REPORT

STRUCTURAL STABILITY ASSESSMENT REPORT

Martin Lake Steam Electric Station

Submitted To: Luminant
1601 Bryan Street
Dallas, TX 75201

Submitted By: Golder Associates Inc.
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Houston, TX 77073 USA

Professional Engineering Firm
Registration Number F-2578

October 2016

Project No. 164816402

Golder Associates

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1.0 INTRODUCTION

1.1 Purpose

The "Disposal of Coal Combustion Residuals (CCR) from Electric Utilities rule" (40 Code of Federal Regulations (40 CFR) Part 257), effective October 19, 2015, requires that existing CCR surface impoundments meeting the requirements of §257.73(b) conduct initial and periodic structural stability assessments in accordance with §257.73(d). This report provides the structural stability assessment for the Martin Lake Steam Electric Station's (MLSES's) CCR Impoundments, identified as the Bottom Ash Ponds (BAPs) – the West Ash Pond (WAP) and the East Ash Pond (EAP) – the New Scrubber Pond (NSP), and the Permanent Disposal Pond-5 (PDP-5).

1.2 Site Background

The MLSES generates bottom ash, fly ash, and flue gas desulfurization (FGD) material during electricity generation. The following surface impoundments, shown on Figure 1, are in operation at the MLSES and subject to the CCR rule.

1.2.1 The Bottom Ash Ponds (BAPs)

The BAPs include the West Ash Pond (WAP) and the East Ash Pond (EAP). The WAP and EAP receive sluice water from bottom ash dewatering bins and other process wastewater sources that typically include bottom ash fines. The BAPs were originally constructed in 1977 with a 2-feet thick compacted clay liner. In 1989, the WAP was relined with a 60-mil high density polyethylene (HDPE) geomembrane over 3 feet of clay on the sideslopes, and the floor with a double 60-mil HDPE geomembrane with a geonet leak detection layer overlying an 18-inch thick clay liner. Both the sideslopes and floor are overlain with a 4-inch thick concrete revetment mat. In 2010 the sideslopes and floor of the EAP were relined with a double 60-mil HDPE geomembrane with a geonet leak detection layer overlying an 18-inch thick clay layer. A geotextile layer was placed between the lower geomembrane and the clay. The liner system on the sideslopes and floor of the EAP are overlain with a 4-inch thick concrete revetment mat.

1.2.2 New Scrubber Pond (NSP)

The NSP, abutting the southeastern portion of the WAP and the southern portion of the EAP, is used to manage FGD wastes and discharge from the sludge thickener sumps, the plant yard sumps, and stormwater management areas. Water collecting in the NSP serves as wet-well make-up water as well as emergency make-up water in the scrubber area. The NSP was originally constructed with the BAPs and lined with clay liner. In 1989, the NSP was relined with a double 60-mil HDPE geomembrane with a geonet leak detection layer. A geotextile layer was placed between the lower geomembrane and the subgrade and a 4-inch thick concrete revetment mat covers the upper geomembrane.

1.2.3 Permanent Disposal Pond-5 (PDP-5)

PDP-5 is primarily used to manage excess liquids including stormwater and excess process wastewater from both the New Scrubber Pond and Bottom Ash Ponds. Recovered CCR wastewaters are received in PDP-5 during cleaning cycles. PDP-5 was constructed in 2010/2011, above PDP-1, PDP-2, and PDP-3, which were previously closed as landfills. PDP-5 is lined with a 3-foot thick clay liner on the sideslopes and a 2-foot thick clay liner on the floor, both overlain with a 0.5-foot thick protective cover soil layer.

1.3 Previous Slope Stability Evaluations

Golder and ETTL Engineers and Consultants (ETTL) have previously performed evaluations on the BAPs, the NSP and PDP-5 as part of the following reports submitted to Luminant:

- Ash and Scrubber Ponds and Permanent Disposal Pond #4, Stability Investigation Report, Luminant Martin Lake SES, Rusk County, Texas, Golder, dated December 2012.
- Geotechnical Investigation, Luminant Martin Lake SES, Reline East Ash Disposal Pond, Tatum, Texas, ETTL, dated December 2008.

The studies found the BAPs and NSP slopes to be adequately stable.

ETTL performed stability evaluations on PDP-5 in 2009, as presented in the following report:

- Geotechnical Investigation, Luminant Martin Lake SES, Vertical Expansion of Permanent Disposal Ponds 1, 2, and 3, Tatum, Texas. ETTL Engineers and Consultants Inc. Tyler, Texas, dated July 2008.
- Geotechnical Investigation, Luminant Martin Lake SES, Vertical Expansion of Permanent Disposal Ponds 1, 2, and 3, Tatum, Texas – Supplemental Seepage and Slope Stability. ETTL Engineers and Consultants Inc., dated October 2009.

The above reports found the design slopes of PDP-5 to be stable as long as drainage is functional, preventing the embankments from saturating.

2.0 SUBSURFACE CONDITIONS

The MLSES site is located in the Martin Creek area which is situated in the Sabine River Valley and lies on the west flank of the Sabine Uplift. The formations in the region comprise sedimentary deposits of continental and marine origin, mainly the lower Wilcox Group flanked by younger beds like the Carrizo Sand. In the Martin Creek area, the Wilcox formation is estimated to be about 650- to 700-feet thick and consists of sandy clays, silty sands, clays, and lignite in varying amounts. The Rockdale formation is the major component in the area among the sediments of the Wilcox group occupying approximately the middle four-fifths of the Wilcox Section. The Wilcox Group is underlain by the Paleocene Midway Group (containing Upper Willis and Lower Kincaid), which is estimated to be 900-feet thick around the site, and is composed mainly of silty clay and clay. The Midway Group overlies a section of Cretaceous Rocks that are approximately 7000-feet thick (Rone Engineers, 1984).

2.1 Site Geology

2.1.1 Bottom Ash Ponds and Scrubber Pond

2.1.1.1 Subsurface Investigations and Laboratory Testing

Information from previous subsurface investigations was used to characterize the subsurface site conditions. In 2008, ETTL conducted a subsurface investigation for the EAP as part of an effort to reline the pond. ETTL drilled twelve borings along the crest of the EAP embankment at approximate elevation 330 feet – mean sea level (ft-msl). All borings were 40-feet deep except one which was 100-feet deep. The boring map and boring logs are presented in Appendix A. Geotechnical laboratory testing – moisture contents, Atterberg limits, grain size distribution, and consolidated-undrained (CU) triaxial compression tests - was conducted on selected samples. The soil index testing results presented as part of the boring logs, while the CU test results from ETTL are summarized in Appendix B.

Golder conducted a subsurface investigation for the WAP and NSP in December 2012. Golder completed eight, 50- to 60-foot deep borings along the crest of the pond embankments at approximate elevation 330 ft-msl. The boring map and boring logs are presented in Appendix A. As part of the investigation, laboratory testing was performed on selected samples in accordance with commonly accepted methods and practices. Undisturbed and disturbed soil samples were tested to determine water content, Atterberg limits, grain size distribution, and shear strength. Water content determination was performed in accordance with ASTM D2216; Atterberg limits were determined in accordance with ASTM D4318; and grain size distribution was performed in accordance with ASTM D422. Shear strength testing consisted of unconsolidated-undrained (UU) triaxial compression in general accordance with ASTM D2850. Laboratory test results are presented in Appendix B.

The findings from the above subsurface investigations were reviewed for their applicability to this study, and are summarized in the following sections.

2.1.1.2 Subsurface Site Conditions

The above borings consisted of fill and native soils. The soils encountered in the borings generally consisted of stiff to hard sandy clays and firm to very dense sands. The subsurface stratigraphy generally consisted of interchanging layers of clays, sandy clays, clayey sands and non-plastic sands. The clayey sand layers ranged in thickness from 2 to 16 feet where encountered. The sandy clay and clay layers are described as firm to hard, low to high plasticity clays and vary in thickness from 2 to 38 feet. Loose to very dense, silty or poorly graded sand was typically encountered beneath or interlayered with the sandy clay/clayey sand strata. The 100-foot boring by ETTL showed deeper layers of very dense silty sand with intermittent layers of hard low plasticity clay.

Water was encountered in each of the eight borings performed by Golder, ranging between El. 296.1 to 303.3 ft-msl. The average water elevation measured in the Golder boreholes, during drilling, was at El. 300.3 ft-msl. The ETTL borings measured the water level to range between El. 304 to 309 ft-msl, with an average water level of El. 306 ft-msl, coinciding with the normal pool elevation of the adjacent Martin Lake (a man-made reservoir).

Groundwater levels measured in 2015, from wells surrounding the BAPs, varied from approximately El. 304 ft-msl in the southeast corner to El. 307 ft-msl in the northwest corner.

2.1.2 Permanent Disposal Pond - 5

2.1.2.1 Subsurface Investigations and Laboratory Testing

In 2008, ETTL performed a pre-construction subsurface investigation for PDP-5 that included a total of eleven borings within the PDP-5 footprint. In addition, three cone penetrometer tests (CPTs) were performed. As part of a supplemental investigation in 2009, ETTL drilled a further three borings within the pond footprint. The map of the borings, and boring and CPT logs are presented in Appendix A.

ETTL performed laboratory tests including natural moisture contents (ASTM D2216), Atterberg limits (ASTM D4318), particle size distributions (ASTM D 1140 and ASTM D422). Unconsolidated-undrained (UU) triaxial compression tests (ASTM D2850) were performed to determine the strength characteristics of cohesive substrata. Direct shear tests (ASTM D3080) were performed on coarser materials including remolded bulk ash samples. Consolidation tests (ASTM D2435) and permeability tests (ASTM D5084) were also performed but are not relevant to the current study. The results of the laboratory tests performed by ETTL are presented in Appendix B.

2.1.2.2 Subsurface Site Conditions

Most of the above borings were drilled through the bottom ash within closed PDP-1, 2, and 3. Based on particle size, the ash classifies as very loose to medium dense poorly graded sands in some locations, to silts in other locations and depths. The borings passing through existing embankments of PDP-1, 2, and 3 contained medium stiff to very stiff clay of low plasticity and/or high plasticity clay with clayey sand. Native soils were identified in deeper borings as very dense silt with hard low plasticity clay seams.

Two borings located outside of the ash encountered groundwater approximately between El. 355 to 368 ft-msl. Groundwater levels measured in 2015, from wells surrounding PDP-5, indicate that the groundwater level varies from approximately El. 355 ft-msl in the north to El. 375 ft-msl in the south.

3.0 STRUCTURAL STABILITY ASSESSMENT - §257.73(d)(1)(i)-(vii)

The CCR rules require conducting periodic structural stability assessments by a qualified professional engineer to document whether the design, construction, operation and maintenance is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater that can be impounded therein.

3.1 Foundations and Abutments - §257.73(d)(1)(i)

As noted above, the foundation soils for the BAPs and NSP generally consist of stiff to hard sandy clays and compact to dense sand. As discussed below, the embankment fill appears to be well-compacted. The foundation soils and abutments of the BAPs and NSP are stable.

Parts of the foundation soils for PDP-5 embankments are founded on the existing bottom ash of underlying PDP-1, 2, and 3 which were previously closed as landfills. Based on particle size, the bottom ash classifies as very loose to medium dense, poorly graded sand at some locations and silts at other locations and depths. Based on the above mentioned ETTL reports and the preparation of foundation materials during construction, the foundations and abutments are generally considered to be stable. The possibility of liquefaction of bottom ash in the foundation is considered in the Safety Factor Assessment report (Golder, 2016).

3.2 Slope Protection - §257.73(d)(1)(ii)

The downstream slopes of the BAPs, NSP and PDP-5 embankments are protected from erosion and deterioration by the establishment of a vegetative cover. Portions of the EAP and the NSP adjacent to Martin Lake are protected from wave action with roller compacted concrete The vegetative cover is inspected weekly for erosion, signs of seepage, animal burrows, sloughing, and plants that could negatively impact the embankment. For the BAPs and NSP, the interior slopes are protected from wave action by concrete revetment mats or riprap. The interior slopes of PDP-5 are covered with vegetative cover for erosion protection.

3.3 Dikes (Embankment) - §257.73(d)(1)(iii)

3.3.1 Bottom Ash Ponds and Scrubber Pond

No construction documentation or testing details of the original BAPs and NSP embankment fills are available. Based on the borings, the embankments were constructed using a clayey fill likely from an on-site borrow source. Golder's subsurface investigation of 2012 and ETTL's investigation of the EAP in 2008 comprised boreholes drilled into the embankment. These borings found the embankment soils to generally consist of stiff to hard sandy clay, clayey sand, and clay, consistent with well-compacted fill. No significant repairs have been performed to the BAPs and NSP embankments since their initial construction, except the relining of the WAP and NSP in 1989, and the relining of the EAP in 2010. Based on a review of past

inspection reports and on recent observations, the BAPs and NSP embankments are sufficient to withstand the range of loading conditions they are subjected to.

3.3.2 Permanent Disposal Pond – 5

PDP-5 was constructed with on-site soils in 2010/2011. A 3-foot thick clay layer was placed over PDP-1, PDP-2 and PDP-3, beneath the new PDP-5 embankment. Sections of the embankment overlie the bottom ash from the closed ponds.

The clay liner was specified to be installed and compacted in 6-inch lifts, to at least 95% Standard Proctor maximum dry density at optimum moisture content to 4% above. The embankment was specified to be constructed in loose lifts of 8-inch maximum thickness, followed by compaction to 95% standard Proctor maximum dry density.

Based on a review of past inspection reports and on recent observations, each of the embankments are sufficient to withstand the range of loading conditions they are subjected to.

3.4 Vegetated Slopes - §257.73(d)(1)(iv)

As of June 14, 2016 the US Court of Appeals for the District of Columbia Circuit issued an Order that remanded and vacated the CCR rule requirement that vegetation on the exterior portions of dikes on CCR surface impoundments be maintained not to exceed six inches in height. EPA will issue a new rulemaking in the future to address this issue.

Each of the surface impoundments at the MLSES are inspected weekly. Luminant maintains the vegetation in a manner that ensures adequate inspections can be conducted.

3.5 Spillways - §257.73(d)(1)(v)

There are no spillways on any of the surface impoundments.

3.6 Hydraulic Structures - §257.73(d)(1)(vi)

The only subsurface penetrations in the BAPs and NSP are 24-inch dewatering lines that pass through the WAP and the NSP embankments, which are used for decanting process wastewater from within the ponds. These dewatering lines connect to a collection sump at the low pressure ash water pump station located to the south of the NSP. All other piping passes above the crest of the embankments.

According to as-built drawings prepared by HDR Engineering, Inc., a 14-inch diameter HDPE overflow pipe, encased in a 20-inch diameter HDPE pipe passes through the southern embankment. Flow through this pipe is controlled with a valve located near the toe of the embankment. Discharge from PDP-5 is accomplished using a submersible pump suspended from a pump platform adjacent to the overflow pipe along the southern embankment. All other piping passes above the crest of the embankment.

No significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris were observed that may negatively affect the operation of the surface impoundments.

3.7 Downstream Slopes Adjacent to Water Body - §257.73(d)(1)(vii)

The east slope of the EAP and the south slope of the NSP are adjacent to Martin Lake. The normal pool elevation of Martin Lake is at El. 306 ft-msl. This water level is relatively shallow against the exterior slope. Moreover, the exterior slopes of both the east side of the EAP and the south side of the NSP are lined with roller compacted concrete to protect these slopes from erosion, as well as seepage. Nevertheless, the impact of drawdown of Martin Lake on the stability of the BAP and NSP embankments is considered in the Safety Factor Assessment report (Golder, 2016). The results of stability analysis indicate that the factor of safety for rapid drawdown conditions is approximately 1.6, which exceeds the typically required value of 1.30.

3.8 Structural Stability Deficiencies - §257.73(d)(2)

No structural stability deficiencies were identified during this assessment.

4.0 CONCLUSION

Based on our review of the information provided by Luminant, on information prepared by Golder Associates Inc., and on our on-site observations, no structural stability deficiencies were identified in the surface impoundments during this assessment.

Golder appreciates the opportunity to assist Luminant with this project. If you have any questions, or require further assistance from Golder, please contact the undersigned at (281) 821-6868.

GOLDER ASSOCIATES INC.

Varenya Kumar
Staff Engineer

Jeffrey B. Fassett, PE
Associate Geotechnical Engineer

VK/JBF/kc

5.0 CERTIFICATION

I hereby certify that this report has been prepared in general accordance with normally accepted civil engineering practices and in accordance with the requirements of 40 CFR 257.73(d).

Jeffrey B. Fassett, PE
Golder Associates Inc.
Firm Registration Number F-2578

6.0 REFERENCES

ETTL Engineers and Consultants Inc. 2008. Geotechnical Investigation, Luminant Martin Lake SES, Vertical Expansion of Permanent Disposal Ponds 1, 2, and 3, Tatum, Texas.

ETTL Engineers and Consultants Inc. 2009. Geotechnical Investigation, Luminant Martin Lake SES, Vertical Expansion of Permanent Disposal Ponds 1, 2, and 3, Tatum, Texas – Supplemental Seepage.

Golder Associates Inc. 2012. Ash and Scrubber Ponds and Permanent Disposal Pond #4 – Stability Investigation Report, Luminant Martin Lake Power Plant, Rusk County, Texas.

Golder Associates Inc. 2016. Safety Factor Assessment Report, Luminant Martin Lake Steam Electric Station.

HDR Engineering Inc. 2011. Martin Lake Steam Electric Station, Rusk County, Texas – Permanent Disposal Pond #5 – As Recorded Drawings.

Pastor, Behling & Wheeler Inc. 2016. Annual CCR Inspection Report. Luminant Martin Lake Steam Electric Station, Ash Pond Area, Permanent Disposal Pond No. 5 & A1 Area Landfill, Rusk & Panola County, Texas

REFERENCE(S)
AERIAL PHOTO SOURCED FROM GOOGLE EARTH PRO DATED: 2015-10-01

10/10/16
STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED PROFESSIONAL ENGINEER

Professional Engineering Firm
Registration Number F-2578

0 1000 2000
1" = 2000' FEET

CLIENT
LUMINANT POWER
MARTIN LAKE

PROJECT
2016 COAL COMBUSTION RESIDUALS
ENGINEERING SERVICES

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-22
PREPARED	VK
DESIGNED	TNB
REVIEWED	MX
APPROVED	JBF

TITLE
GENERAL SITE MAP

PROJECT NO. 164816402
REV. ----
FIGURE 1

Path: \\houston\drafting_2016\164816402 - luminant martin lake\PRODUCTION\ | File Name: 164816402A001.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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APPENDIX A

BORING LOCATION MAP & BORING LOGS

BOTTOM ASH PONDS AND SCRUBBER POND

NOTE: Figure Reference - Golder Associates Inc. 2012. Ash and Scrubber Ponds and Permanent Disposal Pond #4 – Stability Investigation Report, Luminant Martin Lake Power Plant, Rusk County, Texas.

LEGEND

BH-101 BORING LOCATION

REFERENCE

1.) AERIAL SHOWN LICENSED FROM GOOGLE EARTH PROFESSIONAL.

700 0 700
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
LUMINANT - MARTIN LAKE
ASH □ SCRUBBER POND SLOPE STABILITY INVESTIGATION REPORT
RUSK COUNTY, TEXAS

TITLE
BORING LOCATIONS

NJ Authorization #24GA28029100
Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	123-94128		FILE No.	12394128A003	
DESIGN	MGP	12/04/12	SCALE	AS SHOWN	REV. 0
CADD	RG	12/04/12			
CHECK	MGP	12/04/12			
REVIEW	PCM	12/04/12			

FIGURE 1

Drawing file: 12394128A003.dwg Dec 06, 2012 - 11:05am

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Fax: (281) 821-6870

BORING NUMBER BH-201

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/28/12 **COMPLETED** 10/28/12
GROUND ELEVATION 330 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 28.30 ft / Elev 301.70 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		Remove 8" sandy gravel as road base					
		(CL) SILTY CLAY, low plasticity, some sand, trace gravels, red, dry, hard	SH 1	44		5.0	
		(SC) CLAYEY SAND, non-plastic, some silt, tan and gray, dry, compact	SS 2	58	15-10-7 (17)		
5		(CL) SANDY CLAY, low plasticity, some silt, red, tan, and gray, mottled, dry, stiff	SH 3	44		3.5	
		(SC) CLAYEY SAND, fine, subangular, non-plastic, little silt, tan and gray, mottled, dry	SH 4	38		1.5	
10		(CL) SANDY CLAY, low plasticity, little silt and gravel, red, tan, and gray, mottled, dry, hard	SH 5	42		4.5	
15		some silt, no gravel, very stiff at 13.0'	SH 6	58		3.5	
20		some sand veins at 18.0'	SH 7	38		3.0	
25		gray, moist at 23.0'	SH 8	58		2.5	
30		(SC) CLAYEY SAND, fine, subangular, low plasticity, some to little silt	SH 9	71		2.0	
35		some silt, tan and gray, mottled, moist at 33.0'	SS 10	100	9-7-9 (16)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

(Continued Next Page)

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BORING NUMBER BH-201

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
35								
40		some silty sand veins at 38.0'	SH 11	50		2.0		
45		(SM) SILTY SAND, fine, subangular, non-plastic, little clay, tan and red, wet, compact	SS 12	100	11-11-11 (22)			
50		(SP) SAND, medium to fine, subangular, poorly graded, some silt, tan, wet, compact	SS 13	100	5-9-11 (20)			

Bottom of borehole at 50.0 feet.

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BORING NUMBER BH-202

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/29/12 **COMPLETED** 10/29/12
GROUND ELEVATION 330 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 26.70 ft / Elev 303.30 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
0		Remove 6" sandy gravel from road bed						
		(CH) CLAY, medium to high plasticity, some silt, trace fine sand, tan and gray, dry, very stiff to hard	SH 1	50		4.5		
		some sand at 2.0'	SH 2	63		3.5		
5			SH 3	50		5.0		
			SH 4	63		3.75		
		(CL) SANDY CLAY, low plasticity, some to little silt, tan and gray, mottled, moist, firm	SH 5	42		4.0		
10								
		some sand seams, very stiff at 13.0'	SH 6	42		3.0		
15								
		(CL) SILTY CLAY, medium to high plasticity, little find sand, brown, moist, firm	SH 7	58		1.0		
20								
		low plasticity, gray, moist at 23.0'	SH 8	71		5.0		
25		▽						
		(SM) SILTY SAND, fine, subangular, non-plastic, some clay, gray and tan, wet, compact	SS 9	83	7-7-9 (16)			□
30								
		(SC) CLAYEY SAND, fine, subangular, low plasticity, some silt, tan and gray, wet, compact	SS 10	100	3-5-6 (11)			▲ ●
35								

(Continued Next Page)

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BORING NUMBER BH-202

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
35								
40		interbedded clay and sand seams at 38.0'	SS 11	100	8-7-8 (15)			▲●
45		no seams at 43.0'	SS 12	89	4-4-4 (8)			▲ ●
50		(SP) SAND, medium to fine, poorly graded, subangular, non-plastic, some silt and clay, wet, loose	SS 13	100	2-3-4 (7)			▲ ●

Bottom of borehole at 50.0 feet.

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BORING NUMBER BH-203

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/30/12 **COMPLETED** 10/30/12
GROUND ELEVATION 330 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 28.80 ft / Elev 301.20 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		remove 14" sandy GRAVEL as roadbed	SH 1	44		2.75	
		(CL) SILTY CLAY, low plasticity, little sand, gray and tan, mottled, dry, very stiff					
		(CL) SANDY CLAY, low plasticity, some silt, gray and tan, mottled, dry, stiff	SH 2	50		1.5	
5		low plasticity, some sand veins, soft	SH 3	42		1.25	
		(CL-CH) CLAY, low plasticity to medium plasticity, some silt, dark to light gray, dry, stiff	SH 4	67		1.75	
		very stiff at 8.0'	SH 5	50		3.25	
10							
		low plasticity, some silt and fine sand, little coarse sand and fine gravels, subrounded, red and tan, stiff at 13.0'	SH 6	38		1.5	
15							
		(CL) SANDY CLAY, low plasticity, some silt, tan and gray, mottled, dry, stiff	SH 7	44		2.0	
20							
		(SC) CLAYEY SAND, low plasticity, some silt, tan and gray, mottled, compact, moist	SS 8	94	3-7-7 (14)		
25							
		▽ low plasticity, with grey silty clay, some sand, tan at 28.0'	SS 9	94	4-7-8 (15)		
30							
		(SM) SILTY SAND, non-plastic, grading to sand, some silt, little to trace clay, gray, wet, compact	SS 10	100	3-8-9 (17)		
35							

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

(Continued Next Page)

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BORING NUMBER BH-203

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
35								
40		some clay and silt veins, tan at 38.0'	SS 11	100	3-6-6 (12)			▲ ●
45		(SC) CLAYEY SAND, low plasticity, some silt, tan and brown, wet, compact	SS 12	100	4-8-10 (18)			▲
50		(SM) SILTY SAND, non-plastic, trace clay, tan and gray, wet, dense	SS 13	100	8-14-20 (34)			▲

Bottom of borehole at 50.0 feet.

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BORING NUMBER BH-204

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/30/12 **COMPLETED** 10/30/12
GROUND ELEVATION 330 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 31.80 ft / Elev 298.20 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		removed SANDY GRAVEL from roadbed					
		(CL) SILTY CLAY, low plasticity, some sand, tan and gray, mottled, dry, hard	SH 1	67		4.25	
		(CL) LEAN CLAY, low plasticity, some silt, sand, and sand veins, red and gray, dry, very stiff	SH 2	50		3.0	
5		(SC) CLAYEY SAND, low plasticity, some silt and black sandy gravel veins, tan and gray, dry	SH 3	33		5.0	
		(CL) SANDY CLAY, low plasticity, little silt, tan and gray, dry, stiff	SH 4	58		2.0	
10		(SC) CLAYEY SAND, non-plastic to low plasticity, little silty clay seam, tan, brown, with little gray, dry	SH 5	44		2.5	
15		(CL) LEAN CLAY, low to medium plasticity, some silt, trace fine sand, tan, brown, and gray, mottled, dry, stiff	SH 6	67		2.0	
20		some sand, little silt	SH 7	67		1.5	
25		(CL) SANDY CLAY, low plasticity, little silt, tan and gray, moist, very stiff	SH 8	46		3.0	
30		(ML) SANDY SILT, low plasticity to non-plastic, fine, subangular, some clay, tan and gray, moist, soft	SS 9	100	2-1-3 (4)		
		▽ (SM) SILTY SAND, low plasticity to non-plastic, fine, subangular, gray with little brown, dense	SS 10	94	11-14-18 (32)		
35							

▲ SPT N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
□ FINES CONTENT (%) □ 20 40 60 80

(Continued Next Page)

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BORING NUMBER BH-204

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
35								
		(SC) CLAYEY SAND, fine, subangular, interbedded with gray, silty sand, some clay, tan, wet, compact	SS 11	94	4-5-6 (11)			▲ ●
40								
		(CH) CLAY, medium plasticity, little silt, trace fine sand, gray, wet, stiff	SS 12	100	3-5-7 (12)			▲ ●
45								
			SH 13	75		2.0		●
50		Bottom of borehole at 50.0 feet.						

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BORING NUMBER BH-205

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/30/12 **COMPLETED** 10/30/12
GROUND ELEVATION 330.5 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 29.40 ft / Elev 301.10 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
0		(CL) LEAN CLAY, medium plasticity, some silt, trace sand, tan and gray, mottled, dry, hard	SH 1	50		4.0		
		with silty sand seams, very stiff at 2.0'	SH 2	60		3.5		
5		stiff at 4.0'	SH 3	40		1.25		
		very stiff at 6.0'	SH 4	58		3.75		
10			SH 5	44		3.5		
		some to little silt at 13.0'	SH 6	42		3.0		
15								
		some clayey sand seams, stiff at 18.0'	SH 7	40		1.5		
20								
		(CL) SILTY CLAY, low plasticity, some sand, dark gray, moist, stiff	SH 8	67		1.75		
25								
		(CL) SANDY SILTY CLAY, low plasticity, little clay, light gray with little brown, moist, stiff	SS 9	67	2-5-7 (12)			
30		▽						
		(CL) SANDY CLAY, low plasticity, some silt, tan and gray, moist, very stiff	SH 10	60		3.0		
35								

(Continued Next Page)

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BORING NUMBER BH-205

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
35								
		(SC) CLAYEY SAND, interbedded with gray silty SAND, fine, subangular, little clay, compact, wet	SS 11	100	3-6-8 (14)			▲ ●
40								
		(SP) SAND, fine, subangular, non-plastic, some clay, little silt, tan and brown, wet, compact	SS 12	100	4-9-12 (21)			▲●
45								
		medium to fine, tan at 48.0'	SS 13	100	3-6-11 (17)			▲ ●
50								
		very loose at 53.0'	SS 14	33				☐ ●
55								
60								

Bottom of borehole at 60.0 feet.

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BORING NUMBER BH-206

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/30/12 **COMPLETED** 10/30/12
GROUND ELEVATION 330.5 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 30.20 ft / Elev 300.30 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0		(CL) SANDY CLAY, low plasticity, some silt, tan and gray, mottled, dry, stiff	SH 1	44		2.25		
		decreased sand content, very stiff at 2.0'	SH 2	67		3.5		
5		interbedded with silty clay layers, very stiff at 4.0'	SH 3	50		2.25		
		some silty sand veins, very stiff at 6.0'	SH 4	67		3.5		
10			SH 5	52		3.5		
15		trace organics, hard at 13.0'	SH 6	54		4.5		
20		with clayey sand veins, hard at 18.0'	SH 7	50		5.0		
25		some red, moist at 23.0'	SH 8	50		4.5		
30		(CH) SANDY CLAY, medium to high plasticity, some silt, tan and gray, very stiff ▽	SH 9	52		3.25		
35		increased sand and silt content, dark gray, stiff at 33.0'	SH 10	56		1.5		

(Continued Next Page)

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BORING NUMBER BH-206

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
35								
		(SC) CLAYEY SAND, fine, subangular, low plasticity, some to little silt, gray, tan, and red, mottled, wet, compact	SS 11	100	5-6-6 (12)			▲●
40								
		(SM) SILTY SAND, fine, subangular, non-plastic, some clay, wet, loose	SS 12	100	3-4-5 (9)			▲ ●
45								
		(SP) SAND, medium to fine, trace coarse, poorly graded, subangular, non-plastic, some silt, tan, wet, compact	SS 13	100	2-6-12 (18)			▲●
50								
		no coarse, trace clay at 53.0'	SS 14	100	5-8-13 (21)			●▲
55								
		dense at 58.0'	SS 15	100	9-18-23 (41)			● ▲
60								

Bottom of borehole at 60.0 feet.

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BORING NUMBER BH-207

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/31/12 **COMPLETED** 10/31/12
GROUND ELEVATION 330.5 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 34.40 ft / Elev 296.10 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0		remove 8" of SANDY GRAVEL from roadbed						
		(CL) SILTY CLAY, low plasticity, trace fine sand, gray, dry, hard	SH 1	33		5.0		
		(CL) SANDY CLAY, low plasticity, some silt and interbedded sand seams, tan and gray, mottled, dry, firm	SH 2	58		3.0		
5		(SP) SAND, poorly graded, non-plastic, some silt, clay, and gravel, black and tan, dry	SH 3	38		0.0		
		(CL) SANDY CLAY, low plasticity, some silt, gray and tan, dry, firm	SH 4	54		3.0		
		hard at 8.0'	SH 5	50		5.0		
10								
		decrease sand content, stiff at 13.0'	SH 6	56		3.75		
15								
		some sand seams at 18.0'	SH 7	52		2.5		
20								
		(SM) SILTY SAND, non-plastic, fine, subangular, little clay, gray, moist	SH 8	33				
25								
		(CL) SILTY CLAY, non-plastic, some sand, gray, moist, hard	SH 9	60		5.0		
30								
		▽ (SM) SILTY SAND, non-plastic, fine, subangular, little clay, gray with little tan, moist, compact	SS 10	89	6-7-7 (14)			
35								

(Continued Next Page)

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BORING NUMBER BH-207

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
35								
		(SC) CLAYEY SAND, non-plastic, fine, subangular, some silt, gray and tan, wet, loose	SS 11	67	2-3-4 (7)			▲ ●
40								
		compact at 43.0'	SS 12	100	3-5-5 (10)			▲ ●
45								
			SS 13	100	3-5-6 (11)			▲ ●
50								
		(SP) SAND, medium to fine, non-plastic, some silt and clay, gray and tan, wet, loose	SS 14	89	2-2-5 (7)			▲ ●
55								
		(CL) SILTY CLAY, low plasticity, trace fine sand, gray, wet, very stiff	SS 15	100	3-7-12 (19)			▲ ●
60								

Bottom of borehole at 60.0 feet.

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BORING NUMBER BH-208

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/31/12 **COMPLETED** 10/31/12
GROUND ELEVATION 330.5 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 30.00 ft / Elev 300.50 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		remove 12" of SANDY GRAVEL from roadbed					
		(CL) SANDY CLAY, low plasticity, some silt, tan and gray, dry, stiff	SH 1	44		3.5	
		stiff to very stiff at 2.0'	SH 2	50		4.0	
5		hard at 4.0'	SH 3	54		5.0	
		SILTY SAND, nonplastic, some clay, dry	SH 4	31		1.5	
10		(CL) SANDY CLAY, low plasticity, some silt, tan, gray, and red, dry, soft to firm	SH 5	50		2.0	
15			SH 6	40		2.5	
20		very stiff at 18.0'	SH 7	50		3.5	
25		hard at 23.0'	SH 8	46		5.0	
30	▽	some sand seams, moist, very stiff at 28.0'	SH 9	54		3.0	
35		(SC) CLAYEY SAND, fine, subangular, some silt, tan, gray, and red, moist	SH 10	60		2.5	

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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BORING NUMBER BH-208

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
35								
		wet at 38.0'	SH 11	50				
40								
		loose at 43.0'	SS 12	100	3-2-3 (5)			
45								
		(SP) SAND, fine, little medium, non-plastic, subangular, little clay, tan, compact	SS 13	72	1-6-8 (14)			
50								
			SS 14	100	3-6-7 (13)			
55		(SC) CLAYEY SAND, medium, some silt, brown						
		(SM) SILTY SAND, fine, subangular, non-plastic, little clay, gray, compact						
		(CL) SILTY CLAY, low plasticity, dark gray, dense	SS 15	100	7-43-50 (93)			
60		SANDY GRAVEL, non-plastic, planar, lignite coal seam, black, hard						

Bottom of borehole at 60.0 feet.

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BORING NUMBER BH-209

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 11/1/12 **COMPLETED** 11/1/12
GROUND ELEVATION 360 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 46.20 ft / Elev 313.80 ft no reading, cave in at 46
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		(SC) CLAYEY SAND, fine, subangular, medium plasticity, some fine rounded gravel, red and brown, dry	SH 1	33		5.0	
		trace fine rounded gravel, tan and gray, mottled at 2.0'	SH 2	38		5.0	
5		little silt, no gravel at 4.0'	SH 3	38		5.0	
		some silt at 6.0'	SH 4	29		4.5	
		(CL) SANDY CLAY, low plasticity, some silt, tan and gray, dry, firm	SS 5	33	2-2-5 (7)		
10							
		some red, hard at 13.0'	SH 6	21		5.0	
15							
		gray, moist, very stiff at 18.0'	SH 7	29		2.5	
20							
		(CL) LEAN CLAY, low plasticity, some silt, trace fine sand, gray and tan, moist, stiff	SS 8	67	4-6-8 (14)		
25							
		little silt, hard, gray at 28.0'	SH 9	50		5.0	
30							
		grading to clayey sand, very stiff at 33.0'	SH 10	42		3.0	
35							

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

(Continued Next Page)

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BORING NUMBER BH-209

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
35								
40		some silt and sand, gray, tan, and brown, hard at 38.0'	SS 11	100	7-13-14 (27)			
45		(CL) SILTY CLAY, low plasticity, dark gray, moist, hard	SS 12	100	12-20-26 (46)			
50		(SM) SILTY SAND, fine, subangular, non-plastic, some clay, tan and gray, moist, very dense	SS 13	100	14-27-36 (63)			

Bottom of borehole at 50.0 feet.

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BORING NUMBER BH-210

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 11/1/12 **COMPLETED** 11/1/12
GROUND ELEVATION 360 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 47.00 ft / Elev 313.00 ft no reading, cave in at 47
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		(SC) CLAYEY SAND, fine, subangular, some silt, little fine rounded gravel, red, dry					
		trace roots at 1.0'	SH 1	25		5.0	
		tan, gray, and red, mottled at 2.0'	SH 2	21		5.0	
5		compact at 4.0'	SS 3	67	4-7-10 (17)		
			SS 4	39	3-6-6 (12)		
10			SS 5	33	3-4-6 (10)		
15		(CL) SANDY CLAY, low to medium plasticity, little silt, red and gray, dry, very stiff	SH 6	21		3.0	
20		some silt and sand seams, gray and tan, moist, very stiff at 18.0'	SH 7	89		3.5	
25		little red, hard at 23.0'	SH 8	50		4.5	
30		trace subrounded fine gravels and coarse sand at 28.0'	SH 9	29		4.0	
35		(SC) CLAYEY SAND, fine, subangular, some silt, brown and tan, moist	SH 10	35		4.0	

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

(Continued Next Page)

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BORING NUMBER BH-210

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
35								
		(SM) SILTY SAND, fine, subangular, non-plastic, little clay, dark gray, moist, compact	SS 11	50	4-5-5 (10)			▲●
40								
		(CL) SILTY CLAY, low plasticity, little fine sand, gray, moist, stiff	SS 12	94	2-4-5 (9)			▲ ●
45		▽						
		(SM) SILTY SAND, fine, subangular, non-plastic, some clay, gray and tan, mottled, wet, compact	SS 13	100	4-7-8 (15)			▲ ●
50								
			SS 14	89	5-9-9 (18)			▲ ●
55								
		little tan, dense at 58.0'	SS 15	100	7-14-17 (31)			●
60								
			SS 16	100	11-15-19 (34)			● ▲
65								
		some dark brown clay seams at 68.0'	SS 17	100	10-15-25 (40)			● ▲
70								

Bottom of borehole at 70.0 feet.

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

BORING NUMBER BH-211

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 11/2/12 **COMPLETED** 11/2/12
GROUND ELEVATION 360 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 60.20 ft / Elev 299.80 ft no reading, cave in at 60
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		(SC) CLAYEY SAND, some silt and fine rounded gravel, red, dry	SH 1	29		5.0	
		fine, subangular, gray, tan, and red at 2.0'	SH 2	29		3.5	
5		trace fine gravels and coarse sand, loose at 4.0'	SS 3	50	2-3-6 (9)		
		some sandy clay seams, compact at 6.0'	SS 4	39	4-5-8 (13)		
		increase clay and silt content at 8.0'	SS 5	72	4-8-8 (16)		
10							
15		(CL-CH) SANDY CLAY, low to medium plasticity, little silt, gray, tan, and red, dry, stiff	SS 6	33	2-5-6 (11)		
20		some silt at 18.0'	SH 7	50		3.25	
25		brown and tan at 23.0'	SH 8	44		5.0	
30		(ML) SANDY SILT, little clay, tan, moist	SH 9	25			
35		(SM) SILTY SAND, fine, subangular, some clay, tan and gray, dense	SS 10	67	7-15-19 (34)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
□ FINES CONTENT (%) □
20 40 60 80

(Continued Next Page)

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Telephone: (281) 821-6868
Fax: (281) 821-6870

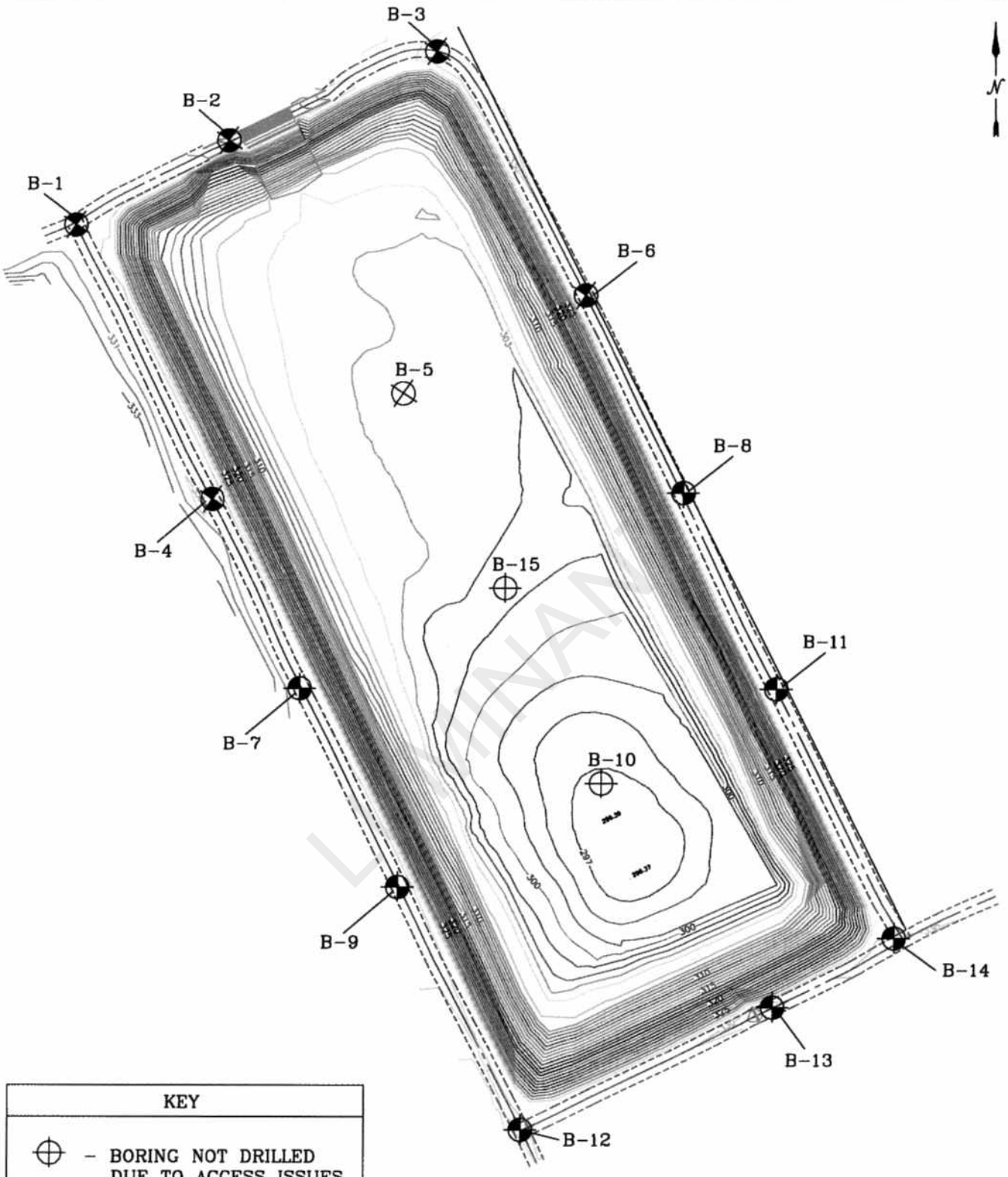
BORING NUMBER BH-211

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
35								
			SS 11	89	9-17-25 (42)			
40								
			SS 12	100	10-14-18 (32)			
45								
		(SC) CLAYEY SAND, low plasticity, fine, subangular, some silt and lean clay, gray and tan, wet, dense	SS 13	89	9-14-18 (32)			
50								
		(SP) SAND, fine, subangular, non-plastic, some silt, little to trace clay, tan, wet, very dense	SS 14	100	17-29-38 (67)			
55								
		little medium at 58.0'	SS 15	78	14-28-33 (61)			
60		▽						
			SS 16	100	17-29-34 (63)			
65								
		(SM) SILTY SAND, fine, subangular, non-plastic, little to trace clay, gray and tan, wet, very dense	SS 17	72	18-27-37 (64)			
70								

Bottom of borehole at 70.0 feet.



ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 595-4421	MARTIN LAKE LUMINANT EAST ASH DISPOSAL POND RUSK COUNTY, TEXAS	PLATE 1 – PLAN OF BORINGS		APPROVED BY:
		JOB NO.: G 2972-08		DRAWN BY: K.C.R.
		DATE: NOV. 2008	SCALE: AS SHOWN	

LOG OF BORING B-1

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/8/08

SURFACE ELEVATION

ETTL ENGINEERS & CONSULTANTS

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1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL		SANDY LEAN CLAY(CL) hard; red, tan, and gray; mottled	P=4.5+					9	28	14	14	55	+40 Sieve =0%, +4 Sieve =0%
				--very stiff	P=3.75										
				--with trace lignite	P=3.0					16	37	14	23	66	+40 Sieve =1%, +4 Sieve =0%
					P=2.75										
10				--hard	P=4.5+										
					N=11										
20					N=16					17	39	16	23	70	+40 Sieve =1%, +4 Sieve =0%
		SM		SILTY SAND(SM) medium dense; red, tan, and gray	N=19										
30				--with gravel	N=22										
		CL		LEAN CLAY WITH SAND(CL) very stiff; red, tan, and gray; interbedded; laminated	N=17										
40				Bottom of Boring @ 40'											

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit (20 40 60 80)

Water Level Est: Measured: Perched:

Water Observations. Seepage @ 28' while drilling. Water level @ 26' and open to 33' upon completion. Water level @ 24' and open to 27' on 10/9/08.

