0041
1944 N. Griffith Blvd., Unit C, Griffith, IN 46319 • (219) 923-9609

## WATER CONTENT DETERMINATION

Project: LEA COUNTY LANDFILL
Job No.: 95042.10
Location of Project: HOBBS, NEW MEXICO
Date of Testing: 12-4-97 THROUGH 12-18-97
Description of Soil:
Date of Weighing:
Tested By: JM

| Boring No. | 108 | 108 | 104 | 108 | 109 | 102 | 101 |
|---|---|---|---|---|---|---|---|
| Sample No. | 215' | 100' | 60.0' | 150.0' | 120.0' | 20.0' | 20.0' |
| Container No. (cup) | SS | AA | AN | AA | AN | A-12 | A-12 |
| Wt. of cup + wet soil | 88.9 | 78.0 | 92.3 | 89.5 | 104.5 | 143.0 | 469.1 |
| Wt. of cup + dry soil | 82.7 | 67.9 | 84.7 | 82.2 | 97.3 | 138.5 | 451.6 |
| Wt. of cup | 14.7 | 15.1 | 14.8 | 15.1 | 14.9 | 16.0 | 15.9 |
| Wt. of dry soil | 68.0 | 52.8 | 69.9 | 67.1 | 82.4 | 122.5 | 435.7 |
| Wt. of water | 6.2 | 10.1 | 7.6 | 7.3 | 7.2 | 4.5 | 17.8 |
| Water content (w)*% | 9.1 | 19.1 | 10.9 | 10.9 | 8.7 | 3.7 | 4.0 |

| Boring No. | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample No. | | | | | | | |
| Container No. (cup) | | | | | | | |
| Wt. of cup + wet soil | | | | | | | |
| Wt. of cup + dry soil | | | | | | | |
| Wt. of cup | | | | | | | |
| Wt. of dry soil | | | | | | | |
| Wt. of water | | | | | | | |
| Water content (w)* % | | | | | | | |

*w = (wt. of water/wt. of dry soil)*100

Remarks:

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1944 N. Griffith Blvd., Unit C, Griffith, IN 46319 • (219) 923-9609


## ORGANIC AND WATER CONTENT DETERMINATIONS
## ASTM D2974

Project: LEA COUNTY LANDFILL

Location of Project: HOBBS, NEW MEXICO

Description of Soil:

Tested By: JM & WSG

Job No.: 95042.10

Date of Testing: 12-16-97 THROUGH 12-18-97

Date of Weighing:

Oven Temperature: 60°C

Furnace Temperature: 440°C

### MOISTURE CONTENT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Boring No. | 111 | 103 | 104 | 111 | 110 | | |
| Sample No. | 140.0' | 5.0' | 4.0' | 485.0' | 90.0' | | |
| Container No. (cup) | 45 | 106 | 222 | TZ | 45 | | |
| Wt. of cup + wet soil | 127.8 | 94.5 | 118.9 | 98 | 188.1 | | |
| Wt. of cup + dry soil | 121.6 | 92.9 | 117.8 | 89.3 | 175.1 | | |
| Wt. of cup | 48.7 | 51.4 | 54.4 | 14.8 | 48.6 | | |
| Wt. of dry soil | 72.9 | 41.5 | 63.4 | 74.5 | 126.5 | | |
| Wt. of water | 6.2 | 1.6 | 1.1 | 8.7 | 13 | | |
| Water content (w)*% | 8.5 | 3.9 | 1.7 | 11.7 | 10.3 | | |

### ORGANIC CONTENT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Boring No. | 111 | 103 | 104 | 111 | 110 | | |
| Sample No. | 140.0' | 5.0' | 4.0' | 485.0' | 90.0' | | |
| Container No. (cup) | 45 | 106 | 222 | 190 | 45 | | |
| Init. wt. of cup + oven dry soil | 121.6 | 92.9 | 117.8 | 126.9 | 175.1 | | |
| Final wt. of cup + burnt soil | 119.4 | 92.5 | 117.4 | 124.3 | 169.9 | | |
| Wt. of cup | 48.7 | 51.4 | 54.4 | 52.4 | 48.6 | | |
| Wt. of oven dry soil | 72.9 | 41.5 | 63.4 | 74.5 | 126.5 | | |
| Wt. Loss | 2.2 | 0.4 | 0.4 | 2.6 | 5.2 | | |
| Organic content (LOI)**% | 3.0 | 1.0 | 0.6 | 3.5 | 4.1 | | |

*w = (wt. of water/wt. of dry soil)*100

**LOI = (wt. loss/wt. of dry soil)*100

Remarks:

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## ORGANIC AND WATER CONTENT DETERMINATIONS
## ASTM D2974

Project: LEA COUNTY LANDFILL

Location of Project: HOBBS, NEW MEXICO

Description of Soil:

Tested By: JM & WSG

Job No.: 95042.10

Date of Testing: 12-3-97 THROUGH 12-16-97

Date of Weighing:

Oven Temperature: 60°C

Furnace Temperature: 440°C

### MOISTURE CONTENT

| Boring No. | 109 | 108 | 111 | 110 | 110 | 111 | |
|---|---|---|---|---|---|---|---|
| Sample No. | 80.0' | 60.0' | 200.0' | 350.0' | 230.0' | 80.0' | |
| Container No. (cup) | 190 | 106 | 45 | 45 | 106 | 190 | |
| Wt. of cup + wet soil | 113.8 | 121.8 | 134.7 | 124.9 | 137.5 | 159.2 | |
| Wt. of cup + dry soil | 106.5 | 117.8 | 123.7 | 115.5 | 131.0 | 145.5 | |
| Wt. of cup | 52.4 | 51.4 | 48.7 | 48.7 | 51.4 | 52.4 | |
| Wt. of dry soil | 54.1 | 66.4 | 75.0 | 66.8 | 79.6 | 93.1 | |
| Wt. of water | 7.3 | 4.0 | 11.0 | 9.4 | 6.5 | 13.7 | |
| Water content (w)*% | 13.5 | 6.0 | 14.7 | 14.1 | 8.2 | 14.7 | |

### ORGANIC CONTENT

| Boring No. | 109 | 108 | 111 | 110 | 110 | 111 | |
|---|---|---|---|---|---|---|---|
| Sample No. | 80.0' | 60.0' | 200.0' | 350.0' | 230.0' | 80.0' | |
| Container No. (cup) | 190 | 106 | 45 | 45 | 106 | 190 | |
| Init. wt. of cup + oven dry soil | 106.5 | 117.8 | 123.7 | 115.5 | 131.0 | 145.5 | |
| Final wt. of cup + burnt soil | 103.0 | 117.1 | 121.4 | 113.6 | 129.4 | 140.6 | |
| Wt. of cup | 52.4 | 51.4 | 48.7 | 48.7 | 51.4 | 52.4 | |
| Wt. of oven dry soil | 54.1 | 66.4 | 75.0 | 66.8 | 79.6 | 93.1 | |
| Wt. Loss | 3.5 | 0.7 | 2.3 | 1.9 | 1.6 | 4.9 | |
| Organic content (LOI)**% | 6.5 | 1.1 | 3.1 | 2.8 | 2.0 | 5.3 | |

*w = (wt. of water/wt. of dry soil)*100

**LOI = (wt. loss/wt. of dry soil)*100

Remarks:

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944 N. Griffith Blvd., Unit C, Griffith, IN 46319 • (219) 923-9609

## SPECIFIC GRAVITY TESTS
## ASTM D854

Project: LEA COUNTY LANDFILL
Job No.: 95042.10
Location of Project: HOBBS, NEW MEXICO
Date of Testing: 12-8-97 THROUGH 12-22-
Description of Soil:
Date of Weighing:
Tested By: WSG

| Jar No. | 1 | 2 | 3 | 4 | 5 | 1 | 1 |
|---|---|---|---|---|---|---|---|
| Boring No. | B-104 | B-108 | B-109 | B-111 | B-110 | B-110 | B-111 |
| Depth | 60.0' | 60.0' | 80.0' | 200.0' | 350.0' | 230.0' | 80.0' |
| Oven Dry Wt. (A) g | 130.6 | 117.8 | 130.5 | 110.7 | 113.7 | 112.6 | 111.0 |
| Wt. Pycn & Water (B) g | 1440.0 | 1440.0 | 1440.0 | 1440.0 | 1440.0 | 1440.7 | 1440.1 |
| Wt. Pycn, Water & Soil (C) g | 1522.3 | 1514.5 | 1521.6 | 1510.8 | 1512.9 | 1511.3 | 1510 |
| Temperature °C | 23 | 23 | 23 | 23 | 23 | 19.0 | 23.5 |
| Temp. Correction (D) | 0.9993 | 0.9993 | 0.9993 | 0.9993 | 0.9993 | 1.0002 | 0.9992 |
| Specific Gravity | 2.70 | 2.72 | 2.68 | 2.77 | 2.79 | 2.68 | 2.70 |

| Jar No. | 2 | 3 | 4 | 5 | 1 | | |
|---|---|---|---|---|---|---|---|
| Boring No. | B-111 | B-104 | B-111 | B-103 | B-110 | | |
| Depth | 140.0' | 4.0' | 485.0' | 5.0' | 90.0' | | |
| Oven Dry Wt. (A) g | 115.7 | 102.0 | 110.3 | 81.3 | 103.3 | | |
| Wt. Pycn & Water (B) g | 1440.1 | 1440.1 | 1440.1 | 1440.1 | 1440.0 | | |
| Wt. Pycn, Water & Soil (C) g | 1513.0 | 1504.0 | 1510.3 | 1491.6 | 1505.6 | | |
| Temperature °C | 23.5 | 23.5 | 23.5 | 23.5 | 23.0 | | |
| Temp. Correction (D) | 0.9992 | 0.9992 | 0.9992 | 0.9992 | 0.9993 | | |
| Specific Gravity | 2.70 | 2.68 | 2.75 | 2.73 | 2.74 | | |

$$\text{SPECIFIC GRAVITY}_{20^\circ C} = \frac{A \times D}{A + B - C}$$

Remarks:

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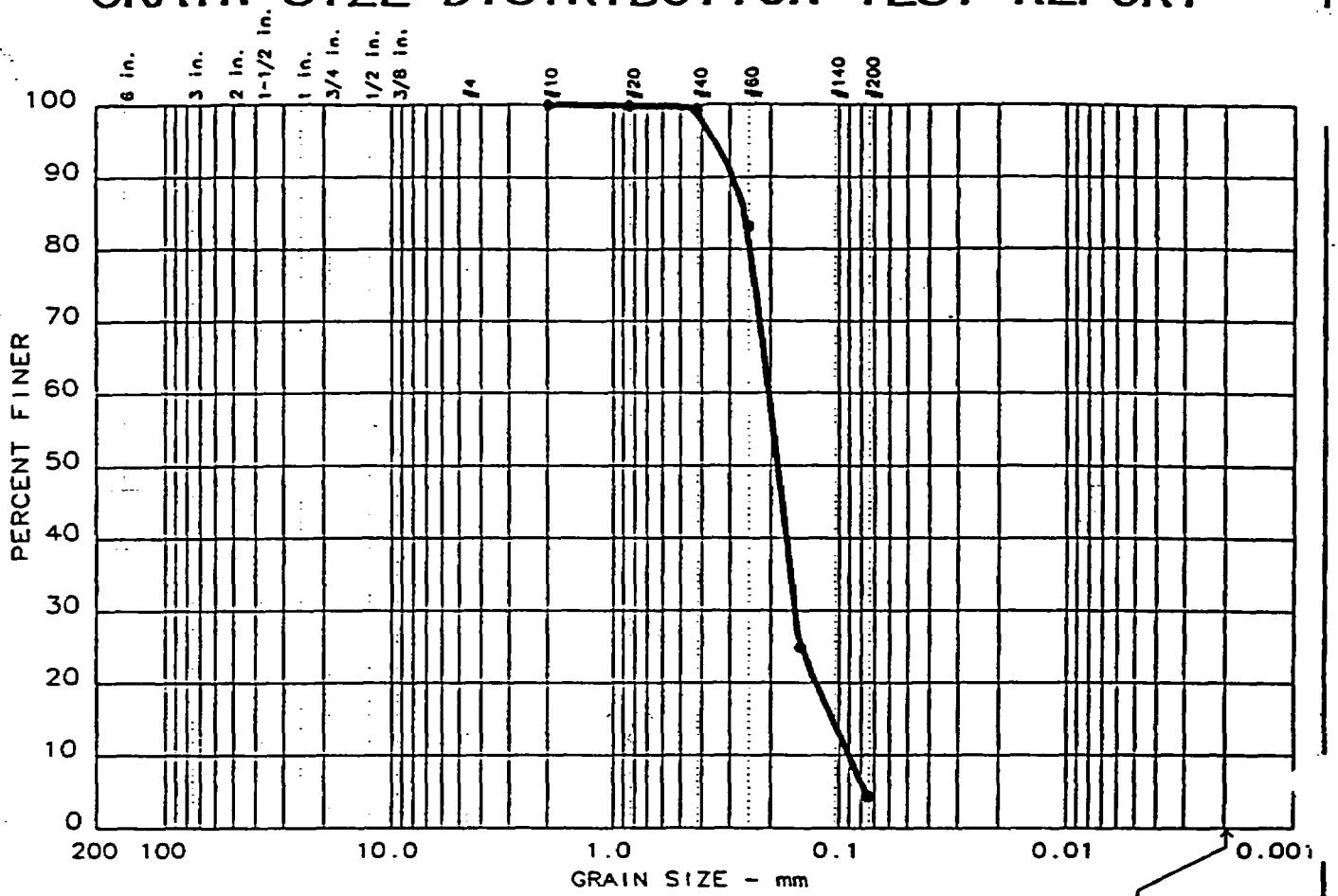
# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 18 | 0.0 | 0.0 | 95.7 | 4.3 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NA | NA | 0.258 | 0.204 | 0.187 | 0.157 | 0.107 | 0.0902 | 1.34 | 2.3 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● REDISH BROWN SAND | SP | A-3 |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
● Location: HOBBS, NEW MEXICO

Date: 1-7-98

Remarks:
SAND #1
3.0' BGS

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

# GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: _

Date: 1-7-98
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: REDISH BROWN SAND
USCS Class: SP
AASHTO Class: A-3
Liquid limit: NA
Plasticity index: NA

## Notes

Remarks: SAND #1 3.0' BGS

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 423.80 |
| Tare = | 0.00 |
| Dry sample weight = | 423.80 |

Tare for cumulative weight retained= 0

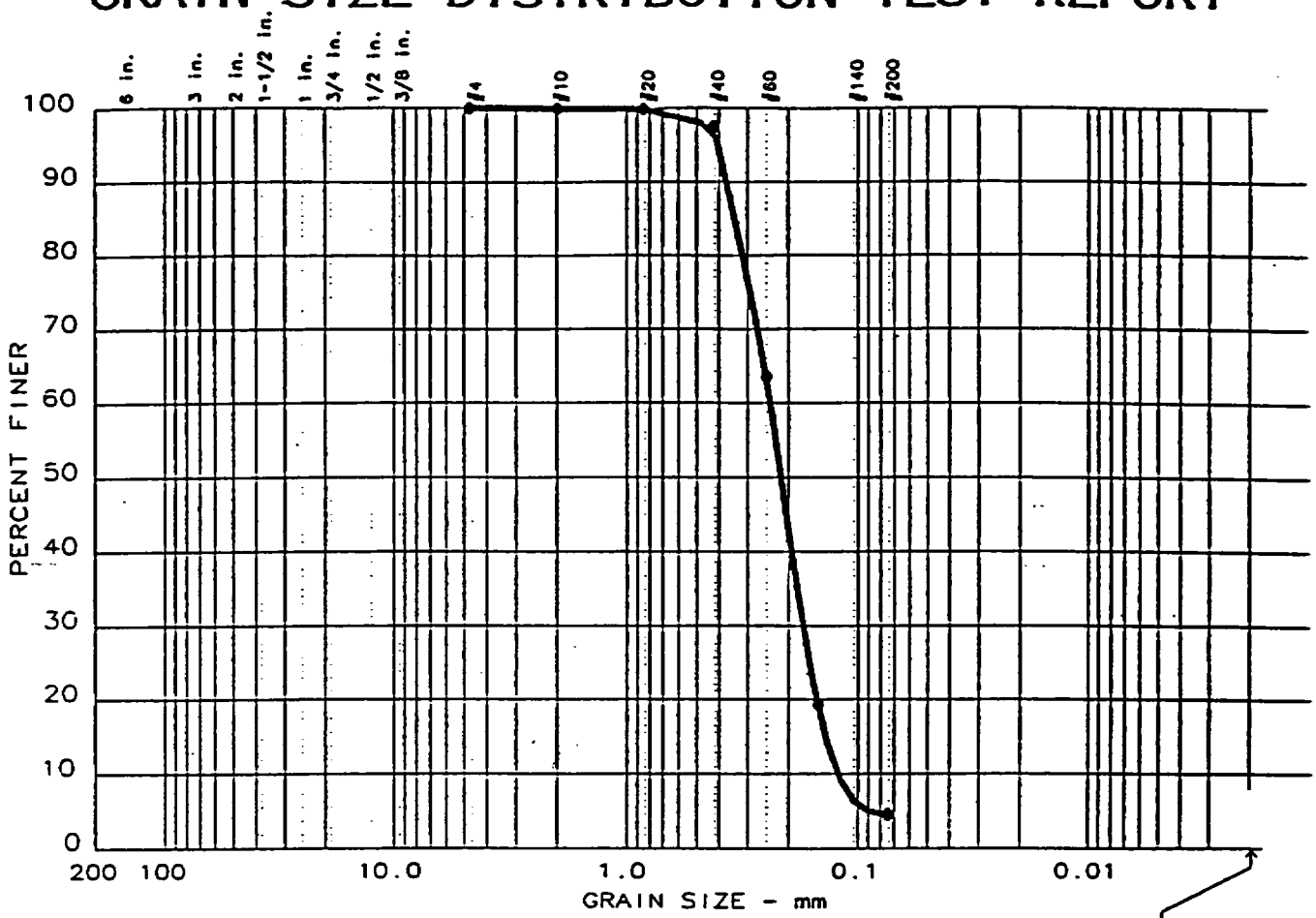
| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 10 | 0.00 | 100.0 |
| # 20 | 0.30 | 99.9 |
| # 40 | 2.60 | 99.4 |
| # 60 | 71.20 | 83.2 |
| # 100 | 318.10 | 24.9 |
| # 200 | 405.40 | 4.3 |

## Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 95.7
% FINES = 4.3

D85= 0.26 D60= 0.204 D50= 0.187
D30= 0.1567 D15= 0.10715 D10= 0.09016
Cc = 1.3351 Cu = 2.2620

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| • | 16 | 0.0 | 0.0 | 95.4 | 4.6 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| • | NA | NA | 0.343 | 0.240 | 0.216 | 0.173 | 0.139 | 0.122 | 1.02 | 2.0 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| • RED SAND | SP | A-3 |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
• Location: HOBBS, NEW MEXICO

Date: 1-7-98

Remarks:
SAND #3
SURFACE

GRAIN SIZE DISTRIBUTION TEST REPORT

**WEAVER BOOS CONSULTANTS, INC.**

Figure No. _____

# GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 16

Date: 1-7-98
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SAND
USCS Class: SP
AASHTO Class: A-3
Liquid limit: NA
Plasticity index: NA

## Notes

Remarks: SAND #3 SURFACE

Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 418.70 |
| Tare = | 0.00 |
| Dry sample weight = | 418.70 |

Tare for cumulative weight retained= 0

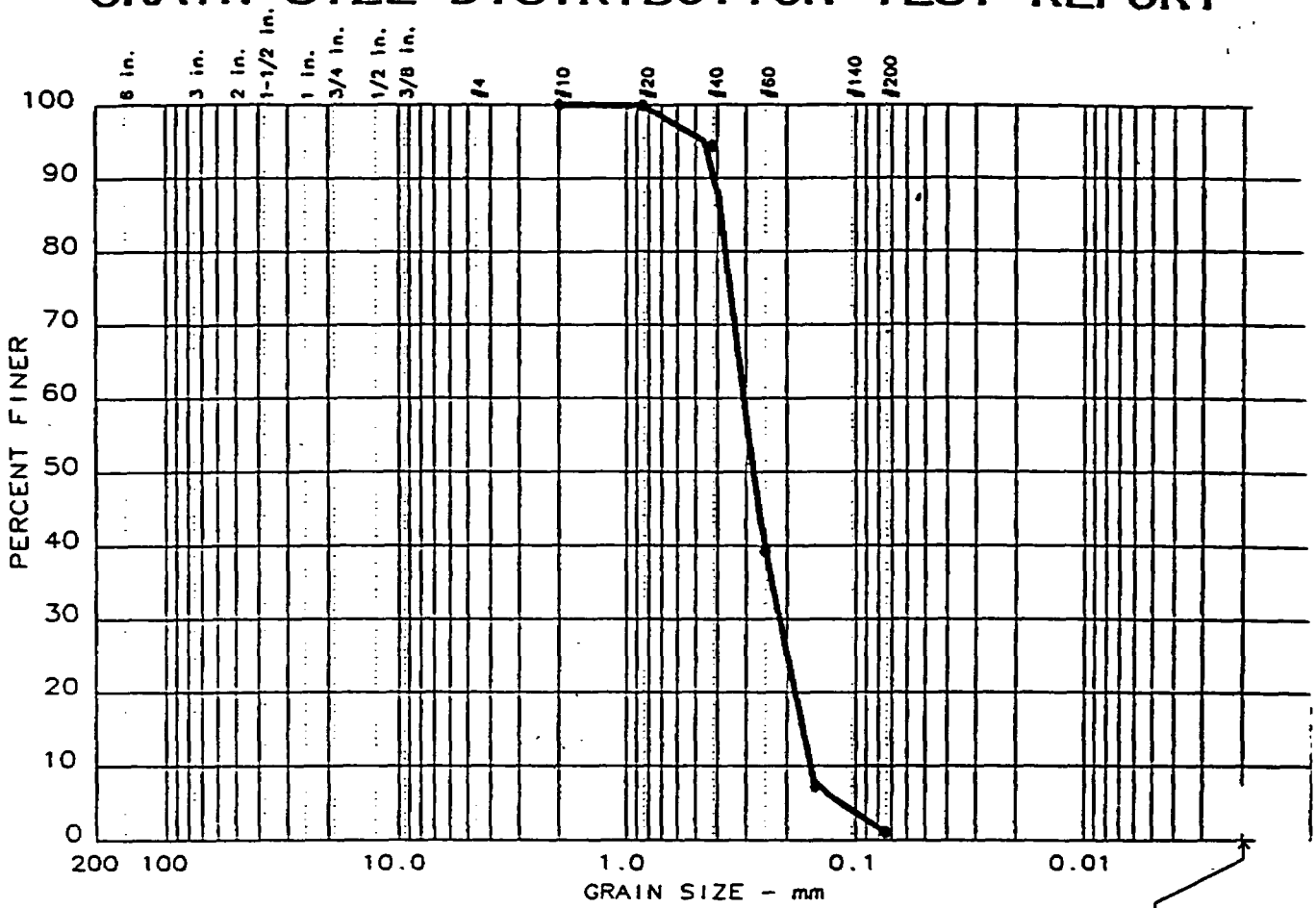
| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 4 | 0.00 | 100.0 |
| 10 | 0.30 | 99.9 |
| 20 | 0.70 | 99.8 |
| # 40 | 10.60 | 97.5 |
| # 60 | 152.50 | 63.6 |
| # 100 | 337.70 | 19.3 |
| # 200 | 399.60 | 4.6 |

## Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 95.4
% FINES = 4.6

D85= 0.34 D60= 0.240 D50= 0.216
D30= 0.1732 D15= 0.13868 D10= 0.12218
Cc = 1.0233 Cu = 1.9634

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| • | 17 | 0.0 | 0.0 | 98.9 | 1.1 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| • | NA | NA | 0.389 | 0.308 | 0.280 | 0.215 | 0.169 | 0.156 | 0.96 | 2.0 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| • RED SAND | SP | A-3 |

Project No.: 95042.10
Project: LEA COUNTY LANDFILL
• Location: HOBBS, NEW MEXICO

Date: 1-7-98

Remarks:
SAND #5
SURFACE

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

## GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 17

Date: 1-7-98
Project No.: 95042.10
Project: LEA COUNTY LANDFILL

### Sample Data

Location of Sample: HOBBS, NEW MEXICO
Sample Description: RED SAND
USCS Class: SP
AASHTO Class: A-3
Liquid limit: NA
Plasticity index: NA

### Notes

Remarks: SAND #5 SURFACE

Fig. No.:

### Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 438.70 |
| Tare = | 0.00 |
| Dry sample weight = | 438.70 |

Tare for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 10 | 0.00 | 100.0 |
| 20 | 0.60 | 99.9 |
| 40 | 24.40 | 94.4 |
| # 60 | 266.30 | 39.3 |
| # 100 | 406.60 | 7.3 |
| # 200 | 434.00 | 1.1 |

### Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 98.9
% FINES = 1.1

D85= 0.39 D60= 0.308 D50= 0.280
D30= 0.2153 D15= 0.16904 D10= 0.15649
Cc = 0.9605 Cu = 1.9702

# WEAVER BOOS CONSULTANTS, INC.

**ENVIRONMENTAL AND GEOTECHNICAL ENGINEERS**

200 S. Michigan Ave., Chicago, IL 60604 • (312) 922-1030

1944 N. Griffith Blvd., Unit C, Griffith, IN 46319 • (219) 923-9609


## Constant Head Permeability Test (ASTM D 2434)

Project: LEA COUNTY LANDFILL

Location of Project: HOBBS, NM

Description of Soil: RED SAND

Job No.: 95042.10

Date of Testing: JAN. 6, 1998

Tested By.: WSG

| Sample Number | Reading Number | Sample Information Length, cm | Area, cm2 | Date Tested | Head h, cm | Time Start | Time End | Total time t, sec | Total Flow Q, ml | K=(QL)/Aht cm/sec | Average K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SAND #1 | 1 | 11.0 | 81.07 | 1/6/98 | 99.70 | | | 540 | 190 | 4.79E-04 | |
| 3.0' BGS | 2 | 11.0 | 81.07 | 1/6/98 | 99.70 | | | 660 | 210 | 4.33E-04 | |
| | 3 | 11.0 | 81.07 | 1/6/98 | 99.70 | | | 600 | 180 | 4.08E-04 | |
| | Average | | | | | | | | | | 4.40E-04 |

c:\projects\95042\10\conhd1.xls

# WEAVER BOOS CONSULTANTS, INC.

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## Constant Head Permeability Test (ASTM D 2434)

Project: LEA COUNTY LANDFILL

Location of Project: HOBBS, NM

Description of Soil: RED SAND

Job No.: 95042.10

Date of Testing: JAN. 6, 1998

Tested By.: WSG

| Sample Number | Reading Number | Sample Information Length, cm | Area, cm2 | Date Tested | Head h, cm | Time Start | Time End | Total time t, sec | Total Flow Q, ml | K=(QL)/Aht cm/sec | Average K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SAND #3 | 1 | 10.0 | 81.07 | 1/6/98 | 99.70 | | | 300 | 110 | 4.54E-04 | |
| SURFACE | 2 | 10.0 | 81.07 | 1/6/98 | 99.70 | | | 300 | 90 | 3.71E-04 | |
| | 3 | 10.0 | 81.07 | 1/6/98 | 99.70 | | | 300 | 85 | 3.51E-04 | |
| | Average | | | | | | | | | | 3.92E-04 |

c:\projects\95042\10\conhd3.xls

# WEAVER BOOS CONSULTANTS, INC.

**ENVIRONMENTAL AND GEOTECHNICAL ENGINEERS**

200 S. Michigan Ave., Chicago, IL 60604 • (312) 922-1030

1944 N. Griffith Blvd., Unit C, Griffith, IN 46319 • (219) 923-9609


## Constant Head Permeability Test (ASTM D 2434)

Project: LEA COUNTY LANDFILL

Location of Project: HOBBS, NM

Description of Soil: RED SAND

Job No.: 95042.10

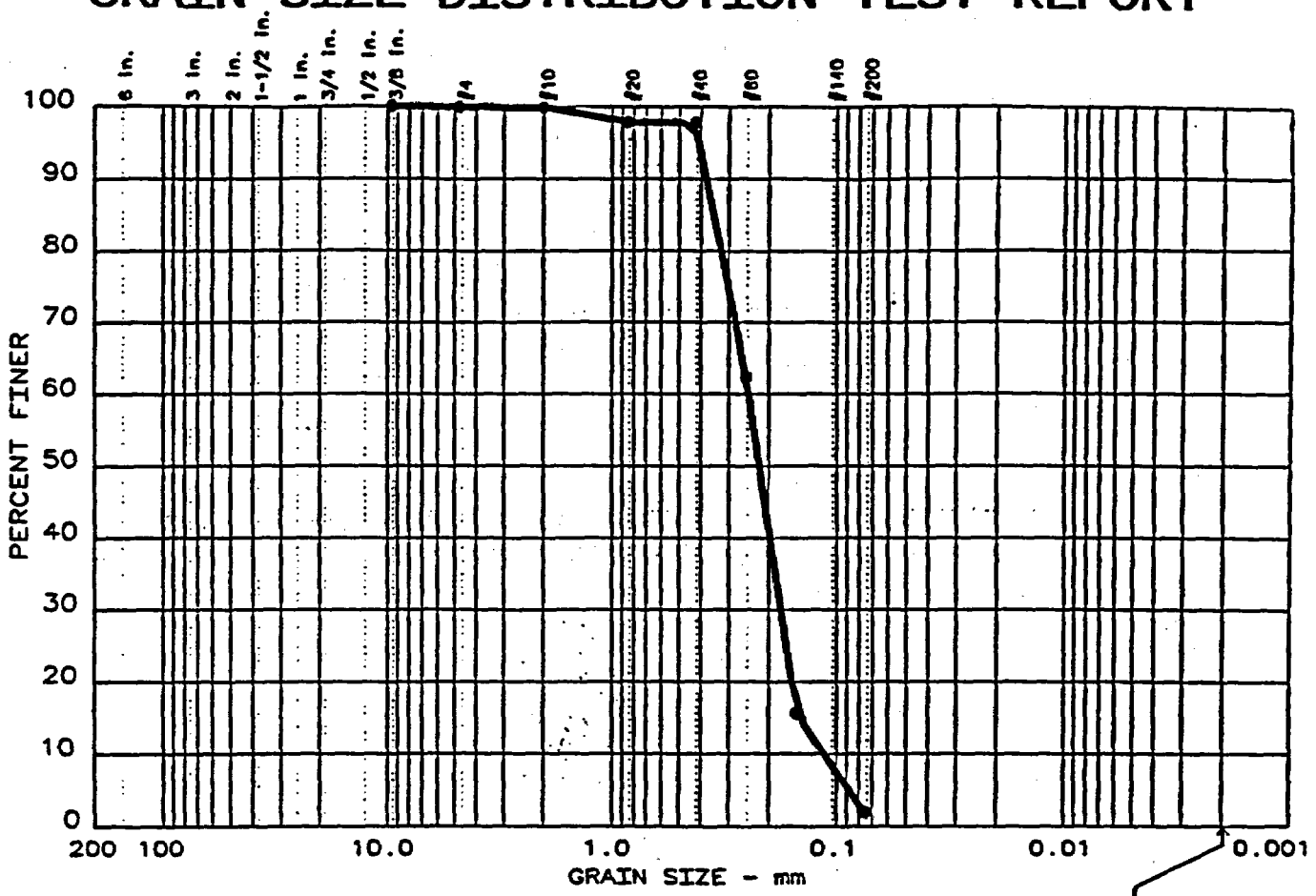
Date of Testing: JAN. 6, 1998

Tested By.: JWM

| Sample Number | Reading Number | Sample Information Length, cm | Area, cm2 | Date Tested | Head h, cm | Time Start | Time End | Total time t, sec | Total Flow Q, ml | K=(QL)/Aht cm/sec | Average K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SAND #5 | 1 | 10.0 | 81.07 | 1/6/98 | 99.70 | | | 540 | 180 | 4.12E-04 | |
| SURFACE | 2 | 10.0 | 81.07 | 1/6/98 | 99.70 | | | 540 | 170 | 3.89E-04 | |
| | 3 | 10.0 | 81.07 | 1/6/98 | 99.70 | | | 540 | 165 | 3.78E-04 | |
| | Average | | | | | | | | | | 3.93E-04 |

c:\projects\95042\10\conhd5.xls

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 5 | 0.0 | 0.0 | 98.0 | 2.0 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 0.349 | 0.244 | 0.218 | 0.175 | 0.144 | 0.112 | 1.13 | 2.2 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● REDDISH BRN SAND, TR SILT | SP | A-3 |