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.850', W 94°33.910'

LOG OF BORING B-11

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/7/08

SURFACE ELEVATION

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		SC		CLAYEY SAND(SC) tan, gray, and red; mottled; with gravel	P=3.0 P=2.25					6	28	12	16	33	+40 Sieve =28%, +4 Sieve =24%
10		CL		SANDY LEAN CLAY(CL) very stiff; tan, gray, and red; mottled	N=17					13	32	13	19	56	+40 Sieve =1%, +4 Sieve =0%
				--stiff	N=11										
20					P=2.25										
					P=3.25					16	38	14	24	68	+40 Sieve =1%, +4 Sieve =0%
30				--red and gray; mottled	P=2.25										
				--tan, red, and gray; mottled	N=15										
40		SM		SILTY SAND(SM) medium dense; gray	N=16										
				Bottom of Boring @ 40'											

BLOW COUNT ● 20 40 60 80
Qu (tsf) ▲ 1 2 3 4
PPR (tsf) ■ 1.0 2.0 3.0 4.0
Torvane (tsf) ◆ 1.0 2.0 3.0 4.0

Natural Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit
20 40 60 80

Water Level Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 38' while drilling. Water level @ 36' and open to 37' upon completion. Water level @ 21' and open to 22' on 10/8/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.773', W 94°33.782'

LOG OF BORING B-12

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/9/08

SURFACE ELEVATION

ETTL ENGINEERS & CONSULTANTS

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DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL		SANDY LEAN CLAY(CL) brown; with gravel											
				--mottled; tan, red, and gray; with sand seams	P=3.5					13	32	15	17	54	+40 Sieve =1%, +4 Sieve =0%
										13	34	15	19	57	+40 Sieve =0%, +4 Sieve =0%
10				--with silty sand											
		CL		LEAN CLAY WITH SAND(CL) very stiff; tan, red, and gray; mottled	N=18					16	30	14	16	75	+40 Sieve =1%, +4 Sieve =0%
20					N=15										
				--with sand seams	N=22										
30		SM		SILTY SAND(SM) dense; gray and red; mottled	N=38										
		CL		SANDY LEAN CLAY(CL) very stiff; gray, red, and tan; mottled	N=18										
40				Bottom of Boring @ 40'											

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit (20 40 60 80)

Water Level Est: Measured: Perched:

Water Observations: Seepage @ 33' while drilling. Water level @ 34' and open to 35' upon completion. Water level @ 23' and open to 31' on 10/10/08.

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.696', W 94°33.830'

LOG OF BORING B-13

ETTL ENGINEERS & CONSULTANTS

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Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/7/08

SURFACE ELEVATION

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL		SANDY LEAN CLAY(CL) very stiff; tan, gray, and red; mottled	P=3.25										
		CL		LEAN CLAY WITH SAND(CL) very stiff; tan, gray, and red; mottled --tan and brown	P=3.0 P=3.75					15	39	16	23	70	+40 Sieve =6%
10		SC		CLAYEY SAND(SC) dense; tan, brown, and red; with gravel	P=3.25					10	40	16	24	47	+40 Sieve =36%, +4 Sieve =33%
		CL		LEAN CLAY WITH SAND(CL) very stiff; tan, brown, and red; with lignite	P=2.75										
20				--red and tan	P=2.0					17	38	16	22	74	+40 Sieve =3%, +4 Sieve =0%
					P=2.25										
30				--tan, red, and gray; mottled	N=18										
		SC		CLAYEY SAND(SC) loose; tan, red, and gray; with trace gravel and ferric material	N=9					18	36	17	19	43	+40 Sieve =36%, +4 Sieve =25%
40				--medium dense Bottom of Boring @ 40'	N=18										

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit (20 40 60 80)

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 37' while drilling. Water level @ 36' and open to 38' upon completion. Water level @ 25' and open to 26' on 10/8/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.713', W 94°33.777'

LOG OF BORING B-14

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/6/08

SURFACE ELEVATION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CL	SANDY LEAN CLAY(CL) hard; tan, gray, and red; mottled; with gravel	P=4.5+										
			P=4.5+					14	40	16	24	53	+40 Sieve =50%, +4 Sieve =49%
			P=4.5+										
			P=4.5+										
10		--stiff	N=12					13	29	13	16	63	+40 Sieve =1%, +4 Sieve =0%
	CL	SANDY LEAN CLAY(CL) very stiff; tan, gray, and red; mottled	N=16										
20		--stiff; interbedded	N=14					16	31	16	15	58	+40 Sieve =2%, +4 Sieve =0%
			N=15										
30		--hard; brown, tan, and red	P=4.5+					12	40	14	26	77	+40 Sieve =1%, +4 Sieve =0%
			N=19										
40		--hard; with gray and brown silty sand	P=4.25										
	SM	SILTY SAND(SM) medium dense; red and gray; saturated											

FIELD STRENGTH DATA: BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0

Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit; 20 40 60 80

Water Level Est.: Measured: Perched:

Water Observations: Water level @ 22' and open to 89' upon completion. Water level @ 26' and open to 27' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.723', W 94°33.756'

LOG OF BORING B-14

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/6/08

SURFACE ELEVATION

ETTL ENGINEERS & CONSULTANTS

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Tyler, Texas 75702
(903) 595-4421

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
50					N=18										
					N=16					22				25	+40 Sieve =1%, +4 Sieve =0%
				--red and tan	N=23										
60		CL		LEAN CLAY WITH SAND(CL) hard; red and tan; interbedded; laminated; with ferric material seams	N=32					22	53	29	24	77	+40 Sieve =3%, +4 Sieve =0%
				--with black lignite seams	N=50/3"										
70		SM		SILTY SAND(SM) very dense; gray; with fat clay partings	N=50/5.5"										
				--gray	N=50/5"										
80					N=50/6"					24	24	21	3	41	+40 Sieve =0%, +4 Sieve =0%
		CL		LEAN CLAY(CL) hard; gray	N=50/6"										

FIELD STRENGTH DATA: BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit; 20 40 60 80

Water Level Est.: Measured: Perched:

Water Observations: Water level @ 22' and open to 89' upon completion. Water level @ 26' and open to 27' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.723', W 94°33.756'

LOG OF BORING B-14

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/6/08

SURFACE ELEVATION

ETTL ENGINEERS & CONSULTANTS

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Tyler, Texas 75702
(903) 595-4421

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA (BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0)	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit; 20 40 60 80)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
90				–with black lignite	N=50/3.5"											
				–dark brown; with silt seams; with lignite seam	N=50/6"											
100				Bottom of Boring @ 100'	N=88											

Water Level Est.: Measured: Perched:

Water Observations: Water level @ 22' and open to 89' upon completion. Water level @ 26' and open to 27' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.723', W 94°33.756'

LOG OF BORING B-2

ETTL ENGINEERS & CONSULTANTS

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Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/8/08

SURFACE ELEVATION

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL		SANDY LEAN CLAY(CL) very stiff; tan, red, and gray	N=19	8	32	14	18	50	+40 Sieve =0%, +4 Sieve =0%
				–hard; red, tan, and gray; mottled	P=4.25						
					P=3.75						
10					P=4.0						
				–with some gravel	P=4.5+						
20			▼	–tan, red, and gray; mottled	N=1	17	28	15	13	63	+40 Sieve =1%, +4 Sieve =0%
				–gray, red, and tan; mottled	N=22	13	39	15	24	54	+40 Sieve =0%, +4 Sieve =0%
30		SM		SILTY SAND(SM) medium dense; red and gray; saturated	N=15						
					N=13						
40				Bottom of Boring @ 40'							

FIELD STRENGTH DATA: BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0

DRY DENSITY (pcf) | COMPRESSIVE STRENGTH (tsf) | FAILURE STRAIN (%) | CONFINING PRESSURE (psi)

Natural Moisture Content and Atterberg Limits: Plastic Limit | Moisture Content | Liquid Limit; 20 40 60 80

Water Level Est: Measured: Perched:

Water Observations: Seepage @ 32' while drilling. Water level @ 29' and open to 32' upon completion. Water level @ 25' and open to 25' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.860', W 94°33.890'

LOG OF BORING B-3

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/8/08

SURFACE ELEVATION

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL		SANDY LEAN CLAY(CL) very stiff; tan, red, and gray; mottled	P=3.5					18	33	13	20	68	+40 Sieve =1%, +4 Sieve =0%
					P=2.5										
					P=3.0										
10					P=3.5										
				--stiff	P=1.5										
20		SC		CLAYEY SAND(SC) medium dense; red	N=15					10	37	15	22	19	+40 Sieve =15%, +4 Sieve =7%
				--gray	N=4										
30		CL		LEAN CLAY WITH SAND(CL) stiff; red, tan, and gray; mottled	N=15					18	34	16	18	71	+40 Sieve =5%, +4 Sieve =0%
				--with sand seams	N=13										
40		SC		CLAYEY SAND(SC) medium dense; gray and red; mottled; with clay seams	N=13										
				Bottom of Boring @ 40'											

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit (20 40 60 80)

Water Level Est: Measured: Perched:

Water Observations: Seepage @ 29' while drilling. Water level @ 28' and open to 34' upon completion. Water level @ 25' and open to 32' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.876', W 94°33.842'

LOG OF BORING B-4

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/8/08

SURFACE ELEVATION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CL	SANDY LEAN CLAY(CL) stiff; tan, red, and gray; mottled	N=13 P=2.5 P=4.5+						
10			P=2.0	13	28	14	14	60	+40 Sieve =1%, +4 Sieve =0%
	SC	CLAYEY SAND(SC) red, tan, and gray; mottled		14	29	14	15	36	+40 Sieve =0%, +4 Sieve =0%
20	CL	SANDY LEAN CLAY(CL) stiff; tan, red, and gray; mottled; with sand seams	N=14						
		–red and tan	N=12	15	44	15	29	67	+40 Sieve =0%, +4 Sieve =0%
30		–with sand seams	N=20						
	SM	SILTY SAND(SM) medium dense; red; saturated	N=20						
40		–red and tan; with gravel	N=39						
		Bottom of Boring @ 40'							

BLOW COUNT 20 40 60 80
Qu (tsf) 1 2 3 4
PPR (tsf) 1.0 2.0 3.0 4.0
Torvane (tsf) 1.0 2.0 3.0 4.0

DRY DENSITY (pcf) | COMPRESSIVE STRENGTH (tsf) | FAILURE STRAIN (%) | CONFINING PRESSURE (psi)

Natural Moisture Content and Atterberg Limits
Plastic Limit | Moisture Content | Liquid Limit
20 40 60 80

Water Level Est: Measured: Perched:

Water Observations: Seepage @ 28' while drilling. Water level @ 27' and open to 30' upon completion. Water level @ 23' and open to 28' on 10/9/08.

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.804', W 94°33.891'

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

LOG OF BORING B-6

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/7/08

SURFACE ELEVATION

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL		SANDY LEAN CLAY(CL) very stiff; tan, red, and gray; mottled	P=3.5										
					P=4.5+										
		SC		CLAYEY SAND(SC) medium dense; tan, red, and gray; mottled	N=17					11	31	16	15	43	+40 Sieve =1%, +4 Sieve =0%
10					N=24										
		CL		LEAN CLAY(CL) stiff; tan, red, and gray; mottled	P=1.75					19	45	16	29	88	+40 Sieve =0%, +4 Sieve =0%
				--very stiff; brown, gray, and red; with sand; trace ferric material and lignite	P=3.25					14	46	17	29	74	+40 Sieve =0%, +4 Sieve =0%
20				--with sand seams	N=19										
				--tan, red, and gray; mottled	N=25					18	46	17	29	84	+40 Sieve =8%, +4 Sieve =3%
30				--tan and gray; mottled	N=18										
		SM		SILTY SAND(SM) tan and gray	N=18										
40		CL		SANDY LEAN CLAY(CL) very stiff; tan and gray											
				Bottom of Boring @ 40'											

FIELD STRENGTH DATA: BLOW COUNT (20 40 60 80); Qu (tsf) (1 2 3 4); PPR (tsf) (1.0 2.0 3.0 4.0); Torvane (tsf) (1.0 2.0 3.0 4.0)

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit (20 40 60 80)

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 28' while drilling. Water level @ 26' and open to 34' upon completion. Water level @ 25' and open to 27' on 10/8/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.833', W 94°33.814'

LOG OF BORING B-7

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/8/08

SURFACE ELEVATION

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL		SANDY LEAN CLAY(CL) hard; tan, red, and gray; mottled	P=4.0										
		CL ML		SANDY SILTY CLAY(CL-ML) very stiff; tan, red, and gray; mottled	P=3.0					16	21	14	7	63	+40 Sieve =0%, +4 Sieve =0%
					P=3.0										
		CL		LEAN CLAY WITH SAND(CL) very stiff; tan, red, and gray; mottled	P=3.25					15	34	16	18	74	+40 Sieve =1%, +4 Sieve =0%
10				--stiff	P=1.5										
					P=1.5					15	36	15	21	72	+40 Sieve =0%, +4 Sieve =0%
20															
		CH		FAT CLAY(CH) stiff; gray, red, and tan; mottled	N=11					25	55	19	36	88	+40 Sieve =1%, +4 Sieve =0%
30		SM		SILTY SAND(SM) medium dense; tan, red, gray, mottled	N=10										
					N=20										
40		CL		SANDY LEAN CLAY(CL) very stiff; red, tan, and gray; mottled											
				Bottom of Boring @ 40'											

FIELD STRENGTH DATA: BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit; 20 40 60 80

Water Level Est: Measured: Perched:

Water Observations: Seepage @ 33' while drilling. Water level @ 32' and open to 35' upon completion. Water level @ 23' and open to 27' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.775', W 94°33.875'

LOG OF BORING B-8

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

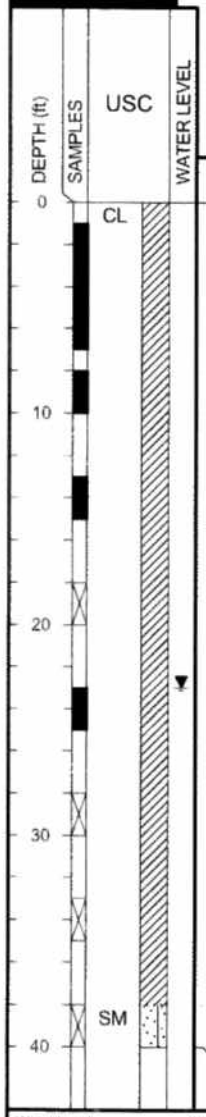
PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/7/08

SURFACE ELEVATION

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421



MATERIAL DESCRIPTION

DEPTH (ft)	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	SANDY LEAN CLAY(CL) hard; tan, red, and gray; mottled	P=4.5+						
		P=4.5+	11	30	13	17	67	+40 Sieve =2%, +4 Sieve =0%
		P=3.5						
		P=4.0	13	29	13	16	67	+40 Sieve =0%, +4 Sieve =0%
10		P=3.5						
	--very stiff	N=15	18	44	18	26	70	+40 Sieve =3%, +4 Sieve =0%
20		P=2.5						
		N=15	16	36	16	20	63	+40 Sieve =9%, +4 Sieve =3%
30	--red and gray; mottled	N=16						
40	SILTY SAND(SM) dense; red, tan, and reddish gray; mottled; saturated	N=26						
	Bottom of Boring @ 40'							

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit (20 40 60 80)

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 38' while drilling. Water level @ 35' and open to 36' upon completion. Water level @ 23' and open to 27' on 10/8/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.803', W 94°33.798'

LOG OF BORING B-9

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/9/08

SURFACE ELEVATION

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL		SANDY LEAN CLAY(CL) hard; tan, red, and gray; mottled	P=4.5+										
					P=4.5										
					P=2.5					14	29	14	15	59	+40 Sieve =2%, +4 Sieve =0%
10					P=3.25										
				--sand content increasing	SF					14	36	15	21	58	+40 Sieve =1%, +4 Sieve =0%
				--with bluish green sandy clay	P=2.5					13	38	14	24	56	+40 Sieve =1%, +4 Sieve =0%
20		SM CL		SILTY SAND(SM) medium dense; gray, tan, and red; mottled	N=16										
				SANDY LEAN CLAY(CL) very stiff; gray, tan, and red; mottled											
		SM		SILTY SAND(SM) medium dense; tan, red, and gray	N=23										
30				--with clay seams	N=14										
				--saturated	N=23										
40				Bottom of Boring @ 40'											

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit (20 40 60 80)

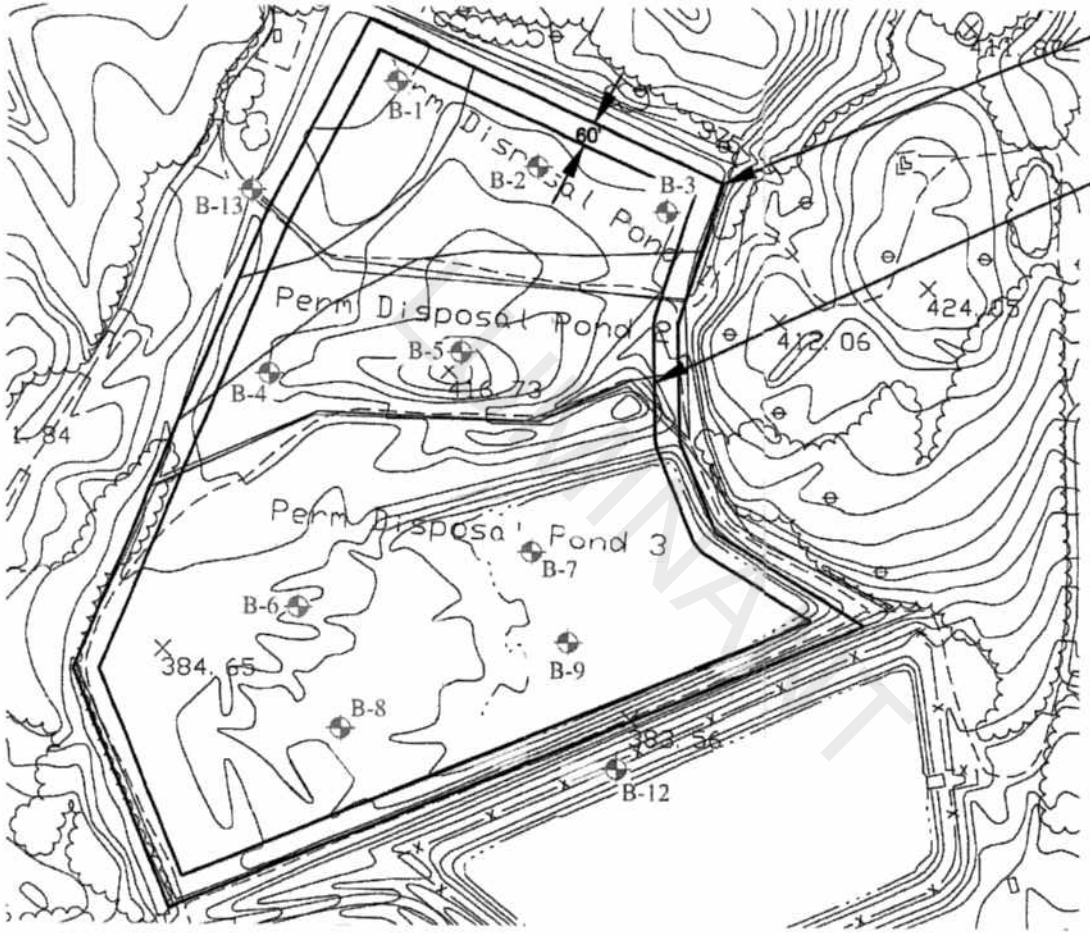
Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 28' while drilling. Water level @ 23' and open to 31' upon completion. Water level @ 23' and open to 29' on 10/10/08.

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetromater (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.745', W 94°33.857'

PERMANENT DISPOSAL POND - 5



ETTL ENGINEERS & CONSULTANTS	LUMINANT MARTIN LAKE PDP 1-3 TATUM, TEXAS	PLATE 1 – PLAN OF BORINGS		APPROVED BY:
		JOB No.: G 2810-08		DRAWN BY: K.C.R.
		DATE: MARCH 2008	SCALE: N.T.S.	

LOG OF BORING B-1

ETTL ENGINEERS & CONSULTANTS

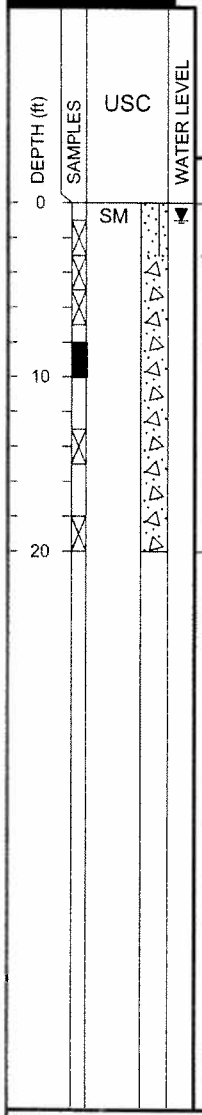
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE 2/22/08

SURFACE ELEVATION 390'



MATERIAL DESCRIPTION

SILTY SAND(SM) loose; tan; moist; with ferric oxide; with organics

ASH SEDIMENT medium dense; black and gray; coarse to very fine-grained sand

--black

--loose; black and gray; coarse to very fine-grained sand

Bottom of Boring @ 20'

FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
N=5					17	16	14	2	34	+40 Sieve =8%, +4 Sieve =3%
N=22	101				23					
N=17					23					
	82				28				23	+40 Sieve =55%, +4 Sieve =26%
N=8					36					
N=9					32				53	

BLOW COUNT (20 40 60 80); Qu (tsf) (1 2 3 4); PPR (tsf) (1.0 2.0 3.0 4.0); Torvane (tsf) (1.0 2.0 3.0 4.0)

Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit (20 40 60 80)

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 7' while drilling. Water level @ 1' and caved to 6' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.790', W 94°34.996'. Minus #200 Sieve (53%) @ 18' (Hydrometer - Specific Gravity 2.608). Dry Density (82) @ 8' (Hydraulic Conductivity K=2.79E-04 cm/sec).

LOG OF BORING B-12

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Rotary Wash

DATE 2/27/08

SURFACE ELEVATION 380'

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		SC		CLAYEY SAND(SC) medium dense; red and orange	N=25											
				--loose; gray, red, and orange	N=9											
		CL		LEAN CLAY WITH SAND(CL) stiff; red, orange, and tan	N=10											
10				--gray and red	N=13						24	47	19	28	79	+40 Sieve =3%, +4 Sieve =0%
				--red and orange												
		SC		CLAYEY SAND(SC) medium dense; red and orange	N=11											
20																
				--with iron oxide cemented sandstone gravel	N=12						17	36	15	21	44	+40 Sieve =21%, +4 Sieve =18%
30		SM		SILTY SAND(SM) medium dense; gray, red, and orange	N=17											
		CL		SANDY LEAN CLAY(CL) medium dense; red, orange, and gray	N=20						20	40	16	24	61	+40 Sieve =5%, +4 Sieve =3%
40					N=17											
				--red and orange; with iron oxide cemented sandstone seam @ 45'												
		SM		SILTY SAND(SM) medium dense; gray, orange, and tan	N=23											
50																

Water Level Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Dry and open to 25' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.513', W 94°34.904'.

LOG OF BORING B-12

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Rotary Wash

DATE 2/27/08

SURFACE ELEVATION 380'

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	ATTERBERG LIMITS(%) PLASTIC LIMIT PL	ATTERBERG LIMITS(%) PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
				--gray, red, brown	N=26											
				--gray and brown	N=28											
60		ML		SILT(ML) dense; brown and gray	N=46	99					26				96	+40 Sieve =2%, +4 Sieve =0%
				--very dense	N=66											
70		CL		LEAN CLAY WITH SAND(CL) hard; gray	N=50/3"											
					N=50/4"	102					22	45	24	21	73	+40 Sieve =24%, +4 Sieve =23%
80		ML		SILT(ML) very dense; gray	N=71											
					N=50/5"	107					23				94	+40 Sieve =2%, +4 Sieve =0%
90					N=70											
					N=80											
100				Bottom of Boring @ 100'												

FIELD STRENGTH DATA: BLOW COUNT (20 40 60 80); Qu (tsf) (1 2 3 4); PPR (tsf) (1.0 2.0 3.0 4.0); Torvane (tsf) (1.0 2.0 3.0 4.0)

Natural Moisture Content and Atterberg Limits: Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)

Water Level Est.: Measured: Perched:

Water Observations: Dry and open to 25' on 2/29/08.

Key to Abbreviations:
- N - SPT Data (Blows/Ft)
- P - Pocket Penetrometer (tsf)
- T - Torvane (tsf)
- L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.513', W 94°34.904'.

LOG OF BORING B-13

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Rotary Wash

DATE 2/19/08

SURFACE ELEVATION 380'

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	SC	CLAYEY SAND(SC) medium dense; red	N=11										
			N=16					14	24	14	10	46	+40 Sieve =3%, +4 Sieve =1%
		--brown and gray	N=38										
		--dense; red and tan	N=47										
10		--tan, red, and gray	N=37										
	CH	FAT CLAY(CH) stiff; red, gray, and tan	P=1.5					23	51	20	31	89	+40 Sieve =7%, +4 Sieve =1%
20		--with iron laminations	P=1.5										
			P=1.5										
	CL	LEAN CLAY(CL) very stiff; gray	N=26					23	48	21	27	94	+40 Sieve =2%, +4 Sieve =0%
30		--hard	P=4.5+										
40		--gray and brown; with iron oxide cemented sandstone seams	P=4.5+										
	ML	SANDY SILT(ML) very dense; gray; with clay seams	N=63					26				66	+40 Sieve =2%, +4 Sieve =0%
50			N=63										

Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit (20 40 60 80)

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 29' while drilling. Water level @ 28' and open upon completion. Water level @ 12' and caved to 14' on 2/29/08.

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.752', W 94°35.072'.

LOG OF BORING B-13

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Rotary Wash

DATE 2/19/08

SURFACE ELEVATION 380'

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION
				--hard; laminated with sand seams
				--very stiff; gray and green; with sand seams
60		CL		LEAN CLAY(CL) hard; gray; laminated with sand seams
		SM		SILTY SAND(SM) very dense; gray
70				
		ML		SILT(ML) very dense; gray
80				--with clay seams
90				
100				Bottom of Boring @ 100'

FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
P=4.5+											
P=2.5											
N=76						26	47	24	23	96	+40 Sieve =2%, +4 Sieve =0%
N=75											
N=50/3.5"											
N=78											
P=SF											
N=50/5"											
N=50/3"											
N=50/4"											

BLOW COUNT: 20 40 60 80
Qu (tsf): 1 2 3 4
PPR (tsf): 1.0 2.0 3.0 4.0
Torvane (tsf): 1.0 2.0 3.0 4.0
Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit; 20 40 60 80

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 29' while drilling. Water level @ 28' and open upon completion. Water level @ 12' and caved to 14' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.752', W 94°35.072'.

LOG OF BORING B-2

ETTL ENGINEERS & CONSULTANTS

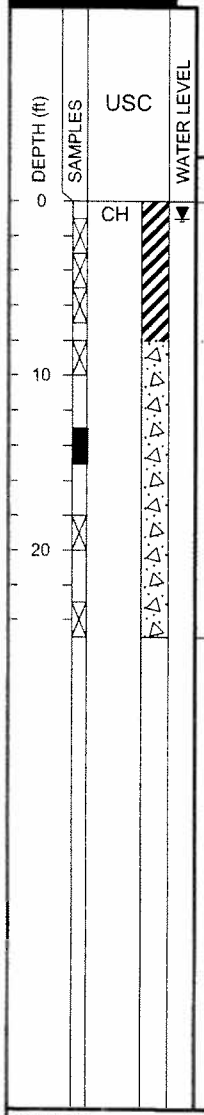
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE 2/22/08

SURFACE ELEVATION 390'



MATERIAL DESCRIPTION

SANDY FAT CLAY(CH) stiff; red and orange

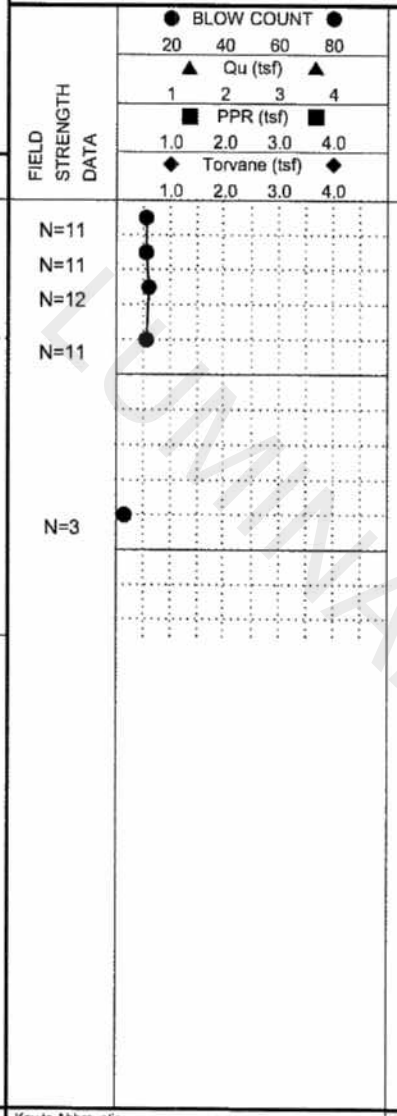
--with sand

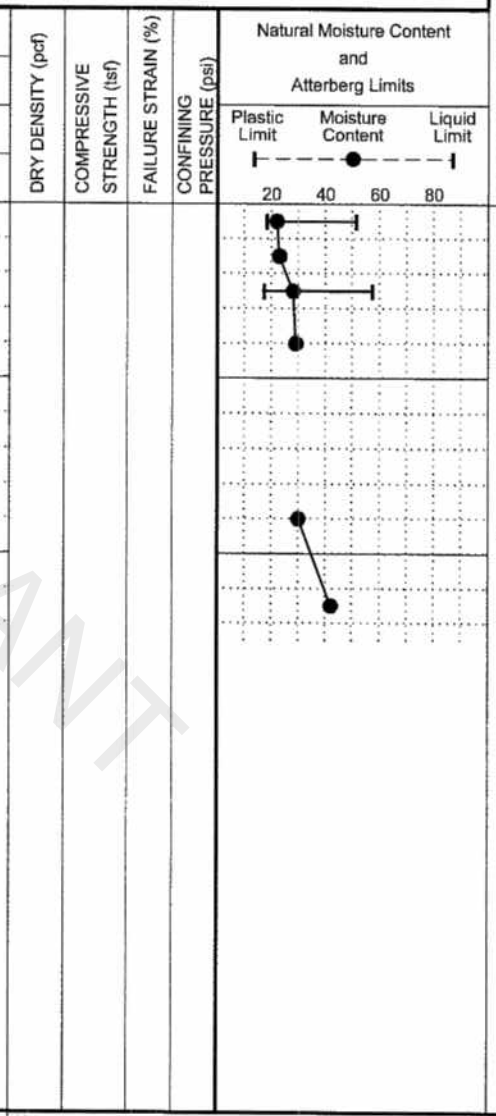
ASH SEDIMENT medium dense; black

--very loose; with organic odor

--light gray

Bottom of Boring @ 25'





MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
22	51	18	33	65	+40 Sieve =9%, +4 Sieve =6%
23					
28	57	17	40	78	+40 Sieve =2%, +4 Sieve =0%
29				16	+40 Sieve =63%, +4 Sieve =40%
30				39	+40 Sieve =36%, +4 Sieve =12%
42				93	

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 13' while drilling. Water level @ 1' and caved to 8' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.764', W 94°34.903'. Minus #200 Sieve (93%) @ 23' (Hydrometer - Specific Gravity 2.675).

LOG OF BORING B-3

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE 2/22/08

SURFACE ELEVATION 390'

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CH	SANDY FAT CLAY(CH) medium stiff; red and orange	N=10	21	54	19	35	69	+40 Sieve =5%, +4 Sieve =1%
		--stiff	N=15	26				42	
		ASH SEDIMENT dense; black	N=42						
10		--medium dense; black and gray; coarse-grained sand	N=20	26				10	+40 Sieve =60%, +4 Sieve =10%
		--very loose; black; coarse to fine-grained sand	N=4	28				9	+40 Sieve =67%, +4 Sieve =35%
20		--no recovery							
		--loose; light gray	N=5	69	49	41	8	100	+40 Sieve =0%, +4 Sieve =0%
30		--medium dense; black; with organic odor	N=21						
		Bottom of Boring @ 30'							

FIELD STRENGTH DATA: BLOW COUNT (20 40 60 80); Qu (tsf) (1 2 3 4); PPR (tsf) (1.0 2.0 3.0 4.0); Torvane (tsf) (1.0 2.0 3.0 4.0)

DRY DENSITY (pcf) | COMPRESSIVE STRENGTH (tsf) | FAILURE STRAIN (%) | CONFINING PRESSURE (psi)

Natural Moisture Content and Atterberg Limits (Plastic Limit – Moisture Content – Liquid Limit; 20 40 60 80)

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 8' while drilling. Water level @ 2' and caved to 8' on 2/29/08..

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.746', W 94°34.855'. Minus #200 Sieve (42%) @ 5' (Hydrometer - Specific Gravity 2.561).

LOG OF BORING B-4

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE 2/22/08

SURFACE ELEVATION 385'

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		SC		SILTY CLAYEY SAND(SC-SM) medium dense; red and brown	N=14										
		SM		--very stiff; red and orange	N=21					15	20	14	6	42	+40 Sieve =1%, +4 Sieve =0%
		SM		SILTY SAND(SM) medium dense; red and tan	N=22										
10		CL		LEAN CLAY(CL) very stiff; red, orange, and tan	N=18					18	35	18	17	85	+40 Sieve =5%, +4 Sieve =1%
				--red, tan, and gray	P=3.5	99	2.40	10	13	22					
20					N=25					21	39	21	18	81	+40 Sieve =0%, +4 Sieve =0%
				Bottom of Boring @ 20'											

Field Strength Data: ● BLOW COUNT ● (20 40 60 80); ▲ Qu (tsf) ▲ (1 2 3 4); ■ PPR (tsf) ■ (1.0 2.0 3.0 4.0); ◆ Torvane (tsf) ◆ (1.0 2.0 3.0 4.0)

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit (20 40 60 80)

Water Level Est.: ▽ Measured: ▼ Perched: ⧩

Water Observations: Seepage @ 3' while drilling. Water level @ Surface and caved to 15' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.675', W 94°35.083'.

LOG OF BORING B-5

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE 2/22/08

SURFACE ELEVATION 415'

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

MATERIAL DESCRIPTION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CH	FAT CLAY WITH SAND(CH) medium stiff; red, orange, and gray	N=6					23	51	16	35	77	+40 Sieve =4%, +4 Sieve =1%
		--soft	N=4										
	CL	SANDY LEAN CLAY(CL) medium stiff; red and orange	N=6					17	28	14	14	60	+40 Sieve =6%, +4 Sieve =1%
10	CH	FAT CLAY WITH SAND(CH) very stiff; red and orange	N=23					23	52	17	35	77	+40 Sieve =4%, +4 Sieve =1%
		ASH SEDIMENT medium dense; gray and black	N=23					25				16	+40 Sieve =54%, +4 Sieve =24%
		--loose	N=7										
20		--medium dense	N=15	62				34				32	+40 Sieve =37%, +4 Sieve =16%
		--loose	N=8										
30		--gray	N=5	62				57				99	+40 Sieve =1%, +4 Sieve =0%
		--very loose	N=4										
40		--loose	N=7										
		Bottom of Boring @ 45'											

Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit (20 40 60 80)

Water Level Est.: Measured: Perched:

Water Observations: 2/29/08. Water level @ 23' and caved to 26' on

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.667', W 94°34.936'.

LOG OF BORING B-6

ETTL ENGINEERS & CONSULTANTS

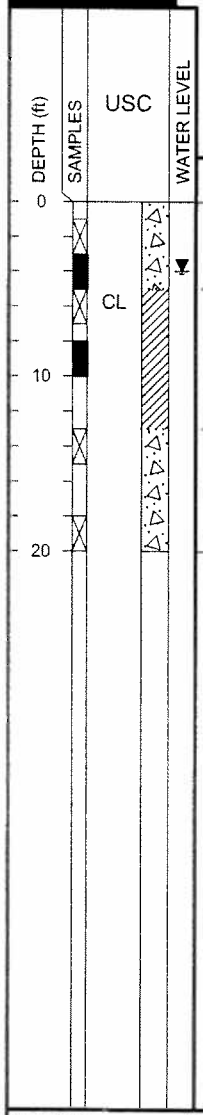
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE 2/22/08

SURFACE ELEVATION 385'



MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
ASH SEDIMENT medium dense; black and tan	N=19					26				44	+40 Sieve =30%, +4 Sieve =13%
	P=SF										
SANDY LEAN CLAY(CL) stiff; red and tan	N=10					22	35	19	16	61	+40 Sieve =7%, +4 Sieve =4%
--very stiff	P=2.5										
ASH SEDIMENT loose; black	N=9					40				61	+40 Sieve =5%, +4 Sieve =2%
--medium dense	N=12					68				84	
Bottom of Boring @ 20'											

Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit (20 40 60 80)

BLOW COUNT (20 40 60 80); Qu (tsf) (1 2 3 4); PPR (tsf) (1.0 2.0 3.0 4.0); Torvane (tsf) (1.0 2.0 3.0 4.0)

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 4' while drilling. Water level @ 4' and caved to 7' upon completion. Water level @ 1' and caved to 8' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.591', W 94°35.088'. Minus #200 Sieve (84) @ 18' (Hydrometer - Specific Gravity 2.732).

LOG OF BORING B-7

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Rotary Wash

DATE 2/28/08

SURFACE ELEVATION 390'

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0				ASH SEDIMENT medium dense; black	N=13					37				16	+40 Sieve =49%, +4 Sieve =10%
				--dense; black	N=40										
					P=4.5	98	2.30	2	6	23					
10				--loose	N=7										
				--very loose	N=4					38				11	
		CL		LEAN CLAY WITH SAND(CL) medium stiff; orange and black	N=7					27	42	17	25	75	+40 Sieve =4%, +4 Sieve =0%
20				--tan and red		104	0.50	13	22	21					
				--medium dense; red and orange	N=22										
30		CH		SANDY FAT CLAY(CH) medium dense; red and orange	N=23					27	53	20	33	69	+40 Sieve =27%, +4 Sieve =22%
					N=22										
40				Bottom of Boring @ 40'											

FIELD STRENGTH DATA: BLOW COUNT (20 40 60 80); Qu (tsf) (1 2 3 4); PPR (tsf) (1.0 2.0 3.0 4.0); Torvane (tsf) (1.0 2.0 3.0 4.0)

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit (20 40 60 80)

Water Level: Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: 2/29/08.

Water level @ 3' and caved to 24' on

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.646', W 94°34.870'. Minus #200 Sieve (11%) @ 13' (Hydrometer - Specific Gravity 2.655).

LOG OF BORING B-8

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MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE 2/20/08

SURFACE ELEVATION 390'

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0				ASH SEDIMENT loose; gray	N=7											
				--very loose; gray and black	N=0						73				95	+40 Sieve =3%, +4 Sieve =0%
10				--medium dense; brown	N=14											
				--very loose; black	N=1											
20					N=3						72				95	+40 Sieve =1%, +4 Sieve =0%
					N=0											
30				--strong odor	N=0						85				99	+40 Sieve =0%, +4 Sieve =0%
				Bottom of Boring @ 30'												

Field Strength Data: BLOW COUNT (20 40 60 80); Qu (tsf) (1 2 3 4); PPR (tsf) (1.0 2.0 3.0 4.0); Torvane (tsf) (1.0 2.0 3.0 4.0)

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit (20 40 60 80)

Water Level Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 4' while drilling. Water level @ 6' and caved to 17' upon completion. Dry and caved to 3' and on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.548', W 94°34.570'.

LOG OF BORING B-9

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE 2/20/08

SURFACE ELEVATION 390'

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0				ASH SEDIMENT very loose; gray	N=3						45				89	
				--loose; black and gray	N=10											
				--medium dense	N=18						45				77	+40 Sieve =4%, +4 Sieve =0%
10				--very loose; black	N=0											
				--loose	N=10						57				94	+40 Sieve =3%, +4 Sieve =0%
					N=5											
20				--very loose	N=1						49				68	+40 Sieve =4%, +4 Sieve =0%
				--gray and black; strong odor	N=0						88				97	+40 Sieve =2%, +4 Sieve =0%
30				Bottom of Boring @ 30'												

Water Level Est.: Measured: Perched:

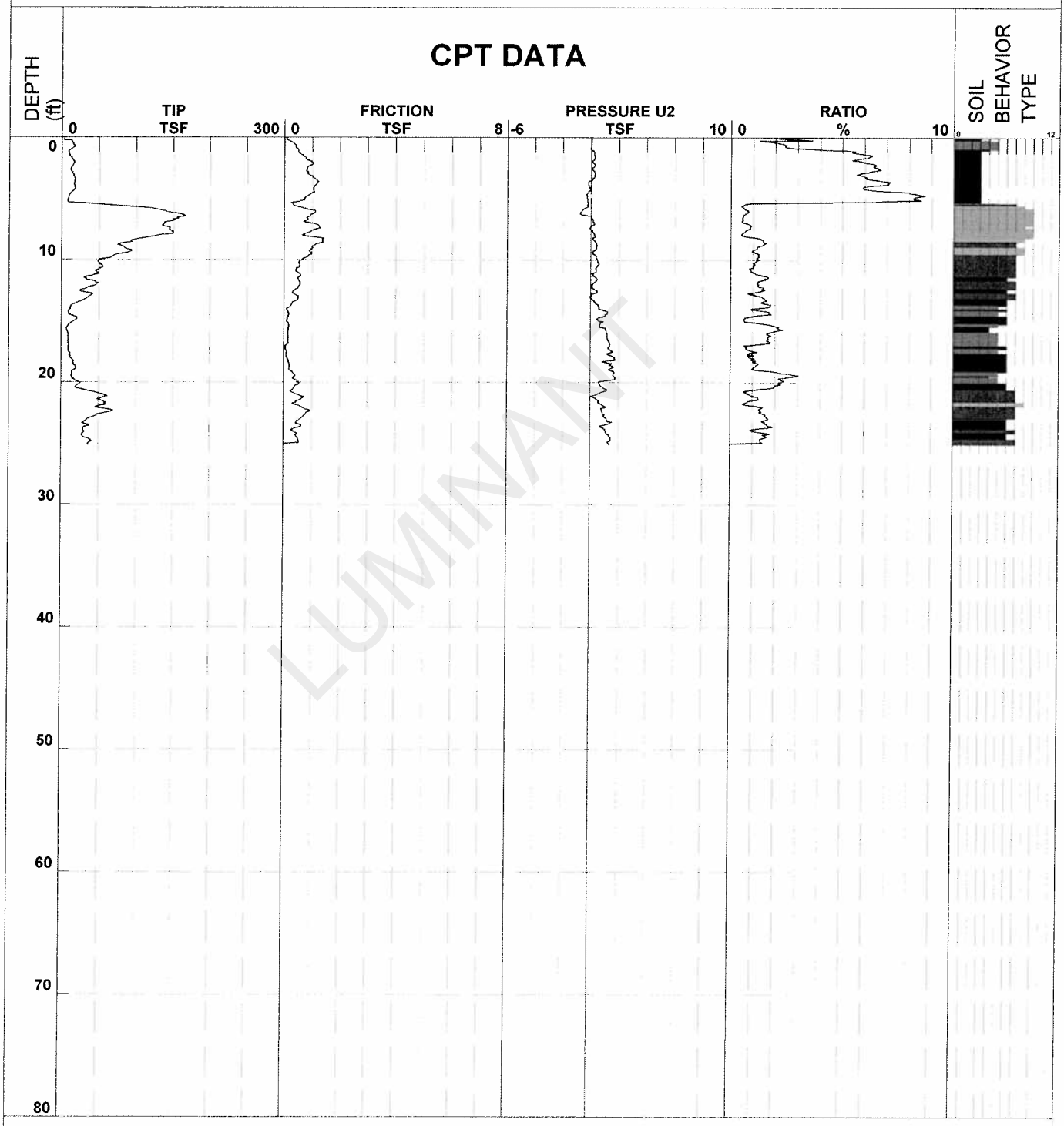
Water Observations: Seepage @ 4' while drilling. Water level @ 6' and caved to 18' upon completion. Dry and caved to 4' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.556', W 94°34.913'. Minus #200 Sieve (89%) @ 1' (Hydrometer - Specific Gravity 2.761).