Project No.: 0016-02-05
Project: LEA COUNTY LANDFILL
● Location: LEA COUNTY, ILLINOIS

Date: 7-21-98

Remarks:
SAMPLE: 1A
UNWASHED
BORING: 500S OW

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

## GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 5

Date: 7-21-98
Project No.: 0016-02-05
Project: LEA COUNTY LANDFILL

### Sample Data

Location of Sample: LEA COUNTY, ILLINOIS
Sample Description: REDDISH BRN SAND, TR SILT
USCS Class: SP
AASHTO Class: A-3
Liquid limit:
Plasticity index:

### Notes

Remarks: SAMPLE: 1A UNWASHED
BORING: 500S 0W
Fig. No.:

### Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 323.20 |
| Tare = | 0.00 |
| Dry sample weight = | 323.20 |

Tare for cumulative weight retained= 0

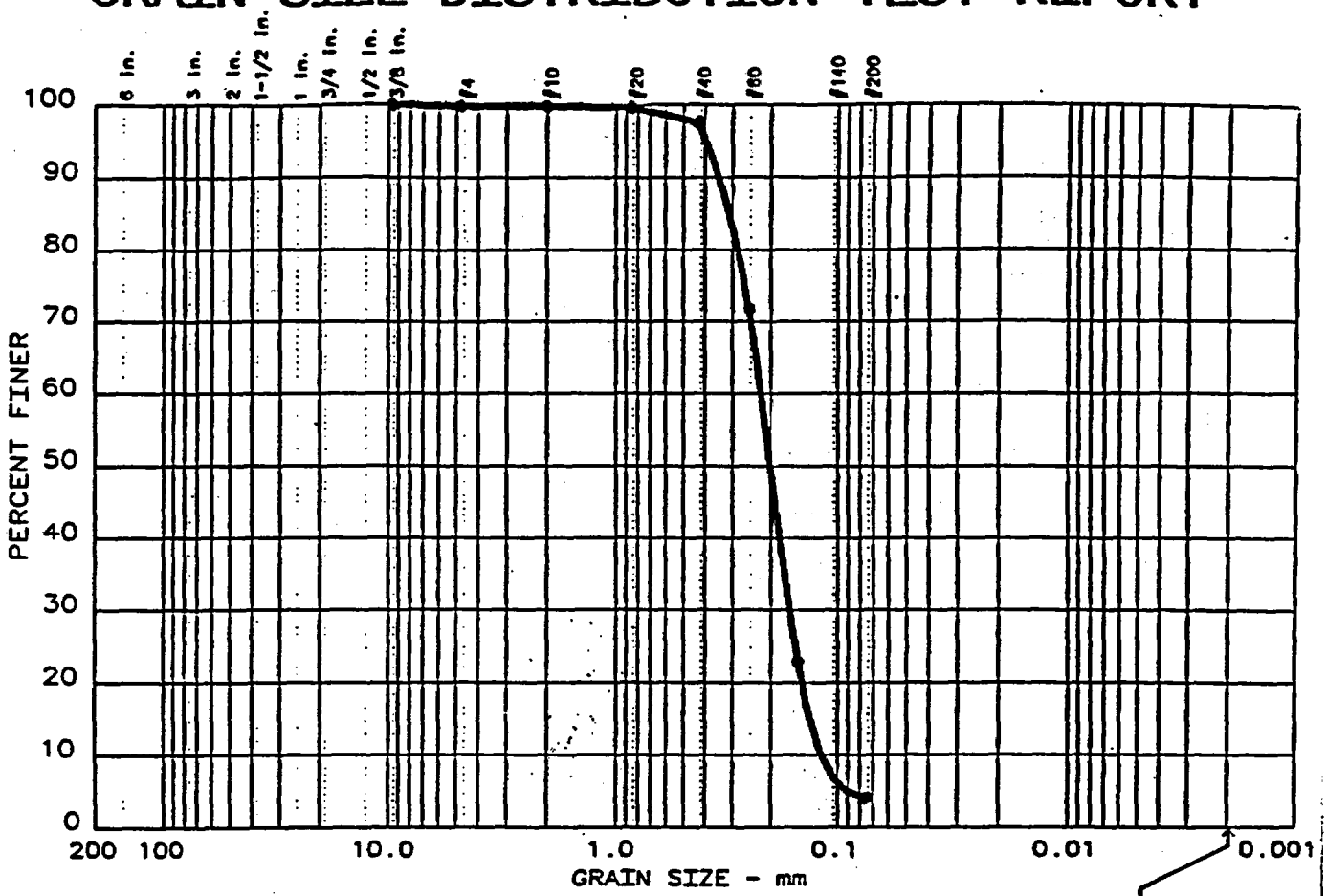
| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| 0.375 inches | 0.00 | 100.0 |
| 4 | 0.10 | 100.0 |
| 10 | 0.30 | 99.9 |
| # 20 | 6.80 | 97.9 |
| # 40 | 7.20 | 97.8 |
| # 60 | 121.50 | 62.4 |
| # 100 | 272.50 | 15.7 |
| # 200 | 316.80 | 2.0 |

### Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 98.0
% FINES = 2.0

D85= 0.35 D60= 0.244 D50= 0.218
D30= 0.1754 D15= 0.14421 D10= 0.11194
Cc = 1.1285 Cu = 2.1752

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 6 | 0.0 | 0.2 | 95.7 | 4.1 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 0.308 | 0.220 | 0.200 | 0.163 | 0.132 | 0.117 | 1.03 | 1.9 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● REDDISH BRN SAND, TR SILT | SP | A-3 |

Project No.: 0016-02-05
Project: LEA COUNTY LANDFILL
● Location: LEA COUNTY, ILLINOIS

Date: 7-21-98

Remarks:
SAMPLE: 2A
UNWASHED
BORING: 500S 210W

GRAIN SIZE DISTRIBUTION TEST REPORT

WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 6

Date: 7-21-98
Project No.: 0016-02-05
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: LEA COUNTY, ILLINOIS
Sample Description: REDDISH BRN SAND, TR SILT
USCS Class: SP Liquid limit:
AASHTO Class: A-3 Plasticity index:

## Notes

Remarks: SAMPLE: 2A UNWASHED
BORING: 500S 210W
Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 312.90 |
| Tare = | 0.00 |
| Dry sample weight = | 312.90 |

Tare for cumulative weight retained= 0

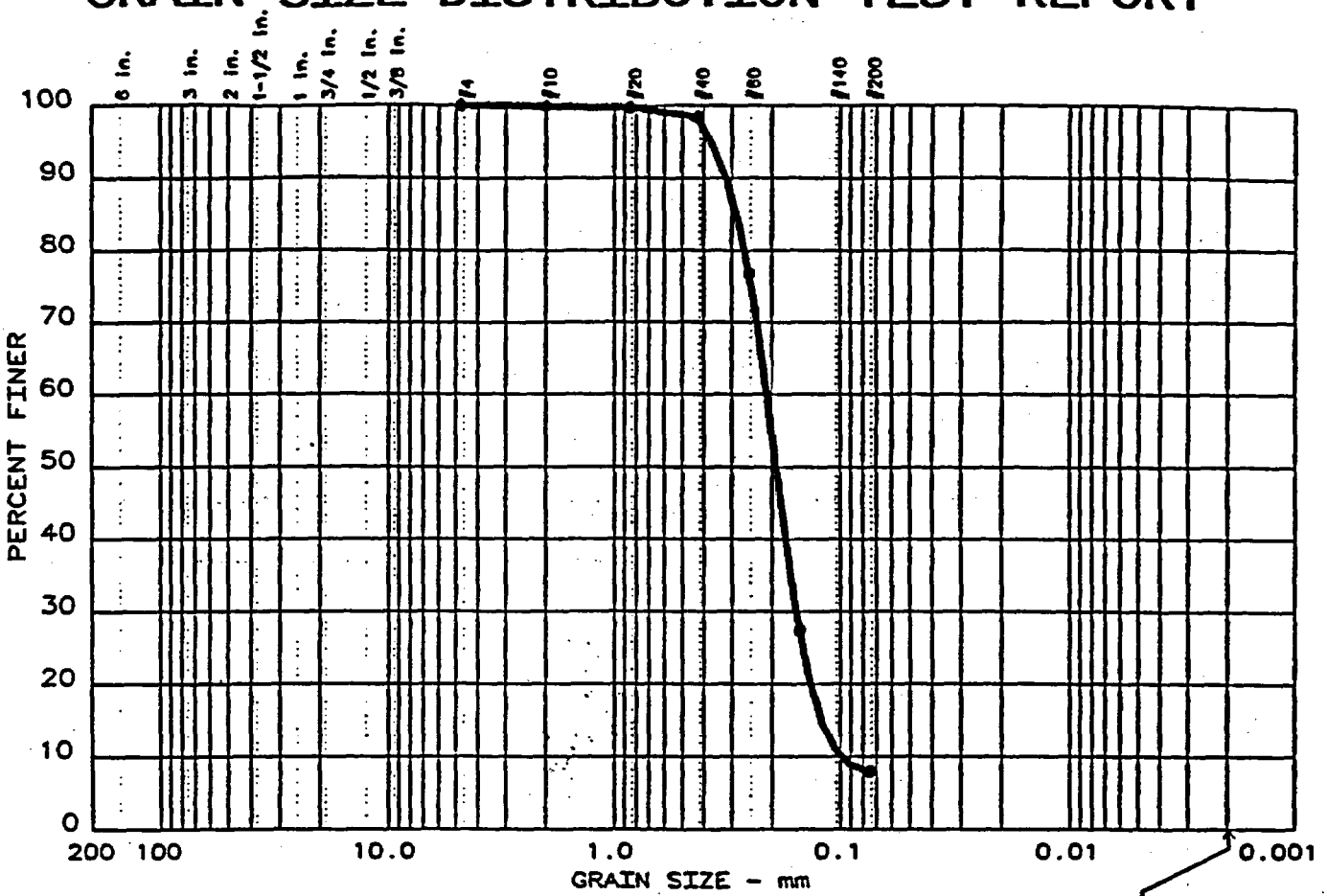
| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| 0.375 inches | 0.00 | 100.0 |
| 4 | 0.50 | 99.8 |
| 10 | 0.70 | 99.8 |
| # 20 | 1.30 | 99.6 |
| # 40 | 7.50 | 97.6 |
| # 60 | 88.20 | 71.8 |
| # 100 | 241.30 | 22.9 |
| # 200 | 300.10 | 4.1 |

## Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.2 % SAND = 95.7
% FINES = 4.1

D85= 0.31 D60= 0.220 D50= 0.200
D30= 0.1633 D15= 0.13213 D10= 0.11722
Cc = 1.0328 Cu = 1.8793

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 7 | 0.0 | 0.0 | 92.0 | 8.0 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 0.284 | 0.209 | 0.190 | 0.155 | 0.120 | 0.0986 | 1.16 | 2.1 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● REDDISH BRN SAND, TR SILT | SP-SM | A-3 |

Project No.: 0016-02-05
Project: LEA COUNTY LANDFILL
● Location: LEA COUNTY, ILLINOIS

Date: 7-21-98

Remarks:
SAMPLE: 3A
UNWASHED
BORING: 500S 700W

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

# GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 7

Date: 7-21-98
Project No.: 0016-02-05
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: LEA COUNTY, ILLINOIS
Sample Description: REDDISH BRN SAND, TR SILT
USCS Class: SP-SM
AASHTO Class: A-3
Liquid limit:
Plasticity index:

## Notes

Remarks: SAMPLE: 3A UNWASHED
BORING: 500S 700W
Fig. No.:-

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 298.20 |
| Tare = | 0.00 |
| Dry sample weight = | 298.20 |

Tare for cumulative weight retained= 0

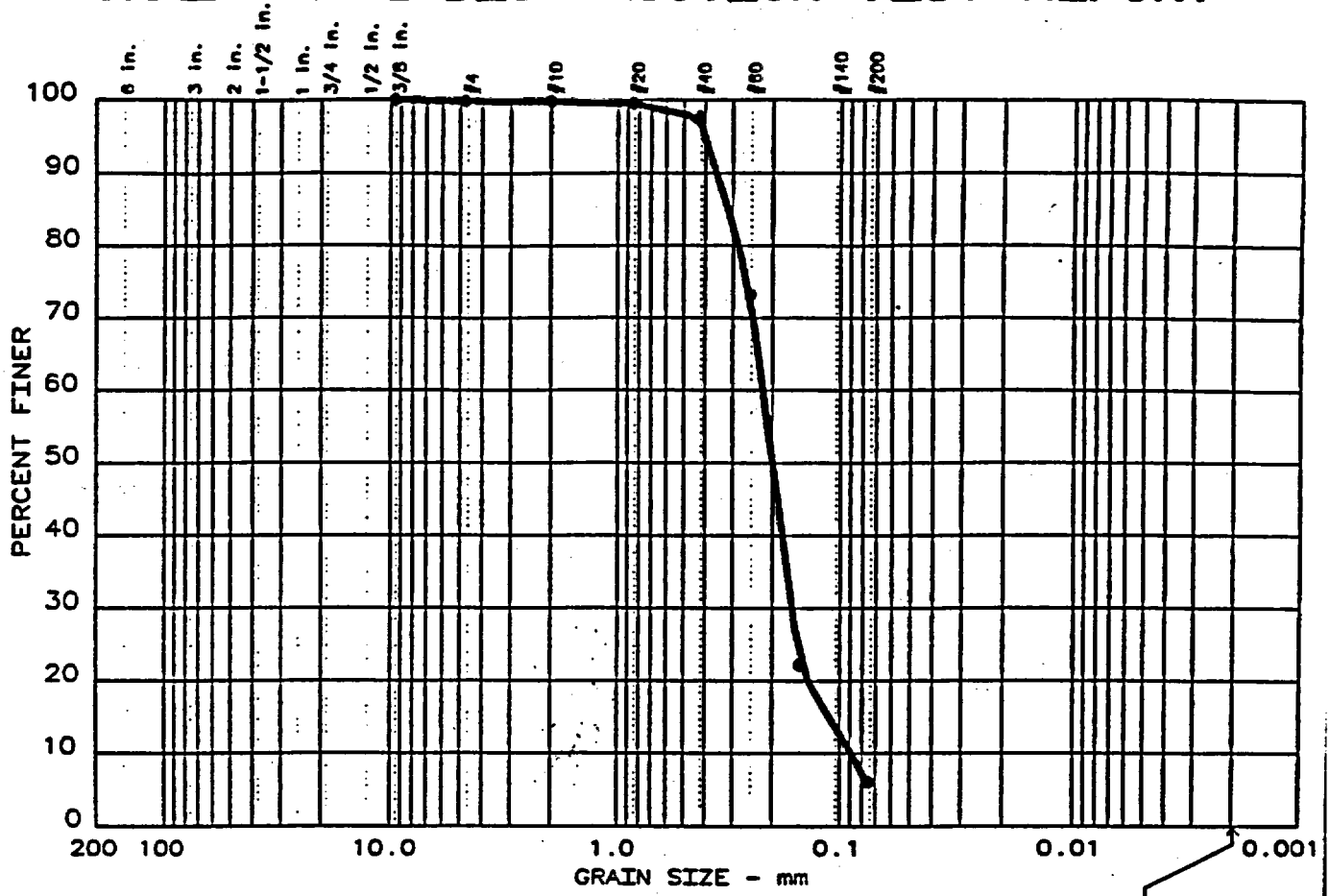
| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 4 | 0.00 | 100.0 |
| 10 | 0.50 | 99.8 |
| 20 | 0.90 | 99.7 |
| # 40 | 4.70 | 98.4 |
| # 60 | 69.20 | 76.8 |
| # 100 | 216.40 | 27.4 |
| # 200 | 274.30 | 8.0 |

## Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 92.0
% FINES = 8.0

D85= 0.28 D60= 0.209 D50= 0.190
D30= 0.1545 D15= 0.11995 D10= 0.09863
Cc = 1.1574 Cu = 2.1208

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 8 | 0.0 | 0.1 | 93.8 | 6.1 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 0.313 | 0.219 | 0.198 | 0.162 | 0.110 | 0.0880 | 1.36 | 2.5 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● REDDISH BRN SAND, TR SILT | SP-SM | A-3 |

Project No.: 0016-02-05
Project: LEA COUNTY LANDFILL
● Location: LEA COUNTY, ILLINOIS

Date: 7-21-98

Remarks:
SAMPLE: 4A
UNWASHED
BORING: 500S 1200W

GRAIN SIZE DISTRIBUTION TEST REPORT
WEAVER BOOS CONSULTANTS, INC.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 8

Date: 7-21-98
Project No.: 0016-02-05
Project: LEA COUNTY LANDFILL

## Sample Data

Location of Sample: LEA COUNTY, ILLINOIS
Sample Description: REDDISH BRN SAND, TR SILT
USCS Class: SP-SM Liquid limit:
AASHTO Class: A-3 Plasticity index:

## Notes

Remarks: SAMPLE: 4A UNWASHED
BORING: 500S 1200W
Fig. No.:

## Mechanical Analysis Data

| | Initial |
|---|---|
| Dry sample and tare= | 319.40 |
| Tare = | 0.00 |
| Dry sample weight = | 319.40 |

Tare for cumulative weight retained= 0

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| 0.375 inches | 0.00 | 100.0 |
| 4 | 0.40 | 99.9 |
| 10 | 0.70 | 99.8 |
| # 20 | 1.70 | 99.5 |
| # 40 | 7.60 | 97.6 |
| # 60 | 85.40 | 73.3 |
| # 100 | 248.40 | 22.2 |
| # 200 | 300.00 | 6.1 |

## Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.1 % SAND = 93.8
% FINES = 6.1

D85= 0.31 D60= 0.219 D50= 0.198
D30= 0.1620 D15= 0.10952 D10= 0.08800
Cc = 1.3630 Cu = 2.4860

# WEAVER BOOS AND GORDON, INC.

ENVIRONMENTAL AND GEOTECHNICAL ENGINEERS

200 S. Michigan Ave., Chicago, IL 60604 • (312) 922-1030

1944 N. Griffith Blvd., Unit C, Griffith, IN 46319 • (219) 923-9609


## Constant Head Permeability Test (ASTM D 2434)

Project: Lea County Landfill

Location of Project: Lea County, Ilinois

Description of Soil: Reddish Brn Sand, TR Silt

Classification: USCS: SP AASHTO: A-3

Remarks: Sample: 1 Washed

Boring: 500S 0W

Job No.: 0016-02-05

Date of Testing: 7-17-98

Tested By.: JWM

| Sample Number | Reading Number | Sample Information Length, cm | Area, cm2 | Date Tested | Head h, cm | Time Start | Time End | Total time t, sec | Total Flow Q, ml | K=(QL)/Aht cm/sec | Average K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 7.0 | 20.27 | 7/17/98 | 119.00 | | | 300 | 690 | 6.67E-03 | |
| | 2 | 7.0 | 20.27 | 7/17/98 | 119.00 | | | 840 | 1570 | 5.42E-03 | |
| | 3 | 7.0 | 20.27 | 7/17/98 | 119.00 | | | 360 | 595 | 4.80E-03 | |
| | 4 | 7.0 | 20.70 | 7/17/98 | 119.00 | | | 420 | 650 | 4.40E-03 | |
| | Average | | | | | | | | | | 5.32E-03 |

# PERMEABILITY TEST REPORT

**TEST DATA:**

Specimen Height (cm): 7.29
Specimen Diameter (cm): 6.07
Dry Unit Weight (pcf): 114.7
Moisture Before Test (%): 15.9
Moisture After Test (%): 23.7

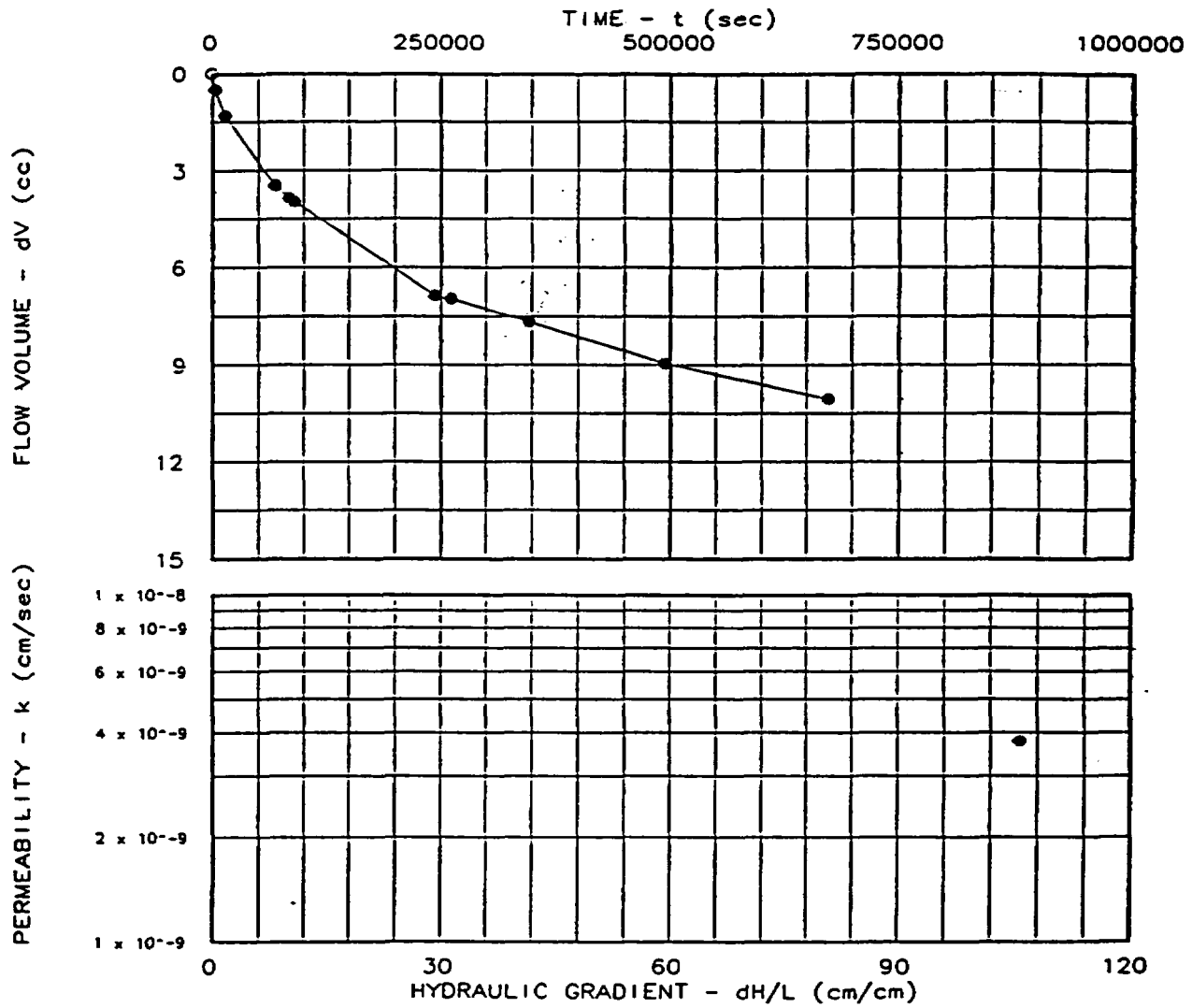
| Run Number: | 1 ● | 2 ▲ |
|---|---|---|
| Cell Pressure (psi): | 36.0 | |
| Test Pressure(psi): | 27.0 | |
| Back Pressure(psi): | 16.0 | |
| Diff. Head (psi): | 11.0 | |
| Flow Rate (cc/sec): | $1.36 \times 10^{-5}$ | |
| Perm. (cm/sec): | $3.78 \times 10^{-9}$ | |

**SAMPLE DATA:**

Sample Identification: BORING: 111
DEPTH: 80.0'
Visual Description: RED SILTY CLAY, TR SAND
Remarks:

Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: FLEXIBLE WALL
Sample type: CORE




Project: LEA COUNTY LANDFILL
Location: HOBBS, NEW MEXICO
Date: 12-16-97

PERMEABILITY TEST REPORT

WEAVER BOOS CONSULTANTS, INC.

Project No.: 95042.10
File No.: 95042.10
Lab No.: 2
Tested by: JWM
Checked by: WSG
Test: CH - Constant head

# PERMEABILITY TEST DATA

## PROJECT DATA

| | |
|---|---|
| ...ect Name: | LEA COUNTY LANDFILL |
| ... No.: | 95042.10 |
| ...ject Location: | HOBBS, NEW MEXICO |
| Project No.: | 95042.10 |
| Sample Identification: | BORING: 111<br>DEPTH: 80.0' |
| Lab No.: | 2 |
| Description: | RED SILTY CLAY, TR<br>SAND |
| Sample Type: | CORE |
| Max. Dry Dens.: | |
| Method (D1557/D698): | |
| Opt. Water Content: | |
| Date: | 12-16-97 |
| Remarks: | |
| Permeameter Type: | FLEXIBLE WALL |
| Tested by: | JWM |
| Checked by: | WSG |
| Test type: | CH - Constant head |

## PERMEABILITY TEST SPECIMEN DATA

| | Before test: | | After test: | |
|---|---|---|---|---|
| ...ameter: | 1 | 2 | 1 | 2 |
| Top: | in | in | in | in |
| Middle: | 2.389 in | in | 2.510 in | in |
| Bottom: | in | in | in | in |
| Average: | 2.39 in | 6.07 cm | 2.51 in | 6.38 cm |

| | | | | | | |
|---|---|---|---|---|---|---|
| Length: | 1 | 2 | 3 | 1 | 2 | 3 |
| | 2.870 in | in | in | 2.898 in | in | in |
| Average: | 2.87 in | 7.29 cm | | 2.90 in | 7.36 cm | |

Moisture, Density and Sample Parameters:

| | | |
|---|---|---|
| Specific Gravity: | 2.70 | |
| Wet Wt. & Tare: | 448.90 | 479.40 |
| Dry Wt. & Tare: | 387.40 | 387.40 |
| Tare Wt.: | 0.00 | 0.00 |
| Moisture Content: | 15.9 % | 23.7 % |
| Dry Unit Weight: | 114.7 pcf | 102.9 pcf |
| Porosity: | 0.3194 | 0.3894 |
| Saturation: | 91.3 % | 100.5 % |

## CONSTANT HEAD PERMEABILITY TEST CONDITIONS DATA

Cell No.: 2 Panel No.: Positions:

| Run Number: | 1 | 2 |
|---|---|---|
| Cell Pressure: | 36.0 psi | 0.0 psi |
| Saturation Pressure: | 35.0 psi | 0.0 psi |
| Inflow Corr. Factor: | 1.00 | 1.00 |
| Outflow Corr. Factor: | 1.00 | 1.00 |
| Test Temperature: | 27.0 °C | 0.0 °C |

## PERMEABILITY TEST READINGS DATA

| CASE D X S R | DATE | TIME (24 hr) | ELAPSED TIME-sec | GAUGE PRESSURE-psi IN | OUT | BURET READING-cc IN | OUT | FLOW VOLUME-cc AVERAGE |
|---|---|---|---|---|---|---|---|---|
| S X | 12/23/97 | 13:03:00 | 0 | 27.0 | 17.0 | 7.80 | 77.50 | 0.00 |
| | 12/23/97 | 14:02:00 | 3,540 | 27.0 | 17.0 | 8.30 | 77.00 | 0.50 |
| | 12/23/97 | 17:03:00 | 14,400 | 27.0 | 17.0 | 9.20 | 76.30 | 1.30 |
| | 12/24/97 | 7:48:00 | 67,500 | 27.0 | 17.0 | 11.80 | 74.60 | 3.45 |
| | 12/24/97 | 12:10:00 | 83,220 | 27.0 | 17.0 | 12.20 | 74.20 | 3.85 |
| | 12/24/97 | 13:30:00 | 88,020 | 27.0 | 17.0 | 12.30 | 74.10 | 3.95 |
| | 12/26/97 | 8:39:00 | 243,360 | 27.0 | 17.0 | 15.80 | 71.80 | 6.85 |
| | 12/26/97 | 13:37:00 | 261,240 | 27.0 | 17.0 | 15.90 | 71.70 | 6.95 |
| | 12/27/97 | 13:08:00 | 345,900 | 27.0 | 17.0 | 16.60 | 71.00 | 7.65 |
| | 12/29/97 | 6:16:00 | 493,980 | 27.0 | 17.0 | 18.00 | 69.80 | 8.95 |
| | 12/31/97 | 8:03:00 | 673,200 | 27.0 | 17.0 | 19.20 | 68.80 | 10.05 |

Test Pressure = 27.0 psi Differential Head = 11.0 psi, 770.1 cm H2O
Gradient = 1.056E 02 Flow rate = 1.359E-05 cc/sec R squared = 0.88804
Permeability, K27.0° = 4.449E-09 cm/sec, K20° = 3.783E-09 cm/sec

# PERMEABILITY TEST REPORT

**TEST DATA:**

Specimen Height (cm): 6.79
Specimen Diameter (cm): 6.20
Dry Unit Weight (pcf): 118.0
Moisture Before Test (%): 11.0
Moisture After Test (%): 17.0

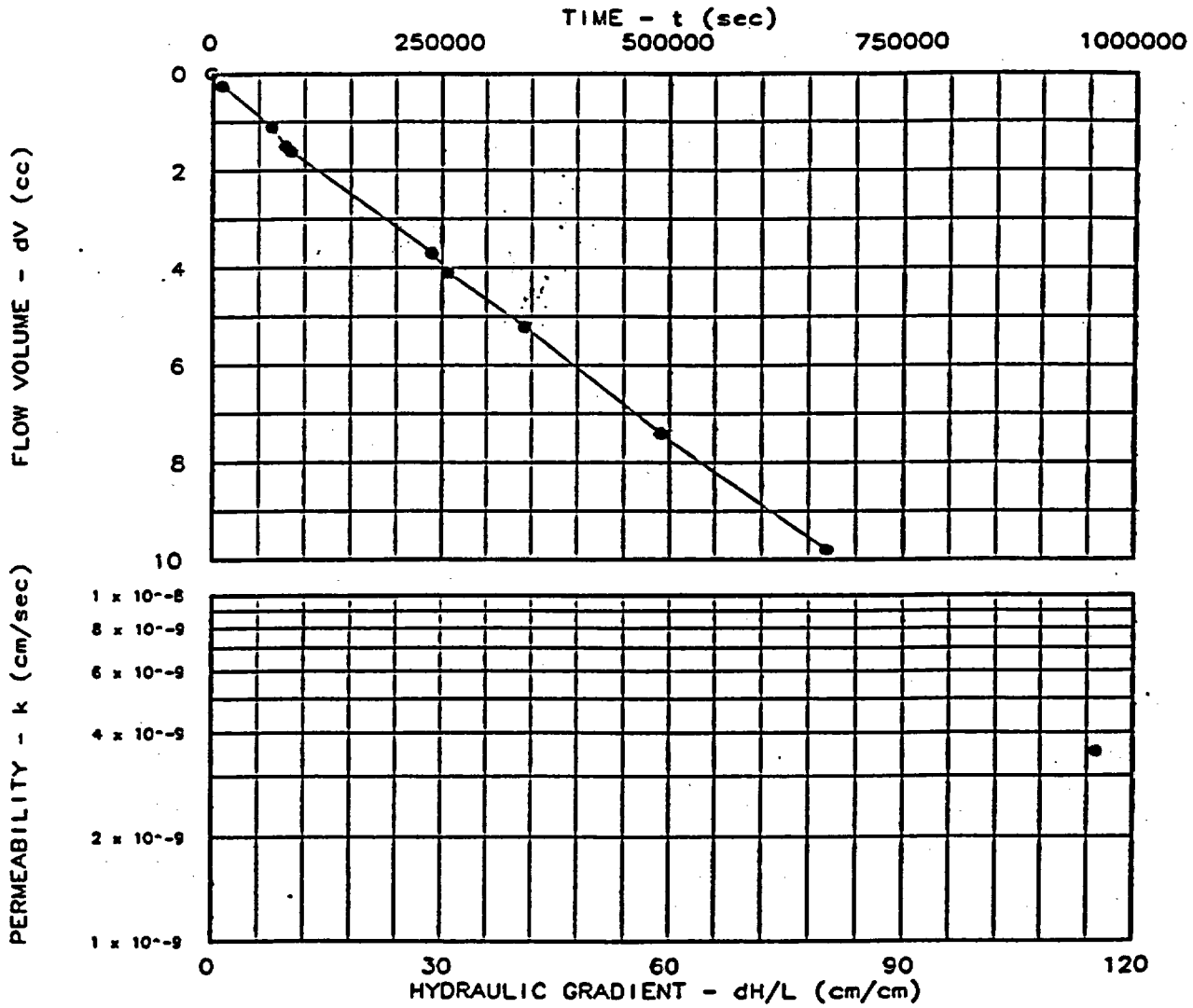
| Run Number: | 1 ● | 2 ▲ |
|---|---|---|
| Cell Pressure (psi): | 38.0 | |
| Test Pressure(psi): | 27.0 | |
| Back Pressure(psi): | 15.9 | |
| Diff. Head (psi): | 11.1 | |
| Flow Rate (cc/sec): | $1.44 \times 10^{-5}$ | |
| Perm. (cm/sec): | $3.52 \times 10^{-9}$ | |

**SAMPLE DATA:**

Sample Identification: BORING: 111
DEPTH: 140.0'
Visual Description: RED SILTY CLAY, TR SAND
Remarks:

Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: FLEXIBLE WALL
Sample type: CORE




Project: LEA COUNTY LANDFILL
Location: HOBBS, NEW MEXICO
Date: 12-16-97

PERMEABILITY TEST REPORT

WEAVER BOOS CONSULTANTS, INC.

Project No.: 95042.10
File No.: 95042.10
Lab No.: 3
Tested by: JWM
Checked by: WSG
Test: CH - Constant head

# PERMEABILITY TEST DATA

## PROJECT DATA

| | |
|---|---|
| Project Name: | LEA COUNTY LANDFILL |
| File No.: | 95042.10 |
| Project Location: | HOBBS, NEW MEXICO |
| Project No.: | 95042.10 |
| Sample Identification: | BORING: 111<br>DEPTH: 140.0' |
| Lab No.: | 3 |
| Description: | RED SILTY CLAY, TR SAND |
| Sample Type: | CORE |
| Max. Dry Dens.: | |
| Method (D1557/D698): | |
| Opt. Water Content: | |
| Date: | 12-16-97 |
| Remarks: | |
| Permeameter Type: | FLEXIBLE WALL |
| Tested by: | JWM |
| Checked by: | WSG |
| Test type: | CH - Constant head |

## PERMEABILITY TEST SPECIMEN DATA

| | Before test: | | | After test: | | |
|---|---|---|---|---|---|---|
| Diameter: | 1 | 2 | | 1 | 2 | |
| Top: | in | in | | in | in | |
| Middle: | 2.440 in | in | | 2.463 in | in | |
| Bottom: | in | in | | in | in | |
| Average: | 2.44 in | 6.20 cm | | 2.46 in | 6.26 cm | |
| Length: | 1 | 2 | 3 | 1 | 2 | 3 |
| | 2.675 in | in | in | 2.690 in | in | in |
| Average: | 2.68 in | 6.79 cm | | 2.69 in | 6.83 cm | |

Moisture, Density and Sample Parameters:

| | | |
|---|---|---|
| Specific Gravity: | 2.70 | |
| Wet Wt. & Tare: | 430.00 | 453.20 |
| Dry Wt. & Tare: | 387.30 | 387.30 |
| Tare Wt.: | 0.00 | 0.00 |
| Moisture Content: | 11.0 % | 17.0 % |
| Dry Unit Weight: | 118.0 pcf | 115.1 pcf |
| Porosity: | 0.3002 | 0.3170 |
| Saturation: | 69.4 % | 99.0 % |

## CONSTANT HEAD PERMEABILITY TEST CONDITIONS DATA

Cell No.: 2 Panel No.: Positions:

| Run Number: | 1 | 2 |
|---|---|---|
| Cell Pressure: | 38.0 psi | 0.0 psi |
| Saturation Pressure: | 35.0 psi | 0.0 psi |
| Inflow Corr. Factor: | 1.00 | 1.00 |
| Outflow Corr. Factor: | 1.00 | 1.00 |
| Test Temperature: | 27.0 °C | 0.0 °C |

## PERMEABILITY TEST READINGS DATA

| CASE D X S R | DATE | TIME (24 hr) | ELAPSED TIME-sec | GAUGE PRESSURE-psi IN | GAUGE PRESSURE-psi OUT | BURET READING-cc IN | BURET READING-cc OUT | FLOW VOLUME-cc AVERAGE |
|---|---|---|---|---|---|---|---|---|
| S X | 12/23/97 | 14:03:00 | 0 | 27.0 | 17.0 | 5.70 | 83.10 | 0.00 |
| | 12/23/97 | 17:04:00 | 10,860 | 27.0 | 17.0 | 6.10 | 83.00 | 0.25 |
| | 12/24/97 | 7:49:00 | 63,960 | 27.0 | 17.0 | 7.00 | 82.20 | 1.10 |
| | 12/24/97 | 12:11:00 | 79,680 | 27.0 | 17.0 | 7.40 | 81.80 | 1.50 |
| | 12/24/97 | 13:31:00 | 84,480 | 27.0 | 17.0 | 7.50 | 81.70 | 1.60 |
| | 12/26/97 | 8:40:00 | 239,820 | 27.0 | 17.0 | 9.60 | 79.60 | 3.70 |
| | 12/26/97 | 13:38:00 | 257,700 | 27.0 | 17.0 | 10.00 | 79.20 | 4.10 |
| | 12/27/97 | 13:09:00 | 342,360 | 27.0 | 17.0 | 11.00 | 78.00 | 5.20 |
| | 12/29/97 | 6:17:00 | 490,440 | 27.0 | 17.0 | 13.00 | 75.60 | 7.40 |
| | 12/31/97 | 8:04:00 | 669,660 | 27.0 | 17.0 | 15.20 | 73.00 | 9.80 |

Test Pressure = 27.0 psi Differential Head = 11.1 psi, 782.3 cm H2O
Gradient = 1.151E 02 Flow rate = 1.439E-05 cc/sec R squared = 0.99888
Permeability, K27.0° = 4.143E-09 cm/sec, K20° = 3.523E-09 cm/sec

# PERMEABILITY TEST REPORT

**TEST DATA:**

Specimen Height (cm): 7.43
Specimen Diameter (cm): 5.99
Dry Unit Weight (pcf): 108.6
Moisture Before Test (%): 14.6
Moisture After Test (%): 24.7

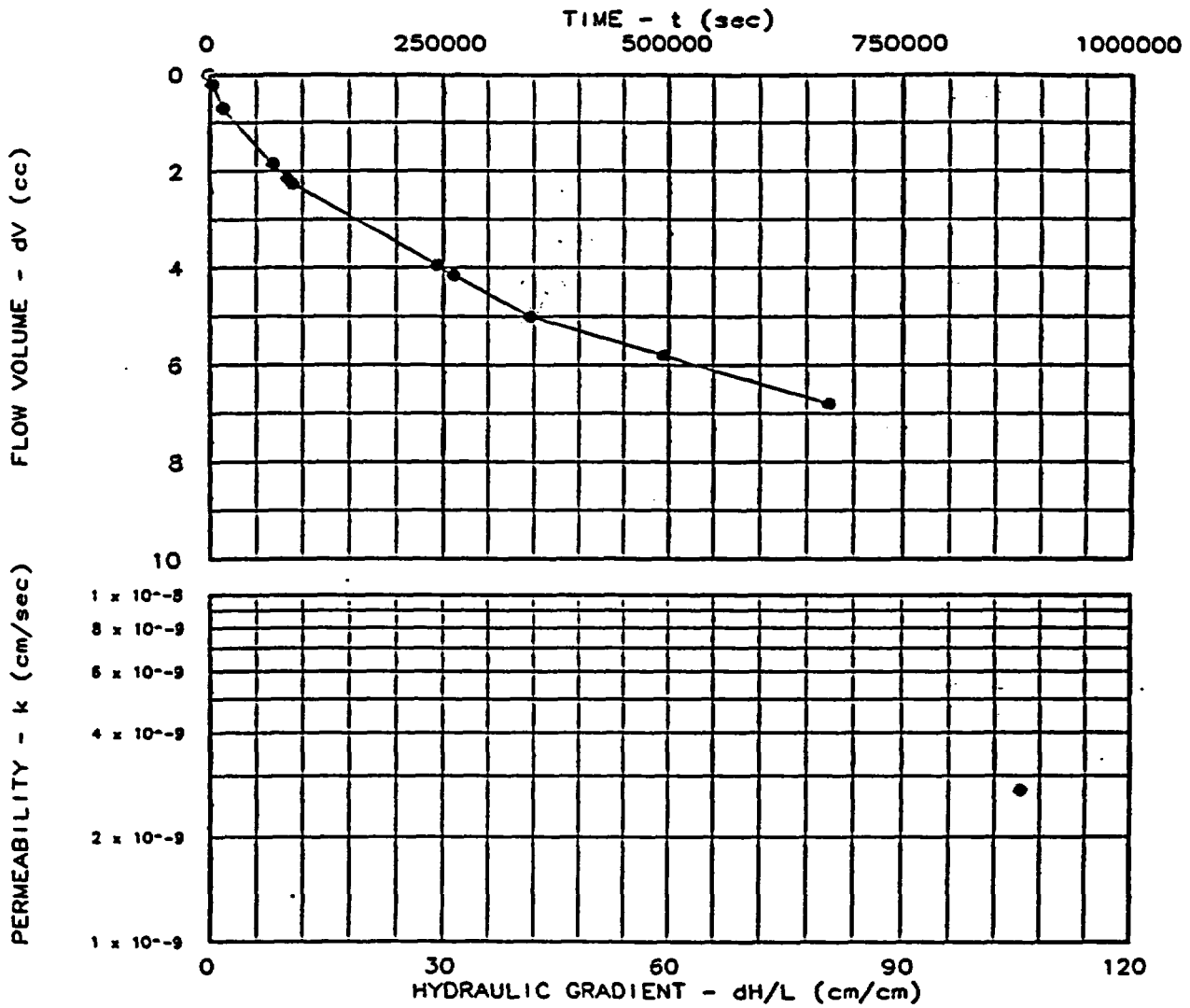
| Run Number: | 1 ● | 2 ▲ |
|---|---|---|
| Cell Pressure (psi): | 39.0 | |
| Test Pressure(psi): | 27.0 | |
| Back Pressure(psi): | 15.9 | |
| Diff. Head (psi): | 11.1 | |
| Flow Rate (cc/sec): | $9.54 \times 10^{-6}$ | |
| Perm. (cm/sec): | $2.73 \times 10^{-9}$ | |

**SAMPLE DATA:**

Sample Identification: BORING: 111
DEPTH: 485.0'
Visual Description: RED SILTY CLAY, TR SAND
Remarks:

Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: FLEXIBLE WALL
Sample type: CORE




Project: LEA COUNTY LANDFILL
Location: HOBBS, NEW MEXICO
Date: 12-16-97

PERMEABILITY TEST REPORT

WEAVER BOOS CONSULTANTS, INC.

Project No.: 95042.10
File No.: 95042.10
Lab No.: 4
Tested by: JWM
Checked by: WSG
Test: CH - Constant head

# PERMEABILITY TEST DATA

## PROJECT DATA

| | |
|---|---|
| Project Name: | LEA COUNTY LANDFILL |
| File No.: | 95042.10 |
| Project Location: | HOBBS, NEW MEXICO |
| Project No.: | 95042.10 |
| Sample Identification: | BORING: 111<br>DEPTH: 485.0' |
| Lab No.: | 4 |
| Description: | RED SILTY CLAY, TR<br>SAND |
| Sample Type: | CORE |
| Max. Dry Dens.: | |
| Method (D1557/D698): | |
| Opt. Water Content: | |
| Date: | 12-16-97 |
| Remarks: | |
| Permeameter Type: | FLEXIBLE WALL |
| Tested by: | JWM |
| Checked by: | WSG |
| Test type: | CH - Constant head |

## PERMEABILITY TEST SPECIMEN DATA

| | Before test: | | | After test: | | |
|---|---|---|---|---|---|---|
| Diameter: | 1 | 2 | | 1 | 2 | |
| Top: | in | in | | in | in | |
| Middle: | 2.360 in | in | | 2.430 in | in | |
| Bottom: | in | in | | in | in | |
| Average: | 2.36 in | 5.99 cm | | 2.43 in | 6.17 cm | |
| Length: | 1 | 2 | 3 | 1 | 2 | 3 |
| | 2.925 in | in | in | 2.922 in | in | in |
| Average: | 2.93 in | 7.43 cm | | 2.92 in | 7.42 cm | |

Moisture, Density and Sample Parameters:

| | | |
|---|---|---|
| Specific Gravity: | 2.75 | |
| Wet Wt. & Tare: | 418.00 | 454.80 |
| Dry Wt. & Tare: | 364.70 | 364.70 |
| Tare Wt.: | 0.00 | 0.00 |
| Moisture Content: | 14.6 % | 24.7 % |
| Dry Unit Weight: | 108.6 pcf | 102.5 pcf |
| Porosity: | 0.3675 | 0.4028 |
| Saturation: | 69.2 % | 100.7 % |

## CONSTANT HEAD PERMEABILITY TEST CONDITIONS DATA

| Cell No.: 4 | Panel No.: | Positions: |
|---|---|---|
| Run Number: | 1 | 2 |
| Cell Pressure: | 39.0 psi | 0.0 psi |
| Saturation Pressure: | 35.0 psi | 0.0 psi |
| Inflow Corr. Factor: | 1.00 | 1.00 |
| Outflow Corr. Factor: | 1.00 | 1.00 |
| Test Temperature: | 27.0 °C | 0.0 °C |

## PERMEABILITY TEST READINGS DATA

| CASE D X S R | DATE | TIME (24 hr) | ELAPSED TIME-sec | GAUGE PRESSURE-psi IN | GAUGE PRESSURE-psi OUT | BURET READING-cc IN | BURET READING-cc OUT | FLOW VOLUME-cc AVERAGE |
|---|---|---|---|---|---|---|---|---|
| S X | 12/23/97 | 13:04:00 | 0 | 27.0 | 17.0 | 7.70 | 84.40 | 0.00 |
| | 12/23/97 | 14:03:00 | 3,540 | 27.0 | 17.0 | 7.90 | 84.20 | 0.20 |
| | 12/23/97 | 17:04:00 | 14,400 | 27.0 | 17.0 | 8.60 | 83.90 | 0.70 |
| | 12/24/97 | 7:49:00 | 67,500 | 27.0 | 17.0 | 10.00 | 83.00 | 1.85 |
| | 12/24/97 | 12:11:00 | 83,220 | 27.0 | 17.0 | 10.30 | 82.70 | 2.15 |
| | 12/24/97 | 13:31:00 | 88,020 | 27.0 | 17.0 | 10.40 | 82.60 | 2.25 |
| | 12/26/97 | 8:41:00 | 243,420 | 27.0 | 17.0 | 12.00 | 80.80 | 3.95 |
| | 12/26/97 | 13:39:00 | 261,300 | 27.0 | 17.0 | 12.20 | 80.60 | 4.15 |
| | 12/27/97 | 13:09:00 | 345,900 | 27.0 | 17.0 | 13.00 | 79.70 | 5.00 |
| | 12/29/97 | 6:18:00 | 494,040 | 27.0 | 17.0 | 13.80 | 78.90 | 5.80 |
| | 12/31/97 | 8:04:00 | 673,200 | 27.0 | 17.0 | 14.70 | 77.80 | 6.80 |

Test Pressure = 27.0 psi Differential Head = 11.1 psi, 782.7 cm H2O
Gradient = 1.054E 02 Flow rate = 9.538E-06 cc/sec R squared = 0.93547
Permeability, K27.0° = 3.208E-09 cm/sec, K20° = 2.728E-09 cm/sec

**WEAVER BOOS CONSULTANTS, INC.**
ENVIRONMENTAL AND GEOTECHNICAL ENGINEERS
200 S. Michigan Ave., Chicago, IL 60604 • (312) 922-1030
14 N. Griffith Blvd., Unit C, Griffith, IN 46319 • (219) 923-9609

## Constant Head Permeability Test (ASTM D 2434)

Project: LEA COUNTY LANDFILL
Location of Project: HOBBS, NM
Description of Soil:
Boring No.: B105

Job No.: 95042.10
Date of Testing: JAN. 28, 1998
Tested By.: JWM

| Sample Number | Reading Number | Sample Information Length, cm | Sample Information Area, cm2 | Date Tested | Head h, cm | Time Start | Time End | Total time t, sec | Total Flow Q, ml | K=(QL)/Aht cm/sec | Average K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 39 | 1 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 300 | 385 | 3.64E-03 | |
| | 2 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 420 | 410 | 2.77E-03 | |
| | 3 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 360 | 295 | 2.32E-03 | |
| | Average | | | | | | | | | | 2.91E-03 |

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## Constant Head Permeability Test (ASTM D 2434)

Project: LEA COUNTY LANDFILL
Location of Project: HOBBS, NM
Description of Soil:
Boring No.: B111

Job No.: 95042.10
Date of Testing: JAN. 28, 1998
Tested By.: JWM

| Sample Number | Reading Number | Sample Information Length, cm | Sample Information Area, cm2 | Date Tested | Head h, cm | Time Start | Time End | Total time t, sec | Total Flow Q, ml | K=(QL)/Aht cm/sec | Average K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 39 | 1 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 660 | 410 | 1.76E-03 | |
| | 2 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 660 | 350 | 1.50E-03 | |
| | 3 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 720 | 325 | 1.28E-03 | |
| | Average | | | | | | | | | | 1.51E-03 |

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44 N. Griffith Blvd., Unit C, Griffith, IN 46319 • (219) 923-0609

## Constant Head Permeability Test (ASTM D 2434)

Project: LEA COUNTY LANDFILL
Location of Project: HOBBS, NM
Description of Soil:
Boring No.: B111

Job No.: 95042.10
Date of Testing: JAN. 28, 1998
Tested By.: JWM

| Sample Number | Reading Number | Sample Information Length, cm | Sample Information Area, cm2 | Date Tested | Head h, cm | Time Start | Time End | Total time t, sec | Total Flow Q, ml | K=(QL)/Aht cm/sec | Average K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | 1 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 840 | 745 | 2.51E-03 | |
| | 2 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 600 | 460 | 2.17E-03 | |
| | 3 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 600 | 435 | 2.05E-03 | |
| | Average | | | | | | | | | | 2.25E-03 |

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4 N. Griffith Blvd., Unit C, Griffith, IN 46319 • (219) 923-0609

## Constant Head Permeability Test (ASTM D 2434)

Project: LEA COUNTY LANDFILL
Location of Project: HOBBS, NM
Description of Soil:
Boring No.: B105

Job No.: 95042.10
Date of Testing: JAN. 28, 1998
Tested By.: JWM

| Sample Number | Reading Number | Sample Information Length, cm | Sample Information Area, cm2 | Date Tested | Head h, cm | Time Start | Time End | Total time t, sec | Total Flow Q, ml | K=(QL)/Aht cm/sec | Average K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 38 | 1 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 840 | 50 | 1.69E-04 | |
| | 2 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 840 | 25 | 8.43E-05 | |
| | Average | | | | | | | | | | 8.43E-05 |

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4 N. Griffith Blvd., Unit C, Griffith, IN 46319 • (219) 923-9609

## Constant Head Permeability Test (ASTM D 2434)

Project: LEA COUNTY LANDFILL
Location of Project: HOBBS, NM
Description of Soil:
Boring No.: B105

Job No.: 95042.10
Date of Testing: JAN. 28, 1998
Tested By.: JWM

| Sample Number | Reading Number | Sample Information Length, cm | Area, cm2 | Date Tested | Head h, cm | Time Start | Time End | Total time t, sec | Total Flow Q, ml | K=(QL)/Aht cm/sec | Average K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 1 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 600 | 395 | 1.87E-03 | |
| | 2 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 600 | 350 | 1.65E-03 | |
| | 3 | 7.0 | 20.27 | 1/28/98 | 121.9 | | | 660 | 345 | 1.48E-03 | |
| | Average | | | | | | | | | | 1.67E-03 |

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# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 11/19/92 | B-2 | 7-C |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: 0'-38' MUD ROTARY; 38'-TD AIR ROTARY | Survey Data: Northing: 7650.8990; Easting: 12296.2097; Ground Surface Elev. (MSL): 3,479.43 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS; 2 1/8" CB | |
| Driller: LANE SCARBOROUGH | Total Depth: 215' BGL | |

Remarks: MUD ROTARY BOREHOLE DRILLED ON 1/11/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| Silty CLAY (CL): continued from previous page. | 40 | NR (GRAB) | 0 / SS 40-42 / 2 | |
| | 45 | NR | 2.2 / CB 42-46 / 4 | |
| | 50 | NR | 3.7 / CB 46-52 / 6 | |
| less plastic, more friable below 52'; st. moist to dry. | 55 | NR (GRAB) | 0 / CB 52-60 / 8 | |
| | 60 | NR (GRAB) | 0.6 / CB 60-66 / 6 | |
| | 65 | NR (GRAB) | DRILLED OUT TO 73' | |
| | 70 | NR | 0.9 / SS 73-75 / 2 | |
| | 75 | | 0.8 / CB 75-80 / 8 | |
| | 80 | | | |

FILE NAME: A-LOG7C.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 11/19/92 | Boring No.: B-2 | Grid No.: 7-C |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: 0'-38' MUD ROTARY; 38'-TD AIR ROTARY | Survey Data: Northing: 7650.8990; Easting: 12296.2097; Ground Surface Elev. (MSL): 3,479.43 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS; 2 1/8" CB | |
| Driller: LANE SCARBOROUGH | Total Depth: 215' BGL | |

Remarks: MUD ROTARY BOREHOLE DRILLED ON 1/11/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| Silty CLAY (CL): continued from previous page. | 80 | NR | 1 / SS 80-82 2 | |
| | 85 | | 2 / 2"S/S 85-87 2 | |
| | | NR | 0 / 3" C/B 87-90 3 | |
| | 90 | | 2 / 2"S/S 90-92 2 | |
| | | NR | 0 / 3" C/B 92-95 3 | |
| | 95 | | 2 / 2"S/S 95-97 2 | |
| ? ? ? | | NR | 0 / 3" C/B 97-100 3 | |
| 97" - 105' Silty CLAY (CL): claystone; mottled dk. red, brownish yellow and occasional inclusions of pale yellow; no longer laminated; appears as accreted clasts; rusty red dendritic pattern throughout - possible organic remnants; v. hard; dry; pale yellow inclusions are silty; isolated silty partings throughout. | 100 | | 2 / 2"S/S 100-102 2 | |
| | 105 | | 3.8 / 3" C/B 102-106 4 | |
| 106' - 119' Silty CLAY (CL): same as above; pale yellow silty inclusions are now stratified in occassional intervals of < 0.10' thick; crumbly due to increased silt in matrix; dry. | 110 | NR | 5.5 / 3" C/B 106-112 6 | |
| | 115 | NR | 2.5 / 3" C/B 112-118 6 | |
| 119' - 140' SEE COMMENTS NEXT PAGE | 120 | | 2.9 / 3" C/B 118-124 6 | |

FILE NAME: A-LOG7C.DWG

# Terra Dynamics Incorporated

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 11/19/92 | B-2 | 7-C |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: 0'-38' MUD ROTARY; 38'-TD AIR ROTARY | Survey Data: Northing: 7650.8990; Easting: 12296.2097; Ground Surface Elev. (MSL): 3,479.43 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS, 2 1/8" CB | |
| Driller: LANE SCARBOROUGH | Total Depth: 215' BGL | |

Remarks: MUD ROTARY BOREHOLE DRILLED ON 1/11/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| 119' – 140' SILTSTONE (ML): white; carbonate cemented silt; vfg biotite and mica flakes; v.hard; laminated and cross-bedded w/ yellow inclusions and yellow along bedding boundaries; mica and biotite flakes concentrated at bedding boundaries. | 120 | NR | 2.9 / 3" C/B 118-124 / 4 | |
| | 125 | | 8 / 3" C/B 132-140 / 8 | |
| | 130 | | | |
| | 135 | NR | 2.5 / 3" C/B 132-140 / 8 | |
| 140' – 145' Silty CLAY (CL): interbedded claystone reddish brown; light and dk. silt fragments throughout; hard; dry; light gray carbonate cemented layers throughout – these layers have irregular boundaries but do not disrupt prevailing bedding structure. | 140 | | 7.5 / 3" C/B 140-148 / 8 | |
| 145' – 184' CLAY (CL): claystone; reddish brown with apparent tubes filled with light gray claystone; hard; slight moisture; slightly slippery. | 145 | NR | | |
| | 150 | NR | 3.6 / 148-156 / 8 | |
| | 155 | | | |
| | 160 | NR | 3.4 / 156-164 / 8 | |

FILE NAME: A-LOG7C.DWG

# Terra Dynamics Incorporated

# SOIL BORING LO

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 11/19/92 | B-2 | 7-C |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: 0'-38' MUD ROTARY; 38'-TD AIR ROTARY | Survey Data: Northing: 7650.8990; Easting: 12296.2097; Ground Surface Elev. (MSL): 3,479.43 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS; 2 1/8" CB | |
| Driller: LANE SCARBOROUGH | Total Depth: 215' BGL | |
| Remarks: MUD ROTARY BOREHOLE DRILLED ON 1/11/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES. | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| CLAY (CL): continued from previous page. | 160 | NR | 3.4 / 3"C/B 156-164 / 8 | |
| | 165 | | 7.8 / 3"C/B 164-172 / 8 | |
| | 170 | | | |
| | 175 | NR | 1.3 / 3"C/B 172-180 / 8 | |
| | 180 | | 6.6 / 3"C/B 180-188 / 8 | |
| 184' - 192'' Silty SAND (SM): sandstone; v. pale brown; vfg sand; carb. cemented; vfg pink and dk. mineral frags.; vfg-fg mica flakes; hard; dry. | 185 | NR | | |
| | 190 | NR | 4.1 / 3"C/B 188-196 / 8 | |
| 196'' - 200' CLAY (CL): claystone; reddish brown; w/ tubes & layers of light gray claystone; hard; sl. moisture; sl. slippery. | 195 | NR | 2 / 3"C/B 196-200 / 4 | |
| | 200 | | | |

FILE NAME: A-LOG7C.DWG

# Terra Dynamics Incorporated

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 11/19/92 | Boring No.: B-2 | Grid No.: 7-C |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: 0'-38' MUD ROTARY; 38'-TD AIR ROTARY | Survey Data: Northing: 7650.8990; Easting: 12296.2097; Ground Surface Elev. (MSL): 3,479.43 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS; 2 1/8" CB | |
| Driller: LANE SCARBOROUGH | Total Depth: 215' BGL | |

Remarks: MUD ROTARY BOREHOLE DRILLED ON 1/11/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| 200'-215' Silty CLAY (CL): v. dark maroon silty claystone, with occasional light greenish gray mottling and pink dendritic mottling; brittle; dry. | 200 | | DRILL OUT TO 215' - LOG CUTTINGS | |
| Gradational color change to dusky red below 210'. | 205 | | | |
| TOTAL DEPTH=215' | 210 | | | |
| | 215 | | | |
| | 220 | | | |
| | 225 | | | |
| | 230 | | | |
| | 235 | | | |
| | 240 | | | |

FILE NAME: A-LOG7C.DWG

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# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/18/93 | Boring No.: B-43 | Grid No.: 7-D |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7197.7520 Easting: 12084.9454 Ground Surface Elev. (MSL): 3,471.23 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| 0'–0.6' TOP SOIL: brown; silty sand; organic material; moist. | 0 | | | |
| 0.6'–19' CALICHE: yellowish pink; calcium carbonate cemented silt and vfg sand; gravel frags.; mod. hard; dry. – hard streaks below 7.5'. | 5, 10, 15 | | DRILL OUT TO 27'; LOG CUTTINGS | |
| 19'–23' CALICHE: yellowish white; calcium carbonate cemented sand and gravel; sand is fg quartz and feldspar; angular to subrounded; gravel is dark, pink and opaque quartzite and feldspar; angular to subrounded; mod. soft; dry. | 20 | | | |
| 23'–26' Gravelly SAND (SW): pinkish tan; vfg to cg quartz feldspar sand; subrounded to rounded; dark, pink and opaque quartz and feldspar gravel; subrounded to rounded; loose; dry. | 25 | | | OGALLALA |
| 26'–31' Silty CLAY (CL): maroon; silty claystone; blocky fracture; non plastic; dry. | 30 | | 1.5 SS 27–28.5 1.5; 0 | TRIASSIC |
| 31'–61' Silty CLAY (CL): dusky red claystone with dendritic mottling of yellow, tan and gray; sl. soapy; blocky fracture; mod. dense; dry. | 35, 40 | NR (CRAB); NR; NR; NR; NR | CB 29–35 8; 1; CB 35–39 4 | |

FILE NAME: A-LOG7D.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 01/18/93 | B-43 | 7-D |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7197.7520 Easting: 12084.9454 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,471.23 |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| | 40 | NR | 2.5 / CB 39-44 / 5 | |
| | 45 | NR | 2 / CB 44-50 / 6 | |
| | 50 | NR | 4.4 / CB 50-60 / 10 | |
| - reduced purple color below 57'; possible vertical fracture with black mineralization along fracture plane at 57'; crumbly to 61'. | 55 | NR | | |
| | 60 | NR | 4.4 / CB 60-66 / 6 | |
| 61'-65' Silty CLAY (CL): rusty red silty claystone with greenish gray inclusions increasing in content toward base; blocky fracture; dry. | 65 | | 10 / CB 66-76 / 10 | |
| 65'-69.8' Silty CLAY (CL): purplish red with heavy mottling of greenish gray inclusions; crumbly; dry. | 70 | | | |
| 69.8'-95' Very Silty CLAY (CL): rusty red v. silty claystone with subtle large mottling of yellow; greenish gray layers and inclusions of calcium carbonate rich material (from 71'-76'); trace dark inclusions; blocky fracture; dry. | 75 | | | |
| | 80 | | | |

FILE NAME: A-LOG7D.DWG

| *Terra Dynamics Incorporated* | **SOIL BORING LO(** |
|---|---|

| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/18/93 | Boring No.: B-43 | Grid No.: 7-0 |
|---|---|---|---|---|