CPT Data

Job Number	04.1908-0020	CPT Number	B-02	Location	Tatum-Tx
Operator	GLENN JOHNSON	Date and T	16-Apr-2008 13:47:38	Cone Number	F7.5CKEW2/B 1866
Client		Elevation		Water Table	

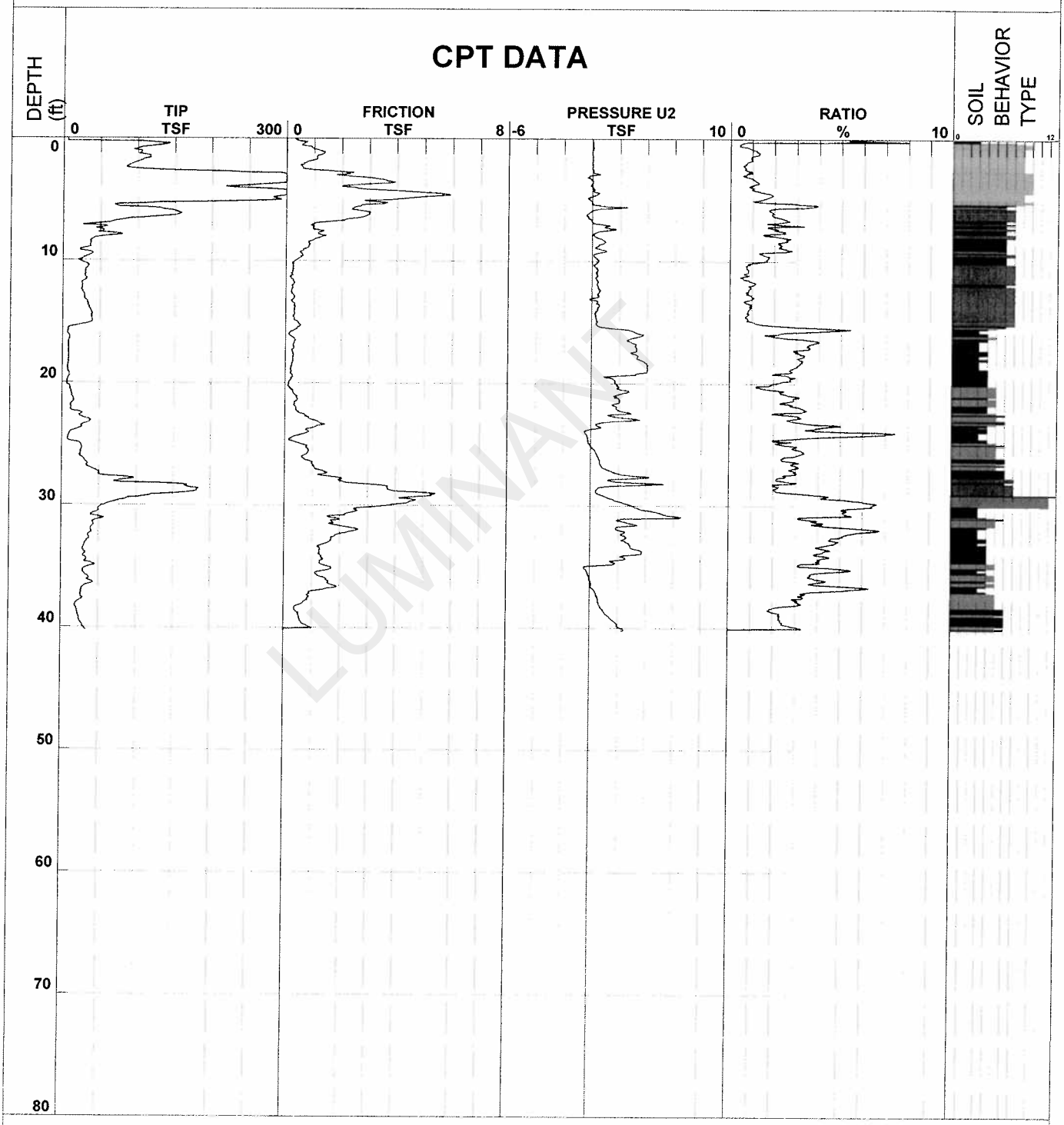


1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

Robertson et al. 1986 * Overconsolidated or Cemented

CPT Data

Job Number	04.1908-0020	CPT Number	B-07	Location	Tatum-Tx
Operator	GLENN JOHNSON	Date and T	16-Apr-2008 12:40:51	Cone Number	F7.5CKEW2/B 1866
Client		Elevation		Water Table	



1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

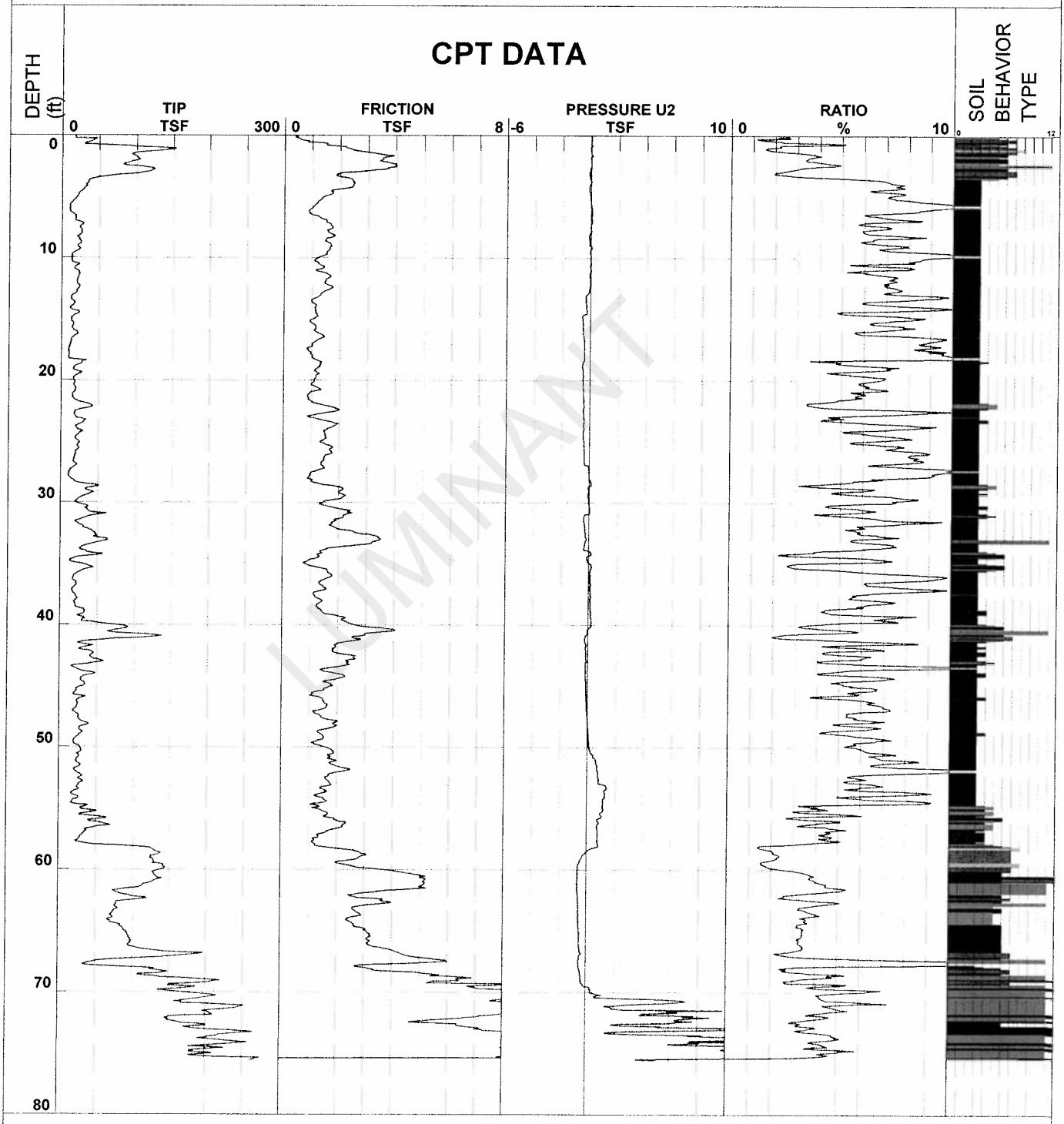
Robertson et al. 1986 * Overconsolidated or Cemented

CPT Data

Job Number 04.1908-0020 | CPT Number B-12 | Location Tatum-Tx

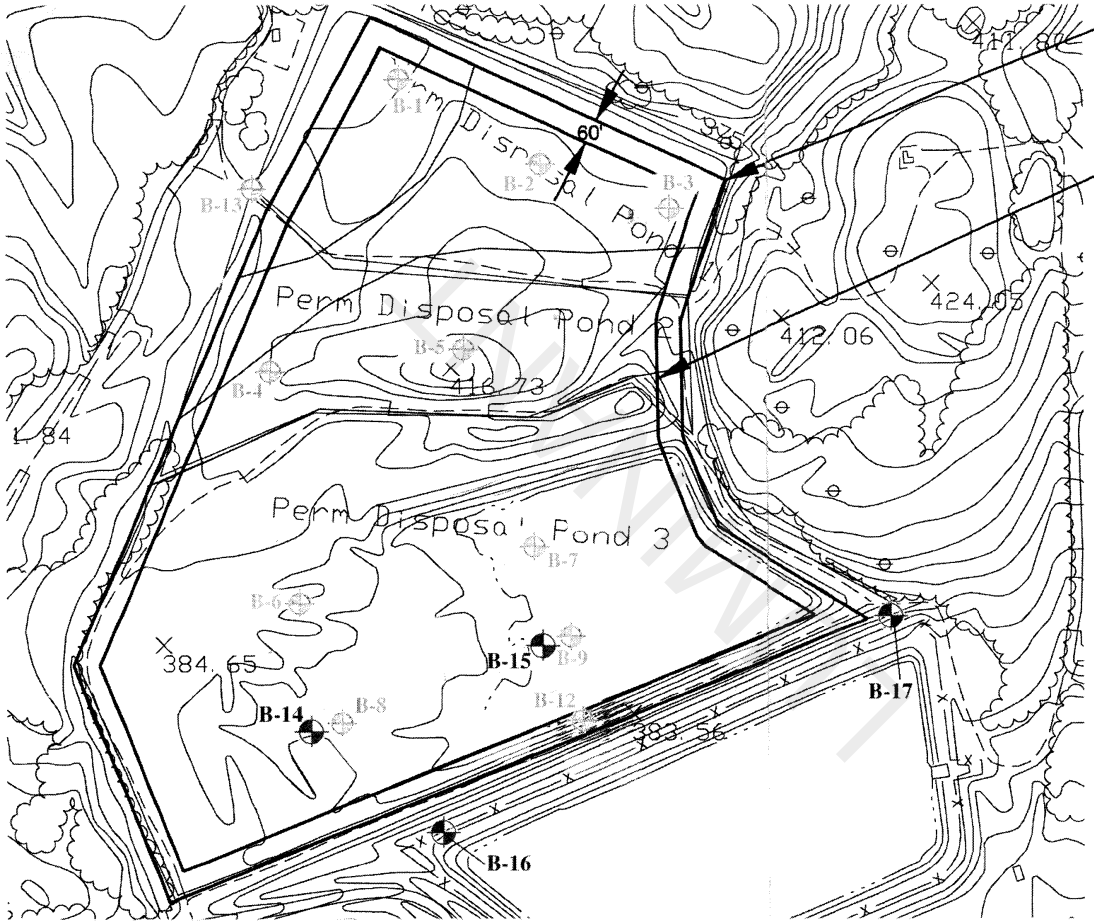
Operator GLENN JOHNSON | Date and T 16-Apr-2008 10:58:47 | Cone Number F7.5CKEW2/B 1866

Client | Elevation | Water Table



1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

Robertson et al. 1986 * Overconsolidated or Cemented



ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 595-4421	LUMINANT MARTIN LAKE PDP 1-3 TATUM, TEXAS	PLATE 1 – PLAN OF BORINGS		APPROVED BY:
		JOB No.: G 3219-09		DRAWN BY: K.C.R.
		DATE: MARCH 2008	SCALE: N.T.S.	

ETTL
ENGINEERS &
CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

LOG OF BORING B-14

PROJECT: Luminant Martin Lake PDP 1-3 Supplemental
Tatum, Texas

PROJECT NO.: G3219-09 **BORING TYPE:** Rotary Wash

DATE 8/18/09

SURFACE ELEVATION

MATERIAL DESCRIPTION

ASH SEDIMENT black;

--dark gray; with silty clay

--black; with sand

--gray

--black; with silt

Bottom of Boring @ 30'

DEPTH (ft)	USC	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		59				83	+40 Sieve=3%, +4 Sieve=0%
		119	111	47	64	89	+40 Sieve=1%, +4 Sieve=0%
10							
		86	65	51	14	95	+40 Sieve=1%, +4 Sieve=0%
20							
30							

FIELD STRENGTH DATA: BLOW COUNT (20 40 60 80); Qu (tsf) (1 2 3 4); PPR (tsf) (1.0 2.0 3.0 4.0); Torvane (tsf) (1.0 2.0 3.0 4.0)

DRY DENSITY (pcf) | COMPRESSIVE STRENGTH (tsf) | FAILURE STRAIN (%) | CONFINING PRESSURE (psi)

Natural Moisture Content and Atterberg Limits (Plastic Limit, Moisture Content, Liquid Limit; 20 40 60 80)

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 5' while drilling.

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32° 15.549', W 94°34.971'

LOG OF BORING B-15

PROJECT: Luminant Martin Lake PDP 1-3 Supplemental
Tatum, Texas

PROJECT NO.: G3219-09 **BORING TYPE:** Rotary Wash

DATE 8/18/09

SURFACE ELEVATION

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA (BLOW COUNT / Qu (tsf) / PPR (tsf) / Torvane (tsf))	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CL	LEAN CLAY(CL) tan, gray, and red	N=16											
		ASH SEDIMENT gray	N=10											
		--no recovery --black; with clay and silt	N=22						42				47	+40 Sieve=9%, +4 Sieve=1%
		ASH SEDIMENT gray; with sand; laminated												
		--with silt	N=2											
10		--with sand	N=1						79				95	+40 Sieve=2%, +4 Sieve=0%
		--full recovery												
20		--no recovery												
		--black	N=9											
		--black and gray	N=1						54				85	+40 Sieve=7%, +4 Sieve=3%
30		Bottom of Boring @ 30'												

Water Level Est.: Measured: Perched:

Water Observations: Seepage @ 5' while drilling.

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32° 15.556', W 94°34.913'

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MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

LOG OF BORING B-16

PROJECT: Luminant Martin Lake PDP 1-3 Supplemental
Tatum, Texas

PROJECT NO.: G3219-09 **BORING TYPE:** Rotary Wash

DATE 8/18/09

SURFACE ELEVATION

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		CL			SANDY LEAN CLAY(CL) orange and tan	P=1.2						
					--tan and gray	P=1.5	13	29	14	15	34	+40 Sieve=1%, +4 Sieve=0%
					--orange and tan	P=4.3						
						P=1.25						
						P=3.6						
10		SC			CLAYEY SAND(SC) gray and orange	P=1.5	16	32	16	16	37	+40 Sieve=0%, +4 Sieve=0%
						N=40						
20		ML CL			SANDY CLAYEY SILT(ML) orange and light gray	N=21						
					LEAN CLAY(CL) gray and reddish tan	N=33	26	46	23	23	82	+40 Sieve=4%, +4 Sieve=1%
30					--orange and tan; with trace of lignite	N=26						
		SC			CLAYEY SAND(SC) tan and brown	P=1.0	29	48	22	26	85	+40 Sieve=5%, +4 Sieve=0%
40		SP			SAND(SP) gray	N=49						
					Bottom of Boring @ 40'							

FIELD STRENGTH DATA: BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0

DRY DENSITY (pcf) | COMPRESSIVE STRENGTH (tsf) | FAILURE STRAIN (%) | CONFINING PRESSURE (psi)

Natural Moisture Content and Atterberg Limits: Plastic Limit | Moisture Content | Liquid Limit; 20 40 60 80

Water Level Est.: Measured: Perched:

Water Observations:

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32° 15.484', W 94°34.965'

ETTL
ENGINEERS &
CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

LOG OF BORING B-17

PROJECT: Luminant Martin Lake PDP 1-3 Supplemental
Tatum, Texas

PROJECT NO.: G3219-09 **BORING TYPE:** Rotary Wash

DATE 8/18/09

SURFACE ELEVATION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CL	SANDY LEAN CLAY(CL) orange and tan	P=4.5+	12	39	15	24	60	+40 Sieve=7%, +4 Sieve=4%
		--orange and brown	P=4.0						
		--red, tan, and yellow	P=4.5	15	53	18	35	51	+40 Sieve=7%, +4 Sieve=1%
		--tan and gray	P=4.5+						
10	SC	CLAYEY SAND(SC) tan	N=40	20	36	24	12	52	+40 Sieve=0%, +4 Sieve=0%
		--tan and brown	N=22						
20		--tan and gray; laminated	N=19						
		--gray and orange	N=20	25	31	13	18	39	+40 Sieve=0%, +4 Sieve=0%
30		--tan	N=30						
		--tan and orange	N=24						
40		Bottom of Boring @ 40'							

FIELD STRENGTH DATA: BLOW COUNT (20 40 60 80); Qu (tsf) (1 2 3 4); PPR (tsf) (1.0 2.0 3.0 4.0); Torvane (tsf) (1.0 2.0 3.0 4.0)

DRY DENSITY (pcf) | COMPRESSIVE STRENGTH (tsf) | FAILURE STRAIN (%) | CONFINING PRESSURE (psi)

Natural Moisture Content and Atterberg Limits: Plastic Limit | Moisture Content | Liquid Limit (20 40 60 80)

Water Level Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Bailed to 20' and open upon completion.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32° 15.566', W 94°34.736'

APPENDIX B

LABORATORY TEST RESULTS

BOTTOM ASH PONDS AND SCRUBBER POND

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

SUMMARY OF LABORATORY RESULTS

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BH-201	0.0							19.2			
BH-201	2.0							13.7			
BH-201	6.0	26	14	12				9.4			
BH-201	8.0							15.1			
BH-201	13.0							16.3			
BH-201	18.0							20.8			
BH-201	23.0	36	14	22				19.9			
BH-201	28.0							18.2			
BH-201	33.0							15.0			
BH-201	38.0				0.85	40		14.9			
BH-201	43.0							21.4			
BH-201	48.0							23.5			
BH-202	0.0							20.8			
BH-202	2.0	55	19	36				17.1			
BH-202	4.0							20.5			
BH-202	6.0							26.7			
BH-202	8.0							15.3			
BH-202	13.0							14.9			
BH-202	18.0	29	13	16				17.1			
BH-202	23.0							17.6			
BH-202	28.0				0.85	49		18.1			
BH-202	33.0							17.0			
BH-202	38.0							20.8			
BH-202	43.0							23.0			
BH-202	48.0							26.2			
BH-203	0.0							12.6			
BH-203	2.0							14.6			
BH-203	4.0							16.1			
BH-203	6.0	50	19	31				21.5			
BH-203	8.0							22.3			
BH-203	13.0							18.0			
BH-203	18.0							14.6			
BH-203	23.0							17.3			
BH-203	25.0							19.9			
BH-203	28.0				2	17		23.6			
BH-203	30.0							27.7			
BH-203	33.0							29.1			
BH-203	38.0							29.4			
BH-204	0.0							13.9			
BH-204	2.0							21.1			
BH-204	4.0							15.0			
BH-204	6.0							16.6			
BH-204	8.0							13.5			

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SUMMARY OF LABORATORY RESULTS

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BH-204	28.0				4.75	58		19.1			
BH-204	33.0							13.8			
BH-204	38.0							21.0			
BH-204	43.0	51	20	31				26.6			
BH-204	48.0							23.8			
BH-205	0.0							17.5			
BH-205	2.0							15.6			
BH-205	4.0							15.5			
BH-205	6.0							20.7			
BH-205	8.0							17.4			
BH-205	13.0	47	15	32				23.0			
BH-205	18.0							22.9			
BH-205	23.0	28	17	11				16.3			
BH-205	28.0				4.75	69		16.4			
BH-205	33.0							14.7			
BH-205	38.0							25.4			
BH-205	43.0							26.7			
BH-205	48.0							25.0			
BH-205	53.0				9.5	11		25.9			
BH-206	0.0							17.1			
BH-206	2.0	44	15	29				15.6			
BH-206	4.0							14.0			
BH-206	6.0							16.2			
BH-206	8.0							21.7			
BH-206	13.0							18.1			
BH-206	18.0							12.2			
BH-206	23.0							15.9			
BH-206	28.0	59	17	42				20.3			
BH-206	33.0							19.8			
BH-206	38.0							18.2			
BH-206	43.0							22.1			
BH-206	48.0							23.3			
BH-206	53.0							23.0			
BH-206	58.0							22.1			
BH-207	0.0							15.6			
BH-207	2.0							15.3			
BH-207	4.0							14.9			
BH-207	6.0							18.2			
BH-207	13.0							18.9			
BH-207	18.0							13.0			
BH-207	23.0							16.9			
BH-207	28.0	31	16	15				16.7			
BH-207	33.0							17.4			

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SUMMARY OF LABORATORY RESULTS

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BH-207	38.0							19.0			
BH-207	43.0							21.8			
BH-207	48.0							22.2			
BH-207	53.0							25.2			
BH-207	58.0							29.8			
BH-208	0.0							20.2			
BH-208	2.0							16.2			
BH-208	4.0							12.9			
BH-208	6.0							11.5			
BH-208	8.0	28	15	13				15.2			
BH-208	13.0							15.9			
BH-208	18.0							20.2			
BH-208	23.0							18.0			
BH-208	28.0							21.3			
BH-208	33.0							18.1			
BH-208	38.0							19.1			
BH-208	43.0							23.7			
BH-208	48.0				4.75	11		24.5			
BH-208	53.0							27.1			
BH-208	58.0							26.1			
BH-209	0.0							9.0			
BH-209	2.0							11.8			
BH-209	4.0	62	21	41				11.8			
BH-209	6.0							12.1			
BH-209	8.0							19.2			
BH-209	13.0							12.3			
BH-209	18.0							21.0			
BH-209	28.0	41	15	26				23.3			
BH-209	33.0							20.0			
BH-209	35.0							21.2			
BH-209	38.0							17.9			
BH-209	43.0							24.0			
BH-209	48.0							21.2			
BH-210	0.0							8.2			
BH-210	2.0							10.7			
BH-210	4.0							13.4			
BH-210	6.0							14.4			
BH-210	8.0							15.7			
BH-210	13.0							21.3			
BH-210	18.0	36	14	22				22.9			
BH-210	23.0							25.0			
BH-210	28.0							18.5			
BH-210	33.0							19.3			

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SUMMARY OF LABORATORY RESULTS

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BH-210	38.0							17.2			
BH-210	43.0							25.6			
BH-210	48.0				9.5	33		33.4			
BH-210	53.0							29.3			
BH-210	58.0							29.3			
BH-210	63.0							26.6			
BH-210	68.0							31.1			
BH-211	0.0							8.7			
BH-211	2.0							13.3			
BH-211	4.0							15.0			
BH-211	6.0							14.5			
BH-211	8.0							13.2			
BH-211	13.0							17.6			
BH-211	18.0	50	17	33				15.0			
BH-211	23.0							11.6			
BH-211	28.0				9.5	52		11.6			
BH-211	33.0							22.5			
BH-211	38.0							21.1			
BH-211	43.0							24.3			
BH-211	48.0							24.3			
BH-211	53.0							24.9			
BH-211	58.0							22.9			
BH-211	63.0							29.5			
BH-211	68.0							26.6			

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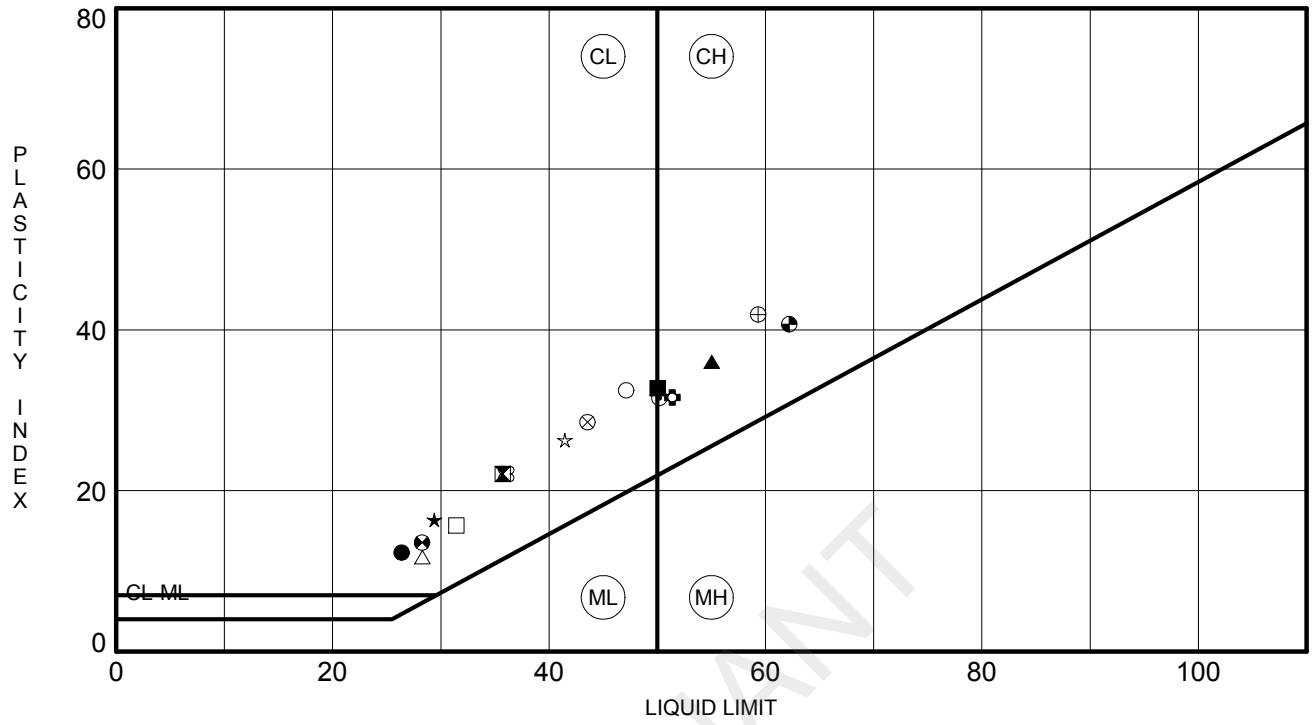
ATTERBERG LIMITS' RESULTS

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	BH-201	6.0	26	14	12		
⧓	BH-201	23.0	36	14	22		
▲	BH-202	2.0	55	19	36		
★	BH-202	18.0	29	13	16		
⊙	BH-203	6.0	50	19	31		
✿	BH-204	43.0	51	20	31		
○	BH-205	13.0	47	15	32		
△	BH-205	23.0	28	17	11		
⊗	BH-206	2.0	44	15	29		
⊕	BH-206	28.0	59	17	42		
□	BH-207	28.0	31	16	15		
⊛	BH-208	8.0	28	15	13		
◒	BH-209	4.0	62	21	41		
☆	BH-209	28.0	41	15	26		
⊠	BH-210	18.0	36	14	22		
■	BH-211	18.0	50	17	33		

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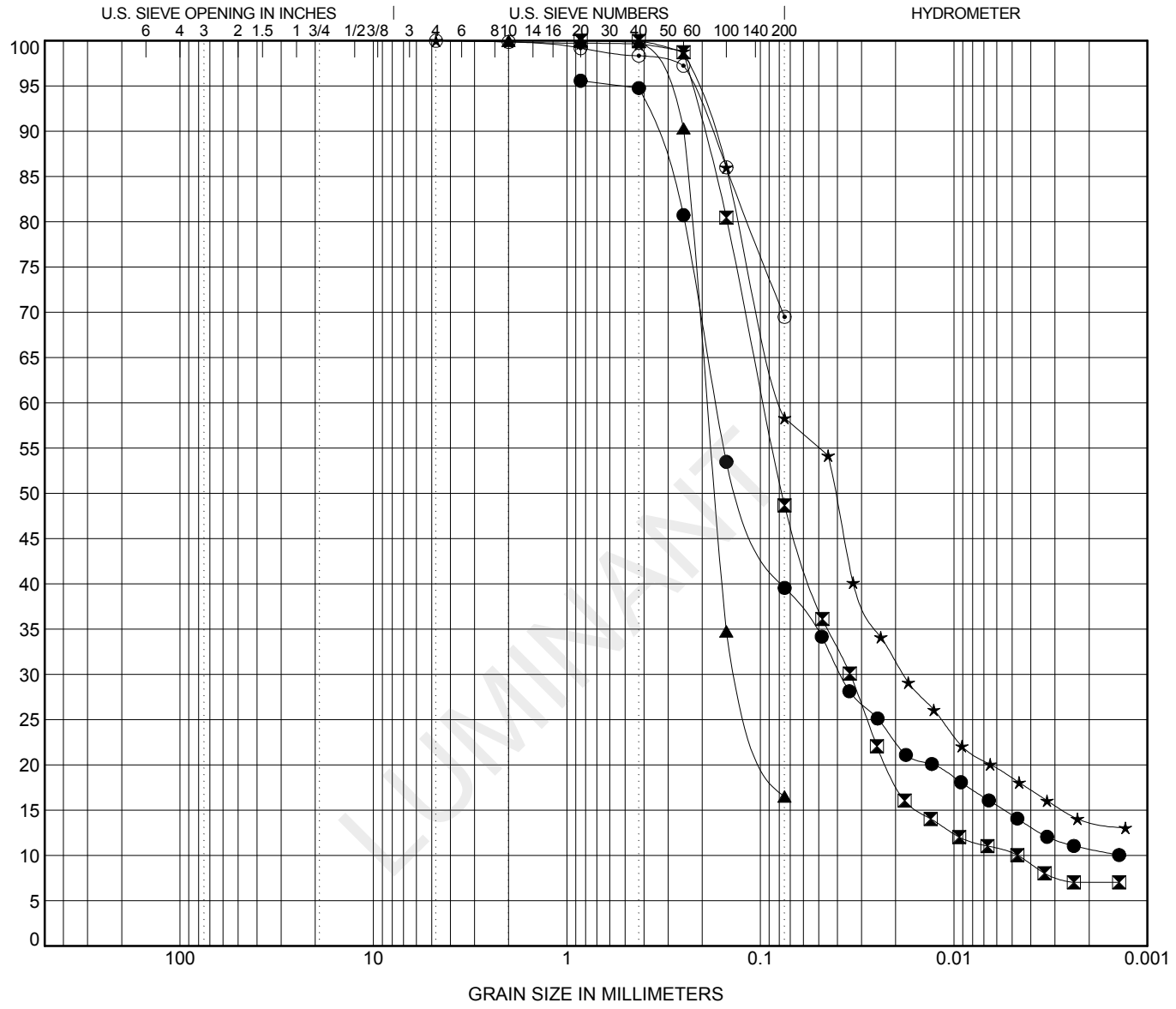
GRAIN SIZE DISTRIBUTION

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**BH-201**	**38**						
⊠	**BH-202**	**28**					**2.63**	**20.54**
▲	**BH-203**	**28**						
★	**BH-204**	**28**						
⊙	**BH-205**	**28**						

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH-201**	**38**	**0.85**	**0.169**	**0.038**			**56.0**	**25.1**	**14.4**
⊠	**BH-202**	**28**	**0.85**	**0.096**	**0.034**	**0.005**	**0.0**	**51.3**	**38.4**	**10.2**
▲	**BH-203**	**28**	**2**	**0.189**	**0.125**		**0.0**	**83.5**	**16.5**	
★	**BH-204**	**28**	**4.75**	**0.078**	**0.018**		**0.0**	**41.7**	**39.8**	**18.5**
⊙	**BH-205**	**28**	**4.75**				**0.0**	**30.5**	**69.5**	

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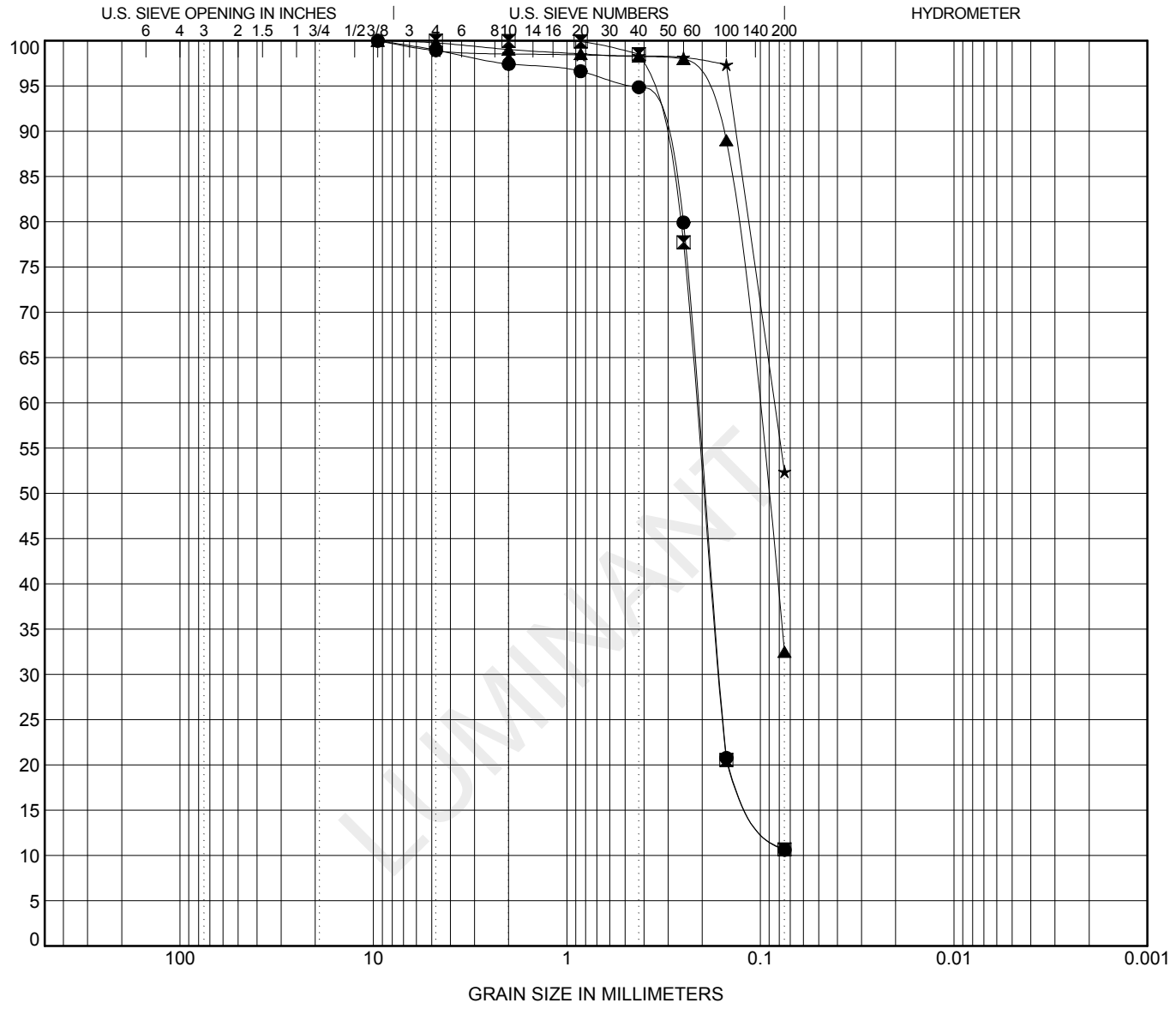
GRAIN SIZE DISTRIBUTION

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

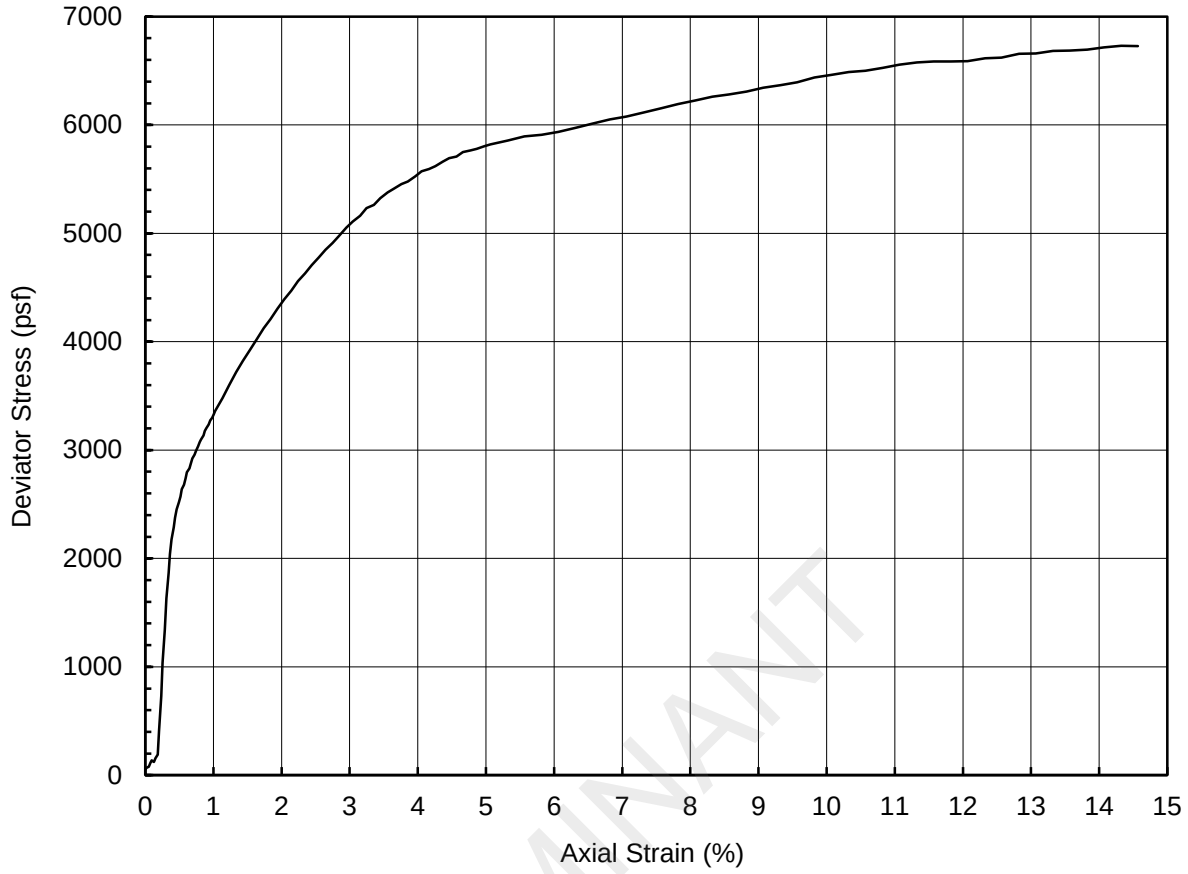


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**BH-205**	**53**					**1.74**	**2.93**
⧓	**BH-208**	**48**					**1.75**	**2.98**
▲	**BH-210**	**48**						
★	**BH-211**	**28**						

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH-205**	**53**	**9.5**	**0.21**	**0.162**		**1.1**	**88.3**	**10.6**	
⧓	**BH-208**	**48**	**4.75**	**0.213**	**0.163**		**0.0**	**89.3**	**10.7**	
▲	**BH-210**	**48**	**9.5**	**0.105**			**0.2**	**67.2**	**32.5**	
★	**BH-211**	**28**	**9.5**	**0.084**			**1.1**	**46.5**	**52.4**	

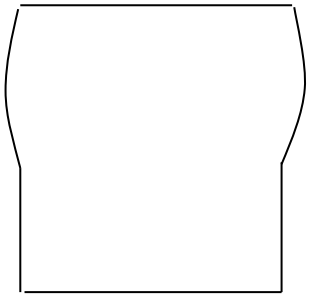
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Yellow Clay (visual classification)					
LL		PI		LI	USCS	

Depth (ft)	4.0	Confining Pressure (psf)	617
Specimen Height (inch)	6.0	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	6732
Initial Specimen Weight (g)	1263.7	Axial Strain at Peak Stress (%)	14.3
Moist Unit Weight (pcf)	131.9		
Initial Water Content (%)	15		
Initial Dry Unit Weight (pcf)	114.6		

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-201 TO-3
Comments	

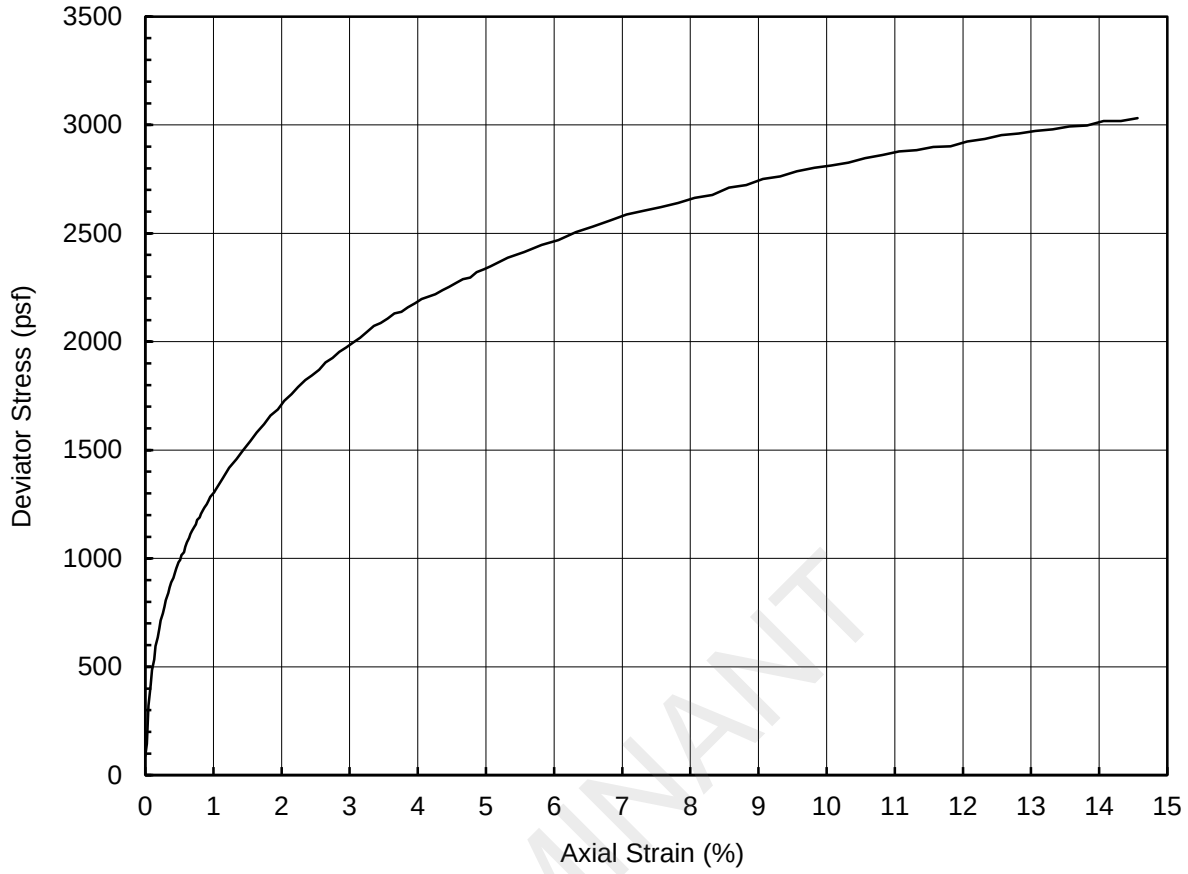


Failure Sketch

Golder Associates

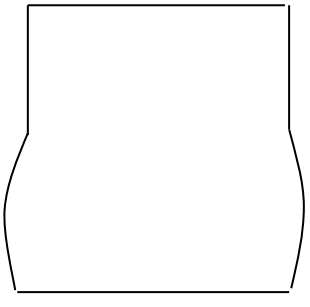
Performed by	**PN**
Date	**12-Nov-12**
Check	**HR**
Review	**SBK**

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Yellow Clay (visual classification)					
LL		PI		LI	USCS	

Depth (ft)	18.0	Confining Pressure (psf)	2371
Specimen Height (inch)	5.9	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	3035
Initial Specimen Weight (g)	1232.8	Axial Strain at Peak Stress (%)	14.8
Moist Unit Weight (pcf)	132.4		
Initial Water Content (%)	19		
Initial Dry Unit Weight (pcf)	111.7		



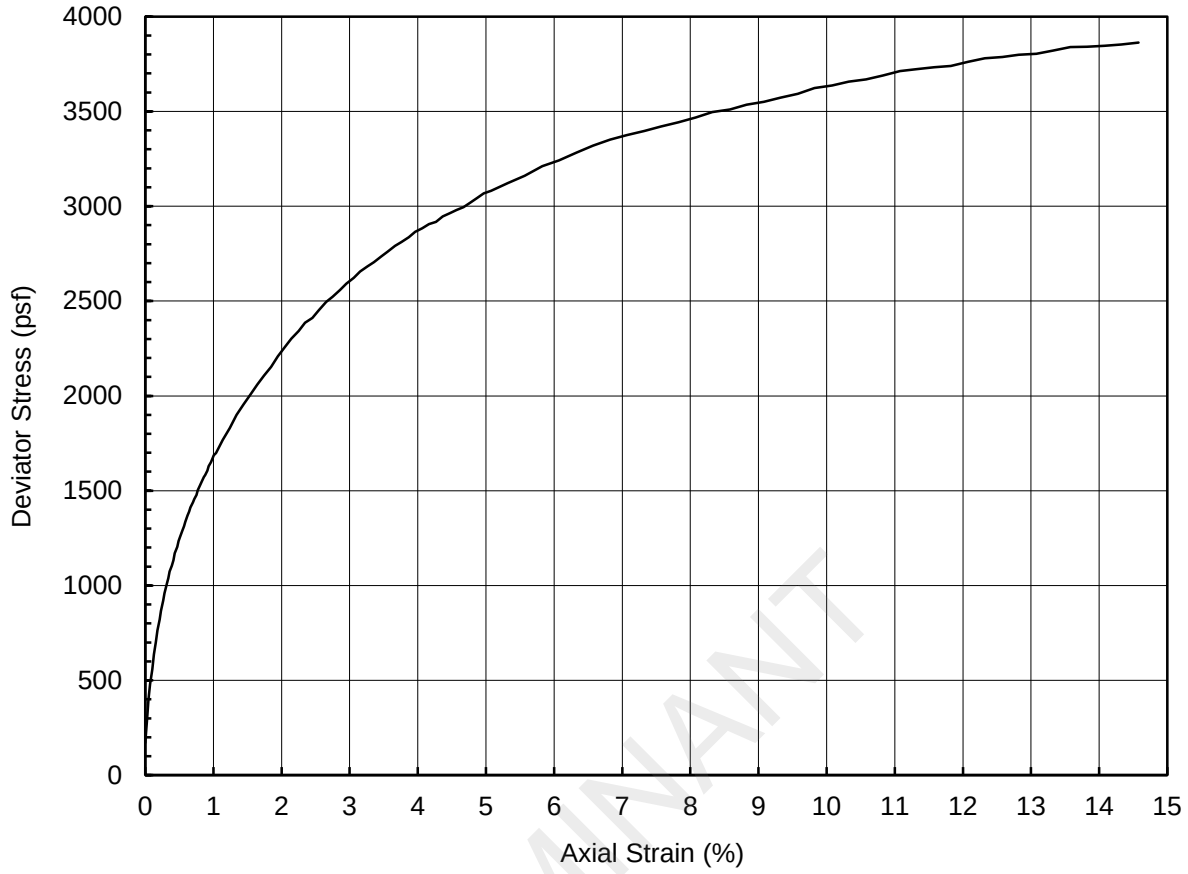
Failure Sketch

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-202 TO-7
Comments	

Golder Associates

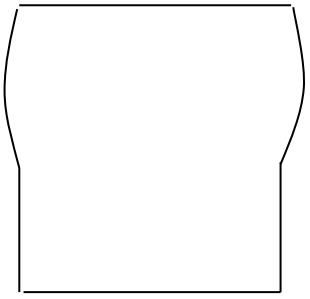
Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Gray Clay (visual classification)					
LL		PI		LI	USCS	