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7197.7520 Easting: 12084.9454 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,471.23 |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| | 80 | | 10 | |
| – possible primary slickenside 84'. | 85 | | CB 76-86 / 10 | |
| | | | 10 | |
| | 90 | | CB 86-96 | |
| – possible primary slickenside 95'. | 95 | | 10 | |
| 96'-100' CLAY (CL): purple with maroon mottling; sl. soapy; crumbly; dry. | | | 2 | |
| TOTAL DEPTH = 100' | | | CB 96-100 / 4 | |
| | 100 | | | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG7D.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 11/19 – 11/20/92 | Boring No.: B-3 | Grid No.: 7-E |
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: 0'-16' MUD ROTARY; 0'-TD AIR ROTARY | Survey Data: Northing: 6744.4660; Easting: 11873.6823; Ground Surface Elev. (MSL): 3,465.56 | | |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2"SS & 3"CB | | | |
| Driller: JOHN/LANE SCARBOROUGH | Total Depth: 100' BGL | | | |
| Remarks: MUD ROTARY BOREHOLE DRILLED ON 1/9/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES. | | | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| 0' – 1' TOP SOIL | 0 | NR | 0 / 0 | |
| 1' – 7'* CALICHE (SM): pinkish white carbonate cemented silt & sand: v. hard; chalky; sand grains are vfg – cg white, pink, opaque and black (granitic). | 5 | NR | 2.2 / 3 (3"CB 1–4); 1.4 / 3 (3"CB 4–7); 1.6 / 4.5 (3"CB 7–11.5) | |
| 9' – 16.5' Silty SAND AND GRAVEL (SM): v. pale brown; vfg – fg sand; white, pink and opaque grains (granitic); silt throughout; carbonate and quartzite gravel throughout; loose; dry; OGALLALA FM.; basal contact based on driller. | 10 | NR | | |
| | 15 | NR (CUTTINGS) | 0 / 4.5 (CS 11.5–16) | |
| 16.5' – 18.2' Clayey SILT (ML): v. pale brown; loose w/ inclusions of caliche & gravel; dry. | | NR | BRILLED-OUT | OGALLALA |
| 18.2' – 20'* Silty CLAY (CL): mottled dk. red, brownish yellow, and occasional inclusions of pale yellow claystone; crumbly; dry. | 20 | NR | 2 / 3 (2"SS 17–19); 1 / 2 (2"SS 19–21) | TRIASSIC |
| 21'* – 26' CLAY (CL): dusky red claystone; hard; stiff; sl. moist; v. dense; slippery; basal contact based on driller. | | NR | 2 / 2 (2"SS 21–23); 1.4 / 2 (2"SS 23–25) | |
| | 25 | NR | 0.5 / 1 (2"SS 25–26) | |
| 26' – 32' Silty CLAY (CL): reddish brown; crumbly; horizontally oriented dk. frags throughout; dry; basal contact based on driller. | 30 | NR (CUTTINGS) | 0 / 6 (3"CB 26–32) | |
| 32' – 40' CLAY (CL): mottled red-brown; hard; firm; v. dense; slippery; basal contact from driller. | 35 | NR | 1.3 / 2 (2"SS 32–34); 1.5 / 2 (2"SS 34–36); 1 / 2 (2"SS 36–38) | |
| | 40 | NR | 0.4 / 2 (2"SS 38–40) | |

FILE NAME: A-LOG7E.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 11/19 - 11/20/92 | Boring No.: B-3 | Grid No.: 7-E |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: 0'-16' MUD ROTARY; 0'-TD AIR ROTARY | Survey Data: Northing: 6744.4660; Easting: 11873.6823; Ground Surface Elev. (MSL): 3,465.56 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2"SS & 3"CB | |
| Driller: JOHN/LANE SCARBOROUGH | Total Depth: 100' BGL | |

Remarks: MUD ROTARY BOREHOLE DRILLED IN 1/9/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| 40' - 60' **Silty CLAY (CL)**: reddish brown; claystone w/ silt parting and inclusion; dendritic pattern common; silt partings and inclusions are light gray; black carbonated leaf fragment along parting; hard; crumbly; dry; basal contact from driller. | 40, 45, 50, 55, 60 | CRAB; NR; NR; NR; NR; NR | 0 / 4 (3"CB 40-44); 1 / 4 (3"CB 44-48); 1.7 / 3 (3"CB 48-51); 2.5 / 6 (3"CB 51-57); 1.2 (3" CB 57-61) | |
| 60' - 65.7'* **Clayey Silt (ML)**: gray and red siltstone with yellow claystone laminations; vfg mica frags. within siltstone; silt-sized dark frags. throughout; hard; mod. crumbly; increased clay content toward base; dry. | 60, 65 | NR; NR; NR; NR | 4; 0.7 / 0.9 (2"SS/61-61.1, 3"CB/61.1-62); 1 / 3 (3"CB 62-65); 0.7 / 3 (3"CB 65-68) | |
| 65' - 74'* **Silty CLAY (CL)**: dusky red and mottled w/ weak red claystone interbedded w/ light reddish brown siltstone; mica frags. throughout siltstone; dk. frags. throughout; crumbly; mod. hard; lighter colors common along dendritic pattern within claystone; dry. | 70 | NR (CRAB); NR (CRAB) | 0 / 3 (3"CB 68-71); 3 / 4 (3"CB 71-75) | |
| 75' - 91.5'* **Silty CLAY (CL)**: dusky red and mottled w/ weak red claystone interbedded w/ light reddish brown siltstone; mica frags. throughout siltstone; dk. frags. throughout; crumbly; mod. hard; lighter colors common along dendritic pattern within claystone; light gray claystone filled tubes below 85'; hard; mod. dense; dry; cross-bedded below 85'. | 75, 80 | NR | 2.7 / 6 (3" CB 75-81) | |

FILE NAME: A-LOG7E.DWG

| *Terra Dynamics Incorporated* | **SOIL BORING LOG** |
|---|---|

| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 11/19 - 11/20/92 | Boring No.: B-3 | Grid No.: 7-E |
|---|---|---|---|---|

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: 0'-16' MUD ROTARY; 0'-TD AIR ROTARY | Survey Data: Northing: 6744.4660; Easting: 11873.6823 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2"SS & 3"CB | Ground Surface Elev. (MSL): 3,465.56 |
| Driller: JOHN/LANE SCARBOROUGH | Total Depth: 100' BGL | |

Remarks: MUD ROTARY BOREHOLE DRILLED ON 1/9/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| Silty CLAY (CL): same as above. | 80 | NR | 2.7 / 6 | |
| | 85 | NR | 4.2 / 6 (3"CB 81-87) | |
| | 90 | NR | 4.5 / 6 (3"CB 87-93) | |
| 93" - 94.5" CLAY (CL): dk. reddish gray claystone; hard; v. dense; dry. | 95 | NR | 1.5 / 7 (3"CB 93-100) | |
| TOTAL DEPTH AT 100' | 100 | | | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG7E.DWG

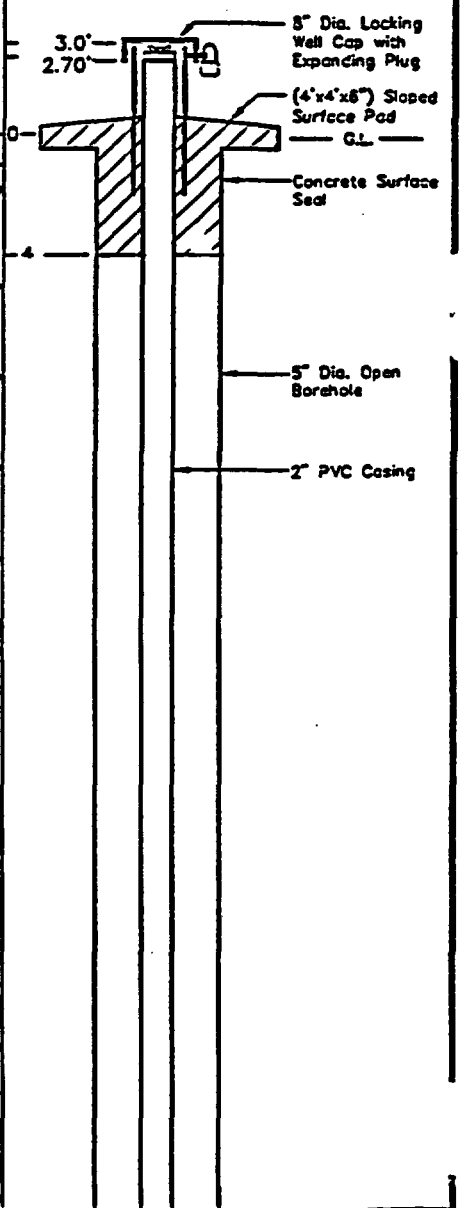
# *Terra Dynamics Incorporated*

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 11/20 - 11/22/92 | Boring No.: B-4 | Grid No.: 7-G |
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 5838.2525 Easting: 11451.1737 | | |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA TEXAS | Sample Method(s): 2" SS CONTINUOUS: 2⅛" CB | Ground Surface Elev. (MSL): 3,444.17 | | |
| Driller: | Total Depth: 270' BGL | Top of PVC Casing Elev.: 3,446.21 | | |

Remarks: CORE FROM 0'-230' DESCRIBED ON 11/27/92; GEOPHYSICAL LOG HOLE DRILLED ON 1/23/93 20' FROM 7-G CORE HOLE - LOG CUTTINGS FROM 230'-270'

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered Ft. / Ft. Sampled |
|---|---|---|---|
| | | 5 | |
| 0'-1.9' TOP SOIL: reddish brown sandy silt; vfg mica frags.; root material; crumbly; dry. | NR | 0 | 1 |
| 1.9'-3.5' CALICHE: pinkish white; carb. cemented silt and sand; v. hard; chalky; vfg sand grains of white, pink, black & opaque (granitic) material; some quartzite gravel; dry. | NR | | 1.5 |
| 5'-8' CALICHE: reddish brown & pale brown; same as above; dry; basal contact from driller. | NR (GRAB) | 5 | 0 |
| BASE OF OGALLALA - TRIASSIC TOP | | | |
| 8'-12.2' Clayey SILT (ML): laminated pink siltstone and weak red claystone; dk. silt frags. throughout; crumbly; dry. | NR | 10 | 2 |
| 12.2'-14' Silty CLAY (CL): weak red claystone; with siltstone along partings and as inclusions; mod. dense; sl. crumbly; hard; sl. slippery. | | | 3 |
| 14'-30.7' Silty CLAY (CL): mottled reddish brown and white claystone; contorted and dendritic; siltstone as partings and inclusions; hard; dense; dry. | NR | 15 | 4 |
| | NR | 20 | 2 |
| | NR | | 1.3 |
| | NR | 25 | 0.6 |
| | NR | | 1.2 |
| | NR | 30 | 3.5 |
| 30.7' - 31.8' Silty CLAY (CL): weak red and pale red mottled siltstone; trace vfg mica frags.; carbonized leaf frags.; hard; mod. crumbly; blocky; soapy; dry. | NR | 35 | |




FILE NAME: A-LOG7GA.DWG

# Terra Dynamics Incorporated

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 11/20 – 11/22/92 | Boring No.: B-4 | Grid No.: 7-G |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 5838.2625 Easting: 11451.1737 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS CONTINUOUS: 2½" CB | Ground Surface Elev. (MSL): 3,444.17 |
| Driller: | Total Depth: 270' BGL | Top of PVC Casing Elev.: 3,446.21 |

Remarks: CORE FROM 0'–230' DESCRIBED ON 11/27/92; GEOPHYSICAL LOG HOLE DRILLED ON 1/23/93 20' FROM 7-G CORE HOLE – LOG CUTTINGS FROM 230'–270'

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered Ft / Ft. Sampled | Well Design |
|---|---|---|---|---|
| Silty CLAY (CL): same description as previous page. | | 35 | 4.1 CB 35-40 | |
| | NR | 40 | 5 CB 40-45 | 5" Dia. Open Borehole |
| | NR | 45 | 3.2 CB 45-51 | 2" PVC Casing |
| dk reddish gray (purple) below 46' w/dendritic pattern and inclusions of brownish yellow. | NR | 50 | 3.8 CB 51-57 | |
| 51.8'–77' Clayey SILT (ML): light gray siltstone; laminated and cross-laminated w/ weak red; vfg mica frags.; mod. dense; hard; concoidal fracture to blocky and sl. fissile; dry. | NR | 55 | 2.3 CB 57-63 | |
| | NR | 60 | DRILLED OUT TO 67' | |
| sandy below 67'; vfg sand along cross-laminated partings; vfg – fg mica frags.; carb. plant remains and frags. | NR | 65 | 2.5 CB 67-71 | |
| | NR | 70 | 6.1 CB 71-75 | |
| | | 75 | | |

FILE NAME: A-LOG7GA.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 11/20 – 11/22/92 | Boring No.: B-4 | Grid No.: 7-G |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 5838.2625 Easting: 11451.1737 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS CONTINUOUS: 2⅛" CB | Ground Surface Elev. (MSL): 3,444.17 |
| Driller: | Total Depth: 270' BGL | Top of PVC Casing Elev.: 3,446.21 |

Remarks: CORE FROM 0'–230' DESCRIBED ON 11/27/92; GEOPHYSICAL LOG HOLE DRILLED ON 1/23/93 20' FROM 7-G CORE HOLE – LOG CUTTINGS FROM 230'–270'

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered Ft / Ft Sampled | Well Design |
|---|---|---|---|---|
| Clayey SILT (ML): same as previous page. | | 75 | CB 71-76 | |
| 77'–98' Silty CLAY (CL): reddish brown; mod. hard; silty laminations w/vfg mica frags; sl. fissile; sl. crumbly; soapy; dry. | NR | | 3 | |
| | | 80 | 1.7 | |
| | NR | | CB 76-83 | 5" Dia. Open Borehole |
| | | 85 | 6 | |
| | | | 3.4 | 2" PVC Casing |
| | NR | | CB 83-91 | |
| | | 90 | 6 | |
| | | | 5 | |
| | | 95 | CB 91-97 | |
| | NR | | 6 | |
| | | | 1.4 | |
| 98'–105' Clayey SILT (ML): reddish brown and grayish brown siltstone; dendritic and mottled coloration pattern; vfg mica and dk. min. frags. throughout; hard; crumbly; dry; color change to light gray below 103'. | NR | 100 | CB 97-103 | |
| | | | 3.2 | |
| 105'–171' Silty CLAY (CL): dk. reddish gray siltstone w/light gray mottling and colored tubes; crumbly; mod. dense; mod. hard; soapy; dry. | | 105 | CB 103-111 | |
| | NR | | | |
| | | 110 | 3 | |
| | | | 1.5 | |
| | NR | | CB 111-119 | |
| | | 115 | | |

FILE NAME: A-LOG7GA.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 11/20 - 11/22/92 | Boring No.: B-4 | Grid No.: 7-G |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 5838.2625 Easting: 11451.1737 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS CONTINUOUS: 2½" CB | Ground Surface Elev. (MSL): 3,444.17 |
| Driller: | Total Depth: 270' BGL | Top of PVC Casing Elev.: 3,446.21 |

Remarks: CORE FROM 0'-230' DESCRIBED ON 11/27/92; GEOPHYSICAL LOG HOLE DRILLED ON 1/23/93 20' FROM 7-G CORE HOLE - LOG CUTTINGS FROM 230'-270'

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered Ft / Ft Sampled | Well Design |
|---|---|---|---|---|
| Silty CLAY (CL): same as previous page. | NR | 115 | 1.5 / 8 CB 111-119 | |
| | NR | 120 | 1.2 / 6 CB 119-125 | 5" Dia. Open Borehole |
| | NR | 125 | 2.1 / 6 CB 125-131 | 2" PVC Casing |
| | NR | 130 | 2.5 / 6 CB 131-137 | |
| | NR | 135 | 0.9 / 8 CB 137-145 | |
| | NR | 140 | 1.2 / 6 CB 145-151 | |
| | NR | 145 | 2.5 / 6 CB 151-157 | |
| | NR | 150 | | |
| | NR | 155 | | |

FILE NAME: A-LOG7GA.DWG

# Terra Dynamics Incorporated

# SOIL BORING & WELL COMPLETION LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 11/20 – 11/22/92 | B-4 | 7-G |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 5838.2625 Easting: 11451.1737 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS CONTINUOUS: 2⅛" CB | Ground Surface Elev. (MSL): 3,444.17 |
| Driller: | Total Depth: 270' BGL | Top of PVC Casing Elev.: 3,446.21 |

Remarks: CORE FROM 0'–230' DESCRIBED ON 11/27/92; GEOPHYSICAL LOG HOLE DRILLED ON 1/23/93 20' FROM 7-G CORE HOLE – LOG CUTTINGS FROM 230'270'

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered Ft. / Ft. Sampled | Well Design |
|---|---|---|---|---|
| Silty CLAY (CL): same as previous page. | NR | 155 | 2.5 / 6 CB 151-157 | |
| | NR (GRAB) | 160 | 0 / 6 CB 157-163 | |
| | NR (GRAB) | 165, 170 | 0 / 8 CB 163-171 | 5" Dia. Open Borehole |
| 171'–175' Silty CLAY (CL): mottled and dendritic light olive brown, grayish brown and weak red; crumbly; soapy; dry. | | | 1.7 / 8 CB 171-179 | 2" PVC Casing; 173.5 |
| 175'–187' Clayey SILT (ML): reddish brown with tubes, mottling and laminations of light gray; concoidal fracture to crumbly; mod. hard; mod. dense; sl. soapy; dry. | NR | 175, 180 | 5 / 8 CB 179-187 | Bentonite Seal ½" Pellets; 183.5 |
| | NR | 185 | | 185 |
| 187'–203.5' Sandy Clayey SILT (ML): grading from dk reddish brown to light gray below 191; hard; blocky fracture; cross-laminated; vfg sand frags. throughout; moist. | NR | 190, 195 | 2 / 8 CB 187-195 | Filter Sand (16–40); 2" Sch. 40 PVC Well Screen, .010 Slots |

FILE NAME: A-LOG7GA.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 11/20 – 11/22/92 | Boring No.: B-4 | Grid No.: 7-G |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 5838.2625 Easting: 11451.1737 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS CONTINUOUS: 2½" CB | Ground Surface Elev. (MSL): 3,444.17 |
| Driller: | Total Depth: 270' BGL | Top of PVC Casing Elev.: 3,446.21 |

Remarks: CORE FROM 0'–230' DESCRIBED ON 11/27/92; GEOPHYSICAL LOG HOLE DRILLED ON 1/23/93 20' FROM 7-G CORE HOLE – LOG CUTTINGS FROM 230'–270'

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | |
|---|---|
| | Sandy Clayey SILT (ML): same as previous page. |
| 203.5'–206' | Clayey Silt (ML): red siltstone; mod. hard; crumbly; laminated; vfg mica and dk. min. frags.; dry. |
| 206'–215' | Sandy SILT (ML): light gray siltstone; hard; blocky fracture; cross laminated; vfg sand; vfg pink & dk. min.frags.; moist. |
| 215'–230' | Silty CLAY (CL): red claystone; mod. hard; crumbly; blocky to conchoidal fracture; sl. soapy; dry. color change to dusky red below 221'. |
| 230'–250' | Clay (CL): maroon claystone; sl. soapy; crumbly; dry. |

Lithic Log: NR

Depth (feet): 195, 200, 205, 210, 215, 220, 225, 230, 235

Recovered Ft. / Ft. Sampled: 1.5/5; 6/6; 3/3; 3/3; 3/3; 1.5/3; 3/3; 3/3; 3/3; 2.5/3

CB 175–200; CB 200–206; CB 206–209; CB 209–212; CB 212–215; CB 215–218; CB 218–221; CB 221–224; CB 224–227; CB 227–230

DRILL TO 270' – LOG CUTTINGS

Well Design: 215; 229.5

Filter Sand (16–40)

2" Sch. 40 PVC Well Screen, .010 Slots

Hole Plug Chips

FILE NAME: A-LOG7GA.DWG

# Terra Dynamics Incorporated

# SOIL BORING & WELL COMPLETION LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 11/20 - 11/22/92 | B-4 | 7-G |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 5838.2625 Easting: 11451.1737 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS CONTINUOUS: 2½" CB | Ground Surface Elev. (MSL): 3,444.17 |
| Driller: | Total Depth: 270' BGL | Top of PVC Casing Elev.: 3,446.21 |

Remarks: CORE FROM 0'-230' DESCRIBED ON 11/27/92: GEOPHYSICAL LOG HOLE DRILLED ON 1/23/93 20' FROM 7-G CORE HOLE - LOG CUTTINGS FROM 230'270'.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered Ft. / Ft. Sampled | Well Design |
|---|---|---|---|---|
| CLAY (CL): maroon claystone; sl. soapy; crumbly; dry. | | 235 | | |
| | | 240 | | |
| Heavy mottled w/ greenish gray, purple, mustard yellow. | | 245 | | |
| | | 250 | | |
| 250'-265' Silty CLAY (CL): maroon silty claystone w/ heavy mottling of greenish gray, purple and mustard yellow; brittle and crumbly; dry. | | | | |
| - less silt below 255'. | | 255 | | |
| | | 260 | | |
| | | 265 | | |
| 265'-270' CLAY (CL): maroon claystone w/ mottling of greenish gray and mustard yellow; soapy; crumbly; dry. | | | | |
| TOTAL DEPTH = 270' | | 270 | | |
| | | 275 | | |

FILE NAME: A-LOG7GA.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/18/92 | Boring No.: B-23 | Grid No.: 7-1 |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 4932.0522 Easting: 11028.4705 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS, 3" CB | Ground Surface Elev. (MSL): 3,429.13 |
| Driller: JOHN SCARBOROUGH | Total Depth: 101' | |
| Remarks: | | |

| | Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|---|
| 0' - 2' | TOP SOIL: brown silty sand; organic; moist. | 0 | | | |
| 2' - 23' | CALICHE: pink; calc. carb. cemented silt with sand and gravel; gradual increase in gravel content with depth; soft; dry. | 5, 10, 15, 20 | | DRILL OUT; LOG CUTTINGS | |
| 23' - 25' | CALICHE: grayish white; gravel frags. throughout; hard; dry. | 25 | | | |
| 25' - 37' | Silty Gravelly SAND (GM): pink and tan; vfg qtz sand and silty sand with red, pink, black and opaque quartzite gravel; sand and gravel is subrounded to well rounded; loose; dry. | 30, 35 | | | |
| 37' - 54" | CLAY (CL): dk. brownish red; mod. hard; sl. soapy; blocky fracture; moist; basal contact from cuttings. | 40 | | 1.3 SS 37-39; 1.8 SS 39-41; 2; 2 | OGALLALA TRIASSIC |

FILE NAME: A-LOG71.DWG

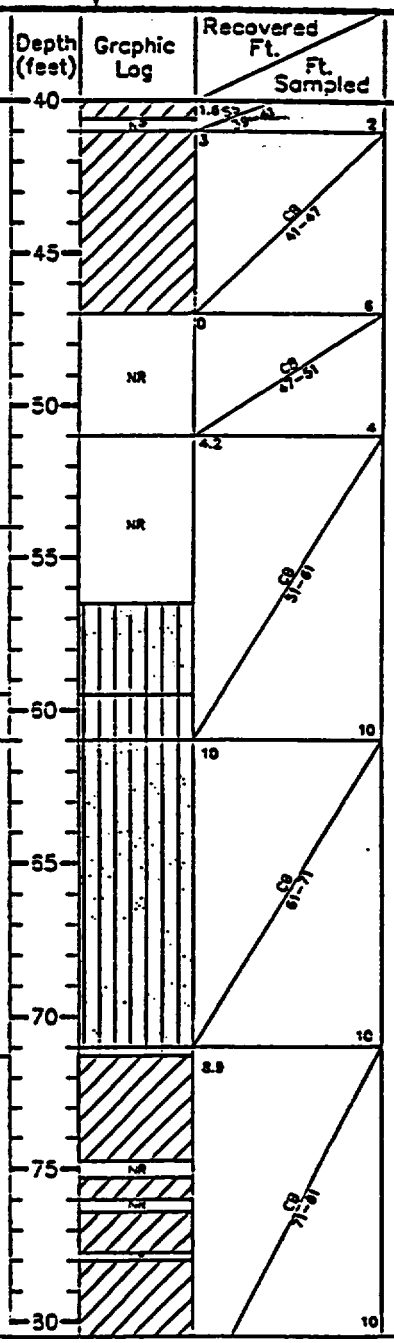
# Terra Dynamics Incorporated

# SOIL BORING LO

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/18/92 | Boring No.: B-23 | Grid No 7-I |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 4932.0522 Easting: 11028.4705 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS, 3" CB | Ground Surface Elev. (MSL): 3,429.13 |
| Driller: JOHN SCARBOROUGH | Total Depth: 101' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | |
|---|---|
| 54' - 59.5' | Sandy Clayey Silt (ML): light greenish gray clayey siltstone with sand throughout; sand is vrg qtz; mica and biotite flakes throughout; small low-angle cross-bedding; thin interbeds of clay and rounded clay nodules; increased clay content toward base; mod. hard; chalky; blocky fracture; dry. |
| 59.5' - 61' | Clayey Silt (ML): cross-bedded light greenish gray and dusky red clayey siltstone grading into dusky red clayey siltstone; trace small mica frags.; mod. hard; blocky fracture; dry. |
| 61' - 71.2' | Silty SAND (SM): speckled appearance with white, olive and opaque vfg sand grains in greenish gray yellow and white silty matrix; calc. carb. cemented silty sandstone; small biotite and med. mica flakes throughout; low angle cross-bedding w/gray and dusky red silty clay rip-up clasts and layers throughout; mod. hard; dusty; blocky fracture; dry. |
| 71.2' - 101' | Silty CLAY (CL): interbedded dusky red claystone and clayey siltstone; mica frags. within siltstone intervals; increasing clay content toward base; greenish gray infilled tubes and inclusions throughout; mod. hard; sl. soapy; blocky fracture with crumbly zones; dry. |




FILE NAME: A-LOG71.DWG

| *Terra Dynamics Incorporated* | **SOIL BORING LOG** |
|---|---|

| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/18/92 | Boring No.: B-23 | Grid No.: 7-! |
|---|---|---|---|---|

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 4932.0522 Easting: 11028.4705 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): 2" SS, 3" CB | Ground Surface Elev. (MSL): 3,429.13 |
| Driller: JOHN SCARBOROUGH | Total Depth: 101' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|
| Silty CLAY (CL): same as above. | 80 | | 8.9 / 71-81 / 10 | |
| | | | 7 | |
| | | NR | | |
| | 85 | NR | CB 81-91 | |
| | | NR | | |
| | 90 | NR | 10 | |
| | | NR | 4 | |
| | | NR | | |
| | | NR | | |
| | 95 | NR | CB 91-101 | |
| | | NR | | |
| TOTAL DEPTH = 101' | 100 | | 10 | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG71.DWG

# Terra Dynamics Incorporated

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No. |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 01/23/93 | B-49 | 8-B |

| | | |
|---|---|---|
| Log By: R.McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 8315.3752 Easting: 12054.4457 Ground Surface Elev. (MSL): 3,481.91 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|---|
| 0'-0.8' | TOP SOIL: dk. brown, silt and sand, with organic material, loose, dry. | 0 | | DRILL OUT TO 44'; LOG CUTTINGS | |
| 0.8'-6.0' | CALICHE: lt. tan-calcitic cemented sand and silt, vfg-fg quartz sand, soft, dry. | 5 | | | |
| 6.0'-29' | Silty SAND (SM): reddish-tan, sand and silt, vfg quartz feldspar sand; loose; dry. | 10 | | | |
| | - caliche cementing scattered 12'-28' | 15 | | | |
| | - chert frags-pebblesized scattered 23'-25' | 20 | | | |
| | | 25 | | | |
| 29'-36' | CALICHE: calcitic and micritic cemented sand and silt, concretion rings in micrite, sandstone lithoclasts in micritic matrix, sandstone lithoclasts have silica concretions, lt. gray, to tan, hard, dry. | 30 | | | |
| | | 35 | | | |
| 36'-42.5' | SAND and GRAVEL (SW): lt. red brown, fg quartz sand, quartz pebbles rounded to subrounded to angular, soft, dry. | 40 | | | |

FILE NAME: A-LOGSB.DWG

# Terra Dynamics Incorporated

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/23/93 | Boring No.: B-49 | Grid No.: 8-B |

| | | |
|---|---|---|
| Log By: R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 8315.3752 Easting: 12054.4457 Ground Surface Elev. (MSL): 3,481.91 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| SAND and GRAVEL (SW): same as above. | 40 | | DRLG | OGALLALA |
| 42.5'-100' CLAY (CL): red with yellow mottling; dry; plastic. | | NR | DRLG | TRIASSIC |
| | 45 | | 1 SS 44-46 2 | |
| | | | 2 SS 46-48 2 | |
| - purple, red and yellow mottling; 48'-50'. | 50 | | 2 SS 48-50 2 | |
| | | | 2 SS 50-52 2 | |
| | | | 1 SS 52-53 1 | |
| - brittle; dry. | 55 | NR ? | 4 CB 53-59 6 | |
| | | NR ? | | |
| - increase in purple coloring brittle; dry. | 60 | NR ? | 2.8 CB 59-65 6 | |
| | | NR ? | | |
| - orange red color with red, yellow, greenish-white and purple mottling. appears to have mixed clay clasts. | 65 | NR ? | 4.1 CB 65-71 6 | |
| | 70 | NR ? | | |
| - orange red, red, yellow, purple mottled without clasts; brittle; dry. | | NR ? | 8.5 CB 71-81 10 | |
| | 75 | | | |
| | 80 | | | |

FILE NAME: A-LOG88.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 01/23/93 | B-49 | B-3 |

| | | |
|---|---|---|
| Log By: R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 8315.3752 Easting: 12054.4457 Ground Surface Elev. (MSL): 3,481.91 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| | 80 | NR ? | 18.5 / 7.5 | CB 71-81 / 10 |
| | | NR ? | | |
| | | NR ? | | |
| - vertically oriented frac at approx. 84'-85'. | 85 | | | CB 81-91 |
| | 90 | | | / 10 |
| | | NR ? | 7.6 | |
| | 95 | | | CB 91-100 |
| | | NR ? | | |
| TOTAL DEPTH = 100' - healed fracture oriented 60° from vertical at approx. 99'. | 100 | | | / 9 |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOGB3.DWG

# Terra Dynamics Incorporated

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/13/93 | Boring No.: B-37 | Grid No.: 8-C |

| | | |
|---|---|---|
| Log By: A. WEEGAR/R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7862.1723 Easting: 11843.1039 Ground Surface Elev. (MSL): 3,477.37 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): CORE BARREL; SPLIT SPOON | |
| Driller: | Total Depth: 101' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|---|
| 0'-0.5' | TOP SOIL: sandy silt; organic material; brown. | 0 | | | |
| 0.5'-16' | CALICHE: white to lt. tan calcite cemented sand and silt; vfg qtz. sand; with lithoclasts of sandstone in calcite matrix; soft drilling. | 5, 10, 15 | | DRILLED OUT WITH ROCK BIT TO 35' -LOG CUTTINGS | |
| 16'-25' | CALICHE: gray to tan, micritic and calcitic cemented sand; silt to occasional gravel sandstone lithoclasts with silica concretions around them; lithoclasts cemented with probable dolomite; quartz and feldspar sand and pebbles; silica chips (conchoidal). | 20, 25 | | | |
| 25'-28' | SAND and GRAVEL (SW): river pea gravel with whitish sand and silt; graded; angular to rounded. | | | | |
| 28'-37' | SAND and GRAVEL (SW): river sea gravel with reddish sand and silt; graded; angular to rounded. | 30, 35 | | | |
| 37'-61' | CLAY (CL): red clay with sand size calcite inclusions; soft; moist. | 40 | | 2 / 35 / 38-40 / 2 | OGALLALA / TRIASSIC |

FILE NAME: A-LOGBC.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/13/93 | Boring No.: B-37 | Grid No.: B-C |

| | | |
|---|---|---|
| Log By: A. WEEGAR/R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data<br>Northing: 7862.1723<br>Easting: 11843.1039<br>Ground Surface Elev. (MSL): 3,477.37 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): CORE BARREL; SPLIT SPOON | |
| Driller: | Total Depth: 101' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|
| - yellow mottling bottom 0.3' (41.7-42); less moist. | 40 | | 2 / SS 40-42 / 2 | |
| | | | 2 / SS 42-44 / 2 | |
| - gray/green clay nodules at 45' approx. 0.15'. | 45 | | 2 / SS 44-46 / 2 | |
| | | | 1.9 / SS 46-48 / 2 | |
| | | NR ? | 1 | |
| | 50 | NR ? | CB 48-51 / 3 | |
| | | NR | 0 / CB 51-57 / 6 | |
| | 55 | NR | 0 / CB 57-61 / 4 | |
| 61'-81' CLAY (CL): yellowish pink, mottled green, yellow, red and gray clay; dry; brittle; almost talcish. | 60 | | 4 / CB 61-65 / 4 | |
| | 65 | NR | 3.5 | |
| | | NR | CB 65-71 / 6 | |
| - red clay with slight yellow mottling; soft plastic; moist. | 70 | NR ? | 5.2 | |
| | | NR ? | | |
| - reddish orange with yellow mottling and gray/green nodules of clay gradually drying out, over dry (1.6' above base of recovery). | 75 | NR ? | CB 71-81 | |
| - "poker chip" clay with mica flakes. | 80 | NR | 10 | |

FILE NAME: A-LOGBC.DWG

| *Terra Dynamics Incorporated* | **SOIL BORING LOG** |
|---|---|

| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/13/93 | Boring No.: B-37 | Grid No.: 8-C |
|---|---|---|---|---|

| | | |
|---|---|---|
| Log By: A. WEEGAR/R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data<br>Northing: 7862.1723<br>Easting: 11843.1039<br>Ground Surface Elev. (MSL): 3,477.37 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): CORE BARREL; SPLIT SPOON | |
| Driller: | Total Depth: 101' | |
| Remarks: | | |

| | Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|---|
| 81'-84' | SILTY CLAY (CL): red clay interbedded with whitish green siltstone. | 80 | NR | 5.2 / CB 71-81 / 10 | |
| 84'-91' | CLAY (CL): red-orange with green clay nodules scattered; brittle with mica flakes. | 85 | | 10 / CB 81-91 / 10 | |
| | | 90 | | 10 / CB 91-101 / 10 | |
| TOTAL DEPTH = 101' | | 95 | | | |
| | | 100 | | | |
| | | 105 | | | |
| | | 110 | | | |
| | | 115 | | | |
| | | 120 | | | |

FILE NAME: A-LOG8C.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/14-15/92 | Boring No.: B-18 | Grid No.: 8-D |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7409.0953 Easting: 11631.7184 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): CORE BARREL | Ground Surface Elev. (MSL): 3,471.98 |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|
| 0' - 1' TOP SOIL: brown silty sand; organic plant material; dry. | 0 | | | |
| 1' - 10.5' CALICHE: pinkish white and grayish tan; calcium carbonate cemented; microcrystalline; v. hard; dry. | 5, 10 | | | |
| 10.5' - 12.25' CALICHE: pinkish white; mod. soft; dry. | | | | |
| 12.25' - 17' CALICHE: pinkish white and grayish tan calcium carbonate cemented; microcrystalline; v. hard; dry. | 15 | | DRILL OUT LOG CUTTINGS | |
| 17' - 22' CALICHE: light pink calc. carb. cemented gravel; white; red, and dk. tan gravel; subrounded to rounded; mod. hard; dry. | 20 | | | |
| 22' - 30' Gravelly SAND (SW): pinkish tan; fg - cg qtz. sand; well rounded; subrounded to well rounded quartzite gravel; white, tan, pink and dk. clasts; loose; dry; basal contact with driller. | 25 | | | |
| 30' - 45' CLAY (CL): mottled dusky red, yellow, purple and light gray clay; mod. hard; sl. plastic; dense; moist. - increased purple coloration below 35'. | 30, 35, 40 | NR, NR, NR | 6, 2.3, 3.9, 3.2 | OGALLALA, TRIASSIC |

FILE NAME: A-LOGED.DWG

# Terra Dynamics Incorporated

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/14-15/92 | Boring No.: B-18 | Grid No.: 8-D |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7409.0953 Easting: 11631.7184 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): CORE BARREL | Ground Surface Elev. (MSL): 3,471.98 |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|
| CLAY (CL): maroon clay with slight mottling of light gray and purple; mod. hard; sl. plastic; dense; moist. | 40 | NR, NR | 3.2 / CB 39-45 / 6 | |
| 45' - 71'". Slightly Silty CLAY (CL): heavily mottled dusky red, maroon, purple, yellow and gray; hard; blocky fracture; dry with occasional zones of dense, moist clay. | 45 | | 5 / CB 45-51 / 6 | |
| | 50 | NR | 0 / CB 51-61 / 10 | |
| - switched out bits; used pilot bit. | 55 | NR | | |
| - primarily dusky red with slight gray, tan and purple mottling. | 60 | | 3.8 / CB 61-65 / 4 | |
| | 65 | NR | 3 / CB 65-71 / 6 | |
| 71'"-100' Silty CLAY (CL): mottled dusky red, light gray and purple; trace mica frags.; hard; sl. crumbly; blocky fracture; dry. | 70 | | 6 / CB 71-77 / 6 | |
| | 75 | | 6.8 / CB 77-87 / 10 | |
| | 80 | | | |

FILE NAME: A-LOG8D.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/14-15/92 | Boring No.: B-18 | Grid No.: 8-D |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7409.0953 Easting: 11631.7184 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): CORE BARREL | Ground Surface Elev. (MSL): 3,471.98 |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|
| Silty CLAY (CL): same as above. | 80 | | 6.8 | |
| | 85 | NR | CB 77-87 | |
| | | | 4.5 / 10 | |
| | 90 | | CB 87-97 | |
| - becoming increasingly crumbly below 92' | | | 3.5 / 5 | |
| | 95 | NR (GRAB) | CB 97-100 | |
| TOTAL DEPTH = 100' | 100 | | 2 | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOGBO.DWG

# Terra Dynamics Incorporated

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/20/92 | Boring No.: B-32 | Grid No.: B-E |
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 6955.8008 Easting: 11420.4446 | | |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,465.58 | | |
| Driller: LANE SCARBOROUGH | Total Depth: 134' | | | |
| Remarks: | | | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|---|
| | | 80 | | 8.4 | |
| 84.9'-93.4' | CLAY (CL): dark maroon claystone with mottling of pinkish gray and tubes of greenish gray; hard; sl. soapy; blocky fracture; dry. | 85 | | CB 78-93 10 | |
| | | 90 | NR | 7.7 | |
| 93.4'-96.8' | CLAY (CL): purple/grey with mottling of pinkish tan; crumbly; dry. | 95 | | CB 93-98 10 | |
| 96.8'-101.4' | Clayey SILTSTONE (ML): greenish gray clayey siltstone with dk. maroon claystone inclusions and thin layers; blocky and platey fracture; hard; sl. moist. | | NR | 9.4 | |
| 101.4'-105' | Sandy SILT (ML): interbedded greenish grey siltstone and dusky red and pinkish yellow silty sandstone; sand is vfg quartz with vfg mica and biotite fragments; sandstone is calc. carb. cemented; hard; blocky fracture; with platey fracture in siltstone intervals; dry. | 100 | | CB 98-108 10 | |
| 105'-121.8' | Silty SAND (SM): white, pink and olive sand with greenish grey and pinkish tan silty matrix; sand is vfg with small to medium mica and biotite flakes; hard; blocky fracture; dry; basal contact. | 105 | | 10 | |
| | | 110 | | CB 108-118 10 | |
| | | 115 | | 4.9 | |
| | | 120 | | CB 118-128 10 | |

FILE NAME: A-LOGSE.DWG

# Terra Dynamics Incorporated

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 12/20/92 | B-32 | 8-E |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 6955.8008 Easting: 11420.4446 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,465.58 |
| Driller: LANE SCARBOROUGH | Total Depth: 134' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| | 120 | | 4.9 | |
| 121.8'-134' Silty CLAY (CL): dusky red & maroon with grayish purple mottling; crumbly; dry. | 125 | NR (CRAB) | CB 118-128 10 | |
| | 130 | NR | 4.1 CB 128-134 8 | |
| TOTAL DEPTH = 134' | 135 | | | |
| | 140 | | | |
| | 145 | | | |
| | 150 | | | |
| | 155 | | | |
| | 160 | | | |

FILE NAME: A-LOGSE.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/22/92 | Boring No.: B-33 | Grid No.: 8-F |

| | | |
|---|---|---|
| Log By: P. GRANT | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 6502.8105 Easting: 11209.2032 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,466.96 |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| 0'-1' TOP SOIL: brown; silty sand; moist. | 0 | | - DRILL OUT TO 25' WITH ROCK BIT. | |
| 1'-24' CALICHE: white sandy silt; calcium carb. cement; hard; dry. | | | | |
| - Ogallala gravels at 5' are white, pink, black quartzite; mbc. here. | 5 | | - LITH. LOG FROM CUTTINGS. | |
| - more gravels below 10'; looser below 10'. | 10 | | | |
| - gravel and coarse sand strata at 18'; drills easily; light tan cuttings; sl. moist. | 15 | | | |
| - yellow silty clay in bottom foot of Ogallala with some small rounded gravels. | 20 | | | OGALLALA |
| 24'-34' CLAY (CL): dark reddish-brown claystone; sl. plastic; crumbly; dense; sl. moist; yellow mottling; white burrow(?) infillings present; sl. reactive to HCl. | 25 | NR (GRAB) | 0 — SS 25-27 — 2 | TRIASSIC |
| | | NR (GRAB) | 0 — CB 27-30 — 3 | |
| | 30 | | 2.6 — CB 30-33 — 3 | |
| | | NR | 3.3 | |
| 34'-42' Silty CLAY (CL): reddish-brown silty claystone; green-gray, yellow & white mottling; crumbly; appears slightly bioturbated; not reactive with HCl; dense; dry; sl. soapy; hard. | 35 | | CB 33-36 — 5 | |
| | | NR | 7 — CB 36-40 | |
| | 40 | NR | | |

FILE NAME: A-LOG8F.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 12/22/92 | B-33 | 8-F |

| | | |
|---|---|---|
| Log By: P. GRANT | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 6502.8105 Easting: 11209.2032 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,466.96 |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| – gradational to silty sand at 42'. | 40 | NR | | |
| 42'–48' SILTY SAND (SM): brownish tan to white; mottled throughout with yellow, brown, gray; v. hard; blocky fract.; f.c. sand to silt with rounded to subangular clasts; calc. cors. cemented grains clear to white to pink; mica flakes; carb.(?) or biotite(?) grains; dry; bedding & cross-bedding present; iron(?) staining; possible borings. | 45 | | CB 38-48 / 10 | |
| 48'–86' SILTY CLAY (CL): reddish brown claystone with silt disseminated; yellow & white mottling; dendritic pattern common; no reaction to HCl; hard; blocky fract.; dry. | 50 | NR | 3.7 / CB 48-52 / 4 | |
| – little silt below 50'. | 55 | NR | 9.5 / CB 52-62 / 10 | |
| – increasing silty interbeds below 66'; scattered clayey silts (green white); dry. | 60 | NR | 9 / CB 62-72 / 10 | |
| – decreasing silt below 75'. | 65 | | | |
| | 70 | NR | 2.5 / CB 72-82 / 10 | |
| | 75 | NR | | |
| | 80 | NR | | |

FILE NAME: A-LOG8F.DWG

| Terra Dynamics Incorporated | SOIL BORING LOC |
|---|---|

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid N. |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 12/22/92 | B-33 | 8-i |

| | | |
|---|---|---|
| Log By: P. GRANT | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 6502.8105 Easting: 11209.2032 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,466.96 |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigra: Interval |
|---|---|---|---|---|
| | 80 | NR | CB 72-82 10 | |
| | | NR | 8 | |
| – less silt towards 85'. | 85 | | | |
| 86'-100' CLAY (CL): reddish purple; claystone; mod. hard; crumbly; dense; red & brown mottling; dry. | | | CB 82-92 | |
| – purple below 90'; sl. plastic. | 90 | | 10 | |
| | | NR | 6.5 | |
| | 95 | | CB 92-100 | |
| TOTAL DEPTH = 100' – same description as above with slightly reddish purple color in places. | 100 | | 8 | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOGBF.DWG

| *Terra Dynamics Incorporated* | **SOIL BORING LO** |
|---|---|

| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/18-19/92 | Boring No.: B-22 | Grid N 8- |
|---|---|---|---|---|

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 5596.6670 Easting: 10786.6818 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,437.08 |
| Driller: LAZARO CASTILLO LANE SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigra Interva |
|---|---|---|---|---|---|
| | | 80 | | 10 CB 72-82 10 | |
| | | | NR | 6.2 | |
| | | 85 | | | |
| 85.8'-89.1' | Clayey Sandy SILT (ML): interbedded and cross bedded dk. reddish brown silty clay and light grayish red sandy silt with light greenish gray silty clay in basal 1'; mica frags. throughout; hard; blocky fracture; basal 1' is soapy; dry. | | | CB 82-92 | |
| 89.1'-100' | Slightly Silty CLAY (CL): dk. reddish brown with dendritic greenish gray mottling, inclusions and layers throughout; trace vfg mica frags.; carbonized plant material; blocky fracture; sl. soapy; dry. | 90 | | 10 | |
| | | | | 6.4 | |
| | | 95 | | CB 82-100 | |
| TOTAL DEPTH = 100' | | | NR | 8 | |
| | | 100 | | | |
| | | 105 | | | |
| | | 110 | | | |
| | | 115 | | | |
| | | 120 | | | |

FILE NAME: A-LOGSH.DWG

# Terra Dynamics Incorporated

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 12-9-92 | B-13 | 9-C |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY: MUD ROTARY 21.8'-32' | Survey Data: Northing: 8073.4781 Easting: 11389.9571 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,476.22 |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | |

Remarks: MUD ROTARY BOREHOLE DRILLED ON 1/8/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES.

| Depth (feet) | Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|
| 0' - 1' | TOP SOIL: brown sandy silt; loose; root material; moist. | DRILL OUT | |
| 1' - 16.5' | CALICHE: white and v. light gray calcium carb. cemented silty sand/sandy silt; trace vfg sand-sized pink min. frags. and fg sand and round gravel size dk. min. frags.; hard; crumbly; dry; natural fractures. Increasing sand and dk. gravel content below 7'. | 1 / CB 1-4 / 3; 1.8 / CB 4-7 / 3; 1.5 / CB 7-10 / 3; 2.4 / CB 10-13 / 3; 4.6 / CB 13-18 / 5 | |
| 18.5' - 28.5' | CALICHE: pink and gray calcium carb. cemented silt; v. hard; blocky fracture; concentric growth rings and apparent nodules; calcite crystal growth in lugs; trace subrounded dk. gravel clast; natural fractures; moist along fractures; basal contact from driller. | 3 / CB 18-21 / 3; DRILL OUT; 5 / CB 21.8-26.8 / 5 | |
| 24' - 32' | Gravelly SAND (SP): vfg to cg pink gravel w/ red, tan, olive and black/brown gravel; loose; sand and gravel is supr. to round; gravel is quartzite; basal contact from driller. | 2.7 / CB 26.8-32 / 5.2 | OCALLALA TRIASSIC |
| 32' - 33' | CLAY (CL): gray; mod. soft; sl. plastic; soapy; moist. | DRILL OUT | |
| 33' - 80' | CLAY (CL): maroon clay; mod. plastic; sticky; soapy; very thin light gray, yellow and black laminations; moist to wet down to about 45'. | 3.7 / CB 33.5-37 / 3.5; 3.8 / SS 37-39 / 2; 3.4 / CB 39-41 / 2 | |

FILE NAME: A-LOG9C.DWG

| *Terra Dynamics Incorporated* | **SOIL BORING LOG** |
|---|---|

| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12-9-92 | Boring No.: B-13 | Grid No.: 9-C |
|---|---|---|---|---|

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY; MUD ROTARY 21.8'-32' | Survey Data: Northing: 8073.4781 Easting: 11389.9571 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,476.22 |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | |

Remarks: MUD ROTARY BOREHOLE DRILLED ON 1/8/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| | 40 | | 0.4 / 39-41 / 2 | |
| | | NR | 0.8 / CB 41-45 / 4 | |
| — Drier from 45' - 50'. | 45 | | 5 / 45-51 / 6 | |
| | 50 | NR | | |
| — Increased moisture & plasticity below 51'. | | NR (GRAB) | 0.5 / CB 51-56 / 5 | |
| — Use clay bit from 56' - 60'. | 55 | NR (GRAB) | 0 / CB 56-60 / 4 | |
| — Use pilot bit w/ increase shoe separation below 60'. | 60 | NR | 0 / CB 60-61 / 1 | |
| | | | 5.2 / CB 61-67 / 8 | |
| | 65 | NR | | |
| | | NR (GRAB) | 0 / CB 67-72 / 5 | |
| | 70 | NR (GRAB) | 0 / CB 72-76 / 4 | |
| | 75 | | 1.7 / CB 76-80 / 4 | |
| | | NR | | |
| | 80 | | | |

FILE NAME: A-LOG9C.DWG

| *Terra Dynamics Incorporated* | **SOIL BORING LOG** |
|---|---|

| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12-9-92 | Boring No.: B-13 | Grid No.: 9-C |
|---|---|---|---|---|

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY; MUD ROTARY 21.8'-32' | Survey Data: Northing: 8073.4781 Easting: 11389.9571 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,476.22 |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | |
| Remarks: MUD ROTARY BOREHOLE DRILLED ON 1/8/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES. | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| 80-100' Silty CLAY (CL): purplish maroon w/ yellow & greenish gray mottling; platy fracture; sl. crumbly; sl. soapy; non-plastic; dry. | 80 | NR | 1.8 / CB 80-84 / 4 | |
| | 85 | | 4 / CB 84-88 / 4 | |
| | 90 | | 8 / CB 88-96 / 8 | |
| | 95 | | 3.8 / CB 96-100 / 4 | |
| TOTAL DEPTH AT 100' | 100 | | | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG9C.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 12/20/92 | B-27 | 9-D |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7620.4057 Easting: 11178.6477 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,472.74 |
| Driller: LANE SCARBOROUGH LAZARO CASTILLO | Total Depth: 100' | |

Remarks: MUD ROTARTY BOREHOLE DRILLED ON 1/3/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| 0'-1' TOP SOIL: brown silty sand; organic material; moist. | 0 | | | |
| 1'-9' CALICHE: pinkish, grayish white; calcium carb. cemented silt and vfg pink sand; v. hard; blocky fracture; dry. | 5 | | DRILL OUT WITH ROCK BIT | |
| | | NR | 2.4 | |
| | | NR | CB 8.0-11.5 | |
| 9'-11.5' Silty Gravelly SAND (GM): pinkish white; vfg qtz. sand with white and dark gravel and partial caliche cementation; mod. loose; dry. | 10 | | | |
| | | NR | 3.5 | |
| 11.5'-25' CALICHE: pink and pinkish gray; microcrystalline calcium carb. cementation with trace vfg pink sand and dark gravel; concentric growth rings; v. hard; dry. | | NR | 3.8 | |
| | 15 | | CB 11.5-16.5 | |
| | | | 5.0 | |
| | | | 4.0 | |
| | 20 | | CB 16.5-21.5 | |
| | | NR | 5.0 | |
| - increased gravel content below 22'. | | | 2.5 | |
| | | | CB 21.5-25 | |
| | | NR | 3.5 | |
| 25'-27.5' Silty Gravelly SAND (GW): dark, white, pink, clear and opaque sand and gravel with pinkish tan silt matrix; sand is subr. to well rd. vfg-cg quartz; gravel is subr.; loose; dry. | 25 | NR (CRAB) | DRILL OUT WITH ROCK BIT | OGALLALA |
| 27.5'-51.3' Silty CLAY (CL): dusky red to maroon silty clay with blue/gray mottling throughout; mod. dense; crumbly in upper 4'; sl. plastic & soapy below 31'; moist. | | | | TRIASSIC |
| | | | 1.5 | |
| | | NR | SS 28-30 | |
| | 30 | | 2 | |
| | | | 1.7 | |
| | | NR | SS 30-32 | |
| | | | 2 | |
| | | | 1.6 | |
| | | NR | SS 32-34 | |
| | | | 2 | |
| | 35 | | 1.8 | |
| | | NR | SS 34-36 | |
| | | | 2 | |
| - yellow mottling below 37'. | | | 1.9 | |
| | | | SS 36-38 | |
| | | | 2 | |
| | | | 1.8 | |
| | | NR | SS 38-40 | |
| | 40 | | 2 | |

FILE NAME: A-LOG9D.DWG

# Terra Dynamics Incorporated

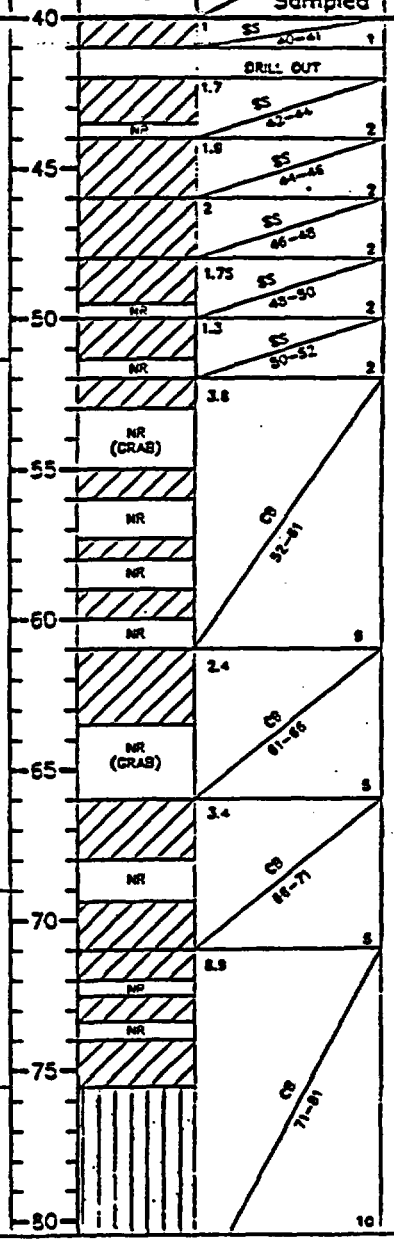
# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/20/92 | Boring No.: B-27 | Grid No.: 9-D |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7620.4057 Easting: 11178.6477 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,472.74 |
| Driller: LAZARO CASTILLO LANE SCARBOROUGH | Total Depth: 100' | |

Remarks: MUD ROTARTY BOREHOLE DRILLED ON 1/3/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES.

| Depth (feet) | Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) |
|---|---|
| | Silty CLAY (CL): same as above. |
| 51.3'-69' | Silty CLAY (CL): light dusky red silty claystone with light gray, yellow and purple/gray dendritic mottling; hard; blocky fracture; sl. crumbly; dry; basal contact from cuttings. |
| 69'-75.5' | Silty CLAY (CL): heavily mottled purple/gray/green with dendritic coloration of dusky red; mod. hard claystone; blocky fracture; dry. |
| 75.5'-83.6' | Sandy SILT (ML): dusky red sandy siltstone with greenish gray mottling in upper 1'; sand is vfg quartz with med. mica and biotite flakes; matrix material reacts with HCl; hard; blocky fracture; sl. chalky; dry. |




FILE NAME: A-LOG9D.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/20/92 | Boring No.: B-27 | Grid No.: 9-D |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7620.4057 Easting: 11178.6477 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,472.74 |
| Driller: LAZARO CASTILLO LANE SCARBOROUGH | Total Depth: 100' | |
| Remarks: MUD ROTARTY BOREHOLE DRILLED ON 1/3/93 NEXT TO ORIGINAL BOREHOLE. LOG IS COMPOSITE OF BOTH BOREHOLES. | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| | 80 | | 3.9 71-81 10; 8.3 | |
| 83.6'-100' Silty CLAY (CL): variegated dusky red, yellow, dark gray one purple silty claystone with siltstone layers; trace vfg mica frags. in siltstone intervals; blocky fracture; moc. hard; dry. | 85 | NR NR NR | CB 81-91 | |
| | 90 | | 10 | |
| | 95 | | 9 CB 71-100 | |
| TOTAL DEPTH = 100' | 100 | | 9 | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG9D.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/20/93 | Boring No.: B-46 | Grid No.: 9-E |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7166.5723 Easting: 10968.3576 Ground Surface Elev. (MSL): 3,467.53 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 101' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|---|
| 0'-2.5' | TOP SOIL: dark brown; clayey sand; v. organic rich; loamy; moist. | 0 | NR (GRAB) | | |
| 2.5'-13' | CALICHE: pinkish white calcium carbonate cemented silt and vfg sand; alternating hard and soft layers; hard layers are grayish tan micrite with silt and vfg pink sand; trace subrounded pink and opaque gravel; dry. | 5, 10 | NR (GRAB) | DRILL OUT; LOG CUTTINGS | |
| 13'-18' | CALICHE: pinkish white calcium carbonate cemented silt and vfg sand; dark, black, opaque and red qtzite gravel frags. throughout; loose; dry. | 15 | NR (GRAB) | | |
| 18'-20.5' | Gravelly SAND (SP): pink vfg quartz sand; black, dark, red and opaque gravel; v. loose; moist. | 20 | (GRAB) | | OGALLALA |
| 20.5'-28' | CLAY (CL): maroon; sl. sandy; dense; sl. plastic; crumbly; trace calcium carbonate nodules; moist. | 25 | NR (GRAB) | 0 SS 22-24 2; 2 SS 24-26 2; 2 SS 26-28 2 | TRIASSIC |
| 28'-37' | CLAY (CL): heavily mottled yellow, bluish gray and purple; sl. sandy; dense; sl. plastic; crumbly; moist-dry. | 30, 35 | | 2 SS 28-30 2; 2 SS 30-32 2; 2 SS 32-34 2; 2 SS 34-36 2; 2 SS 36-38 2; 2 SS 38-40 2 | |
| 37'-40.9' | CLAY (CL): maroon with clasts and trace mottling of grayish purple and yellow; sl. sandy; dense; sl. plastic; crumbly to concoidal fracture; moist. | 40 | | | |

FILE NAME: A-LOG3E.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 01/20/93 | B-46 | 9-E |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7166.5723 Easting: 10958.3576 Ground Surface Elev. (MSL): 3,467.53 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 101' | |
| Remarks: | | |

| | Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|---|
| 40.9'-52' | Silty Clayey SAND (SM): variegated tan, yellow, pink, gray and white siltstone and sandstone with clay laminae and clasts; interbedded and cross-bedded; sand is vfg white quartz and pink feldspar; vfg to cg mica and biotite frags. and flakes; increased sand content below 47'; hard; blocky fracture; calcium carbonate cementation; dry. | 40, 45, 50 | | 1 SS 40-41 1; 10 CB 41-51 10 | |
| 52'-66.9' | Silty CLAY (CL): dark reddish brown and reddish purple silty claystone; with slight purple grey dendritic mottling; greenish gray clasts and worm burrows; dense; blocky fracture to crumbly; dry; gradational change to light dusky red siltstone at base. | 55, 60 | NR NR NR NR | 8.6 CB 51-61 10 | |
| 66.9'-71' | Clayey SILT (ML): light dusky red siltstone and claystone; calcite xl filled fractures; hard; blocky fracture; dry. | 65, 70 | NR NR NR | 8.4 CB 61-71 10 | |
| 71'-101' | Slightly Silty CLAY (CL): reddish brown and yellowish tan slightly silty claystone with greenish gray layers and tubes; calcite filled (45°) diagonal fractures common. | 75, 80 | | 10 CB 71-81 10 | |

FILE NAME: A-LOGSE.DWG

# Terra Dynamics Incorporated

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 01/20/93 | B-46 | 9-E |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Northing: 7166.5723 |
| Driller: | Total Depth: 101' | Easting: 10968.3576 |
| | | Ground Surface Elev. (MSL): 3,467.53 |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| Slightly Silty CLAY (CL); same as above. | 80 | | 7 | |
| | 85 | | CB 81-91 | |
| | 90 | | 10 / 6.4 | |
| | 95 | | CB 91-101 | |
| TOTAL DEPTH = 101' | 100 | | 10 | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG9E.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92; 1/23/93 | Boring No.: B-21 | Grid Well No.: 9-G(1) |

Log By: M. JOHNSON; A. WEEGAR

WELL COMPLETED ON: 1/29/93

Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS

Drilling Method & Bit Sizes: AIR ROTARY

Total Depth: 170'

Sample Method(s): CONTINUOUS FROM 9' TO 170' USING SPLIT SPOON AND CORE BARREL.

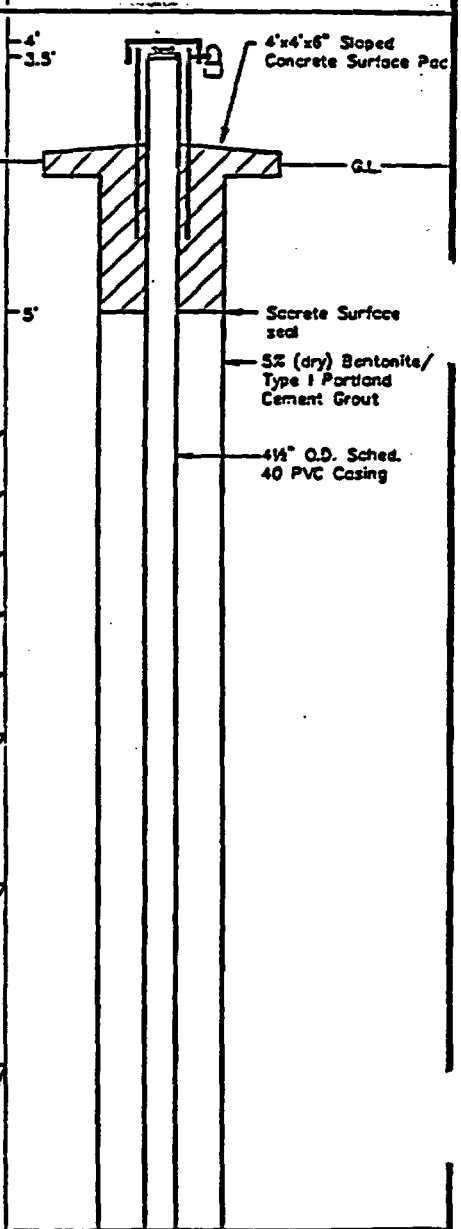
Survey Data:
Northing: 6260.8293
Easting: 10544.8903

Ground Surface Elev. (MSL): 3,454.55

Top of PVC Casing Elev.: 3,458.25

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Recovered FL / FL Sampled |
|---|---|---|---|
| | | 5 | |
| | | 0 | |
| 0'-9' CALICHE: white; some white silty clay, some white pebbles. | NR | 5 | |
| 9'-11' CALICHE<br>BASE OF OGALLALA - TRIASSIC TOP | NR | 10 | 0 SS 9-11 2 |
| 11'-15.5' Silty CLAY (CL): dusky red; hard; waxy; dry; some whitish-gray mottling. | NR<br>NR<br>NR | | .25 SS 11-13 2<br>1.5 SS 13-15 2 |
| 15.5'-23' Slightly Silty CLAY (CL): maroon; hard; waxy; dry; some gray mottling. | | 15 | 1.5 SS 15-17 2<br>1.5 SS 17-19 2 |
| | NR | 20 | 3 CB 19-24 5 |
| 23'-25' Slightly Silty SAND (SM): pinkish-red, well sorted vf-fg angular sand; some yellow and green mottling; HCl perm non-reactive; dry. | | | |
| 25'-26' CLAYEY SAND (SL): white, chalky; HCl reactive; vf sand grains; dry. | | 25 | 5.9 |
| 26'-30' Slightly Silty SAND (SM): pinkish-red, vf-fg angular sand grains; HCl perm numerous gray rip-up clasts; some yellow, green mottling; dry; lighter color with depth. | | | CB 24-30 6 |
| 30'-42.5' Slightly Silty SAND (SM): white, fine grained slightly angular sand; biotite and mica flakes; numerous rip-up white and gray clay clasts; slightly HCl reactive; permeable. | | 30<br>35 | 10 CB 30-40 |

Well Design




FILE NAME: A-LOG3G1.DWG

# Terra Dynamics Incorporated

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92; 1/23/93 | Boring No.: B-21 | Grid/Well No.: 9-G(1) |
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/29/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 | | |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 | | |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 170' | Top of PVC Casing Elev.: 3,458.25 | | |
| Sample Method(s): CONTINUOUS FROM 9' TO 170' USING SPLIT SPOON AND CORE BARREL. | | | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Recovered FL / FL Sampled | Well Design |
|---|---|---|---|---|
| Slightly Silty SAND (SM): same as above. | | 35 | 30-40 / 10 | 5% (dry) Bentonite/ Type I Portland Cement Grout |
| | | 40 | 8.1 | 4½" O.D. Sched. 40 PVC Casing |
| 42.5'-50' Silty CLAY (CL): dusky red; mod. hard; dry; numerous silty sand laminations with depth (slightly HCl reactive); some gray, white mottling. | NR | 45 | CB 10-50 / 10 | |
| | | 50 | 7.8 | |
| 50'-60' Silty CLAY (CL): dusky red; mod. hard; waxy; dry; white and gray mottling, some vf grained sand near top. | NR | 55 | CB 50-60 / 10 | |
| | | 60 | 8.5 | |
| 60'-84' Silty CLAY (CL): dusky red; hard; waxy; dry; white and gray mottling. | NR | 65 | CB 60-70 / 10 | |
| | | 70 | 3.4 | |
| | NR | 75 | CB 70-80 | |

FILE NAME: A-LOGSG1.DWG

# Terra Dynamics Incorporated

# SOIL BORING & WELL COMPLETION LO(

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92; 1/23/93 | Boring No.: B-21 | Grid/Well No.: 9-G(1) |

Log By: M. JOHNSON; A. WEEGAR

WELL COMPLETED ON: 1/29/93

Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS

Drilling Method & Bit Sizes: AIR ROTARY

Total Depth: 170'

Sample Method(s): CONTINUOUS FROM 9' TO 170' USING SPLIT SPOON AND CORE BARREL.