Depth (ft)	6.0	Confining Pressure (psf)	858
Specimen Height (inch)	6.0	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	3877
Initial Specimen Weight (g)	1199.6	Axial Strain at Peak Stress (%)	14.8
Moist Unit Weight (pcf)	124.7		
Initial Water Content (%)	21		
Initial Dry Unit Weight (pcf)	102.7		



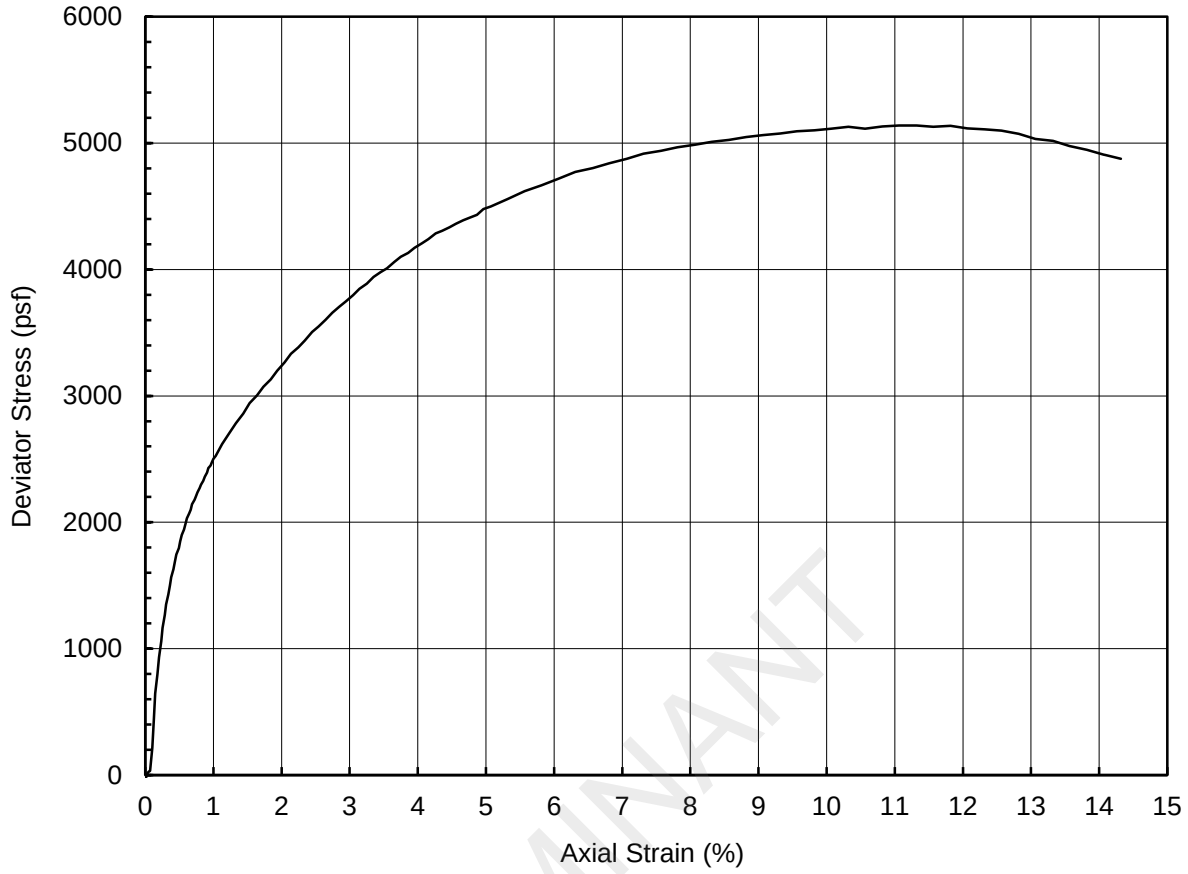
Failure Sketch

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-203 TO-4
Comments	

Golder Associates

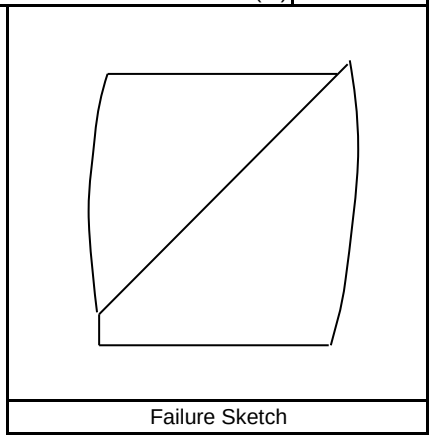
Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Gray Clay (visual classification)					
LL		PI		LI	USCS	

Depth (ft)	23.0	Confining Pressure (psf)	3008
Specimen Height (inch)	6.0	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	5139
Initial Specimen Weight (g)	1192.8	Axial Strain at Peak Stress (%)	11.3
Moist Unit Weight (pcf)	126.6		
Initial Water Content (%)	26		
Initial Dry Unit Weight (pcf)	100.9		



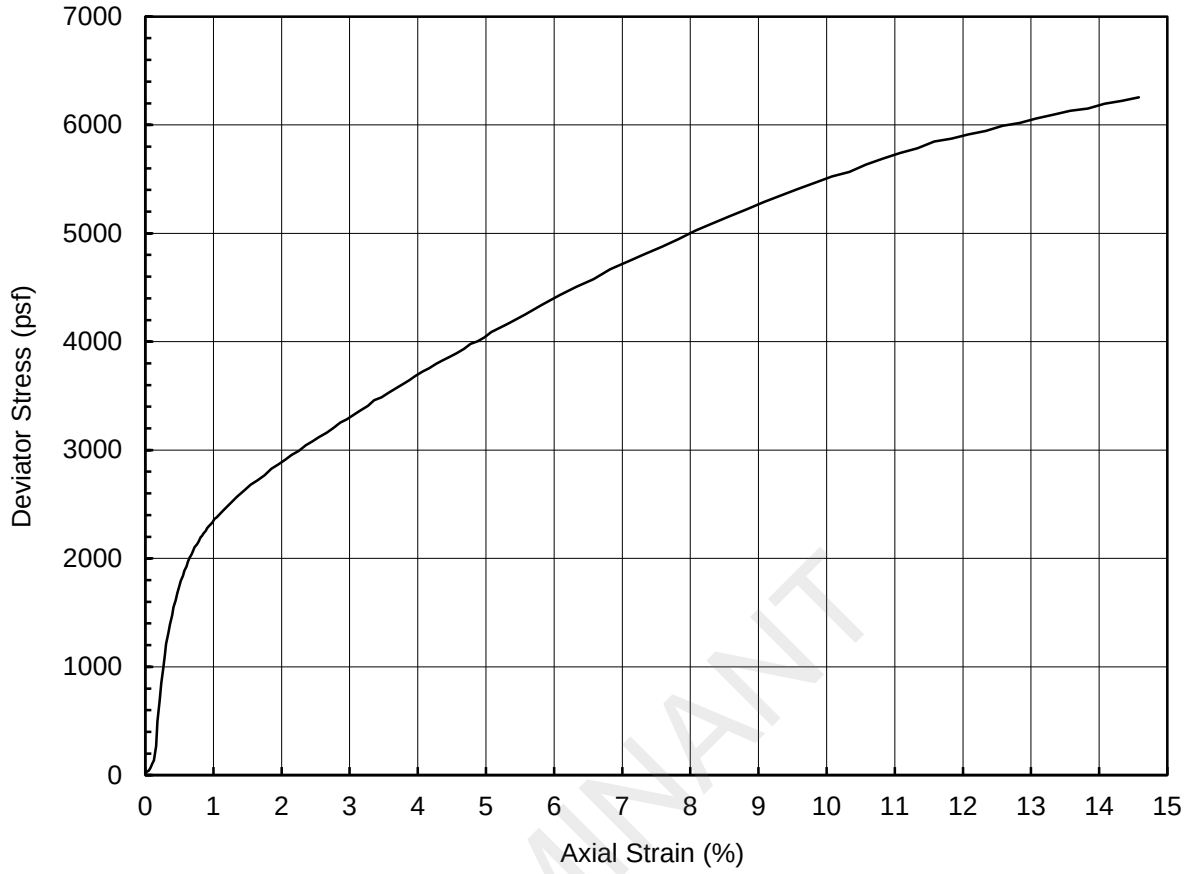
Failure Sketch

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-204 TO-8
Comments	

Golder Associates

Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

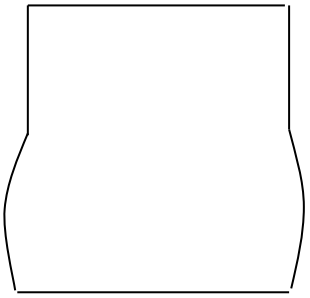
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Yellow Clay (visual classification)					
LL		PI		LI	USCS	

Depth (ft)	13.0	Confining Pressure (psf)	1760
Specimen Height (inch)	5.9	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	6270
Initial Specimen Weight (g)	1252.5	Axial Strain at Peak Stress (%)	14.8
Moist Unit Weight (pcf)	131.9		
Initial Water Content (%)	27		
Initial Dry Unit Weight (pcf)	104.1		

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-205 TO-6
Comments	

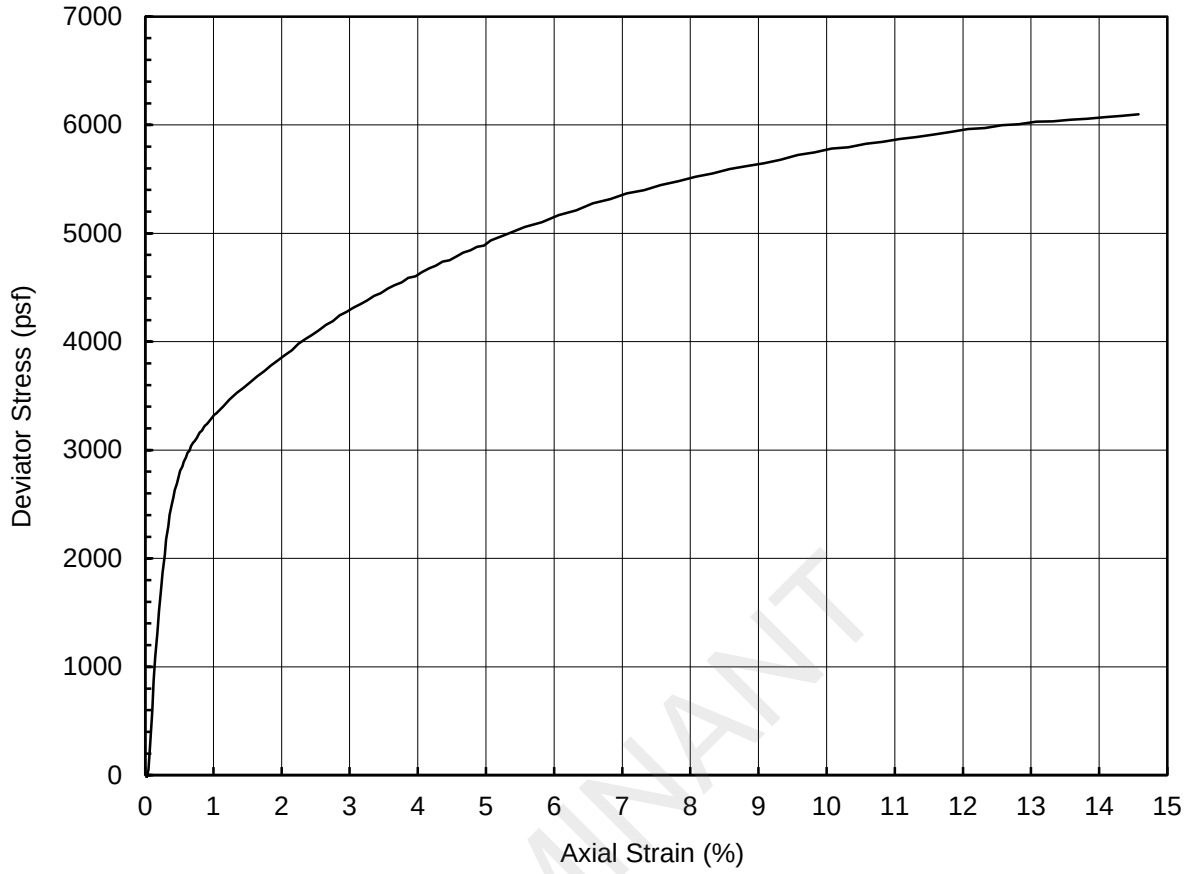


Failure Sketch

Golder Associates

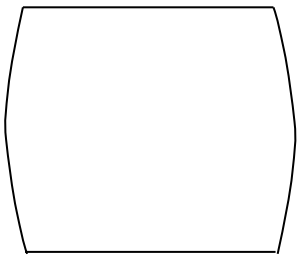
Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Grayish Brown Fat Clay						
LL	59	PI	42	LI	0.1	USCS	CH

Depth (ft)	28.0	Confining Pressure (psf)	3627
Specimen Height (inch)	5.9	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	6110
Initial Specimen Weight (g)	1219.7	Axial Strain at Peak Stress (%)	14.8
Moist Unit Weight (pcf)	127.5		
Initial Water Content (%)	20		
Initial Dry Unit Weight (pcf)	106.6		



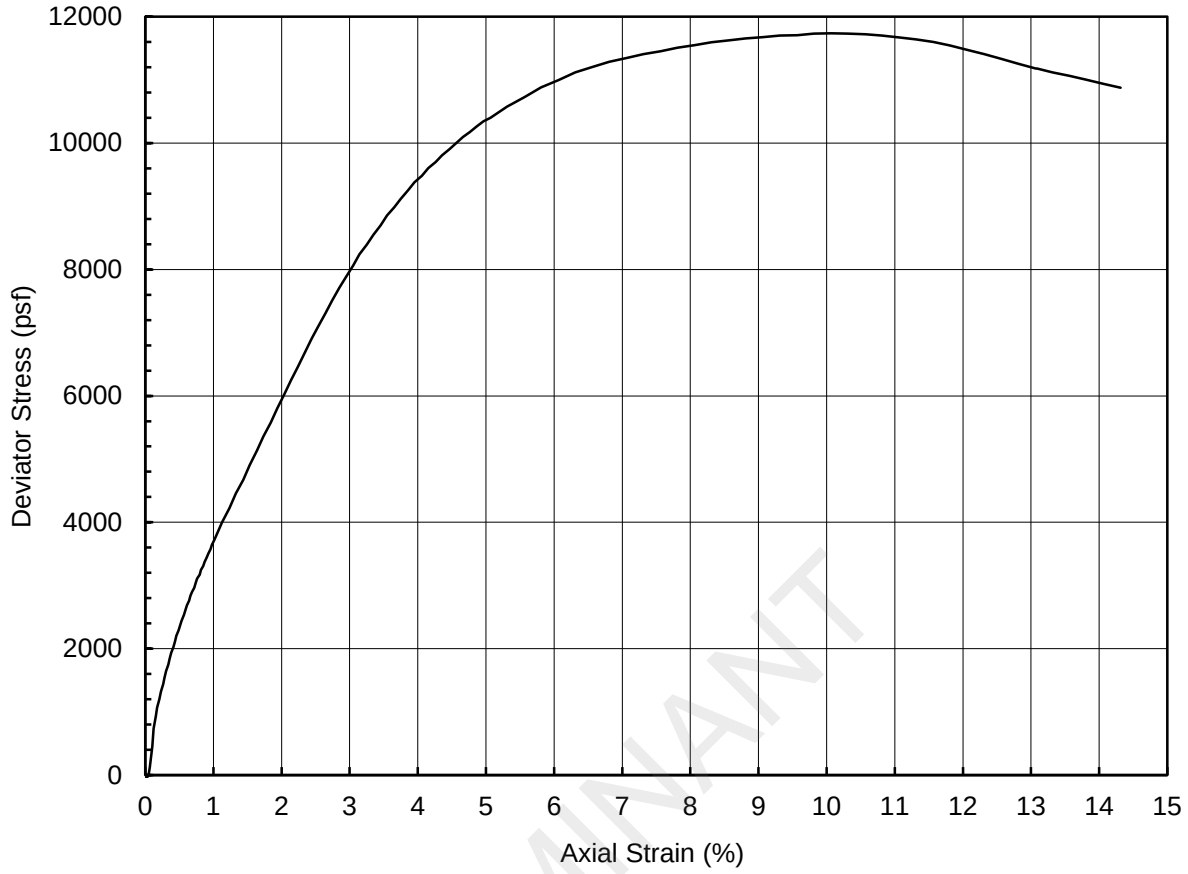
Failure Sketch

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-206 TO-9
Comments	

Golder Associates

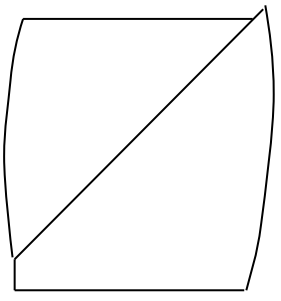
Performed by	**PN**
Date	**15-Nov-12**
Check	**HR**
Review	**JF**

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Grayish Brown Lean Clay						
LL	31	PI	15	LI	0.0	USCS	CL

Depth (ft)	28.0	Confining Pressure (psf)	3620
Specimen Height (inch)	5.9	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	11735
Initial Specimen Weight (g)	1251.9	Axial Strain at Peak Stress (%)	10.1
Moist Unit Weight (pcf)	127.7		
Initial Water Content (%)	16		
Initial Dry Unit Weight (pcf)	109.9		



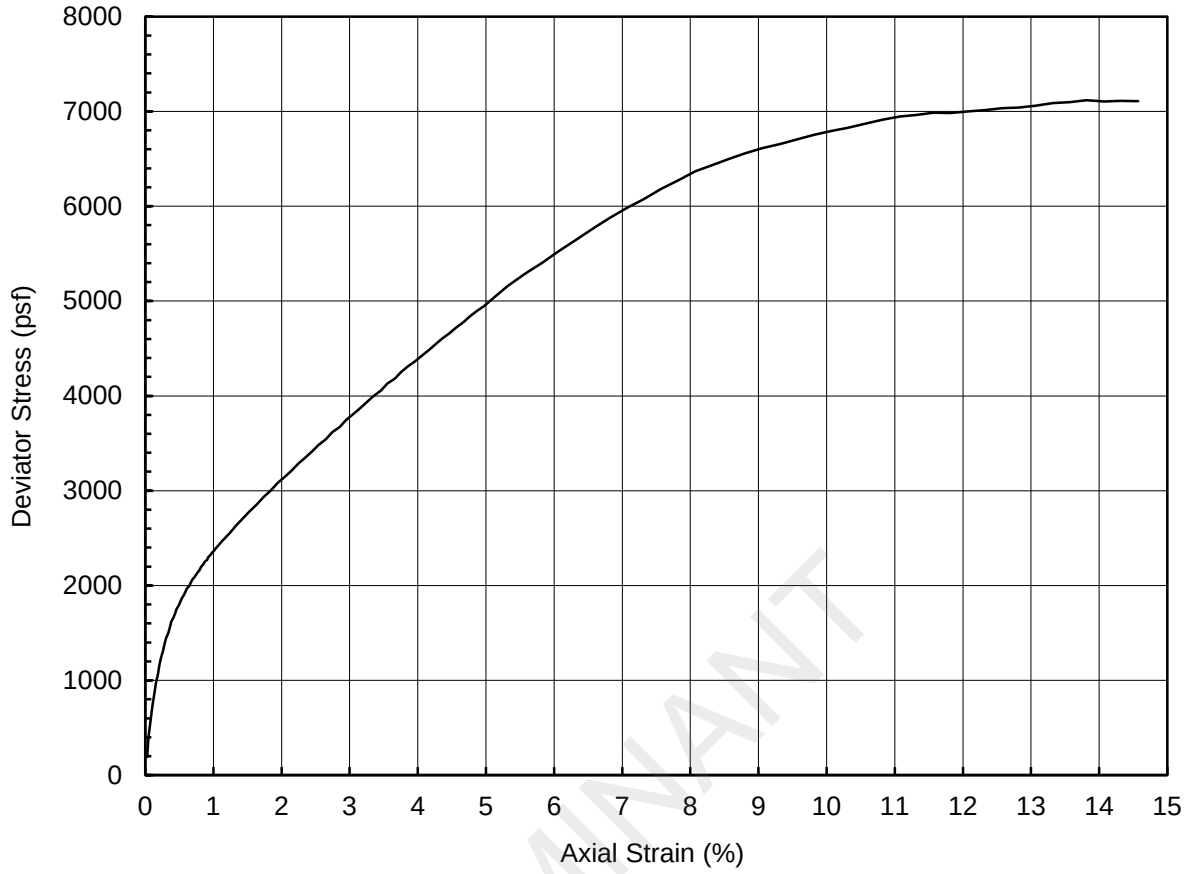
Failure Sketch

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-207 TO-9
Comments	

Golder Associates

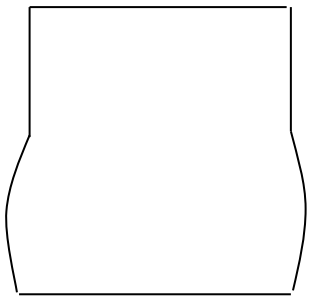
Performed by	**PN**
Date	**15-Nov-12**
Check	**HR**
Review	**JF**

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Yellow Lean Clay						
LL	28	PI	13	LI	0.0	USCS	CL

Depth (ft)	8.0	Confining Pressure (psf)	1046
Specimen Height (inch)	5.9	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	7118
Initial Specimen Weight (g)	1287.7	Axial Strain at Peak Stress (%)	13.8
Moist Unit Weight (pcf)	138.1		
Initial Water Content (%)	14		
Initial Dry Unit Weight (pcf)	120.7		



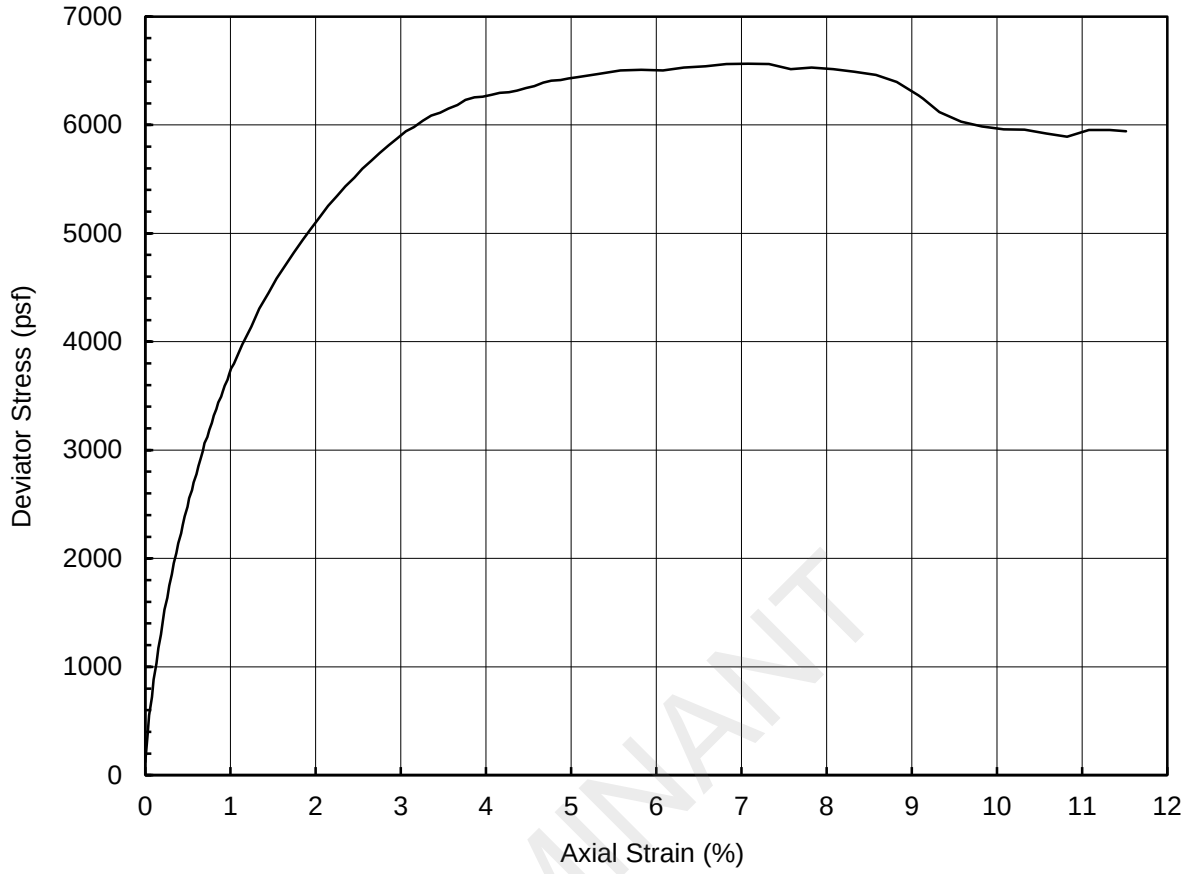
Failure Sketch

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-208 TO-5
Comments	

Golder Associates

Performed by	**PN**
Date	**16-Nov-12**
Check	**HR**
Review	**JF**

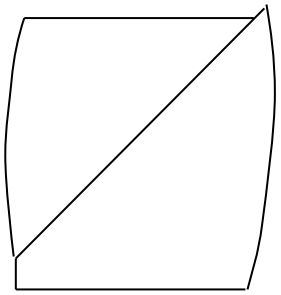
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Grayish Brown Lean Clay						
LL	41	PI	26	LI	0.3	USCS	CL

Depth (ft)	28.0	Confining Pressure (psf)	3624
Specimen Height (inch)	6.0	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	6566
Initial Specimen Weight (g)	1202.8	Axial Strain at Peak Stress (%)	7.1
Moist Unit Weight (pcf)	128.0		
Initial Water Content (%)	22		
Initial Dry Unit Weight (pcf)	104.7		

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-209 TO-9
Comments	

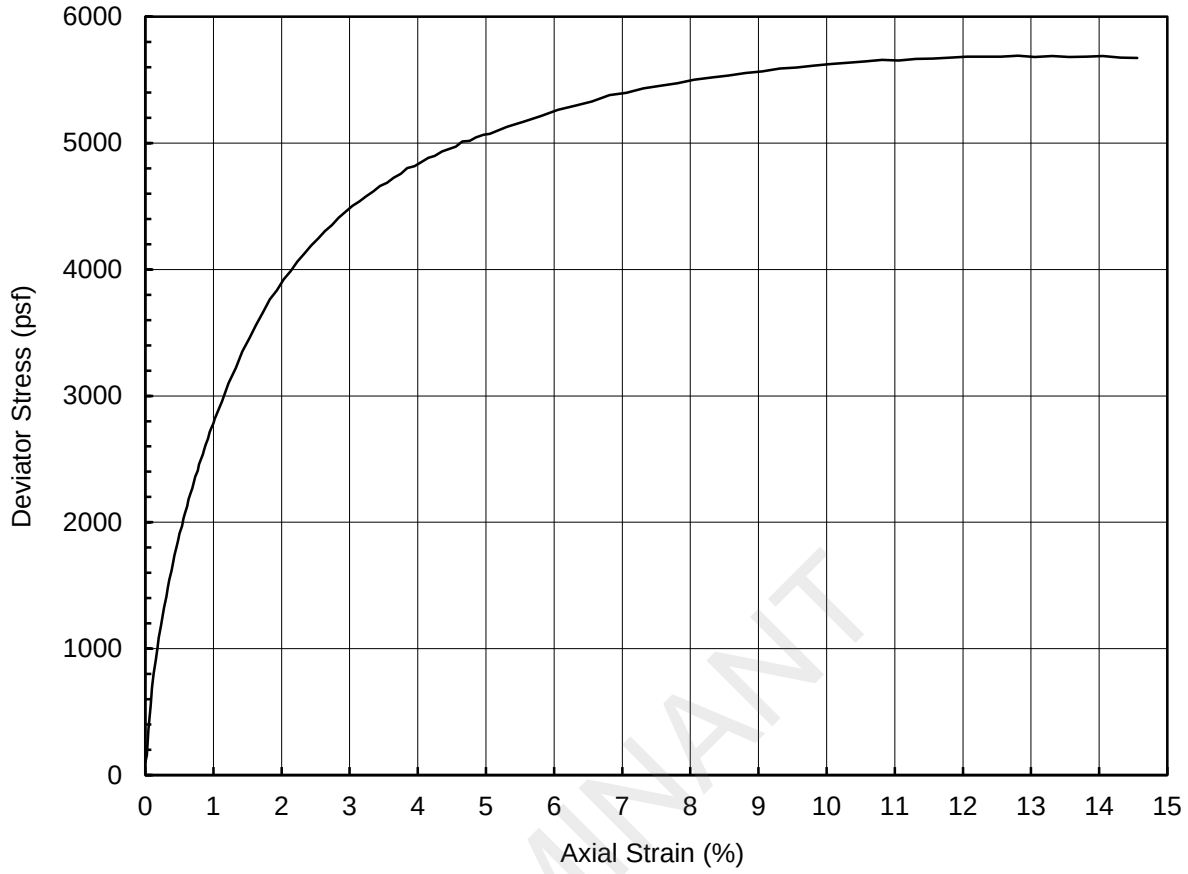


Failure Sketch

Performed by	**PN**
Date	**16-Nov-12**
Check	**HR**
Review	**JF**

Golder Associates

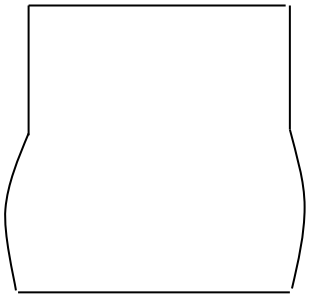
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Gray Lean Clay						
LL	36	PI	22	LI	0.5	USCS	CL

Depth (ft)	18.0	Confining Pressure (psf)	2375
Specimen Height (inch)	6.0	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	5691
Initial Specimen Weight (g)	1192.0	Axial Strain at Peak Stress (%)	12.8
Moist Unit Weight (pcf)	126.7		
Initial Water Content (%)	24		
Initial Dry Unit Weight (pcf)	102.2		

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-210 TO-7
Comments	



Failure Sketch

Golder Associates

Performed by	**PN**
Date	**16-Nov-12**
Check	**HR**
Review	**JF**

PROJECT INFORMATION

PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 06
CLIENT:
November 2008

TRIAXIAL TEST PROGRAM BY GARRY H. GREGORY, P.E.

VERSION 1.0 - AUGUST 1998 - REVISED MARCH 24, 1999

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan, Brown & Red Sandy Lean Clay
Sampled on Site, B-13 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve

Number of Specimens = 3

PLATE: B.1

PLATE: B.2

PLATE: B.3

SPECIMEN DATA

SPECIMEN NO. 1

	initial		final		Diameter			Height		
Moist soil & Tare :	522.40	g	621.30	g	top	2.04	in	Ht 1	4.44	in
Dry soil and Tare :	468.70	g	544.40	g	mid	2.04	in	Ht 2	4.44	in
Tare :	129.80	g	119.40	g	bot	2.04	in	Ht 3	4.44	in
Moisture content :	15.35	%	14.09	%	Avg	2.04	in	Ht4	4.44	in
Weight:	496.1	g						Avg Ht	4.44	in

Change in Ht due to saturation :	-0.02	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.018	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	2.0	cc	Initial dry density :	pcf
Saturation Parameter " B " =	0.95		At test dry density:	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	2.7	Effective Cell Pressure (psi) =		10.0
σ_1' Failure (psi) =	20.41	σ_1 Failure (psi) =	25.01	Estimated ν =		0.35
σ_3' Failure (psi) =	5.41	σ_3 Failure (psi) =	10.00	Back Pressure (psi) =	50.0	
ΔU =	4.6	Total Pore Pressure =	54.6	Cell Pressure (psi) =	60.0	

SPECIMEN NO. 2

	initial		final		Diameter			Height		
Moist soil & Tare :	549.80	g	636.40	g	top	2.01	in	Ht 1	4.44	in
Dry soil and Tare :	469.20	g	560.20	g	mid	2.01	in	Ht 2	4.44	in
Tare :	123.20	g	139.10	g	bot	2.01	in	Ht 3	4.44	in
Moisture content :	15.75	%	14.10	%	Avg	2.01	in	Ht4	4.44	in
Weight:	496.0	g						Avg Ht	4.44	in

Change in Ht due to saturation :	-0.006	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.034	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	3.9	cc	Initial dry density :	pcf
Saturation Parameter " B " =	0.97		At test dry density:	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	3.9	Effective Cell Pressure (psi) =		20.0
σ_1' Failure (psi) =	37.62	σ_1 Failure (psi) =	46.02	Estimated ν =		0.35
σ_3' Failure (psi) =	12.02	σ_3 Failure (psi) =	20.00	Back Pressure (psi) =	50.0	
ΔU =	8.0	Total Pore Pressure =	58.0	Cell Pressure (psi) =	70.0	

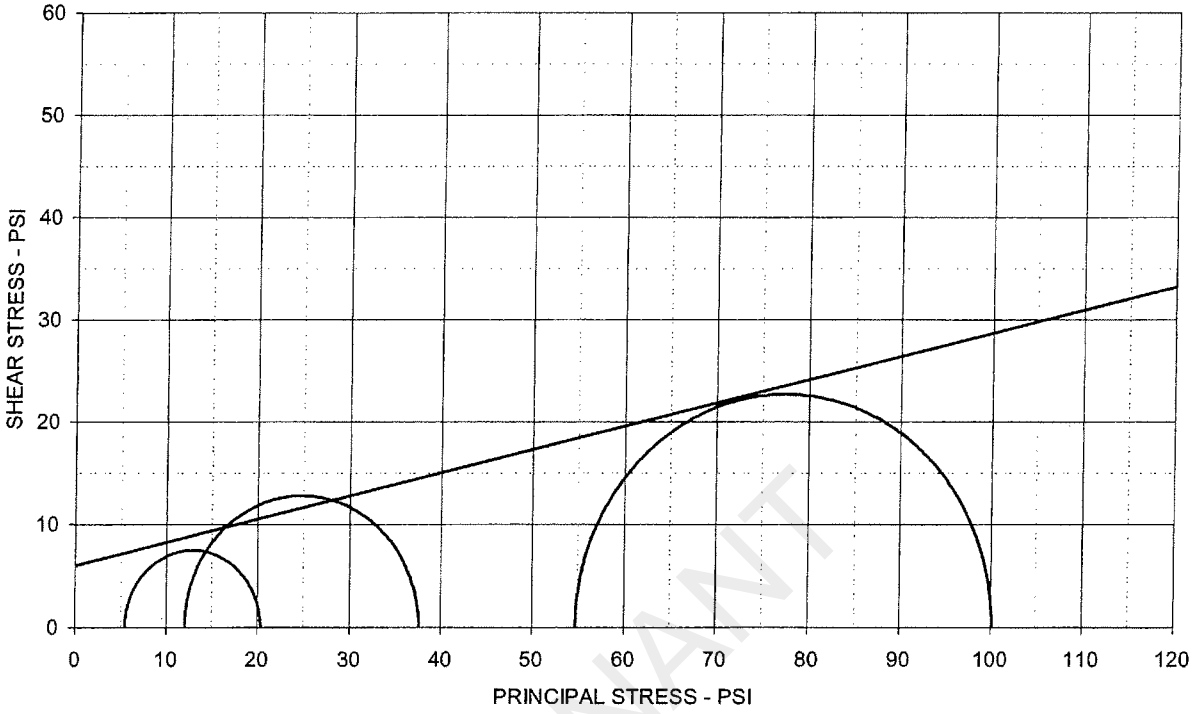
SPECIMEN NO. 3

	initial		final		Diameter			Height		
Moist soil & Tare :	594.50	g	656.50	g	top	2.06	in	Ht 1	4.54	in
Dry soil and Tare :	530.10	g	579.20	g	mid	2.06	in	Ht 2	4.54	in
Tare :	126.30	g	139.30	g	bot	2.06	in	Ht 3	4.54	in
Moisture content :	16.95	%	17.67	%	Avg	2.06	in	Ht4	4.54	in
Weight:	518.0	g						Avg Ht	4.54	in

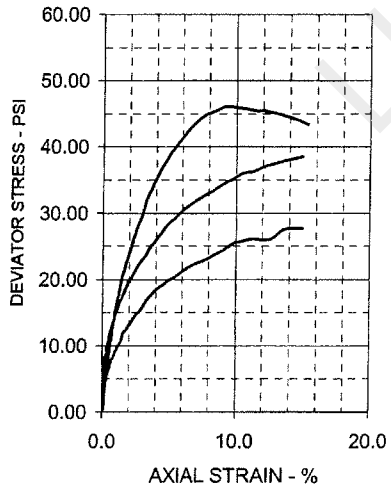
Change in Ht due to saturation :	-0.001	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.052	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	5.6	cc	Initial dry density :	pcf
Saturation Parameter " B " =	0.97		At test dry density:	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	8.5	Effective Cell Pressure (psi) =		40.0
σ_1' Failure (psi) =	100.17	σ_1 Failure (psi) =	95.40	Estimated ν =		0.35
σ_3' Failure (psi) =	54.77	σ_3 Failure (psi) =	49.00	Back Pressure (psi) =	50.0	
ΔU =	-14.8	Total Pore Pressure =	35.2	Cell Pressure (psi) =	90.0	

TRIAXIAL SHEAR TEST REPORT



EFFECTIVE STRESS PARAMETERS	ϕ' = 12.8 deg	c' = 6.0 psi		
SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	15.8	16.6	15.9	
Dry Density - pcf	113.0	115.0	112.5	
Diameter - inches	2.04	2.01	2.06	
Height - inches	4.44	4.44	4.54	
AT TEST				
Final Moisture - %	18.1	18.1	17.6	
Dry Density - pcf	114.0	116.9	115.1	
Calculated Diameter (in.)	2.02	2.00	2.04	
Height - inches	4.40	4.40	4.49	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	15.00	25.60	45.40	
Total Pore Pressure - psi	54.6	58.0	35.2	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	2.7	3.9	8.5	
σ_1' Failure - psi	20.41	37.62	100.17	
σ_3' Failure - psi	5.41	12.02	54.77	



TEST DESCRIPTION

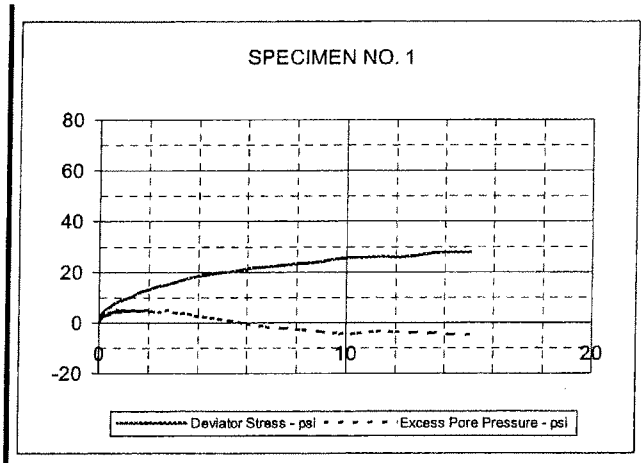
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan, Brown & Red Sandy Lean Clay
Sampled on Site, B-13 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve
G 2972-08, B-13, 3'-10' Fill

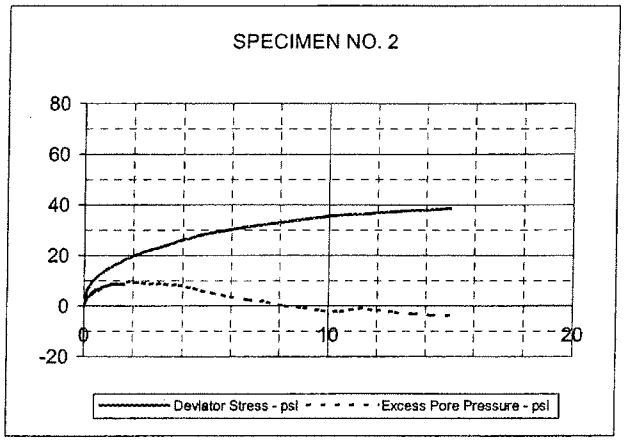
PROJECT INFORMATION

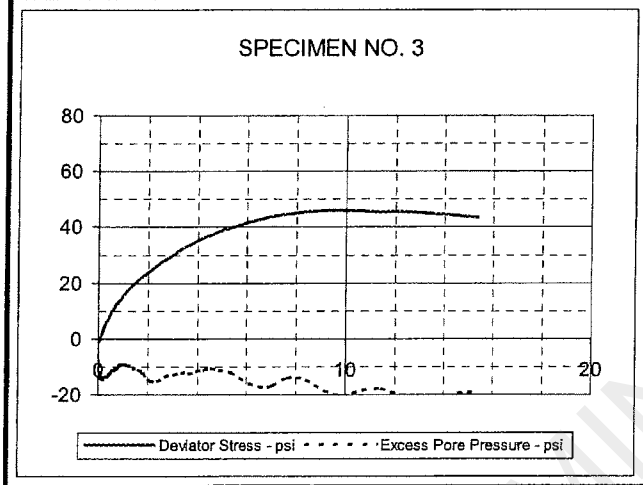
PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

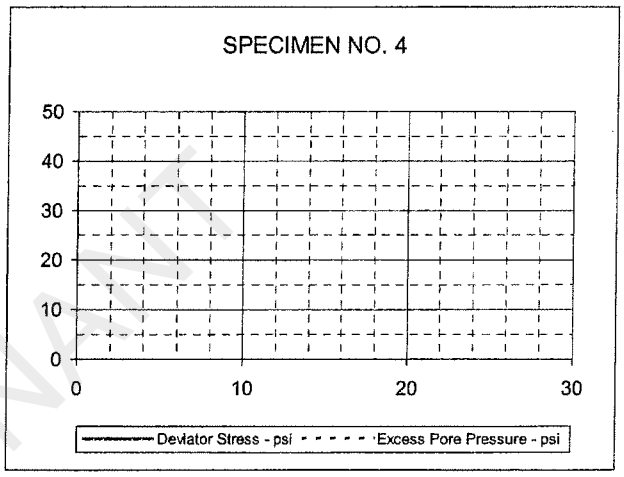
ETTL ENGINEERS & CONSULTANTS

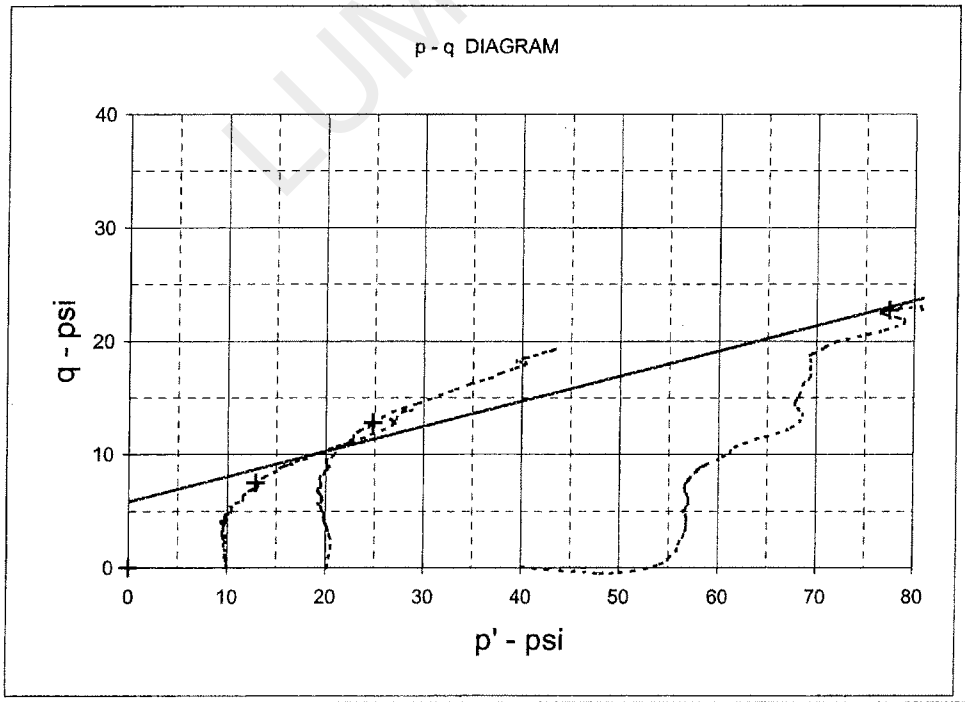
PLATE: B.1







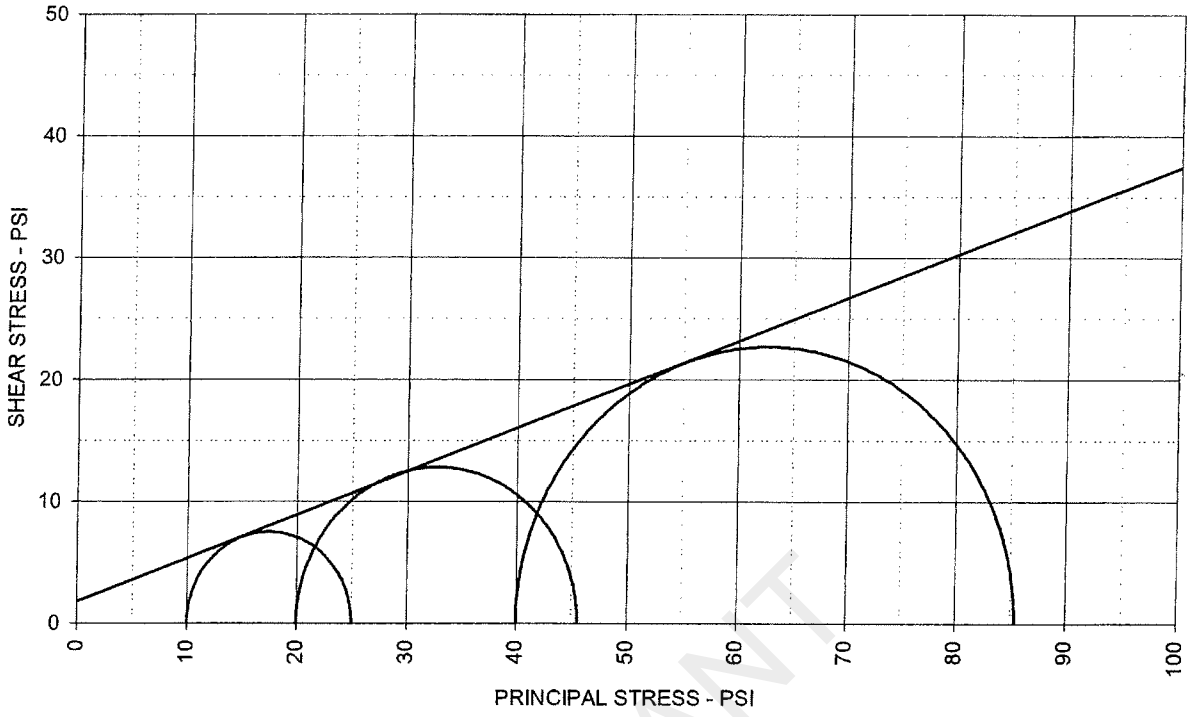




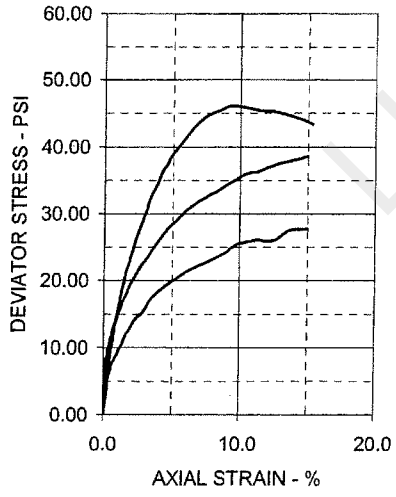
EFFECTIVE STRESS PARAMETERS	R^2 = 0.97	α (deg) = 12.5	a (psi) = 5.8
PROJECT: Luminant East Ash Disposal		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 2972 - 08		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan, Brown & Red Sandy Lean Clay			

G 2972-08, B-13, 3'-10' Fill

TRIAXIAL SHEAR TEST REPORT



TOTAL STRESS PARAMETERS	ϕ = 19.6 deg	c = 1.8 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	15.8	16.6	15.9	
Dry Density - pcf	113.0	115.0	112.5	
Diameter - inches	2.04	2.01	2.06	
Height - inches	4.44	4.44	4.54	
AT TEST				
Final Moisture - %	18.1	18.1	17.6	
Dry Density - pcf	114.0	116.9	115.1	
Calculated Diameter (in.)	2.02	2.00	2.04	
Height - inches	4.40	4.40	4.49	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	15.00	25.60	45.40	
Total Pore Pressure - psi	54.6	58.0	35.2	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	2.7	3.9	8.5	
σ_1 Failure - psi	25.00	45.60	85.40	
σ_3 Failure - psi	10.00	20.00	40.00	

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan, Brown & Red Sandy Lean Clay
Sampled on Site, B-13 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve

PROJECT INFORMATION

PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

ETTL ENGINEERS & CONSULTANTS

PLATE: B.3

PROJECT INFORMATION

PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
November, 2008

TRIAXIAL TEST PROGRAM BY GARRY H. GREGORY, P.E.