Survey Data:
Northing: 6260.8293
Easting: 10544.8903
Ground Surface Elev. (MSL): 3,454.55
Top of PVC Casing Elev.: 3,458.25

| | Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Recovered Ft / Ft Sampled | Well Design |
|---|---|---|---|---|---|
| | Silty CLAY (CL): same as above. | NR | 75 | CB 70-80 / 10 | 5% (dry) Bentonite/ Type I Portland Cement Grout; 4½" O.D. Sched. 40 PVC Casing |
| | | NR | 80 | 8.2 | |
| 84'-90' | Silty CLAY (SM): reddish-brown; hard; dry; brown coloring increasing with depth, some vf sand increasing with depth, some gray mottling; dry. | | 85 | CB 80-90 / 10 | |
| 90'-94' | Silty CLAY (CL): dusky red; hard; dry; some vf sand, gray mottling. | | 90 | 10 | |
| 94'-110' | Slightly Silty SAND (SM): grayish white, vf to fg sand, grains are angular; biotite and mica flakes; some yellow, pink and green color, bottom 1 (one) foot more yellow; HCl permeable; dry; v. slightly HCl reactive. | | 95 | CB 90-100 / 10 | |
| | - Color becoming tan below 105 ft.; some brown/yellow streaking with depth; rip-up clay clasts (white). | | 100 | 10 | |
| | | | 105 | CB 100-110 / 10 | |
| 110'-117.5' | Slightly Silty SAND (SM): tan/yellow, fg sand, slightly angular grains; dry; numerous biotite and mica flakes; some gray, brown streaking; slightly HCl reactive; thin brown, yellow lamination. | | 110 | 10 | |
| | | | 115 | CB 110-120 | |

FILE NAME: A-LOCSG1.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92; 1/23/93 | Boring No.: B-21 | Grid/Well No.: 9-G(1) |

| | | |
|---|---|---|
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/29/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 170' | Top of PVC Casing Elev.: 3,458.25 |
| Sample Method(s): CONTINUOUS FROM 9' TO 170' USING SPLIT SPOON AND CORE BARREL. | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Recovered Ft. / Ft. Sampled | Well Design |
|---|---|---|---|---|
| - Red, fg sand, from 116.5' to 17.5'. | | 15 | CB 110-120 | |
| 117.5'-131.5' Slightly Silty SAND (SM): tan/yellow, fg sand, slightly angular grains; dry; numerous mica and biotite flakes; slightly HCl reactive; thin yellow lamination. | | 20 | 10 | |
| - Red, yellow and gray laminations. Bottom one foot is gray. | | 25 | 10 CB 120-130 | 123.5' 2 x 50lb. Bags Hd. Bent. Chips |
| | | 30 | 10 | 130' |
| 131.5'-170' Silty CLAY (CL): dusky red; numerous gray clay clasts (greenish-white) with occasional mustard yellow mottling; moc. hard; blocky fracture to sl. crumbly; dry. | NR | 35 | 6.6 CB 130-140 | 135' 4" x 30' 0.020 PVC Screen |
| | NR | 40 | 10 DEPTH OFF | 9 x 100lb. Bags TMC 8/16 Sieve Filter Sand |
| | NR | 45 | 9.5 CB 141-151 | |
| | NR | 50 | 10 | |
| | NR | 55 | 8.5 CB 151-161 | |
| | NR | | | |

FILE NAME: A-LOG9C1.DWG

# Terra Dynamics Incorporated

# SOIL BORING & WELL COMPLETION LO

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid/Well No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 12/16/92; 1/23/93 | B-21 | 9-G(1) |

Log By: M. JOHNSON; A. WEEGAR

WELL COMPLETED ON: 1/29/93

Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS

Drilling Method & Bit Sizes: AIR ROTARY

Total Depth: 170'

Sample Method(s): CONTINUOUS FROM 9' TO 170' USING SPLIT SPOON AND CORE BARREL.

Survey Data:
Northing: 5260.8293
Easting: 10544.8903

Ground Surface Elev. (MSL): 3,454.55

Top of PVC Casing Elev.: 3,458.25

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Recovered Ft / Ft. Sampled | Well Design |
|---|---|---|---|---|
| Silty CLAY (CL): same as above. | | 155 | 8.5 / 10 CB 151-161 | 4"x30' 0.020 PVC Screen |
| | NR | 160 | 9.3 / 10 CB 161-170 | 9 X 100lb. Bags TMC 8/16 Sieve Filter Sand |
| | NR | 165 | | 165' 165.5' |
| | NR | 170 | | 4½" |
| TOTAL DEPTH = 170' | | 175 | | 7⅞" |
| | | 180 | | |
| | | 185 | | |
| | | 190 | | |
| | | 195 | | |

FILE NAME: A-LOG9G1.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING & WELL COMPLETION LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid/Well No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 12/16/92: 1/2/93 | B-21 | 9-G(2) |

Log By: M. JOHNSON; A. WEEGAR

WELL COMPLETED ON: 1/25/93

Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS

Drilling Method & Bit Sizes: AIR ROTARY

Total Depth: 223'

Sample Method(s): CONTINUOUS FROM 9' TO 223' USING SPLIT SPOON AND CORE BARREL

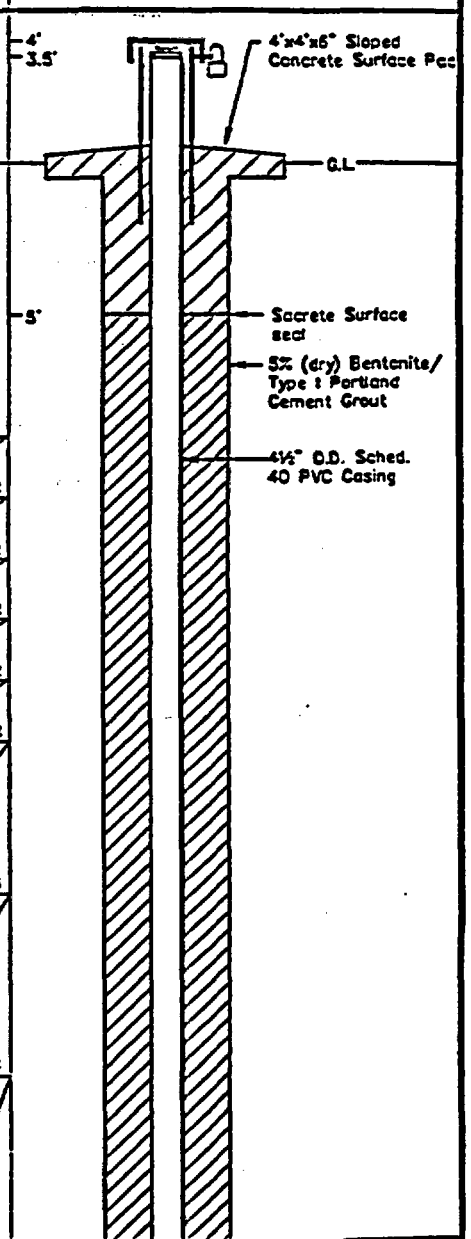
Survey Data:
Northing: 6260.8293
Easting: 10544.8903

Ground Surface Elev. (MSL): 3,454.55

Top of PVC Casing Elev.: 3,457.85

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Recovered FL / FL Sampled |
|---|---|---|---|
| | | 5 | |
| | | 0 | |
| 0'-9' CALICHE; white; some white silty clay, some white pebbles. | NR | 5 | |
| 9'-11' CALICHE<br>BASE OF OGALLALA - TRIASSIC TOP | NR | 10 | 0 / SS 9-11 / 2 |
| 11'-15.5' Silty CLAY (CL); dusky red; hard; waxy; dry; some whitish-gray mottling. | NR<br>NR<br>NR | | .25 / SS 11-13 / 2<br>1.5 / SS 13-15 / 2 |
| 15.5'-23' Slightly Silty CLAY (CL); maroon; hard; waxy; dry; some gray mottling. | NR | 15<br>20 | 1.5 / SS 15-17 / 2<br>1.6 / SS 17-19 / 2<br>3 / CB 19-24 / 5 |
| 23'-25' Slightly Silty SAND (SM); pinkish-red, well sorted vf-fg angular sand; some yellow and green mottling; HCl perm non-reactive; dry. | | | |
| 25'-26' CLAYEY SAND (SL); white, chalky; HCl reactive; vf sand grains; dry. | | 25 | 5.9 / CB 24-30 / 6 |
| 26'-30' Slightly Silty SAND (SM); pinkish-red, vf-fg angular sand grains; HCl perm numerous gray rip-up clasts; some yellow, green mottling; dry; lighter color with depth. | | | |
| 30'-42.5' Slightly Silty SAND (SM); white, fine grained slightly angular sand; biotite and mica flakes; numerous rip-up white and gray clay clasts; slightly HCl reactive; permeable. | | 30<br>35 | 10 / CB 30-40 |

Well Design




FILE NAME: A-LOG9G2.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING & WELL COMPLETION LO

| | | | |
|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92; 1/2/93 | Boring No.: B-21 / Grid/Well No.: 9-G(2) |
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/25/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 | |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 | |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 223' | Top of PVC Casing Elev.: 3,457.85 | |
| Sample Method(s): CONTINUOUS FROM 9' TO 223' USING SPLIT SPOON AND CORE BARREL | | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Ft. / Ft. Sampled | Well Design |
|---|---|---|---|---|
| Slightly Silty SAND (SM): same as above. | | 35 | 30-40 / 10 | |
| | | 40 | 8.1 | |
| 42.5'-50' Silty CLAY (CL): dusky red; mod. hard; dry; numerous silty sand laminations with depth (slightly HCl reactive); some gray, white mottling. | NR | 45 | CB 40-50 / 10 | 5% (dry) Bentonite Type I Portland Cement Grout; 4½" O.D. Sched. 40 PVC Casing |
| 50'-60' Silty CLAY (CL): dusky red; mod. hard; waxy; dry; white and gray mottling, some vf grained sand near top. | NR | 50 | 7.3 | |
| | | 55 | CB 50-60 / 10 | |
| 60'-84' Silty CLAY (CL): dusky red; hard; waxy; dry; white and gray mottling. | NR | 60 | 8.5 | |
| | | 65 | CB 60-70 / 10 | |
| | NR | 70 | 3.4 | |
| | | 75 | CB 70-80 | |

FILE NAME: A-LOG9G2.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92; 1/2/93 | Boring No.: B-21 | Grid/Well No.: S-G(2) |

| | | |
|---|---|---|
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/25/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 223' | Top of PVC Casing Elev.: 3,457.85 |
| Sample Method(s): CONTINUOUS FROM 9' TO 223' USING SPLIT SPOON AND CORE BARREL | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | FL / FL Screened | Well Design |
|---|---|---|---|---|
| | NR | 75 | CB 70-80 10 | |
| | NR | 80 | 6.2 | |
| 84'-90' Silty CLAY (SM): reddish-brown; hard; dry; brown coloring increasing with depth, some vf sand increasing with depth, some gray mottling; dry. | | 85 | CB 80-90 10 | 5± (dry) Bentonite/ Type I Portland Cement Grout |
| 90'-94' Silty CLAY (CL): dusky red; hard; dry; some vf sand, gray mottling. | | 90 | 10 | 4½" O.D. Sched. 40 PVC Casing |
| 94'-110' Slightly Silty SAND (SM): grayish white, vf to fg sand, grains are angular; biotite and mica flakes; some yellow, pink and green color, bottom 1 (one) foot more yellow; HCl permeable; dry; v. slightly HCl reactive. | | 95 | CB 90-100 10 | |
| - Color becoming tan below 105 ft.; some brown/yellow streaking with depth; rip-up clay clasts (white). | | 100 | 10 | |
| | | 105 | CB 100-110 10 | |
| 110'-117.5' Slightly Silty SAND (SM): tan/yellow, fg sand, slightly angular grains; dry; numerous biotite and mica flakes; some gray, brown streaking; slightly HCl reactive; thin brown, yellow lamination. | | 110 | 10 | |
| | | 115 | CB 110-120 | |

FILE NAME: A-LOGS92.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92; 1/2/93 | Boring No.: B-21 | Grid/Well No.: 9-G(2) |
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/25/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 | | |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 | | |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 223' | Top of PVC Casing Elev.: 3,457.85 | | |
| Sample Method(s): CONTINUOUS FROM 9' TO 223' USING SPLIT SPOON AND CORE BARREL | | | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Ft. / Ft. Sampled | Well Design |
|---|---|---|---|---|
| – Red, fg sand, from 116.5' to 17.5'. | | 115 | CB 116-120 | |
| 117.5'–131.5' Slightly Silty SAND (SM): tan/yellow, fg sand, slightly angular grains; dry; numerous mica and biotite flakes; slightly HCl reactive; thin yellow lamination. | | 120 | 10 | |
| – Red, yellow and gray laminations. Bottom one foot is gray. | | 125 | 10 CB 120-130 | 5% (dry) Bentonite, Type I Portland Cement Grout |
| | | 130 | 10 | 4½" O.D. Sched. 40 PVC Casing |
| 131.5'–198' Silty CLAY (CL): dusky red; numerous gray clay clasts (greenish-white) with occasional mustard yellow mottling; mod. hard; blocky fracture to sl. crumbly; dry. | NR | 135 | 8.5 CB 130-140 | |
| | NR | 140 | 10 DEPTH OFF | |
| | NR | 145 | 9.5 CB 141-151 | |
| | NR | 150 | 10 | |
| | NR | 155 | 8.5 CB 151-161 | |

FILE NAME: A-LOG9G2.DWG

# Terra Dynamics Incorporated

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92; 1/2/93 | Boring No.: B-21 | Grid/Well No.: 9-G(2) |
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/25/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 | | |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 | | |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 223' | Top of PVC Casing Elev.: 3,457.85 | | |
| Sample Method(s): CONTINUOUS FROM 9' TO 223' USING SPLIT SPOON AND CORE BARREL | | | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | FL / FL Sampled | Well Design |
|---|---|---|---|---|
| Silty CLAY (CL): same as above. | | 155 | 8.5 CB 151-161 | |
| | NR | 160 | 10 | |
| | | | 9.3 CB 161-171 | |
| | NR | 165 | | 5% (dry) Bentonite/ Type I Portland Cement Grout |
| | NR | 170 | 10 | 4½" O.D. Sched. 40 PVC Casing |
| | | | 10 CB 171-181 | |
| | | 175 | | |
| | | 180 | 10 | |
| | | | 9.5 CB 181-191 | |
| – Increased mustard yellow mottling below 180'. | | 185 | | |
| – 45° slickenside at 186' with calcite crystalization along slip plane; increased greenish grey dendritic mottling below 186'; sl. increased crumbly texture below 186'. | | 190 | 10 | |
| | | | 9.4 CB 191-201 | |
| | | 195 | 10 | |

FILE NAME: A-LOG9G2.DWG

# Terra Dynamics Incorporated

# SOIL BORING & WELL COMPLETION LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid/Well No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 12/15/92: 1/2/93 | B-21 | 9-G(2) |

| | | |
|---|---|---|
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/25/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 223' | Top of PVC Casing Elev.: 3,457.85 |
| Sample Method(s): CONTINUOUS FROM 9' TO 223' USING SPLIT SPOON AND CORE BARREL | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Recovered Ft. / Ft. Sampled | Well Design |
|---|---|---|---|---|
| 196'-208.8' Slightly Silty CLAY (CL): heavily mottled primarily greenish gray and purplish gray with dendritic coloring of reddish brown and mustard yellow; sl. soapy; blocky fracture and crumbly; dry. | | 195 | 9.6 | |
| | | 200 | CB 191-201 | |
| | | | 10 | 201' |
| | | | 9.2 | |
| - reduced greenish gray mottling below 201'. | | 205 | CB 201-211 | 205' |
| 208.8'-223' SILT(ML): greenish gray siltstone; trace vfg mica frags.; hard; blocky fracture; moist. | | | | 209' |
| | | 210 | 10 | 211' |
| - reddish brown clayey siltstone layers; clasts and vertical seams from 213'-224'. | | | 10 | |
| | | 215 | CB 211-221 | |
| - faint cross-lamination below 220'. | | 220 | 10 | 221' |
| | | | | 221.3' |
| TOTAL DEPTH = 223' | | | | 223' |
| | | 225 | | |
| | | 230 | | |
| | | 235 | | |

Well Design:

- 1 Bucket (5 Gal.) of 3/8" Bent. Pellets
- 1 Bucket (5 Gal.) Bentonite (Hand-Milled) Fragments
- 4x10' 0.020 PVC Screen
- 2.5 100lb. Bags TMC 8/16 Sieve Filter Sand
- 4½"
- 7⅞"

FILE NAME: A-LOG9G2.DWG

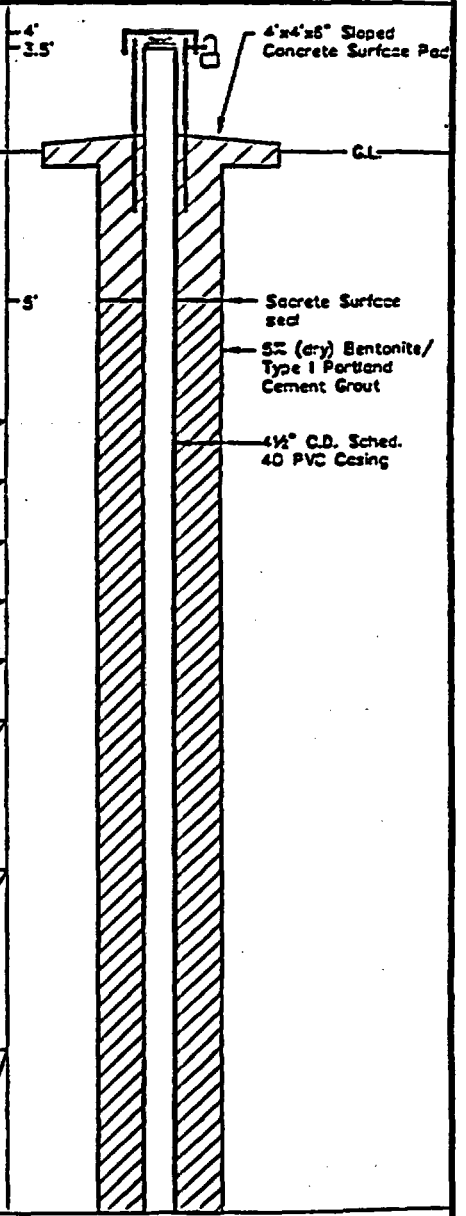
# *Terra Dynamics Incorporated*

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92; 1/23/93 | Boring No.: B-21 | Grid/Well No.: 9-G(3) |
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/25/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 | | |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 | | |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 300' | Top of PVC Casing Elev.: 3,457.65 | | |

Sample Method(s): CONTINUOUS FROM 9' TO 231' USING SPLIT SPOON AND CORE BARREL; GRAB SAMPLES EVERY 5' FROM 231' TO TD.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Recovered FL / FL Sampled |
|---|---|---|---|
| | | 5 | |
| 0'-9' CALICHE: white; some white silty clay, some white pebbles. | NR | 0, 5 | |
| 9'-11' CALICHE<br>BASE OF OGALLALA – TRIASSIC TOP | NR | 10 | 0 / SS 9-11 / 2 |
| 11'-15.5' Silty CLAY (CL): dusky red; hard; waxy; dry; some whitish-grey mottling. | NR, NR, NR | 15 | .25 / SS 11-13 / 2; 1.5 / SS 13-15 / 2 |
| 15.5'-23' Slightly Silty CLAY (CL): maroon; hard; waxy; dry; some gray mottling. | NR, NR, NR | 20 | 1.5 / SS 15-17 / 2; 1.6 / SS 17-19 / 2; 3 / CB 19-24 / 5 |
| 23'-25' Slightly Silty SAND (SM): pinkish-red, well sorted vf-fg angular sand; some yellow and green mottling; HCl perm non-reactive; dry. | | | |
| 25'-26' CLAYEY SAND (SL): white, chalky; HCl reactive; vf sand grains; dry. | | 25 | 5.9 / CB 24-30 / 6 |
| 26'-30' Slightly Silty SAND (SM): pinkish-red, vf-fg angular sand grains; HCl perm numerous gray rip-up clasts; some yellow, green mottling; dry; lighter color with depth. | | | |
| 30'-42.5' Slightly Silty SAND (SM): white, fine grained slightly angular sand; biotite and mica flakes; numerous rip-up white and grey clay clasts; slightly HCl reactive; permeable. | | 30, 35 | 10 / CB 30-40 |




FILE NAME: A-LOGSG.DWG

# Terra Dynamics Incorporated

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92: 1/23/93 | Boring No.: B-21 | Grid/Well No.: 9-G(3) |

| | | |
|---|---|---|
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/26/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 300' | Top of PVC Casing Elev.: 3,457.65 |

Sample Method(s): CONTINUOUS FROM 9' TO 231' USING SPLIT SPOON AND CORE BARREL; GRAB SAMPLES EVERY 5' FROM 231' TO TD.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Recovered Ft. / Ft. Sampled | Well Design |
|---|---|---|---|---|
| Slightly Silty SAND (SM); same as above. | | 35 | CB 30-40 / 10 | |
| | | 40 | 8.1 | |
| 42.5'-50' Silty CLAY (CL); dusky red; mod. hard; dry; numerous silty sand laminations with depth (slightly HCl reactive); some gray, white mottling. | NR | 45 | CB 40-50 / 10 | 5% (dry) Bentonite/ Type I Portland Cement Grout; 4½" O.D. Sched. 40 PVC Casing |
| 50'-60' Silty CLAY (CL); dusky red; mod. hard; waxy; dry; white and gray mottling, some vf grained sand near top. | NR | 50 | 7.8 | |
| | | 55 | CB 50-60 / 10 | |
| 60'-84' Silty CLAY (CL); dusky red; hard; waxy; dry; white and gray mottling. | NR | 60 | 8.5 | |
| | | 65 | CB 60-70 / 10 | |
| | NR | 70 | 3.4 | |
| | | 75 | CB 70-80 | |

FILE NAME: A-LOG9G.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92: 1/23/93 | Boring No.: B-21 | Grid/Well No.: 9-G(3) |
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/26/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 | | |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 | | |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 300' | Top of PVC Casing Elev.: 3,457.65 | | |

Sample Method(s): CONTINUOUS FROM 9' TO 231' USING SPLIT SPOON AND CORE BARREL; GRAB SAMPLES EVERY 5' FROM 231' TO TD.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Recovered Ft. / Ft. Sampled | Well Design |
|---|---|---|---|---|
| Silty CLAY(CL): same as above. | NR | 75 | CB 70-80 | |
| | NR | 80 | 10 / 6.2 | |
| 84'-90' Silty CLAY (SM): reddish-brown; hard; dry; brown coloring increasing with depth, some vf sand increasing with depth, some gray mottling; dry. | | 85 | CB 80-90 | 5% (dry) Bentonite/ Type I Portland Cement Grout |
| 90'-94' Silty CLAY (CL): dusky red; hard; dry; some vf sand, grey mottling. | | 90 | 10 / 10 | 4½" O.D. Sched. 40 PVC Casing |
| 94'-110' Slightly Silty SAND (SM): grayish white, vf to fg sand, grains are angular; biotite and mica flakes; some yellow, pink and green color, bottom 1 (one) foot more yellow; HCl permeable; dry; v. slightly HCl reactive. | | 95 | CB 90-100 | |
| | | 100 | 10 / 10 | |
| - Color becoming tan below 105 ft.; some brown/yellow streaking with depth; rip-up clay clasts (white). | | 105 | CB 100-110 | |
| 110'-117.5' Slightly Silty SAND (SM): tan/yellow, fg sand, slightly angular grains; dry; numerous biotite and mica flakes; some gray, brown streaking; slightly HCl reactive; thin brown, yellow lamination. | | 110 | 10 / 10 | |
| | | 115 | CB 110-120 | |

FILE NAME: A-LCG9G.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING & WELL COMPLETION LO

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92; 1/23/93 | Boring No.: B-21 | Grid/Well No.: 9-G( |
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/25/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 | | |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 | | |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 300' | Top of PVC Casing Elev.: 3,457.85 | | |
| Sample Method(s): CONTINUOUS FROM 9' TO 231' USING SPLIT SPOON AND CORE BARREL; GRAB SAMPLES EVERY 5' FROM 231' TO TD. | | | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Recovered FL / FL Sampled | Well Design |
|---|---|---|---|---|
| – Red, fg sand, from 116.5' to 17.5'. | | 115 | CB 110-120 10 | |
| 117.5'–131.5' Slightly Silty SAND (SM): tan/yellow, fg sand, slightly angular grains; dry; numerous mica and biotite flakes; slightly HCl reactive; thin yellow lamination. | | 120 | 10 CB 120-130 10 | |
| – Red, yellow and gray laminations. Bottom one foot is gray. | | 125 | | 5% (dry) Bentonite/ Type I Portland Cement Grout |
| | | 130 | 6.5 | 4½" O.D. Sched. 40 PVC Casing |
| 131.5'–196' Silty CLAY (CL): dusky red; numerous gray clay clasts (greenish-white) with occasional mustard yellow mottling; mod. hard; blocky fracture to sl. crumbly; dry. | NR | 135 | CB 130-140 10 | |
| | NR | 140 | DEPTH OFF | |
| | NR | 145 | 9.5 CB 141-151 10 | |
| | NR | 150 | 8.5 CB 151-161 | |
| | NR | 155 | | |

FILE NAME: A-LOG9G.DWG

| Terra Dynamics Incorporated | SOIL BORING & WELL COMPLETION LOG | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92: 1/23/93 | Boring No.: B-21 | Grid/Well No.: 9-G(3) |

| | | |
|---|---|---|
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/26/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 300' | Top of PVC Casing Elev.: 3,457.65 |
| Sample Method(s): CONTINUOUS FROM 9' TO 231' USING SPLIT SPOON AND CORE BARREL; GRAB SAMPLES EVERY 5' FROM 231' TO TD. | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Recovered FL / FL Sampled | Well Design |
|---|---|---|---|---|
| Silty CLAY (CL): same as above. | | 155 | 8.5 CR 151-161 | |
| | | 160 | 10 / 9.3 CR 161-171 | 5% (dry) Bentonite/ Type I Portland Cement Grout; 4½" O.D. Sched. 40 PVC Casing |
| | | 165 | | |
| | | 170 | 10 / 10 CR 171-181 | |
| | | 175 | | |
| | | 180 | 10 / 9.5 CR 181-191 | |
| – increased mustard yellow mottling below 180'. | | 185 | | |
| – 45° slickenside at 186' with calcite crystalization along slip plane; increased greenish gray dendritic mottling below 186'; sl. increased crumbly texture below 186'. | | 190 | 10 / 9.6 CR 191-201 | |
| | | 195 | 10 | |

FILE NAME: A-LOG9G.DWG

# Terra Dynamics Incorporated

# SOIL BORING & WELL COMPLETION LO

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92; 1/23/93 | Boring No.: B-21 | Grid/Well No.: 9-G(3) |

| | | |
|---|---|---|
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/26/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 300' | Top of PVC Casing Elev.: 3,457.65 |

Sample Method(s): CONTINUOUS FROM 9' TO 231' USING SPLIT SPOON AND CORE BARREL; GRAB SAMPLES EVERY 5' FROM 231' TO TD.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Depth (feet) | Recovered Ft. / Ft. Sampled | Well Design |
|---|---|---|---|---|
| 196'-208.8' Slightly Silty CLAY (CL); heavily mottled primarily greenish gray and purplish gray with dendritic coloring of reddish brown and mustard yellow; sl. soapy; blocky fracture and crumbly; dry. | | 195 | 9.8 CB 161-201 | |
| | | 200 | 10 | 5% (dry) Bentonite/ Type I Portland Cement Grout |
| - reduced greenish gray mottling below 201'. | NR | | 9.2 CB 201-211 | 4½" O.D. Sch 40 PVC Casing |
| | NR | 205 | | |
| 208.8'-238' SILT(ML); greenish gray siltstone; trace vfg mica frags.; hard; blocky fracture; moist. | | 210 | 10 | |
| - reddish brown clayey siltstone layers; clasts and vertical seams from 213'-224'. | | | 10 CB 211-221 | |
| | | 215 | | |
| | | 220 | 10 | |
| - faint cross-lamination below 220'. | | | 9.2 CB 221-231 | |
| | | 225 | | |
| | | 230 | 10 | |
| | | | LOG CUTTINGS BELOW 231' | |
| | | 235 | | |

FILE NAME: A-LOG9G.DWG

# *Terra Dynamics Incorporated*

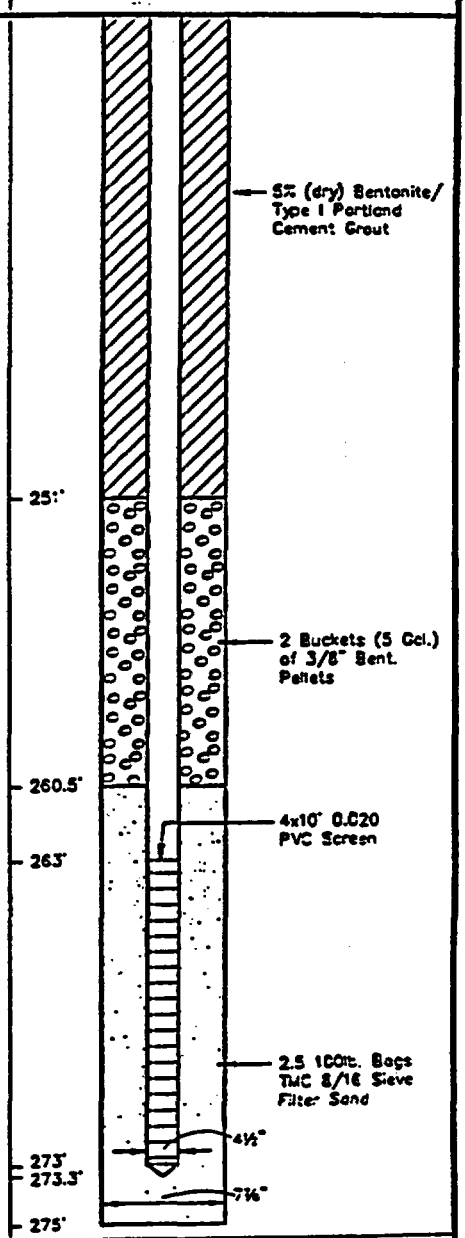
# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92; 1/23/93 | Boring No.: B-21 | Grid/Well No.: 9-G(3) |
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/26/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 | | |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 | | |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 300' | Top of PVC Casing Elev.: 3,457.65 | | |

Sample Method(s): CONTINUOUS FROM 9' TO 231' USING SPLIT SPOON AND CORE BARREL; GRAB SAMPLES EVERY 5' FROM 231' TO TD.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | | Lithic Log | Depth (feet) | Recovered Ft / Ft Sampled |
|---|---|---|---|---|
| | | | 235 | |
| 238'-249' | Silty CLAY (CL): reddish brown and maroon silty claystone with greenish gray mottling. | | 240, 245 | |
| 249'-251' | SILT (ML): greenish gray siltstone. | | 250 | |
| 251'-257' | Silty CLAY (CL): reddish brown and maroon silty claystone with slight purplish gray mottling. | | 255 | |
| 257'-260.5' | Silty CLAY (CL): maroon and purple silty claystone with greenish gray mottling. | | 260 | |
| 260.5'-291' | V. Silty CLAY (ML): reddish brown and maroon very silty claystone with heavy mottling of mustard yellow and purple. | | 265, 270, 275 | |

Well Design




FILE NAME: A-LOG93.DWG

# Terra Dynamics Incorporated

# SOIL BORING & WELL COMPLETION LO

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92; 1/23/93 | Boring No.: E-21 | Grid/Well No.: 9-G(3) |

| | | |
|---|---|---|
| Log By: M. JOHNSON; A. WEEGAR | WELL COMPLETED ON: 1/26/93 | Survey Data: Northing: 6260.8293 Easting: 10544.8903 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | | Ground Surface Elev. (MSL): 3,454.55 |
| Drilling Method & Bit Sizes: AIR ROTARY | Total Depth: 300' | Top of PVC Casing Elev.: 3,457.65 |

Sample Method(s): CONTINUOUS FROM 9' TO 231' USING SPLIT SPOON AND CORE BARREL; GRAB SAMPLES EVERY 5' FROM 231' TO TD.

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered Ft. / Ft. Sampled | Well Design |
|---|---|---|---|---|
| | | 275 | | |
| V. Silty CLAY (ML): same as above. | | 280 | | |
| | | 285 | | |
| | | 290 | | |
| 291'-300' Silty CLAY (CL): dark reddish brown silty claystone. | | 295 | | |
| TOTAL DEPTH = 300' | | 300 | | |
| | | 305 | | |
| | | 310 | | |
| | | 315 | | |

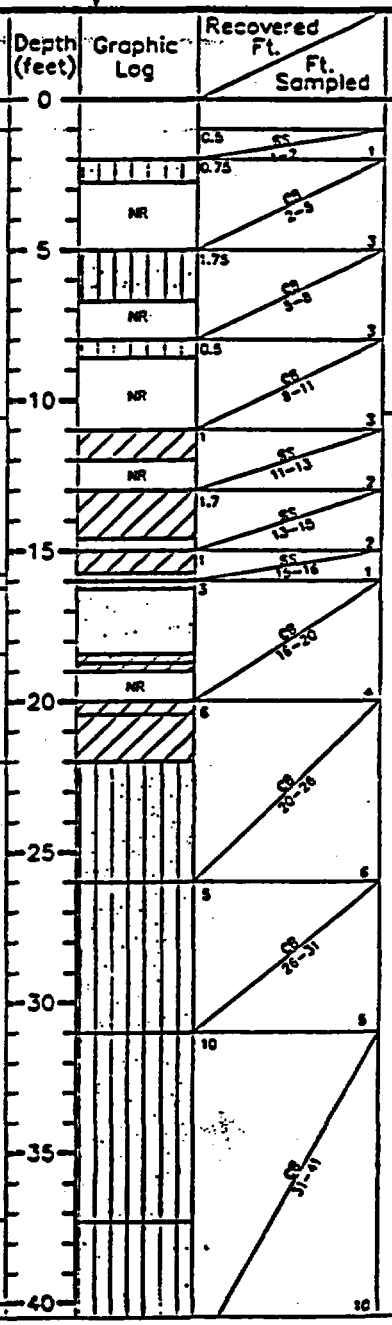
FILE NAME: A-LOG93.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12-10-92 | Boring No.: B-14 | Grid No.: 9-H |
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 5807.9313 Easting: 10333.6242 | | |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,439.66 | | |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | | | |
| Remarks: | | | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | |
|---|---|
| 0' – 1' | TOP SOIL: brown silty sand; organic plant material & roots; moist. |
| 1' – 10.5' | CALICHE: pinkish tan sandy silt; mod. hard; crumbly; calcite crystals along laminations and in vugs; dry; basal contact from driller. |
| 10.5' – 15.7' | Silty CLAY(CL): mottled dusky red, yellow, pink and gray; crumbly; non-plastic; carb. plant material; mica frags.; sl. sandy; dry. |
| 15.7' – 16.2' | Silt (SL): greenish gray siltstone; soft; crumbly; chalky; very strong reaction w/ HCl; mica frags; dry. |
| 16.2' – 18.3' | Silty SAND (SM): reddish brown sand w/ greenish gray, silty matrix; sand is granitic fg. subang. to ang.; contains dk. min. frags. and mica frags; mod. hard; crumbly; blocky fracture; strong reaction w/ HCl to matrix; dry. |
| 18.3' – 22' | Silty CLAY (CL): alternating layers of greenish gray and mottled dusky red and yellow; crumbly; soft to mod. hard; blocky fracture; carb. plant material mica frags; dry. |
| 22' – 37.2' | Silty SAND (SM): reddish brown sand w/ greenish gray, silty matrix; sand is granitic fg. subang. to ang.; mod. reaction w/ HCl to matrix; natural vertical fractures; thinly bedded and cross bedded sandstone and sandy siltstone; mod. perm. to acid; dry. |
| 37.2' – 43' | V. Sandy SILTSTONE (ML): greenish gray siltstone and olive tan sandstone; sand is vfc. subr.; hard; sl. crumbly; med. reaction to HCl; mica frags.; dk. min frags; horiz. to crossbedded; dry. |




FILE NAME: A-LOGSH.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12-10-92 | Boring No.: B-14 | Grid No.: 9-H |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 5807.9313 Easting: 10333.6242 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,439.66 |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|---|
| | | 40 | | 10 / 10 | |
| 43' – 60.1' | Silty SAND (SM): olive, red and pink sand w/ greenish gray matrix; sand is vfg – cg angular to subrounded and poorly sorted; mica & dk. min. frags. throughout; mod. hard; sl. crumbly; mod. perm. to HCl; no reaction w/ HCl; horiz. and crossbedded; slightly higher angle x-bedding and larger grain sand than above; apparent weathered iron oxide zone throughout; dry; basal contact from driller. | 45 | | CB 43-51 | |
| | | 50 | | 10 / 9.1 | |
| | | 55 | | CB 51-61 | |
| 60.1' – 61.70' | CLAY (CL): tannish yellow; soapy; plastic; mod. hard; moist. | 60 | NR | 10 / 0.85 | |
| 61.70' – 65.75' | CLAY (CL): dk. maroon; sl. plastic; soapy; sticky; mod. hard; moist; core jammed in barrel. | | NR | CB 61-65 / 4 | |
| ? ? ? | | 65 | NR | 3.25 | |
| 65.75' – 75' | Clayey Sandy SILT (ML): dusky red sandy, clayey siltstone; dk. min. frags. and mica throughout; hard; blocky fracture; no reaction w/ HCl; non – permeable to HCl; dry. | | | CB 65-69 / 4 | |
| | | 70 | | 5.1 | |
| | | | | CB 69-75 / 6 | |
| 75' – 100' | V. Clayey SILT (ML): dusky red siltstone; hard; coincidal fracture; mica and dk. min. frags.; thinnly laminated; dry; occasional streaks of light greenish gray clay. | 75 | | 3.2 | |
| | | | | CB 75-85 / 10 | |
| | | 80 | | | |

FILE NAME: A-LOG9H.DWG

| *Terra Dynamics Incorporated* | **SOIL BORING LOG** |
|---|---|

| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12-10-92 | Boring No.: B-14 | Grid No.: 9-H |
|---|---|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 5807.9313 Easting: 10333.6242 | | |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,439.66 | | |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | | | |
| Remarks: | | | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| V. Clayey SILT (ML): same as above. | 80 | | 8.2 / 10 (SS 75-85) | |
| | 85 | NR | 3.2 / 6 (SS 85-91) | |
| | 90 | NR | 8.7 / 8 (SS 91-100) | |
| TOTAL DEPTH = 100' | 95 | | | |
| | 100 | | | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG9-1.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/23/93 | Boring No.: B-50 | Grid No.: 10-B |

| | | |
|---|---|---|
| Log By: R. M'GOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 8738.0161 Easting: 11148.0894 Ground Surface Elev. (MSL): 3,480.41 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| 0.0'–1.0' TOP SOIL: dk. brown, sand, silt, organic material, loose, dry. | 0 | | | |
| 1.0'–10' CALICHE: lt. tan, calcitic cemented silt and sand, vfg–fg quartz sand, soft, dry. – reddish tan 8'–10'. | 5 | | DRILL OUT: LOG CUTTINGS | |
| 10'–20' SAND (SW): tan to reddish tan vfg–fg quartz sand; scattered calcitic cemented sand clasts; soft; dry. | 10, 15 | | | |
| 20'–30' CALICHE: lt. tan–gray calcitic and micritic cemented sand and silt, vfg–fg quart sand; micritic cement has concretion rings; sandstone lithoclasts with silica concretions in micritic matrix; hard; dry. | 20, 25 | | | |
| 30'–32.5' SAND and GRAVEL (SW): lt. tan,–gray vfg–fg quartz sand and pebbles; pebbles rounded to angular. | 30 | | | OGALLALA TRIASSIC |
| 32.5'–71.5' CLAY (CL): red with whitish mottling; friable; soft; dry. – silt nodules approx. 1.5" at 36' and 38'. | 35, 40 | | 2 SS 33–35 2; 2 SS 35–37 2; 2 SS 37–38 2; 2 SS 38–41 2 | |

FILE NAME: A-LOG10B.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/23/93 | Boring No.: B-50 | Grid No.: 10-B |

| | | |
|---|---|---|
| Log By: R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 8738.0161 Easting: 11148.0894 Ground Surface Elev. (MSL): 3,480.41 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| – cohesive; plastic; damp; yellow and purple slight mottling. | 40 | | 2 / SS 39–41 2; 2 / SS 41–43 2 | |
| – purplish red with yellow at 43'–45'. | | | 1.8 / SS 43–45 2 | |
| – yellow mottling back at 47'. | 45 | NR | DRLG drag bit | |
| | | | 2 / SS 47–49 2 | |
| | 50 | NR ? | 3.7 / CB 49–59 | |
| | 55 | NR ? | | |
| – healed fracture oriented 30° from vertical. | | NR ? | 10 | |
| | 60 | NR | 3.6 / CB 59–69 | |
| | 65 | NR ? | 10 | |
| | 70 | NR | 8.0 / CB 69–79 | |
| 71.5'–73.5' Silty CLAY (CL); greenish white nodules (3"–4" nodules); dry; brittle; vertical fractures 72'–73'. | | | | |
| 73.5'–100' CLAY (CL); filled (1/4") frac.; calcite Spar, oriented 60° from vertical at 78.0'. | 75 | | 10 | |
| – red orange with yellow and purple mottling and greenish white nodule. | 80 | | | |

FILE NAME: A-LOG10B.DWG

| *Terra Dynamics Incorporated* | **SOIL BORING LOG** |
|---|---|

| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/24/93 | Boring No.: B-50 | Grid No.: 10-B |
|---|---|---|---|---|

| | | |
|---|---|---|
| Log By: R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 8738.0161 Easting: 11148.0894 Ground Surface Elev. (MSL): 3,480.41 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| | 80 | | 4.9 | |
| - 1/2" wafer of spary calcite cemented clay and silt. | | NR ? | | |
| - approx. 86' red, yellow and purple mottled, no whitish nodules. | 85 | NR ? | CB 79-89.5 | |
| | | NR ? | 10.5 | |
| | 90 | | 10.6 | |
| - 95'-97' whitish green clay nodules scattered 0.5"-0.75". | 95 | | CB 89.5-100.1 | |
| TOTAL DEPTH = 100' | 100 | | 10.6 | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG10B.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 01/12/93 | B-36 | 10-C |

| | | |
|---|---|---|
| Log By: A. WEEGAR/R. M^cGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 8284.7750 Easting: 10936.8294 Ground Surface Elev. (MSL): 3,475.51 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): CORE BARREL; SPLIT SPOON | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|
| 0'-0.3' TOP SOIL: dk. brown, loose sand and silt; organic material; moist. | 0 | | | |
| 0.3'-17' CALICHE: whitish to lt. tan, calcite cemented silt and sand; vfg quartz sand; soft. | 5, 10, 15 | | DRILLED OUT WITH ROCK BIT TO 31' – LOG CUTTINGS | |
| 17'-29' CALICHE: gray to lt.tan, calcitic-micritic cemented silt and sand; vfg quartz and feldspar sand; micritic fragments show concretions; sandstone lithoclasts with silica rims in calcitic matrix; concoidal silica fragments; hard. | 20, 25 | | | OGALLALA |
| 29'-99' CLAY (CL): red; scattered calcitic sand particles; soft and moist. – small nodules of green clay. – absense of calcite grains; less moist. | 30, 35, 40 | NR, NR, NP | 1, 2, 2, 2, 1.8 / SS 31-33, SS 33-35, SS 35-37, SS 37-39, SS 39-41 / 2, 2, 2, 2, 2 | TRIASSIC |

FILE NAME: A-LOG10C.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/13/93 | Boring No.: B-36 | Grid No.: 10-C |

| | | |
|---|---|---|
| Log By: R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 8284.7750 Easting: 10936.8294 Ground Surface Elev. (MSL): 3,475.51 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): CORE BARREL; SPLIT SPOON | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|
| – Purplish color at 41'. –30–40% green clay, 41'–42' (Nodular). – Mostly red clay <10% green. – Yellow clay mottling. – Less purple color. | 40, 45, 50, 55 | NR, NR ?, NR ? | 1.8, 1.9, 2, 1.8, 1.8, 2.5, 6.9 | SS 40–41, SS 41–43, SS 43–45, SS 45–47, SS 47–49, CB 49–54 |
| 59'–85' CLAY (CL): red-orange with yellow-green mottling and some green nodules. – Vertical fracture from 60'–60.8'; black secondary mineralization. – Quasi brittle. – Vertical fracture with black mineralization. – 45° fracture; healed with yellow clay. – Yellow/green clay nodules with purple clay concretions. – Brittle – Green clay nodule approx. 0.15 ft. | 60, 65, 70, 75, 80 | NR ?, NR | 6, 8 | CB 54–64, CB 64–74, CB 74–84 |

FILE NAME: A-LOG10C.DWG

| *Terra Dynamics Incorporated* | **SOIL BORING LOG** |
|---|---|

| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/13/93 | Boring No.: B-36 | Grid No.: 10-C |
|---|---|---|---|---|

| | | |
|---|---|---|
| Log By: R.McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): CORE BARREL; SPLIT SPOON | Northing: 8284.7750<br>Easting: 10936.8294 |
| Driller: | Total Depth: 100' | Ground Surface Elev. (MSL): 3,475.51 |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|
| | 80 | | 8 / CB 74-84 / 10 | |
| 85'-96' CLAY (CL): pinkish yellow due to increased content of yellow to whitish green clay.<br>- green clay nodules approx. 0.15 ft.<br>- 45° healed fracture 91'.<br>- 30° healed fracture 89'<br>- hard and brittle and dry.<br>- purple 95'-96' | 85<br>90<br>95 | NR<br>NR ? | 9.9 / CB 84-94 / 10<br>4.9 / CB 94-100 / 6 | |
| 96'-100' CLAY (CL): orange yellow.<br>- 45° frac. healed 99.5' and 98.5'.<br>TOTAL DEPTH = 100' | 100 | | | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG10C.DWG 1=360

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 01/18/93 | B-44 | 10-D |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7831.6956 Easting: 10725.4492 Ground Surface Elev. (MSL): 3,469.62 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| | Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|---|
| 0'-0.2' | TOP SOIL: brown; silty sand; organic material; moist. | 0 | | | |
| 0.2'-5' | CALICHE: yellowish white; trace dark and pink vfg sand fragments; soft; med. hard pinkish tan layers; dry. | | | | |
| 5'-18' | CALICHE: yellowish white; hard; trace vfg to cg dark and pink sand frags.; dry. | 5, 10, 15 | | DRILL OUT TO 25'; LOG CUTTINGS | |
| 18'-23' | Gravelly SAND (SW): tan; fg to cg sand; angular to subrounded; dark, white, pink and opaque gravel throughout; angular; loose; dry. | 20 | | | OGALLALA |
| 23'-42.8' | Silty CLAY (CL): maroon clay; dense; sl. plastic; moist. | 25, 30, 35, 40 | NR; NR; (CRAB); (CRAB); (CRAB); (CRAB); NR | 1.4 SS 26-28 2; 1.7 SS 28-30 2; 0 SS 30-32 2; 0 SS 32-34 2; 0 SS 34-36 2; 0 SS 36-38 2; 1.6 SS 38-40 2 | TRIASSIC |

FILE NAME: A-LOG10D.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/18/93 | Boring No.: B-44 | Grid No.: 10-D |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7831.6956 Easting: 10725.4492 Ground Surface Elev. (MSL): 3,469.62 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| | 40 | | 1.7 / SS 40-42 | |
| | | | 0.7 / SS 42-43 | |
| 42.8'-53.4' Silty SAND (SM): multicolored grayish green, yellow, tan and pink silty sandstone and thin intervals of sandy siltstone; "salt and pepper" appearance of vfg to fg quartz and feldspar sand with fg to cg mica and biotite flakes; gray and yellow clay clasts throughout; increased clay clasts in basal 3'; trace black mineralization along bedding; mod. hard; calcium carbonate cemented; blocky fracture and crumbly; dry. | 45 | | 7 / CB 43-51 | |
| | 50 | | 8 | |
| 53.4'-58.6' Silty CLAY (CL): purple red with heavy mottling of yellow and gray; fg-cg mica frags; crumbly; dry. | 55 | | 7 / CB 51-61 | |
| 58.6'-60' Silty CLAY (CL): rusty red silty claystone; crumbly; dry. | | | | |
| 60'-61' Silty CLAY (CL): purple red with heavy mottling of yellow and gray; vfg mica frags.; tubes and inclusions of silty/sandy material similar to that found at 42.8'-53.4'; crumbly; dry. | 60 | | 10 | |
| 61'-73' Silty CLAY (CL): alternating layers of purple/rusty red and heavily mottled yellow and pinkish red silty claystone; occasional clasts and tubes of greenish gray clay; blocky fracture to crumbly; mod. hard; dry. | 65 | | 5.8 / CB 61-71 | |
| | 70 | | 10 | |
| 73'-82' Silty CLAY (CL): dusky red silty claystone; greenish gray clasts and tubes throughout; dense; blocky fracture; dry. - primary slickenside at 78.5' with calcium carbonate cementation along fracture plane (30°-45° angle). | 75 | | 9.2 / CB 71-81 | |
| | 80 | | 10 | |

FILE NAME: A-_0G10D.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/18/93 | Boring No.: B-44 | Grid No.: 10-D |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7831.5956 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Easting: 10725.4492 |
| Driller: | Total Depth: 100' | Ground Surface Elev. (MSL): 3,469.62 |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| | 80 | | | |
| 82'-88' Silty CLAY (CL): rusty red and heavily mottled with yellow and grayish purple; greenish gray clasts and tubes throughout; blocky fracture; dry. | 85 | | 8.1 / CB 81-91' | |
| 88'-100' Silty CLAY (CL): purple claystone with yellow and greenish gray mottling; crumbly; greenish grey tubes throughout; dry. | 90 | NR NR | 10 | |
| | 95 | NR NR NR NR | 5.5 / CB 91-100 | |
| TOTAL DEPTH = 100' | 100 | | 9 | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG1CO.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92 | Boring No.: E-19 | Grid No.: 10-E |

| | | |
|---|---|---|
| Log By: A. WEEGAR; R. M^cGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7378.4802 Easting: 10514.3261 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,467.76 |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| 0'-1' — TOP SOIL: brown silty sand; organic material; soft; loose; moist. | 0 | | | |
| 1'-13' CALICHE: pinkish white; calcium carb. cemented; hard; microcrystalline; dry. | 5, 10 | NR (CRAB) | DRILL OUT TO 19' W/ROCK BIT | |
| 13'-19' Gravelly SAND (SW): pink sand with white, red, black and opaque gravel; sand is vfg-cg quartz; well rounded; gravel is subr. to well rounded quartzite; loose; dry. | 15 | NR (CRAB) | | |
| 19'-36' Slightly Silty CLAY (CL): dusky red with whitish grey mottling; dense; sl. plastic; moist. — color change to maroon with whitish grey mottling below 21'. | 20, 25, 30, 35 | | 19-21: 2, SS, 2; 21-23: 2, SS, 2; 23-25: 2, SS, 2; 25-27: 2, SS, 2; 27-29: 2, SS, 2; 29-31: 2, SS, 2; 31-33: 1.5, SS, 2; 33-35: 1.5, SS, 2; 35-37: 1.6, SS, 2 | GOALLALA TRIASSIC |
| 36'-37.9' Slightly Silty CLAY (CL): dusky red; crumbly; mod. hard; dry. | | | | SS/37-37.5 |
| 37.9'-41' Clayey Silt (ML): greenish white, grey and yellow siltstone; mica frags.; mod. hard; chalky; crumbly; dry. | 40 | | 3.5, CS, 37.5-41 | |

FILE NAME: A-LOG1CE.DWG

# Terra Dynamics Incorporated

# SOIL BORING LO

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92 | Boring No.: B-19 | Grid No 10-E |

| | | |
|---|---|---|
| Log By: A. WEEGAR; R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7378.4802 Easting: 10514.3261 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,467.76 |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| | Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|---|
| 40'-51' | Silty SAND (SM): speckled appearance of red, pink, white and green sand frags. with white, yellow and green matrix; sand is vfg-fg; subr. to rounded; small to large biotite and mica flakes throughout; mod. perm. to HCl; no reaction with HCl; low angle cross-bedding; mod. hard; chalky; sl. crumbly; dry. | 40, 45, 50 | | 3.5 / 3.5 / 10; CB 41-51 / 10 | |
| 51'-53.9' | Silty SAND (SM): top 0.3'; speckled red, white and green sand frags., white, yellow and green matrix; sand fg. uncemented. additional as above, no rip-up clasts; drilling break at 53'. | | NR | 6.4 | |
| 53.9'-60' | Slightly Silty CLAY (CL): maroon; crumbly; mod. hard; very slightly moist. | 55, 60 | | CB 51-60 / 9 | |
| 60'-62.8' | No sample recovered. | | NR | 7.2 | |
| 62.8'-70' | Slightly Silty CLAY (CL): dusky red; crumbly; mod. hard; dry; numerous gray-white silty clay clasts with black speckles, (soapy clasts) some silt clasts, (tan). | 65, 70 | | CB 60-70 / 10 | |
| 70'-80' | Slightly Silty CLAY (CL): dusky red; crumbly; mod. hard; dry; gray-white, tan mottling. | 75, 80 | | 9.9; CB 70-80 / 10 | |

FILE NAME: A-LOG1CE.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16/92 | Boring No.: B-19 | Grid No.: 10-E |

| | | |
|---|---|---|
| Log By: A. WEEGAR; R. M^cGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7378.4802 Easting: 10514.3261 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,467.76 |
| Driller: LANE SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| 80'-90' Slightly Silty CLAY (CL); dusky red; slightly maroon; mod. hard; gray-white, tan mottling; crumbly; dry. | 80 | NR | 5.6 / CB 80-90 / 10 | |
| | 85 | | | |
| 90'-100' Slightly Silty CLAY (CL); maroon; mod. hard; less mottling; slightly sticky; dry. | 90 | NR | 7.0 / CB 90-100 / 10 | |
| | 95 | | | |
| TOTAL DEPTH = 100' | 100 | | | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG10E.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LO

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/19/92 | Boring No.: B-25 | Grid N: 10-F |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 6925.4458 Easting: 10302.9162 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,467.67 |
| Driller: LIZARO CASTILLO JOHN SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| | Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|---|
| 0'-0.3' | TOP SOIL: brown silty sand; organic material; moist. | 0 | | | |
| 0.3'-5' | CALICHE: grayish white; calcium carb. cemented silt w/ vfg pink sand frags.; concentric growth rings; v. hard; dry. | | NR (GRAB) | DRILL OUT WITH ROCK BIT TO 19.5'- LOG CUTTINGS | |
| 5'-11' | CALICHE: grayish pink; quartz sand and gravel throughout; mod. hard (i.e., softer than above); dry. | 5 | NR (GRAB) | | |
| | | 10 | | | |
| 11'-19.5' | Silty Gravelly SAND (SW): pink and opaque sand grains, white dark and red gravel with pinkish tan silt matrix; sand is vfg-fg; sand and gravel is subrounded to rounded quartz; loose; dry. | 15 | NR (GRAB) | | OGALLALA |
| 19.5'-31' | CLAY (CL): maroon w/mottling of pinkish gray; dense; sl. soapy; blocky fracture; crumbly in upper 2'; moist. | 20 | NR | 1.9 / SS 19.5-21.5 / 2 | TRIASSIC |
| | | | NR | 1.7 / SS 21.5-23.5 / 2 | |
| | | 25 | NR | 2 / SS 23.5-25.5 / 2 | |
| | | | NR (GRAB) | 0 / SS 25.5-27.5 / 2 | |
| | | | NR (GRAB) | 0 / SS 27.5-29.5 / 2 | |
| | | 30 | NR (GRAB) | DRILL OUT | |
| 31'-38' | Silty CLAY (CL): dusky red w/ pinkish gray mottling; trace vfg mica frags; mod. dense; moist. | | NR | 1.7 / SS 31-33 / 2 | |
| | | | NR | 1.7 / SS 33-35 / 2 | |
| | | 35 | NR | 1.75 / SS 35-37 / 2 | |
| | | | NR | 1.6 / SS 37-39 / 2 | |
| 38'-83.2' | Slightly Sandy Silty CLAY (CL): (see next page for description). | 40 | | 2.3 / CB 39-49 | |

FILE NAME: A-LOG1DF.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/19/92 | Boring No.: B-25 | Grid No.: 10-F |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 6925.4458 Easting: 10302.9162 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,467.67 |
| Driller: LIZARO CASTILLO JOHN SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|
| 38'-63.2' Slightly Sandy Silty CLAY (CL): multicolored mottling of light greenish grey, yellow, dusky red and purple sandy siltstone and claystone; silty claystone clasts and layers floating within a sandy siltstone matrix; sand is vfg quartz with small mica flakes throughout; carb. plant material; calcareous veins throughout; mod. dense; sl. crumbly; blocky fracture; claystone is sl. soapy; dry; becoming siltier toward base. | 40 | | 6.3 / CS 38-43 / 10 | |
| | 45 | | | |
| | 50 | NR (GRAB) | 0 / CS 43-53 / 10 | |
| | 55 | | | |
| | 60 | | 0 / CS 53-63 / 4 | |
| 63.2'-99' Silty CLAY (CL): interbedded purple and dusky red silty clay with clasts and layers of greenish gray clayey silt; vfg mica frags. within silty layers; carb. plant material common in clayey zones; mod. hard to 67'; very crumbly below 67'; dry. | | NR | 3.8 / CS 63-67 / 4 | |
| | 65 | | | |
| | | NR | 3 / CS 67-72 / 5 | |
| | 70 | NR | | |
| | | NR | | |
| | | | 1.5 / CS 72-77 / 5 | |
| | 75 | NR | | |
| | | NR | | |
| | | NR (GRAB) | 0.5 / CS 77-81 / 4 | |
| | 80 | | | |

FILE NAME: A-LOG10F.DWG

R

# Terra Dynamics Incorporated

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/19/92 | Boring No.: B-25 | Grid No.: 10-F |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 6925.4458 Easting: 10302.9162 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,467.67 |
| Driller: LIZARO CASTILLO JOHN SCARBOROUGH | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|
| Silty CLAY (CL): interbedded purple and dusky red silty clay with clasts and layers of greenish gray clayey silt; vfg mica frags. within silty layers; carb. plant material common in clayey zones; very crumbly; dry. | 80 | NR | CB 77-81 | |
| | | NR | 1.9 / 4 | |
| | | NR | | |
| | | NR | | |
| | 85 | NR | CB 81-87 | |
| | | NR | 6 | |
| | | NR | 1 | |
| | | NR | | |
| | 90 | NR | CB 87-92 | |
| | | NR | 5 | |
| | | NR | 3 | |
| | | NR | | |
| | 95 | NR | CB 92-100 | |
| | | NR | | |
| | | NR | | |
| | | NR | | |
| 99-100' Very Silty CLAY (CL): dusky red with light greenish gray inclusions; dense; slightly soapy; | 100 | | 8 | |
| TOTAL DEPTH AT 100' | | | | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG10F.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/11/93 | Boring No.: B-35 | Grid No.: 11-C |

| | | |
|---|---|---|
| Log By: A. WEEGAR/R. M^cGOWEN | Drilling Method & Bit Sizes: 0-31.7 MUD ROTARY (HOLT) 31.7- AIR ROTARY (SCARBOROUGH) | Survey Data: Northing: 8496.1842 Easting: 10483.4609 Ground Surface Elev. (MSL): 3,474.91 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): CORE BARREL; SPLIT SPOON | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Depth (feet) | Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|
| 0'-0.1' | TOP SOIL: brown silty sand; organic material; loose; moist. | NR (GRAB) | DRILL OUT WITH AUGER | |
| 0.1'-5.5' | SILT (ML): yellow to light tan caliche cemented silt; mod. soft; dry. | | | |
| 5.5'-12.5' | Gravelly Silty SAND (SM): yellow to light tan calcium cemented silt (same as above); overlying light tan/pink caliche cemented silty sand; overlying caliche cemented pink sand with dark and red gravel; mod. soft with increasing hardness towards base. | NR | 0.5 CB 5.5-11.5 6 | |
| 12.5'-19.3' | CALICHE: pinkish brown calcium carb./dolomitic cemented sand, silt, gravel with concentric growth clasts; appears as growth clasts floating in matrix of silty sandy gravel; sand is vfg-fg quartz and feldspar; gravel is dark and red; v. hard; non-fractured. | NR | 3.8 CB 11.5-16.5 5 | |
| 19.3'-23.8' | CALICHE: whitish tan calc. carb./dolomitic cemented silty sand with clasts of pink gravelly sand; whitish tan silty sand is vfg qtz. and feldspar with trace dark gravel; pink clasts are granitic vfg sand and gravel; partially healed vertical fracture; v. hard. | | 5.2 CB 16.5-21.7 5.2 | |
| 23.8'-28.7' | CALICHE: pinkish tan sand with gravel; sand is vfg-fg qtz. and felspar; sub rounded; gravel is angular red, black and opaque; trace vugs (<2 mm) and diagonal fractures; reduced cementation in basal 0.5'; v. hard; basal contact from drill-break. | NR | 4.1 CB 21.7-26.7 5 | |
| 28.7'-30.7' | Sandy GRAVEL (GW): pink sand with opaque, white, dark and red gravel and cobbles; sand is vfg; gravel and cobbles angular to well rounded; v. loose; basal contact from drill break; red clay below 30.7'. | NR | 1.1 CB 26.7-31.7 5 | OGALLALA |
| 30.7'-42' | CLAY (CL): dusky red; hard; dense; with white calc. carb. inclusions; moist; yellow and purple mottling below 38'. | NR | DRILL OUT 1.85 SS 32-34 2 | TRIASSIC |
| | | | 2 SS 34-36 2 | |
| | | | 2 SS 36-38 2 | |
| | | | 2 SS 38-40 2 | |