VERSION 1.0 - AUGUST 1998 - REVISED MARCH 24, 1999

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Sample
DESCRIPTION: Gray, Tan & Redd. Br Sandy Clay w/ some Gravel
Sampled on Site, B-2 8' to 20' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve

PLATE: B.1

PLATE: B.2

PLATE: B.3

Number of Specimens = 3

SPECIMEN DATA

SPECIMEN NO. 1

	initial		final		Diameter			Height	
Moist soil & Tare :	479.30	g	630.20	g	top	2.08	in	Ht 1	4.25	in
Dry soil and Tare :	429.60	g	548.70	g	mid	2.08	in	Ht 2	4.25	in
Tare :	129.70	g	128.00	g	bot	2.08	in	Ht 3	4.25	in
Moisture content :	19.57	%	19.37	%	Avg	2.08	in	Ht4	4.25	in
Weight:	496.8	g						Avg Ht	4.25	in

Change in Ht due to saturation :	-0.014	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	0.005	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	0.6	cc	Initial dry density :	pcf
Saturation Parameter " B " =	0.96		At test dry density:	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	2.4	Effective Cell Pressure (psi) =		
σ_1' Failure (psi) =	36.26	σ_1 Failure (psi) =		Estimated ν =	0.35	
σ_3' Failure (psi) =	8.24	σ_3 Failure (psi) =		Back Pressure (psi) =	50.0	
ΔU =		Total Pore Pressure =	51.8	Cell Pressure (psi) =	60.0	

SPECIMEN NO. 2

	initial		final		Diameter			Height	
Moist soil & Tare :	505.50	g	616.20	g	top	2.08	in	Ht 1	4.40	in
Dry soil and Tare :	451.40	g	537.60	g	mid	2.08	in	Ht 2	4.40	in
Tare :	114.00	g	102.60	g	bot	2.08	in	Ht 3	4.40	in
Moisture content :	16.03	%	16.07	%	Avg	2.08	in	Ht4	4.40	in
Weight:	511.6	g						Avg Ht	4.40	in

Change in Ht due to saturation :	0.01	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.048	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	7.0	cc	Initial dry density :	pcf
Saturation Parameter " B " =	0.98		At test dry density:	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	3.4	Effective Cell Pressure (psi) =		
σ_1' Failure (psi) =	48.53	σ_1 Failure (psi) =		Estimated ν =	0.35	
σ_3' Failure (psi) =	13.88	σ_3 Failure (psi) =		Back Pressure (psi) =	50.0	
ΔU =		Total Pore Pressure =	56.1	Cell Pressure (psi) =	70.0	

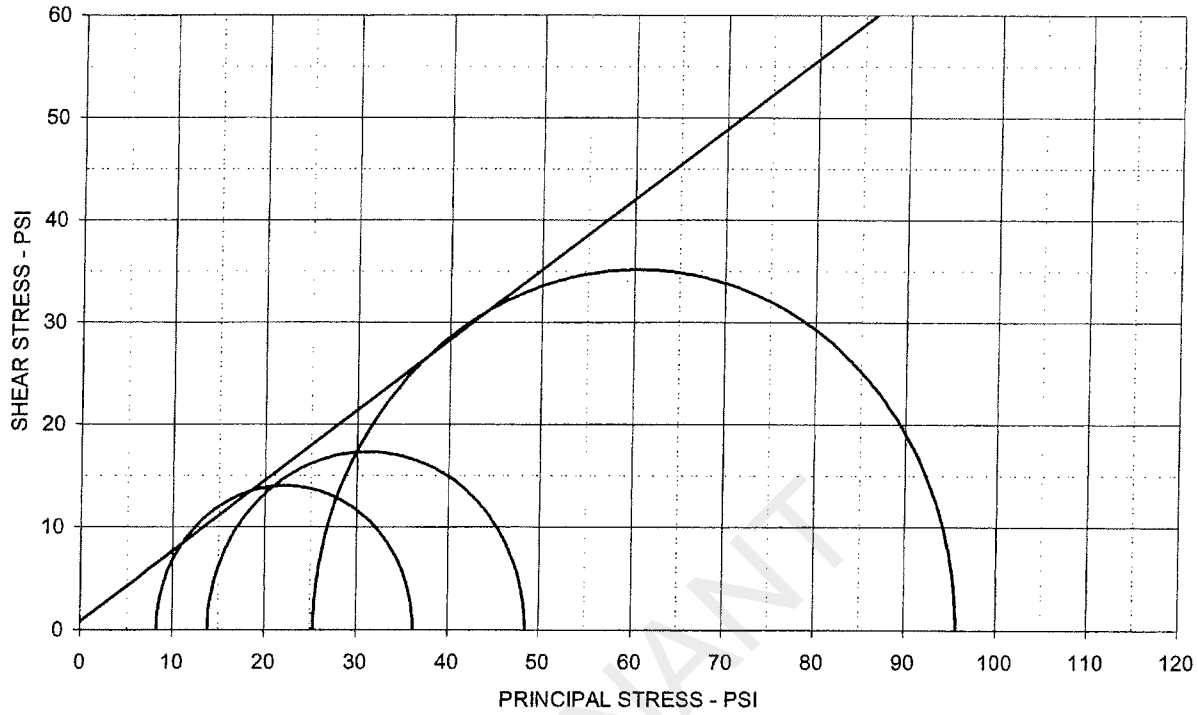
SPECIMEN NO. 3

	initial		final		Diameter			Height	
Moist soil & Tare :	414.70	g	721.50	g	top	2.11	in	Ht 1	4.62	in
Dry soil and Tare :	381.70	g	652.20	g	mid	2.11	in	Ht 2	4.62	in
Tare :	102.50	g	139.10	g	bot	2.11	in	Ht 3	4.62	in
Moisture content :	11.72	%	13.51	%	Avg	2.11	in	Ht4	4.62	in
Weight:	579.6	g						Avg Ht	4.62	in

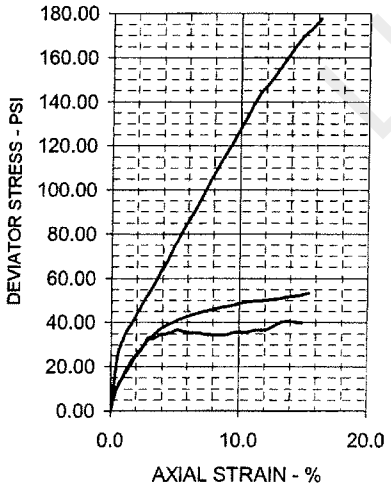
Change in Ht due to saturation :	-0.021	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.018	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	5.4	cc	Initial dry density :	pcf
Saturation Parameter " B " =	0.99		At test dry density:	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	4.6	Effective Cell Pressure (psi) =		
σ_1' Failure (psi) =	95.68	σ_1 Failure (psi) =		Estimated ν =	0.35	
σ_3' Failure (psi) =	25.40	σ_3 Failure (psi) =		Back Pressure (psi) =	50.0	
ΔU =		Total Pore Pressure =	64.6	Cell Pressure (psi) =	90.0	

TRIAXIAL SHEAR TEST REPORT



EFFECTIVE STRESS PARAMETERS	ϕ' = 34.4 deg	c' = 0.8 psi		
SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	16.6	16.0	11.8	
Dry Density - pcf	112.3	112.1	122.3	
Diameter - inches	2.08	2.08	2.11	
Height - inches	4.25	4.40	4.62	
AT TEST				
Final Moisture - %	19.4	18.1	13.5	
Dry Density - pcf	112.6	115.3	124.9	
Calculated Diameter (in.)	2.08	2.07	2.10	
Height - inches	4.24	4.37	4.58	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	28.02	34.65	70.28	
Total Pore Pressure - psi	51.8	56.1	64.6	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	2.4	3.4	4.6	
σ_1' Failure - psi	36.26	48.53	95.68	
σ_3' Failure - psi	8.24	13.88	25.40	



TEST DESCRIPTION

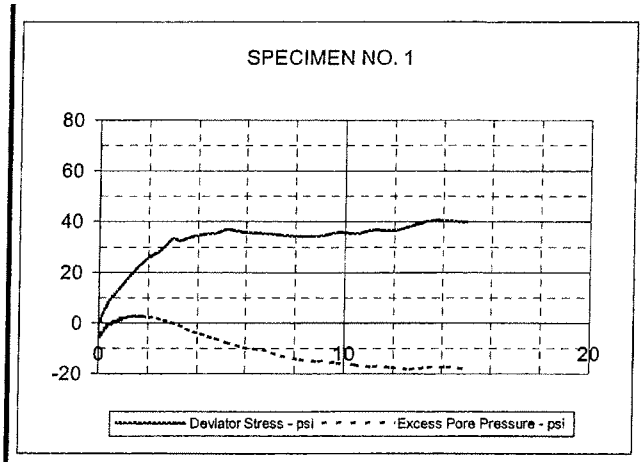
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Sample
DESCRIPTION: Gray, Tan & Redd. Br Sandy Clay w/ some Gravel
Sampled on Site, B-2 8' to 20' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve
G 2972-08, B-2, 8'-20' Native

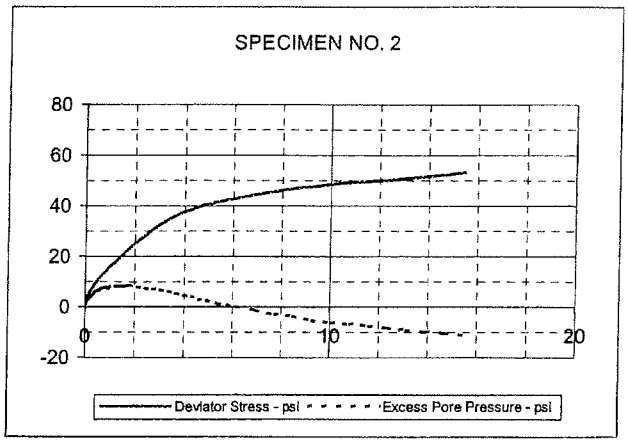
PROJECT INFORMATION

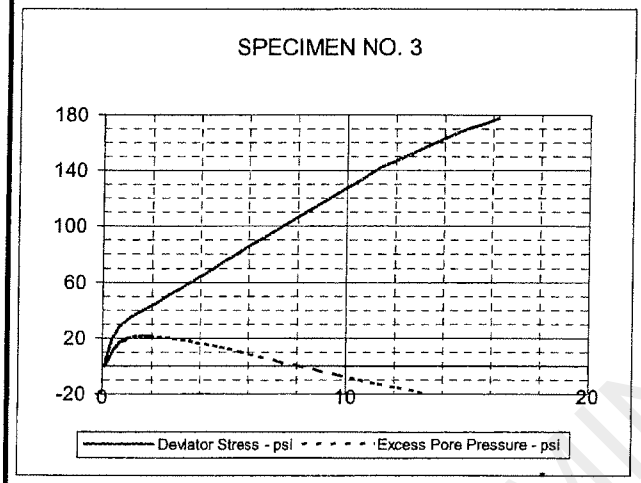
PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

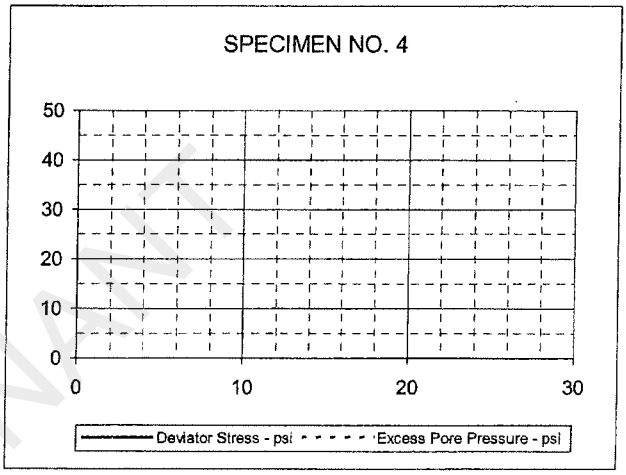
ETTL ENGINEERS & CONSULTANTS

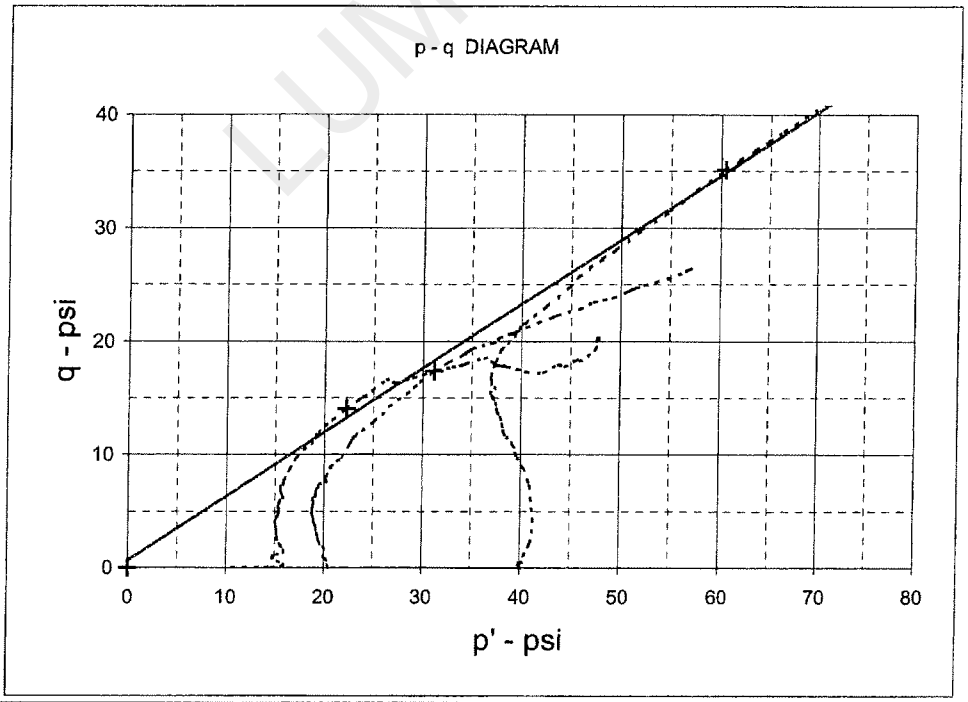
PLATE: B.1







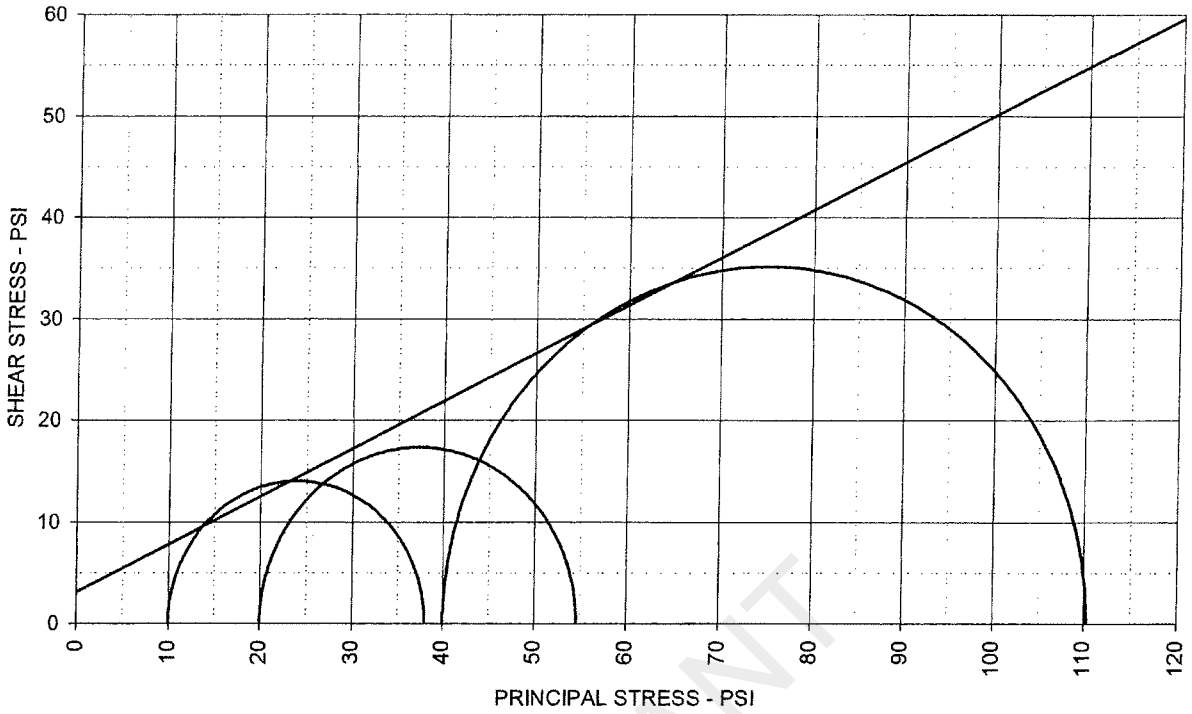




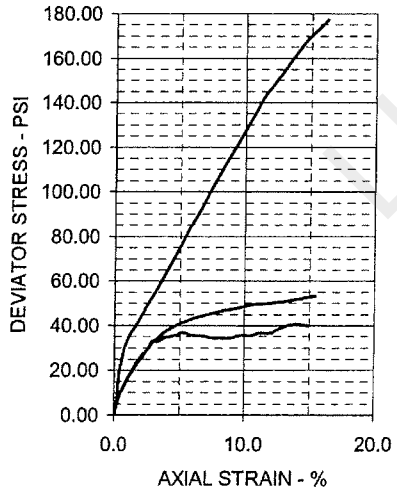
EFFECTIVE STRESS PARAMETERS	R^2 = 0.99	α (deg) = 29.5	a (psi) = 0.7
PROJECT: Luminant East Ash Disposal		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 2972 - 08		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Gray, Tan & Redd. Br Sandy Clay w/ some Gravel			

G 2972-08, B-2, 8'-20' Native

TRIAXIAL SHEAR TEST REPORT



TOTAL STRESS PARAMETERS	ϕ = 25.2 deg	c = 3.1 psi		
SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	16.6	16.0	11.8	
Dry Density - pcf	112.3	112.1	122.3	
Diameter - inches	2.08	2.08	2.11	
Height - inches	4.25	4.40	4.62	
AT TEST				
Final Moisture - %	19.4	18.1	13.5	
Dry Density - pcf	112.6	115.3	124.9	
Calculated Diameter (in.)	2.08	2.07	2.10	
Height - inches	4.24	4.37	4.58	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Fallure Stress - psi	28.02	34.65	70.28	
Total Pore Pressure - psi	51.8	56.1	64.6	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	2.4	3.4	4.6	
σ_1 Failure - psi	38.02	54.65	110.28	
σ_3 Failure - psi	10.00	20.00	40.00	



TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Sample
DESCRIPTION: Gray, Tan & Redd. Br Sandy Clay w/ some Gravel
Sampled on Site, B-2 8' to 20' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve

PROJECT INFORMATION

PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

ETTL ENGINEERS & CONSULTANTS

PLATE: B.3

PROJECT INFORMATION

PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 06
CLIENT:
November 2006

TRIAXIAL TEST PROGRAM BY GARRY H. GREGORY, P.E.

VERSION 1.0 - AUGUST 1998 - REVISED MARCH 24, 1999

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan & Red Sandy Lean Clay w/ Roots
Sampled on Site, B-1 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve

PLATE: B.1

PLATE: B.2

PLATE: B.3

Number of Specimens = 3

SPECIMEN DATA

SPECIMEN NO. 1

	initial		final		Diameter			Height	
Moist soil & Tare :	539.30	g	625.10	g	top	2.07	in	Ht 1	4.23 in
Dry soil and Tare :	452.00	g	546.00	g	mid	2.07	in	Ht 2	4.23 in
Tare :	127.40	g	126.90	g	bot	2.07	in	Ht 3	4.23 in
Moisture content :	16.19	%	16.31	%	Avg	2.07	in	Ht4	4.23 in
Weight:	493.2	g						Avg Ht	4.23 in

Change in Ht due to saturation :	0.02	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.006	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	3.2	cc	Initial dry density :	pcf
Saturation Parameter " B " = 0.97			At test dry density:	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	1.4	Effective Cell Pressure (psi) =		10.0
σ_1' Failure (psi) =	29.29	σ_1 Failure (psi) =	82.94	Estimated ν =		0.35
σ_3' Failure (psi) =	6.35	σ_3 Failure (psi) =	10.00	Back Pressure (psi) =	50.0	
ΔU =	3.7	Total Pore Pressure =	53.7	Cell Pressure (psi) =	60.0	

SPECIMEN NO. 2

	initial		final		Diameter			Height	
Moist soil & Tare :	548.00	g	591.00	g	top	2.01	in	Ht 1	4.25 in
Dry soil and Tare :	492.70	g	519.10	g	mid	2.01	in	Ht 2	4.25 in
Tare :	136.60	g	124.60	g	bot	2.01	in	Ht 3	4.25 in
Moisture content :	15.53	%	14.23	%	Avg	2.0	in	Ht4	4.25 in
Weight:	462.2	g						Avg Ht	4.25 in

Change in Ht due to saturation :	-0.009	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.038	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	4.2	cc	Initial dry density :	pcf
Saturation Parameter " B " = 0.99			At test dry density:	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	3.0	Effective Cell Pressure (psi) =		20.0
σ_1' Failure (psi) =	40.52	σ_1 Failure (psi) =	45.29	Estimated ν =		0.35
σ_3' Failure (psi) =	14.53	σ_3 Failure (psi) =	20.00	Back Pressure (psi) =	50.0	
ΔU =	5.6	Total Pore Pressure =	55.5	Cell Pressure (psi) =	70.0	

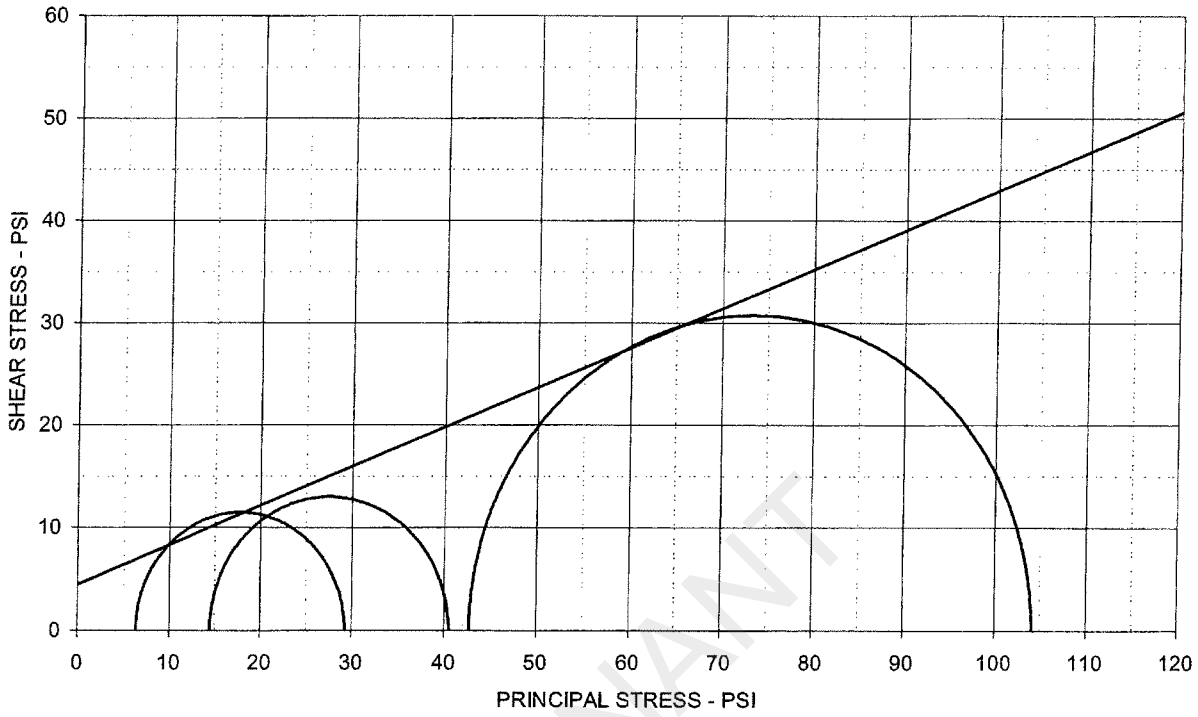
SPECIMEN NO. 3

	initial		final		Diameter			Height	
Moist soil & Tare :	431.00	g	628.40	g	top	2.10	in	Ht 1	4.26 in
Dry soil and Tare :	385.90	g	558.80	g	mid	2.10	in	Ht 2	4.26 in
Tare :	105.00	g	119.40	g	bot	2.10	in	Ht 3	4.26 in
Moisture content :	18.00	%	13.84	%	Avg	2.10	in	Ht4	4.26 in
Weight:	510.5	g						Avg Ht	4.26 in

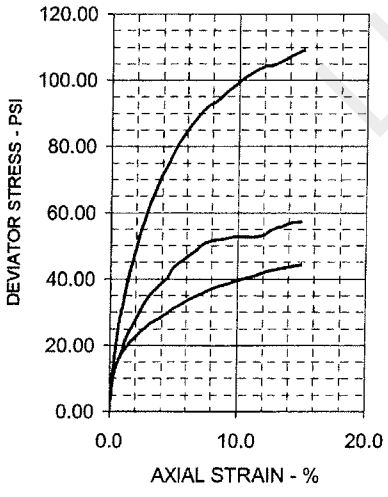
Change in Ht due to saturation :	-0.017	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.039	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	4.6	cc	Initial dry density :	pcf
Saturation Parameter " B " = 0.97			At test dry density:	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	3.0	Effective Cell Pressure (psi) =		40.0
σ_1' Failure (psi) =	104.13	σ_1 Failure (psi) =	101.42	Estimated ν =		0.35
σ_3' Failure (psi) =	42.71	σ_3 Failure (psi) =	40.00	Back Pressure (psi) =	50.0	
ΔU =	-2.7	Total Pore Pressure =	47.3	Cell Pressure (psi) =	90.0	

TRIAXIAL SHEAR TEST REPORT



EFFECTIVE STRESS PARAMETERS	ϕ' = 21.0 deg	c' = 4.5 psi		
SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	16.2	15.5	16.1	
Dry Density - pcf	113.6	113.1	113.3	
Diameter - inches	2.07	2.01	2.10	
Height - inches	4.23	4.25	4.28	
AT TEST				
Final Moisture - %	18.3	18.2	15.8	
Dry Density - pcf	115.2	115.3	115.5	
Calculated Diameter (in.)	2.08	1.99	2.08	
Height - inches	4.24	4.21	4.22	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	22.94	25.99	61.42	
Total Pore Pressure - psi	53.7	55.5	47.3	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	1.4	3.0	3.0	
σ_1' Failure - psi	29.29	40.52	104.13	
σ_3' Failure - psi	6.35	14.53	42.71	



TEST DESCRIPTION

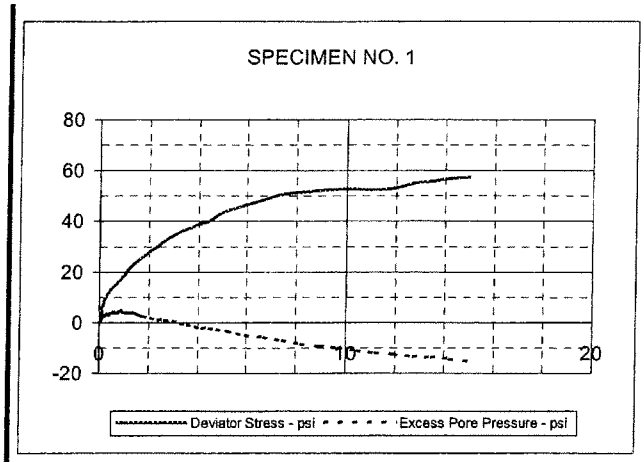
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan & Red Sandy Lean Clay w/ Roots
Sampled on Site, B-1 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve
G 2972-08, B-1, 3'-10' Fill

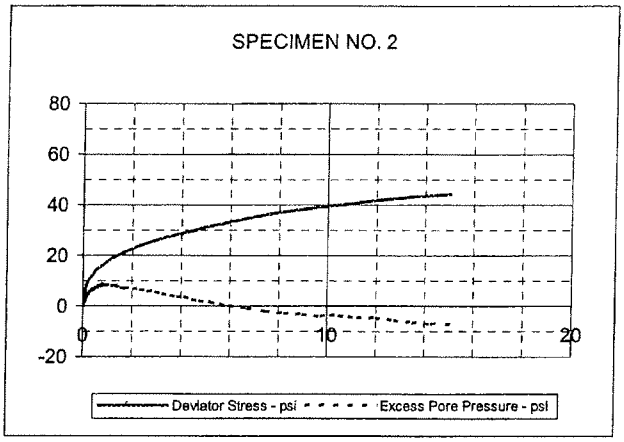
PROJECT INFORMATION

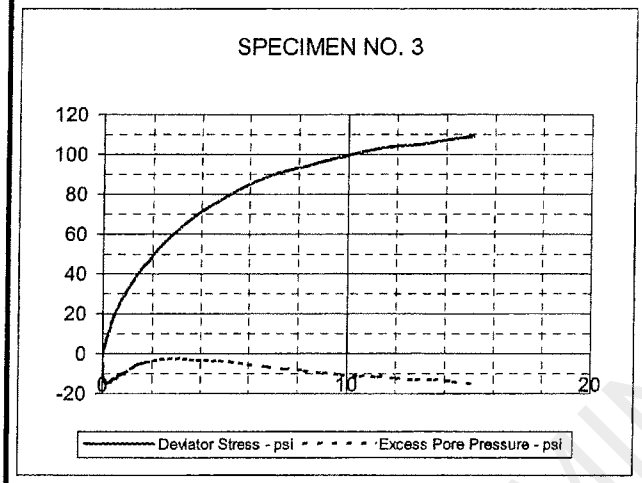
PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

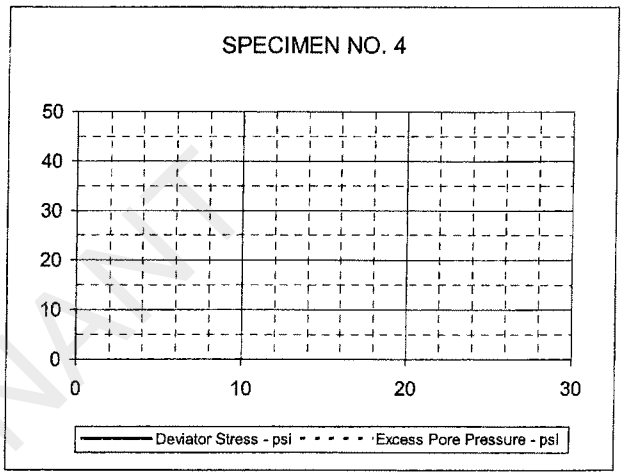
ETTL ENGINEERS & CONSULTANTS

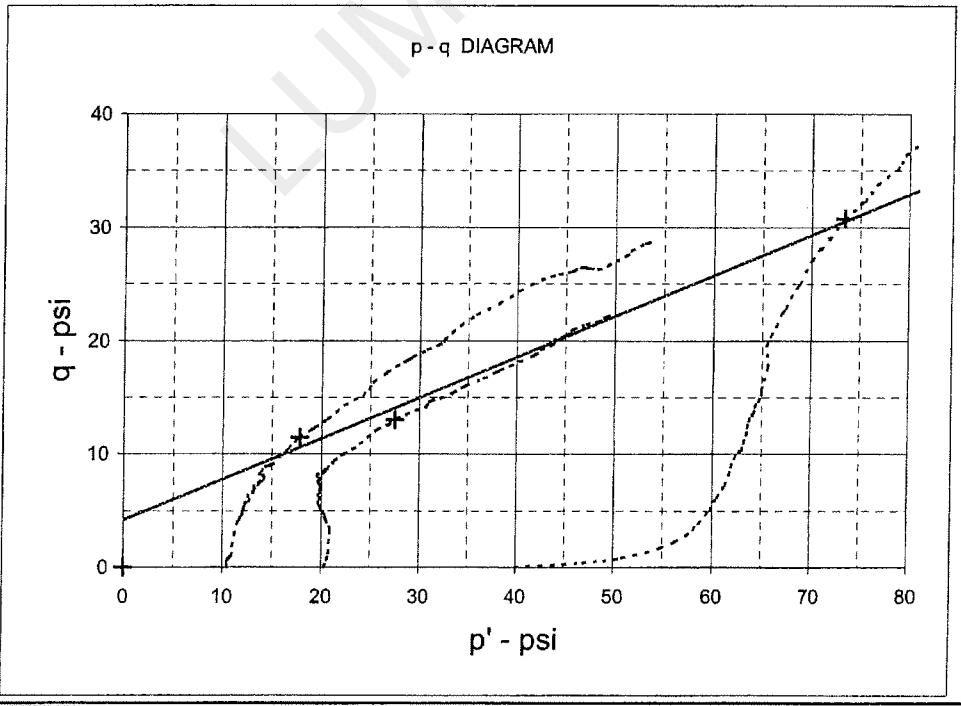
PLATE: B.1







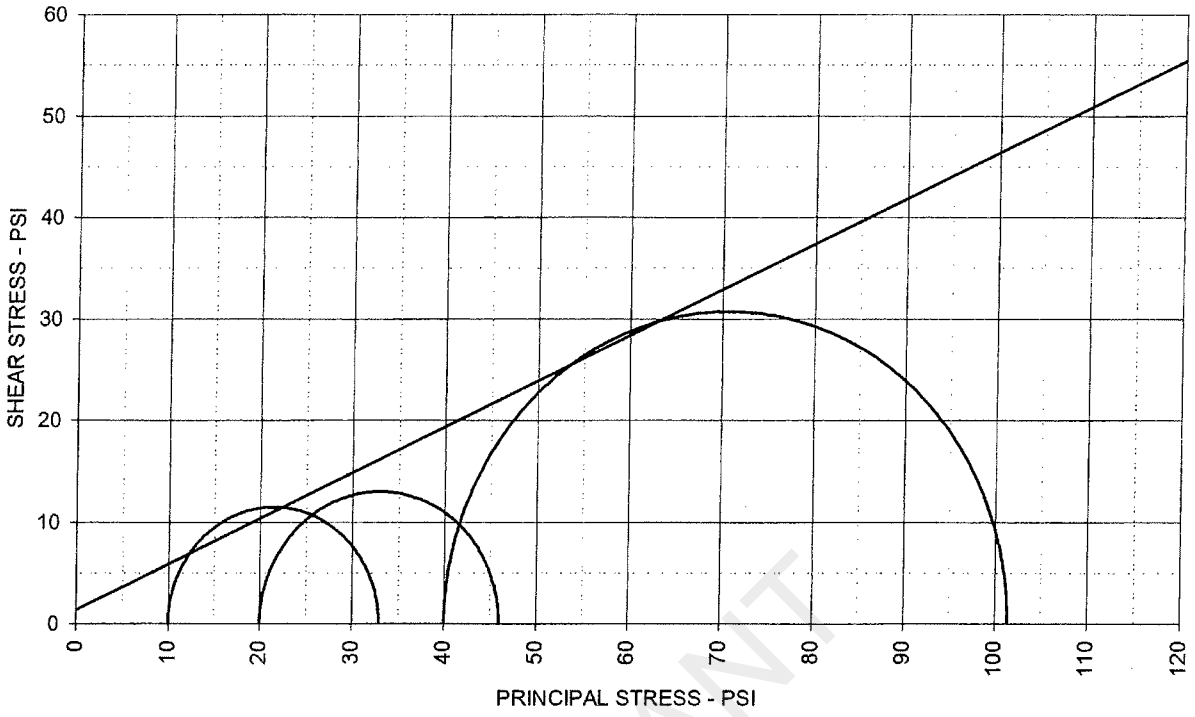




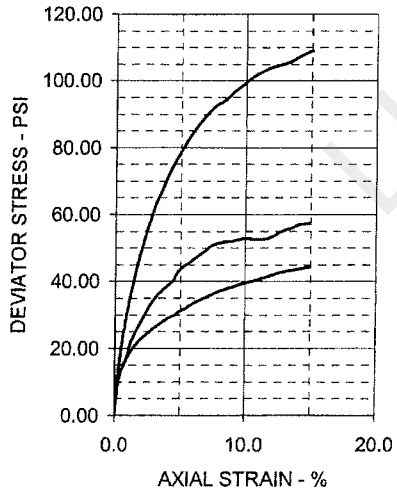
EFFECTIVE STRESS PARAMETERS	R^2 = 0.99	α (deg) = 19.7	a (psi) = 4.2
PROJECT: Luminant East Ash Disposal		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 2972 - 08		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan & Red Sandy Lean Clay w/ Roots			

G 2972-08, B-1, 3'-10' Fill

TRIAXIAL SHEAR TEST REPORT



TOTAL STRESS PARAMETERS	ϕ = 24.2 deg	c = 1.4 psi		
SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	16.2	15.5	16.1	
Dry Density - pcf	113.6	113.1	113.3	
Diameter - inches	2.07	2.01	2.10	
Height - inches	4.23	4.25	4.28	
AT TEST				
Final Moisture - %	18.3	18.2	15.8	
Dry Density - pcf	115.2	115.3	115.5	
Calculated Diameter (in.)	2.08	1.99	2.08	
Height - inches	4.24	4.21	4.22	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	22.94	25.99	61.42	
Total Pore Pressure - psi	53.7	55.5	47.3	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	1.4	3.0	3.0	
σ_1 Failure - psi	32.94	45.99	101.42	
σ_3 Failure - psi	10.00	20.00	40.00	



TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan & Red Sandy Lean Clay w/ Roots
Sampled on Site, B-1 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve

PROJECT INFORMATION

PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

ETTL ENGINEERS & CONSULTANTS

PLATE: B.3

PERMANENT DISPOSAL POND - 5

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Luminant Martin Lake, PDP 1-3
CLIENT: TXU
CONTRACTOR: not given
JOB No. : **G 2810 - 08**

REPORT No.:
DATE SAMPLED: February 2008
SAMPLED BY: ETTL Drill Crew
LOCATION: MLSES
SAMPLE No. :
DESCRIPTION: Gray & Dark Gray Bottom Ash
TECHNICIAN: M. Thompson
DATE: 04/15/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**47.69**
% Retain	+0.05 mm	**99.26**
% Passing	0.05 to 2.0 mm	**51.57**
% Passing	0.002 to 0.05 mm	**0.72**
% Passing	> 0.002 mm	**0.02**

WEIGHT OF SAMPLE (AIR DRY)	100.00
WEIGHT OF SAMPLE (OVEN DRY)	99.90
PERCENT RETAINED ON # 10	47.69
SPECIFIC GRAVITY	2.563

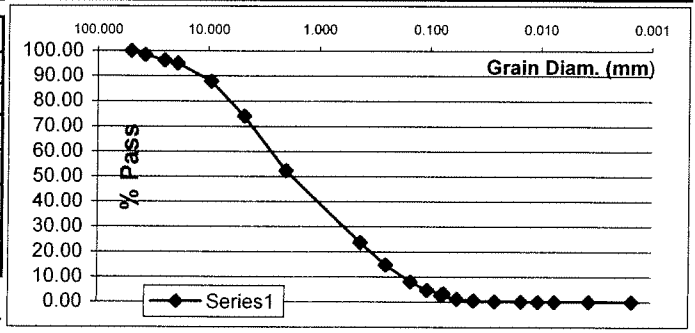
	Mc Hydrom
Tare Wt	29.89
Wet Wt.	68.94
Dry Wt	68.90
MC	0.1025%

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	54.66	76.31	0.425	23.69
60	71.63	85.20	0.250	14.80
100	84.45	91.91	0.150	8.09
140	90.93	95.30	0.105	4.70
200	93.54	96.67	0.075	3.33

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
21.5	5.7	11.0	5.3	15.5	0.0141	1.02	0.5	0.0787	2.82
21.5	5.7	8.0	2.3	16	0.0141	1.02	1	0.0566	1.21
21.5	5.7	6.8	1.1	16.1	0.0141	1.02	2	0.0401	0.57
21.5	5.7	6.2	0.5	16.3	0.0141	1.02	5	0.0255	0.25
21.5	5.7	6.0	0.3	16.3	0.0141	1.02	15	0.0147	0.15
21.5	5.7	5.8	0.1	16.3	0.0141	1.02	30	0.0104	0.04
21.5	5.7	5.8	0.1	16.3	0.0141	1.02	60	0.0074	0.04
21.5	5.7	5.8	0.1	16.3	0.0141	1.02	250	0.0036	0.04
22.0	5.6	5.6	0.0	16.3	0.0140	1.02	1440	0.0015	0.02

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	100	10	188.06	686.13	22.5	99.90	747.18	21.5	**2.563**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	2"	0.00	100.00
	1-1/2"	89.00	98.47
Air Dry Start Wt.:	1"	215.04	96.31
5836.8	3/4"	288.14	95.06
Dry Start Wt.:	3/8"	709.78	87.83
5830.82	No 4	1510.97	74.09
	No 10	2780.46	52.31



Remarks:

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Luminant Martin Lake, PDP 1-3
CLIENT: TXU
CONTRACTOR: not given
JOB No. : **G 2810 - 08**

REPORT No.:
DATE SAMPLED: February 2008
SAMPLED BY: ETTL Drill Crew
LOCATION: B-9, 1'-3'
SAMPLE No. :
DESCRIPTION: Gray Ash (Cementing)
TECHNICIAN: H. Walka
DATE: 03/14/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**0.08**
% Retain	+0.05 mm	**41.35**
% Passing	0.05 to 2.0 mm	**41.27**
% Passing	0.002 to 0.05 mm	**56.63**
% Passing	> 0.002 mm	**2.02**

WEIGHT OF SAMPLE (AIR DRY)	100.00
WEIGHT OF SAMPLE (OVEN DRY)	99.73
PERCENT RETAINED ON # 10	0.08
SPECIFIC GRAVITY	2.761

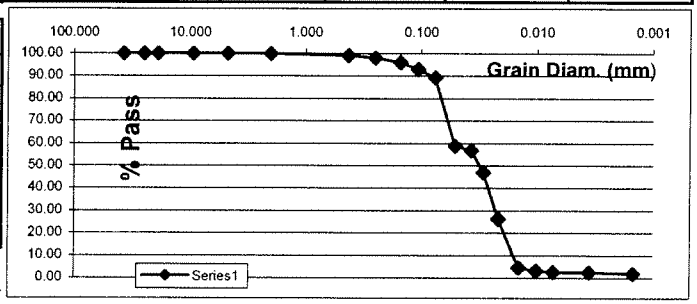
	Mc Hydrom
Tare Wt	29.50
Wet Wt.	62.41
Dry Wt	62.32
MC	0.2742%