FILE NAME: A-LOG11C.DWG

# Terra Dynamics Incorporated

# SOIL BORING LC

| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/11/93 | Boring No.: B-35 | Grid N 11-C |
|---|---|---|---|---|

| | | |
|---|---|---|
| Log By: A. WEEGAR/R. McGOWEN | Drilling Method & Bit Sizes: 0-31.7 MUD ROTARY (HOLT) 31.7- AIR ROTARY (SCARBOROUGH) | Survey Data: Northing: 8496.1842 Easting: 10483.4609 Ground Surface Elev. (MSL): 3,474.91 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): CORE BARREL: SPLIT SPOON | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|
| 42'-100' CLAY (CL): heavily mottled purple, gray and yellow; claystone; mod. hard; brittle; primarily blocky fracture with some zones of fissile claystone; greenish gray inclusions throughout; trace ferros oxide nodules; dry. | 40 | NR | 1.6 SS 40-42 2 | |
| | | NR | 1.5 SS 42-44 2 | |
| | 45 | NR | 1.8 CB 44-48 4 | |
| | | NR | 1.1 CB 48-51 3 | |
| | 50 | NR | 2 CB 51-57 6 | |
| | 55 | NR | 2.35 CB 57-63 6 | |
| | 60 | NR | 4.7 CB 63-69 6 | |
| - calc. carb. cemented layers and nodules common below 69'. | 65 | NR | 7.3 CB 69-79 10 | |
| | 70 | NR | | |
| | 75 | NR | | |
| | 80 | NR | 4.2 CB | |

FILE NAME: A-LOG11C.DWG

# Terra Dynamics Incorporated

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/11/93 | Boring No.: B-35 | Grid No.: 11-C |

| | | |
|---|---|---|
| Log By: A. WEEGAR/R. M^cGOWEN | Drilling Method & Bit Sizes: 0-31.7 MUD ROTARY (HOLT) 31.7- AIR ROTARY (SCARBOROUGH) | Survey Data: Northing: 8496.1842 Easting: 10483.4609 Ground Surface Elev. (MSL): 3,474.91 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): CORE BARREL; SPLIT SPOON | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Intervals |
|---|---|---|---|---|
| CLAY (CL): same as above. | 80 | | 4.2 / CB 79-85 / 6 | |
| - vertical fracture at 82'-83'; indications of ferrous oxide mineralization along fracture plane. | 85 | NR | 2.8 / CB 85-90 / 5 | |
| - green clay nodule approx. 0.2 ft. | 90 | NR | 7.2 / CB 90-100 / 10 | |
| - purplish color; rubbly; upper 1.0 ft. | 95 | NR | | |
| - green clay nodule approx. 0.1 ft. | | | | |
| - scattered green clay nodules: 0.05'-0.1'. | | | | |
| TOTAL DEPTH = 100' | 100 | | | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG11C.DWG

# Terra Dynamics Incorporated

AUSTIN, TEXAS (512) 795-8183

# SOIL BORING & WELL COMPLETION LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid/Well No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 12/16-12/18/92 | B-20 | 11-D |

Log By: A. WEEGAR; P. GRANT
0-130' 130' TO TD

Driller:

Drilling Company:
SCARBOROUGH DRILLING, INC.
AMESA, TEXAS

Total Depth: 275'

Drilling Method & Bit Sizes: AIR ROTARY

Sample Method(s): 2"SS + 3"CB; GRAB SAMPLES EVERY 5' FROM
CONTINUOUS: 201' TO TD

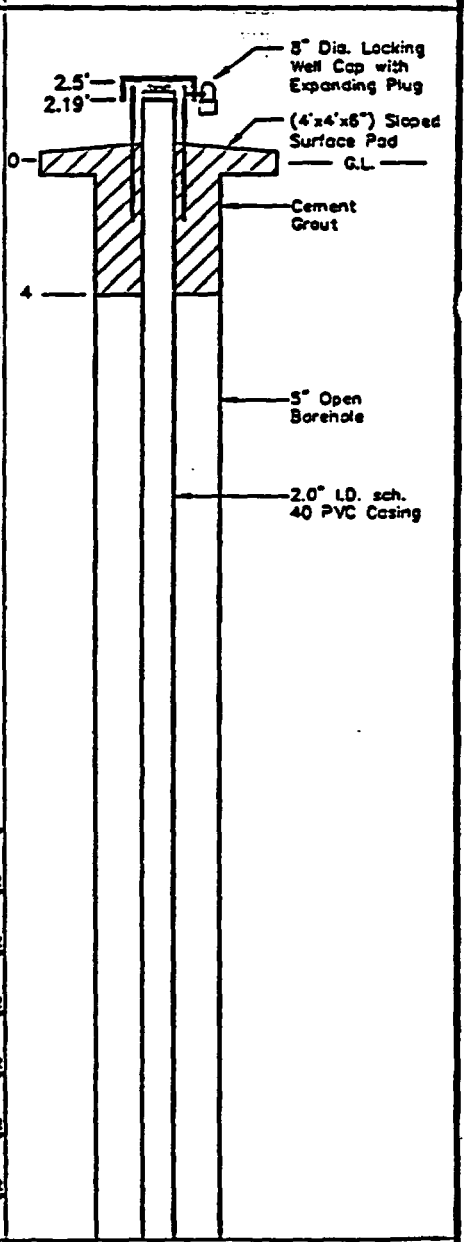
Survey Data:
Northing: 8042.8943
Easting: 10272.5320

Ground Surface Elev. (MSL): 3,470.04

Top of PVC Casing Elev.: 3,472.23

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered FT / FT Sampled |
|---|---|---|---|
| | | 5 | |
| 0'-1' TOP SOIL: brown silty sand; loose; organic material; moist | | 0 | |
| 1'-7' CALICHE: pinkish white; calc. carb. cemented silt with vfg sand; sand grains are pink and opaque; mod. hard; crumbly; chalky; dry. | | 5 | DRILL-OUT W/ROCK BIT NR (GRAB) |
| 7'-18' CALICHE: brownish gray & pinkish brown; microcrystalline with calcite crystals; vfg to cg sand throughout; sand is brown, red and opaque qtz; subrounded-well rounded; v. hard; dry. | | 10 | |
| | | 15 | |
| 18'-20' CALICHE: pinkish white; calc. carb. cemented sand and gravel; sand is vfg-cg, subr. to rd. qtz.; gravel is red, black, white and opaque, subr. to rd. quartzite; mod. hard; dry. | | | |
| 20'-22' Gravelly SAND (SW): pinkish tan; vfg-cg qtz. sand; subr. to rd.; gravel is white, black, red and opaque quartzite; subr. to rd.; loose; dry. | | 20 | |
| BASE OF OGALLALA - TRIASSIC TOP | | | |
| 22'-48' CLAY (CL): maroon with greenish gray and purple mottling; mod. hard; dense; sl. plastic; blocky fracture; moist. | | 25 | 2 SS 22-24 2; 2 SS 24-26 2; 2 SS 26-28 2; 1.5 SS 28-30 2 |
| - no mottling below 24' | | 30 | 2 SS 30-32 2; 2 SS 32-34 2; 2 SS 34-36 |
| | | 35 | |

Well Design




File Name: A-LOG110.DWG

# Terra Dynamics Incorporated

AUSTIN, TEXAS (512) 795-8183

# SOIL BORING & WELL COMPLETION LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid/Well No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 12/16-12/18/92 | B-20 | 11-D |

Log By: A. WEEGAR; P. GRANT
0-130' 130' TO TD

Driller:

Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS

Total Depth: 275'

Drilling Method & Bit Sizes: AIR ROTARY

Sample Method(s): 2"SS + 3"CB; GRAB SAMPLES EVERY 5' FROM
CONTINUOUS: 201' TO TD

Survey Data:
Northing: 8042.8943
Easting: 10272.5320

Ground Surface Elev. (MSL): 3,470.04

Top of PVC Casing Elev.: 3,472.23

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered Ft. / Ft. Sampled | Well Design |
|---|---|---|---|---|
| - color change to dusky red with gray infilled tubes and inclusions below 36'. | | 35 | 1 / 2; 2 SS 36-38 / 2; 2 SS 38-40 / 2 | |
| | | 40 | 1.5 SS 40-42 / 2; 2 SS 42-44 / 2 | 2.0" I.D. sch. 40 PVC Casing |
| | NR | | | |
| | NR | 45 | 3.4 CB 44-48 / 4 | |
| 46'-51.6' Sandy SILT (ML): speckled mottling dusky red and greenish gray; trace vfg sand grains, mica and biotite flakes throughout; mod. hard; blocky fracture; increased sand content. | | 50 | 4 CB 48-52 / 4 | 5" Open Borehole |
| 51.6'-70.3' Silty CLAY (CL): dusky red with yellow, gray and purple mottling; carbonaceous plant material; mod. hard; sl. soapy; blocky fracture; dry. | NR | 55, 60 | 5 CB 52-62 / 10 | |
| | NR | 65 | 1.3 CB 62-67 / 5 | |
| | | 70 | 4.2 CB 67-72 / 5 | |
| 70.3'-72.5' Clayey SILT (ML): heavily mottled dusky red and purple silty clay and light pinkish gray clayey silt; convoluted bedding structure; mica frags. within silty zones; mod. hard; back fracture; dry. | NR | | | |
| 72.5'-80' Slightly Silty CLAY (CL): dusky red with slight mottling of yellow and gray; claystone; mod. hard; dense; blocky fracture; dry; basal contact from cutting. | | 75 | 7.3 CB 72-81 | |

File Name: A-LOG11D.DWG

# Terra Dynamics Incorporated

AUSTIN, TEXAS (512) 795-8153

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16-12/18/92 | Boring No.: B-20 | Grid/Well No.: 11-D |

Log By: A. WEEGAR; P. GRANT 0-130' 130'. TO TD

Driller:

Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS

Total Depth: 275'

Drilling Method & Bit Sizes: AIR ROTARY

Sample Method(s): 2"SS + 3"CB; GRAB SAMPLES EVERY 5' FROM
CONTINUOUS: 201' TO TD

Survey Data:
Northing: 8042.8943
Easting: 10272.5320
Ground Surface Elev. (MSL): 3,470.04
Top of PVC Casing Elev.: 3,472.23

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered Ft. / Ft. Sampled | Well Design |
|---|---|---|---|---|
| | | 75 | CB 72-81 9 | |
| | | 80 | | |
| | NR | | 3.4 | 2.0" I.D. sch. 40 PVC Casing |
| | NR | | | |
| | | 85 | CB 81-91 10 | |
| 86'-97' Silty CLAY (CL): purple with light gray mottling; crumbly; dry. | NR | | | 5" Open Borehole |
| | NR | | | |
| | NR | 90 | | |
| | | | 2.4 | |
| | NR | 95 | CB 91-97 6 | |
| 97'-105.6' CLAY (CL): purple with slight gray mottling; hard; v. dense; sl. plastic; moist. | | | 0.8 | |
| | NR | 100 | CB 97-103 6 | |
| | NR | | 7 | |
| | | 105 | CB 103-111 8 | |
| 105.6'-151' Silty CLAY (CL): dusky red silty claystone mottled with gray & pink in a dendritic pattern; contains inclusions of greenish gray silt; hard; mod. dense; blocky fracture; dry. | | 110 | 10 | |
| | | 115 | CB 111-121 | |

File Name: A-LOG2G.DWG

# Terra Dynamics Incorporated

AUSTIN, TEXAS (512) 765-8183

# SOIL BORING & WELL COMPLETION LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid/Well No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 12/16-12/18/92 | B-20 | 11-D |

Log By: A. WEEGAR; P. GRANT
0-130' 130' TO TD

Driller:

Drilling Company:
SCARBOROUGH DRILLING, INC.
LAMESA, TEXAS

Total Depth: 275'

Drilling Method & Bit Sizes: AIR ROTARY

Sample Method(s): 2"SS + 3"CB; GRAB SAMPLES EVERY 5' FROM
CONTINUOUS: 201' TO TD

Survey Data:
Northing: 8042.8943
Easting: 10272.5320

Ground Surface Elev. (MSL):
3,470.04

Top of PVC Casing Elev.:
3,472.23

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered Ft. / Ft. Sampled | Well Design |
|---|---|---|---|---|
| Silty CLAY (CL) cont.: same description as previous page. | | 115 | CB (111-121) 10 | |
| | | 120 | 8 | 2.0" I.D. sch. 40 PVC Casing |
| | | 125 | CB (121-131) 10 | 5" Open Borehole |
| - 0.1' green-gray clayey silt (ML): dry. | NR | 130 | 5.5 | |
| | | 135 | CB (131-141) 10 | |
| | NR | 140 | 7.4 | |
| - 0.25' greenish- grey silty clay (CL): dry. | | 145 | CB (141-151) 10 | |
| | NR | 150 | 3.5 | |
| 151'-162.3' CLAY (CL): reddish purple with gray-green mottling and inclusions throughout; moc. hard; mod. dense; s. plastic; dry. | NR | 155 | CB (151-161) | |

File Name: A-LOG2G.DWG

# Terra Dynamics Incorporated

AUSTIN, TEXAS (512) 795-8183

# SOIL BORING & WELL COMPLETION LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid/Well No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 12/16-12/18/92 | B-20 | 11-D |

Log By: A. WEEGAR; P. GRANT
0-130' 130' TO TD

Driller:

Drilling Company:
SCARBOROUGH DRILLING, INC.
LAMESA, TEXAS

Total Depth: 275'

Drilling Method & Bit Sizes: AIR ROTARY

Sample Method(s): 2"SS + 3"CB; GRAB SAMPLES EVERY 5' FROM
CONTINUOUS: 201' TO TD

Survey Data:
Northing: 8042.8943
Easting: 10272.5320
Ground Surface Elev. (MSL): 3,470.04
Top of PVC Casing Elev.: 3,472.23

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered FL / FL Sampled | Well Design |
|---|---|---|---|---|
| | NR | 155 | CB 151-161 | |
| | NR | 160 | 10 | |
| | | | 7.3 | 2.0" I.D. sch. 40 PVC Casing |
| 162.3'-172' CLAY (CL): grayish-purple claystone with gray-green mottling and larger inclusions throughout; mod. hard; dense; sl. plastic; finely veined with calcite(?) filled fractures; dry. | | 165 | CB 161-171 | |
| | NR | 170 | 10 | 5" Open Borehole |
| | NR | | 3 | |
| 172'-243' CLAY (CL): reddish purple with gray-green mottling and scattered inclusions; mod. hard; mod. dense; sl. plastic; scattered calcite(?) filled veins; dry. | | 175 | CB 171-181 | |
| | NR | 180 | 10 | |
| | NR | | 3 | |
| (CL) same as above but with few veins. | | 185 | CB 181-191 | |
| | NR | 190 | 10 | |
| | NR | | 4.7 | |
| (CL) same as above but no veins. drill rate-2 min./ft. | | 195 | CB 191-201 | |

File Name: A-LOG2G.DWG

# Terra Dynamics Incorporated

AUSTIN, TEXAS (512) 795-8183

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16-12/18/92 | Boring No.: B-20 | Grid/Well No.: 11-D |

Log By: A. WEEGAR; P. GRANT
0-130' 130' TO TD

Driller:

Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS

Total Depth: 275'

Drilling Method & Bit Sizes: AIR ROTARY

Sample Method(s): 2"SS + 3"CB; GRAB SAMPLES EVERY 5' FROM
CONTINUOUS: 201' TO TD

Survey Data:
Northing: 8042.8943
Easting: 10272.5320
Ground Surface Elev. (MSL): 3,470.04
Top of PVC Casing Elev.: 3,472.23

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered FL / FL Sampled | Well Design |
|---|---|---|---|---|
| CLAY (CL): same as above. | | 195 | 191-201 | 5" Open Borehole |
| | NR | 200 | 10 | 2.0" I.D. sch. 40 PVC Casing |
| at 201' switch over to drag bit(fishtail bit) to drill down until cuttings show sand; bagged cuttings every 5'; reamed out to 5". | | 205 | GRAB SAMPLES AT 5' INTERVALS | Bentonite Pellet Seal |
| | | 210 | | |
| | | 215 | | Filter Sand |
| | | 220 | | |
| | | 225 | | |
| | | 230 | | |
| | | 235 | | 2.0" Sch. 40 PVC Wel. Screen .010 SLOTS |

File Name: A-LOG2G.DWG

# Terra Dynamics Incorporated

AUSTIN, TEXAS (512) 795-8183

# SOIL BORING & WELL COMPLETION LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 12/16-12/18/92 | Boring No.: B-20 | Grid/Well No.: 11-D |

Log By: A. WEEGAR; P. GRANT
0-130' 130' TO TD

Driller:

Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS

Total Depth: 275'

Drilling Method & Bit Sizes: AIR ROTARY

Sample Method(s): 2"SS + 3"CB; GRAB SAMPLES EVERY 5' FROM
CONTINUOUS: 201' TO TD

Survey Data:
Northing: 8042.8943
Easting: 10272.5320

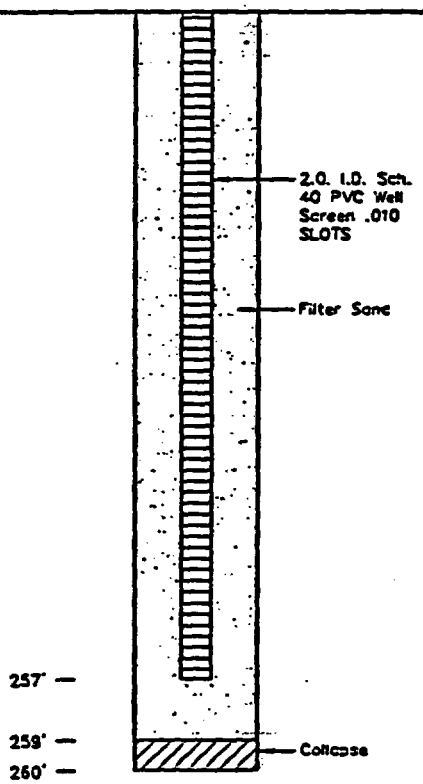
Ground Surface Elev. (MSL): 3,470.04

Top of PVC Casing Elev.: 3,472.23

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Lithic Log | Depth (feet) | Recovered Ft. / Ft. Sampled |
|---|---|---|---|
| at 239' cuttings color lightened, but still (CL) as above. | | 235, 240 | |
| 243'-248' Silty CLAY (CL): light tan color plus previous dark clay. | | 245 | |
| 248'-260' CLAY (CL): reddish purple with gray-green mottling and scattered inclusions; mod. hard; mod. dense; sl. plastic; dry. | | 250, 255 | |
| 260'-275' Clayey SILTSTONE (ML): dusky red and tan siltstone with claystone interbeds; greenish gray mottling throughout; increased greenish gray siltstone below 270 feet; brittle; trace of vfg. mica frags.; dry. | | 260, 265, 270, 275 | |

Total Depth = 275 feet

Well Design




File Name: A-LOG2C.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/20/93 | Boring No.: B-45 | Grid No.: 11-E |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7590.39 Easting: 10860.29 Ground Surface Elev. (MSL): 3,468.3 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| | Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|---|
| 0'-0.4' | TOP SOIL: brown; silty sand; organic material; moist. | 0 | | | |
| 0.4'-12' | CALICHE: pinkish white; calc. carb. cemented quartz silt and sand; mod. hard; trace dark, red and opaque quartz gravel frags.; dry. | 5, 10 | | DRILL OUT; LOG CUTTINGS | |
| 12'-19' | Sandy SILT (ML): pink; quartz silt and sand; slight calc. carb. cementation; loose; dry. | 15 | | | |
| 19'-24' | Silty CLAY (CL): reddish brown silty clay with white powdery calc. carbonate in layers along vertical fractures disseminated throughout; dense; sl. plastic; moist. | 20 | NR | 0.7 SS 19-21 2; 2 SS 21-23 2; 2 SS 23-25 2 | OGALLALA TRIASSIC |
| 24'-39.4' | Silty CLAY (CL): reddish brown silty clay with grayish tan and bluish gray mottling and casts; dense; sl. plastic; moist. — trace mottling below 31'. | 25, 30, 35 | | 2 SS 25-27 2; 2 SS 27-29 2; 2 SS 29-31 2; 2 SS 31-33 2; 2 SS 33-35 2; 2 SS 35-37 2; 1.7 SS 37-39 2 | |
| | | 40 | | 0.8C SS 39-40 | |

FILE NAME: A-LOG11E.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LO

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No. |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 01/20/93 | B-45 | 11-E |

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 7590.39 Easting: 10860.29 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Ground Surface Elev. (MSL): 3,458.3 |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| | Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|---|
| 39.4'-44.6' | Sandy Cl SILT (ML): mottled tan, brown and rusty red clayey siltstone with sand; vfg white quartz sand grains throughout; trace vfg mica frags.; black mineralization throughout; mod. hard; blocky fracture; crumbly 42'-43.5'; dry. | 40 | | 4.8 / CS 40-45 | |
| 44.6'-45.5' | Sandy Silty CLAY (CL): mustard to greenish gray claystone; silt and vfg quartz sand throughout. | 45 | | 5 / 3.5 | |
| 45.5'-47.6' | Sandy Clayey SILT (ML): yellow, tan and gray clayey siltstone with white and opaque vfg quartz sand grains and vfg mica frags.; mod. hard; horizontally laminated; blocky fracture and crumbly; dry. | | NR | | |
| 47.6'-54.9' | Silty Sand (SM): yellow and grayish tan siltstone matrix with vfg white, opaque and pink quartz and feldspar sand grains; vfg to cg mica and biotite flakes throughout; cross-bedded; blocky fracture; dry. | 50 | | CS 45-55 / 10 | |
| 54.9'-66.2' | Silty CLAY (CL): dark red silty claystone with bluish gray mottling; greenish gray elliptical zones and apparent worm burrows below 62'; burrows have sandy material incorporated into center portion of burrow; trace black mineralization throughout; blocky to concoidal fracture; dense; mod. hard; dry. | 55 | NR | 7 | |
| | | 60 | NR | CS 55-65 / 10 | |
| | | 65 | | 4.5 | |
| 66.2'-100' | Slightly Silty CLAY (CL): dark red claystone with purple and gray mottling throughout; yellow and mustard coloration below 69' with greenish gray clasts and worm holes below 70'; trace black mineralization throughout; mod. hard; sl. soapy; blocky fracture; dry. | 70 | NR | CS 65-71 / 5 | |
| | - diagonal fractures from 71'-79'; fractures are at 45° and bidirectional (> and <); healed with calc. carb. cementation and clay; occasional drilling-induced slickensides. | 75 | | 10 / CS 71-81 | |
| | | 80 | | 10 | |

FILE NAME: A-LOG11E.DWG

| *Terra Dynamics Incorporated* | **SOIL BORING LOG** |
|---|---|

| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/20/93 | Boring No.: B-45 | Grid No.: 11-E |
|---|---|---|---|---|

| | | |
|---|---|---|
| Log By: A. WEEGAR | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Northing: 7590.39<br>Easting: 10860.29 |
| Driller: | Total Depth: 100' | Ground Surface Elev. (MSL): 3,468.3 |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| Slightly Silty CLAY (CL): same as above. | 80 | | | |
| | | NR | 8.1 | |
| | | NR | | |
| | 85 | | CB 81-90 | |
| | | | 9 | |
| – increased purple color and crumbly below 91'. | 90 | | 4.7 | |
| | | NR | | |
| | | NR | | |
| | 95 | NR | CB 90-100 | |
| | | NR | | |
| TOTAL DEPTH = 100' | | NR | 10 | |
| | 100 | | | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG11E.DWG

# Terra Dynamics Incorporated

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 1/24/93 | Boring No.: B-31 | Grid No 12-i |

| | | |
|---|---|---|
| Log By: R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 9160.6675 Easting: 10241.7105 Ground Surface Elev. (MSL): 3,475.71 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|---|
| 0.0'-1.5' | TOP SOIL: dk. brown, sand, silt; organic material; loose; dry. | 0 | | | |
| 1.5'-19' | SAND (SW): lt. tan to red tan, vfg-fg sand, with scattered clasts of calcitic cemented sand and silt; soft; loose; dry. | 5, 10, 15 | | DRILL OUT; LOG CUTTINGS | |
| 19'-29' | CALICHE: lt. tan-gray calcitic micritic cemented sand and silt, vfg-fg otz sand; sandstone lithoclasts with silica concretions in micritic matrix; concretion rings in micrite; hard; brittle; dry. | 20, 25 | | | |
| 29'-32.5' | SAND and GRAVEL (SW): tan-lt. brown, sand, fg quartz to quartz pebbles and cobbles; rounded to angular; soft; dry. | 30 | | | OGALLALA |
| 32.5'-37' | CLAY (CL): red with white mineralization (flaky, nonreactive to HCl), and some silt; soft; moist. | 35 | | 2; SS 33-35; 2; 2; SS 35-37; 2 | TRIASSIC |
| 37'-100' | CLAY (CL): red with yellow mottling; soft; dry. – red, yellow, and purple mottling at 39'. | 40 | | 1.8; SS 37-39; 2; 2; SS 39-41; 2 | |

FILE NAME: A-LOG129.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 1/24/93 | B-51 | 12-B |

| | | |
|---|---|---|
| Log By: R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 9160.6675 Easting: 10241.7105 Ground Surface Elev. (MSL): 3,475.71 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| CLAY(CL): same as above. | 40 | | 2 SS 39-41 2; 2 SS 41-43 2 | |
| | | NR | 0 SS 43-45 2 | |
| | 45 | NR | 0 CB 45-51 6 | |
| | 50 | NR | 0 CB 51-57 6 | |
| | 55 | NR ? | 1.7 CB 57-63 6 | |
| - red, yellow and purple mottled; from 59' to 59.5' was hard calcitic cemented clay-broken and watered(hard and brittle). | 60 | NR ? | | |
| - from 61' to 61.2' was red, yellow, and purple mottled; brittle; dry. | | NR ? | 4.4 CB 63-71 8 | |
| | 65 | NR ? | | |
| | 70 | NR ? | 1.0 CB 71-81 10 | |
| | 75 | NR | | |
| | 80 | | | |

FILE NAME: A-LOG12B.DWG

# Terra Dynamics Incorporated

# SOIL BORING LO

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 1/24/93 | Boring No.: B-51 | Grid N 12- |

| | | |
|---|---|---|
| Log By: R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | Northing: 9160.6675 |
| Driller: | Total Depth: 100' | Easting: 10241.7105 |
| Remarks: | | Ground Surface Elev. (MSL): 3,475.71 |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| CLAY (CL): same as above. | 80 | | | |
| – rubble – 81'–87' | | NR | 1.5 | CB 81–87 |
| | 85 | NR | | 6 |
| | | | 1 | CB 87–91 |
| | 90 | NR ? | | 4 |
| | | | 3.7 | |
| – red, yellow and purple mottled with whitish green clay nodules. | | NR ? | | CB 91–100 |
| | 95 | NR ? | | |
| TOTAL DEPTH = 100' | 100 | | | 9 |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG12B.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 01/24/93 | B-52 | 12-C |

| | | |
|---|---|---|
| Log By: R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 8707.59 Easting: 10003.09 Ground Surface Elev. (MSL): 3,473.3 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| | Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|---|
| 0.0'-0.5' | TOP SOIL: dk. brown, sand, silt; organic material; loose; dry. | 0 | | | |
| 0.5'-4.0' | CALICHE: lt. tan; calcitic cemented sand and silt; vfg quartz sand; soft; dry. | | | DRILL OUT; LOG CUTTINGS | |
| 4.0'-9.0' | SAND and SILT (SM): lt. tan to lt. brown, vfg-fg quartz with scattered clasts of calcite cemented sand and silt; soft; dry. | 5 | | | |
| 9.0'-21.5' | CALICHE: lt. tan-gray, calcitic and micritic cemented sand and silt; vfg-fg quartz sand; concretion rings in micrite frags.; sandstone lithoclasts with silica concretion; hard; dry. | 10, 15, 20 | | | |
| 21.5'-26' | Silty SAND (SW): lt. tan, vfg quartz sand; sorted; rounded; soft; dry. | 25 | | | |
| 26'-30' | SAND and GRAVEL (SW): reddish brown, fg-mg quartz sand, rounded and sorted, pebbles and cobbles; quartz rounded to angular; poorly sorted; soft; dry. | 30 | | | @CALLALA TRIASSIC |
| 30'-77' | CLAY (CL): red, purple, and yellow mottled; plastic; damp. | | | 0 SS 31-33 2 | |
| | | | NR | 1.9 SS 33-35 2 | |
| | | 35 | NR ? | 0.2 SS 35-37 2 | |
| | | | NR ? | | |
| | | | NR ? | 1.5 SS 37-39 2 | |
| | - dry; plastic; less purple 37'-39'. | 40 | | 1.8 SS 39-41 2 | |

FILE NAME: A-LCG12C.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| Location: | Project No.: | Date Drilled: | Boring No.: | Grid No.: |
|---|---|---|---|---|
| ANDREWS CO. LANDFILL SITE | 92-152 | 01/24/93 | B-52 | 12-C |

| | | |
|---|---|---|
| Log By: R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 8707.59 Easting: 10003.09 Ground Surface Elev. (MSL): 3,473.3 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| – red, purple and yellow mottling white silt nodule 0.75" at approx. 41.5'; plastic; dry. | 40 | NR | 1.5 SS 39-41 2; 1.8 SS 41-43 2 | |
| – scattered nodules of yellow to white clay. | 45 | NR | 0 SS 43-45 2; 1.4 SS 45-47 2 | |
| – red, purple and yellow mottling; no nodules. | 50 | | 2 SS 47-49 2; 2 SS 49-51 2; 2 SS 51-53 2 | |
| | 55 | NR | 0 CB 53-59 8 | |
| – red-orange with yellow and purple mottling; dry; brittle. | 60 | NR ? NR ? | 1.5 CB 59-65 8 | |
| | 65 | | 8 CB 65-71 8 | |
| – 0.75 ft. red-orange clay with yellow and purple mottling. | 70 | NR ? | 1.5 | |
| | 75 | NR ? | CB 71-81 | |
| 77'-81' SANDSTONE (SM): red-orange and white, vfg quartz sand with calcite cement and mica flakes; hard; brittle; dry. | 80 | NR ? | 10 | |

FILE NAME: A-LOG12C.DWG

# *Terra Dynamics Incorporated*

# SOIL BORING LOG

| | | | | |
|---|---|---|---|---|
| Location: ANDREWS CO. LANDFILL SITE | Project No.: 92-152 | Date Drilled: 01/24/93 | Boring No.: B-52 | Grid No.: 12-C |

| | | |
|---|---|---|
| Log By: R. McGOWEN | Drilling Method & Bit Sizes: AIR ROTARY | Survey Data: Northing: 8707.59 Easting: 10003.09 Ground Surface Elev. (MSL): 3,473.3 |
| Drilling Company: SCARBOROUGH DRILLING, INC. LAMESA, TEXAS | Sample Method(s): SPLIT SPOON; CORE BARREL | |
| Driller: | Total Depth: 100' | |
| Remarks: | | |

| Unified Soil Classification/Description (Color, Texture, Structure, Grain Size) | Depth (feet) | Graphic Log | Recovered Ft. / Ft. Sampled | Stratigraphic Interval |
|---|---|---|---|---|
| – plugged core bit | 80 | NR ? | 1.4 / 10 | |
| 81'–100' CLAY (CL): red, yellow and purple mottled, dry, brittle. | | NR ? | 2 / 10 (CB 81–91) | |
| | 85 | | | |
| | 90 | NR ? | | |
| – purple cuttings. | 95 | NR | 6 / 10 (CB 91–97) | |
| – purple clay with nodule approx. 2" of greenish white clay. | | NR ? | 1.3 / 6 (CB 97–100) | |
| TOTAL DEPTH = 100' | 100 | NR ? | 3 | |
| | | | END OF CORE | |
| | 105 | | | |
| | 110 | | | |
| | 115 | | | |
| | 120 | | | |

FILE NAME: A-LOG12C.DWG