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	0.92	1.00	0.425	99.00
60	1.92	2.00	0.250	98.00
100	3.90	3.99	0.150	96.01
140	7.07	7.16	0.105	92.84
200	10.67	10.77	0.075	89.23

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
23.0	5.2	65.0	59.8	6.6	0.0138	0.98	0.5	0.0502	58.67
23.0	5.2	63.0	57.8	7	0.0138	0.98	1	0.0365	56.71
23.0	5.2	53.0	47.8	8.6	0.0138	0.98	2	0.0286	46.89
23.0	5.2	32.0	26.8	12	0.0138	0.98	5	0.0214	26.27
22.5	5.4	10.0	4.6	15.6	0.0140	0.98	15	0.0142	4.51
22.5	5.4	8.5	3.1	15.8	0.0140	0.98	30	0.0101	3.04
22.5	5.4	8.0	2.6	16	0.0140	0.98	60	0.0072	2.55
22.0	5.6	8.0	2.4	16	0.0140	0.98	250	0.0035	2.39
22.0	5.6	7.5	1.9	16.1	0.0140	0.98	1440	0.0015	1.90

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	50	7	179.97	678.12	22.5	49.86	709.93	22.5	**2.761**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
334.9	3/4"	0.00	100.00
Dry Start Wt.:	3/8"	0.00	100.00
333.98	No 4	0.00	100.00
	No 10	0.26	99.92



Remarks:

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Luminant Martin Lake, PDP 1-3
CLIENT: TXU
CONTRACTOR: not given
JOB No. : **G 2810 - 08**

REPORT No.:
DATE SAMPLED: February 2008
SAMPLED BY: ETTL Drill Crew
LOCATION: B-7, 13'-15'
SAMPLE No. :
DESCRIPTION: Gray Ash
TECHNICIAN: H. Walka
DATE: 03/14/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**59.89**
% Retain	+0.05 mm	**92.28**
% Passing	0.05 to 2.0 mm	**32.39**
% Passing	0.002 to 0.05 mm	**4.63**
% Passing	> 0.002 mm	**3.09**

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.81
PERCENT RETAINED ON # 10	59.89
SPECIFIC GRAVITY	2.655

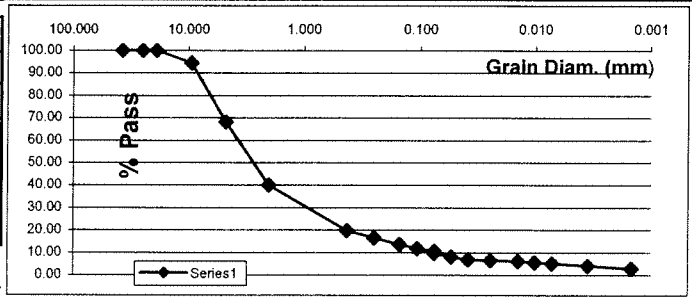
Mc Hydrom	
Tare Wt	30.03
Wet Wt.	45.86
Dry Wt	45.80
MC	0.3805%

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	25.25	80.22	0.425	19.78
60	29.25	83.44	0.250	16.56
100	32.74	86.25	0.150	13.75
140	35.11	88.16	0.105	11.84
200	36.67	89.42	0.075	10.58

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
22.0	5.6	17.5	11.9	14.5	0.0140	1.00	0.5	0.0752	9.61
22.0	5.6	15.5	9.9	14.8	0.0140	1.00	1	0.0537	8.00
22.0	5.6	14.0	8.4	15	0.0140	1.00	2	0.0383	6.79
22.0	5.6	13.5	7.9	15.2	0.0140	1.00	5	0.0244	6.39
22.0	5.6	13.0	7.4	15.2	0.0140	1.00	15	0.0141	5.99
21.5	5.7	12.5	6.8	15.3	0.0141	1.00	30	0.0101	5.46
21.5	5.7	12.0	6.3	15.3	0.0141	1.00	60	0.0071	5.05
22.0	5.6	10.5	4.9	15.6	0.0140	1.00	250	0.0035	3.97
22.0	5.6	9.0	3.4	15.8	0.0140	1.00	1440	0.0015	2.77

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	25	4	179.25	677.26	22.5	24.91	692.79	22.5	**2.655**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
243.3	3/4"	0.00	100.00
Dry Start Wt.:	3/8"	13.45	94.47
242.38	No 4	77.42	68.18
	No 10	145.71	40.11



Remarks:

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Luminant Martin Lake, PDP 1-3
CLIENT: TXU
CONTRACTOR: not given
JOB No. : **G 2810 - 08**

REPORT No.:
DATE SAMPLED: February 2008
SAMPLED BY: ETTL Drill Crew
LOCATION: B-6, 18'-20'
SAMPLE No. :
DESCRIPTION: Tan Ash
TECHNICIAN: H. Walka
DATE: 03/14/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**10.97**
% Retain	+0.05 mm	**18.74**
% Passing	0.05 to 2.0 mm	**7.77**
% Passing	0.002 to 0.05 mm	**77.39**
% Passing	> 0.002 mm	**3.87**

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.81
PERCENT RETAINED ON # 10	10.97
SPECIFIC GRAVITY	2.732

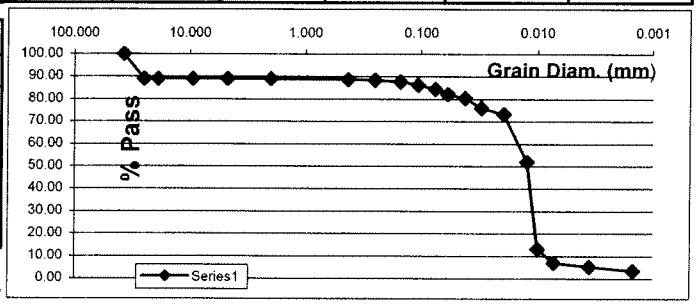
	Mc Hydrom
Tare Wt	29.86
Wet Wt.	51.33
Dry Wt	51.25
MC	0.3740%

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	0.26	11.44	0.425	88.56
60	0.42	11.72	0.250	88.28
100	0.78	12.36	0.150	87.64
140	1.61	13.85	0.105	86.15
200	2.62	15.65	0.075	84.35

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
22.0	5.6	52.0	46.4	8.8	0.0140	0.99	0.5	0.0586	82.16
22.0	5.6	51.0	45.4	8.9	0.0140	0.99	1	0.0417	80.39
22.0	5.6	48.5	42.9	9.4	0.0140	0.99	2	0.0303	75.97
22.0	5.6	47.0	41.4	9.6	0.0140	0.99	5	0.0194	73.31
22.0	5.6	35.0	29.4	11.5	0.0140	0.99	15	0.0122	52.08
22.0	5.6	13.0	7.4	15.2	0.0140	0.99	30	0.0099	13.15
22.0	5.6	9.5	3.9	15.8	0.0140	0.99	60	0.0072	6.96
22.0	5.6	8.5	2.9	16	0.0140	0.99	250	0.0035	5.19
22.0	5.6	7.5	1.9	16.1	0.0140	0.99	1440	0.0015	3.42

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	50	3	179.93	678.11	22.5	49.81	709.70	22.5	**2.732**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	28.83	89.03
262.8	3/4"	28.83	89.03
Dry Start Wt.:	3/8"	28.83	89.03
261.82	No 4	28.83	89.03
	No 10	28.83	89.03



Remarks:

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Luminant Martin Lake, PDP 1-3
CLIENT: TXU
CONTRACTOR: not given
JOB No. : **G 2810 - 08**

REPORT No.:
DATE SAMPLED: February 2008
SAMPLED BY: ETTL Drill Crew
LOCATION: B-3, 5'-7'
SAMPLE No. :
DESCRIPTION: Black Ash
TECHNICIAN: H. Walka
DATE: 03/06/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**11.60**
% Retain	+0.05 mm	**76.50**
% Passing	0.05 to 2.0 mm	**64.91**
% Passing	0.002 to 0.05 mm	**21.88**
% Passing	> 0.002 mm	**1.62**

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.53
PERCENT RETAINED ON # 10	11.60
SPECIFIC GRAVITY	2.561

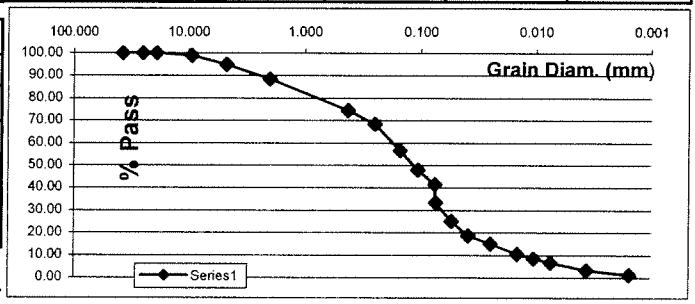
	Mc Hydrom
Tare Wt	29.43
Wet Wt.	65.41
Dry Wt	65.07
MC	0.9540%

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	7.81	25.54	0.425	74.46
60	11.21	31.61	0.250	68.39
100	17.82	43.41	0.150	56.59
140	22.64	52.01	0.105	47.99
200	26.25	58.45	0.075	41.55

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
20.0	6.2	24.5	18.3	13.3	0.0143	1.02	0.5	0.0738	33.31
20.0	6.2	20.0	13.8	14.2	0.0143	1.02	1	0.0539	25.11
20.0	6.2	16.5	10.3	14.7	0.0143	1.02	2	0.0388	18.74
20.0	6.2	14.5	8.3	15	0.0143	1.02	5	0.0248	15.10
20.0	6.2	12.0	5.8	15.5	0.0143	1.02	15	0.0145	10.55
19.5	6.4	11.0	4.6	15.6	0.0145	1.02	30	0.0104	8.44
19.5	6.4	10.0	3.6	15.8	0.0145	1.02	60	0.0074	6.62
20.0	6.2	8.0	1.8	16.1	0.0143	1.02	250	0.0036	3.27
19.5	6.4	7.0	0.6	16.3	0.0145	1.02	1440	0.0015	1.15

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	100	7	179.97	678.12	22.5	99.06	738.67	21.0	**2.561**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
335.3	3/4"	0.00	100.00
Dry Start Wt.:	3/8"	3.42	98.98
332.13	No 4	17.17	94.88
	No 10	38.89	88.40



Remarks:

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT:	Luminant Martin Lake, PDP 1-3
CLIENT:	TXU
CONTRACTOR:	not given
JOB No. :	**G 2810 - 08**
REPORT No.:	
DATE SAMPLED:	February 2008
SAMPLED BY:	ETTL Drill Crew
LOCATION:	B-2, 23'-25'
SAMPLE No. :	
DESCRIPTION:	Light Gray & Black Ash
TECHNICIAN:	H. Walka
DATE:	03/06/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**0.76**
% Retain	+0.05 mm	**16.00**
% Passing	0.05 to 2.0 mm	**15.24**
% Passing	0.002 to 0.05 mm	**83.90**
% Passing	> 0.002 mm	**0.09**

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.16
PERCENT RETAINED ON # 10	0.76
SPECIFIC GRAVITY	2.675

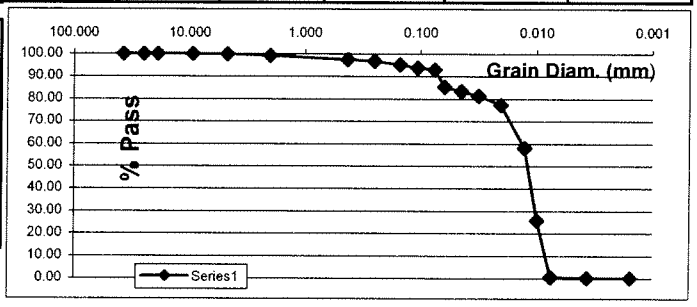
	Mc Hydrom
Tare Wt	29.91
Wet Wt.	55.02
Dry Wt	54.60
MC	1.7011%

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	0.89	2.56	0.425	97.44
60	1.22	3.22	0.250	96.78
100	2.01	4.82	0.150	95.18
140	2.67	6.15	0.105	93.85
200	3.07	6.96	0.075	93.04

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
20.0	6.2	48.5	42.3	9.4	0.0143	1.00	0.5	0.0620	85.37
20.0	6.2	47.5	41.3	9.6	0.0143	1.00	1	0.0443	83.35
20.0	6.2	46.5	40.3	9.7	0.0143	1.00	2	0.0315	81.33
20.0	6.2	44.5	38.3	10.1	0.0143	1.00	5	0.0203	77.30
20.0	6.2	35.0	28.8	11.7	0.0143	1.00	15	0.0126	58.12
20.0	6.2	19.0	12.8	14.3	0.0143	1.00	30	0.0099	25.83
20.0	6.2	6.5	0.3	16.3	0.0143	1.00	60	0.0075	0.59
20.0	6.2	6.3	0.1	16.3	0.0143	1.00	250	0.0037	0.19
19.5	6.4	6.4	0.0	16.3	0.0145	1.00	1440	0.0015	0.07

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	50	4	179.25	677.26	22.5	49.16	708.22	21.0	**2.675**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
144.3	3/4"	0.00	100.00
Dry Start Wt.:	3/8"	0.00	100.00
141.89	No 4	0.10	99.93
	No 10	1.10	99.24



Remarks:

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT:	Luminant Martin Lake, PDP 1-3
CLIENT:	TXU
CONTRACTOR:	not given
JOB No. :	**G 2810 - 08**
REPORT No.:	
DATE SAMPLED:	February 2008
SAMPLED BY:	ETTL Drill Crew
LOCATION:	B-1, 18'-20'
SAMPLE No. :	
DESCRIPTION:	Black, Tan & Gray Ash
TECHNICIAN:	H. Walka
DATE:	03/06/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**14.96**
% Retain	+0.05 mm	**64.42**
% Passing	0.05 to 2.0 mm	**49.46**
% Passing	0.002 to 0.05 mm	**35.29**
% Passing	> 0.002 mm	**0.29**

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.29
PERCENT RETAINED ON # 10	14.96
SPECIFIC GRAVITY	2.608

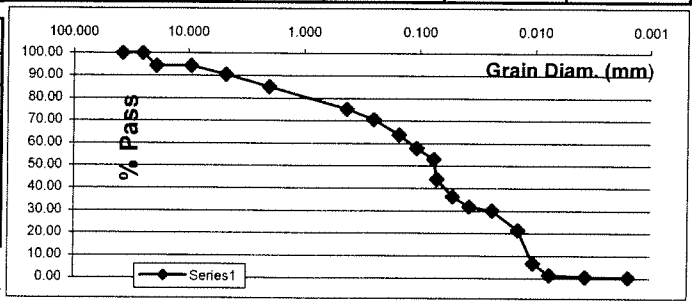
	Mc Hydrom
Tare Wt	29.29
Wet Wt.	59.40
Dry Wt	58.97
MC	1.4488%

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	5.76	24.90	0.425	75.10
60	8.38	29.42	0.250	70.58
100	12.31	36.20	0.150	63.80
140	15.78	42.19	0.105	57.81
200	18.60	47.05	0.075	52.95

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
20.0	6.2	31.5	25.3	12.2	0.0143	1.01	0.5	0.0707	44.08
20.0	6.2	27.0	20.8	13	0.0143	1.01	1	0.0516	36.24
20.0	6.2	24.5	18.3	13.3	0.0143	1.01	2	0.0369	31.88
20.0	6.2	23.5	17.3	13.5	0.0143	1.01	5	0.0235	30.14
20.0	6.2	18.5	12.3	14.3	0.0143	1.01	15	0.0140	21.43
20.0	6.2	10.0	3.8	15.8	0.0143	1.01	30	0.0104	6.61
20.0	6.2	7.0	0.8	16.3	0.0143	1.01	60	0.0075	1.38
20.0	6.2	6.5	0.3	16.3	0.0143	1.01	250	0.0037	0.51
19.5	6.4	6.5	0.1	16.3	0.0145	1.01	1440	0.0015	0.23

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	100	3	179.93	678.11	22.5	98.57	739.11	20.5	**2.608**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
268.4	3/4"	15.10	94.37
Dry Start Wt.:	3/8"	15.10	94.37
264.57	No 4	25.58	90.47
	No 10	40.15	85.04



Remarks:

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Luminant Martin Lake, PDP 1-3
CLIENT: TXU
CONTRACTOR: not given
JOB No. : **G 2810 - 08**

REPORT No.:
DATE SAMPLED: February 2008
SAMPLED BY: ETTL Drill Crew
LOCATION: MLSES
SAMPLE No. :
DESCRIPTION: Tan & Gray Econimizet Ash
TECHNICIAN: M. Thompson
DATE: 04/15/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**41.02**
% Retain	+0.05 mm	**95.89**
% Passing	0.05 to 2.0 mm	**54.87**
% Passing	0.002 to 0.05 mm	**3.55**
% Passing	> 0.002 mm	**0.55**

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.98
PERCENT RETAINED ON # 10	41.02
SPECIFIC GRAVITY	2.670

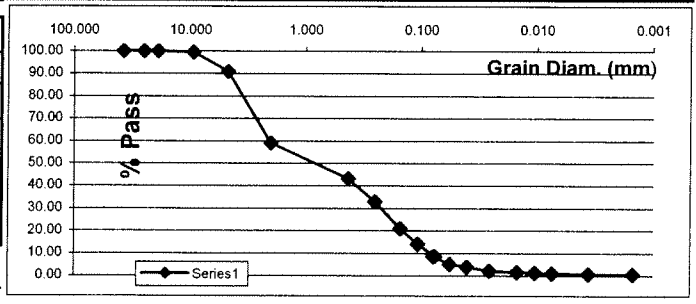
	Mc Hydrom
Tare Wt	30.27
Wet Wt.	62.43
Dry Wt	62.42
MC	0.0311%

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	13.34	56.76	0.425	43.24
60	22.12	67.12	0.250	32.88
100	32.26	79.09	0.150	20.91
140	38.01	85.87	0.105	14.13
200	42.66	91.36	0.075	8.64

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
21.5	5.7	13.0	7.3	15.2	0.0141	1.00	0.5	0.0780	8.58
21.5	5.7	10.0	4.3	15.6	0.0141	1.00	1	0.0558	5.04
21.5	5.7	9.0	3.3	15.8	0.0141	1.00	2	0.0397	3.86
21.5	5.7	7.5	1.8	16.1	0.0141	1.00	5	0.0254	2.09
21.5	5.7	7.0	1.3	16.1	0.0141	1.00	15	0.0146	1.50
21.5	5.7	6.8	1.1	16.1	0.0141	1.00	30	0.0104	1.27
21.5	5.7	6.5	0.8	16.3	0.0141	1.00	60	0.0074	0.91
21.5	5.7	6.3	0.6	16.3	0.0141	1.00	250	0.0036	0.68
22.0	5.6	6.0	0.4	16.3	0.0140	1.00	1440	0.0015	0.51

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	100	7	179.97	678.12	22.5	99.97	740.78	21.5	**2.670**

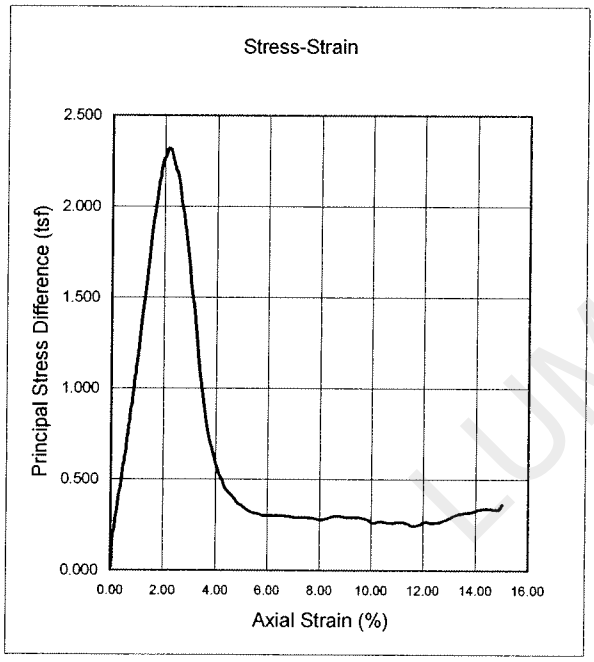
	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
2182.9	3/4"	0.00	100.00
Dry Start Wt.:	3/8"	12.53	99.43
2182.22	No 4	200.01	90.83
	No 10	895.12	58.98



Remarks:

ASTM D 2850 Confined Compressive Strength of Cohesive Soil

Project: Luminant Martin Lake: PDP 1-3



Project No.:	G 2810-08	
Boring No.:	B-7	
Depth, ft.:	5'-7'	
Material:	Black Ash with Gravel	
Initial Height	5.706	Inches
Initial Diameter	2.767	Inches
Moisture Content:	22.9%	%
Dry Density:	97.5	lbs/cu ft
Specific Gravity (Assumed)	2.670	
Volume of Solids:	0.585	
Volume of Voids	0.415	
Void Ratio:	0.709	
Confining Pressure:	6.1	PSI
Pocket Penetr. Reading:	4.5	
Torvane (T)		
Rate of Strain: (%/ min)	1.0%	
Peak Strain:	**2.1**	%
Max Stress:	**2.32**	**TSF**
Date:	3/11/2008	

1/2 Stress (KSF)	2.321
Strain at 1/2 Stress (%)	0.99
Type of Specimen:	Native
Remarks:	

Secant Modulus (KSF) @ 1/2 Peak Stress 234

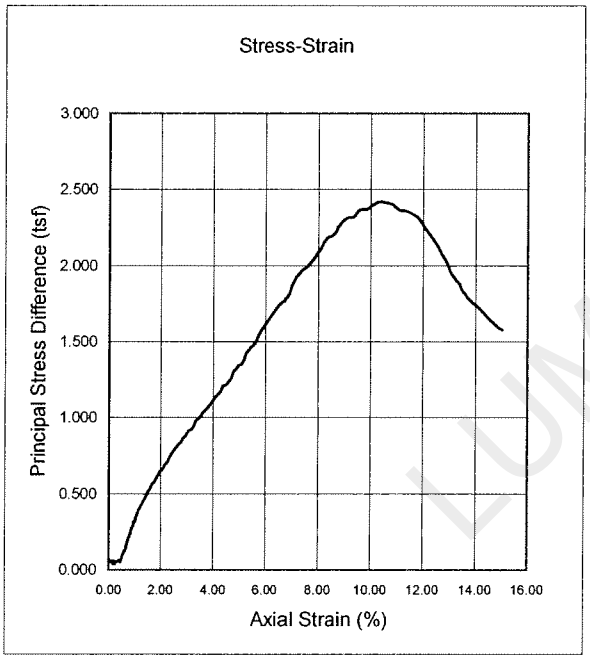
RQD Value: 100%

Angle of Fracture in Degrees: 65

Sketch of Fracture:

ASTM D 2850 Confined Compressive Strength of Cohesive Soil

Project: TXU PDP: Martin Lake, TX



Project No.:	G 2810-08	
Boring No.:	B-4	
Depth, ft.:	13'-15'	
Material:	Red & Gray Laminated Lean Clay	
Initial Height	3.613	Inches
Initial Diameter	2.667	Inches
Moisture Content:	22.3%	%
Dry Density:	99.4	lbs/cu ft
Specific Gravity (Assumed)	2.670	
Volume of Solids:	0.596	
Volume of Voids	0.404	
Void Ratio:	0.677	
Confining Pressure:	13	PSI
Pocket Penetr. Reading:	3.5	
Torvane (T)		
Rate of Strain: (%/ min)	1.0%	
Peak Strain:	**10.3**	%
Max Stress:	**2.42**	**TSF**
Date:	5/12/2008	

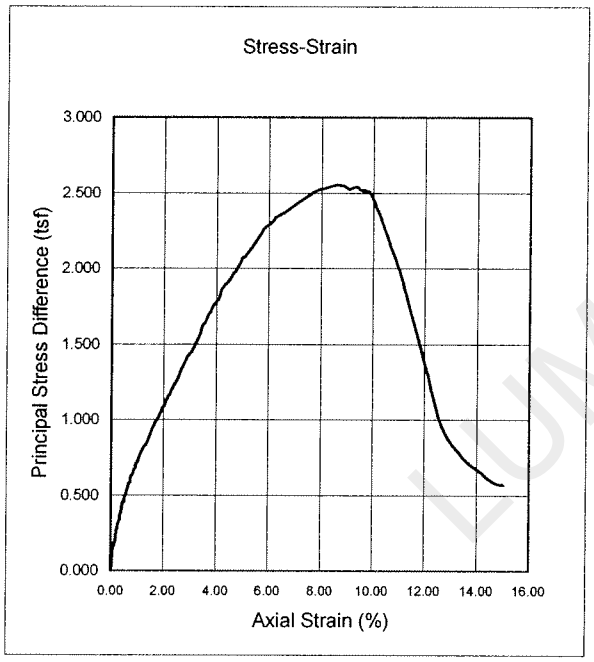
1/2 Stress (KSF)	2.416	Secant Modulus (KSF) @ 1/2 Peak Stress	61
Strain at 1/2 Stress (%)	3.94	RQD Value:	100%
Type of Specimen:	Native	Angle of Fracture in Degrees:	N/A

Remarks: undefined fracture

Sketch of Fracture:

ASTM D 2850 Confined Compressive Strength of Cohesive Soil

Project: Luminant Martin Lake: PDP 1-3



Project No.:	G 2810-08	
Boring No.:	B-4	
Depth, ft.:	13'-15'	
Material:	Light Gray & Red Slity Clayey Sand w/ Ferric seams	
Initial Height	5.688	Inches
Initial Diameter	2.75	Inches
Moisture Content:	21.5%	%
Dry Density:	104.6	lbs/cu ft
Specific Gravity (Assumed)	2.670	
Volume of Solids:	0.628	
Volume of Voids	0.372	
Void Ratio:	0.593	
Confining Pressure:	13	PSI
Pocket Penetr. Reading:	3.9	
Torvane (T)	1.138	
Rate of Strain: (%/ min)	1.0%	
Peak Strain:	**8.6**	%
Max Stress:	**2.55**	**TSF**
Date:	4/11/2008	

1/2 Stress (KSF) 2.552

Strain at 1/2 Stress (%) 2.54

Type of Specimen: Native

Secant Modulus (KSF) @ 1/2 Peak Stress 100

RQD Value: 100%

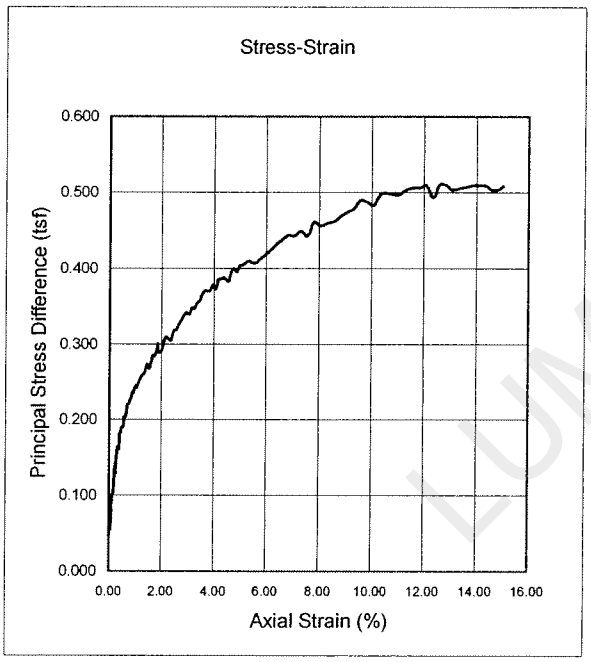
Angle of Break in Degrees: 60

Remarks:

Sketch of Fracture:

ASTM D 2850 Confined Compressive Strength of Cohesive Soil

Project: Luminant Martin Lake: PDP 1-3



Project No.:	G 2810-08	
Boring No.:	B-7	
Depth, ft.:	23'-25'	
Material:	Black, Red, Tan, & Gray Clay w/ gravel	
Initial Height	5.686	Inches
Initial Diameter	2.717	Inches
Moisture Content:	21.0%	%
Dry Density:	103.9	lbs/cu ft
Specific Gravity (Assumed)	2.670	
Volume of Solids:	0.624	
Volume of Voids	0.376	
Void Ratio:	0.603	
Confining Pressure:	21.7	PSI
Pocket Penetr. Reading:		
Torvane (T)		
Rate of Strain: (%/ min)	1.0%	
Peak Strain:	**12.8**	%
Max Stress:	**0.51**	**TSF**
Date:	3/11/2008	

1/2 Stress (KSF) 0.510

Strain at 1/2 Stress (%) 1.20

Type of Specimen: Native

Secant Modulus (KSF) @ 1/2 Peak Stress 43

RQD Value: 100%

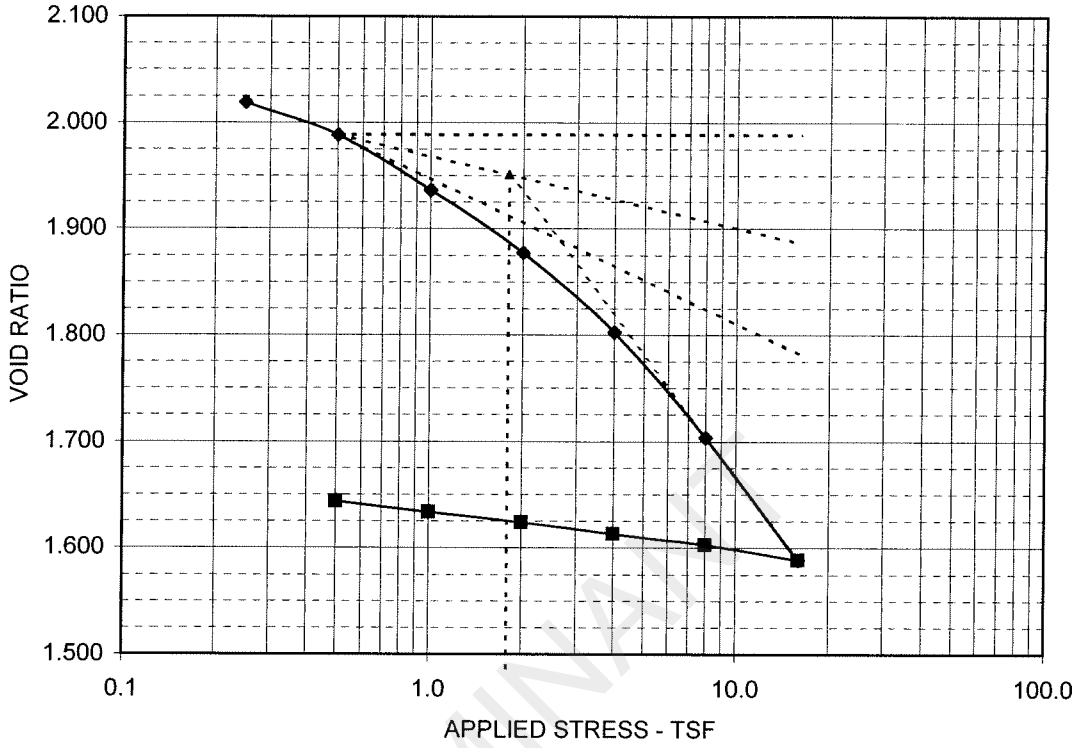
Angle of Break in Degrees: 53

Remarks: Not able to find a well defined fracture

Sketch of Fracture:

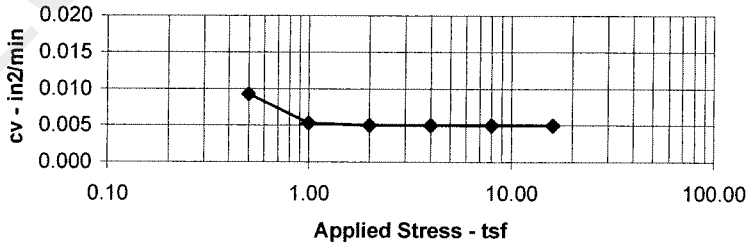
CONSOLIDATION TEST REPORT

ASTM D 2435



C_c = 0.381	C_r = 0.033	e_0 = 2.0191	Pc (tsf) = 1.79	OCR = 10.2

LOAD tsf	c_v in^2/min	k in/min
Seating	NA	NA
0.50	9.34E-03	9.85E-07
1.00	5.36E-03	4.89E-07
2.00	5.03E-03	2.65E-07
4.00	5.04E-03	1.73E-07
8.00	5.03E-03	1.18E-07
16.00	5.03E-03	7.08E-08

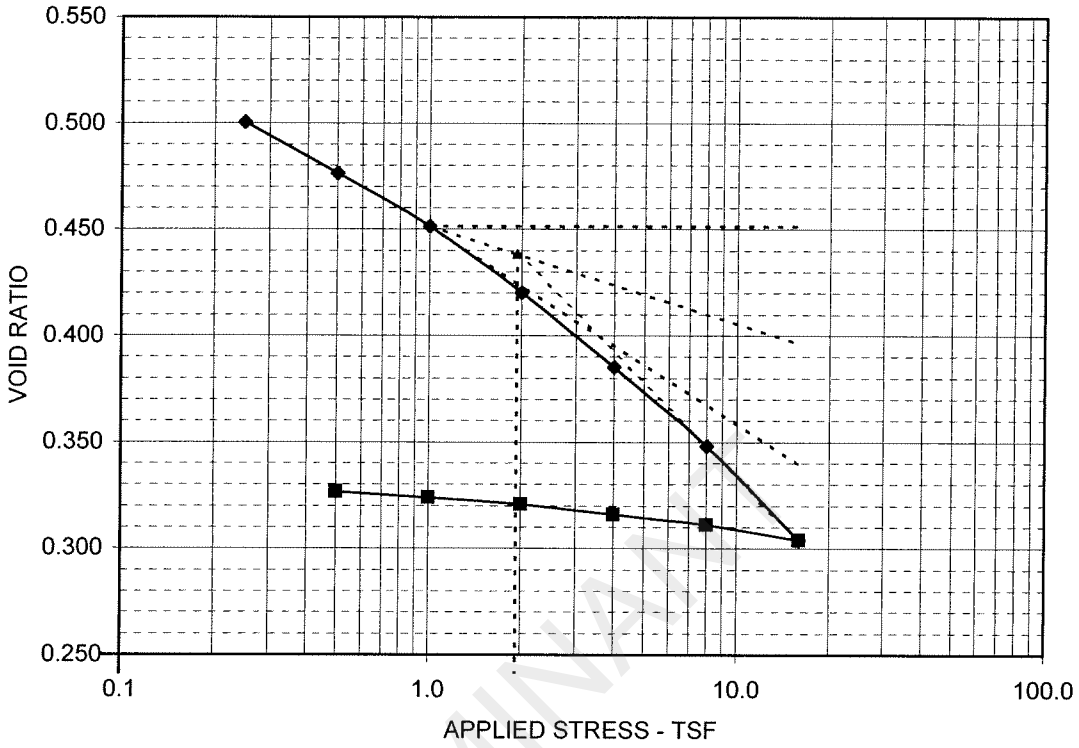


c_v values calculated by Sivaram and Swamee's Method

SAMPLE AND TEST DATA				PROJECT INFORMATION	
SAMPLE LOCATION: B-6, 3-5'				PROJECT:	Luminant Martin Lake PDP 1-3
DESCRIPTION: Ash, black and dark gray				LOCATION:	Rusk, TX.
				PROJECT NO.:	ETT08002-07
LL: NA	PL: NA	PI: NA	-200:NA	CLIENT:	ETTL Engineers & Consultants, Inc.
ASSUMED SPECIFIC GRAVITY:			2.70	CLIENT NO.:	G2810-08
MC Initial:	58.1%	MC Final:	47.2%	DATE:	4/24/2008
Dia. (in.) :	2.50	Height (in.) :	1.000	REMARKS: OCR calculated based on Pc and vertical overburden	
Initial Sat %:	70.2	Final Sat %:	100.0	*GREGORY GEOTECHNICAL*	PLATE B-CN.1
DRY DENSITY (pcf):			55.8		

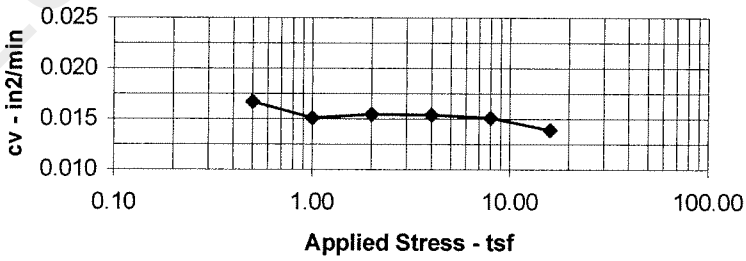
CONSOLIDATION TEST REPORT

ASTM D 2435



C_c = 0.146	C_r = 0.012	e_0 = 0.5597	Pc (tsf) = 1.93	OCR = 3.5

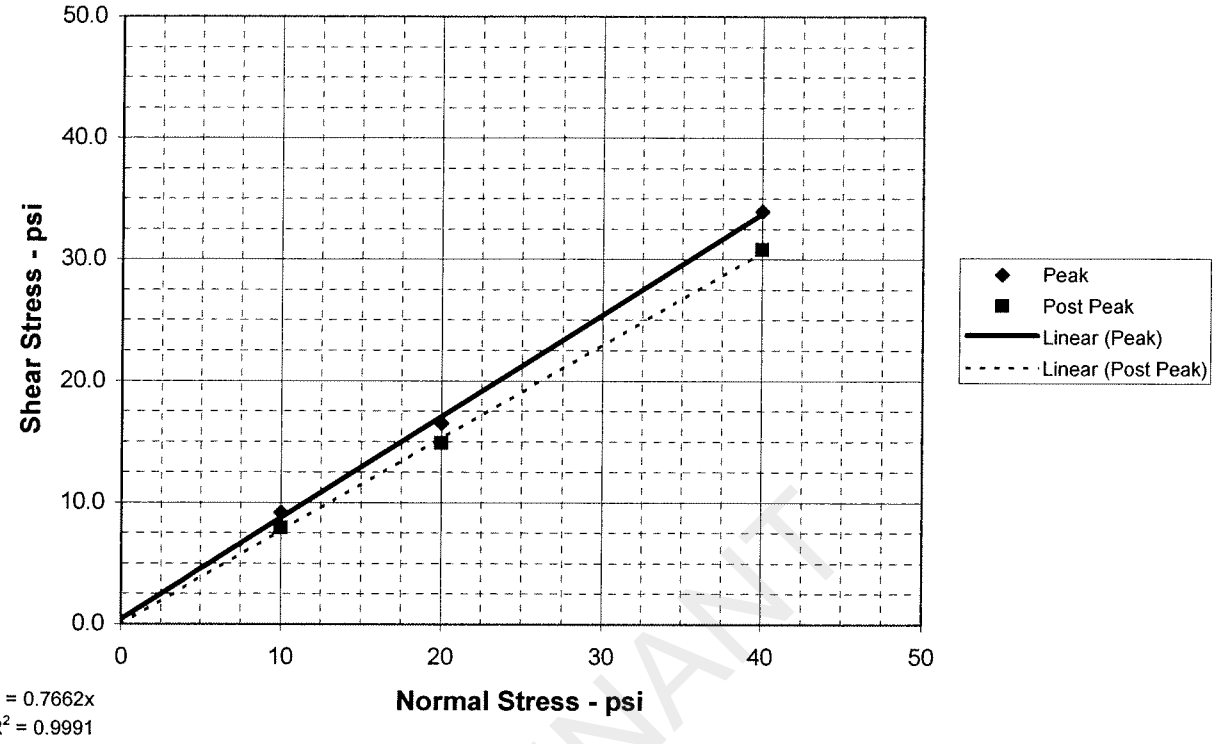
LOAD tsf	c_v in^2/min	k in/min
Seating	NA	NA
0.50	1.67E-02	2.82E-06
1.00	1.51E-02	1.33E-06
2.00	1.55E-02	8.75E-07
4.00	1.54E-02	5.00E-07
8.00	1.51E-02	2.67E-07
16.00	1.39E-02	1.50E-07



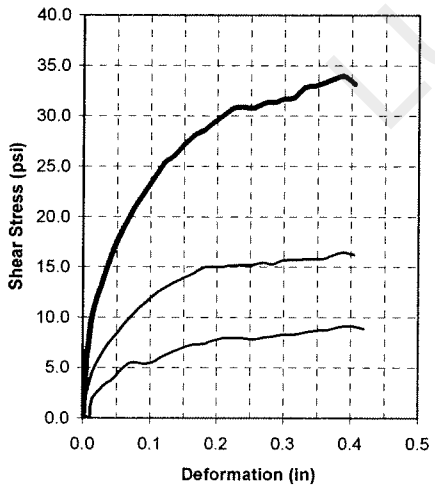
c_v values calculated by Sivaram and Swamee's Method

SAMPLE AND TEST DATA				PROJECT INFORMATION	
SAMPLE LOCATION: B-4, 8-10'				PROJECT:	Luminant Martin Lake PDP 1-3
DESCRIPTION: Clayey Sand , reddish brown with gray				LOCATION:	Rusk, TX.
				PROJECT NO.:	ETT08002-07
LL: NA	PL: NA	PI: NA	-200: NA	CLIENT:	ETTL Engineers & Consultants, Inc.
ASSUMED SPECIFIC GRAVITY:			2.70	CLIENT NO.:	G2810-08
MC Initial:	13.0%	MC Final:	19.6%	DATE:	4/24/2008
Dia. (in.) :	2.50	Height (in.) :	1.000	REMARKS: OCR calculated based on Pc and vertical overburden	
Initial Sat %:	70.2	Final Sat %:	100.0		
DRY DENSITY (pcf):		108.0		*GREGORY GEOTECHNICAL*	PLATE B-CN.2

DIRECT SHEAR TEST REPORT



PEAK STRENGTH PARAMETERS	ϕ = 39.8 deg	c =	0.5 psi
POST PEAK STRENGTH PARAMETERS	ϕ = 37.5 deg	c =	0.0 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	52.1	29.3	21.2	
Dry Density - pcf	50.2	71.7	95.2	
Diameter - inches	2.50	2.50	2.50	
Height - inches	1.13	1.13	1.13	
AT TEST				
Final Moisture - %	64.3	25.0	31.6	
Dry Density - pcf	55.8	79.1	117.3	
Height-End of Consol. (in.)	1.02	1.03	0.92	
Height-End of Shear (in.)	0.97	0.99	0.89	
Normal Stress - psi	10.0	20.0	40.0	
Peak Failure Stress-psi	9.2	16.5	34.0	
Post Peak Failure Stress-psi	7.9	14.9	30.8	
Strain Rate - inches/min.	0.00300	0.00300	0.00300	
Peak Failure Strain - %	16.2	15.6	15.6	
Post Peak Failure Strain %	8.4	7.2	9.6	

Dry Density at test based on initial moisture and height at end of consolidation.

TEST DESCRIPTION

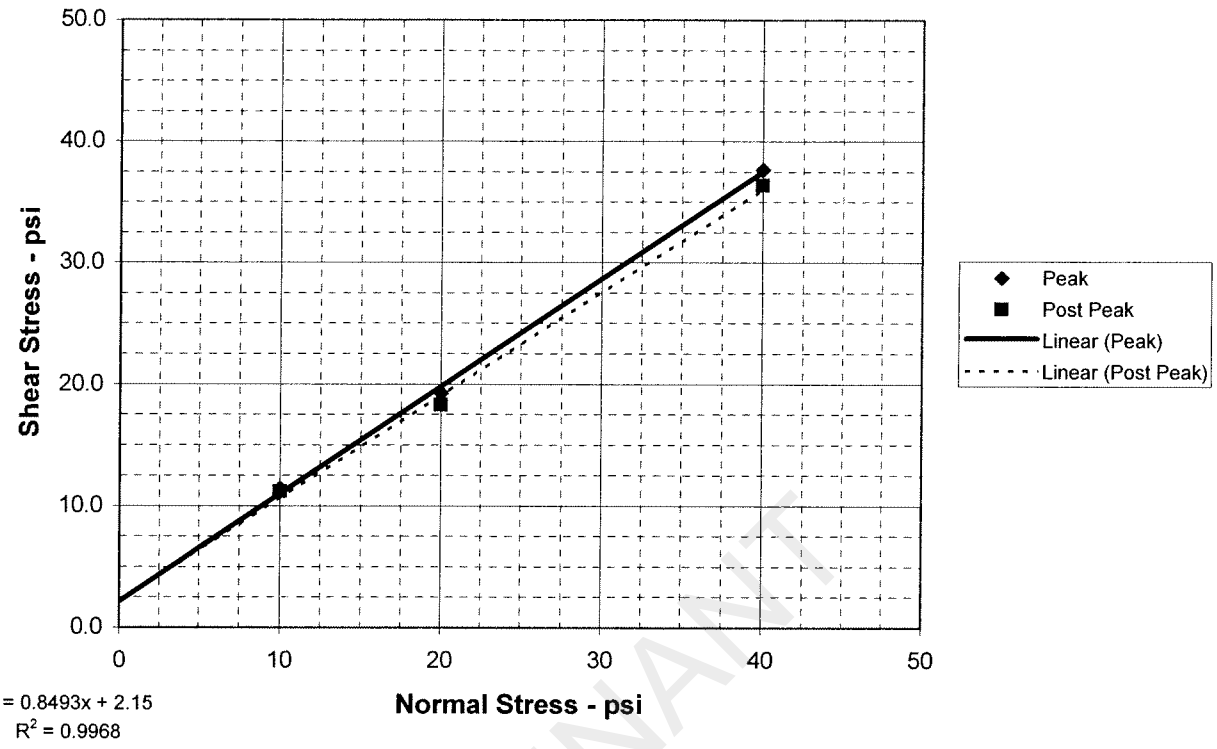
TYPE OF TEST & NO: CD-DS-1
SAMPLE TYPE: Shelby Tube
DESCRIPTION: Ash, black and gray
SAMPLE LOCATION: B-6, 3-5 ft
ASSUMED SPECIFIC GRAVITY: 2.65
LL: 35 PL: 19 PI: 16 Percent -200: 61
REMARKS: Multi-Specimen

PROJECT INFORMATION

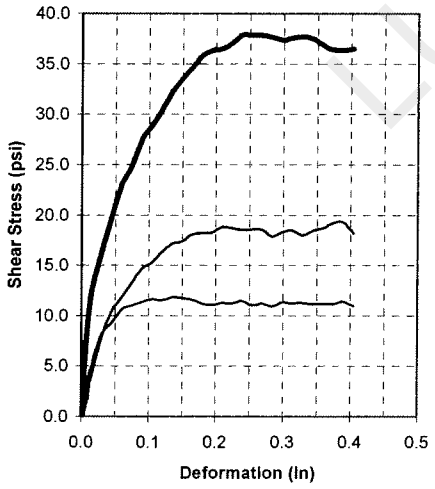
PROJECT: Luminant Martin Lake PDP 1-3
LOCATION: Rusk , TX
PROJECT NO: ETT08002-07 (G2810-08)
CLIENT : ETTL Engineers & Consultants, Inc
DATE:4/25/08

GREGORY GEOTECHNICAL | PLATE: B-DS.1

DIRECT SHEAR TEST REPORT



PEAK STRENGTH PARAMETERS	ϕ = 41.4 deg	c =	2.2 psi
POST PEAK STRENGTH PARAMETERS	ϕ = 40.3 deg	c =	2.2 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	13.1	13.1	13.1	
Dry Density - pcf	71.8	71.7	71.7	
Diameter - inches	2.50	2.50	2.50	
Height - inches	1.00	1.00	1.00	
AT TEST				
Final Moisture - %	38.5	37.4	31.6	
Dry Density - pcf	73.6	73.7	75.8	
Height-End of Consol. (in.)	0.98	0.97	0.95	
Height-End of Shear (in.)	1.00	0.96	0.92	
Normal Stress - psi	10.0	20.0	40.0	
Peak Failure Stress-psi	11.4	19.3	37.7	
Post Peak Failure Stress-psi	11.2	18.3	36.4	
Strain Rate - inches/min.	0.00300	0.00300	0.00300	
Peak Failure Strain - %	15.6	15.6	13.2	
Post Peak Failure Strain %	13.8	12.0	15.0	

Dry Density at test based on initial moisture and height at end of consolidation.

TEST DESCRIPTION

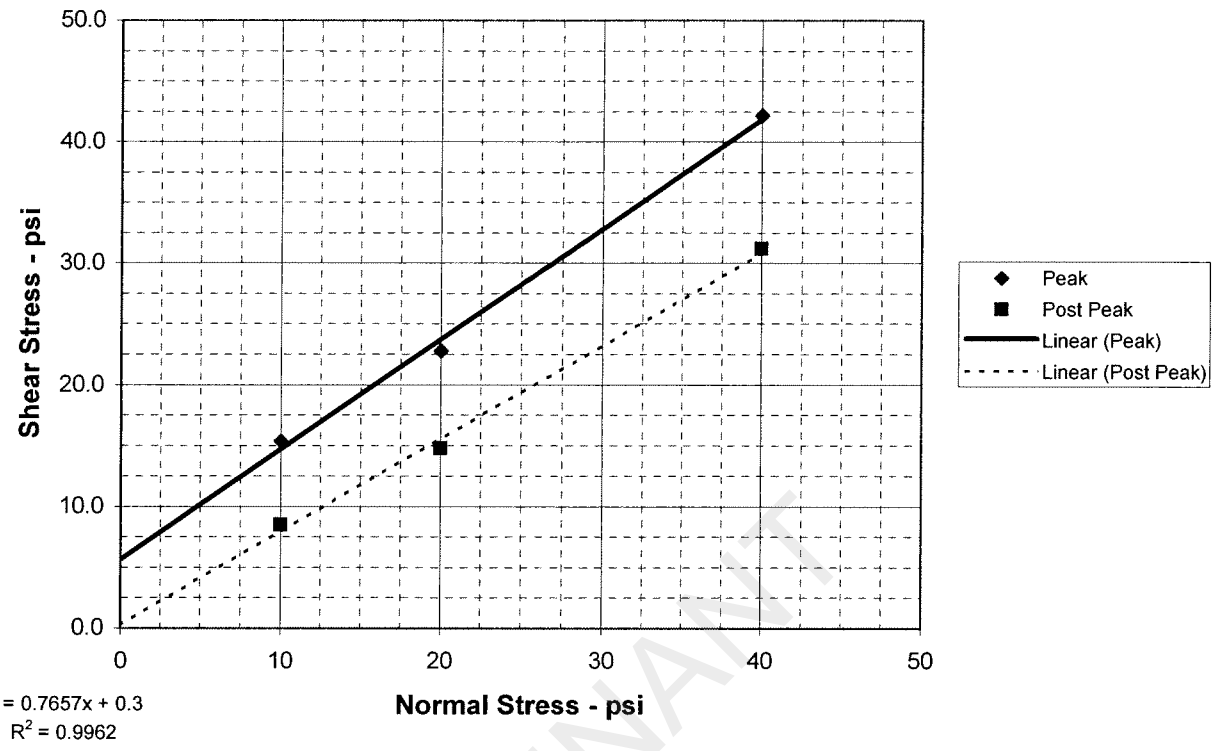
TYPE OF TEST & NO: CD-DS-2
SAMPLE TYPE: Re-Compacted
DESCRIPTION: Ash, black and dark gray
SAMPLE LOCATION: MLSES (Bulk)
SPECIFIC GRAVITY: 2.56
LL: NP PL: NP PI: NP Percent -200: 3.33
REMARKS: Multi-Specimen

PROJECT INFORMATION

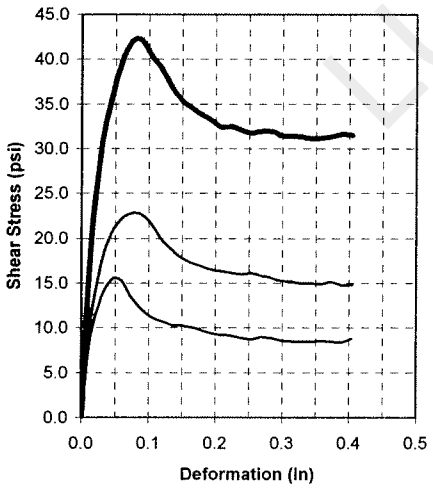
PROJECT: Luminant Martin Lake PDP 1-3
LOCATION: Rusk , TX
PROJECT NO: ETT08002-07 (G2810-08)
CLIENT : ETTL Engineers & Consultants, Inc
DATE:5/6/08

GREGORY GEOTECHNICAL PLATE: B-DS.2

DIRECT SHEAR TEST REPORT



PEAK STRENGTH PARAMETERS	ϕ = 42.1 deg	c =	5.7 psi
POST PEAK STRENGTH PARAMETERS	ϕ = 37.4 deg	c =	0.3 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	0.1	0.1	0.1	
Dry Density - pcf	71.7	71.7	71.7	
Diameter - inches	2.50	2.50	2.50	
Height - inches	1.00	1.00	1.00	
AT TEST				
Final Moisture - %	50.3	37.4	31.6	
Dry Density - pcf	73.4	73.1	73.1	
Height-End of Consol. (in.)	0.98	0.98	0.98	
Height-End of Shear (in.)	1.01	1.01	0.99	
Normal Stress - psi	10.0	20.0	40.0	
Peak Failure Stress-psi	15.4	22.8	42.2	
Post Peak Failure Stress-psi	8.5	14.8	31.2	
Strain Rate - inches/min.	0.00300	0.00300	0.00300	
Peak Failure Strain - %	17.6	3.0	3.6	
Post Peak Failure Strain %	15.0	15.6	13.8	

Dry Density at test based on initial moisture and height at end of consolidation.

TEST DESCRIPTION

TYPE OF TEST & NO: CD-DS-2
SAMPLE TYPE: Re-Compacted
DESCRIPTION: Economized Ash, tan and gray
SAMPLE LOCATION: MLSES (Bulk)
SPECIFIC GRAVITY: 2.67
LL: NP PL: NP PI: NP Percent -200: 8.64
REMARKS: Multi-Specimen

PROJECT INFORMATION

PROJECT: Luminant Martin Lake PDP 1-3
LOCATION: Rusk , TX
PROJECT NO: ETT08002-07 (G2810-08)
CLIENT : ETTL Engineers & Consultants, Inc
DATE:5/20/08

GREGORY GEOTECHNICAL PLATE: B-DS.3

PROJECT INFORMATION

PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

TRIAXIAL TEST PROGRAM BY GARRY H. GREGORY, P.E.

VERSION 1.0 - AUGUST 1998 - REVISED MARCH 24, 1999

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Shelby Tube Sample
DESCRIPTION: Tan w/ Red & Gray Clayey Sand
Sampled on Site, B-16 8' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Diameter and Both Ends Trimmed + # 4 Sieve

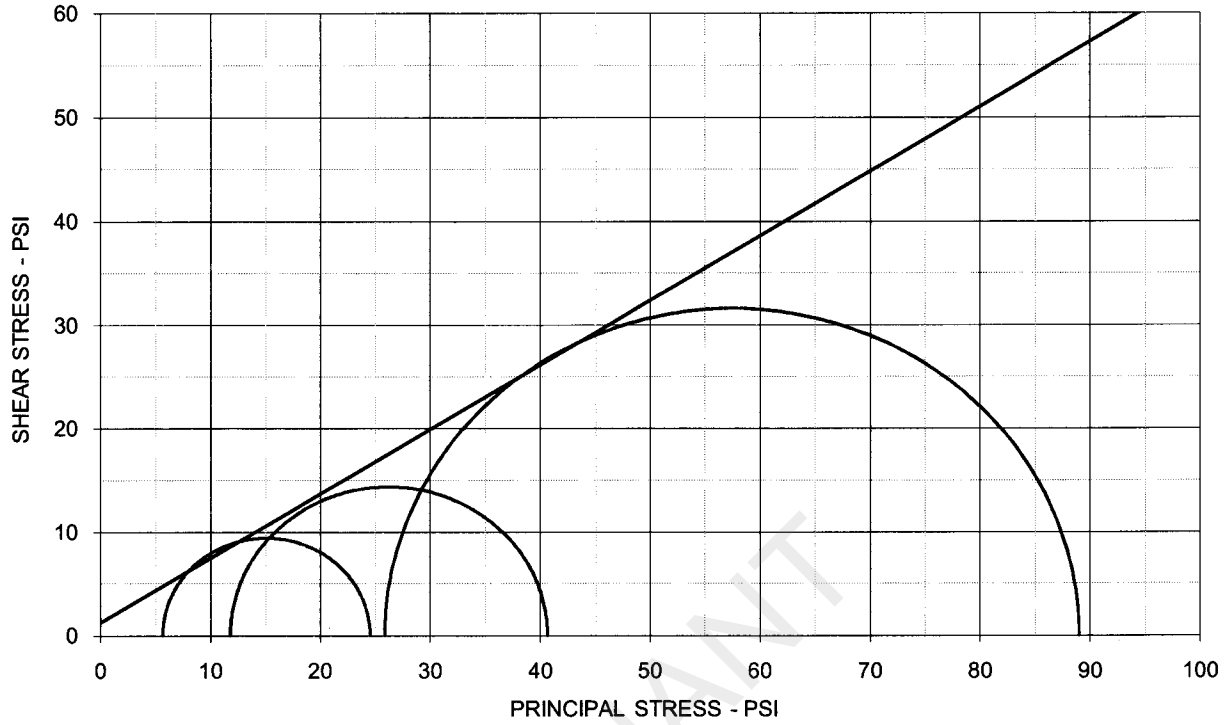
Number of Specimens = 3

PLATE: B.1

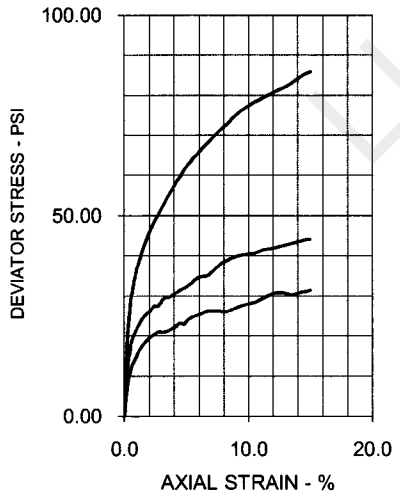
PLATE: B.2

PLATE: B.3

TRIAXIAL SHEAR TEST REPORT



EFFECTIVE STRESS PARAMETERS	ϕ' = 31.9 deg	c' = 1.3 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	17.2	16.8	16.3	
Dry Density - pcf	112.6	114.4	115.0	
Diameter - inches	2.47	2.46	2.48	
Height - inches	4.98	4.97	5.00	
AT TEST				
Final Moisture - %	18.4	16.5	16.0	
Dry Density - pcf	113.1	115.3	116.9	
Calculated Diameter (in.)	2.47	2.46	2.50	
Height - inches	5.00	4.97	5.06	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	18.88	28.83	63.14	
Total Pore Pressure - psi	54.3	58.2	64.1	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	1.8	3.0	5.2	
σ_1' Failure - psi	24.54	40.64	89.01	
σ_3' Failure - psi	5.66	11.81	25.87	

TEST DESCRIPTION

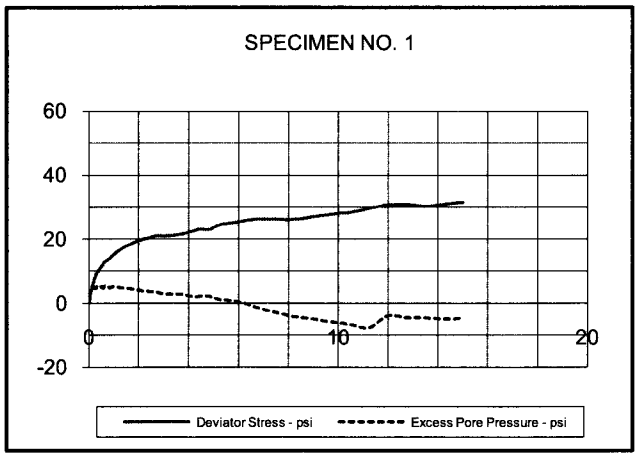
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Shelby Tube Sample
DESCRIPTION: Tan w/ Red & Gray Clayey Sand
Sampled on Site, B-16 8' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Diameter and Both Ends Trimmed + # 4 Sieve
~~G 3219-09, B-16 8'-10' Native~~

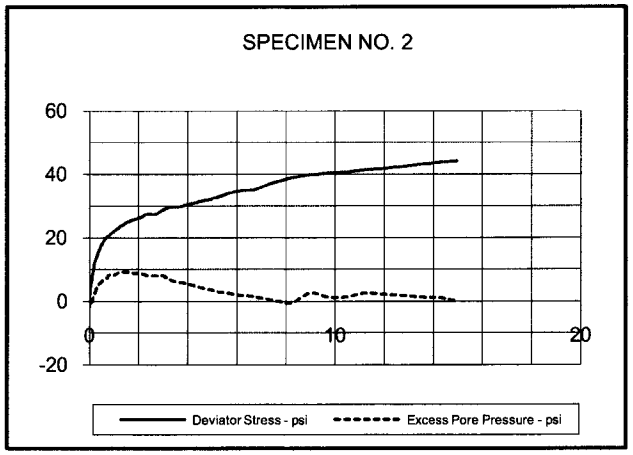
PROJECT INFORMATION

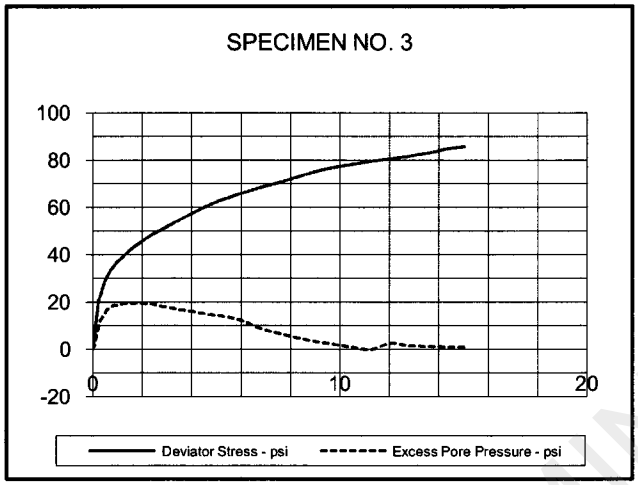
PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

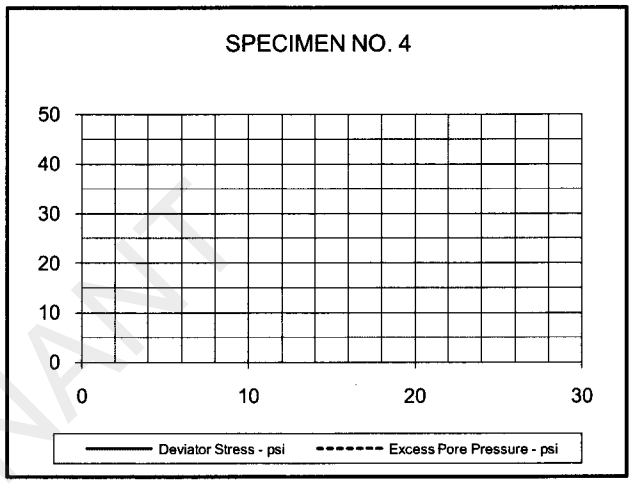
ETTL ENGINEERS & CONSULTANTS

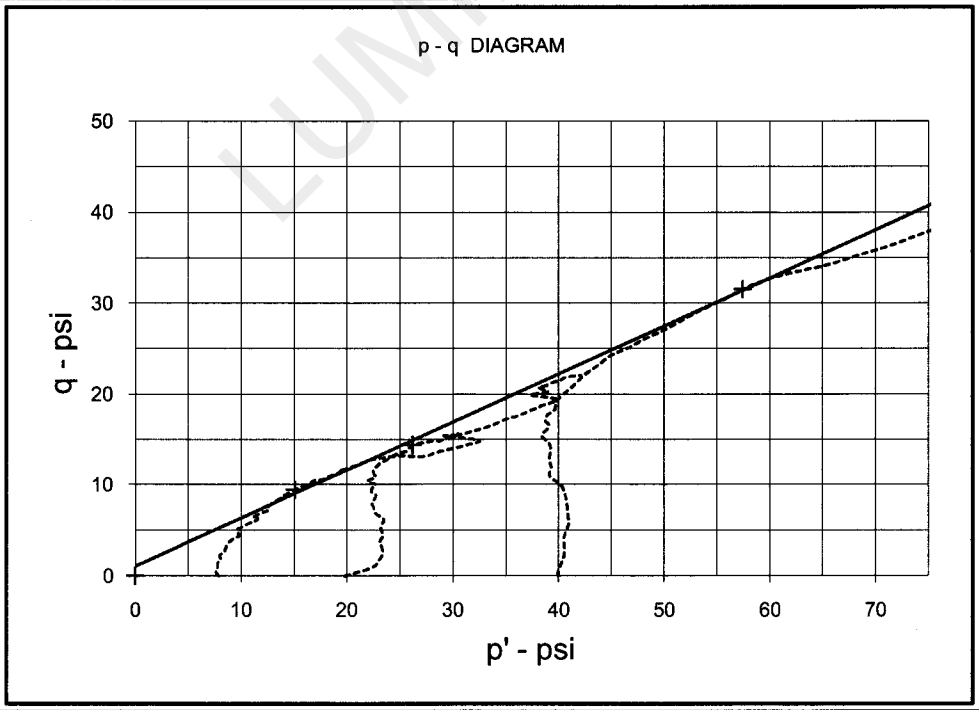
PLATE: B.1







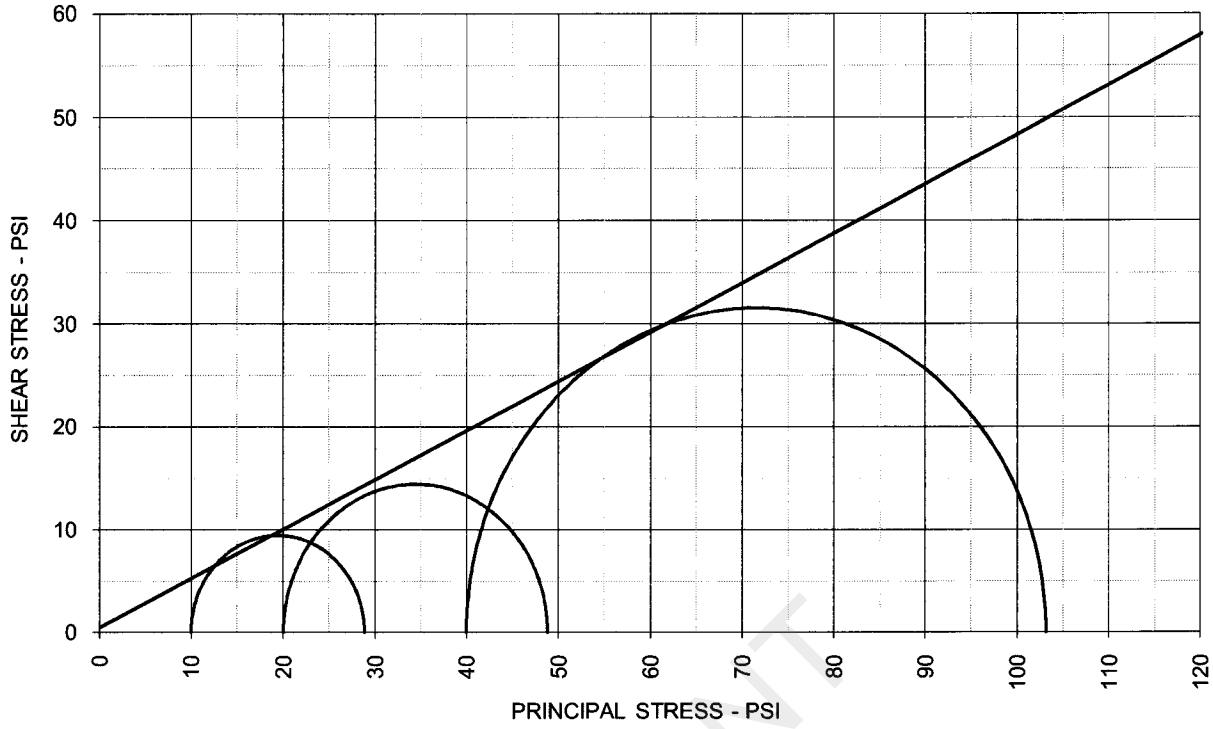




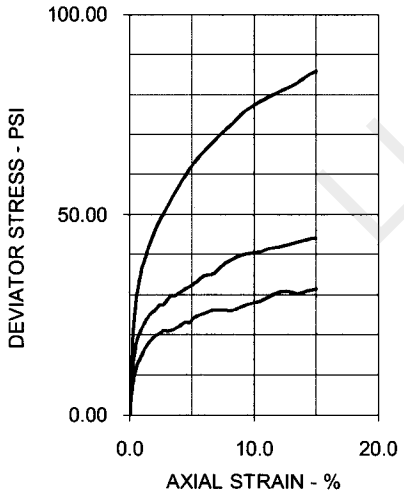
EFFECTIVE STRESS PARAMETERS	R^2 = 1.00	α (deg) = 27.9	a (psi) = 1.1
PROJECT: Martin Lake PDP 1 - 3 Supplemental		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 3219 - 09		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan w/ Red & Gray Clayey Sand			

G 3219-09, B-16 8'-10' Native

TRIAXIAL SHEAR TEST REPORT



TOTAL STRESS PARAMETERS	ϕ = 25.6 deg	c = 0.5 psi		
SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	17.2	16.8	16.3	
Dry Density - pcf	112.6	114.4	115.0	
Diameter - inches	2.47	2.46	2.48	
Height - inches	4.98	4.97	5.00	
AT TEST				
Final Moisture - %	18.4	16.5	16.0	
Dry Density - pcf	113.1	115.3	116.9	
Calculated Diameter (in.)	2.47	2.46	2.50	
Height - inches	5.00	4.97	5.06	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	18.88	28.83	63.14	
Total Pore Pressure - psi	54.3	58.2	64.1	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	1.8	3.0	5.2	
σ_1 Failure - psi	28.88	48.83	103.14	
σ_3 Failure - psi	10.00	20.00	40.00	



TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Shelby Tube Sample
DESCRIPTION: Tan w/ Red & Gray Clayey Sand
Sampled on Site, B-16 8' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Diameter and Both Ends Trimmed + # 4 Sieve

PROJECT INFORMATION

PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

ETTL ENGINEERS & CONSULTANTS

PLATE: B.3

PROJECT INFORMATION

PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

TRIAXIAL TEST PROGRAM BY GARRY H. GREGORY, P.E.

VERSION 1.0 - AUGUST 1998 - REVISED MARCH 24, 1999

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Shelby Tube Sample
DESCRIPTION: Tan & Red Sandy Lean Clay
Sampled on Site, B-17 3' to 7' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Diameter and Both Ends Trimmed + # 4 Sieve

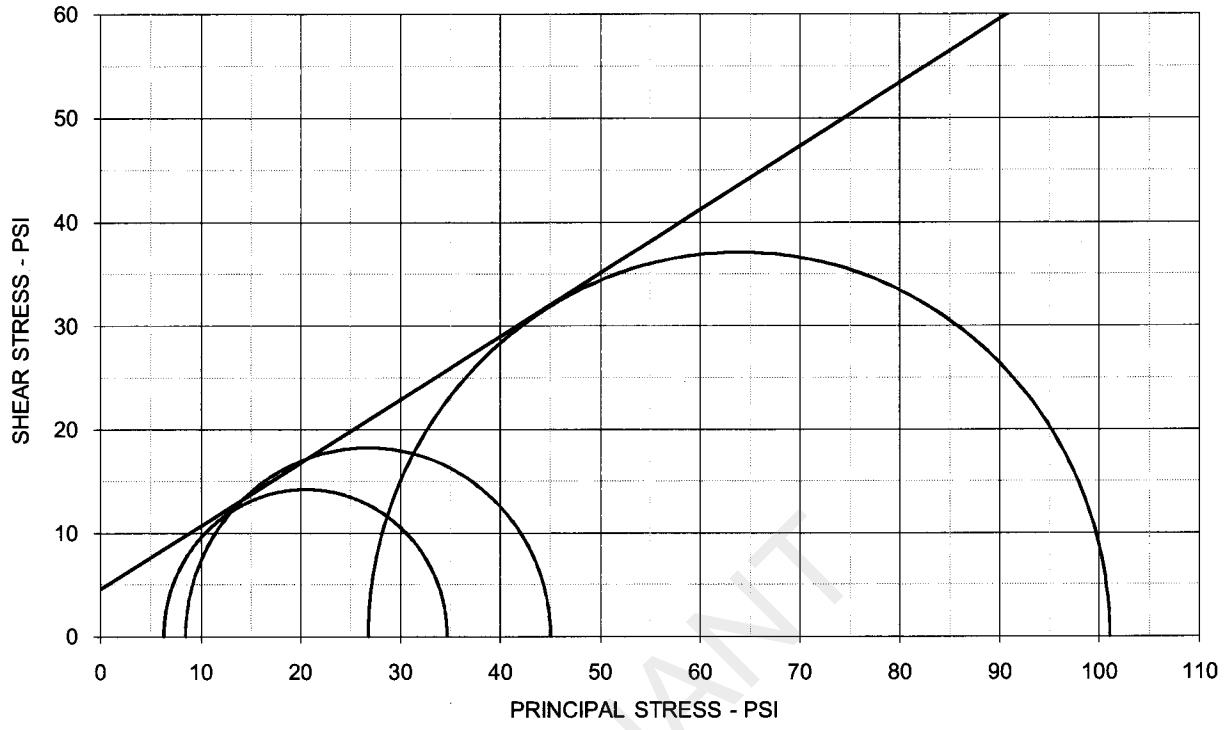
PLATE: B.1

PLATE: B.2

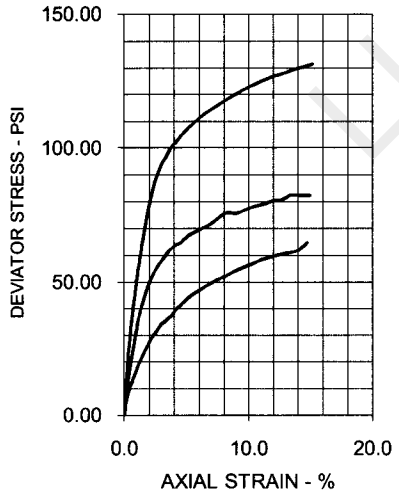
PLATE: B.3

Number of Specimens = 3

TRIAXIAL SHEAR TEST REPORT



EFFECTIVE STRESS PARAMETERS	ϕ' = 31.4 deg	c' = 4.6 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	16.2	13.3	13.9	
Dry Density - pcf	113.5	121.6	115.5	
Diameter - inches	2.49	2.49	2.50	
Height - inches	5.08	5.00	5.16	
AT TEST				
Final Moisture - %	18.1	14.7	16.3	
Dry Density - pcf	114.1	123.3	117.2	
Calculated Diameter (in.)	2.50	2.50	2.52	
Height - inches	5.10	5.04	5.22	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	28.40	36.54	74.24	
Total Pore Pressure - psi	53.7	61.5	63.2	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	0.8	3.5	1.8	
σ_1' Failure - psi	34.71	45.04	101.03	
σ_3' Failure - psi	6.31	8.50	26.79	

TEST DESCRIPTION

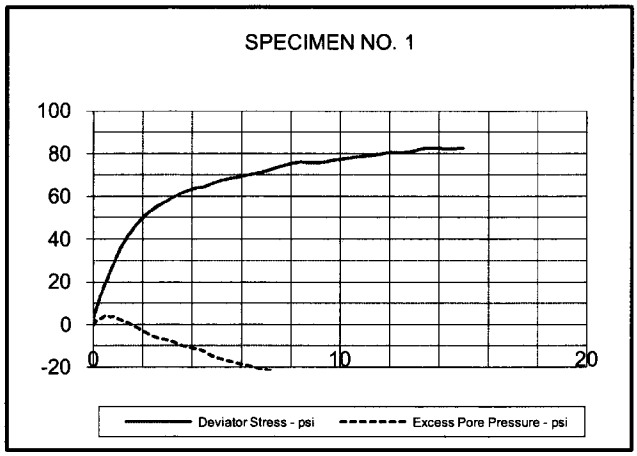
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Shelby Tube Sample
DESCRIPTION: Tan & Red Sandy Lean Clay
Sampled on Site, B-17 3' to 7' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Diameter and Both Ends Trimmed + # 4 Sieve
G 3219-09, B-17 3'-7' Native

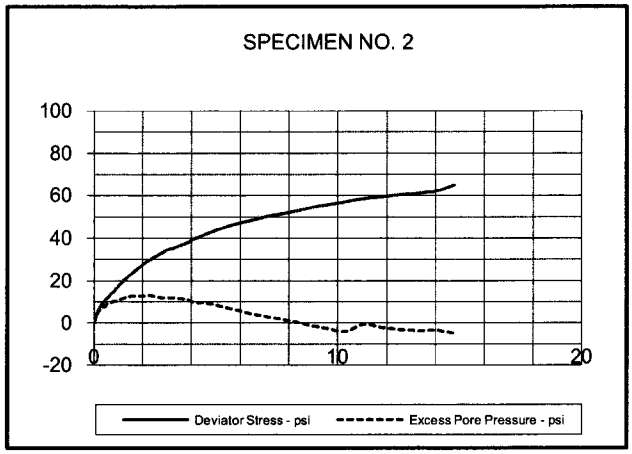
PROJECT INFORMATION

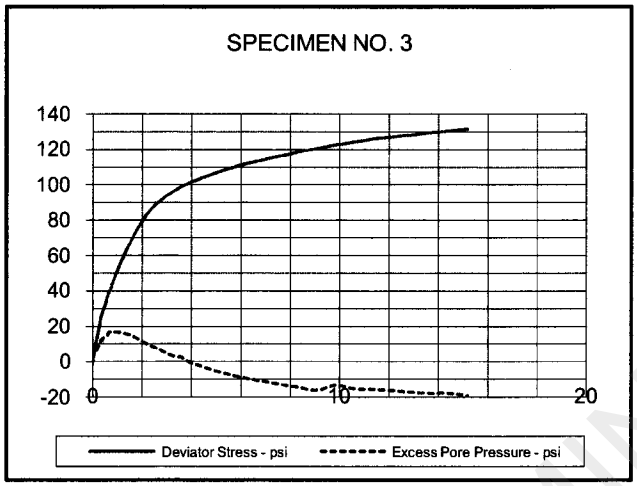
PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

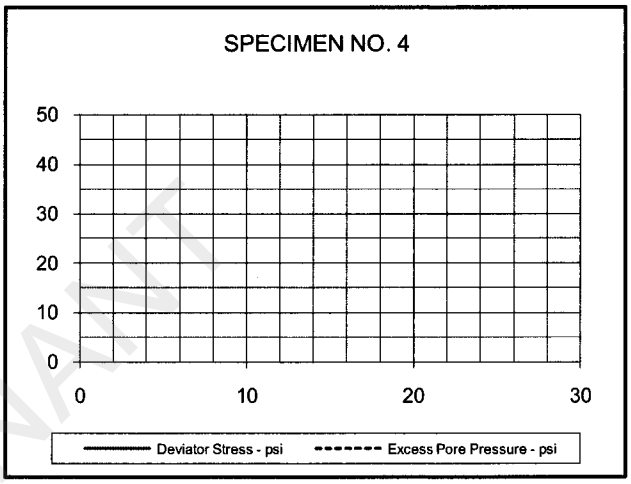
ETTL ENGINEERS & CONSULTANTS

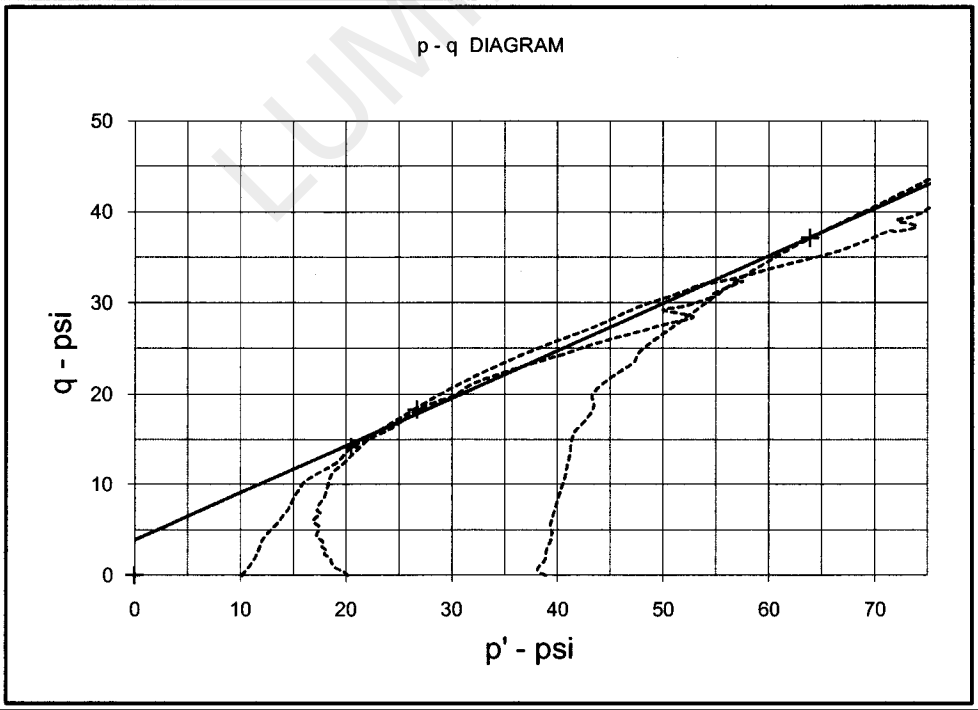
PLATE: B.1







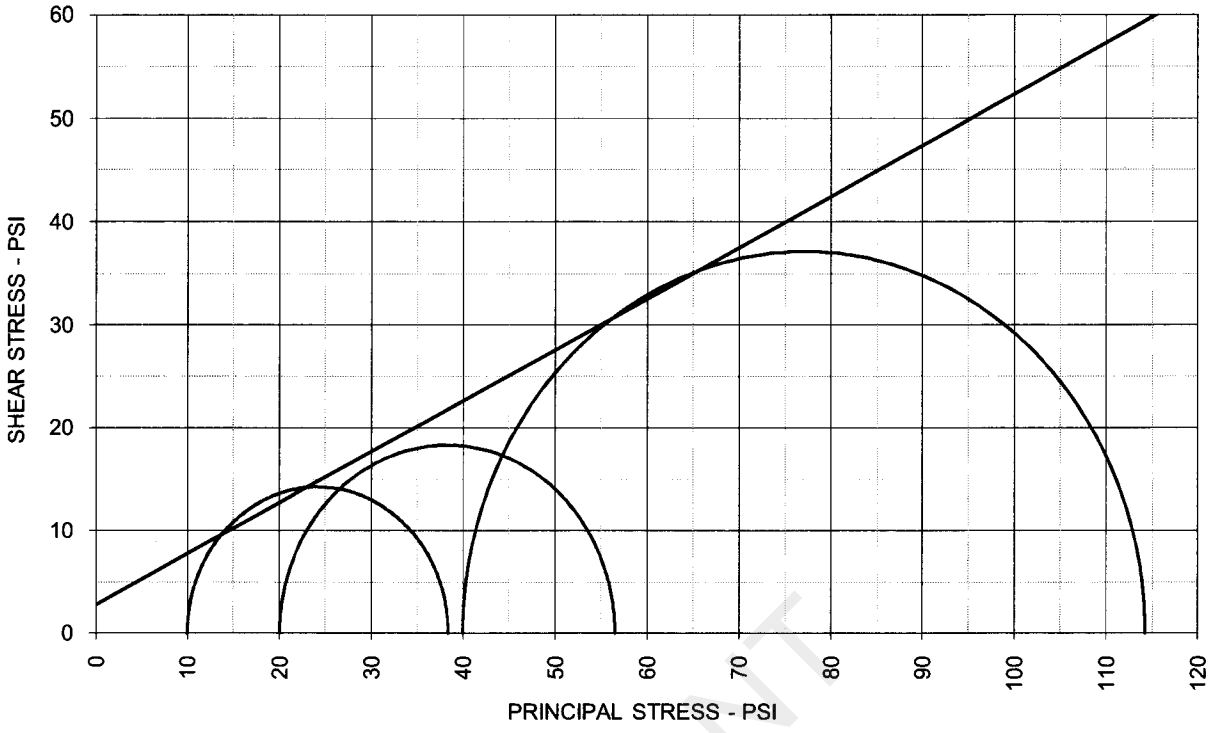




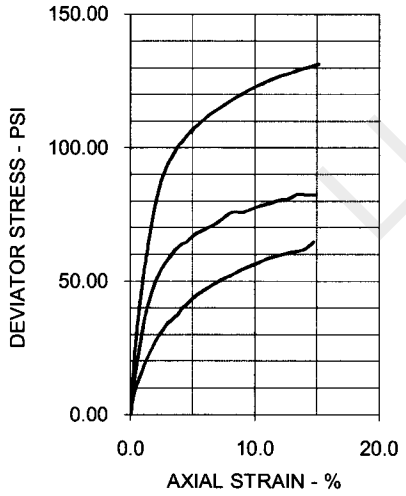
EFFECTIVE STRESS PARAMETERS	R^2 = 1.00	α (deg) = 27.5	a (psi) = 3.9
PROJECT: Martin Lake PDP 1 - 3 Supplemental		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 3219 - 09		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan & Red Sandy Lean Clay			

G 3219-09, B-17 3'-7' Native

TRIAXIAL SHEAR TEST REPORT



TOTAL STRESS PARAMETERS	ϕ = 26.4 deg	c = 2.8 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	16.2	13.3	13.9	
Dry Density - pcf	113.5	121.6	115.5	
Diameter - inches	2.49	2.49	2.50	
Height - inches	5.08	5.00	5.16	
AT TEST				
Final Moisture - %	18.1	14.7	16.3	
Dry Density - pcf	114.1	123.3	117.2	
Calculated Diameter (in.)	2.50	2.50	2.52	
Height - inches	5.10	5.04	5.22	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	28.40	36.54	74.24	
Total Pore Pressure - psi	53.7	61.5	63.2	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	0.8	3.5	1.8	
σ_1 Failure - psi	38.40	56.54	114.24	
σ_3 Failure - psi	10.00	20.00	40.00	

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Shelby Tube Sample
DESCRIPTION: Tan & Red Sandy Lean Clay
Sampled on Site, B-17 3' to 7' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Diameter and Both Ends Trimmed + # 4 Sieve

PROJECT INFORMATION

PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

ETTL ENGINEERS & CONSULTANTS

PLATE: B.3

PROJECT INFORMATION

PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

TRIAXIAL TEST PROGRAM BY GARRY H. GREGORY, P.E.

VERSION 1.0 - AUGUST 1998 - REVISED MARCH 24, 1999

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Lab Molded
DESCRIPTION: Tan & Reddish Tan Silty Sand
Sampled on Site, TP- 31 0' to 5' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve 2%
LL: 20 PL: 17 PI: 3 Percent -200: 27%
REMARKS: Both Ends Trimmed + # 4 Sieve 1%

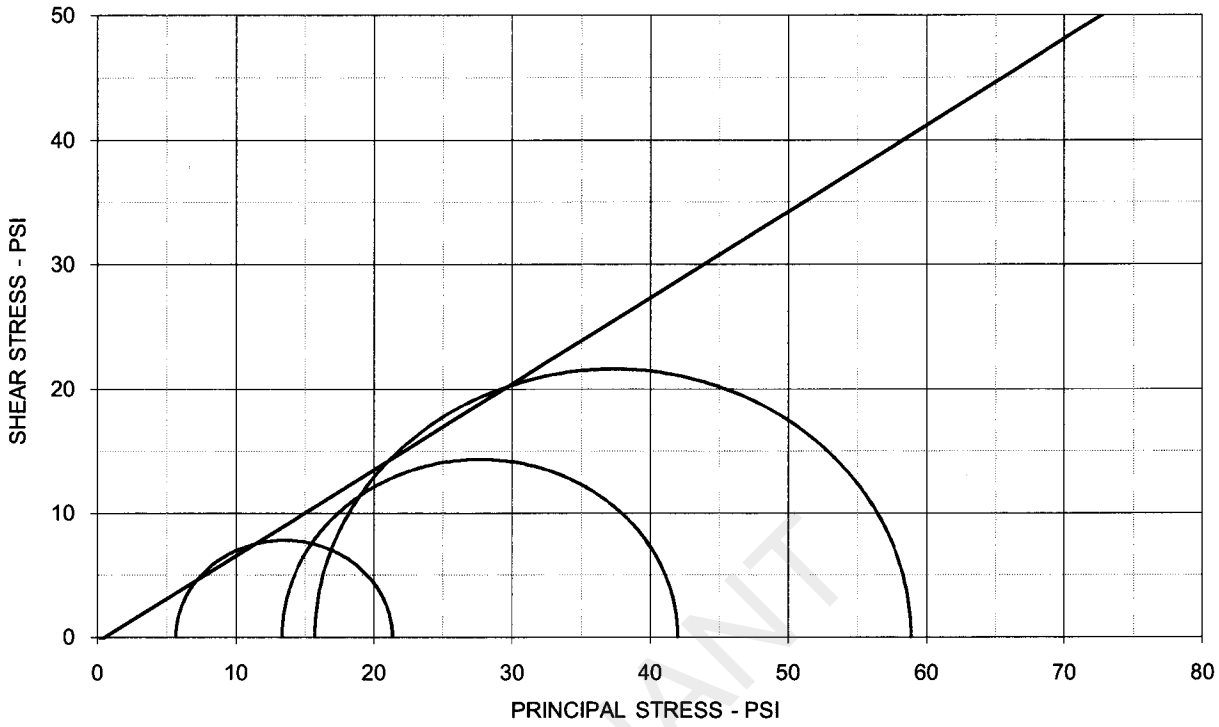
PLATE: B.1

PLATE: B.2

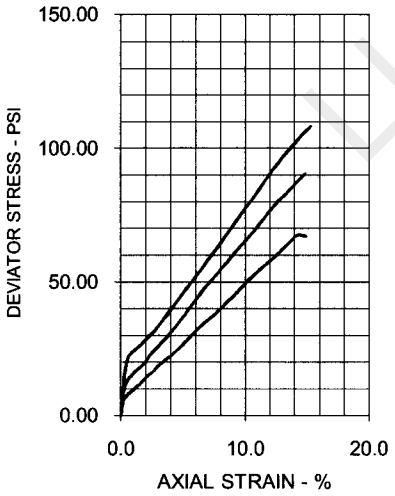
PLATE: B.3

Number of Specimens = 3

TRIAXIAL SHEAR TEST REPORT



EFFECTIVE STRESS PARAMETERS	ϕ' = 34.7 deg	c' = -0.4 psi		



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	17.3	17.2	17.4	
Dry Density - pcf	110.3	110.5	110.4	
Diameter - inches	2.87	2.87	2.85	
Height - inches	5.57	5.59	5.61	
AT TEST				
Final Moisture - %	17.2	16.7	16.5	
Dry Density - pcf	110.6	111.6	112.0	
Calculated Diameter (in.)	2.87	2.88	2.87	
Height - inches	5.58	5.62	5.66	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	15.65	28.63	43.17	
Total Pore Pressure - psi	54.3	56.7	74.3	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	2.4	3.5	4.6	
σ_1' Failure - psi	21.35	41.97	58.90	
σ_3' Failure - psi	5.70	13.34	15.73	

TEST DESCRIPTION

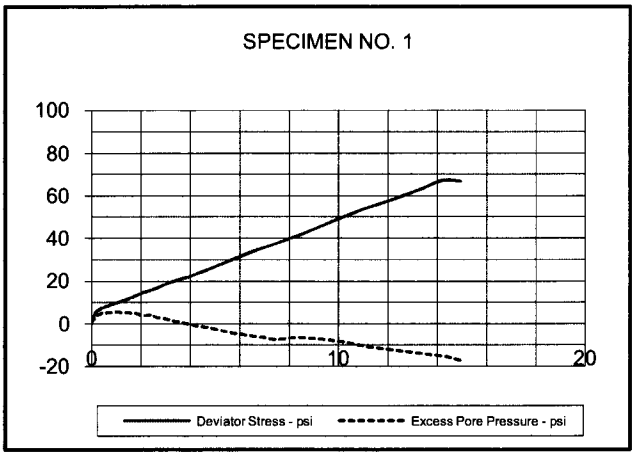
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Lab Molded
DESCRIPTION: Tan & Reddish Tan Silty Sand
Sampled on Site, TP- 31 0' to 5' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve 2%
LL: 20 PL: 17 PI: 3 Percent -200: 27%
REMARKS: Both Ends Trimmed + # 4 Sieve 1%
G 3219-09, TP-31 0'-5' Lab Molded

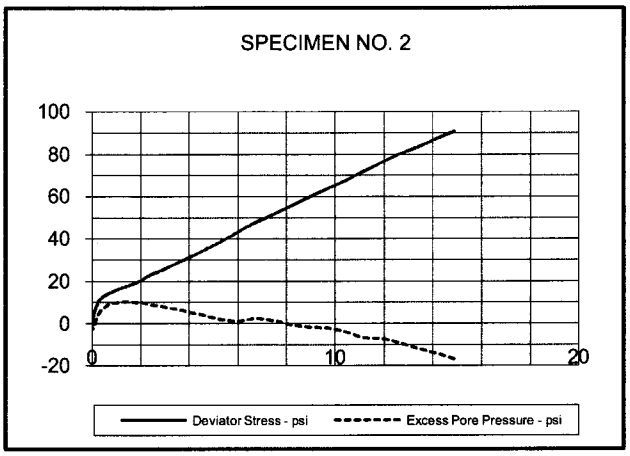
PROJECT INFORMATION

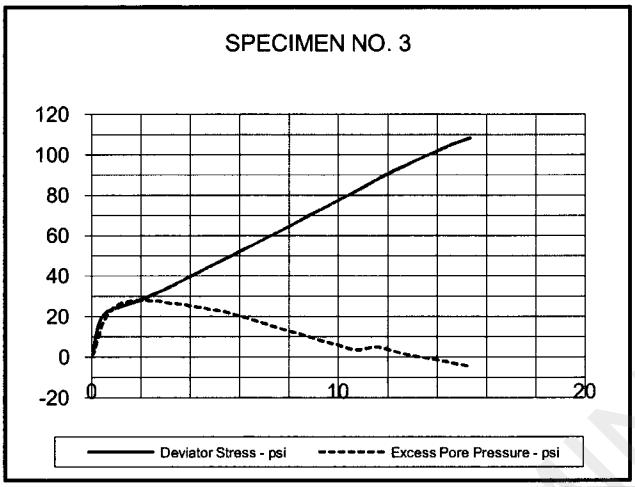
PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

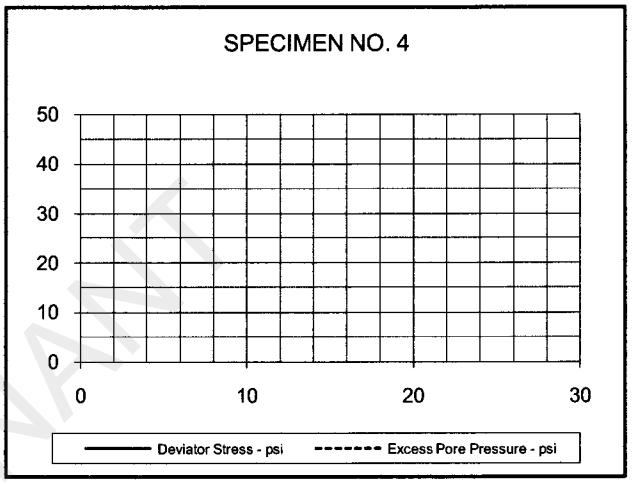
ETTL ENGINEERS & CONSULTANTS

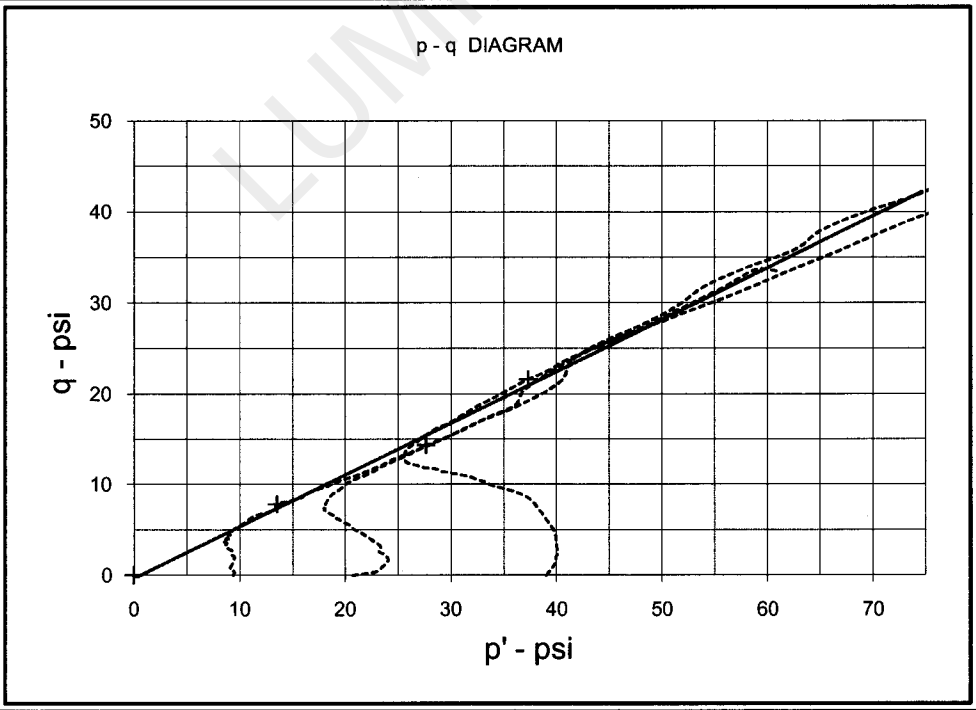
PLATE: B.1







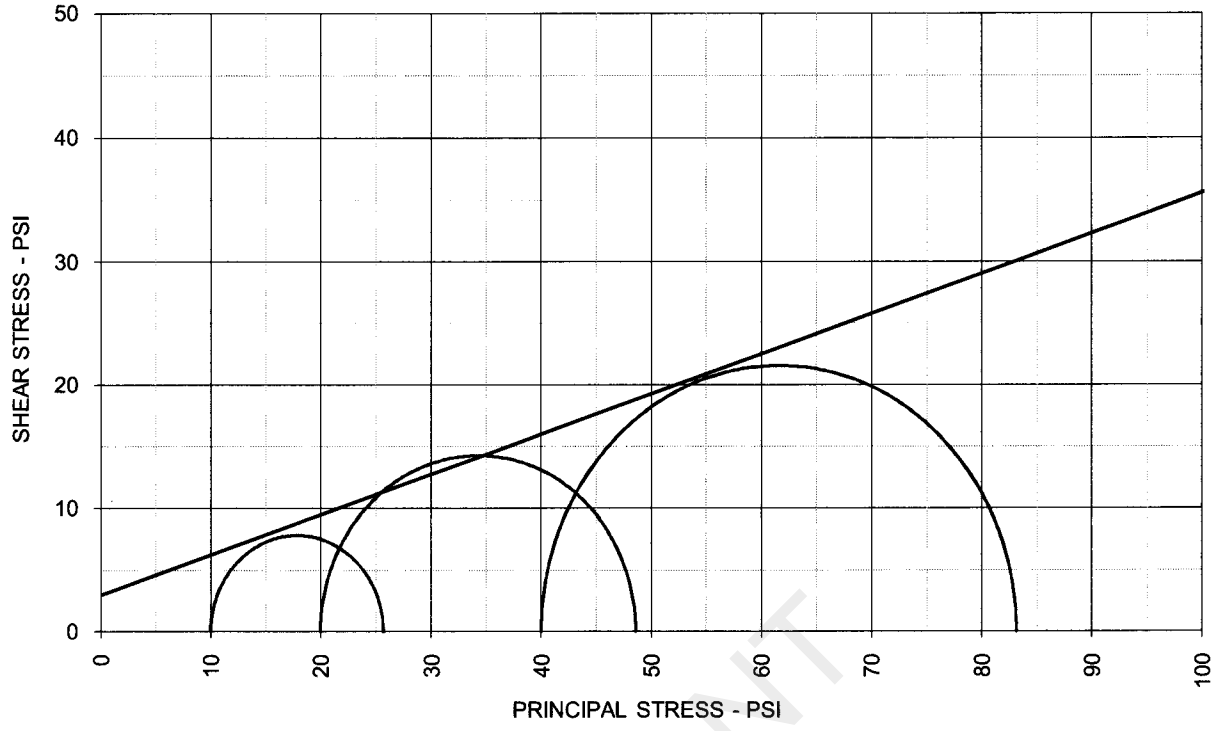




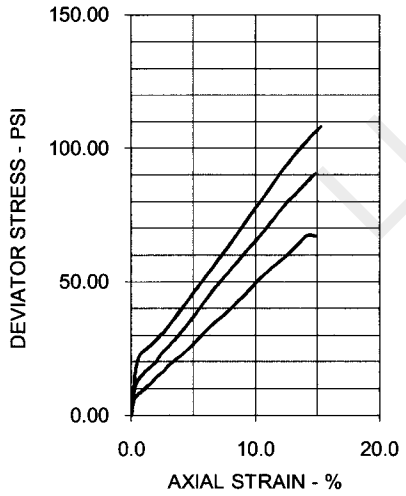
EFFECTIVE STRESS PARAMETERS	R^2 = 0.98	α (deg) = 29.7	a (psi) = -0.3
PROJECT: Martin Lake PDP 1 - 3 Supplemental		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 3219 - 09		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan & Reddish Tan Silty Sand			

G 3219-09, TP-31 0'-5' Lab Molded

TRIAXIAL SHEAR TEST REPORT



TOTAL STRESS PARAMETERS	ϕ = 18.0 deg	c = 3.0 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	17.3	17.2	17.4	
Dry Density - pcf	110.3	110.5	110.4	
Diameter - inches	2.87	2.87	2.85	
Height - inches	5.57	5.59	5.61	
AT TEST				
Final Moisture - %	17.2	16.7	16.5	
Dry Density - pcf	110.6	111.6	112.0	
Calculated Diameter (in.)	2.87	2.88	2.87	
Height - inches	5.58	5.62	5.66	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	15.65	28.63	43.17	
Total Pore Pressure - psi	54.3	56.7	74.3	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	2.4	3.5	4.6	
σ_1 Failure - psi	25.65	48.63	83.17	
σ_3 Failure - psi	10.00	20.00	40.00	

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Lab Molded
DESCRIPTION: Tan & Reddish Tan Silty Sand
Sampled on Site, TP- 31 0' to 5' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve 2%
LL: 20 PL: 17 PI: 3 Percent -200: 27%
REMARKS: Both Ends Trimmed + # 4 Sieve 1%

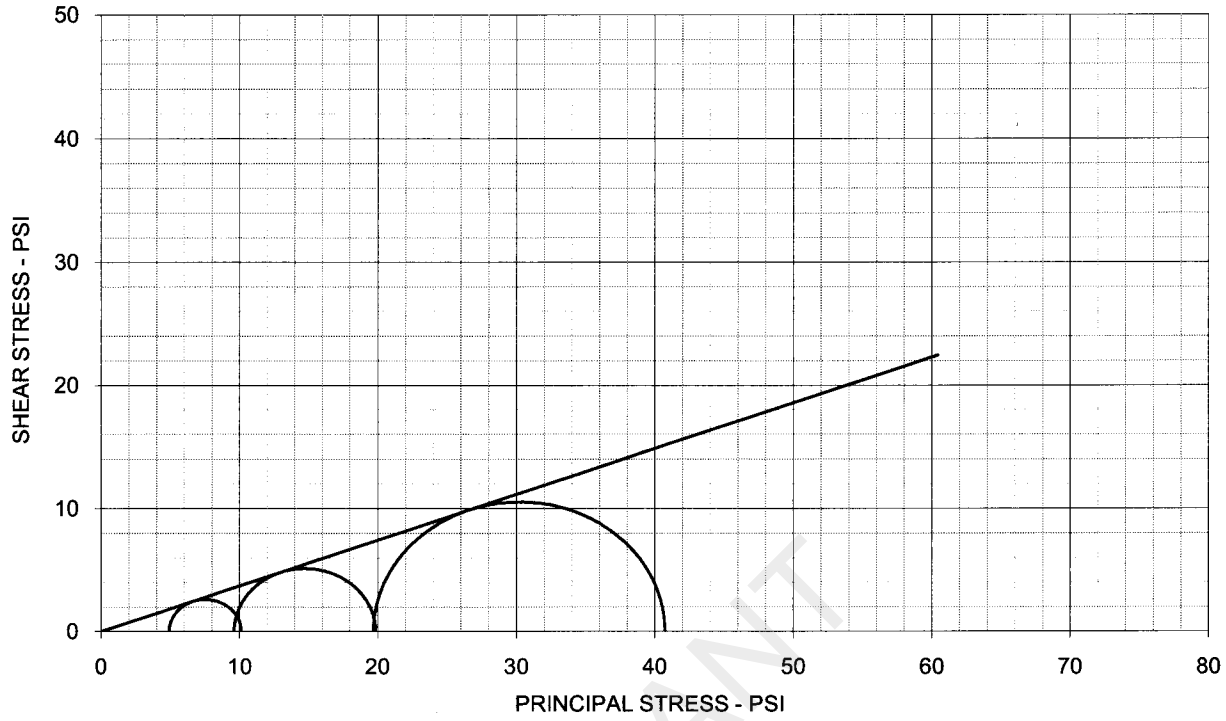
PROJECT INFORMATION

PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

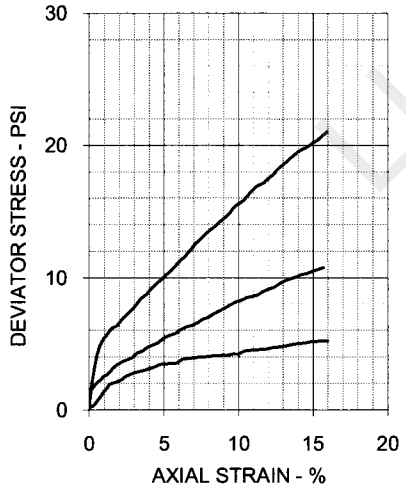
ETTL ENGINEERS & CONSULTANTS

PLATE: B.3

TRIAXIAL SHEAR TEST REPORT



EFFECTIVE STRESS PARAMETERS	ϕ' = 20.4 deg	c' = 0.0 psi		
SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	26.1	24.6	21.3	
Dry Density - pcf	94.3	95.8	101.6	
Diameter - inches	1.40	1.40	1.40	
Height - inches	2.81	2.85	3.20	
AT TEST				
Final Moisture - %	26.1	24.6	21.3	
Dry Density - pcf	94.3	97.0	101.6	
Calculated Diameter (in.)	1.40	1.40	1.40	
Height - inches	2.81	2.85	3.20	
Effect. Cell Pressure - psi	5.0	10.0	20.0	
Failure Stress - psi	5.21	10.25	21.03	
Total Pore Pressure - psi	20.0	20.0	20.0	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	15.6	14.2	15.9	
σ_1' Failure - psi	10.11	19.85	40.73	
σ_3' Failure - psi	4.90	9.60	19.70	



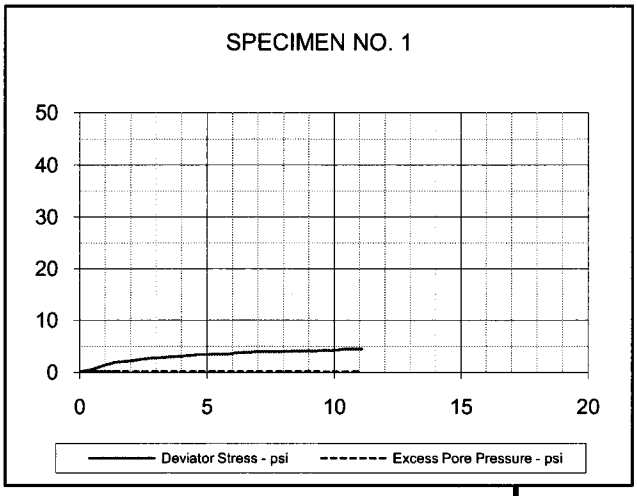
TEST DESCRIPTION

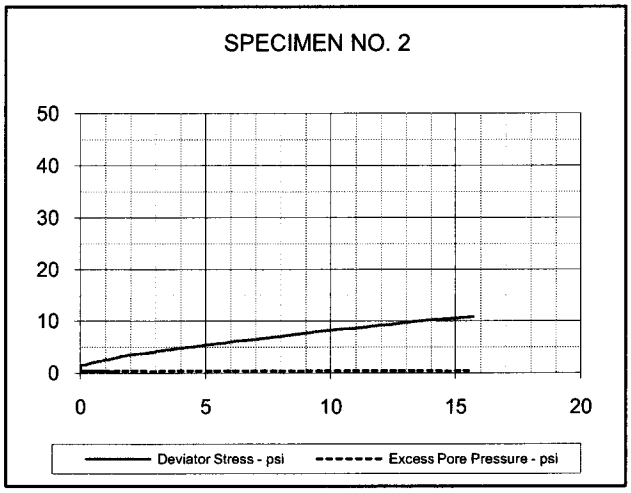
TYPE OF TEST & NO: CD Triaxial - CD-1
SAMPLE TYPE: SHELBY TUBE
DESCRIPTION:SANDY LEAN CLAY(CL), tan br w/ red br and gray
SAMPLE LOCATION: B-16, 3-5'
ASSUMED SPECIFIC GRAVITY: 2.70
LL: 43 PL: 14 PI: 29 Percent -200: 56
REMARKS: Tested in a fully softened remolded state

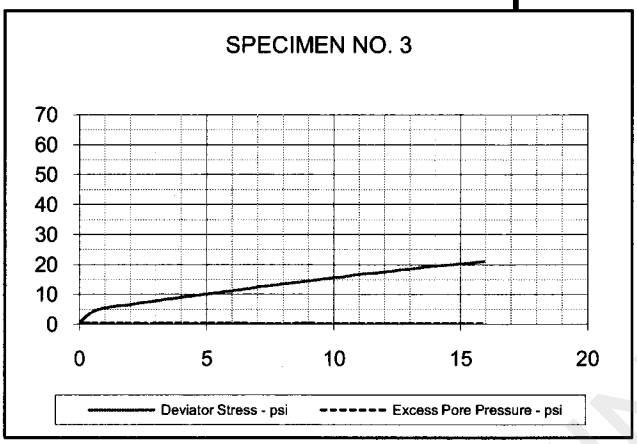
PROJECT INFORMATION

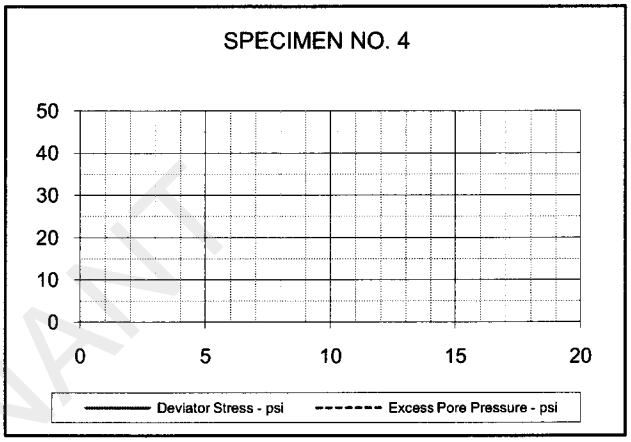
PROJECT: Luminant Martin Lake PDP 1-3 Vertical Expansion
LOCATION: Tatum, TX
PROJECT NO: ETT08002-11
CLIENT: ETTL Engineers & Consultants, Inc.
DATE: 9/15/09

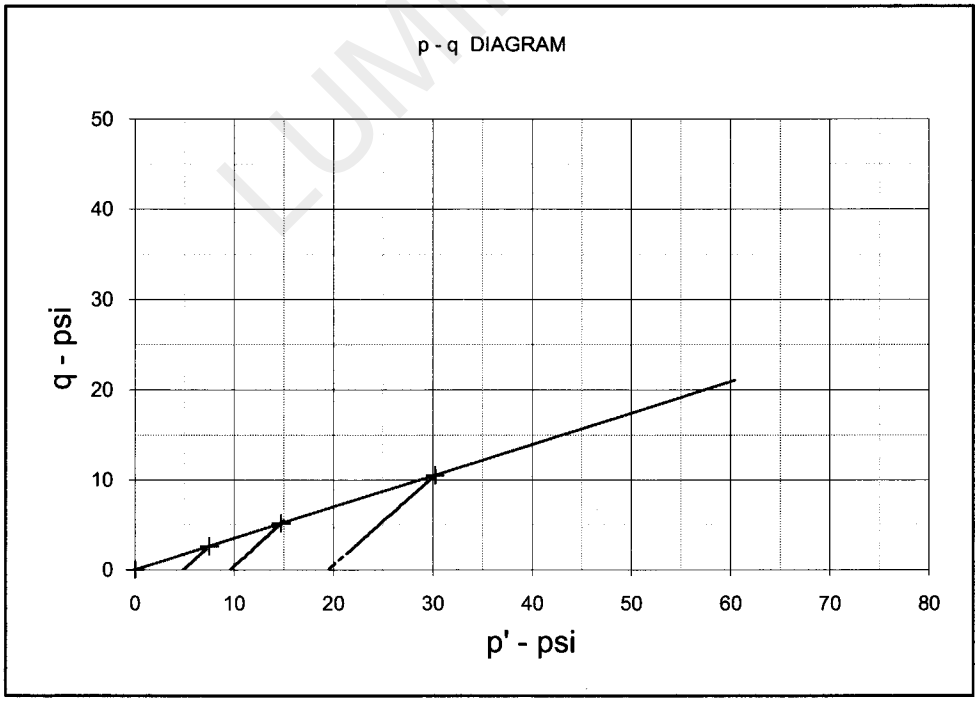
GREGORY GEOTECHNICAL | PLATE: B-CD.1







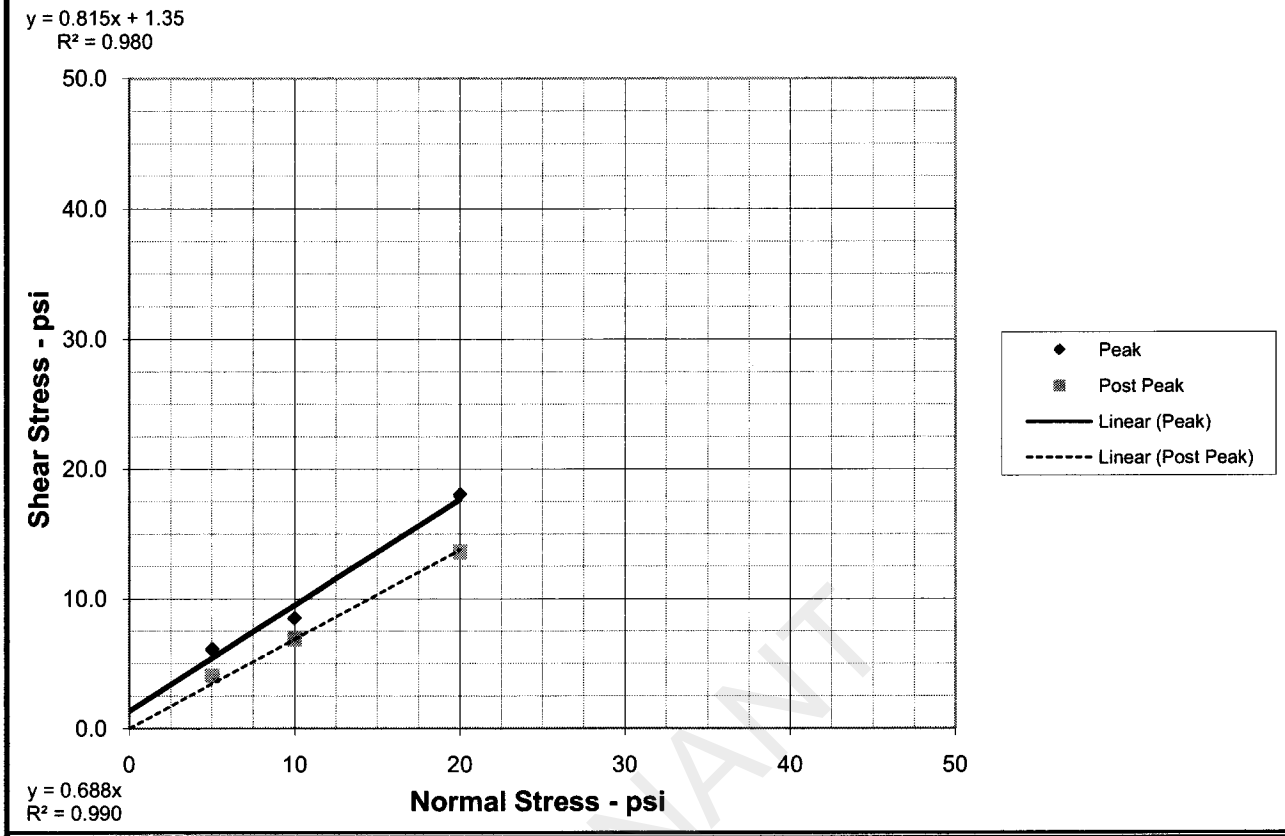




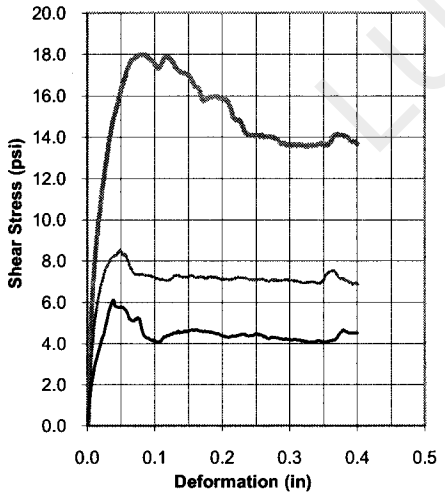
EFFECTIVE STRESS PARAMETERS	R^2 = 1.000	α (deg) = 19.2	a (psi) = 0.0
PROJECT: Luminant Martin Lake PDP 1-3 Vertical Expansion		TYPE OF TEST & NO: CD Triaxial - CD-1	
PROJECT NO: ETT08002-11		***GREGORY GEOTECHNICAL***	PLATE: B-CD.2
DESCRIPTION:SANDY LEAN CLAY(CL), tan br w/ red br and gray			

CD-08002-11-01.xls

DIRECT SHEAR TEST REPORT



PEAK STRENGTH PARAMETERS	ϕ = 39.2 deg	c = 1.4 psi
POST PEAK STRENGTH PARAMETERS	ϕ = 34.6 deg	c = 0.0 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	41.3	42.3	48.4	
Dry Density - pcf	78.9	72.5	72.9	
Diameter - inches	2.50	2.50	2.50	
Height - inches	1.00	1.00	1.00	
AT TEST				
Final Moisture - %	46.6	59.5	31.6	
Dry Density - pcf	81.0	74.2	73.0	
Height-End of Consol. (in.)	1.03	1.02	1.00	
Height-End of Shear (in.)	1.03	1.03	1.01	
Normal Stress - psi	5.0	10.0	20.0	
Peak Failure Stress-psi	6.1	8.5	18.0	
Post Peak Failure Stress-psi	4.1	6.9	13.6	
Strain Rate - inches/min.	0.00030	0.00030	0.00030	
Peak Failure Strain - %	1.6	1.9	3.1	
Post Peak Failure Strain %	4.3	12.7	11.8	

Dry Density at test based on initial moisture and height at end of consolidation.

TEST DESCRIPTION

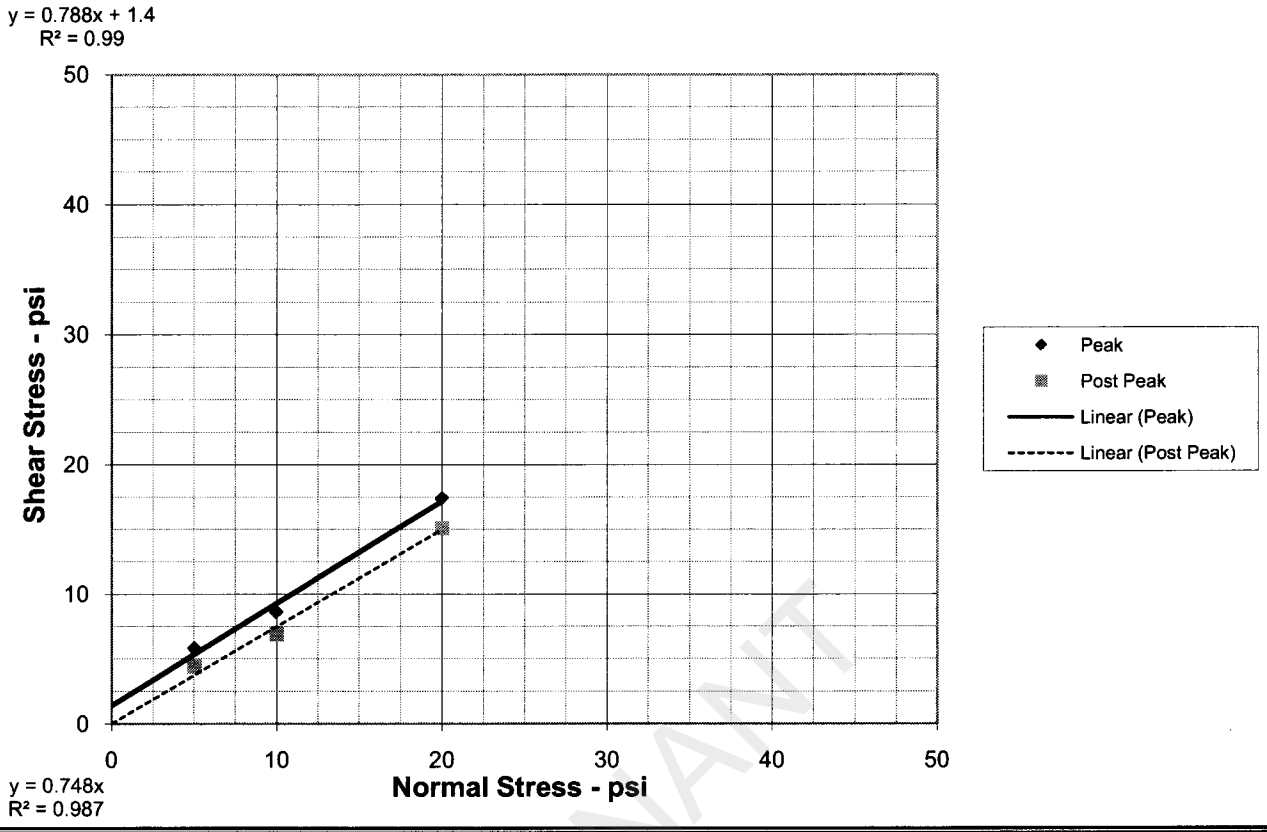
TYPE OF TEST & NO: CD-DS-1
SAMPLE TYPE: Shelby Tube
DESCRIPTION: SILT(MH), black (classification tests from 13-15 ft)
SAMPLE LOCATION: B-15, 18-20 ft
ASSUMED SPECIFIC GRAVITY: 2.65
LL: NP PL: NP PI: NP Percent -200: 95
REMARKS: Tested at natural MC

PROJECT INFORMATION

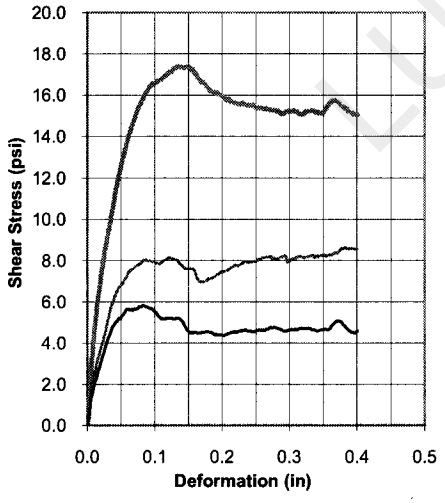
PROJECT: Luminant Martin Lake PDP 1-3 Vertical Expansion
LOCATION: Tatum, TX
PROJECT NO: ETT08002-11 (G3219-09)
CLIENT : ETTL Engineers & Consultants, Inc
DATE: 9/25/09

GREGORY GEOTECHNICAL PLATE: B-DS. 1

DIRECT SHEAR TEST REPORT



PEAK STRENGTH PARAMETERS	ϕ = 38.3 deg	c = 1.4 psi
POST PEAK STRENGTH PARAMETERS	ϕ = 36.8 deg	c = 0.0 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	47.2	47.5	46.5	
Dry Density - pcf	77.0	73.3	72.6	
Diameter - inches	2.50	2.50	2.50	
Height - inches	1.00	1.00	1.00	
AT TEST				
Final Moisture - %	47.2	47.5	31.6	
Dry Density - pcf	77.0	73.3	72.6	
Height-End of Consol. (in.)	1.00	1.00	1.00	
Height-End of Shear (in.)	0.98	0.98	0.99	
Normal Stress - psi	5.0	10.0	20.0	
Peak Failure Stress-psi	5.8	8.6	17.4	
Post Peak Failure Stress-psi	4.4	6.9	15.1	
Strain Rate - inches/min.	0.00030	0.00030	0.00030	
Peak Failure Strain - %	3.1	15.0	3.1	
Post Peak Failure Strain %	7.8	6.8	12.8	

Dry Density at test based on initial moisture and height at end of consolidation.

TEST DESCRIPTION

TYPE OF TEST & NO: CD-DS-2
SAMPLE TYPE: Shelby Tube
DESCRIPTION: SILT(MH), black (classification tests from 13-15 ft)
SAMPLE LOCATION: B-15, 18-20 ft
ASSUMED SPECIFIC GRAVITY: 2.65
LL: NP PL: NP PI: NP Percent -200: 95
REMARKS: Tested in a fully softened remolded state

PROJECT INFORMATION

PROJECT: Luminant Martin Lake PDP 1-3 Vertical Expansion
LOCATION: Tatum, TX
PROJECT NO: ETT08002-11 (G3219-09)
CLIENT : ETTL Engineers & Consultants, Inc
DATE: 9/23/09

GREGORY GEOTECHNICAL PLATE: B-DS. 2

ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Martin Lake PDP 1 - 3 Supplemental, Tatum, Texas
Date: 8/26/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : G 3219-09 Permometer Data

Boring No.:	B - 14	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:		aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	3' to 5'	M1 =	0.030180	C = 0.000414194		Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T = 0.203859738				

Material Description : Dark Gray Ash

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			502.16	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			502.16	g	Tare No.:	T 20	Tare No.:	T 22
Diameter :	2.85	in	7.24	cm2	Wet Wt.+tare:	522.84	Wet Wt.+tare:	625.95
Length :	2.80	in	7.12	cm	Dry Wt.+tare:	393.34	Dry Wt.+tare:	480.79
Area:	6.38	in^2	41.16	cm2	Tare Wt:	160.27	Tare Wt:	140.47
Volume :	17.88	in^3	292.92	cm3	Dry Wt.:	233.07	Dry Wt.:	340.32
Unit Wt.(wet):	**106.97**	pcf	**1.71**	g/cm^3	Water Wt.:	129.5	Water Wt.:	145.16
Unit Wt.(dry):	**68.77**	pcf	**1.10**	g/cm^3	% moist.:	**55.6**	% moist.:	**42.7**

Specific Gravity: **2.60** Max Dry Density(pcf) = 68.7952 OMC = 55.5627065
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 81.52 Void ratio (e) = **1.36** Porosity (n)= **0.58**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.04

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/26/2009	8	4.5	2.1553335	25	0.889	2.66E-05	7.55E-02	
8/26/2009	10	4.05	2.6053335	25	0.889	2.79E-05	7.91E-02	
8/26/2009	12	3.6	3.0553335	25	0.889	2.99E-05	8.48E-02	
8/26/2009	14	3.25	3.4053335	25	0.889	3.12E-05	8.84E-02	

SUMMARY

ka = 2.89E-05 cm/sec Acceptance criteria = 25 %

			Vm		
ki					Vm = |ka-ki| / ka x 100
k1 =	2.66E-05	cm/sec	7.8	%	
k2 =	2.79E-05	cm/sec	3.5	%	
k3 =	2.99E-05	cm/sec	3.5	%	
k4 =	3.12E-05	cm/sec	7.8	%	

Hydraulic conductivity	k =	**2.89E-05**	cm/sec	**8.19E-02**	ft/day
Void Ratio	e =	**1.36**			
Porosity	n =	**0.58**			
Bulk Density	γ =	**1.71**	g/cm3	**107.0**	pcf
Water Content	W =	**0.61**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**2.96E-10**	cm2	(at 20 deg C)	

Liquid Limit	LL	
Plastic Limit	PL	
Plasticity Index	**PI**	
- 200 Sieve		%
+ No 40 Sieve		%
+ No 4 Sieve		%

Respectfully Submitted

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ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Martin Lake PDP 1 - 3 Supplemental, Tatum, Texas
Date: 8/26/2009 Panel Number : P 2 ; ASTM D 5084
Project No. : G 3219-09 Permometer Data

Boring No.:	B - 14	ap =	0.031416 cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:		aa =	0.767120 cm2		Pipet Rp	6.7	cm3
Depth (ft):	16' to 17'	M1 =	0.030180	C = 0.000414194	Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T = 0.203859738			

Material Description : Dark Gray Ash

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			457.47	g	Tare No.:	T 18	Tare No.:	T 16
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	711.07	Wet Wt.+tare:	569.97
Wet Wt: of Sample :			457.47	g	Dry Wt.+tare:	478.92	Dry Wt.+tare:	412.38
Diameter :	2.85	in	7.24	cm2	Tare Wt:	146.73	Tare Wt:	151.98
Length :	2.80	in	7.12	cm	Dry Wt.:	332.19	Dry Wt.:	260.4
Area:	6.38	in^2	41.16	cm2	Water Wt.:	232.15	Water Wt.:	157.59
Volume :	17.88	in^3	292.92	cm3	% moist.:	**69.9**	% moist.:	**60.5**
Unit Wt.(wet):	**97.45**	pcf	**1.56**	g/cm^3				
Unit Wt.(dry):	**57.36**	pcf	**0.92**	g/cm^3				

Specific Gravity: **2.50** Max Dry Density(pcf) = 57.38916 OMC = 69.8847045
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 87.92 Void ratio (e) = **1.72** Porosity (n)= **0.63**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.04

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/26/2009	80	4.2	2.4553335	25	0.889	3.20E-06	9.06E-03	
8/26/2009	90	4.05	2.6053335	25	0.889	3.10E-06	8.79E-03	
8/26/2009	100	3.9	2.7553335	25	0.889	3.04E-06	8.61E-03	
8/26/2009	110	3.75	2.9053335	25	0.889	3.00E-06	8.52E-03	

SUMMARY

ka = 3.08E-06 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	3.20E-06 cm/sec	3.6	%	Vm = |ka-ki| / ka x 100
k2 =	3.10E-06 cm/sec	0.5	%	
k3 =	3.04E-06 cm/sec	1.5	%	
k4 =	3.00E-06 cm/sec	2.6	%	

Hydraulic conductivity	k =	**3.08E-06**	cm/sec	**8.74E-03**	ft/day
Void Ratio	e =	**1.72**			
Porosity	n =	**0.63**			
Bulk Density	γ =	**1.56**	g/cm3	**97.5**	pcf
Water Content	W =	**0.64**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**3.16E-11**	cm2	(at 20 deg C)	

Liquid Limit	LL	
Plastic Limit	PL	
Plasticity Index	**PI**	
- 200 Sieve		%
+ No 40 Sieve		%
+ No 4 Sieve		%

Respectfully Submitted

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake Supplemental, TP-31, Tatum, Texas
Date: 9/9/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : G 3219-09 Permometer Data

Boring No.:	TP- 31	ap =	0.031416 cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9228	aa =	0.767120 cm2		Pipet Rp	6.7	cm3
Depth (ft):	0' to 5'	M1 =	0.030180	C = 0.000414162	Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T = 0.203870442			

Material Description : Tan & Reddish Tan Silty Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			627.20	g	Tare No.:	T 6	Tare No.:	T 1
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	841.20	Wet Wt.+tare:	841.71
Wet Wt. of Sample :			627.20	g	Dry Wt.+tare:	749.54	Dry Wt.+tare:	741.72
Diameter :	2.89	in	7.33	cm2	Tare Wt:	217.39	Tare Wt:	217.29
Length :	2.88	in	7.30	cm	Dry Wt.:	532.15	Dry Wt.:	524.43
Area:	6.55	in^2	42.23	cm2	Water Wt.:	91.66	Water Wt.:	99.99
Volume :	18.82	in^3	308.41	cm3	% moist.:	**17.2**	% moist.:	**19.1**
Unit Wt.(wet):	**126.90**	pcf	**2.03**	g/cm^3				
Unit Wt.(dry):	**108.26**	pcf	**1.73**	g/cm^3				

Specific Gravity: **2.65** Max Dry Density(pcf) = 108.3018 OMC = 17.2244668
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 95.65 Void ratio (e) = **0.53** Porosity (n)= **0.35**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 8.81

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
7/31/2009	600	5.3	1.3550759	25	0.889	1.98E-07	5.63E-04	
7/31/2009	720	5.1	1.5550759	25	0.889	1.95E-07	5.53E-04	
7/31/2009	840	5	1.6550759	25	0.889	1.80E-07	5.12E-04	
7/31/2009	960	4.8	1.8550759	25	0.889	1.82E-07	5.17E-04	

SUMMARY

ka = 1.89E-07 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	1.98E-07 cm/sec	5.0	%	Vm = |ka-ki| / ka x 100
k2 =	1.95E-07 cm/sec	3.2	%	
k3 =	1.80E-07 cm/sec	4.5	%	
k4 =	1.82E-07 cm/sec	3.6	%	

Hydraulic conductivity	k =	**1.89E-07**	cm/sec	**5.36E-04**	ft/day
Void Ratio	e =	**0.53**			
Porosity	n =	**0.35**			
Bulk Density	γ =	**2.03**	g/cm3	**126.9**	pcf
Water Content	W =	**0.30**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.94E-12**	cm2	(at 20 deg C)	

Liquid Limit	LL	20
Plastic Limit	PL	17
Plasticity Index	**PI**	**3**
- 200 Sieve		27 %
+ No 40 Sieve		2 %
+ No 4 Sieve		1 %

Respectfully Submitted

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Project:	Luminant Martin Lake Supplemental, Tatum, Texas
Client:	HDR
Contractor:	
Job No.	**G 3219 - 09**
Sample No.:	**9228**
Date Sampled:	8/26/2009
Material Origin:	TP- 31
Sampling Info. provided By:	Jacob LeNoir
Location Sampled:	TP- 31
Material Description:	Tan & Reddish Tan Silty Sand
Sampled By:	Jacob LeNoir
Technician:	T. Sliger
Date:	8/28/2009

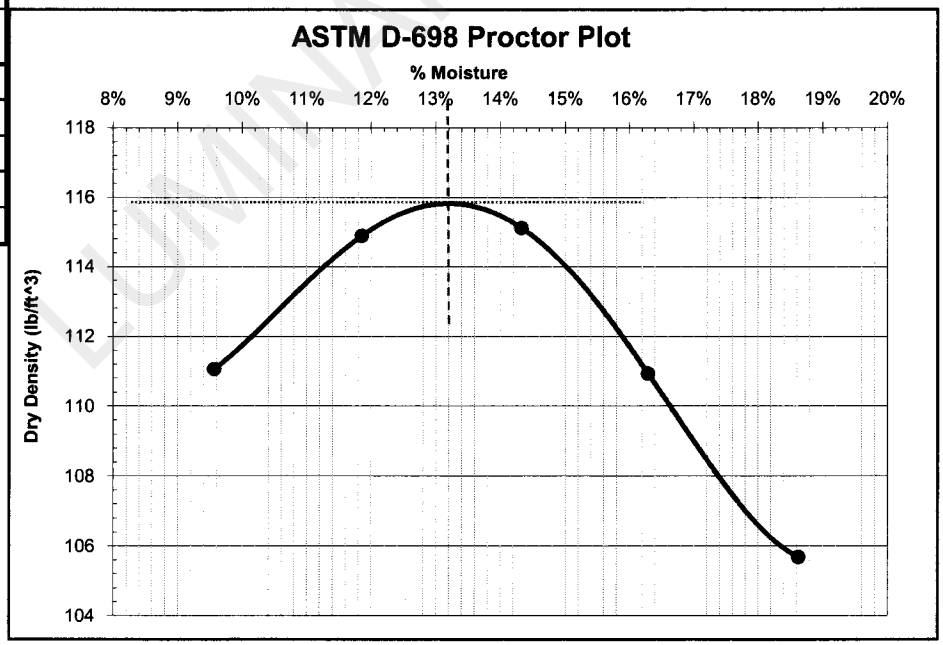
Maximum Dry Density: (ASTM D 698)	115.9	(lb/ft^3)
Optimum Moisture Content:	13.2	(%)

Classification

LL	20
PL	17
PI	3

-200 Sieve	27%
+40 Sieve	2%
+4 Sieve	1%

Proctor Points	
% Moisture	Dry Density (lb/ft^3)
9.6%	111.1
11.9%	114.9
14.3%	115.1
16.3%	110.9
18.6%	105.7



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